

Digital solutions for grid and market integration of renewable energies

Virtual Power Plant & Solar/Wind Power Forecasts

2nd German-Algerian Energy Day

Algier, 28.11.2019
Ulrich Kaltenbach

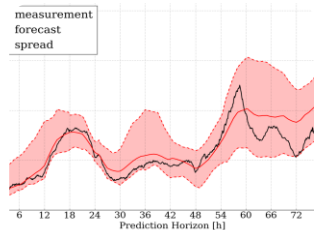
About energy & meteo systems

Company



- Owner-managed since its founding in 2004
- Located in Oldenburg, Germany
- 90 employees (software developers, physicists, meteorologists)

Services



- Accurate power forecasts for solar, wind, demand, grid congestions
- Market-leading Virtual Power Plant (SaaS)
- Consultancy and R&D

Users



- Transmission, Distribution and Independent System Operators
- Energy trading companies
- Plant operators (IPPs, utilities etc.)

Diverse Customer Base. A Selection.

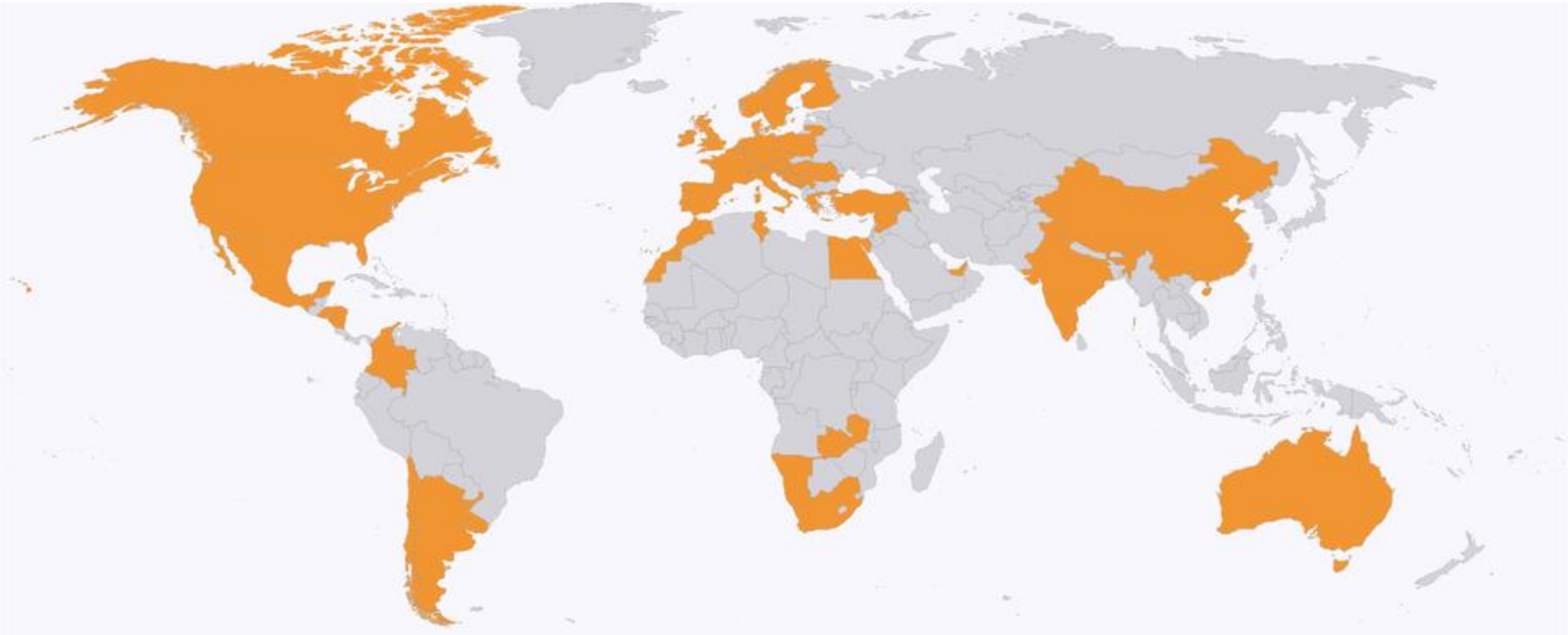
TSOs/ISOs



Energy generators/traders



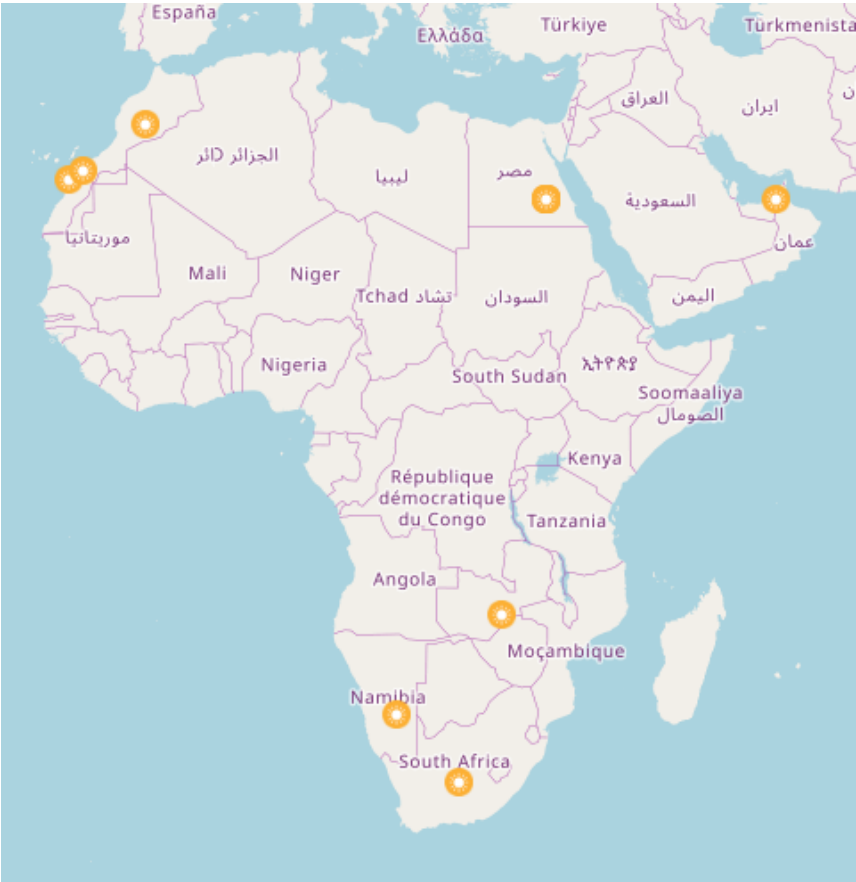
International business activities



Currently forecasted:

- **280 GW of wind power**
- **130 GW of solar power**

Forecasting activities in Africa



Customer	Sterling & Wilson
Countries	Egypt, Morocco, Namibia, Zambia, South Africa
Service	Solar power forecasts
Scope	11 solar parks
Capacity	632 MW

Forecasting activities in Africa



Customer	STEG
Country	Tunisia
Service	Wind power forecasts
Scope	3 wind parks
Capacity	243 MW

