

# SC C1 Annual Report, 2012

Prepared by Phil Southwell, Chairman

## System Development and Economics

### Overview

Study Committee C1 is focused on issues related to the development and economics of power systems. It examines the drivers for investment in power network facilities, decision processes and tools which support them. This covers both investments to increase the power transfer capability of a network and those to maintain acceptable reliability of facilities. In this regard, asset management and risk assessment in respect of existing facilities are key activities.

Throughout 2012 the work of C1 has evolved, along with the challenges of system development and planning in an uncertain economic environment. The expansion and integration of renewables has seen new, innovative power system solutions which have emerged as the percentage of renewables in some power systems has reached (and passed) a series of tipping points. However, economic challenges in Europe and the shale-gas revolution in the United States have altered the costs and deployment rates of low-carbon solutions. Following the Japanese earthquake and *tsunami* hitting the Fukushima nuclear plant, the policy response has been to reduce nuclear power. A similar response in Germany has altered long-term power system plans radically. Throughout developing, and especially developed nations, there have been decreasing budgets and an emphasis on lower-cost options. This has reframed the work of C1 members.

In light of the changing international trends, C1 is reviewing its overall program. Furthermore, in establishing study priorities and ultimately working groups, C1 members consider the technical aspects of the power systems, the requirements and expectations of customers, new technologies that lower cost or improve performance, total asset lifetime issues and overall business impacts.

Activities addressing the above consider different economic and policy drivers for investment, the role of new technology in meeting future system capacity requirements, the impact of grid codes, ways to manage uncertainty associated with future scenarios and the evolving nature of planning criteria. A key historical feature of the latter has been reliability drivers for investment in network capacity in order that security of supply within net importing areas can be kept at or above some minimum level. Such security of supply considerations are manifested across a spectrum spanning, at one end, the trade-off between the costs and benefits of providing additional system capacity to limit the number of occasions on which quite localised disturbances lead to interruptions to supply and, at the other, events, sometimes quite complex but generally rare, that lead to very widespread interruptions to supply that often take tens of hours to fully restore. However, notwithstanding planning standards being the first reference point for an investment planner to identify shortfalls in network capacity and justify reinforcement, recent Working Group activity has highlighted interactions among a number of key industry documents and procedures. These include investment in monitoring and control facilities,

the anticipated use of corrective measures on the system, and the need to ensure, in advance and particularly when new generators apply for connection, which protection systems are well coordinated and grid code requirements reliably adhered to.

### **Strategic Direction**

Study Committee C1 focuses on providing unbiased, useful information for system development practitioners and planners, as well as policy makers, across the world. While the position, nature and role of system development and planning continue to evolve, SC C1 has generally aligned its work to the CIGRE Strategic Plan 2010-2020.

The work of Study Committee C1 is generally broken down into the following areas: system development; business investment; and asset management. The emphasis of each of these three areas is refreshed every two years at the Paris SC meeting. However, from ongoing consultation with the C1 Advisory Groups and receiving input from C1 members worldwide, it is apparent that these basic categories of Study Committee C1 work remain relevant. The asset management work is focussed on broad high level issues that cut across a number of study committees. As such there tends to only be one or two working groups, in this area, in operation at any one time.

A summary and brief description of ongoing, as well as recently completed, working groups and technical brochures for system development; business investment; and asset management is as follows:

### **System Development**

- **TB 433 Planning to Manage Power Interruption Events:** This TB reviews major events that have occurred over a number of years and examines planning opportunities that may limit the impact of major unreliability events rather than prevent their occurrence.
- **TB 453 Glossary of Terms used in the Electric Industry:** This TB provides the definitions of various terms in the following domains: Electric quantities, Electric Systems, System Operations, Electricity Market and Entities in the Electricity Market.
- **WG C1.9 Planning Issues for Newly Industrialised and Developing Countries:** This soon to be published TB documents the issues, methods and approaches to carrying out power system planning in developing and newly industrialised countries within Africa and provides a technical summary for each country.
- **WG C1.13 System complexity and dynamic performance:** This soon to be published TB focuses on voltage stability aspects and discusses how active and passive compensation devices (FACTS) can help to improve voltage stability.
- **JWG C1/C2/C6-18 Coping with limits for very high penetrations of renewable energy:** This WG is exploring the limits to the penetration of renewable energy in electric power systems that are today considered in different islanded and continental power systems worldwide, as well as the technical problems causing such limits.
- **WG C1-19 Green field network, designing future networks ignoring existing constraints:** Without considering the constraints of existing infrastructure, this

