powel

FACT SHEET

Powel Demand - Electricity demand forecasting

The difficulties of forecasting the market demand for electrical energy are well known to participants in the energy market. The financial penalties for inaccurate forecasts can be large, as the market is highly intolerant to imbalances. Meeting contract obligations on power delivery depends on reliable forecasting methods and tools.

Powel Demand is an ideal forecasting solution for any company involved in the electricity power market - either as producer, supplier, retailer or even as a system operator. It provides accurate demand forecasts based on historical information and weather forecasts

Expensive Imbalances

Electricity is the only commodity that is produced and consumed simultaneously; therefore, it must always be a perfect balance between supply and consumption in the electricity power market. Market players must independently be able to predict the future market demand and the behavior of the other players, as a basis for their own bids, contracts and commitments. The price for introducing imbalances can be a heavy burden both on the supply side and on the demand side. Imbalances between supply and demand are normally caused by changing weather conditions, abnormal prices, and special events like accidental shutdown of large plants, various consumption during holidays or simply by inaccurate forecasts. The system operator will have to cover up for the imbalance by charging the players responsible for it.

The main benefit of accurate electricity demand forecasts is reduced imbalance power and by that lower cost in the imbalance market.

Improved Forecasting with Demand

Powel Demand is a tool for forecasting electricity demand and works by combining historical information about electricity consumption correlated to variations in weather parameters (temperature, wind speed and sun radiation) and patterns in consumer behavior related to variations over day/night, week, seasons and holidays. The model also take into account special events in the electricity consumption that is not related to the weather, like shutdown of large plants by accident or cut off because of high consumption prices. The period of forecasting is normally for as long as the weather forecast is significantly reliable, typically 7-14 days. Electricity demand forecast is calculated and stored as time series with resolution normally ranging from 15 minutes to one hour intervals.

Powel Demand is a powerful tool for use by producers, retailers, consumers and system operators in the electricity market. It is a "self-learning" model based on Kalman filter technology. Time dependent consumption variation parameters (season, weekday, time of day and special holidays) are defined, along with a weather model covering the variables of temperature, wind speed and sun radiation.

Powel Demand is a robust system with a long track record, being successfully used in regions with different climatic conditions.

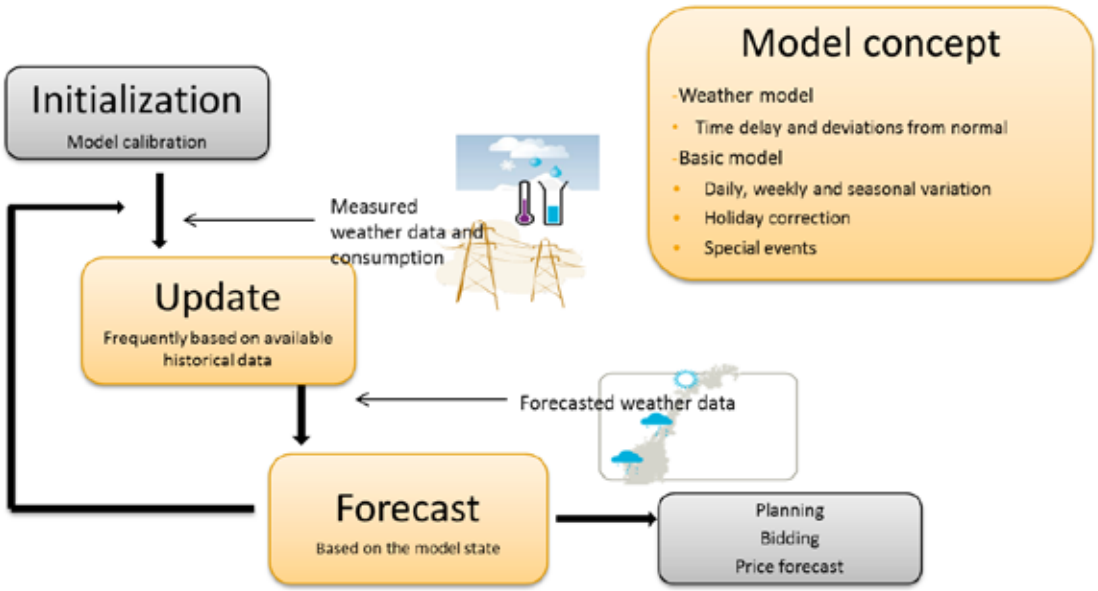
Use of Powel Demand

The operation of **Powel Demand** is based on a few logical steps. First, the model must be initialized for any new forecasting area (could be a country, a region or a specific group of customers), and historical data must be imported for all the variables in the model. Typically the model needs at least four months of data to produce a good calibration. When the forecasted values for climate parameters are imported, an electricity demand forecast will be calculated.

Once the actual electricity consumption and weather parameters for previous day have become historical facts, these metered values should be entered into the Powel Database to be used in **Powel Demand**. The collection of required input data may be an automatic batch process, or in the form of manual imports. These data could also be automatically controlled and corrected with Powel tools. There is also a data control function inside the Demand model.

The metered time series are used as input to the daily update of the **Powel Demand** model. The correlation between metered weather data and metered electricity consumption is analyzed during these daily updates. The results from this analysis will continuously be added to the statistics to improve the accuracy of coming forecasts.

All the electricity demand forecasts and related data are stored as time series in the Powel database. For exchange with other systems, the time series may be exported in a number of commonly used formats like .csv or .xls.



Powel Demand could also be used to forecast the power demand for other energy sources that are related to the variations in the weather, such as gas and thermal heating.

Model the Demand forecasting process in Nimbus

The update and forecasting process in Powel Demand can be done by using Powel Nimbus. Powel Nimbus is a process oriented user interface covering the whole data flow including input data control and correction and results using time series reports with charts, tables and status monitor. This process can be a user-configured task with different work steps and automatic set up on a daily basis with a deadline.

A chart function allows the user to correct the time series data graphic. It is also possible to store the delta change in a separate time series for later analysis.

Powel Smart Energy

Powel Demand is part of the Powel Smart Energy portfolio for energy planning, which consists of integrated modules for forecasting, simulation and optimization, trading, settlement, position management and nominations.

The Powel Smart Energy portfolio utilize Powel Time Series Manager, which automatically collects, controls, corrects, scales, sums and stores input and output data in the database to be used in the different processes.