CIGRE Study Committee C2 – Operation and Control

PROPOSAL FOR THE CREATION OF A NEW WORKING GROUP (1)

WG* C2.23	**Name of Convenor : Ben Li (Canada)** **E-mail address**: ben@benli.ca
Technical Issues # (2): 6	**Strategic Directions # (3): 2, 1**
The WG applies to distribution networks (4): Yes	
Title of the Group: System Restoration Procedure and Practices	

Scope, deliverables and proposed time schedule of the Group :

Background :

System Operators (SOs) are responsible for operating their portions of the integrated transmission system to ensure interconnected system security. Among other duties, SOs must respond to system disturbances, and restore the transmission grid and supply to customer load after disturbances. The latter part is generally referred to as system restoration.

Despite having the same objective to restore system and load as expeditiously as possible, restoration practices and procedures may vary from one SO to another or may differ between interconnected systems due to differences in system and market design and in physical characteristics. Further, there may be times when system restorations may not proceed as expeditiously as expected due to a variety of reasons. There is thus a value in reviewing the system restoration methods and processes adopted used by various SOs, and the lessons learnt from actual events to identify challenges and explore ways to improve the effectiveness and efficiency in system restoration.

Scope :

- Compare the methods used, the technical requirements applied and the processes adopted by SOs/interconnected systems on system restoration, and how these issues are addressed in Grid Codes and operational procedures;
- Compare the preparedness approaches including verification and update to restoration plan, testing of key facilities, and training of operators and key personnel in system restoration and communications procedures;
- Compare the application software, the technical capability and requirements on network model, awareness systems (for broader area observability) and voice and data communication used for coordinating restoration among control centers;
- Compare the governing framework, communication protocol and chain of command adopted by SOs when directing system restoration;
- Compare and propose coordination procedures with distribution system operators, neighboring SOs, including energization and restoration from neighboring systems where such practice is adopted;
- Compare the practices in communicating with senior management, government agencies, regulatory authorities, the general public, press and media as well as other key stakeholders on impacts of disturbances and progress in restoration;
- Highlight common approaches, unique approaches and assess/propose preferred or best approaches in system restoration and communication with stakeholders and after the fact reporting of restoration process;

- Review restoration experience following large disturbances, and identify challenges faced by the SOs, and propose effective solutions to overcome such challenges to improve restoration effectiveness, efficiency and communication protocol thereby allowing the SOs to focus on the restoration tasks while keeping stakeholders duly informed.

Deliverables :

- Initial findings available for CIGRE session 2014
- Paper to be presented at CIGRE 2016 SC C2 session

Time Schedule : start : 2013 **Final report** : 2015

The work will be divided into 4 phases:

- Phase 1 : Constitution of the WG and definition of proceeding (second half of 2013)
- Phase 2 : Collection of information and analyses
- Phase 3 : First draft (Fall of 2014)
- Phase 4 : Final report (Technical Brochure) and presentation of results (Summer 2015)

Comments from Chairmen of SCs concerned :

Approval by Technical Committee Chairman : M. Wald
Date : 21/05/2013

(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 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