IEEE and Nuclear Power Industry

Meeting On
Standard Development Organizations
&
Utility Coordination

Daryl Harmon, Secretary,

Nuclear Power Engineering Committee

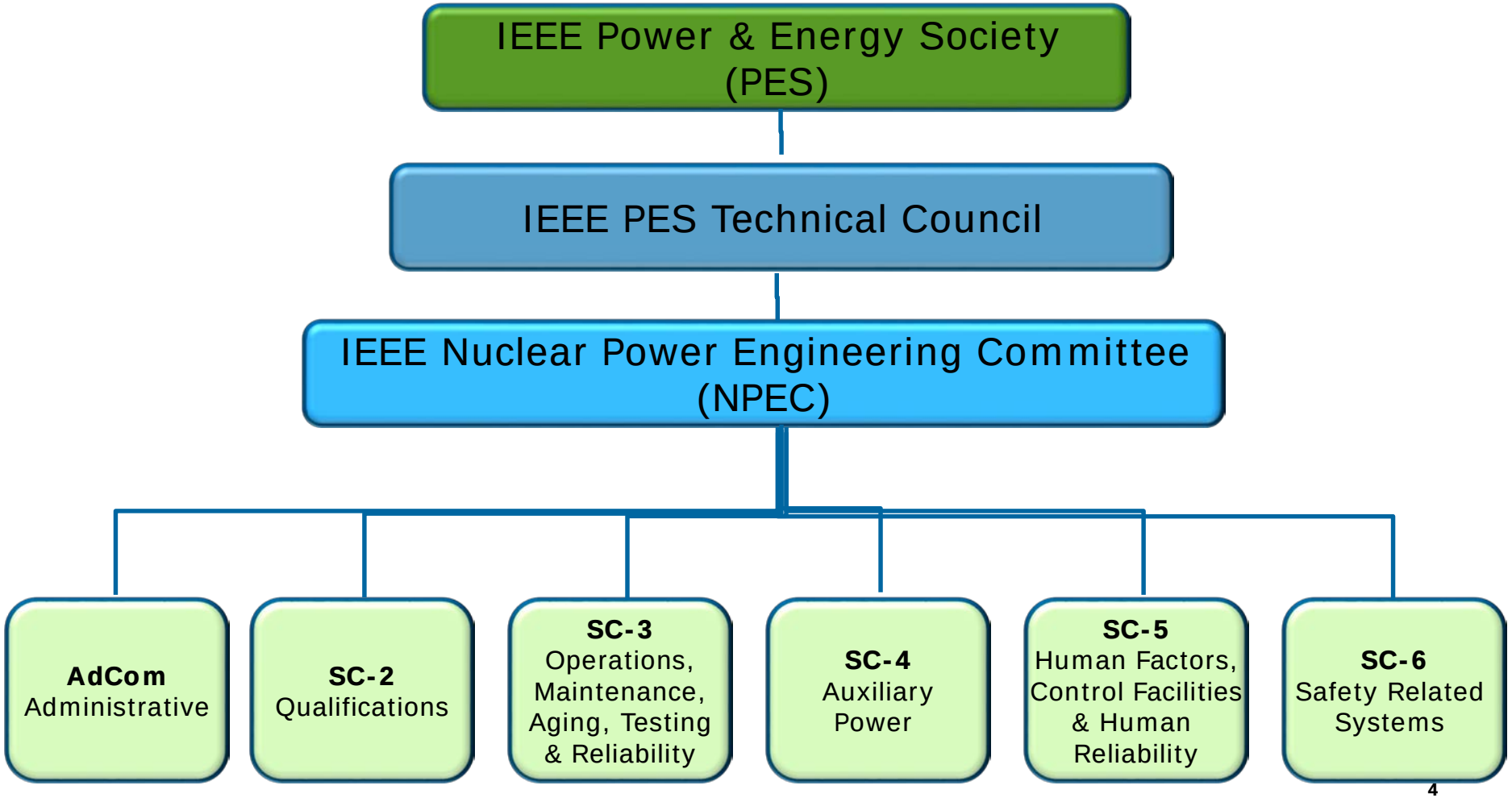
Agenda

- IEEE and NPEC Introduction
- International Collaboration and Benefits
- NPEC Conformity Program
- Synergy of Working Groups
- Utility Participation
- Succession Planning
- Challenges

NPEC Scope

- NPEC Scope
  - NPEC scope covers all nuclear power related technical and standards writing activities within the IEEE.
- NPEC Fact Sheet
  - Identifies all subcommittees/working groups and standards maintained by them
  - Available to the public at: http://grouper.IEEE.org/groups/npec/index.html