Key technologies for renewable energy integration

Challenges arising from decentralized variable energy production

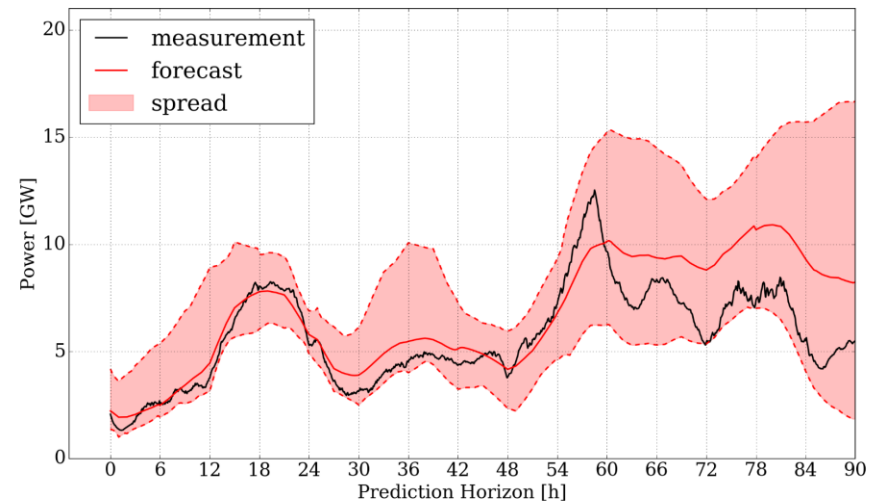
- you need to know the current production of your solar and wind plants
- you need to know the future production schedule
- you need to control your assets as far as possible

Our solution:

