Horizon 2020

Call: H2020-ICT-2016-2017

(Information and Communication Technologies Call)

Topic: ICT-15-2016-2017

Type of action: IA

(Innovation action)

Proposal number: 731795

Proposal acronym: ELECTRA

Deadline Id: H2020-ICT-2016-1

Table of contents

How to fill in the forms

The administrative forms must be filled in for each proposal using the templates available in the submission system. Some data fields in the administrative forms are pre-filled based on the previous steps in the submission wizard.

Proposal ID **731795** *Acronym* **ELECTRA**

1 - General information

Topic	ICT-15-2016-2017
Call Identifier	H2020-ICT-2016-2017
Type of Action	IA
Deadline Id	H2020-ICT-2016-1

Acronym: ELECTRA

Proposal title*: Energy vaLuE Chain Transformation thRough big datA technoLogies

Note that for technical reasons, the following characters are not accepted in the Proposal Title and will be removed: < > " &

Duration in months: *36*

Fixed keyword 1	*Geo-information and spatial data analysis*	Add	
Fixed keyword 2	*Web and information systems, database systems, information re*	Add	Remove
Fixed keyword 3	*Data visualization*	Add	Remove
Fixed keyword 4	*Real time data analytics*	Add	Remove
Fixed keyword 5	*Very large data bases*	Add	Remove

Free keywords: *Enter any words you think give extra detail of the scope of your proposal (max 200 characters with spaces).*

Proposal ID **731795** *Acronym* **ELECTRA**

Abstract

Digital technologies are among the key enablers for achieving every single goal of the Energy Union: an integrated, reliable and low-emission energy market, fostering innovation and competitiveness. Digitising Europe's energy market will support a new, more customer centric paradigm with new roles for both current stakeholders and many new players in the field. ELECTRA will adopt Big Data technologies and link them to the Energy value chains by implementing large scale pilots to bring value and benefits to the vast amount of data generated in the energy domain; the overall aim is accelerate the transition process of the European Energy Sector. ELECTRA will bring results beyond the current state of practice (deployment of smart metering, automation/control technologies) in the energy market's four main domains: generation, distribution, retail and management. ELECTRA
In order to reach their main objectives, the ELECTRA consortium has defined a work plan consisting of four main pillars:
• Identify an Holistic methodology to validate and deploy digitalized solutions for the energy sector
• Given the steady increase in the installation of smart meters (energy, water, gas, etc.), provisioning of Big Data tools initially for Energy
• Delivery of added value services & successful solutions enabling the Energy value chain transformation
• Increase the awareness of big data benefits to the industrial sector and boost market adoption of Big Data solutions in the Energy Sector
ELECTRA will facilitate a cooperation of stakeholders along the entire energy value chain in order to validate the benefits of Big Data analytics in a wide range of business processes, development and demonstration of innovative business models will together with the leverage of additional investments and a strategy for technology transfer and dissemination ensure industry uptake, and ultimately increased competitiveness, both for the European energy market and the ICT sector.

Remaining characters 24

Has this proposal (or a very similar one) been submitted in the past 2 years in response to a call for proposals under the 7th Framework Programme, Horizon 2020 or any other EU programme(s)? ○ Yes ◉ No

Proposal ID **731795** *Acronym* **ELECTRA**

Declarations

1) The coordinator declares to have the explicit consent of all applicants on their participation and on the content of this proposal.	☒
2) The information contained in this proposal is correct and complete.	☒
3) This proposal complies with ethical principles (including the highest standards of research integrity — as set out, for instance, in the European Code of Conduct for Research Integrity — and including, in particular, avoiding fabrication, falsification, plagiarism or other research misconduct).	☒

4) The coordinator confirms:

- to have carried out the self-check of the financial capacity of the organisation on http://ec.europa.eu/research/participants/portal/desktop/en/organisations/lfv.html or to be covered by a financial viability check in an EU project for the last closed financial year. Where the result was "weak" or "insufficient", the coordinator confirms being aware of the measures that may be imposed in accordance with the H2020 Grants Manual (Chapter on Financial capacity check); or	◉
- is exempt from the financial capacity check being a public body including international organisations, higher or secondary education establishment or a legal entity, whose viability is guaranteed by a Member State or associated country, as defined in the H2020 Grants Manual (Chapter on Financial capacity check); or	○
- as sole participant in the proposal is exempt from the financial capacity check.	○

5) The coordinator hereby declares that each applicant has confirmed:

- they are fully eligible in accordance with the criteria set out in the specific call for proposals; and	☒
- they have the financial and operational capacity to carry out the proposed action.	☒

The coordinator is only responsible for the correctness of the information relating to his/her own organisation. Each applicant remains responsible for the correctness of the information related to him/her and declared above. Where the proposal to be retained for EU funding, the coordinator and each beneficiary applicant will be required to present a formal declaration in this respect.

According to Article 131 of the Financial Regulation of 25 October 2012 on the financial rules applicable to the general budget of the Union (Official Journal L 298 of 26.10.2012, p. 1) and Article 145 of its Rules of Application (Official Journal L 362, 31.12.2012, p.1) applicants found guilty of misrepresentation may be subject to administrative and financial penalties under certain conditions.

Personal data protection

Your reply to the grant application will involve the recording and processing of personal data (such as your name, address and CV), which will be processed pursuant to Regulation (EC) No 45/2001 on the protection of individuals with regard to the processing of personal data by the Community institutions and bodies and on the free movement of such data. Unless indicated otherwise, your replies to the questions in this form and any personal data requested are required to assess your grant application in accordance with the specifications of the call for proposals and will be processed solely for that purpose. Details concerning the processing of your personal data are available on the privacy statement. Applicants may lodge a complaint about the processing of their personal data with the European Data Protection Supervisor at any time.

Your personal data may be registered in the Early Warning System (EWS) only or both in the EWS and Central Exclusion Database (CED) by the Accounting Officer of the Commission, should you be in one of the situations mentioned in:
-the Commission Decision 2008/969 of 16.12.2008 on the Early Warning System (for more information see the Privacy Statement), or
-the Commission Regulation 2008/1302 of 17.12.2008 on the Central Exclusion Database (for more information see the Privacy Statement) .

Proposal ID **731795** *Acronym* **ELECTRA**

List of participants

#	Participant Legal Name	Country
1	ATOS SPAIN SA	Spain
2	GAS NATURAL SDG SA	Spain
3	GAS NATURAL FENOSA GENERACIÓN, S.L.	Spain
4	UNION FENOSA DISTRIBUCION SA	Spain
5	FUNDACIO EURECAT	Spain
6	BARCELONA SUPERCOMPUTING CENTER - CENTRO NACIONAL DE SUPERCOMPUTACION	Spain
7	ZABALA INNOVATION CONSULTING, S.A.	Spain
8	COMMISSARIAT A L ENERGIE ATOMIQUE ET AUX ENERGIES ALTERNATIVES	France
9	ELECTRICITE DE FRANCE	France
10	ORANGE SA	France
11	POWEL AS	Norway
12	STIFTELSEN SINTEF	Norway
13	SINTEF ENERGI AS	Norway
14	The Norwegian Smartgrid Centre	Norway
15	COMPUTAS AS	Norway
16	HAFSLUND NETT AS	Norway
17	DANMARKS TEKNISKE UNIVERSITET	Denmark
18	NYFORS ENTERPRISE AS	Denmark
19	ENFOR AS	Denmark
20	ENEL INGEGNERIA E RICERCA SPA	Italy
21	ENEL GREEN POWER	Italy

Proposal ID **731795** *Acronym* **ELECTRA**

#	Participant Legal Name	Country
22	FLYBY SRL	Italy
23	ALMA MATER STUDIORUM - UNIVERSITA DI BOLOGNA	Italy
24	SAP SE	Germany
25	FUNDACION TECNALIA RESEARCH & INNOVATION	Spain
26	RICOH SPAIN IT SERVICES SLU	Spain
27	NOVASOL AS	Denmark
28	SDG consulting Italia S.p.A.	Italy
29	YOURIS.COM	Belgium
30	CHINA ELECTRIC POWER RESEARCH INSTITUTE (SEAL) SOE	China (People's Republic of)

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **ATOS SPAIN SA**

2 - Administrative data of participating organisations

PIC	***Legal name***
999993856	*ATOS SPAIN SA*

Short name: ATOS SPAIN SA

Address of the organisation

Street CALLE DE ALBARRACIN 25

Town MADRID

Postcode 28037

Country Spain

Webpage www.atos.net

Legal Status of your organisation

Research and Innovation legal statuses

Public body ..... no
Non-profit ..... no
International organisation ..... no
International organisation of European interest ..... no
Secondary or Higher education establishment ..... no
Research organisation ..... no

Legal person ..... yes

Enterprise Data

SME self-declared status ..... 2013 - no
SME self-assessment ..... unknown
SME validation sme ..... unknown

Based on the above details of the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

NACE Code: 72 - Scientific research and development

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **ATOS SPAIN SA**

Department(s) carrying out the proposed work

Department 1

Department name: Atos Research & Innovattion ☐ not applicable

☒ Same as organisation address

Street: CALLE DE ALBARRACIN 25

Town: MADRID

Postcode: 28037

Country: Spain

Dependencies with other proposal participants

Character of dependence	***Participant***	

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **ATOS SPAIN SA**

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title: Mr. Sex: (•) Male ( ) Female

First name: **Martin** Last name: **WAGNER**

E-Mail: **martin.2.wagner@atos.net**

Position in org.: Project Manager

Department: Energy & Transportation ☐ Same as organisation

☒ Same as organisation address

Street: CALLE DE ALBARRACIN 25

Town: MADRID Post code: 28037

Country: Spain

Website:

Phone 1: +xxx xxxxxxxxx Phone 2: +xxx xxxxxxxxx Fax: +xxx xxxxxxxxx

Other contact persons

First Name	*Last Name*	*E-mail*	*Phone*
Andrea	Rossi	andrea.rossi@atos.net	
Juan	Rico	juan.rico@atos.net	

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **GNF**

PIC	***Legal name***
990556047	*GAS NATURAL SDG SA*

Short name: GNF

Address of the organisation

Street PLACA DEL GAS 1

Town BARCELONA

Postcode 08003

Country Spain

Webpage www.gasnatural.com

Legal Status of your organisation

Research and Innovation legal statuses

Public body ..... no

Non-profit ..... no

International organisation ..... no

International organisation of European interest ..... no

Secondary or Higher education establishment ..... no

Research organisation ..... no

Legal person ..... yes

Enterprise Data

SME self-declared status ..... 2012 - no

SME self-assessment ..... unknown

SME validation sme ..... unknown

Based on the above details of the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

NACE Code: 3510 - Electric power generation, transmission and distribution

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **GNF**

Department(s) carrying out the proposed work

Department 1

Department name: Technology Programmes Department ☐ not applicable

☒ Same as organisation address

Street: PLACA DEL GAS 1

Town: BARCELONA

Postcode: 08003

Country: Spain

Dependencies with other proposal participants

Character of dependence	***Participant***	

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **GNF**

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title: Mrs

Sex: ○ Male ◉ Female

First name: **Trinidad**

Last name: **Carretero**

E-Mail: **mtcarretero@gasnatural.com**

Position in org.: Technology Programmes Director

Department: Technology Programmes

☐ Same as organisation

☒ Same as organisation address

Street: PLACA DEL GAS 1

Town: BARCELONA

Post code: 08003

Country: Spain

Website: www.gasnatural.com

Phone 1: +34934025456

Phone 2: *+xxx xxxxxxxxx*

Fax: *+xxx xxxxxxxxx*

Other contact persons

First Name	***Last Name***	***E-mail***	***Phone***
Albert	Amargós	aamargos@gasnaturalfenosa.com	+34934025456

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **GEN**

PIC	***Legal name***
920263542	*GAS NATURAL FENOSA GENERACIÓN, S.L.*

Short name: GEN

Address of the organisation

Street Plaza del Gas, 1

Town Barcelona

Postcode 08003

Country Spain

Webpage www.gasnaturalfenosa.com

Legal Status of your organisation

Research and Innovation legal statuses

Public body ..... no

Non-profit ..... no

International organisation ..... no

International organisation of European interest ..... no

Secondary or Higher education establishment ..... no

Research organisation ..... no

Legal person ..... yes

Enterprise Data

SME self-declared status ..... unknown

SME self-assessment ..... unknown

SME validation sme ..... unknown

Based on the above details of the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

NACE Code: -

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **GEN**

Department(s) carrying out the proposed work

Department 1

Department name: CESOM – Generación España ☐ not applicable

☐ Same as organisation address

Street: Avenida de San Luis, 77

Town: Madrid

Postcode: 28033

Country: Spain

Dependencies with other proposal participants

Character of dependence	***Participant***	

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **GEN**

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title: Mr. Sex: (•) Male ( ) Female

First name: **Alberto** Last name: **Martinez Zabaleta**

E-Mail: **amartinezz@gasnaturalfenosa.com**

Position in org.: -

Department: CESOM ☐ Same as organisation

☐ Same as organisation address

Street: Avenida de San Luis, 77

Town: Madrid Post code: 28033

Country: Spain

Website: www.gasnaturalfenosa.com

Phone 1: +34 915 893 318 Phone 2: +xxx xxxxxxxxx Fax: +xxx xxxxxxxxx

Other contact persons

First Name	***Last Name***	***E-mail***	***Phone***
Anna	Domenech	adomenech@zabala.es	

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **UFD**

PIC	***Legal name***
963498382	*UNION FENOSA DISTRIBUCION SA*

Short name: UFD

Address of the organisation

Street AVENIDA SAN LUIS 77

Town MADRID

Postcode 28033

Country Spain

Webpage www.gasnaturalfenosa.es

Legal Status of your organisation

Research and Innovation legal statuses

Public body ..... no

Non-profit ..... no

International organisation ..... no

International organisation of European interest ..... no

Secondary or Higher education establishment ..... no

Research organisation ..... no

Legal person ..... yes

Enterprise Data

SME self-declared status ..... 2011 - no

SME self-assessment ..... unknown

SME validation sme ..... unknown

Based on the above details of the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

NACE Code: E - Water supply

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **UFD**

Department(s) carrying out the proposed work

Department 1

Department name: Smart Grids ☐ not applicable

☒ Same as organisation address

Street: AVENIDA SAN LUIS 77

Town: MADRID

Postcode: 28033

Country: Spain

Dependencies with other proposal participants

Character of dependence	***Participant***	

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **UFD**

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title: Mr. Sex: (•) Male ( ) Female

First name **Mariano Gaudo** Last name **Gaudo**

E-Mail **mgaudo@gasnaturalfenosa.com**

Position in org.: Head of Smart Grids Activities

Department: Smart Grids ☐ Same as organisation

☒ Same as organisation address

Street: AVENIDA SAN LUIS 77

Town: MADRID Post code: 28033

Country: Spain

Website: www.gasnaturalfenosa.com

Phone 1: +34 912 015 594 Phone 2: +xxx xxxxxxxxx Fax: +xxx xxxxxxxxx

Other contact persons

First Name	***Last Name***	***E-mail***	***Phone***
Ramon	Jane	rjane@gasnaturalfenosa.com	+34 934029141

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **EURECAT**

PIC	***Legal name***
928030235	*FUNDACIO EURECAT*

Short name: EURECAT

Address of the organisation

Street AVENIDA UNIVERSITAT AUTONOMA 23

Town CERDANYOLA DEL VALLES (BARCELONA)

Postcode 08290

Country Spain

Webpage www.eurecat.org/

Legal Status of your organisation

Research and Innovation legal statuses

Public body ..... no

Legal person ..... yes

Non-profit ..... yes

International organisation ..... no

International organisation of European interest ..... no

Secondary or Higher education establishment ..... no

Research organisation ..... yes

Enterprise Data

SME self-declared status ..... 2014 - no

SME self-assessment ..... unknown

SME validation sme ..... unknown

Based on the above details of the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

NACE Code: -

Department(s) carrying out the proposed work

Department 1

Department name: Smart Management Systems ☐ not applicable

☒ Same as organisation address

Street: AVENIDA UNIVERSITAT AUTONOMA 23

Town: CERDANYOLA DEL VALLES (BARCELONA)

Postcode: 08290

Country: Spain

Department 2

Department name: Big Data Analytics ☐ not applicable

☐ Same as organisation address

Street: Av. Diagonal 177

Town: Barcelona

Postcode: 08018

Country: Spain

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **EURECAT**

Department 3

Department name: IT Security ☐ not applicable

☐ Same as organisation address

Street: Av. Diagonal 177

Town: Barcelona

Postcode: 08018

Country: Spain

Dependencies with other proposal participants

Character of dependence	***Participant***	

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **EURECAT**

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title: Ms

Sex: ○ Male ◉ Female

First name: **Regina** Last name: **Enrich**

E-Mail: **regina.enrich@eurecat.org**

Position in org.: Senior researcher

Department: Smart Management Systems ☐ Same as organisation

☒ Same as organisation address

Street: AVENIDA UNIVERSITAT AUTONOMA 23

Town: CERDANYOLA DEL VALLES (BARCELONA) Post code: 08290

Country: Spain

Website: www.eurecat.org

Phone 1: +34 93 594 47 00 Phone 2: +xxx xxxxxxxxx Fax: +xxx xxxxxxxxx

Other contact persons

First Name	***Last Name***	***E-mail***	***Phone***
Lucia	Recio	lucia.recio@eurecat.org	+34 93 238 14 00
Gabriel	Anzaldi	gabriel.anzaldi@eurecat.org	+34 93 594 47 00

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **BSC**

PIC	***Legal name***
999655520	*BARCELONA SUPERCOMPUTING CENTER - CENTRO NACIONAL DE SUPERCOMPUTACION*

Short name: BSC

Address of the organisation

Street Calle Jordi Girona 31

Town BARCELONA

Postcode 08034

Country Spain

Webpage www.bsc.es

Legal Status of your organisation

Research and Innovation legal statuses

Public body ..... yes

Non-profit ..... yes

International organisation ..... no

International organisation of European interest ..... no

Secondary or Higher education establishment ..... no

Research organisation ..... yes

Legal person ..... yes

Enterprise Data

SME self-declared status ..... 2011 - no

SME self-assessment ..... unknown

SME validation sme ..... unknown

Based on the above details of the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

NACE Code: 72 - Scientific research and development

Department(s) carrying out the proposed work

Department 1

Department name: Computer Science ☐ not applicable

☐ Same as organisation address

Street: Carrer Jordi Girona, 29

Town: Barcelona

Postcode: 08034

Country: Spain

Department 2

Department name: Earth Science ☐ not applicable

☐ Same as organisation address

Street: Carrer Jordi Girona, 29

Town: Barcelona

Postcode: 08034

Country: Spain

Dependencies with other proposal participants

Character of dependence	***Participant***	

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **BSC**

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title: Dr.

Sex: ○ Male ◉ Female

First name: **Rosa M.**

Last name: **Badia**

E-Mail: **rosa.m.badia@bsc.es**

Position in org.: Group Manager

Department: Computer Science - Workflows and Distributed Computing ☐ Same as organisation

☐ Same as organisation address

Street: Carrer Jordi Girona, 29

Town: Barcelona Post code: 08034

Country: Spain

Website: www.bsc.es

Phone 1: +34 934134075 Phone 2: +34 934137721 Fax: *+xxx xxxxxxxxx*

Other contact persons

First Name	***Last Name***	***E-mail***	***Phone***
Kim	Serradell	kim.serradell@bsc.es	+34934134051
Isabel	Martinez	isabel.martinez@bsc.es	+34934137570

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **ZABALA**

PIC	***Legal name***
996410094	*ZABALA INNOVATION CONSULTING, S.A.*

Short name: ZABALA

Address of the organisation

Street PASEO SANTXIKI 3 BIS

Town MUTILVA ALTA NAVARRA

Postcode 31192

Country Spain

Webpage www.zabala.es

Legal Status of your organisation

Research and Innovation legal statuses

Public body ..... no

Non-profit ..... no

International organisation ..... no

International organisation of European interest ..... no

Secondary or Higher education establishment ..... no

Research organisation ..... no

Legal person ..... yes

Enterprise Data

SME self-declared status ..... 2012 - yes

SME self-assessment ..... 2012 - yes

SME validation sme ..... 2011 - yes

Based on the above details of the Beneficiary Registry the organisation is an SME (small- and medium-sized enterprise) for the call.

NACE Code: 74.1 - Legal, accounting, auditing, consultancy

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **ZABALA**

Department(s) carrying out the proposed work

Department 1

Department name: European Projects ☐ not applicable

☒ Same as organisation address

Street: PASEO SANTXIKI 3 BIS

Town: MUTILVA ALTA NAVARRA

Postcode: 31192

Country: Spain

Dependencies with other proposal participants

Character of dependence	***Participant***	

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **ZABALA**

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title: Ms

Sex: ○ Male ◉ Female

First name: **Artiza** Last name: **Elosegui**

E-Mail: **aelosegui@zabala.es**

Position in org.: R&D and Innovation consultant

Department: European Projects ☐ Same as organisation

☒ Same as organisation address

Street: PASEO SANTXIKI 3 BIS

Town: MUTILVA ALTA NAVARRA Post code: 31192

Country: Spain

Website: www.zabala.eu

Phone 1: 0034948198000 Phone 2: 003225138122 Fax: *+xxx xxxxxxxxx*

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **CEA**

PIC	***Legal name***
999992401	*COMMISSARIAT A L ENERGIE ATOMIQUE ET AUX ENERGIES ALTERNATIVES*

Short name: CEA

Address of the organisation

Street RUE LEBLANC 25

Town PARIS 15

Postcode 75015

Country France

Webpage www.cea.fr

Legal Status of your organisation

Research and Innovation legal statuses

Public body ..... yes

Non-profit ..... yes

International organisation ..... no

International organisation of European interest ..... no

Secondary or Higher education establishment ..... no

Research organisation ..... yes

Legal person ..... yes

Enterprise Data

SME self-declared status ..... 2007 - no

SME self-assessment ..... unknown

SME validation sme ..... 2007 - no

Based on the above details of the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

NACE Code: - - Not applicable

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **CEA**

Department(s) carrying out the proposed work

Department 1

Department name: ORANGE/IMT/OLPS/BIZZ/INFSVC ☐ not applicable

☐ Same as organisation address

Street: 905 RUE ALBERT EINSTEIN

Town: SOPHIA ANTIPOLIS

Postcode: 06921

Country: France

Dependencies with other proposal participants

Character of dependence	***Participant***	

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **CEA**

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title: Mr.

Sex: (•) Male ( ) Female

First name: **Cédric** Last name: **Auliac**

E-Mail: **cedric.auliac@cea.fr**

Position in org.: -

Department: - ☐ Same as organisation

☒ Same as organisation address

Street: RUE LEBLANC 25

Town: PARIS 15 Post code: 75015

Country: France

Website:

Phone 1: Phone 2: +xxx xxxxxxxxx Fax: +xxx xxxxxxxxx

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **EDF**

PIC	***Legal name***
999926829	*ELECTRICITE DE FRANCE*

Short name: EDF

Address of the organisation

Street AVENUE DE WAGRAM 22

Town PARIS 08

Postcode 75008

Country France

Webpage www.edf.fr

Legal Status of your organisation

Research and Innovation legal statuses

Public body ..... no
Non-profit ..... no
International organisation ..... no
International organisation of European interest ..... no
Secondary or Higher education establishment ..... no
Research organisation ..... no
Legal person ..... yes

Enterprise Data

SME self-declared status ..... 2007 - no
SME self-assessment ..... unknown
SME validation sme ..... 2007 - no

Based on the above details of the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

NACE Code: 351 - Electric power generation, transmission and distribution

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **EDF**

Department(s) carrying out the proposed work

Department 1

Department name: EDF R&D Lab Saclay ☐ not applicable

☐ Same as organisation address

Street: 7 Bd Gaspard Monge

Town: PALAISEAU

Postcode: 91120

Country: France

Dependencies with other proposal participants

Character of dependence	***Participant***	

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **EDF**

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title: Dr.

Sex: (•) Male ( ) Female

First name: **Georges** Last name: **Hebrail**

E-Mail: **georges.hebrail@edf.fr**

Position in org.: Senior Researcher

Department: EDF R&D Lab Saclay ☐ Same as organisation

☐ Same as organisation address

Street: 7 Bd Gaspard Monge

Town: PALAISEAU Post code: 91120

Country: France

Website: http://researchers.edf.com

Phone 1: +33178194590 Phone 2: +xxx xxxxxxxxx Fax: +xxx xxxxxxxxx

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **ORANGE SA**

PIC	***Legal name***
999908981	*ORANGE SA*

Short name: ORANGE SA

Address of the organisation

Street RUE OLIVIER DE SERRES 78

Town PARIS

Postcode 75015

Country France

Webpage www.francetelecom.com

Legal Status of your organisation

Research and Innovation legal statuses

Public body ..... no

Non-profit ..... no

International organisation ..... no

International organisation of European interest ..... no

Secondary or Higher education establishment ..... no

Research organisation ..... no

Legal person ..... yes

Enterprise Data

SME self-declared status ..... 2013 - no

SME self-assessment ..... unknown

SME validation sme ..... unknown

Based on the above details of the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

NACE Code: 61 - Telecommunications

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **ORANGE SA**

Department(s) carrying out the proposed work

Department 1

Department name: ORANGE/IMT/OLPS/BIZZ/INFSVC ☐ not applicable

☐ Same as organisation address

Street: 905 RUE ALBERT EINSTEIN

Town: SOPHIA ANTIPOLIS

Postcode: 06921

Country: France

Dependencies with other proposal participants

Character of dependence	***Participant***	

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **ORANGE SA**

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title: Mr.

Sex: (•) Male ( ) Female

First name: **Thierry** Last name: **Nagellen**

E-Mail: **thierry.nagellen@orange.com**

Position in org.: RESPONSIBLE FOR STRATEGIC STUDIES

Department: ORANGE/IMT/OLPS/BIZZ/INFSVC ☐ Same as organisation

☐ Same as organisation address

Street: 905 RUE ALBERT EINSTEIN

Town: SOPHIA ANTIPOLIS Post code: 06921

Country: France

Website:

Phone 1: +33492945284 Phone 2: +33679850844 Fax: +33493653591

Other contact persons

First Name	***Last Name***	***E-mail***	***Phone***
Danièle	Le Borgne	daniele.leborgne@orange.com	+33299124591

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **POWEL AS**

PIC	***Legal name***
969460487	*POWEL AS*

Short name: POWEL AS

Address of the organisation

Street KLAEBUVEIEN 194

Town TRONDHEIM

Postcode 7037

Country Norway

Webpage www.powel.com

Legal Status of your organisation

Research and Innovation legal statuses

Public body ..... no

Non-profit ..... no

International organisation ..... no

International organisation of European interest ..... no

Secondary or Higher education establishment ..... no

Research organisation ..... no

Legal person ..... yes

Enterprise Data

SME self-declared status ..... 2011 - no

SME self-assessment ..... unknown

SME validation sme ..... unknown

Based on the above details of the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

NACE Code: 93 - Sports activities and amusement and recreation activities

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **POWEL AS**

Department(s) carrying out the proposed work

Department 1

Department name: ORANGE/IMT/OLPS/BIZZ/INFSVC ☐ not applicable

☐ Same as organisation address

Street: 905 RUE ALBERT EINSTEIN

Town: SOPHIA ANTIPOLIS

Postcode: 06921

Country: France

Dependencies with other proposal participants

Character of dependence	***Participant***	

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **POWEL AS**

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title: Mr.

Sex: (•) Male ( ) Female

First name: **Klaus**

Last name: **Livik**

E-Mail: **klaus.livik@powel.no**

Position in org.: -

Department: -

☐ Same as organisation

☒ Same as organisation address

Street: KLAEBUVEIEN 194

Town: TRONDHEIM

Post code: 7037

Country: Norway

Website:

Phone 1:

Phone 2: +xxx xxxxxxxxx

Fax: +xxx xxxxxxxxx

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **STIFTELSEN SINTEF**

PIC	***Legal name***
999980761	*STIFTELSEN SINTEF*

Short name: STIFTELSEN SINTEF

Address of the organisation

Street STRINDVEIEN 4

Town TRONDHEIM

Postcode 7034

Country Norway

Webpage www.sintef.no

Legal Status of your organisation

Research and Innovation legal statuses

Public body ..... no
Non-profit ..... yes
International organisation ..... no
International organisation of European interest ..... no
Secondary or Higher education establishment ..... no
Research organisation ..... yes
Legal person ..... yes

Enterprise Data

SME self-declared status ..... 2013 - no
SME self-assessment ..... unknown
SME validation sme ..... 2013 - no

Based on the above details of the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

NACE Code: 721 - Research and experimental development on natural sciences and engineering

Proposal ID **731795**	*Acronym* **ELECTRA**	*Short name* **STIFTELSEN SINTEF**

Department(s) carrying out the proposed work

Department 1

Department name: SINTEF ICT, Networked Systems and Services ☐ not applicable

☒ Same as organisation address

Street: STRINDVEIEN 4

Town: TRONDHEIM

Postcode: 7034

Country: Norway

Dependencies with other proposal participants

Character of dependence	***Participant***	

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **STIFTELSEN SINTEF**

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title: Dr.

Sex: (•) Male ( ) Female

First name: **Arne** Last name: **Berre**

E-Mail: **arne.j.berre@sintef.no**

Position in org.: Chief Scientist

Department: Networked Systems and Services ☐ Same as organisation

☐ Same as organisation address

Street: Forskningsveien 1

Town: Oslo Post code: 0314

Country: Norway

Website: www.sintef.no

Phone 1: +47 9204 7452 Phone 2: +xxx xxxxxxxxx Fax: +xxx xxxxxxxxx

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **SINTEF ENERGI AS**

PIC	***Legal name***
999513221	*SINTEF ENERGI AS*

Short name: SINTEF ENERGI AS

Address of the organisation

Street Sem Saelandsveg 11

Town TRONDHEIM

Postcode 7465

Country Norway

Webpage www.sintef.no

Legal Status of your organisation

Research and Innovation legal statuses

Public body ..... no

Non-profit ..... yes

International organisation ..... no

International organisation of European interest ..... no

Secondary or Higher education establishment ..... no

Research organisation ..... yes

Legal person ..... yes

Enterprise Data

SME self-declared status ..... 2013 - no

SME self-assessment ..... unknown

SME validation sme ..... unknown

Based on the above details of the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

NACE Code: 721 - Research and experimental development on natural sciences and engineering

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **SINTEF ENERGI AS**

Department(s) carrying out the proposed work

Department 1

Department name: SINTEF Energi, Energy Systems ☐ not applicable

☒ Same as organisation address

Street: Sem Saelandsveg 11

Town: TRONDHEIM

Postcode: 7465

Country: Norway

Dependencies with other proposal participants

Character of dependence	***Participant***	

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **SINTEF ENERGI AS**

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title: Dr. Sex: (•) Male ( ) Female

First name: **Boye** Last name: **Annfelt Høverstad**

E-Mail: **boyeannfelt.hoverstad@sintef.no**

Position in org.: Research Manager

Department: SINTEF ENERGI AS ☒ Same as organisation

☒ Same as organisation address

Street: Sem Saelandsveg 11

Town: TRONDHEIM Post code: 7465

Country: Norway

Website:

Phone 1: +47 95154202 Phone 2: +xxx xxxxxxxxx Fax: +xxx xxxxxxxxx

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **The Norwegian Smartgrid Centre**

PIC	***Legal name***
921154778	*The Norwegian Smartgrid Centre*

Short name: The Norwegian Smartgrid Centre

Address of the organisation

Street Sem Sælands vei 11

Town Trondheim

Postcode 7465

Country Norway

Webpage www.smartgrids.no

Legal Status of your organisation

Research and Innovation legal statuses

Public body ..... no

Non-profit ..... yes

International organisation ..... no

International organisation of European interest ..... no

Secondary or Higher education establishment ..... no

Research organisation ..... no

Legal person ..... yes

Enterprise Data

SME self-declared status ..... unknown

SME self-assessment ..... unknown

SME validation sme ..... unknown

Based on the above details of the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

NACE Code: 9499 - Activities of other membership organizations n.e.c.

Proposal ID **731795**	*Acronym* **ELECTRA**	*Short name* **The Norwegian Smartgrid Centre**

Department(s) carrying out the proposed work

No departement involved

Department name ☒ not applicable

☐ Same as organisation address

Street *Please enter street name and number.*

Town

Postcode

Country

Dependencies with other proposal participants

Character of dependence	***Participant***	

Proposal ID **731795**	*Acronym* **ELECTRA**	*Short name* **The Norwegian Smartgrid Centre**

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title: Dr.

Sex: ○ Male ◉ Female

First name: **Grete**

Last name: **Coldevin**

E-Mail: **grete.coldevin@smartgrids.no**

Position in org.: Executive Director

Department: The Norwegian Smartgrid Centre ☒ Same as organisation

☒ Same as organisation address

Street: Sem Sælands vei 11

Town: Trondheim

Post code: 7465

Country: Norway

Website: www.smartgrids.no

Phone 1: +47 93087713

Phone 2: *+xxx xxxxxxxxx*

Fax: *+xxx xxxxxxxxx*

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **COMPUTAS**

PIC	***Legal name***
963070418	*COMPUTAS AS*

Short name: COMPUTAS

Address of the organisation

Street LYSAKER TORG 45

Town LYSAKER

Postcode 1327

Country Norway

Webpage http://www.computas.com

Legal Status of your organisation

Research and Innovation legal statuses

Public body ..... no
Non-profit ..... no
International organisation ..... no
International organisation of European interest ..... no
Secondary or Higher education establishment ..... no
Research organisation ..... no
Legal person ..... yes

Enterprise Data

SME self-declared status ..... 2010 - yes
SME self-assessment ..... unknown
SME validation sme ..... 2010 - yes

Based on the above details of the Beneficiary Registry the organisation is an SME (small- and medium-sized enterprise) for the call.

NACE Code: 72 - Scientific research and development

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **COMPUTAS**

Department(s) carrying out the proposed work

Department 1

Department name: ORANGE/IMT/OLPS/BIZZ/INFSVC ☐ not applicable

☐ Same as organisation address

Street: 905 RUE ALBERT EINSTEIN

Town: SOPHIA ANTIPOLIS

Postcode: 06921

Country: France

Dependencies with other proposal participants

Character of dependence	***Participant***	

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **COMPUTAS**

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title: Mr.

Sex: (•) Male ( ) Female

First name: **Roar** Last name: **Fjellheim**

E-Mail: **roar.fjellheim@computas.com**

Position in org.: -

Department: COMPUTAS AS ☒ Same as organisation

☒ Same as organisation address

Street: LYSAKER TORG 45

Town: LYSAKER Post code: 1327

Country: Norway

Website:

Phone 1: Phone 2: +xxx xxxxxxxxx Fax: +xxx xxxxxxxxx

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **HAFSLUND NETT AS**

PIC	***Legal name***
939653842	*HAFSLUND NETT AS*

Short name: HAFSLUND NETT AS

Address of the organisation

Street Drammensveien 144

Town Oslo

Postcode 0247

Country Norway

Webpage www.hafslundnett.no

Legal Status of your organisation

Research and Innovation legal statuses

Public body ..... no

Non-profit ..... no

International organisation ..... no

International organisation of European interest ..... no

Secondary or Higher education establishment ..... no

Research organisation ..... no

Legal person ..... yes

Enterprise Data

SME self-declared status..... unknown

SME self-assessment ..... unknown

SME validation sme..... unknown

Based on the above details of the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

NACE Code: -

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **HAFSLUND NETT AS**

Department(s) carrying out the proposed work

Department 1

Department name: ORANGE/IMT/OLPS/BIZZ/INFSVC ☐ not applicable

☐ Same as organisation address

Street: 905 RUE ALBERT EINSTEIN

Town: SOPHIA ANTIPOLIS

Postcode: 06921

Country: France

Dependencies with other proposal participants

Character of dependence	***Participant***	

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **HAFSLUND NETT AS**

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title: Mr.

Sex: (•) Male ( ) Female

First name: **Kjell**

Last name: **Anders**

E-Mail: **kjell.anders.tutvedt@hafslund.no**

Position in org.: -

Department: HAFSLUND NETT AS ☒ Same as organisation

☒ Same as organisation address

Street: Drammensveien 144

Town: Oslo

Post code: 0247

Country: Norway

Website:

Phone 1:

Phone 2: +xxx xxxxxxxxx

Fax: +xxx xxxxxxxxx

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **DTU**

PIC	***Legal name***
999990655	*DANMARKS TEKNISKE UNIVERSITET*

Short name: DTU

Address of the organisation

Street Anker Engelundsvej 1, Bygning 101

Town KONGENS LYNGBY

Postcode 2800

Country Denmark

Webpage www.dtu.dk

Legal Status of your organisation

Research and Innovation legal statuses

Public body ..... yes
Non-profit ..... yes
International organisation ..... no
International organisation of European interest ..... no
Secondary or Higher education establishment ..... yes
Research organisation ..... yes

Legal person ..... yes

Enterprise Data

SME self-declared status ..... 2013 - no
SME self-assessment ..... unknown
SME validation sme ..... unknown

Based on the above details of the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

NACE Code: - - Not applicable

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **DTU**

Department(s) carrying out the proposed work

Department 1

Department name: ORANGE/IMT/OLPS/BIZZ/INFSVC ☐ not applicable

☐ Same as organisation address

Street: 905 RUE ALBERT EINSTEIN

Town: SOPHIA ANTIPOLIS

Postcode: 06921

Country: France

Dependencies with other proposal participants

Character of dependence	***Participant***	

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **DTU**

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title: Prof. Sex: (•) Male ( ) Female

First name: **Henrik** Last name: **Madsen**

E-Mail: **hmad@dtu.dk**

Position in org.: Professor

Department: DTU Compute ☐ Same as organisation

☐ Same as organisation address

Street: Richard Petersens Plads - Building 324

Town: Kgs. Lyngby Post code: DK-2800

Country: Denmark

Website: http://www.compute.dtu.dk/

Phone 1: 45 45253408 Phone 2: +45 20834304 Fax: *+xxx xxxxxxxxx*

Other contact persons

First Name	***Last Name***	***E-mail***	***Phone***
Janne Kofod	Lassen	jkla@dtu.dk	+4545253420

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **NYFORS ENTERPRISE AS**

PIC	***Legal name***
928295142	*NYFORS ENTERPRISE AS*

Short name: NYFORS ENTERPRISE AS

Address of the organisation

Street SALTUMVEJ 22

Town BRONDERSLEV

Postcode 9700

Country Denmark

Webpage www.nyfors.dk

Legal Status of your organisation

Research and Innovation legal statuses

Public body ..... no

Non-profit ..... no

International organisation ..... no

International organisation of European interest ..... no

Secondary or Higher education establishment ..... no

Research organisation ..... no

Legal person ..... yes

Enterprise Data

SME self-declared status ..... 2014 - yes

SME self-assessment ..... unknown

SME validation sme ..... unknown

Based on the above details of the Beneficiary Registry the organisation is an SME (small- and medium-sized enterprise) for the call.

NACE Code: 351 - Electric power generation, transmission and distribution

Proposal ID **731795**	*Acronym* **ELECTRA**	*Short name* **NYFORS ENTERPRISE AS**

Department(s) carrying out the proposed work

No departement involved

Department name ☒ not applicable

☐ Same as organisation address

Street *Please enter street name and number.*

Town

Postcode

Country

Dependencies with other proposal participants

Character of dependence	***Participant***	

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **NYFORS ENTERPRISE AS**

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title: Mr. Sex: (•) Male ( ) Female

First name: **Johan** Last name: **Ungermann Poulsen**

E-Mail: **jup@nyfors.dk**

Position in org.: Project Manager

Department: NYFORS ENTERPRISE AS ☒ Same as organisation

☒ Same as organisation address

Street: SALTUMVEJ 22

Town: BRONDERSLEV Post code: 9700

Country: Denmark

Website:

Phone 1: Phone 2: +xxx xxxxxxxxx Fax: +xxx xxxxxxxxx

Other contact persons

First Name	*Last Name*	*E-mail*	*Phone*
Henrik	Mentz	hm@nyfors.dk	

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **ENFOR**

PIC	***Legal name***
968694478	*ENFOR AS*

Short name: ENFOR

Address of the organisation

Street LYNGSO ALLE 3

Town HORSHOLM

Postcode 2970

Country Denmark

Webpage www.enfor.dk

Legal Status of your organisation

Research and Innovation legal statuses

Public body ..... no

Non-profit ..... no

International organisation ..... no

International organisation of European interest ..... no

Secondary or Higher education establishment ..... no

Research organisation ..... no

Legal person ..... yes

Enterprise Data

SME self-declared status ..... 2009 - yes

SME self-assessment ..... unknown

SME validation sme ..... 2009 - yes

Based on the above details of the Beneficiary Registry the organisation is an SME (small- and medium-sized enterprise) for the call.

NACE Code: 72 - Scientific research and development

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **ENFOR**

Department(s) carrying out the proposed work

Department 1

Department name: ORANGE/IMT/OLPS/BIZZ/INFSVC ☐ not applicable

☐ Same as organisation address

Street: 905 RUE ALBERT EINSTEIN

Town: SOPHIA ANTIPOLIS

Postcode: 06921

Country: France

Dependencies with other proposal participants

Character of dependence	***Participant***	

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **ENFOR**

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title: Mr.

Sex: (•) Male ( ) Female

First name: **Henrik**

Last name: **Aalborg Nielsen**

E-Mail: **han@enfor.dk**

Position in org.: CTO

Department: ENFOR AS

☒ Same as organisation

☒ Same as organisation address

Street: LYNGSO ALLE 3

Town: HORSHOLM

Post code: 2970

Country: Denmark

Website: www.enfor.dk

Phone 1: +45 45350350

Phone 2: +xxx xxxxxxxxx

Fax: +xxx xxxxxxxxx

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **ENEL INGEGNERIA E RICERCA SPA**

PIC	***Legal name***
995503920	*ENEL INGEGNERIA E RICERCA SPA*

Short name: ENEL INGEGNERIA E RICERCA SPA

Address of the organisation

Street VIA MANTOVA 24

Town Rome

Postcode 00198

Country Italy

Webpage www.enel.it

Legal Status of your organisation

Research and Innovation legal statuses

Public body ..... no

Non-profit ..... no

International organisation ..... no

International organisation of European interest ..... no

Secondary or Higher education establishment ..... no

Research organisation ..... no

Legal person ..... yes

Enterprise Data

SME self-declared status ..... 2008 - no

SME self-assessment ..... unknown

SME validation sme ..... 2008 - no

Based on the above details of the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

NACE Code: E - Water supply

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **ENEL INGEGNERIA E RICERCA SPA**

Department(s) carrying out the proposed work

Department 1

Department name: Research and Innovation - Global Thermal Generation ☐ not applicable

☐ Same as organisation address

Street: Via Andrea Pisano, 120

Town: Pisa

Postcode: 56122

Country: Italy

Dependencies with other proposal participants

Character of dependence	***Participant***	
Same Group	ENEL GREEN POWER	

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **ENEL INGEGNERIA E RICERCA SPA**

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title: Dr.

Sex: ○ Male ◉ Female

First name: **Daniela** Last name: **Pestonesi**

E-Mail: **daniela.pestonesi@enel.com**

Position in org.: Senior Researcher

Department: GEN. SYSTEMS, EFFICIENCY & FLEXIBILITY - Reserach & Innovation ☐ Same as organisation

☐ Same as organisation address

Street: Via Andrea Pisano, 120

Town: Pisa Post code: 56122

Country: Italy

Website: www.enel.it

Phone 1: +39 050 6185746 Phone 2: +39 3287263926 Fax: *+xxx xxxxxxxxx*

Other contact persons

First Name	***Last Name***	***E-mail***	***Phone***
Eleonora	Melone	eleonora.melone@enel.com	+390506185323
Silvia	Gasperetti	silvia.gasperetti@enel.com	+390506185903

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **EGP**

PIC	***Legal name***
985816433	*ENEL GREEN POWER*

Short name: EGP

Address of the organisation

Street VIALE REGINA MARGHERITA 125

Town ROMA

Postcode 00198

Country Italy

Webpage http://www.enel.com

Legal Status of your organisation

Research and Innovation legal statuses

Public body ..... no

Non-profit ..... no

International organisation ..... no

International organisation of European interest ..... no

Secondary or Higher education establishment ..... no

Research organisation ..... no

Legal person ..... yes

Enterprise Data

SME self-declared status ..... 2011 - no

SME self-assessment ..... unknown

SME validation sme ..... 2011 - no

Based on the above details of the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

NACE Code: E - Water supply

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **EGP**

Department(s) carrying out the proposed work

Department 1

Department name: Innovation and Sustainability ☐ not applicable

☒ Same as organisation address

Street: VIALE REGINA MARGHERITA 125

Town: ROMA

Postcode: 00198

Country: Italy

Dependencies with other proposal participants

Character of dependence	***Participant***	
Same Group	ENEL INGEGNERIA E RICERCA SPA	

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **EGP**

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title: Dr.

Sex: ○ Male ◉ Female

First name: **Sandra**

Last name: **Scalari**

E-Mail: **sandra.scalari@enel.com**

Position in org.: Senuior Reseracher

Department: Innovation and Sustainability - Open Innovation, Planning & Repor

☐ Same as organisation

☐ Same as organisation address

Street: Via Andrea Pisano, 120

Town: PISA

Post code: 56122

Country: Italy

Website: www.enelgreenpower.com

Phone 1: +39 050 6185582

Phone 2: *+xxx xxxxxxxxx*

Fax: *+xxx xxxxxxxxx*

Other contact persons

First Name	***Last Name***	***E-mail***	***Phone***
Maurizio	Gentili	maurizio.gentili@enel.it	+390506185822

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **Flyby**

PIC	***Legal name***
998685714	*FLYBY SRL*

Short name: Flyby

Address of the organisation

Street VIA PUINI CARLO 97

Town LIVORNO

Postcode 57128

Country Italy

Webpage http://www.flyby.it

Legal Status of your organisation

Research and Innovation legal statuses

Public body ..... no
Non-profit ..... no
International organisation ..... no
International organisation of European interest ..... no
Secondary or Higher education establishment ..... no
Research organisation ..... no
Legal person ..... yes

Enterprise Data

SME self-declared status ..... 2012 - yes
SME self-assessment ..... 2012 - yes
SME validation sme ..... 2009 - yes

Based on the above details of the Beneficiary Registry the organisation is an SME (small- and medium-sized enterprise) for the call.

NACE Code: 93 - Sports activities and amusement and recreation activities

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **Flyby**

Department(s) carrying out the proposed work

Department 1

Department name: Innovation and Sustainability ☐ not applicable

☒ Same as organisation address

Street: VIA PUINI CARLO 97

Town: LIVORNO

Postcode: 57128

Country: Italy

Dependencies with other proposal participants

Character of dependence	***Participant***	
Same Group	ENEL INGEGNERIA E RICERCA SPA	

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **Flyby**

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title: Mr.

Sex: (•) Male ( ) Female

First name: **Andrea** Last name: **Masini**

E-Mail: **andrea.masini@flyby.it**

Position in org.: Chief Technology Office

Department: Technology Office ☐ Same as organisation

☒ Same as organisation address

Street: VIA PUINI CARLO 97

Town: LIVORNO Post code: 57128

Country: Italy

Website:

Phone 1: Phone 2: +xxx xxxxxxxxx Fax: +xxx xxxxxxxxx

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **UNIBO**

PIC	***Legal name***
999993953	*ALMA MATER STUDIORUM - UNIVERSITA DI BOLOGNA*

Short name: UNIBO

Address of the organisation

Street VIA ZAMBONI 33

Town BOLOGNA

Postcode 40126

Country Italy

Webpage www.unibo.it

Legal Status of your organisation

Research and Innovation legal statuses

Public body ..... yes

Non-profit ..... yes

International organisation ..... no

International organisation of European interest ..... no

Secondary or Higher education establishment ..... yes

Research organisation ..... yes

Legal person ..... yes

Enterprise Data

SME self-declared status ..... unknown

SME self-assessment ..... unknown

SME validation sme ..... unknown

Based on the above details of the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

NACE Code: 853 - Higher education

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **UNIBO**

Department(s) carrying out the proposed work

Department 1

Department name: Department of Computer Science and Engineering - DISI ☐ not applicable

☐ Same as organisation address

Street: Mura Anteo Zamboni 7

Town: Bologna

Postcode: 40126

Country: Italy

Dependencies with other proposal participants

Character of dependence	***Participant***	

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **UNIBO**

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title: Prof. Sex: ○ Male ◉ Female

First name: **Michela** Last name: **Milano**

E-Mail: **michela.milano@unibo.it**

Position in org.: Full Professor

Department: Department of Computer Science and Engineering - DISI ☐ Same as organisation

☐ Same as organisation address

Street: Viale Risorgimento 2

Town: Bologna Post code: 40136

Country: Italy

Website: https://www.unibo.it/sitoweb/michela.milano

Phone 1: 00390512093790 Phone 2: - Fax: -

Other contact persons

First Name	*Last Name*	*E-mail*	*Phone*
Silvia	Vecchi	ict-tss.euro@unibo.it	+39051208855

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **SAP SE**

PIC	***Legal name***
999911212	*SAP SE*

Short name: SAP SE

Address of the organisation

Street DIETMAR HOPP ALLEE 16

Town WALLDORF

Postcode 69190

Country Germany

Webpage www.sap.com

Legal Status of your organisation

Research and Innovation legal statuses

Public body ..... no

Non-profit ..... no

International organisation ..... no

International organisation of European interest ..... no

Secondary or Higher education establishment ..... no

Research organisation ..... no

Legal person ..... yes

Enterprise Data

SME self-declared status ..... 2013 - no

SME self-assessment ..... unknown

SME validation sme ..... unknown

Based on the above details of the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

NACE Code: 62 - Computer programming, consultancy and related activities

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **SAP SE**

Department(s) carrying out the proposed work

Department 1

Department name: SAP UTILITIES ☐ not applicable

☒ Same as organisation address

Street: DIETMAR HOPP ALLEE 16

Town: WALLDORF

Postcode: 69190

Country: Germany

Dependencies with other proposal participants

Character of dependence	***Participant***	

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **SAP SE**

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title: Mr. Sex: (•) Male ( ) Female

First name: **Maher** Last name: **Chebbo**

E-Mail: **maher.chebbo@sap.com**

Position in org.: -

Department: SAP UTILITIES ☐ Same as organisation

☒ Same as organisation address

Street: DIETMAR HOPP ALLEE 16

Town: WALLDORF Post code: 69190

Country: Germany

Website:

Phone 1: Phone 2: +xxx xxxxxxxxx Fax: +xxx xxxxxxxxx

Other contact persons

First Name	*Last Name*	*E-mail*	*Phone*
Hartmuth	Oellermann	hartmuth.oellermann@sap.com	
Wolfgang	Gerteis	wolfgang.gerteis@sap.com	

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **TECNALIA**

PIC	***Legal name***
999604110	*FUNDACION TECNALIA RESEARCH & INNOVATION*

Short name: TECNALIA

Address of the organisation

Street PARQUE CIENTIFICO Y TECNOLOGICO DE B

Town DERIO BIZKAIA

Postcode 48160

Country Spain

Webpage www.tecnalia.com

Legal Status of your organisation

Research and Innovation legal statuses

Public body ..... no

Legal person ..... yes

Non-profit ..... yes

International organisation ..... no

International organisation of European interest ..... no

Secondary or Higher education establishment ..... no

Research organisation ..... yes

Enterprise Data

SME self-declared status ..... 2007 - no

SME self-assessment ..... unknown

SME validation sme ..... 2007 - no

Based on the above details of the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

NACE Code: 721 - Research and experimental development on natural sciences and engineering

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **TECNALIA**

Department(s) carrying out the proposed work

Department 1

Department name: ICT Division - European Software Institute ☐ not applicable

☐ Same as organisation address

Street: Parque Tecnologico de Bizkaia, Edif. 700

Town: Derio (Bizkaia)

Postcode: 48160

Country: Spain

Dependencies with other proposal participants

Character of dependence	***Participant***	

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **TECNALIA**

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title: Mr.

Sex: (•) Male ( ) Female

First name: **Jesus** Last name: **Santamaria**

E-Mail: **jesusm.santamaria@tecnalia.com**

Position in org.: Programmes Director

Department: ICT Division - European Software Institute ☐ Same as organisation

☐ Same as organisation address

Street: Parque Tecnológico de Bizkaia, Edificio 700, c/Geldo

Town: Derio Post code: 48160

Country: Spain

Website: www.tecnalia.com

Phone 1: +34 663994376 Phone 2: +xxx xxxxxxxxx Fax: +xxx xxxxxxxxx

Other contact persons

First Name	*Last Name*	*E-mail*	*Phone*
Iñaki	Angulo	inaki.angulo@tecnalia.com	
Iraide	Unanue	iraide.unanue@tecnalia.com	

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **RICOH SPAIN IT SERVICES SLU**

PIC	***Legal name***
949926433	*RICOH SPAIN IT SERVICES SLU*

Short name: RICOH SPAIN IT SERVICES SLU

Address of the organisation

Street AVENIDA VIA AUGUSTA 71/73

Town SANT CUGAT DEL VALLES

Postcode 08173

Country Spain

Webpage www.aventia.com

Legal Status of your organisation

Research and Innovation legal statuses

Public body ..... no

Non-profit ..... no

International organisation ..... no

International organisation of European interest ..... no

Secondary or Higher education establishment ..... no

Research organisation ..... no

Legal person ..... yes

Enterprise Data

SME self-declared status ..... unknown

SME self-assessment ..... unknown

SME validation sme ..... unknown

Based on the above details of the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

NACE Code: 72 - Scientific research and development

Proposal ID **731795**	*Acronym* **ELECTRA**	*Short name* **RICOH SPAIN IT SERVICES SLU**

Department(s) carrying out the proposed work

Department 1

Department name: Consulting & Innovation ☐ not applicable

☒ Same as organisation address

Street: AVENIDA VIA AUGUSTA 71/73

Town: SANT CUGAT DEL VALLES

Postcode: 08173

Country: Spain

Dependencies with other proposal participants

Character of dependence	***Participant***	

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **RICOH SPAIN IT SERVICES SLU**

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title: Mr.

Sex: (•) Male ( ) Female

First name: **Jordi** Last name: **Sala**

E-Mail: **jordi.sala@ricoh.es**

Position in org.: Consulting & Innovation Manager

Department: Consulting & Innovation ☐ Same as organisation

☒ Same as organisation address

Street: AVENIDA VIA AUGUSTA 71/73

Town: SANT CUGAT DEL VALLES Post code: 08173

Country: Spain

Website: www.ricoh.es

Phone 1: +34 93 582 12 00 Phone 2: +xxx xxxxxxxxx Fax: +xxx xxxxxxxxx

Other contact persons

First Name	***Last Name***	***E-mail***	***Phone***
Irem	Oc	irem.oc@ricoh.es	

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **NOVASOL AS**

PIC	***Legal name***
925534328	*NOVASOL AS*

Short name: NOVASOL AS

Address of the organisation

Street VIRUMGARDSVEJ 27

Town VIRUM

Postcode 2830

Country Denmark

Webpage www.novasol.dk

Legal Status of your organisation

Research and Innovation legal statuses

Public body ..... no

Non-profit ..... no

International organisation ..... no

International organisation of European interest ..... no

Secondary or Higher education establishment ..... no

Research organisation ..... no

Legal person ..... yes

Enterprise Data

SME self-declared status ..... 2015 - no

SME self-assessment ..... unknown

SME validation sme ..... unknown

Based on the above details of the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

NACE Code: 55 - Accommodation

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **NOVASOL AS**

Department(s) carrying out the proposed work

Department 1

Department name: ORANGE/IMT/OLPS/BIZZ/INFSVC ☐ not applicable

☐ Same as organisation address

Street: 905 RUE ALBERT EINSTEIN

Town: SOPHIA ANTIPOLIS

Postcode: 06921

Country: France

Dependencies with other proposal participants

Character of dependence	***Participant***	

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **NOVASOL AS**

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title: Mr.

Sex: (•) Male ( ) Female

First name: **Thomas** Last name: **Kieldsen**

E-Mail: **thomas.kieldsen@novasol.com**

Position in org.: Group Business Development Manager

Department: Business Development ☐ Same as organisation

☒ Same as organisation address

Street: VIRUMGARDSVEJ 27

Town: VIRUM Post code: 2830

Country: Denmark

Website:

Phone 1: Phone 2: +xxx xxxxxxxxx Fax: +xxx xxxxxxxxx

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **SDG consulting Italia S.p.A.**

PIC	***Legal name***
919607337	*SDG consulting Italia S.p.A.*

Short name: SDG consulting Italia S.p.A.

Address of the organisation

Street Via San Gregorio 29

Town Milano

Postcode 20124

Country Italy

Webpage www.sdggroup.com

Legal Status of your organisation

Research and Innovation legal statuses

Public body ..... unknown

Non-profit ..... unknown

International organisation ..... unknown

International organisation of European interest ..... unknown

Secondary or Higher education establishment ..... unknown

Research organisation ..... unknown

Legal person ..... yes

Enterprise Data

SME self-declared status..... unknown

SME self-assessment ..... unknown

SME validation sme..... unknown

Based on the above details of the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

NACE Code: -

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **SDG consulting Italia S.p.A.**

Department(s) carrying out the proposed work

Department 1

Department name: ORANGE/IMT/OLPS/BIZZ/INFSVC ☐ not applicable

☐ Same as organisation address

Street: 905 RUE ALBERT EINSTEIN

Town: SOPHIA ANTIPOLIS

Postcode: 06921

Country: France

Dependencies with other proposal participants

Character of dependence	***Participant***	

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **SDG consulting Italia S.p.A.**

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title: Mr.

Sex: (•) Male ( ) Female

First name: **Giorgio**

Last name: **Moresi**

E-Mail: **giorgio.moresi@sdggroup.com**

Position in org.: Executive Director

Department: Predictive Analytics

[ ] Same as organisation

[x] Same as organisation address

Street: Via San Gregorio 29

Town: Milano

Post code: 20124

Country: Italy

Website:

Phone 1:

Phone 2: +xxx xxxxxxxxx

Fax: +xxx xxxxxxxxx

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **YOURIS**

PIC	***Legal name***
985482171	*YOURIS.COM*

Short name: YOURIS

Address of the organisation

Street DREVE DU PRESSOIR 38

Town BRUSSELS

Postcode 1190

Country Belgium

Webpage www.youris.com

Legal Status of your organisation

Research and Innovation legal statuses

Public body ..... no

Non-profit ..... yes

International organisation ..... no

International organisation of European interest ..... no

Secondary or Higher education establishment ..... no

Research organisation ..... no

Legal person ..... yes

Enterprise Data

SME self-declared status ..... 2013 - yes

SME self-assessment ..... unknown

SME validation sme ..... 2013 - yes

Based on the above details of the Beneficiary Registry the organisation is an SME (small- and medium-sized enterprise) for the call.

NACE Code: 92 - Gambling and betting activities

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **YOURIS**

Department(s) carrying out the proposed work

Department 1

Department name: Secretariat ☐ not applicable

☐ Same as organisation address

Street: Rue des Colonies 11

Town: Bruxeles

Postcode: 1000

Country: Belgium

Dependencies with other proposal participants

Character of dependence	***Participant***	

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **YOURIS**

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title: Mr. Sex: (•) Male ( ) Female

First name: **Mario** Last name: **Martinoli**

E-Mail: **publisher@youris.com**

Position in org.: Director

Department: - ☐ Same as organisation

☐ Same as organisation address

Street: Via Torino 2

Town: Milano Post code: 20123

Country: Italy

Website: www.youris.com

Phone 1: +39 348 2202 808 Phone 2: +39 02 725 46 305 Fax: +xxx xxxxxxxxx

Other contact persons

First Name	***Last Name***	***E-mail***	***Phone***
Elisabeth	Schmid	elisabeth.schmid@youris.com	+39 02 725 46 304

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **CEPRI**

PIC	***Legal name***
969054833	*CHINA ELECTRIC POWER RESEARCH INSTITUTE (SEAL) SOE*

Short name: CEPRI

Address of the organisation

Street XIAOYINGDONGLU 15 QINGHE

Town BEIJING

Postcode 100192

Country China (People's Republic of)

Webpage www.cepri.sgcc.com.cn

Legal Status of your organisation

Research and Innovation legal statuses

Public body ..... no

Non-profit ..... no

International organisation ..... no

International organisation of European interest ..... no

Secondary or Higher education establishment ..... no

Research organisation ..... no

Legal person ..... yes

Enterprise Data

SME self-declared status..... unknown

SME self-assessment ..... unknown

SME validation sme..... unknown

Based on the above details of the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

NACE Code: E - Water supply

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **CEPRI**

Department(s) carrying out the proposed work

Department 1

Department name: R&D Division of State Grid ☐ not applicable

☒ Same as organisation address

Street: XIAOYINGDONGLU 15 QINGHE

Town: BEIJING

Postcode: 100192

Country: China (People's Republic of)

Dependencies with other proposal participants

Character of dependence	***Participant***	

Proposal ID **731795** *Acronym* **ELECTRA** *Short name* **CEPRI**

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title: Mrs

Sex: ○ Male ◉ Female

First name: **Qiang**

Last name: **WU**

E-Mail: **wuq_0506@126.com**

Position in org.: Expert Researcher

Department: CHINA ELECTRIC POWER RESEARCH INSTITUTE (SEAL) SOE ☒ Same as organisation

☒ Same as organisation address

Street: XIAOYINGDONGLU 15 QINGHE

Town: BEIJING

Post code: 100192

Country: China (People's Republic of)

Website:

Phone 1:

Phone 2: *+xxx xxxxxxxxx*

Fax: *+xxx xxxxxxxxx*

Proposal ID **731795** *Acronym* **ELECTRA**

3 - Budget for the proposal

No	Participant	Country	(A) Direct personnel costs/€	(B) Other direct costs/€	(C) Direct costs of sub-contracting/€	(D) Direct costs of providing financial support to third parties/€	(E) Costs of inkind contributions not used on the beneficiary's premises/€	(F) Indirect Costs / € (=0.25(A+B-E))	(G) Special unit costs covering direct & indirect costs / €	(H) Total estimated eligible costs / € (=A+B+C+D +F+G) BENEFICIARY	(I) Reimburse-ment rate (%) BENEFICIARY	(J) Max.EU Contribution / € (=H*I) BENEFICIARY	(K) Costs of third parties linked to participant THIRD PARTIES	(L) Max.EU Contribution / € THIRD PARTIES	(M) Total Costs for BENEFICIARY & THIRD PARTIES (=H+K)	(N) Max.EU Contribution / € BENEFICIARY & THIRD PARTIES (=J+L)	(O) Requested EU Contribution / € BENEFICIARY & THIRD PARTIES
1	Atos Spain Sa	ES	775000	111333	0	0	0	221583,25	0	1107916,25	70	775541,38	0	0	1107916,25	775541,38	775541,38
2	Gnf	ES	725760	29000	102000	0	0	188690,00	0	1045450,00	70	731815,00	0	0	1045450,00	731815,00	731815,00
3	Gen	ES	786240	14000	52000	0	0	200060,00	0	1052300,00	70	736610,00	0	0	1052300,00	736610,00	736610,00
4	Ufd	ES	786240	14000	42000	0	0	200060,00	0	1042300,00	70	729610,00	0	0	1042300,00	729610,00	729610,00
5	Eurecat	ES	369800	22000	0	0	0	97950,00	0	489750,00	100	489750,00	0	0	489750,00	489750,00	489750,00
6	Bsc	ES	278800	22000	0	0	0	75200,00	0	376000,00	100	376000,00	0	0	376000,00	376000,00	376000,00
7	Zabala	ES	172500	24000	0	0	0	49125,00	0	245625,00	70	171937,50	0	0	245625,00	171937,50	171937,50
8	Cea	FR	313440	26100	0	0	0	84885,00	0	424425,00	100	424425,00	0	0	424425,00	424425,00	424425,00
9	Edf	FR	1554000	198450	37500	0	0	438112,50	0	2228062,50	70	1559643,75	0	0	2228062,50	1559643,75	1559643,75
10	Orange Sa	FR	471440	22500	0	0	0	123485,00	0	617425,00	70	432197,50	0	0	617425,00	432197,50	432197,50
11	Powel As	NO	824550	20000	0	0	0	211137,50	0	1055687,50	70	738981,25	0	0	1055687,50	738981,25	738981,25
12	Stiftelsen Sintef	NO	571920	22000	0	0	0	148480,00	0	742400,00	100	742400,00	0	0	742400,00	742400,00	742400,00
13	Sintef Energi As	NO	477750	14000	0	0	0	122937,50	0	614687,50	100	614687,50	0	0	614687,50	614687,50	614687,50
14	The Norwegian Smartgrid Centre	NO	153400	21500	0	0	0	43725,00	0	218625,00	100	218625,00	0	0	218625,00	218625,00	153037,50
15	Computas	NO	560945	18500	0	0	0	144861,25	0	724306,25	70	507014,38	0	0	724306,25	507014,38	507014,38
16	Hafslund Nett As	NO	607200	26000	0	0	0	158300,00	0	791500,00	70	554050,00	0	0	791500,00	554050,00	554050,00
17	Dtu	DK	350000	22000	0	0	0	93000,00	0	465000,00	100	465000,00	0	0	465000,00	465000,00	465000,00
18	Nyfors Enterprise As	DK	339200	36500	0	0	0	93925,00	0	469625,00	70	328737,50	0	0	469625,00	328737,50	328737,50
19	Enfor	DK	368000	16500	0	0	0	96125,00	0	480625,00	70	336437,50	0	0	480625,00	336437,50	336437,50

20	Enel Ingegneria E Ricerca Spa	IT	682650	28000	0	0	0	177662,50	0	888312,50	70	621818,75	0	0	888312,50	621818,75	621818,75
21	Egp	IT	821400	265889	60000	0	0	271822,25	0	1419111,25	70	993377,88	0	0	1419111,25	993377,88	993377,88
22	Flyby	IT	414000	33333	0	0	0	111833,25	0	559166,25	70	391416,38	0	0	559166,25	391416,38	391416,38
23	Unibo	IT	313600	27000	0	0	0	85150,00	0	425750,00	100	425750,00	0	0	425750,00	425750,00	425750,00
24	Sap Se	DE	750000	78000	0	0	0	207000,00	0	1035000,00	70	724500,00	0	0	1035000,00	724500,00	724500,00
25	Tecnalia	ES	378400	18000	0	0	0	99100,00	0	495500,00	100	495500,00	0	0	495500,00	495500,00	495500,00
26	Ricoh Spain It Services Slu	ES	400500	34000	0	0	0	108625,00	0	543125,00	70	380187,50	0	0	543125,00	380187,50	380187,50
27	Novasol As	DK	280000	75667	0	0	0	88916,75	0	444583,75	70	311208,63	0	0	444583,75	311208,63	311208,63
28	Sdg Consulting Italia S.p.a.	IT	157500	17000	0	0	0	43625,00	0	218125,00	70	152687,50	0	0	218125,00	152687,50	152687,50
29	Youris	BE	94900	11500	0	0	0	26600,00	0	133000,00	100	133000,00	0	0	133000,00	133000,00	133000,00
30	Cepri	CN	171000	22500	0	0	0	48375,00	0	241875,00	70	169312,50	0	0	241875,00	169312,50	0,00
	Total		14950135	1291272	293500	0	0	4060351,75	0	20595258,75		15732222,40	0,00	0,00	20595258,75	15732222,40	15497322,40

Proposal ID **731795** *Acronym* **ELECTRA**

4 - Ethics issues table

1. HUMAN EMBRYOS/FOETUSES		Page
Does your research involve Human Embryonic Stem Cells (hESCs)?	○ Yes ◉ No	
Does your research involve the use of human embryos?	○ Yes ◉ No	
Does your research involve the use of human foetal tissues / cells?	○ Yes ◉ No	
2. HUMANS		**Page**
Does your research involve human participants?	○ Yes ◉ No	
Does your research involve physical interventions on the study participants?	○ Yes ◉ No	
3. HUMAN CELLS / TISSUES		**Page**
Does your research involve human cells or tissues (other than from Human Embryos/ Foetuses, i.e. section 1)?	○ Yes ◉ No	
4. PERSONAL DATA		**Page**
Does your research involve personal data collection and/or processing?	○ Yes ◉ No	
Does your research involve further processing of previously collected personal data (secondary use)?	○ Yes ◉ No	
5. ANIMALS		**Page**
Does your research involve animals?	○ Yes ◉ No	
6. THIRD COUNTRIES		**Page**
In case non-EU countries are involved, do the research related activities undertaken in these countries raise potential ethics issues?	○ Yes ◉ No	
Do you plan to use local resources (e.g. animal and/or human tissue samples, genetic material, live animals, human remains, materials of historical value, endangered fauna or flora samples, etc.)?	○ Yes ◉ No	
Do you plan to import any material - including personal data - from non-EU countries into the EU? *For data imports, please fill in also section 4.* *For imports concerning human cells or tissues, fill in also section 3.*	○ Yes ◉ No	
Do you plan to export any material - including personal data - from the EU to non-EU countries? *For data exports, please fill in also section 4.* *For exports concerning human cells or tissues, fill in also section 3.*	○ Yes ◉ No	

Proposal ID **731795** *Acronym* **ELECTRA**

If your research involves low and/or lower middle income countries, are benefits-sharing actions planned?	◯ Yes ◉ No	
Could the situation in the country put the individuals taking part in the research at risk?	◯ Yes ◉ No	
7. ENVIRONMENT & HEALTH and SAFETY		Page
Does your research involve the use of elements that may cause harm to the environment, to animals or plants? *For research involving animal experiments, please fill in also section 5.*	◯ Yes ◉ No	
Does your research deal with endangered fauna and/or flora and/or protected areas?	◯ Yes ◉ No	
Does your research involve the use of elements that may cause harm to humans, including research staff? *For research involving human participants, please fill in also section 2.*	◯ Yes ◉ No	
8. DUAL USE		Page
Does your research have the potential for military applications?	◯ Yes ◉ No	
9. MISUSE		Page
Does your research have the potential for malevolent/criminal/terrorist abuse?	◯ Yes ◉ No	
10. OTHER ETHICS ISSUES		Page
Are there any other ethics issues that should be taken into consideration? Please specify	◯ Yes ◉ No	

I confirm that I have taken into account all ethics issues described above and that, if any ethics issues apply, I will complete the ethics self-assessment and attach the required documents. ☒

How to Complete your Ethics Self-Assessment

Proposal ID **731795** *Acronym* **ELECTRA**

5 - Call specific questions

Open Research Data Pilot in Horizon 2020

If selected, all applicants will participate in the Pilot on Open Research Data in Horizon 2020[1] , which aims to improve and maximise access to and re-use of research data generated by actions. Participating in the Pilot does not necessarily mean opening up all research data. Actions participating in the Pilot will be invited to formulate a Data Management Plan in which they will determine and explain which of the research data they generate will be made open.

Applicants have the possibility to opt out of this Pilot and must indicate a reason for this choice.

Participation in this Pilot does not constitute part of the evaluation process. Proposals will not be evaluated favourably because they are part of the Pilot and will not be penalised for opting out of the Pilot.

We wish to opt out of the Pilot on Open Research Data in Horizon 2020.	○ Yes	◉ No

[1] *According to article 43.2 of Regulation (EU) No 1290/2013 of the European Parliament and of the Council, of 11 December 2013, laying down the rules for participation and dissemination in "Horizon 2020 - the Framework Programme for Research and Innovation (2014-2020)" and repealing Regulation (EC) No 1906/2006.*

Data management activities

The use of a Data Management Plan (DMP) is required for projects participating in the Open Research Data Pilot in Horizon 2020, in the form of a deliverable in the first 6 months of the project.

All other projects may deliver a DMP on a voluntary basis, if relevant for their research.

Are data management activities relevant for your proposed project?	◉ Yes	○ No

A Data Management Plan will be delivered (Please note: Projects participating in the Open Research Data Pilot **must** include a Data Management Plan as a deliverable in the first 6 months of the project).	☒
Data Management is part of a Work Package.	☒
Data Management will be integrated in another way.	☐

ELECTRA
- Energy vaLuE Chain Transformation thRough big datA technologies
ICT-15-2016 Innovation Action

List of participants

Participant No *	Participant organisation name	Short Name	Country
1 (Coordinator)	ATOS SPAIN S.A	ATOS	ES
2	GAS NATURAL FENOSA SDG, S.A	GNF	ES
3	GAS NATURAL FENOSA GENERACIÓN, S.L.	GEN	ES
4	UNIÓN FENOSA DISTRIBUCIÓN, S.A.	UFD	ES
5	FUNDACIÓN EURECAT	EURE	ES
6	Barcelona Supercomputing Center – Centro Nacional de Supercomputación	BSC	ES
7	ZABALA Innovation Consulting, S.A.	ZABALA	ES
8	Commissariat à l'Energie Atomique et aux Energies Alternatives	CEA	FR
9	EDF Group	EDF	FR
10	ORANGE	ORA	FR
11	Powel AS	Powel	NO
12	STIFTELSEN SINTEF	SIN-ICT	NO
13	SINTEF Energi	SIN-EN	NO
14	The Norwegian Smart Grid Centre	TNSGC	NO
15	Computas AS	COM	NO
16	Hafslund Nett AS	HFS	NO
17	Technical Univesity of Denmark	DTU	DK
18	Nyfors Entreprise A/S	NYF	DK
19	ENFOR A/S	ENF	DK
20	Enel Ingegneria & Ricerca	EIR	IT
21	Enel Green Power SpA	EGP	IT
22	Flyby	FBY	IT
23	Università di Bologna	UNIBO	IT
24	SAP AG	SAP	DE
25	FUNDACION TECNALIA RESEARCH & INNOVATION	TECNA	ES
26	RICOH	RICOH	ES
27	NOVASOL A/S	NOVA	DK
28	SDG Group	SDG	IT
29	youris.com	YOURI	BE
30	China Electric Power Research Institute	CEPRI	CN

1. Excellence

1.1 Objectives

ELECTRA aims at using Big Data technologies to get disruptive functionalities, transforming the energy system towards the digital era, making it thriving in the connected Digital Single Market

ELECTRA sees an emerging "Digital Energy" trend that reflects new structures of power system.
The adoption of Big Data technologies and their application to the different large scale pilots, developed and deployed in ELECTRA, aim at boosting this process in the European Energy Sector, bringing results, beyond the deployment of smart metering and automation and control technologies, and the current state of the art, in its four main domains: generation, distribution, retail and energy management. To ensure an integrated and efficient implementation of the demo activities related to the different domains, the design, preparation and testing of large scale pilots will be guided and supported providing a holistic perspective of the European scenario. By the right configuration and adaptation of appropriate Big Data solutions in real industrial scenarios, with the involvement of key stakeholders, the proper validation and assessment of pilot's results and the next deployment of the technologies will be guaranteed. ELECTRA will foster new business models and processes and transform work in a competitive and collaborative digital economy.

1.1.1 Background and motivation

The need to make a more effective use of existing resources in order to assure a sustainable society has fostered a paradigm change in many fields. The energy sector is no exempted. With the 2030 climate and energy framework building on the 2020 climate package [1] and the 2050 energy roadmap [2], Europe engages an early transformation of its energy system. The **Energy Union** strategy highlights the need to invest in research and innovation to embrace the necessary changes towards security of supply, sustainability, and competitiveness. The commitments reached at CoP 21 [3] strengthen the political engagement in this direction.

*Digital technologies are the key enablers to achieve a **reliable and low-emission energy system**, supporting the **new customer centric paradigm**, and to successfully address main challenges identified by the new EU SET-plan, with new roles for current stakeholders and many new players in the field. The challenge is to make the best use of technology to get disruptive functionalities, adapting the energy system to the digital era and make it thriving in the connected **Digital Single Market***

Collaboration among ICT and energy stakeholders is not new. The Energy sector has applied digital technologies for a long time for activities such as simulation, modeling, planning, and operation of its assets, all of them contributing to achieve a better quality of the services while reducing costs. The digitalization of the whole energy value chain has set the foundation to deliver a more secure, clean and efficient energy.
However, the on-going overall **energy system revolution** creates the need for breaking the silos among the different applications and data usages. In fact, the further deployment of sensors for monitoring and automated control of equipments and the handling of the huge amount of generated data turns to be a must to address the new challenges faced by electric utilities in the new scenario represented by:

- The penetration of **renewable generation sources** into the distribution grid to deliver cleaner energy but at the same time introducing volatility and the need for more accurate forecasts.
- The bi-directionality of power flow introduced by **distributed generation**; energy no longer flows from centralized power plants through transmission and distribution network to consumers but can be generated and consumed locally and surplus can be injected into the grid altering the normal energy flows and voltage profiles.

- The transformation of passive consumers into **active prosumers** , producing, storing, and consuming their own energy under different forms. The impact on Energy consumption of **time-variant prices (e.g. TOU, CPP)** and **demand response** schemes which af**fect load demand cu**rves
- **Minimizing technical and non-technical losses** in Energy production, transport and distribution
- The role of a massive deployment of **electric vehicles**, introducing needs of the network and at the same time providing storage capacity
- The increasing demands on **grid operators' responsiveness** to consumer demands regarding power capacity, service reliability and quality, and cost efficiency.

The further **digitalisation of the energy system will increasingly break the barriers**:

- *among silo applications and data sets*; building synergies between the "back-office" and the "front-end" link with the customer.
- *among business processes*; facilitating information exchange and service composition among players, *enabling the development of open interoperable solutions* through standards and architecture model

The large amount of collected data boosted by the reduction of costs derived from distributed and cloud environments and the drop of hardware costs has not been exploited in a way that all players in the different value chain can obtain clear business or social benefits from it.

The digitalisation of the energy system requires the adoption of novel approaches and ICT tools for creating added value on top of all the data collected in the different parts of energy value chain. The energy domain covers the 5 V's of Big Data:

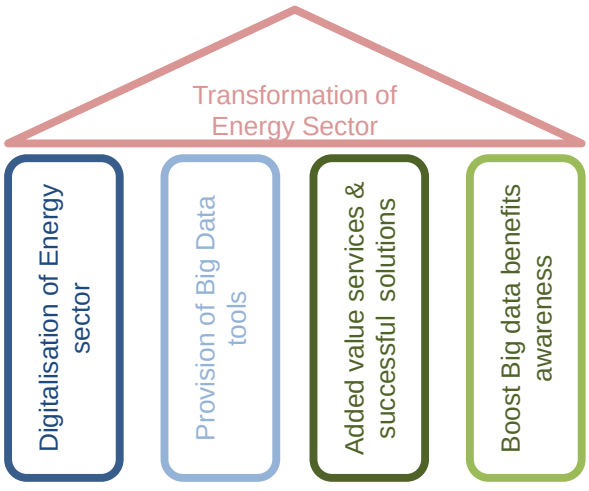
- **Volume** is assured by the vast amount of data collected in power generation, grid operation, retail services and in energy management applications.
- **Velocity** is required for the nature of energy sector operation demanding real time intervention.
- **Variety of data**, not restricted only to smart meters readings or operational data, yet weather forecasts, images from drones, data from plant machineries/components, price from the energy market, billing information, social media and so forth are part of the variety of data formats to be taken into account.
- **Veracity** or equivalently uncertainty is introduced by non-deterministic phenomena (weather, load demand), inconsistency and incompleteness introduced by measuring and communication equipment, ambiguities when integrating data from different systems.
- **Value** is the enabler to materialize any new project; no go-ahead will be given without a clear business or social benefit.

ELECTRA links the Big Data and Energy value chains, with a mainly focus on the Electricity vector, demonstrating, through the implementation of large scale pilots, the benefits of big data tools bringing value to the vast amount of data generated in the energy domain

1.1.2 Project objectives

The General ELECTRA Objective is to "Contribute to the transformation of the Energy sector through its digitalisation in order to support the achievement of a reliable and low-emission energy system".
ELECTRA will support this main objective through four main pillars.

