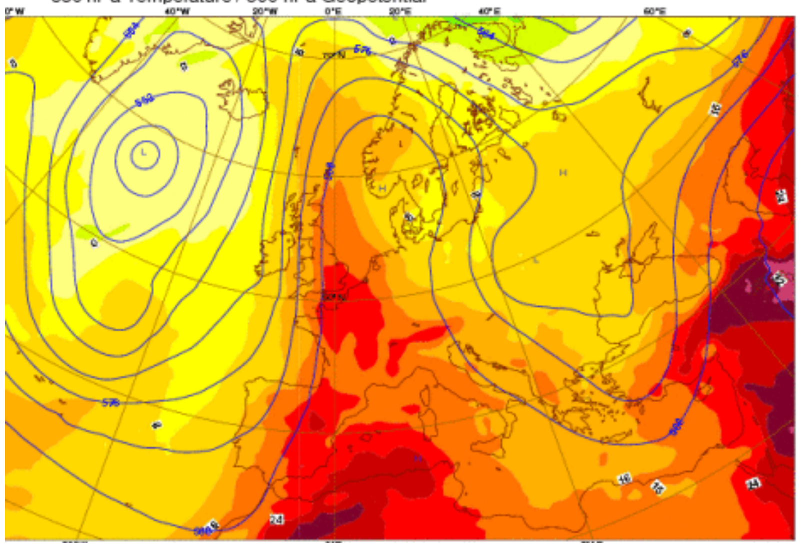
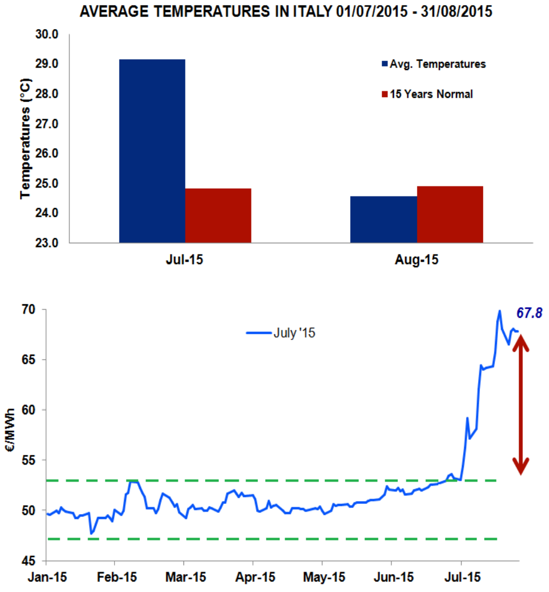
The Added Value of Seasonal Climate Forecasting for Integrated Risk Management

Case study 1: Heat Wave in Italy



Extreme heat wave in southern Europe
July 2015



Increase in power prices associated with spike in summer

Co-designers
ENEL
EURAC
ENEA

Priority climatic variables:

- Tmp2m

Mandatory Time Resolution:

- Monthly

Desirable Time Resolution:

- Weekly

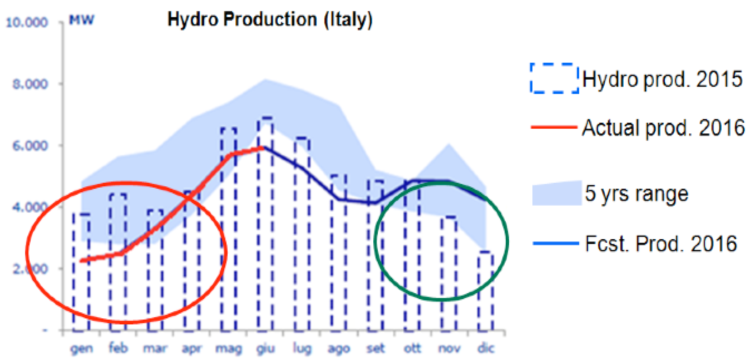
University of East Anglia
enel
ENEA
Met Office
AWS TRUEPOWER
WEMC World Energy & Meteorology Council
eurac research
alperia

Grant Agreement n. 776868

The Added Value of Seasonal Climate Forecasting for Integrated Risk Management

SECLI FIRM

Case study 2: Drought in Italy



Mild and dry winter 2015/2016 in the Alps and Apennines => Gas price movements in the context of low demand and hydroelectric production

