



IEC/TC OR SC:	SECRETARIAT:	DATE:
TC 8	Italy	2017-01

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A. STATE TITLE AND SCOPE OF TC

TC8: System aspects of electrical energy supply¹

To prepare and coordinate, in co-operation with other TC/SCs, the development of international standards and other deliverables with emphasis on overall system aspects of electricity supply systems and acceptable balance between cost and quality for the users of electrical energy. Electricity supply system encompasses transmission and distribution networks, generators and loads with their network interfaces.

This scope includes, but is not limited to, standardization in the field of:

- Terminology for the electricity supply sector,
- Characteristics of electricity supplied by public networks,
- Network management from a system perspective,
- Connection of network users (generators and loads) and grid integration,
- Design and management of de-centralized electricity supply systems e.g. microgrids, systems for rural electrification,

While relying on efficient and secure data communication and exchange, TC8's scope does not include standards for communication with appliances and equipment connected to the electric grid or for communication infrastructure serving the electric grid.

TC8 is responsible for basic publications (horizontal standards) on standard voltages, currents and frequencies ensuring the consistency of the IEC publications in these fields.

TC8 cooperates also with several organizations active in the field of electricity supply such as CIGRE, CIREN, IEEE, AFSEC, IEA.

SC 8A: Grid Integration of Renewable Energy Generation

To prepare and coordinate, in co-operation with other TC/SCs, the development of international standards and other deliverables for grid integration of variable power generation from renewables such as PV and wind energy with emphasis on overall system aspects of electricity supply systems (grids) as defined in TC 8 scope, but not covering issues usually covered by regulation such as renewable policies. SC 8A focuses on the impact of a high percentage of renewables connected to the grid, considering that their variability and predictability impact the functioning of the whole electricity grid. It covers grid integration standards for renewable energy, aggregating contributions of all grid users and prescribing interaction modes between the grid and power plants. This includes requirements for interconnection and related tests for grid code compliance, as well as standards or best practice documents for planning, modeling, forecasting, assessment, control and protection, scheduling and dispatching of renewables with a grid level perspective.

¹ New TC 8 Title and Scope as presented during the TC 8 meeting in Frankfurt (October 2016), pending TC 8 P-member and SMB approval.

SC 8A deals with the grid level requirements enabling secure, non-discriminatory and cost effective operation of electricity supply systems with a significant share of renewable generation and cooperates with TC 82, TC 88, TC 95, TC 114, TC 115, TC 117, TC 120 and other product committees to ensure technical feasibility and verification of the implementation of the grid level requirements.

SC 8A coordinates with TC 8 which covers standards related to Distributed Energy Resources (e.g. interconnection with the grid, design and operation of micro grids).

B. MANAGEMENT STRUCTURE OF THE TC

TC8

Working Groups:

WG 1: Terminology

WG 7: General Planning, Design, Operation and Control of Microgrids

WG 8: To define a general framework and procedures for maintenance of electrical energy supply networks

Project Teams:

PT 62786 Distributed Energy Resources Interconnection with the Grid

Maintenance Teams:

MT 1: Maintenance of IEC 60038, IEC 60059 and IEC 60196

MT 2: Maintenance of IEC/TS 62749

SC8A

Working Groups:

WG 1: Terms and definitions of grid integration of renewable energy generation

WG 2: Renewable energy power prediction

Joint Working Groups:

JWG 4: Grid code compliance assessment for grid connection of wind and PV power plants

Ad Hoc Groups:

AHG3: Roadmap of grid integration of renewable energy generation

C. BUSINESS ENVIRONMENT

The electricity supply market is undergoing rapid changes, with many new actors and fundamental changes in processes, replacing a market with vertically integrated monopolies.

The relations between various parties are increasing in complexity. In many parts of the world the infrastructures need to be renewed, and generally will grow to meet the demand and the fast

growing phenomena of distributed generation. On the other hand developing countries need to invest a lot in order to provide electricity supply and build infrastructures for basic need and increasing demand.

In Europe, “Draft Grid connection codes” have been under development by ENTSO-E in view of being endorsed by the European Commission. At the same time, numerous pre-standardisation activities are conducted in CIGRE’s Study Committees.