- Holistic methodology to validate and deploy digitalized solutions for the Energy sector
- Provision of Big Data tools
- Generation of added value services and successful solutions
- Promote Big Data benefits awareness and boost market adoption of Big Data solutions in the Energy Domain.



These pillars development and demonstration activities will be complemented by the dissemination and exploitation activities planned, described in section 2to expand the impact of the results beyond the consortium and the project timeline boundaries.
Although electric energy will be the main form of energy considered in the project, hereafter the proposal will generally refer to the energy system as a whole.

Objective 1 Identify an Holistic methodology to validate and deploy digitalized solutions for the Energy sector

The adoption of Big Data technologies and its application to the different large scale pilots deployed in ELECTRA aims at boosting the digitalisation process of European Energy Sector bringing results beyond the deployment of smart metering and the current state of the art of energy innovation in its four main domain: generation, distribution, retail and efficient management.

1.1. Define methodology and tools to guide and support the large scale pilots' preparation and demonstration. Provide a holistic perspective of the scenarios ensuring an integrated and efficient implementation of the different demonstration activities.

1.2. Configuration and adaptation of appropriate Big Data solutions for the four energy value chain domain areas above described

1.3. Deployment, testing and validation of technology in real industrial scenarios. The four domains covered in ELECTRA will develop large scale pilots with the participation of key stakeholders in each of the four domains. This will assure the right validation and assessment of pilot's results.

Objective 2 Provisioning of Big Data tools for the Energy sector

ELECTRA pilots will set a test-bench for the technical assessment of the big data tools provided by the partners. These tools cover the full set of requirements identified by BDVA and they will be aligned with the requirements set by the Energy sector.

2.1. Alignment of pilot conditions with configuration parameters. The tools that are going to be deployed in the different pilots require setting some parameters according to the needs of the use cases.

2.2. Deployment and preparation of pilot components. This stage covers the setting up and the customization process followed by each pilot to get ready for the operation based on the configuration parameters defined previously.

2.3. Experimentation and validation of the tools. The interaction between technical providers and pilot managers leads to the improvement of the performance by the refinement of tools.

2.4. Final tools iteration. This last stage focuses on the assessment of the tools based on KPIs identified and in their opportunities for market adoption and replicability to be extended beyond ELECTRA scope.

Objective 3 Delivery of added value services & successful solutions enabling the Energy value chain transformation

Data collection of end user service providers whose activities rely on efficient energy management are within the scope of ELCTRA. The use-cases selected allow demonstrating the applicability, effectiveness and real business opportunities of the development and applications of big data solutions in the sector.

3.1. Identification of value potential for existing data sets. Data collected in different use-cases is relevant for the characterisation of behavioural patterns that can be improved.

3.2. Selection of suitable tools for Big Data analysis. ELECTRA partners provide a complete set of tools that can be applied to different use cases. The accuracy of the tool customization process will also impact the improvement of the service offered and energy system overall sustainability.

3.3. Delivery of the value created. The added value need to be adopted by current service users and will be also exploited as an attracting method for engaging new ones. The communication activities become strategic for the transformation of the technical results into competitive advantages.

Objective 4 Increase the awareness of the benefits of big data application to industrial sector

ELECTRA consortium focuses mainly on transforming energy domain, however the tools, results and methodologies that will be applied can be extended to other utilities in the same domain, but also to other domains and to others industrial sector.

4.1. Setting up the use case boundaries and KPIs. The participation of the external stakeholders in this process paves the path towards the extension of project results in later stages of the project.

4.2. Pilot result validation and assessment. The monitoring of project results by the selected stakeholders will help in all the phases of the pilots. ELECTRA aims at acting in an adaptive way for integrating feedback and advice thus maximizing

the success of the project.

4.3. Business adoption, replicability and scaling-up. The outcomes of the pilots will be validated by the stakeholders participating in the Advisory Board, due to this, project methodologies, results and tools will be extended to be applied in the domains covered by those stakeholders and not only by the partners participating in ELECTRA.

Objective5 Boost market adoption of Big Data solutions in the Energy Sector

The digitalisation of the Energy sector requires specific tools demonstrating a clear improvement and new business value compared with the state of the art processes and procedures. Moreover, the exploitation of information analysis coming out of large scale pilots demonstration will also allow a "breaking-the silos-effect" over the Energy value chain, thus transforming it into a more data-driven value chain.

5.1. Business driven large scale pilots' preparation, evaluation and assessment. ELECTRA aims at achieving a full alignment between, on one side the technical & demonstration activities coming out of the large scale pilots and, on the other, the business processes of the industrial actors involved in ELECTRA. This synergy will help to maximize the impact in terms of market replicability and uptake for every industrial actor participating in the Consortium

5.2. Pilot results validation and assessment. The customization of the tools and the use cases during pilots' life will follow the requirements derived both from technical side, and also from the business perspective.

5.3. Communication of project impact. ELECTRA will extend the coverage of project results taking advantage of the project' communication strategy. The success stories created within project pilots and the collaboration with the stakeholders in the Advisory Board will be promoted in specific industrial events for pushing the transformation of energy system..

1.1.3 Measures and indicators

In order to assess the impact and results of ELECTRA Project preliminary key performance indicators (KPI) have been identified at Global, Technical and Non-technical level. An ex-ante assessment of the KPIs has been made during the proposal preparation stage in order to provide provisional information at an earlier stage and to identify targets **to be achieved by the End of the Project**. The technical and non-technical KPIs will be adapted and aligned among the Large Scale Pilot in the framework of WP2. The KPIs will be based on information provided in the periodic and final reports of the Project, so substantial data for them will only become available in the later stages of ELECTRA.

Correspondent Objective	KPI	Description of the indicator	Dimension	Target
Holistic methodology to validate and deploy digitalized solutions for the Energy sector	*Increase of competitiveness of Energy Companies*	*Competitiveness includes: extension of market share, O&M cost decrease, Energy production/ distribution and service provision increase, Internal knowledge and innovation capacity increase.*	*%*	*+20*
Boost market adoption of Big Data solutions in the Energy Sector	*Investment leveraging*	*Investments leveraged in big data technologies through ELECTRA Project and consequent market share increasing for technology providers*	*%* *€*	*+25%* *at least 100 M€*

ICT Technical KPI

Correspondent Objective	KPI	Description of the indicator	Dimension	Target
Provisioning of Big Data tools for the Energy sector	Data volume	Increase in the volume of data handled through Big Data solutions from start to end of the project	%	50
	Data velocity	Increase in the velocity of data handled through Big Data solutions from start to end of the project	%	50
	Data variety	Increase in the average number of different data sources used in data analytics processing within ELECTRA Project	%	60
	Big data tools	Increase in the numbers of big data tools used by the pilot partners within ELECTRA Project	%	80
	Big data services	Increase in the numbers of big data tools that use new common services among the ICT partners within ELECTRA Project	%	50

Non-technical KPI

Correspondent Objective	KPI	Description of the indicator	Dimension	Target
Increase the awareness of the benefits of big data application to industrial sector	*Customers/end users involved*	*Number of customers/end users involved within Electra Project*	*-*	*750000*
	Stakeholders awareness on big data application	*Number of stakeholders reached by communication and dissemination activities*	*Stakeholders direclty or indirectly reached via information campaigns dedicated 1-to-1 comms social and online media at EU/global level*	*more than 10000*
	Effectiveness of communication and dissemination activities	*4 workshops organized to promote the project results to regional and national stakeholders of relevance* *4 webinars organized addressed to the members of the Stakeholders' Ecosystem*	*Participants (with multiplying effect since many are members of clusters, associations,projects)*	*240 (60 in each workshop)* *200 (50 in each webinar)*
Boost market adoption of Big Data solutions in the Energy Domain	*Citizens awareness on big data application*	*Number of person reached by communication and dissemination activities*	*citizens directly or indirectly reached via information campaigns social and online media at EU/global level*	*more than 400000*
	Adoption of ELECTRA technology in core business activities	*The adoption of LSP results into core business activities will allow to improve operation performance and demonstrate the benefits of adoption of Big Data technologies*	*Months after project finalisation*	*12-24 months*

1.2 Relation to the work programme

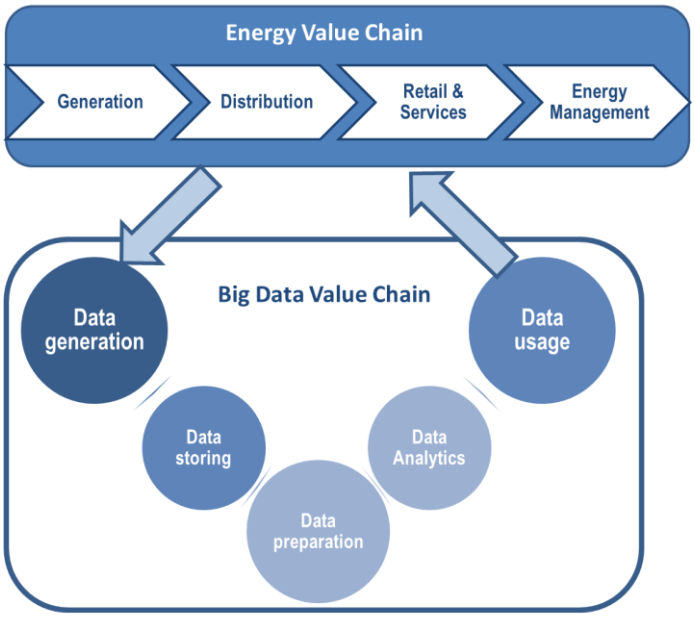
Challenges and Scope address by the topic	How ELECTRA addresses the challenge
Stimulate effective piloting and targeted demonstrations in large-scale sectorial actions ("Large Scale Pilot actions"), in data-intensive sectors, involving key European industry actors	**ELECTRA aims at building a large scale pilot that combines the application of Big Data technologies and transformation of the Energy sector**. As the availability of existing and new data sources in the different stages of energy value chain has not yet been fully exploited, the project aims to boost the digitalisation and transformation of the whole sector in Europe, as declared in the project objectives and as implemented in technical WPs. ELECTRA structure has been created considering not only the requirements of the relevant players that take part in the consortium, but also influenced by the collaboration of different stakeholders that participates in the transformation scenario.
Large Scale Pilot actions should address domains of strategic importance for EU industry and carry out large scale sectorial demonstrations which can be replicated and transferred across the EU and in other contexts.	**ELECTRA works on the Energy domain** as reference: the utilities participating in the project have been carefully selected not only for their data collection capabilities, but also for their capabilities in exploiting and disseminating the project results in EU and beyond (§2). The utilities cover the generation, distribution, and retail domains: thanks to the dissemination activities foreseen inside and outside the consortium, the methodologies, results and lessons learnt will be transferred to other companies in the same domain, but also to other domains such as water, gas and in the manufacturing sector in general.
Large Scale Pilot actions will propose replicable solutions by using existing technologies or very near-to-market technologies that could be integrated in an innovative way and show evidence of data value	**The solutions that ELECTRA is proposing for addressing those challenges are currently on the market or at high TRL**, as detailed in the annex. The focus of the activities in ELECTRA is on the five Vs of Big Data; *Volume, Veracity, Velocity, Variety* and *Value*, testing and customizing the different tools for addressing the challenging requirements of the different energy domain use cases.

Large Scale Pilot actions are expected to exhibit substantial visibility, mobilisation, and commercial and technological impact.	The implementation plan of ELECTRA defines three main phases including crossing activities and professional profiles. Since the beginning of the project ELECTRA will work to maximize the market impact of the project pilots, as explained in the project methodology (§1.3). **ELECTRA defines multidisciplinary teams to address the challenges presented in the three key domains (technical validation, business impact, communication strategy)**. The partners' profiles, (§4), give evidence of the commitment and the balance between these areas. Furthermore, the selection of the stakeholder group members has followed the same criteria.
Proposals should demonstrate that they have access to appropriately large, complex and realistic data sets.	**ELECTRA is composed by Energy Operators providing large and complex data sets, coming from the operation of their assets, from their customers, and also from their internal business processes**, that will challenge the Big data tools provided by the ICT companies participating in the project. Finally, the participation of partners specialized in the development of effective communication strategy will pave the way towards market impact, increasing the awareness of the main results of the ELECTRA project.
Demonstrate how industrial sectors will be transformed by putting data harvesting and analytics at their core.	The transformation of the Energy domain cannot be achieved only by the implementation of a few use cases ruled by European Energy industry key players. The **ELECTRA consortium is going to evaluate the scaling up and market replicability of the validated solutions (WP9) from a technical and economic point of view: the whole chain of the Energy sector, in current and future energy scenario in EU, and beyond, will be taken into account, together with the ICT providers crossing markets** (§2). Doing that ELECTRA will count also on the support of stakeholders whose added value services & solutions enable the Energy value chain transformation: their collaboration in the project is crucial for the creation of an open inclusive environment in which different companies can benefit from ELECTRA results.

1.3 Concept and methodology

ELECTRA is transforming the Energy sector by applying the benefits of data driven innovation*. Big Data closes a virtuous circle that boosts the potential of this Sector digitalization.*

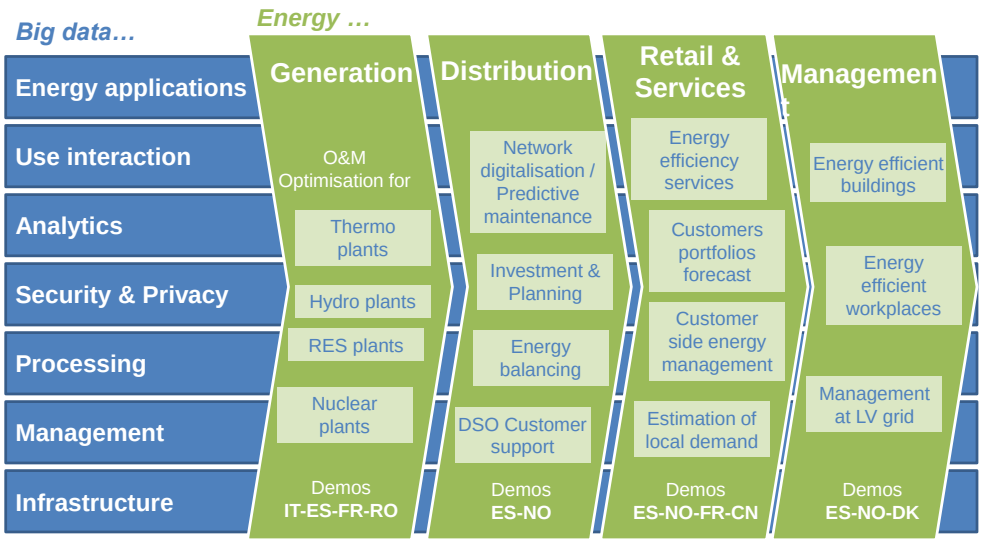
The impact of Big Data technologies in the Energy domain is increasing due to the digitalisation of all the steps in the value chain. ELECTRA will exploit the synergies between energy and data, deploying different use cases and scenarios, demonstrating the improvements achieved. The following figure depicts the flow of information and actions that is going to be implemented in ELECTRA. As it has been stated above, the digitalisation of the Energy sector will create lot of data, which will be provided to the Big Data value chain, the data need to be stored, then prepared, because the sources and nature of the data is different and metadata attached is also relevant for its categorisation and the analysed. The implementation details of the solutions in the Big Data domain are critical since they have to deal with the five Vs (Volume, Velocity, Variety, Veracity and Value). The last aspect is the creation of Value and the delivery to the Energy side. The results from the application of Big Data tools is delivered to the different domains of the Energy sector that will optimise the way they are acting, thus creating new data that will be also analyse.



The structure of ELECTRA Large Scale Pilot (LSP) follows a "single system" philosophy, adopting an integrated approach comprising four layers. Herein after the pilot will be described using the following terminology:

- **Domains**: The energy value chain has been divided into 4 major domains (Generation, Distribution, Retail & Services and Energy management).
- **Use cases**: They represent key business and productivity challenges for the each energy domain where Big Data technologies can provide significant benefits.
- **Demonstrators**: Each use case will be demonstrated in different EU Member States. The demonstrators developed share objectives, key activities, technologies and data sets. This will allow reaching a "common ground" despite national context.

It is worth to highlight that the ELECTRA LSP has been designed to cover both the energy and the big data value chains as represented in the scheme below.



The following section summarise the rationale behind the selection of the different use cases in line with the ELECTRA's objectives, including a brief description of their scope and key features.

1.3.1 Large Scale Pilot description and evaluation

Generation domain

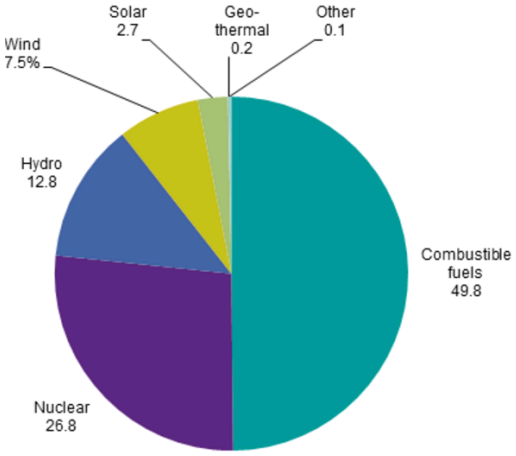
The potential of big data in the Energy sector remains only lightly tapped. European utilities have now the opportunity to turn data into a competitive advantage and drive better business performance. Many electric utilities in particular **power generation companies**, are still rather traditional in their thinking. However, the Generation domain of this pilot intends to take advantage of the disruptive opportunity presented by big data technologies into the first step of the energy value chain. For this purpose, it will demonstrate the applicability, effectiveness and real business opportunities of the development and implementation of big data analytics into power production.

The use of Big Data analytics in the Generation domain will foster a strategic change in power generation **plant management** strategies. It will leverage the disruptive change in the sector, allowing to move **from on-condition to risk-based maintenance approaches** and to permit **optimum asset management strategy implementation,** properly balancing conflicting business needs through the adoption of **Data driven Business Decision Support Systems.**

The demonstrators aim at getting a **decision-making system** based on industrial process data analytics and correlation with other external data sources in order to minimize maintenance and operation costs and to increasing production and its quality, in a framework of energy contest transformation and a constraint market that requires more and more flexible operating plants to provide sufficient balancing power to offset and/or balance out the variability of renewable energy.

The business areas of the energy generation sector are classified according to the energy sources used. ELECTRA will focus on the most important ones:

- Fossil Fuel
- Hydro Power
- RES (wind and solar)
- Nuclear



According to Eurostat almost the half of the net energy generated in the EU-28 in 2013 came from fossil fuels (49.8%) and nuclear (26.8%), while hydropower plants represent the 12.8%, followed by wind turbines 7.5 % and solar power 2.7%.

In order to improve the 4 selected business areas selected, the Pilot deals with the development of **advanced predictive analytics on plant components/units and business analytics**. These will be the baseline to develop a support decision system allowing to maximise production while minimizing plant maintenance and operation costs.

The main approach of the generation pilot development is to leverage Big Data value on the capability to manage a big volume and variety of data:

- Volume: about $9x10^9$ structured data/h estimated per generation power plant (based on fossil fuel). An additional volume of unstructured data will be used related to different kind of plants.
- Variety:
  - different types of structured and unstructured data: plant machinery measures, diagnostics elaborated values, costs value, maintenance and production reports, etc

- different sources - internal and external “silos”: Plant Data servers, Enterprise Management Systems, Asset Management Systems, Document Management Systems.

The solution must face the challenge of ensuring security, privacy and respect for ownership while using an open infrastructure for data storage (eg. standard SQL) in a typical cloud solution.

A business intelligence architecture will be deployed in the frame of ELECTRA project. ICT dedicated solutions will be identified and adapted aiming to reach the following outcomes:

1. **Data Integration and Storage:** integration and storage of additional data sources, focusing on the unstructured ones.
2. **Predictive diagnostic analytics for components/Units:** advanced predictive analytics on assets with the scope of early detection of failures and of components degradation.
3. **Operation & Maintenance plan optimization:** business analytics will correlate the main outcomes of predictive diagnostics with maintenance costs, providing an optimized maintenance planning oriented to defer costs and risk based and an optimized daily production load profile.
4. **Business Decision Support System:** The Business Decision Support System will merge data about the overall fleet production, demand side forecasts, predictions on plants failures and corresponding production loss, individual plant maintenance costs and failure risks, and will provide alternative future investment and maintenance plans that are in line with simulated market scenarios. The business decision support system will be created leveraging multi-criteria, stochastic optimization techniques to take into the intrinsic uncertainty of predictions and also different metrics (such as maintenance intervention costs, production lost, total cost including CAPEX expenditure, fleet production).
5. **Best Practice Guidelines:** a methodology will be developed to transfer the main findings and lessons learnt during the pilot and the tools developed to other use cases and domains.

EDF, EIR, EGP and GNF intend to engage internal and external stakeholders by promoting specific industrial events in order to communicate the main public results coming from the application of Big Data Technologies in Generation domain. The characteristics of the seven demonstration sites across France, Italy, Spain and Romania will allow the replicability of the developed ICT solutions in Europe and in the other countries where these global utilities operate, boosting their market adoption.

Distribution domain of the pilot

Traditionally, DSOs have operated as asset-centric companies, physically managing energy distribution infrastructure assets. With the upgrade of this infrastructure into ‘smart grids,’ however, their asset base is being expanded to include intelligent monitors, sensors and meters.

DSOs becoming data-centric companies, using digital technologies to optimise asset management, integrate distributed renewable energy resources (RES) and improve network stability and security. They are also able to leverage consumer and network data to deliver better quality of service and engagement [4].

Today, most European DSOs operate high-voltage, medium-voltage, and low-voltage networks, and connect a majority of RES. Their impact on, and responsibility towards, overall system stability is high. However, while more control and observability is quickly being gained in service mainly in HV and also partially in MV grids, the **LV network** is still missing visibility of power and voltage, more knowledge on connectivity, and better worker support. This situation is strongly limiting the evolution of the MV/LV grid to be able to incorporate seamlessly integration of distributed generation, demand response and energy balance as well as to empower the different actors involved and promoting new business opportunities.

The solution is clear: great amount of data generated by smart meters and secondary substations is giving DSOs the opportunity to rethink traditional system operations pursuing efficient asset management, increasing the degree of automation and flexibility and improving quality of service. Big data technology is the key to seize this opportunity, thus increasing efficiency of the **major business areas of the distribution sector**:

- Network Operation and Maintenance
- Network Investment and Planning
- Energy Balance
- Customer support (at supply points)

The Big Data solutions to be developed will use capacities such as deep data mining and analytics, virtual visualization and machine learning to work with the data sets presented at the WP description. The outcomes expected from the solutions are:

- **Operation and Maintenance:**
  - Improving power quality monitoring, prediction and handling through the implementation of real time control of LV network as nowadays is under operation on HV/MV networks,
  - Acquiring capacity for very fast response and thorough analysis of contingencies and their consequences through digital support for grid operations and field technicians,

- Achieving new capabilities in predictive maintenance and self-healing concepts which will lead to a reduction of operational costs and necessary actions in field,
- Using predictive analytics based on sensor data to smarten asset management with a fully digital allocation of spare parts, work, and logistics.

- **Network Investment and Planning:**
  - Optimising of network investments - long-term system planning and integration with other (regional) grids through the evaluation of energy data to predict grid loads and anticipate bottlenecks.
  - Developing digital business processes, replacing manual transactions in procurement, inventory management, invoicing and payment processing;
- **Energy Balance:**
  - Integrating demand/supply balancing services to optimise grid utilisation using real-time processing of load data and generation.
- **Relationship with Customers at supply points:**
  - Acquiring the ability to predict and handle power infeed with bi-directional power flow to manage thanks to a quick aggregation and analysis of different data
  - Allowing data-enabled transactions among DSOs, aggregators and supplier, aggregator and consumers, standardised and secure data exchange to support market communications.

As from their design phase, the solutions will approach scalability and replicability issues. The demonstrators will take place in two different contexts: **Spain and Norway**. In addition, the **ELECTRA partners will also get involved in the replication of the solution: only GNF is present in 30 countries all over the world which provides an idea of the replicability potential of the consortium.**

Retail and Services domain of the pilot

On the energy customer side, the main origin of the digital revolution is related to both the deployment of smart meters and the introduction of metering devices at a low cost in households and other buildings thanks to Internet of Things. These devices provide much detailed information on how electric power is consumed by the different customers. This data can be used by DSO & retailers (to optimize their services) and by customers (to support their decision taking).

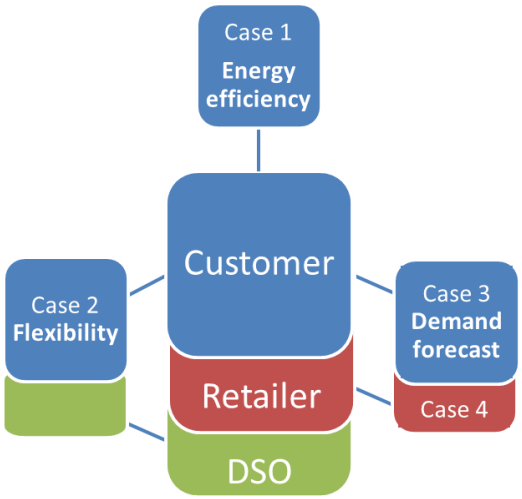
ELECTRA contributes to the transformation of the energy retail sector by defining new advanced services both to suppliers and to customers, using Big Data technologies.

As for services to customers, the pilot will develop:

- **services to improve energy efficiency in residential buildings** by providing recommendations using fine grain smart metering data;
- **services to groups of customers which enable them to manage their energy** while offering demand flexibility to the grid operation;
- **services to help individual B2B customers/local authorities to manage their energy** by providing them a forecast of their energy consumption.

As for services to the suppliers themselves, the pilot will develop:

- **services of demand forecasting at a local scale**, possibly with varying portfolios in the case customers may churn from/to other suppliers
- outcomes will also be used by DSOs for energy balancing.



The challenges faced by these use cases are key to the retail and services domain.

- **Energy efficiency**: Smart meters information is provided to the customers on dedicated web-sites or web apps while real time interconnected in-home display solutions increase customers awareness on their consumptions. These systems can collect very detailed data on consumption and other parameters at low marginal cost. The processing of the data provided can be the basis of value-added services like precise estimation of energy consumption by uses. In parallel, start-up companies targeting the same services are proposing innovative solutions making use of even more detailed data (kHz sampling).

- **Demand flexibility**: Empowered customers can actively contribute to the operation of the grid through demand response, energy storage and distributed generation. This flexibility represents an important resource for smarter and more cost-efficient DSO solutions. Most work on demand-side load scheduling focuses on optimal scheduling of the load for single appliances or homes. Collaboration between consumers and producers is usually handled by automated negotiation. This will typically be sub-optimal; a centralized optimization of all demand, storage and generation within the customer group will achieve a better utilization of the available flexibility. However, this dramatically increases the complexity of the optimization problem, and requires the use of new and efficient methods.
- **Local demand estimation and forecast**: New projects are launched by local authorities aiming at developing open data sets. They are an opportunity for local actors to communicate with their citizens increasing the transparency and efficiency of their management procedures as well as allowing citizens to participate in public decision making. Among the new challenges faced by the energy utilities exploitation of these open data sets and the data coming from smart grids equipment, billing and open datasets.
  The demand forecast faces as well an additional challenge caused by the **time varying portfolios of customers with churn**. Due to the opening of energy markets, energy providers face with customer churn, needing to forecast more and more volatile portfolios. In this competitive environment, the challenge consists in identifying different drivers of the churn and include them in a forecasting model based on energy data. These drivers could be related to the customer profile (age, type of contract…) but also to market data such as the money spend by the concurrency in marketing campaign, concurrency offers, energy prices… A second issue is how to model energy demand of such a volatile portfolio supposing that we have access to real time data from smart meters or network measurements.

The key innovation in these use cases is using newly available data about energy consumption at a fine temporal and spatial grain. The data sources are mainly smart meters installed for basic services such as billing. In addition, the demonstrators will use data about the human activity coming from additional sources such as open data sets or commercially available data like meteorology or mobile phone activity. Using this new data by processing them with data analytics methods will provide new services at a very low cost since this data is not collected only for this purpose. Existing investment is used to provide new digital services, consequently at a marginal cost. The whole big data value chain contributes to these use cases, from data collection to end users applications. Though this approach is quite common for internet and telecommunication companies, this is very new and innovative for utilities like EDF, GNF and HFS. As from its design phase, the solutions will approach scalability and replicability issues. The demonstrators will take place in **France**, **Spain, Norway and China**. In addition, the ELECTRA partners will also get involved in the replication of the solution.

Energy Management

An indicative target for 2030 at the EU level of at least 27% increase on energy efficiency[5].

The EU has put in place a comprehensive regulatory framework on **energy efficiency**, based (among others) on the Energy performance of buildings directive, mandating buildings certification and the setting of requirements for nearly-zero energy buildings, and the Energy Efficiency directive, putting forward binding energy efficiency measures across the energy value chain. Aiming at the implementation of this regulatory framework,

ELECTRA aims at helping to **remove persistent barriers to energy efficiency** (mainly those of non-technological nature) **and demand side flexibility**, demonstrating the impact of Big Data technologies and Data Driven systems in the achievement of Energy Efficiency goals.

This is the main goal of this pilot domain.

Increasing energy efficiency in buildings: Buildings account for 40% of EU final energy demand and a third of the EU natural gas consumption, mainly for space heating and the supply of domestic hot water. The building sector, provides the second largest untapped and cost-effective potential for energy savings after the energy sector itself [6]. Energy consumption in existing buildings can be reduced by half or three quarters [7] using existing techniques and solutions. There are important co-benefits from making buildings more energy efficient, including job creation and retention, health improvements [8], better energy security, industrial competitiveness and fuel poverty alleviation. The big data analytics in ELECTRA will enable and demonstrate a suite of methods for generating information embedded in smart meter data. The outcome will be automated methods for energy labelling, methods for identifying the most suitable buildings for investments related to energy performance upgrade of existing buildings, and methods for guidance related to occupancy behaviour

Increasing energy efficiency in workplaces: Offices and increasing number of different office devices cause a significant energy consumption and contribute to 2% of global CO2 emissions. Different vendors develop systems for energy efficiency in devices at a very basic level, generally based on the establishment of different operation modes that vary based on the use, to reduce their consumption. On the other hand, office ICT equipment has evolved in recent years, both in terms of information availability of its operation and at a level of available connectivity to acquire this information and to exploit it. The availability of this vast amount of information has enormous potential to improve the efficiency and operation of the equipment is now

possible. Therefore, this use case will focus on improving energy workplaces based on the consumption of printing systems. Within ELECTRA, the energy efficiency mechanisms will be improved by adapting them dynamically to the consumer profiles and situations while their consumption pattern varies. Finally, the energy efficiency recommendations are realized ad-hoc and manually for the customers who require this information

Improving energy and power management at distribution grids: The low voltage distribution grids will face serious challenges due to an expected increase on distributed energy loads and generators such as EVs, PV installations, heat pumps, small wind turbines, etc. This creates stability issues, voltage drops, congestions, etc. The challenge of optimising Energy and Power Management at low voltage grids will be faced by **focusing on 1) charging of a large number of electric vehicles, and 2) summerhouses areas**. The main reason for selecting the latter is that are over-represented with respect to power related problems in low voltage grids. ELECTRA will lead to a number of solutions for operation of low voltage distribution grids. This includes methods for fault prediction, reduction of interruption duration, demand response, control of power related services, and hence for a better and more secure use of the capacity of the low voltage grids. The demonstrators will be developed in **Spain, Denmark and Norway**. The partners intend to extend its outcomes to other European countries, taking advantage of their global presence in Europe, thus demonstrating the replicability of the defined energy efficiency models.

1.3.2 Project value-added solutions and business models

In economics of data, there is a high expectation that the use of data would generate large returns to scale and scope as data is a capital that could be reuse many times with positive feedback. This feedback will reinforce networks effects at the supply and demand side, and in the same time enhance the accumulation of data. This growing data-centric ecosystem implies also some new costs like data storage, new costs that are far behind the two main advantages: return to scale and return to scope. First, return to scale because data accumulation will lead to major improvement in many services, attract more consumers of data, consumers who will decide also collecting new data. Second, return to scope based on new insights collected through first analyses leading to contextualize initial data collection with other datasets and create new sources of higher insights for new services.

These two main advantages are two main pillars to imagine and create new business approach for dedicated markets. **ELECTRA project expects to implement the data economy for the Energy market based on innovative use cases and concrete prototypes covering data collections, smart analyses and new and high-value insights for new services.**

The energy market is a multi-sided market itself covering many types of services for the following energy value chain areas: Generation, Distribution, Retail and Services, Energy management. In each area, energy players can collect lots of data and information that could deeply change the associated businesses. To reinforce this approach and to go beyond, ELECTRA project aspires to propose different data analytics capabilities and to analyse data linkage [9] for use case to propose the best cross-fertilization.

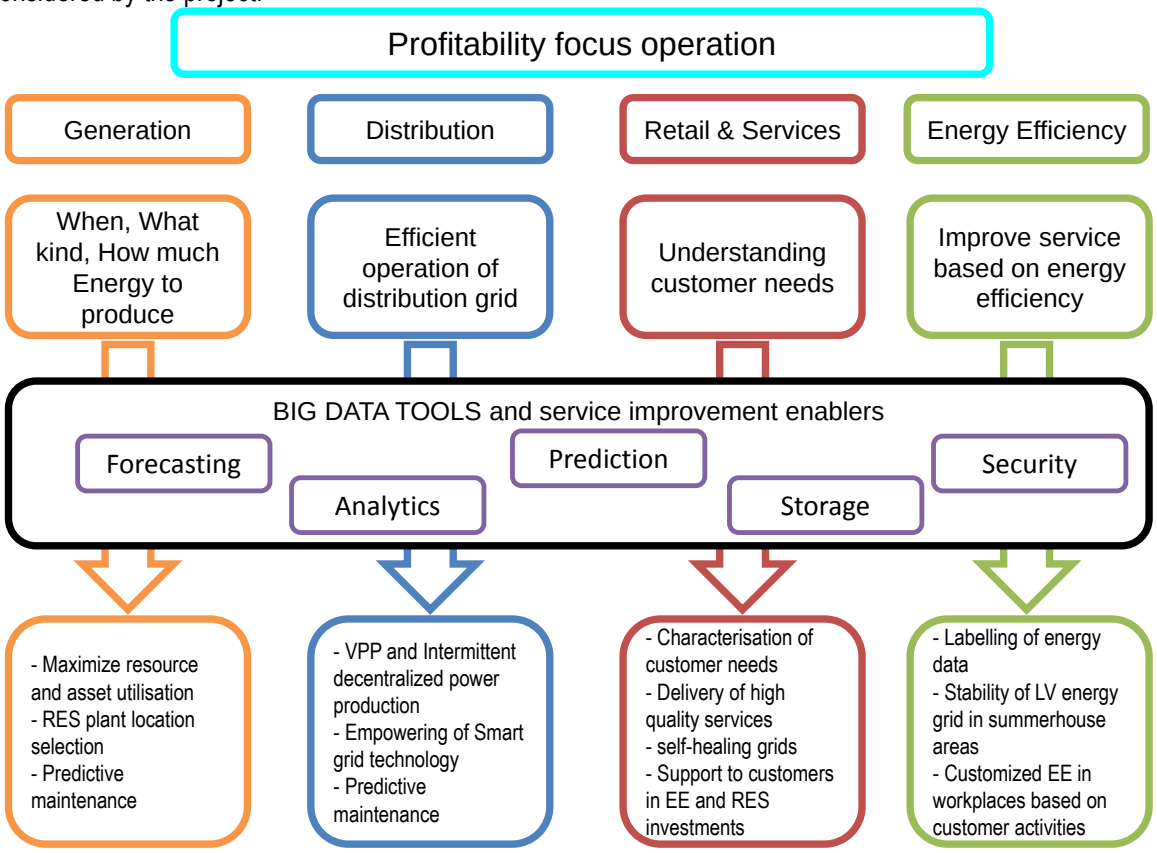
ELECTRA project will propose the integration of a Big Data environment customized for the Energy market and for the different sources of data: generation plants, smart meters and secondary substations, distribution grids, electric hardware, customers premises, market, environment Deploying several Big and Fast Data assets from the infrastructure layer up to visualization tools and analytics environments, ELECTRA will completely emphasize the advantages of a multi-sized market and based on implemented use cases, increase the effect of return on scope. Of course, to fully take benefits from Big and Fast Data technologies, additional datasets from other vertical sectors will be integrated, typically to improve modelisation regarding energy multi-sources integration, customers' behaviours depending of dedicated contextual environments and globally to improve energy management.

The complete integration of Big Data technologies inside the four main pillars of the energy value chain increasing reactivity and better knowledge of customers behaviours through low voltage network analysis will propose many business models insights: concrete valorisation of grid infrastructures responsiveness when decreasing energy production and coming into energy management world, including energy storage planning and management - detailed energy profiling of customers - innovative development of new hardware to manage energy demand-response phases, and last but not least monetization of new data collected through energy networks following clear privacy-preserving guidelines.

The deployment of Big Data solutions in Energy sector enables the transition from reactive to proactive management, creating new business opportunities for Energy companies and ICT providers.

The benefits derived from ELECTRA activities will be received by both Energy utilities and ICT companies. The first will increase the operational performance reducing their OPEX and also the increase the performance of their investments due to the analysis of the data that leads to decisions. ICT companies on the other hand will face new challenges and opportunities derived from the inherent value of the data driven industrial sector. The creation and optimization of the tools and ICT infrastructures will increase market share pushing forward the adoption of Big Data solutions.

The following figure show how the different domains addressed by ELECTRA change through the exploitation of Big Data tools that are considered by the project.



1.3.3 Project positioning

Data Driven Innovation has been identified as a key trigger for the development of society and economy in different sectors. OECD has indicated that Data Driven innovation is a key pillar for the growth in the 21st century as reported in *"Data-Driven Innovation; Big Data for Growth and Well-Being October 06, 2015"*. OECD has started a project called *"New sources of growth; Knowledge Based Capital"* with two main objectives:

- Improve the evidence base on the role of data for promoting growth and well-being, and
- Provide policy guidance on how to maximize the benefits of the data-driven economy, while mitigating the associated risks.

ELECTRA partners are putting together the needs, the tools and the knowledge for bringing Innovation in the Energy sector. The combination of the components provided by the partners, all of them with a TRL over 6, with other products and technologies already available in the complete the technological needs that have been identified for the implementation of ELECTRA's demonstrators.

The ELECTRA architecture has been divided in several areas:

- Energy applications covering the four domains that are addressed by the project.
- Architecture and Platforms in a Big Data Framework - with configured platforms for Energy applications
- Big Data Analytics including tools for Prescriptive and

Predictive Analytics for predictive maintenance and Energy forecasting, Real time Analytics for Energy monitoring and proactivity and Visualisation an Descriptive Analytics for Energy data analysis

- Big Data Technologies with services for Big Data Processing, Data Management, Acquisition, Curation and Storage, with security and privacy
- Big Data Infrastructure with physical resource management and Energy relevant Datasets
- The figure shows the name of the ELECTRA partners in their focus areas, and supported open source tools. The partner's products and tools with their TRLs are described in a separate annex.

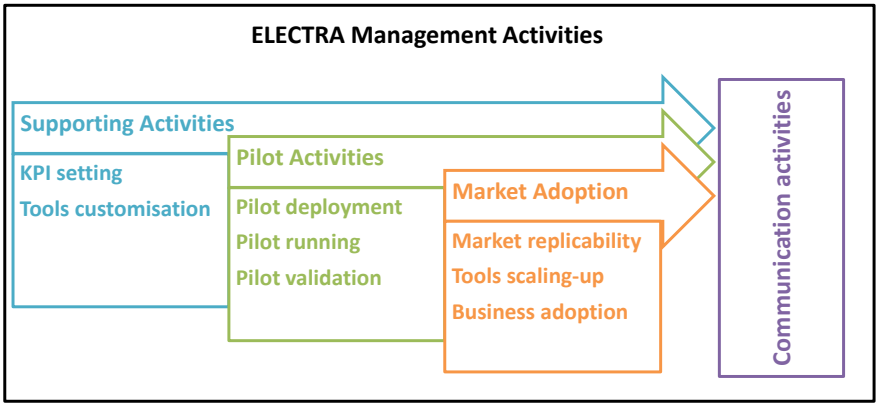
ELECTRA also counts on the experiences from previous projects, in FP7, H2020 and National initiatives. The following table shows a list of actual projects with direct relevance for a synergy with ELECTRA project:

PROJECT	DESCRIPTION	LINK TO ELECTRA
I3RES (ICT-based Intelligent management of Integrated RES for the smart grid), FP7-ICT, 2012-2015	To integrate renewable energy sources in the distribution grid by incorporating intelligence at three different levels: RES integration, the participation of all actors in the energy market, and in the overall operation of the network. (www.i3res.eu)	The I3RES results are used in the Energy Distribution use cases; PROLOAD, Demand and Flexibility Management. The capacities of the developed technology include: Feature selection; Supervised and unsupervised learning; Clustering techniques; Classification models; Forecasting methods.
INERTIA (Integrating Active, Flexible and Responsive Tertiary Prosumers into a Smart Distribution Grid), FP7-ICT, 2012-2015	Introduction of the Internet of Things and Services principles to the Distribution Grid Control and DSM Operations. It will provide an overlay network for coordination and active grid control, running on top of the existing grid and consisting of distributed and autonomous intelligent Commercial Prosumer Hubs (www.inertia-project.eu)	The INERTIA results are used in the Energy Distribution use cases Distributed Energy Resources Model. Moreover the project has also delivered a tool for Power Flow analysis at grid level to detect grid nodes in which flexibility can be demanded by the grid operator.
OS4ES (Open System For Energy Services), FP7-ICT, 2014-2017	To provide a solution that closes the current information, communication and cooperation gap between DERs and DSOs, by delivering an innovative Open Service System that enables dynamic DER-DSO cooperation (www.os4es.eu/)	The OS4ES results will be used in the Energy Distribution use cases Grid Operator level application to request flexibility from Distributed Energy Resources.
UPGRID (Smart Electricity Systems and Interoperability), H2020-LCE, 20015-2018	To develop, deploy and demonstrate innovative solutions for advanced operation and exploitation of LV/MV networks in a fully smart grid environment improving the capacity of the networks as enablers for Distributed Generation and Customer empowering (ses.jrc.ec.europa.eu/upgrid)	The UPGRID results will be used in the Energy Distribution use cases Grid operation. Analysis Tool of the events generated by the smart meters in order to detect grid faults. Consumption forecasting
ARROWHEAD (Service Interoperability Enabling Collaborative Automation), ARTEMIS, 2013-2017	To implement and evaluate the cooperative automation through real experimentations in applicative domains: electro-mobility, smart buildings, infrastructures and smart cities, industrial production, energy production and energy virtual market (www.arrowhead.eu)	ARROWHEAD has been used to improve the advanced functionalities of the consumption forecast's assets, that will be used in some of the Retail&Services use cases
BeyWatch (Building Energy Wathcer FP7-ICT-2007-2)	BeyWatch aims at using ICT tools for environmental management and energy efficiency. BeyWatch develops an energy-aware and user-centric solution, able to provide intelligent energy monitoring/control and power demand balancing at home/building & neighbourhood level	The project deals with topics like user centric solution for energy monitoring and control that will be considered in the context of ELECTRA.

1.3.4 Methodology

The methodology followed in ELECTRA aims at exploiting the synergies among partners in the consortium so as to maximize the impact of the results of the Project. ELECTRA activities address two main challenges; on the one hand, transforming the Energy value chain by the improvement of current procedures; and on the other hand, the provision of added value services derived from a better and deeper understanding of the information generated and collected. According to these two ideas, ELECTRA includes four areas of actuation included in the figure below. In order to achieve the objectives in each area, ELECTRA consortium is composed by a multi-disciplinary team that covers from the partner perspective and also from the individuals participating in the project, the required expertise in technical, business and communication areas.

The first group presented are the **Supporting Activities**. This group covers the refinement of the use cases that are going to be deployed in the different pilots. The first definition of the use cases is provided in the proposal, but for the validation it is necessary to set the value of the KPIs that will be used for the assessment and validation.



The second group covers the **Pilot Activities**. The core of the project relies on the pilot activities, there are several cycles in the pilots that includes deployment and configuration of the tools for the execution of the uses cases. During the running phase, ELECTRA will also progressively improve the pilot and tools. The validation of the pilot will run in parallel and will feed back pilot configuration and assessment process.

The third group focuses on **Market Adoption** of the results and solutions developed in ELECTRA. The results of project pilots clearly impact the selected use cases, but the scope of the project is to extend the results, tools and methodology beyond. The objective is to assure replicability of results obtained in the Energy domain to other utilities, and also promote the use of the tools in different areas. At this point the participation of external stakeholders becomes a relevant input that can simplify the definition of business strategies.

These three will be reinforced by **Communication** activities. They represent a key element of the project to increase the market share and awareness of big data tools in the energy domain. The partners participating in the project guarantees an important share of overall energy market in the countries with pilots, but for extending these results beyond the scope of partners' individual adoption, ELECTRA is defining a strategy for disseminating the benefits and the results and conclusions obtained during the project. The communication activities also involve the relationship with external stakeholders, who can play the role of early adopters of project solutions.

Finally, the ELECTRA **Management** activities objective is to develop an effective and comprehensive administrative, financial and legal management to ensure the successful execution of the project. More precisely management activities will perform smooth and effective management and coordination of the consortium ensuring the right functioning of the governing bodies established, thus ensuring the achievement of all project objectives in terms of time, quality and costs.

1.3.5 Gender Issues

Project Management activities will include the promotion of specific actions and control over gender issues along the project, including them, annually, in the reporting period's reports. Actions that would be undertaken to promote gender equality will consider:

- Carry out and initial planning and diagnosis of women participation at the beginning of the project.
- Include women as much as possible in the technical performance of the different WPs and tasks of the project.
- Positive actions for women scientists re-entering professional life.
- Promote visibility in patents authors and exploitation and business activities.
- Promote visibility in publication and citation of articles and activities.

According to the report "Women in Energy: Closing the gender Gap" (World Petroleum Council, 2013), a gender gap already exists in the energy sector, being still a male-oriented sector. Nevertheless, some progresses are being made due mainly to flexible work schedules and childcare provisions contributing to conciliate personal and working life.

1.4 Ambition

1.4.1 Progress beyond State of the Art

ELECTRA as an Innovation Action has the ambition of improving the current status in the Energy sector by providing existing or close-to-market Big Data technologies to be applied in innovative Energy sector scenarios, thus bringing clear improvement to the current status.

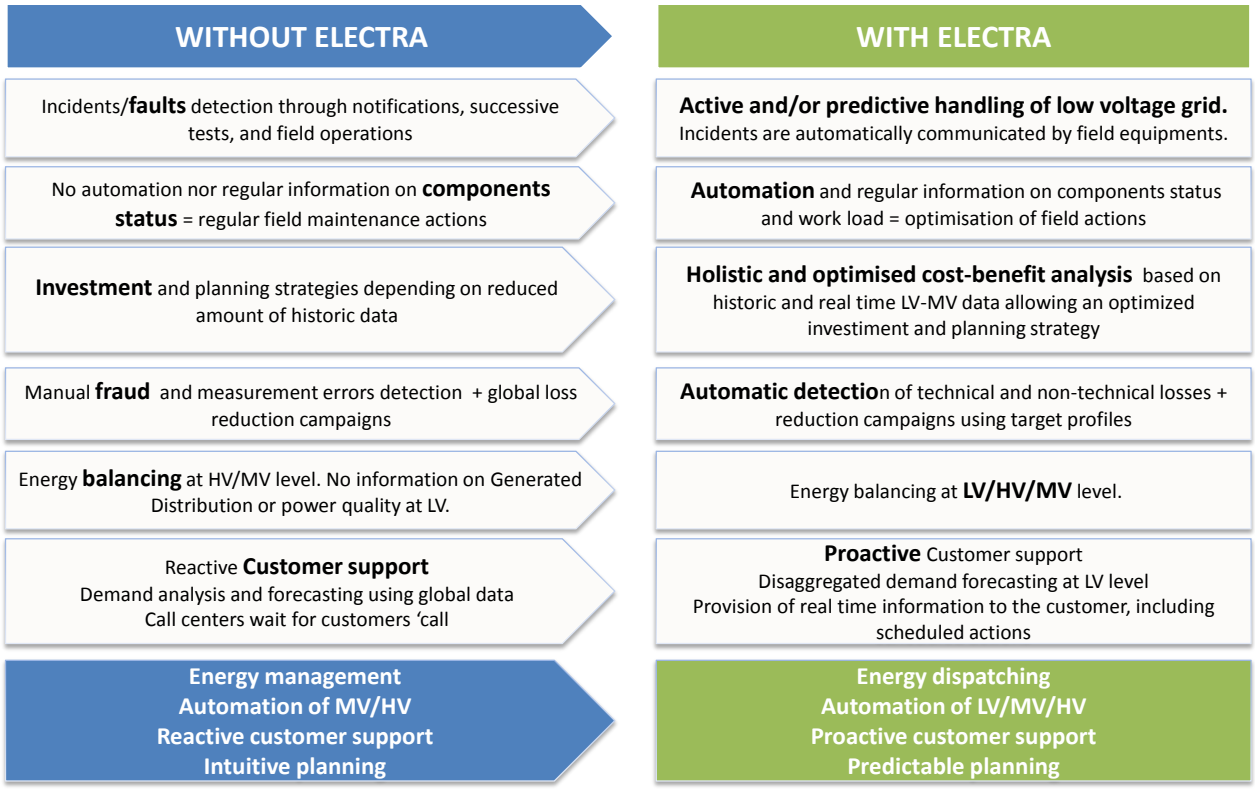
Domain	Current status	ELECTRA ambition
Energy Applications	Current Energy applications are typically not taking advantage of Big Data technologies	ELECTRA will enable Energy applications to be based on big data technologies and to take further advantage of the large volume of data becoming available form a variety of datasets, supported by relevant technologies and approaches for visual, predictive and real time analytics.
Architecture and platforms	A number of Big Data technology stacks exists, and experiences shows that it is not possible to create one platform that meets the need for all different situations.	ELECTRA will provide a Big Data Framework with various components in different areas enabling the creation of configured platforms for different situations, with a basis in already offered Big Data platforms from partners like SAP, ORANGE, EURECAT and others – where many share common components from the Apache Big Data stack of technologies.
Big Data Analytics for Energy	Visualisation and Descriptive Analytics As the amount of data to be presented falls in the big data domain, to make data accessible, usable and understandable becomes a challenge	ELECTRA combines current status of technology with data driven approaches, aiming to exploit operational, technical and contextual datasets. A number of visualisation toolsets from partners, combined with open source toolset from partners will be used in order to achieve this.
	Prescriptive and Predictive Analytics 10] [11] Existing approaches rely on rule based systems and physical models	ELECTRA addresses other sources of decision model components: ***Big data mining***, extracting correlations, regularities, patterns and causal relations from data on different sources, namely generation/consumption data, past failures, production losses, market data. ***Predictive models [12]*** simulating the dynamics of the different energy system components (the plant components, failure models, cost models and expected production, the market). For predictive models ELECTRA will make large use of advanced machine learning techniques coming from deep networks that overcome the limitation of traditional statistical learning techniques and are able to extract complex non-linear dependencies among data in an unsupervised fashion. The foundation for this is the existing generic Machine Learning solutions and also advanced statistical prediction tools from a number of the ELECTRA partner.
	Real time Analytics Existing solutions are typically not able to handle the analytics of real time sensor data efficiently. .	ELECTRA applications actually require really fast computation to deliver up to date insights to decision makers. Big Data in-Memory Databases like SAP HANA is in particular suitable for the delivery of high performance analytics. • Data summary technics will be used to extract meaningful statistics locally and store the data later on, in centralized data centres, • Early detection algorithms will allow identifying faults before they compromise the systems nominal behaviour, • Online learning will be investigated to continuously update predictive models and ensure they remain on par with new incoming time series.
Big Data stream processing and orchestration	"Fast data"- consists in processing very fast (possibly in almost real time) incoming data to deliver immediate value. Practically, few solutions really process individual data points as soon as they enter the system and many tools achieve micro-batch processing.	ELECTRA will support the usage of various Big Data processing frameworks (e.g. Spark, Flink, Storm) and partner offerings (e.g. SAP and BSC COMPSs) tools. Data streaming, other sources of data and stored data will provide an atomic volume of information that need to be orchestrated, ELECTRA is addressing this challenge by supporting the orchestration across services execution, business process decisions and planning execution.
Big Data Security /Privacy	The widespread use of ICT solutions in the smart grid, privacy risks become inherent introducing risks associated with customer privacy [13] [14].	ELECTRA will tackle this issue following the principle Privacy-by-design [15]thus providing organizations with a means to, by considering privacy from the outset, achieve a positive-sum scenario, meeting both privacy and functionality requirements and minimizing prosumer reluctance to participate in the energy big data ecosystem.

Big Data Management	Current Energy data management solutions are often fragmented and created as isolated silos of data, and not scalable for the increased volumes of data that is emerging.	ELECTRA will deliver services for Big Data Management following the data value chain from Acquisition to Curation and Storage, with support for the appropriate level of security and privacy required in the Energy sector. Integration of data from a variety of sources will be supported with different federation technologies.
Infrastructures and energy relevant datasets	Current infrastructures are often separated into different	ELECTRA will provide an approach that allows for easier access to and integration of data from various existing physical infrastructures and be able to support both cloud-based and "on premises" storage and processing resources, including access to sensor information.

1.4.2 Innovation potential

1.4.2.1 Innovation potential in Generation Domain

ELECTRA will change the generation domain by retrieving value from all data collected from components in a power plant, also affected by measure errors, instrumentation failures, data collected from Asset Management Systems, and external data sources, identifying correlations and insights that improve current performance, , production and maintenance plans.



1.4.2.2 Innovation potential in the Distribution Domain

ELECTRA will enable the distribution sector to take advantage of the large amount of data generated by the deployment of smart meters. This will lead to a definitive step towards the digitalization of the distribution sector by achieving the automation of the LV network, a global energy dispatching, a more predictable planning and finally a proactive customer support at the supply point side.

WITHOUT ELECTRA	WITH ELECTRA
Incidents/**faults** detection through notifications, successive tests, and field operations	**Active and/or predictive handling of low voltage grid.** Incidents are automatically communicated by field equipments.
No automation nor regular information on **components status** = regular field maintenance actions	**Automation** and regular information on components status and work load = optimisation of field actions
Investment and planning strategies depending on reduced amount of historic data	**Holistic and optimised cost-benefit analysis** based on historic and real time LV-MV data allowing an optimized investiment and planning strategy
Manual **fraud** and measurement errors detection + global loss reduction campaigns	**Automatic detection** of technical and non-technical losses + reduction campaigns using target profiles
Energy **balancing** at HV/MV level. No information on Generated Distribution or power quality at LV.	Energy balancing at **LV/HV/MV** level.
Reactive **Customer support** Demand analysis and forecasting using global data Call centers wait for customers 'call	**Proactive** Customer support Disaggregated demand forecasting at LV level Provision of real time information to the customer, including scheduled actions
Energy management **Automation of MV/HV** **Reactive customer support** **Intuitive planning**	**Energy dispatching** **Automation of LV/MV/HV** **Proactive customer support** **Predictable planning**

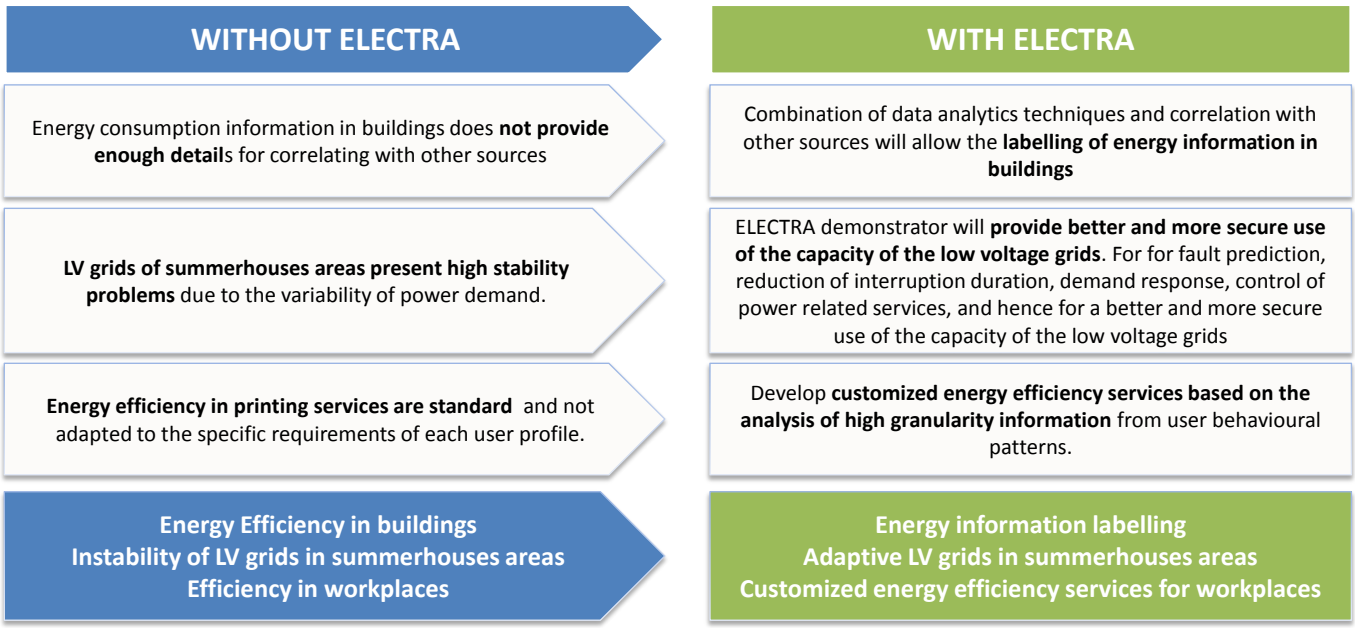
1.4.2.3 Innovation potential in Energy Retail and Services

ELECTRA enables the transformation of the real time and historical information collected from customers into actionable recommendation, leading to optimization of energy usage and management.

WITHOUT ELECTRA	WITH ELECTRA
Benchmark-based recommendation on energy efficiency in households (only monthly consumption considered in the recommendation system)	**Individual recommendation on energy efficiency** with operational actions proposed (change in behaviour, renewal of equipment, building renovation)
No demand-response flexibility in the distribution grid or demand-response operated only from the grid side	**Demand-response flexibility** in the distribution grid operated with a **collaboration with and between customers**
B2B customers **ignore their electricity needs** in the future	B2B customers **know their expected electricity consumption in the future** and can make decisions to optimize their use of energy in relation with activity
Electricity suppliers **optimize their electricity provisioning at a national level** with a fixed perimeter of customers	Electricity suppliers **optimize their electricity provisioning at a local level**, managing local renewable generation and varying portfolios due to churn
Retail and Services	**Optimised retail and services**

1.4.2.4 Innovation potential in Energy management

ELECTRA will enable and demonstrate the cross-fertilisation among complementary domains that benefits not only the final customers but also all the stakeholders in the Energy value chain.



2 Impact

2.1 Expected impacts

The ELECTRA consortium will demonstrate the technologies and solutions described in Section 1 as key to accelerate the transformation of the European energy sector in order to cater for the present and future market needs. The exploitation of these solutions will contribute to strengthen Europe's position as provider of products and services based on individual and business creativity. Furthermore, it is a European objective is to roll out the industrial strategy for the data value chain in order to develop Europe's data driven economy as outlined in the Communication adopted on July 2nd 2014 [32]. This requires validated demonstrations of advances in key industrial ecosystems. For the energy sector, this endeavour will contribute to achieving the goals in the *Energy Union*.

ELECTRA, by improving access, creation, management and use of data, will make information and knowledge accessible for all the energy market actors: those actors' needs are represented in the project through the use cases, which also cover a considerable portion of the technology providers' products and services market. Aside from energy domain market-pull, the technology providers (some of which are already operating in other industrial environments) will engage in a technology-push, towards the energy market. The research centres will, through their participation in ELECTRA, gain knowledge and help foster the competitiveness of Europe in the global market. The following paragraphs, schematically resumed in Table 1, detail the project's expected economic, social, and environmental impacts.

Table 1 – ELECTRA specific contributions to the expected impact.

Demonstrated increase of productivity in main target sector of the Large Scale Pilot Action by at least 20%;	In the energy domain the increase of productivity can be synthetically represented as: 1) improvement of generation fleet O&M performance, 2) continually improvements of DSOs operational excellence, and 3) customers' empowerment as energy prosumers and market players. Productivity could be increased by 15% to 20% [16] [17] [33]. Reduction of unplanned outages, more flexibility, a better integration of operation activities, an increase of the value delivered to the customer base, and the decrease of energy costs are some of the elements that can contribute. In ELECTRA the consortium utilities will demonstrate this increase in the different energy domain through the adoption of the developed Big Data tools provided by technology and service providers. Additionally the presence in the consortium of worldwide companies and of the Stakeholders' Group will spread the impact even beyond Europe (Africa, USA, CHINA).
Increase of market share of Big Data technology providers of at least 25% if implemented commercially within the main target sector of the Large Scale Pilot Action;	The 78% of organizations have identified digital transformation as a critical priority to address within the next two years [20] [21] [33] but only the 15% of companies have so far planned to address digital transformation. The demonstration of ELECTRA, integrating a huge amount of data sourced by sensors and other technologies with Big Data tools, will pave the way to utility digital transformation. Technology and service providers of the consortium will be able to increase their market share in the energy domain of at least 25%, thanks to the large investments that end-users are planning to do after the demonstration and validation phases.

Doubling the use of Big Data technology in the main target sector of the Large Scale Pilot Action;	Less than 1% of the data which exist in business today are being analysed and turned into business benefit. The scalability and replicability of the solutions demonstrated in ELECTRA will quickly scale up the big data technology exploitation in the energy domain.
Leveraging additional target sector investments, equal to at least the EC investment;	The business plans reported in this section are a consequence of the utilities willingness to exploit Big data technologies on a significant part of their assets: they will leverage additional investments, largely overcoming the EC investments. Besides, many of the consortium utilities have been already working on Big data, implementing pilots and experimental activities with consistent investments and human resources involved.
At least 100 organizations participating actively in Big Data demonstrations.	The expression of interest to the project already expressed by some significant stakeholders, representing power system actors' associations and ICT technology and service providers, through support letters paves the way to the opening to those organizations members of ELECTRA demonstration activities and results.
Other impacts – Environmental and socially important impacts.	The ELECTRA project will address all the pillars for a sustainable growth: **People** (social sector), **Planet** (environmental sector), and **Profit** (economic sector) ELECTRA innovative technologies will also strongly contribute to implement SET-Plan objectives in terms of security of energy supply, especially in EU regions requiring new energy infrastructure or the refurbishments of old ones.

2.1.1 Contribution to the expected impacts set out in the work programme

A preliminary evaluation at proposal level of the impacts coming from a synergic use of Big Data Technologies in the energy domain can be done through the extension of the expected benefits coming from single use cases to a significant portion of the correspondent energy domain European assets. Table 2 details how the project will contribute to the fulfilment of the expected targets indicated in the ICT15 topic:

Table 2 – Energy Domain Assets in EU and in the Consortium

	EU 28 perimeter			***Installed capacity within ELECTRA Consortium [GW]***				
Generation Domain	***No of plants***	***Installed Power [GW]***	***Yearly produced Energy[TWh]***	***EDF***	***EIR***	***EGP***	***GNF***	***Total***
WIND	*17000*	*142*	*315(2014)*	*1.4*		*5,7*	*1.2*	*8,3*
PV	*37000*	*88(2014)*	*105(2014)*	*0.4*		*0.44*		*0,84*
HYDRO	*3341*	*144*	***145***	*23.5*	*29.6*		*1.9*	*55,0*
C. CYCLE	***907***	***254***	***831***	*12.8*	*16.1*		*7.3*	*36,2*
COAL	*230*	*129*	*664*	*2.9*	*17.0*		*2,1*	*22,0*
NUCLEAR	*101*	*167 [20]*	*1.192*	*63.2*				*63,2*

Table 3 Exploitation of ELECTRA results in the energy domain

	EU 28 perimeter				***Overall circuit length lines within ELECTRA Consortium [MKm]***			
Distribution Domain	***Overall length of distribution lines[18] [MKm]***	***2014 Energy transported [TWh]***	***Number of connected customers [MN]***	***Smart meters deploymen t[19] [MN]***	***EDF [20]***	***HSF [21]***	***GNF[30]***	***Total***
	9,9	***2700***	***260***	***45***	***1,3***	***0,04***	***64***	***65,34***

	EU 28 perimeter	***Numbers of customers within ELECTRA Consortium [Mn]***

Retail & Service and Energy management Domain	***Numbers of customers [MN]***	***2014 Total volumes sold [TWh]***	***EDF***	***HSF***	***GNF [30]*** (gas+energy)	***Ricoh (Machines in Field)***	***Total***
	260	***2700***	***39***	***1,08***	***11,6***	***1,1***	***51,68***

Increase of productivity in the energy domain and replication capability

In the energy domain the productivity concept comes up from the combination of several elements which contribute to the success of the specific domain core businesses. Looking at the different domains we can identify global productivity index such as:

1. Improvement of generation fleet O&M performance,
2. Improvement of DSOs operational excellence
3. Customers' base expansion and increase of services added value
4. Customers' empowerment as energy prosumers and market players.
5. Improvement of MiF (Machines in Field) service and performance

In Table 4 each demonstration umbrella illustrates its productivity increase indicators and the expected improvement coming from the application of ELECTRA big data solutions to a significant portion of their asset park.

Increase of market share of Big Data technology providers of commercial implemented solutions in the energy domain and replication potential in crossing areas

Currently the 78% of organizations have identified digital transformation as a critical priority to address within the next two years [18][19] but only the 15% of companies have so far planned to address digital transformation. The ELECTRA demonstration activities, of integrating a huge amount of data sourced by sensors and other technologies with Big Data tools, will pave the way to utility digital transformation: technology and service providers of the consortium will be able to increase their market share in the energy domain of at least 25%, thanks to the large investments that end-users are planning to do after the demonstration and validation phases. Although the solutions developed in the pilots will be implemented in the energy domain use cases, the project results will include assets and components that could be **reused in other markets and industries.** Word leader ICT providers and SMEs have addressed the project needs, proposing to demonstrate their latest innovations. ELECTRA technology providers plan to further develop their technologies and to perform the corresponding technology transfer actions required to have an impact beyond the project market frame. The final return on investments for technology providers depends also on the market opportunities to replicate the business models also in sectors different from the energy one. Hereunder this replication potential is preliminary analysed; the next table resumes what the technology and Service providers of the ELECTRA consortium expects from the exploitation of the project results. In 2.2.1.2 the technology and service providers individual exploitation plans and commercial interests are resumed..

Doubling the use of Big Data technology in the energy domain and leveraging additional investments

Less than 1% of the data in business today is being analysed and turned into business benefit. The scalability and replicability of the solutions demonstrated in ELECTRA will quickly scale up the big data technology exploitation in the energy domain. Increasing the use of Big Data Technologies and services in the energy domain implies a corresponding leverage of additional investments from the end users: the potential for leveraging additional investments can be estimated by assuming the replication of the solutions across the European energy sector. The business plans reported in this section are a consequence of the utilities willingness to exploit Big data technologies beyond the project on a significant part of their assets: if applied they will leverage additional investments, largely overcoming the EC investments. Besides, many of the consortium utilities have been already working on Big data, implementing pilots and experimental activities with consistent investments and human resources involved. The following table reports these preliminary evaluations respect to the energy domains explored in the project.

Table - Productivity Increase Indicators

Domain	Use case	Productivity Increase Index Description	Productivity Index Value

Generation	Fossil fuel	Increase of the overall availability of power plants, reducing downtime and failures, decreasing the production costs: maintenance plan optimization will reduce preventive and corrective maintenance. An overall optimized management of the fleet will permit to maximize the revenues from the energy market and to answer better to the market energy services request.	+10% availability
	Hydro	Application of predictive analytics will permit both to reduce the overall unavailability linked to spillways reduction, and improve production management as a result of better requirements in turbines, integrating rainfall forecast, prices and technical conditions of the facilities, increasing revenues.	+10% availability
	Wind	Application of Big Data Analytics on the WIND Fleet and integration of additional data sources such as CMS and gearbox oil analysis are expected to increase detection rate and improve plant monitoring; savings are related to: repairing/replacing main components, personnel costs, spare parts and lost energy due to plant unavailability. Main targets are: predicting 90% of all main component failures, reduce long downtime events by 50%. .	Overall savings up to 10% of O&M costs
	Solar	Application of Solar Fleet Big Data analytics and integration of additional data sources such as drone's images are expected to increase detection rate and improve plant monitoring; savings regard: repairing equipment, personnel, spare parts and produced energy linked to plant availability. Targets include: avoiding the 90% of all main components failures, reduce long downtime periods of 50%.	Overall savings up to 10% of O&M costs
	Nuclear	Improving the availability of the generation fleets is therefore a major concern for EDF. Three levers have been identified to improve the health assessment of critical assets of Nuclear Power Plants: Reduction of unexpected outages by early warning of potential failures. Improvement of diagnosis robustness in case of abnormal behaviour. Optimization of the maintenance strategy at a fleet level	10-20% availability
Distribution	Grid Digitalization and Predictive Maintenance	• Maintenance costs optimization, including: o Reduction of working capital and inventory requirements via improved maintenance planning: o Increase of efficiency of documentation and reporting of grid • Operation Optimization, including: o Reduction of interruption number and duration o Increase of utilization of grid capacity integrity o Reduction of failures and outages	20-30% improvement in operation, at least 70-80% of incidents 20% reduction of LV interruptions
	Energy Balance and Fraud Detection	o Improvement of energy balance: o Increase of detected fraud o Reduction on infrastructure investments	+60% reduction of economic losses
	Proactive Customer Support and Response	• More efficient Customer support: o Reduction of the reaction time at the call centers o Increase of customer satisfaction/ service quality	4-8 % higher ratios of customer satisfaction and service quality
Retail&services	Energy efficiency diagnosis and recommendation services	To help customers to reduce their energy consumption up to 10%. [22]. For the French residential customers (27M) with a consumption of 132TWh in 2014 (adjusted to normal temperature), this means a reduction of 13TWh yearly,. Internal tools development by utilities will help reducing service costs per customers.	10% Energy consumption reduction EDF estimated 2-5M€ incoming

	Demand flexibility as a valuable resource for cost-efficient grid operation	Consumers' engagement as active participants in the operation of the energy system can give significant value for both DSOs and customers. Expected impacts include: - Reduced investments in network upgrades, higher utilization of invested capital (grid components) - Shorter restoration time and reduction of planned outages - Increased hosting capacity for both production (RES) and consumption (EV, PHEV).	+20% income from service retail to DSO
	Estimating/ forecasting of energy demand at a local scale	Providing a forecasting of their consumption to individual B2B customers and to local authorities will generate a revenue associated with the service and improve customer loyalty.	This is estimated to contribute up to 7M€ annual competitivity gain for EDF
	Demand forecast for time varying portfolios of customers with churn	Improving by 1% the accuracy of demand forecasting in France corresponds to a gain of 2.5M€ per year.	A 1% gain is expected.
Energy Management	Energy Efficient Homes and Customer interaction with Smart Meter	Improved smart energy services, including controllers for heating/cooling related to property management o A well-structured, searchable, open access databases for analysis and visualization of existing energy data o Information related to big data generated time series for the intelligent houses o Methods for demand response related services	30% savings
	Energy and Power Management in Summer House Areas	Competitive advantage. Furthermore such big data methods for operation low voltage grids are required for reliable operations.	30% estimated savings
	Energy Efficient Workplaces	Increase of energy savings through user behaviour optimisation through energy efficiency recommendations. The project will contribute up to 30% energy and paper consumption reduction in office printing devices. The project results would affect Ricoh's all fleet that are sold in 200 countries.	30% energy reduction

Table 4- Exploitation of ELECTRA results in the energy domain Productivity Increase Indicators

Domain	Use case	Exploitation and investment Description	Exploitation number	Investment plan [M€]
Generation	Fossil fuel	EIR after the validation of the innovative ICT solution at CCGT Termini Imerese Power Plant will deployed the innovative technologies in additional power plants, located mainly Italy and Spain	From 0,7 to6.5 GW in the future 5 years	More than 15 times the EC grant
		GNF, after the cost-benefit analysis results, will apply Big Data technologies to the whole fleet owned.	4 thermal units	20% of GNF Fossil fuelled investment plan
	Hydro	EIR after the validation of the innovative ICT solution in Soverzene Hydro Plant and in Roncovalgrande Pump Hydro will deployed, the innovative technologies in additional hydro power plants located mainly Italy, Spain and Latin America,	From 1,2 to 7,9GW	More than 15 times the EC grant
		GNF, after the cost-benefit analysis results, will apply Big Data technologies to the whole fleet owned.	2 hydro units	20% of GNF Hydro investment plan
	Wind	EGP estimates to apply in the future 5-10 years the technologies validated in Italy and Spain during the project to a 50% at least of its wind park in Europe and in the world (US, Latin America, Africa), with significant investments; so far EGP has already approved investments for more than 7M€ in pilot solutions deployment.	From 2 to 4 GW	More than 10 times the EC grant
		GNF, after the cost-benefit analysis results, will apply Big Data technologies to the whole fleet owned.	3 wind units	20% of GNF WIND investment plan
	Solar	EGP estimates to apply in the future 5-10 years the technologies validated in Italy and Spain during the project to a 50% at least of its PV park in Europe and	From 0,2 to 0,3 GW	More than 10 times the EC grant

		in the world (US, Latin America, Africa), with significant investments; so far EGP has already approved investments for more than 2M€ in specific PV pilot solutions deployment.		
	Nuclear	Maintenance investments of the French nuclear fleet can be estimated around 55 billion Euros between 2011 and 2025		More than 10 times the EC grant
Distribution	Grid Digitalization and Predictive Maintenance. Network Investment and Planning Energy Balance and Fraud Detection Proactive Customer Support and Response	By 2020 Hafslund intends to increase the use of Big Data tools for distribution system operation and planning, following the roll-out of smart meters to all customers and monitoring of several thousand substations by 2019.	70-80% of smart meters installed on customer basis Several 1000 of substations monitored	Near 200M€ in smart meter technology integration by 2019 in Europe
Retail& services	Energy efficiency diagnosis and recommendation services	The French legislator promotes the development of real time in-home display solutions to increase customer's awareness on their consumptions (French "energy transition law" in August 2015). The equipment will be provided for free to any of fuel-poor customers equipped with a Linky meter (this will be paid by the CSPE). EDF plans to provide this equipment to additional customers with a paying energy efficiency recommendation service.	2-4M customers expected by 2020	150-300M€ investment by 2020
	Demand flexibility as a valuable resource for cost-efficient grid operation	By 2020 Hafslund intends to increase the use of Big Data tools for distribution system operation and planning, following the roll-out of smart meters to all customers and monitoring of several thousand substations by 2019.	70-80% of smart meters installed on customer basis Several 1000 of substations monitored	Near 200M€ in smart meter technology integration by 2019
	Estimating/forecasting of energy demand at a local scale	After the ELECTRA project, the service will be industrialized and deployed for B2B and local authority's customers.	2 M customers eligible	More than 10 times the EC grant.
	Demand forecast for time varying portfolios of customers with churn	After the ELECTRA project, the service will be industrialized and deployed internally at EDF to improve the management of energy.	Estimation of 20 energy manager users	More than 10 times the EC grant.
Energy Management	Energy Efficient Homes and Customer interaction with Smart Meter	NYFORS will be able to guide end-users on how to optimize energy efficiency investments for their homes	Before 2020 all customers will have a smart meter	More than 50 times EC grant
		This demonstration will provide NOVASOL with some competitive advantages related to the summerhouse owners	NOVASOL operates +40000 summer houses in EU	More than 10 times EC grant
	Energy and Power Management in Summer House Areas	In order to operate future low voltage grids DSO operators, and here NYFORS needs this technology	NYFORS operates the DSO grid in the Northern part of Denmark	More than 20 times EC grant
		NOVASOL will be able to provide more competitive services to the owners of the summer houses	More than 40000 summer houses in EU	More than 20 times EC grant

	Energy Efficient Workplaces	Big Data technologies will be used to achieve Ricoh's Mid- and Long-Term Environmental Impact Reduction Goals (Total Lifecycle CO_2 emissions by 30% by 2020 and by 87.5% by 2050 from 2000 levels)	100% Ricoh MFP's by 2050	5% of Ricoh Group revenue is invested in R&D

At least 100 organizations participating actively in Big Data demonstrations

A stakeholder eco-system of external organization has been built up already at proposal preparation stage, including experts and researchers recruited by ELECTRA partners. The recruitment and identification of relevant organizations that could take part in the ELECTRA LSP big data demonstrations and replicate the ELECTRA results will continue throughout the duration of the project. Via the activity of task 10.4 . Once identified, the organizations belonging to this ecosystem will be the first target of the dissemination activities and will act as a mouthpiece in the respective activity fields through their own communication channels. Moreover, a selection of these organizations will be directly involved in the activities of the project, more specifically through task9.4 they will be exposed and engaged in the ELECTRA piloting activities starting from the second cycle having as well the opportunity to participate in the feedback loop to improve the last of the ELECTRA piloting cycles as defined in section 3.1. Thanks to the active participation and engagement of the Stakeholder's Eco-system, all these organizations will be aware of the project LSPs results and economic results which can be further implemented and have an impact in rolling out an industrial strategy to develop Europe's data driven economy. The ELECTRA Stakeholders eco-system will be as well participating in workshops and will be stimulated to visit the demonstration sites. Besides, a public engagement strategy oriented to the involvement of other organizations in the energy pilots, especially those related with final energy customers, will be defined and carried out in the project (see WP9 and WP10 activities), with the final aim to enlarge the stakeholders' group and the project dissemination public, as better described in section 2.2. At the time of the proposal preparation the ELECTRA Stakeholder Eco-System is composed by the following associations, that roughly represents **1700 companies and organizations; these organizations have shown interest and commitment with a Letter of Support attached in Annex I to the ELECTRA objectives and activities.**

Website	Description/Domain/Scope	Membership	Members
www.kic-innoenergy.com/	**KIC InnoEnergy** is an operational framework amongst the three actors of the knowledge triangle in the energy sector: industry, research and higher education, and ensure that this integration of the three.	KIC InnoEnergy`s network of partners we build connections across Europe, bringing together inventors and industry, entrepreneurs and markets, graduates and employers, researchers and businesses.	52
www.vgb.org	**VGB PowerTech** e.V. is the European technical association for power and heat generation. VGB PowerTech brings together companies, for which the operation of power plants and the corresponding technologies form an important base for their business.	EVG member companies are operators, manufacturers and institutions involved in the field of power industry. Members from 34 countries represent an installed capacity of 461,000 MW	488
www.ict4water.eu/	European Commission initiative on ICT and Water Management	A cluster hub for the 15 EU-funded sister projects on ICT and Water Management	150
www.bigdatabcn.com/	Big Data CoE Barcelona is a new centre driven that will build, develop and provide tools, data sets and value-added Big Data capabilities.	Companies, Research Centres, Public Bodies and institutions in the Catalonia Region	15
www.cencenelec.eu/	The European Committee for Standardization (CEN) and the European Committee for Electrotechnical Standardization (CENELEC) are two distinct private international non-profit organizations based in Brussels.	Leading providers of voluntary European Standards and related products and services for the benefit of businesses, consumers and other standard users in Europe.	33
www.epri.com/	The **Electric Power Research Institute**, is a not-for profit organization conducting research and development relating to the generation, delivery and use of electricity for the benefit of the public (EU-USA)	The worldwide membership that supports EPRI's work and mission comprises more than 1,000 organizations. While most members are electric utilities, many are firms, government agencies, corporations.	1000

Moreover other four companies have expressed their interest and commitment through Letter of Support and contact with ELECTRA partners: 2 SMEs form Italy specialized in Big Data technologies (www.sis-ter.it/ ; www.iconsulting.biz), 1 ESCO from Italy as well (www.sea-side.it), 1 Public Enterprise from Norway Enova (www.enova.no) and EsCom , an energy company from South Africa, that approximately generates 95% of the electricity used in South Africa and approximately 45% of the electricity used in Africa (www.eskom.co.za/). Eurelectric, sector association which represents the common interests of the energy industry at pan-European level, have as well express interest in the project via Letter of Interest.