IEEE PES Nuclear Power Engineering Committee (NPEC) Structure



NPEC Objectives

Consensus building forum to produce standards from diverse organizations:

- Nuclear Plant owners, operators/utilities
- NSSS developers and vendors
- Architect Engineers
- Regulators
- Product servicing companies
- Manufacturers

Produced IEEE Standards Endorsed Through Regulatory Guides

Battery sizing & maintenance

Instrumentation & Control Systems (Analog & Digital)

Class 1E Electrical Power System

Primary Guidance for Environmental Qualification

Seismic Qualification

Human Factors (*in process*)

Post Accident Monitoring

NPEC's Industry Contribution

- An IEEE standard endorsed by the regulator provides the most efficient approach for a license amendments & application.
- The presence of regulators in the consensus building process sheds light on real problems and choices in solutions – leading to greater knowledge and acceptance by all parties involved.

NPEC's Industry Contribution (cont.)

- Working aggressively to address increased use of digital technology (IEEE 603, IEEE 7-4.3.2)
- Committed to addressing evolving issues and producing acceptable solutions (e.g. cyber security task force)
- Committed to the nuclear promise in reducing costs and achieving operational excellence
- Welcoming ideas on areas where NPEC can facilitate advancements in these areas through new standards or revision to existing standards (e.g. classification)

International Collaboration & Benefits

- IEEE continues to build collaboration with other standards development organizations
- Various cooperation agreements with IEC exist and a memorandum with IAEA was recently signed
- Such collaboration leads to new plant designs conforming to joint / shared standards that have US requirements embedded
- Joint standards help the designers to get regulatory acceptance in multiple countries without undue effort.

IEC – IEEE Joint Standards

Joint Standards Issued

Standard	Year	Title
62582-1	2011	Nuclear power plants - Instrumentation and control important to safety - Electrical equipment condition monitoring methods - Part 1: General
62582-2	2011	Nuclear power plants - Instrumentation and control important to safety - Electrical equipment condition monitoring methods - Part 2: Indenter modulus
62582-3	2012	Nuclear Power Plants - Instrumentation and control important to safety - Electrical equipment condition monitoring methods - Part 3: Elongation at break
62582-4	2011	Nuclear power plants - Instrumentation and control important to safety - Electrical equipment condition monitoring methods - Part 4: Oxidation induction techniques
P60780-323	2016	Qualification of Electrical Equipment Important to Safety for Nuclear Facilities REGULATORY GUIDE 1.89 - to be revised

Joint Standards with IEC Under Development

Project	Type	Title
IEEE-344	Revision	Seismic Qualification of 1E Equipment
IEEE-1082	Revision	Human Action Reliability Analysis for Nuclear Power Generating Stations. THE NEW REVISION WILL BE ADOPTED BY IEC
P62582-5	New	Nuclear Power Plants - Instrumentation and control important to safety - Electrical equipment condition monitoring methods Part 5: Optical time domain reflectometry

International/ National Collaborations

IEEE membership collaboration in NPEC with

Japan, Germany, China, India, Sweden, etc.

Nuclear Energy Institute Participation

Electrical Power Research Institute

Nuclear Utility Group on Equipment Qualification

NPEC's Industry Contribution

New area of IEEE effort to efficiency and effectiveness in the procurement of EQ components

NPEC Conformity Program

- Class 1E devices used by end users in nuclear power facilities should conform to IEEE 323 standard
- Class 1E device conformity should be certified
- Conformance should be assessed by third party authorized independent experts and/or authorized test laboratories
- Certified devices may bear an IEEE certification logo and listed on a public registry managed by IEEE

Major Stakeholders

- **Utility & Plant owner Benefits**
  - Ability to leverage a common, shared resource for certification and testing
  - Expanded base of compliant suppliers
  - Interoperability to minimize risks of deployment choices
  - Lower occurrence of fraudulent and non-compliant products
- **Vendors**
  - Expanded potential national and global market
  - Reduced burden for utility required testing
- **Local governments & regulatory agencies**
- **Plant designers and engineers**
- **EQ testing facilities**
- **Insurers**

Lab Accreditation – Planned Process

- Three labs have been identified as pioneer labs
  - Curtiss Wright, Kinetrics & NTS
  - MoUs were signed in 2015
  - Planning for IEEE audits in Q3/4 2016
- IEEE Audit Checklist
  - NUPIC, NQA-1, NAIC, 10 CFR 50 Appendix B requirements
  - Assessment of laboratory based on ISO/IEC 17025
- Audit to assess lab's technical competence
  - Desk audit (Documentation audit) conducted before onsite audit
  - IEEE will assemble audit team – composed of quality & technical experts

Lab Accreditation – Planned Process (cont.)