Co-designers
ENEL
Alperia
EURAC
ENEA

Priority climatic variables:

- tmp2m,
- Total precipitation,
- Snow fall,
- Snow depth,
- Snow density,
- water balance

Mandatory Time Resolution:

- Monthly

State of the Art

Enel:

- Analyzed data from ERA – Interim;
  - Found snow density anomalous data between 2003-2014.
- Downloaded ERA – 5 data
  - hourly data from Copernicus website;
  - monthly data from ECMWF website;
- Transformed the data in a regular grib format;
- **EGU 2019!**

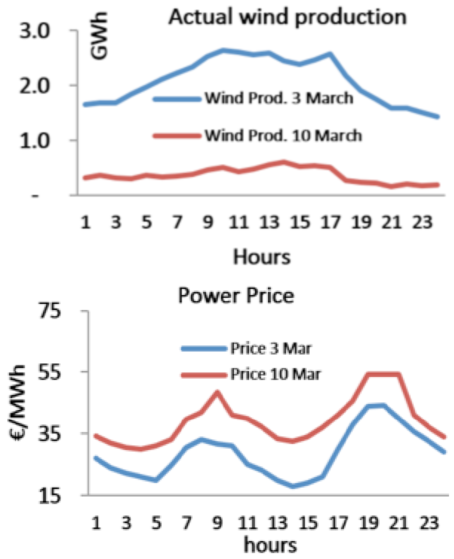
University of East Anglia
Met Office
AWS TRUEPOWER
WEMC World Energy & Meteorology Council
eurac research
alperia
Grant Agreement n. 776868

The Added Value of Seasonal Climate Forecasting for Integrated Risk Management

SECLI FIRM

Case study 3: Wind variability in Southern Italy

Variable wind speeds in Southern Italy in the first two weeks of March 2016



Variations in wind power production and price and implications for thermal power production and price

Co-designers
ENEL
ENEA
KNMI
UEA

Priority climatic variables:

- Wind speed at 10 meters

Mandatory Time Resolution:

- Weekly

...State of Art:

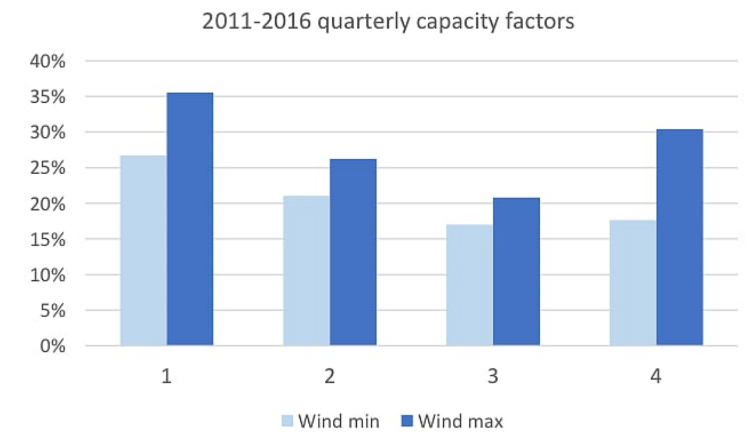
- To be solved problems with C3S DS
- Needed weekly resolution to analyze the event

University of East Anglia · enel · ENEA · Met Office · AWS TRUEPOWER · WEMC World Energy & Meteorology Council · eurac research · alperia

Grant Agreement n. 776868

The Added Value of Seasonal Climate Forecasting for Integrated Risk Management

Case study 4: High/low winds in Spain and energy generation



January 2014 – March 2014. For the high production of wind and hydro energy.

December 2014 – January 2015 low production.

Demonstrating the impact of using wind speed seasonal forecast information for a big utility with multiple generation assets of different technologies.