2.1.2 Improving innovation capacity and integration of new knowledge

Innovation Capacity

ELECTRA project is generated by the **collaboration of a strong consortium of partners** covering during its implementation the whole value chain of big data technologies to support data driven economy (knowledge centres, SME, System Integrators, Industrial players and end users), not only for the energy sector. As the ICT-15 topic of this call aims at Large Scale Pilots actions for developments at TRL7 and higher, the majority of the solutions to be demonstrated in the project have a clear path to market. Furthermore, they have a high innovation potential for paving the way for the energy domain transformation into a data driven economy. ELECTRA is proposing the **deployment of a set of** (open and standard-based) **mature big data solutions in a set of four interconnected pilot domains** (energy generation, energy distribution, retail & services, and energy management), addressing the different technical, administrative and socioeconomic constraints and needs of the more relevant actors. The proposed solutions include new technological components, functions, services, tools and related business models, when relevant, and will be specified, designed, developed, integrated and demonstrated at international level with the active participation of those targeted actors as project partners or as members of the external advisory group.

New Knowledge Integration

The adoption in the pilots of advanced big data technologies will allow the integration of new knowledge, strengthening competitiveness and industrial growth, also thanks to the consortium composition and to the presence of an advisory board and of a stakeholders' group. As an example, the use of Decision Support Systems (DSS) based on data for predictive maintenance and operation, is a general technique that can be applied to the energy production sector, but also to many other manufacturing sectors that share many characteristics with power generation plants: they are capital intensive, there is significant pressure to reduce both downtime and cost and production stoppages might lead to huge losses. In addition, the manufacturing sector, as the energy one, faces pressures from a shortage of skilled personnel and the increasing need to continue to improve returns on existing assets. The widespread adoption of the data-aware DSS techniques used in ELECTRA might significantly impact manufacturers by including: elimination of unnecessary maintenance tasks, reduction of replacements in components, reduction of unplanned downtime, extension of asset lifetime. Also the integration of new data sources, such as images coming from drone monitoring systems, along the whole architecture value chain, or the integration of data coming from different big data platforms, will make available new information streams which can be used at strategic level for different business functions and in different contexts, from Operation and maintenance to engineering and construction, safety and security.

Scalability and Replicability

Development, integration and demonstrations will be carried out in seven different European countries (Denmark, France, Germany, Italy, Norway, Spain, and Romania) under their own regulatory frameworks and socioeconomic characteristics; so the demonstrators' configuration will represent a significant implementation set of the current European energy scenarios. Besides, the open and standardized approach of the project is key to ensure scalability, interoperability and replicability. These features will be verified not only in the demonstration phase but also in the Scaling-up and Market replicability activities (WP9) through the technical and economic evaluation of the different use cases configurations and different business models, paving the way to the exploitation of the results beyond the end of the project.

2.1.3 Environmental and social impact

European policies state a clear commitment to drive progress towards a low-carbon economy which ensures competitive and affordable energy for all consumers, to create new opportunities for growth and jobs, to provide greater security of energy supply, and to reduce import dependence for the Union as a whole. To support this progress, European 2020 and 2030 policy frameworks were developed [23] [24] to ensure that EU meet both its climate and energy targets, setting increasingly higher targets to cut in greenhouse gas emissions, to increase energy share from renewables, and improve energy efficiency. Among the social targets addressed by Europe in 2020, the increase of the employment rate (75% of the 20-64 year-olds to be employed) and fighting poverty and social exclusion (at least 20 million fewer people in or at risk of poverty and social exclusion) are particularly relevant for the project social impact.

ELECTRA project will respond to the EU requirements to support a sustainable growth addressing all the pillars of the sustainability concept: People (social sector), Planet (environmental sector), and Profit (economic sector). As these pillars are often interconnected, the actions adopted in one sector could contribute to maximize the effect of the expected impact in a different sector. This interconnection is incorporated in the project as a clear task in the scenarios definition in WP2 and ultimately determined in WP9 where the analysis of the possible exploitation of the project solutions will be conducted. Table 6 shows in a synoptic way the expected impacts on the social, environmental, and economic sectors: the project approach will contribute to reach the main objectives fixed into the SET-Plan as well as those fixed in EU documents concerning energy security and efficiency.

Key Issue	ELECTRA Expected impact
Security of energy supply	ELECTRA will offer a set of innovative technologies able to increase the overall productivity of the energy domain, strongly contributing to implement SET-Plan objectives [26] in terms of security of energy supply, especially in EU regions requiring new energy infrastructure or the refurbishments of old ones. The increase of all generation sources performance and cost, of the distribution and provision of energy services operational efficiency, the promotion of customers' participation to the energy market, will increase on the whole the reliability of the power system, increasing security of energy supply. As an example, analysing data coming from sensors installed into facilities will enable failure forecast and fast error detection, which can reduce maintenance expenses, and minimize time spent for repair, so that a facility can increase its availability and increase security of supply.
Job Opportunities	The project will pave the way to the development of European technologies affecting industry and SME and rising job opportunities in the different technologies sectors, due to their application inside and beyond Europe. The application of ELECTRA technologies to new and refurbished energy infrastructures is expected to contribute to increase the average value of job vacancy rate in EU (1.5% in 2014) through job opportunities in different areas of Europe [27].
Quality of Life	Consumers will experience (even) better availability of electricity supply (up-time) and interruptions due to unscheduled maintenance and repair will be less frequent and of shorter duration. ELECTRA will deliver improved quality of supply (EN50160) and improved customer service, faster and more accurate solutions. Besides, efficient and validated demand response operation and rewarding is expected to contribute to quality of life as well.
User empowerment	The project has an important focus on citizens as, through the implementation of ELECTRA technologies in the retail domain, end users will be able to manage their energy production and consumption, so they will be able to make informed decisions, and take an active role in the energy and service market. Besides, the DSS developed at strategic level, will empower communities and municipalities in communities' energy related decision.
Greenhouse Gas Emission reduction	Better operation of generation plants and of distribution infrastructure, better focus of maintenance activities planning will have an impact on the global efficiency of the power system with a global effect on GHG emission. In the generation domain, as an example, Big Data predictive analytics and operation optimization will guarantee more efficiency and increase availability of power plant reducing the frequency and time of start-up which are critical for emission. The possibility to apply these approaches on different machineries and systems will permit to avoid pollutant emissions in case of degradation of the abatement systems performances. On another front, the use of big data techniques tools in hydro power plants' management will also result in a more sustainable use of hydro resource in case of drought due to climate change events and, at the same time, this kind of optimization will lead to a more sustainable use of renewable energy. The OECD [28] reports that the use of data driven smart-grid applications could reduce CO2 emissions by more than 2 gigatonnes (the equivalent of EUR 79 billion).
Increase renewable energy consumption share	The project will allow both a better operation of conventional power plants and of renewable ones, supporting the optimization of generation mix and of the energy system operation, and reducing the LCOE, with a final impact also on the increase of renewable penetration share.
Increase of energy efficiency	At customers' level the project will support a better management and usage of energy, paving the way to a global increase of energy efficiency. In the generation domain, anomaly condition detection will reduce emissions by avoiding reducing less efficient equipment and plant incorrect operation (operation at low load that implies major emissions) or potential damage on equipment (degradation of the abatement systems performance implies increase of pollution).

Industry competitiveness strengthening	The outcomes of ELECTRA will also contribute to strengthen the position of the European Energy service providers, that will be able to offer additional services and improved already existing services, being the Energy one a market with great potential for creating growth and employment. This aspect has been detailed in section 2.1.1. For instance, analysing big data from sensors attached to facilities will enable facility interruption forecast and fast error detection, which can reduce maintenance expenses and minimize time spent for repair so that a facility can start its operation as soon as possible and avoiding possible impact on grid stability. ELECTRA will create global and efficient business models for product and various services delivering on of the full Energy value chain, and will stimulate the development of new and improved services to end users -therefore improving also the interaction between energy actors and end users and technology services providers, - and supporting European technological development, creating sustainable and responsible services in such way.

2.1.5 Barriers and obstacles

In Section 1 the main challenges arising from the present characteristics and needs of the energy sector as well as the great opportunities emerging from energy domain digitalization were presented. Digital can help the world use energy and natural resources responsibly today and tomorrow while providing reliable, sustainable, and affordable energy for all people. In order to guarantee access to the Digital Energy for all energy stakeholders the access to a broad set of data is required, to bring new capabilities to improve the current ecosystem. The key business driver for the energy sector transformation proposed by ELECTRA is optimising the sector costs and environmental performance without affecting security and quality of supply, while hosting a very large and further increasing penetration of renewable and distributed generation. The increase of productivity and market share of Big Data providers, and the increase of the use of Big Data all along the energy value chain are the main expected impacts: this value chain can be split into 4 major business energy domains: the table below identifies for each domain key business drivers and barriers to overcome.

Business Area	Business drivers	Barriers to Business development
Generation	Energy generation fleets are distributed both from a geographical and a technological point of view: there is a strong need for large-scale action in generation parks for their optimal operation & maintenance, but also for the improvement of plant design and construction. Current ICT architecture development and data technologies produce promising results, but these are not yet deployed at large scale in a systematic manner, allowing covering multiple technologies & countries contexts.	Data unavailability or poor data quality and a lack of architecture and analytics scalability may hamper deployment at large scale and scalability of economic benefits. Different regulatory contexts may lead to business cases with different economic perspectives. Cultural and Multilanguage barriers may hamper easy deployment across countries and tools usage.
Distribution	Network operation and maintenance: Handling future demands of higher reliability, renewable integration and increased use of smart metering will require network flexibility, with interactions on monitoring and control. Network investments and planning: Investments in power distribution systems constitute a significant part of the electric network expenses. An efficient project and portfolio management tool will allow to better scope and plan projects with the consequence to reduce costs. Energy Balance: With the strong penetration of distributed generation EU is facing, new ways of integrating more distributed generation in the networks will require both to increase the network hosting capacity and to cope with several different generation units and different network topologies (rural vs. urban, radial vs. meshed, different voltage levels).	The cost associated to the large number of assets to be computerised / adapted and the required capillarity of the telecoms. Poor observability of MV and LV networks resulting from the lack of sufficient metering. Availability of data (availability of equipment to measure data, communicate events; lack of historical data) Risks and difficulties in managing the distribution network, the inefficient operation can result in; overload, instability, unbalance… Lack of interoperability of grid management systems Rigidity of the regulation that could cause that some of the smart grids advantages not to be perceived or believed by the involved stakeholders. Weak participation of prosumers, and rest of stakeholders due to regulation
Retail & Services	Knowing customers, through social channel and other source of information, to deliver engaging, personalized and collaborative experiences. Improve interactions with the final customer to remove barriers, improve and accelerate business results taking into account a given customer context Propose new energy services and equipment to help customers to reach a more rational use of energy.	Lack of customer motivation and participation Privacy concern related to the use of customer information derived from data captured Final customer cost to install equipment to execute demand response program

Energy Management	Leverage sustainability optimisation program on customer site remotely. Recommend best practices to reduce cost of energy and other costs. Active customers contributing with demand response, energy storage and distributed generation will be a valuable resource for the distribution grid. This flexibility can be utilized for a more efficient operation of the grid. The participation of customers in active demand is of major importance for any electric energy system. The follow up of real time electricity variations will allow to aggregate individual demand responses into demand response volumes that are large enough to be traded on market places	Privacy concerns derived from monitoring of user consumption patterns. Final customer value recognition to go for such program. Weak participation of prosumers, and rest of stakeholders due to regulation

2.2 Measures to maximise impact

2.2.2 Dissemination and exploitation of results

2.2.1.1 Dissemination and communication strategy

The objectives of the dissemination and communication activities are:

- To ensure the uptake of the final results by the main groups of stakeholders: Customers, Generation Operators, ESCOs, DSOs, Energy retailers, industrial partners from the Energy and Big Data domains, RTDs, investors, society, public opinion, and technology suppliers
- To ensure informed policy making in the areas of Energy and ICT (policy makers, regulators, standardization bodies).
- To spread out the services/applications developed
- To disseminate the outputs in order to facilitate their potential replication
- To increase the awareness of Big Data technologies as facilitators for developing new services applications
- To reach the citizens to empower them in making informed decisions about their Energy consumption and take an active role in their use of Energy

The communication and dissemination strategy aims at fine tuning WHO (target audiences) will receive WHAT (key messages), HOW (communication channels) and WHEN (implementation and time planner). This entails tailoring of the messages towards these target audiences; decision on the best communication channels and tools to reach the target audiences; development of a detailed implementation plan involving all consortium partners. A communication and dissemination strategy will be developed in the project to provide a framework and schedule for the different activities. Impact indicators are defined with all the dissemination players, to monitor the impacts of the dissemination activities (participants to dissemination events, number of scientific papers accepted in peer reviews, stakeholders engaged in the workshops) and communication players, to monitor of the communication activities (factsheets, website, communication material, press releases for general media, social media, citizen reached in the webinars

TARGET STAKEHOLDERS and MESSAGES

The clear **categorisation of target groups** allows undertaking dedicated and targeted dissemination actions. Target stakeholders of the dissemination and communication activities will be reached at local, national, European and global level and are represented by:

TARGET GROUPS	To be reached locally, nationally or at European level	GOALS
End users of energy and **General public,** citizens	Locally (by the local retailers)	▸ Disseminate the specific services and Increase awareness of user's empowerment and self-management of the energy consumption
Electric Utilities and Energy Service Companies, either SMEs, LEs or public companies	European, national and local)	▸ As utilities are the main end-users of the technologies developed in the project, results and impacts on assets and customer basis will be provided as well as attractive business models. Utilities will be able to provide in turn these outcomes data to the technology providers to determine market size.
Companies, ICT providers either SMEs, LEs or public companies	European, national and local)	▸ Disseminate the technical publishable results including the technology performance, technical improvements and applications in the investigated domains. Technology providers, starting from project methodology and validated results, will develop new business case and models increasing the project impact and exploitation potential.
Clusters, ETPs, associations,	European, national and local with	▸ This audience will be constantly informed of the activities and

other stakeholder community of both Big Data and Energy	global impact)	outcomes of the project, as well as of publishable results. Their feedback to the project outputs is expected related to policy and regulation, KPI, and to business cases, in order to mobilise sector interest and increase awareness of Big Data technologies as facilitators for developing new services
Other consortia of large scale pilots of other domains that Energy	European and national level	▸ Foster cross-sector collaboration, sharing experience ▸ Creating favourable conditions for the replication and scaling up of the best technological solutions and their application in different sectors, and best practice sharing
Standardization bodies & Regulation Authorities	European, national and local with global impact	▸ Support new regulations/standards to accelerate adoption of project services and products piloted and developed.
Policy makers & Public bodies	European, national and local with global impact	▸ EC and EP, regional local authorities, public bodies will be informed to propose recommendations to improve the existing regulatory framework ▸ Communicate the impact of project results also in socio-economical and environmental sectors
Media and specialized press	European, national and local with global impact	▸ Raise awareness and promoting the publication of project dissemination material

The overall goal is to disseminate the project objective and results among the interested stakeholders, demonstrating the added value, innovation, technologies and new services developed within the project. In addition to the communication activities and channels described in section 2.2.2, each partner shall also use its own dissemination networks to further publicize the project and thus ensure maximum visibility and impact at a regional, national and EU level.

Dissemination and Communication

In the following table the main communication channels and types of information for each group of stakeholders is reported. The dissemination strategy will be rolled out in parallel with the other project activities. It will aim to maximize the impact and visibility of the project among all relevant stakeholders in the Energy sector at European level. Special remark to that **dissemination of the results will occur after the adequate measures for protection of IPR** will be put in place. The following target groups, communication channels and types of information required have been pre-identified:

TARGET GROUPS	GOAL	COMMUNICATION CHANNELS
Internal		
Project partners including technology transfer offices and media offices	Ensure that relevant departments at partner organisations are aware and informed of the project and can disseminate correct information when approached.	▸ Internal channels (i.e. Consortium members collaborative space within the website) ▸ Consortium mailing distribution list
EC (project officer as point of contact)	Ensure the EC has up to date information on the state of the project and achievements for its dissemination purposes.	▸ Regular meetings ▸ E-mail
External		
End users of Energy sector and General Public	Present the services developed and available for them and raise awareness	▸ Website ▸ Webinars ▸ Project workshops
Electric utilities and Energy service companies (retailers, ESCOs) and ICT providers able **to acquire the services** piloted and developed	Present the services developed and available for further exploitation	▸ Website ▸ Conferences and Industrial fairs and exhibitions* ▸ Project workshops
Clusters, ETPs, associations, other stakeholder community of Big Data and Energy	Share experience, mobilise sector interest	▸ Website ▸ Publications ▸ Conferences and Industrial fairs and exhibitions* ▸ Project workshops ▸ Participation in the Advisory Board ▸ Participation of project partners in their General Assemblies
Standardisation bodies & Regulation Authorities	Support new regulations/standards to accelerate adoption of project services and products piloted and developed.	▸ Participation in the Advisory Board

Policy makers & Public bodies at European, national and regional level	Raise awareness, influence policy priorities.	▸ Website ▸ Regional/national events ▸ Final conferences
Media and specialized press at European, national and regional level	Raise awareness and promoting the publication of project publications	▸ Journals ▸ Networking: mailing, etc.

* Industrial fairs and exhibitions of potential interest described in section 2.2.2.

How the proposed measures will help to achieve the expected impact

Strategies and business models developed by ELECTRA are conceived to be customizable, interoperable, scalable and replicable as this is key to ensure their success in the market and therefore to achieve the expected impact of the project. On the one hand, **raising awareness** on the benefits for end-users and energy services providers with the opportunities ELECTRA provides will facilitate market acceptance of its outcomes. Measures to achieve this are webinars addressed to end-users, workshops organized in every location of the large scale pilots, attendance to European and international trades and fairs. On the other hand, **fostering cross-sector collaboration** with other consortia of large scale pilots of other domains that Energy and **creating favourable conditions for the replication and scaling up** of ELECTRA solutions and their application in different sectors. This will be achieved by inviting other consortia partners to the project workshops and by organizing the workshops in collaboration with their own workshops (addressed in a dedicated task within WP10). The Big Data technologies piloted and developed under the ELECTRA will be disseminated among other sectors with the aim of reaching further business opportunities and markets. Finally, by **creating favourable conditions for rapid adoption of project results** by disseminating the added-value of the solutions through clusters, associations, ETPs, standardisation bodies, etc. This will be achieved with the close collaboration with the Advisory Board and mainly with the activities foreseen for community building such as the participation in European and international trades, organisation of workshops by the pilot leaders (to which these clusters, associations, ETPs, standardisation bodies, etc. will be invited).

2.2.1.2 Individual dissemination, exploitation plans and commercial interests

Individual communication, exploitation plans and commercial interest	
Communication Plans	**Exploitation Plans and Commercial Interests**
ENERGY PROVIDERS – UTILITIES	
Roadmap of **Gas Natural Fenosa Generación** to integrate and disseminate outcomes of this large scale pilot has the priority (short term) on fleet) **located in Spain (10,39 GW** of gas, hydro and wind). Second step will include power plants **overseas considering the same technologies (2,85 GW).** Third step will be application on **coal power plants and other generation technologies (2,26 GW**) managed by CESOM.	Business evolution and associated eexploitation plan is basically oriented to the increase of O&M efficiency. First estimations are based on these objectives: 1. Reducing **unscheduled downtime and major failures** in **combined cycle and coal**. Big Data impact will be **not less than 1 M € / year**, both in reducing the number of breakdowns entity and the severity of them. 2. Improved production management in **hydroelectric** power plants as a result of better requirements in turbines when integrating rainfall forecast, prices and technical conditions of the facilities, estimated at least **15% annual increase in expected revenues**. 3. Improvement of **15%** of productivity in terms of **windmill** by avoiding unavailability, reducing downtime periods in at least 24 hours per occurrence. This goal is expected to be achieved via better maintenance management due to early warning advisory. Improvement of 8% in productivity based on of better management of unavailability of the fleet. 4. Reduction of **preventive maintenance** load. The application of big-data techniques in managing maintenance actions will reduce the workload in this activity by at least **20%** in the global fleet. In order to implement this Plan **foreseen investment in Big Data** will represent **at least the 20% of the annual platform investments until 2020** of GNF Generación.

ELECTRA goals for transforming network distribution activities and processes is fully aligned with new **strategic plan for DSO business transformation recently launched in Union Fenosa Distribucion**. Digitalization of the network is the main topic behind this strategy covering a potential impact (electricity and gas) of **9 million distribution points in Spain and more than 14 millions in other countries** of Europe and Southamerica. In terms of network length and energy distributed, electricity consist of 228.118 km and 51.412 GWh and in the case of gas networks is 136.113 km and 424.290 GWh.	Experience derived of the demonstration of big data solutions on 4 Pilot use cases covering all range of activities in DSO Business will provide these main expected benefits: ▸ To achieve **60% reduction of non-technical losses due to billing fraud**. In 2014**, 164.731 fraud files were opened in Spain** and this amounts more than 150 M€ annually. ▸ To integrate all data generated by electricity **smart meters (4 million) and secondary substations (40.000**) in order to reach **real time operation of Low Voltage network** (LV) ▸ To optimize efficiency in different **processes associated to supervision and maintenance** of electricity networks (**between 20-30%** depending of each particular process). ▸ To transform **customer support and call centres from a reactive to a clearly proactive position.** Data integration of different sources and forecasting of network incidences will allow to improve information to the customers of any supply problem and maintenance actions. Another main goal is to identify potential reasons of any incoming call to the telephone platforms in advance to the question or claim stated by the customer. Forecast is to **reach better ratios of customer satisfaction and service quality (4-8 % higher).**
Gas Natural Servicios is playing the roles of Retailer and ESCO company for residential and commercial market in Spain, combining energy (electricity and gas) selling with a portfolio of services related to equipment maintenance (boiler, air-conditioning,..), mobility or energy efficiency. Large scale pilot of ELECTRA will consider different segmentations of total residential and commercial customers in Spain (**11,69 million contracts**). Some examples of target customers are those who integrates **both gas and electricity supply (1,42 million customers**) and all where we are offering **maintenance or efficiency services (2,57 million customers**).	Previous experience on big data analytics in the commercial area have demonstrated relevant results on better understanding of customer behavior as a first step **to tailor energy services and tariffs to their real needs and interests as well as reaching better ratios of customer loyalty**. Other benefits are concerning efficiency **improvement with customer interaction/link Increasing the use of digital channel for sales and services** will allow reaching more and different typology of users and reaching cost reduction of other channels, thanks to social networks and publicity. Last group of benefits considered in our business plan are related to **enhance added-value of existing services** offered to residential, commercial and SME markets. Submetering of electricity consumption or advance detection of malfunctioning of heating/air-conditioning equipment and other home appliances **without installation of new components are of great interest**. A preliminary estimation of economic impact considering **savings and new revenues associated to above mentioned strategy is established in 2-2,5 M€ every year** for Retail and ESCO business area in Spain.
The **EDF** communication plan is different for the different use cases considered in the project. As for Energy Retail & Services use cases, the results of the project will be disseminated within the EDF Group to develop widely new services to its customers. As for the Generation use case, the results of the project will be published and shared with the scientific community when possible.	**EDF** will exploit the results in operations at the end of the project. As for the Energy Retail & Services, the goal is to offer the new developed services to all customers, first in France and later in other countries where the EDF Group operates. As for the Generation use case, the goal is to industrialize the optimization maintenance tools tested on nuclear plants when they show improvement in the maintenance operations.
As end-user of the technologies developed in the project, **ENEL Group** intends to deploy the pilot results to its fossil fuel and hydro fleet at national, European and international level. The involvement in the Project of the ICT and Operational Performance Optimization departments will assure the exploitation of the results within the company. The presence of EIR in several international energy associations will contribute to the dissemination of generation pilot results. EIR dissemination activities will include newsletters & website, workshop attendance, and demo site visits.	Following actively technology trends for Industry 4.0 that considers BigData as one of the enabling technology, **Enel Group** will implement BigData Technologies and advanced tools as strategic solutions for the digitalization. The solutions will be implemented to improve the O&M process on a total estimated power capacity of more than 15 GW in the next 5 years. It is expected that the fully deployment of ELECTRA solutions to overall fossil fuel and hydro fleet will reduce the maintenance and the unavailability costs up to 20%.

EGP internal dissemination activities will include newsletters & website, workshop attendance, and demo site visits, but also specific knowledge transfer activities to O&M people. EGP will participate and contribute to the project dissemination activities, including stakeholders workshops and demonstrators newsletter. EGP will disseminate the project results also in the EU associations which belong to.	**EGP** will evaluate the impact of Big Data technologies on its business, contributing also to the determination of technology providers' market size. EGP intends to deploy the generation pilot results to its geographical and technological distributed fleet, in Europe and beyond. Optimal O&M supporting tools and correspondent business plans will be applied in different countries taking into account specific contexts, allowing also a knowledge transfer to other renewable technologies (eg geothermal plants) and to other departments such as E&C and purchase.
Hafslund Nett will communicate the progress and results of ELECTRA internally in the organization, including District Heating and Generation and Market as well as to our partners in the utility associations we are a member of. Experience and results from ELECTRA will be important in the training and recruitment of network operators.	Big data solutions showing successful results will be implemented by the different subdivisions where economically viable. **Hafslund Nett** intend to use the results from the project to suggest adaptions of existing tools and systems from our current providers, as well as making relevant adaptions to future RFPs. The end result will be increased ROI on meters, sensors and control components, and improved operation efficiency and customer satisfaction.
NYFORS will make presentations of Electra results by electronic newsletters reaching 1000 industry and academic subscribers.	The expertise **NYFORS** will gain during the ELECTRA project will be valuable in delivering services and products to our customers. Nyfors estimates a raise in business for heat pumps, solar cells and energy products of 30% gained by the knowledge from analysing "Big Data" from smart meters into sophisticated time series.
BIG DATA & TECHNOLOGY PROVIDERS - Companies	
ATOS will contribute to the scientific and business dissemination of the project publishing in relevant journals and presenting in international conferences the results of its research activities within the project. ATOS will as well disseminate the ELECTRA results through its Scientific Community, which is ATOS think-tank in digital innovation, publishing quarterly position papers renowned within the ICT consultancy market.	ELECTRA results will upgrade **ATOS** portfolio in the Energy & Utility market to offer ATOS clients' the latest in Big data technology based on enable real-time information. Specifically, ATOS commercial interest in ELECTRA is due to both its Big Data infrastructure layer and its Big data application layer in the energy domain towards ATOS clients already in the Consortium (GNF, ENEL, EDF, CEA) and towards potential replicability to other utilities to be reached via the ELECTRA Stakeholder Network. ATOS expects its Big Data service line to grow 30% in the following five years, boosted mostly in the infrastructure applications and in two reference markets: banking and energy utilities. This is why ELECTRA is an innovation action of promising commercial & strategic importance for the whole company.
Orange has recently started a new activity in Poland with Orange Energy acting like an Electricity retailer: results from ELECTRA demonstration activities could be adapted for this new activity in Europe as well as in Africa.	**Orange** has already started to integrate Big Data technologies for its own needs as well as developing dedicated offers for its customers. Orange expects to deliver to its customers the most advanced Big Data technologies and services especially in the following three areas:(i) Analytics as a Service; (ii) New Machine Learning techniques; and (iii) Secured Data monetization services. Orange Essentiel 2020 strategic plan targets Big Data as the third key enabler forf the company.
Computas intends to fully integrate the ELECTRA results in communicating with the market, using its customer network, web and social media, commercial events, etc. Main target will be the energy domain, but also include other sector where similar Big Data to solutions are relevant, incl. oil & gas. We will display ELECTRA results regularly at national and international business events.	**Computas** intends to exploit ELECTRA results in two dimensions: a) based on IP acquired in ELECTRA, we will further refine the Distribution demonstrators and offer them as software solutions to current and potential customers in the Distribution domain, and b) the Big Data expertise gained in ELECTRA will be packaged as new service offering to industry customers, complementing already existing Information Management services. We expect at least an overall doubling (100% increase) of the income from our Big Data related services and products.
Powel will implement the demonstrated technology from ELECTRA in its commercial products and offer it to a global market. Results and big data technology from the project will be highlighted as key selling points. It results will also be used in our marketing generally (advertisements, fairs, home page etc.).	As a result of the project and as a provider of software technology applications to distribution and generating companies, **Powel** expects to offer to the energy sector market the latest in big data technology and enable real-time information and data from smart meters. The company's business plan is to double increase the revenue from sales to the energy value chain market with more than 50 % during the coming three years.
Flyby will make presentations of Electra results at the many international conferences (e.g. EU-PVSEC, EWEA, EMS or	**FlyBy** expects to use the knowhow and expertise acquired during the ELECTRA developments to enlarge the range of its possible services in

ECAC). Flyby will disseminate results of Electra through materials published on Flyby website	the field of energy management and in particular for predictive maintenance application for RES.
SAP is organizing European event every year (Utilities conference; Oil and Gaz conference etc.) with more than 1000 participants where SAP is already sharing its European commission related activities. The outcome of the project will be integrated in the conferences communication . Also SAP is proposing to collaborate with ERAnetSG+ for further dissemination and to promote project dissemination in relevant industry groups where SAP has a deeper engagement (ESMIG, EEGI, ETP SG, national SG organizations, ebIX)	**SAP** wants to boost its cloud revenue (including SAP big data applications) by 2 in the next 4 years. To drive this ambition SAP wants to benefits from ELECTRA demonstration to replicate the model in other energy intensive industry like for example chemical, metal, oil and gas etc. The project is an opportunity to build a big data framework that could be used as a foundation to replicate the model to improve maintenance efficiencies, reduce the impact of energy on the product value sold by companies.
	TECNALIA will exploit their ELECTRA assets following distinct business models: Consultancy services, agreements with ICT energy services companies. Through **TECNALIA** Ventures, a wholly owned subsidiary for the commercialization of innovative technology-based results to transform them into investable business opportunities and managing the portfolio of TECNALIA spin-offs, currently up to 15 start-ups in a wide range of sectors. Replication of big data solutions to other domains (apart from energy) will be also considered.
BIG DATA & TECHNOLOGY PROVIDERS - RTOs	
CEA will disseminate tits results through publications in technical literature to support the trend of Big Data adoption in the energy sector. Attendance to thematic congresses to show how ELECTRA contributes to the demonstration of data sciences power to the energy industry will also be strongly supported.	Through its natural role of technological transfer toward the industry that **CEA** intends to exploit the progress made during the course of this project.
SINTEF ICT is leading the Norwegian GEMINI-centre of excellence for Big Data together with the Universities of Oslo and Trondheim and is leading the Technical Priorities in BDVA, and will use these organisations to support this dissemination strategy.	**SINTEF** has through the company vision of "Technology for a better society" a current operational strategy to bring data-driven innovation based on Big Data into practical usage by industrial and public users, replicating big data success examples.
SINTEF Energi project results and experience will be disseminated through publications, events incl. national and international conferences, and communication in non-technical fora; building social acceptance for the transition to a European renewable energy system with active customers.	The incorporation of Big Data technology with domain expertise in our tools and technology offerings will strengthen our ability to understand and exploit the value potential of Smart Grid, AMI and IoT, in cooperation with national and international industry partners.
DTU is leading the Danish Research Center for IT-Intelligent Energy Systems (CITIES) and we expect a lot of synergy between ELECTRA and this and other national projects. DTU will use the knowledge gained in ELECTRA in future research and innvoation activities, and some of the results will also be embedded in the education at the University. DTU will disseminate the results of the demonstrations in ELECTRA in both an number of journal papers and more public oriented events.	The knowledge gained on big data technologies and energy systems in by the demonstrations and development in ELECTRA will boost our knowledge and capabilities on methods for design and operation of future intelligent and integrated energy systems. Consequently this will help Denmark finding the most suitable parth for obtaining a fossil-free energy system in 2050. We also expect that this implies that we can stay on the forefront in relation to exporting solutions for future energy systems.
EURECAT will disseminate ELECTRA's results at scientific and industrial level through attendance to congresses, fairs and events, publication of papers and dissemination programs, Some examples of congresses organized by EURECAT are: BDigital Global Congress (16 editions, now Eurecat Global Congress), and Big Data Congress. EURECAT has a large online community (26.000 members/followers) reachable for dissemination purposes and can spread ELECTRA success case in the framework of the Big Data CoE Barcelona.	As a result of ELECTRA, **EURECAT** will be able to offer more advance services in terms of technology readiness to current and new potential customers. It is foreseen a growth 25% by the exploitation of EURECAT BigPlay platform as a service and data analytics modules, as well as consultancy and training. The main target markets are energy and water utilities through the Water-Energy nexus where EURECAT has been doing research in the last years and has laid the foundation to become a technological reference partner in the big data ecosystem, both in private & public projects.
BSC projects' results are exploited in its computing infrastructures, mainly in the MareNostrum supercomputers, by making them available in production to all their users. BSC	**BSC** strategy for the next four years aims to build end-to-end analytic workflows for its main applications, based on the layer of Analytics as a Service to be deployed in ELECTRA, and the application of cognitive

will also use large international events on HPC such as SC (more than 10,000 participants) and ISC (more than 3000 participants) events, to provide high visibility to the project.	computing to derive knowledge from data. Results coming from ELECTRA developments will not only impact in the Earth Science applications related to weather prediction but most BSC applications
The main aim of **UNIBO** exploitation concerns the knowledge transfer of competencies and expertise in big data management and analytics developed in academia to companies.	ELECTRA will increase the capacity of **UNIBO** to participate to other projects, to consultancy activities in the energy sector and to open a spin-off company leveraging the project results and tools
ENFOR will contribute to the dissemination activities by presenting the results obtained in ELECTRA at international conferences and papers. In addition, the developed methods and results will be highlighted in marketing material such as brochures and product white papers.	The methods developed in Electra will be built into **ENFOR's** existing forecasting and building analysis product portfolio enabling easier deployment in customer situations with heterogeneous big data inputs thereby bring down implementation costs. ENFOR sees this as an important step to insure a wider deployment of big data within forecasting and building analysis within the energy sector.
OTHER SERVICE PROVIDERS	
RICOH will contribute to dissemination and communication activities by assisting to international conferences and events to reach to professionals of IT and printing sectors. Ricoh will also take advantage of its marketing positioning in order to publish specific press realises in specialized media and of its memberships in associations, AMETIC, CEOE, adigital and MKT.	Development of sustainable products and services is key for Ricoh as an environmental responsible company and also to provide a clear value added for its customers. Ricoh will exploit the project results to optimize the operation of its products (mainly MFPs) and to offer energy and environment consultancy services to its clients for sustainable offices.
NOVASOL is part of Wyndham Worldwide which has a corporate initiative called Wyndham Green. Here we plan to expose our efforts and pilot results in the internal world which is big but also locally in Denmark via Association of Danish Holiday House Letters and on social media like Facebook and Twitter.	Our objective is to use the pilot on research level to gain collaborative insight about distributed data and extent the use by incorporate all 40.000 European holiday cottages in order to offer automated services for house owner, holiday makers and NOVASOL operations.
Zabala will contribute will contribute to the dissemination to the strategic stakeholders by leading two tasks of WP10: "T10.3 Community Building" and "T10.2 - Training Sessions" thanks to its experience in managing European Networks and the relation among their members. Dissemination to strategic stakeholders will be made through the coordination of EIP SCC and ETP SmartGrids.	**ZABALA** will: Organize local and European dissemination events for different stakeholders and coordinate stakeholder Workshops and Community Building activities; and Coordinate training sessions addressed to the Stakeholders Ecosystem group. This will allow increasing its vast network of contacts and reinforce its strategic positioning at European level.
YOURIS will be responsible for the development and maintenance of the project communication channels, visual identity and public communication activities and tools addressing a wide public represented by stakeholders at large, citizens and consumers. Being youris.com an acknowledged distribution platform towards online, social and TV media, it will enhance outreach to large audiences and engagement with a wide online community also exploiting its already existing communication channels and communities (the web platform and social media)	The ELECTRA project will provide **YOURIS** with new contents on European research and innovation in the form of articles/interviews and videos to further populate its platform and social media channels and increase the number of users of its contents. The project will represent an opportunity to increase knowledge in digital energy and big data technologies for the production of new articles and videos to increase its target audiences and network of contacts to raise its chances for possible future collaborations.
The **NSGC** will make presentations of Electra results at the yearly National Smart Grid Conference; publish 4-6 articles in the NSGC's bi-monthly; disseminate results of Electra through webinars offered to our partners in the Global Smart Grid Federation (GSGF) and the European Technology platform for smart grids (ETP Smartgrids).	
SDG Group will disseminate Electra results through publications in technical literature and participation to conventions, seminars, workshops to support the trend of Big Data adoption in the energy sector, and all the other market sectors that could be impacted by Electra outcomes. SDG contribution will be focused on research and innovation issues that will come from the project itself, starting up communications campaigns and marketing initiatives to	**SDG Group** will contribute to communicate ELECTRA Project contents mainly related to Predictive & Prescriptive modelling tools and techniques and Big Data Visual & Discovery approach used to improve the overall Electra model and delivered solutions. The communication campaign will be made initially in the form of articles/interviews and videos used to populate its platform and social media channels, addressing actions to increase the number of users of its contents. Furthermore, SDG will use conventions, seminars, workshops and all the

address messages to all the people and organizations potentially interested to collaborate with SDG and other ELECTRA partners on the topics and solutions during the project	other SDG marketing initiatives to increase its target audiences and network of contacts. All of above having in mind the raising of chances for possible future collaborations

2.2.1.3 Knowledge management and protection strategy

Regarding Knowledge Management and protection strategy, ELECTRA will generate a fair amount of useful results and data along the requirement phase and during the course of Large Scale Pilots implementation and validation. Like any collaborative project, there is a need to share knowledge and data among partners to design and build the expecting pilots: for this purpose ELECTRA will use standard collaborative tools, including an infrastructure through which available datasets can be efficiently shared among the partners and with third parties partners in other Big Data PPP projects.
Therefore the IPR management strategy will be implemented into the Consortium Agreement protecting Energy competitiveness and supporting the dissemination of Big Data value with the openness and replicability of solutions for other business sectors. The Consortium Agreement will be based on the DESCA model promoted by European Commission and addressed the features of H2020..

2.2.1.4 Research data management

Research Data Management activities will be supported with the aim to sustenance the data management life cycle for all data that will be collected, processed or generated by ELECTRA. Consequently, ELECTRA includes a specific task and deliverable in D1.3 whose first version will be delivered the 6th month of the project. This deliverable will evolve during the lifetime of ELECTRA project in order to present the status of the project's reflections on data management.

2.2.2 Communication Channels

Communication activities differ from dissemination ones as the former involve communicating outputs to peers and more expert public involved in big data technologies and digital energy, while communication is aimed at the public at large through an iterative, interactive and multidirectional process involving a wide range of additional stakeholders and the citizens. Communication will aim at stimulating awareness on society's increasing dependence on reliable and controlled delivery of electrical power (EVs, sensitive equipment, always-on Internet, etc.) and improving customers' understanding of how they can gain from tariffs and demand side actions, creating an enabling environment by mobilising intermediaries, knowledge brokers and the media to contextualise and connect project outcomes with end-users in policy and practice.

ELECTRA communication activities have been divided between the internal communication (i.e. among ELECTRA partners, see Section 3.2) and the external communication, the latter aiming to promote the project and raise its visibility to a wide range of audience ensuring that ELECTRA's value creation reaches the potential end-users and its results encourage European players and society to achieve further user and advancements. To this end, ELECTRA communication activities will necessarily focus on a few key headlines outlining the project's results, transforming sometimes complex technical jargon into customized key messages aiming at less specialised audiences. The selection of communication tools will rely on the type of targeted audience, already identified in the dissemination section above (see Section 2.2.1 and WP10).
This section summarizes the communication channels ELECTRA will put in place to be used by partners for disseminate and communicate partial and final results of the project. Communication will be pursued through:

Website - the main entry point featuring information for both the professional community and the general public;
Social media - will be used to ensure the highest visibility of ELECTRA on the web and increase project outreach already from the beginning of the project. A dedicated social media strategy will be developed to assess the most efficient and effective channels for the project's scope;
Visual identity and printout materials for ELECTRA - including templates for presentations, project presentation kit, flyers, factsheets providing information and updates about the project and its results;
Press and news releases on specific project issues and milestones, or promoting project events will be produced and distributed to online and social media. An average of at least two press/news releases per year are expected to be produced and distributed.
Articles & interviews - as part of the dissemination and communication strategy, at least four journalistic articles/interviews will be produced by professional independent journalists for publication on the project website and wide web distribution to online media and across other information multipliers and well reputed public communication platforms such as Alpha Galileo, blogs and social media;
The **ELECTRA web video** will summarize the scope and outcomes of the project through engaging and original new forms of visual story telling. Distribution of the video will play a key role in guaranteeing the maximum outreach of the video messages

and contents. It will be accessible via the project's website and distributed online via social media and other portals. Communication will be pursued through community building activities addressed to strategic stakeholders:

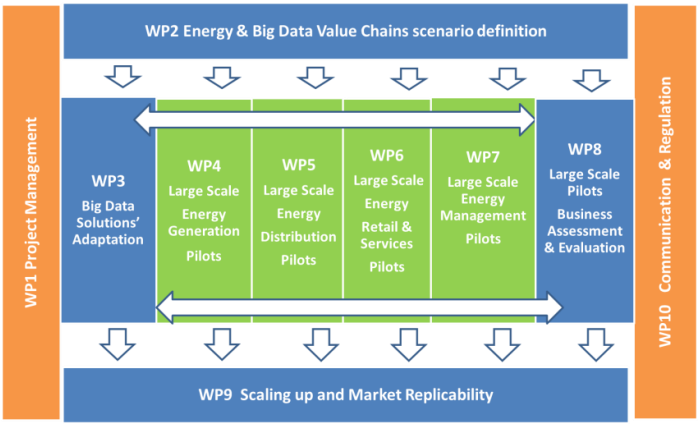
Stakeholders' workshops: With the aim to promote the project results to regional and national stakeholders of relevance under the concept of local actions with global impact (Act locally, impact globally) and make the link with regional, national and EU policies.

Interactions with other EU consortia, platforms, clusters, and associations: ELECTRA consortium will interact with other projects, platforms, clusters, associations active in the European space and that are relevant energy services as well as Big Data applied in other domains.

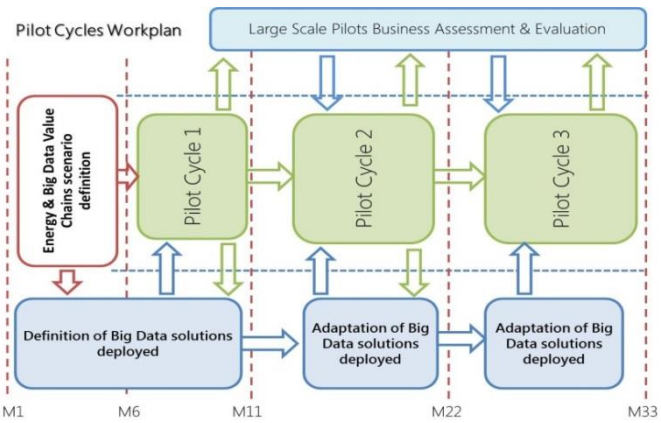
Organisation of webinars: 4 training sessions will be organized using a webinar platform to optimize the access of participants.

3. Implementation

3.1 Overall Structure of the work plan

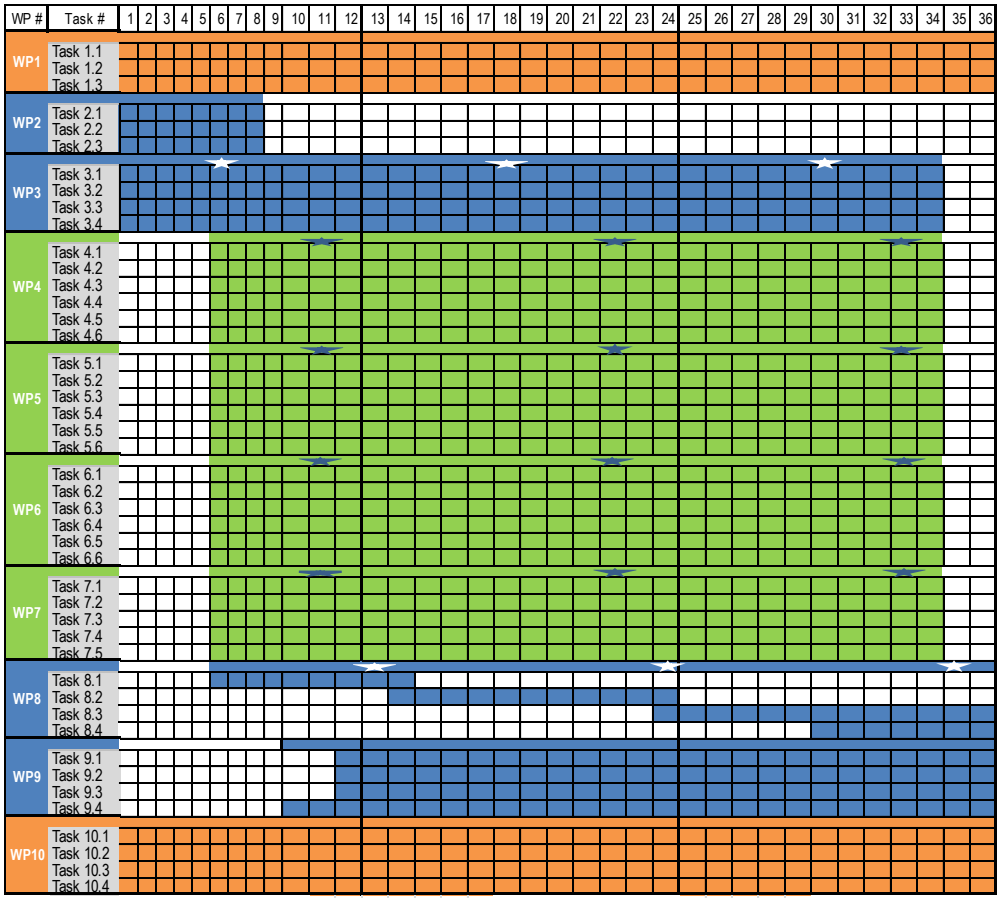


The ELECTRA project is a 36 months project. The work is divided into different activities, as defined in section 1.3.4; ELECTRA activities are further broken down into manageable sections of coherent tasks as outlined in the GANTT chart in the following page. The project tasks are grouped in a total of 10 WPs, as described in the subsequent figure, where interrelation among them are as well outlined. Large Scale Pilots activities are the core of the ELECTRA project spanning from WP4 to WP7. Supporting activities are included in WP2 and WP3 serve as ICT technical enablers and inception to the piloting activities. Market adoption activities have the double purpose of, on one hand, aligning the pilot activities to the business needs (WP8) and to exploiting the project results, specifically by replication and market uptake of the pilot activities (WP9). Finally management & communication activities support all the other activities in terms of project management & coordination (WP1-WP10) and communication to the relevant stakeholders (WP9). The project will start with WP2, which launches the activities required for energy scenario definition, big data tools requirement and project KPI definition and with WP3 that firstly define the state of the art of the available big data solutions available from the technological partners and then adapt them to energy domain pilots all along the duration of the project. WP4-WP7 reflects the deployment, running and validation of the large scale pilots in the energy domains identified in ELECTRA.



WP8 encompasses the business assessment and validation of the pilot results according to the business needs of the industrial partners and as well all along the course of the project. So that WP9 can built-up on the LSPs pilots' results and replicate them for utilities inside and outside ELECTRA, or other relevant stakeholder that will be engaged during the course of the project, also belonging to different industrial sectors.WP10 addresses project's public branding & awareness, community building, engagement and regulation and standardization activities. WP1 covers besides project coordination, quality assurance & ethics aspects. In order for the ELECTRA large scale pilot activities to be efficiently supported by the big data enablers and by the business assessment, a structure of cycles has been designed in which two loops, one from big data tools adaptation and the other from the business evaluation activity are continuously feeding and incrementally improving the execution of the pilots. The first pilot cycle (M6-M10), pilot settings & adaptation, basically focuses on o preliminary validation of the pilots using only a small sample of the data sets. This cycle will be shorter than the following one as it has a significant smaller scope and the first results/outcomes are evaluated by WP8. The second cycle (M11-M22) deals already with a full scale implementation. At the beginning of this phase all data sets and big data tools are properly adapted for running and reaching a complete validation using KPI initially defined in WP2, taking into account also the first business assessment from WP8. The third cycle (M23-33) is a pilots' impact optimization: based on the analysis of the results and KPI obtained on phase 2 and from the further evaluation from the business areas of the different

utilities, improvements are considered on the pilot in order to maximize its impact on processes and day to day energy business.



3.1a – Work Package Descriptions

3.1a – Work Package Descriptions

Work package number	1	Lead Beneficiary									ATOS				
Work package title	Project Management & Coordination														
Participant number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Short name of participant	ATOS	GNF	GEN	UFD	EURE	BSC	ZAB	CEA	EDF	ORA	POW	SIN-ICT	SIN-En	TNSGC	COM
Person/months	45	2	0	0	0	0	0	0	2	2	0	2	0	0	0
Participant number	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Short name of participant	HFS	DTU	NYF	ENF	EIR	EGP	FLYBY	UNIBO	SAP	TECNA	RICOH	NOVA	SDG	YOURI	CEPRI
Person/months	2	0	2	0	2	0	0	0	2	0	0	0	0	0	0
Start	M1		End												M36

Objectives - To develop an effective and comprehensive administrative, financial and legal management to ensure the successful execution of the project. In particular:

- To ensure the achievement of all project objectives in terms of time, quality and costs
- To perform smooth, effective management and coordination of the consortium ensuring the right functioning of the governing bodies established.
- To ensure that the project maintains its relevance towards the objectives of the program
- To manage resources, monitor the project performance and manage risks, ethics and contingencies
- To establish appropriate communication channels with funding actors as well as consortium partners

Description of work

Task 1.1 – Project Coordination, administrative & financial management (**ATOS;** HFS; SIN-ICT; EIR; GNF; EDF; NYF; ORA; SAP)

The main role of Project coordination is the overall management of the project regarding the administrative issues and the preparation and consolidation of the periodic reports in order to perform decision-making, clear external and internal communication, as well as effective administrative and technical control. The coordinator will maintain a set of management structures and will assume responsibility for contacting the Project Officer; the work will be organized in formulating propositions for potential modifications of the work plan, supervising contacts with all external organisations and delivering all types of reports and deliverables in a coordinated way. It also covers maintenance of financial records, coordination of costs submissions, preliminary checks of individual costs against known criteria (contractual commitments, progress reports ad delivery of results) and consolidation of cost, follow-up of EC payments and distribution of partner shares.

T1.2 – Quality assurance, Risk & Ethics management (ATOS)

This task will set up a Project Quality Board consisting of the Project Coordinator, the Technical Manager, the Quality Manager. The Quality assessment plan will be produced at the beginning of the project (M6) that describes in detail the quality requirements of the project and the respective guidelines in order to achieve this quality level. Additionally this task will deliver a detailed risks contingency plan for the technical and other objectives of the project that will be continuously updated during project lifetime, starting with table in section 3.2.7. Risks assessment will be performed on a continuous manner, in relation also with the activities of the Innovation & Exploitation Board, assessing new opportunities but also potential implementation risks that might arise during the lifespan of the project. This same board will define an Ethical working group to provide ongoing support to consortium concerning ethical and legal issues and ethical concerns and mitigation plans will be included in the Risk Assessment and Contingency Plan.

T1.3 Data Management Plan (ATOS)

The objective of Data Management Plan is to establish the measures for promoting the findings during the project's life. It will enhance and ensure relevant project's information transferability and will take into account the restrictions established in the Consortium Agreement. The Plan will set the basis for the dissemination and exploitation activities and the procedures for sharing project data. The plan will be periodically updated evolving in parallel with the development of project activities. This task is also in charge of identifying and monitoring all relevant national and international European legislation and directives related of the countries where the data collection will take place in collaboration with task T10.5.

Deliverables

D1.1 – Project Management Report (M12;M24;M36) – (ATOS)

D1.2 – Quality & Risk assessment, contingency plan (M3;M16;M28) – (ATOS)

D1.3 – Data Management Plan (M6; M36) – (ATOS)

Work package number			**2**			Lead Beneficiary									**HAFSLUND**
Work package title			**Energy & Big Data Value chains scenario definition**												
Participant number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Short name of participant	ATOS	GNF	GEN	UFD	EURE	BSC	ZAB	CEA	EDF	ORA	POW	SIN-ICT	SIN- En	TNSGC	COM
Person/months	6	6	6	6	4	2	0	2	4	2	4	2	3	0	5
Participant number	**16**	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Short name of participant	**HFS**	DTU	NYF	ENF	EIR	EGP	FLYBY	UNIBO	SAP	TECNA	RICOH	NOVA	SDG	YOURI	CEPRI
Person/months	**13**	2	0	0	3	2	7	2	6	2	7	0	0	0	0
Start	**M1**							End							**M8**

Objectives - Define scenarios and requirements from both the Energy value chain & the Big Data value chain to align project large scale pilots identifying project & work package specific KPIs. In particular this WP will:

- Define the energy pilots scenarios for business assessment and validation
- Specify the requirements for Big Data tools & solutions for their adaptation into the energy LSPs
- Define the key performance and transformation indicators

WP2 is a cross-sectional work package that will define methodology and tools to guide and support the Large Scale Pilots preparation and demonstration work: Scenarios for energy domain pilots and use cases, requirements for Big Data tools, and KPIs for business and technical value assessment. WP2 will provide a holistic perspective on the pilots and use cases implemented in WPs 4-7, ensuring an integrated and efficient implementation of the different demonstration activities. WP 2 will also lay the foundations for the work done in WP 3 (Big Data

Solutions' Adaptation) by specifying the use case Big Data requirements, taking into account the available cyber-physical infrastructure in the demonstrators. Additionally, WP2 will provide the necessary context, framework and scenario hypotheses for WP 8 (Business Assessment and Validation) and WP 9 (Scaling-up and Market Replicability). The technology selection and the scenario identification will be representative of the EU context thanks to the contribution of several utilities located in different areas of Europe, and to the interaction with the Stakeholders' Group.

Description of work

Task 2.1 – Energy domain pilots´ scenario definition (**HFS**; ATOS; GNF; GEN; UFD; SIN-ENE; EIR; EGP;DTU;FBY; SAP; RICOH)

This task covers the identification of activities per domain in the energy value chain system illustrated by the structure WP4-WP7. The work will also identify how and when (order, schedule, duration) the different use cases in the project can be demonstrated in the different pilots, including the identification of the roles of each pilot participant. The mapping of the domains, use cases and roles will result in an overview of Big Data in the energy sector, but also result in a common framework to structure the demonstration activities in this project. When evaluating use cases and Big Data concept, it is also important to involve business side of partners to identify not only technical goals but also those related to the business adoption and how to use the new data. As a basis for the planned use cases to be tested, a certain number of scenarios will be defined and characterized in advance to evaluate possible business cases including one or more innovative technological solutions, and under different evolutionary trends (electricity/gas usage and mix trends, big data technologies technical and economic trend; geographic applicability and costs; power plant operating modes). In order to have detailed and realistic scenarios to be used to assess the business cases of WP8 and evaluate the Scalability/Replicability of WP9, a number of sites will be chosen (associated to the pilots inside the project) where the set of technologies and systems tested in the project will be applied. These sites will be chosen starting from the operational experience of the pilot participants, to have a strong support for data. Current regulation and its expected evolution will allow the selection of scenarios in different EU areas. The following elements will be important in the characterization of the scenario hypothesis definitions:

- Evolution of electricity price and regulation
- Power plant operation
- New technology for monitoring and control in the distribution grid
- Increased amount of flexibility from the customers side

The trends for these parameters will be established based on collection of historical data from the utilities as well as from the open literature, review of studies from European and international organisations (ONU, IEA) and scientific literature. The output of this task will be used as input for WP8 and WP9 to make an (economic and technological) sensitivity analysis.

Task 2.2 – Big Data tools & solutions requirement definition (**COM;** ATOS; GNF; GEN; UFD; EURE; BSC; CEA; EDF; SIN-ICT; ORA; POW; HFS; FBY; UNIBO; SAP;TECNA; RICOH)

This task defines the cyber-physical requirements for the application of partner tools to the scenarios and use cases defined in the project. The objective of this task is to provide a starting point for the Big Data platform defined and developed in WP 3 (Big Data Solutions' Adaptation), by establishing bounds for the requirements to the Big Data solutions, taking into account:

a) The capabilities and characteristics of the physical and technological infrastructures at the pilot sites, including the characteristics of available data sets,
b) The computational requirements of the proposed use cases, and
c) The capabilities and characteristics of the computational resources and infrastructure provided by both technology partners and pilot sites in the project.

The pilots in this project cover almost all aspects of the energy value chain, from generation to consumption. As is clear from the use case descriptions in WPs 4-7, there is a wide diversity between actors and use cases, along several dimensions:

- Current and best practice for monitoring and control vary from relatively well developed for generation plants, to very limited for traditional power distribution. This is currently changing with the introduction of advanced metering infrastructures (AMI). However, given the lack of a common regulatory framework, combined with a lack of consensus regarding the value potential of AMI, the capabilities provided by AMI across Europe are quite diverse, both in terms of the technical potential of the meters, and in terms of the upstream communication and processing architectures.
- The dependency of use cases on online and historical data, and in particular, the relationship between data quality and resolution on the one hand, and the value potential of each use case on the other.
- The maturity and stability of metering and control infrastructure, potentially in combination with regulatory conditions and restrictions

This task will analyse the proposed use cases with respect to these dimensions, and establish the corresponding requirements for the Big Data tools. This will be important not only for the technical implementation and execution of the pilots, but also for demonstrating the general applicability of the proposed approaches. In conjunction with the output from Task 2.3, this will also provide the foundation for WP 8 to quantify the value potential of the different use cases, and of Big Data technologies to the sector as a whole, under the conditions and constraints set out by the available sensory and control equipment and infrastructure. The requirements of each use case will be characterized according to relevant standards and conventions, including the NIST Reference Model for Big Data, and the Big Data V's.

Task 2.3 – Definition of project KPIs (**HFS;** ATOS; GNF; GEN; UFD; EURE; EDF; POW; SIN-ICT; SIN-ENE; COM; EIR; EGP; FBY; SAP; RICOH)

This task will define the primary Key Performance Indicators (KPIs) for the project, defining both *what* and *where* to measure the different indicators. Subsequent work packages will use these KPIs to validate the technical contribution and business aspects of the concepts and solutions under demonstration. The KPIs will also enable the demonstrators to measure progress in the different cycles of the project. Finally, they will provide an important starting point for evaluating the applicability of the proposed solutions beyond the scope of this project. Taking into account the number of use cases and demonstrators in the project, this task will focus on the overall KPI measures, while their concrete implementation may depend on internal benchmarks that will be further defined in subsequent work packages.

The following are examples of KPIs valid for this project:

- Generation efficiency indicators. These may include productivity indicators for conventional generation, downtime and cost of interruption indicators (e.g. SAIDI, SAIFI), and exploitation indicators for renewable generation (e.g. curtailing).
- Efficiency and productivity indicators for energy distribution. These may include measures of power quality, reliability, losses and customer satisfaction (e.g. measures based on EN 50160).
- Measures of energy usage transformation. These may include measures of energy efficiency, demand flexibility, customer participation, and technology adoption.

This work package will take into account that the introduction of Big Data technologies, alongside the drastic increase in sensory and control possibilities brought about by—among other factors—IoT and AMI rollout, will cause radical changes to the work processes in several areas of the energy sector. For instance, AMI rollout will in some cases lead to a revolutionary improvement in distribution system observability. Depending on the current system reliability and efficiency, this may in turn be expected to cause incremental improvements in end-product quality. This task will consequently focus on developing not only traditional KPIs, but also measures of both incremental and disruptive transformations in the energy value chain.

Deliverables

D2.1 – Energy domain scenarios (M6) – (Hafslund)

A roadmap for the demonstration activities planned in the project, focusing on pilots, use cases, time schedule etc., promoting national and trans-national benefits.

D2.2 –Requirements of Big Data tools and mapping into the scenarios (M6) – (Computas)

Description of requirements for Big Data tools for use cases and scenarios.

D2.3 – Definition of project KPIs per energy domain (M8) (Hafslund)

Report – overview of relevant KPIs and transformation indicators for each work package.

Work package number			**3**			Lead Beneficiary						**SINTEF-ICT**			
Work package title			Big Data Solutions' Adaptation for Energy												
Participant number	1	2	3	4	5	6	7	8	9	10	11	**12**	13	14	15
Short name of participant	ATOS	GNF	GEN	UFD	EURE	BSC	ZAB	CEA	EDF	ORA	POW	**SIN-ICT**	SIN- En	TNSGC	COM
Person/months	16	0	0	0	20	32	0	13	0	17	16	**23**	5	0	12
Participant number	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Short name of participant	HFS	DTU	NYF	ENF	EIR	EGP	FLYBY	UNIBO	SAP	TECNA	RICOH	NOVA	SDG	YOURI	CEPRI
Person/months	0	4	0	3	0	0	22	27	44	17	0	0	15	0	0
Start	**M1**									End					**M34**

Objectives - The main objective of this WP is the configuration and adaptation of Big Data technologies for the needs of Energy applications in the four energy value chain pilot areas: Energy Generation, Energy Distribution, Energy Retail and Services and Energy Management.

Specific Objectives are:

- Establish a Big Data Framework with configured platforms for Energy applications
- Enabling Energy Applications with support from the Big Data Framework
- Provide tools for Prescriptive and Predictive Analytics for predictive maintenance and Energy forecasting
- Provide tools for Big Data Real time Analytics for Energy monitoring
- Provide tools for Big Data Visualisation an Descriptive Analytics for Energy data analysis
- Provide services for Big Data Management, Acquisition, Curation and Storage, with security and privacy
- Big Data Physical Infrastructures

Description of work

Task 3.1 - Big Data Framework with configured platforms (**SIN-ICT;** ATOS; GNF; GEN; UFD; EURE; BSC; ZAB; CEA; EDF; SIN-EN; ORA; POW; TNSGC; COM; HFS; DTU; NYF; ENF; EIR; EGP; FBY; UNIBO; SAP; TECNA; RICOH; NOVA; SDG; YOUR; CEPRI)

This task will establish the ELECTRA Big Data Energy Framework as an architecture consisting of the tools and services needed by the Energy applications, and instantiated for the different pilots and use cases according to their needs. It will evolve through the various incremental milestones of the project with upgraded components as they evolve through the project. The foundation for this is a set of existing platforms based on configurations of open source components from the Apache Big Data stack, including the existing EURECAT BigPlay platform, Orange Data Flex Cloud platform and the Big Data Europe platform. A Docker based architecture will be used as support in the integration of various components offered by the project partners in the different tasks of this workpackage. BSC will provide support for the integration of distributed programming and high performance computing facilities into the framework. The Big Data Framework also includes support for the SAP Hana Big Data platform with the HANA in-Memory distributed database architecture for high performance analytics. Different configurations of the Big Data Framework will be instantiated for the different pilots and use cases in the project.

Task 3.2 - Big Data Analytics for Energy (**ORANGE;** ATOS; GNF; GEN; UFD; EURE; BSC; ZAB; CEA; EDF; SIN-ICT; SIN-EN; POW; TNSGC; COM; HFS; DTU; NYF; ENF; EIR; EGP; FBY; UNIBO; SAP; TECNA; RICOH; NOVA; SDG; YOUR; CEPRI)

The task of providing tools for energy analytics will be divided between the following three subtasks.

Subtask 3.2.1 - Big Data Visualization (**SDG**, BSC, EURECAT, ORANGE, POWEL)

This task will be providing tools for descriptive analysis and visualisation of the datasets that will be introduced by the Energy pilots. These tools will be supported by the foundation laid by existing technologies such as ORANGE Khiops, orange.biolab.si and projects such as Apache Zeppelin, Pig, Drill and DataFu. The Energy applications/tools EURECAT DSS, SDG Visualization and User Interaction for Decision Support, XX YY will make use of appropriate selections of these technologies and share the common patterns of usage of this in their relevant applications for further Big Data technology adaptations for these.

Subtask 3.2.2 - Big Data Prescriptive and Predictive Analytics (**BSC**, ENFOR, EURE, FLYBY, SAP, SDG, SIN-ICT, SIN- ENE, TECNA, UNIBO)

This task will provide prescriptive and predictive analytics tools as required by the Energy pilots. In particular in the areas of predictive maintenance and forecasting of energy demand. The foundation for this is the existing generic Machine Learning solutions from BSC, UNIBO Empirical Model Learning, EURECAT KIWI ML, SDG Early Alert engine and Apache's Mahout and H20 system, and optimisation software such as the SCOOP Scheduler, SIMADES and PowerScheduler from SINTEF ICT, and UNIBO's Google OR based Deep Network. DTU is providing their statistical method AQUANFOR which is a unique method for adaptive quantile forecasting, and this method is now one of the most widely used methods for probabilistic forecasting - also supporting non - Gaussian data, like failures. This will be prepared for usage within the various pilot use cases. The Energy applications/tools from Powel's Smart Energy Suite, Predictive Maintenance and Dynamic Reinvestment products, TECNALIA PROLOAD, LEAD MANAGER and Thermal imaging process control, ENFOR WPPT Wind Power Prediction Tool, ENFOR PRESS Heat load and energy system optimization, ENFOR LOADFOR Electricity load prediction, ENFOR SOLARFOR Solar power prediction, ENFOR PRICEFOR power price prediction, EURECAT SEM LoadScheduler and LoadForcaster, the BSC Weather Forecasting, SAP Hana PDMS, and UNIBO's ENERGY-OPT and ePolicy will make use of appropriate selections of these technologies and share the common patterns of usage of this in their relevant applications for further Big Data technology adaptations for these.

Subtask 3.2.3 - Big Data Real time Analytics for Monitoring (**CEA**, EURECAT, FLYBY, ORANGE, POWEL, SAP)

This task aims at providing the tools for real-time streaming analytics that will be used in the ELECTRA pilot use cases. There will be a focus on the topics of operation condition scoring – health assessment and remaining life value – performance monitoring and proactive sensing. Existing tools/applications including TECNALIA's SG-Doctor and GRID_OPERATION, and the Fly-By Res2Grid, will be adapted so that they share and make use of common underlying generic real-time streaming technology and their common patterns of usage to ensure that they take advantage of the Big Data technologies. These underlying frameworks will involve Computas' CODIO and FrameSolutions, and the ORANGE Cepheus and Flexible Data solutions.

Task 3.3 – Big Data Management and Processing for Energy (**SAP**;ATOS; GNF; GEN; UFD; EURE; BSC; ZAB; CEA; EDF; SIN-ICT; SIN-EN; ORA; POW; TNSGC; COM; HFS; DTU; NYF; ENF; EIR; EGP; FBY; UNIBO; TECNA; RICOH; NOVA; SDG; YOUR; CEPRI)

The task of providing tools and services for Big Data for Energy will be divided between the following three subtasks.

Subtask 3.3.1 - Big Data Processing and Orchestration (**ORANGE,** BSC, COMPUTAS, ORANGE, SINTEF ICT, UNIBO, SAP)

This task aims at providing the data processing frameworks and services that will execute the Big Data Energy pilot analytics applications/tools from ELECTRA in a Big Data environment, and the frameworks and services that orchestrate such applications/tools at runtime to allow for flexibility in regards to underlying infrastructure, scaling, performance, data location for privacy and security, real-time requirements and failure handling. The parallel batch and real time streams from the Lambda architecture will be adapted to fit the requirements of the Big Data analytics for Energy, by using open source technologies such as Apache's Hadoop, Spark, Storm, Flink, Oozie and Pig, which will be accompanied by the ORANGE Flexible Data framework and PyCOMPs/COMPs programming environments provided by BSC.

Subtask 3.3.2 - Big Data Security and Privacy (**EURECAT**; SAP, ORANGE)

Since ELECTRA will be dealing with both personal data – for which handling and storage is regulated by national law's and EU regulations – and sensitive data related to the industry partner's operations, there will be a need for solutions that ensure data security and privacy. This task aims at providing such solutions through frameworks and services that focus on these aspects of Big Data management.. The foundation for this is being provided by the existing EURECAT Intelligence Centre and Cybercrime system, ORANGEs Flexible Data framework, and other open source technologies such as Apache Knox.

Subtask 3.3.3 - Big Data Management - Acquisition, Storage and Curation (**UNIBO**, BSC, ORANGE, SINTEF ICT, POWEL, DTU)

This task aims at providing the frameworks and services that will manage the very foundation of the ELECTRA Big Data Energy pilot, namely the data itself. Both the new incoming data, and data in existing stores, will have to be efficiently and properly handled to ensure that it is accessible, correct and accurately annotated and linked to be of use to the Big Data Analytics, and that the required resources is available for storage, and for handling streaming data to prevent data loss and corruption. The acquisition and enrichment will make use of the ORANGE Flexible Data framework, Powel Mesh and the Big Data Manager developed by Powel, SINTEF ICT's DataGraft platform and UNIBOs middleware for integration of data sources from SAP HANA to the Apache Cassandra database. It will also build upon technologies such as RabbitMQ, and the Apache Flume, Kafka and Samza frameworks.The CITIES Smart Energy Services from DTU with SE-OS/REP/Data services is supporting a Smart-Energy Operating-with Smart-Energy Data Repository and Smart-Energy Data Management for historical data and realtime data. For storage and curation existing technologies will be employed, including OpenLink Virtuosos, Ontotext GraphDB, Apache Cassandra, HBase, Hive and Accumulo, and MongoDB. These technologies will be further empowered by the dataClay and Hecuba services that are provided by BSC.

Task 3.4 – Big Data Physical Infrastructures, Cloud, HPC and sensors for Energy (**ATOS**; GNF; GEN; UFD; EURE; BSC; ZAB; CEA; EDF; SIN-ICT; SIN-EN; ORA; POW; TNSGC; COM; HFS; DTU; NYF; ENF; EIR; EGP; FBY; UNIBO; SAP; TECNA; RICOH; NOVA; SDG; YOUR; CEPRI)

This task will provide the connections to the physical infrastructure that will be used to host the applications, platforms and services during the project, and the interfaces to new sensors. Interfaces to Service-, Platform- and Infrastructure-as-a-Service solutions will be provided through the ATOS Hybrid Cloud Layer – based on Alien4Cloud – and deployment and runtime management of cloud applications supported by tools like CloudML from SINTEF ICT, both integrated with the TOSCA standard for Topology and Orchestration Specification for Cloud Applications. The ORANGE Things framework will provide access to sensors and other data providers. The energy and utility companies involved in ELECTRA have already large investments in infrastructure for the storage of sensor data from the different areas of energy generation and distribution and Historian databases like Pi-OSISoft already contains archives with many years of data. The data in these systems will also be utilised as a part of the ELECTRA infrastructure.

Deliverables

D3.1 a, b - Big Data platform, architecture and infrastructure guidelines for Energy applications (M6; M12) (SIN-ICT)

D3.2.a, b, c - Use case implementation guidelines for Big Data applications – Analytics (M8; M18; M30) (ORANGE)

D3.3 a, b, c - Use case implementation guidelines for Big Data applications – Big Data Management and Processing (M8;M18;M30) (SAP)

D3.4 – Final guidelines for Big Data tools (M34) (SIN-ICT)

Work package number			**4**		Lead Beneficiary							**EIR**			
Work package title			**Large Scale Energy Generation Pilot**												
Participant number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Short name of participant	ATOS	GNF	GEN	UFD	EURE	BSC	ZAB	CEA	EDF	ORA	POW	SIN-ICT	SIN- En	TNSGC	COM
Person/months	0	13	74	0	7	16	0	0	21	0	0	0	2	0	0
Participant number	16	17	18	19	**20**	21	22	23	24	25	26	27	28	29	30
Short name of participant	HFS	DTU	NYF	ENF	**EIR**	EGP	FLYBY	UNIBO	SAP	TECNA	RICOH	NOVA	SDG	YOURI	CEPRI
Person/months	0	2	0	0	**108**	129	49	29	33	8	0	0	5	0	0
Start	**M6**									End					**M34**

Objectives - WP4 aims to build up a Large Scale Pilot (LSP) in the Energy Generation domain demonstrating the applicability, effectiveness and real business opportunities of the development and implementation of big data tools & analytics. This LSP deals with the development of advanced predictive analytics on plant components and business analytics in order to support decision makers in minimizing Operation & Maintenance (O&M) costs and failure-driven lost production for different types of Energy production plants. The Energy generation domain covers the main electricity production systems, Fossil fuel, Hydro, Nuclear and Renewable, with four Use Cases (UC) named from UC1 to UC4 and with 8 demonstrators: N.2 Fossil Fuel (EIR1 and GNF1), N.2 Hydro Power (EIR2 and GNF2) and N.3 Renewable (EGP1, EGP 2 and GNF3) and N.1 Nuclear (EDF1).The main objective of this LSP is to get a decision-making system based on industrial process data analytics and correlation with other external data sources in order to increase industry assets response to market volatility and to reduce O&M costs. To fulfil this objective, for each demonstrators, ICT dedicated solutions will be identified, developed and adapted in collaboration with WP3, aiming to reach the following outcomes:

- New data source integration and storage ;
- Development and test of Predictive analytics for sub-components/components/Generation Units ;

- Development and test of a tool for Operation & Maintenance plan scheduling and optimization;
- Development and test of Business Decision Support System at fleet level.

Description of work

Task 4.1 – **Energy Generation pilots' alignment & coordination** (**EIR**, GNF; GEN; BSC; EIR; EGP; FBY; UNIBO; SAP; TECNA)
This task focuses on coordination and planning of the different use cases and demonstrators inside the Energy Generation and their alignment with the Big Data solution proposed within WP3 for each domain. Energy utilities will collaborate with ICT providers in the application, adjustment and fine-tuning of the proposed tools in the piloting domain-specific activities. This task as well coordinates the iterative three piloting cycles in this energy domain enabling utilities to test the tools and provide feedback to ICT providers for improving techniques and tools. The outcomes of this iterative process are documented in WP3 deliverables. This task involves as well the adaptation of the datasets for their use in each demonstrator. Common datasets to all use cases in the energy generation domain are: a) data coming from the plant operation, b) data from asset management c) data from past maintenance interventions along with costs and production losses. Additional specific data sets for each use case are described in the following tasks where the specific Generation domain use cases, based indifferent countries, are described.

Task4.2 – O&M optimization for Fossil fuel power plant – UC1 - (**EIR**, GNF; GEN; BSC; EIR; EGP; FBY; UNIBO; SAP; TECNA;DTU; EURE; SDG)

This task use case includes one EIR demonstrator and one GNF demonstrator, they will have the main scope of :

- integrating in a one data lake specific for BigData applications, all the structured and unstructured data related to critical machineries, asset data and unit production data.
- developing of machine learning failure prediction models for the early detection of component/unit failures and degradations and for assessing the health of the asset,
- developing business models to define optimal O&M plans of the main components based on predictive/preventive maintenance techniques, in concert with root cause failure analysis, and Risk Base Maintenance Techniques
- developing a proof of concept on simulated different market scenarios for integrated O&M planning at fleet level

Nevertheless additional data from the rest of the fleet will be used to assess the replicability of the tools implemented.

Subtask 4.2.1 – Demonstrator EIR1 in Italy (**EIR**; SDG, UNIBO)
The Demonstrator will be focused on Turbogas Combined Cycle (TGCC) plant of Termini Imerese (778MW)
Data integration and storage: A detailed analysis of structured and unstructured data sets will be carried out (EIR, SDG, UNIBO). Regarding critical machineries the main (gas turbines, electric generators, heat recovery, steam generators of one production unit) data will concern: production, performance, machinery parameters for an historical period of at least 4 years (approximately 1 TeraByte per primary machinery), archived on plant data historian PI OsiSOft server. The asset data will concern Maintenance notification, Work orders (type of activity, time and costs), Spare parts, and Unplanned plant Unavailability (causes, duration and related costs) and are, archived on SAP (Asset Management System) for more than 5 years for a total of 10 Terabyte of data. Unit production data, energy unbalances are also available in Plant Data historian data base. Inspection reports, lubricant oil laboratory analysis, NDT measures, retuning tests archived as documents (mainly pdf files) in a documentation repository, will be used as unstructured information.
In the first application layer (Predictive analytics), the machine learning failure prediction models will be mainly focused on the most critical component, the GasTurbine, for which it is required timely detection of high pressure vibrations and accelerations inside the combustion chamber to avoid shutdowns that imply the inspection of the combustion chamber integrity with high costs of loss of production and maintenance activities (EIR, UNIBO). For the second application layer (O&M planning) will use the following data sets: Output of the predictive analytics on CCGT main machineries; maintenance costs and time of planned and unplanned activities (data already available in the SAP DB), historical data on type of failures occurred and frequencies (data already available in the SAP and Plant Data Server), SpareParts (data already available in the SAP DB) (EIR, UNIBO). In the third application layer (BDSS), the objective is to simulate different market scenarios providing alternative maintenance and plant availability plans and future investment at fleet level collecting data from different CCGT PP in Italy (Priolo Gargallo, Termini Imerese, La Casella) The system will collect data related to historical production, demand side forecast, failure risks, maintenance costs. The output of the models will be stored in the data lake and available for reporting and display to different user profiles (EIR, UNIBO).

Subtask 4.2.2 – Demonstrator GEN1 in Spain (**GNF**; SAP, SINTEF, TECNALIA)

The demonstrator will be focused on Meirama, Robla II and Narcea III Coal Power Units and Cartagena and Sagunto Combined Cycle Power Plants. Data Integration and Storage. The data sets of GEN are homogeneous for all the plants, independently from location and generation technology. Process signals (around 70k signals). Structured data on DCS, PLCs and other on-field equipment. Actualized in variable lapses from seconds to some minutes, including time stamp, stored on PI OsiSoft servers; monitoring signals. Structured data coming from on-line and off-line condition monitoring software tools currently installed (vibration, CC combustion, performance and condition – statistical, non-parametrical -systems) actualized in variable lapses from seconds to weeks; other external signals: Spreadsheets, data logger, analysis reports, 3rd part signals, web based meteorological data, thermography and image reports, opened WO (these data are mainly unstructured, and several of them can be actualized periodically); historical information from other systems: CMMS, ERP, QSE management systems, in DB, text, pdf or images format; and external information: Industry standards, procedures and legal regulations, manufacturer recommendations, forum, blogs and other social media, in text, pdf or images format. In the First application layer (Analytics for different assets) anomalous operating condition scoring (health assessment or remaining life value) and new machine learning prognostic models will

be developed, based on actual condition monitoring systems and on new data sets collected. Models may be focused on equipment and systems, as the remaining life value score. In the specific case of coal pp, models for air-coal combustion process or boiler-feedwater process are expected. The Second application layer (O&M planning) will be focused on the development of models to: provide prescriptive actions to be carried out, in terms of: logistic of spares and tools, procedures regarded to licenses, safety, maintenance, operation or environment; automatically launch of certain actions, such as Work Orders, spares Purchase Orders, etc., and operative recommendations, such as download, increase of environmental measurements, etc.; forecast of expected maintenance cost; evaluate expected impact of operative recommendations, in terms of performance, environmental impact and costs; subprocess of automatized on-line maintenance of the models, based on the new historical data continuously gathered; provide exact information to the on-field team (mainly maintenance foremen) about the assets to be maintained, in prioritized form, with the attained information: technical documents, procedures of all kinds, status of related logistic process, etc. and new data to the BD system: on-field measurements, thermography pictures, machine status information, ability to open Work-Orders, etc.; and evolve from preventive and predictive maintenance process to a condition based maintenance process. This application layer is expected to be applicable for all de demonstration fleet, despite locations or generation technology, in a homogeneous way and unique platform. In the Third application layer models will be developed to provide permanent advice to dispatching and bidding bureau of current status (on-line and expected power plants health value, prognostics, current performance, severity of environmental affectation as the case maybe, etc.) of each of the thermal units and to supply specific recommendations in order to take advantage of the flexibility capabilities of the whole fleet, including hydro power plants in the decision task.

