



S2S4E

Climate Services
for Clean Energy

Decision-making under a changing climate? A climate service for clean energy in Spain and beyond

COP25

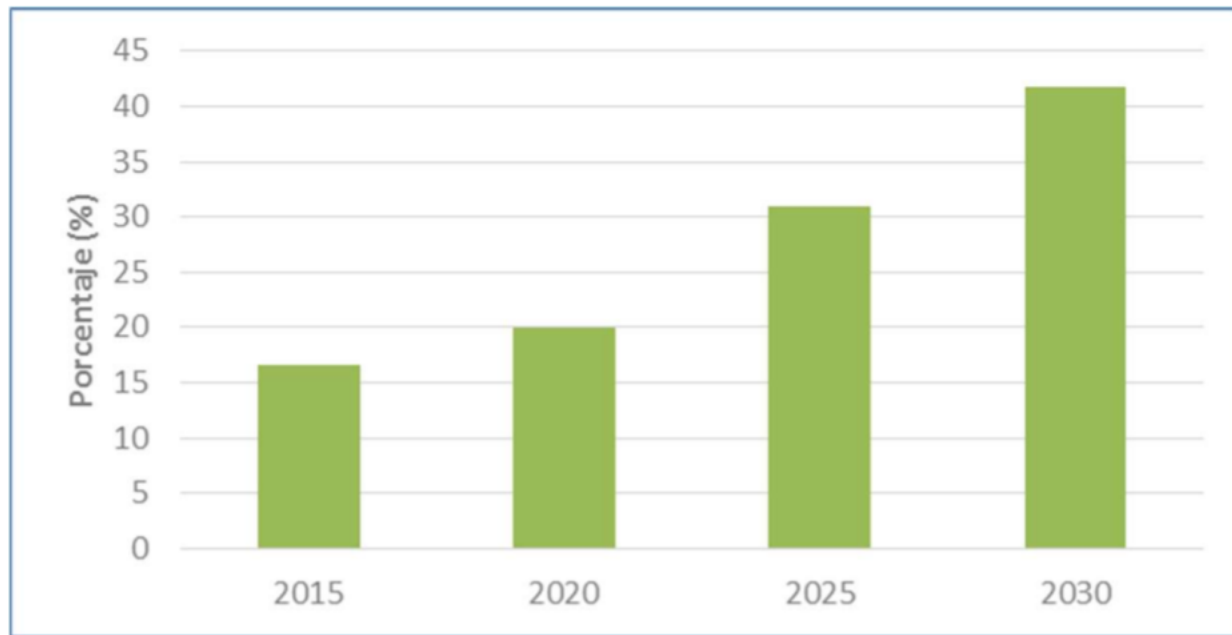
Ilaria Vigo, Barcelona Supercomputing Center



*This project has received funding from the Horizon 2020 programme under grant agreement n°776787.
The content of this presentation reflects only the author's view. The European Commission is not responsible
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National Energy and Climate Plan | Spain 2021-2030

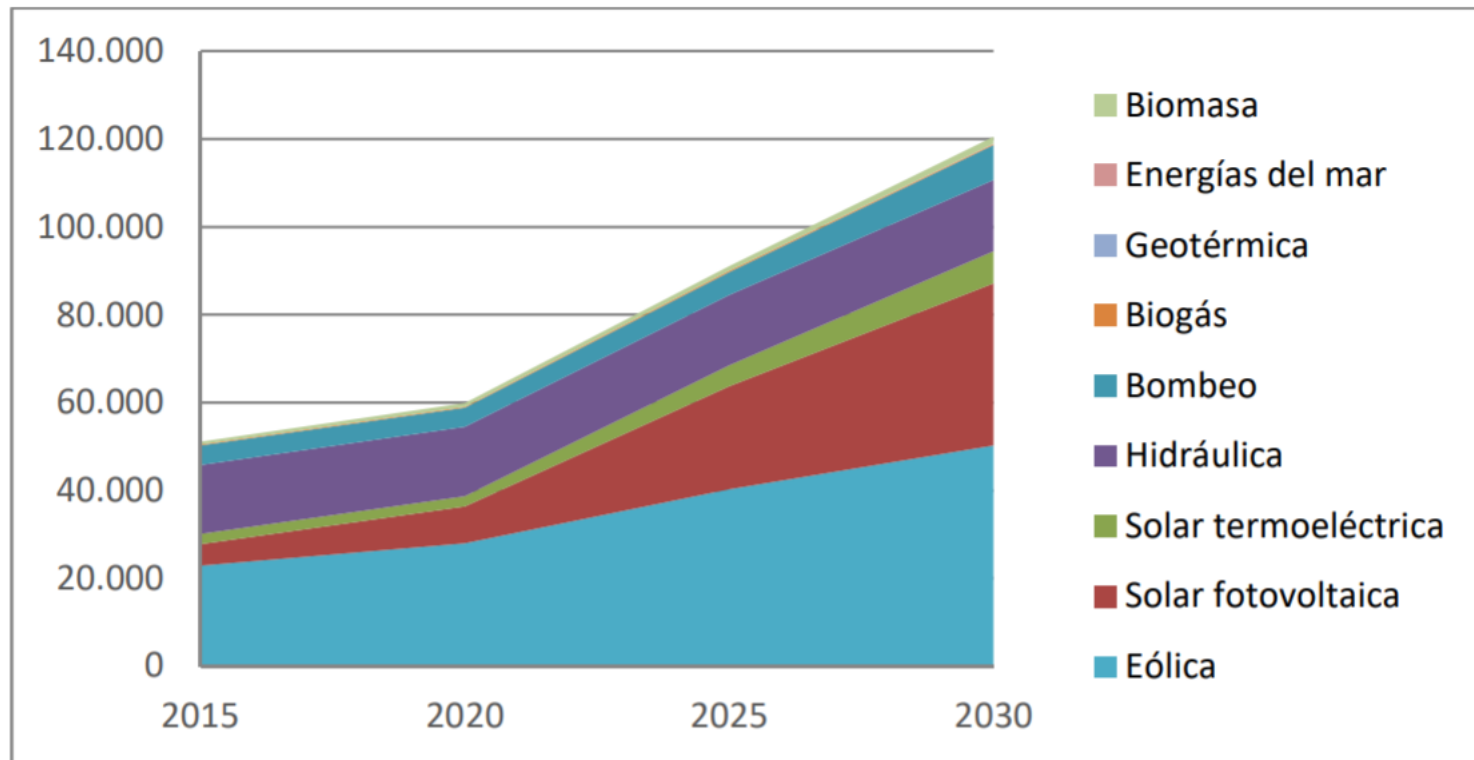
- ▶ Goal 2030: renewable energy should account for 42% of Spanish energy needs



