S2S4E
Climate Services for Clean Energy

Best practices – Climate Sprint

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This project has received funding from the Horizon 2020 programme under grant agreement n°776787.

How climate services & the S2S4E tool bring value to the energy sector

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Climate services: starting point

- "A climate service is a **decision aide** derived from climate information that assists individuals and organizations in society to make improved **ex-ante decision-making**."

Source WMO (World Meteorological Organization)

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S2S4E Scope

Weather forecast	Climate predictions		Climate projections
1-15 days	Sub-seasonal: 10 d-1 month	Seasonal: 1 month–2 years	Decadal: 2-30 years	20-100 years

Time

Applications for wind/solar/hydro generation

Post-construction decisions

Energy producers: commit energy sales for next day
Grid operators: Market prices and grid balance
Energy traders: Anticipate energy prices
Plant operators: planning for cleaning and maintenance

Post-construction decisions

Energy producers: Resource management strategies
Energy traders: Resource effects on markets
Plant operators: Planning for maintenance works, especially offshore wind O&M
Plant investors: anticipate cash flow, optimize return on investments

Pre-construction decisions

Power plant developers: Site selection. Future risks assessment.
Investors: Evaluate return on investments
Policy-makers: Asses changes to energy mix
River-basin managers: understand changes to better manage the river flow

Applications for demand

Daily operation decisions

Grid operators:
Anticipate hot/cold days.
Schedule power plants to reinforce supply.
Energy traders: Anticipate energy prices.

Mid-term planning

Grid operators:
Anticipate hotter/colder seasons Schedule power plants to reinforce supply.
Energy traders:
Anticipate energy prices.

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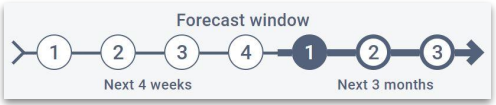
Long-term planning

Grid operators:
Anticipate addition of more capacity.
Adaptation of transmission lines
Policy-makers:
Plan addition of more capacity.
Understand changes to energy mix



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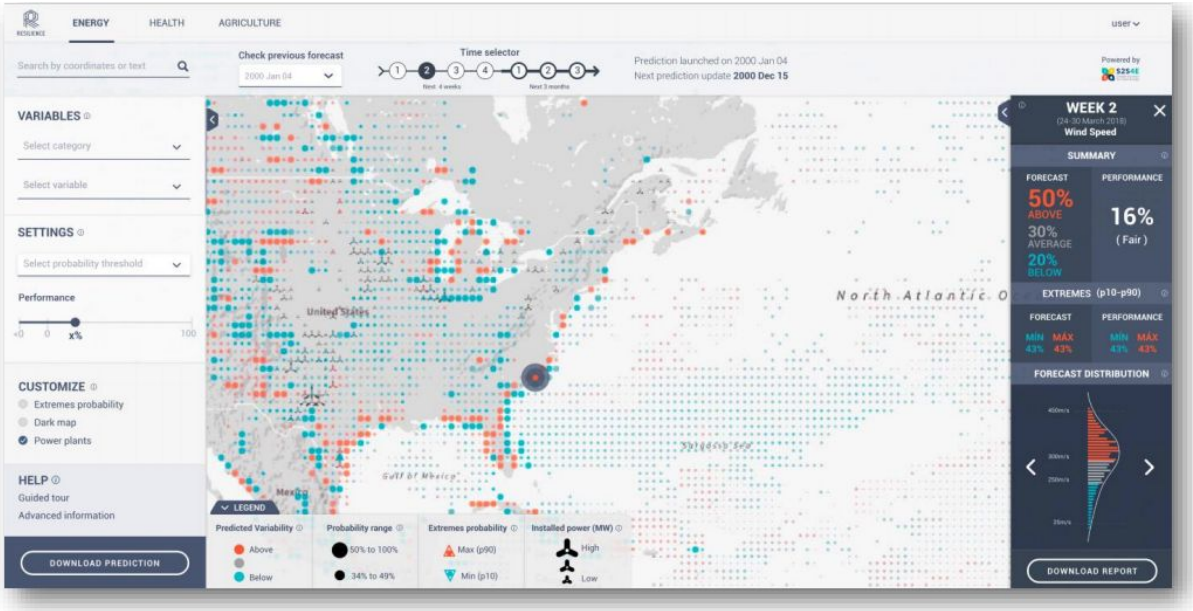
S2S4E Decision Support Tool

- Integration for the first time of sub-seasonal to seasonal (S2S) climate predictions with RE production and electricity demand.



