CIGRE Study Committee B4

PROPOSAL FOR THE CREATION OF A NEW WORKING GROUP

JWG [1]N° B4.82/IEEE	**Name of Convenor:** Garth Irwin (Canada) **E-mail address**: gdi@electranix.com	
Technical Issues #[2]: 8	**Strategic Directions #[3]: 1**	
The WG applies to distribution networks[4]: Yes		
Potential Benefit of WG work #[5]: 4		
Title of the Group: Guidelines for Use of Real-Code in EMT Models for HVDC, FACTS and Inverter based generators in Power Systems Analysis		

Scope, deliverables and proposed time schedule of the WG:

Background:

Modelling for HVDC, FACTS, wind turbines, solar generators and other power system equipment that connect to the AC grid through often used generic inverters lack accuracy in transient stability and electromagnetic transients. There is no guarantee that generic based models are valid under a wide range of system conditions – perhaps only tested for pre-defined small steady state steps/disturbances.

The problem is becoming more important as so many new power electronics equipment are being installed in the power systems. As there is a technical gap between the manufacturers of these devices (who wrote the code, and are the only ones who truly know what is going on inside of the models) and the end-user/utility (who is responsible to perform engineering and operational studies make sure it plays nice with the grid), some guidelines to provide standard procedures become necessary. Although represents an increasingly huge amount of work for everyone (developers, program developers, utilities etc.) to keep track of all of these models – there is no other option besides establishing rules to prevent potential serious issues in the grid.

Due to this increase use of fast acting power electronic controllers, combining with the fact that wind and solar sources do not contribute to system inertia there is a huge demand for more accurate simulations of controls and protection, and accountability/enforcement to ensure expected good actual performances.

Software technology allows possibilities to interface "real-code" controls and protection for inverters (Wind, PV – Photovoltaic Cells, BESS – Battery Energy Storage Systems, HVDC, SVC – Static VAR compensator, STATCOM etc.) as opposed to models using building blocks or the use of generic models in EMT programs, either by real-time simulations (on-line) as well as off-line commercially available software at almost real-time runs. This involves the use of executable versions of code to be released by a manufacturer, thus avoiding full disclosure of sensitive proprietary intellectual property.

Scope:

The scope of this Joint Task Force covers the following:

1. To specify what parameters should be considered when asking accurate models for EMT simulations of inverter based equipment such as Wind generators, PV, BESS, HVDC, SVC, STATCOM etc from their manufacturers
2. Demonstrate the difference (and need) between using a generic models vs Real-

code (OEM) as they impact the results. Provide guidance on the implications of these results to asset owners, utilities and other stakeholders. Provide guidance on best approaches in using generic models in the complete absence of OEM provided model codes. What offline checks/tests can be performed to maximize confidence levels with the given OEM models or in their absence, with the generic models. Provide typical benchmark circuit or advice on how to form one.

Deliverables:

☒ Technical Brochure and Executive Summary in Electra

☒ Electra Report

☒ Tutorial[6]

☒ Webinar[6]

Time Schedule: start: September 2019 **Final Report**: April 2023

Approval by CIGRE Technical Council Chair:

Date: February 28th, 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.