Contribution of renewable energies on final consumption with the set of planned measures. Source: Plan Nacional Integrado de Energía y Clima 2021-2030

National Energy and Climate Plan | Spain 2021-2030

- ▶ Evolution of installed capacity of renewable technologies (MW)

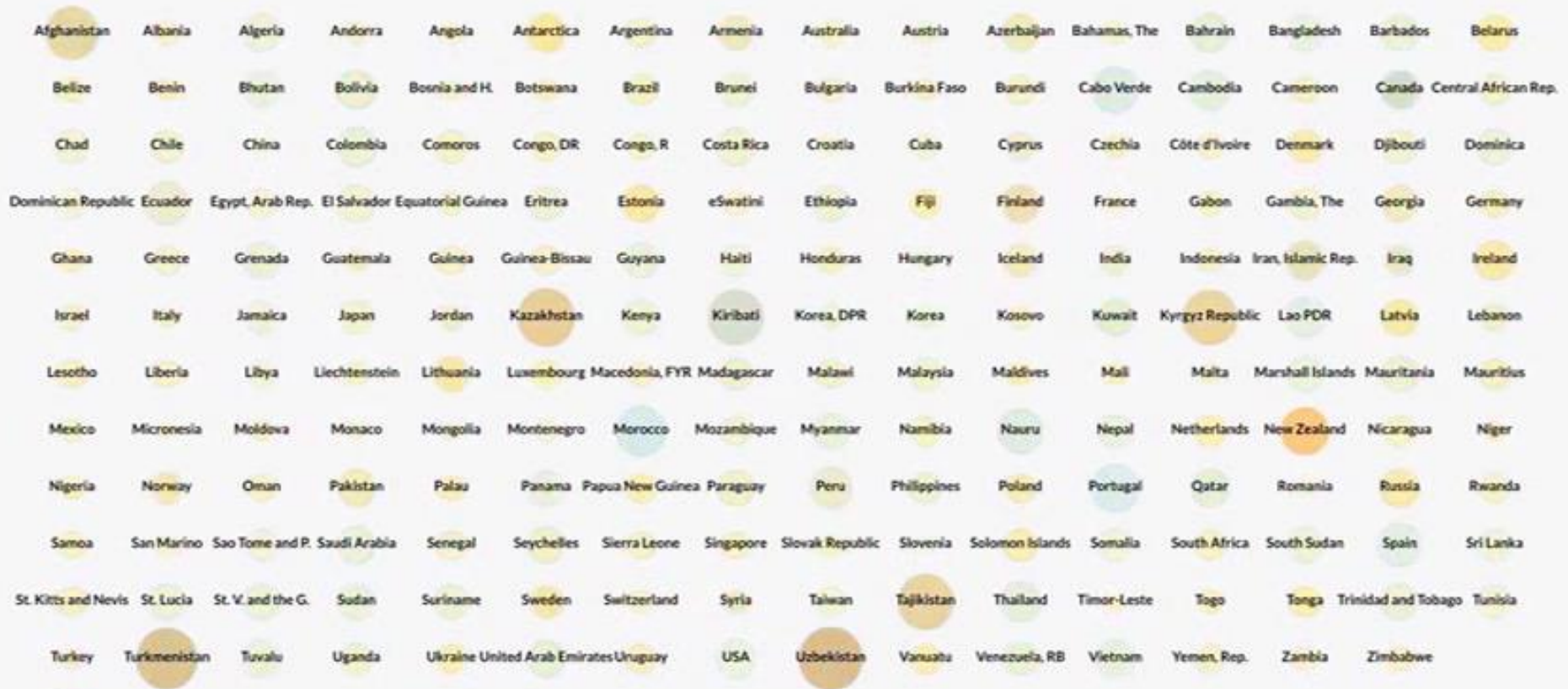


Source: Plan Nacional Integrado de Energía y Clima 2021-2030



Temperature Anomalies by Country Years 1880 - 2017

1971



Data Source:
 NASA GISS, GISTEMP Land-Ocean Temperature Index (LOTI), ERSSTv5, 1200km smoothing
<https://data.giss.nasa.gov/gistemp/>
 Average of monthly temperature anomalies. GISTEMP base period 1951-1980.

Video license: CC-BY-4.0
 Antti Lipponen (@anttilip)

