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IEC presentation by Richard Schomberg, Chairman IEC Smart Grid Strategic Group

1. What is the IEC and what role did it play in the development of the five foundational Smart Grid Standards recommended by NIST?
2. Describe the process for the development of this particular group of IEC Standards
3. Provide a brief background on the role of SDOs like the IEC in developing Smart Grid standards
4. Explain why standards are living documents that will continue to evolve
5. What do you see as the future work needed to develop standards?

1. About the IEC

The IEC (International Electrotechnical Commission) was founded in 1906 to establish common international terms and measurements. In the century since then, it has become the pre-eminent international standard-setter for electrical, electronic and related technologies commonly known as “electrotechnology”. IEC involvement in standardization for power generation, transmission and distribution goes back to the very beginning of its existence and has evolved over the years as new technologies became available. Within this context the IEC has published hundreds of standards, of which close to 100 have been identified to have the most direct impact on the development of Smart Grids.

The IEC:

- Is one of three International Standard Development Bodies (ISDOs) - the other two are ISO and ITU - that develop globally relevant voluntary, consensus-based international standards.
- Includes 162 countries – 81 members and 81 affiliates that are representative of all developed economies and a large majority of developing nations.
- Provides a global platform where close to 10 000 experts from industry, government and end-users discuss, agree and prepare standards that are needed to enable international trade, interoperability, safety, efficiency and reliability of systems and products. Those experts represent the electrotechnical interests of their respective IEC member country.
- Has an official working liaison with NIST (bi-annual systematic cross review of work plans, and process for analysis of targeted needs).
- Closely cooperates with professional SDOs (Standard Development Bodies) in the USA, including IEEE, ASTM, SAE, IPC, IEIA, JEDEC, AAMI, and many more on an international level. Whenever useful, the IEC brings globally relevant de-facto industry standards into the international consensus-based process to adopt them as IEC International Standards.
- Head office: Geneva/Switzerland, USA regional office: Boston
- IEC US National Committee (US NC) sits within ANSI. The US NC participates actively in 157 Technical Committees and Subcommittees (TCs and SCs) out of a total of 179. The USA is one of the founding members of the IEC. The actual idea to create the IEC was launched at the St. Louis Worlds Fair in 1904.

Consensus-based, voluntary standards

International Standard Development Bodies like the IEC, ISO and ITU publish so called consensus-based, voluntary standards. This means that standards developed through this process meet with the approval of a majority or sometimes all participating member countries. They represent a common point of view of all concerned parties. Participation in

the standard-setting process and the acceptance of the standards that result of the process are always voluntary.

In the IEC, each country's national electrotechnical interests are represented by the National Committee (NC). In each member country hundreds of experts are involved in the national standardization process and designate delegates that represent their interests and needs in the international standardization process. In the IEC, each member country can cast a single vote to approve, modify or reject a given standard.

Standards built via this process are widely used and accepted in all developed and most developing countries. The resulting harmonization of technical rules has increased international competition and innovation, produced important efficiency gains, and enabled international trade, opening up the global market. IEC International Standards provide the WTO with an important reference for their TBT (Technical Barriers to Trade) Agreement. They are an important business tool for manufacturers and serve as a basis for conformity assessment.

The value of IEC Standards results directly from the strength of its bylaws, the effective and balanced representation of the industry, and the traceability on how consensus is built. The IEC directives provide straightforward [rules to follow](#). The IEC Central Office headquartered in Geneva supervises compliance.

2. IEC “foundational” Smart Grid Standards

The five core IEC Smart Grid families of Standards that have been recommended by NIST for US Smart Grid projects, are universally considered to be fundamental to any Smart Grid project. They have also been referenced in Smart Grid roadmaps published in several countries around the world, including the USA, Germany, and China.

These standards are essential to achieving homogeneous communication systems that interoperate seamlessly. They also minimize the need for costly gateways and adapters that increase complexity and risk. They are already widely used in the industry by integrators (IEC CIM) and by manufacturers (IEC 61850), and in some cases are advertised as a competitive advantage.

