[Document reference]

BUSINESS PLAN

CENELEC/TC or SC	Secretariat	Date
CLC/TC45AX	France	2018-01-10

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TC or SC title: Instrumentation, control and electrical power systems of nuclear facilities

A Background

A.1 Europe relies on nuclear energy for its present and its future

As of November 2016 there is a total of 186 nuclear power plant units with an installed electric net capacity of 163,685 MWe in operation in Europe (five there of in the Asian part of the Russian Federation) and 15 units with an electric net capacity 13.696 MWe were under construction in six countries even if after the March 2011 Fukushima events some European countries decided to shutdown their old NPRs and took the path of disengagement from nuclear energy.

For the 21st century energy will remain for Europe one of the major issues to face[1]. Nuclear energy, as the largest single source of carbon-free and base load electricity in Europe has a key role to play in solving European energy problems. At the same time, a realistic assessment of its potential cannot ignore the essential question of its public acceptance. Long-term sustainability, safety of operation and safe management of waste all types influence the general publics' perception of nuclear as a viable energy source[2] .

Safety of operation of nuclear power plants relies on instrumentation and control (I&C) and electrical power systems, which together with plant operations personnel, serves as the 'central nervous system' of a nuclear power plant[3].

A.2 IEC/SC45A develops International Standards for nuclear power facilities' instrumentation, control and electrical power systems since the 60's

IEC/SC45A (International Electrotechnical Commission, Sub-Committee 45A (Instrumentation, control and electrical systems of nuclear facilities), established in 1963, prepares standards applicable to the electronic and electrical functions and associated systems and equipment used in the instrumentation, control and electrical power systems of nuclear energy generation facilities (Nuclear Power Plants, fuel handling and processing plants, interim and final repositories for spent fuel and nuclear waste) to improve the efficiency, safety and security of nuclear energy generation. Those standards cover the entire lifecycle of these I&C and electrical power systems, from conception, through design, manufacture, test, installation, commissioning, operation, maintenance, aging management, modernization and decommissioning. In this context, one of the IEC/SC45A strategic tasks is to review and comment on drafts of IAEA (International Atomic Energy Agency) safety and security code in order to maintain consistency between IAEA and IEC documents and identify detailed technical aspects for which IEC standard developments are appropriate and responsive to the market needs.

IEC/SC45A liaises and collaborates at international level with different organizations: IAEA, OECD/NEA (Nuclear Energy Agency of the Organization for Economic Co-operation and Development), IEEE/NPEC (Nuclear Power Engineering Committee of the Institute of Electrical and Electronics Engineers).

IEC/SC45A portfolio comprises 73 published standards, more information on this committee, those sub committees and the documents they published are to found on the IEC website.

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[1] World Energy Council, « The role of nuclear power in Europe »
[2] SNETP vision report, Foreword, Janez Potocnik, Commissioner for science and research
[3] IAEA Nuclear Energy Series, N° NP-T3.12 « Core knowledge on instrumentation and control systems in nuclear power plants »

A.3 CLC/TC45AX expert community paved the way for nuclear standardization in Europe

From the early 60's till end of the 90's no European nuclear standard was published, the European standardization system being de facto aligned on the European legal situation framed by the 1957 Rome Treaty according to which nuclear safety of NPP was outside the European competences, as opposed to radiation protection for workers.

In 2000, the situation changed. Some projects were launched at the Commission level ; WENRA (Western European Nuclear Regulator Association) started its activities. A debate was launched between the representatives of the European National Committees taking part to IEC/SC45A activities to envisage the possibility to produce European standards related to safety of NPPs. The debate concluded that development of European standards related to safety of NPPs was premature, but it opened the door for the development of standards related to radioprotection for workers using published IEC/SC45B (International Electrotechnical Commission, Sub-Committee 45B (Radioprotection instrumentation) standards.

In 2002, the European Court of Justice (ECJ) clarified in Case 29/99 that the Community shares competences with Member States in respect of nuclear safety as well as radiation protection.

