Study Committee C1

Working Group C1-32

TRANSPOWER

Establishing best practice approaches for developing credible electricity demand and energy forecasts for network planning

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Motivation

Accurately forecasting the amount of electricity that will be consumed by loads is critical to enable network owners to make prudent investment and operational decisions:

- Network adequacy assessment;
- Transmission and distribution congestion management;
- Transmission and distribution planning;
- Electricity balancing.

WG C1-24

CIGRE WG C1-24 examined the increasing use of market simulations to determine economic benefits of transmission augmentations and hence justify those augmentations. This work identified that load forecasts need to have sufficient granularity to support an effective assessment of the economic impacts of network augmentation. The WG C1-24 report identified that a number of demand conditions need to be studied to develop a robust assessment of the economic benefit.

Load forecasting

Some areas for consideration:

- Accurate load forecasts need to consider both peak and minimum demand and energy consumption, and for many applications hourly loads over entire target years.
- The flexibility of demand in relation to price (price elasticity) which can be used for demand side response (DSR).
- Differentiating the total energy consumed by customers, in any time interval, from the electricity generated by the customer's own distributed generation, will also become important for distribution and transmission congestion management, distribution and transmission planning, and electricity system balancing and adequacy assessment.
- Understanding the energy consumed at a distribution level, as coupled with energy tariffs this defines the revenue network owners can expect to derive from customers.

Changing network utilisation

The increasing installation of embedded generation in distribution networks and the characteristics of that generation (particularly roof-top PV) are changing the utilization of the transmission and distribution networks across time.

High penetration of roof-top PV

High penetration of roof-top PV on distribution feeders in Australia, California, Germany and elsewhere has already suppressed the midday peak network utilization, and peak demand is moving to the early evening. As PV may continue to become less expensive, such changes may increase in scale and become more wide spread world-wide. Such changes to the timing of the peak demand net of distributed generation, and that the peak network utilization may be driven by peak insolation rather than demand, present another challenge for forecasters.

Challenges

The following issues make the task of producing accurate load forecasts challenging:

- changes to customer behavior responding to increases in electricity prices and the availability of new embedded generation systems such as roof-top PV arrays;
- Limited information available to system operators about the installed generation capacities beyond the customers' meters, e.g. roof-top PV and actual hourly or better metering of consumption and distributed generation;
- government policies encouraging energy efficiency;
- government and regulatory policies in tariff requirements (e.g. flat fee or dynamic pricing);
- government policies encouraging embedded generation in distribution networks;
- uncertainty regarding economic activity;
- uncertainty regarding exchange rates;
- uncertain demand from trade exposed industries.

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Scope

This working group aims to examine the demand and energy forecasting techniques currently being employed by network companies around the world. The working group will seek to identify:

1. What are the key issues and challenges that need to be addressed in producing load forecasts to support network planning and system adequacy activities?

2. What methodologies are employed in developing forecasts? Including

   a. How are uncertain future developments such as the electric car, heat pump or rooftop PV penetration being accounted for in energy and load forecasting?

   b. What time granularities (hourly all year or even shorter intervals), time horizons (how many years into the future), and scenario handling are employed in developing forecasts?

   c. How are transmission and distribution system operators cooperating in developing forecasts for loads and for distributed generation?

   d. What is the relationship between data used for operational time scale load and generation forecasting and planning timescale forecasting?

3. What approaches are employed to assess the accuracy of forecasts, and to adjust them in reaction to observed developments?

Scope (continued)

4. Those best practice techniques that tend to produce the most accurate forecasts and that meet emerging needs and applications for demand forecasts.

5. What issues need to be overcome to adopt best practice techniques? These may include better forecasting tools, improved data and data systems.

6. The impacts of demand side response on demand forecasting techniques, and what this means for best practice.

The scope will be addressed by developing and executing an electronic survey of network companies to identify current forecasting issues and best practice approaches.

Current Status

Formation of working group membership is underway. We are still looking for representatives from Africa and North and South America in particular.