CIGRE Study Committee B3

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

WG N° B3.55	**Name of Convenor: Suriya Prungkhwunmuang** (Thailand) **E-mail address**: suriya.pr@egat.co.th
Strategic Directions #[2]: 1	**Technical Issues #[3]: 1, 3, 9**
The WG applies to distribution networks[4]: Yes	
Potential Benefit of WG work #[6]: 1, 3, 6	
Title of the Group: Design guidelines for substations connecting battery energy storage solutions (BESS)	

Scope, deliverables and proposed time schedule of the Group:

Background:

The integration of renewable distributed energy resources such as energy storage, photovoltaic and wind into the grid is challenging. Individually, small connections seem minor, however collectively the volume and the nature of these inverter-based loads will change the network parameters; specifically low fault level, low inertia and bi-directional power flows.

Battery energy storage solutions (BESS) are a key part of this growth. These modular systems can be very quickly delivered and installed. Furthermore, the magnitude is easily scaled up from tens to thousands of MW.

This background and the potential for massive uptake in electrification to support the development of a low carbon future network places a significant burden on the substation.

Scope:

1. Provide guidance on methods for the evaluation of output rating and performance at the point of common coupling (PCC)
2. Identify and provide guidance on managing bi-directional power flows in the design and operation of the host substation. Establish the potential impact on traditional protection and control schemes.
3. Identify the changes required in both transmission and distribution substation design necessary to facilitate future battery storage.
4. Consideration of the impact on substation layouts and infrastructure (e.g. multiple connections)
5. Consideration of services substations will need to provide to accommodate these applications (e.g. active network management schemes & auxiliary services)
6. Establish a set of best practice recommendations and guidelines for the connection and commissioning of BESS into existing substations.

Deliverables:

☒ Technical Brochure and Executive summary in Electra

☒ Electra report

☒ Tutorial[5]

Time Schedule: **Start**: September 2018 **Final Report**: September 2021

Approval by Technical Council Chairman:

Date: 21/08/2018

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
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 (ref. 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

Table 3: Potential benefit of work

1	Commercial, business or economic benefit 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 direction
5	Guide or survey related to existing techniques. Or an update on past work or previous Technical Brochures
6	Work likely to have a safety or environmental benefit