https://s2s4e.eu/dst

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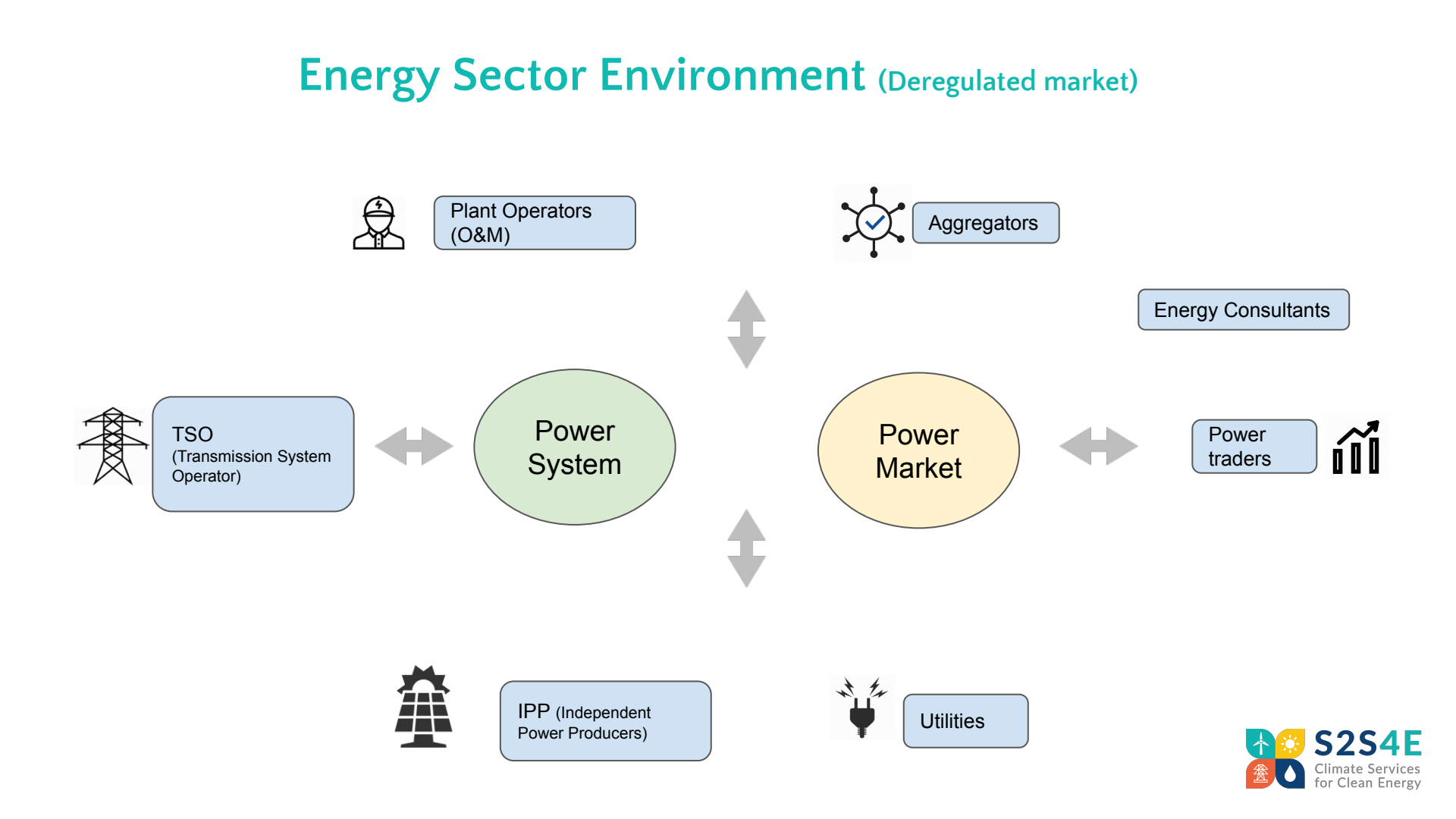
Energy Sector Environment (Deregulated market)



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Decision-making process

Examples of decisions to make

- When to buy or sell power? (hedging & trading)
- When to sign power purchase long term contracts?
- When to schedule or reschedule grid/offshore wind farms maintenance activities?
- Do I need to release water flow from a reservoir?

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DST – High quality signals

Obtain <u>high quality signals</u>

Of Sub-seasonal to seasonal (Energy & Climate)