Link: <https://youtu.be/PhbdyNnUliM>

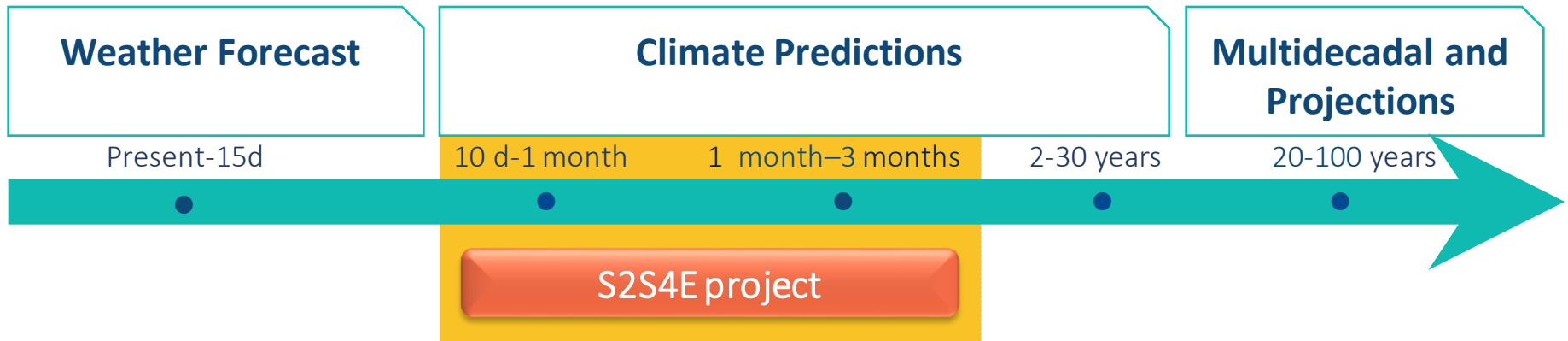
Examples of extreme events | Spain

Late Summer 2016

- ▶ Heat wave
- ▶ Wind drought

March 2018

- ▶ High wind speed
- ▶ High precipitation
- ▶ Cold spell



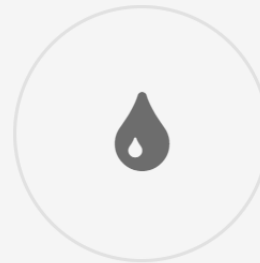
WIND POWER

Wind speed and capacity factor predictions



SOLAR POWER