- All IEEE approved testing facilities will be:
  - Audited for their technical competence and quality
    - Utilizing ISO/IEC 17025 standard and relevant IEEE NPEC stds.
  - Qualified to one of THREE categories
    - Category 1 – Lab can perform testing independently
    - Category 2 – Lab can perform testing after IEEE approval of test plan
    - Category 3 – Lab can perform testing under IEEE witness engineer
  - Audited every 3 years
  - Published on the IEEE Certification Program website

Synergy of Working Groups & Committees

- Meets minimum of twice in an year
- Utility, regulatory and engineering services perspectives are balanced for ideal solution
- Produces higher level of acceptance for standards and regulatory positions
- Personal contact with experts in the area for resolving plant unique issues and advancing knowledge
- A forum to gather thoughts and comment on new regulatory initiatives

Utility Participation

- Nuclear Power Engineering Committee – 23%
  - SC-2 Qualification - 21%
  - SC-3 Op's, Maintenance, Aging, Testing & Reliability – 32%
  - SC-4 Auxiliary Power – 37%
  - SC-5 Human Factors, Control Facilities & Human Reliability – 0%
  - SC-6 Safety Related Systems – 11%

Utility Representation

American Electric Power	Exelon	PPL
Arizona PS	Forsmarks Kfaftgrupp	PSEG
Constellation Energy	KEPCO	SCANA
Dominion	Luminent	SNPTC
DTE Energy	NextEra	Southern Nuclear
Duke Energy	PG&E	STP Nuclear
Entergy		TVA

Succession Planning

- All NPEC activities have great value for nuclear power generation
- As a minimum, assign one person for each subcommittee and assign a junior staff for 2 years to assume that role when retirement is anticipated
- Every meeting is a free training program on most current issues
- Two meetings per year sustains the essential synergy to keep the momentum on important issues
- Meeting beyond the critical two will be done through conference calls & video conferencing

Challenges

- Current size of the NPEC requires a hotel that can offer 5 meeting rooms and associated projection TV, microphone, etc.

- Appreciate local assistance in reducing cost

- Need continued support to keep the organization in the steady track of accomplishments by offering experienced staff for addressing critical area: digital I&C, Class 1E power systems, EQ for license renewal and human factors

Question…… ? Comments…….. ?

NPEC Officers

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Vice Chairman: Thomas Koshy Thomas.Koshy@nrc.gov

Secretary: Daryl Harmon HarmonDL@Westinghouse.com

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Top-cited Periodicals

IEEE Technical Societies/Councils

- Aerospace & Electronic Systems
- Antennas & Propagation
- Broadcast Technology
- Circuits & Systems
- Communications
- Components, Packaging, & Manufacturing Technology
- Computer
- Computational Intelligence
- Consumer Electronics
- Control Systems
- Council on Electronic Design Automation
- Council on Superconductivity
- Dielectrics & Electrical Insulation
- Education
- Electromagnetic Compatibility
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- Geosciences & Remote Sensing
- Industrial Electronics
- Industry Applications
- Information Theory
- Intelligent Transportation Systems
- Instrumentation & Measurement
- Lasers & Electro-Optics
- Magnetics
- Microwave Theory & Techniques
- Nanotechnology Council
- Nuclear & Plasma Sciences
- Oceanic Engineering
- Power Electronics
- **Power & Energy (Nuclear)**
- Product Safety Engineering
- Professional Communication
- Reliability
- Robotics & Automation
- Sensors Council
- Signal Processing
- Social Implications of Technology
- Solid-State Circuits
- Systems Council
- Systems, Man, & Cybernetics
- Technology Management Council
- Ultrasonics, Ferroelectrics, & Frequency Control
- Vehicular Technology

IEEE Standards Association

IEEE STANDARDS ASSOCIATION

- Globally recognized standards
- Over 900 active standards
- More than 500 standards under development
- Over 7,000 individual members and 20,000 standards developers from every continent
- 200+ corporate members

- Leverages the breath of 40+ technical areas
- Independent global community
- Open standards process
- Clear IPR policy

Innovative Solution

SEAMLESS INTEGRATION

BETWEEN

IEEE CERTIFICATION PROGRAM PARTICIPANTS

IEEE Process

Accredited Labs

Certified Products

Nuclear Power Plants

NPEC Conformity Assessment Steering Committee

ICAP Committee of invited subject matter experts from utilities, regulators, manufacturers, testing laboratories and independent consultants

- Formed in October 2014

Chaired by Jonathan Cornelius (Tyco) and John White (Past SC2 Chair)

