WEATHER FOR VAGE – IMPROVING THE VALUE OF VARIABLE AND UNCERTAIN POWER GENERATION IN ENERGY SYSTEMS

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The purpose is to improve operational decision making in the power systems when considering the variability and uncertainty of wind, photovoltaic (PV), water inflow, heat and electricity demand, their correlations and possible sources of flexibility. The whole energy system will be modelled and impact of weather variations will be estimated on the unpredictable and predictable part of the system. The modelling covers the area of Nord Pool Spot (Nordic countries, Eastern Baltic countries and UK).

Energy consumption is largely depending on weather and its variations. Renewable energy, mainly solar power, wind power and hydro-power covers almost 30% on production side in Finland and more in other Nordic countries. The energy modelling part is taken care by VTT Technical Research Centre of Finland Ltd.

Providing weather information for energy modelling:
- Calibrated ensemble forecast for short and medium ranges
- Calibrated ECMWF ENS forecasts up to +15 days
- MEPS forecasts for +2 days with high resolution – currently MEPS data is not calibrated

Application of ECMWF ENS data in energy modelling system:
About one year of ECMWF archived data for test period Calibration of temperature, 100 m wind speed and precipitation amount ensemble forecasts Methodology has been developed in joint Hirlam-Aladin co-operation and it uses mostly Non-Gaussian Regression with 42 days sampling window.

MEPS or MetCoop EPS (Sweden, Norway, Finland) experimentation
HARMONIE NWP model, cy40h1.1
- 2.5 km horizontal resolution
- 65 vertical levels
- Non-hydrostatic model
- AROME physics
- Explicit deep convection
- Parametrized shallow convection

Control run every 3 hours up to +66h
- 3D-VAR for upper air parameters
- 9 members for ensemble every 6 hours up to +48h
- Development of stochastic physics (STTP method) for this project
- HarmonEPS testing with baseline model version

Conclusions

Ensemble calibration increase skill in most cases. However, the current calibration methodology does not take into account local effects. The shortcoming may be fixed by taking extra predictors like or by making the local bias correction first and the general ensemble calibration after local bias correction.

More information about the project: http://clicinnovation.fi/activity/vage/