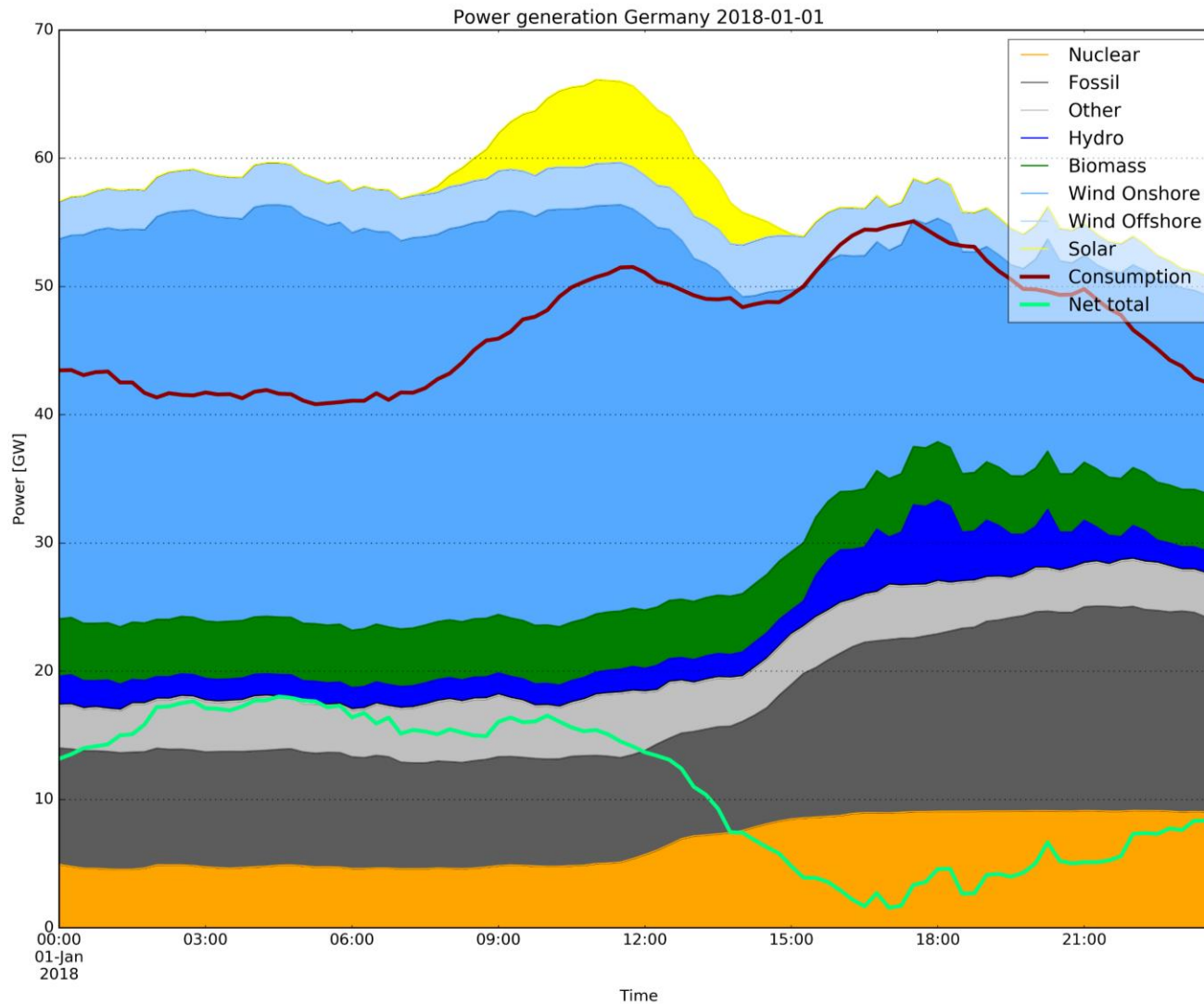
Virtual Power Plant



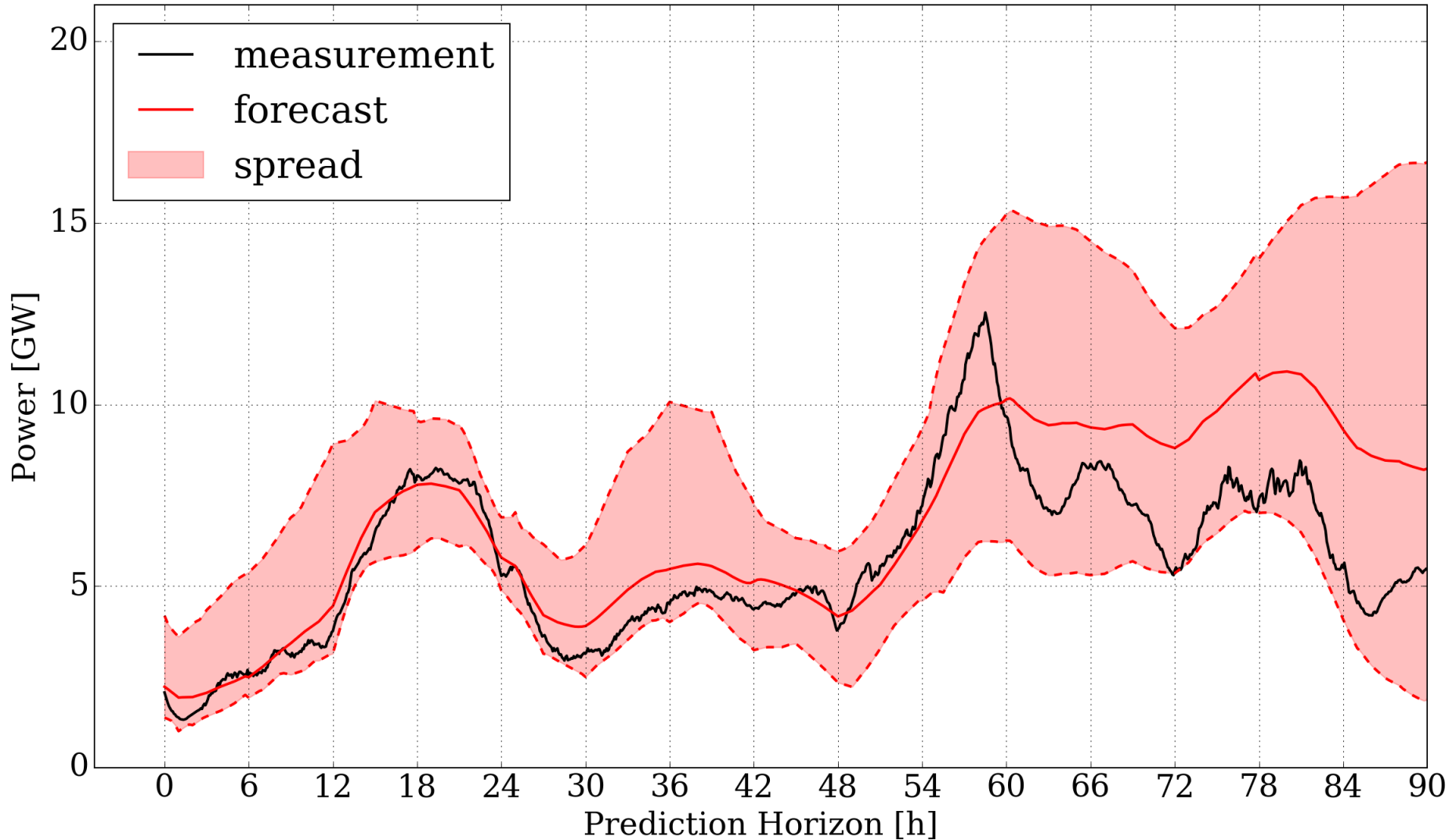
Wind & Solar Power Forecasts



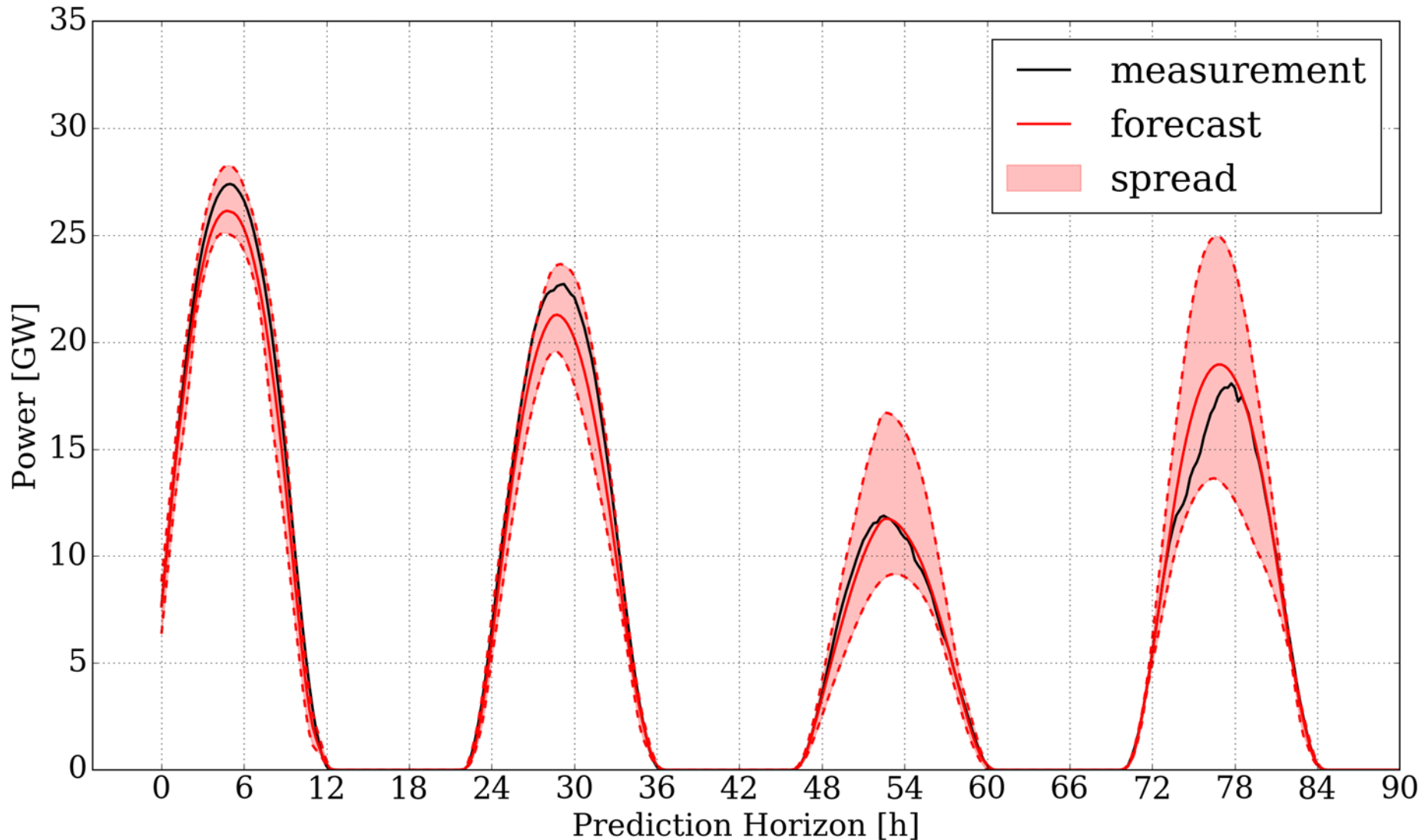
New Year's Eve: very high share of RE in Germany



