CIGRE Study Committee A1

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

WG* N° A1.49	**Name of Convenor :** Johnny Rocha (BR) **E-mail address**: johnny.rocha@power.alstom.com	
Technical Issues # (2): N/A		**Strategic Directions # (3): 2**
The WG applies to distribution networks (4): No		
Title of the Group: Magnetic core dimensioning limits in Hydro-Generators		

Scope, deliverables and proposed time schedule of the Group:

Background:

Developments in the understanding of the 'state of the art' properties of laminated silicon-steel and current economic drives are requiring generator designers to revisit design concepts related to dimensioning criteria and the limits related to their usage.

The use of finite element methods during the design stage of magnetic cores can accurately determine the actual performance of the core in service, however, it is not always possible to apply these tools to the design of hydro-generators, even when dealing with retrofit challenges. This is due to the fact that their application may demand advanced computing capacity and significant amounts of time that are not available during the bidding stage.

Historically, it was, and still is, problematic to find magnetic limits to work with when proceeding with an analytical dimensioning methodology, even based on actual silicon-steel characteristic BxH curves. The design constraints start with the standard BxH characteristic curves that currently are limited to 1.8T and sometimes one can find induction levels greater than this limit. As the machine saturation condition impacts on its efficiency and reactance values, and since some level of saturation may occur in operation e.g. due to unbalanced magnetic pull, there is a need to establish a consensus regarding the limits of modern magnetic core dimensioning procedures.

Scope:

1 Properly define accepted saturation levels associated with the main components of the magnetic circuit;

2 Based on collective technical knowledge within the study committee clearly state the main factors or variables that contribute to generator core saturation;

3 Evaluate the need to extend the current induction limit of silicon steel sheets saturation curves over 1.8T;

4 Analyse the impact of higher magnetic core saturation levels on the excitation system to state new design requirements;

5 Analyse the impact of the saturated materials on the different reactances (transient and sub-transient reactance);

6 Assess operation constraints of hydro-generators operating at higher core saturation levels.

The results of this WG will guide the main considerations to be addressed in the technical specification process.

Deliverables:

Report to be published in Electra or Technical Brochure with summary in Electra

Main Tasks and Time Schedule:

		2015												2016											
	DESCRIPTION	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
1	Approval of TOR of WG																								
2	Questionnaire preparation																								
3	Recruitment of collaborators																								
4	Submittal of questionnaires																								
5	Collection of responses and follow up																								
6	Updated presentation at Paris meeting																								
6	Data processing																								
7	First report and issue of a complimentary questionnaire																								
8	Collection of responses and follow up																								
9	Final data processing																								
	Report presentation at Madrid meeting																								
10	Final report draft preparation																								
11	Report submittal and review																								

Comments from Chairmen of SCs concerned :

Approval by Technical Committee Chairman :

Date : 21/11/2014

(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