Task4.3 O&M optimization Hydro Power Plant - **UC2** – (**GEN**, EIR, GNF; GEN; BSC; EIR; EURE)

This task use case includes one EIR demonstrator, Soverzene Hydro Plant and Roncovalgrande Pump Hydro Plant, PHP, in Italy, and one GNF demonstrator, Miño Basin and Tajo Basin power plants in Spain; they will have the main aim of:

- integrating in a one data lake specific for BigData applications, all the internal and external, structured and unstructured data (satellite images, weather forecast,).
- defining and evaluating a performance index analysing the trend variation of each group either in generation and pumping mode for efficiency maximization,
- developing specific models enabling the prediction or early detection of machinery faults, by immediately identifying root causes, estimating residual life of key components and optimizing the maintenance plan of the main machineries. coupled with a monitoring system on water intakes and a production forecast to avoid or minimize spillways effect, integrating operational and energy markets predictive tools and information in order to feed a decision support system that optimizes bidding strategies and minimizes unbalances
- developing fleet management tools for the identification of optimal dispatching rules of each plant

Nevertheless additional data from the rest of the fleet will be used to assess the replicability of the tools implemented

Subtask 4.3.1 – Demonstrator EIR2 in Italy (**EIR**; Powel, FBY, UNIBO)

The Demonstrator will be focused on Hydro plants: 4 Groups of Soverzene Hydro Plant (240 MW) and 8 Groups of Roncovalgrande Pump Hydro Plant, PHP, (1GW). Data integration at storage (EIR, FBY). Data availability on hydro power plants actually may vary a lot due to specific characteristic of water intakes of each plant and no historical trends have been stored so far. The data will have a sample rate of few seconds for what concern plant operating data and different sample rates for data regarding market (~ 15 minutes), weather forecast (i.e. 1 hour). All the main plant unit historical operational data are archived on PT PI OsiSOft server. New sensors related to water intakes (e.g. mass flow, etc.) will be installed and data will be gathered in the local SCADA system and stored in a plant database. The first application layer will be focused on the definition and evaluation of a performance index evaluating the performance of the generation/pumping unit with respect to an internal benchmark. The output of the models will be stored in the data lake and available for reporting and display to different users (EIR, Powel). The second application layer (O&M planning) will be focused on the correlation of the performance index with internal and external information in order to predict water availability, optimize basin management, increase production and minimize water spillways. The outputs will be presented in specific dashboards integrating all asset information, new maintenance plans and maintenance crew scheduling (EIR, Powel). The third layer will implement the BDSS: the objective is to provide prescriptive insights to the fleet operators using data mining/machine learning techniques. The system will collect data related to historical production, demand side forecast, failure risks, weather, market strategies, maintenance costs, network constrains etc. Using prescriptive algorithms the system will provide insights on dispatching strategies at fleet level, and guidelines to optimize the resources utilization (ERI, UNIBO).

Subtask 4.3.2 – Demonstrator GEN2 in Spain (**GEN**; GEN, SAP, SINTEF, BSC)

The demonstrator will be focused on Miño Basin and Tajo Basin power plants. Nevertheless, data from the rest of hydro power plant in Spain should be used. Data Integration and Storage**.** Data for this subtask will be supplied from DCS, for the particular case of hydro power plants, inside the data sets of GEN +15k signals are supplied by the hydro demonstration fleet. Also, all the hydro power plant are monitored with vibration and condition (statistical – non parametric) systems only. Rests of characteristics depicted for thermal GEN demonstration are fully applicable. In the First application layer (Analytics for different assets)**,** as in thermal demonstration, anomalous operating condition scoring (health assessment or remaining life value) and new machine learning prognostic models will be developed, based on actual condition monitoring systems and all new data sets collected. Performance monitoring system for each generation unit has to be developed in order to be used in this layer. Models may be focused on equipment and systems. Remaining life value has to score equipment, systems and power plant. The Second application layer (O&M planning) will integrate the information described in Second application layer for thermal demonstration, focused on hydro power plants. As stated before, it must be done in a homogeneous way and in a unique platform. The Third application layer will develop models to supply specific recommendations of production, taking into account meteorology and price, with both

historical and forecasted data. Models should also provide permanent advice to dispatching and bidding bureau of current status (on-line and expected health value, prognostics, severity of dam or spill risks, current performance, etc.) of each of the hydro units.

Task4.4 –O&M plan optimization in RES – UC3 - (**EGP**, GNF; GEN; FBY; UNIBO; SIN-EN, BSC; DTU; EURE)

This task use case includes two EGP demonstrators, Wind and Solar PV generation in Italy and Romania, and one GNF demonstrator, Wind generation in Spain; they will have the main scope of :

- Developing and validating suitable component predictive diagnostic analytics for early detection of failures and component degradation behaviour,
- Optimizing renewable fleet ordinary and extraordinary maintenance plans through the development of a business decision support system, to move current maintenance method from an on-condition reactive to a risk-based predictive + proactive approach.

Subtask 4.4.1 – Demonstrator EGP1 WIND- Romania / Italy (**EGP;** FBY)

At Data Integration & Storage Level, data from wind farms Conditioning Monitoring Systems (CMS) will be integrated in EGP Architecture to make them available for further processing: activities will include integration at different architecture layers, extension of taxonomy and data structuring, and reporting and visualization modules. Live operation of CMS data integration, developed by EGP, will be conducted in test plants, according to specifications and KPI metrics defined previously. At Predictive analytics level, activities will assess and further develop EGP/ FBY existing models for Wind Turbine predictive maintenance, based on Signal Trending, Statistical Models and Physical Models: models were developed by OEMs and service providers and by EGP and FBY, with available SCADA data; CMS data will be possibly integrated as a further data source. Demonstration will include: validation, improvement, training of the models/algorithms with historical data, and live operation in EGP Big data Architecture, aiming at the evaluation of the best strategy for model implementation. Validation will take place at laboratory level for available models respect to a set of pre-defined KPIs, including on-site inspections, and comparison/integration with CMS analysis. The best models (3÷4) will be selected for live implementation and improvement actions in terms of: look-ahead time horizon, turbine types and components, precision, estimated economical value for warning/alert, according to T4.1 requirements. Models live operation will be conducted with real time field data, including continuous warnings/alerts delivered to O&M and periodic assessment, and final validation of performances will take place with respect to selected KPIs. At O&M plan optimization level additional maintenance models will be specified taking into account maintenance costs, production costs, and also spare parts' availability, according to current maintenance practise, including governing criteria and paradigms, for integration with failure models. At Business Decision Support System level a best practices module for transferring of O&M experience to E&C activities and procurement will be specified and an analytics/ reporting module at cloud computing level will be developed. Demo validation phase will involve ~7 wind farms located in Italy and Romania (154 Wind Turbines and 291 MW of installed capacity).

Subtask 4.4.2– Demonstrator EGP2 Solar - Romania/ Italy (**EGP**; FBY,UNIBO)

At Data Integration & Storage Level, data coming from Drones used for PV plant monitoring, will be integrated in EGP Architecture to make them available for further processing: activities will include integration at different architecture layers, extension of taxonomy and data structuring, and reporting and visualization modules. A first validation of module aging and thermal defect detection will be led at EGP Catania Laboratories in a controlled environment. Live operation of drone data integration will be led by EGP supported by FBY in the test plants, according to specifications and KPI metrics defined previously. *At Predictive analytics level,* activities are meant to: roll out the off line existing models for PV modules power electronics early failure detection on different suppliers' equipment, and validate them in live mode, through their integration in the EGP Big data Analytics Architecture. Models will be ported in live mode inside EGP Architecture, including integration along the whole data chain developing specific data analytics and reporting modules. Final validation will be conducted by EGP supported by FBY, with real time field data, according to KPI metrics defined previously. At O&M plan optimization level additional maintenance models will be specified taking into account maintenance and production costs, according to current maintenance practise, including governing criteria and paradigms, for integration with failure models. At Business Decision Support System level a risk based Multi-Criteria Optimization Model will be implemented integrating predictive models, cost and production models, including governing criteria and paradigms, risk based maintenance KPI, user interface: a first live operation will be led by EGP with UNIBO and FBY support. Lesson learnt from this operation will allow the extension to the whole EGP PV park fleet. Demo validation phase will involve a PV EGP plant in Romania and then will be extended to a few more plants located in Romania and Italy.

Subtask 4.4.3 – Demonstrator GEN3 WIND in Spain (**GEN**, GNF; SAP, SINTEF, BSC)

Data Integration and Storage. Data for this subtask will be supplied from the same system described for Fossil Fuel and Hydro demonstrators. For the particular case of wind farm, inside the data sets of GEN +20k signals are supplied by the wind demonstration fleet. Also, all the wind farms are monitored with (statistical – non parametric) condition systems only. The other features depicted for thermal GEN demonstration are fully applicable. In the First application layer Analytics for different assets), as in hydro demonstration, anomalous operating condition scoring (health assessment or remaining life value) and new machine learning prognostic models will be developed, based on actual condition monitoring systems and all new data sets collected. Performance monitoring system for each wind mill has to be developed in order to be used in this layer. Models may be focused on equipment and systems. Remaining life value has to score equipment, systems and power plant. The Second application layer (O&M planning) will integrate the information described in Second application layer for thermal demonstration, focused on wind mills power units. As stated before, it must be done in a homogeneous way and in a unique platform. The Third application layer will be to develop models to provide forecasts of short and medium term production, in order to supply specific recommendations of maintenance.

Task 4.5 – O&M optimization for Nuclear Power Plant - UC4 – (**EDF**, EURE)

This task includes one EDF demonstrator composed of 58 French nuclear power plants (minimum 5 of 1300MW technology). The scope of

demonstrator is applying predictive analytics tools for the early detection of component/unit failures and degradations and for assessing the health of the asset; applying business analytics tools to shift from on-condition reactive to risk-based predictive maintenance ; developing a proof of concept on simulated scenarios for integrated O&M planning at fleet level.

Subtask 4.5.1 – Demonstrator EDF1 in France (**EDF**, EURE**)**

Data integration and storage: an archive of process data of the 58 French nuclear power plants is available (more than 100Tb for the 58 Nuclear Power Plants). This archive contains detailed information concerning the operation of many plant components and sub-components: there is an average of 8000 parameters available per unit with an average sampling rate of 20 seconds. Additional data is also available such as monitoring data for turbines (vibration data etc.) and textual information in maintenance/service reports. In the *first application layer (Predictive analytics)*, machine learning failure prediction models will be mainly focused on nuclear power critical components: Reactor Coolant Pumps, Turbo generators from the nuclear fleet. For the second application layer (O&M planning*)* we will use the following data sets: output of the predictive analytics on power main machineries; maintenances logs and expertise logs.

Task 4.6 – Energy Generation pilots outcome analysis (**EIR;**GNF; GEN;EURE; EDF; EGP; FBY;SAP)

This task provides a final technical analysis of the outcomes and lesson learned from the different demonstrators across the different use cases (the previously described tasks) of the Energy Generation domain. This analysis is based upon the set of KPIs provided by WP2, specifically by T2.3. This task provides as well the continuous feedback loop towards WP8, therefore triggering pilots' impact evaluation and assessment, as well based on a set of KPI defined in task T2.3. The feedback loop will be carried out continuously all along the pilot duration (in the three evaluation cycles described) and will focus on the impact analysis outcomes of each demonstrator. The description & outcomes of this iterative process are documented in WP8 deliverables as well as an analysis of the transformation achieved by this energy domain at the end of the project

Deliverables

D4.1.1 - Large Scale Energy Generation Pilots' implementation plan (M8) EIR

D4.2.1 – Fossil fuel UC1 implementation report (M12; M23; M34) (EIR; GEN)

D4.2.2 a, b – Fossil fuel UC1 demonstrators (M22; M33) (a) EIR (b) GEN

D4.3.1 – Hydro UC2 implementation report (M12; M23; M34) (EIR; GEN)

D4.3.2 a, b – Hydro UC2 demonstrators (M22; M33) (a) EIR (b) GEN

D4.4.1 – Wind UC3 implementation report (M12; M23; M34) (EGP; GEN F)

D4.4.2 a, b – Wind UC3 demonstrators (M22; M33) (a) EGP (b) GEN

D4.4.3 – Solar UC4 implementation report (M12; M23; M34) (EGP; GEN)

D4.4.4 a, b – Solar UC4 demonstrators (M22; M33) (a) EGP (b) GEN

D4.5.1 – Nuclear UC5 implementation report (M12; M23; M34) (EDF)

D4.5.2 – Nuclear UC5 demonstrator (M22; M33) (EDF)

D4.6.1 – Large Scale Energy Generation Pilots' assessment & achievements (M34) (EIR)

Work package number			**5**		Lead Beneficiary						**UFD**				
Work package title			**Large Scale Energy Distribution Pilot**												
Participant number	1	2	3	**4**	5	6	7	8	9	10	11	12	13	14	15
Short name of participant	ATOS	GNF	GEN	**UFD**	EURE	BSC	ZAB	CEA	EDF	ORA	POW	SIN-ICT	SIN- En	TNSGC	COM
Person/months	38	22	0	**74**	24	13	0	6	0	0	48	8	14	0	28
Participant number	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Short name of participant	HFS	DTU	NYF	ENF	EIR	EGP	FLYBY	UNIBO	SAP	TECNA	RICOH	NOVA	SDG	YOURI	CEPRI
Person/months	42	0	0	0	0	0	0	0	0	31	0	0	0	0	0
Start	**M6**								End						**M34**

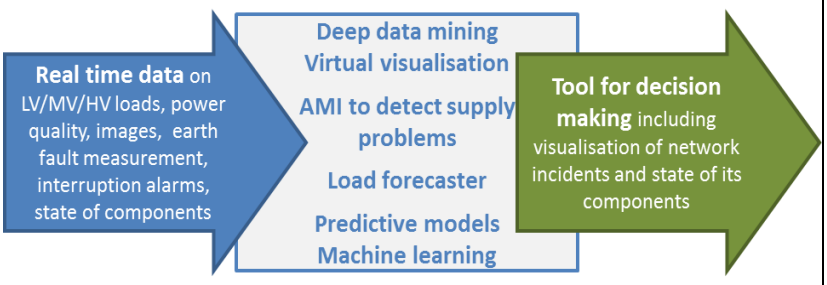
Objectives - The main objective of WP5 is the implementation, running and preliminary assessment of the different demonstrators for the use cases within the Energy Distribution domain; thus, allowing demonstrating the applicability, effectiveness and real business opportunities of the development and applications of big data solutions in the sector. In order to achieve a major impact on the transformation of the energy distribution sector, this WP will focus in the development of demonstrators in the four core business areas of the sector through the following four use cases (from UC6 to UC9): **Operation and Maintenance/Grid Digitalization and Predictive Maintenance – UC6; Network Planning/Network Investment and Planning UC7; Energy Balance/Energy Balance and Fraud Detection – UC8; Relationship with**

Customers (DSO users – supply points) / Proactive Customer Support and Response – UC9. The demonstrators of the use cases will be implemented in Spain and Norway by DSOs supported by ICT providers. For each demonstrator, ICT dedicated solutions will identified and adapted in collaboration with WP3. The overall objective of this Large Scale Pilot is taking a significant step towards the distribution network digitalisation in order to help system operators making optimal decisions and at the same time customers getting every day benefits and value added services

Description of work

T5.1 - Energy Distribution pilot alignment & coordination – (**UFD;** GNF, HFS;BSC; EURE; BSC; CEA; POW; SIN-EN; COM; TECNA)
This task focuses on coordination and planning of the different demonstrators inside the Energy Distribution domain and their alignment with the Big Data solutions proposed within WP3. The energy utilities will collaborate with the ICT providers in the application, adjustment and fine-tuning of the proposed tools in the piloting activities specific of this domain. This task coordinates also the three iterative cycles of the pilot allowing the utilities to test the tools and share recommendations with ICT providers for their improvement. The outcomes of this iterative process are documented in WP3 deliverables. This task involves as well the adaptation of the datasets for their use in each demonstrator. The types of datasets that are common to all use cases in this energy domain are: Smart meters / MDM Platforms (Meter Data Management); Secondary Substation Sensors: supervision and automation of secondary substations; SCADA for HV/MV networks and models of grid topology; External data sources: weather service, social media, public statistics; Data from Distributed Generation. Details and description of additional data sets specific to each use case are provided in the following task descriptions.

T5.2 Grid Digitalization & Predictive Maintenance – UC6 - (**UFD;** GNF**;** HFS, *ATOS, TECNA, EURE, BSC, COM, SIN-EN; SIN-ICT; POW*)



Aim: Demonstrating the value of Big Data technology applied to new and existing data sets in distribution networks for optimising network operation and maintenance. New challenges concerning distributed generation and integration of energy markets described in Section 1 create a need to implement real time control of LV networks. This level of control is nowadays only under operation on HV/MV networks. For this purpose, this case will use massive machine learning (ML) and other big data analytics techniques to improve network management. It will allow Investigation of causes of faults/interruptions or other service quality deviations. High resolution data from smart meters will enable a deeper analysis of deviation causes. Additionally, predictive models generated from past cases will avoid faults while enabling timely and cost-efficient interventions in the future; Condition-based maintenance and its extension to predictive maintenance: Each grid component will be represented by an individual ML behavior model, which will be updated frequently, combining data. Predictions from the ML will be used as input to maintenance planning, enabling optimized maintenance scheduling and dispatching; Support to decision-making for optimization of network operations. In addition to the list of data sets presented in task 5.1 it is worth to highlight the following specificities in the data sources to be used in this use case: Smart meters: Configured to deliver not only customer / household data, but also data indicating the state of the neighboring network components (transformers, switches, etc.), load, PQ-measurements, earth fault measurements, interruption data/alarms. Supervision images of components to be analyzed to produce condition data. Sources: on-site/on-line cameras, helicopters, drones, etc.; Customer/household, state of components; Accessible descriptions and models of network topology; Historical data of maintenance actions; Data provided by the Customer Relationship Management system (CRM) and Call Centers; Data on distributed generation. The data will feed the network operations center, allowing the operators and maintenance engineers to visualize network incidents and state of its components.

***Subtask 5.2.1 Demonstration in Spain** (**UFD**; GNF**,** ATOS, TECNA, EURE, BSC)*

Focus: Predictive maintenance and early identification of faulted sections in distribution grids, in order to improve quality and continuity of supply. It is possible to perform a predictive maintenance by using the data provided by the devices deployed throughout MV networks, as well as the events provided by the AMI. The information provided by these devices can indicate in advance situations correlated with further outages due to faults (e.g., early detection of high impedance faults that could lead to further outages due to trips). The data available in Spain come from approx. 2 million smart meters and 15.000 automated secondary substations.

Advanced tools analyzing this information enables predictive maintenance, increasing the quality of service and reducing SAIDI and SAIFI. By identifying the network sections where there is a high probability of fault, maintenance crews can optimize their works, prioritizing the relevant maintenance actions and increasing the level of security, thus optimizing the use of resources.

***Subtask 5.2.2 Demonstrator 1 in Norway – Fault and Quality Management** (**HFS,** COM, SINTEF, POW)*

Localization and handling of faults/interruptions and quality deviations in distribution grids using smart meters, in order to secure quality of supply to customers (time scale: minutes to hours). Data available in the HFS distribution network (load, PQ-measurements, earth fault measurements, interruption data/alarms) from approx. 700.000 smart meters (pilot 2016 and full deployment 2018) Data from sensors in substations (fault location devices, load, voltage, temperature). Approx. 3000 sensors (2018) Accessible descriptions and models of network topology; Open data sources (weather data, statistics)

***Subtask 5.2.3 Demonstrator 2 in Norway – Predictive Network Maintenance** (**HFS**, COM, SINTEF, POW)*

Predictive maintenance of network components based on data from smart meters and connected sensors in substations, including digital

images, in order to optimize maintenance plans (time scale: hours to weeks). Data sets for this demonstrator are largely identical to Subtask 5.2.2, plus image data for condition assessment.

Task5.3 Network Investment and Planning – UC7 - (HFS, GNF, UFD, *EURE, BSC, SIN-EN, SIN-ICT, POW*)

Aim: Demonstrating Big Data solutions for planning and investment using historic and real time LV-MV data in order to improve the analysis capacity and optimise decision making. This task will develop and demonstrate innovative network investment and planning techniques. These will be based on big data analytic tools able to handle, in a centralized and coordinated way, present and historical values from many different sources. The tools will use automatic adaptive estimation and statistical forecasting methods. By cost benefit analysis the resulting big data tools will rank the most cost efficient grid investment alternatives and prioritize based on different factors in order to evolve the grid. Both technical and non-technical factors will be considered. In addition to the list of data sets presented in task 5.1 it is worth to highlight: Data from the outage system (both planned and unplanned) ; Data from directional fault passage indicators and MV DMS additionally to other sensors in Substations ; Accessible descriptions and models of grid topology ; Historical and customer measurements, external data sets such as demography and urban development, regulation, grid quality indexes, PV penetration; internal data sets such as: grid architecture models, security requirements, investment capacity etc. The key is to leverage existing data instead of deploying new devices to perform similar functionalities. Thus, the demonstrators will aggregate and correlate data from all sensors deployed in field (MV and LV) to improve the accuracy in asset inventories making the operation cost decrease. Additionally, barriers imposed by the limitations of the present distribution network planning standards will be examined.

***Subtask 5.3.1 Demonstration in Spain (UFD**; GNF; TECNA, EURECAT, BSC)*

Focus: Distribution network investment planning using data gathered from MV and LV supervision devices. Advanced Distribution Management Systems (DMS) cover the task of collecting information from the IEDs deployed along distribution networks. New innovative tools should support the usability of the information available at the DMS. From the information provided by both the MV supervisors deployed along the MV networks, as well as the LV supervisors installed in the LV side of secondary substations, and by the means of statistical process and big data analysis, it will be possible to improve the knowledge on the loading level of the network assets, and their influence on other network issues identified, such as voltage fluctuations and other power quality problems. A deep analysis of the information collected will help to identify the parts of the network potentially overloaded or close to its limit of operation, and the periods when this is produced. Advanced tools analyzing information will therefore help to facilitate the labor of network reinforcement and investment planning, thus prioritizing the most important actuations, and optimizing the use of resources.

***Subtask 5.3.2 Demonstration in Norway (HFS**, COM, SINTEF, POW)*

Distribution network investment planning using historical and real-time big data for improved analysis and decision support, in order to achieve higher utilization of invested capital (grid components), reduced CAPEX and OPEX (time scale: weeks to years). Data sets for this demonstrator are largely identical to Subtask 5.2.2, with more emphasis on historical data.

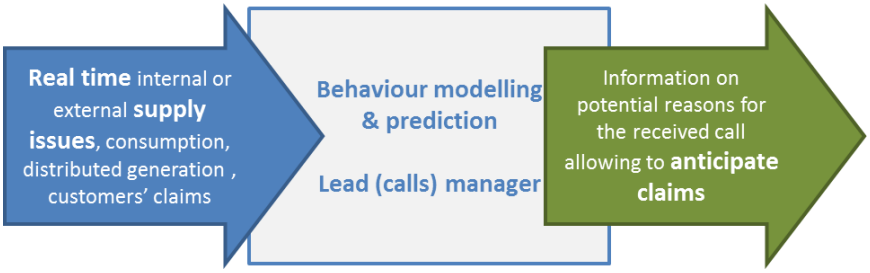
T5.4 – Energy Balance and Fraud Detection – UC8 - (**UFD**; GNF; *ATOS, TECNA, EURE, BSC*)

Aim: Demonstrating innovative Big Data strategies for energy balance including losses reduction, and fraud detection in order to improve energy efficiency for electricity distribution and revenue protection for utilities. This use case will focus on demonstrating holistic and innovative energy balancing processes integrating ICT solutions supporting: -Better accuracy and faster calculations for energy balance for LV/MV/HV, Pattern recognition for automatic detection of different types of non-technical losses (NTL); Geographical location of losses in order to simplify specific campaigns for inspection and losses reduction; -Cross correlation with external data sources for both NTL and TLAdvanced detection of electricity meters malfunctioning and increase of energy efficiency for electricity distribution . In addition to the list of data sets presented in task 5.1 it is worth to highlight: Distributed Generation data; CRM and information provided by Call Centers

***Subtask 5.4.1 Demonstration in Spain (UFD**; GNF**,** ATOS, TECNA, EURE, BSC)*

Focus: Perform Energy balances and identify technical and non-technical losses by taking advantage of the recently deployed Advanced Meter Reading infrastructure. By end 2015, Advanced Meter Reading infrastructure deployment in GNF reached 2 million smart meters fed through 15000 secondary substations. The new hourly information available from Smart Meters and Low Voltage supervisors installed at the LV side of secondary substations, together with LV network models, can be used to perform energy balances and state estimations, from which it is possible to determine losses and differentiate between technical and non-technical losses. Deep analysis of the data, using big data techniques, can help to identify suspicious behaviors in consumptions and non-technical losses, thus improving the fraud detection. In addition, the information provided by LV supervisors on phase balancing, harmonics, and other power quality indices, will help to perform actions focused on losses reduction in the networks where losses are higher. The developments in this task will therefore help to improve the overall efficiency of the distribution system.

T5.5 Proactive Customer Support and Response – UC9 – (**UFD**; GNF, *ATOS, TECNA, CEA, SIN-EN, BSC*)



Aim: Demonstrating disruptive solutions for proactive B2B customer support and response at supply points level. Solutions considered will be based on real time information and recommendations adapted to consumption patterns. This use case will demonstrate solutions to ensure high standards of quality of service to B2B customers by increasing the DSOs capacity to both prevent and solve network incidents. The solution will target the improvement of the Call Center efficiency (decreasing the average time for solution solving) by processing the most relevant information at the network connection point (customer). Therefore the solution will provide real time information of breakdowns and scheduled works in field, deliver recommendations for improving energy efficiency adapted to specific consumption patterns. It will as well support demand response by cconducting online and offline estimation of savings to know the effect of demand-response incentives and decide next incentives to send, namely award billing; increasing the frequency and detail of metering and including real-time information on network situation, maintenance issues and energy balances in order to develop automated solutions to optimise consumption patterns. This

Deliverables (brief description and month of delivery)

D5.1.1- Large Scale Energy Distribution Pilot implementation plan (M8) (UFD)

D5.2.1 – Grid Digitalization & Predictive Maintenance UC6 implementation report (M12; M23; M34) (UFD; HFS)

D5.2.2 a, b, c – Grid Digitalization & Predictive Maintenance UC6 demonstrators (M22; M33) (a) UFD (b) (c) HFS

D5.3.1 – Network Investment and Planning UC7 implementation report (M12; M23; M34) (HFS; UFD)

D5.3.2 a, b – Network Investment and Planning UC7 demonstrators (M22; M33) (a) UFD (b) HFS

D5.4.1 – Energy Balance and Fraud Detection UC8 implementation report (M12; M23; M34) (UFD)

D5.4.2 – Energy Balance and Fraud Detection UC8 demonstrator (M22; M33) (UFD)

D5.5.1 – Proactive Customer Support and Response UC9 implementation report (M12; M23; M34) (UFD)

D5.5.2 – Proactive Customer Support and Response UC9 demonstrator (M22; M33) (UFD)

D5.6.1 - Large Scale Energy Distribution Pilots assessment & achievements (M34) (HFS)

Work package number			**6**			Lead Beneficiary						**EDF**			
Work package title			**Large Scale Energy Retail & Services Pilot**												
Participant number	1	2	3	4	5	6	7	8	**9**	10	11	12	13	14	15
Short name of participant	ATOS	GNF	GEN	UFD	EURE	BSC	ZAB	CEA	**EDF**	ORA	POW	SIN-ICT	SIN- En	TNSGC	COM
Person/months	0	36	0	0	13	0	0	28	**106**	28	0	7	8	0	0
Participant number	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Short name of participant	HFS	DTU	NYF	ENF	EIR	EGP	FLYBY	UNIBO	SAP	TECNA	RICOH	NOVA	SDG	YOURI	CEPRI
Person/months	8	0	0	0	0	0	0	0	0	18	0	0	0	0	72
Start	**M6**								End						**M34**

Objectives WP6 aims at the implementation, running and preliminary assessment of the different demonstrators for the use cases within the Energy Retail and Services domain demonstrating the applicability, effectiveness and business opportunities of big data analytics. Providing advanced services to customers related to energy management is one of the most important challenges for energy utilities. Big data analytics is a competitive approach when dealing with massive segments of customers (e.g. residential, professional, SME's). This Large Scale Pilot contributes to the transformation of the energy retail sector by defining new advanced services to customers using big data technologies. This transformation should introduce a significant improvement in energy efficiency and energy management in households and buildings by providing automated recommendation or control of customers' equipment (ex. heating, water heating, appliances, energy generation, energy storage). WP6 will focus on the following 4 use cases, from UC10 to UC13: **Energy efficiency diagnosis and value-added/advisory services – UC9 ; Demand flexibility as a valuable resource for cost-efficient grid operation and management – UC10; Estimating/forecasting of electricity demand at a local scale – UC11; Demand forecast for time varying portfolios of customers with churn – UC12.** The demonstrators of the use cases will be implemented in four different countries by energy suppliers supported by ICT providers. For each demonstrator, ICT dedicated solutions will be identified and adapted in collaboration with WP3.

Description of work

Task 6.1 - Energy Retail & Services pilot alignment & coordination (**EDF**, GNF, CEA, ORA, EURE, TECNA)

This task focuses on coordination and planning of the different demonstrators inside the Energy Retail and Services domain and their alignment with the Big Data solutions proposed within WP3. The energy utilities will collaborate with the ICT providers in the application, adjustment and fine-tuning of the proposed tools in the piloting activities specific of this domain. This task coordinates also the three iterative cycles of the pilot allowing the utilities to test the tools and share recommendations with ICT providers for their improvement. The outcomes of this iterative process are documented in WP3 deliverables. This task involves as well the adaptation of the datasets for their use in each demonstrator. The types of datasets that are common to all use cases in this energy domain are: Smart meters / MDM Platforms (Meter Data Management); data sets generated for on-going services on HAN (Home Area Network) and IoT (Internet of Things); External data sources: weather service, social media, public statistics, open data; Details and description of additional data sets specific to each use case are provided in the following task descriptions.

Task 6.2 –Energy efficiency diagnosis and value-added/advisory services – UC10 - (**EDF**, GNF, CEA, ORA, EURE, TECNA)

The goal of this use case is to reach better understanding of customer behavior through pattern recognition of energy consumption in order to provide recommendations and incentives to residential and commercial customers for them to make a more rational use of energy thus improving the energy efficiency in their households or buildings. For this purpose, big data solutions will be applied allowing to performing:

analysis of electricity usage at a fine grain, including the Advanced detection of malfunctioning of specific systems (heating/air-conditioning equipment, home appliances); pattern recognition, identifying precisely the different usages of electricity upon time. This will improve understanding of consumer behavior. The pattern recognition process will not entail the installation of additional meters. It will be performed on measures either uploaded by an existing smart metering infrastructure, or by sensors connected downstream meters (with a sampling rate from 1 Hz to 1 MHz). Depending on sampling rates, different storage and processing architectures have to be considered. The expected outcome of this task is an interface with the customer providing the necessary to allow them: estimating energy consumption, estimating thermal inertia, optimising tariff plan, detecting abnormal equipment behaviour, planning building renovation or equipment renewal.

Subtask 6.2.1 – EDF demonstrator in France: "Advanced energy services for residential customers" (**EDF**, CEA, ORANGE)

Activities in the demonstrator: Design, prototyping and testing of a NILM (Non-Intrusive Load Monitoring) algorithm that enables advanced energy information services to customers and can be used at a large scale, together with the development of real time in home display solutions (making use of 2 to 10s sampled total consumption data); Development of new energy services for residential customers (potentially 25M in France), to help them to better manage their comfort, and to monitor their energy consumption; Evaluation and comparison of potential alternative/complementary solutions making use of kHz sampled data or of data provided by connected objects. Datasets to be used (in addition to data which is common to WP6); 2 to 4s (total) consumption data representative of various households (with or without electrical heating, with or without water heating, etc.), and associated sub metering data for NILM algorithm adjustment (150 customers equipped); 2 to 10s total consumption data will be available at a larger scale from the deployed in home display solutions.

Subtask 6.2.2 - **GNF demonstrator in Spain: Customer value-added Services & Energy Efficiency Advisory** (**GNF**, EURE, TECNA)

Gas Natural Servicios is playing the roles of Retailer and ESCO company for residential and commercial market in Spain, combining energy (electricity and gas) selling with a portfolio of services related to equipment maintenance (boiler, air-conditioning), installation construction and operation, mobility or energy efficiency. This demonstrator will improve customer satisfaction, interaction and loyalty by providing personalized energy efficiency advice and services as well as innovative and combined electricity and gas tariffs that help customers to reach a more rational use of energy. It will also provide adaptation of tariffs to the needs of each customer and develop advanced demand-response strategies. The approach is the integration of social networks data (twitter, Instagram) for better knowledge of the quality perception of different services and to use predictive tools covering many different applications from cash flow predictability understanding and minimizing non-payments to the advanced detection of malfunctioning of home equipment/appliances for enhancing added-value of our services to the customers. Demonstrator will be focus on different segmentations of total residential and commercial customers in Spain (11,69M contracts). Some examples of target customers are those who integrates gas and electricity supply (1,42M customers) and all where we are offering maintenance or efficiency services (2,57 M customers) without considering geographic differentiation. We are also planning to take advantage of data generated from some Lighthouse and other EU initiatives in the field of Smart Cities or IoT where Gas Natural Servicios is involved as is the case of the GrowSmarter project.

Task6.3 Demand flexibility as a valuable resource for cost-efficient grid operation – UC11 - (**HFS**; SIN- ICT, SIN- ENE, CEPRI, ORA)

Aim: Exploit high-resolution AMI (Advanced Metering Infrastructure) data and modern optimisation tools to quantify the technical potential for customer flexibility as a resource in grid operations. This use case demonstrates how the increasing amount of metering data can be utilized for a cost-efficient operation and maintenance of the distribution grid, by exploiting customer flexibility. The use case considers a group of customers, and calculates their technical potential for demand response and peak shaving. Building on the NILM approach of use case 1 (this WP), analysis of high-resolution AMI data will identify and characterise available flexibility resources. SINTEF ICT's software tool for fast and dynamic load and generation scheduling will subsequently quantify the overall potential of groups of customers, as defined by the needs of the DSO. At the same time, this use case also aims at improving the energy efficiency in regional energy consumption by providing reasonable energy saving scheme for customers and by leading them to execute peak load shifting.

Subtask 6.3.1 - Hafslund demonstrator in Norway: "emand flexibility as a resource for network investment planning - (**HFS**, SIN-ICT, SIN-Ene)

The actors in this demonstrator are the DSO (Hafslund Nett), the smart meter data collector, and the customers (with smart meters installed) in a given geographical area. The demonstrator will focus on reducing peak loads in the distribution grid that arise from the simultaneous charging of a large number of electric vehicles. The target area is Oslo that is among the cities in the world with the most electric vehicles per capita and the city that won the European E-Visionary Award 2015. The results from this work package will be important drivers for the demonstration activities in WP5, and contribute to the transformation of distribution system operation and management. Activities and data in the demonstrator; Data collection; AMI metering of customers and substations, with resolution up to 2 Hz. Input from a selection of Hafslund smart meters (> 10.000 at project start, complete rollout of approx. 700.000 during project period); Load and flexibility prediction based on smart meter data; Prediction of expected load flow in the grid due to weather forecasts, customers profiles, grid topology; Identification of "signatures" in meter data from e.g. charging of electric vehicles; Estimation of flexibility potential for individual loads/appliances; Optimisation of flexibility potential from groups of customers; Enabling an optimised co-ordination of loads within groups of customers, based on the needs and capacity limitations in the grid, as defined by the DSO; Evaluation of potential for reduction of peak loads that arise from the simultaneous charging of a large number of electrical vehicles (based on simulations); Demonstration (in simulation, using the above data) of the ability to exploit the technical potential for peak control and levelling through a combination of optimised coordination, different pricing incentives and various levels of responsiveness from customers; Flexible demand will be a cost-efficient alternative to grid investments, contribute to reduced outages and improved power quality. This use case therefore provides essential input to the use cases related to grid operation and management; ICT solutions will be provided by the use case partners, as well as through close cooperation with the other pilot participants.

Volume/Variety storage, descriptive analytics and diagnostics for load forecasting, load decomposition and scheduling.

Subtask 6.3.2 - CEPRI demonstrator in China: "Demand-side management strategies using large-scale individual load data to analyse customer behaviour" – (**CEPRI**, EDF)

Activities in the demonstrator: *Data collection/pre-processing/visualization*: Smart meter data from anonymous user; External data (weather service, geographic data, social media, public statistics); *Demand-side management and response:* Customer classification, according to the different climate conditions (such as wet or dry area, high or low temperature), different social strata (such as residential, small and medium businesses); Cluster analysis, drawing daily load curves of electrical equipment for each kind of customers; Analysis of characteristics of main electrical equipment; Set up customer behaviour model (this model will get the total demand response of an area or a certain type of customers to analyse the reliability and provide evidence for demand management/respond); *Demand-side energy efficiency analysis and management:* Using the electric meter data to identify load ratio of different customer types; Form a typical load curve, according to the industry, quarterly aggregate customers data; Energy efficiency analysis.

Task 6.4 Estimation/forecasting of electricity demand at a local scale – UC12 - (**EDF;** CEA, ORANGE, CEPRI)

This use case focuses on designing data analytics (visualization, feature extraction) and forecasting models at a local scale (city, groups, communities or individual customers) and exploiting these models to forecast at different horizons (1h, 1 week to 1 year), with possibly time varying subsets of heterogeneous customers.

Subtask 6.4.1: Demonstrator 1 in France, "Forecasting of aggregated electricity demand at a local scale" (**EDF;** CEA, ORANGE)

This demonstrator focuses on modeling electricity consumption at a local scale with machine learning and statistical models crossing heterogeneous (time series, spatial data) datasets: energy, meteorology, customers databases, urban open data sets or any related open data base. A substantial amount of work stands in the constitution of this data base and preprocessing of these complex data. After this modeling step we will then be able to produce forecasts as well as simulations of future consumption at any spatial/temporal scale. We also propose to relate these simulations and forecasts with electricity prices to produce an estimate of the associated energy costs. The outcome of the demonstrator is a tool for consumption forecast/electricity cost planning for collectivity/local groups of customers. Activities in the demonstrator Data collection/preprocessing/visualization; Model selection and evaluation; Design of a graphical interface for load forecasting representation at a local scale. Datasets to be used: Urban data from EDF subsidiaries (waste, urban lightning, heat load); Local billing data (EDF); Electricity market data.

Subtask 6.4.2: Demonstrator 2 in France, "Forecasting of electricity demand for individual B2B customers" (**EDF**; CEA, ORANGE)
The objective of the demonstrator is to develop services aiming at empowering the B2B customers in their Energy consumption. These services will apply to Soho and to commercial and services sites. Activities in the demonstrator: To empower the customer; we will develop the following functionalities: Forecasting of day ahead consumption at a daily grade and at a fine grade (for instance hourly); Consumption end month forecasting, periodically updated (for instance daily) and comparison with similar customers; Standby consumption estimation analysis and comparison with similar customers; Impact of weather on energy consumption (via heating and cooling); Datasets to be used (in addition to data which is common to WP6); Historical electric consumption data of minimum of 8000 customer sites (10 minutes data for a minimum of 1 year); Contractual information related to each customer: localization of the site, economic activity, billing and rating data.

Subtask 6.4.3 – CEPRI demonstrator in China: "Power load forecasting based on big data technology" (**CEPRI**, EDF) Under new grid structure and new operating mode, this demonstrator uses big data technology on power load forecasting. Machine learning, probability and statistics knowledge are used to analyse 'power big data' implement load forecasting under new grid operation. Activities in the demonstrator: Data collection, cleaning, storage, visualization; Power load forecasting through big data technology; Study multi-dimensional factors that influence load forecasting, find relevance and quantitative methods; Estimate the new load type and renewable energy impact on load curves, using big data technology to meet the short-term forecasting accuracy requirements ;Coordination of various forms of power generation program based on big data load forecasting; Datasets to be used: Internal and external multi-dimensional grid.

Task 6.5 Demand forecast for time varying portfolios of customers with churn – UC12 - (**EDF**, CEA, ORANGE)

Due to the opening of energy markets, electricity providers face with customer churn and need to forecast more volatile portfolios. In this competitive environment, our problem consists in identifying different drivers of the churn and includes them in a forecasting model based on electricity data.

Subtask 6.5.1: Demonstrator in France, "Forecasting of electricity demand for varying customer portfolios" (**EDF**, CEA, ORANGE)

This demonstrator focuses on forecasting the total consumption of our portfolio in presence of churn. This is a complex issue as we have to identify the good drivers of churn among many potential ones, crossing various information sources: web scrapping (e.g. price comparator), market information, customer profiles, survey and integrate them in a forecasting model. Different statistical model selection procedure will be used for that. The second step will be to use metering data to forecast a time varying portfolio of customers. We will then use online machine learning procedures. The outcome of the demonstrator is a tool for consumption forecast/electricity demand of a time varying portfolio. Activities in the demonstrator: Data collection/preprocessing/visualization; Model selection and evaluation; Design of a graphical interface for load forecasting representation at a local scale. Datasets to be used. Smart metering data from 32000 big customers with information on their process (EDF); Survey data (EDF), electricity market data.

T6.6 - Energy Retail & Services pilot outcome analysis (**EDF**, GNF, CEA, ORA)

This task provides a final technical analysis of the outcomes and lessons learned of the different demonstrators across the different use cases (the previously described tasks) of the Energy Retail and Services domain. This analysis is based upon the set of KPIs provided by

WP2, specifically by T2.3. This task provides as well the continuous feedback loop towards WP8, therefore triggering pilots' impact evaluation and assessment, as well based on a set of KPI defined in task T2.3. The feedback loop will be carried out continuously all along the pilot duration (in the three evaluation cycles described) and will focus on the impact analysis outcomes of each demonstrator. The description & outcomes of this iterative process are documented in WP8 deliverables as well as an analysis degree of transformation achieved by this energy domain at the end of the project.

Deliverables

D6.1.1- Large Scale Energy Retail and Services Pilot implementation plan (M8) – EDF

D6.2.1 – Energy efficiency diagnosis and value-added/advisory services UC10 implementation report (M12; M23; M34) (EDF)

D6.2.2 a, b – Energy efficiency diagnosis and value-added/advisory services UC10 demonstrators (M22; M33) (a) EDF (b) GNF

D6.3.1 – Demand flexibility as a valuable resource for cost-efficient grid operation UC11 implementation report (M12; M23; M34) (HFS)

D6.3.2 a, b – Demand flexibility as a valuable resource for cost-efficient grid operation UC11 demonstrators (M22; M33) (a) HFS (b) CEPRI

D6.4.1 – Estimation/forecasting of electricity demand at a local scale UC12 implementation report (M12; M23; M34) (EDF)

D6.4.2 a, b, c – Estimation/forecasting of electricity demand at a local scale UC12 demonstrators (M22; M33) (a) EDF (b) EDF (c) CEPRI

D6.5.1 – Demand forecast for time varying portfolios of customers with churn UC13 implementation report (M12; M23; M34) (EDF)

D6.5.2 – Demand forecast for time varying portfolios of customers with churn UC13 demonstrators (M22; M33) (a) EDF

D6.6.1 - Large Scale Energy Retail and Services Pilot assessment & achievements (M34) (Leader: EDF)

Work package number			**7**			Lead Beneficiary						**NYF**			
Work package title			**Large Scale Energy Management Pilot**												
Participant number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Short name of participant	ATOS	GNF	GEN	UFD	EURE	BSC	ZAB	CEA	EDF	ORA	POW	SIN-ICT	SIN- En	TNSGC	COM
Person/months	0	0	0	0	4	3	0	0	0	0	0	0	0	0	0
Participant number	16	17	**18**	19	20	21	22	23	24	25	26	27	28	29	30
Short name of participant	HFS	DTU	**NYF**	ENF	EIR	EGP	FLYBY	UNIBO	SAP	TECNA	RICOH	NOVA	SDG	YOURI	CEPRI
Person/months	0	40	**50**	36	0	0	0	0	0	0	61	27	0	0	0
Start	**M6**									End					**M34**

Objectives - The main objective of this WP is the implementation, running and preliminary assessment of the different demonstrators for the use cases within the Energy Management domain. Thus, allowing demonstrating the applicability, effectiveness and real business opportunities of the development and applications of big data solutions. In order to achieve a major impact in the **transformation** of the energy management domain big data technologies are introduced. For this WP the transformation will lead to methods for the use of big data analytics for identifying the most suitable buildings for energy performance improvements using smart meter data and energy informatics, methods for energy and power management in distribution grids, and big data analytics for introducing energy efficient work places. More specifically this WP will focus on the following three use cases, from UC14 to UC16: **Energy Efficient Homes and Customer interaction with Smart Meter (UC14), Energy and Power Management in Summer House Areas (UC15), Energy Efficient Workplaces (UC16).** The 5 demonstrators of this LSO will be implemented in two different countries by energy supply companies and ICT providers. For each demonstrator, ICT dedicated solutions will identified and adapted in collaboration with WP3.

Description of work

Task 7.1 – Energy Management data tools, pilot alignment and coordination (**DTU**, BSC, NYF, ENF, RICOH, NOVA)

This task will focus coordination and planning of the different demonstrators related to Energy and Power Management domain and on the interaction with WP3. The energy stakeholders and utilities will collaborate with the ICT providers in the application, adjustment and fine-tuning of the proposed tools. This task will consist of consecutive iterations all along the pilot life allowing the energy providers to test the tools and share recommendations with ICT providers for their improvement. This task will continuously interact with WP3 and provide suggestions for improvements of the big data tools providers in WP3. The types of Datasets that are used in the use cases of this WP are smart meters time series data, building comfort related time series data (temperature, CO2, humidity, noise), data from operations, weather data, Building information data, Social data, power quality time series (voltage and frequency) and Internet of Things. For all the areas within the value chain ensuring a proper security, reliability and privacy of the system will be key.

Task 7.2 – Energy Efficient Buildings (Customer interaction with Smart Meters) - UC14 - (**NYF**, DTU, EURE , ENF)

In this use case new methods for big data analytics of smart meter data and comfort related data will be established and demonstrated. Data

from different sources will be combined in order to obtain information about energy efficiency using smart meter data. This includes background information about the building, indoor measurements, local weather measurements as well as meteorological forecasts. Real data of this type will typically be heterogeneous since not all buildings are equipped with the same type and number of sensors, background information differs across buildings, sampling rates differ, etc. The complex data structure calls for big data methods capable of handling variety and veracity, as well as volume due to the large number of buildings, which must potentially be handled. The big data methods will be applied in order to facilitate statistical / advanced time series analysis for pre-processed data establishing methods for smart meter data analytics for: 1) Handling the specific heterogeneous data 2) Detecting issues with energy efficiency of buildings, 3) Providing guidance on occupancy behaviour, and 4) Provide input for Demand Side Management in DSO networks.

SubTask 7.2.1 Demonstration for NYFORS (**NYFORS**, ENFOR, DTU)

Smart meter readings from a large number of buildings will be provided by NYFORS together with more detailed measurements from a smaller number of buildings, and available background information such as, building type, heating equipment type, ground floor area, construction year, etc. Initially, one year of data will be provided for analysis where after a pilot-system for automatically updating the analyses over time will be implemented. The aim is to establish methods for big data analytics of smart meter data for energy efficiency guidance. At Nyfors, the amount of data from smart meters will grow by 70% by 2020 meaning a lot of new opportunities to provide customers with new services such as heat pumps, smart home solutions, etc. This DSO-Consumer interaction will provide energy efficiency at the end-user level as well at the DSO level..

SubTask 7.2.2 Demonstration for NOVASOL (**NOVA**, DTU, ENFOR)

Time series of building comfort related data like temperature, noise, CO2, etc. will be provided by NOVASOL for a number of different summerhouses. The amount and validity of the data will vary from house to house, but the general idea is to develop tools based on big data analytics to establish an on-line estimate of the indoor conditions, energy consumption and the related occupancy behavior. The analytic should fit to the available data in the individual houses, and hence for this demonstrator the amount of data, sampling time, representation, accuracy of data will vary from house to house providing challenges for the tools for big data analytics. This demonstrator will generate knowledge about relations between occupancy characteristics and comfort. NOVASOL operates more than 40.000 houses in Europe.

Task 7.3 –Energy and Power Management in distribution grids - UC15 - (**NOVASOL,** DTU, NYF, ENF)

The purpose of this use case is to develop and demonstrate big data ICT solutions using on-line data for energy and power management in DSO grids. The use cases will demonstrate how complex big data management and data analytics can be used for energy and power management in weak low voltage grids. The use case will zoom in on the issues expected for future low voltage grids with a large penetration of eg PV installations, EV and heat pumps. Similarly the use case will demonstrate the power load flexibility obtained by big data intelligent power consumption and power to heat IoT technologies. The case studies will be centered around DSO grids with a large number of summerhouses since such grids typically are rather weak, and they are exposed to very complex consumption and power profiles.

SubTask 7.3.1 Demonstration for NOVASOL (**DTU**, NOVASOL, NYFORS, ENFOR)

This subtask will consider grids containing summerhouses with an indoor swimming pool, charging for EV, heat pumps and/or PV generation. Such summer houses represent a challenge both for the home automation systems and for the low voltage grid operator (DSO grid operator). For Novasol new methods for identifying the optimal water temperature and indoor air temperature will be derived. The large thermal inertia of the water in the swimming pools will be used to enable savings which utilizes the fact that the power price depends highly on the actual wind power production. In general the optimal operation will depend on a number of factors, and it is expected that this big data enabled advance control principles can be used to generate added value for NOVASOL and the owners of the summerhouses.

SubTask 7.3.2 Demonstration for NYFORS (**NYFORS**, NOVASOL, ENFOR)

For Nyfors the goal is to identifying big data analytics for on-line monitoring and operation of complex low voltage power grids using complex data analytics. In the future the increasing numbers of EVs, PV installation, Power-to-heat technologies will provide a challenge for the DSO grids, and a summerhouse low voltage grid with PV installation, EV charging options, swimming pools, represents already such power quality related challenges. The DSO operators will demand response frameworks which are established using on-line data generate price-based demand response functions using big data analytics. Big data informatics will be used to describe power quality issues with the purpose of implementing a next generation of demand response technologies. It is expected future smart and green cities will also face a need for such methods due to an increased installation of PV, use of EVs, local heat pumps.

Task 7.4 – Energy Efficient Workplaces, how to operate office devices efficiently– UC16 - (**Ricoh,** DTU)

The aim is to analyse the data information operation available from the workplace devices, through Big Data infrastructure, to obtain customized recommendations for the users in order to achieve energy efficient and sustainable workplaces. The data collected from more than 50.000 multifunctional products (MFP) will be analysed to design the energy requirements of each workplace and to define personalized measures to reduce the energy consumption from the current consumption levels including associated costs and CO_2 emissions reductions. The data collected by the tool @remote will be specifically managed using dedicated computational Big Data infrastructure and will be used to automatically calculate the energy savings, CO_2 avoidance by saving trees and cost savings due to energy consumption reduction as well as calculation of sheets of paper saved, cost of savings, trees saved, CO_2 sequestered by trees (KgCO) and manufacturing CO_2 avoidance. As a result of these analysis, the energy efficiency requirements and behaviours of each customer will be defined and added value feedback and recommendations and intelligent reports will be generated to help customers to optimize their daily office operations and to enhance their environmental awareness and make use of office devices in the most energy efficient way.

SubTask 7.4.1 Demonstration in Spain (RICOH, EURECAT, BSC**)**

The demonstration will consider data acquisition, treatment and processing from a global amount of 50.000 devices operating in Spain. The obtained figures will be completed with additional information from other devices (available from the consortium, open data, etc.). The data collected will be used to analyse and define the usage pattern of the customers via EURECAT recommender module. It's planned to perform a monitoring activity of the energy efficiency models/services, developed along the demonstration, over more than 500 devices (which will be included progressively).In order to manage the information regarding customer feedback involved in the demonstration, a specific methodology supported with the required assets will be defined and developed (such as, Web portal or Mobile App). During the demonstration process, and after the initial validation phase in Spain to tune the modules, the pilot will be extended to another European country, taking advantage of Ricoh's global presence in Europe, to demonstrate the replicability of the defined energy efficiency models/services. Data sets to be used are: operation type (Printing/Copy/Fax and colour), paper (number of pages printed, duplex pages and its percentage, combine pages and its percentage), energy consumptions by Ricoh products and, operation cycles from MFPs and global metering and/or submetering of energy consumption of the customer (if available from the customer or through the energy provider), energy prices (hourly, where available), temperatures (current and forecast), relative humidity, location etc. from external data sources.

Task 7.5 – Energy and Power Management pilot outcome analysis (NYF; BSC, DTU, ENF, RICOH**)**

This task will provide a technical analysis of the outcomes and lessons learned of the different demonstrators across the different use cases (the previously described tasks) of the Energy Management Service domain. For this analysis the set of KPIs provided by WP2 will be used. This task will also feed into WP8 deliverables with respect to the impact and assessment of the methodologies and the demonstrators.

Deliverables

D7.1.1- Large Scale Energy Management Service pilot implementation plan (M8) – (DTU)

D7.2.1 – Energy Efficient Buildings (Customer interaction with Smart Meters) UC14 implementation report (M12; M23; M34) (NYF)

D7.2.2 a, b – Energy Efficient Buildings (Customer interaction with Smart Meters) UC14 demonstrators (M22; M33) (a) NYF (b) NOVA

D7.3.1 – Energy and Power Management in distribution grids UC15 implementation report (M12; M23; M34) (NOVA)

D7.3.2 a, b – Energy and Power Management in distribution grids UC15 demonstrators (M22; M33) (a) NYF (b) NOVA

D7.4.1 – Energy Efficient Workplaces, how to operate office devices in the most efficient manner UC16 implementation report (RICOH)

D7.4.2 – Energy Efficient Workplaces, how to operate office devices in the most efficient manner UC16 demonstrators (M22; M33) (RICOH)

D7.5.1 – Energy Distribution pilot overall impact analysis (M34) (Leader: DTU)

Work package number			**8**			Lead Beneficiary						**ATOS**			
Work package title			Large Scale Pilots Business Assessment and Evaluation												
Participant number	**1**	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Short name of participant	**ATOS**	GNF	GEN	UFD	EURE	BSC	ZAB	CEA	EDF	ORA	POW	SIN-ICT	SIN- En	TNSGC	COM
Person/months	**30**	3	8	8	0	0	0	0	2	0	0	0	4	0	0
Participant number	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Short name of participant	HFS	DTU	NYF	ENF	EIR	EGP	FLYBY	UNIBO	SAP	TECNA	RICOH	NOVA	SDG	YOURI	CEPRI
Person/months	3	0	0	0	4	4	7	4	0	4	8	0	0	0	0
Start	**M6**									End					**M36**

Objectives - Key performance indicators (KPI) provided by T2.3 will be the initial input to the WP enabling the evaluation of the performance at pilot sites to ensure change dynamically the performance of the project when required. To add value to the KPI process a further element is the on-going evaluation of KPIs during the project. Performance against the initial targets will be evaluated throughout the project at project gateways - defined as evaluation and assessment cycles - to allow rapid identification when a performance objective falls below the acceptable level and the implementation of corrective measures is necessary. Furthermore, this WP will assure the safe and sound transfer of pilots' results (per cycle) to be compared to project's KPIs identified in the early stages of the project that concerns business aspects for the development of the fundaments needed to support a Consortium Business Plan. WP8 will perform three cycles of evaluation and assessment at each pilot site: 1. Deployment process and validation (Cycle 1); 2. Full scale implementation (Cycle 2); and 3. Impact and outcomes optimisation (Cycle 3). Each of them will provide feedback for improvement of KPIs for next cycle. And will finalize with the Domain Transformation Analysis. WP8's objectives performed by its task will identify exceptional performance, enabling the recognition of success in a timely manner.

Description of work

T8.1 - Energy pilots Business Assessment & Evaluation First Cycle (**ATOS**; GEN,UFD, EDF, FBY, UNIBO, RICOH)

This task will monitor the results provided by the performance of the pilots by comparing them with the KPIs provided by Task 2.3 during the execution of the deployment cycle. The resulting gap analysis will provide feedback, impact validation and potential improvements for the KPIs for the following evaluation cycle. Furthermore, some of the KPIs needed for the next cycle (T8.2)) will not be obtainable until practical completion and the availability of information evolves as the project progresses and pilot sites deployment has been finished.

T8.2 - Energy pilots Business Assessment & Evaluation Second Cycle (**ATOS**; GEN,UFD, EDF, EIR, EGP, FBY, UNIBO, RICOH, SAP, HFS, TECNA)

This task will monitor the results provided by the performance of project's pilots by comparing them with the KPIs provided by Task 2.3 (improved with T8.1 results) during the execution of the execution cycle. The resulting gap analysis will provide feedback, impact validation and potential improvements for the KPIs for the following evaluation cycle. Furthermore, some of the KPIs needed for the next cycle (T8.3) will not be obtainable until practical completion and the availability of information evolves as the project progresses and pilot sites execution has been finished.

T8.3 - Energy pilots Business Assessment & Evaluation Third Cycle (**ATOS**; GEN,UFD, EDF, EIR, EGP, FBY, GNF, RICOH, HFS, TECNA)

This task will monitor the results provided by the performance of project's pilots by comparing them with the KPIs provided by Task 2.3 (improved with T8.2 results) during the execution of the validation cycle. The resulting gap analysis will provide feedback, impact validation and potential improvements for the pilot sites before finished the project. Final results will provide the fundaments for the execution of T8.4.

T8.4 - Energy Domains Transformation Final Analysis (**ATOS**; GEN,UFD, EDF, IR, EGP, FBY, GNF, RICOH, HFS)

This task summarizes the results provided by three previous tasks by evaluate the results achieved in terms of business impact, thus providing a set of recommendations that will help in the maximization of project outcomes. It also will assess the impact of the final results. Final KPIs analysed will be those related with the business aspects of project's pilots from the use case perspective, but also from the contribution to the transformation of the energy domain. For the industrial partners, the pilots will deliver enhanced products, new or evolved tools whose added value should be boosted and promoted so as to maximize market share using big data technologies and also in the big data market itself. The pilots will be used for benchmarking the success of the application of big data technologies in the energy domain. These strategies are considered a first step of the replication and scaling up process that will be developed in WP9.

Deliverables

D8.1 – Energy Pilots' Evaluation and Impact Analysis Report – First Cycle (M14) – Leader: **ATOS**

D8.2 – Energy Pilots' Evaluation and Impact Analysis Report – Second Cycle (M24) – Leader: **ATOS**

D8.3 – Energy Pilots' Evaluation and Impact Analysis Report – Third Cycle (M35) – Leader: **ATOS**

D8.4 – Energy Pilots' Business Impact Assessment towards Domains' Data-driven Transformation (M36) – Leader: **ATOS**

Work package number			**9**			Lead Beneficiary							**ORANGE**		
Work package title			Scaling-up and Market replicability												
Participant number	1	2	3	4	5	6	7	8	9	**10**	11	12	13	14	15
Short name of participant	ATOS	GNF	GEN	UFD	EURE	BSC	ZAB	CEA	EDF	**ORA**	POW	SIN-ICT	SIN- En	TNSGC	COM
Person/months	16	9	7	7	10	0	2	0	2	**20**	0	3	0	4	1
Participant number	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Short name of participant	HFS	DTU	NYF	ENF	EIR	EGP	FLYBY	UNIBO	SAP	TECNA	RICOH	NOVA	SDG	YOURI	CEPRI
Person/months	1	0	0	0	3	11	4	0	4	2	8	0	0	0	0
Start	**M9**									End					**M36**

Objectives - WP9 activities focus on the extension of pilot results beyond the scope of the demonstrators defined in WP4-7. WP9 aims at defining the required tools and procedures for assuring the adoption of project results, the creation of impact in the market and the involvement of stakeholders in the project so as to create a more complete eco-system. More in detail, the main objectives will be: Application of pilots use case methodology and results to other utilities within and outside ELECTRA consortium

- Analysis of the customization requirements imposed to the Big Data tools used during ELECTRA pilots to prepare them to target a market share wider than ELECTRA scope.
- Create an exploitation strategy that allows ELECTRA to deliver the added value products and services created.
- Development of updated business plans for the exploitation of the tools that have been provided by project's partners.
- Management of the External Advisory Board and the active engagement of the Stakeholder ecosystem into the demonstration

activities and its potential replication.

Description of work

Task 9.1 – Energy pilots outcomes Scaling-up & Market Replicability (EGP, ATOS; GEN,UFD, EDF, ORA, EIR, EGP, GNF, RICOH)

This task will foster the replicability of the results obtained and methodologies followed in the different ELECTRA demonstrators. Additionally this task will work on the definition of the conditions for the scaling-up of the activities covered by the partners. Starting from the different use cases validated results; the CBA of a set of virtual cases will be evaluated. The virtual cases will be defined coupling technological solutions and business models in a few scenarios, different in terms of size, geographical and social contexts. Techno-economical evaluations will be carried on, with reference to the scenario and success parameters defined in WP2, and the results of demo activities performed in WP4 to 7, to determine the main economic parameters of their future application. There is the need of defining of methodology to build up virtual use cases which are significant for a sensitivity analysis and for the scaling and replicability evaluation of pilot use cases. Scenarios defined in WP2 and KPIs will give the technological, geographical and size constraints for the virtual use case definition and for the sensitivity matrix build up. Besides, use case configurations will give the structure for virtual use case configuration. At least a couple of virtual use cases have to be defined for each domain. The aim is to identify a number of parameters to conduct the sensitivity analysis using the Net Present Value economic calculation. With reference to the virtual cases definition for the different domains, a techno-economic analysis will be conducted, encompassing the following:

- Determine main techno-economic parameters of virtual use cases
- Determine CAPEX and OPEX values and conduct the Net Present Value for the virtual use case lifetime
- Apply a sensitivity analysis respect to the parameters defined previously

Task 9.2 – Big Data tools & solutions Scaling-up & Replicability (EURECAT, SIN-ICT**,** COM, ATOS; GEN,UFD, FBY, TECNA, ORA, GNF, RICOH, SAP)

This task will analyse the customization needs towards maximizing market potential of the big data tools and techniques applied in the 7 large scale pilots in the energy domain in order to achieve a market share increase for technology providers beyond the scope of the project in terms of scalability of big data tools to extend the scope in terms of assets (whole generation fleet, other infrastructures, more customer segments) or area (other regions or countries). On the other side, an extensive study of other domains and markets with potential applicability will be conducted. The first targeted group of this exploration will be other commodity industries, with special emphasis to the water industry; apart from similarities between electricity and water distribution, there is a tight link between the two domains, the so called water-energy nexus. Other domains that have been identified in a preliminary analysis are: chemical, metal, oil and gas industry. The replicability potential will be studied in terms of:

- Big data paradigm: Does the data generated by the domain fits into the 5 V's (Volume, Veracity, Velocity, Variety and Value)?
- Need for advance data processing: Can process performance be improved by applying big data analytics? How much?
- Impact at business level: analysis of CAPEX and OPEX of the proposed solution
- Technical, economic, regulatory and social barriers to be overcome to penetrate the market

The expertise provided by the partners participating in the proposal in the targeted domains will be exploited to obtain the information needed to conduct the above mentioned analysis.

Task 9.3 – Exploitation strategy and Business Plan development (ORANGE, EURE, EGP, SAP**,** COM, ATOS; GEN,UFD, FBY, EIR, EGP, GNF, RICOH)

This task focuses on monitoring and compiling partners' exploitation activities seeking synergies among them. The pilot activities developed will help to define target groups and business cases within and beyond project activities. This task will be aligned with WP8 developments since the refinement of activities in the different pilot cycles will be oriented to the maximization of business potential of ELECTRA solutions. The activities included in this task are:

- Analysis of exploitable results and definition of IPRs (patents, licensing properties…)
- Development of a concrete business plan guided by project results and improved by the contact with the stakeholders collaborating with ELECTRA
- The progress and evolution of business plans are going to be reported by the end of year 2 and year 3, in which pilot activities will be already running and validated thus gathering all the information needed to maximize market impact of project developments.

Task 9.4 –Advisory Board & Stakeholder Eco-System Engagement (ATOS, GNF**,** ZAB, ORA, TNSGC, EIR, EGP, RICOH)

This task will set up and make operative the External Advisory Board and the ELECTRA Stakeholder Eco-System with representatives and organizations coming both of energy and the ICT domains and with representatives from other vertical industrial markets. In this approach the ELECTRA Stakeholder Eco-System will be engaged and made aware of the project activities by the WP10 Community Building and in this task a selection of these organizations will be engaged in the activities of the project and specifically made aware of the results of the large scale piloting activities in the four energy domain with the final goal of being replicated in other countries, contexts and companies or in other relevant vertical market. To be deeply connected to the project, it is expected to have remote Advisory Board meeting every quarter (2 hours) and a twice a year face to face meeting (1 day). Management of the relationship with the advisory Board will cover the following activities:

- Market and Business scenarios derived of interaction of big data and energy value chains

- Recommendations to use cases and demonstrators to improve scenario and technical solutions to apply
- Provision of specific requirements aligned with their needs/expertise
- Advisor on the implementation of dissemination and communication actions

Deliverables (brief description and month of delivery)

D9.1 – ELECTRA scenarios scalability and replicability (M27; M36) – Leader: EGP

This document will provide a guideline to facilitate the scalability and replicability of the use cases and its results so as to extend the benefits of Big Data beyond project scope.

D9.2 – ELECTRA Big Data tools scalability and replicability (M27; M36) – Leader: EURECAT

This document will provide a guideline to ease the scalability and replicability of big data tools to extend the market share of big data technological solutions to other customers and domains based on lessons learnt during the large scale pilot market needs.

D9.3 – ELECTRA exploitation and business plan (M24; M36) – Leader: ORANGE

These reports will include the exploitation plans, both individual and as project. They will be complemented with an analysis of the market status for Energy and also for ICT providers.

D9.4 –Management of ELECTRA eco-system (M12; M24; M36) – Leader: ATOS

The participation of the EAB in project activities will be a key factor in the success of ELECTRA activities, additionally the collaboration of the members the eco-system will also help ELECTRA in the achievement and dissemination of project's results. The deliverable will have a first version (M12) that includes the plan for the rest of the project whilst the other two will be an update of the plan and the report of the activities developed.

Work package number			**10**			Lead Beneficiary							**SAP**		
Work package title			Communication & Standardization												
Participant number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Short name of participant	ATOS	GNF	GEN	UFD	EURE	BSC	ZAB	CEA	EDF	ORA	POW	SIN-ICT	SIN- En	TNSGC	COM
Person/months	4	5	9	9	4	2	21	2	3	2	1	3	3	9	1
Participant number	16	17	18	19	20	21	22	23	**24**	25	26	27	28	29	30
Short name of participant	HFS	DTU	NYF	ENF	EIR	EGP	FLYBY	UNIBO	**SAP**	TECNA	RICOH	NOVA	SDG	YOURI	CEPRI
Person/months	1	2	1	1	3	2	3	2	**11**	4	5	1	1	13	4
Start	**M1**								End						**M36**

Objectives The objective of WP10 is to disseminate and promote the main outcomes for bringing added value to the results of the ELECTRA project by consolidating the main findings into a single package in a format that is attractive for the relevant stakeholders, decision makers, institutions, organizations, the industry and civil society across the EU, and hence to stimulate further actions and to foster the replicability of the outcomes. WP10 takes the key messages and packaged know-how to the Energy sector and other cross-domain activities in the countries where the pilots take place, in other countries EU-wide and internationally. To increase the probability of replication of use and management of Big Data in Energy sector beyond the pilots implemented in project framework WP10 builds working relations and community based on experience and knowledge exchange and transfer with a number of associations that support the project activities, with the Stakeholders' Eco-system and the External Advisory Board (EAB). Community building is the core of the communication and dissemination activities. Additionally, with the aim of engaging stakeholders out of the consortium, webinars are planned to provide the stakeholder ecosystem with the latest findings and outcomes of the project. Their viewpoint and feedback will be requested as active participants of this initiative. An incentive programme will be created to increase the impact of the project activities. Finally, standardisation strategy of the project will be defined and developed to ensure interoperability, provide dissemination of the results and facilitate their introduction into the market.

Description of work

T10.1 Communication & Dissemination strategy (YOURIS; ZABALA)

This task aims at fine-tuning the Communication and Dissemination Strategy described in 2.2.1 section to provide a schedule for the different activities to be implemented during the ELECTRA project with special attention to the countries and regions in which the pilots will be deployed. It will also outline the roles and responsibilities of partners and the conditions ensuring proper dissemination to strategic sectors of the generated knowledge, related to confidentiality, publication and use of the knowledge.

Thanks to continuous monitoring of the impacts of the Communication and Dissemination activities of the project and the partners through a six-monthly reporting activity, the strategy will be updated every year to reschedule, if needed, the tasks and responsibilities and to include new relevant events, conferences, trades that might be identified throughout the project lifecycle.

T10.2 Communication activities and training sessions (YOURIS, and all**)**

Subtask 10.2.1 Communication activities (YOURIS)

General **communication materia**l will be produced as described in the section 2.2.2 with a clear and **innovative visual identity**. The visual identity along with the manual of use will be launched in month 2 of the project. Printout materials, including a brochure, a roll-up poster as well as other collaterals such as factsheets, will be produced in month 5 and updated during the project lifecycle. Design, development and continuous update of a project **web site** will be done following the description provided in the section 2.2.2. ELECTRA will count with profiles in professional **social networks** such as LinkedIn and Twitter used as direct communication channels with other professionals from the Energy and Big Data sectors.

Subtask 10.2.2 Contact with media (YOURIS)

Press releases as well as online European resources such as a yearly special-interest newsletter and journal articles and news releases will be used to inform target audiences on relevant developments of the project and their impact. They will be widely disseminated through online and social mass media and information multipliers. Two short web videos will be produced and distributed. It will focus on objectives, expected impacts and benefits. The videos will include footage, animations and infographics be distributed via the project website and will be promoted via online and social media. It will also be used as a supporting dissemination tool in fairs, conferences and workshops. This task will also be devoted to keep frequent contact with national and European media, especially in the 4 countries where the large pilots will take place. To increase knowledge sharing among experts and position the project in the scientific community, publications in technical literature and dedicated journals as well as conference papers will be performed by the scientific and technical.

Subtask 10.2.3 Training sessions (ZABALA; WP4-7 LEADERS)

Eight training sessions will be organized using a webinar platform with different audience and objectives:

Four sessions (as many as large domains) will be organized addressed to the ELECTRA consortium partners for cross-fertilisation of the different case uses of the pilots with the aim of sharing findings and knowledge gained. These webinars will be organized in close collaboration between dissemination leader and pilot leaders and teams to foster the replicability of the solutions. They will be organized between months 25 and 30 where the first milestones of the pilots will have been reached and where best practice sharing will contribute to enrich the last phase of the large pilots. Other four sessions will be organized addressed to the Stakeholders' Eco-system with the latest findings and outcomes of the project. These webinars will also be organized in close collaboration between dissemination leader and pilot leaders and teams to reinforce the engagement of the members of the Stakeholders' Eco-system by creating discussion and requesting feedback from them. These will be organized after the first milestone of the pilots, i.e., in month 12. The conclusions of the discussions will feed the next phase of the 4 pilots.

T10.3 Community Building (ZABALA, ATOS, GNF, GEN, UFD, SIN-ICT, SIN-EN, TNSGC, EGP, TECNA, RICOH, CEPRI**)**

Subtask 10.3.1 Stakeholders' Workshops (ZABALA and PILOT LEADERS)

These workshops aim to promote the project results to regional and national stakeholders of relevance. Four stakeholders' workshops will be organised during the project framework, one in each country in which the large pilots will be implemented. In addition to the members of the Stakeholders' Eco-system, Industrial actors (mainly companies of Energy sector interested in the project results), associations of both Energy sector and Big Data domain and public administrations chosen on the basis of their expertise will be proactively approached with dissemination activities that will be custom made to the sectors and markets chosen. Additional specific workshops will be considered in the course of the project if is identified as necessary.

Subtask 10.3.2 Interactions with other EU consortia, platforms, associations related of the Energy sector (ZABALA)

ELECTRA consortium will interact with other programmes, platforms, clusters, associations active in the European space that are relevant to our activities mainly focused on the Energy services to be piloted as well as Big Data applied in other domains. Further detail in section 2.2.2.

Subtask 10.3.4 Participation in European and international trades, fairs, conferences (PILOT LEADERS)

Project partners will attend European and international trades, fairs, conferences as described in section 2.2.2.with the aim of promoting the results of ELECTRA. Booths will be allocated with specifically designed identity focused on the product/service to be shown. When possible, key note speakers will participate in the conferences to introduce the findings of the ELECTRA project.

Task 10.4 Standardization & Regulation (SAP, GNF, GEN, UFD, EURE, EDF, SIN-EN, TNSGC, EIR, FBY, SAP, RICOH**)**

Technical standards are the playing rules of the market and standardization system constitutes a wide network of collaboration and knowledge transfer. As a consequence, standardization supports research and innovation in the important aspects of ensuring interoperability, provide dissemination of the results and facilitate their introduction into the market. This task will coordinate the standardization strategy from the initial planning of the project and during its development: identification of applicable standards, published or under development; identification of new standardization fields; collaboration with existing standardization technical committees; technical proposals for new or revised standards; participation and leadership in new or revised standards writing.

This task will also identify from the pilot areas and usecases key regulatory issues ("secondary legislation"). The issues will come from different national regulatory context that might require harmonization but also from individual topics like regional balancing, privacy/security issues (providing customer consent to access data), different access regimes e.g. to smartmeters, incentivation for innovation / reimbursement for investments, incentivation of prosumers etc.. Relevant regulatory topics will be collected and described at national / EU level and after alignment in the consortium if applicable addressed to the corresponding regulatory bodies. During the task we will also coordinate/provide regulatory advice where appropriate

Deliverables

D10.1 ELECTRA website (M3) –YOURIS

D10.2 The Communication & Dissemination strategy (M12, M24, M36) - ZABALA

D10.3 Communication materials: visual identity, brochure, first video, first press release (M6), second video (M30) ; training sessions (M36) - YOURIS

D10.4 Progress reports on community building activities (M12, M24, M30) - ZABALA

D10.5 Report on standardization & regulation activities (M18, M36) - SAP

Table 3.1b: List of work packages

WP	Title	Lead Participant N	Lead Participant Short Name	Person-Months	Start Month	End month
1	Project Management & Coordination	1	ATOS	61	1	36
2	Energy & Big Data Value chains scenario definition	16	HFS	96	1	8
3	Definition/adaptation of ICT solutions	12	SIN_ICT	286	1	32
4	Large Scale Pilot Energy Generation	20	EIR.	496	6	34
5	Large Scale Energy Pilot Distribution	2	UFD	348	6	34
6	Large Scale Pilot Energy Retail and Services	9	EDF	324	6	34
7	Large Scale Energy Management Pilot	18	NYFS	221	6	34
8	Large Scale Pilots Business Assessment and Evaluation	1	ATOS	89	6	36
9	Scaling-up and Market Replicability	10	ORANGE	113	9	36
10	Communication and Regulation	24	SAP	132	1	36
				2166		

The Table 3.1c includes the most representative deliverables that will be used to set ELECTRA's milestones. The full list of deliverables is not only included within the description of each WP, but also reported in the Annex of the proposal. The dissemination level considered by default is Public and only those which include sensitive information regarding project coordination and strategic exploitation plans of the members of the consortium will be released as Confidential.