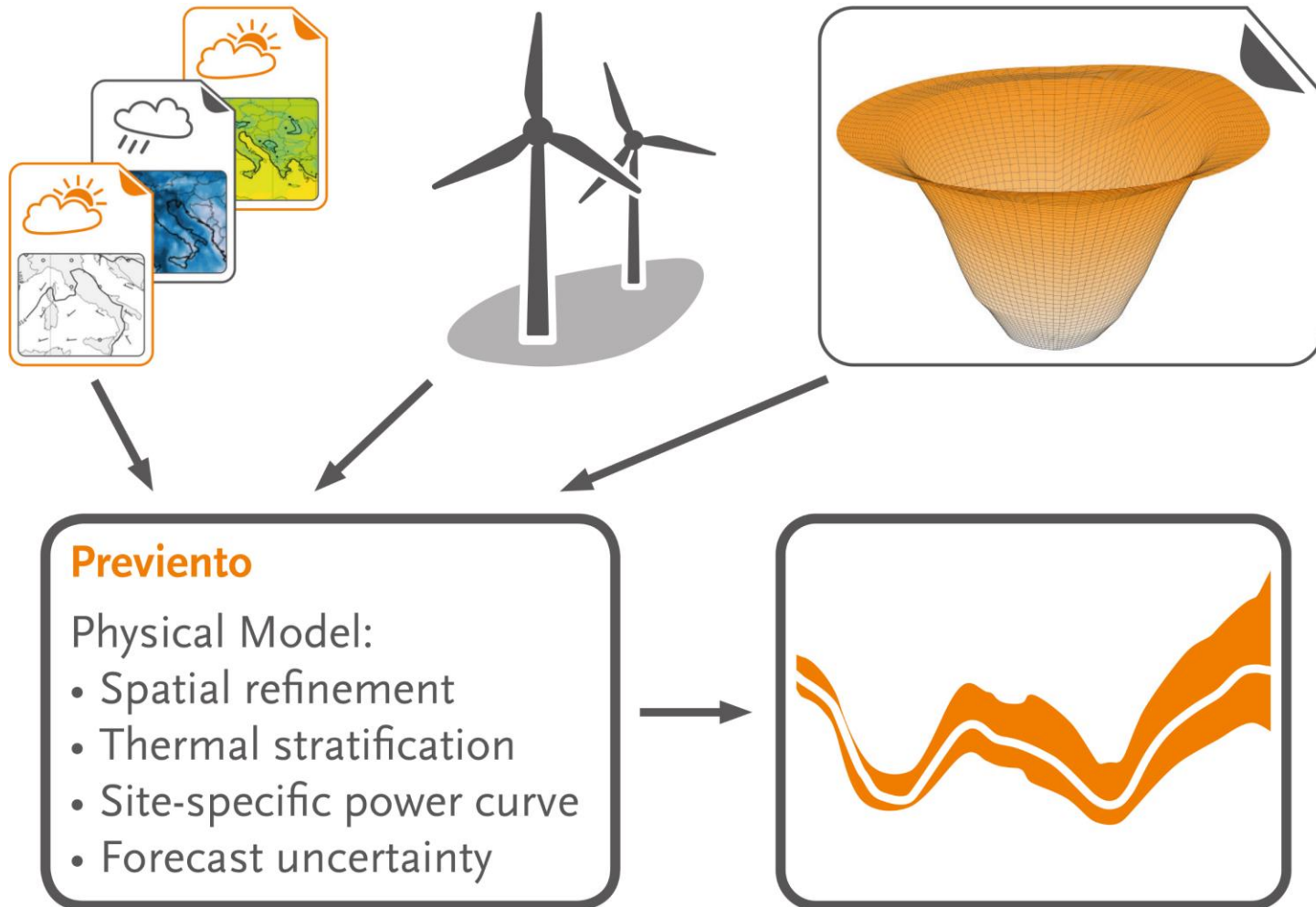
How does a wind power prediction look like?



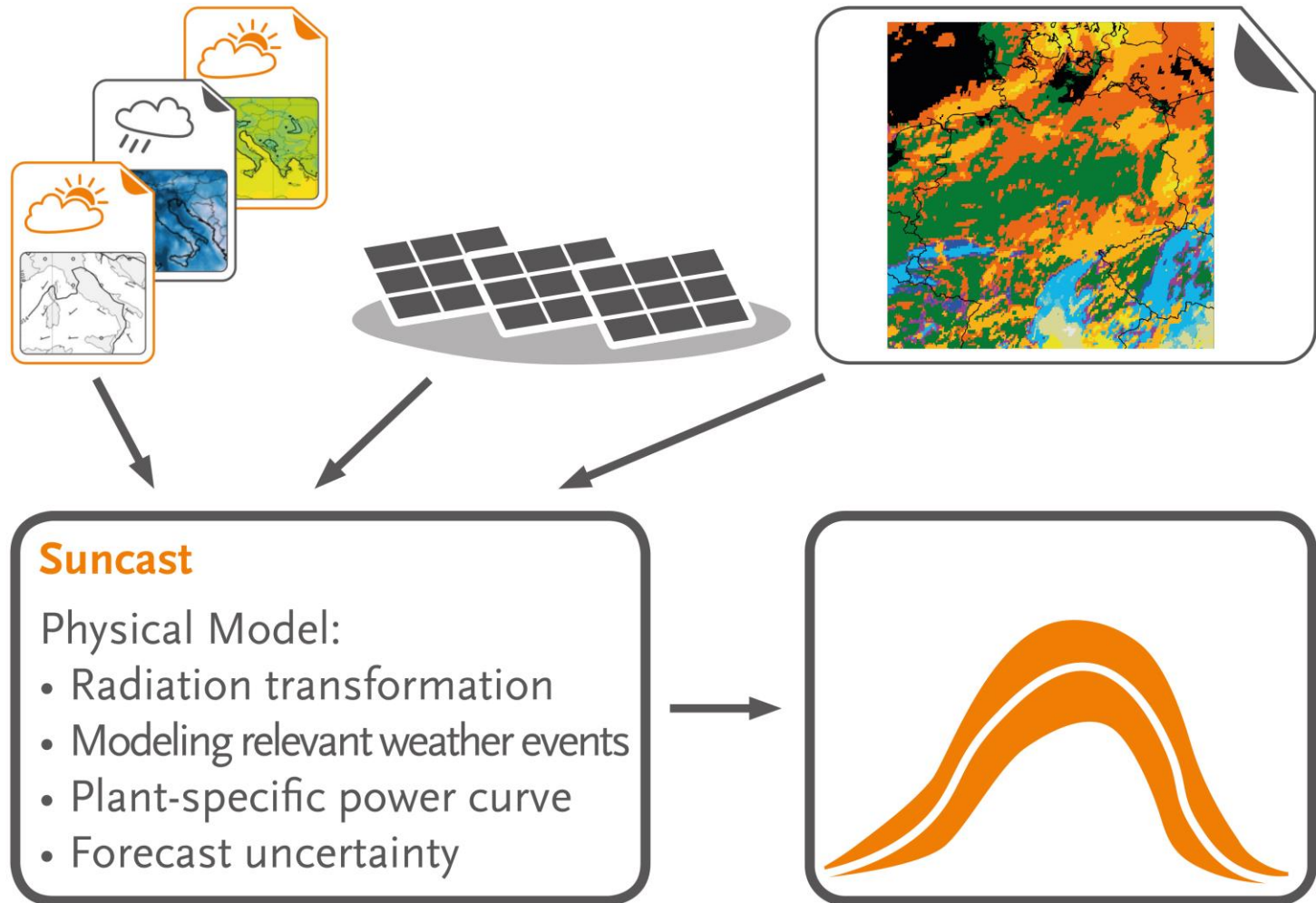
How does a solar power prediction look like?



