



INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

Standardization of Relays and Protection In Smart Grid

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■ Smart Grid

➤ Challenges

- As we all know, Smart grid has been a very hot topic in the fields of power system around the world in recent years, it is also the key theme of today's meeting. The development of Smart Grid is mainly coping the coming challenges, such as:
 - To meet the worldwide increasing energy demand
 - To minimize environmental impact, etc.

➤ No clear definition and scope

- It is difficult to accurately define the smart grid and its scope
- Smart Grid may have different meanings to different people

➤ But common understanding

- Optimize the delivery of electricity and achieve an interoperable and secure operation of power system

■ Standardization of Smart Grid

➤ Why need standardization?

- To achieve the goal of interoperability and security, it is necessary to unify the Smart Grid construction and development into a reasonable standard framework

➤ The development of standardization of Smart Grid

- In the autumn of 2008, during IEC General Meeting in Sao Paulo, Brazil, IEC/SMB approved the creation of a Smart Grid Strategic Group-IEC/SMB/SG3
- In June, 2010, IEC/SMB/SG3 issued the first edition IEC Smart Grid standardization RoadMap. Now the second edition is underway
- In 2010 and 2011, IEC/SMB/SG3 organized two workshops
 - To promote the relevant Smart Grid TCs/SCs to accelerate their standardization work
 - To provide greater clarity and specificity of SG3 goals and objectives