Processed information

Probabilistically delimited

Make better decisions

Manage Risks

Reduce cost of operations

Investing decision

Increase activity benefits

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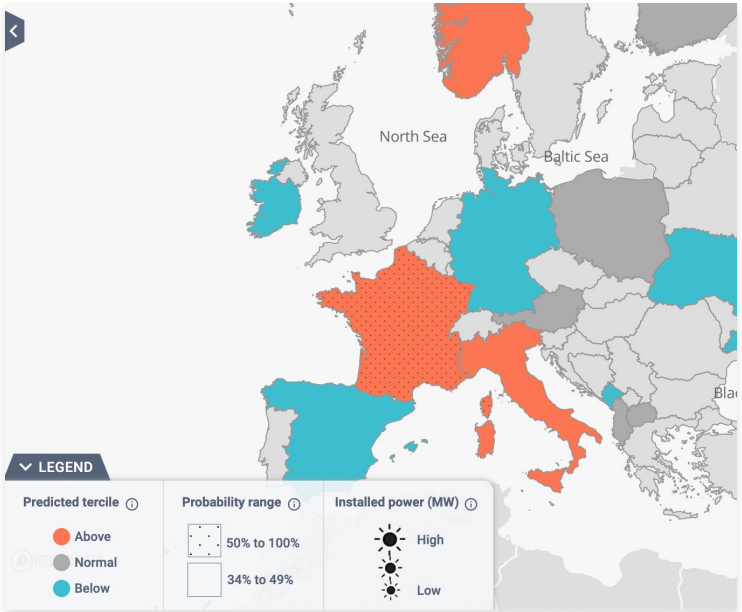
Variables in the DST

- **Essential climate variables:**

  (per grid point / country aggregated):
  - Wind speed
  - Temperature (Tmean/Tmax/Tmin)
  - Solar radiation
  - Precipitation
  - Mean sea level pressure

- **Energy Indicators:**
  - Wind capacity factor
  - Solar capacity factor
  - Electricity demand at country level
  - Hydro power (inflow/ annual snow max anomaly)



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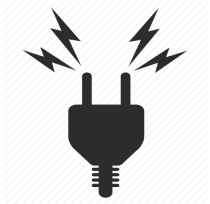
Price Signals – Power & Gas

- Pool price (power) main drivers
  - Electricity Demand
  - Wind Power production
  - Nuclear power plants availability
  - Solar & Hydro production
  - CO2 emissions & Natural gas prices
  - Inter-connections (Grid)
  - …
- Natural Gas price main drivers
  - Oil (Brent) market price
  - Electricity price & demand
  - Economic growth (Industrial consumption)
  - Geopolitics
  - Climate (Temperature)
  - LNG (Liquid Natural Gas) availability
  - …



Linked to S2S4E climate & energy indicators

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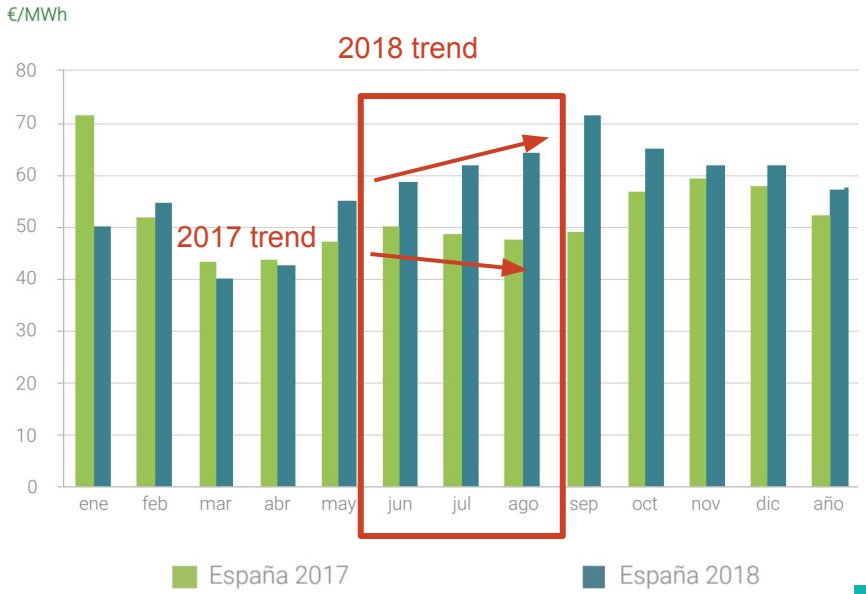
Importance of trends & signals

- Goal: Anticipate pool prices (Long & Short term)

—> Price signals

- Demand & RES production S2S

Average daily pool price 2017 & 2018 (Spain)



Source: OMIE (Market operator)

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Importance of trends & signals