Solar radiation and capacity factor predictions



HYDROPOWER

Prediction and changes in inflow predictions

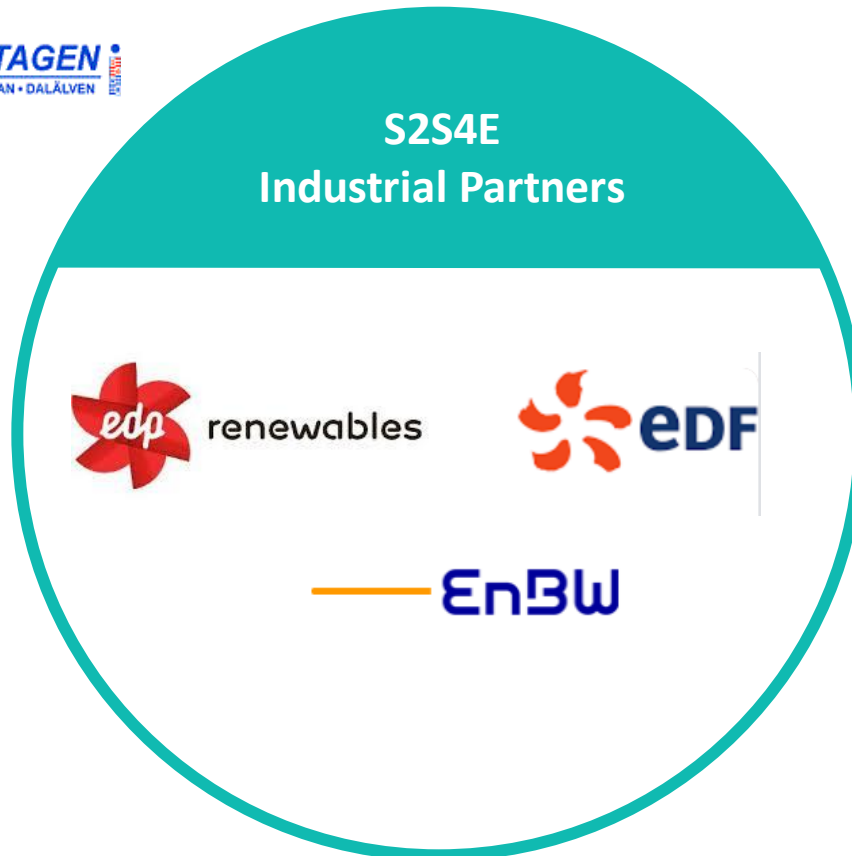


ENERGY DEMAND

Temperature and consumption rates predictions

Co-Production with industrial partners...

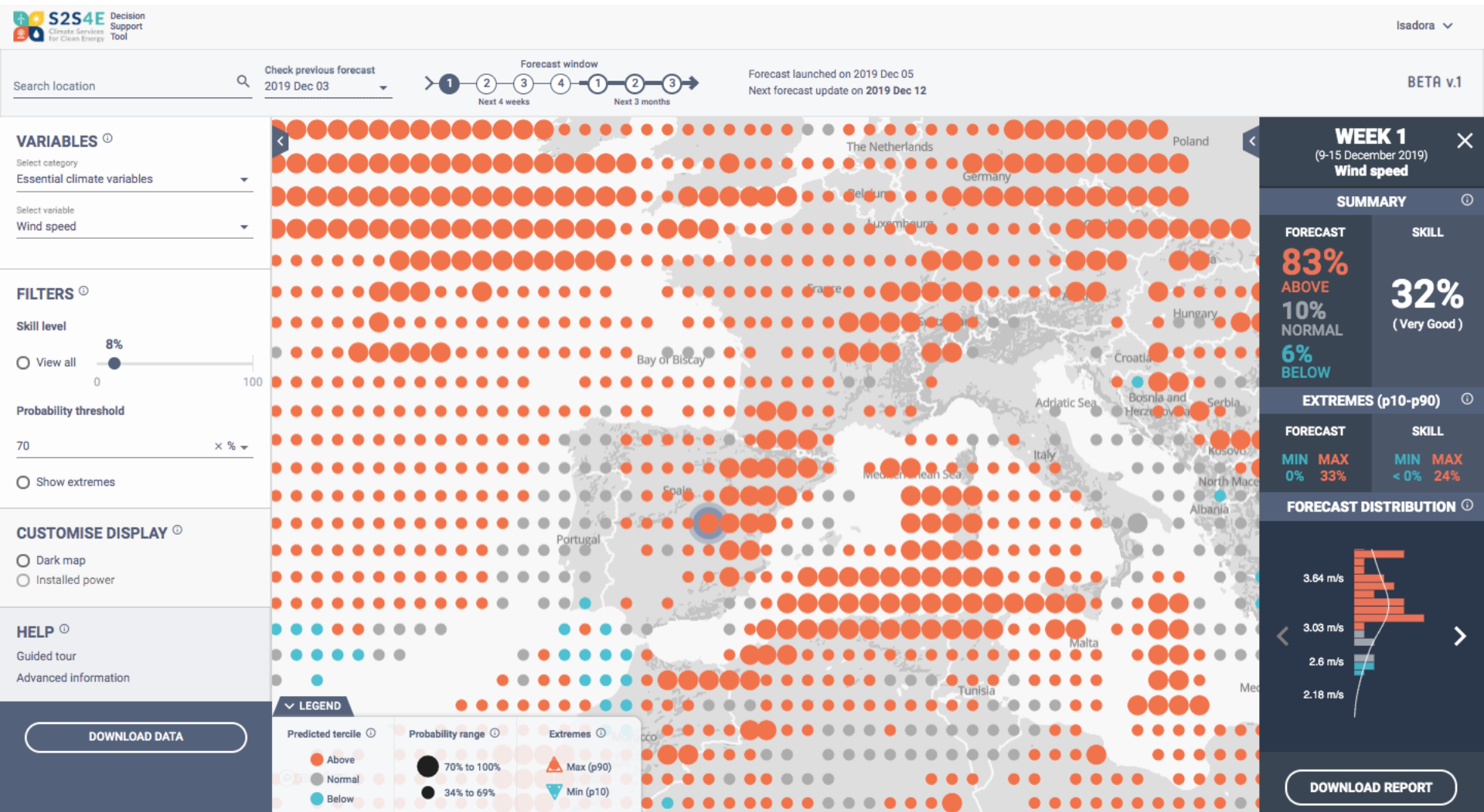
VATTENREGLERINGSFÖRETAGEN
UMEÄLVEN • ÄNGERMANÄLVEN • INDALSÄLVEN • LJUNGAN • LJUSNAN • DALÄLVEN