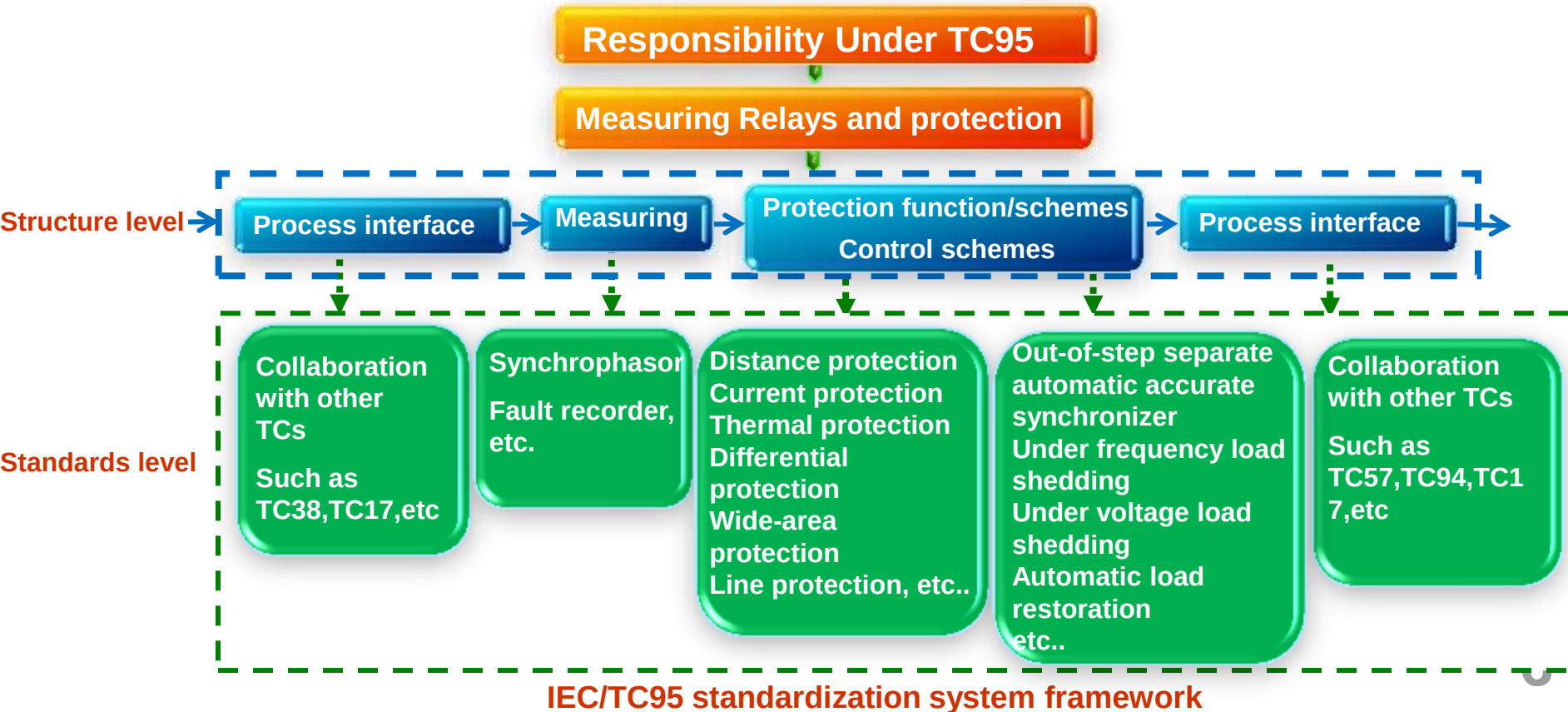
Background

- **The role of IEC/TC95 in Smart Grid standardization framework**
 - **The standardization framework of Smart Grid is a system engineering, very large and complex**
 - All devices or system which are related to Smart Grid have their own Technical Committee to develop the relevant standards
 - **Whatever, as the fundamental functions of Smart Grid, the standards related to monitoring, control and protection are the basis for standards of Smart Grid**
 - Same as the role of TC57, identified as the backbone TC in Smart Grid Standardization framework by IEC/SMB/SG3, being responsible for interoperability of devices and systems connected to Smart Grid
 - TC95 is also identified as the fundamental TC by IEC/SMB/SG3 to be responsible for security of devices and systems in Smart Grid

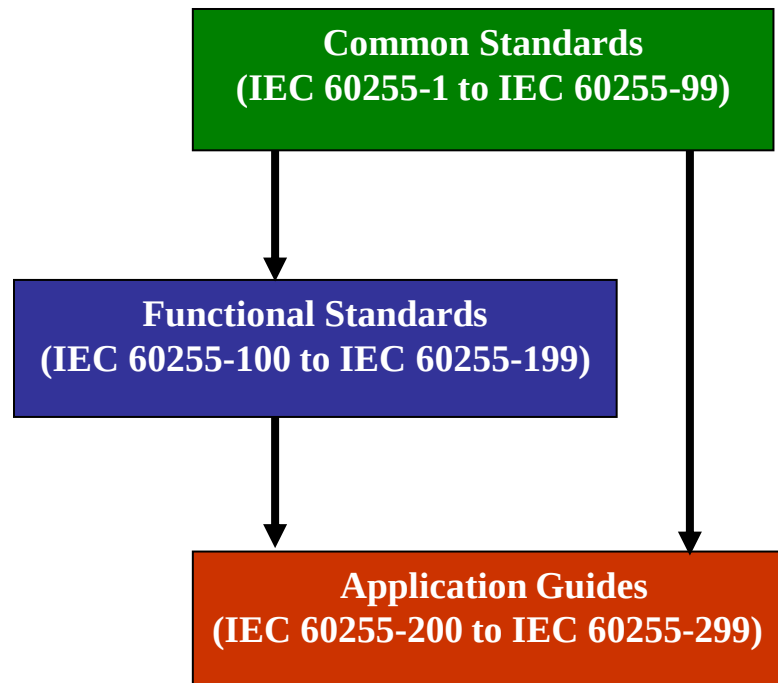
Brief Introduction to TC95

■ The scope:

To prepare international standards for measuring relays and protection equipment used in the various fields of electrical engineering covered by the IEC, taking into account combinations of devices to form schemes for power system protection including the control, monitoring and process interface equipment used with those systems.



