

European Technology Platform for the Electricity Networks of the Future ETP-SmartGrids

Working Group description and initial RTD topics.

Working Group 1: Networks Assets

Chairman: P. Nabuurs. KEMA, Netherlands

Participants: U. Keussen. E.O.N. Netz GmbH, Germany
E. Handschin. University of Dortmund, Germany
V. Efthymiou. Electricity Authority of Cyprus
J. Scott. OFGEM, UK
J.L. del Valle. IBERDROLA, Spain
N. Leffler. ABB, Switzerland

The vision is that in the electricity network of the future global and local power systems coexist (and work together).

The global system is familiar with the present day situation, except for more power flows across Europe, due to trading and the presence of large-scale (off shore) wind power plants.

The local power system(s) can be quite different from today's, nearly self-supporting area's are possible compared to more classical (consuming) area's. Many generators (different technology) based on renewable energy or CHP are present.

The future customer gets "more in control" and asks for service differentiation and is environmental concerned.

Based on this vision a number of consequences follows, such as: increased need for power flow steering at the transmission (bulk power) level, power flows in both directions at the distribution level, more balancing needs (due to fluctuating nature of generation) and availability of real time price information.

This gives rise to questions like:

- How will the power exchange layer between "global" and "local" look like?
- What markets mechanisms are needed e.g. for balancing?
- How to deal with the emerging shared public-private responsibility for Power Quality and reliability?
- How is the transition from the present state to the desired future accomplished? Who must be involved and what is needed to speed up?

Working Group 2: Network Operations

Chairman: Tahir Kapetanovic, Energie-Control GmbH, Austria
Participants: Livio Gallo, Enel Distribuzione, Italy
Norberto Santiago, Grupo ZIV S.A., Spain
Magdalena Wasiluk-Hassa, PSE-Operator S.A., Poland
Bernd Buchholz . Siemens, Germany
Duncan Botting. ABB, Switzerland
Ronnie Belmans, K.U. Leuven, Belgium
Joao do Nascimento Baptista. ELECPOR, Portugal
Carlo Sabelli, GRTN, Italy

Vision for the future electricity networks operations¹

In the coming decades, the evolution of the electricity network operations will be characterized by two streams resulting from the electricity market liberalization and thus emerging of new players in the field, from the ever increasing decentralization in terms of services, generation, demand aspects, etc., but requiring at the same time much better coordination, exchange of information and operations' co-working:

- Distribution network operations and services, traditionally oriented to supply and demand – hence one might say with a more “electricity use(r)-centric view” - will introduce practices like distribution dispatching, real-time network calculations, etc., that were previously typically found in the transmission grid operations.
- Transmission network operations and services with a strong “operations-centric view” will have to consider a new brand of operational practices allowing for decentralized operations but with a coordinated control, forecasting of volatile and hardly predictable generation like wind, etc., which are presently more typical for the distribution.

The operations strategies will require technical architectures to allow flexibility, reliability, security and efficient use of network resources both in transmission and distribution. Society as a whole is the “stakeholder” of the electricity networks of the future. The electricity networks of the future will have to be able to perform the task to supply electric energy to the consumers, whenever and wherever needed. They will have to support the market for electric energy and electric energy services in order to make this market transparent – the network operations in both transmission and distribution networks will play the crucial role here as a seamless and underlying “enabler” of this evolution.

Areas of network operations interest, activity and projects

¹ The scope of Network Operations includes: (i) transmission and distribution, (ii) real time operation & control and planning, (iii) Ancillary services, (iv) cross-border issues, (v) control systems and communications, (vi) contingency analysis & management, system defence, restoration, (vii) regulatory framework and market rules, (viii) non-discriminatory treatment of incumbents and non-incumbents and (ix) external dependencies like infocom, assets & asset management, generation/storage, metering/billing, accounting

- Creating market place – interfaces: the activities, projects, and components of network operations that are needed for achieving the European vision of the Internal Electricity Market, from the perspective of cross-border trading, interconnections, network access and other “interfaces” to the network
- Creating market place – enabling technologies: technologies like WAMs or SCADA systems with their improvements, that enable creation of the market place from the network operations viewpoint
- Users’ services and demand side – interfaces: interfaces related to the aspects of the user/demand side and requirements e.g. demand side management, unbundling of information and management systems, enabling of switching processes, etc.
- Users’ services and demand side – enabling technologies: from the perspective of network operations and recognizing externalities (e.g. AMR).

