CIGRE Study Committee A1

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

JWG* A1/C4.52	**Name of Convenor :** Nicholas Miller (USA) **E-mail address**: nicholas.miller@ge.com
Technical Issues # (2):5	**Strategic Directions # (3): 1,2**
The WG applies to distribution networks (4): No	
Title of the Group: Wind generators and frequency-active power control of power systems	

Scope, deliverables and proposed time schedule of the Group :

Background :

As wind generation is becoming a significant component of the generation portfolio in many power systems, provision of frequency-active power control is being required of this technology in many regions. This joint working group between A1 and C4 will document the state-of-art in developing such capabilities for wind turbine generators and both the system technical performance aspects of such controls and the impact of such controls on equipment design and performance.

Scope :

- Impact of wind generators on frequency and active power control of power systems, including:
  - Inertial based controls, which rely primarily on manipulation of electrical parameters (e.g. torque, power, excitation) and the energy balance between inertial energy of turbine-generator drive-train.
  - Governor-like controls, which substantively alter the mechanical power from the interaction of the turbine blades with the wind while manipulating electrical parameters
  - Curtailment, ramp-rate control, in which wind generator power production is limited in response to instruction by a supervisory control, including but not limited to, a wind plant control
  - Primary and secondary regulation with wind plants, using these controls
  - Systemic impacts and interaction between these controls, and controls on other generation and resources on the power grid, and general impact/improvement in power system dynamic performance
- State of the art of frequency-active power control of wind generators
  - Characteristics and implementation of present wind turbine-generator controls
  - Characteristics and implementation of present wind power plant controls, and the interaction between individual wind generators and plant supervisory controls
  - Examples and measurements from wind generators and wind plants
- Impact of frequency-active power control on wind generators
  - Impact on stator and rotor winding stress and design, including thermal, insulation, mechanical design
  - Impact on wind turbine-generator drive-train stress and design, including torsional and bearing stress, thrust and bedplate stress, tower stress
  - Impact on wind generator electrical design, including excitation/power converter rating and design
  - Impact of wind generator auxiliary design, including pitch actuators,

- Grid code and Standards requirements
    - Illustrative examples of language used in grid codes and standards to define specific requirements and expectations
    - Observations of the impact on stator and rotor winding stress and design, including thermal, insulation, mechanical design. Recommendations on applicable standards.

Deliverables : Report to be published in Electra or technical brochure with summary in Electra

Time Schedule : Start : May 2015 **Final report** : 2018

Comments from Chairmen of SCs concerned: Both SC A1 and C4 chairmen have reviewed and are in agreement with this proposed JWG.

Approval by Technical Committee Chairman :
Date : 15/04/2015

(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