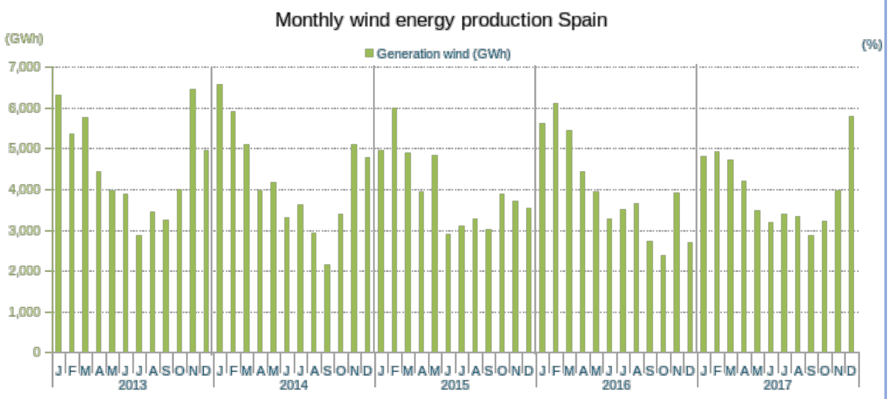
Co-designers
ENDESA - ENEL
AWS Truepower - UL
UEA

Priority climatic variables:

- Wind speed at 10 meters

Mandatory Time Resolution:

- Weekly



* Source: RED electrica de España.

Grant Agreement n. 776868

The Added Value of Seasonal Climate Forecasting for Integrated Risk Management

SECLI FIRM

Case study 5: Strong El Niños and energy mix planning

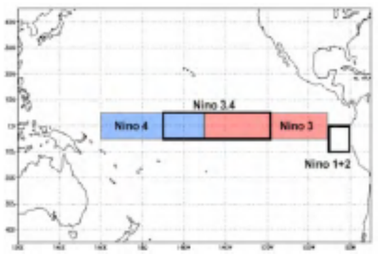


Figure 1: The Niño 3.4 region of the Pacific Ocean

Figure 2: The regions of Colombia

The El Niño-Southern Oscillation (ENSO) cycle.

Severe drought between 2015-2016 in Colombia as a result of a strong El Niño event.

Designing adequate decision-support products to predict the expected amount of flow for hydro resources.

Co-designers
EMGESA- ENEL
Celsia
AWS Truepower - UL
UEA

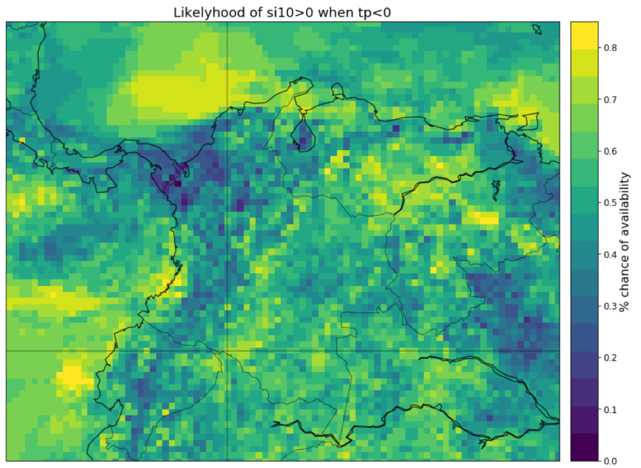
Priority climatic variables:

- tmp2m,

- Total precipitation,

Mandatory Time Resolution:

- Monthly



Study of optimization of optimal energy mix of renewable energy sources hydro, wind and solar.

* Source: ERA5 data (2010-2017)

University of East Anglia
Met Office
AWS TRUEPOWER
WEMC World Energy & Meteorology Council
eurac research
alperia
Grant Agreement n. 776868

Case study 5: State of the art

EMGESA- Enel:

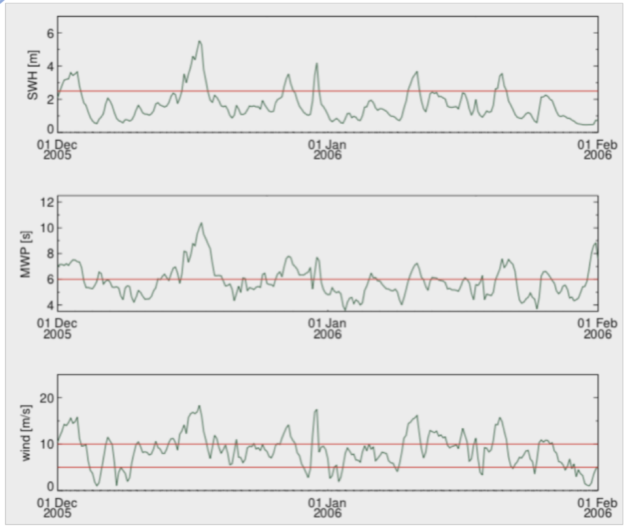
- Analyzing data from ERA-5
- Implemented link functions by Enel -> to be applied to Colombian CS