Table 3.1c: List of Deliverables

Deliverable (number)	Deliverable name	WP number	Short name of lead participant	Type	Dissemination level	Delivery date (in months)
D1.3 a, b	Data Management Plan	1	ATOS	R	CO	M6; M36
D2.1	Energy domain scenarios	2	HFS	R	PU	M6
D2.3	Definition of project KPIs per energy domain	2	HFS	R	PU	M8
D3.1 a, b	Big Data platform, architecture and infrastructure guidelines for Energy applications	3	SIN-ICT	R	PU	M6; M12
D3.2 a, b, c	Use case implementation guidelines for Big Data applications – Analytics	3	ORANGE	R	PU	M8;M18; M30
D3.3 a, b, c	Use case implementation guidelines for Big Data Energy applications – Big Data Management and Processing	3	SAP	R	PU	M8;M18; M30
D4.1.1	LSP Energy Generation implementation plan	4	EIR	R	PU	M8

D4.2.2 a, b	Fossil fuel UC1 demonstrators	4	(a) EIR (b) GNF	D	CO	M22; M33
D4.3.2 a, b	Hydro UC2 demonstrators	4	(a) EIR (b) GNF	D	CO	M22; M33
D4.4.2 a, b	Wind UC3 demonstrators	4	(a) EGP (b) GNF	D	CO	M22; M33
D4.4.4 a, b	Solar UC4 demonstrators	4	(a) EGP (b) GNF	D	CO	M22; M33
D4.5.2	Nuclear UC5 demonstrator	4	EDF	D	CO	M22; M33
D4.6.1	LSP Energy Generation assessment & achievements	4	EIR	R	PU	M34
D5.1	Large Scale Energy Distribution Pilot implementation plan	5	GNF	R	PU	M8
5.2.2	Grid Digitalization & Predictive Maintenance UC6 demonstrators	5	(a) GNF (b) (c) HFS	D	CO	M22; M33
D5.3.2 a, b	Network Investment and Planning UC7 demonstrators	5	(a) GNF (b) HFS	D	CO	M22; M33
D5.4.2	Energy Balance and Fraud Detection UC8 demonstrator	5	GNF	D	CO	M22; M33
D5.5.2	Proactive Customer Support and Response UC9 demonstrator	5	GNF	D	CO	M22; M33
D5.6	Large Scale Energy Distribution Pilots assessment & achievements	5	HFS	R	PU	M34
D6.1	Large Scale Energy Retail and Services Pilot implementation plan	6	EDF	R	PU	M8
D6.2.2 a, b	Energy efficiency diagnosis and value-added/advisory services UC10 demonstrators	6	(a) EDF (b) GNF	D	CO	M22; M33
D6.3.2 a, b	Demand flexibility as a valuable resource for cost-efficient grid operation UC11 demonstrators	6	(a) HFS (b) CEPRI	D	CO	M22; M33
D6.4.2 a, b	Estimation/forecasting of electricity demand at a local scale UC12 demonstrators	6	(a) EDF (b) EDF (c) CEPRI	D	CO	M22; M33
D6.5.2	Demand forecast for time varying portfolios of customers with churn UC13 demonstrators	6	EDF	D	CO	M22; M33
D6.6	Large Scale Energy Retail and Services Pilot assessment & achievements	6	EDF	R	PU	M34
D7.1	Large Scale Energy Management Service pilot implementation plan	7	DTU	R	PU	M8
D7.2.2 a, b	Energy Efficient Buildings (Customer interaction with Smart Meters) UC14 demonstrators	7	NOVA	D	CO	M22; M33
D7.3.2 a, b	Energy and Power Management in distribution grids UC15 demonstrators	7	NOVA	D	CO	M22; M33
D7.4.2	Energy Efficient Workplaces, how to operate office devices in the most efficient manner UC16 demonstrators	7	RICOH	D	CO	M22; M33
D7.5	Energy Distribution pilot overall impact analysis	7	DTU	R	PU	M34
D8.1	Energy Pilots' Evaluation and Impact Analysis Report – First Cycle	8	ATOS	R	PU	M14
D8.2	Energy Pilots' Evaluation and Impact Analysis Report – Second Cycle	8	ATOS	R	PU	M24

D8.3	Energy Pilots' Evaluation and Impact Analysis Report – Third Cycle	8	ATOS	R	PU	M35
D8.4	Energy Pilots' Business Impact Assessment towards Domains' Data-driven Transformation	8	ATOS	R	PU	M36
D9.1	ELECTRA scenarios scalability and replicability	9	EGP	R	PU	M27; M36
D9.2	ELECTRA Big Data tools scalability and replicability	9	EURECAT	R	PU	M27; M36
D9.3	ELECTRA exploitation and business plan	9	ORANGE	R	CO	M24; M36
D9.4	Management of ELECTRA eco-system	9	ATOS	R	PU	M12; M24; M36
D10.1	Project Website	10	YOURIS	R	PU	M3
D10.2	The Communication & Dissemination strategy	10	YOURIS	R	PU	M12, M24, M36
D10.3	Communication materials: visual identity, brochure, first video, first press release (M6), second video (M30)	10	YOURIS	R	PU	M6; M30
D10.4	Progress reports on community building activities	10	ZABALA	R	PU	M12, M24, M30
D10.5	Report on standardization & regulation activities	10	SAP	R	PU	M18, M36

Table 3.2a: List of milestones

Milestone number	Milestone name	Related work package(s)	Estimated date (in month)	Means of verification
M1	Project website and social network release	WP10	M3	D10.1
M2	Scenario requirements and KPIs, Data management plan and Pilot implementation plans	WP1, WP2, WP4, WP5,WP6,WP7	M8	D1.3, D2.3, D4.1, D5.1, D6.1, D7.1
M3	Architecture and evaluation of pilot 1st cycle, and communication and dissemination strategy	WP3, WP8, WP10	M14	D3.1, D8.1, D10.2
M4	First version of ELECTRA demonstrators	WP4, WP5, WP6, WP7	M22	D4.x.2, D5.x.2, D6.x.2, D7.x.2
M5	Energy Pilot's evaluation and impact Analysis report – 2nd cycle; Progress on Community building activities	WP8, WP10	M24	D8.2, D10.4
M6	Implementation guidelines for Big Data applications – final version	WP3	M30	D3.3c, D3.2c
M7	Final version of ELECTRA demonstrators	WP4, WP5, WP6, WP7	M33	D4.x.2, D5.x.2, D6.x.2, D7.x.2
M8	Assessment and achievements of Large Scale Pilots	WP4, WP5, WP6, WP7	M34	D4.6, D5.6, D6.6, D7.5
M9	Energy Pilots' Business impact Assessment, Scenarios and application scalability and replicability, Exploitation and business plans, Report on management of ELECTRA eco-system	WP8, WP9, WP10	M36	D8.4, D9.1, D9.2, D9.3, D9.4

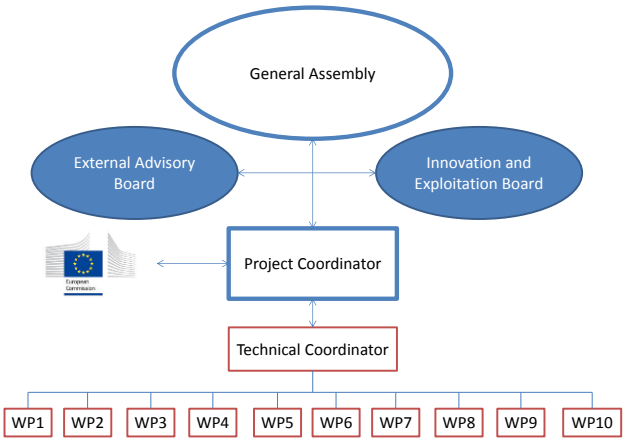
3.2 Management structure, milestones and procedures

This section describes the governing bodies of the ELECTRA project, and the main roles of the various organisations within the project's management structure. The project objectives as stated in section 1.1.2 can be only accomplished if an effective project management structure is implemented and project ground rules, especially a good management of the innovation process, are agreed shared by all partners. Due to the degree of complexity of this project and the great number of partners, a consistent management structure is needed to facilitate a smooth project operation and collaboration among partners, setting and managing the effective delivery of the project results while checking continuously the potential market and hence guaranteeing the timeliness and validity of the project results. The management structure proposed for ELECTRA aims therefore at facilitating the co-operation between partners while maintaining a strict control of gradual achievements of the project objectives. It distinguishes between decision-making structures, organisation of daily operations and the monitoring of

the innovation. This aspect, as well as the mentioned bodies, and specially their composition, are described below in further detail. The main objective of the proposed management structure is to ensure that the project is proceeding according to the plan, objectives and milestones, and delivering the appropriate innovative results to the market. A more detailed description of the responsibilities of each governing body and role will be agreed in the Consortium Agreement (CA) and then formalized at month 3 in the quality plan deliverable.

3.2.1 Governing Bodies

The **General Assembly** (GA) is the ultimate decision-making body of the Consortium, chaired by the Project Coordinator and also one representative of each partner. It will be responsible for monitoring and harmonize the activities and progress of the project, give strategic direction of the project and will be in charge of the high level management, providing recommendations for amendments to the work plan, major technical, financial and resource allocation decision and assessing and resolving any type of conflict situations. If a major modification of the overall project or a particular action to solve any conflict or mitigate risks is required, the decision will be made after consultation with all the members. The GA will meet at the start of the project and at least two times per year. Additional meetings, teleconferences and videoconferences will be on an ad-hoc basis as required for urgent matters or if a majority of partners agree on it. Internal consensus among the ELECTRA partners on managerial issues is vital to the final success. Whenever possible all the decisions will be adopted by general consensus, but in case of no consensus a set of rules for decision making will be in place. The exact responsibilities and rules for conflict resolution through voting will be detailed in the CA and in the quality plan deliverable D1.2.The GA shall be responsible for the overall direction of the Project. GA responsibilities will be outlined in detail in the CA.



The **Impact and Exploitation Board** (I&E Board) is responsible for the management of the impact and the exploitation aspects of the project and includes all WP Leaders. The needs of a separate board from WP9 and WP10 arise from the need of managing the transformation and innovation processes across the entire project, avoiding the isolation of the exploitation and market perspective in a single work package. Chaired by the WP9 leader, the I&E Board focus on setting and monitoring the exploitation strategy for ELECTRA, checking the progress of business objectives, monitoring of the market, including competitor analysis and business opportunities, business and Innovation risk management. It as well ensure to interpret business strategy and determine innovative solutions supporting the implementation strategy; monitor and present new processes and ideas to improve the innovative aspects of the project; ensure the dissemination of the innovative project results to the appropriate channels. The I&E Board will meet periodically, at least with the same periodicity as the GA, to ensure a cross-fertilization between the innovation and implementation processes, assessing the status of the ELECTRA assets, the state-of-the-art of the technology and trends, competitors, and monitoring all the innovation process.

The **External Advisory Board (EAB)** is composed of Technical, business and domain-specific experts of high profile and relevance. Special emphasis will be put on the representation of all the stakeholders in the Energy domain, so that, besides the viewpoints of partners directly included in the consortium, ELECTRA can get further views and opinions on requirements and functionalities developed in ELECTRA. The EAB is responsible of the following tasks: advisor for the Exploitation, Innovation and Impact activities; major communication link between ELECTRA and Industry, both in the Energy & ICT/Big Data domains; it ensures ELECTRA significantly impacts Energy & ICT European Industry; it provides additional input to the requirements definition and validates the outcomes of ELECTRA before submitting them to a wider community of the Stakeholder Eco-System as identified in Task 9.4. All EAB members shall be required to sign an appropriate non-disclosure agreement prior to participating in any EAB meeting or other project related meeting, activity or decision. The EAB shall report to and be accountable to the GA and will meet at least twice a year.

3.2.2 Project roles

The **Project coordinator (PC), Mr. Andrea Rossi,** from ATOS, leads all managerial tasks and acts as intermediary between the Consortium Partners and the Commission. Management tasks will focus on the following aspects: Facilitation and co-ordination of communication between all the participants; Ensuring that the results and appropriate documents are properly delivered ;Maintenance of library of documents produced; Identification and involvement of experts as required ; Audit and production of deliverables for the Commission ;Monitoring of the quality of work in the project and its rate of progress; Management of the funding devoted to the project; Periodic reporting to the Commission; Fulfils the co-ordination responsibilities of the contract with the European Commission; Early detection and mitigation of possible risks of the project in

order to minimise the impact of any problem that could arise; Management of the innovation and the quality assurance; Coordinates financial tasks; Chairing the General Assembly.

The Technical & ICT coordinator (TSC), Arne Berre from SINTEF, is responsible for the project's overall ICT vision and leader of the big data technical activities of the project and will be also responsible for defining and reviewing the ICT tools and platforms strategy for ELECTRA, checking the scientific and technical progress, agenda and chairing of technical meetings, monitoring progress of action items, Identifying trends and technologies which could be of interest to the project, generating a technical assessment of completed and ongoing activities, scientific and technical risk management and integration of technical activities within the project, supporting the use cases

Work package Leader (WPL). ELECTRA partners own a wide variety of relevant and sometimes exclusive knowledge, expertise and experience. To ensure the optimal use of this expertise and to maximise fertile interaction between partners, work is divided in work packages (WP) each of them under the responsibility of a WP leader. The work of WP leaders lasts as long as the WP is in progress. They are responsible for keeping the time schedule and the appropriate implementation related to their WP. It is also within their duties to make the necessary contacts with the TSC regarding any technical related issues, with leaders of other WPs, with the GA when their activities depend on, with the I&E board in relation to the managing of the innovation process, or with the rest of the partners involved in the day-to-day WP work.

3.2.3 Decision procedures and conflict resolution

In general, it is expected that the procedures derived from overall coordination tasks will be followed by the concerned WPs, and that primary mechanism for decision-making and resolving conflicting views throughout all groups within the project will be by consensus. In the exceptional circumstances when conflicts cannot be solved on WP level, the Project Coordinator may be called by the respective WP-Leader and asked to resolve the conflict. Partners will make efforts to ensure that no heavyweight overhead is generated. The goal is always to improve the overall functioning of the project and to improve the quality, consistency and impact of the project results. If the PC cannot resolve a conflict it will be brought forward to the General Assembly for a decision. The General Assembly will attempt to resolve the issue with the principles that will be outlined and agreed in the Consortium Agreement (CA). Any conflicts that cannot be resolved through those principles will be handled according to the dispute resolution provision set forth in the CA.

3.2.4 Communication flow and meetings

It is well known that systematic and timely implementation of information flow is central for any Consortium based project. Nevertheless, overflow of information should obviously also be avoided. The communication flow between ELECTRA members will be implemented by periodic face-to-face and virtual meetings of GA and I&E Boards; discretional working meetings at each WP, phone and e-mail interchanges (day to day cooperative working infrastructure).The following table lists the meetings scheduled along the duration of the project. The Consortium Plenary Meeting (CPM) will be held 3 times a year, the GA and the I&E Board twice a year, all scheduled in the same dates of the CPMs. At demand, WP meetings or National Pilots meetings can be held for a maximum of twice a year per justified requests of the responsible partners. The Annual Review meeting of the project, performed by external auditors – experts in the field – will take place on request of the European Commission. The EC together with the Project Coordinator determines date, agenda, duration and location. The ELECTRA Coordinator has the duty to communicate with the project partners on a systematic and frequent basis even if no problems are identified with all WP leaders during the lifecycle of their WP to assure the smooth flow of project's activities. The information within ELECTRA will be classified into three levels of communication (confidential, restricted, public) to guarantee the right compromise between dissemination and protection of knowledge, according to the EC rules and the agreements between the project partners. All ordinary messages related to a certain work package will be communicated among all partners involved in that Work package. Nevertheless, any special important issues or problems within the frame of a WP, are going to be forwarded to the WP leader (if the message is not initiated by him/her) and to the GA. As it has been described above the number of meetings should be minimised to a certain extent, but the interaction among partners which is brought up during these meetings is considered of crucial importance.

3.2.5 Statement of Quality & Evaluation Process

The Consortium recognises that a dedication to quality is vital to project's mission and essential for delivering consistent results. Therefore the Consortium agrees on developing a Statement of Quality with regards to its work. The ELECTRA Consortium agrees to the pursuit of excellence since the inception of the project. The Consortium recognises also that, in a diverse group, individual commitment needs to be guided and strengthened by a framework of policies and procedures. The purpose of such a framework is to agree on aims and objectives, to set out means for their attainment and to monitor and evaluate progress with a view to revision and further development. In order to achieve its mission, the consortium will establish quality assurance procedures. The work progress of the project will be constantly monitored and supervised by the GA according to the quality management requirement included in the Quality Assurance Plan that will be produced in month 3 (contained in deliverable Quality Plan) to guarantee a good development of the project. An internal peer review will be performed for each document

produced. Each WP leader will submit all the produced documents to an appropriate expert internal to another partner organization –not involved in the same WP – to check for the quality of the documents produced. Finally, as part of the evaluation process we will apply a list of milestones and a risk management approach assessing risk in technical, operational and human resources, the probability that they happens and the impact they will have in the project. Risk will be reported in the management quarterly reports as well as the actions to reduce the threats and to solve the situations when these threats materialize.

3.2.6 Project's Innovation management approach

ELECTRA will develop and maintain a framework for systematic innovation management in line with the European Technical Specification [31] (TS) for Innovation Management. Such innovation management approach includes activities that are required for generating innovations and is applicable to all public and private organisations regardless of sector, type or size. As the guiding principles of the TS establish, the project innovation management strategy follows a PDCA structure (Plan-Do-Check-Act). This facilitates its potential integration with other standardised business management systems existing in partner organisations. The key activities foreseen in this project, inspired by the TS, cover: **Understanding the context of the project -** This activity focuses on scanning and analysing information about the external environment related to the project to identify present and future challenges. **Leadership for innovation and strategy** - ELECTRA will develop a common vision of what the project is expected to achieve. It will also define the type of innovation sought for and the level of novelty (e.g. incremental, radical or disruptive). Responsibilities and authorities for the relevant roles will be assigned and communicated. This activity is also meant to foster a culture that supports innovation, such as communication and sharing, openness and collaboration, and failure tolerance. **Planning for innovation success** - Planning is based on the outputs of external and internal analyses carried out in the 'understanding of the context ', as well as the policies established in the strategy. This activity will determine the risks and opportunities in a way to ensure that the innovation achieves anticipated results and that undesired effects are prevented or reduced. **Innovation support** - The Innovation and Exploitation Board (I&E Board) will coordinate partners' effort dedicated to innovation management. In particular, it will ensure that appropriate communication mechanisms are in place to raise awareness internally regarding the project's innovation processes. Its role will also be to supervise the creation, sharing, update, storage and protection of documented information, providing evidence regarding the effectiveness of the innovation management approach. Refer to section 3.2.1 for complete I&E Board's responsibilities.

Innovation management process - This activity focuses on establishing check points (phase-gate / go-no go) to assess the progress of the project towards the development of exploitable results. It focuses on protection of the results, in accordance with the guidelines established in the previous activity 'Innovation Support'. Partners will make plans to ensure the availability of funding and organizational resources for market introduction of the project results and establish the mechanisms to find out their degree of acceptance in the market. **Assessment of the performance and improvement of the innovation approach** - This activity is dedicated to the monitoring, measuring, analysis and assessment of KPIs established for the previous activities, such as growth rate of profit, economic income, operating margin, market share, RoI, scientific impact, intangible assets generated (IP), impact on environmental or social sustainability. It will result in a set of lessons learnt that will be reverted to the EC and to the top management of partners involved.

3.2.7 Risk Management

ELECTRA will be based on innovative research and the demonstration and adaptation state of the art of Big Data technologies into the energy market domains; consequently a number of risks are involved in the project implementation. However, risks have been identified by the Consortium along with respective contingency plans, summarised in the following table. In addition, there will be a constant and iterative activity on identifying new risks and necessary mitigation strategies throughout the project, concluded and summarised in Task 1.2.

Description of risk	WP(s)	Proposed risk-mitigation measures
General/ Technical Risks		
Deviation between business advice and technical implementation	WP8	The participation of both profiles in the definition of the scenarios and the KPIs that will be later used for the assessment will help to keep aligned both interests. Despite the market dynamic and the business needs could change during project life the cycling structure of the project will be used to assure the progress of pilots combining technical progress and market demand.
Large Scale Pilot Implementation Risks		
Limited operational experience with Big Data in energy sector	WP4-7	Early prototyping, close interaction with end-users and use of experience from other sectors. Explore possibilities of combining data-driven methods with expert knowledge.
Poor reliability of smart meters PLC in certain areas may affect outcomes of big data analytics	WP5	Data is not lost because download cover all data since last communication but big data tools have to be designed to update all information and manage "data holes" during several days/weeks
Customers Privacy concerns to	WP5	To be able to demonstrate to the customers their own benefits in most of the use cases

allow data from smart meters used under big data framework		considered as well as well-defined rules for privacy and security of energy consumption data are implemented
ICT solution deployed don't achieved expected results	WP4-7	The methodology proposed in ELECTRA will ensure to reach optimal results due to the three cycles of iterations foreseen in the validation of ICT solution deployed in each domain..
The business fully adoption of BigData technologies outcomes due to cultural and traditional thinking	WP4	**The presence of business people** (Power Plant operators, Performance Optimization function peoples, Technical Support Experts) are actively involved into ELECTRA project providing their continuous feedback on tools and results effectiveness.
Demo tests cannot be set-up due to technical reasons and data availability	WP4	In case of demo site unavailability for technical reasons, the partners will select a new site with similar characteristics to perform tests and will provide similar data sets in terms of volume and quality.
Basically all houses are different and calls for tailored big data technologies	WP7	We will have a continuous dialog with the other WPs to gain knowledge from the rest of the consortium. Furthermore we will establish an advisory board consisting of companies and experts which are highly interested in ELECTRA and the subjects related to WP7, but which couldn't participate directly due to obvious limitations.
Residential customers acceptance of services based on individual smart metering data for privacy reasons.	WP6	Communication and explanation towards customers. Use of a "privacy by design" approach in applications, to protect personal data (access control, distributed computation).
Low accuracy of demand forecasts using smart metering and external data	WP6	Working with varying horizons and time steps, with adaptation of the targeted services.
Communication, Market Replicability & Exploitation Risks		
Lack of Market Replicability of the results achieved within the ELECTRA LSPs	WP9	Advisory board will be involved since the beginning of the pilots in a dynamic way to manage any divergence with energy market expectations. Recommendations will be delivered to ELECTRA pilots. In addition, coordination meetings will be organized at Big Data PPP level with other projects to anticipate Big Data solutions replicability
Lack of interest or active engagement on the ELECTRA project by external stakeholders	WP10	Additional clusters, associations and platforms will be contacted at European and national level of both Energy and Big Data domains such as the ones listed in section 2.2.. Moreover, especial attention will be paid to engage external stakeholders in the workshops organized in the locations of the pilots. If needed a dedicated communication campaign will be designed addressed to external stakeholders. Synergies with other related consortia will be exploited to attract stakeholders.
Lack of awareness for the project objectives & results to outside target audiences	WP10	The communication strategy will be revised periodically and adapted to increase the awareness. If needed, the updated strategy will reinforce and increase the dissemination, communication activities as well as dissemination events in the countries involved.
Management Risks		
Partner leaves Consortium/ Partner Underperforming	WP1	The coordinator will ensure control and management of the work in progress so that other partners can complete the work, until a new partner is found (in case that is considered necessary). If a partner is underperforming the GA will identify the issue, take the proportionate measures that will be agreed among the partners in the Consortium Agreement.
Key staff illness/leave during critical project phase	WP1	All partners have experienced staff that may replace and take over the work assigned to the leaving member, either temporarily or permanently. System of project representatives and deputies will be enforced in the Quality Plan.
Poor quality of deliverables and delay in meeting the deadlines	WP1-WP10	Proper internal peer review procedures and criteria will be in place in order to ensure the quality of the deliverables and their preparation in a timely manner.

3.3 Consortium as a whole

The ELECTRA consortium has clear European value and it is composed by **thirty (30) partners** from **six (6) European countries.** All partners have leading-edge scientific knowledge, industrial presence, business and capacity in the EU-28 territory and beyond. Along with this, the ELECTRA Consortium is coupled with innovation capabilities related to the projects' core objectives, which require a cross-border, and interdisciplinary approach in the domain themes of the project: Energy and Big Data technologies.

The ELECTRA partners also bring together a unique and balanced combination of both technical and business skills as well as the necessary expertise in order to form an effective consortium, bringing together **17 Large Companies** (6 from ICT, 8 from Energy, 1 from Real Estate, 1 Industry Manufacturer), **6 SMEs** (1 from Energy, 2 from ICT, 2 from Consulting, 1 Energy Cluster Association) and complemented by **7 Universities & Research Centres**. The complementarity of the consortium with respect to the technologies and piloting activities to be developed for the scope of the project is presented in the following section. The consortium will collaborate together in all phases foreseen in the workplan, as also described in the methodology described in Section 1.3.4, towards fulfilling the ambitions envisioned.

3.3.1 Description of the consortium

Figure shows the complementary skills of each partner and their synergies that will lead to the success of the ELECTRA project. Furthermore the picture clearly depicts the interdisciplinary nature of the ELECTRA consortium bringing together the supply side from the ICT-Big Data domain and the demand side from the energy domain. It involves partners that excel in different scientific, technological and business areas. The partners' expertise and their distinct roles in the project with respect to the ELECTRA objectives are thoroughly outlined here below.

Partner Main Business	Specialized Know- How / Role in the Project
ATOS - international digital service company	Strategic industrial partner that will lead the overall management of the project and the business assessment and evaluation of the Large Scale Pilots. Project Coordinator & Technological provider
GNF - Multinational energy services group.	GNF main asset is its extensive experience in design, engineering, construction and operation of all kinds of installations such as generation, transmission and distribution of electricity and natural gas in both the domestic and international areas.
GEN owns the third power generation fleet in Spain (18% coal, 18% hydro, 64% combined cycle)	From GEN's centralized monitoring centre (CESOM), all generation fleet of GNF is supervised. CESOM expertise in managing and analyzing huge amount of data for the improvement of power plant performance and condition will provide realistic data sets and a clear business approach
UFD - Distribution company developing, maintaining and operating HV/MV/LV facilities.	UFD will play a key role in the Distribution demonstrators. It has a large experience and extensive involvement in European projects in this field. As a member of EDSO for Smart Grids can support the replication of the solution among other DSOs.
EURECAT - Technology centre providing the industrial and business sector with differential technology	EURECAT multidisciplinary team will apply its R&D expertise in different aspects along de Big data value chain, Its role as the manager of the Big Data Centre of Excellence Barcelona will foster the dissemination of ELECTRA and facilitate dissemination for replicability other domains.
BSC - Spanish national supercomputing facility & a hosting member of the PRACE distributed supercomputing infrastructure	BSC contributes to Electra with contributions from two of its research departments: computer science and earth science. These two departments are key players in programming models for distributed computing, storage technologies and analytics; and in climate modelling and prediction. BSC will also act as link to Cloud and HPC infrastructures.
ZABALA - International consultancy firm specializing in comprehensive consultancy of R&D & Innovation	ZABALA, as lead the Secretariat of ETP Smart Grids since 2007 and lead of the management team of the EIP SCC, in addition to many other projects and to its own network, will lead community building activities contributing thus to the stakeholders engagement for increasing project impact.
CEA - Technological Research Division focuses on advanced manufacturing, embedded systems.	CEA will also develop recommendation algorithms. CEA expertise in signal processing, machine learning and rule-based expert systems will provide ELECTRA with invaluable top-level technologies.
EDF - is a world leader in the energy market, from generation to trading, network management & first EU producer of renewable energy	EDF provides several use cases to ELECTRA and develops associated demonstrators. The main use cases are related to the energy retail and services domain, to develop new big-data-based services to customers which take advantage of newly available data (smart metering data but also connected objects data and external data).
ORANGE - one of the world's leading telecommunications operators aiming at delivering Big Data services for its customers.	Orange multidisciplinary team will be involved in technical and pilots activities to deliver architecture for distributed Big Data close to Fog Computing, collecting data and managing real-time analytics. Orange will manage the use of anonymization technics to support useful cross-fertilization insights between several types of stakeholders. Orange will manage ELECTRA Business Exploitation task
Powel - Develops and provides software solutions and services to energy companies for operation, maintenance & decision support.	Provider of technology to be demonstrated. Involved in use cases in generation (WP4) and distribution (WP5). Focus on big data and energy domain knowhow in applications bringing value to the actual project stakeholders. Powel solution is replicable and will help to achieve ELECTRA objectives by being commercialized and promoted in an international market.

SINTEF ICT - is the largest unit within the SINTEF group, a private, independent, nonprofit research foundation.	SINTEF ICT is a technology partner with a responsibility for the overall Big Data architecture in the project. SINTEF supports the complete Big data value chain, from the big data architecture and platform, to data analytics and data management with a focus on handling variability through linked data and on data management for proactive sensing. ELECTRA Technical Coordinator
SINTEF Energi - Non-profit applied research & technology institute creating innovative energy services.	SINTEF Energy Research is a technology partner with long experience in analysing and deriving value from monitoring data in the power sector. SINTEF Energy's domain expertise and tools will contribute to the exploitation of Big Data and the achievement of technical ELECTRA objectives
NSGC - National technology platform for Smartgrids and a non-profit membership organization for the promotion of Smartgrids.	The Norwegian Smartgrid Centre (NSGC) is a national initiative within the European Smartgrid Technology Platform for smartgrids In Electra the NSGC will contribute to achieve goals for communication, standardization and regulation, and the impact of ELECTRA to a broader ecosystem of actors.
Computas – Provider of ICT solutions to the energy industries and the public sector, incl. services spanning the full solution life cycle.	Computas' main focus will be to architect, implement and evaluate several Big Data demonstrators in WP5 Energy Distribution, incl. demonstrators based on large smart meter data sets / data streams and advanced analytics (esp. machine learning) to radically improve performance and reduce cost of grid operations, maintenance and planning.
Hafslund - is the largest DSO in Norway and the fifth largest in the Nordic countries, serving approx 570K customers in 40 municipalities	Hafslund Nett (HN) has one of northern Europe's most advanced control centres for power grid operations and hydropower generation. Due to large investments in state of the art smart meter technology currently being installed for all customers and remote monitoring equipment in several thousand substations, HN will be able to provide unique data sets for use in this project.
DTU – one of the foremost technical universities in EU persistently increasing developing industry partnerships.	DTU's main focus is to facilitate the link between the big data technologies and the demonstrators in WP7. DTU will be involved in stochastic modelling, forecasting and control. A main responsibility will be to lead the demonstrators related to Energy Management, and try to ensure that the solutions established and demonstrated will have a large impact.
NYFORS - provides cheap energy and energy advice to about 45,000 customers and it is a Danish DSO.	Nyfors will provide data from smart meters to the "Big Data" setup for the energy management pilot. Nyfors will provide knowledge to the project in form of know how in energy efficiency of buildings and industrial building. Nyfors will be leading its use case Energy Efficient Homes and Building
ENFOR provides ICT solutions for the energy sector mostly for the renewable segment (solar, wind) and for district heating systems.	ENFOR provides software and solutions for wind power prediction, optimal operation of district heating systems, predictions of heat or power load, solar power forecasting, forecasting of energy prices. It plans to contribute in the project with NWP climate data, proto-type procedures, forecast systems, and handling of technical infrastructure for analytical and forecast procedures.
EIR - Research division that assures development and exploitation of the innovation opportunities for the Enel Global Generation business areas.	EIR will be mainly involved in the generation domain pilot and will contribute to demonstrate the applicability, effectiveness and business opportunities of big data analytics implementation in Fossil Fuel and Hydro Power Plants. EIR boasts a vast expertise in managing the engineering processes related to the development and coordination of research & innovation activities.
EGP- Construction & operation of renewable energy generation plants globally with a generation mix (wind, solar, hydro, geo, biomass)	EGP, as global renewable energy operator, will contribute to the generation domain pilot. EGP vast expertise in O&M, ICT, and Innovation will be involved in the project activities, making available their existing ICT assets, and will contribute to achievement and demonstration of pilots in the generation domain.
FBY - Innovative ICT systems for renewable energy management.	FBY will take part to the design & development of the use-cases dedicated to removable energy. FBY works on hydroelectric, photovoltaic and wind renewable power plants focusing its contributions in the methodological analysis for forecasting, assessing the health of renewable plants.
UNIBO - University whose main goals are scientific research, education and technology transfer	UNIBO has a strong experience in decision support systems, in prescriptive data analytics and in data management coming from the research activity performed in previously funded EU projects whose methodologies, results & tools can be successfully reused, further developed in ELECTRA.
SAP runs world-class software solutions solving complex problems to help invent, commercialize, products and services	SAP is a major software vendor in the utilities area. SAP has a strong digital strategy in the Energy and Natural Resources domain. We have gathered knowledge from many big data projects and we'll provide our experience in the digital industry trends. SAP will provide utilities expertise and big data technologies to support the generation domain.
Tecnalia - Applied research centre specialised in data modelling and analytics for energy	TECNALIA will apply mature developments on big data & smart-analytics technologies in the use cases of WP4-6 and will collaborate actively in the WP3 Big Data solutions' adaptation (tasks T3.1 Big Data Applications and T3.3 Big Data Analytics)
RICOH - Global technology company specialized in IT services, office imaging equipment.	RICOH is a multicultural industrial partner that will contribute to the improvement of the office devices and services by application of Big Data technologies. As being worldwide leader in Managed Print and Content Services, RICOH will lead the energy efficient workplaces use case.
NOVASOL is a pan European holiday cottage rental with 40.000 ++ units in 29 countries	Provide large scale units to carry out pilot field test for energy management by installing low voltage equipment such as home automation equipment which will be online controllable in order to incorporate in demand response predicable system.

SDG Group - a global management consulting firm, with practices of Business Analytics & Corporate Performance Management.	SDG will contribute to the project working mainly on Predictive & Prescriptive issues and on Visual & Discovery Analytic topics that will be addressed and developed into the project. SDG will realize a predictive & prescriptive early alert solution fed by live streaming data related to a significant power generation plant component
Youris - is an independent non-profit communication agency supporting public communication.	Youris.com will be in charge of the dissemination strategy/plan and execution of it via the dissemination and communication activities outlined in section 2.2. It will be as well responsible for the web & social media presence of the project
CEPRI - multi-discipline research institute directly affiliated to the State Grid Corporation of China	CEPRI participates in ELECTRA with two demonstrators in WP6 in collaboration with EDF and will disseminate the results of ELECTRA projects outside the EU-28 boundaries, therefore enlarging the stakeholders' eco-system.

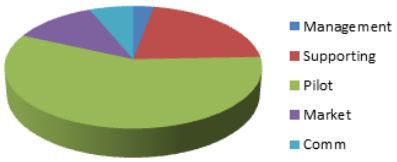
3.3.1 Description of the industrial /commercial involvement

Given the shape of the ELECTRA consortium, largely industrial, the partners' commercial involvement in the project can be considered more than relevant. All the industrial partners (21 out 30) are committed to the project with distinct roles and clear exploitation potential and business plans, mostly aligning with the overall ELECTRA objective of transforming digitally their industrial domain through the exploitation of big data solutions. The partners' expertise and their distinct roles in the project with respect to the ELECTRA objectives are thoroughly outlined in the table above and the commercial interests and exploitation plans of the industrial partners are outlined in section 2.

3.3.2 Other countries

CEPRI is a comprehensive and multi-discipline research institute directly affiliated to the State Grid Corporation of China (SGCC); CEPRI participates in ELECTRA with 2 demonstrators in WP6 in collaboration with EDF and its budget will be funded by the Chinese Innovation Authorities

3.3 Resources to be committed



ELECTRA has achieved a well-balanced distribution of resources – both in terms of costs and person-months over the five major project tasks as defined in section 1.3. 4. As presented in the figure the resources allocated for the different tasks are in line with the needs of Large Scale Pilot project. The core group of activities belong to the pilot themselves, and as can be seen in the resource table, the amount of resources for each of the domains addressed is in line with the number of demonstrators that are going to be developed. For this reason WP4 allocated effort is higher than the other pilots and other WPs.

Additionally, ELECTRA as innovation action requires some effort for the customization of the ICT tools (WP3) and also for the proper definition of the scenarios that are going to be deployed in the different demonstrators representing the second larger amount of resources of the whole project. The participation of business profiles in ELECTRA is a key success factor for the project, we have defined a full WP for their actuation & pilot's assessment so as to assure a safe and sound integration of ELECTRA solutions into the business lines of the different companies that compose the consortium. Another main objective of the project is to increase the awareness of Big Data potential by demonstrating though the Large Scale Pilots its impact in the Energy domain, its potential replicability by other energy stakeholders and also by other vertical domains. In order to achieve this objective, we have defined a clear market replicability (WP9) and communication strategy (WP10) allocating the resources to cover the different stakeholder groups that are target as presented in section 2..2 Finally, the experience of Atos as coordinator of research projects and the different WPL has identified to define the amount of resources required for assuring a proper development of all the managerial tasks. Overall, ELECTRA LSPs will deliver a total of 29 demonstrators covering 16 use cases over the four energy domains identified. This effort has been adequately matched in terms of resources: the overall budget sums 20.599.010€ for a EC Contribution equal to 15.562.911€ (76% of the total budget);

Table 3.4a: Summary of staff effort

Participant nº/ Short Name		WP1	WP2	WP3	WP4	WP5	WP6	WP7	WP8	WP9	WP10	Total PM
1	ATOS	45	6	16	0	38	0	0	30	16	4	155
2	GNF	2	6	0	13	22	36	0	3	9	5	96
3	GNF Gen	0	6	0	74	0	0	0	8	7	9	104
4	UFD	0	6	0	0	74	0	0	8	7	9	104
5	EURECAT	0	4	20	7	24	13	4	0	10	4	86
6	BSC-CNC	0	2	32	16	13	0	3	0	0	2	68
7	ZABALA	0	0	0	0	0	0	0	0	2	21	23
8	CEA	0	2	13	0	6	28	0	0	0	2	51
9	EDF	2	4	0	21	0	106	0	2	2	3	140
10	ORANGE	2	2	17	0	0	28	0	0	20	2	71
11	Powel	0	4	16	0	48	0	0	0	0	1	69
12	SINTEF ICT	2	2	23	0	8	7	0	0	3	3	48
13	SINTEF Energi	0	3	5	2	14	8	0	4	0	3	39
14	TNSGC	0	0	0	0	0	0	0	0	4	9	13
15	Computas	0	5	12	0	28	0	0	0	1	1	47
16	Hafslund	2	13	0	0	42	8	0	3	0	1	69
17	DTU	0	2	4	2	0	0	40	0	0	2	50
18	NYFORS	2	0	0	0	0	0	50	0	0	1	53
19	ENFOR	0	0	3	0	0	0	36	0	0	1	40
20	EIR	2	3	0	108	0	0	0	4	3	3	123
21	EGP	0	2	0	129	0	0	0	4	11	2	148
22	Flyby	0	7	22	49	0	0	0	7	4	3	92
23	UNIBO	0	2	27	29	0	0	0	4	0	2	64
24	SAP	2	6	44	33	0	0	0	0	4	11	100
25	Tecnalia	0	2	17	8	31	18	0	4	2	4	86
26	RICOH	0	7	0	0	0	0	61	8	8	5	89
27	NOVASOL	0	0	0	0	0	0	27	0	0	1	28
28	SDG Group	0	0	15	5	0	0	0	0	0	1	21
29	Youris	0	0	0	0	0	0	0	0	0	13	13
30	CEPRI	0	0	0	0	0	72	0	0	0	4	76
	TOTAL	61	96	286	496	348	324	221	89	113	132	2166

73% of the total budget correspond to direct costs of personnel (14.950.135€), 20% to indirect costs (4.061.103€), 8% to other direct costs (1.294.272€) and 2% to subcontracting costs (293.500€).

3.4.1 Other direct cost

A closer look at the direct costs: Travel Costs (2.51% in respect to the total budget, 45.26% of overall direct) comprehend project meetings; perform dissemination and exploitation activities and attending meetings with the European Community. Equipment and consumables costs (2.67% in respect to the total budget, 46.54% of other direct) include the costs for mainly hardware infrastructures & services in WP3-WP7 and the demonstrations in WP4-WP7. Costs of audits sums up 83.950€ (1% of the overall direct costs). Subcontracting costs are claimed by GNF, GEN, UFD, EDF and EGP, all utilities, for services outside their internal knowledge and expertise. Third parties companies are used by ATOS, GNF, UFD, BSC, EIR, EGP, FBY. Details of their assigned tasks and descriptions of the third parties is provided in section 4.2. Table 3.4b below shows the justification of the only two partners that are over the 15% ration of other direct costs/personnel costs (EGF/NOVASOL).

Table 3.4b: 'Other direct cost' items

21/EGP	**Cost (€)**	**Justification**
Travel	20500	Travels and accommodation costs for participation to 9 general assemblies, 6 demo meetings, and 4 other WP meetings or Cross WP or Dissemination
Equipment	236889	Mortgage quotes for yearly software licences renovation during the project: licences are related to the existing EGP big data architecture which will be used during EGP demonstrators experimental operation. Licences include: SAS Big Analytics for Big Data, SAS HP Analytics Econometrics, SAS HP Analytics Statistics, Sas for Facility Analytics; mortgage is calculated taking into account a depreciation period of 36 months, a usage of 26 months inside the project and a 20% of allocation to the project.
Total	257389	
27/NOVASOL	**Cost (€)**	**Justification**
Travel	17000	Travels and accommodation costs for participation to 9 general assemblies, 6 demo meetings, and 4 other WP meetings or Cross WP or Dissemination
Equipment	58667	Electric Car charger 5 units; Heatpump control (10 units);Gateway & GPRS (30 units) ;Sensors (heat, Co2, humidity, motion) (30 units) ;Solar panel control (5 units) - requires houses with existing panels not new purchase
Total	75.667	

Proposal Technical Annex, Sections 4-5

Table of Contents

SECTION 4

4.1 Participants (Applicants)

4.1.1 Atos Spain

Partner Full name		**ATOS SPAIN S.A.**			
Partner nº	1	**Short name**	ATOS	**Country**	Spain

Organisation profile:

Atos SE (Societas Europaea) is a leader in digital services with 2014 pro forma annual revenue of circa € 11 billion and 93,000 employees in 72 countries. Serving a global client base, the Group provides Consulting & Systems Integration services, Managed Services & BPO, Cloud operations, Big Data & Cyber-security solutions, as well as transactional services through Worldline, the European leader in the payments and transactional services industry. With its deep technology expertise and industry knowledge, the Group works with clients across different business sectors: Defense, Financial Services, Health, Manufacturing, Media, Utilities, Public sector, Retail, Telecommunications, and Transportation. Atos is focused on business technology that powers progress and helps organizations to create their firm of the future. The Group is the Worldwide Information Technology Partner for the Olympic & Paralympic Games and is listed on the Euronext Paris market. Atos operates under the brands Atos, Atos Consulting, Atos Worldgrid, Bull, Canopy, Unify and Worldline. For more information, visit: www.atos.net

Atos Research & Innovation (ARI) is the R&D hub for emerging technologies and a key reference for the whole Atos group. With almost 30 years of experience in running Research, Development and Innovation projects, we have become a well-known player in the EU context. Our multidisciplinary and multicultural team has the skills to cover all the activities needed to run projects successfully, from scientific leadership to partnership coordination, from development of emerging technologies to the exploitation of project outcomes, with a strong focus on dissemination, innovation adoption and commercialization.

Atos is a founding member of the European Technology Platform NESSI (Networked European Software and Services Initiative). Our company is a major partner in Future Internet-related initiatives being member of the FI PPP Steering Board and Industrial Advisory Board. Since 2014, Atos is a founding member of the Big Data Value Association (BDVA), assuming the roles of Vice-presidency and Deputy Secretary-general. We are also member of the 5G PPP Steering Board. Additionally, Atos is a member of NetWorld2020, NEM, Nanomedicine, ERTICO, CELTIC, NIS, EOS, LSEC, ETSI, OW2, OASIS, Cloud Security Alliance, Eurocities, etc. Finally Atos is a core member of the KIC EIT HEALTH and an official member of the KIC EIT DIGITAL associated node Madrid. At national level, Atos is currently holding the Presidency and Secretary of PLANETIC for ICT, as well as the Vice-presidency of es.Internet for Future Internet technologies, and is member of several others, such as PESI, Logistop, eVIA for Health and Independent Living, NanoMed or the Spanish Railways Technology Platforms (PTFE).

Core List of publications and projects:

List of up to five (5) publications

Florent Leménager, Céline Joannic (EDF R&D), Raul Soriano (ITE), Raul Bachiller Prieto (Iberdrola) Marta Alberto Monferrer (ATOS), Nicolas Espejo Portero (Nucleo), Ralf Mosshammer (SIEMENS) “Assessment and outlook of the

OpenNode smart grid architecture", CIRED, Stockholm, June 2013

Martin-de-Vidales-Ramirez Maria, Martin Wagner Neumann, Rolando Palma Zelada, (ATOS), eDASH e-Mobility Broker, EV27, Barcelona, November 2013

List of up to five (5) products/services

OpenNode Middleware, Technology Asset & Know-how of ATOS Research & Innovation (Wagner; Palma)

OpenNode Virtual Secondary Substation Node, Technology Asset & Know-how of ATOS Research & Innovation (Wagner; Palma)

List of up to five (5) relevant previous projects or activities

JOSPEL (Low energy passenger comfort systems based on the joule and peltier effects)

The aim of JOSPEL project is the development of a novel energy efficient climate system for the optimization of interior temperature control management in electrical vehicles through an integrated approach that combines the application of the thermoelectric Joule and Peltier effect, the development of an efficient insulation of the vehicle interior, the energy recovery from heat zones, battery life increase duration enhancement as a side effect of thermal management, battery consumption reduction by Peltier cooling integration, innovative automated and eco-driving strategies and the electronic control of power flows. Main objective is the reduction of at least 50% of energy used for passenger comfort (<1,250 W) and at least 30% for component cooling in extreme conditions with reference to electric vehicles currently on the market. http://jospel-project.eu/

e-DASH (Electricity Demand and Supply Harmonizing for EVs)

Harmonization of electricity demand in Smart Grids for sustainable integration of electric vehicles. This is addressed by an intelligent charging system supported with near real-time exchange of charge related data between EVs and the grid. e-DASH aims at the harmonization of electricity demand in Smart Grids for sustainable integration of electric vehicles. This is addressed by an intelligent charging system supported with near real-time exchange of charge related data between EVs and the grid. http://edash.eu

OPENNODE (Open Architecture for Secondary Nodes of the Electricity SmartGrid)

OpenNode focuses on the research and development of an open Secondary Substation Node (SSN), which is seen as an essential control component of the future smart distribution grid, a middleware to couple the SSN operation with the utility systems for grid and utility operation and a modular communication architecture based on standardized communication protocols. ATOS' final results of Open Node include prototypes of the Middleware and the Virtual SSN developed with the collaboration of Atos Word Grid. Both are available for demonstration and are the basis to be used as baseline TRL 5-6 for new developments and deployments. http://opennode.atosresearch.eu

SOMABAT (SOlid Material for High Power Li Polymer BATteries)

Development of an environmentally friendly, safe and performing high power lithium polymer battery technology specifically targeted for electric vehicles. The SOMABAT project aims to develop a more environmentally friendly, safer and better performing high power lithium polymer battery technology specifically targeted for electric vehicles. The focus is on novel breakthrough recyclable solid materials to be used as anode, cathode and polymer electrolyte. The latest alternatives for recycling the different components and a complete life cycle analysis of the battery will also be focused on during this project. http://somabat1.ite.es

Key personnel:

C1	**Andrea Rossi (**male**)** holds a degree in Economics and a Master in Business Administration both from the

	University of Bologna. He started his professional career in 2001 as E-Business Coordinator in the pharma industry in Eli Lilly Italy and then as Product Manager in Eli Lilly UK. In 2005, he became Marketing Manager for Avent-Philips in London. Since September 2007 he has joined the Atos Research and Innovation in Madrid where is currently working as Head of Energy & Transport Market managing a large research team. In the past 5 years, he has acquired strong R&D experience in managing European FP7 projects focusing mainly on Innovation Management, Smart Cities and Smart Grid (OPEN CITIES, QUALIPSO, BIVEE, FI-WARE, e-DASH, SAGA). He has been Exploitation Manager for QUALIPSO IP, OPEN CITIES. He's currently Project Coordinator of COSMOS (iot-cosmos.eu), and SAGA (KIC-INNOENERGY project).
C2	**Martin Wagner (**male**)** holds two Engineering degrees, one in Mechanical Engineering from the Simón Bolivar University and the other one in System Engendering from the Universidad Nacional Abierta, both in Venezuela. He is currently a Senior Consultant at Atos Research & Innovation focused on utility services (energy, water, gas, etc.) for development of smart cities, and worked as Project Manager on energy related projects like OpenNode, FINSENY, e-Dash. He´s 35 years of experience working with Business Processes, Data Management (including Data Warehousing and Business Intelligence), and Best Practices defined by ITIL and COBIT for organizations in Spain, Portugal, USA and Latin-American. He worked with customers from market segments like banks, insurance, telecommunication, industry and public administrations.
C3	**Maria Guadalupe Rodríguez Díaz (**female**)** has a degree in Mathematics from the Universidad Complutense de Madrid (UCM), has studied Technical Engineer Surveying in the Polytechnic University of Madrid (UPM) and holds the Diploma of Advanced Studies (DEA) in the area of Geodesy, Cartography and Photogrammetry, University of Alcala (UAH) where she also perform her doctoral thesis. She is currently working in ARI, Research and Innovation in Atos group, where she has participated and coordinated in a number of projects including MUGAGABE, ADIENC, EO2Heaven, Web n+1, Scalearn, Ciudad2020, RepAIR, P-SOCRATES and UNCAP. In addition she combines this activity with the position of associate professor at UAH related with area of Geodesy and Cartography, being also involved in research projects. She is a member of the SECFT, Spanish brand of the International Cartographic Association (ICA) and has been a speaker at various national and international congresses taking several publications in prestigious journals.
C4	**Juan Rico (**male**)** received a degree in Telecommunications Engineering in 2006 and a Master degree in Information Technology and Communication in Mobile Networks in 2009 from the University of Cantabria Spain. He is currently working in ARI, Research and Innovation in Atos. Previously, he worked as Senior Researcher at TST and University of Cantabria leading and participating European project and city scale pilots in FP6 and FP7 programs (BUTLER, EXALTED, COSMOS, CLIPS), ENIAC and Celtic PLUS (TILAS, TOISE) programs. In 2012 as technical manager of SICRA project was awarded by ESA (European Space Agency) in the Galileo Master Contest. He also acts as expert for French ANR (Agencie National Recherche) reviewing and evaluating R&D proposals. He is co-author of several magazine papers, book chapters and conference papers, and has participated in panels and round tables discussing about innovation supported by IoT in Smart cities.

Role in the proposal:

ATOS will be in charge of the Project Coordination (WP1) and Leader of WP8 (LSP Business Evaluation and Assessment). ATOS will be as well in charge of T9.4 making sure the project will have continuous feedback from the outside through the External Advisory Board and, at the same time, involving the organizations engaged into the Stakeholder Eco-system are exposed to the ELECTRA project results, taking advantage of them and possibly replicate them in their own energy domain or other industrial vertical market of relevance. Besides covering the roles of Project Coordinator and WP Leader, ATOS will be as well Quality Manager of the project.

4.1.2 GAS NATURAL FENOSA

Partner Full name		GAS NATURAL FENOSA SDG, S.A			
Partner nº	2	**Short name**	**GNF**	**Country**	**Spain**

Partner entity description and relevance:

Gas Natural Fenosa Group is **a multinational energy services group whose activities include generation, supplying, distributing, commercialization of natural gas and electricity business**. Gas Natural Fenosa (GNF) is a leading multi-national in the gas and power sectors operating i**n 25 countries. It offers service to more than 20 million customers** on the five continents, and almost 50% of its EBITDA and employees are associated to activities outside Spain. Its international presence puts it in an ideal position to be able to capitalise on the growth of new regions which are in the process of economic growth, making it one of the world's most important operators.

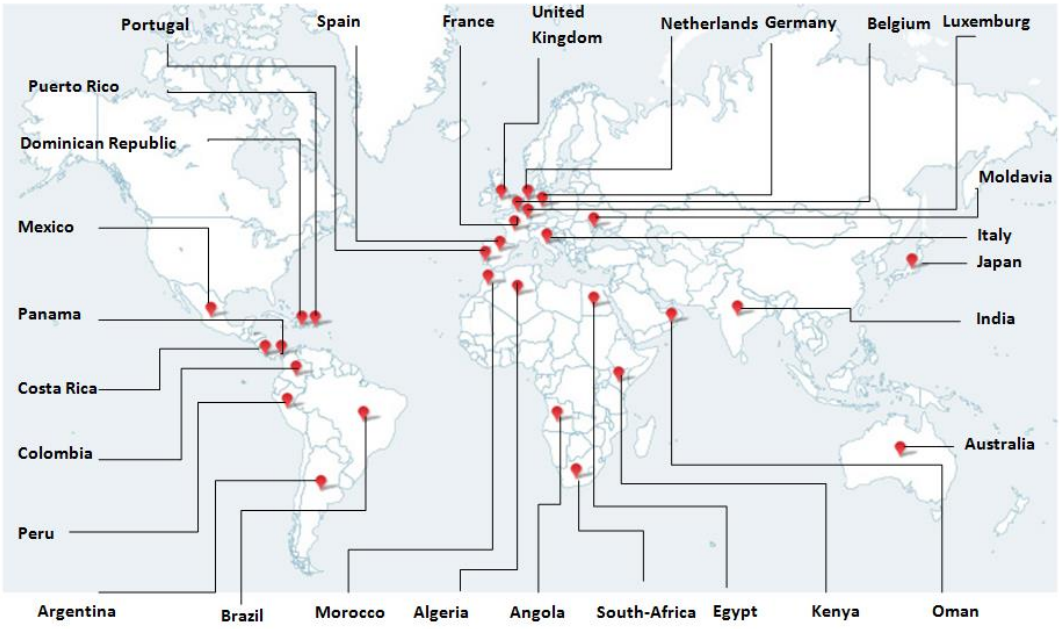


FIGURE XX – GNF INTERNATIONAL PRESENCE.

Following the acquisition of Unión Fenosa, Spain's third biggest power company, GNF has achieved its objective of integrating its gas and electricity businesses in a single company, capable of competing efficiently in energy markets subject to a process of increasing integration, globalisation and levels of competition. **It is the largest integrated gas and power company in Spain and Latin America, leading the natural gas sales market in the Iberian Peninsula**, and is the world's third largest liquid natural gas (LNG) operator, with a fleet of 13 methane carriers.

Its main asset is its extensive experience in design, engineering, construction and operation of all kinds of installations such as generation, transmission and distribution of electricity and natural gas in both the domestic and international areas. In the last years GNF has been very active in Smart Grid,Smart City AND Internet of Things initiatives, leading massive deployment of electricity smart meter in Spain and gas smart meters in Italy and promoting different European projects as ENSO, GROWSMARTER,IGREENGRID, DISCERN, ME3GAS, 3EHOUSES or DC4CITIES.

Gas Natural SDG is the mother company of the group Gas Natural Fenosa but the organization is focused on Business Areas covering different activities along energy value chain from a multiutility perspective and working as independent companies. Leadership and coordination of our participation as GNF Group In ELECTRA project will be taken within this mother company or corporative area where Technology Division, Information System Division and Business Transformation Division are integrated. These three Divisions
always work closely to the the business areas of the group, sharing the leadership of activities of this type projects as is the case of pilot activities always under the responsibility of companies as Gas Natural Fenosa Generacion, Union Fenosa Distribucion, Gas Natural Servicios or Gas Natural Informática who will be involved directly as partners or affiliated third parties .
www.gasnaturalfenosa.com

Infrastructure and equipment:

- The company distributes electricity in Spain, Moldova and Latin America. In Spain Unión Fenosa Distribución is the third largest operator with nearly 4 million customers, while integrating Latin America distribution in several countries as Colombia and Panama we reach 10.4 million supply points and 228,808 Km of electricity network .
- Concerning gas distribution in Europe and Latin America, GNF provides 12.9 million supply points with a 135,113 km-wide network. The company is a leader in Spain, where it distributes natural gas to over 1,000 municipalities in nine regions and has over 5.1 million customers, and it has a solid presence in Italy, distributing to 225 municipalities and 0.5 million customers. In Latin America, it is the leading distribution company, where it distributes to over 6.3 million of customers. Its core markets are Mexico, Colombia, Brazil and Argentina. It operates in six of the ten most important cities in Latin America.

Core List of publications and projects:

List of up to five (5) products/services

List of up to five (5) relevant previous projects or activities

EnSO – Energy for Smart Objects

EnSO will bring to market innovative Autonomous Micro Energy Sources (AMES) that allows definitive differentiation to the autonomous smart systems of the targeted applications. EnSO AMES generic building block technologies will be customizable. As large volume market segments are targeted, EnSO manufacturing challenges will develop high throughput processes that will be versatile enough to produce at the targeted competitive cost customized AMES.
The EnSO ecosystem will involve all the value chain from key materials and tools needed to reach expected cost and sufficient volume capabilities, to several demonstrators in different field of application (H2020-ECSEL JU-Call 2015)

GROWSMARTER - Transforming cities for a smart, sustainable Europe

It is one of biggest Smart City lighthouse projects in the framework of H2020, demonstrating at Stockholm, Koln and Barcelona, 12 smart integrated solutions as a way of preparing for a wider market rollout. These solutions are integrated in specially chosen sites making demonstration easy to reach and take part of for the 5 follower cities and other European and international study groups (H2020-SCC-2014)
http://www.grow-smarter.eu/

IGREENGRID - IntegratinG Renewables in the EuropEaN electricity Grid

IGREENGrid (IntegratinG Renewables in the EuropEaN Electricity Grid) project focuses on increasing the hosting capacity for Distributed Renewable Energy Sources (DRES) in power distribution grids without compromising the reliability or jeopardizing the quality of supply. The core of IGREENGrid is to share knowledge and promote the best practices identifying potential solutions for the effective integration of DRES in the six existing Demo Projects in LV and MV grids participating to the project and validating them via simulation in other environments to assess the scalability and replicability at EU level. (FP7-ENERGY 2013-2016)
http://www.igreengrid-fp7.eu/overview

DISCERN - Distributed Intelligence for Cost-Effective and Reliable Dis-tribution Network Operation

The target of DISCERN is to assess the optimal level of intelligence in the distribution networks and to determine the replicable technological options that will allow a cost-effective and reliable enhancement of observability and

controllability of the future distribution networks in Europe. (FP7-ENERGY 2013-2016)
http://www.discern.eu/

ME3GAS - Smart Gas Meter& Middleware for Energy Efficient Embedded Services

ME³GAS project addresses the development of a new generation of smart gas meters, based on embedded electronics, communications and remote management as well as to put consumers in control of their energy efficiency and appliances at home as a result of that European Directives is imposing information on energy consumption as a clear measure for energy-saving usage without compromising comfort or convenience. ME3GAS makes use of the service-oriented middleware for embedded systems being developed in previous projects taking advantage of its huge potential to create services and applications across heterogeneous devices to develop an energy-aware middleware platform.(ARTEMIS JU-Call 2010)
http://www.me3gas.eu/

3 E Houses- Saving Energy and the Environment Across Europe

3e-HOUSES project deals with the integration of the most established ICT technologies in social housing in order to provide an innovative service for energy efficiency through real time monitoring of the energy consumption, Integration of renewable energies and creating the resources to lower energy consumption. The results achieved in the social houses in UK, Germany and Spain will be used as input in this new project. (ICT PSP)
http://www.3ehouses.eu/

DC4CITIES - Environmentally sustainable data centres for Smart Cities

This FP7 project has as main objective to
increase the energy efficiency of data centres increasing their flexibility by energy consumption shifting taking into account the availability of Renewable Energies. (FP7-SMARTCITIES-2013 ICT)
http://www.dc4cities.eu/en/

Infrastructure and equipment:

The Smart Energy application's pilot will be deployed in electricity infrastructure in Spain. GNF is the third-largest gas and electricity distribution company in Spain, with more than .9 million connection points for DSO operations.

Relevant publications products and services:

The company distributes electricity in Spain, Moldova and Latin America. Electricity distribution in Europe is centered in Spain and Moldavia: They are the third largest Spanish operator with nearly 4 million customers, while in Moldavia we supply more than 840,000 customers. Moreover, in Latin America, they provide services to more than 2.9 million customers in Colombia and Panama.

Collaborator profiles	
C1	**Ramón Jané (male).** Telecommunication Engineering Degree and Phd studies by the Polytechnic University of Catalonia. Over 25 years experience in the energy industry and R&D activities after previous background in optical devices for communications and bio-medical instrumentation, since he joined Catalana de Gas in 1988. Later in the company Gas Natural, he has had various roles as responsible of technology departments and the project management of development activities in the field of ICT to be implemented in different business areas and more recently in smart metering and smart communities initiatives. He has relevant experience in the coordination and leadership of European projects for more than 15 years in the framework of energy, microelectronics and ICT Programs as well as member of different standardization committees, working groups and advisory boards.
C2	**Manuel Calvo (male).** Degree in Mining Engineering from the Polytechnic University of Madrid and has completed several post-degree courses in the areas of the energy and management. He has worked for the company for 20 years, fulfilling different technical responsibilities in the Technology and Engineering Division. His position now as is the current Engineering and Technology Innovation Director off Projects in the area of electricity and gas networks working together and providing support to Distribution Business Division is fundamental for transforming processes and integrating new solutions in a field of activity in GNF Group that represents about 50% of our EBITDA all over the world.

C3	**Jordi Esparbé Mainar (male).** Systems Engineering degree at Universidad Ramon Llull (La Salle) and Program Management IESE-GNF. Currently working as Technology and Innovation Manager for Gas Natural Fenosa since 2014 and Business Partner System of Deregulated Market for Gas Natural Fenosa from 2001 to 2013. High skills in Team natural leader, resource management, deeply engaged in innovative projects, process management, and high IT strategy vision
C4	**Alberto Amargós (male).** Telecommunications engineering Degree at UPC University, Barcelona (Spain) and in possession of the Project Manager Professional certification given by the Project Manager Institute. Working in big consultancy firms since 1998 (PriceWaterhouseCoopers and IBM), later in the water sector - since 2008 in Agbar Group – Suez Environement as the Smart Metering IT responsible and since 2015 in Gas Natural Fenosa as Head of Internal Consulting Area doing consulting support for all business areas in Gas Natural and responsible for special strategic projects.
C5	**Carlos Ondaro (m).** Mining Engineer working at Gas Natural Informática with more than 20 years experience managing projects on software development and integration for the energy field. Since 2014, he is providing support to Generation, Renewable Energy and Energy planning Units in the GNF Group. He has a wide experience in software management for power generation and energy market.
C6	**Jordi Valentines (m).** Industrial Engineer with a degree on business sciences. He has more than 15 years' experience managing projects on software development and integration for the energy field. Since 2005 he is at Gas Natural Informática providing support to the Regulated Business Unit of GNF; now as head of Business Partne Group of the distribution domain.
C7	**Javier Casanova (m).** Telecommunications engineer. He has more than 20 year experience in software development and its application to the energy domain. His position at Gas Natural Informática as Business Partner of Commercialization and Retail Division involve direct responsibility over evolution and transformation of ICT platforms associated to the activities for residential and commercial customers.

4.1.3 Gas Natural FENOSA Generacion

Partner Full name		GAS NATURAL FENOSA GENERACIÓN, S.L.			
Partner nº	3	**Short name**	GEN	**Country**	**Spain**

Partner entity description and relevance:

Gas Natural Fenosa Generación, S.L.U, is a power generation company of the Gas Natural Fenosa Group, dedicated to maintain and operate hydro, combined cycle and coal fired boiler power plants in order to deliver electric energy and ancillary services to Iberian Electricity Market. It is the third biggest generation company in Spain, with 2 GW in hydro, 2 GW in coal and +7GW in cc power plants. Furthermore, provide quality, environmental and safety assurance, operational and maintenance on field supervision, best practices procedures, and monitoring & supervision services, to all the generation companies of Gas Natural Fenosa Group, both nationally and internationally, accounting for more than 15 GW installed capacity (conventional and renewables technologies) in 9 countries.

Infrastructure and equipment:

Gas Natural Fenosa Generation power plants have the infrastructure needed for the gathering on-line operative data (around 100k signals will be available for ELECTRA project). From the other side, CESOM department is equipped with hardware, software and skilled people for the manipulation and analysis of data in terms of performance, condition and vibration monitoring.

Core List of publications and projects:

List of up to five (5) products/services

GNFG services focus in maintaining and operating hydro, combined cycle and coal fired boiler power plants in order to deliver electric energy and ancillary services to Iberian Electricity Market.

List of up to five (5) relevant previous projects or activities

LOW HYDRO: Low head and multipurpose approach for minihydropower generation using novel compact turbines.

The LOW-HYDRO project aims to **develop new cost-effective technological solutions for high efficiency hydropower generation capable of tapping the potential of low head applications (<15m)**. Many small hydropower projects are never realized as the development costs or investment becomes too large. A significant part of the cost is the civil works for the hydropower plant construction (dam, penstock, power house, etc.), including any infrastructure development required to access the site and the other major cost is related to electro-mechanical equipment; different studies in Norway and Spain have shown that electromechanical equipment counts for around 40% of total investment. In this way novel turbine design and new engineering solutions will contribute significantly to installation simplification and LCOE reduction.

Furthermore our multipurpose approach will also contribute to climate change mitigation and security of energy supply, as well as to keep EU in a leading position in the field of hydropower.
http://www.eurogia.com/projects/eurogia2020-projects/105-low-hydro-.html

Infrastructure and equipment:

Gas Natural Fenosa Generation power plants have the infrastructure needed for the gathering on-line operative data (around 100k signals will be available for ELECTRA project). From the other side, CESOM department is equipped with hardware, software and skilled people for the manipulation and analysis of data in terms of performance, condition and vibration monitoring.

Collaborator profiles	
C1	**Alberto Martínez** (male). Industrial Engineering Degree by the University of Oviedo. Since 1990 working in the power generation sector. Experienced as mechanical maintenance manager at coal power plant, later in the start-up of the Spanish Electricity Market as trader at bidding bureau. In 1999 assumed the responsibility of plant manager during the commissioning and early years of commercial operation at combined cycle power plants, first in Mexico and later in Spain. After the process of merge between Gas Natural and Union Fenosa in 2009, coordination of activities related with the unification of process and procedures in generation area. Since 2015, responsible of CESOM department.
C2	**Rubén Hernández Panadero (male).** Computer Science Engineering Degree by the Carlos III University of Madrid and Master's degree in Energy Business. Working since 2001 in energy sector, with 6 years of experience in Wholesale Electricity Markets with responsibilities related to analysis, reporting and data management. Working in the power generation department since the merge between Gas Natural and Union Fenosa in 2009, assuming functions in a cross-functional team with responsibilities in the study of O&M power plants parameters and dispatching requirements according to optimize portfolio, knowledge management, optimization of processes. Currently is the responsible of implementation of supervision and monitoring tools at power units, and development of new ones, at CESOM department.
C3	**Santiago Vázquez Galatas** (male).*Mining Engineering Degree* by the Technical University of Madrid. Working since 2005 in energy sector. First as project engineering with pre-feasibility and feasibility studies related to renewable energy developments. Later, took the roll as operation manager assistant at coal power plant. In 2009 assumed new roll as technical assistance and detailed engineering in hydraulic and combined cycle power plants. In 2013 joined CESOM department, assuming functions related to monitoring condition, performance and vibrations analysis. Nowadays works in the team in charge of implementation of supervision and monitoring tools at power units, and development of new ones, at CESOM department
C4	**Miguel Ángel Campo Ara** (male).*Industrial Engineering Degree* by the University of Zaragoza. Since 1996 working in the power generation sector. Experienced first as project engineer, later on as field engineer during erection and commissioning of up to 7 combined cycle power units, both in Mexico and Spain. Since 2012, responsible of CESOM's platform for the follow-up of performance, condition and reliability of GNF generation assets.
C5	**Eva Medina Evangelio** (female).*Industrial Engineering 3-year Degree* by the University of Madrid. Since 2003 working in the power generation sector. Experienced first as technical control at a HFO-engine power plant in Dominican Republic. Later on as technical assistance for O&M projects management (contract and Q&EMS fulfilment), also including support for commercial bids and coordination for new projects (international). Since 2009 working at CESOM's platform for the follow-up of performance, condition and reliability of GNF generation assets

Role in the proposal:

Gas Natural Fenosa Generation has included power plants remote support in its strategic plan since 2009, as a milestone to achieve better margin whilst reducing operative risk. With this target in mind, an O&M specialized supervision center (CESOM), was developed. The services of CESOM are provided for the whole fleet of Gas Natural Group around the world. Thus, great amount of diverse origin data and experience in their management can be provided.

4.1.4 Union FENOSA Distribucion

Partner Full name		UNIÓN FENOSA DISTRIBUCIÓN, S.A.			
Partner nº	4	Short name	UFD	Country	Spain

Partner entity description and relevance:

Unión Fenosa Distribución is a distribution company of the Gas Natural Fenosa Group dedicated to develop, maintain and operate HV/MV/LV facilities in order to deliver **electricity** to its market, whilst ensuring quality, safety, efficiency and demonstrating concern for the environment. It provides services both nationally and internationally. It is the third bigger DSO of the Spanish Electricity Market. UFD promotes international best practices in managing energy infrastructure, harmonizing their activities and development of talented professionals with a concern for the environment and sustainable development.

In the last years UFD has been very active in Smart Grids initiatives, leading massive deployment of electricity smart meter in Spain and gas smart meters in Italy and participating in different European projects as; HiPerDNO; METERON; OVI-RED or PRICE, among others.

Infrastructure and equipment:

Its grid length reaches more than 125,000 km (11,000 km HV and 114,000 km MV&LV), the grid installed capacity is 38,000 MVA; with 36,000 GWh delivered to more than 3 million supply points scattered across a market with a surface of approximately 81,000 km2.

Core List of publications and projects:

List of up to five (5) products/services

Since 1999, UFD is responsible for the **regulated electricity distribution activity** of Grupo Gas Natural Fenosa. Its basic role is to transport electricity from the generation plants and transport network to end users.
Because electricity supply is a universal service, it must be supplied to everyone who requests it. This makes electricity distribution an economic activity with a highly social component.
The company builds, maintains and operates the networks with a commitment to guarantee an efficient, safe and high-quality service. UFD is especially meticulous when it comes to protecting the environment, by helping to improve energy efficiency and reduce consumption with a modern distribution network adapted to this purpose from a technological and management point of view.
As a result of the investment process it is undertaking together with the resources allocated to operating and maintaining facilities, service reliability has exceeded 99% in recent years.

List of up to five (5) relevant previous projects or activities

HiPerDNO: High Performance Computing Technologies for Smart Distribution Network Operation
New HPC tools and techniques have been recently developed to cost-effectively solve large scale computational challenges in areas such as genomics, biomedicine, particle physics and other major scientific and engineering fields that require similarly scalable communications, computation and data analysis. Based on such recent success it is the aim of this research project to develop a new generation of distribution network management systems that exploit novel near to real-time HPC solutions with inherent security and intelligent communications for smart distribution network

operation and management. Cost effective scalable HPC solutions will be developed and initially demonstrated for realistic distribution network data traffic and management scenarios via off-line field trials involving several distribution network owners and operators. Duration: 1st February 2010 - 31st January 2013. (Funding programme: FP7 ICT & Energy Call 2010-2013)
http://www.hiperdno.eu/

METERON- Supporting the development and deployment of advanced metering infrastructures in Europe
Meter-ON is a coordination and support action to steer the implementation of smart metering solutions throughout Europe. The project aims at speeding up and optimizing the adoption of smart metering technologies and infrastructures in Europe by effectively collecting the most successful experiences in the field and highlighting the conditions that enabled their development.
http://www.meter-on.eu/

OVI-RED - Virtual Network Operator with Storage
The OVI-RED project aims to design, develop and implement a system for managing a set of microgrids that, at the same time, manage individually the resources contained in its Local microgrid with presence of diverse distributed energy storage technology, energy capacity and manageability , using as principal basis the concept of Virtual PowerPlant. The approach of the OVI-RED project is to aggregate the capacity of many DER, generation and storage to present only one point of management to the distributor of the network. The management system of the microgrid can be operated locally and remotely by a centralized microgrid management system. In this way, the Distribution System Operator gain visibility over distributed resources and their use can be maximized, contributing to the efficiency and stability of the system.

PRICE - Joint Project of Intelligent Networks in the Henares Corridor
It is an initiative of Gas Natural Fenosa and Iberdrola aiming to give an answer to the technological challenges worldwide in the next generation of electrical systems. Some of the most important challenges to be faced in the forthcoming years are the aging of systems and electrical infrastructure, the growth in demand for energy supply, the increasing presence of renewable energy sources, the integration of electric vehicles (EV) in the network and the need to improve the security of energy supply and reduce dependence on non-renewable energy sources. In order to develop it, the PRICE project is based on the following sub-projects: PRICE-RED: Monitoring and Automation; PRICE-GEN: Energy Management; PRICE-GDI: Distributed Generation; PRICE-GDE: Demand Management.

http://www.priceproject.es

Infrastructure and equipment:

Its grid length reaches more than 125,000 km (11,000 km HV and 114,000 km MV&LV), the grid installed capacity is 38,000 MVA; with 36,000 GWh delivered to more than 3 million supply points scattered across a market with a surface of approximately 81,000 km2.

Relevant publications products and services:

Collaborator profiles	
C1	**Julio Gonzalo (male).** Electrical and Electronics Engineer. Since 2012, he is the Asset Management Director of UFD. High skills in industrial design and innovation on the field of power generation, energy management, smart grids and energy efficiency.
C2	**Mariano Gaudo (male).** Electrical Engineer with more than 20 years' experience managing successful project related to Smart Metering, SCADA and Smart Grids. Currently responsible for design and innovation of intelligent networks, defining and managing the implementation of new technological solutions.

C3	**Fernando Salazar (male).** Electrical Engineer and Master in Microelectronics by Universidad Politécnica de Madrid. He began his career in 1996 in Andersen Consulting and has worked for B.E.A Systems. He joined Unión Fenosa in 2002 as software architect in the IT Department and was responsible of the systems Enterprise Architecture in Unión Fenosa from 2006 to 2009. He is currently responsible for R & D and demonstration projects in the area of smart grid.
C4	**Javier de la Torre (male).** Obtained the 12th grade at Lower Dauphin High School, Pennsylvania (USA); B.Sc. in Industrial Engineering with specialty on power plants and transmission lines at ICAI of the Pontificia Comillas University, Madrid (Spain). His over 20 year career has been dedicated to the power energy sector in activities as HV substation control and protection design ,construction and commissioning of HV facilities, automation of hydraulic power plants, distribution network design and construction. He has worked both in Spain and abroad in countries like Panama, Mexico, Nicaragua, Philippines and Montenegro. Throughout his career he has held various positions from Project Engineer to General Manager of the Engineering subsidiary in Panama. Currently responsible for the Engineering Unit of electrical power distribution at GNF Engineering.
C5	**Eva González (female).** Degree in Electrical Engineering from the University of Oviedo (Spain) in 2006. She has ten years' experience in electricity distribution and transmission area, acting as project engineer in several HV projects in the field of overhead and underground power lines and technology projects at GNF Engineering. She also held positions of electrical design engineer, developing and implementing technical standards. In the last five years, she has been working in the smart grid field, giving technical and managerial support in different national and international projects such as IGREENGrid, DISCERN, IDE4L, KIC-SST, KIC-ASS, REDNA and PRICE.

Role in the proposal:

UFD, as a member of the European DSOs' Association for Smartgrids, provides large experience and extensive involvement in European projects in this field. It will have a key role in the **Distribution domain** of the pilot.

4.1.5 Eurecat

Partner Full name		FUNDACIÓN EURECAT			
Partner nº	5	Short name	EUROCAT	Country	Spain

Partner entity description and relevance:

Eurecat is the major Technology Centre of Catalonia and the result of the integration, since the 1st May 2015, of the most important Catalan technology centres: Ascamm, Barcelona Media, BDigital and Cetemmsa. It provides the industrial and business sector with differential technology and advanced expertise, it offers solutions to their innovation needs and boosts their competitiveness in a fast-paced environment.

The range of services offered by the centre are primarily focused on: applied R&D, technological services, information technology consulting, highly specialized training, product and service development, and promotion and distribution of technological innovation.

Eurecat aims its services at all business sectors but especially at seven key strategic areas identified by the regional Research and Innovation Strategies for Smart Specialisation, RIS3Cat: Food, Energy and Resources, Industrial Systems, Design-based Industries, Industries related to sustainable mobility, Health Industries and cultural, experience-based industries.

Eurecat combines the experience of over 450 professionals, generating an annual income of €38M.

The new center serves over a thousand businesses, participates in over 100 national and international R&D&i high level strategic projects, and has 36 international patents and 9 technology-based companies. It is made up of eight centers in Catalonia and one more in Latin America (Brazil).

Name and Description of the Department(s) contributing to the execution of the Project

The Technical experience Eurecat brings to the project is related to the following units:

- **The Smart Management Systems (SMS) Unit** at Eurecat has proven experience in data value chain management (collection-Information-Knowledge-Intelligence) by means of research, design and development of solutions (algorithms, methodologies, modules, mobile apps, platforms) based on the combination of different technologies such as AI, machine learning, data analytics, optimization, and information and knowledge management, applied specially to advanced manufacturing, agri-food, energy and sustainability domains.
  SMS has a wide expertise in the application of intelligent resource management and decision support tools; the development of interoperable and real-time platforms to fuse and integrate heterogeneous sources of information; the promotion of open, streaming and linked data environments inside knowledge management solutions capable

of sharing and combining information between multi-level stakeholders and domains.
SMS's portfolio includes technologies susceptible of being exploited and promoted in the factories for the future, smart cities and smart grids integrating technologies for the development of services and software that enables managing heterogeneous information. These technologies include artificial intelligence and Big Data applied to decision support, complex-event processing and context awareness applications.

- **Big Data Analytics Unit**: this Unit has wide experience in information retrieval and knowledge generation from a large spectrum of heterogeneous data sources (open data, social networks, indoor positioning systems, etc.), big data infrastructures (polyglot persistence, distributed computing, stream processing), data analytics (user modelling, geospatial analysis, recommendation systems, predictive modelling, etc. specially applied to mobile services, retailing, tourism and urban services) and visualization (3D interactive visualization, Digital catalogues, etc.). In connection to this Unit, Eurecat also hosts the Big Data Centre of Excellence Barcelona, a public-private initiative led by Eurecat, the Government of Catalonia, the Barcelona City Council and ORACLE to boost the Big Data paradigm amongst local companies, especially SMEs.

- **IT Security Unit:** EURECAT's technical capacities in these domains derive from the experience of their Security group personnel participation in several private and public R&D&I projects (specifically in the CIP-PSP Program). Additionally, these two main activity lines have led EURECAT to develop a strong collaboration with diverse financial institutions, particularly with CaixaBank, (MonPriv partner #6), a major Spanish bank, headquartered in Barcelona and notorious for being a highly technology innovation driven institution.

Business Motivation and Activities in the project:

The main interest for Eurecat to participate in the project is to apply already developed technology in large scale demonstrators. The deployment in a real environment will allow to enhance data analytics modules and tune the parameters for the specific scenario. Furthermore, the collaboration with top European technological partners and utilities foster networking activities and the potential deployment of exploitation activities beyond the scope of the project.

Within ELECTRA project, EURECAT will contribute by providing analytics tools for the implementation of the use cases on predictive maintenance, fraud detection, user profiling, energy efficiency recommendations, grid balancing and customer flexibility. Furthermore, it will contribute to transversal activities in the field of advance visualization techniques, cybersecurity and big data management. Finally, it will support the realization of the Spanish pilot site.

Expertise from previous and on-going projects:

BEAMS – FP7 http:://ict-beams.eu Its strategic goal is the development of an advanced, integrated management system which enables energy efficiency in buildings and special infrastructures from a holistic perspective, that will allow the management of diverse, heterogeneous sources and loads

Nobel Grid Project – H2020 http://nobelgrid.eu/ Provides advanced tools and ICT services to all actors in the Smart Grid and retail electricity market in order to ensure benefits from cheaper prices, more secure and stable grids and clean electricity.

Ciudad2020 Project – INNPRONTA http://www.innprontaciudad2020.es/ where EURECAT was in charge of traffic prediction models based on social media analysis

ATRAPA project - consists of a system to aid real-time decision-making for land-side management at airports (regional funded)

ARTIFICE – (private project) - implements anomaly and early fraud identification in order to mitigate effects, applied to banking sector (private project delivered to one of the top banking organizations in Spain)

Infrastructure and equipment:

Infrastructure: EURECAT is not an infrastructure provider but holds their own infrastructure.

Platform: the hardware agnostic capabilities of EURECAT Big Data platform allows exporting our solutions in several infrastructures. The Big Data infrastructures research team is focused on create and improve this platform as a service offering the complete data workflow and data value chain with horizontal scalability capabilities offering the biggest catalogue of development environments for the data scientist and data analysts.

Processing:

Applications: Data mining and machine learning techniques applied to anomaly detection, forecasting, optimization, device modelling, and user profiling.

Orchestration

Relevant publications products and services:

"Microgrid Management based on economic and technical criteria," R. Enrich, P. Skovron, M. Tolós and M. Torrent-Moreno - presented at the EnergyCon 2012 IEEE International Energy Conference and Exhibition – Towards user-centric smart systems – , Florence, September 2012

"Big Data y Bases de Datos Espaciales: un análisis comparativo" M. Planaguma , R. Gimenez , J Simoes, proceedings SIG Libre Girona 2015.

"Cicerone: Design of a Real-Time Area Knowledge-Enhanced Venue Recommender", D. Villatoro, J. Aranda, M. Planaguma , R. Gimenez, M. Torrent. Proceedings of the Workshop on Ubiquitous Data Mining @ IJCAI'13, 2013.

"Distributional Semantic Pre-filtering in Context-Aware Recommender Systems" V. Codina, F. Ricci, and L. Ceccaroni. User Model User-Adapted Interaction. doi:10.1145/2542668, 2015.