- Goal : Anticipate production & consumption patterns

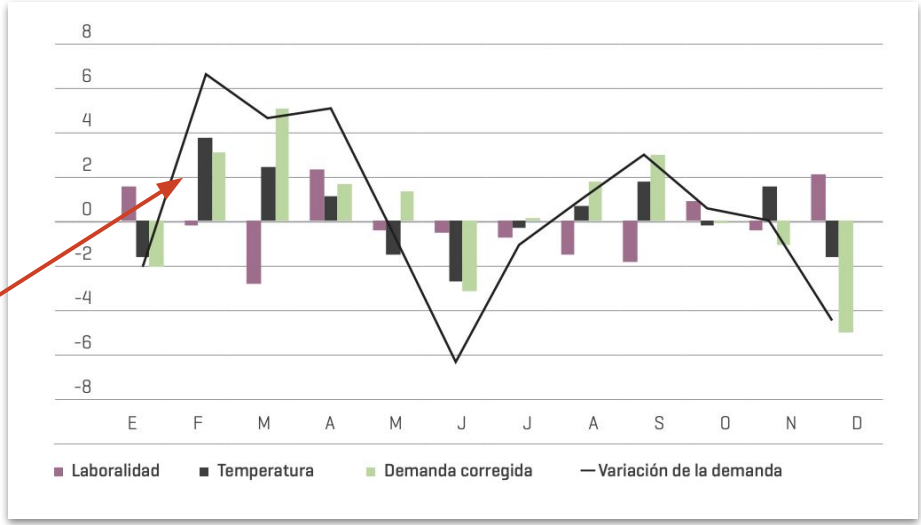
—> Energy signals

- RES power production

- Essential Climate variables

Temperature

Components of monthly electricity demand Iberia (2018)



Source: REE (Transmission System Operator)

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S2S – Grid & country level energy signals

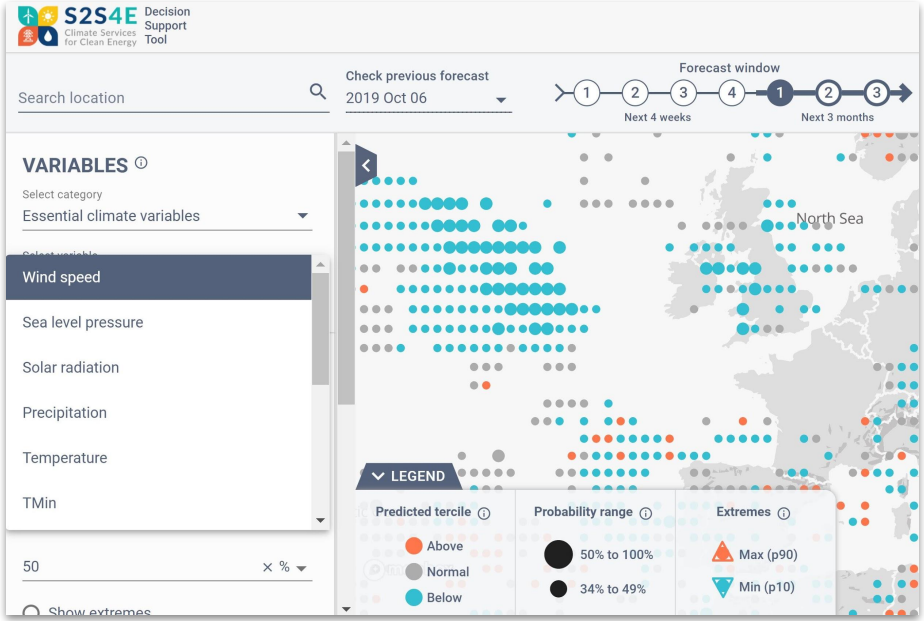
Potential direct beneficiaries

- **TSO**
  - Energy Mix considerations (supply)
  - O&M, stop planning

- **O&M teams (IPP)**
  - Operations (Offshore)

→ *probabilistically delimited*

→ *grid level*



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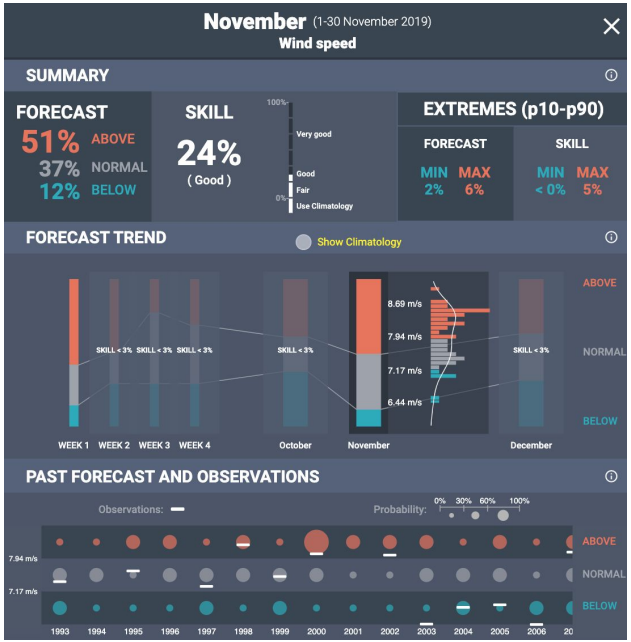
S2S – “Inputs” for price signals

Potential direct beneficiaries

- **Traders**
- **Aggregators**
- **IPP**
- **Energy Consultants**

→ *probabilistically delimited*

→ *market level*



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Thank you

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

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