- WG is exploring the design of future power systems for the long-term and considers the implications for the planning of today's power systems.
- **WG C1-20 Accommodating high load growth and urban development in future plans:** This WG is reviewing the methodologies and processes followed to formulate and prepare the development plans of transmission networks designed to supply high density urban areas within different countries.
  - **JWG C4/B4/C1.604 Influence of Embedded HVDC Transmission on System Security and AC Network Performance:** This JWG follows on from previous work on the application of HVDC and examines special control features of HVDC systems, overload capabilities etc.
  - **WG C1.27 Definition of reliability in light of new developments in various devices and services which offer customers and system operators new levels of flexibility** This WG will determine if there is a need for a modified or expanded definition of adequacy in light of the expected new devices and services.

### **Business Investment**

- **WG C1-15 Review the drivers for transmission investment decisions and the role of technical planning criteria in transmission investment:** This WG reviews the rationale used for transmission investment decisions, establishes the role of technical planning criteria in investment decisions and identifies trends in investment drivers.
- **WG C1-22 New investment decision processes and regulatory practices required to deal with changing economic drivers:** This WG is reviewing decision processes in a changing environment and will propose orientations for future processes.
- **WG C1-23 Transmission investment decision points and trees** This WG is establishing if and how target networks are being used and if they are used to generate decision trees and key decision points. In particular, it is investigating processes used to determine the timelines of the decision points in the different countries and the methods used.
- **WG C1-24 Tools for developing Optimum Network Development Plans:** This WG is studying the need for new tools and techniques to assist in the development and economic justification of long-term transmission plans.

### **Asset Management**

- **TB 422 Transmission Asset Risk Management:** This TB describes developments in electricity transmission systems and specifically as it applies to the major risk of asset aging. In particular it identifies international developments in asset management that have influenced new approaches and specifications which emphasise or mandate risk management as one of the key processes for asset management decision making.
- **Invited Paper, E. Rijks (NL), G. Sanchis (DE), P Southwell (AU), “Asset Management Strategies for the 21<sup>st</sup> Century”, *Electra*.** The article summarises the current status of asset management in transmission companies, as informed by CIGRE analysis and industry best practice. It also reviews emerging trends in

asset management, which is of particular relevance to decision-makers and executives.

- **WG C1-25 Risk Management and Information Processes for Asset Management in Electricity Transmission Companies for current and future power systems:** This WG will provide an insight into the current and future application of asset management, risk management and the information needed for these processes in electricity transmission companies as we prepare for future challenges.

### **Future work**

Future C1 work is aligned to the objectives outlined above and will ultimately be categorised into system development, business investment and asset management. The latter will particularly consider the implications of the activities on asset management strategies and methods. The work is also guided by two technical committee projects “Power Systems of the Future” and “Energy Efficiency”. Both have helped elevate broader, system-wide issues. Furthermore, C1 is producing a paper on disaster recovery which has a range of Cigre-wide implications. Subsequently, this will be published as an *Electra* article and the paper may be used to help frame some future C1 Working Groups considering planning responses after a major disaster.

### **New Working Groups**

The future work outlined above will be regularly reviewed for relevance and priority and will shape new working groups as resources become available. At the time of writing, prior to the Paris Session, there have been no new working groups initiated. It is expected that a number of new working groups will be created after the Paris meeting.

### **Meetings and events**

- “The Electric Power System of the Future: Integrating supergrids and microgrids”, 13-15 September 2011, Bologna, Italy.

Further information can be obtained by contacting the SC Secretary, Peter Roddy or the SC Chairman, Phil Southwell. Contact details can be found on the C1 website.