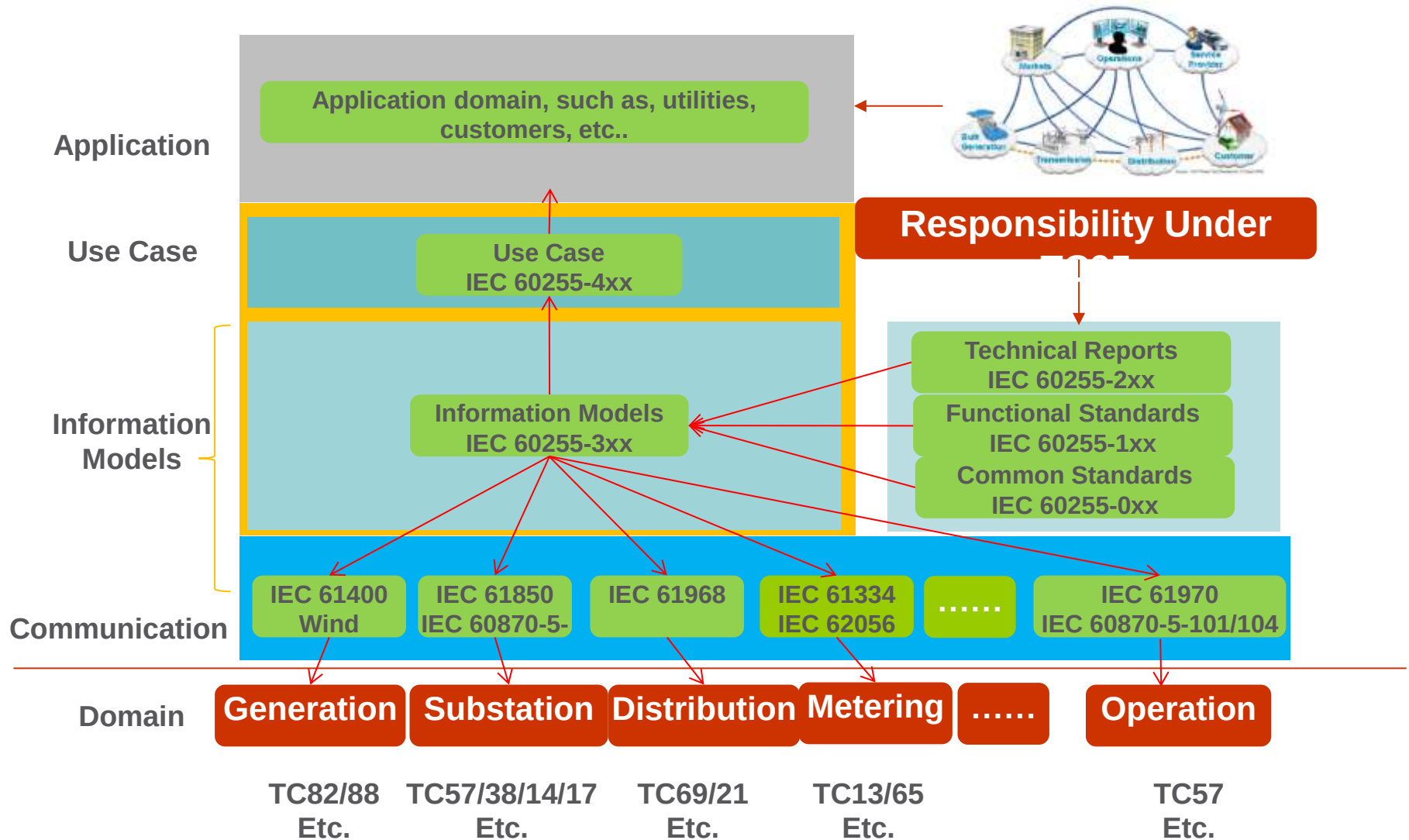
- The Framework of IEC TC95 standards



Brief Introduction to TC95

- The standards falling under the responsibility of TC95 based on the following numbering rules:
 - **Common Standards start with IEC 60255-1 to IEC 60255-99**
 - Which are basic and common requirements for relays and protection: such as insulation, safety, EMC etc.
 - **Protection Functional Standards start with IEC 60255-100 to IEC 60255-199**
 - This part is concerned with the minimum requirements for protection in the terms of functional logic, performance and test method
 - **Technical Reports to provide application guidance start with IEC 60255-200 to IEC 60255-299**
 - The series standards are prepared in the form of technical reports to guide users in application of protection scheme configuration

In the future



■ TC95 membership

- 18 P-Members (including Russia) , 16 O-Members

■ TC95 Liaison

- **Internal IEC:** TC14, TC17, TC8, TC38, TC77, TC57
- **External IEC:** CIGRE/SC B5, CIGRE/SC D2, CIGRE/SC C4, IEEE

■ TC95 Working Group

- **MT1:** Vocabulary and terminology (IEC60050-447)
- **MT2:** EMC Requirements (IEC60255-26)
- **MT3:** General and safety Requirements (e.g.IEC60255-1,IEC60255-27)
- **MT4:** Protection functional standards(IEC60255-187 under developing)
- **JWG1:**IEC/IEEE, Synchrophasor Measurement for power systems (IEC/IEEE 60255-118-1)
- **AHG2:** New protection requirements for the smart grid

■ The achievements we have made

- Up to now, there have been 57 publications developed under the responsibility of TC95 and now, with the development of technology and the market demand, only 13 publications kept by merging, withdrawal
- In the past decades, the standards developed by TC95 have been widely accepted by electricity supply utilities, manufacturers of power system protection and industrial users
- They are normally used at the regional and national level and often used as the basis for contracts. As an example, some TC 95 publications are used to support European directives and as the regulation for product certification

■ Common Standards

- IEC 60255-1, General Requirements (Ed 1.0 2009.08),
 - Replaces the previous IEC 60255-6
- IEC 60255-21-1,2,3, Mechanical Requirements (1988.09, 1988.10, 1993.09)
- IEC 60255-24 COMTRADE (Ed2.0, 2013.04), IEEE C37.111-2013
- IEC 60255-26, EMC Requirements (Ed 3.0 2013.05) , IEC 60255-11,22,25,26 were replaced.
- IEC 60255-27, Safety Requirements (Ed 2.0, 2013.10)
 - Also cover the former IEC 60255-5 (2000.12)
 - Requirements, design and tests to deal with risks of mechanical hurt and fire

■ Functional Standards (Published)

- IEC 60255-151 Current Protection (2009.08)
 - Former IEC 60255-3
- IEC 60255-127 Voltage Protection (2010.04)
 - Former IEC 60255-3
- IEC 60255-149 Thermal Overload Protection (2013.07)
 - Former IEC 60255-8
- IEC 60255-121 Distance Protection (2014.03)
 - Former IEC 60255-16 (1982.01)



