CIGRE Study Committee C1

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

JWG with CIRED* N° C1.29	**Name of Convenor :** John Wilson (UNITED KINGDOM) **E-mail address**: john.wilson3@nationalgrid.com **Name of Co-Convenor (CIRED): Riccardo Lama** **E-mail address**: riccardo.lama@enel.com
Technical Issues # (2): TI1, TI5	**Strategic Directions # (3): SD1**
The WG applies to distribution networks (4): Yes	
Title of the Group: Planning criteria for Transmission Network in presence of active distribution systems.	

Scope, deliverables and proposed time schedule of the Group :

Background:

Significant increase in penetration of distributed energy resources (DER), use of interconnection with other grids, and utilization of SmartGrid technologies makes transmission system planning more challenging than in the past. Already now in some areas the fulfillment of consumers' need is mostly ensured by dispersed generation and flexible operating techniques which are connected directly to the distribution system; in the near future.

Due to the increasing degree of control of DER and loads which are foreseen in the near future, distribution systems will be self-sufficient for the majority of time, only requiring frequency-related services from the transmission system and occasionally voltage support; however, in particular operational conditions (e.g. failures in embedded generation, distribution network faults, interconnector non-availability) or in specific periods of day, week or year (e.g. excess generation in non-peak or maintenance periods), they will need not only services, but also active power integration (or, conversely, active power collection) to a large extent.

Previous demand planning criteria has been initially based on very little use of DER, with small evolutionary modifications made to planning standards to cater for distributed resource growth.

The use of historical data relating to TSO-DSO net power exchange in order to plan the evolution of transmission systems may eventually lead to underestimation of the need to reinforce the HV network; at the same time, dimensioning the system in order to be able to supply the full transformation power installed (and, symmetrically, to collect to the extent of full transformation power installed) could give rise to unacceptable over sizing.

Historical measurements and users' data are available both at TSO and at DSO level and include active power exchange measurements, load and generation data, interconnection capability and measurements; through an appropriate TSO-DSO shared methodology it should be possible to define the best possible use of them in order to combine robust planning with efficient resource allocation.

Scope:

The working group will investigate the growth of distributed energy resources and highlight the implications for planners. The specific activities of the working group will be broken up as follows:

1. Assess most common, both traditional and "state-of-the-art", methodologies for Transmission planning taking into account the presence of DER, comparing them in terms of complexity, accuracy, system security and cost-efficiency.
2. Define tentative "future-proof" criteria for planning of transmission systems connecting distribution systems with zero or negligible TSO-DSO active power exchange in ordinary condition (e.g. < |10%| of transformation installed power for > 90% of yearly time), eventually specifying presently unavailable data or measurements which are crucial for this purpose.
3. Develop alternative scenarios of DER development in order to evaluate the extent of "mandatory" adoption of innovative planning criteria in the short- and mid-term.
4. Define the basic need to be taken into account in planning the development of distribution grids, in order to assure the requested level of services to be provided to the system (e.g. frequency and voltage control, emergency control, islanding, etc.).

Deliverables: Booklet about "future-proof" demand planning criteria for Transmission Networks, with summary published in *Electra*.

Time Schedule: Start: September 2013 **Final report**: September 2015

Comments from Chairmen of SCs concerned :

Approval by Technical Committee Chairman :
Date : 24/07/2013

(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