"Method and apparatus for continuous and implicit local authentication of wireless mobile users based on dynamic profiling of conduct pattern" European patent 14 189 367-7 a nombre de FUNDACIÓ PRIVADA BARCELONA DIGITAL CENTRE TECNOLOGIC y CAIXABANK

Collaborator profiles	
C1	**Gabriel Anzaldi** (male) Head of the Smart Management Systems Unit at EURECAT. He studied Electronic Engineering at IESE, Advanced Studies Diploma (DEA) in Electronic Technology by Polytechnic University of Catalonia (UPC), Telecommunication Engineering at the Polytechnic University of Madrid (UPM), achieved his MSc in Telecommunications at the Buenos Aires Technological Institute (ITBA), and MSc in communications at the US Signal Centre. He holds and extensive and multidisciplinary experience along product life cycle including, system development, innovation planning, scouting and business models along different sectors (public, private), both nationally and internationally, holding different positions such as Design Engineer; Project Manager; Researcher; Presales Engineer; Technical Director; R&D Director; CTO and collaborating with SMEs and large companies. In this context, Gabriel has been coordinating process company focused on i electronic board production (20,000 complex board/day). With regards this company, he also was in charge of implementing a production line in China with notorious success for the company. Currently, he leads projects related to water-energy management and big date applied to different sectors. Additionally, He has worked as a researcher at the UPC for several years and has contributed to different congresses, publications and papers related to resource management. He has also worked on USPTO Application #20050117723.
C2	**Regina Enrich** (female) is a senior researcher in the Smart Management Systems R&D Unit and project manager, and works in projects related to Energy Efficiency and Electromobility. She holds a M.Sc. in Telecommunication engineering from Universitat Politècnica de Catalunya, in Barcelona. She has worked at

	Grupo AIA in projects concerning monitoring and managing of the electric grid, gas and electricity load forecasting algorithms based on neural networks.
C3	**Marc Planagumà** (Male) is researcher on EURECAT Big Data Analytics Unit and Manager of Big Data Infrastructures research group. MSc. in Telecommunications Engineering by UPC - BarcelonaTech. He holds a wide experience on software architecture for large-scale solutions, cloud computing and distributed systems applied on research projects from Eurecat and R&D Mobility group at BDigital previously. Pior to joining BDigital he has participated on several research projects on Telefonica I+D specialised in data-mining, knowledge-discovery and recommender systems. He was invited as guest researcher in Berlin Big Data Center and Big Data Analytics research group from Beuth Hochschule für Tecnik Berlin led by Prof. Dr. Stefan Edlich where he was specialising in state-of-the-art tools for Big Data real time analysis and focused on the Apache Flink framework improvement. He is member of program committee of NoSQL Matters and Distributed Matters congress, he has authored several peer-reviewed publications and has three patents in the field of recommenders.
C4	**Antonio Torrente** (male) is the Head of the Laboratory of Interactive Virtual Visualization (Lv2) of Eurecat, now embedded into the Big Data Analytics Unit, and coordinates and develops interactive visualization projects since 2008, both as stand-alone interactive systems, and as data integration solutions. (Interactive 3D models of urban planning, self-learning tools for industrial processes, etc.). At the Lv2 we research and develop applied methodologies and integrated visualization systems applied to industrial, medical or geolocated information for example, where the focus is to make complex information available to a wider range of users, facilitating the decisions and general access to the results, adding value to previous existing information.
C5	**Mario Reyes** (male) is a Senior Researcher at Eurecat's IT Security Unit. He received the M.Sc. in Computer Engineering at the Polytechnic University of Catalonia (UPC) in 1991 and the Ph.D. in Computer Science at the Autonomous University of Barcelona (UAB) in 1998. He holds a CISA certification and a Systems Audit Postgraduate. During seven years (from 1991 to 1998), he has been a research staff at the National Centre in Microelectronics, in Barcelona (CNMB-CSIC), within the Bio-inspired Systems Group. During ten years, he has been a research staff at the Computer Science at the Autonomous University of Barcelona, at the Microelectronics Department. During five years he has been the eGovernment and Security Intelligence Team Manager at S21sec (Security Enterprise in Barcelona, Spain). He has been an invited researcher in several research centers, notably at the Fuzzy Logic Systems Institute (FLSI, Iizuka, Japan).
C6	Lucia Arévalo (female), Head of the Research Communication Office (RCO) at EURECAT. She holds a degree in Information Science (Journalism) from the Universitat Autonoma de Barcelona, a MSc in Strategic Communication Management from ESADE and a MSc in Corporate Communications Management by the Polytechnic University of Catalonia – School of Business Administration. She is a journalist specialised in Corporate Communication and Digital Marketing with more than 15 years of professional experience in companies of the Media, ICT and R&D sectors. Before joining EURECAT, she worked at Barcelona Digital Technology Centre as a Head of Corporate Communication and Marketing. She has large experience in developing, executing and monitoring projects' dissemination and communication plans.

4.1.6 BSC-CNC

Partner Full name		Barcelona Supercomputing Center – Centro Nacional de Supercomputación			
Partner nº	6	Short name	BSC	Country	Spain

Partner entity description and relevance:

BSC was established in 2005 and is the Spanish national supercomputing facility and a hosting member of the PRACE distributed supercomputing infrastructure. BSC houses MareNostrum, one of the most powerful supercomputers in Europe. The mission of BSC is to research, develop and manage information technologies in order to facilitate scientific progress. BSC combines HPC service provision, and R&D into both computer and computational science (life, earth and engineering sciences) under one roof and currently has over 400 staff from 41 countries. BSC has collaborated with industry since its creation, and participates in various bilateral joint research centers with companies such as IBM, Microsoft, Intel, NVIDIA and Spanish oil company Repsol. The center has been extremely active in the EC Framework Programmes and has participated in seventy-nine projects funded by it. BSC is a founding member of HiPEAC, the ETP4HPC and other international fora.

Business Motivation and Activities in the project:

In this proposal, two of these research departments are participating: Computer Sciences and Earth Sciences. The Computer Sciences department is organized in different groups that do research in topics related to the Big Data technologies, in areas of programming models, storage methodologies, data analytics, etc. The Earth Sciences Department was established with the objective of conducting research in Earth system modelling. The research focuses on atmospheric emissions, air quality, mineral dust transport, global and regional climate modelling and prediction, and climate services for private and public users.

BSC, can provide:

- COMPSs - programming models for distributed platforms, including cloud and integrated with new storage technologies (dataClay, Hecuba)
- Tiramisu - deep mining framework, usable for image recognition among others
- Meteorological forecast (up to 72 hours) to predict meteorological conditions.
- Climate predictions (up to 7 seven months) to anticipate the variations in energy supply and demand is essential to stabilize, strengthen and secure the energy network as a whole.
- Re-analyses assessment to study past events.

Expertise from previous and on-going projects:

- EUBrazil Cloud Connect - http://www.eubrazilcloudconnect.eu
- EUBrazil BigSea - http://www.eubra-bigsea.eu
- ASCETIC - http://www.ascetic-project.eu
- HBP - https://www.humanbrainproject.eu/es/home
- CALIOPE – http://www.bsc.es/caliope/
- EUPORIAS - http://www.euporias.eu/

Infrastructure and equipment:

MARE NOSTRUM: MareNostrum has a peak performance of 1,1 Petaflops, with 48,896 Intel Sandy Bridge processors

in 3,056 nodes, including 84 Xeon Phi 5110P in 42 nodes, with more than 115 TB of main memory and 2 PB of GPFS disk storage. In June 2013, MareNostrum was positioned at the 29th place in the TOP500 list of fastest supercomputers in the world.

Access to different world wide meteorological, climate and aerosol modelled and observational data, including but not limited to ESGF Nodes, air quality and mineral dust model simulations, station observations and NCEP and ECMWF reanalysis data.

Relevant publications products and services:

- PyCOMPSs/COMPSs programming model – compss.bsc.es
- PyCOMPSs: Parallel computational workflows in Python, Enric Tejedor, Yolanda Becerra, Guillem Alomar, Anna Queralt, Rosa M Badia, Jordi Torres, Toni Cortes, and Jesús Labarta, International Journal of High Performance Computing Applications, first published on August 19, 2015 as doi:10.1177/1094342015594678
- Francesc Lordan, Enric Tejedor, Jorge Ejarque, Roger Rafanell, Javier Álvarez, Fabrizio Marozzo, Daniele Lezzi, Raúl Sirvent, Domenico Talia, Rosa M. Badia: ServiceSs: An Interoperable Programming Framework for the Cloud. J. Grid Comput. 12(1): 67-91 (2014)
- CALIOPE project: www.bsc.es/caliope/ including mobile applications in digital stores.
- Soret, A., Torralba, V., Davis, M., Doblas-Reyes, F., Gonzalez-Reviriego, N., 2015. Climate predictions for site selection: a new generation of risk management tools. EWEA Resource Assessment workshop, Helsinki, Finland, 2-3 June 2015

Collaborator profiles	
C1	**Dr. Rosa M Badia** (female) holds a PhD on Computer Science (1994) from the Technical University of Catalonia (UPC). Since year 2008 she is a Scientific Researcher from the Consejo Superior de Investigaciones Científicas (CSIC) and manager of the Workflows and Disttributed Computing group at the BSC since 2005 and coordinator of the Big Data activities at BSC. She has been an Associated Professor at the UPC from 1997 to 2008. From 1999 to 2005, she was also involved in research and development activities at CEPBA. Her current research interests cover the programming models for distributed computing platforms and its integration with novel storage technologies for Big Data. She has participated in several European projects. Dr. Badia has been IP of project SIENA, and of project EU-Brazil OpenBIO. She is also a member of the HiPEAC2 NoE. She is currently participating in EU funded projects: HBP, EUBra BIGSEA, ASCETIC, TANGO, EUROSERVER, NEXTGENIO, MUG, BioExcel.
C2	**Msc. Kim Serradell Maronda**, (male). Is Bachelor (2005) in Computer Sciences for the Facultat d'Informàtica de Barcelona (FIB-UPC) and for the Grande école publique d'ingénieurs en informatique, mathématiques appliquées et télécommunications de Grenoble (ENSIMAG). Since 2014 is also Master on High Performance Computing from the Facultat d'Informàtica de Barcelona (FIB-UPC). Currently, he is the co-manager of the Computational Earth Science (CES) group at the Earth Sciences department in the Barcelona Supercomputing Center (BSC). The CES group is a multidisciplinary team of 15 members with different IT profiles that interacts closely with all the other groups of the Earth Sciences Dept. In the last years, he has been in charge for the system administration of all the computational resources of the department and he was also responsible of supervising the operational runs of the NMMB/BSC-Dust model and CALIOPE Air Quality System in the HPC infrastructures of the BSC. He has been involved in European projects like IS-ENES (1 & 2), ESiWACE, SDS-WAS, BDFC or CONSOLIDER.
C3	**Dr. Albert Soret, (male),** holds a PhD in Environmental Engineering from the Polytechnic University of Catalonia (Barcelona). He is head of the Services group at BSC-ES. He is a postdoc researcher with 10 years of experience in earth sciences. His research focuses on assessing the impact of climate on socio-economic sectors through the development of user-oriented services that ensure the transfer of the technology developed and the adaptation to a rapidly changing environment. He is Work Package leader within the CLIM4ENERGY project. Between others, he is participating in the EC-FP7 projects: NEWA, EUPORIAS, SPECS, IMPREX and PRIMAVERA.
C4	**Prof. Francisco Doblas-Reyes (male),** Head of ES-BSC. He is an expert in the development of seasonal-to-decadal climate prediction systems. He has been involved in the development of the EC-Earth climate forecast

	system since its inception. He was an IPCC lead author in the Fifth Assessment Report, serves in WCRP and WWRP scientific panels, is a member of the ENES HPC Task Force, has participated in a number of FP4 to FP7 projects and is author of more than 100 peer-reviewed papers. He is shaping BSC's plans for the development of a weather and climate modelling service that brings the latest developments of HPC and Big Data research to the Earth science community, increasing at the same time the resilience of the European society to weather, air quality and near-term climate extremes.

4.1.7 Zabala Innovation Consulting

Partner Full name		ZABALA Innovation Consulting, S.A.			
Partner nº	7	Short name	ZABALA	Country	Spain

Partner entity description and relevance:

ZABALA is an independent international consultancy firm (SME) founded in 1986 specializing in comprehensive consultancy of both R&D and Innovation management, as much for industrial or services enterprises as for regional, national and Community administrations. Its mission is to make innovation the key factor of the competitiveness for both companies and administrations. A multidisciplinary team of 200 professionals covers all the technical and economic fields of our clients: engineering in different disciplines, socio-economic, legal, journalism, administrative, etc. The head office is in Pamplona (Spain). It has branches in other 5 cities in Spain, in Brussels and in London.

ZABALA has l**ed the Secretariat of ETP Smart Grids since 2007**, supporting the ETP Smart Grids' operational activity, and still keeps in charge of this task. Main activities undertaken within this initiative can be summarized as follows:

- Supporting the main bodies that are part of the internal structure of the SmartGrids ETP.
- Providing support in the definition, management and development of high quality public results.
- Providing support in the implementation of a communication strategy based around an information center (public internet site), international conferences, newsletters, participation in other conferences and direct cooperation with the European Commission.
- Website development and management.
- Implementing monitoring activities and quality control reviews of platform activities and results.

ZABALA leads the management team of the E**IP Smart Cities & Communities (EIP SCC)** since 2014 assuring the activity of the EIP facilitating a fluent communication among members and operational groups, both by acting as link and providing an operational web platform that enhances collaboration among the members. Besides, ZABALA, as coordinator, has organized all the meetings and events required for the best development of this initiative, scheduling meetings, preparing agendas, hiring venues and providing all the needed specialized staff for the smooth course of such events.

ZABALA is contractor for the development of the Knowledge Platform of the EU Public Private Partnership PPP SPIRE "Sustainable Process Industry" (2015-2016).

In addition to the mentioned EIP on Smart Cities and Communities, ETP Smart Grids and PPP SPIRE, it must be highlighted that in terms of networking expertise at European level, Zabala participates in the following European networks:

- Eco-innovation: Greenovate! Europe is a new European grouping in the field of respectful environmental innovation culture (www.greenovat-europe.eu) that promotes different projects.
- Eco-pro INNOVATIONSEEDS (2012-2013). European Project creating a network to disseminate the results of projects related to eco-innovation.
- Member of INNOWATER (2011-2013) and the Spanish Water Platform.

Our collaborations with all kind of forums and sectors allows us to share our knowledge by means of workshops, days, practical courses, seminars, conferences, general and specialized press, etc. Some examples are GRID+ project (leader of the work packages concerning the dissemination of results of European projects in the scope of electric grids and interconnections with all the platforms and existing forums at world-wide level.) and INNOWATER.

Finally, ZABALA coordinates FINODEX (Future INternet Open Data EXpansion), SME accelerator born value creation of and support to innovative ICT services based on PPP FI technologies and massive reuse of Open Data, involving SMEs and web entrepreneurs.

Business Motivation and Activities in the project:

Along the many projects in which ZABALA has participated, it has acquired a deep experience in managing European Networks and the relation among their members. Dissemination to strategic stakeholders has also been a strong aspect of the previously mentioned initiative, what ZABALA has professionally enhanced through the coordination of EIP SCC and ETP SmartGrids, organization of large events, and active participation in workshops, networking and training sessions.

The core expertise of ZABALA within the ELECTRA project relates to communicating and disseminating research results to a variety of audiences. ZABALA will:

- Organize local and European dissemination events for different stakeholders
- Organize and coordinate stakeholder Workshops and Community Building activities
- Coordinate training sessions addressed to the project partners

Coordinate training sessions addressed to the Stakeholders Ecosystem group

Expertise from previous and on-going projects:

In addition to the projects mentioned above, Zabala participates or has participated in the following European initiatives:

- GRID+, Project funded by FP7 which is supporting the European Electricity Grid Initiative. Among its responsibilities, Zabala managed and coordinated the interaction with stakeholders and initiatives (in Europe and abroad) and carried out dissemination activities.
- SINFONIA: funded by FP7, It is a five-year initiative to deploy large-scale, integrated and scalable energy solutions in mid-sized European cities. At the heart of the initiative is a unique cooperation between two pioneer cities (Innsbruck and Bolzano), working hand in hand to achieve 40 to 50% primary energy savings and to increase the share of renewables by 20% in two pioneer districts.
  ZABALA's tasks in this project include administrative and financial management of the project supporting the project coordinator and the 37 partners of the project; and economic impact and EU-wide integrated assessment of replication potential of smart district template.
- REPLICATE, a Smart City lighthouse project funded by H2020, with the participation of 36 partners with a total budget of €25 million.
- INNEON: project funded under the CIP, is a Eccoinnovation Network for Investment. ZABALA is the coordinator, being the sole liaison with the European Commission, evaluating entrepreneur's projects and investor, and developing and maintaining the online platform.
- INNOWATER. Partnership that facilitated the market access of innovative water technologies (FP7).
- PRONANO. FP7 commercial exploitation of nanotechnology research. ZABALA was the coordinator. (www.pronano.eu).
- REMake. Eco-innovation voucher schemes for companies. (FP7)
- COWIN. Commercial exploitation of advanced technologies coming from collaborative European research work. (FP7)

Infrastructure and equipment:

N/A

Relevant publications products and services:

ZABALA carries out studies supporting the Innovation, the design and the implementation of R&D&I sustaining programmes and evaluates its impact for, i.a., DG for Regional Policy, DG of Research & Innovation, DG of Enterprise Policy.

Collaborator profiles	
C1	**Marie Latour**, (female) has a double degree in Management by the "Bordeaux Ecole de Management" (France) and the "Madrid Chamber of Commerce" (Spain) and an MSc in European Affairs by the "Institut Catholique de Paris" (France). She is currently the Head of Office of Zabala in Brussels where she manages a team of 9 consultants. Marie has more than 13 years' experience in the management of R&I EU funded projects with a special focus on the EU member states. Marie is currently managing the Secretariat of the ETP on Smart Grids, having successfully organized last General Assembly in Brussels with more than 200 participants. Moreover, she has participated as an external expert within the EIP on Smart Cities and Communities (Integrated Infrastructures Action Cluster). She also has a strong knowledge of the EU energy regulatory framework and a deep understanding on the EU national markets. She has advised policy makers and key stakeholders a on national policy frameworks related to photovoltaics in Europe and globally, which included Monitoring, researching, analyzing and comparing existing and new policy developments to support photovoltaic deployment in the whole European market as well as in leading foreign markets.
C2	**Artiza Elosegui** (female), MSc in Telecommunications Engineering, she has been working for Zabala for 6 years (2,5 out of them in the office or Brussels) as consultant in project management in the fields of R&TD and technology dissemination. She has vast experience in EU funded innovation projects and programmes; wide knowledge on EU horizontal thematic programmes, such as FP7/H2020 and COSME, ERASMUS+, etc. including frequent update on the progress of the forthcoming programmes; she elaborates project proposals (mainly answering to ICT or Energy related calls). She participates as partner in EU projects as administrative and financial manager of the project supporting the project coordinator and the partners of the project. She is currently involved in the SINFONIA project (GA no 609019, 5-year initiative involving 25 beneficiaries and 13 third parties to deploy large-scale, integrated and scalable energy solutions in middle-sized European cities) being part of the coordination team and providing administrative and financial support to the partners. Her involvement in SINFONIA includes also performing the economic impact and EU-wide integrated assessment of replication potential of smart district template. She has in the management of logistics for the organisation of events, missions, etc. and in the organisation of workshops and conferences. She has experience with web-based learning platforms participating in the development of 12 websites of EU funded projects and in the newsletters for various projects and for ZABALA.
C3	**Susana Garayoa** (female), Bachelor in Audio-visual Communications specialized in corporate communication. She is currently Head of EU Projects Communication department of Zabala, giving support to the 61 EU funded ongoing projects currently managed by the company. She has more than 15 year of experience in communication management, with a journalist and enterprise background. She previously worked at CRANA (Environmental Resources Foundation of Navarra) as Responsible in Communication. Furthermore, she collaborates as Associated Professor in the University of Navarra, teaching the subject of Environmental Journalism.

4.1.8 CEA

Partner Full name		Commissariat à l'Energie Atomique et aux Energies Alternatives			
Partner nº	**8**	Short name	**CEA**	Country	**France**

Partner entity description and relevance:

The French Atomic Energy and Alternative Energy Commission (CEA) is one of the leading research institutes in Europe. Apart from its core activities in the fields of nuclear energy, fundamental research in biology and physics, it is also the main French player for technological transfer from the academia to the industry. It develops a broad portfolio of innovative solutions in the fields of ICTs, energy, and healthcare. It has an annual operating budget of €600 million and serves 145 international customers. It gathers 4,500 researchers and engineers from a wide range of fields, from microelectronic and nanomaterials to software engineering and telecommunication.

In CEA-Tech, software solutions are the responsibility of the **List institute** which is specialized in smart digital systems. It concentrates CEA's data-science teams which rely on 120 data-scientists with complementary skills and know-how in physics, mathematics, statistics and computer science.

Business Motivation and Activities in the project:

Based on this technology/competency portfolio, CEA offers to contribute to the development of following technical functionalities where is has significant experience, knowledge and tools:

- **Transversal WP - Analytics**: This would basically correspond to the transversal tasks focusing on developing a Big/Fast data analysis toolbox for the project community.
- **Dedicated WP – UC/pilot specific**: Additional efforts will be dedicated to the implementation/adaptation of these tools for specific pilot environments and evaluation/demonstration activities.

With respect to UC, technical contributions may cover:

- **Real time monitoring**
  - Technical and non-technical (i.e. Fraud) loss detection
  - malfunction/Failure detection & diagnosis,
  - Electricity usage monitoring, identification of energy consumption footprint
- **Predictive analysis**
  - On line modelling and forecasting of energy demand and production (fine grain data mining)
  - Predictive & proactive maintenance (failures anticipation)
- **Decision support system (prescriptive analytics)**
  - Recommender system for contingency (e.g. maintenance) operations and problems troubleshooting
  - Consumer behavioural analysis & Load profiles segmentation
  - Personalized advices/recommendation for comfort and energy saving,

These topics will be addressed mainly through the development of dedicated analytics applications (including the data preparation step) while data aggregation and management solutions will be based on existing technologies already developed and installed at CEA premises.

These activities will be achieved through different steps:

- Functional and non-functional specifications of the BD solutions based on the UC and datasets provided by utility partners
- Design and prototyping (through adaptation/extension of existing technologies, whenever possible) of the BD applications.
- integration into a BD framework for further testing and evaluation (to this respect, CEA's own BD cluster may be used)

Expertise from previous and on-going projects:

Most of CEA's data science expertise has been applied through bilateral collaboration with industry partners. Our activity focus mainly on systems monitoring (real time data analysis) for security and manufacturing applications, as well as on Big data approaches, mainly in the field of biological sciences. In order to broaden the scope of its technologies, CEA is also actively involved in collaborative projects, both at the national and European levels. Representative examples, relevant for the current proposal, are listed below:

IT2RAIL - Real time events processing for public transportation monitoring and multimodality support.

[http://www.it2rail.eu/]

Smart Water For Europe – intelligent monitoring (early anomalies detection and mitigation planning) of water distribution networks. [https://sw4eu.com/]

STREAMER – distributed intelligence for optimized building management systems

[http://www.streamer-project.eu/Main.aspx?uri=4,171,164]

MOBISC & DESCARTES – events stream analysis and real time recommendations for crisis management.

[http://www.systematic-paris-region.org/fr/projets/mobisic]

[http://www.systematic-paris-region.org/fr/projets/descartes]

e-Dash – Energy demand forecasting and load planning for large fleets of Electric Vehicles operating via the energy market.

http://www.egvi.eu/projects/18/38/e-DASH-Electricity-Demand-and-Supply-Harmonization-for-EVs-July-2014

Infrastructure and equipment:

To conduct their research, CEA's data science teams have on site:

- A Linux cluster aiming at studying big/fast data solutions (i.e. Hadoop, SPARK & STORM). The software stack, which is continuously evolving, contains data aggregation (e.g. KAFKA) and resources allocation (e.g. YARN) tools.
  Current configuration (to be extended in the near future): 9 nodes with 32 cores, 128 GB of RAM, 8TB each. Ethernet connection.
- An HPC cluster dedicated to numerical analysis and simulation. It implements parallel computing solution in a MS Windows environment.
  Current configuration: 70 servers with various specs (8-32 cores & 16-128 GB RAM). InfiniBand connection.

Relevant publications products and services

Collaborator profiles	
C1	**Cédric Auliac** (male)**.** After a master degree in molecular and computational biology and a Ph.D. on genomic data analysis, he joined the CEA, for a one year post-doctoral position, working on the analysis and classification of geophysical data. He is now a research engineer in the Data Analysis and Intelligent Systems Laboratory at CEA LIST where he is mainly involved in industrial and European projects regarding commodity (energy & water) and mobility management as well as smart manufacturing. While he is mainly interested in the learning of graphical probabilistic models and evolutionary computation, his activities now focus on data streams processing and online learning for industrial monitoring applications.
C2	**Jean-Philippe Poli** (male)obtained his PhD in Computer Sciences in 2007 from University Paul Cézanne in Marseilles. The topic of his PhD thesis was the automatic structuring of television archives and was involved in K-Space (network of excellence) and in a national project in massive data (former name of Big Data). He joined the CEA LIST for a two-years postdoctoral fellowship in 2007 and was involved in several projects: from gene selection for diagnosing prostatic cancers to constraints satisfaction for geodesic scenarios generation. He is now part of the Data Analysis and Intelligent Systems Laboratory at CEA LIST. His interests range from complex system modelling to decision systems, with a great focus on fuzzy expert systems. He has been promoted to CEA Expert in artificial intelligence.
C3	**Cédric GouyPailler** (male)**,** was born in Grenoble, France, in 1983. He received a Ph. D degree in biomedical engineering in 2009, and both the engineering degree in electronics and the M.Sc. degree in Cognitive Sciences in 2006, from the Grenoble University, Grenoble, France. Cédric GouyPailler worked during his Ph.D. on EEGbased Brain Computer Interfaces. He developed advanced machine learning and signal processing tools for biomedical engineering. Besides its academic activities, he has demonstrated top tier data scientist skills to solve hands on applications from various real life challenges (most notably on kaggle.com, ranking amongst the top 1/1000th contestants). In 2015, he won the first prize in the competition “BCI Challenge @NER”, hosted on kaggle.com (against 261 teams). His current research interests include statistical signal processing and largescale machine learning algorithms, with applications to stream and big data analytics.

4.1.9 EDF

Partner Full name		EDF Group			
Partner nº	9	**Short name**	**EDF**	**Country**	**France**

Partner entity description and relevance:

The **EDF Group** is a world leader in the energy market, active in all areas of electricity from generation to trading and network management. **EDF is the first European producer of renewable energy**. Leader in the French and British electricity markets, firmly established in many European countries including Poland and Italy, industrial operator in Asia, EDF is a worldwide reference as a utility with great expertise in R&D, engineering, power plant operation, network management and energy trading. In 2011, EDF produced 630 TWh of electricity with a turnover of 65 billion €. EDF has 37 million customers and 160,000 employees worldwide. 95% of the electricity generated by EDF is carbon-free.

EDF invests in ICT technology and particularly in Big Data solutions in order to be competitive in the electricity European market. ICT technology is applied in every sector of activity of EDF but the contribution of EDF in the ELECTRA project will focus to the use of Big Data technology in the "Energy Retail and Services" and the "Generation" domains. EDF Research and Development (EDF R&D) will head the contribution of EDF in ELECTRA and people from the different business units (mainly the Commercial division) will also contribute to the project.

(EDF R&D) employs **2200 people** (mainly located in the European Union) including 1200 scientists and 220 PhD students. A growing share of EDF R&D's research activities is led through partnerships with industrials and academic entities worldwide. Regarding Big Data, EDF R&D aims at identifying technological breakthroughs and turning the most promising ones into reality at industrial scale. EDF is an active member of the PPP Big Data as a full member of the "Big Data Value Association".

Core List of publications and projects:

List of up to five (5) products/services

List of up to five (5) relevant previous projects or activities

Relevant European projects:

- http://www.beywatch.eu/
- http://www.cityopt.eu/

Energy efficiency current service to residential customers:

- https://particulier.edf.fr/fr/accueil/compteur-et-consommation/consommation/agir-sur-ma-consommation.html

Predictive maintenance tool used at EDF in nuclear power plants:

- http://www.instepsoftware.com/company/instep-software-news/91-edf-selects-instep-to-monitor-plants-in-france

Infrastructure and equipment:

Relevant publications products and services:

Predictive maintenance

- *Equipment diagnostics based on comparison of past abnormal behaviors using a big data platform* – C. Mai, R. Chevalier - PHME Third European Conference of the Prognostics and Health Management Society 2016.
- *Assessment of statistical and classification models for monitoring EDF's assets* – R. Chevalier, D. Provost, R. Seraoui, HMIT NPIC 2009 Knoxville US.

Demand forecasting

- *GEFCom2012 Electric load forecasting and backcasting with semi-parametric models*, R. Nedellec, J. Cugliari, Y. Goude, , International Journal of Forecasting, 30, 375 – 381, 2014.
- *Semi-parametric models and robust aggregation for GEFCom2014 probabilistic electric load and electricity price forecasting*, P. Gaillard, R. Nedellec, Y. Goude, International Journal of Forecasting, 2015.
- *A SARIMAX coupled modelling applied to individual load curves intraday forecasting*, S. Bercu, F. Proïa, Journal of Applied Statistics, 2013.
- *Simultaneous confidence bands in curve prediction*, J.M. Azais, S. Bercu, J.C. Fort, A. Lagnoux-Renaudie, P. Lé, Journal of the Royal Statistical Society (JRRS-C) Vol.59, 2010.

Customer services

- *Chiaroscuro: Transparency and Privacy for Massive Personal Time-Series Clustering*, T. Allard, G. Hébrail, F. Masseglia, E. Pacitti, ACM SIGMOD, Melbourne, Australia; 2015.
- *Decortic: A method for detecting and estimating the consumption of electrical space heating*, B. Charbonnier, NILM 2015, London.
- *A Smooth Transition Model for Multiple-Regime Time Series*, M. Sanquer, F. Chatelain, M. El-Guedri, N. Martin, IEEE Transactions on Signal Processing, Institute of Electrical and Electronics Engineers, 2013, 61 (7), pp.1835-1847.

Smart metering and sensor big data management

- *Searching time series with Hadoop in an electric power company*, A. Bérard, G. Hébrail, BIG'MINE 2013, ACM-KDD Conference, Chicago, 2013.
- *Real-time Energy Data Analytics with Storm*, M.L. Picard, R. Saissy, S. Maby, B. Jacquin, C. Bernard, B. Grossin, Hadoop Summit, San José, California, USA, June 2014.

Collaborator profiles	
C1	**Roger CHEVALIER** (male) is a **senior research engineer** in the "Simulation and Information Technologies for Power Generation Systems" Department at EDF R&D. He joined EDF R&D in 1982 and his main activities were first focused the on-site vibration expertise of nuclear power plants main components (tests and modelling). From 1996 to 2006, he was project leader of five successive EDF projects dealing with monitoring systems, condition-based maintenance and prognosis of critical components of nuclear and fossil power plants. From 2009 to 2012, he was manager of the EDF SA contribution in an Energy Technologies Institute (ETI) project, which aimed at developing and demonstrating a groundbreaking holistic monitoring system for offshore wind farms. Finally, since 2009 he is President of the French AFNOR Commission on monitoring and diagnostic and Chairman of ISO / TC 108/SC5/WG2 "condition monitoring of machines / Diagnostics of machines". As a senior engineer at EDF R&D, he has got the mission to pave the way for the integration of new technologies and first principles models in condition monitoring of machines.
C2	**Karine del Medico** (female) graduated in 1992 from Institut de Statistiques de l'Université de Paris (Université Pierre et Marie Curie). She is now a **senior project manager** in the Innovation Department within the Commercial Division of the EDF Group. Karine is in charge of conducting the Smart Home project that aims at using IOT to provide more added value services to the customer. From 2010 to 2012, she has been working in the EDF IT Division as the "Datamining and customer analysis" project manager. The project was dedicated to acquire a better understanding of the customers' actual needs.
C3	**Georges Hebrail** (male) is a **senior researcher** at EDF R&D. His domain of expertise covers Information Systems, Business Intelligence and Data Analytics, today called "big data". As a researcher at EDF R&D, he has been working on data mining approaches applied to the energy sector, both for customer relationship management by enriching customer databases using data mining techniques, and for back office analysis of electric power

	consumption curves by developing an interactive clustering software called "Courboscope". From 2002 to 2010, he was a professor of computer science at Telecom ParisTech engineering school, teaching and doing research in the field of information systems and business intelligence, with a focus on time series management, stream processing and mining. He is currently working on Big Data solutions for the different activities of the EDF Group (generation, electrical distribution network, smart metering, customer relationship management), including the management of open data and the development of new algorithms of data mining preserving the privacy of customers. He has published more than 50 papers in international journals, conferences and workshops.
C4	**Yannig Goude** (male) is an **expert research engineer** at EDF R&D since 2008 in the "Optimisation Simulation Risk and Statistics" Department. He is also an associate professor at the university Paris-Sud 11 Orsay since 2013. He obtained his PhD. in statistics and probability in 2007 at the university Paris-Sud 11 Orsay. His current research interests are electricity load forecasting, time series, machine learning, semi-parametric models and online aggregation of experts. He is managing the project "Statistics for Energy Management" dedicated to research works on energy market modelling.
C5	**Marie-Anne LOTZ** (female) is a **research engineer** in the "Statistics and Business Intelligence" Department at EDF R&D. She joined EDF R&D in 2015, and her main activities are focused on data science and electricity consumption forecasting on the individual scale (predictive models). Previously, she has been working for 5 years for a software company, specialized in analytics and data science, in Paris. On a daily basis, she calculated statistics, she conducted profile analyses and she built predictive models and scores that aim at predicting customers' behaviors and at understanding them. She produced statistical studies for her clients (banks, retail, insurance companies…) about their customers. Previously she studied statistics in Toulouse University and in Lyon University. As a consequence, she received 2 master degrees in statistics and business intelligence, in 2009 and 2010.
C6	**Jean-Marc JICQUEL** (male) is a **research engineer**. He has been working as a manager of electrical substations in ERDF (the French distribution company). Since 1993, he is working in the "Energy Efficiency in the buildings" Department at EDF R&D. He began to carry out energy audits and building thermal studies. The second part of his work concerns the analysis of commercial buildings load curves. His current work is related to the operation of building management systems (BMS) to detect faults management. He filed three patents about the management of water heating. He has co-supervised a PhD thesis with laboratories of the Mines de Paris engineering school on thermal model identification and is co-supervising another one with Telecom ParisTech.
C7	**Alexandre Girard** (male) is a **research engineer**. He graduated in 2000 from Ecole Centrale de Paris. He has been working as an engineer in the society Apside Technologies as a consultant for EDF R&D from 2000 to 2005 on control and optimization problems for the nuclear and thermal power plants. He is currently working at the "Simulation and Information Technologies for Power Generation Systems" Department at EDF R&D on signal and image processing questions for different domains, especially on the identification of thermal models for residential and tertiary buildings. He has co-supervised a thesis with laboratories of the Mines de Paris engineering school on thermal model identification and is co-supervising another one with Telecom Paris

4.1.10 ORANGE

Partner Full name		Orange			
Partner nº	**10**	Short name	**Orange**	Country	**France**

Partner entity description and relevance:

Orange is one of the world's leading telecommunications operators with annual sales of 43.5 billion euros and has 170,000 employees worldwide at 31 December 2012, including 105,000 employees in France. Present in 32 countries, the Group has a total customer base close to 231 million customers at 31 December 2012, including 172 million mobile customers and 15 million broadband internet (ADSL, fiber) customers worldwide. Orange is one of the main European operators for mobile and broadband internet services and, under the brand Orange Business Services, is one of the world leaders in providing telecommunication services to multinational companies.

With its industrial project, "conquests 2015", Orange is simultaneously addressing its employees, customers and shareholders, as well as the society in which the company operates, through a concrete set of action plans. These commitments are expressed through a new vision of human resources for employees; through the deployment of a network infrastructure upon which the Group will build its future growth; through the Group's ambition to offer a superior customer experience thanks in particular to improved quality of service; and through the acceleration of international development.

Business Motivation and Activities in the project:

Orange aims at delivering Big Data services for its customers, especially Business customers. These services include data collection, data publishing, Analytics as a service, all these functionalities under strict privacy guidelines.

In Electra project, Orange will focus its efforts on data collection and distributed big data, especially in the IoT environment (data collection from objects like smart meters and capability to apply Big Data models close to the object, or manage analytics at object level)

In addition Orange wants to deliver current best of class anonymization services and evaluate with partners advanced technologies like homomorphic encryption to ensure the best approach for data monetization.

As an industrial partner, Orange has a strong interest in operational results that could be adopted by the largest market. To achieve this ambitious objective Orange will lead WP9 related to business replicability.

Expertise from previous and on-going projects:

- X-Data: this French project (2013-2015) focused on data monetization and value of analytics regarding cross-fertilization between datasets from different sectors (Energy, Telco, Utilities…) Privacy was also an important enabler in this project (k-anonymization)
- FI-CORE is the infrastructure project from Public Private Partnership Future Internet (rebranded recently FIWARE) which aims at providing a set of enablers to instantiate platform as a service for several vertical sectors. Big Data enablers developed during this project are under integration into Orange commercial offers

Infrastructure and equipment:

Orange expects to use Flexible Data infrastructure, its Big Data infrastructure, from Big Data virtualization on top of Open stack cloud layer, till Big Data portal to publish and share datasets. In addition Flexible Data includes also access to Analytics tools like Khiops.

For Distirbuted Big Data like envisioned in some Use Cases (WP6) Orange will reuse and improve tools already implemented on small hardware like Rasperry Pi taking the best of additional technologies like Docker and Mesos to deploy analytics in IoT environment (fog computing)

Relevant publications products and services:

Collaborator profiles	
C1	**Mr Thierry Nagellen** (male), who is currently Big Data Research Project manager at Orange Labs, has a Master in Telecommunication and Computer Science. He is Research Program Manager in Orange Labs, in charge of Big Data activities like Big Data Platforms and Big Data Management. Previously he was also leading Orange contribution in Future Internet Public Private Partnership (FP7).
C2	**Dr Sébastien Canard** (male)is a research engineer at Orange Labs, in the Applied Crypto Group. He received the doctorate degree in computer sciences from the Université de Caen Basse-Normandie (France), in 2003. His research interests include the design of efficient and secure cryptographic protocols, mainly related to privacy-preserving telecommunication services. His main contributions concern cryptographic tools to provide both anonymity and accountability, or to perform computations over encrypted data.
C3	**Dr Frédéric Guyard** (male)is Research Engineer at Orange Labs since 2001. he has a Ph.D. in Mathematics from the University of Nice (France). He has held research positions at the Weierstrass Institute (Berlin, Germany), at the Technical University Hamburg (Germany) and at the Ecole Polytechnique Fédérale de Lausanne (Switzerland). His current interests are focused on datamining and learning machine especially in the context of Big-Data.
C4	**Mr Frédéric Théron** (male) has a Master in Computer Science. He is Anticipation Project Manager in Orange Labs, in charge of innovative Big Data infrastructure to be deployed in cloud environments.

4.1.11 Powel

Partner Full name		Powel AS			
Partner nº	**11**	Short name	**Powel**	Country	**Norway**

Partner entity description and relevance:

Powel AS is a private owned Norwegian ICT company with 400 employees. Powel develops and delivers ICT software solutions and technology in an international market to companies in the whole value chain of the power industry (metering, grid, generation, trade, data management). Powel holds excellent power industry knowhow and 50% of its revenue comes from consultancy services while the other part is from software products and solutions. Powel technology is today managing big data challenges in smart metering, grid operation and power generation. The big data technology solution is basically generic and applicable in the whole power industry value chain.

Business Motivation and Activities in the project:

In the ELECTRA project Powel will be a technology provider for use cases both for distribution and generation demonstrators. This is a type of companies which represent main market for Powel as a provider of software solutions and applications in an international market. Powel has long term experience in managing big data for decision support, analytics and O/M in the energy industry. We experience that the amount of information and data is increasing fast and big data challenges and opportunities are coming up as important for this industry. By participating in ELECTRA, Powel will achieve skills in using big data technologies to expand our business and knowledge. ELECTRA will position us as an innovative company which uses advanced big data technology in their solutions. Indirectly Powel will in its operation market European big data technology and demonstrate how this will add value to energy industry. The main contribution from Powel to ELECTRA is applications and big data technology used in the pilots.

Expertise from previous and on-going projects:

As a technology provider with applications and big data technology regarding time series management and decision tools, Powel has many projects which include deliveries of solutions. For distribution companies we have delivered more than 80 GIS/DMS solutions in Nordic market and for generation companies we are a global leader in solutions for hydro power generation planning and power trade. As an example it can be mentioned that we are in a process of delivering a hydro power solution for UNIPER/EON. Powel is about to finalize its own big data technology named Powel MESH.

Infrastructure and equipment:

The aim of the Powel solutions and contribution are to improve monitoring, analytics, predictions and decision making processes by using a variety of data sources – real time and historical.

The Powel deliveries are either cloud based services, tailored and demonstrated for each use case or delivered from a platform at customer's environment.

For each offering it is given required information as follows:

Big Data Manager (Powel MESH):

The Powel solution for big data management is used for smart meter data and data related to time series and events in general in the energy value chain. The solution includes sophisticated VEE features and analytics for reporting etc. and is integrated with applications and third party solutions. The solution is used in several big data projects.

Dashboard:

Several user interfaces and dashboards for visualization of big data and analytics for decision support, monitoring and control purposes. They integrate with applications and are in some cases interactive apps. The dashboards are typically related to map interfaces and GIS/DMS in the distribution area.

Monitoring:

For distribution grid management it is applied user interfaces which in real-time monitor the status of the grid including end customer's quality of supply/outages. The information is collected from sensors, SCADA/DMS and other sources. Information is presented as alarms and alerts in addition to different status information.

Prediction:

Machine learning applied to predictions for conditioned based maintenance based on sensor measurements, historian data of failures and regulatory framework regarding quality of supply and operational standards.

Grid Operation and Planning:

Efficient grid operation and planning requires decision support tools which is based on historian data, real time measurements and grid characteristics including demand side. The information is input to algorithms which ranks actions and decisions regarding operational and planning tasks and actions. The solution collects data and process it – and reports it- for decision support.

Forecaster:

Forecasting toolkit comprising different technologies that allows selection of input variables, resolution and horizon. It is applied for short term demand, wind and inflow forecasting of many clients for different purposes and in several European countries. Forecasting modules are tailored for the actual kind of forecast (Kalman, HBV, etc.).

Optimal:

An application used for optimizing energy generation and trade for the short and medium term market. It has resolution from minutes to days and basic data input is time series and parameters from historian sources and forecasts of price, fuel prices and weather. The optimization is used for business decision support and maintenance planning. The solution is used in several European countries. (Technology…)

Relevant publications products and services:

Metering: https://www.valider.no/nyheter1.html (Norwegian)

Generation:http://www.powel.com/about/news/powel-mesh-advanced-analysis-for-power-producers/

Smart Grid: http://www.powel.com/solutions/infrastructure1/

Collaborator profiles	
C1	**Klaus Livik (**male**):** More than 20 years experiences in ICT projects related to the electricity value chain. Experience from SINTEF, utilities and Powel. Project manager and research scientist in several European projects. Holds an M.Sc. in physics from NTNU.
C2	**Tore Vestues (**male**)**: IT-architect and developer with focus on cloud and disruptive technologies. 15 years of experience developing software within a broad range of industries. The last two years with full focus on software

	development related to smart grid. Holds an M.Sc. in Informatics from NTNU.
C3	**Tor Hovland (**male**)**: 15 years' experience developing software, mostly related to energy production, trade and meter data management. Has also had roles as chief architect, product portfolio manager and business manager. Holds an M.Sc. in physics from NTNU.
C4	**Stein Petter Agersborg (**male**)**: 15 years of experience developing software, mostly related to energy production, trade, meter data management and NIS. Project manager for large development projects and is heading Powel's Business Analytics department which delivers solutions for Big Data analytics. Holds an M.Sc. in physics from NTNU.

4.1.12 SINTEF

Partner Full name		STIFTELSEN SINTEF			
Partner nº	12	Short name	SIN-ICT	Country	Norway

Partner entity description and relevance:

STIFTELSEN SINTEF (www.sintef.no) is the largest unit within the SINTEF group. SINTEF is Scandinavia's largest independent research organization, and is a non-profit research foundation. SINTEF employs 2100 people most of whom are located in Trondheim and Oslo (Norway). More than 90% of the annual turnover derives from contract research for industry and the public sector in Norway and internationally, with only a small state funding (around 6%). SINTEF is multidisciplinary, with international top-level expertise in a wide range of technological and scientific disciplines, medicine and the social sciences. The SINTEF vision is "technology for a better society", and it is an important aspect of the societal role to contribute to the creation of more jobs. SINTEF acts as an incubator, commercializing technologies through the establishment of new companies. SINTEF Stiftelsen is participating in this consortium by SINTEF ICT through the department for Networked Systems and Services (NSS), and the Department of Applied Mathematics. SINTEF is one of the founding organisations in the European BDVA, Big Data Value Association, http://www.bigdatavalue.eu. Through this role SINTEF is involved in the European industry and research activities in the Big Data domain, in particular as one of the signing partners of the Big Data PPP (Public Private Partnership). SINTEF is also involved in standardisation activities on Big Data with ISO/IEC JTC WG9 Big Data, and in OMG and the Industrial Internet Consortium, http://www.iiconsortium.org/

SINTEF ICT, Networked systems and services, Smart Data group offers basic software and leading expertise in Big Data with a particular emphasis on Big Data Architecture and Big Data Management. SINTEF ICT, Applied mathematics offers basic software and leading expertise in Big Data Analytics and Visualization – with a foundation in optimization, simulation, and visualization. These assets will be utilized to fulfil tasks across several use cases, primarily related to planning, routing, scheduling, network (re)design, constrained clustering, AI (Heuristics, Knowledge Based Systems, Case Based Reasoning, Machine Learning)

Business Motivation and Activities in the project:

SINTEF ICT is a technology partner with a responsibility for the overall Big Data architecture in the project. SINTEF ICT is having the technical coordination of the project and the lead of WP3 on Big Data Solutions' Adaptation for Energy.

SINTEF supports the complete Big data value chain, from the big data architecture and platform, to data analytics and data management with a focus on handling variability through linked data and on data management for proactive sensing. This is also in synergy with the SINTEF ICT role of being responsible for the Technical priorities in the BDVA organisation and being the leader of the GEMINI Big Data Centre of Excellence in Norway with a further strategy for dissemination of ELECTRA success cases for replication and transfer to other domains. SINTEF is in addition having a business motivation for the further industrial usage of a Big Data toolbox based on software components from the Electra project, combined with the open source DataGraft data transformation and linked data technology software that SINTEF is bringing into the project. Project results and experience will be further be disseminated through publications, events incl. national and international conferences, and communication in non-technical fora; focusing on the opportunities and big data technologies that will enable data-driven innovation in various sectors.

Expertise from previous and on-going projects:

- **proDataMarket** (http://prodatamarket.eu, 2015-2017), coordinated by SINTEF, a Horizon 2020 Big Data Innovation project, which provides a data marketplace for geospatial and property-related data based on use of Linked Data technologies.
- **DaPaaS** (http://dapaas.eu, 2013-2015), coordinated by SINTEF, develops A Data- and Platform-as-a-Service Approach to Efficient Data Publication and Consumption. It aims to simplify the data publication process for organizations with limited expertise in the field, and to reduce the costs for data integration & consumption. At the same time, DaPaaS targets the creation of an application ecosystem and a hosting environment for 3rd party data-driven applications. DaPaaS is a key initiative from which results will be extensively used in this project
- **SmartOpenData** (http://www.smartopendata.eu, 2013-2015) creates a Linked Open Data infrastructure (including software tools and data) fed by public and freely available data resources, existing sources for biodiversity and environment protection and research in rural and European protected areas and its National Parks
- **ProaSense** (http://www.proasense.eu, 2013-2016), coordinated by SINTEF, develops a set of technologies and novel approaches for scalable storage and access to real time sensed data; development of smart sensing services, services for anticipation management, approaches for probabilistic stream processing and goal-driven Complex Event Processing
- **INFRARISK** (http://www.infrarisk-fp7.eu, 2013-2017) - a European project integrating data related to risks and natural hazard events for critical infrastructures, using linked data technologies.
- **ENVIROFI**, EU FP7 (ICT, FI-PPP), 2011-2013 (www.envirofi.eu). The Environmental Observation Web and its Service Applications. Usage Area project on Environment of the Phase 1 of the Future Internet PPP (FI-PPP)

Infrastructure and equipment/software:

1. **DataGraft: www.datagraft.net -** Data transformation tool with support for linked data representations.

2. **Cloud components configuration and orchestration** http://cloudml.org/ - now becoming part of the OASIS TOSCA standard on Topology and Orchestration for Cloud components.

3. **Data analytics components:** SCOOP on discrete optimization and network optimization, https://www.sintef.no/en/software/scoop.scheduler/

Relevant publications products and services:

1. Carlos Granell, Arne J. Berre et.al., "Future Internet technologies for environmental applications", Journal of Environmental Modelling & Software, Volume 78, April 2016, Pages 1–15

2. Arne J. Berre and Sven Schade (editors), Proceedings of the Workshop "Environmental Information Systems and Services - Infrastructures and Platforms - with Citizens Observatories, Linked Open Data and SEIS/SDI Best Practices", October 2015

3. D. Roman, D. Norheim: An Overview of Norwegian Linked Open Data - Applications in Regional Development and Environmentally Friendly Behavior. Proceedings of the 4th International Conference on Information, Process, and Knowledge Management (eKNOW 2012) in Valencia, Spain, from January 30, 2012 to February 4, 2012.

4. Arne J. Berre et. al, Big Data Processing and Apps for Citizens' Observatories - The CITI-SENSE Approach, INSPIRE'2015 and GeoWorld'2015, Lisbon, Portugal, May 2015

5. Arne J. Berre and Sven Schade (editors), Proceedings of the Workshop "Environmental Information Systems and Services - Infrastructures and Platforms - with Citizens Observatories, Linked Open Data and SEIS/SDI Best Practices", January 2015, http://ceur-ws.org/Vol-1322
6. Arne J. Berre, S. Schade, D. Roman: Environmental Infrastructures and Platforms with Citizens Observatories and Linked Open Data. ISESS 2013: 688-696.

7. Arne J. Berre; T. Usländer, S. Schade "Identification and Specification of Generic and Specific Enablers of the Future Internet - Illustrated by the Geospatial and Environmental Domain.", Lecture Notes in Computer Science, Volum 6994. s. 278-289, 2011

Collaborator profiles	
C1	**Dr. Arne-Jørgen Berre** (male) is chief research scientist at SINTEF. He received his Ph.D. on "Object-Oriented Systems Interoperability" from the Norwegian University of Science and Technology in 1993. He has been working with object-oriented and non-relational databases since the late 1980's – with the HyperModel benchmark for Graph-databases published in 1990. He has been involved in geographic data management and standardisation activities of geospatial infrastructures and models since the start of ISO/TC211 and OGC in 1995. He has served as technical manager and project manager for a number of IST projects related to semantically interoperable systems, environmental and geospatial services. In particular DISGIS, ATHENA, INTEROP, ACE-GIS, SWING, SHAPE, ENVISION, ENVIROFI and CITI-SENSE, and involved in proDataMarket, DaPaaS and ProaSense. He is currently the leader of TF6 on Technical Priorities in the Big Data Value Association (BDVA) with responsibilitiy for the subgroups on Big Data Management, Architecture, Analytics, Privacy, Visualisation and Standardisastion, and the leader of the Norwegian GEMINI Centre of Excellence on Big Data.
C2	**Dr. Dumitru Roman** (male) works as a Senior Research Scientist at SINTEF ICT, which he joined at the end of 2009. He is currently the project coordinator of the proDataMarket Big Data Innovation project in Horizon 2020 and the DaPaaS project and was previously the project coordinator of the FP7 DaPaaS project and the FP7 Environmental Services Infrastructure with Ontologies (ENVISION) project and the technical coordinator for the preceding Semantic Web Services Interoperability for Geospatial Decision Making (SWING) project. In the context of PlanetData and Semicolon2 projects has lead the development of several applications based on Norwegian open public data.
C3	**Mr. Jakob Høgenes** (male) is research engineer at SINTEF. He obtained his M.Sc. in Engineering Cybernetics from the Norwegian University of Science and Technology in 2015, specializing in the field of medical image analytics with the subject "Model-Based Estimation of Intracardiac Blood Flow Velocity Patterns Based on Ultrasound Imaging". He is currently working in the EU H2020 project MC-SUITE, where Big Data methodology and technologies – including Apache Hadoop, Spark, Storm, Mesos, CouchDB and more – is being exploited to improve upon the productivity of the manufacturing industry, reducing the gap between the programmed process and the real part.
C4	**Dr. Atle Riise** (male) is senior research scientist at SINTEF. He received his Ph.D. on "Integrated planning and scheduling in operational patient management" from the University of Oslo in 2015. He has been a researcher in optimization methods since 1998. His main research focus is on hard planning, routing, and scheduling problems in real world applications. He is the project manager for a new SINTEF initiative within load scheduling in a demand response context. He has also served as the project manager or technical manager for several national and international research projects. In the period 2003-2007, Atle Riise was the research manager and group leader for the Optimisation group in the Department of applied mathematics, in SINTEF ICT

4.1.13 SINTEF Energi

Partner Full name		SINTEF Energi			
Partner nº	13	Short name	SIN-EN	Country	Norway

Partner entity description and relevance:

SINTEF Energy Research is a company that is part of the SINTEF Group. SINTEF Energy Research is a universally beneficial research institute, formally identified by the EU Commission as a non-profit organisation. The institute maintains a strong position in the EU's Framework Programme for research, and participates in an extensive range of projects linked to issues such as energy systems, energy planning, wind power, CO_2 transport, and cleaning technologies for gas- and coal-fired power plants. The institute's high-level technical profile provides an excellent basis for positioning its research community at the forefront of European energy research.

The ELECTRA primarily engages the Department of Energy Systems, which focuses mainly on the electric power system. Relevant resources include:

- Deep knowledge of (electric) power system and value chain
- Applied research on active power networks and Smart Grid
- Machine learning and analytics applied to the energy system: load forecasting and modelling, demand response, customer acceptance, modelling of price/load dynamics, time series analysis and modelling from multiple projects (ElDeK, EcoGrid EU, Cossmic EU, ++).
- Extensive experience with sensors and metering equipment, including data processing, handling and analysis.
- Decision support models and tools for preventive maintenance and reinvestment planning – asset management
- Models and tools for component lifetime and failure probability estimation
- Suite of optimization and planning tools for the energy sector. In operational use by several European energy producers.

Business Motivation and Activities in the project:

SINTEF Energy Research aims to use its combination of domain expertise and machine learning and data analytics competence to develop innovative data-driven models for the project use cases.

The power system value chain, in particular the customer end of the chain (including the distribution system), is undergoing a revolution in terms of both the need for and capability of monitoring and control. The rapid introduction of distributed intermittent RES drives the former, and the rollout of AMI is central to the latter. As an applied energy research institute, it is paramount for SINTEF Energy Research to be at the forefront of this transformation process. The ELECTRA project is an opportunity to consolidate numerous on-going research efforts under a Big Data value chain perspective.

SINTEF Energy activities in the project will focus on the integration of Big Data technologies with domain expertise on selected use cases. The effort will be two-fold: through cooperation with technology providers from the ICT sector, and through adaptation of existing tools and methodologies to take advantage of the possibilities offered by Big Data technology.

Expertise from previous and on-going projects:

EcoGrid EU (2011-2015): Coordinator of an EU FP7 project demonstrating real-time market-based demand response for small-scale consumers on the island of Bornholm. http://www.eu-ecogrid.net/

DeViD (2012-2015): Main R&D partner of the Norwegian innovation project "DeViD": Demonstration and Verification of Intelligent Distribution Networks. Topics included smart planning, maintenance and operation, exploitation of user flexibility and value potential from AMI. https://www.sintef.no/projectweb/devid/

SPESNETT (2012-2016): Smarter operation, planning, monitoring and control of power quality, in order to reduce the need for extensive and expensive upgrades in the distribution network. http://www.energinorge.no/skjulte-paagaaende-prosjekter/spenningskvalitet-i-smarte-nett-spesnett-article9518-560.html

FlexNett (2015-2017): The FlexNet project will contribute to increased flexibility in smart distribution networks through demonstration and verification of technical and market-based solutions for flexibility at various levels of the power grid and for the benefit of different power system actors and stakeholders. https://www.sintef.no/projectweb/flexnett/

MonitorX: Develops models for condition monitoring and fault/lifetime prediction. Develops model for risk monitoring. Develop models for scheduling and timing of maintenance and reinvestment.

Other projects: http://www.sintef.no/projectweb/fram/

http://www.sintef.no/en/projects/syslife-system-for-tilstands-og-levetidsrelaterte-/

www.sintef.no/eldek/

Infrastructure and equipment:

1. Energy Applications:
   - EFP: Tool for estimation of failure probability for power system components. Current prototype in Excel/Matlab. Uses life curves and expert domain knowledge. TRL 7, in industrial use today.
   - Aha: Tool for estimating power quality and identifying power quality events based on high-resolution metering data. Current prototype in Matlab. TRL 3, currently under development.

Both tools are developed by SINTEF Energy Research and owned by Energi Norge. Project use is pending agreement with owner.

Relevant publications, products and services:

Reports from the above mentioned projects, especially EcoGrid, DeVID, Spesnett, SysLife and FRAM (some reports in Norwegian only).

Henning Taxt, Helge Seljeseth, Henrik Kirkeby, (2015). New methods for distribution network monitoring with smart meters – verifying data in network information systems, CIRED, Lyon, 2015.

Helge Seljeseth, Henrik Kirkeby, Henning Taxt, (2015). Benefits of voltage measurements with smart meters, CIRED, Lyon, 2015.

Catrinu-Renström, Maria Daniela, Istad Maren, Nordgård Dag Eirik (2011). Dealing with uncertainties in long term investment planning of electricity distribution systems with distributed generation. Advances in Safety, Reliability and Risk Management: proceedings of the European Safety and Reliability Conference, ESREL 2011.

Høverstad, B.A. et al., "Short-Term Load Forecasting With Seasonal Decomposition Using Evolution for Parameter Tuning," in *IEEE Transactions on Smart Grid,* , 6(4), 2015.

Sæle, H.; Grande, O.S., "Demand Response from Household Customers. Experiences from a Pilot Study in Norway", in *IEEE Transactions on Smart Grid*, 2 (1), 2011.

Wiborg, T. C.; Solvang, E.; Heggset, J.; Daleng, J., *The Development and Implementation of Competence and Tools for optimal Maintenance*, in Proc. HydroVision 2004, 2004.

EFP: Tool for estimation of failure probability for power system components. Current prototype in Excel/Matlab. Uses life curves and expert domain knowledge. In industrial use today.

Aha: Tool for estimating power quality and identifying power quality events based on high-resolution metering data. Currently under development in the SPESNETT project.

C0ollaborator profiles	
C1	**Boye Høverstad (**male**),** Research Manager, PhD computer science (NTNU, 2010). Researches the use of data-driven and machine learning methods in distribution system control centres for smart grid. Areas of expertise include data analysis, forecasting, simulation and modelling, with specific focus on applications in electric power systems domain.
C2	**Hanne Sæle (**female**)**, Research Scientist, M.Sc. electrical engineering (NTNU, 1998). Experience as Research Manager, Research Scientist and Project Manager at SINTEF Energy Research. Areas of expertise include Smart Grids, demand response, end-users behaviour, energy consumption, power market, network tariffs, demand side management, energy efficiency projects, and AMR/smart metering technology.
C3	**Maren Istad (**female**)**,, Research Scientist, specializing in condition assessment of grid components, state estimation, asset management and maintenance in power production and distribution network. Involved in numerous projects targeting use of sensor data for optimal asset management in the electric power system.
C4	**Thomas Welte (**male**),** Research Scientist, specializing in reliability and lifetime analysis; maintenance planning, strategies, modelling and optimization; analysis of inspection and lifetime data; and degradation models, all with application to the energy sector.

4.1.14 The Norwegian Smartgrid Centre

Partner Full name		The Norwegian Smart Grid Centre			
Partner nº	**14**	Short name	**NSGC**	Country	**Norway**

Partner entity description and relevance:

The Norwegian Smartgrid Centre (NSGC) is a national initiative within the European Smartgrid Technology Platform (ETP Smartgrids) that connects us to 11 national and regional platforms across Europe. The NSGC acts as a member of the Board of Directors of the Global Smartgrid Federation (GSGF) constituted by similar organizations in 18 countries globally. The Norwegian Smart Grid Centre (NSGC) is a national center for competence building within smart grids and has approx. 45 members from power companies, telecom and the supply industry as well as universities and research institutes. The Centre is a membership organization fostering a higher degree of collaboration between Industry and R&D Institutions. The NSGC works for the promotion of research and development, education, demonstration projects and commercialization within Smart Grids in Norway. A key element in the work of the NSGC is the coordination of the Norwegian Demonstration program for Smart Grids, "**Demo Norway"**, with seven large real life demonstration sites comprising more than 20.000 network customers and one national smart grid laboratory. The seven real life demonstration sites under the **Demo Norway** umbrella are hosted by different power companies. Such a demonstration program is needed to successfully address the novel integration challenges identified by the EU SET-Plan*;* the consumer becomes active and is put at the center of the energy system; a demand focus that increases energy efficiency across the energy system; an energy system optimization leading to a secure, cost-effective, clean and competitive energy supply.

Business Motivation and Activities in the project:

ELECTRA will be the first demonstration project ever in Norway on dig data and the power of big data analytics for the transformation of the energy system, set in an European context. The Norwegian Smart Grid Centre is highly interested in the expected project results of ELECTRA and will actively communicate and disseminate results amongst the national members of the NSGC, and to the international network through the Global Smart Grid Federation and The European Smart Grid Technology platform. Nationally, NSGC will has plans for dissemination to industry and regulators specifically:

- Presentations of project results at the yearly National Smart Grid Conference with app. 300 participants (50% participation from grid operators, 30% from ITC industry, 20% from academic community, regulators and industry associations)
- 4-6 articles disseminated through the NSGC's bi-monthly, electronic newsletters reaching 800 industry and academic subscribers in Norway.
- Additionally, the project will contribute to an international dissemination of results through one of the webinars offered by the Norwegian Smart Grid Centre to its partners in the Global Smart Grid Federation (GSGF). NSGC is a member of the Global Smart Grid Federation. Hosting open webinars on specific subjects is one of the obligations by being a member of the Global Smartgrid Federation. The webinars are announced though the GSGF network.

The NSGC's activities in ELECTRA will focus communication, dissemination, standardization, and the engagement with the broader stakeholder eco-system.

Expertise from previous and on-going projects:

Ongoing (2010 -): National Coordination of 7 Smart Grid Demonstration Projects in which 6 are executed by DSO's and one i Executed by a TSO: Demo Smart Energy Hvaler (www.smartenergihvaler.no); Demo Steinkjer (www.demosteinkjer.no); Demo Lyse Smart City Grid and customer Services (www.demolyse.no); Demo Hafslund Grid Faults and Interruptions handeling: Demo BKK Flexible Grid Operation; Demo SFE Smart Valley; TSO Pilot North Norway Load Management and smart system operation.

Ongoing: Program manager of the annual National Smart Grid Conference with app 300 participants and 35 presentation.

Ongoing: Active in the European Smart Grid Technology Platform (general assembly, working groups, workshops, and webinar)

Ongoing: Serving at the Board of Directors at the Global Smart Grid Federation

Infrastructure and equipment:

Relevant publications products and services:

2015. *Norwegian National Smart Grid Research Strategy*. Report Co-authored by the members of the Scientific Committee of the Norwegian Smart Grid Centre. www.smartgrids.no

2014. *Moving towards the Smart Grid: The Norwegian Case.* Olav B. Fosso, Marta Molinas, Kjell Sand, and Grete H. Coldevin. Paper at the 2014 International Power Electronics Conference, Japan 2014.

2014. *Demo Norway for Smart Grids*. Characteristics of the Norwegian power system and electricity use and a presentation of the ongoing demonstration activities in Norway. "Case book" contribution to the International Smart Grid Action Network (ISGAN)

2014. *Recommendations to the Government*'s White Paper on Holistic Energy Politics for 2030-2050 (to be released in 2016). Paper authored by the Steering Committee of the Norwegian Smart Grid Centre. www.smartgrids.no

2014 *Smart Grid Strategy for Research, Testing and Demonstration for Norwegian DSOs* that are members of the Norwegian Smart Grid Centre. Report co-authored with the DSO representatives, SINTEF Energy and Enfo Consulting. www.smartgrids.no

Collaborator profiles	
C1	**Grete H. Coldevin** (female), Ph.D. and Executive Director of The Norwegian Smartgrid Centre. Managing the Norwegian Smart Grid Centre (NSGC) representing 45 leading companies and academic institutions in Norway for the advancement of the smart grid. Activities: 1) Promote education, research, demonstration and standardization. 2) Maintain international network through The Global Smart grid Federation, IEA International Smart Grid Action Network, and European Technology Platform for Smart Grids. 3) Formulate strategic priorities as input to national authorities and energy agencies. 4) Establish and coordinate a National Smart Grid Technology Innovation Platform—"Demo Norway for Smart Grid".
C2	**Kjell Sand** (male), Ph.D. and acting as Scientific Manager in The Norwegian Smartgrid Centre and is employed at NTNU (The Norwegian University of Science and Technology) as associate professor at the Department of Electric Power Engineering. He graduated as Electrical Engineer (M.Sc), 1976 from Norwegian University of Science and Technology (NTNU) and received his Ph.D degree from NTNU in 1987. His areas of research and project work has been within: Smart grids, Power system planning, power system asset and risk management, power quality, power system reliability, regulatory issues (monopoly regulation of TSOs and DNOs, benchmarking), power system tariffs and cost issues, design and development of power system analysis software (Network Information System development).

	He has been active for many years in international work within CIGRE, CIRED, EURLECTRIC, IEC and CENELEC

4.1.15 Computas

Partner Full name		Computas AS			
Partner nº	15	Short name	COMPUTAS	Country	NORWAY

Partner entity description and relevance:

Computas is an ICT solutions provider based in Norway delivering services and solutions for work processes and integrated operations in industry and public services. Core competencies include system development, architecture and integration, project management, and consulting. Computas has participated in several domestic and EU-funded R&D projects. The company employs approx. 300 highly skilled engineering professionals and staff members.

Business Motivation and Activities in the project:

Computas' main motivation for participating in the project is to become more competitive in the industrial energy solutions and services market by developing technical and managerial capabilities adapted to Big Data business areas, including smart grids. Computas will act as an implementation partner of LSP demonstrators, including but not limited to WP5 Energy Distribution, providing architecture, design, development, and testing activities. Computas will also provide specialized skills and technology in:

- Semantic Hubs (Big data collection, integration, and distribution), based on previous work with Hafslund Nett (DataNav) and the EPIM organization (Exploration & Production Information Management)
- Process orchestration and collaboration, based on large scale process management applications and Computas tools FrameSolutions™ and CODIO (see section on relevant products)

Expertise from previous and on-going projects:

Current development and test work for Hafslund Nett related to smart meter rollout:

- Interfaces between Hafslund integration hub (DataNav triple store) and other systems, mostly based on SOAP/XML
- Interfaces to smart meter data in MS Azure to meter data collection solution, work order system, CAB, GIS system, and "My Page" services
- Quality portal, unified interface to system data flows, accessible to developers, testers, and operational personnel

Previous work in Integrated Operations ("smart grids for the oil & gas industry"), including:

- ENIOC (2013-15), Coordination management in distributed operation centers, real-time data integration, visualization and case management. NFR grant DEMO2000 226054.
- CODIO (2010-12), Collaborative decision making in integrated operations, data driven models, uncertainty handling and Bayesian decision networks. NFR grant PETROMAKS 175899.

Infrastructure and equipment:

Comprehensive infrastructure supporting nearly 300 software professionals:

- Server farm with high redundancy and VMware-based virtual server management
- Highly secure and high speed intranet (Gigabit Ethernet) and Internet connections
- Complete development environments for large scale software projects (.Net and Java)
- ISO 9001 certified quality system, agile development methodology, certification focus

Relevant publications products and services:

Products:

- FrameSolutions™ - Process orchestration for Adaptive Case Management
- CODIO - Collaborative decision making in distributed operations centers

Services:

- Business process management
- System architecture & integration
- Software engineering services
- Collaboration and compliance solutions
- Information Management/Big Data
- Consulting and project management

Publications:

- Big Data in Subsea Solutions, Subsea Valley Conference and Exhibition 2014, Fornebu, Norway, April 2014, R. Fjellheim
- Smart Collaboration for Decision Making in Drilling, SPE 167391, SPE Intelligent Energy International Conference and Exhibition, Dubai, October 2013, R. Fjellheim et al.
- Artificial Intelligence and Autonomy in Oil & Gas, NFA Autonomy in the Oil & Gas Industry Conference, Stavanger, Norway, March 2012, R. Fjellheim

Collaborator profiles	
C1	**Roar Fjellheim (**male**)**, Director, Business Development. MSc in technical cybernetics and computer science, NTNU. Roar served 6 years at CERN, Geneva as software engineer, before co-founding Computas in 1985. His responsibilities have included technology, quality and R&D management, as well as business development and project management. Since 2005, Roar has initiated and managed projects in the oil & gas and energy industries, mainly projects to optimize operations through digital technology. He is also an adjunct professor at the Univ. of Oslo (AI, integrated operations, big data).
C2	**Jon Gunnar Aasen (**male**)**, Head of Department and Section Manager, Energy industries. Jon-Gunnar has more than 10 years' experience project financing and project management of European cooperation projects (FP7, Interregional and EEA grants). The last 6 years he has worked in IT development projects as project manager for both customers and suppliers. Including a domain responsibility for power and grid companies, he is also heading Computas' efforts in compliance services and content management.
C3	**Armen Julukian (**male**)**, has a Ph.D in Computer Science and statistics from NTNU and is an experienced analyst (data mining, data modelling, predictive analytics, statistics and more). Armen has deep knowledge in Business Intelligence and data analytics frameworks (Microsoft SQL Server, Microsoft Azure ML studio, SAS Institute, R, SPSS, Matlab and Stata). Armen is currently working in one the largest data warehouse projects in Norway as an analyst (NAV – the Norwegian Labour and Welfare Administration).
C4	**Mona Tran** (female) is an experienced test manager and project manager coming from the programming side of IT projects. Being a former teacher and mathematician, she has also developed very good communication skills. She has specialized in test management over the last couple of years and works currently as test manager in Hafslund Nett and the AMS smart meter project.

4.1.16 Hafslund

Partner Full name		Hafslund Nett AS			
Partner nº	16	Short name	Hafslund	Country	Norway

Partner entity description and relevance:

Hafslund Nett AS (HN) is the largest Distribution System Operator (DSO) in Norway and the fifth largest in the Nordic countries, serving approximately 680 000 customers in 40 municipalities. Business Motivation and Activities in the project:

Hafslund Nett has a staff of 300 and a turnover of more than M€400.

Hafslund Nett's parent company, Hafslund ASA, is a leading supplier of electricity and district heating, the majority of whose customers are located in Oslo, Akershus. Hafslund has produced renewable hydropower for more than 100 years, with a strong focus on bioenergy and waste-to-energy.

Hafslund owns one of Europe's most state-of-the-art operations centres that manages, monitors and optimises the operation of Hafslund's power grid and the company's power and district heating plants.

Expertise from previous and on-going projects:

- DeVID - Demonstration and Validation of Intelligent Distribution Nets
- SPESNETT – Power quality in Smart Grids
- NGF – Energy Management in Agriculture
- SESAME – Big Data Energy Data Hub based on Semantic Linked data technologies

From the SESAME project Hafslund is now investing a large effort into creating a Big Data solution with a Semantic Hub as the integration point for all the administrative and technical information in Hafslund, including links to the AMS measurements. The plan is that all the information managed by Hafslund will be managed by this Hub from 2017.

The SESAME investment represents a new strategic direction towards Hafslund becoming a data driven organisation, and the ELECTRA project will become a valuable addition to this Big Data managment effort – enabling us to gain even more value from our collected and connected data.

Infrastructure and equipment:

Hafslund Nett owns and operates the power distribution network for Oslo and most of Akershus county and portions of Østfold county. Hafslund also owns and operates the regional distribution network in Østfold county.

Relevant publications products and services:

Kjølle, Gerd Hovin; Vadlamudi, Vijay Venu; Kvistad, Sigurd; Tutvedt, Kjell Anders. (2013) Potential for improved reliability and reduced interruption costs utilizing smart grid technologies. CIRED 2013 Electricity Distribution Systems for a Sustainable Future.

Collaborator profiles	
C1	**Åshild Vatne,** (female) (M.Sc./siv.ing. Power Engineering) Assistant research coordinator, Hafslund Network Strategy
C2	**Per Edvard Lund** (male) (M.Sc./siv.ing. Power Engineering) Director Hafslund Network Strategy Responsible for Asset Management, Long Term Planning, R&D portfolio and Smart Grid strategy Mr.
C3	**Kjell Anders Tutvedt**, (male) (M.Sc./siv.ing. Power Engineering) Senior engineer, Hafslund Network Strategy Responsible for Smart Grid, Hafslund AMS/Smart meter project Experience from fault analysis and grid operation at Hafslund Control Centre
C4	**Robert Seguin**, (male) (Phd. Physics) Research coordinator, Hafslund Network Strategy

4.1.17 DTU

Partner Full name		Technical Univesity of Denmark			
Partner nº	17	Short name	DTU	Country	Denmark

Partner entity description and relevance:

Today, DTU is ranked as one of the foremost technical universities in Europe, and continues to set new records in the number of publications, and persistently increase and develop our partnerships with industry. DTU is one of the funding organizations in the European Big Data Value Association (BDVA).

As of October 2015 Reuters Top 100 World's Most Innovative University ranked DTU as 1st in the Nordic region and 7th in Europe. According to the Leiden Ranking Citation impact indicator (top 10% publications – all sciences) DTU was ranked 1st in the Nordic region and 48th in Europe.

DTU Compute http://www.compute.dtu.dk/english/about_us

DTU Compute is Denmark´s largest environment for mathematics and computer science with more than 400 employees, and currently the largest department on DTU. The expertise is within the fields of Mathematics, Statistics, Complex Systems Theory, Forecasting, Control, Optimization, Numerical Analysis, Cognitive Systems, Image Analysis, Software Engineering and Embedded Systems. DTU Compute has a high focus on applications and one of the mail areas of applications is Energy and Power Systems Modelling, Forecasting and Control.

Mathematics and computer science are in everything - from the artificial pancreas to the self-repairing computer through forecasts for surplus wind energy to Facebook and Google. IT and mathematics lay the foundations for what we can achieve, constituting he key technologies for our future digital society.

Hot topics today include Big data, or tiny sensors placed in buildings or on clothes or inserted under the skin to measure how we feel and what we need, better foods or bespoke pharmaceuticals. All areas where DTU Compute is in the thick of things. DTU Compute is hosting the national Big Data Innovation Center. DTU Compute is responsible for the white paper on Big Data Analytics within BDVA.

DTU Compute is head of CITIES (Center for IT-Intelligent Energy Systems in Cities), which currently is the largest research project related to Smart Cities in Denmark (www.smart-cities-centre.org).

Business Motivation and Activities in the project:

DTU is responsible for WP7 which is the Large Scale Pilot in the Energy and Power Management Domain. Furthermore DTU Compute will actively participate in WP3 with a focus on T3.3 Big Data Analytics.

Expertise from previous and on-going projects:

- **SmartNet** (2016-2019), H2020 project focusing on the used of big data and statistical modelling for optimizing DSO and TSO interactions in future smart grids. The project aims to develop optimal market structures and optimal interactions to leverage flexibility in low voltage grids.
- **National Big Data Innovation Center** (2016-2020). A national funded big data innovation center. The kickoff meeting is in May 2016.
- **CITIES (Center for IT-Intelligent Energy Systems in Cities)** (2014-2019). A Danish National Research Center on IT and data mining related to smart cities with a focus on big data ICT, IoT and Energy Systems Integration. Currently this is the largest national research project on smart cities.
- **IRPWind, EU FP7 (2014-2017).** The aim is to foster better integration of European research activities in the field of wind energy research with the purpose of accelerating the transition to a low-carbon society.

- **NORSEWInD. EU FP7 (2009-2013).** Research and innovation project focusing on offshore wind power data and planning, meteorology and forecasting (2009-2013).

Infrastructure and equipment/software:

1. **Big Data Analytics.** DTU Compute is main responsible for the BDVA White Paper on Big Data Analytics.

2. Smart-Energy Operation-Systems. A Big Data ICT setup for intelligent energy systems integration.

3. **Data analytics components:**

- WPPT: One of the worlds must widely used software for probabilistic wind power forecasting for large scale systems (now available via companies).
- CTSM-R: Combined statistical and physical modelling in R.
- HPMPC: A toolbox for High-Performance implementation of solvers for Model Predictive Control. It contains routines for fast solution of MPC and MHE (Moving Horizon Estimation) problems on embedded hardware.
- **COCO:** A tool to:
  1) Provide a rapid prototyping environment for continuation toolboxes for large complex and dynamical systems.
  2) Form a crystallization point for a community of continuation toolbox developers.
- OFMC: Automated Protocol Verifier. We assume that such a protocol is run in an insecure network (like the Internet) where all communication may be read by the intruder, messages may be blocked, and the intruder may insert new messages. Finally, the intruder may also be (under his real name) a dishonest participant of the network. OFMC will try to find an attack against the protocol or verify that it satisfies its goals.

Relevant publications products and services:

1. O. Corradi, H. Ochsenfeld, H. Madsen, P. Pinson, Controlling electricity consumption by forecasting its response to varying prices, IEEE Transactions on Power Systems, Vol. 28, pp. 421-429, 2013.
2. P. Meibom, K. Hilger, H. Madsen, D. Vinther: Energy comes together in Denmark: The key to a future fossil-free Danish power system, IEEE Power and Energy Magazin, Vol. 11, pp. 46-55, 2014.
3. J.M.M. Gonzáles, A.J. Conejo, H. Madsen, P. Pinson, M.Zugno, *Integrating Renewables in Electricity Markets, Operational Problems*, Springer, 429 pp., 2014
4. M. Zugno, J.M. Morales Gonzales, P. Pinson, H. Madsen: A bilevel model for the electricity retailers' participation in a demand response market, Energy Economics, Vol 36, pp. 182-197, 2014.
5. J.E.B. Iversen, J.M. Moralez Gonzales, J.K. Møller, H. Madsen, Probabilistic forecasts of solar irradiance by stochastic differential equations, Environmetrics, Vol. 25, pp. 152-164, 2014.
6. N. O'Connell, P. Pinson, H. Madsen, M. O'Malley, Benefits and challenges of electrical demand response; A critical review. Journal of Renewable and Sustainable Energy Reviews, Vol. 39, pp. 686-699, 2014.
7. S. Fabrizio, H.W. Bindner, H. Madsen, D. Torregrossa, L. Reyes Chamoro, M. Paolone, A model predictive control strategy for the space heating of a smart building including cogeneration of a fuel cell-electrolyzer system, Journal of Electric Power & Energy Systems, Vol. 62, pp. 879-889, 2014.
8. J.E.B. Iversen, J.M. Moralez Gonzáles, H. Madsen, Optimal charging of an electric vehicle using a Markov decision process, Applied Energy, Vol. 123, pp. 1-12, 2014.
9. E.B. Iversen, J.K. Møller, J.M. Morales, H. Madsen, Inhomogeneous Markov Models for describing driving patters, accepted, IEEE Transactions on Smart Grid, 2015.
10. H. Madsen, J. Parvizi, R. Halvgaard, L.E. Sokoler, J.B. Jørgensen, L.H. Hansen, K.B. Hilger: Control of Electricity Loads in Future Electric Energy Systems, in Handbook of Clean Energy Systems, Wiley, 2015.
11. E. Lindstrom, H. Madsen, N. Vicke, Consumption management in the Nord Pool region; A stability analysis, Journal of Applied Energy, Vol. 146, pp. 239-246, 2015.

