CIGRE Study Committees C4 and C2

PROPOSAL FOR THE CREATION OF A NEW WORKING GROUP

JWG [1]N° C4/C2.58/IEEE	**Name of Convenor: Udaya Annakkage (Canada)** **E-mail address: Udaya.Annakkage@umanitoba.ca**
Technical Issues #[2]: 3,5,8,10	**Strategic Directions #[3]: 1,2**
The WG applies to distribution networks[4]: Yes	
Potential Benefit of WG work #[5]: 3,5	
Title of the Group: Evaluation of Voltage Stability Assessment Methodologies in Transmission Systems	

Scope, deliverables and proposed time schedule of the WG:

Background:

Voltage stability is defined as the ability of a power system to maintain acceptable voltage levels at all buses, following a disturbance in the system. Whereas the definition and fundamentals of voltage stability have not changed, the way it is assessed and the circumstances under which it occurs require a revision as the power system is going through a major generation transition towards power electronics interfaced generation.

CIGRE and IEEE have published in the past several reports on voltage stability (some examples are CIGRE Technical Brochures 91, 128, 231, and 504, and IEEE Technical Report 90TH0358-2) and a more recent one on the contribution of distributed energy resources to system stability (IEEE Technical Report PES -TR22).

These reports, most of them between two and three decades old, have been serving as reference documents for voltage stability. They provide an overview on:

1. The available methods/techniques (including scientific foundation) to assess the voltage stability of power systems,
2. Indices used for quantifying voltage stability,
3. Available tools for voltage stability assessment, and
4. The industry practice on assessment of voltage stability.

Although the reports have been a good reference for voltage stability, an update of the work is required considering that the power system has evolved considerably since 1990. Mainly the generation and load (two important aspects for voltage stability) are increasingly being interfaced to the grids using power electronics. Therefore, there is a need to reassess the applicability of the methods presented in the aforementioned references.

Scope:

The aims of this work are:

1. To describe how voltage stability is expected to be impacted as a result of the transition towards power electronics interfaced generation
2. To describe the influence of the shift from transmission connected generation to distributed energy resources on voltage stability
3. To identify which classical voltage stability methodologies are currently still being used
4. To identify any shortcomings (as perceived by industry/academia) in the classical methodologies and assess the current and future needs of industry
5. To identify whether new methodologies to assess voltage stability in power systems with increased power electronics interfaced devices (PEID) have already been

defined (industry and academia)

6. To get insights in if and how voltage stability is being assessed and monitored in the operational time frame (e.g. use of DSA/WAMS/stability indices for quantifying the distance to voltage instability)
7. To describe the interaction between transmission and distribution in weak voltage situations
8. To describe and give guidance on available controls (e.g. NERC PRC-010-2) for reinforcing voltage security or stop dangerously evolving operating conditions

In order to achieve these objectives, it is proposed to establish a joint CIGRE/IEEE Working Group in order to reach wider participation from countries throughout the world. From CIGRE, SC C4 and SC C2 are involved. From IEEE, the Power System Dynamic Performance Committee (Subcommittee Power System Stability/WG on Voltage Stability) is the preferred collaboration partner.

Deliverables:

☒ Technical Brochure and Executive Summary in Electra

☒ CSE Paper

☒ IEEE Transaction Paper

☒ Tutorial[6]

☒ Webinar[6]

Time Schedule: start: August 2019 **Final Report**: December 2021

Approval by CIGRE Technical Council Chair:

Date: June 13th, 2019

Approval by IEEE Technical Committee Chair:

Date:

Notes: [1] Working Group (WG) or Joint WG (JWG), [2] See attached Table 1, [3] See attached Table 2, [4] Delete as appropriate, [5] See attached Table 3,
[6] Presentation of the work done by the WG

Table 1: Technical Issues for creation of a new WG

1	Active Distribution Networks resulting in bidirectional power and data flows within distribution levels up to higher voltage networks
2	Digitalization of the Electric Power Units (EPU): Real-time data acquisition includes advanced metering, processing large data sets (Big Data), emerging technologies such as Internet of Things (IoT), 3D, virtual and augmented reality, secure and efficient telecommunication network
3	The growth of direct current (DC) and power electronics (PE) at all voltage levels and its impact on power quality, system control, system operation, system security, and standardisation
4	The need for the development and significant installation of energy storage systems, and electric transportation, considering the impact they can have on the power system development, operation and performance
5	New concepts for system operation, control and planning to take account of active customer interactions, and different generation types, and new technology solutions for active and reactive power flow control
6	New concepts for protection to respond to the developing grid and different generation characteristics
7	New concepts in all aspects of power systems to take into account increasing environmental constraints and to address relevant sustainable development goals.
8	New tools for system technical performance assessment, because of new Customer, Generator and Network characteristics
9	Increase of right of way capacity through the use of overhead, underground and submarine infrastructure, and its consequence on the technical performance and reliability of the network
10	An increasing need for keeping Stakeholders and Regulators aware of the technical and commercial consequences and keeping them engaged during the development of their future network

Table 2: Strategic directions of the Technical Council

1	The electrical power system of the future: respond to speed of changes in the industry
2	Making the best use of the existing systems
3	Focus on the environment and sustainability
4	Preparation of material readable for non-technical audience

Table 3: Potential benefit of work

1	Commercial, business, social and economic benefits for industry or the community can be identified as a direct result of this work
2	Existing or future high interest in the work from a wide range of stakeholders
3	Work is likely to contribute to new or revised industry standards or with other long term interest for the Electric Power Industry
4	State-of-the-art or innovative solutions or new technical directions
5	Guide or survey related to existing techniques; or an update on past work or previous Technical Brochures
6	Work likely to contribute to improved safety.
7	Work addressing environmental requirements and sustainable development goals.