In 2007 WENRA published its Safety Reference Levels, and the publication of that document launched again in IEC/SC45A the debate between the representatives of the European National Committees, on the possibility of development of European standards related to safety of NPPs. A survey was ordered by the CENELEC on the use and penetration of IEC/SC45A standards in Europe and on the basis of that report CENELEC BT decided in 2007 to activate CLC/TC45AX (CENELEC Technical Committee 45AX (Instrumentation and control of nuclear facilities)) and CLC/TC45B (Radioprotection instrumentation) to produce EN standards by adoption of IEC standards on their respective domains.

In 2009, in the Council Directives 2009/71/EURATOM, the IAEA and WENRA documents were recognized.

In 2009/2010, WENRA issued documents concerning "Safety Objectives for New Power Plants".

In 2012, the CEN/CENELEC focus group on nuclear energy recommended for the ISO TC85 & SC's establishment of a process of adoption of its exiting and forthcoming standards functionally similar to the CLC/TC45AX one, namely after having confirmation that the IEC/ISO candidate standards were approved at the IEC/ISO final stage of development by the majority of the European national committees entitled to vote and that no European national committee raised significant concerns for the application of these IEC/ISO standards in the European countries.

As of December 2017, CLC/TC45AX published 21 EN standards which correspond to non modified IEC/SC45A standards; those standards being consistent and coherent with the IAEA safety and security principles and terminology.

B Business Environment

B.1 General

The market environment of nuclear energy is currently changing due to new demands for energy connected to the development of the economy of fast growing countries (China, India, Brazil), the increased perception of the climate change, the increase in prices of oil and natural gas and high uncertainties about the availability of future resources in a small number of countries generating geopolitical risks and the deregulation of the electricity market in many countries.

In this context, nuclear power shows important advantages, but it also has its own handicaps. It requires controlling nuclear safety and security, the issues of non proliferation, and the guarantee of the access to the resources, (enriched uranium and nuclear fuel), the issues of environmental protection and this requires thinking the future development of the nuclear energy in view of the principles of transparency and sustainable development.

Currently the international market shows a strong demand of nuclear power production capacity, leading to new orders of reactors, and to new programs to increase capacity, increase life cycle, increase of the safety level or to increase the availability rate of the reactors in operation.

Simultaneously, in particular due to the Fukushima events, programs are developing on decommissioning and demolition of first generation reactors and remediation of nuclear sites, as well as waste and spent fuel management facilities.

B.2 Market demand

Even if the I&C and electrical power system market demand for nuclear power plants is directly linked to a strong demand for new nuclear power production capacity or for the renovation of existing ones, the size of the demand of this specific market is very small compared to the size of the industrial I&C and electrical power system market, not speaking of general public electrical appliance market.

B.3 Trends in technology

Nowadays, electronics and programmable components are embedded in nearly all devices available on the market and the I&C and electrical power system designers have no other choice than to use them.

The level of complexity of those electronics and programmable components represents a real challenge for their users to understand their behaviour in order to justify properties of systems integrating them in particular in term of dependability, reliability and security which necessary to achieve the safety and security goals.

B.4 Market trends

Due to the fact that I&C and electrical power systems used in nuclear power plants have specific ways (objective of simplicity in design, deterministic or predicable behaviour, evidence concerning of the absence of error) to take into account issues related to safety and security the nuclear I&C and electrical power system market is a niche market, even if there are some attempts to use industrial I&C and electrical power system complying with non nuclear safety standards.

The nuclear I&C and electrical power system market demand is now global and is demanding for standards recognized and interpreted globally by industry actors but also by regulators.

B.5 Ecological environment

As I&C and electrical power systems are used in nuclear power plant to control safety and security those systems are de facto related to the protection of the ecological environment.

B.6 Involvement of societal stakeholders

Concerning nuclear safety concerns and particularly the protection of the environment and of the people, every country is completely responsible for the nuclear safety, security and radiological protection of its citizens on its domestic territory. National regulations can thus introduce specific requirements, which have strong implications in the national codes and standards and may create obstacle to the creation of a global and efficient international market and standards. It is the national safety authorities and their technical support organizations that are in charge of the responsibility to protect their environment and their people. They have the necessary technical understanding of the topic to take actively part to the IEC/SC45A and CLC/TC45AX debates which are only technical in their National Committees and in the related international and European meetings, representing their government and their people.