All of these IEC “foundational” Smart Grid Standards have been developed by TC (Technical Committee) 57: Power systems management and associated information exchange, according to strict protocols that are summarized in IEC/TR 62357 *Reference architecture for object models, services and protocols pertaining to Power system control and associated communications*. They have been reviewed in great detail in [the IEC roadmap for Smart Grid Standards](#).

28 countries participate actively (right to vote) in IEC TC 57 and an additional 16 nations have observer status.

3. The role of the IEC in developing Smart Grid standards

The IEC has been working in the power sector for many decades, and the breath of its work thoroughly impacts what we call today the Smart Grid. Over the last century, the IEC has become one of the most internationally trusted sources of standards for the energy sector.

The 100 published suites of technical Standards that have been developed by 24 TCs have been grouped in the IEC Smart Grid Roadmap and are ready for use by industry and utilities.

With them, the IEC offers the broadest portfolio of technical Smart Grid Standards. Gaps are currently being filled by bringing the best standards from other organizations into the consensus-based process via fast-track adoption.

Today, any given Smart Grid project will require the simultaneous use of many standards. Most of these standards were not written at the same time with a view to making them fit together. However, increasingly those standards will need to be integrated into a systems approach. In the meantime, the mere fact that all IEC International Standards are built and updated according to the same stringent protocols provides the reassurance that they will evolve in a predictable way and retain their robustness in the long run.

Today the IEC is closely involved in the development of Smart Grid projects in 15 countries around the globe.

4. Standards are continuously enhanced

All IEC Standards are subject to systematic, regular review and maintenance following the processes described in the directives. The length of each maintenance cycle depends on the maturity of the technology and industry needs. While each standard receives a so called “stability date”, which indicates the next scheduled review, those cycles can be altered when deemed necessary.

The Smart Grid will be in never ending evolution and therefore needs strong standards that adapt, grow and endure for many years. Depending on what they refer to in the Smart Grid, standards might need to evolve faster or slower.

The five IEC Standards recommended by NIST are amongst the most mature of the IEC portfolio. These standards deal with aspects of interoperability largely technology independent. For this reason they are able to accommodate the evolution of the grid and the integration of new technologies.

5. What the future holds

The IEC is undertaking the following efforts to maintain and improve the usability, consistency and strength of its Smart Grid Standards:

1. Smart Grid standards, as complex as they are, have to become easier to use.

Until now mostly standards experts were able to determine on a project by project basis, which standards would be needed for a given part of the grid. The IEC is preparing a [mapping solution](#) that will allow any Smart Grid professional to work with standards. This tool will assist them in drawing the right conclusions, every time. It will allow to position any given standard in relation to its role in the Smart Grid and extract commonalities, differences and interactions with other standards. This approach will also allow SDOs to better identify gaps and overlaps in the existing portfolio of standards.

2. Structures and processes need to be put in place to allow conformity assessment to verify if standards have been properly implemented in the Smart Grid.

ANNEX:

Suite of Standards - description	Number	First publication	Next revision
Telecontrol equipment and systems <i>Facilitate exchanges of information between control centres.</i>	IEC 60870 consists of 37 parts	between 1988 and 2007	2012
Substation Automation <i>Communication networks and systems in substation</i> Facilitates substation automation, communication and interoperability through a common data format.	IEC 61850 consists of 18 parts	between 2002 and 2010	between 2010 and 2015
Common Information Model (CIM) / Energy Management <i>Energy management system application program interface (transmission)</i>	IEC 61970 consists of 11 parts	between 2004 and 2009	between 2010 and 2012
Common Information Model (CIM) / Distribution Management <i>Application integration at electric utilities - System interfaces for distribution management</i>	IEC 61968 consists of 7 parts	between 2003 and 2010	between 2010 and 2012
Security <i>Power systems management and associated information exchange - Data and communications security</i> Addresses the cyber security of the communication protocols defined by the preceding IEC standards.	IEC 62351 consists of 7 parts	between 2005 and 2010	between 2012 and 2013