CIGRE Study Committee A1

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

WG* N° A1.59	**Name of Convenor : Charles Millet (Canada)** **E-mail address**: millet.charles@hydro.qc.ca
Technical Issues # (2): X	**Strategic Directions # (3): 2**
The WG applies to distribution networks (4): Yes	
Title of the Group: Survey on Industry Practices and Effects associated with the Cutting Out of Stator Coils in Hydrogenerators.	

Scope, deliverables and proposed time schedule of the Group:

Background :

The stator winding is one of the key components in a hydrogenerator. When a fault to ground occurs in service it is not always possible to proceed immediately to the replacement of the faulted coil due to commercial or contractual reasons where the generator must be returned back to service as soon as possible. The solution is often to cut out the faulted coil and to operate the generator with a voltage unbalance until a scheduled outage period in which the faulted coil can be replaced.

The replacement of form-wound bars can be quite easy to perform with skilled personnel as long as spare bars are available. The situation is quite different when replacement of a multi-turn coil is required. In this case; one solution, which requires highly skilled personnel and a significant amount of work, is to cut the airgap leg of some good coils, remove and replace the faulted coil and splice the new airgap coil legs into position. The other solution, which is much easier to perform and will cost much less, is to cut out the faulted coil and to operate the generator with a voltage unbalance until it is rewound.

What can also occur is that more than one coil has to be removed in the same generator and this could happen for various reasons:

- more than one coil was damaged in the fault,
- adjacent coils were damaged during the cutting out operation and fail the hi-pot test,
- successive faults to ground occurred in different periods of time during the life of a winding,
- other coils were intentionally cut out to help balancing out the phase voltages.

The focus of this WG will be to describe the different practices associated with cutting out coils and give guidelines on the best practices to ensure safe operation of the generator with cut out coils and to lessen the negative impact on the generator output.

Scope :

In particular, the WG will focus on:

- The circumstances of the fault, i.e. routine hi-pot or fault in operation;
- The techniques used to locate the faulted coil;
- The cutting out practices, i.e.: site work on windings with individual bars and on windings with multi-turn coils;
- The problems encountered after having cut out coils, i.e.: excessive temperature rise, vibrations, damper bars overheating, Mvar absorption restriction, etc.

- Prediction and/or measurement of the current unbalance, the increase of the stator temperature rise, the restriction on generator output and the vibration of the stator core;
- The feasibility studies and/or practices done to attempt to balance windings as much as possible by cutting out good coils or disconnecting parallel circuits;
- Some limits that could be made on the number of cut out coils in circuits, and in phases.

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

Time Schedule: Start: January 2017 **Final report:** April 2019

Milestone	**Date**
TOR approval	January 2017
Forming of team	February/March 2017
Draft questionnaire 1	September 2017 (to be presented at Vienna meeting)
Comments by members and experts	December 2017
Final questionnaire	March 2018
Draft report 1	August 2018 (to be presented at Paris meeting)
Comments by members and experts	December 2018
Final report approval	April 2019
Document ready to be published in Electra	June 2019
Tutorial	August 2019 (to be presented at Delhi meeting)

Comments from Chairmen of SCs concerned :

Approval by Technical Committee Chairman : M. Waldner

Date : 09/02/2017

(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 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