CIGRE Study Committee B3

PROPOSAL FOR THE CREATION OF A NEW WORKING GROUP [1]

WG* N° B3.48	**Name of Convenor: Johan Smit (NL)** **E-mail address**: j.j.smit@tudelft.nl
Technical Issues # [2]: 8, 10	**Strategic Directions # [3]:** 2
The WG applies to distribution networks [4]: Yes	
Title of the Group: Asset health indices for equipment in existing Substations	

Scope, deliverables and proposed time schedule of the Group:

Background:

Asset Health Indices (AHI) have been used to manage the risks associated with ageing transformer fleets and other specific asset types but the AHI methodology can be applied to all significant assets substation wide to manage risks, and determine the condition-based needs for maintenance or replacement. By extending this activity beyond transformers to all significant assets it should be possible to manage the risks that would follow failure at the bay and substation level. WG B3.32 identified the widespread role of condition assessment used in conjunction with time, reliability-centred and risk-based methods. It also identified diagnostic methods in use to perform assessment on a wide range of asset types. WG B3.34 identified future substation opportunities to process all site condition and performance information from site to corporately based servers. This may then provide tools for the asset manager to control risks, for example with simple displays on a network basis, so optimising asset management decisions. The proposed WG would aim to progress from these two groups to provide substation AHI methodologies.

Scope:

The group will review existing CIGRE activities, documents and other literature that relate to the ageing of primary substation assets, particularly the work of A2 and A3, and the work of WG B3.32 and B3.34. The assets proposed include circuit breakers, disconnectors, instrument transformers, surge arresters and batteries. Power transformers would be included in so far as their input would be derived from the ongoing work of WG A2.49. T&D switchgear will be included to liaise with the work of WG A3.32. Previous work by other study committees such as B4 in developing guidelines for HVDC will be considered to ensure alignment. Other asset types will be considered where applicable, referencing existing work or studies by the relevant study committees.

The areas of interest are to develop common AHI methodology for these assets and identifying how best to provide asset managers with substation displays based on performance and risk. The work involves:

- Reviewing past work on failure modes and failure rates, together with diagnostics and condition assessment. This would also identify the importance of age to functional and catastrophic failure modes, i.e.: the risk of failure from wear-out and random failure modes. This links to the usefulness of statistical or condition based approaches.
- Reviewing current practice by AM/RCM teams and identifying status/condition/risk metrics.
- Determining which of the parameters need to be assessed individually to determine if urgent corrective action is needed and also the impact of these actions on the AHI. Determining how each of these parameters can be combined to determine the overall condition of each asset type.
- Identifying how best to integrate performance histories of the asset types, identifying how best to use the knowledge that designs have varying performance histories (information using failure statistics and forensic investigations together with trip reports, excessive maintenance costs etc.)
- Determining how weightings can be assigned to the various parameters to develop health indices. Consideration should be given to both deterministic and probabilistic methods.
- Considering how best to display AHI for assets in each bay and substation, including dynamic data feeding in and continuously updating the AHI output.

- Identifying how to incorporate asset health indices information in asset expenditure decision-making (both capital and operating). This may involve the review of other information, for example business interruption costs, network criticality, performance, utilization, obsolescence, failure impact on safety and environmental impact etc.

Deliverables: Technical brochure published: April 2019

Summary in Electra: April 2019

Tutorial: 2019

Time Schedule: start: November 2016 **Final report**: 2019

Comments from Chairmen of SCs concerned:

Approval by Technical Committee Chairman:

Date : 30/11/2016

(1) or 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