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TC title: Technical Committee n° 13: Electrical Energy Measurement and Control

A. Background

CLC/TC 13 was established in the 1990's in view of preparing the necessary standards framework of electrical metering equipments in the context of European Directives and Mandates based on IEC Standards.

Electricity measurement and control equipment is used in power stations, along the transmission, distribution and supply network, and at industrial, commercial and residential customers. Metering systems provide data for various purposes including but not limited to billing, market and network operation, energy management, and customer information.

CLC/TC 13 is composed of Experts representing the System Operators, Utilities, Regulators and technical designers, vendors or integrators. Liaisons have been established with CEN/TC 294, CLC/TC 205 and ETSI/TC oneM2M and formal partnerships or co-operations have been agreed with several partners such as EURELECTRIC, ESMIG, OIML and DLMS UA.

CLC/TC 13 and IEC/TC 13 are working in close cooperation on main technical subjects.

CLC TC13 works to support relevant EU Directives such as the Measuring Instruments Directive (2014/32/EU), EMC Directive (2014/30/EU), and the EC Mandate M/441 on Smart Metering coordinated by the CEN-CLC-ETSI Coordination Group for Smart Meters (CG-SM). Two working groups have been established:

- WG 01: Electricity meters for active energy of class A, B and C in support of the MID
- WG 02: Data models and protocols for additional functionality of and data exchange in interoperable multi-utility smart metering systems. As Mandate M/441 has been officially closed and WG02 has achieved its goals to develop and publish the Technical Specifications in the framework of Mandate M/441 it has been decided during the plenary of May 16th 2019 to disband this Working Group.

B. Business Environment

B.1. General

The metering industry is going through fundamental changes. Driven by smart metering and smart grid initiatives, metering has changed to become a fast moving sector. Smart metering is essential to create smart grids.

*Liberalizatio*n of the electrical energy markets has broken up monopolies and introduced competition to varying degrees in all activities. Many customers worldwide and in particular in Europe should now be able to choose their energy and service providers taking the best offers available. Many customers also have the opportunity to generate locally and use or sell this energy. Such customers are also known as “prosumers”, from the combination of the words *producer* and *consumer*.

With *globalisation*, many utilities, meter manufacturers and metering system providers operate on a global level. This leads – to a certain extent – to harmonized requirements, global procurement processes and price equalisation. Open standards guaranteeing interoperability become essential.

Sustainable electricity supply, protection of the environment, energy efficiency, energy saving, and the integration of renewable energy resources became top political and business priorities: smart metering and smart grid projects have been started throughout the world. Smart metering also encompasses now non-electricity metering.

To operate energy markets and assets efficiently in this new and dynamic environment, and to facilitate using energy efficiently, more data is needed, more often, by more stakeholders. Data security and privacy of personal data become essential requirements.

In addition to these main trends, requirements for metering systems are deeply affected by legislation and regulation – generally on regional or national level.

To meet new needs, simple kWh meters, time switches and ripple control receivers are being massively replaced by multi-function, communicating “smart” meters that provide export/import energy-, demand- and power quality measurement, load management, local generation management, customer information, customer and contract management and other value added functions.

Metering data must be accurate, traceable and auditable. Smart meters are integrated into metering systems that exchange data with other systems, in support of a range of business processes. They may interface with smart grids as well as with home and building electronic systems and EV charging systems.

The number of electricity meters in operation worldwide in 2018 is estimated to be 1.67 billion – and a large proportion will continue to be replaced in the next 8-10 years by smart meters. The installed base of electricity meters in Europe is estimated to be 232 million and by 2020, around 70 % has to be replaced by smart meters. In 2022, almost 100% ot the meters in Europe should be smart meters. In 2018, 101 million of them were already installed.

NOTE: It is not the intention of this report to judge these forecasts or to quantify the growth.

The market growth and the regional demand for metering equipment and systems is determined by factors like population, housing, industrial development, electrification and meter replacement programs. It is expected that due to these factors, and, in particular, due to large smart meter roll-outs as well as due to a shorter useful life (compared to electromechanical meters), the annual demand for meters and systems will grow, while large fluctuations may occur.

The European Commission published its Clean Energy Package in 2019 with requirements to cut emissions through greater use of renewables and more efficient use of energy. There is greater emphasis on smart meters and on better use of data to help consumers to better manage their consumption. Requirements for more sophisticated metering will drive the market for the next ten years.