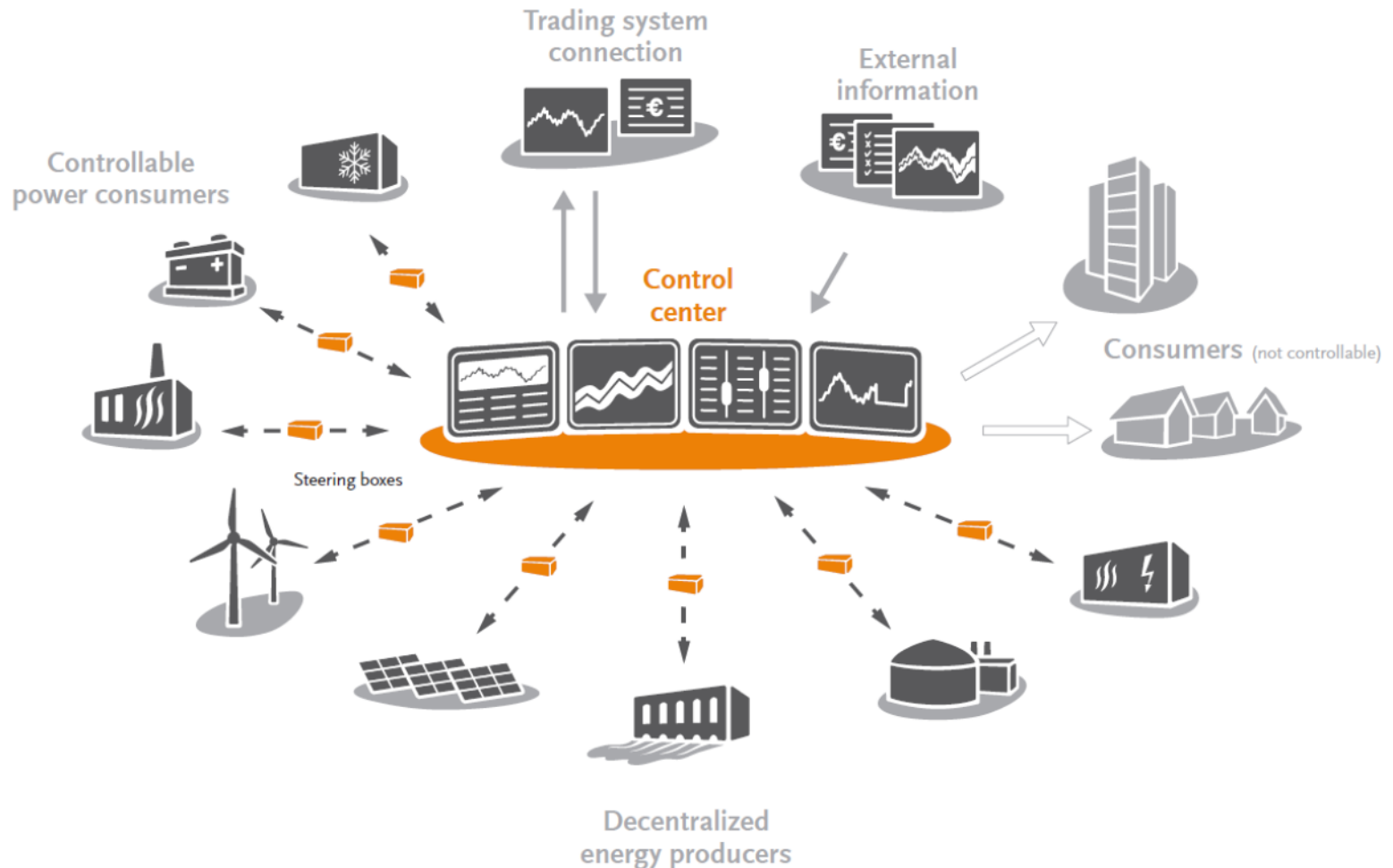
Prevento wind power forecasting system



Suncast solar power forecasting system



VPP as control center for distributed generation and load



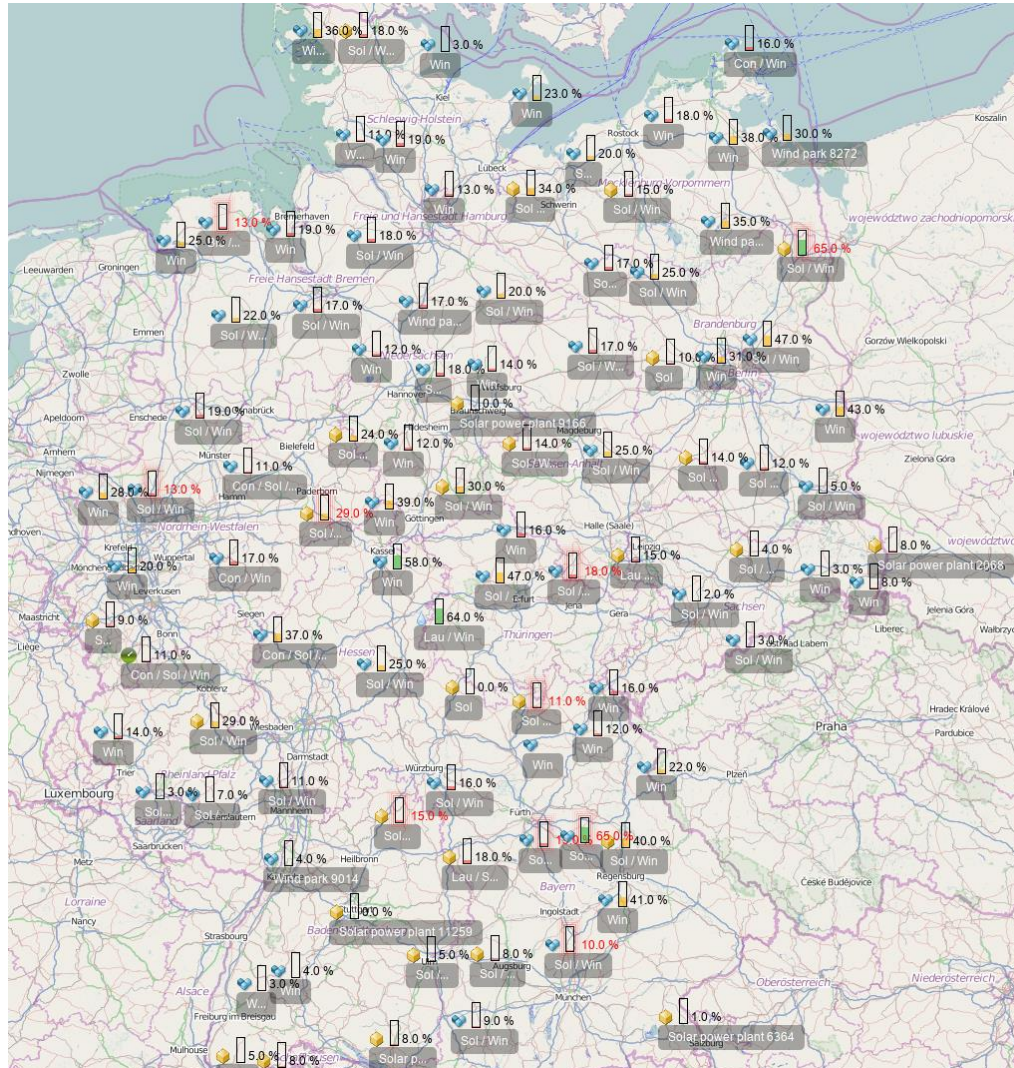
Our Virtual Power Plant (VPP)

- Platform to manage
 - real-time production data
 - outage information
 - production schedules
 - forecasts and situational awareness of weather events
 - market data
 - remote control of units and portfolios