Working Group 3: Demand and Metering

Chairman: Maher Chebbo. SAP EMEA, France
Participants: Livio Gallo. ENEL Distribuzione, Italy
Mariane Osterkorn. REEEP, Austria
Sandiago Elustondo. Group ZIV S.A., Spain

The objectives of the WG3 were set to:

- Provide a creative way of looking at the vision 2030 by getting to 3 stages of maturity (2005, 2015, 2030)
- Suggest to the Advisory Council a logical structure of the vision document including assumptions, background, key performance indicators (metrics), key issues, barriers, opportunities, roadmap and proof of concept.
- Provide inputs to the Vision from the Demand and Metering business processes side, in line with the Advisory Council objectives.

The following work packages were identified for R&D activities:

- Study of investment impact of unstable regulation
- Installation of E-meters
- Flexible and tailored tariffs based on customers needs
- Remote flexible contracts management
- Automatic Meter Management systems
- Energy “on demand” management
- Value added services, multi-metering applications and home automation systems
- DSM for optimizing the generation of power based on customer demand
- Interconnections with Ukraine and Russia
- Full free Energy Market
- Harmonization of existing standards
- Real-time measurements to optimize load profiles and utilization of components
- Connection of DER, customers, local grids through an integrated network nation wide

Working Group 4: Generation and Storage

Chairman: Nikos Hatzargyriou. NTUA, Greece
Participants: Yves Bamberger. EdF R&D, France
Nick Jenkins. University of Manchester, UK
Paul Smith. ESB National Grid, Ireland

The objectives of WG4 were set to:

- Provide inputs to the Vision document in line with the „Template“ distributed by the Executive Board on 17. October 2005
- Propose the contents of the Vision’s „Appendices“, covering generation and storage topics
- Define the „Roadmap“ for the scope of generation and storage, as defined above, with explanations in terms of vision, key issues and proof of concept.

This Working Group deals with generation issues in relation to network development and operation, especially distributed generation. In this context, generation is distinguished in three groups:

- Small, Distributed Generation up to 100s kW (Microgeneration, CHP, PVs, small WTs, etc.)
- Medium, Distributed Generation up to 100 MW (Wind farms of 10 to 30 MW, Diesel Gensets, Gas Engines of 1 MW to 10 MW, etc.)
- Large, Central Generation above 100 MW

Storage will be dealt with in two main functions:

- Enabling the wide use of new forms of generation including distributed, intermittent renewable sources.
- Introduction of large scale storage in power system operation and planning

The WG4 members have held a brainstorming session after the 3rd AC on 9th September 2005, two telephone conferences on the 3rd and 15th of October 2005 and exchanged a series of e-mails. They have provided input to the Vision document by defining the Key Generation and Storage Issues (Barriers and Opportunities) in short-, medium- and long-term (beyond 2020).

The main research and activity goals identified in the roadmap in order to operate the system with a high penetration of DER maintaining the same level of security and reliability of supply are:

- New tools to study DG Integration (to start immediately)
- Studies of DG contribution to ancillary services (to start immediately)

- Advanced storage including Pilot installations (Technology research should start immediately, Pilot installations to be undertaken after technology is developed and we know what we want storage for)
- Demos of Active MV networks to increase integration of DG but also of active MV networks to allow LV/MV connected DG to be integrated into HV network
- Investigation of ESCo concept and demonstration
- Active micro generation and energy storage in consumer dwellings (Houses)

These goals have been supplemented with the roadmap, vision and proof of concept and have provided input to the vision document.