...and external stakeholders



Decision Support Tool



Search location

Check previous forecast
2019 Dec 03 ▾



Forecast launched on 2019 Dec 05
Next forecast update on 2019 Dec 12

BETA v.1

VARIABLES ⓘ

Select category
Essential climate variables

Select variable
Precipitation

FILTERS ⓘ

Skill level
0%

View all 0% 100%

Probability threshold
50 % ▾

Show extremes

CUSTOMISE DISPLAY ⓘ

Dark map
 Installed power

HELP ⓘ

Guided tour
Advanced information

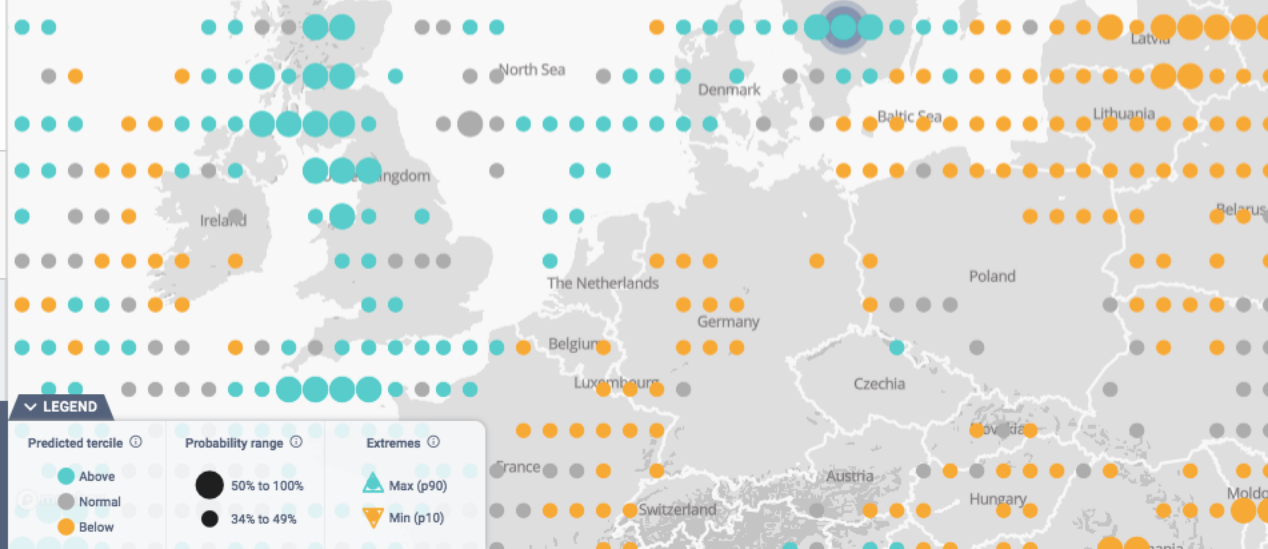
DOWNLOAD DATA

Categories

- Essential Climate
- Wind Energy
- Solar Energy
- Hydro Energy
- Energy Balance

Variables

- Climate variables (T, wind, precipitation, etc.)
- Energy indicators (capacity factor, demand, etc.)



WEEK 3 (23-29 December 2019)
Precipitation

SUMMARY ⓘ

FORECAST	SKILL
60% ABOVE 38% NORMAL 2% BELOW	16% (Good)