By the end of 2012, more than 100 countries had started to develop wind power and the global installed capacity reached 282.5 GW , meanwhile, the global installed capacity of photovoltaic power reached 102 GW . RE generations will be expected to have a broad application and a booming market because of its clean, sustainable characteristics.

SC8A focus on impact of high shares of renewable connected to the network considering that their variability and unpredictability could prevent the correct functioning of the whole electricity grid.

D. MARKET DEMAND

There is a need for standards to support opening the market to new actors, for new forms of business and better conditions for consumers, but at the same time increase the quality and availability, and more generally the dependability of supply. Although a lot of standards are in place or under development, it is necessary to improve the coordination between the existing committees involved and ensure that all necessary system aspects are covered, and develop a flexible framework.

Regulation authorities are interested in consensus documents that assist them to organize their activity, supervise the evolution of the market and make comparisons between operators and between countries. TC8 develops standards that can be used to demonstrate compliance to Grid Codes or other applicable regulatory framework. Consensus standards giving clear definitions of the essential characteristics and methods of measurement of the relevant parameters and performance indicators are desirable tools. Clear and equitable definitions for the connection conditions are needed, for example, for the new forms of power generation and transfer.

There is a general demand for consensus documents and standards that can be a reference to:

- implement harmonized regulatory frameworks;
- specify and design flexible solutions that enable technical and commercial innovation;
- define the essential technical and economical characteristics, and methods of assessment and measurement;
- clarify the conditions to be respected by the different involved parties for fair sharing of responsibilities, and proper operations (power producers, grid operators, distribution network operators, system and equipment manufacturers, suppliers, consumers, authorities, industrial and private users...).

RE generation is more and more often the power technology of choice as national governments, utilities, energy developers seek to diversify their energy mix and reduce CO2 emissions.

Experiences with high share of renewables are already made in some parts of the world. Standards for grid connection can help to share these experiences by defining terms, ways of implementation and listing best practices; standardized grid support functions with accurate terms and definitions are of great value to manufacturers.

The market is also exploring “non conventional” solutions. There is a need for standards enabling the development of secure, reliable and cost-effective decentralized systems for electrical energy supply, alternative/complement/precursor to traditional large interconnected and highly centralized systems. The most popular application of decentralized system is currently the “microgrid” (see IEV definition) with its applications for developing countries (focussing on access to electricity) as well as for developed countries (focussing on high reliability, black-out recovery and/or services).

E. TRENDS IN TECHNOLOGY AND IN THE MARKET

Developments in information and communication technologies allowing a better connection of the end user to markets will allow new services and benefits. It will also allow new operating margins for example implementing demand response mechanisms, and enable energy efficiency to better respect the environment. Standardization will also foster markets of needed advanced commercial solutions (networks automation, meters...) for the benefits of users.

LVDC appears to be an option, again, for electricity distribution, inside buildings (e.g. in IT industry) and outside (e.g. for Energy access in developing countries). TC8 is first concerned with basic characteristics (standard voltages, currents) and then with potential application in decentralized supply systems.

New forms of generation, primarily based on renewable form of energy sources as well as electric energy storages, are being developed and introduced into the electricity networks. Incorporating more RE generation will bring variability and uncertainty into the grid. Worldwide studies and experiences in recent years have shown that new technical solutions are needed to address these difficulties. The new solutions will include new technologies, methods and practices, applied in order to provide more flexibility and improve the efficiency of power systems, constantly balancing generation and load to make the power systems reliable and maintain security of supply, e.g. avoid any interruption in the supply of power.

Some RE generation technologies related to adding system stability and flexibility are listed as follows:

- Advanced grid performances of RE generation,
- Centralized voltage control of RE generation cluster,
- Smart operational state monitoring and maintenance of RE power plant,
- RE generation modelling improvements,
- More accurate RE power forecasts,
- Enhancement of optimized dispatching & operation tools and practices.

F. SYSTEMS APPROACH ASPECTS (REFERENCE - AC/33/2013)

TC 8 is developing standards at system level, and collaborates with the other TCs that are developing product standards.

