CIGRE Study Committee C1

PROPOSAL FOR THE CREATION OF A NEW WORKING GROUP

WG* N° C1.32	**Name of Convenor :** Graeme Ancell (New Zealand) **E-mail address**: graeme.ancell@transpower.co.nz
Technical Issues (1): 1, 5, 7	**Strategic Directions (2): 1**
The WG applies to distribution networks: Yes	
Title of the Group: Establishing best practice approaches for developing credible electricity demand and energy forecasts for network planning	

Scope, deliverables and proposed time schedule of the Group :

Background:

Accurately forecasting the amount of electricity that will be consumed by loads is critical to enable network owners to make prudent investment decisions. Accurate load forecasts need to consider both peak and minimum demand and energy consumption, and for many applications hourly loads over entire target years. Equally a better understanding of the flexibility in demand in relation to price (price elasticity) which can be used for demand side response (DSR) is a key factor. Understanding the peak and minimum demand for electricity from connected loads allows the adequacy of the network to be assessed. Understanding the energy consumed can be equally important, particularly at a distribution level, as coupled with energy tariffs this defines the revenue network owners can expect to derive from customers. 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.

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;
- the fact that some system operators may not yet have complete information about the installed generation capacities beyond the customers' meters, e.g. roof-top PV, and even less system operators may have 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.

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 forecasts must therefore facilitate study of a

variety of network loading conditions, and a variety of adequacy assessment needs.

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. For example, 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.

The scope of the working group is to examine best practice approaches from around the world and emerging trends.

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?
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.

Deliverables : Report to be published in *Electra* or technical brochure with summary in Electra

Time Schedule : start : July 2014 **Final report** : September 2016

Comments from Chairmen of SCs concerned :

Approval by Technical Committee Chairman :
Date : 24/04/2014

M. Wald

(1) See attached table 1 – (2) See attached table 2

Table 1: Technical Issues of the TC project "Network of the Future" (cf. Electra 256 June 2011)

1	Active Distribution Networks resulting in bidirectional flows within distribution level and to the upstream network.
2	The application of advanced metering and resulting massive need for exchange of information.
3	The growth in the application of HVDC and power electronics at all voltage levels and its impact on power quality, system control, and system security, and standardisation.
4	The need for the development and massive installation of energy storage systems, and the impact this can have on the power system development and operation.
5	New concepts for system operation and control to take account of active customer interactions and different generation types.
6	New concepts for protection to respond to the developing grid and different characteristics of generation.
7	New concepts in planning to take into account increasing environmental constraints, and new technology solutions for active and reactive power flow control.
8	New tools for system technical performance assessment, because of new Customer, Generator and Network characteristics.
9	Increase of right of way capacity and use of overhead, underground and subsea infrastructure, and its consequence on the technical performance and reliability of the network.
10	An increasing need for keeping Stakeholders aware of the technical and commercial consequences and keeping them engaged during the development of the network of the future.

Table 2: Strategic directions of the TC (cf. Electra 249 April 2010)

1	The electrical power system of the future
2	Making the best use of the existing system
3	Focus on the environment and sustainability
4	Preparation of material readable for non technical audience