EXTREMES (p10-p90) ⓘ

FORECAST	SKILL
MIN 0% MAX 27%	MIN 8% MAX < 0%

FORECAST DISTRIBUTION ⓘ

DOWNLOAD REPORT

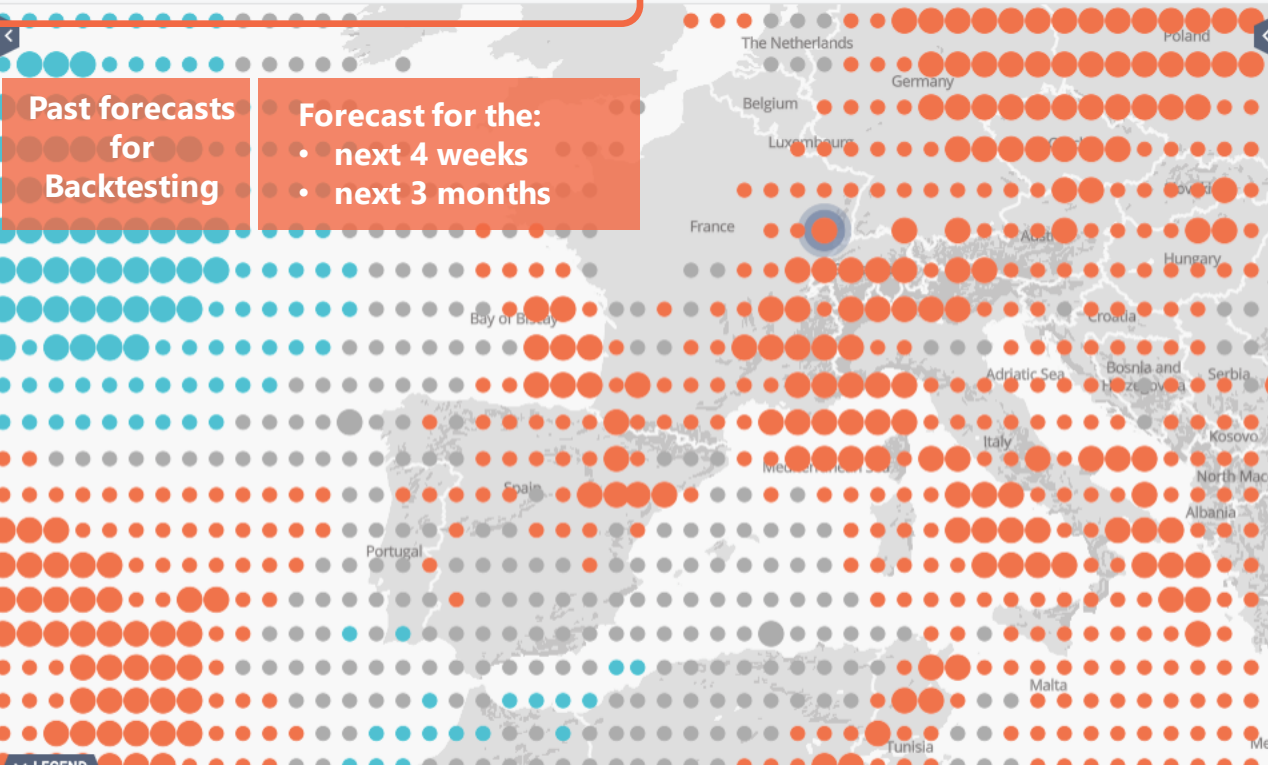
Check previous forecast
2019 Dec 03

Forecast window
 1 2 3 4 1 2 3
 Next 4 weeks Next 3 months

Forecast launched on 2019 Dec 05
Next forecast update on 2019 Dec 12

Past forecasts for Backtesting

Forecast for the:
 • next 4 weeks
 • next 3 months



VARIABLES ⓘ

Select category
Essential climate variables ▾

Select variable
Temperature ▾

FILTERS ⓘ

Skill level
0%
View all [slider] 100

Probability threshold
60 × % ▾

Show extremes

CUSTOMISE DISPLAY ⓘ

Dark map
Installed power

HELP ⓘ

Guided tour
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LEGEND

Predicted tercile ⓘ
 Above (orange dot)
 Normal (grey dot)
 Below (blue dot)

Probability range ⓘ
 60% to 100% (large dot)
 34% to 59% (medium dot)

Extremes ⓘ
 Max (p90) (orange triangle)
 Min (p10) (blue triangle)