TC 8 has initiated the Use Case driven approach, as defined in the IEC/PAS 62559 "Methodology for Developing Requirements for Energy Systems", paving the way for the IEC System Committee Smart Energy. TC 8 has taken a position of coordinator of the development of Generic Use Cases in collaboration with the relevant TCs (activity transferred to SyC Smart Energy in 2015), and should keep a close contact and observe the major market developments in the different Use Case areas. Smart Grids require such an analytic approach in order to identify gaps and necessities for standardization. The object and scope of TC8 deals with general aspects of electricity supply and this influence many stakeholders. For this reason, several Technical Committees and international organizations have been requested to participate in TC 8 work.

This cooperation has been reinforced due to the growing complexity of the power system, with particular attention to projects in new IEC TCs or SyCs such as PC 118, TC 120, SyC Smart Energy, TC 57 as well as ICT sector standardization bodies.

TC8 cooperates with Technical Committees such as TC 13, TC14, TC17, TC38, TC57, TC59, TC64, TC69, SC77A, TC82, TC88, TC95, TC99, TC114, TC115, TC120, TC122, SyC Smart Energy, SyC LVDC and new TC 123 on Management of Assets to ensure technical feasibility and implementation of its system level requirements.

TC8 contributes to System Committees actions, especially Smart Energy and LVDC, by supporting

the development of (Generic) Use Cases and by closing identified gaps within its scope.

G. CONFORMITY ASSESSMENT

TC8 currently doesn't have standards directly used by IEC CA Systems. Projects, e.g. projects on interconnection with the grid, might generate need for conformity assessment requirements in future, in relation with Grid Codes.

H. 3-5 YEAR PROJECTED STRATEGIC OBJECTIVES, ACTIONS, TARGET DATES

STRATEGIC OBJECTIVES 3-5 YEARS	ACTIONS TO SUPPORT THE STRATEGIC OBJECTIVES	TARGET DATE(S) TO COMPLETE THE ACTIONS
TC8		
To develop and keep up to date the terms and definition of International Electrotechnical Vocabulary	WG 1 will contribute to the amendments of chapters of the IEC dealing with electricity supply system, namely 601-605 and 617	2017
To deliver guidelines on network planning and operation, taking into account new challenges from deregulated electrical market and new actors on the network.	WG 7 will develop technical specifications for: <ul style="list-style-type: none"> - general planning and design of microgrids; - technical requirements for operation and control of microgrids - Technical Requirements - Protection requirements in microgrids Cooperation with IEC SEG 6 is recommended.	2017
To develop requirements for the connection of distributed generation and standards permitting to demonstrate compliance with them. To provide inputs on Smart Grid development to SyC Smart Energy and other TCs	PT 62786 will work on the standardization of technical aspects for distributed energy resources (DER) interconnection with the grid. In its activity, PT62786 has to duly take into consideration the practices of the different Countries and it has to be bound by laws and standards already developed driven by local Regulators, Authorities and Governments. As most of distributed energy resources are RE generators, coordination	2017

	with SC 8A is necessary.	
To maintain major reference standards (IEC 60038, IEC 60059 and IEC 60196) and technical specifications (TS 62749)	<p>MT 1 will review IEC 60038 and add a part dealing with LVDC voltages for supply systems in coordination with IEC SEG4</p> <p>MT 2 will maintain the TS62749 by collecting information from different region of the world and cooperate with IEC SC 77A for improving the consistency of power quality vs. compatibility levels.</p>	2018
To define a general framework and procedures for maintenance of electrical energy supply networks	WG 8 will work on TS 63060	2017
SC8A		
SC8A: To develop a standard framework for grid integration of RE generation;	<p>SC8A has to initiate its activity by:</p> <ul style="list-style-type: none"> - collecting and summarizing the common market needs on international standards for grid integration of large-capacity RE generation; - collecting information from regulatory context in different countries, e.g. network codes, renewable policies, and identify relevant issues for standardization; - developing definitions relating to grid integration of RE in coordination with TC8/WG1 ; - AHG 3 will work out a roadmap for the development of IEC standards concerning grid integration of large- capacity RE generation; Experts from relevant TCs (e.g. TC 88, TC 82, TC 120) will be invited to join AHG 3. 	2017

	Future projects might cover the development of a TR of offshore wind power grid integration.	
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