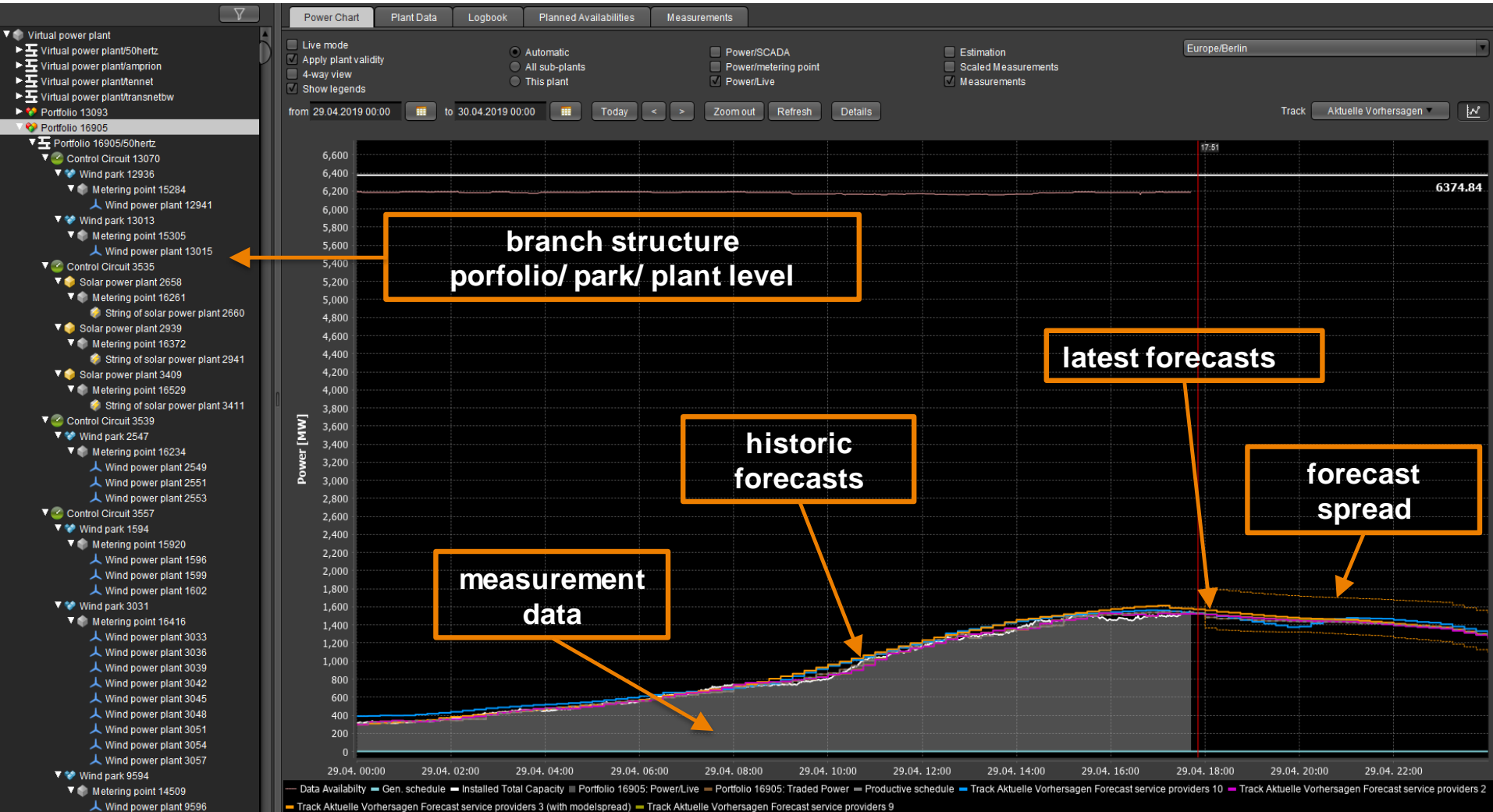


energy & meteo systems

Monitoring of decentralized units: Map overview



Monitoring of decentralized units: Technical overview

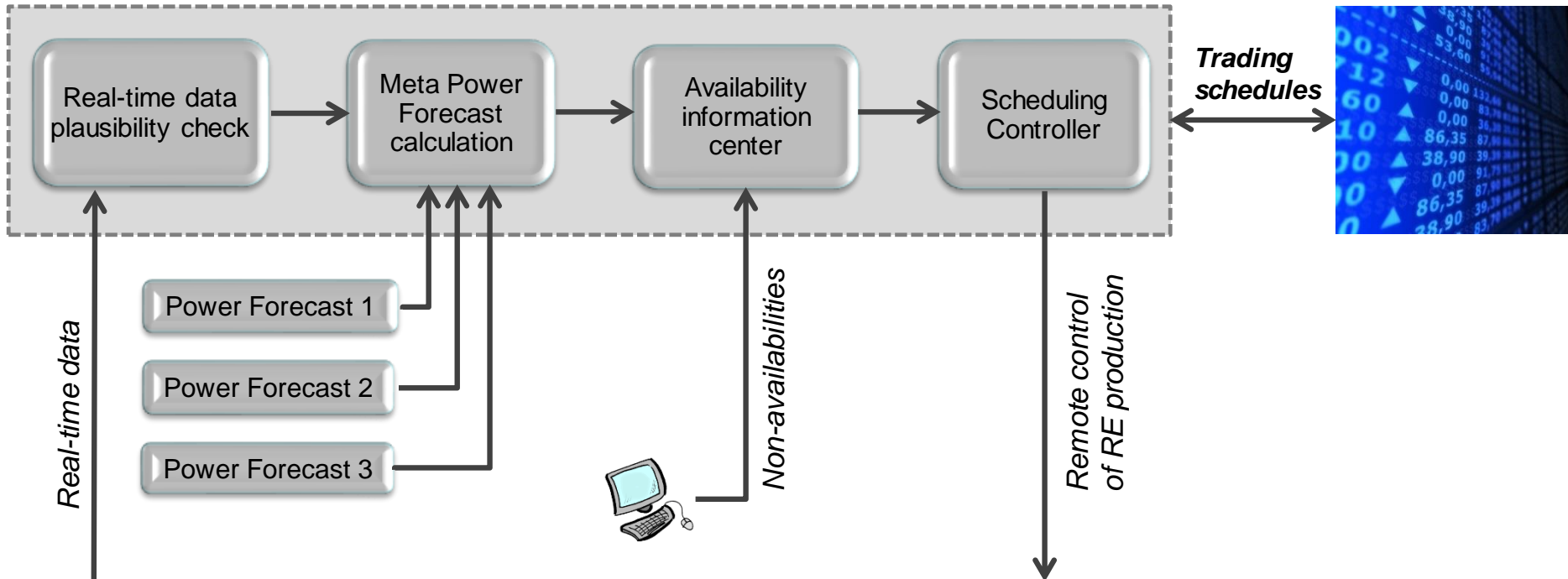


Selection of business models of „Virtual Power Plants“ (VPP)

- VPP as sales service by utility or trader („aggregator“)
 - Trading company contracts various assets of different owners, production and flexibility of plants is sold via different energy markets (intraday, spot, regulation market)
- VPP as control room software for grid operators
 - Control room with data management and scheduling for decentralized/renewable units
- VPP as optimization system for industrial energy supply
 - Combine output of production units, storage and controllable loads to cost-efficiently cover demand