WEEK 3 ⓘ
 (23-29 December 2019)
Temperature

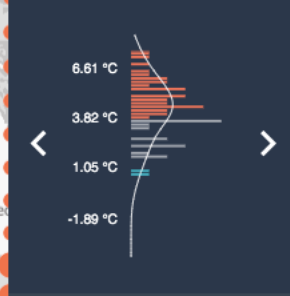
SUMMARY ⓘ

FORECAST	SKILL
63% ABOVE	3% (Fair)
31% NORMAL	
6% BELOW	

EXTREMES (p10-p90) ⓘ

FORECAST	SKILL
MIN MAX	MIN MAX
0% 8%	3% 1%

FORECAST DISTRIBUTION ⓘ



DOWNLOAD REPORT

DOWNLOAD DATA

Search location Check previous forecast 2019 Dec 03 ▾



Forecast launched on 2019 Dec 05
Next forecast update on 2019 Dec 12

BETA v.1

VARIABLES ⓘ

Select category
Essential climate variables ▾

Select variable
Temperature (country) ▾

FILTERS ⓘ

Skill level

View all

Probability threshold

80 × % ▾

Show extremes

CUSTOMISE DISPLAY ⓘ

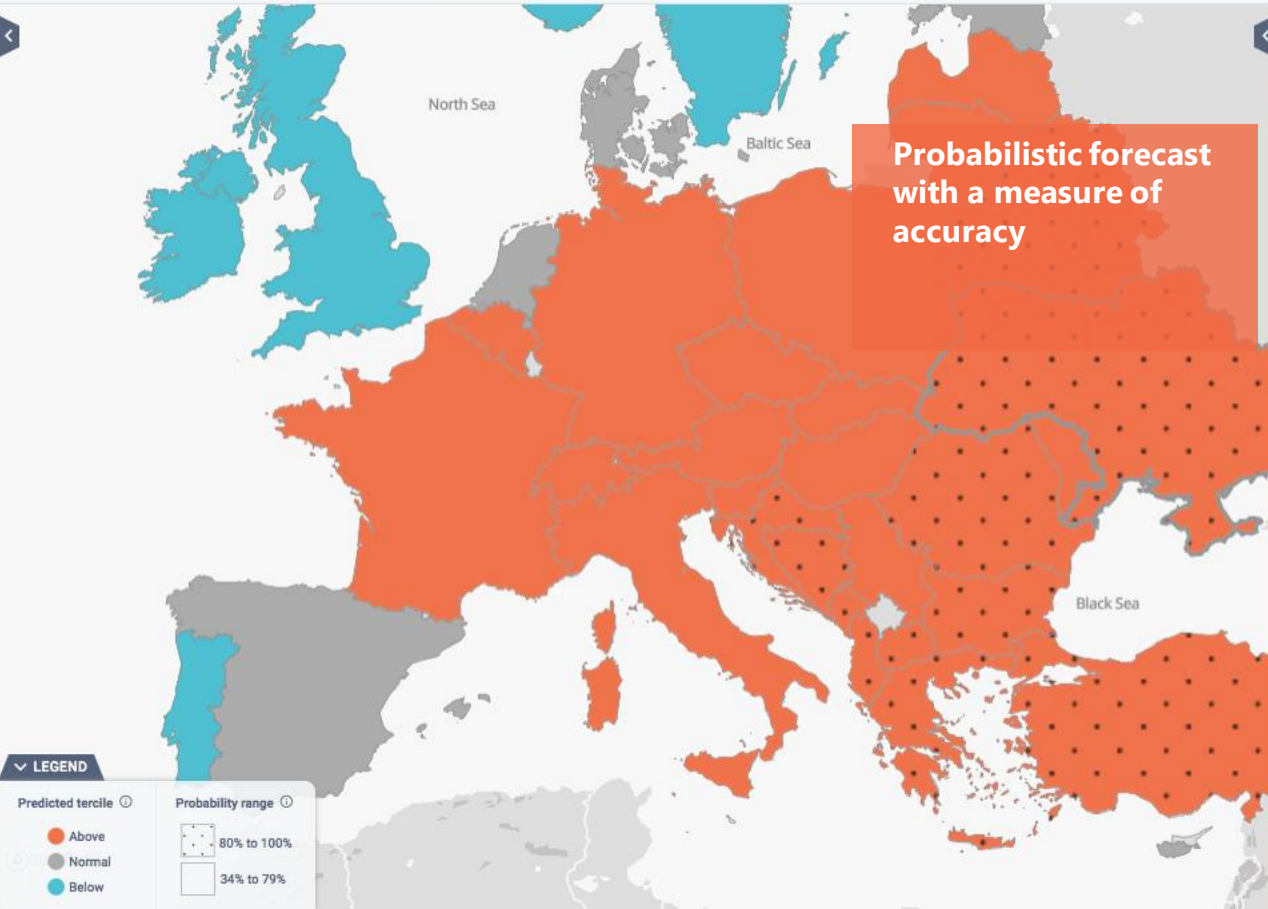
Dark map

Installed power

HELP ⓘ

[Guided tour](#)

[Advanced information](#)



LEGEND

Predicted tercile ⓘ

- Above
- Normal
- Below

Probability range ⓘ

- 80% to 100%
- 34% to 79%

WEEK 1 ⓘ

(9-15 December 2019)
Temperature (country)

SUMMARY ⓘ

FORECAST	SKILL
92% ABOVE	39% (Very Good)
6% NORMAL	
2% BELOW	

EXTREMES (p10-p90) ⓘ

FORECAST		SKILL	
MIN	MAX	MIN	MAX
0%	63%	19%	36%

FORECAST DISTRIBUTION ⓘ

... and other services

Webinars

WEBINAR #2 | 25 NOV 2019



In this webinar "Climate forecasts for the Upcoming Winter Season", scientists from S2S4E give insight on forecasts for the next four weeks and three months provided in the online Decision Support Tool.

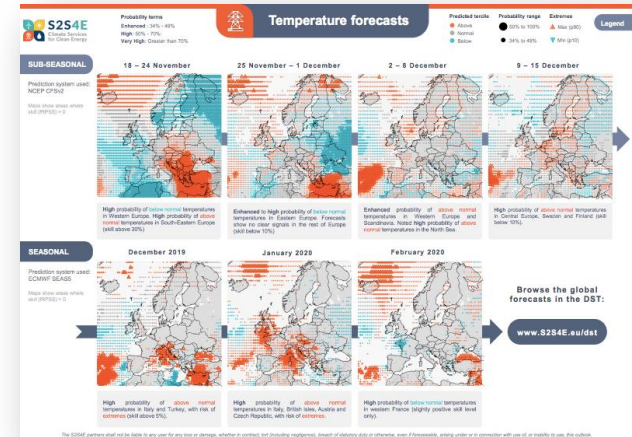
R-package CSTools



R-Programming

<https://cran.r-project.org/package=CSTools>

Monthly outlooks



Case studies & Factsheets



High snowmelt and rain in Sweden

July 2015

WHAT:

- ▶ Substantial snowmelt
- ▶ Above normal precipitation

IMPACT:

- ▶ Reservoirs filled up too early
- ▶ Unproductive water release



Seasonal Forecasts
to reduce water loss

Cold spell and wind drought in Europe

WHAT:

- ▶ Extremely low temperature
- ▶ Below normal wind speed

IMPACT:

- ▶ Sharp increase in electricity demand
- ▶ Low wind power production
- ▶ **Peak in energy prices**



Sub-Seasonal Forecasts
For hedging

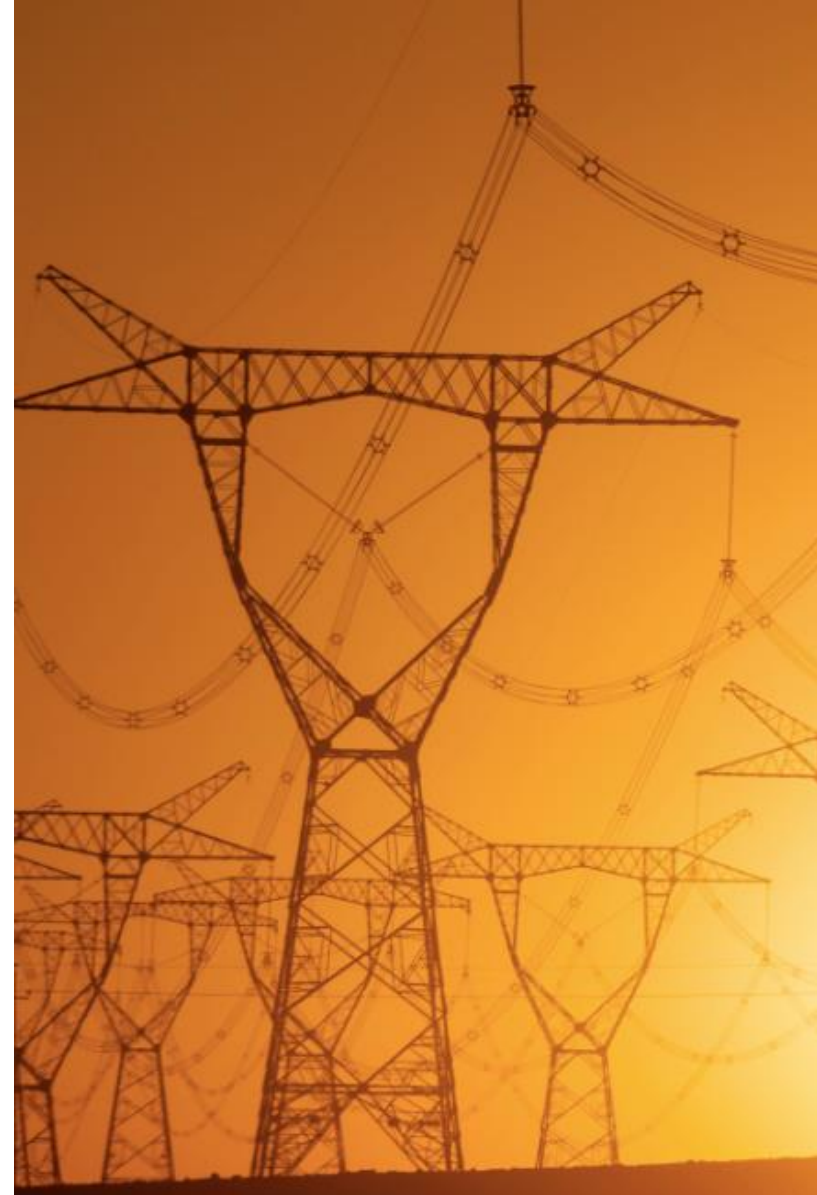
Cold spell and wind drought in Europe

WHAT:

- ▶ Extremely low temperature
- ▶ Below normal wind speed

IMPACT:

- ▶ Sharp increase in electricity demand
- ▶ Low wind power production
- ▶ High risk of energy imbalance in the grid



S2S
for the grid

Clean Energy for All Europeans package

- ▶ Regulation (EU) 2019/941, 5 June 2019
- ▶ On risk-preparedness in the electricity sector

...assessing seasonal and short-term adequacy, namely monthly, week-ahead to at least day-ahead adequacy...

...covering [...] severe weather conditions, variable demand in particular peaks depending on weather conditions, and variability of production of energy from renewable sources;

...methodology [...] shall provide for a probabilistic approach

...methodology shall take into account the specificities of each Member State's energy sector, including specific weather conditions and external circumstances.

Thank you

Get in touch for more information!



S2S4E

Climate Services
for Clean Energy



Public reports of the project will be available for download on the S2S4E website: www.s2s4e.eu



Project coordinator: Albert Soret, Barcelona Supercomputing Center (BSC)
Contact us: s2s4e@bsc.es



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This project has received funding from the Horizon 2020 programme under grant agreement n°776787. The content of this presentation reflects only the author's view. The European Commission is not responsible for any use that may be made of the information it contains.