Institutionalizing Forecasting
Northern States Power-Minnesota
Northern States Power-Wisconsin
Public Service Company of Colorado
Southwestern Public Service Company

• No. 1 utility wind provider
• Top-ten utility for solar capacity
• Leader in emission reductions
• Nationally recognized in energy efficiency
• Member of the Dow Jones Sustainability Index
• **Park Potential** (0-30min) – An estimate of the high limit of the wind plant. Typically, this will be the same as the generation value except during periods of curtailment.

• **Operational Forecasting** – (0.5hrs-168hrs) An estimate of generation of the wind farm for use in short-term planning models.

• **Long-Term Forecasting** – (1wk+) An estimate of “typical” generation from a plant or plants used in long-term operational and resource planning studies.
OPERATIONAL FORECASTS
OPERATIONAL FORECASTS FOR A MARKET PARTICIPANT

Market

- Day-Ahead Commitment Plan
- Generation
- Generation setpoint
- Generation
- Generation setpoint
- Generation
- Generation
- Generation

EMS

- Operator
- DA Analyst
- Meteorologist
- Extreme events
- Other Non-Critical Plant Data
- Power Plant Manager

Plant Meter

- Plant SCADA
- Generation
- Generation setpoint

Plant

- Generation
- Generation setpoint
- Generation
- Generation

Data Historian

- FTP

Web based Fx display

- FTP

Internal network

- FTP

Forecast Vendor

- .CSV

Other Wx Tools

- FTP

FTP

- FTP
OPERATIONAL FORECASTS FOR A BALANCING AUTHORITY

- Forecast Vendor
- FTP
- .CSV
- Internal network
- Generation Modeling Software
- Generation Modeling Software
- Web based Fx display
- Data Historian
- Other Wx Tools
- Meteorologist
- DA Analyst
- Operator
- EMS
- Plant Meter
- Plant SCADA
- Power Plant Manager
- Day-Ahead Commitment Plan
- Extreme events
- Generation
- Generation setpoint
- Other Non-Critical Plant Data
- Internal network
- Generation
- Generation setpoint
- Other Wx Tools
OPERATIONAL FORECASTS FOR A BALANCING AUTHORITY

IMPLEMENTATION
- Forecast Vendor
- IT Administrator
- Post- Analyst
- Other Wx Tools
- .CSV

EXECUTION
- Day-Ahead Commitment Plan
- Power Plant Manager
- Plant SCADA
- Plant Meter
- Generation
- Generation setpoint
- Operator
- DA Analyst
- Meteorologist
- Web based Fx display
- Generation Modeling Software
- Data Historian
- Internal network
- FTP

Other Non-Critical Plant Data
OPERATIONAL FORECASTS
WHAT DO YOU NEED

BASICS
• Location (Latitude, Longitude)
• Installed Capacity
• Historic Hourly Data (training data)

ADVANCED
• Real-Time Generation
• Availability Data
• Park Potential
• Meteorological Data
**NOW-CASTING & AGC**

**5-MIN ECONOMIC DISPATCH**

**Participant Forecast**
- Market
  - Generation
  - Generation setpoint (5min)
  - Park Potential
- EMS
  - Generation
  - Generation setpoint (5min)
  - Plant High Limit
- Plant Meter
- Plant SCADA

**Market Forecast**
- Market
  - Generation
  - Generation setpoint (5min)
- Park Potential
- Market Forecast
  - Generation
  - Generation setpoint (5min)
- Plant Meter
- Plant SCADA

**AGC**

**Balancing Authority**
- EMS
  - Generation
  - Generation setpoint (4sec)
  - Plant High Limit
- Plant Meter
- Plant SCADA

**Now-casting** (0-60min) – An estimate of the high limit of the wind plant. Typically, this will be the same as the generation value except during periods of curtailment.
LONG-TERM FORECAST
LONG-TERM FORECASTS

ANTICIPATE COSTS IN PLANNING PROCESSES

An Integrated Resource Plan Requires Typical VER Forecasts

- Suboptimal system dispatch due to wind forecast error
- Fuel supply flexibility
- Transmission upgrades
- Increasing wind curtailment volumes
- Increased O&M on thermal units due to cycling
- Additional Reserves due to wind variability
LONG-TERM FORECASTS

• Historic Data (best!)
  – Generation profiles by geographic region
  – Multiple historic years

• Resource Assessment Study
  – Generation profiles by geographic region
  – Multiple historic years

• Developer Data (worst!)
  – Often overstated
  – Not coordinated by year
  – Better than nothing

http://www.nrel.gov/electricity/transmission/data_resources.html