Concerning public acceptance, transparency and commitment of stakeholders, the development of the production and the use of IEC and CENELEC standards should contribute to provide public confidence, which is a vital necessity for the future development of nuclear energy and other nuclear activities, the transparency of the IEC and CENELEC process offers the public the opportunity to act as a stakeholder or an interested party; The IEC and CENELEC process offers the guarantee of an international and an European consensus.

B.7 Involvement of SMEs

The suppliers of I&C and electrical power systems used in nuclear power plants are usually global companies involved in nuclear industry and in the nuclear power plant market since decades, nowadays this market is in transition to become a more competitive global market, with a very small number of vendors which is even reducing; moreover the interaction with policies of preservation or creation of a national technology in some countries creates a very complex situation.

It seems difficult SMEs directly access the market of I&C and electrical power systems used in nuclear power plants due to the complexity of the situation described previously, the reducing number of suppliers, the processes related to nuclear safety which are very specific and require an important investment to enter the market and also because due to odds at stake often experience in nuclear safety or in similar domain is required to enter the market.

C System approach aspects

The nuclear industry market being global, it is important the CLC/TC45AX standards are as global as possible, namely adopted non modified IEC/SC45A standards approved at the IEC final stage of development by all the European national committees entitled to vote and that no European national committee raised significant concerns for the application of these IEC/SC45A standards.

Concerning the selection of the IEC/SC45A standards to be adopted, the advantage to have a complete but limited, consistent and up-to-date set of European standards to cost efficiently frame the domain was identified when CLC/TC45AX was activated in 2007. In order to reach that efficiency goal, CLC/TC45AX chooses to limit the number of adoptable standards without modification, considering as candidate systematically only level 1 and 2 standards[4] and considering on a case by case basis level 3 standards. CLC/TC45AX does not consider level 4 documents for adoption.

D Objectives and strategies (3 to 5 years)

The adoption without modification of nearly all level 1 and 2 published IEC/SC45A standards according to the CLC/TC45AX rules of selection is completed.

New or revised level 1 and 2 IEC/SC45A standards to be published will have to be considered for adoption as soon as available in the IEC routinely.

Deployment of CLC/TC45AX standards in Europe and in the neighbourhood of Europe is the first priority CLC/TC45AX task and an efficient means for that is the collaboration with the European Commission in particular JRC, DG ENER.

Development of the harmonized use and interpretation of CLC/TC45AX standards in the different European countries involving for that all the industrial stakeholders (suppliers and operators) but also regulators (Safety Authorities and Technical Support Organizations).

E Action plan

Meet annually to review the actions launched and the results obtained in terms of maintenance of the collection of the adopted IEC/SC45A standards but also in terms of deployment of CLC/TC45AX standards in Europe.

Pursue and develop the collaboration with European Commission in particular JRC and DG ENER to achieve the deployment and the harmonized interpretation and use of CLC/TC45AX standards in Europe.

Collaborate with ISO/TC85 and CEN/TC430 to develop working synergies at European level.

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[4] IEC/SC45A standard series is structured in 4 levels. The top-level documents of the IEC SC45A standard series are IEC 61513 and IEC 63046, the entry points of the series which provides general requirements respectively for I&C systems and electrical power systems that are used to perform functions important to safety in NPPs.

IEC 61513 and IEC 63046 refers directly to other IEC SC45A standards for general topics related to categorization of functions and classification of systems, qualification, separation of systems, defence against common cause failure, software aspects of computer-based systems, hardware aspects of computer-based systems, control rooms and electrical power systems design. The standards referenced directly at this second level should be considered together with IEC 61513 and IEC 63046 as a consistent document set.

At a third level, IEC SC45A standards not directly referenced by IEC 61513 and IEC 63046 are standards related to specific equipment, technical methods, or specific activities. Usually these documents, which make reference to second-level documents for general topics, can be used on their own.

A fourth level extending the IEC SC45 standard series, corresponds to the Technical Reports which are not normative.

F Useful links to CENELEC web site

TC home page giving access to Membership, TC/SC Officers, Scope, Publications, Work programme
https://www.cenelec.eu/dyn/www/f?p=104:7:1493333398622601::::FSP_ORG_ID,FSP_LANG_ID:1258679,25

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