B.2. Market demand

The customers of IEC/ or CLC/ TC 13 standards are manufacturers, system providers, electricity generation, trading, transmission, distribution and supply companies, meter operators, meter data agents, legal metrology bodies, testing institutes and end customers. These stakeholders need standards that cover all aspects of metering equipment and systems and facilitate their global trading, while taking into account differences in the operating environment and electrical infrastructure.

Many IEC/TC 13 standards are globally recognized and used.

In Europe, through the IEC/CENELEC cooperation agreement, they are generally adopted as European Standards (and named EN IEC 6XXXX). A joint cooperation between CENELEC and Japan continues to be supported with the aim of creating a bigger market for devices meeting CENELEC standards. To support the specific requirements of the European Measuring Instruments Directive (MID) for active electrical energy meters, CENELEC/TC 13 has developed “home grown” product standards: the EN 50470 series. These are strongly based on the IEC 62052 and 62053 series. This work will continue within the new framework of the Mandate M/541.

For addressing the standardization gap in the frequency range 2-150 kHz the CLC/TR 50579 *Electricity metering equipment (a.c.) - Severity levels, immunity requirements and test methods for conducted disturbances in the frequency range 2 kHz - 150 kHz* has been developed. Also some compatibility levels have been defined in the new amendments to IEC 61000-2-2 ED2, published by IEC SC 77A.

To fulfil the European Smart Metering Standardization Mandate M/441, technical specifications for data exchange in Smart Metering systems have also been developed by CLC/TC 13 in close co-operation with IEC/TC 13 and the other European Standardization Organizations CEN/TC 294, CLC/TC 205 and ETSI/TC oneM2M.

B.3. Trends in technology

Integration of new technologies into metering and control equipment in areas of electronics, information technology and communications has provided extra functionality and new features. These new technologies may affect the way requirements and test methods are specified. The most important trends are the following:

- extensive use of electronic technologies such as digital signal processing, mixed signal circuits and firmware. To keep the functionality up-to-date, firmware may have to be updated during the life of the product. This may be subject to legal metrology control;
- higher maximum currents and the more general presence of supply / load control switches fitted in meters or controlled by them;
- integration of local energy generation systems;
- new architectures, in particular modular and multi-part metering systems, with the various functions implemented in more than one physical device;
- new kind of instrument transformer with low voltage analogue and digital interfaces;
- new communication technologies;
- advanced cryptographic technologies;
- changes in network conditions and EMC environments due to the growing use of non-linear loads, power line and radio communications with better protection needed against undue influences.

B.4. Market trends

In addition to those described in Section B.1, the following factors are important:

- changes in the life cycle management of metering equipment;
- opening of the market by abolishing trade barriers;
- involvement of communication and business data management companies in metering;

B.5. Ecological environment

Smart meters play an important role in informing customers and raising their awareness of energy use. Therefore they contribute to the efficient and economical use of natural resources.

As meters are continuously powered, low self-consumption is also important. Low operating temperature of the meter is also an important factor in meter life expectancy.

Electricity meters are expected to work continuously over extended periods with no or little human intervention. They are installed all along the electrical network, in widely differing environments. Therefore, they have to meet strict requirements covering mechanical, electrical, climatic, environmental and safety to perform as specified in any of these environments.

Traditional electromechanical designs use non-hazardous materials and with life spans of several decades, safe disposal of decommissioned meters is not generally an issue. Electronic meters may have shorter life cycles due to functional obsolescence, and some types may contain batteries and other hazardous materials. Therefore, this aspect may become more important in the future as smart meters are withdrawn from service.

B.6. Involvement of societal stakeholders

The introduction of smart metering systems and their mass rollout in the EU Member States has and will have a significant impact in the daily life of the consumers, citizens and on the environment. Therefore, it is crucial that the societal stakeholders are involved in the standardization process so that they can influence according to their needs.

Generally, the national technical committees are open to the relevant stakeholders. On TC level, CLC/TC 13 has granted the permanent observership to ECOS, the European Environmental Citizens Organisation for Standardisation.

ANEC, the European consumer voice in standardization (European Association for the Co-ordination of Consumer Representation in Standardisation), is one of the stakeholders of the CEN-CLC-ETSI Smart Meters Coordination Group, originally established to coordinate the standardization work within the framework of the Smart Metering Mandate M/441.