Application 1: Trading of wind and solar power with VPP and forecasts

Virtual Power Plant



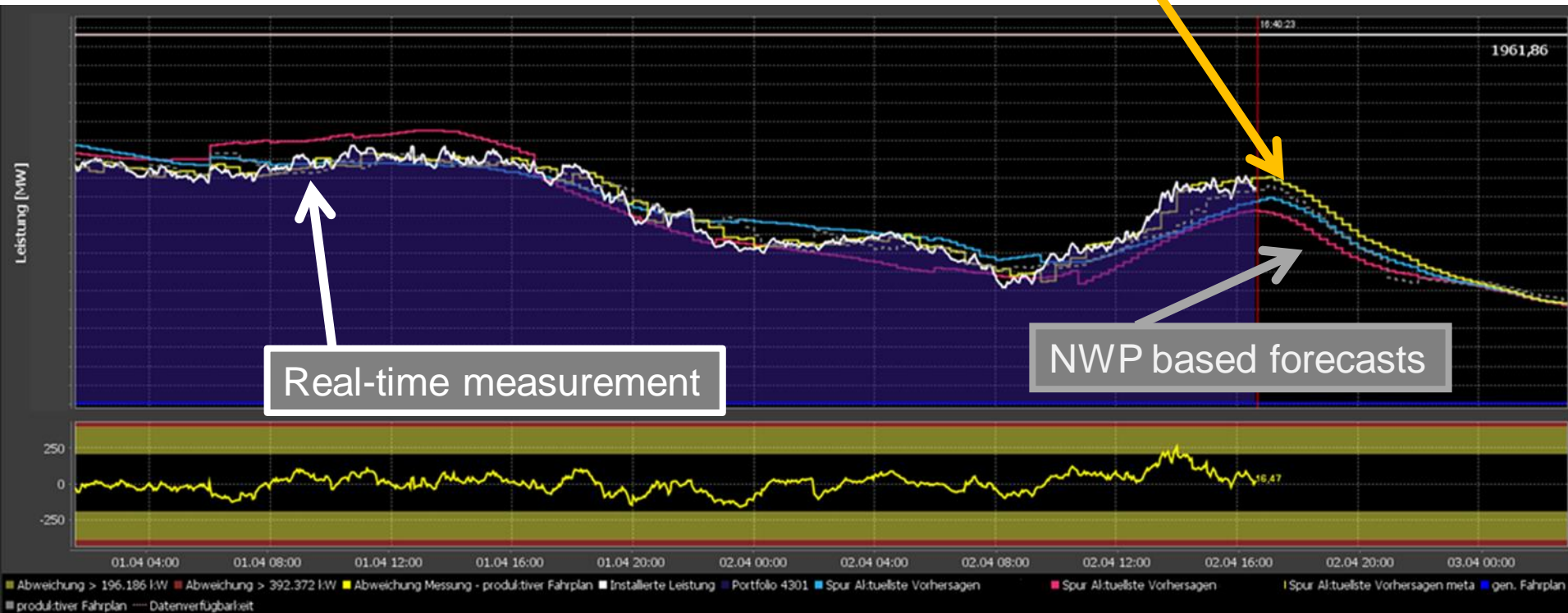
Renewable energy portfolio



Application 1: Trading of wind and solar power with VPP and forecasts

Deviations of forecast can be settled on intraday market to reduce balancing costs.

Shortest-term meta forecasts



Application 1: Trading of wind and solar power with VPP and forecasts

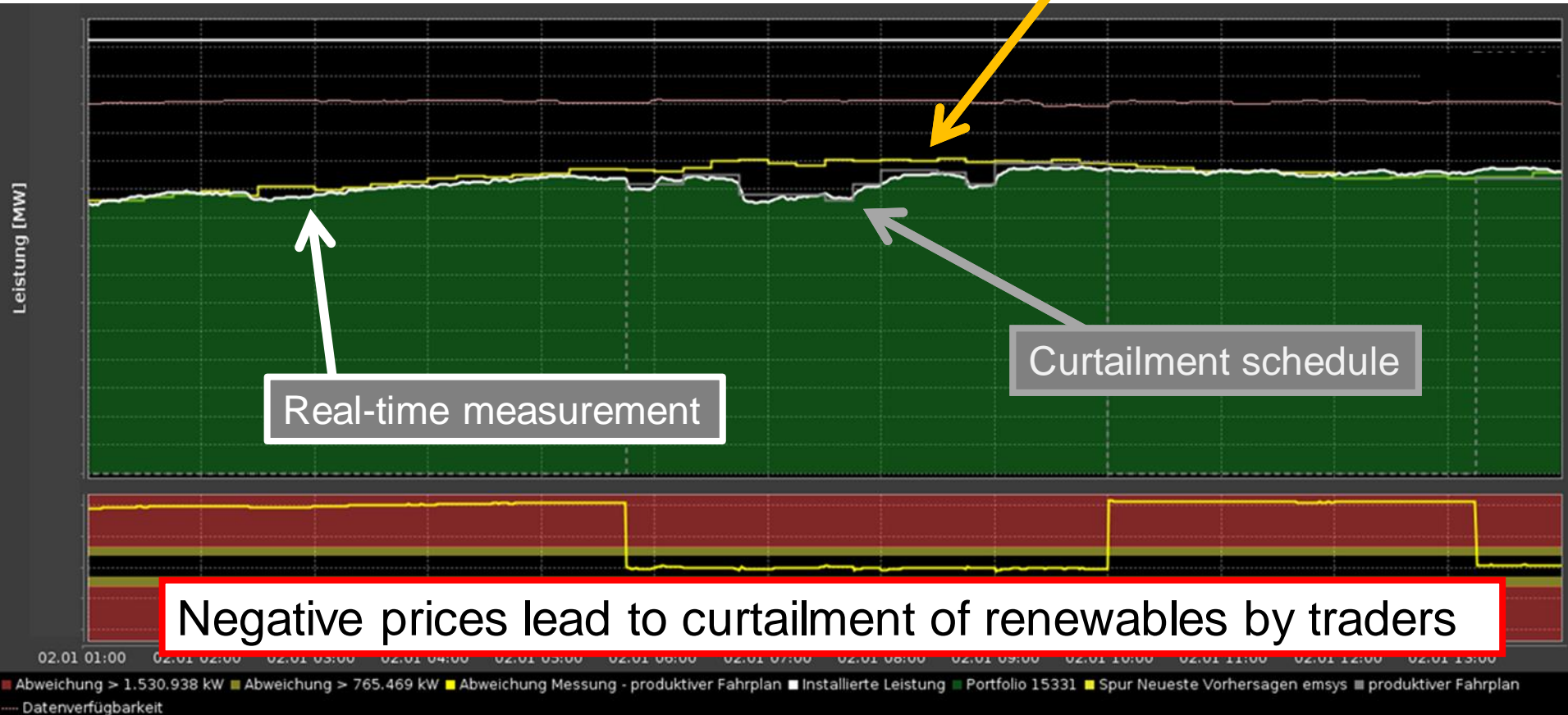
Remote control of plants

Meteorological production

Real-time measurement

Curtailment schedule

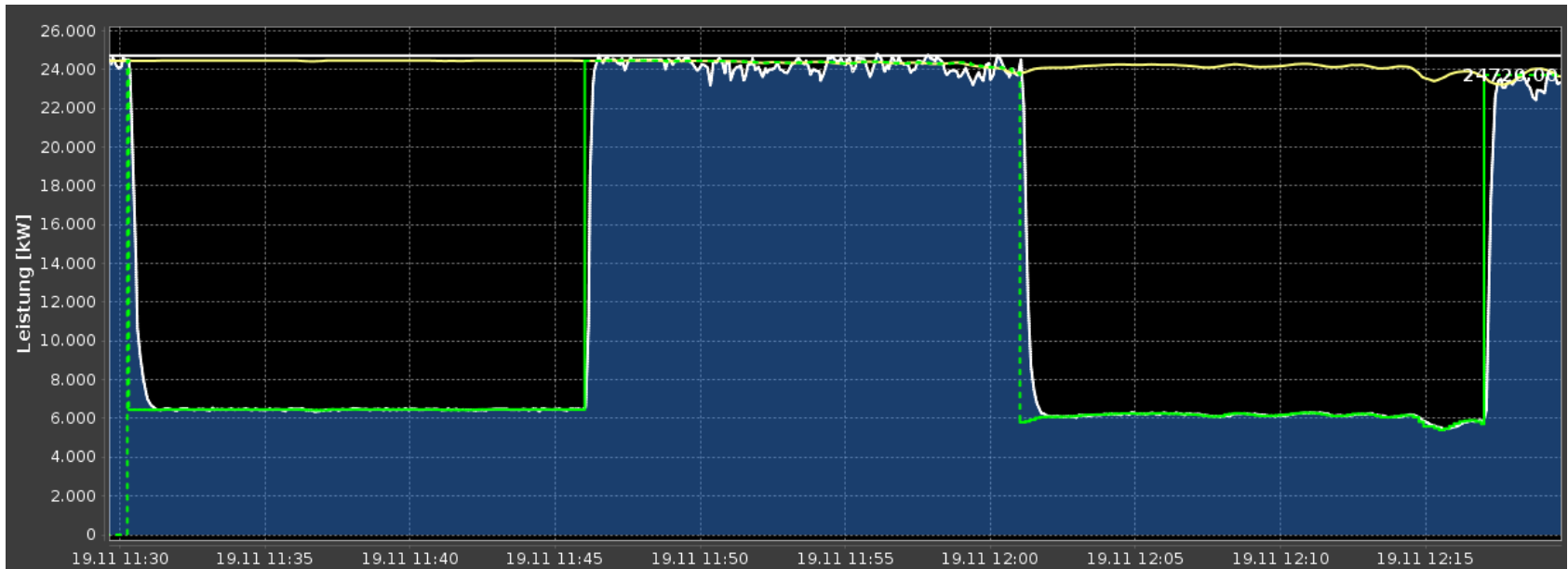
Negative prices lead to curtailment of renewables by traders



