



CIGRE Study Committees C1, C4

PROPOSAL FOR CREATION OF A NEW JOINT WORKING GROUP

JWG C1/C4.36	Name of co-convenor: Valdson Simoes (BR) E-mail address: valdson.jesus@eletrobras.com Name of co-convenor: Stanislav Utts (RU) E-mail address: utts-sa@so-ups.ru
Technical Issues # (2): 5, 7	Strategic Directions # (3): 1, 2
The WG applies to distribution networks (4): Yes	
Title of the Group: Review of Large City & Metropolitan Area power system development trends taking into account new generation, grid and information technologies.	
Scope, deliverables and proposed time schedule of the Group: <p>Background: We are experiencing a prolonged period of population growth globally and an increase in urbanization. The number of Large Cities & Metropolitan Areas is increasing as is their size both in terms of population and surface area. Accordingly, electricity consumption and power system load are growing and are concentrated in densely populated areas. In addition, Large Cities & Metropolitan Areas are important political and economic centers, and loss of load, or even load curtailment, can have a significant financial impact on companies and consumers. The safety and reliability of power systems must endure when facing today's challenges such as capacity and power balancing adequacy, restoration and modernization of the networks, and the installation of new generating and power system equipment.</p> <p>New technologies have been developed since the turn of the century and this coincides with the need to replace ageing, key assets in the power systems which grew rapidly in the middle of the 20th Century. Rather than replace assets on a like-for-like basis, however, it is important to recognise that economic drivers have changed and these will influence the power system of the future. Cross industry coordination and cooperation is required to successfully manage power system operations for Large City & Metropolitan Areas while new technologies are being deployed. Criteria and principles for large cities power system operation and development will be proposed.</p> <p>The following items will also be taken into account: power flows to and from the distribution network; application of innovative measurement devices; development of electric vehicles; active and reactive power flow control technologies and their increasing automation; economic drivers for Large City & Metropolitan Area development; large scale HV and UHV cable route penetration; and, rooftop PV penetration etc. The Large City & Metropolitan Area power system development trends and operational features will be assessed both for transmission and distribution networks due to their growing interaction.</p> <p>Scope: In order to address the issues highlighted above, this JWG will:</p> <ol style="list-style-type: none"> 1. Review the current state of Large City & Metropolitan Area power system supplies with a view to: <ul style="list-style-type: none"> • Defining the terms «Large City» and «Metropolitan Area» in relation to the power system; 	

- Identifying power system development trends over the past 10 years in relation to the expansion of Large City & Metropolitan Areas, and analysing how these trends are shaped by the planning process for transmission, distribution and security of supply;
 - Defining the characteristics, features, challenges, and common requirements in relation to the planning for Large City & Metropolitan Area power systems. Particular attention will be paid to: high generating capacity and load concentration; electricity consumption structures; power balancing using local electricity generation capacity and external power flows; rated voltage level increase; reliability and stability problems; fault (short circuit current) levels; power factor and power quality issues; effects of reverse power flows; and, anti-islanding issues etc.;
 - Documenting current special requirements for Large City & Metropolitan Area development planning (if any);
 - Determining the existing and prospective economic drivers related to the development of Large City & Metropolitan Area power systems.
2. Define the existing and potential prospective technologies at transmission and distribution level to be applied in Large City & Metropolitan Area power systems for improved sustainability and controllability, including the following:
- Exploitation of the control capabilities of Renewable Energy Sources (RES) and dispersed generation;
 - Battery storage systems, FACTS and HVDC, and other generator technologies for voltage and power flow control, reactive power compensation and power system stability improvement;
 - Use of modern HV and UHV cable lines, gas-insulated substations, high capacity substation installation near load centers, underground electric equipment installations (underground substation);
 - Use of smart metering, demand response approach and other smart grid concepts.
3. Identify Large City & Metropolitan Area power system development trends, highlight common issues, and highlight drivers for the further development of power system security criteria and planning principles.

Besides experts from SCs C1 and C4, also liaison experts from SCs B1, B2, B4, C2 and C6 will be invited.

Deliverables: Electra article, Technical Brochure, material for Cigre Tutorials, and papers for inclusion in Cigre Colloquia, Symposia and Sessions as appropriate.

Time Schedule: Start March 2017

Final report: January 2019

Comments from Chairmen of SCs concerned: Comments related to participation of experts from other SCs, and on the need to keep the scope manageable (partly solved by avoiding references to system operation where the actual focus was on system planning and design).

Approval by CIGRE Technical Committee Chairman:

Date: 06/02/2017



- (1) Joint Working Group (JWG) - (2) See attached table 1 – (3) See attached table 2
(4) Delete as appropriate

**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 standardization.
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