B.7. Involvement of SMEs (Small and Medium-sized Enterprises)

The big utilities, larger manufacturers and system providers mainly drive standardization in the field of Electrical Energy Measurement and Control. The opening of the energy market in Europe and the introduction of smart metering systems attracted new companies coming from the SME segment for offering system components, software solutions and customers services for metering. However, there remains a low number of experts representing SMEs within CLC/TC 13.

C. System approach aspects

A system approach becomes more relevant for CLC/TC 13 as smart metering is an essential part of smart grids. In the context of the European Smart Meter Mandate M/441, CLC/TC 13 is one of the coordinating Technical Committees and as such is a member of the Coordination Group for Smart Meters. The CG-SM was originally established to track the mandated standardization work under M/441 but its terms of reference were extended to cover developments in cyber security related to smart meters and new requirements arising from the 2018 Clean Energy Package. The liaisons established under M/441 have been maintained:

- CLC/TC 205, to address the data exchange with Home and Building Electronic Systems (HBES);
- CEN/TC 294, to address the remote reading of all kind of mostly battery operated meters, like water, gas, heat, heat cost allocators and electricity meters;
- ETSI/TC M2M, to address the data exchange for the G2 interface in the M/441 reference architecture.

For the cooperation with Technical Committees on IEC level, formal liaisons exist between IEC/TC 13 and:

- TC 8, to address issues on system aspects of electrical energy supply, and in particular to work on use cases for smart metering;
- TC 38, to address the impact of new instrument transformers with low voltage analogue and digital interfaces;
- TC 57, to address data exchange between systems, to harmonize data models and protocols;
- TC 69, to address data exchange between charging stations and electric vehicles and measurement of electrical energy;
- SC 77A and CISPR to address EMC low frequency phenomena; and
- TC 85, to follow specifications for power quality functions of meters and metering functions for network analysers.

Technical Liaison Partnerships have been agreed with:

- the DLMS User Association, for the development of communication standards supporting the DLMS/COSEM data model and the maintenance of EN 62056 standards series;
- Meters & More Association, for the development of communication standards and communication profile;
- OSGP Alliance, for the development of communication standards based on the Open Smart Grid Protocol and communication profile;

Observer Status has been granted by CLC/TC 13 to:

- ECOS, the European Environmental Citizens Organisation for Standardisation;
- Digitaleurope, representing the digital technology industry in Europe including IT, Telecommunication and consumer electronics companies and national associations;
- ENTSO-E, the European Network of Transmission System Operators for Electricity

Furthermore, CLC/TC 13 will maintain the external liaisons with WELMEC, EURELECTRIC, and OIML.

D. Objectives and strategies (3 to 5 years)

Maintain CLC/TC 13 EN standards anticipating changes in market requirements, technology and environment, without sacrificing the necessary stability to achieve quality and interoperability. CLC/TC 13 standards also continues to support the roll-out of the new MID in response to the M/541.

> The CLC/TC 13 standards are developed in close collaboration with IEC/TC 13. In particular, CLC/TC 13 is committed to avoid any conflicts between IEC and CENELEC standards. It is also planned to remove CENELEC standards once equivalent IEC standards are harmonized. Deviations to IEC standards are only considered if they are required for harmonization with European directives.

Work closely with the EC in its review of the Low Voltage Directive with the objective of removing the clause in Annex II which excludes electricity meters. This will remove the ambiguity that presently exists whereby smart meters fitted with radios are covered by the LVD via the RED but meters without radios fitted are not.

Partnering with industry players, promote the use of EN standards, in particular the use of open standards for meter data exchange guaranteeing interoperability.

E. Action plan

WG 01 will maintain the EN 50470 Series and the European aspects of relevant IEC TC13 metrology standards and support the EMC standardisation activities of other TCs to ensure immunity of electricity meters.

New standardization requests of the Commission to the ESOs in support of the MID and the EMCD, currently still in the draft stage, will have to be addressed by CLC/TC13 as far as electricity meters are concerned.

WG01 will review actions arising from the 2018 Clean Energy Package for any aspects that may affect metrology standards.

F. Useful links to CENELEC web site

CLC/TC 13 home page gives access to Membership, TC/SC Officers, Scope, Liaisons, WG/MT/PT structure, Publications issued along with their Stability Dates, Work Program.

John Cowburn, CLC/TC 13 Chairman

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