Brief Introduction to TC95

■ Functional Standards (Ongoing)

- IEC/IEEE 60255-118-1 Synchrophasor, IEEE C37.118.1
- IEC 60255-187-1 Generator, Motor, Transformer, Reactor Differential Protection
- IEC 60255-187-2 Busbar Differential Protection
- IEC 60255-187-3 Line Differential Protection
- IEC 60255-187-4 High impedance differential relays
 - Former IEC 60255-13 (1980.01)

- **Functional Standards – Function element standard**
 - **Both basic characteristic and additional features**
 - **CT and VT requirements are included.**
 - **SV and GOOSE are covered.**
 - **Both steady-state and dynamic performance are covered.**
 - **Off-nominal frequency**
 - **Harmonics, steady-state and transient.**
 - **Inrush current**
 - **Over-excitation**
 - **Double in-feed**
 - **.....**

■ Functional Standards (Planned)

- IEC-60255-124 V/F
- IEC-60255-125 Synchronizing or sync. check
- IEC-60255-132 Directional power relay
 - Former IEC 60255-12(1980.01)
- IEC-60255-140 Field relay
- IEC-60255-160 Voltage or current balance relay
- IEC-60255-167 ac directional overcurrent relay
- IEC-60255-178 Phase-angle measuring relay
- IEC-60255-179 Reclosing relay
- IEC-60255-181 Frequency relay
- IEC-60255-185 carrier or pilot-wire relay

- **Application Guides (planned)**
 - **IEC 60255-200, Generator Protection**
 - **IEC 60255-201, Motor Protection**
 - **IEC 60255-202, Transformer Protection**
 - **IEC 60255-203, Reactor Protection**
 - **IEC 60255-204, Busbar Protection**
 - **IEC 60255-205, Line Protection**
 - **IEC 60255-206, Circuit Breaker Protection**

■ Strategies

- TC95 will focus not only on the renovation of the existing standards, but also on the development of new functional standards with the development of Smart Grid, close collaborations with other TCs are needed when appropriate
- The proposed work program on future projects is as follows:

The development strategies of IEC/TC95

WG/MT	standards	priority
JWG 1	IEC60255-118-1 phasor measurement (synchrophasor)	under progress
MT 2	IEC60255-26 EMC	Priority 1
MT3	IEC60255-1 common requirements	Priority 1
	IEC60255-27 product safety	Priority 2
MT 4	IEC60255-187-1 transformer differential	under progress
	IEC60255-187-2 busbar differential	under progress
	IEC60255-187-3 Line differential	under progress
	IEC60255-181 frequency	Priority 1
	IEC60255-167 ac directional overcurrent	Priority 2
	IEC60255-132 directional power	Priority 3
	IEC60255-125 synchronizing or synchronism-check	Priority 4
	IEC60255-179 ac reclosing	Priority 5

The development strategies of IEC/TC95

- For your information, the minutes of the TC95 plenary meeting held in Clearwater, Florida, USA, on December 5th 2014 is as follows (**press the following area to hyperlink the whole PDF document**)



95/328/RM
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2015-01-16

INTERNATIONAL ELECTROTECHNICAL COMMISSION

TECHNICAL COMMITTEE 95: MEASURING RELAYS AND PROTECTION EQUIPMENT

Unconfirmed Minutes of the meeting held in Clearwater, Florida, USA, on December 5th 2014.

NOTE: Meeting documents can be downloaded from the IEC document server, see [95/327/MTG](#)

1. Participation

LI	Yaping	CN as Chairman
VOLUT	Serge	FR as Secretary
JACQUEMART	Charles	IEC Central Office

Delegates

<u>BASTIGKEIT</u> <u>BRUNELLO</u> HU HUIXIA <u>ZHAO</u> YUAN ALIBERT TANTIN <u>ROCHOW</u> KORNEL CORONA TAKANI BONETTI HOLST JENAKER SHONO <u>STOCKTON</u> UDREN APOSTOLOV <u>YALLA</u>	Boris Gustavo Jiawei Yang Xicai Wenguang Philippe Pascal Norbert Petri Roberto Hydeyki Andrea Stig Peter Takaya Mark Eric Alexander Murty	Austria Canada China China China China France France Germany Hungary Italy Japan Sweden Sweden Sweden Sweden United Kingdom United States United States United States
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Representing 11 countries

- Relays and protection equipment are the key parts to ensure the security and stability of Smart Grid.
- The standardization of IEC/TC95 shall play the leading role in promoting the technology progress and practical operation.
- IEC/TC95 shall actively involve more international experts in the area to study on the standardization work of relays and protection to meet the needs of Smart Grid.

Thanks for your attention