The Added Value of Seasonal Climate Forecasting for Integrated Risk Management

SECLI FIRM

Case study 6: North Sea wind and waves impact on maintenance planning and logistics

Access by vessel depends on
wave height, wind speed, etcetera.
Different thresholds for different means of access



Standard method | If required | Emergency

Examples; Climatic variables

- Significant wave height
- windspeed

Desirable variables :

- Precipitation

Mandatory Time Resolution:

- To be decided (Weekly)

Under investigation:

- Application: maintenance & supply
- Area
- Skill

University of East Anglia · enel · ENEA · Met Office · UL AWS TRUEPOWER · WEMC World Energy & Meteorology Council · eurac research · alperia

Grant Agreement n. 776868

The Added Value of Seasonal Climate Forecasting for Integrated Risk Management

SECLI FIRM

Voor onderhoud:

- Stromingsrichting (Getij)
- Stromingssnelheid
- Windrichting
- Windsnelheid
- wolkenhoogte
- Golfperiode
- Significante golfhoogte
- Neerslag, regen, sneeuw, IJssel
- Temperatuur
- Luchtvochtigheid
- Luchtdruk

Voor transport en systeem:

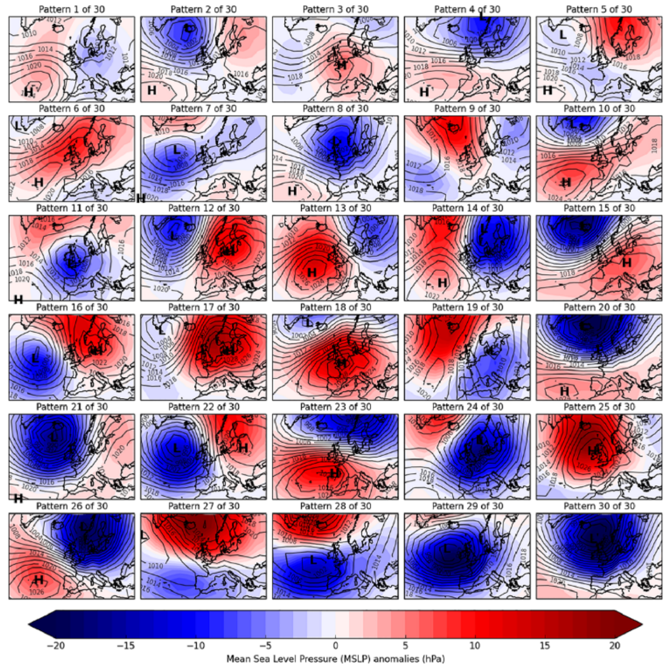
- Koude periode (hogedrukgebied boven midden Europa)
- Warme/hete periode (hogedrukgebied boven midden Europa)
- Windvoorspelling (richting + snelheid) op zee/langs de kust.

University of East Anglia
enel
ENEA
Met Office
AWS TRUEPOWER
WEMC World Energy & Meteorology Council
eurac research
alperia
Grant Agreement
n. 776868

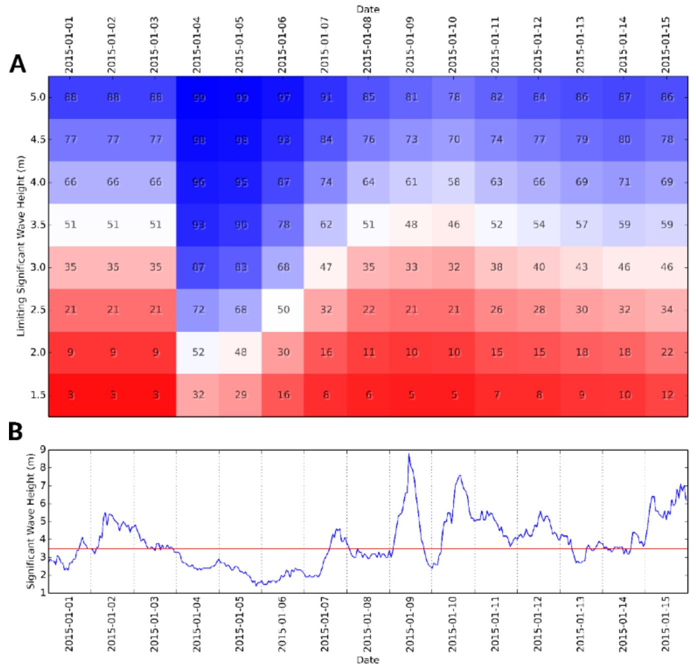
The Added Value of Seasonal Climate Forecasting for Integrated Risk Management

