# **Energy & Meteorology Nexus**

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# **Energy & Meteorology go hand in hand**



# **Energy & Climate feedback**

#### **Emissions**



## Energy



Meteorology

Weather, Climate &

Water

#### Impacts



The Energy industry has a multidecadal experience in dealing with meteorological variables, so what's the big deal?

The landscape, in both climate and energy spaces, is changing rapidly



# Fossil fuels have the lion's share

Estimated Renewable Energy Share of Global Final Energy Consumption, 2012



REN21. 2014. Renewables 2014 Global Status Report (Paris: REN21 Secretariat).





# **Strong growth in renewables**





IRENA (2014)

# **CO2** emissions and temperature



IPCC AR5 (2013)



# **Disasters due to natural events**



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EM-DAT (2012)

## **Global changes in streamflow projections**



Change in streamflow for RCP8.5, 2040–2069 (2050s) vs1971–2000 Reductions in usable capacity for 61–74% of the hydropower plants



van Vliet et al. (2016)

## **Global changes in water temperature projections**



Change in water temperature for RCP8.5, 2040–2069 (2050s) vs 1971–2000

Reductions in usable capacity for 81–86% of the thermoelectric power plants



van Vliet et al. (2016)

# Addressing the ever variable nature of climate



# Monthly forecasts for hydro power



Forecast date

in France



Hydropower represents 20.6% of EDF's installed capacity in France and provides very attractive flexibility during peaks in demand. Forecasts of river flow and water stocks are therefore crucial for the managers of the system.



Dubus (2014)





**ECEM** Target

Climate Change Service

### Energy Mix assessment for:

- Present day
- Seasonal Forecasts
- Climate Change







## **ECEM Motivation**

Climate Change Service climate.copernicus.et



Increasing share of power supply from variable renewable energy (RE) sources. Demand variability is also increasing. The transformation is taking place against a **variable and changing climate**.



**ECEM Demonstrator** 

Climate Change Service

The purpose of the ECEM demonstrator is to enable the energy industry and policymakers to assess how well different energy supply mixes in Europe will meet demand, over different time horizons (from seasonal to long-term decadal planning), focusing on the role climate has on the mixes.





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### ECEM Demonstrator Mock up

OPERNICUS Europe's eyes on Earth Climate Change Service climate.copernicus.eu





# Harmonising meteorological information to effectively tackle energy resilience



# A lot of expert knowledge around ...

- IEA Wind and Solar Heating & Cooling Tasks
- WMO Commission for Climatology
- IRENA
- World Bank
- EU-Copernicus
- American/European Meteorological Society
- ESIP-FED



# ... but how can one

## 1 Navigate the system?

# 2 Be re-assured the information available can be trusted?

# Obtain better access to data?





GFCS is a UN-led initiative which provides a worldwide mechanism for coordinated actions to enhance the quality, quantity and application of climate services.

**Energy has been recently adopted as a priority area** 

See draft of Energy exemplar at: http://gfcs.wmo.int/sites/default/files/2015.10.27 IBCS MC-3-d05-2-REV1-Energy Exemplar-Approved\_en.docx

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http://gfcs.wmo.int/

# **GFCS–Energy Implementation**

- Final endorsement of the exemplar by IBCS MG
- Stakeholders interface platform
  - Coordination and implementation support
  - Partnership with Energy organizations such as IEA, IRENA and WEC and boundary institutions such as WBCSD and WEMC
- Compilation of tools and methods, fill gaps
- Applied work and demonstrations in specific regional and market contexts
  - E.g. proposal preparation for GCF



# **Areas of Focus for Energy**

- 1. Identification & Resource Assessment
- 2. Impact assessments (incl. infrastructure and environment)
- 3. Site Selection & Financing
- 4. Operations & Maintenance
- 5. Energy Integration
  - Market trading (incl. supply and demand forecasts) & Insurance
  - Energy efficiency



# **Requirements – Building Blocks**

	User Interface Platform	Climate Services Information System	Observations and Monitoring	Research Modelling and Prediction
Identification & Resource Assessment	<ul> <li>Provide</li> <li>information</li> <li>about</li> <li>appropriate</li> <li>repositories of</li> <li>data and</li> <li>products for</li> <li>resource and</li> <li>climate risk</li> <li>estimation</li> </ul>	<ul> <li>Historical datasets of relevant</li> <li>meteorological data (in situ, satellite-derived</li> <li>and model- based) and related</li> <li>metadata</li> </ul>	<ul> <li>In situ, and satellite- derived</li> <li>meteorological data for</li> <li>assessment of</li> <li>resources and</li> <li>risks</li> </ul>	<ul> <li>Improvement of observation instrumentation</li> <li>Improvement of satellite retrieval and conversion algorithms</li> </ul>
Impact assessments	<ul> <li>Identify relevant</li> <li>meteorological and climate</li> <li>phenomena for specific</li> <li>infrastructure</li> </ul>	<ul> <li>Historical datasets and climate analyses of extreme events</li> </ul>	<ul> <li>High-grade in situ data</li> <li>Air quality and gas emission database</li> </ul>	<ul> <li>Characterization of extreme events and probabilities, return periods, probabilities of occurrence, exceedance</li> </ul>

 $\leftarrow \text{ CAPACITY DEVELOPMENT AND SUPPORT } \rightarrow$ 

# What is a (Weather/)Climate Service?





A set of actions aimed at helping 'people' make the best use of climate information so as to improve their 'business'



What is the difference between a Climate Service and ...

... a Banking Service? ... a Car Service? ... a Medical Service?







# Traditional Sales Approach

Out of Comfort Zone







Pull is nice but nothing wrong with push – The Need Creation – requires a lot of market research and a good dose of tact & intuition!





## World Energy & Meteorology Council

- WEMC's primary goal is to enable improved sustainability, resilience and efficiency of energy systems under ever changing weather and climate
- WEMC is based at the University of East Anglia (UEA) in the UK





http://www.wemcouncil.org/



## World Energy & Meteorology Council

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WEMC VISION

- To enhance productivity and policy formulation for the energy industry through a close collaboration
- To achieve improved adoption of weather, climate and other environmental information by the energy industry towards more efficient and sustainable risk management practices
- To maximize the exchange of weather, climate and other environmental information between developed and developing countries



# Take away messages

- Energy and Meteorology are closely connected
- Energy systems are already experiencing sizeable impacts, which are likely to become more severe
- There is a strong need:
  - to improve knowledge of meteorological data and processes
  - to provide trusted information to the energy industry through coordination efforts
  - to improve access to meteorological, and possibly energy, data



# Thank you