CIGRE Study Committee C6

PROPOSAL FOR THE CREATION OF A NEW WORKING GROUP

WG[1] C6.36	**Name of Convenor:** Jason Taylor (USA) **E-mail address**: JTaylor@epri.com
Technical Issues #[2]: 1, 2, 3, 4, 5, 7, 8	**Strategic Directions #[3]: 1, 3**
The WG applies to distribution networks[4]: Yes	
Potential Benefit of WG work #[5]: 1, 4, 5, 6	
Title of the Group: Distributed Energy Resource Models for Impact Assessment	

Scope, deliverables and proposed time schedule of the WG:

Background:

Three important factors significantly impact the needs for models and tools to support distribution planning and operation with increasing penetration of distributed energy resources:

1. The continued proliferation of distributed energy resources and the need to include the impact of these resources on distribution investment requirements. These resources include distributed renewables (PV, wind), other distributed generation, energy storage, electric vehicle charging and dynamic customer loads that can be used as a resource for the power system. The combination of these resources as alternatives to traditional distribution investments are often referred to as “non-wires alternatives.” Distribution planning models and tools must be able to represent these resources in distribution planning scenarios.
2. The convergence of distribution operations with distribution planning. Since distribution systems of the future will include distributed energy resources with control systems that must be integrated with the control and operation of the distribution system, planning models and tools must also represent these control systems to determine the impact on distribution designs and investment requirements.
3. The models (both planning and real time models for operations) for these distributed energy resources and control systems need to be aggregated to support requirements for TSO/DSO coordination in the future. This coordination becomes a basic requirement for future planning and operations tools and systems.

With these requirements for advanced distribution planning systems, there is a need to develop benchmark models for different types of distributed resources that will be considered in planning studies. The impact of DER will need to be evaluated in a variety of planning assessments – static load flows, quasi-static time-series assessments, fault analyses, harmonic studies, dynamic studies, electromagnetic transient simulation, and reliability assessments. Different DER models will be needed for different assessments – there is a need for industry coordination around the framework for these models, data needs and actual benchmark models for generic types of DER that can be used at the planning stage. There is also a need to

consider emerging assessment methods that can be used to better facilitate DER integration (such as probabilistic load flow, hosting capacity and locational value assessments).

Additional drivers for this work include the continued development of local energy community concepts where DER is an integral part of the community energy management, the broad penetration of electric vehicles and the potential for advanced electric vehicle charging management, design of Distributed Energy Resource Management Systems (DERMS) as an integral part of future distribution management, and Common Information Model requirements for inclusion of DER in the different types of distribution simulation studies.

Scope:

The scope of this working group is to present, analyze, assess and describe the need and possible approaches for benchmark DER models that can be used for a variety of distribution systems studies.

The following topics will be explored and discussed within the WG.

1. Discuss new needs for DER models, including operation and control system characteristics for distribution system operation and planning that includes full integration of DER. Review the goals of distribution planning and operation for including “non-wires alternatives” as part of distribution investment decisions and also for including DER impacts on distribution operations considering the integration within customer systems, communities and for support of the bulk power system (TSO/DSO interface requirements). Review the types of planning studies that will require assessment of the impacts and benefits of DER.
2. Characterize the basic DER model requirements associated with the different types of studies described above, and the different time frames required. Review the DER characteristics for various types of DER. Review the types of models required to assess the impacts and benefits of DER.
3. Develop requirements for benchmarking DER models based on the type of study and the type of DER involved – for example smart inverters, energy storage and controllers, electric vehicle charging management, microgrid controllers, customer energy management systems and smart loads.
4. Explore the expected impacts of emerging techniques and systems – probabilistic methods, aggregation, transactive systems – on the adequacy of the DER benchmark models and their integration in the distribution assessment and planning tools.
5. Develop an approach for documenting generic benchmark DER models for system and planning studies and differences between these benchmark models and actual models of vendor DER systems and controls.
6. Identify and discuss use cases, experiences and case studies for DER benchmark models from existing and planned implementations, studies, projects and practices.
7. Provide recommendations and guidelines as to how the benchmark models can be applied and used in different types of analysis and simulation tools.

Joint work with other SCs:

Liaison experts from SC C1, C2 and C4 will be invited. Results from parallel or already finalised WGs will be taken into account, i.e. TB 727 (Modelling of Inverter-Based Generation for Power System Dynamic Studies), WG C2.40 TSO-DSO Co-Operation – Control Centre Tools Requirements, JWG C1/C6.42 (Planning tools and methods for systems facing high levels of distributed energy resources), or JWG C4/B4.38 (models for network harmonic studies).

Deliverables:

☒ Technical Brochure and Executive Summary in Electra

☐ Electra Report

☒ Tutorial[6]

☒ Webinar[6]

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

Approval by Technical Council Chairman:

Date: June 5th, 2019

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.