Collaborator profiles	
C1	**Prof. Henrik Madsen (**male**)** is a Professor of Stochastic Dynamical Systems, and he is currently the Head of Center for IT-Intelligent Energy Systems (CITIES). He was appointed Ass. Prof. In Statistics in 1986, Assoc. Prof. In 1989, and Professor in Mathematical Statistics with a special focus on Stochastic Dynamical Systems in 1999. He has been responsible for or involved in a large number of national and EU funded projects. His main research interest is related to analysis and modelling of stochastic dynamical systems, and the application areas are mostly related to Energy Systems, Informatics and Process Modelling. He has authored or co-authored approximately 500 reviewed papers and 12 books. Most of the books are related to mathematical statistics and time series analysis. Homepage: www.henrikmadsen.org
C2	**Assoc Prof. Peder Bacher (**male**)** is a specialist in robust time adaptive statistical methods for energy related modelling applications related to climate dependent systems. Mostly focused on forecasting and estimation of system performance (KPIs). Specific applications count: solar power forecasting (PV and thermal), wind power forecasting, heat load forecasting (single family houses), grey-box models for buildings (as basis for control (MPC)). He did his PhD (2008-2012) at DTU Compute and has been working there since, now as an assistant professor**.**

4.1.18 NYFORS

Partner Full name		Nyfors Entreprise A/S			
Partner nº	**18**	Short name	**Nyfors**	Country	**Denmark**

Partner entity description and relevance:

Nyfors is an energy company in North Jutland, Denmark with more than a 100 years of experience and nearly 100 employees who work professionally to ensure delivery of utility services and advice of high quality. Nyfors provide cheap energy and energy advice to about 45,000 customers. The company's aim is to optimize the everyday life of our customers in the form of solar cells, heat pumps and alarm products. We develop and optimize solutions that ensure comfort, safety and lower energy consumption. We advise the costumer throughout the buying process. The business of Nyfors is based on our customer needs. Furthermore, Nyfors is a Danish DSO managing a large part of the distribution grid in Northern Jutland.

About Nyfors http://www.nyfors.dk/om-nyfors/om-nyfors

About Nyfors DSO http://www.nyforsnet.dk/Nyfors_Net-6719.aspx

At Nyfors and in the society surrounding us there is a growing desire that the energy sector contributes to the development of intelligent energy. It is essential that the framework for the industry and Nyfors' development is present. The Danish parliaments focus on solving climate change problems is currently the motivation for politicians to introduce incentives for the development of an intelligent energy system.

Business Motivation and Activities in the project:

For Nyfors as the DSO, these new methods for analysing "Big Data" from smart meters will contribute to a growing business into the energy optimization area. At Nyfors, the amount of data from smart meters will grow by 70% by 2020 meaning a lot of new opportunities to provide customers with new services such as heat pumps, smart home solutions, etc. This DSO-Consumer interaction will provide energy efficiency at the end-user level as well as the DSO level and help to reduce the emissions of CO2 into the atmosphere.

Nyfors is participating in WP7 which is the Large Scale Pilot in the Energy and Power Management Domain. Nyfors will be leading task 7.2 and subtask 7.3.2

Expertise from previous and on-going projects:

- **SmartNet** (2016-2019), H2020 project focusing on the use of big data and statistical modelling for optimizing DSO and TSO interactions in future smart grids. The project aims to develop optimal market structures and optimal interactions to leverage flexibility in low voltage grids.
- **Totalflex** (2012-2015). The TotalFlex project is a project under the ForskEL programme - Energinet.dk's programme for supporting research and development within eco-friendly electricity production technologies. The project is based on the results of a number of earlier research projects within a.o. Smart Grid and Home Automation.

Infrastructure and equipment/software: 1. **SCADA – Grid management system.** **2. Sonwin Billing System.** Customer smart meter → dataflow for database
Relevant publications products and services: **http://www.nyfors.dk/om-nyfors/om-nyfors**

Collaborator profiles	
C1	**Johan Ungermann Poulsen (**male**).** Bachelor of Technology Management and Marine Engineering**.** 32-Year-old Marine Engineer – graduated from Martec maritime and polytechnic college in Frederikshavn. Specialist in energy efficiency of industrial buildings, working with building automation systems, energy optimization, ventilation, home automation, CE marking of products and project management. Furthermore, I have a background as electrical engineer working with electrical installation on-shore.
C2	Not decided at the moment

4.1.19 ENFOR

Partner Full name		ENFOR A/S		ENFOR Forecasting and Optimization for the Energy Sector	
Partner nº	**19**	Short name	**ENFOR**	Country	**Denmark**

Partner entity description and relevance:

ENFOR A/S provides solutions for the energy sector. We provide software and solutions for wind power prediction, optimal operation of district heating systems, predictions of heat or power load, solar power forecasting, forecasting of energy prices, etc.

Most of our software solutions can be implemented locally or as web-services. We also provide consultancy services and development of specialized software.

Our systems use a mix between physical and statistical system modelling. This has allowed us to enable e.g. heat load analysis capabilities of smart meter data. The concept has been tested as part of nationally funded projects.

In the project, ENFOR plan to contribute with NWP climate data, proto-type procedures, forecast systems, and handling of technical infrastructure for analytical and forecast procedures

Business Motivation and Activities in the project:

For Nyfors as the DSO, these new methods for analysing "Big Data" from smart meters will contribute to a growing business into the energy optimization area. At Nyfors, the amount of data from smart meters will grow by 70% by 2020 meaning a lot of new opportunities to provide customers with new services such as heat pumps, smart home solutions, etc. This DSO-Consumer interaction will provide energy efficiency at the end-user level as well as the DSO level and help to reduce the emissions of CO2 into the atmosphere.

Nyfors is participating in WP7 which is the Large Scale Pilot in the Energy and Power Management Domain. Nyfors will be leading task 7.2 and subtask 7.3.2

Expertise from previous and on-going projects:

- See WPPT, PRESS, SOLARFOR, and LOADFOR at www.enfor.dk
- Project "Modelling of energy consumption in buildings" financed by the Danish Electricity Saving Trust. The project does not have an URL, but some of the results relevant here were presented at:
- http://iet.jrc.ec.europa.eu/energyefficiency/workshop/international-workshop-whole-building-testing-evaluation-and-modelling-energy-assessment under the title "Estimation of energy performance using data from smart meters" (link to paper/presentation unfortunately not working). Please contact han@enfor.dk to receive a copy.

Infrastructure and equipment/software:

Data Management:

- Handling/provision of NWP data (based on GRIB-format or similar).
- Handling of anonymized smart meter data for analysis purposes.
- Handling of anonymized background/context data (e.g. household/building characteristics).

- Handling of online load/production measurements (anonymized if applicable).

Data Architecture:

- In relation to the above.

Data Analytics:

- Specialized analytical models/methods/systems based on in-house software for selected applications, e.g. heat load / thermal characteristics, standby consumption monitoring, PV-forecasting, etc.

Security/Privacy:

- ENFOR apply strict security on all levels, but expect to receive anonymized data if these relate to persons/households.

Visualization:

- Forecast visualization; WPPT web-GUI (JavaScript) if applicable.

Relevant publications products and services:

Analysis of energy consumption in single family houses

Short-term heat load forecasting for single family houses

Online short-term solar power forecasting

An Overview of Wind Power Forecast Types and their Use in Large-scale Integration of Wind Power.

Collaborator profiles	
C1	Mr. **Torben Skov Nielsen** (male), is managing director and co-founder of ENFOR. He holds a Ph.D. in Statistics from Informatics and Mathematical Modelling, Technical University of Denmark on the topics of statistical methods for prediction and control of non-linear stochastic systems. He has more than 25 years' experience with on-line application of mathematical models and has worked with forecasting of wind energy and heat load in more than 20 years. He is the main responsible for the development of WPPT and PRESS - on-line tools for prediction of wind power and heat load, respectively. He has published a large number of research papers regarding prediction of wind power, heat load and related subjects.
C2	**Mr. Henrik Aalborg Nielsen** (male), is head of model development and co-founder of ENFOR. He holds a Ph.D. in Statistics from Informatics and Mathematical Modelling, Technical University of Denmark in modelling of parametric and non-parametric systems. Before founding ENFOR he was employed as Assoc. Prof. at the Technical University of Denmark and has been working with modelling and optimization in relation to energy systems for 20 years. He has published a large number of research papers regarding prediction of wind energy, heat load, power load and related subjects.

4.1.20 ENEL Research

Partner Full name		Enel Ingegneria & Ricerca			
Partner nº	**20**	Short name	**EIR**	Country	**Italy**

Partner entity description and relevance:

ENEL Ingegneria e Ricerca S.p.A. is a part of ENEL Group, the principal electricity operator in Italy and one of Europe's main listed utilities. It is an integrated player, active in the power and gas sectors. Enel today operates in 40 countries worldwide, has over 97,000 MW of net installed capacity and sells power and gas to around 61 million customers.

EIR is a service division for the companies of the Enel group (Global Generation Division), managing the engineering processes related to the development and coordination of research activities. It assures the scouting, development and exploitation of the innovation opportunities for the Global Generation business areas.

EIR will participate in the project through its Research Area, whose headquarter is located in Pisa. The Research Area employs about 130 people (30% female) and for more than 30 years has been active in the field of innovative generation systems, energy conversion, plant diagnostics and automation, generation systems from renewable sources. Research activities are supported by mathematic models and numerical simulation together with experimental tests carried on in EIR experimental areas.

Business Motivation and Activities in the project:

EIR will develop advanced predictive analytics on plant components and business analytics in order to support decision makers in maximizing production and minimizing maintenance and operation costs for different types of Energy production plants.

EIR will focus its activities in developing predictive diagnostic analytics for components with the final aim to detect components failures and components degradation. Beside, EIR will build up an optimal O&M Plan by developing business analytics that correlate the main outcomes of predictive diagnostics with maintenance and unavailability costs. Finally, a BDSS (Business Decision Support System) will be developed in order to optimize the costs allocation and the production plan at fleet level.

In the frame of the project, EIR will make available three different Italian sites: Turbogas Combined Cycle (CCGT) located in Termini Imerese, Soverzene Hydro Plant located in Soverzene and Roncovalgrande Pump Hydro Plant located in Roncovalgrande. These industrial sites will used to test the ICT solutions deployed in the project.

The characteristics of selected sites are compliant with the whole fleet of Enel Global Generation. This aspect will allow the replicability of the ICT solutions in other fossil fuel and hydro power plants located in different geographical areas.

EIR will contribute to the final analysis of the project results in terms of scalability and market replicability of the solutions tested in the pilots as well as in the communication and dissemination activities foreseen in the proposal.

Expertise from previous and on-going projects:

EIR has recently started its activities in the field of Big data Architecture for O&M.

EIR is involved in the innovation initiatives of ENEL group in general and of Global Generation division in particular through a Strategic Research Program in which a specific project is devoted to topics Big Data Predictive Analytics for O&M. Beside, EIR, through its technical unit Generation Systems, Efficiency and Flexibility ensures advanced solutions for improving monitoring and diagnostic systems for thermal and hydro power plants.

EIR hasn't been involved in previous National and European project based on Big Data solutions.

Infrastructure and equipment:

EIR will participate to the project making available the current Big Data Architecture for further developments and implementation.

EIR will also make available all the data acquired on DCS, plant data historian, off-line measures on components, ERP and CMMS data and the rationalization, collection and storage in a data lake accessible for BigData approaches and techniques.

Beside, EIR will contribute with the following industrial sites located in Italy: one CCGT power plant as reference plant for predictive and business analytics development but with the perspective of extension to all the Italian fleet (**8 units** in Italy): Termini Imerese (1), Priolo Gargallo (2), La Casella (3), Porto Corsini (2) and **Spain** (**6 units** on the Islands + **1 unit** on the Continent): Granadilla (2), Barranco (2), Cas Tresores (2)) and two Hydro Power Plants located in Soverzene and Roncovalgrande.

EIR also developed specific acquisition systems for Gas Turbine instability finalized to collect high frequency data on combustion chamber pressure and acceleration in order to collect an higher amount of data related the machinery behaviour in case of critical events to be analyzed with big data techniques. The system is installed on all the main TG in Italy and Spain.

Similarly, an high frequency data acquisition and storage system, for the selected Hydro power plants, is under development, ensuring the possibility to rely on a complete, consistent and qualified dataset of information in order to carry out hydro power plant performance analysis.

Relevant publications products and services:

- E. Bartaloni, C. Di Odoardo, D. Conzonato, L. Guidi, D. Pestonesi: "The Fieldbus Technology and the Predictive Maintenance in the New Power Plants of ENEL Produzione", Powergen Europe 2003, 6-8 May 2003, Messe-Dusseldorf (D).
- D.Pestonesi, M.Scapeccia, M.Costarelli, L.Franceschini: "Remote Supervision Centre for the ENEL Combined Cycle Plants"; International Congress "Methodologies for Emerging Technologies in Automation", Roma (I), 13-15 Novembre 2006. Second award as "best paper" and published on the International ISA (International Society of Automation) Book titled "Modeling, Control Simulation and Diagnosis of Complex Industrial & Energy Systems" (2007).
- D.Pestonesi. V. Cenci, M. Ghironi, L. Guidi, M. Lauro: "Advanced diagnostics and predictive maintenance to improve availability and reliability of ENEL plants"; POWER-GEN Europe 2005, 26th –28th June 2007, Feria de Madrid, Spain. Best Paper Award for Track 8 - Automation & Information Systems.
- Patent num: 102015000062599, "Metodo per la valutazione automatica in-linea dell'efficienza di una turbina kaplan" (Oct-2015), M. Masotti, A. Quadrelli, R. Suffredini, S. Sello

Collaborator profiles

C1	**Dr. Daniela Pestonesi (**female**),** graduated in Electronic Engineering at Milano Politecnico in 1992. She works in ENEL Engineering and Research Division, Research department. She acts as **technological focal point on Automation and Diagnostics** cross area for issues regarding the identification of synergies and the fostering of technological alignment in collaboration with the technical unit of Enel Research Department. She is currently Project Manager of projects named "**Monitoring and Diagnostic systems for Thermal PP O&M**: Advanced sensors and wireless sensor networks; **Big Data Predictive Analytics for O&M**", in the sphere of Safety she is Project Manager of projects such as "Safety devices and applications for Power Plant operators and Safety manager; Virtual Reality solutions for Safety Training; Advanced Protection Equipment for operators". Finally she is project manager of projects on "Drones and Robotics solutions for inspection activities"; "Augmented Reality applications for O&M optimization". Her experience in the ENEL Group concerns mainly automation, ICT for industrial process, diagnostics, robotics and cybersecurity of Industrial Control Systems, with particular focus on operation and maintenance optimization and on cross itemsl' such as logic security and Safety. She gained her professional experiences in ENEL, collaborating with the New Plant Development Engineering Department as specialist for the automation, systems integration, HMI innovative solutions for the new Power Plants. She was project leader of a research project for the development of a Diagnostics system for all the thermoelectric power plants main machinery. As specialist of automation she was **project leader of innovative projects** such as the realization of the Remote Supervision Centre for the ENEL Combined Cycle Plants. She is **Technical Commission coordinator** in the "**CLUI-EXERA**" no profit association of companies and organizations that invest heavily in instruments and in measurement, control and automation systems. She is ENEL **scientific contact in the commission board** of **IEC 65-E standardization**.
C2	**Dr. Sonia Scarcia (**female**),** M.Sc in Innvation Managment at Scuola di Studi Superiore S. Anna of Pisa in 2002 and Executive Master in IT Governance – Project Management Professional (PMP) Certification PMI Institute – at Luiss Business School of Rome in 2012. She works in Enel Global **Information & Communication Technology (ICT) division**, Solution Center Generation, Renewables, Trading & Upstream Gas. Currently, she is Head of Business Development, Engineering & Construction and Plants Operation Solutions. Heading a team of 40 people in 12 Countries with an overall budget allocation of around 25 Million euro. She has the responsibility to **identify and to provide IT solutions for Generation Business Processes**, both Conventional and Renewables, through the entire value chain, moving from BD planning tools to Operational Improvement System for O&M activities. For each solution in charge for the overall end-to-end life cycle, starting from identification of business needs to budgeting, design and implementation, up to final delivery and management of operating systems. These IT solutions, defined dealing directly with first and second lines of the Divisions, are set to **enable business decision making processes**, helping integrating geographical, technological and functional portfolio while promoting synergies among business and global/local perspective. She is currently involved in the following projects: **Worldwide Global Generation Monitoring Room & Dashboard**; **Innovative solution for Predictive diagnostic**; implementation of the **System Map Cloud Migration** and **Application Portfolio Rationalization**. From January 2013 to December 2014, she is head of Business Relationship Management (BRM) for Energy Management Process Italy and Europe in Enel Global ICT, BRM Unit. Her main duty was in **supporting Energy Management processes** managing all IT system related to Generation Fleet Management and **Trading Business Unit**. From February 2010 to December 2012, she was head of **Competence Center Market analysis and production optimization** within Enel Servizi, Demand & Delivery GEM Unit. She was in charge to support Production Optimization Unit to comply with all regulatory market changes occurred since 2010 introducing the Intraday Market Session. As international work experience, she was in Russia at Enel OGK-5 as **ICT Integration Manager (Expat contract)** in the international Department of Enel Servizi (from 2007 to 2009).
C3	**Dr. Marco Del Romano (**male**)**, M.Sc. in Computer Science Engineering at La Sapienza University of Rome in 2007. Certified SCRUM Product Owner in 2016. He works in Enel Global **Information & Communication Technology division**, within Business Development, Engineering & Construction and Plant Operation Solution of Generation Solution Center.

	He is currently a **Solution Manager** whose main responsibilities in the perimeter assigned are to support the design of main relevant solutions and foster use of common methodologies and criteria supervising their implementation at global level; guarantee **alignment to business strategy**, ensuring **business executive engagement**; elaborate **business and technical requirements**, prepare project plan and executing technical project management, **design business solutions** according to architectural guidelines, develop test and deploy solutions with an end-to-end perspective. Looking at the last experiences where Dr. Romano has been involved the following projects are mainly representative. "**Predictive Maintenance**" applied to power plant devices whose main objective is to reduce the planned and reactive maintenances to the advantage of a predictive ones, reducing costs and increasing the availability of the Plant. Main challenges are represented to the data integration, the data volume managed and the taxonomy of the heterogeneous data type involved. "**Resource Management**" for Technical Support department has the main objectives are to better manage the resource allocation to the maintenance activities of the power plant devices over the world to increase the capacity and the efficiency of the works. Main challenges are related to the number of resources involved ant to the change management process. "**Global Data Management**" and "**Global Generation Platform**" projects aim to support **Operational & Performance Optimizatio**n department within the Global Generation, mainly to collect and monitor technical indicators of the generation fleet, booth real time data and validated KPIs all over the world like power profile production, unavailability, fuel consumption, plant status and so on. Main challenges are related to the data integration of the heterogeneous and different system/data sources involved and to the complexity of the overall architecture.
C4	**Enrico Falesiedi (**male**),** mechanical engineer, direct report to the Head of CCGT/Oil & Gas of Enel Global Generation. He is currently in charge for the **operational excellence and performance** improvement of the technology line fleet trough dedicated projects O&M, **external benchmarks** and **best practice sharing** and **Project Coordinator of Local and Global value creation projects**, with direct impact on costs, performances and first margin increase. From April 2012 to December 2014 he was responsible of **O&M business process improvement** for SuGRES Power Plant and head of the SuGRES CCGT Unit. He was also in charge of the CCGT O&M structure and in charge of improving the performance of the SuGRES CCGT Unit. He was responsible for implementation of O&M organization model for the whole SuGRES Power Plant and project leader in dedicated projects of main LTSAs contract renegotiation strategy with GE. His main skills are in: • knowledge and direct experience of energy production process; • strong attention to performance improvement and identification of the necessary action to complete it (organizational and processes) • power plants management and organization; • strong project management skills with the ability to work with challenging deadlines and manage multiple projects simultaneously; • interpersonal and communication skills; His other main previous experiences were in ENEL International Division – ISOS Department – Operation Support Unit (from August 2007 to December 2007) and in Enel Generation and Energy Management – Enel Produzione – Business area Oil and Gas (from May 2005 to July 2007)
C5	**Fabio Coppiardi (**male**),** electric engineer. He joined in Enel in 2008. He is currently in Global Hydro Division of Enel Global Generation and he is involved in the following main projects: **SAP E4E** (from February 2015), **Project Web generation Portal & Global Monitoring Room** (from June 2014), Project **External Benchmarking** con PA consulting (from 2015 to 2016), **PWAY Project** and projects focused on **predictive maintenance** in collaboration with SAP. From March 2010 to January 2015 he was in Generation Division of Enel Energy Management and Market Italy. He was responsible for **planning the production of hydro power plant** in Sondrio (from 2010 to 2015) and **activities in the business hydro unit** in Vittorio Veneto (from 2008 to 2009). Beside, he was involved in **SAP project for Season** (from February to August 2014) and in the Italian project **OASI MERCATI APERTI** in collaboration with CESI.

	His main previous experience was in Enel Generation and Energy Management in Business Hydro Unit of Vittorio Veneto (from December 2008 to December 2009).
C6	**Silvia Gasperetti (female)**, graduated in Industrial Chemistry at University of Pisa (Italy). She joined Enel on December 2003 where she started working in projects focused on particulate matter from combustion process. Mrs. Gasperetti has been coordinated the chemical laboratory, located in Pisa, for five years, currently she's part of Global Generation Area, where she acts **as coordinator for the identification of funding opportunities at national and international level**, and supports the **preparation and management of funded projects**. She has worked in several co-funded research projects at European level like, among others, **DEBCO** (2006) as **technical coordinator of the Project**, **OCTAVIUS** (2011), **ONCORD** (ongoing).
C7	**Nicola Rossi (**male**),** head of Generation Systems, Efficiency and Flexibility of Enel Engineering and Research Department. He tooks a degree in Chemical Engineering at University of Pisa (Italy) on April 2000. He joined Enel Produzione Ricerca on October 2000 where he started working as a combustion engineer. Mr Rossi coordinated many activities in the fields of **advanced mathematical modeling**, **pilot and full scale combustion testing**. From 2005 to 2009 he covered the positions of Senior Researcher and Technical Manager and he was Project Engineer of the Brindisi Sud CO2 Project from 30/06/2006 to 30/06/2008. From 2010 to 2012 he headed the Fuels and Power Generation Systems Unit within Enel Ingegneria and Research Division. From 2012 to 2014 he managed the Generation, Diagnostic and Automation Unit in Enel Ingegneria and Research Division, with the responsibility of coordinating research, development and demonstration programs and service contracts in the fields of combustion, high efficiency power generation technologies, **advanced diagnostic systems and automation**. Since January 2015 he is in charge of the Generation Systems, Efficiency and Flexibility within ENEL Global Generation R&D. Mr. Rossi has relevant international experience. He has been ENEL's scientific contact person in a number of co-funded research projects at European level: MINNOX and BIOFLAM (2000), COALCOMBOPT (2001), DEBCO (2006), DECARBIT (2007), H2-IGCC (2009), OXYCORR (2009), ENCIO (2011), RELCOM (ongoing), ONCORD (ongoing). He was ENEL representative in the "Technology Task Force" of the **European Zero Emission Platform** (ZEP) in 2008, Member of the "**International Flame Research Foundation**" (IFRF) from 2001 to 2015, Member of the **Executive Board of the Italian Section of the Combustion Institute** from 2008 to 2010.
C8	**Gianluca Gigliucci (**male**)**, head of Hydro and Distributed Generation Research Unit of Enel Engineering and Research Department. His responsibilities are in Definition, proposal, management and supervision of research projects; Management of relationships with research institution and partners; Human resource management to ensure focus on objectives, balanced load between people and synergies between the different ongoing projects; Know-how development and professional growth of the people working in the research unit. Currently his main research topics are focused on: • **Hydro power plants**: optimization of generation efficiency of existing plants; improvement of remote intakes to lower maintenance requirements ; short, mid and long-term forecast of hydro resource availability to optimize operation and dispatching; definition of improved monitoring and diagnostic tools to be applied to hydro plants; use of robots to support hydro plant maintenance. • **Energy storage**: assessment of energy storage technologies; definition of business models and business cases to deploy storage technologies at Enel generation sites; demonstration of storage adoption through real demos; increase flexibility of pumping hydro plants to increase revenues from offering balancing services to the grid; definition of diagnostics needs to support storage technology deployment; management of battery end-of-life. • **Distributed generation**: follow-up of distributed generation technologies; model the electric system to assess impact of regulatory scenario evolutions (e.g. capabilities of distributed generation to offer services to the balancing markets) on conventional generation proficiency; definition of Global Gx opportunities in deploying distributed generation in mature and growing markets. Previous experience includes activities in the field of Solar photovoltaics; Solar thermodynamics; **Energy storage and Renewable integration into the electric grid**; Energy system modelling; **Customer energy efficiency**; Provision of new energy-based services to customers; **Impact of e-mobility on grids and on the environment**; Assessment of electric city demos. Research projects are carried out by means of physical and economic modelling and by lab assessment and demonstration. From 2012 to 2014 he was member of **IEA** Task VIII – Very Large Scale Photo-Voltaic Power Systems and **EASE** Executive Board (European Association for Storage of Energy)

C9	**Irene Fastelli (**female**),** chemical engineer, joined Enel Engineering and Research Department in 2006. Her activities are focused on innovative systems and energy conversion technologies within the national and international energy scenarios, participating to related national and international funded projects such as **STORE** and **HYDROSTORE**. Main research topics dealt with renewable energy power plants, distributed generation, hydrogen production/storage/reuse and energy storage systems. Currently she is involved in Enel storage research program, which includes modelling, experimental activities, feasibility analysis and demonstrations on storage systems.
C10	**Angela Italiano (**female**),** computer scientist, joined in Enel Engineering and Research Department in 2014. Before Enel she worked as researcher in the **National Council of Researcher** on projects ranging from design and development of Web Application, design, management and development of Web Service in a cloud computing infrastructure and problems solving in cloud computing environment (SaaS,PaaS). In Enel, she has worked as **data scientist in the areas of power generation**. Her activities are focused also on design and analyse efficient solution of problems process covering all the following activities: **requirement gathering, solution design, build guidance, testing and also technological scouting to identify the best technical solution available in the market.**
C11	**Matteo Masotti (**male**)**, physicist who over the last 6 years, since he joined Enel Engineering and Research Department in 2010. He has worked as **data scientist in the areas of power generation**, **weather modelling and satellite data analysis**. He has worked on projects ranging from developing algorithms for power plant performance optimization to trade model algorithms for day-ahead power market, smart meter data classification and time series anomaly detection on power plants operational data. Previous experience includes short to medium range meteorological analysis over the Italian domain, supervision and implementation of atmospheric models and satellite data analysis for radiation, wind and wave assessment for energy utilities.
C12	**Marco Biscuola (**male**),** mechanical engineer, joined in Enel Engineering and Research Department in 2012. His activities are focused in the field of generation systems, efficiency and flexibility of power plants. Previous experience includes **monitoring and diagnostic of the main machinery within the power plants**; **failure analysis and performance monitoring**.
C13	**Stefano Sigali (**male**),** graduated in Aerospace Engineering at University of Pisa (Italy) in 2004; he joined Enel Produzione Ricerca in June 2004. Since 2007 he **managed of several research projects with national and European partnerships**. His main activities are focused in the fields of combustion, new production technologies and diagnostics.
C14	**Gualtiero Bruti** (male), Aerospace Engineering graduated at the University of Pisa (Italy) in 2010, he joined Enel Engineering and Research Department in December 2010. Working in the Generation Systems, Efficiency and Flexibility group, his main activities are focused in the fields of combustion, advanced instrumentation, monitoring and diagnostics.

4.1.21 ENEL Green Power

Partner Full name		Enel Green Power SpA			
Partner nº	21	Short name	EGP	Country	Italy

Partner entity description and relevance:

Enel Green Power is the Enel Group company that develops and manages energy generation from renewable sources at a global level, with a presence in Europe, the Americas and Africa. EGP is a major global operator in the field of energy generation from renewable sources, with an annual production of 29 TW/h, meeting the energy consumption of over 10 million families and avoiding 16 million tonnes of CO2/year. EGP has an installed capacity exceeding 10 GW (2015), produced by around 700 plants in 15 countries and with a generation mix that includes wind, solar, hydro, geothermal and biomass. Thanks to its €8.8 billion of investments for growth, EGP is set to increase its installed capacity by more than 7,000MW by 2019. EGP operates some 740 plants in 16 countries, in Europe, the American continent, Africa and Asia. This geographical diversification allows it to maximise the strategic growth options, while minimising regulatory and country risk.

While in Europe EGP wind plants overcome 3000 MW of capacity, in Spain EGP has 1710 MW of power consolidated in 97 renewable energy facilities, located around the whole country, most of which (1,615) from WIND.

From the data collection and treatment point of view, thanks to the high level of automation and ICT infrastructure, EGP O&M manages every day a vast amount of information corresponding to around 85 bln signals/year.

EGP will participate to the project through its departments of Innovation & Sustainability, Operation & Maintenance and Information& Communication Technologies, who will bring their specific expertise into the pilot development and demonstration.

The Catania Solar Lab, operating since 2007, is part of EGP Innovation Area; it is a centre of excellence for the study of solar energy systems. The Laboratory is accredited for PV modules' Qualification tests according to the International Standards (CEI EN 61215 and CEI EN 61646). The main activities performed in the lab deal with test on commercial and innovative PV modules, development of specific testing techniques for characterization of non-conventional technologies (e.g. hetero-junctions, multi-junction thin films) and for measurement of hidden defects, development of physical models to select the suitable technologies for each specific application and to enable advanced diagnostics, development of monitoring, diagnostic and forecasting tools to optimize PV plant operation.

Business Motivation and Activities in the project:

EGP generation fleet is distributed both from a geographical and technological point of view. There is a need for large-scale action in distributed generation parks for their optimal operation & maintenance.

Main issues in O&M are the early detection of faults, to allow appropriate interventions, anticipating failures and reduce O&M costs and failure-driven lost production. But support is needed also to improve plant design and construction: the main driver is to increase EGP fleet growth, efficiency and profitability in the O&M integrated scenario, reducing O&M costs and improving energy production through the implementation of data-driven predictive maintenance services aimed at the early detection of wind and PV

solar equipment's faults.

EGP will contribute to the project through two relevant use cases mainly related to predictive O&M for renewable Power plants, working in the pilot requirements definition, and in the pilot operation and validation, in close collaboration with the technology providers.

EGP is expected also to contribute to the final analysis of the project results in terms of scalability and market replicability of the solutions tested in the pilots, and to the communication and dissemination activities foreseen in the proposal.

Expertise from previous and on-going projects:

In the field of Big data Architecture for O&M, EGP has already some on-going internal projects related both to the development of a comprehensive big data architecture for the O&M of its world-wide distributed power generation fleet and to the implementation of specific analytics for predictive O&M of plant equipment.

EGP has coordinated and joined a number of projects under the scope of National and European Research and Demonstration programs and it has been responsible of the promotion and implementation of several new technologies

In the solar field, the most significant projects are:

- **FAST TRACK: FP7-NMP 2012-2015** Accelerated development and prototyping of nano-technology-based high-efficiency thin-film silicon solar modules.
- **AGATHA (Advanced grating for thin films solar cell) (FP7, 2010-2013**): Development of novel materials, device structures and fabrication methods suitable for thin film solar cells and TCOs including organic photovoltaics. EU – India Coordinated Call
- **SOPHIA (SOlar PHotovoltaic research InfrAstructure) (FP7, 2011-2015):** The project offers experimental facilities in the field of PV technologies to European researchers under the 7th Framework program project, bringing together 18 main PV Research Centers in Europe. Most aspects of PVs are addressed, ranging from specific material issues (silicon, thin films, organic) to cell modeling and from photovoltaic module lifetime to complete system characterization.

Infrastructure and equipment:

EGP will participate to the project making available its Big Data Architecture to be used for demonstrators in the generation domain.

This architecture has been developed by EGP with the main goal to enable the business users to monitor, even near real time, the operation of each facility and promptly prevent failures, thereby reducing- "No-production Plants" costs and Maintenance costs.

Thanks to this platform and the developed analytics, data and information from EGP plants are made available in real time: more than 700 plants in 16 countries, for wind, hydro and geo, are currently visible (5000 wind turbine for 10GW installed), with a rate of about ~ 1,6 mln signals/10min.

Models have been created for each type of Generation Unit together with a specific set of Signals, and an historical data base including all data (On-site inspections, SCADA) from the plants. A set of analytics are already available to predict early failure and evaluate component degradation rate.

Figure 1 represents the different layers of EGP Big Data Architecture, which functions are described below

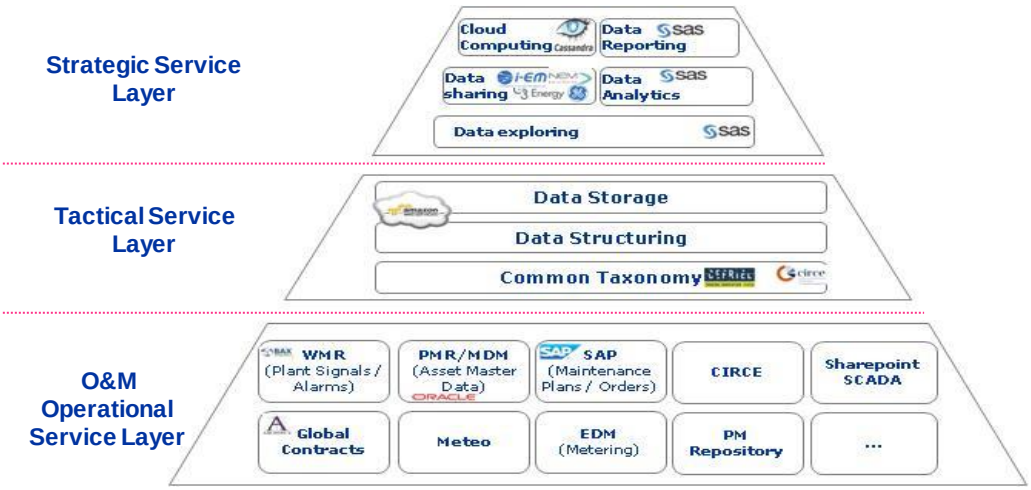


Figure 1 – EGP Big Data Architecture Functional Scheme

At Operational Service Layer, all data coming from different sources and characterizing in real time the behaviour of each GU, are collected and updated according to the timings of each sources automatic synchronization between WMR and CLOUD.

At Tactical Service Layer a cloud infrastructure has been implemented, on order to make data injection, common taxonomy definition, data structuring, and storage for data coming from all O&M Sources, letting them available for analysis and reporting.

At Strategic Service Layer, specific functionalities are made available:

- Data Sharing: through Cloud to Cloud services, able to share data between EGP & external providers
- Data Analytics: to make analysis such as Predictive Maintenance, TAM, failure analysis, root cause analysis etc..
- Cloud Computing services aimed at sharing computing resources
- Data Reporting: institutional/custom rep. at Country/Central Level

The architecture is currently at pilot level and allows the implementation of further functionalities at Strategic Service level and the integration of additional data sources at Operational and Tactical Service level.

The architecture implementation has required the adoption of an Amazon Cloud Platform (Iaas - Infrastructure as a Service) allowing the implementation of customized and tailored application stacks (web servers, databases etc.) compliant to IT requirements and user.

Best-in-class technologies have been integrated in the architecture: Cassandra and Cloudera. Cassandra and Hadoop hybrid cluster includes: the distributed stream processing engine Spark Streaming, SparkSQL, Cassandra NoSQL database as data storage in near real time, the Hadoop platform as distributed file system (HDFS) and distributed computing (Map-reduce) data storage.

The BigData environment is open to software tools for decision support: the kind of data are huge and very heterogeneous with management processes very different - from batch to near real time.

The BigData platform in Cloud allows, more easily than in the past, advanced scalability to growing data sets and relevant processing performance.

The EGP demonstration field will include a set of Wind Farms located in Italy and Romania, and also PV Solar plants from Italy and Romania will be include in the specific Solar Use case.

Besides, for laboratory set up and first validation of models and analytics of the Solar use case, EGP Innovation will make available the laboratory infrastructure of Catania Solar lab, including: (make a selection of significant labs)

- Ageing or climatic chambers for testing of PV modules (indoor laboratory) with three environmental rooms : (i) Uva, Uvb, rain and thermal chamber (the separate or combined action of rain, temperature and ultraviolet radiation). (ii) Climate chamber (very low temperatures (down to -40 °C), very high temperatures (+90 °C), and different humidity conditions (+10% to +90%)), (iii) Salty fog room (corrosive atmosphere containing sodium chloride and is used to measure resistance to corrosion of all the PV modules' metal parts)

- Powerful indoor testing facilities: solar simulators for PV modules and cells (c-Si and thin film), thermal infrared equipment

- Outdoor test station for PV flat modules: Testing on different kind of (parallel) PV flat modules, max power generation and long term energy yield

- Infrared thermal imaging camera for the detection of thermal distribution and hot spots phenomena on PV devices in real outdoor conditions

- Electroluminescence (EL) , Infrared (IR) imaging non-destructive measurement techniques

Relevant publications products and services:

F.Fioretti, F. Bizzarri, G.Cirillo, C.Pregagnoli, U. De Angelis,F. MArcucci, L.Torrisi,R.Tajani - "Analysis of Limited Area Models for Wind Power Prediction", Meteorological Magazine, Italian Air Force, November 2011

M.Russo, G.Leotta, P.M.Pugliatti, G.Gigliucci –"Genetic Programing for Assessing Forecasting Limits, Model Complexity, and Feature Selection in Photovoltaic Plants without Cloud Analysis", Sol. Energy, 105, 264-273 (2014).

Collaborator profiles	
C1	**Dr. Fabio Salvatore Leonardi (**male**).** Electronic engineer specialized in control and automation with professional experience in project management of control and monitoring systems for the energy sector. He started his career in research working for the I.N.F.N. (National Institute for Nuclear Physics) involved in the development and implementation of control boards and software systems for Data Acquisition and real time monitoring of data acquired from hundreds of underwater optical and acoustic sensors. In 2010, he joined Enel Infrastructure and Networks and entered the Energy distribution sector, managing development projects of the MV/LV Electrical grid, analysing and supervising the energy flow utilizing Data acquired remotely and collected in a control and monitoring system as well as managing maintenance activities of MV/LV lines, primary and secondary substations and supporting the implementation of smart sensors for smart grid projects. Since 2014 he has been working in the renewable energy sector, for Enel Green Power, working in the Global Control and monitoring system unit and managing projects on SCADA systems, Control and Monitoring Rooms development at worldwide level, design of Incident management systems and processes. His passion about innovation and new technologies led to involvement with Big Data initiatives, predictive maintenance modelling, augmented reality and support to start-ups in transforming innovative ideas into business solutions.

C2	**Mr. Gennaro Caruso (**male**),** computer science engineer, is currently Head of ICT Renewable Energies Design and Coordination in EGP. His responsibilities focus on design, developing and implementing strategic ICT initiatives with the goal of creating and improving systems covering the new needs of the different department in Enel Green Power (Business Development, Engineering & Construction and Operation & Maintenance departments). He leads initiatives through effective coordination of a cross functional team managing risks and programs issues. He joined ENEL in 2014 have a degree in Computer engineer specialized in electronic and telecommunication. He has over 20 years' experience in a variety of industrial sectors (Aerospace, fixed and mobile telecommunications, railway, automotive, Oil & Gas and Renewable Energies) and functions (R&D, Engineering, Operational, Quality, ICT, Risk & Pricing).He had the opportunity to contribute to achieve specific strategic business objectives of several multinational companies (ENEL, GE, FIAT GROUP, ALSTOM, SIEMENS, TELECOM LAB., ALENIA SPACE).
C3	**Dr. Federico Fioretti (**male**),** mechanical engineer, gained his professional experience in the field of wind energy. He started his career in a private engineering company, then joined Enel Research in 2007, dealing with research projects about wind energy and being involved in the development of advanced wind power forecasting systems. In 2012 he joined the Quality Assurance EPC Unit in Enel, becoming Inspections & Tests Coordinator for projects of refurbishing/developing thermo-electrical power plants in Russia for the Enel Group, coordinating inspections and tests, at Enel's suppliers 'premises, for the manufacturing of all the components for thermo-electrical power plants. From the end of 2013 he joined the Innovation Department of Enel Green Power. As Innovative Business Opportunity Manager, he is currently in charge of all the Innovation and Sustainability activities regarding Wind Energy and Renewable Energy Power Forecasting, in Enel Green Power.
C4	**Dr. Sandra Scalari (**female**)**, electric engineer, gained her professional experiences in project and development of automation and control systems. She joined Enel Research in 1991 and from 1994 to 2006 she was involved on the fields of dynamic modelling of generation system processes and automation. She was project coordinator of Enel Research plant dynamic simulation group where she coordinated, among others, the Puertollano IGCC Dynamic Simulator Project financed by Elcogas and the EC. From 2007 to 2012 she coordinated the research activities related to smart grids, storage, and energy efficiency, actively participating to several national and international projects. From 2012 to 2015 she was part of the Generation Technology Strategy Unit of the Enel Research Area, dealing with smart energy strategic issues and with the preparation and management of funded projects. Now she's part of Enel Green Power Innovation Area, where she acts as coordinator for the identification of funding opportunities at national and international level, and supports the preparation and management of funded projects
C5	**Ph.D. Eng. Maria Luisa Lo Trovato** (female), doctoral degree in Energy systems and Environment, Electric engineer, specialized in innovative renewable energy systems implementation, modelling and testing. She started working in Enel Research in 2005, first for her master degree thesis, then for an internship in 2007 for a project aiming to design the solar thermodynamic molten salts-based field integrated in Archimede CCPP. From 2007 to 2010 she was involved in the exploitation of innovative PV concentrating systems at Enel solar lab, joined EU-FP7 projects and several international PV-sector specialist conferences as author and co-author of several papers. From 201o to 2012 she was responsible for the management of the service contract signed with Enel Green Power for testing several PV modules technologies according to IEC standard test protocols and, as internal certified Auditor manager, she has been in charge for the entire lab tests sequence planning according to the quality assurance rules and accreditation standard ISO 17025. From 2012 to 2014 she was in charge for solar Operational efficiency process in Operation and Maintenance dept. in Enel Green Power. She is currently working within the Technical support unit of O&M Solar Competence Centre as Project manager of several projects aiming to give specialist support for the optimization of solar monitoring processes and systems and performance of EGP solar portfolio through dissemination of best practices and guidelines.
C6	**Dr Fabrizio Bizzarri (male**) electrical engineer, Working for a different customer and company he developed a long standing experience in the design of HVAC system and technological plants for industrial and commercial customer, working on the construction even of some innovative technology like solar thermal, fuel cells, cogeneration plant and critical Energy application in the field of telecommunications (UPS and local microgrid). Entered in Enel group in 1996 he has been involved in different company and activities starting from ENEL DISTRIBUZIONE through SE.M.E. dedicated to professional customer and ENEL.SI working for marketing unit launching many innovative products and service, where, he founded in 2001 the on line service SAT (technical/economical support for affiliates),then he was

	Technical director for the company coordinating the Project Manager for business activity. Joined in ENEL GREEN POWER in 2008 taking care of all new activities related to renewable energy, he was Head of solar centre of excellence and in 2012 founded the innovation department of EGP. He is, also an expert in safety services and a member of two Italian Electrical committee CEI on solar plant and storage system. Starting from 2015 he become Leader of innovative business opportunity.
C7	**Dr. Giuseppe Leotta (male**), physic, gained his professional experiences in project and development of automation and control systems. He joined in Conphoebus in 1985 and from 1990 to 2002 he was involved on the design of simulation models for photovoltaic systems. He joined ENEL in 2003 dealing with research projects about solar fields energy and being involved in the development of advanced photovoltaic power forecasting systems. He was project coordinator of Enel Research of the testing activities on the photovoltaic modules becoming Tests Coordinator and Test Specialist to the Enel Lab at Catania. Now he is part the Innovation Department of Enel Green Power. As Innovative Business Opportunity Manager, he is currently in charge of all activities regarding the generation PV system and technical modelling

4.1.22 Flyby

Partner Full name		Flyby			
Partner nº	22	Short name	**Flyby**	Country	**Italy**

Partner entity description and relevance:

Flyby is an independent Italian SME company, developing applied research solutions mainly based on remote sensing technologies.

Flyby's processes are managed according to UNI EN ISO9001:2008 quality standards. For the more demanding space projects the methods set down in the European Space standards (ECSS) are also applied.

Interdisciplinary background and expertise in various fields allow Flyby to face complex challenges in applied research and to develop innovative products that bring a high added value to the many Institutional and Private customers.

The company is managed by the founder Dr. Emilio Simeone (Laurea in Physics, PhD in Applied Optics). The staff is composed by fifteen collaborators with MS and PhD level education and skills in Computer Science, Physics, Telecommunication, Electronics, Signal Processing Engineering, Artificial Intelligence.

Flyby has provided services and products based on optical remote sensing to many customers into different market sectors like Oil & Gas Corporations, Defense governmental bodies, Environmental agencies, Aerospace Corporations.

Flyby's instruments, services and products find their main applications in the following fields:

1. Environmental monitoring and protection
2. Space and aerospace
3. Defense & Security
4. Renewable energies

The company conducts two lines of business: the first is represented by the constant involvement in various R&D projects funded by the European Space Agency (ESA), the Italian Space Agency (ASI), the European Commission (EC) and by other regional agencies; the second line consists in selling the commercial products that derive from prototype applications developed in the R&D projects.

Flyby Propose on the market energy management solutions for renewable energy projects since 2005. In particular, Flyby provides Business Intelligence solutions for Energy Management. Public and private players requires expertise in innovation, reliability and risk minimization in the following areas:

- distributed generation from renewable sources
- smart grids and energy storage systems
- energy efficiency solutions, control and optimization of energy consumption
- electric vehicles and sustainable mobility

The entire Flyby infrastructure has been developed following the philosophy of Business Intelligence (BI) in order to transform data into knowledge and provide decision support systems.

The success of this implementation is the use of techniques of historicizing, analysis and presentation of data

in order to support decision making of Energy Management.

The Flyby Business Intelligence technology consists of three layers: the data layer, the analysis layer and the presentation layer.

Flyby adopts systems of Big Data Analytics to manage all the information acquired and processed (georeferenced within spatial database).

Flyby services run on an IaaS (Infrastructure as a Service) powered by following feature:

- Scalable, adaptable to the customer needs
- High reliability: SLA of 99.9%
- Redundant: distributed architecture in the cloud across multiple servers in different geographic world regions
- High performances guaranteed for the provision of services (i.e. Bandwidth)

Business Motivation and Activities in the project:

Flyby is interested in use cases related to Energy generation, for all the renewables: solar, wind and hydro.

The interest is in developing, implementation and test of advanced diagnostics and predictive tools through Big Data technology application in order to monitor, detect and prevent renewable plants faults and reduce lost production.

The solution shall be based on the analysis of the data signals status and events.

The contributions will be to:

- Predictive maintenance
- Energy demand forecasting
- Anomaly detection

Transversal contribution:

- Security
- Visualization
- Scalability

Expertise from previous and on-going projects:

Flyby's cutting edge competence is the capability to develop dedicated algorithms for the processing and managing of data, especially those coming from optical sensors, and the capability to model complex systems. Such capabilities stem from the multi-disciplinary background of Flyby's R&D personnel, who is active in both assimilating the latest achievements of scientific literature and in collaborating with important public and private research centers.

Flyby has a leading experience in the field of data processing in particular its competences include:

fusion of optical EO based environmental parameters with on-ground sensors measures or with SAR measures (e.g. pan-sharpening) , Artificial Intelligence techniques: decision support systems, neural network processors, fuzzy logic processors (e.g. target detection and pattern recognition), modeling of solar light interaction with atmosphere/land/sea, simulation of scenarios and sensors for UAVs platforms

Bayesian analysis for classification of any substance/material properties, processing of satellite and airborne multi-hyperspectral imagery, Differential Optical Absorption Spectroscopy, FT-IR, Fluorescence, LIDAR

etc.

As regards geo-referenced images, Flyby has leading experience in software development and project involving various scenarios: satellite data, web services, and client applications from desktop and mobile platform too. In particular some web services are available for general clients (desktop and mobile platform) to retrieve data satellite information as numerical value (UV index, ozone values etc....) and geo-tiff images. Starting from data satellite information, Flyby web services are able to offer a wide range of possibilities to clients; some mobile apps have been developed accordingly to these characteristics.

The following are only some of the R&D European projects in which Flyby has participated acquiring significant expertise:AURORA(EC-H2020), SATENERG (customer: ASI), MACC (EC-FP7), ENDORSE (EC-FP7), FISHSAT (ESA), SATOUR (ESA), PRIMI (ASI), LIMES (EC-FP6), BIOSHORE (ESA), EOREA (ESA), SEALINE (ESA), HAPPYSUN (ESA), ROSES (ESA), STRIM (ASI).

Infrastructure and equipment:

FLYBY provides its products and services through the software delivery model called Software as a Service (SaaS), that runs on Microsoft Azure cloud-based platforms. This infrastructure gives not only the necessary know-how to build and handle the cloud-based ICT platform included in the proposed work, but also gives the possibility to integrate Big Data Analytics frameworks for both structured and unstructured data inside FLYBY infrastructure, as Apache Hadoop or Microsoft HDInsight.

Relevant publications products and services:

1. M. Morelli, F. Ruffini, A. Masini and M. A. C. Potenza, "Web tools for performance analysis and planning support for solar energy plants (PV, CSP, CPV) starting from remotely sensed optical images" in Proc. EnviroInfo, 2-4 September 2013
2. M. Morelli and F. Flore, "Satellite data for solar ultraviolet and photovoltaic management services" in Proc. The growing use of GMES across Europe's regions, 2012

Flyby through his controlled company i-EM Srl offers a complete solution for the management of renewable generation: monitoring of RE plants, storage systems, energy efficiency, energy forecast.

EController is the solution for renewable energy plants owners and operators: it is the ideal tool both for prosumers and market operators. Thanks to an advanced big data analysis approach, Econtroller is your decision support tool providing accurate, updated and necessary information (Business Intelligence) such as performances, diagnostics and energy production predictions.

E2Manager is the perfect solution for Energy Managers and ESCO. It provides monitoring, analysis and energy efficiency control services, ideal for prosumers needs. E2Manager provide power yield forecast of renewable energy plants; This solution allows active management of energy efficiency.

RES2GRID is the solution for the forecast and newscast of energy renewable generation: solar, wind, hydro. The Decision Support Systems innovative solution, ideal for Virtual Power Producers. It allows a smart grid approach to the management of micro-networks and their integration with the high distributed power generation, electric vehicles, and renewable energy sources.

Collaborator profiles	
C1	**Dr. Emilio Simeone** (male) received his Laurea degree in Physics from University of Pisa in 1988 and his PhD degree in Applied Optics from the University of Florence in 2000. From 1991 to 2000 he has been Head of the Research & Development Department of Kayser Threde group (Italy). Currently he is the managing Director of Flyby srl and of i-EM srl. His technical and research activities have been in the area of data processing and optics design. He has been Project Manager of several international and national projects.

C2	**Dr. Andrea Masini** (male) received his Laurea degree in telecommunications engineering and his PhD degree in remote sensing from University of Pisa in 2004 and 2008, respectively. He is now working as technical director at Flyby S.r.l, Livorno, Italy. His current research interests concern image processing, in particular environmental monitoring from remotely sensed images, pattern recognition and information fusion. He has been Project Manager of National and international funded projects. He is the author or co-author of more than 20 scientific papers in journals and conferences
C3	**Dr. Marco Morelli** (male) received the Laurea degree (M.S.) in Physics from the University of Pisa (Italy) in 2011. Since 2011 he is doing research activities at the Research & Development Department of Flyby S.r.l. (Livorno, Italy) in the fields of satellite remote sensing and downstream services development. He received his PhD degree in Applied Physics in 2015 at the Physics Department of the University of Milano (Italy), participating also to the ESA EO Summer School 2014 in Frascati (Italy). He worked in the frame of the FP7-MACC project (2009-2011), and in the frame of the FP7-ENDORSE project (2011-2013), being the leader of the WP dedicated to Product Development and the author of several deliverables. He is currently the Technological Responsible of the Horizon 2020 AURORA project, being the leader of WP5 "Data Acquisition and Storage" and the leader of several related tasks. His research activities are mainly focused on the development of downstream services from Earth Observation data. He is the author or co-author of more than 10 scientific papers in journals and conferences
C4	**Dr. Michele Paperini** (male) received his Laurea degree in Computer Science from Pisa University in 2001. After twenty years of working as an independent developer now he is the ICT Manager of Flyby S.r.l, Livorno, Italy. Currently he is developing projects for mobile platforms. In particular his main interest regards the integrations from database server software, web system software and app for mobile platform.

4.1.23 Universitá di Bologna

Partner Full name		ALMA MATER STUDIORUM Università di Bologna			
Partner nº	**23**	Short name	**UNIBO**	Country	**Italy**

Partner entity description and relevance:

Almost 1000 years old, the University of Bologna (UNIBO) is known as the oldest University of the western world. Nowadays, UNIBO still remains one of the most important institutions of higher education across Europe and the second largest university in Italy with **11 Schools, 33 Departments and about 84.000 students**; it is organized in a multi-campus structure with 5 operating sites (Bologna, Cesena, Forlì, Ravenna and Rimini), and, since 1998, also a permanent headquarters in Buenos Aires.

With regard to the **capability of attracting funding**, UNIBO is very active both at National and European level. At European level, with 87,8 million Euros from FP7 and other EU funded programs (274 projects funded in 2007-2013; in 58 of them UNIBO was coordinator) UNIBO is the **second Italian university for the attractiveness of European funding for research**, 37th in the European ranking of institutions of higher education. In Horizon 2020, UNIBO is involved in 44 funded projects – in 8 of them UNIBO is coordinator – with 14.49 million Euro. UNIBO is also affiliate partner of the EIT KIC "EIT ICT Labs". At National level UNIBO ranks second for competitive research funding from the Italian Government.

At the University of Bologna, activities related to European funding programs are supported by the European Research and Innovation Office. With about 30 people, organized in 4 thematic units plus another unit specifically devoted to ERC and Marie Curie programs, the office assists research groups in the whole project lifecycle: networking and lobbying, consortium building, proposal preparation, negotiation and project management. The European Research and Innovation Office steadily cooperates with the Knowledge Transfer Office, supporting the IP protection and exploitation, and the take up and commercialization of project results.

With regard to the **international reputation**, UNIBO has been awarded the use of the logo "HR Excellence in Research" and is among the top 5 Italian universities in the main **International rankings,** e.g., 2nd Italian university (75th position) in the international QS - World University Rankings of the world best universities; 4th Italian University (201-250th position) in the World University Rankings.

The activity of the University of Bologna will be conducted within Department of Computer Science and Engineering (DISI). DISI is one of the strongest centers for computer science and engineering research, covering such diverse areas as artificial intelligence, autonomic and complex systems, bio-informatics, middleware systems, networks, programming languages, formal methods, hardware and software systems and their applications in medicine, energy, environment and society, to cite just a few.

Activities in the project:

The groups involved in the Department of Computer Science and Engineering cover aspects related to data management and prescriptive analytics. In WP3 UNIBO will develop a data management middleware that integrates various data sources and provides a unique view to the service layer. In WP4 UNIBO will actively participate to the Energy Generation Pilot by developing a Business Decision support system that enables the predictive maintenance at plant and fleet level able to provide optimal maintenance plans and production

forecasts. In addition, UNIBO will produce investment plans within capex budgets envelopes

Expertise from previous and on-going projects:

- **Google Focused Grant Program on Mathematical Optimization and Combinatorial Optimization in Europe on Machine Learning in Combinatorial Optimization:** The grant is devoted to the integration of machine learning techniques in Combinatorial Optimization solvers. The techniques have been tested on a case study **Thermal Aware Dispatching of parallel application on multi-core platforms and on data centers**.

- **Google Research Faculty Award: DeepOpt: Encoding Deep Networks in Combinatorial Optimization Problems.** This award concerns a study on the integration of machine learning models with particular emphasis on deep networks in Combinatorial optimization models.

- **e-POLICY** (coordinated by UNIBO): FP7-ICT project, whose main aim is to support policy makers in their decision process across a multi-disciplinary effort aimed at engineering the policy making life-cycle. Global and individual perspectives on the decision process are merged and integrated. The project focuses on regional energy planning and promotes the assessment of economic, social and environmental impacts during the policy making process (at both the global and individual levels).

- **DAREED**: FP7-ICT project funded in the smart city joint call, aiming at defining decision support systems for energy efficiency in the building and district level. Many techniques used for DAREED will be reused to improve the energy footprint of the productive process.

- **COLOMBO:** FP7-ICT project related to the creation of cooperative systems for traffic management, namely traffic control and monitoring. The environmental aspect is taken into account in COLOMBO as potential emissions are computed and simulated under realistic assumptions.

Infrastructure and equipment:

Relevant publications products and services:

- Michela Milano: Sustainable energy policies: research challenges and opportunities. DATE 2013: 1143-1148
- Michela Milano, Barry O'Sullivan, Marco Gavanelli: Sustainable Policy Making: A Strategic Challenge for Artificial Intelligence. AI Magazine 35(3): 22-35 (2014)
- Michela Milano, Michele Lombardi: Strategic decision making on complex systems. Constraints 19(2): 174-185 (2014)
- Andrea Borghesi, Michela Milano, Marco Gavanelli, Tony Woods: Simulation Of Incentive Mechanisms For Renewable Energy Policies. ECMS 2013: 32-38
- Michela Milano: Optimization for Policy Making: The Cornerstone for an Integrated Approach. CP 2013: 1-2

Collaborator profiles

C1	**Prof Michela Milano (**female**),** PhD in Computer Science. Her research and teaching records include activities in the area of Decision support and optimization. In these fields Michela Milano has published more than 130 papers in international conferences and journals. She edited five books on Hybrid Optimization and Constraint Programming. She is Editor in Chief of the Constraints Journal. She is Area Editor of INFORMS Journal on Computing, Constraint Programming Letters and was member of the Editorial Board of the Constraint International Journal. She is a member of the advisory board of the Optimization Research Group at NICTA, Australia. She is the coordinator of the FP7 EU ePolicy project (2011-2014) *Engineering the Policy Making Life Cycle* and partner of a number of FP7 EU projects related to energy, DAREED and COLOMBO and principal investigator of a Google Focused Grant Program on Mathematical Optimization and Combinatorial Optimization in Europe on Machine Learning in Combinatorial Optimization, described above. Michela Milano has been national coordinator of the International Exchange Italia-Quebec on Logistic.
C2	**J Prof. Ilaria Bartolini (**female**)** is Associate Professor at the Department of Computer Sciences and Engineering (DISI) of the University of Bologna. Her current research mainly focuses on collaborative filtering, learning of user preferences, similarity search and browsing techniques for very large collections of “non-conventional” data (such as text documents, images, video/audio streams, time series, and, more in general, any interesting “patterns”) based on both the automatic characterization of the content by means of “low-level features” and its “semantics”. She has developed and spread worldwide query models based on these characterizations, together with efficient and scalable query processing algorithms for highly differentiated users. Among relevant national and international research projects she participated, "Patterns for Next-Generation Database Systems - PANDA" (European Community-funded IST/FET project about the management of information obtained through Data Mining processes), "Data-Centric Genomic Computing - GenData 2020" (MIUR PRIN Italian project aiming to the effective and efficient management of genetic Big Data so as to foster their accessibility).
C3	**Prof. Marco Patella (**male**)** Marco Patella is an associate professor at DISI (Department of Computer Science and Engineering). His scientific research activity primarily focuses on query processing issues in multimedia databases. In this context, he achieved relevant results in the design and theoretical analysis of access methods and in the creation of query processing algorithms. More recently, he also performed research in the fields of information retrieval in image databases, Data Mining, and semantic querying in peer-to-peer networks. Marco Patella is one of the developers of M-tree which is widely recognized as the state-of.the-art reference for metric spaces indexing methods. Among national/international research projects he worked in, "HERMES (Foundations of High Performance Multimedia Information Management Systems) - ESPRIT Long Term Research, N. 9141", "Patterns for Next-Generation Database Systems - PANDA" (European Community-funded IST/FET project about the management of information obtained through Data Mining processes), and "Data-Centric Genomic Computing - GenData 2020" (MIUR PRIN Italian project aiming to the effective and efficient management of genetic Big Data so as to foster their accessibility).
C4	**Michele Lombardi (**male**):** Michele Lombardi is a a fixed-term assistant professor at University of Bologna. He is working on the integration of heterogeneous techniques for Combinatorial Optimization. His expertise is on Constraint Programming, Integer Linear Programming and Machine Learning, with main applications on resource allocation and scheduling problems, and on price-scheme definition in the energy market. Michele has a PhD in Electrical, Computer and Telecommunications Engineering. He received the AI*IA "Marco Cadoli" PhD award in 2010, and honorable mentions at the CP 2011 and ICAPS 2012 PhD awards. He has been a visiting researcher at EPFL, Cornell University, and the Université Catholique de Louvain. He has been a reviewer for international journals, program committee member for international conferences, and a speaker at the invitation-only Internationl Symposium on Mathematical Programming in 2012 and 2015. He has co-chaired two doctoral programmes, a summer school on Constraint Programming, and an international workshop. He contributed to the FP7 projects "ePolicy", "Therminator" and "Predator", to the FP7 ERC "Multitherman", to the JTI ARTEMIS "SMECY" and to the Google Focused Grant “Model Learning in Combinatorial Optimization: a Case Study on

	Thermal Aware Dispatching". He is currently contributing the FP7 project DAREED, on decision support systems for the energy market at district scale.
C5	**Alessio Bonfietti (**male**)** is a Post-Doctoral Fellow at DISI, University of Bologna; his research activity is related to Constraint Programming and its integration with Integer Programming , Artificial Intelligence and Machine Learning techniques. He obtained a Ph.D. in Computer Engineering at the University of Bologna. He has published papers and performed reviews for international conferences and journals and he is in the program committees of various international AI Conferences. He received the AI*IA "Marco Cadoli" PhD award in 2013. He was involved in the FP7 EU ePolicy project (2011-2014) *Engineering the Policy Making Life Cycle* and in the COLOMBO project (2012-2015).

4.1.24 SAP

Partner Full name		SAP AG			
Partner nº	24	Short name	SAP	Country	Germany

Partner entity description and relevance:

For 40 years, SAP has helped businesses run better through world-class software solutions that solve complex problems to help invent, commercialize, and mainstream the products and services of the global economy. SAP is a major actor in the utilities area with 2,700+ utilities customers worldwide and 90% of utilities companies in the Forbes 2000 run SAP.

The strategy of SAP is to provide innovative applications in order to improve utilities initiatives. To succeed in the new energy environment, SAP provides solution to the utilities market in order to give customers, partners, and employees access to the information, solutions, and services they need – anytime, anywhere:

- Real time data platform can help to meet this challenge. The ability to leverage huge volumes of data across and beyond the utility enables fast analysis of positive and negative trends and better decision making.
- Cloud-based applications play an essential role in enabling information-sharing both inside and outside a utility.

Business Motivation and Activities in the project:

We would like to leverage our technologies to augment the impact of our digital solutions in collaboration with European power supply and electric grid companies.

Application areas cover e.g. load forecasting, energy price forecasting and forecasting the supply of renewable energy sources as well as forecasting of energy flows in grids. Advanced reinforcement learning is used for generating strategies in energy trading, efficient plant operations or energy management. We really want to take this opportunity to improve our visibility towards our customers and increase our business knowledge in the improvement of generation operations

Expertise from previous and on-going projects:

SAP is already engaged in several project related to energy and big data topics (eBADGE; Flexiciency; FutureFlow; NEW 4.0) where SAP proposed its technology to partner in order to build new innovations.

Also SAP is also engaged many Big data proof of concept with customers like Center point, Alliander, Basf, AGP etc.

Infrastructure and equipment:

The strategy of SAP is to provide innovative applications in order to improve utilities initiatives. To succeed in the new energy environment, SAP provides solution to the utilities market in order to give customers, partners, and employees access to the information, solutions, and services they need – anytime, anywhere:

- Real time data platform can help to meet this challenge. Utilities need to collect, store, and analyze mountains of data in real time. From customer histories to compliance reports, from technical and operational data to energy forecasts and smart meter statistics – all will have to be digested quickly,

without the lag time typically associated with data management processes. The ability to leverage huge volumes of data across and beyond the utility enables fast analysis of positive and negative trends and better decision making.

- Mobile apps can help utilities improve business processes significantly by enabling workers to transfer relevant information to or from any mobile device. The apps can also help field technicians and other staff improves productivity and delight customers.

- Cloud-based applications play an essential role in enabling information-sharing both inside and outside a utility. Low-cost and quick to deploy, pay-as-you-go technology helps organizations of all sizes reduce capital investments and achieve benefits. Cloud solutions and services from SAP help utility companies handle a wide range of mission-critical processes. From interfaces with electric vehicles to connecting with trading partners, the solution portfolio is both comprehensive and focused.

- Multichannel app and real time data base can be integrated in the cloud application. This cloud platform can exchange information with third party applications.

In-memory computing is a concept brought to life by the breakthrough SAP HANA platform. While relatively young by commercial standards, the rapid adoption of SAP HANA across the utilities industry validates its massive potential for digital businesses.

With SAP HANA in-memory computing, we can now finally:

- Leverage Big Data from meters, sensors, weather, social, and geospatial sources. Bringing all data signals together leads to optimal decision making, which can be instantly acted upon in transactional systems via human and machine-to-machine interfaces
- Extend the business process to interoperate with business partners in near real time via advanced cloud-based business networks
- Modernize business processes from finance to supply chain, enterprise asset management and meter-to-cash, running them in real time with no data replication and no batch programs

Relevant publications products and services:

The applications developed by SAP are driven by the value and are KPI oriented. For each application developed, SAP was asking about what value can bring SAP? The answer of SAP is to drive innovation and develop applications to:

- Manage large data base, provide accelerated enterprise processes and real time analytics: HANA Database
- Offer flexible communication to facilitate exchange of data over different channels: Multichannel Foundation for Utilities
- Run solution in the cloud to reduce capital investment : Enterprise Cloud

SAP has invested in technologies and, on the other hand, in high skilling of its consultant who have a huge experience in the utilities area. SAP can propose transformation approach, and can recommend best practices. It will accelerate the implementation and also in help to secure the project.

Collaborator profiles	
C1	**Maher Chebbo** (male) Vicepresident Energy & Natural Resources at SAP. Chairman of ETP Smart Grids Demand and Metering and Retail Group. Chairman of DigitalEurope SmartGrids,

	incl. Smart Cities group Co-founder of EU SmartGrids and Chairman of ETP SmartGrids Demand & Metering group Member of the Advisory Group of ICT Infrastructure for energy-efficient buildings and neighborhoods Member of the Board of EEGI, the SmartGrids Task Force and CEN-CENELEC M490 Member of the Board of REEEP (Renewable Energy and Energy Efficiency Partnership) Member of the Executive Board of ARMINES (50 R&D Labs of Ecole des Mines de Paris) Vice President of ESMIG (European Smart Metering Industry Group) Maher joined SAP 17 years ago (1996) where he co-founded its Corporate In-Venturing Unit (SAP INSPIRE) in 2003 and where he held various responsibilities as a Regional Business Unit Manager and Director of Innovation. Maher co-founded a German Renewable startup and, before joining SAP, led at Cap Gemini the Power & Communication industries for 6 years. Maher holds an Engineering Degree in Mechanical and Energy. He holds as well a PhD Energy degree from Ecole des Mines de Paris where he is member of the Board (ARMINES). He has an MBS in Electronics and a BA specialization in Entrepreneurship, Finance, Innovation and investments.
C2	**Fritz Schwarzlaender** (male) Industry Value Engineering at SAP Fritz Schwarzländer has 28 years' experience in consulting, especially in business process reengineering, organizational development, value analysis, project and quality management, business and IT strategies, system analysis and data modelling. In the last 18 years, he gathered an in-depth experience in the utilities, water and wastewater industries in the fields of retail, customer care, billing, accounting, metering, legal affairs, regulatory affairs, controlling, maintenance, operations, quality assurance, and engineering. For the last 8 years he has focused on market liberalization, unbundling and regulatory affairs in utilities (mainly in European countries). Before joining SAP he worked for EnBW and RWE, mainly as a Project Manager or as a Change Agent.
C3	**Mateu Munar** (male) Head of Consulting Services for Utilities in EMEA at SAP Industrial Engineer 15 Years in the IT for the Utilities Industry and 8 years in SAP
C4	**Stephane Dotto** (female) Industry Value Engineering at SAP Electricity Engineering and Computer Science He is a value engineer working for SAP and experienced in helping organizations identifying levers to increase their performance and reduce costs.

	With 12 years of experience SAP utilities. He brings his experience to drive innovative approaches for business development. Hi is helping organizations identifying the value of business transformations leveraging technological solutions and innovations Industries area: Utilities, Chemical, Oil Gas, Mining. Previously he was Business consultant with 10 years of experience in the area of Utilities. He had long term project assignment, and various spot consulting missions, acting as Business Architect, Implementation consultant, Teacher, Tester, project review.

4.1.25 Tecnalia

Partner Full name		FUNDACION TECNALIA RESEARCH & INNOVATION			
Partner nº	**25**	Short name	**TECNALIA**	Country	**Spain**

Partner entity description and relevance:

FUNDACIÓN TECNALIA RESEARCH & INNOVATION (www.tecnalia.com) is a private, independent, non-profit applied research centre of international excellence. Legally a Foundation, TECNALIA is the leading private and independent research and technology organisation in Spain and one of the largest in Europe, employing 1,319 people (198 PhDs) and with income of 94 Million € in 2014.

The whole team at TECNALIA has one GOAL: to transform knowledge into GDP, meaning wealth to improve people's quality of life by generating business opportunities for industry. TECNALIA is committed to generate major impacts in economic terms, by means of innovation and technological development, addressed by 8 business divisions, covering economic sectors of Energy, Industry, Transportation, Construction, Health and ICT. TECNALIA has been granted over 250 patents and promoted more than 30 spin-off companies.

TECNALIA is a key agent in the ERA - European Research Area, holding position 11th among RECs and 23th overall in EC's 7th FP7 Monitoring Report (Final). TECNALIA actively participates in the governing bodies of several European Technology Platforms, and in the BDVA PPP, and partners in 377 FP7 projects, coordinating 81 of them; in H2020 TECNALIA participates in 87 projects, coordinating 17 of them, up to December 2015. TECNALIA is a member of EARTO and of EUROTECH, linking together the most important research centres in Europe. TECNALIA has been the more active organization in the ARTEMIS programme, participating in 27 projects and also in 6 ECSEL projects.

TECNALIA Ventures is wholly owned subsidiary for the commercialisation of innovative technology-based results, turning innovative technology assets into new profitable and sustainable businesses and generating economic value for society. TECNALIA Ventures focuses on accelerating the development of disruptive technologies to transform them into investable business opportunities and managing the portfolio of TECNALIA spin-offs, currently integrated by a portfolio of 15 start-ups in a wide range of sectors.

The University of the Basque Country (EHU/UPV), Tecnalia and Donostia International Physics Center (DIPC) are the founding members of Euskampus (2010, http://euskampus.ehu.es/en/), a project with attained the qualification of International Campus of Excellence from the Spanish Ministry of Education (2010). Euskampus partners with the PRES of the Universities of Bordeaux in the Euskampus-Bordeaux Transborder Campus.

On the other hand, TECNALIA is an equal opportunity employ with current ratio of female/male employees of 42/58.

OPTIMA (Optimization, Modelling and Analytics) business area within the ICT Division focuses its activity and know-how on the derivation of optimization, clustering, forecasting, data mining, and in general, artificial intelligence techniques to model and solve highly complex problems unable to be tackled by means of conventional mathematical approaches.

The Energy Division has expertise in electro technology, active demand solutions for the Smart-Grid, the implementation of dispatching support software tools, data modelling, network simulation, partial discharge analysis, electromagnetic compatibility, and electronics. A DG laboratory exists and it is equipped with several types of micro generation equipment.

Business Motivation and Activities in the project:

TECNALIA has several mature developments applying big data & smart-analytics technologies to the energy domain

such as energy efficiency management in buildings, renewable integration, energy generation (renewable)/consumption forecast, smart-grid based on load curve analysis, among others. TECNALIA will apply some of these applications in the use cases and demonstrators of the WP4 Energy Generation, WP5 Energy Distribution and WP6 Energy Retail & Services, and will collaborate actively in the WP3 Configuration and adaptation of Big Data ICT solutions/tools, in the task T3.2 Big Data Analytics for Energy.

Expertise from previous and on-going projects:

I3RES: ICT-based Intelligent management of Integrated RES for the smart grid (http://www.i3res.eu/v1/) FP7-ICT, 2012-2015.

INERTIA: Integrating Active, Flexible and Responsive Tertiary Prosumers into a Smart Distribution Grid (http://www.inertia-project.eu/inertia/) FP7-ICT, 2012-2015.

OS4ES: Open System for Energy Services (http://www.os4es.eu/) FP7-ICT, 2014-2017.

UPGRID: Smart Electricity Systems and Interoperability (http://ses.jrc.ec.europa.eu/upgrid) H2020-LCE, 20015-2018.

ARROWHEAD: Service Interoperability Enabling Collaborative Automation (www.arrowhead.eu) ARTEMIS, 2013-2017.

ADDRESS: Active Distribution networks with full integration of Demand and Distributed energy Resources (http://www.addressfp7.org/) FP7-ENERGY, 2008-2013.

Infrastructure and equipment:

1. **INGRID**. A reference advanced Smart Grid laboratory with the following main capabilities: a. Electrical equipment for Transport & Distribution networks testing platform. b. High power converters and power electronics platform. UPGRID 26 | 86 c. Electrical systems for renewable energy platform. d. Electrical storage platform.

2. **Centre for Development and Demonstration of DER technologies.** A set of manageable and interconnected generation, storage and load devices that allow the development, verification, tests, assessment and demonstration of DER technologies emulating the different conditions of the MV/LV smart grids.

3. **KUBIK**. Demonstration and experimentation infrastructure in the field of Smart Energy Building including capabilities for the integration and test of DER, DM and Energy Efficiency assets and processes.

4. Demonstration and Assessment Interoperability framework for Smart Grids PLC-based protocols.

5. **Interoperability Centre:** Smart EV2Grid charging-discharging framework, covering both technological and business modelling approaches.

Relevant publications products and services:

1. Itziar Landa-Torres, Diana Manjarrés, Sancho Salcedo-Sanz, Javier Del Ser, Sergio Gil-Lopez. A multi-objective grouping Harmony Search algorithm for the optimal distribution of 24-hour medical emergency units. Expert Syst. Appl. 40(6): 2343-2349 (2013)

2. Diana Manjarrés, Itziar Landa-Torres, Sergio Gil-Lopez, Javier Del Ser, Miren Nekane Bilbao, Sancho Salcedo-Sanz, Zong Woo Geem. A survey on applications of the harmony search algorithm. Eng. Appl. of AI 26(8), pp: 1818-1831 (2013)

3. Itziar Landa-Torres, Emilio G Ortiz-Garcia, Sancho Salcedo-Sanz, María J Segovia-Vargas, Sergio Gil-Lopez, Marta Miranda, Jose M Leiva-Murillo, Javier Del Ser Evaluating the internationalization success of companies through a hybrid grouping harmony search—extreme learning machine approach. IEEE Journal of Selected

Topics in Signal Processing, Vol. 6, N. 4, pp: 388-398 (2012)

4. D. Manjarrés, J. Del Ser, S. Gil-López, M. Vecchio, I. Landa-Torres, S. Salcedo-Sanz, R. López-Valcarce On the Design of a Novel Two-Objective Harmony Search Approach for Distance- and Connectivity-based Node Localization in Wireless Sensor Networks. Engineering Applications of Artificial Intelligence, Vol. 26, N. 2, pp. 669–676, February 2013

5. I. Landa-Torres, S. Gil-López, J. Del Ser, S. Salcedo-Sanz, D. Manjarrés, J. A. Portilla-Figueras. Efficient Citywide Planning of Open WiFi Access Networks using Novel Grouping Harmony Search Heuristics. Engineering Applications of Artificial Intelligence. Volume 26, Issue 3, March 2013, Pages 1124–1130.

Collaborator profiles	
C1	**Sergio Gil-Lopez (**male**)** received the M.Sc. degree in Physics from Universidad de La Laguna, Tenerife, Spain in 2001, although the first half of his university studies was done in the Universidad Autonoma de Madrid, Spain. His Ph.D. degree in Atmospheric Physics from Universidad de Granada (at Instituto de Astrofísica de Andalucía, CSIC) was obtained in 2006. During his Ph. D. studies he spent three months in two Atmospheric German researcher centers (IMK in Karlsruhe and ICFG1 in Jüelich) for scientist collaboration. His thesis deals about Stratospheric to Mesospheric Ozone Retrieval from MIPAS/ENVISAT data. Currently, he is a Data Scientist senior researcher in OPTIMA (Optimization, Modelling and Analytics) business area at TECNALIA RESEARCH & INNOVATION with nearly 10 years of experience. Although he has had one year's break in Ariadna Instrument S. L. working in the developing of an Intelligent algorithm for Low Voltage Network Topology Estimation, fraud detection techniques and energy balance estimations for the Smart Grids. He has co-authored more than 37 international journal papers and more than 43 conference contributions, 5 filed patents and 2 supervised PhDs. He has also been involved in the organization of various national and international conferences, either in charge for chairing positions. His current interests deal with tackling Smart Analytics applied to Energy optimization, Smart Grids, NP-hard optimization problems through the application of heuristic and evolutionary algorithms, parallel algorithms search, local search methods, multi-objective cost functions problems, clustering/grouping, neural networks, fuzzy logic, among others.
C2	**Diana Manjarres (**female**)**, PhD. Telecommunication Engineering from the University of the Basque Country (UPV-EHU) and PhD in Information Technology from the University of Alcala de Henares (UAH). Currently, Diana is a researcher at the OPTIMA Unit of TECNALIA RESEARCH & INNOVATION working in the area of Telecommunications and Artificial Intelligence. Her research focuses on heuristic techniques for NP-hard optimization problems, multi-objective optimization, data-mining, pattern analysis, neural networks, clustering and grouping problems related to different fields of knowledge. During her 6-year-long research career she has coauthored more than 10 scientific publications in various international journals (Applied Soft Computing, Engineering Applications of Artificial Intelligence, Expert Systems with applications…) and 10 technical papers in renowned conferences such as MACOM, ISDA, etc.
C3	Telecommunication Engineering degree, **Itziar Landa (**female**)** is a PhD researcher at TECNALIA RESEARCH & INNOVATION working in the area of optimization problems related to smart grids and consumption patterns through the derivation and application of different ad-hoc heuristics (evolutionary algorithms, local search processes or multi-objective techniques, among others). During her 7-year-long research career she has co-authored over 10 articles in international journals and over 8 contributions to various renowned conferences in the field. Currently it belongs to business area OPTIMA (ICT- ESI division) participating in research projects in the implementation of approaches meta- heuristics to optimization problems of real life, a field in which he has done his thesis.
C4	**Emilio Rodríguez (**male**)** holds a BSc in Electrical Engineering, MSc in Radiocommunications, and a PhD degree in Electromagnetic Compatibility from the University of the Basque Country. He is a Project Manager and Senior Researcher in the Smart Grids Area of TECNALIA with 20-year experience in project development and research on EMC problems in electrical systems, power quality, DER integration, demand side management, smart metering, and communications for smart grids. In these areas he is the co-author of around 50 publications and 2

	patents. He was a Visiting Researcher at the EMC Advanced Projects Department, ERA Technologies Ltd., Leatherhead, U.K. (1995), and at the SP Technical Research Institute of Sweden, Borås, Sweden (1997). Dr. Rodríguez is also a lecturer at the Faculty of Engineering of the University of Deusto, Bilbao.
C5	**Sandra Riaño (**female**)** holds a BSc and a MSc in Automatics and Industrial Electronics Engineering (University of Deusto, Bilbao, 2006). She is a Researcher in the Smart Grids Area of TECNALIA since 2008. Her main research activities are related to DER integration, Demand Response, Energy Efficiency, Smart Metering and communications for Smart Grids. In these areas, she has worked closely with electrical manufacturers and utilities.

