Energy Valley Bavaria: Flexible Power Plants

Modeling & Analysis of the Future European Transmission System

The large-scale deployment of renewable generation within the future European power system poses a range of challenges in the field of network planning and operation. Improvement of existing transmission infrastructure and use of new operational strategies, such as curtailment of renewable generation, will be required to avoid line overloading during times of peak feed-in, whilst advanced generator dispatch strategies will be used to ensure sufficient generator ramping flexibility is provided.

Modeling: Unit Commitment & Power Flow

- **Load Flow Model**
  - Impedance network calculated from geographical line lengths

- **Time-Series Input Data**
  - Hourly weather and load information

- **Unit Commitment & Dispatch**
  - Finding cost optimal solution for power plant operation to model the electricity market

Analysis: How to Guarantee a Stable and Secure Energy Supply?

Upgrade of Transmission Lines

- Planned HVDC links in Germany are included in the model to evaluate their effects on the power systems. Policy advice can be derived from the scenarios.

Renewable Energy Curtailment

- During peak feed-in, line overloading can occur. Feed-in curtailment (left) may cost less than line upgrades.

Dynamic Stability

- The addition of power plant control system models (above) allows the investigation of dynamic stability after system faults such as line and generator outages (left). This gives a measure of how secure the supply is during high renewable feed-in.

Optimal Generator Dispatch

- Including temperature in UC allows to find optimal preheating strategies. New options for flexible power plants can be evaluated.