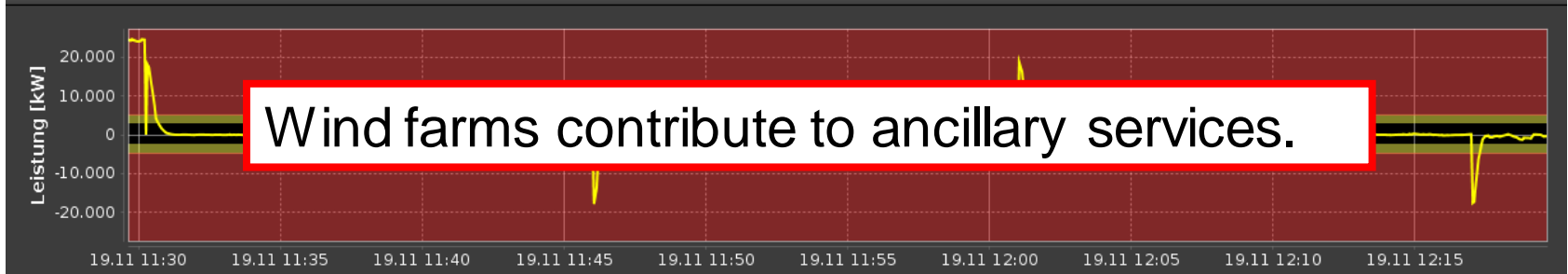
Application 2: Offering regulation power with Virtual Power Plant

- Assets connected to VPP can supply primary, secondary or tertiary reserve power
- Often pre-qualification by grid operator required (in particular Germany)
- VPP has to cover high standards on availability and security
- In Germany wind farms are able to participate

Application 2: Offering tertiary reserve power with wind parks



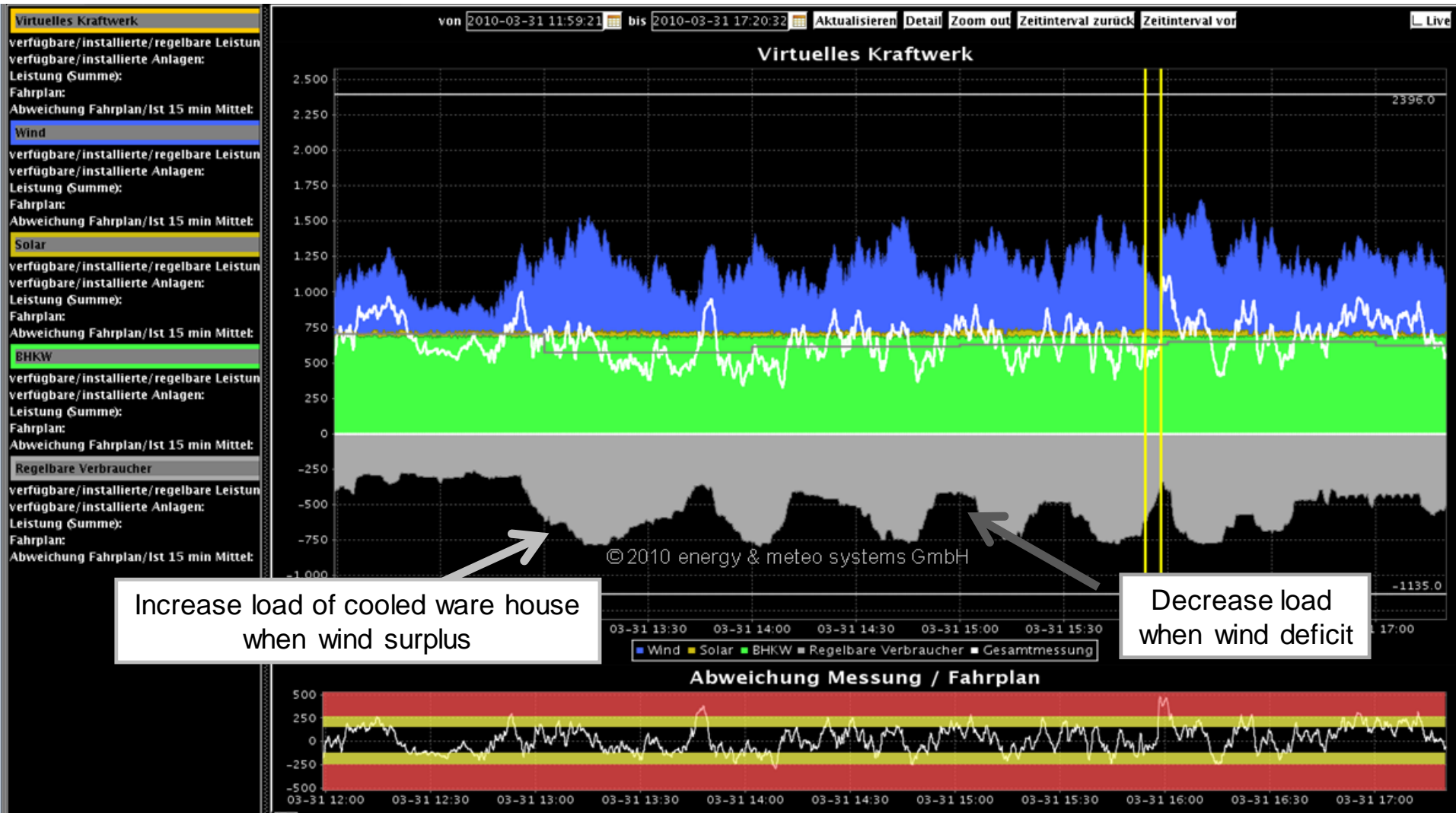
Abweichung Messung - Dispatched



Application 3: Demand Side Management

- Cooled warehouse(s) connected to VPP as load
- Load acts as storage
- VPP used to optimize energy supply and purchase via spot market and regulation market
- Production units such as wind farms and solar plants added
- Also used to minimize impact of forecasting errors

Application 3: Demand Side Management



Thank you!

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