SECLI FIRM

Case study 7: North Sea weather windows in seasonal shoulder months



Analysis of weather patterns (→ wave and wind conditions) in Spring/Autumn



Identification of calm weather windows for the scheduling of marine operations

Co-designers: Shell

(+ link to CS6)

Priority sub-seasonal variables:

- Significant Wave Height
- Mean Wave Period
- 10m Wind Speed

Mandatory Time Resolution:

- Daily

Desirable Time Resolution:

- Daily

Present practice:

Limited use of fortnightly, monthly and sub-/seasonal outputs, with judgement of the MetOcean Engineer relied upon when long-range decision essential.

UEA University of East Anglia · enel · ENEA · Met Office · UL AWS TRUEPOWER · WEMC World Energy & Meteorology Council · eurac research · alperia

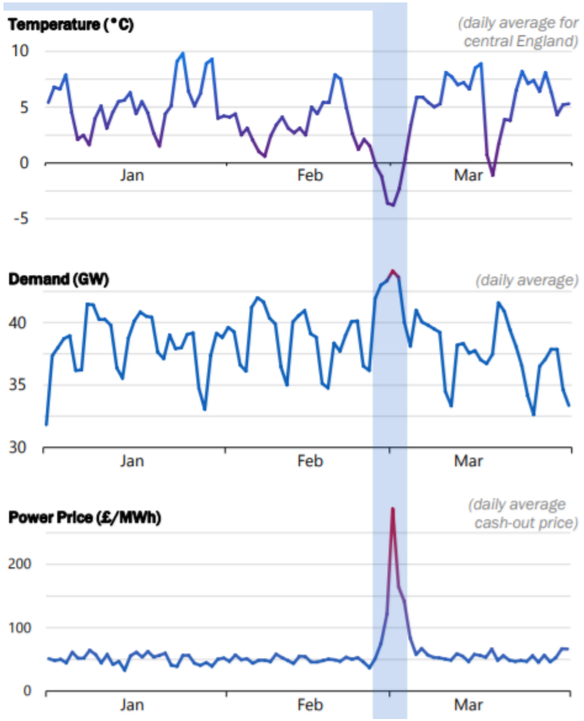
Grant Agreement n. 776868

The Added Value of Seasonal Climate Forecasting for Integrated Risk Management

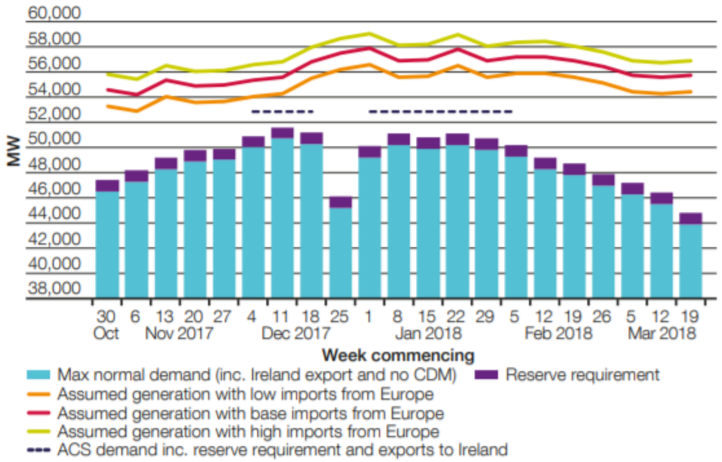
SECLI FIRM

Case study 8: Energy demand balancing

Winter 2018 and 2010



Present practice – winter outlook:



Normalised demand: forecast for each week of the year based on a 30 year average of each relevant weather variable that is related to demand.