4.1.26 RICOH

Partner Full name		RICOH		RICOH imagine. change.	
Partner nº	26	Short name	**RICOH**	Country	**Spain**

Partner entity description and relevance:

The Ricoh Group is a multinational imaging and electronics company with 109.950 employees operating business in approximately 200 countries and regions of the world. Its portfolio ranges from products designed to help people interact with information including office imaging equipment (multifunctional products (MFP), printers, etc.), production printers, suppliers, digital cameras and industrial products such as thermal-based media, semiconductors and factory automation cameras to services and solutions such as Managed Document Services and IT solutions. In addition to technology, the Ricoh Group is known for its customer-centric approach. As a responsible global citizen, the group is also working proactively to build a sustainable society throughout business activities.

In 2014, the Ricoh was named to Top 100 Global Innovators list by Thomson Reuters and has been recognized by the FTSE4Good Index Series for the eleventh consecutive year. In 2015, it was listed in the Dow Jones Sustainability Indices (DJSI) for third consecutive year and earned a revenue of 2,231.9 billion yen.

Ricoh Spain with 1.700 employees and a turnover of more than 200M€ is specialized in IT services, office imaging equipment, production print solutions, business and strategic solutions, development and maintenance of technological applications and outsourcing services.

Ricoh is a leader at the top of the consulting sector in the area specific to TMT (Telecom, Media and Technology) and works to provide its clients with a broad vision of the sector, having the proven ability to build solid strategies based on ICT with the aim to help their clients achieve their business goals. At same time Ricoh can design and implement technology solutions and manage outsourcing applications, infrastructure and processes. It fosters the use of quality assurance methodologies and provides functional and technological specialization.

Business Motivation and Activities in the project:

Ricoh will contribute to the project primarily on the execution of the use case Energy Efficient Workplaces in WP7- Energy Management. This contribution will be backed on the experience on energy efficient and sustainable workplaces and existing data sets gathered from multifunctional products (MFP) of the customers during recent years, as well as knowledge of key technologies and personnel with extensive experience and skills. Ricoh will realize pilot demonstrations with its customers in Spain.

Expertise from previous and on-going projects:

PIDaaS Project. This CIP-PSP project, where RICOH is participating as partner, and contributing with the technological base for the construction of pilots. The aim of the PIDaaS project is to create an innovative identity management service, including the identity assurance service, relying on biometric traits as one of the most important factor for the identity assurance and including other meta-data (obtained from hardware, software and network) to better define the level of certainty of the authentication request. The PIDaaS project will add to this framework the biometric template protection schemes (BTPS) which allows the use of biometric traits while avoiding the inherited risk of classic biometric solutions, by providing: irreversibility, unlinkability, revocability and renewability to biometric pseudo-bioidentities generated thanks to the BTPS technology. From the end-user point of view, biometrics solves the risk of

impersonations.

Environmental Sustainability Analysis & Design. This project is provided by Ricoh to its customers to leverage the results of the Environmental Impact Analysis and to create an optimized solution design addressing the customer's environmental policies, procedures and best practices within the document management area that will reduce factors with a negative impact on the environment. In addition, Ricoh leverages the elements identified in the analysis to ensure that recommendations will have a positive measurable impact on the following key resources:
• Energy Consumption (also known as Energy Data)
• Paper Consumption (also known as Paper Data)
• CO2 Emissions

Using the results of the Environmental Impact Analysis as baseline data, the Ricoh project team develops a Recommended Environmental Sustainability Design Report for the customer's organization. The team also provides a recommended Implementation Plan and Return on Investment (ROI) Projection based on visible cost savings and unaccounted costs, such as productivity gains. The content of the Environmental Optimization Report includes strategies and recommendations for:
• Reduction of overall electricity consumption of printers and multifunctional devices
• Hard copy output reduction
• Reduction and neutralizations of CO2 emissions (zero carbon footprint)
• Printing policy

@Firma. Evolution development of the @firma platform with more than 10 years of experience within this solution for the Spanish Ministry for Public Administration and Finance. @firma supports the generation and validation of electronic signatures and certificates with more than 800 public bodies integrated, more than 1.100 applications and an average of 10 million transactions/month. @firma is the identity provider for the transnational Stork project and also as identity provider through electronic certificate for the project Cl@ve. @firma was recognized as Best Practice Labe by ePractice.eu (http://www.epractice.eu/node/277227).

Smart borders. This is a public contracted project that RICOH is developing jointly with the General Direction of the Spanish Police. The project consists in the development of a system for controlling entries and exits of travellers within the Schengen area. The system includes the verification of documents, criminal records, digital fingerprints, vehicles ... Among others, a complete set of integrations are performed with different systems of state security including passports systems, visas, digital fingerprints, airports access controls, etc.

Smart Barcelona (national INFOREGIÓ Program): The project consists in the functional, technical definition and development of a multi-service platform for Smart City services. The project includes the definition of the global architecture of a Smart City platform that should be able to integrate most of the urban/energy/environmental services in a city. The project has been developed with the Barcelona City Council and other industrial partners; more information can be found at www.smartbarcelona.cat.

Infrastructure and equipment:

Relevant publications products and services:

RICOH's product portfolio includes:

Multifunctional products (MFP): Ricoh constantly seeks to deliver new value to accommodate changing work styles by offering an array of such imaging equipment as MFPs and printers and other hardware. Underpinning these offerings are complete solutions that range from supplying software and consumables to constructing and supporting information technology environments, managing networks, and providing maintenance services and user support. Ricoh manufactures and markets thermal media, optical equipment, semiconductors, electrical components and measuring

equipment.

@Remote: Tool to collect and submit meter data on a schedule such as number of pages printed, quality of paper, energy consumption etc. from multifunctional products and laser printers.

Device Manager NX provides timely data and the ability to efficiently monitor and manage multiple printing devices.

RICOH's service portfolio includes:

Managed Document Services: Ricoh focuses on process, people, technology and innovation to drive continues improvement. Ricoh helps organisations flexibility so they can better manage and leverage information. Complementing the services management underpinning our print and document services program are consultation and proven project and change management methodologies.

Information Technology Services: Ricoh provides a single point of contact for all IT support to totally optimize office environments. These services cover everything from product procurement to full IT infrastructure support through continuous monitoring and operational support for devices. Ricoh helps its customers through measures to reduce their costs, enhance security and maintain business continuity.

Sustainability Management Services: Ricoh helps customers to comprehensively visualize environmental impacts through product lifecycles, enabling them to optimally select and install equipment based on analysis of their printing and usage needs. These services extend from proposals for recycling and reusing products to providing reports on power consumption and the use of energy-saving modes.

Consulting and innovation: Definition and development of innovation projects (R+D+i), defining new services; including Business Case and profitability analysis, Functional / Operating / Technological Consulting, and Strategic/ Director and Operation Plans.

Technology assessment: Analysis of specifications and technical requirements, Integration of Smart services, Development and implementation of innovative services, considering a number of new technologies including Big Data, Digital Signage, RFID, web and mobile platforms, etc.

Collaborator profiles	
C1	**Jordi Sala (**male**),** Consultancy and Innovation Director at Ricoh. He holds a Telecommunication Engineering Degree by the Polytechnic University of Catalonia (Barcelona) and a Master in Business by the Ramon Llull University (La Salle Business School-Barcelona). He has a relevant experience leading multi-technology related projects for more than 15 years, specially oriented to Public Administration, Utilities and Telecom segments as main business focus. He has been involved at different levels in over 70 ICTs consultancy and development projects, including a number of R+D projects under different programmes (FP7, CIP ICT-PSP, Artemis and other national programmes). He has also 5 years of experience as lecturer in the Ramon Llull University.
C2	**Irem Oc (**female**),** Consultant at Ricoh holding a degree in Environmental Engineering from the Middle East Technical University (Turkey). She has MSc degree from Euro-Aquae Programme with full-scholarship from the European Commission and another MSc degree in Water Technology and Management from Polytechnic University of Catalonia (Spain). She has experience in consultancy in the area of information and communication technologies.
C3	**Paloma Morales (**female**),** MDS Sales Specialist at Ricoh, holding a Business Administration degree and a Master in E-commerce and Sales Management by EAE Business School. She has a large experience in environmental consultancy focused on printing devices and offices technical efficiency. She has involved in Ricoh Europe environmental focus group for four years, and working in develop an environmental value proposal for the customer, defining the Go To Market and leading BSI environmental auditory in Spain.

C4	**Cristina Lerma (**female**),** MDS Manager at Ricoh holding an Industrial Engineering Degree by the Polytechnic University of Catalonia (Barcelona) and a Management Development Program by IESE Business School. Broad experience leading technological projects specially taking into account organizational change management approach. Currently, she is in charge of the Management Document Services team where sustainability plays a key role through all the printing and IT service model: consultancy, implementation, reporting and optimization.

4.1.27 NOVASOL

Partner Full name		NOVASOL A/S			
Partner nº	27	Short name	NOVASOL	Country	Denmark

Partner entity description and relevance:

Novasol A/S is a Vacation Rentals company with More than 40 years' experience and a size of 500+ FTEs (www.novasol.com) established in December 1968 called Nordisk Ferie was established. The first product of this new company was cabin holidays in Norway. The company started as a one-man business in a basement in Copenhagen.

North Europe's largest company for holiday rentals

Today, the company has developed into Northern Europe's largest company for holiday rentals with 40.000 holiday rentals in 29 European countries. The new name of the company is NOVASOL and the company

is a member of the Wyndham Vacation Rentals. NOVASOL has subsidiaries in a number of countries, several walk-in offices in popular holiday areas.

Selection of key locations includes: Copenhagen, Risskov, Oslo, Gothenburg, Hamburg, Berlin, Tilburg, Paris, Cannes, Monteriggioni, Venice, Pula, Siofok, Prague, Innsbruck, Zurich, Barcelona, Warsaw and

Stettin. Additionally we have more than 30 local service offices.

The difference between then and now is immense - but the essential principles and standards have been carried through and are under NOVASOL still the same and even after 40 years we still maintain the

same 3 principles which have always characterized NOVASOL. This is quality, service and reliability.

Quality, service and reliability

At NOVASOL, we aim to differentiate us from other companies by providing:

- quality holiday rentals, which are handpicked and quality
- inspected by NOVASOL employees
- a better and more individual customer service
- complete reliability, which means you can trust our promises.

Finally, our business concept is based on holding on to our customers - be it the holiday rental owner or the guest. This can best be done through reliability and hard, determined work based on the principle "we keep what we promise - and preferably a little more".

Our house types are pool houses, Whirlpool, Sauna or standard. We have about 900 units in Denmark with an indoor pool with an estimated yearly consumption of 30.000 kWh.

Business Motivation and Activities in the project:

To provide energy management to house owners from a research perspective and collaborated together with university and DSO/TSO that we otherwise would not have access to expertise from. Thereby creating competitive advantages but also to show a clear signal about green initiatives and the use of renewable energy.

Expertise from previous and on-going projects:

NOVASOL participates currently in **SmartNet** (2016-2019), H2020 project focusing on the use of big data and statistical modelling for optimizing DSO and TSO interactions in future smart grids. The project aims to develop optimal market structures and optimal interactions to leverage flexibility in low voltage grids.

Infrastructure and equipment:

Relevant publications products and services:

Collaborator profiles	
C1	**Mr. Thomas Kieldsen** works as Group Business Development Manager at Novasol A/S. Thomas has three university degrees; one in Spanish, one in Management Accounting & Process Management (IT) from CBS in Denmark and an MBA from University of Aarhus, Denmark. Thomas has since April 2014 worked with Smart House & Grid Management as a new area of test in Novasol. He works with business and product development by use of Internet of Things (IOT) and home automation in holiday cottages across Europe with smart metering smart grid technology.

Role in the project:

Participation as end-user to the "Danish" pilot Thomas has since April 2014 worked with Smart House & Grid Management as a new area of test in Novasol. He works with business and product development by use of Internet of Things (IOT) and home automation in holiday cottages across Europe with smart metering smart grid technology.

4.1.28 SDG Group

Partner Full name		SDG Group			
Partner nº	**28**	Short name	**SDG**	Country	**Italy**

Partner entity description and relevance:

The SDG Group was set up in 1994. Since the very first day, the business community has pinpointed SDG as a fervent laboratory for Innovation and Development for planning and controlling methodologies and practices, as well as an emergent consulting firm focused on the design and implementation of Decision Support Systems.

In 1997 a new growth strategy was laid out with a clear and sharp focus on business intelligence solutions. It was then that SDG decided to focus on disruptive Management Intelligence and Analytics consultancy services. SDG Group strove to become a leader in providing BA expertise through a perfect blend of management consulting and IT skills.

SDG Group is today a global management consulting firm, having a leading vision in the practices of Business Analytics and Corporate Performance Management. SDG recognizes its own core competencies in the continuous Research & Development of models and solutions, operating side-by-side with our clients' teams, supporting them in unlocking their intellectual value and taking full advantage of the latest Business Analytics and Big Data technologies. Innovative ideas and cutting-edge solutions support high performing consulting projects, while people skills and experiences ensure long-term win-win relationships with our customers.

SDG has become a centre of excellence in the end-to-end tasks of modelling and implementing solutions, supporting such business processes and areas as: Business Analytics, Predictive Models, Performance Management, Big Data Framework.

Drawing upon more than 20 years of experience in Planning & Controlling, Financial Reporting, Operational Performance Management and Marketing projects, SDG has developed and fine-tuned its innovative Management Intelligence practice to meet any and all Industries requirements, unlocking and enabling new ways to better manage their specific analytics needs. Our services are described as follows:

Business Services
- Sales & Operation Planning
- Business Analytics
- Enterprise Performance Management

CFO Services
- CPM
- Financial Consolidation
- Integrated Planning

FSC Financial & Capital Markets
- Corporate Controlling
- Remote Analytics
- Risk Management

VSA Visual & Search
- Social Intelligence
- Visual & Mobile

- Discovery Analytics

PMA Predictive & Mining
- Predictive Analytics Models
- Streaming Data Integration
- Statistical Applications

IIT Innovative Intelligence Transformation
- EDWH Framework
- In Memory Appliances
- Big Data Architecture

Business Motivation and Activities in the project:

SDG will contribute to the project giving its contribute mainly to:

- Predictive & Prescriptive issues
- Visual & Discovery Analytic issues

that will be addressed and developed into the project

SDG will realize a predictive & prescriptive early alert solution feeded by live streaming data related to a significant power generation plant component (i.e. the alternator or another component chosen by Enel according to the other project partners)

Expertise from previous and on-going projects:

SDG is characterized by the ability to combine lateral and vertical thinking, which means ability to carry successes and expertise gained in one field to other fields, on one side, and deepness of knowledge and know-how in extremely technical topics. So SDG was able to develop methodology and computing engines aimed to predict failures in a number of different complex systems such as power plants, pharmaceutical manufacturing processes and IoT systems. Our competence in predictive, prescriptive, optimization and more general analytical applications ranges from statistical models, to deep learning models, spiking neural networks, spectral methods and topological data analysis. Markov decision processes and adaptive dynamic programming, active learning and genetic algorithms, and so on. The computing environments for specialized topics are combined with vendor tools and environments to provide robust frameworks encompassing advances in scientific computing not available in such tools and environments. SDG is also involved as an external partner (with no economic contribution) in the *Advanced Multi-Variate Analysis for New Physics Searches at the LHC,* a project involving Universities and Research Centers and will host two PhD candidates to foster their ability to apply state-of-the art machine learning and statistical modeling to fields other than high-energy physics.

Infrastructure and equipment:

We are able to deploy our solutions using a number of big data and big computing solutions, going from Hadoop-based and Spark-based architectures, to SAP/HANA and other high-performance equipment and infrastructures. We use the major analytical tools complemented by scientific and technical-oriented environment and languages like R, Python, Scala and C. We are also able to work with special purpose libraries like JavaPlex, Phat, Gudhi, Pysheaf, VTK and to state-to-the-art environments like H20 and PurePredictive. Among the tools we use: SAS, SAP Predictive Analytics, IBM SPSS, Knime, Weka.

Relevant publications products and services:

Publications by M. Sanarico (SDG Chief Data Scientist):

- G. Vittadini, M. Sanarico (2006) ***The Cluster-Weighted Framework and the Multilevel Model*** (2006) Proceedings of the Compstat Satellite Meeting Knemo (Knowledge Extraction and Modeling).

- Pozzoli M; Traversi E; Cioffi G; Stenner R; Sanarico M; Tavazzi L. *Loading manipulations improve the prognostic value of Doppler evaluation of mitral flow in patients with chronic heart failure.* Circulation 1997;95(5):1222-30

- Seminar "Topological Data Analysis: Topology Meets Data" – University of Milan Bicocca – Department of Mathematics and Applications. June 11, 2015.

Services/Products (customized solutions developed and deployed into projects):

- Predictive framework for predictive maintenance and diagnostic, working both in streaming and offline.

- Predictive engine based on a combination of Multichannel Singular Spectrum Analysis and Linear Recurrent Relationship Forecasting applied to load forecasting at substation level.

Some applications encompassing big data based on the above services/products:

- Predictive application of neural networks in steelmaking industry, predictive detection of the presence critical defects in steel slabs

- Predictive Maintenance solution for pharmaceutical manufacturing process based on streaming data and a big data architecture using Hadoop for heterogeneous data storage. The analytical core of the solution is based on a combination of multichannel singular spectrum analysis and machine learning applied to signals noise-filtered and taking into account the inter-dependencies of the sensor-measured quantities. An early version of the solution has been successfully applied to very hard to detect failures in combined cycle power plants during a pilot project.

- System for the for analysis and forecasting of air pollution in an urban area in cooperation with ENEA (ATMOSFERA project)

- Health Analytics for Pacifico Seguros (Perù): Baseline risk, Evolution of risk in time, Effectiveness of prevention programs

Collaborator profiles	
C1	**Maurizio Sanarico** (male) has a Degree in Mathematics (University of Pisa, Italy). He's teaching from 1885 in various Master and Doctorate courses and seminars. He has written about 20 original publications in Applied Statistics and Mathematics. He has contributed to 2 books about the quantitative evaluation of Health Care Services and Educational Systems at University level, and many publications on scientific journals and book chapters. He has a strong experience in applied statistics, predictive and prescriptive issues. Actually, he works as Executive Director in SDG, responsible for the Predictive and Streaming Analytics Division. He has strong relationships and cooperation with Academic and Research Institutions. Member of the Supervisory Board of the AMVA4NewPhysics network (with CERN, INFN, Oxford University, University of Padua, Clermont Ferrand University and others)
C2	**Giorgio Moresi** (male) has a degree in Computer Science (University of Turin, Italy). He's been a professor in University of Bologna, Italy, teaching Strategic Planning and Web Economy. He has written two books (*Big Data Business Discovery* and *BSC applied to Public organizations*), and written articles about New BI, Big Data, Visual and Discovery Analytics on several magazines. He's teaching from years in various Master and Doctorate courses and seminars. In 2009 he's been the founder partner of Italy QlikView Consulting, where he worked as CEO until 2012, starting to experiment Enterprise DWH based on associative theory. He's now

	strongly involved on innovative DWH modelling projects, based on in-memory columnar DBs and DWHs, experimenting new BI Enterprise solutions to develop effective and high speed user interfaces connected to big data engines. Actually, he works as Executive Director in SDG, responsible for the Visual and Discovery Analytics Division.
C3	**Massimiliano Silano** (male) became an engineer at Politecnico di Torino (Italy), and studied at University of Brighton (UK) and BSc (HONS) European Business with Technology. He worked until 1999 as a Senior Researcher at the Centre For Innovation Management, Brighton. and University Of Twente – Holland. He has published several publications (book chapters, refereed articles, international conference papers) related to innovation management, continuous improvement and environmental management issues. He's strongly involved on Big data architectures, working both on structured and unstructured data. Actually, he's a partner in SDG, responsible for the BIG DATA and CMO Division
C4	**Riccardo Beltrami** (male) became an engineer at Politecnico di Milano (Italy. He's member of Scientic Board of Master in Business Intelligence & Knowledge Management at University of Verona (Italy). He collaborate with the CUOA Business School – Vicenza (Italy) – Workshop: Business & Logistic Control in Food Companies, and worked on Master in Auditing & Controlling at University of Pisa (Italy). Actually, he's a partner in SDG, responsible for the Consumer Product Industry Division.

4.1.29 Youris

Partner Full name		youris.com			
Partner nº	29	Short name	YOURIS	Country	Belgium

Partner entity description and relevance:

youris.com, a European Economic Interest Group based in Brussels, is an independent non-profit communication agency supporting and improving public communication and dissemination of European innovation and research achievements. Its member organizations are based in Italy, France and Germany. youris.com partners with consortia in EU and public-funded projects and non-profit organizations (research centres, universities, associations, etc.) to enhance dialogue with stakeholders and the public at large. It supports research activities and outcomes through targeted communication services and strategies to increase outreach and impacts on society as a whole. The youris.com web platform, launched in 2005, is today a primary public communication service and a source of information on European science and technology for the media and the public at large. youris.com highlight research results in Bioeconomy, Environment, Energy, Smart Cities, Health, Mobility, Nanotechnologies, Society, ICT and many others.

Business Motivation and Activities in the project:

youris.com will be involved in WP10, specifically in public communication activities, articles, news releases, videos and in the set up and management of the project distribution channels: website and social media.

Expertise from previous and on-going projects:

Within European projects youris.com masters a) dissemination and communication techniques, distribution of information and monitoring of impacts; b) relations with the media (online, social and TV media); c) dissemination and communication activities, including web strategies (design, set up and management), community building (through social media tools), different video formats, public science communication via articles and interviews distributed on the web, design of dissemination materials, Newsletters, networking and dialogue with stakeholders at large d) coordination and management of the overall communication and dissemination activities within EU projects. youris.com has been working as communication and dissemination partner in fourteen FP7 projects (including two CSA projects directly coordinated by youris.com) and in eleven Horizon2020 projects, at present. Out of them, twelve projects cover the EeB, energy and smart cities areas.

Infrastructure and equipment:

Not applicable

Relevant publications products and services:

To date, youris.com holds a record of 600 videos, articles and interviews produced on EU research and innovation. On TV media, it relies on a global network of 120 national public TV broadcasters and an audience of over 150 million TV viewers worldwide has been reached through youris.com video reportages. More than 10 million unique users worldwide have come across youris.com articles and videos online. The youris.com distribution platform is an acknowledged source of information on European innovation for global media: its contents (articles, interviews, videos) are globally distributed and regularly taken up by online newspapers and magazines, information multipliers and social media networks, TV broadcasters. youris.com has been working as dissemination and communication leader in fourteen EU-funded projects covering the energy, EeB, bioeconomy and smart cities domains

Collaborator profiles	
C1	**Elena Gaboardi** (female) is partner and projects supervisor at youris.com GEIE (www.youris.com). She is managing director of iCons (www.icons.it), a founding member of youris.com. She has more than twenty years' experience in business development, project management, budget implementation and research activities in EU-funded projects and studies, and for private customers. She has expertise in the communication, dissemination and exploitation of the knowledge created within R&D projects, innovation transfer, business analysis, impact

	analysis of R&D projects and programmes, policy evaluation and benchmarking. She has initiated and managed a number of EU funded projects on behalf of youris.com and iCons srl. Previously, she has been project manager of numerous projects and studies carried out both for the EC and for private customers on behalf of a major Italian consultancy group, Databank Consulting. Expert evaluator in FP5, FP6 and FP7 of the European Commission. She holds a degree, magna cum laude, from the Catholic University of Milan.
C2	**Elisabeth Schmid** (female) has been working as consultant for EC projects in various research domains and as a coordinator of EU project office activities since 2005. In 2009 she joined youris.com in charge of the coordination of youris.com communication activities. Since then she has worked as project manager in a number of EU-funded projects on energy efficiency, smart cities, environment, society. In the past 5 years she has successfully initiated more than ten EU-funded projects and has coordinated the dissemination and 6 EU-funded projects. She's currently managing the communication and dissemination activities of three projects in the Smart Cities and EeB domain: REMOURBAN, CITyFiED and DIRECTION. She has also worked on different communication and management activities in a number of Coordination and Support Actions (CSA) and Specific Support Actions (SSA) coordinated by youris.com on bioeconomy, environment, health, mobility and nanotechnologies
C3	**Marcello Bardellini** (male) has a Master Degree in Economics and Political Science at the University of Milan and a Master Diploma in Marketing and Communication Management. He has a professional background in market analysis, more than four years' experience in European Projects with a focus on e-procurement and mistery shopping on e-government covering different European countries. He joined youris.com in 2013 and he is in charge of project management & communication activities of EU-funded projects, stakeholders' relations management, development of dissemination and communication strategies and measurement of impacts. He is project manager and directly involved in the dissemination and communication activities in projects in the EeB and smart cities area, R2CITIES, and in the bioeconomy area, iMETland and ISOBIO. He is also responsible for exploitation tasks in the BUILDHEAT project.
C4	**Alice de Ferrari** (female), Web, Social Strategist and Project Manager at youris.com, has a degree in Communication Sciences. Alice has 5 years' experience in traditional and digital communication agencies for clients from different industries, with a strong specialization in Social Media, community management and editorial strategies. She developed strong skills with web2.0 tools and applications for community building and social networking. Alice is currently project manager of the Dissemination & Communication activities of the FP7 RAIN project and the H2020 BUILDHEAT and CrowdFundRES projects

4.1.30 CEPRI

Partner Full name		China Electric Power Research Institute			
Partner nº	**30**	Short name	**CEPRI**	Country	**China**

Partner entity description and relevance:

China Electric Power Research Institute (CEPRI) was established in 1951. It is a comprehensive and multi-discipline research institute directly affiliated to the State Grid Corporation of China (SGCC). It now has 12 research departments, nearly 3000 employees, among those 1270 experts with doctor or master degrees. CEPRI is primarily engaged in research on extra-high/ultra-high voltage ac & dc transmission & distribution, bulk power system analysis and security control, power distribution and renewable energy, power electronics, ICT, energy efficiency evaluation, etc.

CEPRI attaches importance to the application of big data analytics in smart grids. In 2014, CPERI set up a special team on big data. The team has finished strategy research, including scenario design, roadmap compilation. The team has developed big data platform and are developing several applications in the technical fields of power distribution, power consumption, power scheduling. Big data analytics based on AMI and other data sources is one of the most important focal points at present.

Business Motivation and Activities in the project:

Motivation: To share experience and lessons in big data research and practice with other participants. To cultivate personnel especially Ph.D candidates, to improve their capability of independent research on big data analytics and widen their views through the international cooperation.

Activities: 1) undertaken independent research on big data analytics based on AMI data and some other external data, 2) take part in exchanges and discussions with other participants ; 3) send doctor degree students to do research in EDF for six months or a year if it is possible; 4) hold workshop or seminar in China.

Expertise from previous and on-going projects:

Have solid knowledge bases both for power engineering and for data mining. Have undertaken and finished the strategy research on smart grid big data entrusted by SGCC. Participated in CEPRI big data platform development and application development. Working on power mapping research and development, renewable energy policy effect analysis based on smart grid big data, entrusted by SGCC. Doing research on power system situation awareness using random matrix theory (RMT) based on WAMS.

Infrastructure and equipment:

With digital-analog hybrid laboratory, self-developed big data platform, AMI monitoring system, customer energy consumption evaluation platform.

Collection of large volume data from many SGCC application systems.

Relevant publications products and services:

[1] Zhang Dongxia, Miao Xin, Liu Liping, et al. Research on development strategy for smart grid gig data [J].Proceedings of the CSEE. Vol.35 No.1,2015. pp.1-10.

[2] Zhao Teng, Zhang Yan, Zhang Dongxia. Application technology of big data in smart distribution grid and its prospect analysis[J]. Power System Technology. 2014(12). pp.3305-3311.

Zhang Dongxia,

[3] Huang Yanhao, Yu zhihong, Shi Dongyu, et al. Study on the application of electric power big data technology in power system simulation Vol.35 No.1,2015. pp 13-20.

[4] Huang Yanhao, Yu zhihong, Shi Dongyu, et al. Strategy of huge electric power system stability quick judgment based on massive historical online data. Vol.36 No.3, 2016. pp 596-603.

[5] Xin Miao, Dongxia Zhang. The opportunity and challenge of big data's application in distribution grids. 6th International Conference on Electricity Distribution. Shenzhen, 23-26 Sept. 2014.

[6] Liu Daowei, Zhang Dongxia, Sun Huadong, et al. Constructioin of stability situation quantitative assessment and

adaptive control system for large scale power grid in the spatio-temporal big data environment. [J].Proceedings of the CSEE. Vol.35 No.2,2015. pp.268-277.
[7] Liu Keyan, Sheng Wanxing , Zhang Dongxia et al. Big data application requirements and scenario analysis in smart distribution network. [J]. Proceedings of the CSEE. Vol.35 No.2, 2015. pp.287-293.
[8] Zhang Dongxia, Wang Jiye, Liu Keyan, et al. The application of big data technology in power distribution and consumption systems [J]. Power Supply and Consumption. 2015. No.8. pp.1-6.
[9] Miao Xin, Zhang Dongxia, Sun Dedong. The opportunity and challenge of big data's application in power distribution networks[J]. Power System Technology. 2015(11). pp.3122-3127.
[10] Zhang Dongxia, Qiu Caiming,Wang Xiaorong, et al. Big Data in Global Clean Energy Development and Application [J]. Electric Power ICT. 2015(2).
[11] Zhang Dongxia, et al. Big data application in energy internet [R]. submitted to China Energy Bureau. 2015.

Collaborator profiles	
C1	Zhang Dongxia, born in 1964, got her doctor degree in Tsinghua University in 1999. Since then she has been working in CEPRI. Her research interests include smart grid, big data. etc.
C2	Wu Qian, born in 1991, pursuing her doctor degree in the graduate school of CEPRI from 2013. Her research interests include smart grid, big data.
C3	Liu Wei, born in 1989, got his master degree in North China Electric Power University in 2014. Since then pursue doctor degree in CEPRI. His research interests include smart grid, big data. etc.
C4	Huang Yanhao. Born in 1978, Got his doctor degree in the graduate school of CEPRI in 2014. His research interests include power system simulation technology, big data.etc.
C5	Wang Xiaorong, born in 1973, got her doctor degree in Xian Jiaotong University in 2000, Since then she has been working in CEPRI. She is vice leader of big data special team on big data in CEPRI. Her research interests include renewable energy grid integration, big data.
C6	Chunyu Deng, born in 1982, got his master degree in North China Electric Power University in 2008. He worked in State Grid Research Institute from 2008 to 2015. Now he is the leader of big data special team on big data in CEPRI. His research interests include power system telecommunication technologies, big data, computer science.

4.2 THIRD PARTIES INVOLVED IN THE PROJECT (INCLUDING USE OF THIRD PARTY RESOURCES)[1]

4.2.1 Atos Spain

Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	N
Does the participant envisage that part of its work is performed by linked third parties	Y
ATOS IT Solutions and Services Iberia S.L. belongs to the Atos group. The activities that will be developed by the third party are those related with the T8.1, T8.2, T8.43 and T84., the definition and business evaluation of the three cycles of LSP piloting activities and respective feedback loop to the LSP implementation in the 3 domains. The effort that will be allocated to this third party will be 25 PM along the whole duration of the project.	
Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)	N

4.2.2 GAS NATURAL FENOSA SDG, S.A

Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	N
Does the participant envisage that part of its work is performed by linked third parties	Y
Gas Natural Servicios SDG, S.A. is the company who operates in the Retail Energy Market selling electricity, gas, and different services to residential, commercial and SME customers . Furthermore this company is playing the role of ESCO (Energy Services Company) of the Gas Natutal Fenosa Group. His participation in the Retail & Services Doian of the large scale pilot will provide their expertise in the overall management of energy supply services to industry, managing incidents and providing maintenance services. It operates in Spain, France and Portugal, having a plan for expansion in Europe. One of its main activities is to provide energy efficiency services to almost 2,500 customers in Spain. PIC number: 983054455	
Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)	N

Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	N
Does the participant envisage that part of its work is performed by linked third parties	Y
Gas Natural Informática S.A. develops and maintains software, platforms and IT systems for data processing of all activities of the Group. Gas Natural Informática, S.A. operates as a subsidiary of Gas Natural SDG SA and will play a key role in ELECTRA project providing requirements and technology contribution to the adaptation of big data tools and data sets preparation but furthermore for transforming existing ICT systems and business platforms in order to implement pilots under realistic conditions to be able to evaluate big data transformation of internal processes and activities. PIC number:949766965	

[1] A third party that is an affiliated entity or has a legal link to a participant implying a collaboration not limited to the action. (Article 14 of the Model Grant Agreement).

Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)	N

4.2.3 Union FENOSA Distribucion

Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	N
Does the participant envisage that part of its work is performed by linked third parties	Y

Gas Natural Fenosa Engineering S.L.U (GNFE) is the is the energy engineering company of the Gas Natural Fenosa Group, in the areas of power generation, transmission and distribution of electricity and gas.
GNFE started operations in 1989 as the engineering subsidiary of the Unión Fenosa company (previous Gas Natural Fenosa),
specializing in the energy sector. Its main asset is its extensive experience in design, engineering, construction and operation of
all kinds of installations such as generation, transmission and distribution of electricity and natural gas in both the domestic and

international areas. Currently, GNFE has become the engineering subsidiary in charge of engineering and technology in the whole Gas Natural Fenosa Group. The main services provided by GNFE are shown in the image at the right.(PIC: 983794468)

Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)	N

4.2.3 BSC

Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	**N**
Does the participant envisage that part of its work is performed by linked third parties	**Y**

Some of the work carried out at the Barcelona Supercomputing Center–Centro Nacional de Supercomputación will be contributed free of charge by BSC Third Parties (Article 12 Grant Agreement): **Spanish Council for Scientific Research (CSIC) and Universitat Politècnica de Catalunya (UPC).**

The BSC is a consortium that is composed of the following member institutions: the Universitat Politècnica de Catalunya and the Spanish and the Catalan governments. Both UPC and the Spanish government (through CSIC) contribute in kind by making human resources available to work on projects. The relationship between BSC and CSIC and UPC (respectively) is defined in an agreement with each institution that was established prior to the start of this

project.

Consejo Superior de Investigaciones Científicas (CSIC)

Some CSIC researchers carry out their work at universities and research centers based in Spain, institutions with which CSIC actively collaborates. This collaboration takes place within the framework of long-term agreements, ensuring that CSIC researchers are fully integrated into teams and research projects. CSIC has signed collaboration agreements with several entities, including the BSC.

The relationship between BSC and CSIC is defined in an agreement established prior to the start of this project, and thus, not limited to it. BSC is free to use these resources provided by CSIC at will, they are therefore assimilated as "own resources" and will be charged to the project without being considered as a receipt. The cost will be declared by the beneficiary and it will be recorded in the accounts of the third party. These accounts will be available for auditing if required.

Dra. Rosa Maria Badia is a CSIC researcher of the Instituto de Investigación en Inteligencia Artificial (IIIA) affiliated with the BSC. She carries out her research in association with the Barcelona Supercomputing Center - Centro Nacional de Computación on the BSC premises.

Universitat Politècnica de Catalunya (UPC)

The High Performance Computing research group of the Computer Architecture Department at the Universitat Politècnica de Catalunya (UPC) is the leading research group in Europe in topics related to high performance processor architectures, runtime support for parallel programming models, performance tuning applications for supercomputing and Cloud Computing.

The High Performance Computing research group at the UPC shares many key resources with the BSC, including several key personnel that will be dedicated to this project. There is a signed Collaboration Agreement between the UPC and the BSC establishing the framework of the relationship between these two entities. According to this agreement, several professors of the UPC are made available to the BSC to work on projects.

ICREA (Institució Catalana de Recerca i Estudis Avançats) will provide resources (professor/researcher) free of charge to the BSC as a third party (Article 12 Grant Agreement). ICREA is a foundation supported by the Catalan Government and guided by a Board of Trustees which aims to recruit top scientists for the Catalan R&D system: scientists capable of leading new research groups, strengthening existing groups, and setting up new lines of research.

Following the rules of ICREA, although the salary costs of **Prof. Francisco Doblas-Reyes** are paid by ICREA, he is assigned to physically work at Barcelona Supercomputing Center (Earth Science Department). The terms and conditions of this cooperation between ICREA and Barcelona Supercomputing Center are reflected in a bilateral agreement between the two parties.

The beneficiary, BSC, is free to use these resources at will. They are therefore assimilated as "own resources" of the beneficiary, and will be charged to the project without being considered as a receipt. The cost will be declared by the beneficiary and it will be recorded in the accounts of the third party. These accounts will be available for auditing if required.

Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)	**N**

4.2.4 EIR

Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	No
Does the participant envisage that part of its work is performed by linked third parties	Yes

EIR intends to involve in the Project the following linked third parties: **Enel Spa and Enel Produzione**.

Enel Spa, mainly the ICT solution centre, which has the main objectives:

- to guarantee alignment to business strategy and ensure accountability for ICT solutions addressing Global Business Lines' needs
- to define budget coherently with business initiatives, elaborate technical requirements, design business solutions according to formal specifications and architectural guidelines, develop and test solutions and manage applications with an end-to-end perspective
- to foster the adoption of global ICT solutions in order to enable process homogenization at business line level, providing also local solution if needed.

Enel Spa will be involved in the framework of ELECTRA for the definition of ICT requirements and deployments of ICT solutions developed

Enel Produzione, mainly the Operational Performance Optimization Department, which has the main objective:

- To optimize materials and service management of Global Generation fleet
- To improve operational planning and analysis of Global Generation fleet
- To ensure Systems Improvement for, for the Global Generation
- To analyse and define Industrial and Environmental Risk Management for the Global Generation

Enel Produzione will be involved in the framework of ELECTRA for the definition of business requirements, deployments of ICT solutions developed, and analysis of the results.

Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)	No

4.2.5 EGP

Does the participant plan to subcontract certain tasks (please note that core tasks of the action should not be sub-contracted)	Y
Open SAS application maintenance support and open big data infrastructure application maintenance activities will be assigned through a bid, according to current EGP purchase department rules. These activities are necessary for the ordinary maintenance of EGP pilot infrastructure. Currently they are assigned to the following providers: Accenture and Reply.	
Does the participant envisage that part of its work is performed by linked third parties?	Y

EGP intends to involve **ENEL Spa** as third party through its ICT solution center: they will be involved in the definition of ICT tools requirements, and their deployments and validation in EGP demonstrators. Besides **ENEL GREEN POWER ESPAÑA S.L.,** and **ENEL Green Power Romania**, both companies of the Enel Group, will be mainly involved in the field demonstration activities.	
Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)?	N

4.2.6 FlyBy

Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	N
Does the participant envisage that part of its work is performed by linked third parties	Y

Flyby intends to involve in the Project the following linked third party: **i-EM S.r.l. (I-EM)**

i-EM provides Business Intelligence solutions for Energy Management. The entire i-EM infrastructure has been developed following the philosophy of Business Intelligence (BI) in order to transform data into knowledge and provide decision support systems.
The success of this implementation is the use of techniques of historicizing, analysis and presentation of data in order to support decision making of Energy Management.
The i-EM Business Intelligence technology consists of three layers: the data layer, the analysis layer and the presentation layer.
i-EM adopts systems of Big Data Analytics to manage all the information acquired and processed (georeferenced within spatial database).

i-EM offers a **complete solution** for the management of renewable generation: **monitoring of RE plants, storage systems, energy efficiency, energy forecast.**

In particular:

- **EController** is the solution for renewable energy plants owners and operators: it is the ideal tool both for prosumers and market operators. Thanks to an advanced big data analysis approach, Econtroller is your decision support tool providing accurate, updated and necessary information (Business Intelligence) such as performances, diagnostics and energy production predictions.
- **RES2GRID** is the solution for the forecast and nowcast of energy renewable generation: solar, wind, hydro.

The Decision Support Systems innovative solution, ideal for Virtual Power Producers. It allows a smart grid approach to the management of micro-networks and their integration with the high distributed power generation, electric vehicles, and renewable energy sources.

Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)	N

Section 5

5.1 Ethics

ELECTRA does not have Ethics issues.

5.2 Security[2]

Please indicate if your project will involve:

- activities or results raising security issues: (**NO**)
- 'EU-classified information' as background or results: (**NO**)

[2] Article 37.1 of the Model Grant Agreement: *Before disclosing results of activities raising security issues to a third party (including affiliated entities), a beneficiary must inform the coordinator — which must request written approval from the Commission/Agency.* Article 37.2: *Activities related to 'classified deliverables' must comply with the 'security requirements' until they are declassified. Action tasks related to classified deliverables may not be subcontracted without prior explicit written approval from the Commission/Agency. The beneficiaries must inform the coordinator — which must immediately inform the Commission/Agency — of any changes in the security context and — if necessary — request for Annex 1 to be amended (see Article 55*

ELECTRA

- Energy vaLuE Chain Trasformation thRough big datA technoLogies

ICT-15-2016 Innovation Action

Proposal Annexes

Table of Contents

DETAILED DELIVERABLE LIST

Deliverable (number)	Deliverable name	WP Num	Short name of lead participant	Type	Dissemination level	Delivery date (in months)
D1.1 a, b, c	Project Management Report	1	ATOS	R	CO	M12,M24, M36
D1.2	Quality & Risk assessment, contingency plan	1	ATOS	R	CO	M3,M16, M28
D1.3 a, b	Data Management Plan	1	ATOS	R	CO	M6, M36
D2.1	Energy domain scenarios	2	Hafslund	R	PU	M6
D2.2	Requirements of Big Data tools and mapping into the scenarios	2	Computas	R	PU	M6
D2.3	Definition of project KPIs per energy domain	2	Hafslund	R	PU	M8
D3.1 a, b	Big Data platform, architecture and infrastructure guidelines for Energy applications	3	SIN-ICT	R	PU	M6, M12
D3.2 a, b, c	Use case implementation guidelines for Big Data applications – Analytics	3	ORANGE	R	PU	M8,M18, M30
D3.3 a, b, c	Use case implementation guidelines for Big Data Energy applications – Big Data Management and Processing	3	SAP	R	PU	M8,M18, M30
D3.4	Final guidelines for Big Data tools	3	Sin-ict	R	PU	M34
D4.1	LSP Energy Generation implementation plan	4	EIR	R	PU	M8
D4.2.1	Fossil fuel UC1 implementation report	4	EIR; GNF	R	PU	M12, M23, M34
D4.2.2 a, b	Fossil fuel UC1 demonstrators	4	(a) EIR (b) GEN	D	PU	M22, M33
D4.3.1	Hydro UC2 implementation report	4	EIR GEN	R	PU	M12, M23, M34
D4.3.2 a, b	Hydro UC2 demonstrators	4	(a) EIR (b) GEN	D	PU	M22, M33
D4.4.1	Wind UC3 implementation report	4	EGP GNF	R	PU	M12, M23, M34
D4.4.2 a, b	Wind UC3 demonstrators	4	(a) EGP (b) GEN	D	PU	M22, M33
D4.4.3	Solar UC4 implementation report	4	EGP GEN	R	PU	M12, M23, M34
D4.4.4 a, b	Solar UC4 demonstrators	4	(a) EGP (b) GNF	D	PU	M22, M33
D4.5.1	Nuclear UC5 implementation report	4	EDF	R	PU	M12, M23, M34
D4.5.2	Nuclear UC5 demonstrator	4	EDF	D	PU	M22, M33
D4.6	LSP Energy Generation assessment & achievements	4	EIR	R	PU	M34
D5.1.1	Large Scale Energy Distribution Pilot implementation plan	5	UFD	R	PU	M8
D5.2.1	Grid Digitalization & Predictive Maintenance UC6 implementation report	5	UDF HFS	R	PU	M12, M23, M34

5.2.2	Grid Digitalization & Predictive Maintenance UC6 demonstrators	5	(a) UDF (b) (c) HFS	D	PU	M22, M33
D5.3.1	Network Investment and Planning UC7 implementation report	5	HFS UDF	R	PU	M12, M23, M34
D5.3.2 a, b	Network Investment and Planning UC7 demonstrators	5	(a) UDF (b) HFS	D	PU	M22, M33
D5.4.1	Energy Balance and Fraud Detection UC8 implementation report	5	UDF	R	PU	M12, M23, M34
D5.4.2	Energy Balance and Fraud Detection UC8 demonstrator	5	UDF	D	PU	M22, M33
D5.5.1	Proactive Customer Support and Response UC9 implementation report	5	UDF	R	PU	M12, M23, M34
D5.5.2	Proactive Customer Support and Response UC9 demonstrator	5	UDF	D	PU	M22, M33
D5.6.1	Large Scale Energy Distribution Pilots assessment & achievements	5	HFS	R	PU	M34
D6.1.1	Large Scale Energy Retail and Services Pilot implementation plan	6	EDF	R	PU	M8
D6.2.1	Energy efficiency diagnosis and value-added/advisory services UC10 implementation report	6	EDF	R	PU	M12, M23, M34
D6.2.2 a, b	Energy efficiency diagnosis and value-added/advisory services UC10 demonstrators	6	(a) EDF (b) GNF	D	PU	M22, M33
D6.3.1	Demand flexibility as a valuable resource for cost-efficient grid operation UC11 implementation report	6	HFS	R	PU	M12, M23, M34
D6.3.2 a, b	Demand flexibility as a valuable resource for cost-efficient grid operation UC11 demonstrators	6	(a) HFS (b) CEPRI	D	PU	M22, M33
D6.4.1	Estimation/forecasting of electricity demand at a local scale UC12 implementation report	6	EDF	R	PU	M12, M23, M34
D6.4.2 a, b, c	Estimation/forecasting of electricity demand at a local scale UC12 demonstrators	6	(a) EDF (b) EDF (c) CEPRI	D	PU	M22, M33
D6.5.1	Demand forecast for time varying portfolios of customers with churn UC13 implementation report	6	EDF	R	PU	M12, M23, M34
D6.5.2	Demand forecast for time varying portfolios of customers with churn UC13 demonstrators	6	EDF	D	PU	M22, M33
D6.6.1	Large Scale Energy Retail and Services Pilot assessment & achievements	6	EDF	R	PU	M34
D7.1.1	Large Scale Energy Management Service pilot implementation plan	7	DTU	R	PU	M8
D7.2.1	Energy Efficient Buildings (Customer interaction with Smart Meters) UC14 implementation report	7	NYF	R	PU	M12, M23, M34
D7.2.2 a, b	Energy Efficient Buildings (Customer interaction with Smart Meters) UC14 demonstrators	7	NOVA	D	PU	M22, M33

D7.3.1	Energy and Power Management in distribution grids UC15 implementation report	7	NOVA	R	PU	M12, M23, M34
D7.3.2 a, b	Energy and Power Management in distribution grids UC15 demonstrators	7	(a) NYF (b) NOVA	D	PU	M22, M33
D7.4.1	Energy Efficient Workplaces, how to operate office devices in the most efficient manner UC16 implementation report	7	RICOH	R	PU	M12, M23, M34
D7.4.2	Energy Efficient Workplaces, how to operate office devices in the most efficient manner UC16 demonstrators	7	RICOH	D	PU	M22, M33
D7.5.1	Energy Distribution pilot overall impact analysis	7	DTU	R	PU	M34
D8.1	Energy Pilots' Evaluation and Impact Analysis Report – First Cycle	8	ATOS	R	PU	M14
D8.2	Energy Pilots' Evaluation and Impact Analysis Report – Second Cycle	8	ATOS	R	PU	M24
D8.3	Energy Pilots' Evaluation and Impact Analysis Report – Third Cycle	8	ATOS	R	PU	M35
D8.4	Energy Pilots' Business Impact Assessment towards Domains' Data-driven Transformation	8	ATOS	R	PU	M36
D9.1	ELECTRA scenarios scalability and replicability	9	EGP	R	PU	M27, M36
D9.2	ELECTRA Big Data tools scalability and replicability	9	EURECAT	R	PU	M27, M36
D9.3	ELECTRA exploitation and business plan	9	ORANGE	R	CO	M24, M36
D9.4	Management of ELECTRA eco-system	9	ATOS	R	PU	M12, M24, M36
D10.1	ELECTRA website		YOURIS	O	PU	M3
D10.2	The Communication & Dissemination strategy	10	ZABALA	R	PU	M12, M24, M36
D10.3	Communication materials: visual identity, brochure, first video, first press release (M6), second video (M30), Training session (M36)	10	YOURIS	R	PU	M6, M30, M36
D10.4	Progress reports on community building activities	10	ZABALA	R	PU	M12, M24, M30
D10.5	Report on standardization & regulation activities	10	SAP	R	PU	M18, M36

TRL TECHNOLOGIES TABLE

CATEGORY – PROVIDER – TECHNOLGY	Subcategory			TRL
Big Data Framework with configured platforms:				
EURECAT Big Play Platform-as-a-Service				5
ORANGE Flexible Data				9
SAP HANA Cloud Platform				9
SINTEF ICT Apache Platform (Big Data Europe reference)				9
Big Data Analytics for Energy:	Prescriptive	Real-time	Descriptive	
BSC Weather forecasting	x			7
Tiramisu – Deep learning suit	x			5
ENFOR WPPT – Wind power prediction tool	x	x		7
PRESS – Heat Load Prediction and Energy Systems Optimization	x	x		7
LOADFOR – Electricity Load Prediction	x	x		7
SOLARFOR – Solar Power Forecasting	x			7
PRICEFOR – Power Price Prediction	x			7
EURECAT Big Play Platform-as-a-Service	x	x	x	5
KIWI ML – Machine Learning Framework	x		x	5
SEM LoadForecaster and LoadScheduler	x			5
DSS – Personalized recommendations for energy efficiency	x			5
FLYBY ECONTROLLER – Complete solution for photovoltaic monitoring	x	x		6
RES2GRID – Now- and forecasting of renewable energy generation		x		6
ORANGE Khiops – Data-mining environment			x	7
Cepheus – Complex Event Processing for embedded and small gateways	x			7
Orange.biolab.si – Open source framework for UI/machine learning	x			7
POWEL Smart Energy Suite	x	x	x	9
Predictive Maintenance – Condition monitoring and maintenance	x	x		9
Dynamic Reinvestment – Grid development decision support system	x			9
SAP HANA Advanced Analytics	x	x	x	9
Predictive Maintenance and Service	x			9
SDG Early Alert Predictive & Prescriptive Engine	x			5
Visualization and User Interaction for Decision Support			x	5
SINTEF ICT SCOOP Scheduler – Generic solver for constrained scheduling	x			5
TECHNALIA Thermal imaging process control for coal combustion	x			6
GRID_OPERATION – AMI Event analysis for supply problem detection	x			6
LEAD MANAGER – Optimal incoming call management far call centers	x			6
SG-Doctor – Load curve analysis for fraud and user characterization	x			6
PROLOAD – Energy and Gas consumption forecast	x			6
UNIBO Empirical model learning methodology	x			4
Deep networks for predicting temporal series	x			5
ePolicy – Decision support system	x			5
ENERGY-OPT – Combinatorial stochastic multi-criteria optimization	x			5
APACHE Mahout, H2O, FlinkML, MLlib, SAMOA – Machine learning	x		x	9

Pig, Drill – Data analysis			x	9
Big Data Management and Processing for Energy:	Processing - Security - Data mgmt.			
BSC PyCOMPSs/COMPSs – Programming environment for parallel applications	x			7
dataClay – Self-contained objects library			x	5
Hecuba – Autonomic management for Cassandra DB			x	5
COMPUTAS FramceSolutions – BPM tool for Adaptive Case Management	x			9
CODIO – Framework for Collaborative Teamwork and Decision Support	x			9
EURECAT Big Play Platform-as-a-Service	x	x	x	7
CIC – Intelligent digital threat system		x		5
ORANGE Flexible Data – Big Data Framework	x	x	x	9
POWEL Mesh – Big data technology/repository/integrator	x		x	7
Big Data Manager – Smart meter data and energy value chain time series			x	7
SAP HANA Cloud Platform – In-memory database and application services	x	x	x	9
HANA Cloud Connector		x	x	8
SINTEF ICT DataGraft – Transformation and reliable access capabilities for data			x	7
CloudML – Dynamic provisioning and deployment of multi-cloud systems	x			7
UNIBO Middleware for integrating SAP HANA data sources and Cassandra DB			x	3
AKKA Toolkit and runtime for building concurrent distributed applications	x			9
ANSIBLE – Provisioning and deployment				9
APACHE Hadoop	x		x	9
Stoorm, Spark, Flink, Flume	x			9
Kafka, Cassandra, HBase, Hive, Accumulo			x	9
Oozie – Workflow management	x			8
Mesos, YARN – Orchestration frameworks				9
Knox – REST API Gateway for interacting with Hadoop clusters		X		8
CADVISOR Analyzes resource usage and performance of containers				9
DOCKER Swarm – Cluster manager for containers				8
ELASTIC Elasticsearch, Logstash and Kibana	x		x	9
GRAFANA General purpose dashboard and graph composer	x			9
MESOSPHERE Marathon – Mesos framework for container orchestration				7
MONGODB NoSQL database			x	9
ONTOTEXT GraphDB – RDF triple storage			x	9
OPENLINK Virtuoso – RDF Triple storage			x	9
PIVOTAL RabbitMQ – Message queue			x	9
POSTGRESQL Database			x	9
PROMETHEUS Service monitoring system and time series database	x		x	9
REDIS In-memory data structure store, for database, cache and message broker			x	9
Big Data Physical Infrastructures, Cloud, HPC and sensors for Energy:				
ATOS Hybrid Cloud Layer				7
BSC MareNostrum supercomputer – Largest supercomputer in Spain (available for testing)				9
BSCs private research cloud operated by BSC with OpenNebula				9
ORANGE Cloud				9
SAP HANA Cloud Platform				9

LETTERS OF SUPPORT

1. KIC InnoEnergy

Dr.Jose María Zabala
General Director
Zabala Innovation Consulting, S.A.
Paseo Santxiki 3 bis, 31192 Mutilva (Spain)

Eindhoven, 23 March 216

LETTER OF SUPPORT

We, KIC InnoEnergy, declare that we have a special interest in the results of the proposed project addressed to the call for proposals "H2020-ICT-2016-1" topic "ICT15-2016-17: Big Data PPP: Large Scale Pilot projects in sectors best benefitting from data-driven innovation" called

"ELECTRA
Energy vaLuE Chain Trasformation thRough big datA technoLogies"

Which is coordinated by ATOS, a leader in digital services, that provides a solid backbone of ever-evolving business technology services and solutions and specialised in Big Data.

At KIC InnoEnergy, we build sustainable, long-lasting operational frameworks based on industry, research and higher education within the energy sector. We ensure that this integration is efficient and has a significant impact on innovation.

Therefore, ELECTRA is relevant for KIC InnoEnergy because it directly addresses the full deployment of large scale pilots of the large amount of data generated and collected in the whole energy value chain. ELECTRA that offers a huge potential for improving performance and efficiency of nowadays processes and looking towards an overall transformation of the different energy domains: generation, distribution, commercialization and efficient us of energy management.

We will support the ELECTRA consortium in order to apply Big Data technologies and techniques to exploit the value of those data transferring the results not only to improve current Energy services but also to transform the way that utilities value chain is conceived.

We strongly support the consortium to maximize replicability of the use cases and facilitate a smooth transfer of the results to the market. We will specifically support the transference of the knowledge, results and services obtained in the pilots.

Finally, I would like to take this opportunity to express our interest in being informed in the progress of the ELECTRA project, in disseminating the project and their results through our communication channels, in participating in the meetings and workshops for discussing new mechanisms of cooperation among parties that will be organised along the duration of the project in order to contribute as far as possible to the achievement of the final aim of ELECTRA.

Yours,

Diego Pavia
Chief Executive Officer
KIC InnoEnergy

KIC InnoEnergy
VAT : 8500.04.287.B.01

1/1

High Tech Campus Bldg 69
5656 AG Eindhoven

2. VGB Powertech

VGB POWERTECH

VGB PowerTech e.V. | Postfach 10 39 32 · 45039 Essen | Germany

Your reference:

Your letter of:

Our reference:

In charge:
Erlend Christensen
Phone: +49 201 8128 222
Fax: +49 201 8128 300
E-Mail: erlend.christensen@vgb.org

To whom it may concern

Date:
01 April 2016

LETTER OF SUPPORT

We, VGB PowerTech e.V., declare that we have a special interest in the results of the proposed project addressed to the call for proposals 'H2020-ICT-2016-1' topic 'ICT15-2016-17: Big Data PPP: Large Scale Pilot projects in sectors best benefitting from data-driven innovation' called

'ELECTRA
Energy vaLuE Chain Trasformation thRough big datA technoLogies'

which is coordinated by ATOS, a leader in digital services, that provides a solid backbone of ever-evolving business technology services and solutions and specialised in Big Data.

VGB PowerTech e.V. is the European technical association for power and heat generation. As voluntary association VGB PowerTech brings together companies, for which the operation of power plants and the corresponding technologies form an important base for their business.
Therefore, ELECTRA is relevant for VGB because it directly addresses the full deployment of large scale pilots of the large amount of data generated and collected in the whole energy value chain. ELECTRA that offers a huge potential for improving performance and efficiency of nowadays processes and looking towards an overall transformation of the different energy domains: generation, distribution, commercialization and efficient us of energy management.

We will support the ELECTRA consortium in order to apply Big Data technologies and techniques to exploit the value of those data transferring the results not only to improve current Energy services but also to transform the way that utilities value chain is conceived.

We strongly support the consortium to maximize replicability of the use cases and facilitate a smooth transfer of the results to the market. We will specifically support the transference of the knowledge, results and services obtained in the pilots.

VGB PowerTech e.V.
Deilbachtal 173 | 45257 Essen
Germany Phone: +49 201 8128 0
http://www.vgb.org
Tax Id.: DE119892759

Place of business: Essen
Legal court: Essen, VR 1788
Tax reference: 112/5739/1174
Chairman: Dr. Bernhard Fischer
Executive Managing Director:
Erlend Christensen

Bank details:
Postbank Essen
No.: 53 320 438 | BLZ: 360 100 43
Commerzbank AG
No.: 4 051 044 | BLZ: 360 800 80

Sparkasse Essen
No.: 218 101 | BLZ: 360 501 05
Sparkasse Essen IBAN:
DE53 3605 0105 0000 2181 01
SWIFT (BIC): SPESDE 3 E

3. EPRI

EPRI | ELECTRIC POWER RESEARCH INSTITUTE

C. THOMAS ALLEY, JR.
Vice President,
Generation

United States, April 12, 2016

Ms. Sandra Scalari
Innovation and Sustainability – Open Innovation, Planning & Reporting
Enel Green Power S.p.A.
56122 Pisa, Italy, Via Andrea Pisano, 120

Subject: Letter of Support "H2020-ICT-2016-1" topic "ICT15-2016 17: Big Data PPP: Large Scale Pilot projects in sectors best benefitting from data-driven innovation" called "ELECTRA Energy value Chain Transformation through big data technologies"

Dear Ms. Scalari:

We, the Electric Power Research Institute, Inc. (EPRI), declare that we have a special interest in the concept of the proposed project addressed to the call for proposals "H2020-ICT-2016-1" topic "ICT15-2016-17: Big Data PPP: Large Scale Pilot projects in sectors best benefitting from data-driven innovation" called **"ELECTRA Energy value Chain Transformation through big data technologies"** which is coordinated by ATOS Spain, an organization engaged in digital services, that provides business technology services and solutions and specializes in Big Data.

EPRI is a U.S. nonprofit corporation organized under the laws of the District of Columbia Nonprofit Corporation Act and recognized as a tax exempt organization under Section 501(c)(3) of the U.S. Internal Revenue Code of 1986, as amended, and subject to the conditions set forth in this Letter, supports this proposal in furtherance of its public benefit mission. EPRI conducts research, development and demonstration relating to the generation, delivery and use of electricity for the benefit of the public. Operating as an independent nonprofit organization, EPRI brings together scientists and engineers as well as experts from academia and industry to help address global challenges in electricity. Through its broad European membership base and the European presence of its subsidiary, EPRI International Inc. (in Ireland, the United Kingdom and Spain), EPRI is familiar with European research approaches, and excited to expand its European involvement.

EPRI's key objective is to make electricity safe, reliable, affordable, and environmentally responsible for society through collaboration, thought leadership, and scientific and technological innovation. Therefore, ELECTRA is relevant for EPRI because it directly addresses the full deployment of large scale pilot projects regarding the large amount of data generated and collected in the whole energy value chain which is a key component of EPRI research conducted by several of EPRI's programmatic research areas in the Generation Sector including Instrumentation, Controls and Automation; Maintenance, Management and Technology; and Operations Management and Technology. ELECTRA offers a huge potential for improving performance and efficiency of current processes and looking towards an overall transformation of the different energy domains: generation, distribution,

Together . . . Shaping the Future of Electricity

1300 West W.T. Harris Boulevard, Charlotte, NC 28262-8550 USA • 704.595.2566 • Fax 704.595.2867 • calley@epri.com

4. ICT4Water

Barcelona, 07th April 2016

Mr. Andrea Rossi
Head of Energy & Transport Market
Research and Innovation Group
Atos Spain SA
Calle Albarracín 25
Madrid 28037 Spain

LETTER OF SUPPORT

We, The ICT for water cluster (ICT4WATER), declare that we have a special interest in the results of the proposed project addressed to the call for proposals "H2020-ICT-2016-1" topic "ICT15-2016-17: Big Data PPP: Large Scale Pilot projects in sectors best benefitting from data-driven innovation" called

"ELECTRA
Energy vaLuE Chain Trasformation thRough big datA technoLogies"

which is coordinated by ATOS, a leader in digital services, that provides a solid backbone of ever-evolving business technology services and solutions and specialised in Big Data.

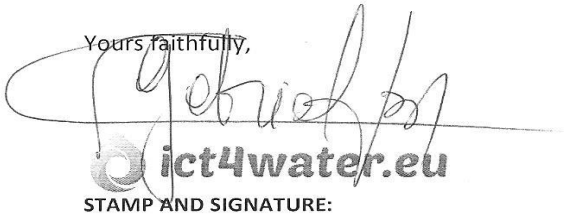
The ICT4WATER (http://ict4water.eu) is a cluster of ICT and water management oriented projects, all co-funded by the European Commission, our common goal is to increase efficiency in water management (including Water-Energy Nexus) and enable greater cooperation among utilities, operators and users by deploying solutions provided by Information and Communication. Therefore, ELECTRA is relevant for ICT4WATER because it directly addresses the full deployment of large scale pilots of the **large amount of data** generated and collected **in the whole energy value chain. ELECTRA** that offers a huge potential for improving performance and efficiency of nowadays processes and looking towards an overall transformation of the different energy domains: generation, distribution, commercialization and efficient us of energy management.

We will support the ELECTRA consortium in order to apply Big Data technologies and techniques to **exploit the value** of those data transferring the results not only to improve current Energy services but also to transform the way that utilities value chain is conceived.

We strongly support the consortium to maximize replicability of the use cases and facilitate a smooth transfer of the results to the market. We will specifically support the transference of the knowledge, results and services obtained in the pilots.

Finally, I would like to take this opportunity to express our interest in being informed in the progress of the ELECTRA project, in disseminating the project and their results through our communication channels, in participating in the meetings and workshops for discussing new mechanisms of cooperation among parties that will be organised along the duration of the project in order to contribute as far as possible to the achievement of the final aim of ELECTRA.

Yours faithfully,



STAMP AND SIGNATURE:
NAME OF THE SIGNATORY: Gabriel Anzaldi Varas
POSITION: Co-Manager

5. BigDataBCN

Barcelona, 23rd March 2016

Mr. Andrea Rossi
Head of Energy & Transport Market
Research and Innovation Group
Atos Spain SA
Calle Albarracin 25
Madrid 28037 Spain

LETTER OF SUPPORT

We, the Big Data Centre of Excellence Barcelona, BIGDATA CoE, declare that we have a special interest in the results of the proposed project addressed to the call for proposals "H2020-ICT-2016-1" topic "ICT15-2016-17: Big Data PPP: Large Scale Pilot projects in sectors best benefitting from data-driven innovation" called

"ELECTRA Energy valuE Chain Trasformation thRough big datA technoLogies"

which is coordinated by ATOS, a leader in digital services, that provides a solid backbone of ever-evolving business technology services and solutions and specialised in Big Data.

Big Data CoE Barcelona is a a centre driven by Eurecat Technology Centre, the Government of Catalonia, the Barcelona City Council and Oracle that builds, develops and provides tools, data sets and value-added Big Data capabilities to enable companies on defining, testing and validating Big Data models before its final implementation. We work with a model of innovation and a infrastructure to allow a significant improvement in companies' process of strategic decision-making and will accelerate the innovation process of the business sector. Therefore, ELECTRA is relevant for BigData CoE Barcelona because it directly addresses the full deployment of large scale pilots of the **large amount of data** generated and collected **in the whole energy value chain. ELECTRA** that offers a huge potential for improving performance and efficiency of nowadays processes and looking towards an overall transformation of the different energy domains: generation, distribution, commercialization and efficient us of energy management.

We will support the ELECTRA consortium in order to apply Big Data technologies and techniques to **exploit the value** of those data transferring the results not only to improve current Energy services but also to transform the way that utilities value chain is conceived.

We strongly support the consortium to maximize replicability of the use cases and facilitate a smooth transfer of the results to the market. We will specifically support the transference of the knowledge, results and services obtained in the pilots.

Finally, I would like to take this opportunity to express our interest in being informed in the progress of the ELECTRA project, in disseminating the project and their results through our communication channels, in participating in the meetings and workshops for discussing new mechanisms of cooperation among parties that will be organised along the duration of the project in order to contribute as far as possible to the achievement of the final aim of ELECTRA.

Yours faithfully,

SIGNATURE:
NAME OF THE SIGNATORY: Dr. Marc Torrent Moreno
POSITION: Director of the Big Data CoE Barcelona

6. CEN - CENELEC

CEN – European Committee for Standardization
CENELEC – European Committee for Electrotechnical Standardization

Ms. Marie Latour
Head of Brussels Office
Zabala Innovation Consulting, S.A.
Rue Bellard 20
1040 Brussels

Brussels, 11 April 2016

Subject: support letter for the project "ELECTRA Energy vaLuE Chain Trasformation thRough big datA technoLogies"

Dear Ms. Latour,
We have been informed about your proposal entitled "ELECTRA Energy vaLuE Chain Trasformation thRough big datA technoLogies" which will be submitted to the call "ICT15-2016-17: Big Data PPP: Large Scale Pilot projects in sectors best benefitting from data-driven innovation"

As the European Committees for Standardization (CEN and CENELEC), we bring together business federations, commercial and consumer organisations, environmental groups and other stakeholders such as the research community. We are actively promoting the links between the research community and the standardization community, mainly through our Research Helpdesk[1].

We would look forward to receive the project's feed-back on the standards and standardization projects in the ICT field applied to the energy sector. These inputs can happen through the participation of the project partners in the technical work of the National Committees, or through a Project Liaison[2]. A Project Liaison will allow the project consortium to exchange information throughout the running of the project with the standardization community and contribute to ongoing European standardization work.

[1] More information about our activities on research and innovation: www.cencenelec.eu/research.

[2] ftp://ftp.cencenelec.eu/EN/EuropeanStandardization/Guides/25_CENCLCGuide25.pdf; section 7

Avenue Marnix 17 – 1000 Brussels – Belgium
Tel: +32 2 550 08 11 - Fax: +32 2 550 08 19 – info@cencenelec.eu - www.cencenelec.eu

7. ENOVA

Trondheim, April 6th 2016

Andrea Rossi
Head of Energy & Transport Market
Research and Innovation Group
Atos Spain SA

LETTER OF SUPPORT

I, Gunnel Fottland, representing Enova SF, declare that we have an interest in the results of the proposed project addressed to the call for proposals "H2020-ICT-2016-1" topic "ICT15-2016-17: Big Data PPP: Large Scale Pilot projects in sectors best benefitting from data-driven innovation" called

"ELECTRA
Energy valuE Chain Transformation thRough big datA technoLogies"

which is coordinated by ATOS, a leader in digital services, that provides a solid backbone of ever-evolving business technology services and solutions and specialised in Big Data.

Enova is a public enterprise that is owned by the Ministry of Petroleum and Energy. Our task is to promote more efficient energy consumption and increased production of "new" renewable energy. ELECTRA is relevant for Enova because it directly addresses the full deployment of large scale pilots of the large amount of data generated and collected in the whole energy value chain. ELECTRA that offers a huge potential for improving performance and efficiency of nowadays processes and looking towards an overall transformation of the different energy domains: generation, distribution, commercialization and efficient us of energy management.

We will support the ELECTRA consortium in order to apply Big Data technologies and techniques to exploit the value of those data transferring the results not only to improve current Energy services but also to transform the way that the energy value chain is conceived.

In particular, we will support and augment the value of the Norwegian demonstration activities, by providing access to data from the on-going AMS project, organized and financed by Enova. This project encompasses annotated AMI data along with other measurements from 25.000 households spread across 7 Norwegian DSOs.

We strongly support the consortium to maximize replicability of the use cases and facilitate a smooth transfer of the results to the market. We will specifically support the transference of the knowledge, results and services obtained in the pilots.

Finally, I would like to take this opportunity to express our interest in being informed in the progress of the ELECTRA project, in disseminating the project and their results through our communication channels, in participating in the meetings and workshops for discussing new mechanisms of cooperation among parties that will be organised along the duration of the project in order to contribute as far as possible to the achievement of the final aim of ELECTRA.

Yours faithfully,

STAMP AND SIGNATURE: Gunnel Fottland
NAME OF THE SIGNATORY: Gunnel Fottland
POSITION: Division Manager Buildings and Infrastructure

enova
Enova SF
Prof. Brochs gt. 2
N-7030 Trondheim
tlf. 73 19 04 00
faks 73 19 04 01

CATEGORY – PROVIDER – TECHNOLGY	Subcategory			TRL
Big Data Framework with configured platforms:				
EURECAT Big Play Platform-as-a-Service				5
ORANGE Flexible Data				9
SAP HANA Cloud Platform				9
SINTEF ICT Apache Platform (Big Data Europe reference)				9
Big Data Analytics for Energy:	Prescriptive - Real-time - Descriptive			
BSC Weather forecasting	x			7
Tiramisu – Deep learning suit	x			5
ENFOR WPPT – Wind power prediction tool	x	x		7
PRESS – Heat Load Prediction and Energy Systems Optimization	x	x		7
LOADFOR – Electricity Load Prediction	x	x		7
SOLARFOR – Solar Power Forecasting	x			7
PRICEFOR – Power Price Prediction	x			7
EURECAT Big Play Platform-as-a-Service	x	x	x	5
KIWI ML – Machine Learning Framework	x		x	5
SEM LoadForecaster and LoadScheduler	x			5
DSS – Personalized recommendations for energy efficiency	x			5
FLYBY ECONTROLLER – Complete solution for photovoltaic monitoring	x	x		6
RES2GRID – Now- and forecasting of renewable energy generation		x		6
ORANGE Khiops – Data-mining environment			x	
Cepheus – Complex Event Processing for embedded and small gateways	x			
Orange.biolab.si – Open source framework for machine learning	x			
POWEL Smart Energy Suite	x	x	x	9
Predictive Maintenance – Condition monitoring and maintenance	x	x		9
Dynamic Reinvestment – Grid development decision support system	x			9
SAP HANA Advanced Analytics	x	x	x	9
Predictive Maintenance and Service	x			9
SDG Early Alert Predictive & Prescriptive Engine	x			5
Visualization and User Interaction for Decision Support			x	5
SINTEF ICT SCOOP Scheduler – Generic solver for constrained scheduling	x			5
TECHNALIA Thermal imaging process control for coal combustion	x			
GRID_OPERATION – AMI Event analysis for supply problem detection	x			
LEAD MANAGER – Optimal incoming call management far call centres	x			
SG-Doctor – Load curve analysis for fraud and user characterization	x			
PROLOAD – Energy and Gas consumption forecast	x			
UNIBO Empirical model learning methodology	x			3
Deep networks for predicting temporal series	x			5
ePolicy – Decision support system	x			
ENERGY-OPT – Combinatorial stochastic multi-criteria optimization	x			
APACHE Mahout, H2O, FlinkML, MLlib, SAMOA – Machine learning	x		x	9
Pig, Drill – Data analysis			x	9
Big Data Management and Processing for Energy:	Processing - Security - Data mgmt.			

BSC PyCOMPSs/COMPSs – Programming environment for parallel applications	x			7
dataClay – Self-contained objects library			x	5
Hecuba – Autonomic management for Cassandra DB			x	5
COMPUTAS FramceSolutions – BPM tool for Adaptive Case Management	x			9
CODIO – Framework for Collaborative Teamwork and Decision Support	x			9
EURECAT Big Play Platform-as-a-Service	x	x	x	7
CIC – Intelligent digital threat system		x		5
ORANGE Flexible Data – Big Data Framework	x	x	x	9
POWEL Mesh – Big data technology/repository/integrator	x		x	7
Big Data Manager – Smart meter data and energy value chain time series			x	7
SAP HANA Cloud Platform – In-memory database and application services	x	x	x	9
HANA Cloud Connector		x	x	8
SINTEF ICT DataGraft – Transformation and reliable access capabilities for data			x	7
CloudML – Dynamic provisioning and deployment of multi-cloud systems	x			7
UNIBO Middleware for integrating SAP HANA data sources and Cassandra DB			x	3
AKKA Toolkit and runtime for building concurrent distributed applications	x			9
ANSIBLE – Provisioning and deployment				9
APACHE Hadoop	x		x	9
Stoorm, Spark, Flink, Flume	x			9
Kafka, Cassandra, HBase, Hive, Accumulo			x	9
Oozie – Workflow management	x			8
Mesos, YARN – Orchestration frameworks				9
Knox – REST API Gateway for interacting with Hadoop clusters		X		
CADVISOR Analyzes resource usage and performance of containers				9
DOCKER Swarm – Cluster manager for containers				8
ELASTIC Elasticsearch, Logstash and Kibana	x		x	9
GRAFANA General purpose dashboard and graph composer	x			9
MESOSPHERE Marathon – Mesos framework for container orchestration				7
MONGODB NoSQL database			x	9
ONTOTEXT GraphDB – RDF triple storage			x	9
OPENLINK Virtuoso – RDF Triple storage			x	9
PIVOTAL RabbitMQ – Message queue			x	9
POSTGRESQL Database			x	9
PROMETHEUS Service monitoring system and time series database	x		x	9
REDIS In-memory data structure store, for database, cache and message broker			x	9
Big Data Physical Infrastructures, Cloud, HPC and sensors for Energy:				
ATOS Hybrid Cloud Layer				7
BSC MareNostrum supercomputer – Largest supercomputer in Spain (available for testing)				9
BSCs private research cloud operated by BSC with OpenNebula				9
ORANGE Cloud				9
SAP HANA Cloud Platform				9

REFERENCES

1 2020 Climate and Energy package - European Commission - http://ec.europa.eu/clima/policies/strategies/2020/index_en.htm
2 2050 Energy strategy - European Commission - https://ec.europa.eu/energy/en/topics/energy-strategy/2050-energy-strategy
3 United Nations Conference on Climate Change
4 "'Digital DSO' – a vision and the regulatory environment needed to enable it" published by EDSO for Smart Grids
5 http://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/ec/145397.pdf
6 Eichhammer, W. et al.: Study on the Energy Savings Potentials in EU Member States, Candidate Countries and EEA Countries. 2009
7 Energy Efficiency Plan 2011, COM(2011) 109
8 Multiple benefits of investing in energy efficient renovation of buildings. Impact on Public Finances Copenhagen Economics, October 2012 (http://www.renovate-europe.eu/Multiple-Benefits-Study)
9 Data linkage : information depends on how the underlying data are organized and structured
10 R. B. Faiz and Eran A. Edirisinghe, Decision Making for Predictive Maintenance in Asset Information Management Interdisciplinary Journal of Information, Knowledge, and Management Volume 4, 2009
11 R.A. Akerkar, P.S. Sajja, Knowledge-based Systems, Jones and Bartlett pubs. 2010
12 I.Goodfellow, Y.Bengio, A. Courville Deep Learning, MIT Press in preparation, 2016 http://www.deeplearningbook.org/front_matter.pdf
13 R.A. Akerkar, P.S. Sajja, Knowledge-based Systems, Jones and Bartlett pubs. 2010
14 1I.Goodfellow, Y.Bengio, A. Courville Deep Learning, MIT Press in preparation, 2016 http://www.deeplearningbook.org/front_matter.pdf
15 Privacy by Design in the Age of Big Data". Ann Cavoukian and Jeff Jonas, 2012 (https://www.ipc.on.ca/images/Resources/pbd-big_data.pdf)
16 MIT's Center for Digital Business and Capgemini report, "The Digital Advantage: how digital leaders outperform their peers in every industry
17 SAP Benchmarking
18 Eurelectric DSO Paper 2013
19 Benchmarking smart metering deployment in the EU-27 with a focus on electricity- 2014
20 World Nuclear association, 2016
21 HSF Annual Report 2015
22 https://www.eia.gov/conference/2014/pdf/presentations/gupta.pdf
23 1http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32009D0406&from=EN
24 http://eur-lex.europa.eu/images/n/pdf-hover.png
25 http://ec.europa.eu/europe2020/europe-2020-in-a-nutshell/targets/index_en.htm
26 SET-Plan COM (2009) 519
27 EU Employment and Social Situation
28 OECD (2013), "Exploring Data-Driven Innovation as a New Source of Growth: Mapping the Policy Issues Raised by "Big Data"", OECD Digital Economy Papers, No. 222, OECD Publishing
29 ENEL Sustainability report 2014 – Perimeter worldwide
30 GNF Corporate responsibility Report 2015- Perimeter worldwide
31 UNE-CEN/TS 16555-1:2013

Digitally signed by sealingservice.grants.ec.europa.eu
Date: 2016.04.12 21:03:39 CEST
Reason: Acknowledgment of Receipt

This electronic receipt is a digitally signed version of the document submitted by your organisation. Both the content of the document and a set of metadata have been digitally sealed.

This digital signature mechanism, using a public-private key pair mechanism, uniquely binds this eReceipt to the modules of the Participant Portal of the European Commission, to the transaction for which it was generated and ensures its full integrity. Therefore a complete digitally signed trail of the transaction is available both for your organisation and for the issuer of the eReceipt.

Any attempt to modify the content will lead to a break of the integrity of the electronic signature, which can be verified at any time by clicking on the eReceipt validation symbol.

More info about eReceipts can be found in the FAQ page of the Participant Portal. (http://ec.europa.eu/research/participants/portal/page/faq)