Participation from North America, China and Europe

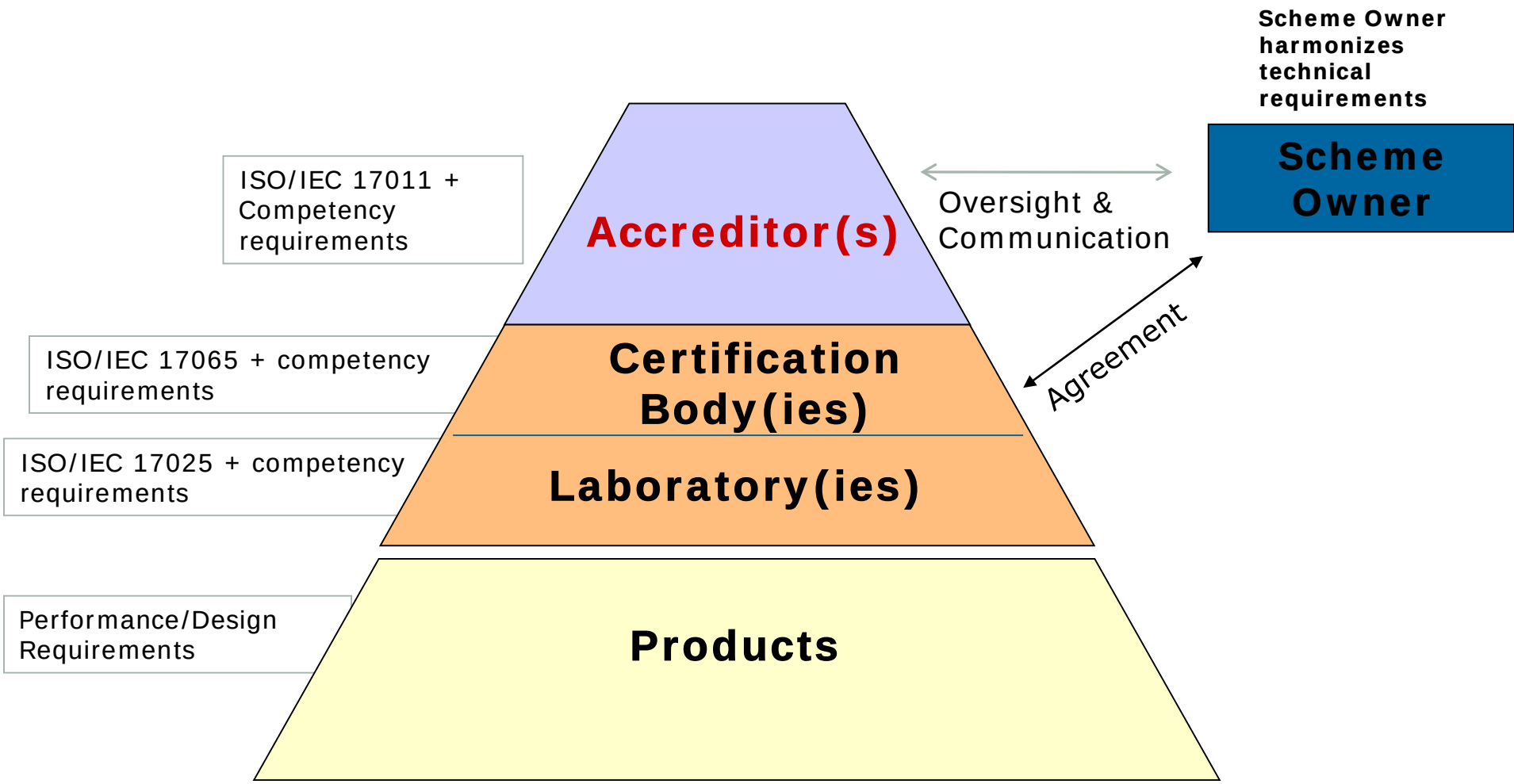
Developing lab auditing and qualification process

Developing equipment certification process

Developing test report template

Determining requalification and re-testing frequencies

Conformity Assessment
Certification Scheme – Single Scheme



Courtesy of G.Gillerman @ NIST

Other reading materials

- Proposed IEEE Conformity Assessment Program White Paper available
  - http://www.techstreet.com/ieee/products/1904401
- EnergyBiz Article
  - http://community.energycentral.com/community/energy-biz/new-standard-simplifies-process-qualifying-nuclear-safety-equipment
- Recent Press Releases
  - http://standards.ieee.org/news/2016/iec_ieee_60780_323.html
  - http://standards.ieee.org/news/2015/nuclear_mous.html

Contact Information Page

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