Co-designers: National Grid

Priority climatic variables:

- tmp2m
- w10m
- irradiance
- Weather typing

Time Resolution:

- ➢ Hourly

The real time demonstrator will determine winter peak demand using National Grid's existing demand model, driven by seasonal climate forecasts (instead of climatology).

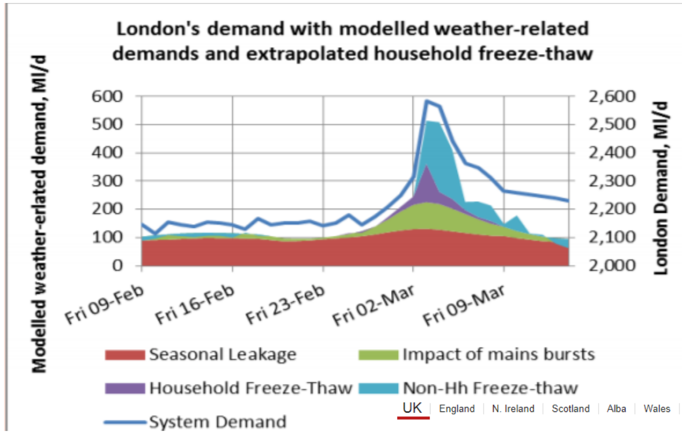
University of East Anglia · enel · ENEA · Met Office · AWS TRUEPOWER · WEMC World Energy & Meteorology Council · eurac research · alperia

Grant Agreement n. 776868

The Added Value of Seasonal Climate Forecasting for Integrated Risk Management

Case study 9: Identifying periods of stress to the supply – demand balance

Acute demand situations e.g. Winter 2018 and summer 2017, Low supply situations e.g 2012




UK | England | N. Ireland | Scotland | Alba | Wales | Cymru | Local News

Hosepipe ban to be imposed in drought-hit parts of UK

12 March 2012

Share

Water companies across southern and eastern England are to introduce hosepipe bans amid drought conditions.

Seven firms say they will impose water restrictions after two unusually dry winters left reservoirs, aquifers and rivers below normal levels.

Southern Water, South East Water, Thames Water, Anglian Water, Sutton

The bans may prohibit people from washing cars, watering gardens and filling swimming pools

Priority climatic variables:

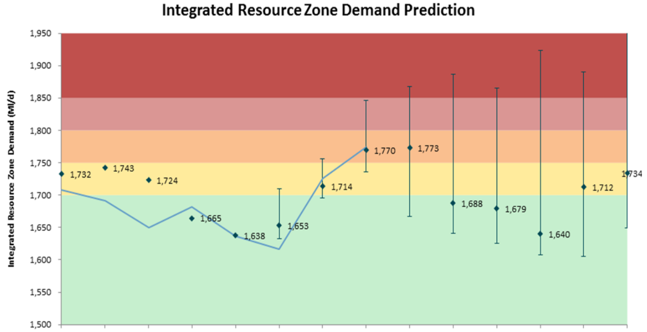
1. **Maximum temperature**
2. **Minimum temperature**
3. **Rainfall**
4. **Sunshine**
5. **Regimes**

Time Resolution:

- Daily

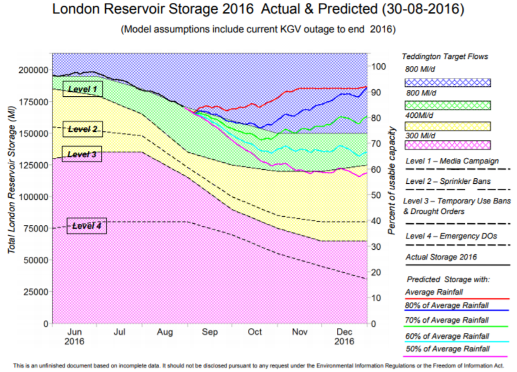
Co-designers: Thames Water

Present practice:



10 day ahead demand forecast

Demand prediction – based on climatology



Supply prediction – based on climatology

University of East Anglia
Met Office
AWS TRUEPOWER
WEMC World Energy & Meteorology Council
eurac research
alperia
Grant Agreement n. 776868