

## IEEE Power and Energy Society Entity Annual Report

2023

**Entity: Nuclear Power Engineering Committee**

**Website: <https://site.ieee.org/pes-npec/>**

**Chair: Mark Bowman**

**Vice-Chair: Robert Konnik**

**Secretary: Eric Rasmussen**

**Immediate Past Chair: John White**

### 1. Significant Accomplishments:

NPEC is responsible for developing and maintaining nuclear power plant standards in the electrical and electronic area within PES. These standards are used by the nuclear industry around the world to design and maintain nuclear power plants and other nuclear facilities. NPEC maintains 43 active standards and has a total of 26 standards projects currently underway, including 5 new standards:

- P2425, *Standard for Electromagnetic Compatibility Testing of Electrical and Instrumentation and Control Equipment at Nuclear Power Generating Stations and Other Nuclear Facilities*
- P2421, *Guide for Designing and Developing Computer-Based Displays for Monitoring and Control of Nuclear Facilities*
- P379.1, *Guide for Application of the Single-Failure Criterion to Nuclear Power Generating Station Safety Systems*
- P61226, *Standard for categorization and classification of I&C and electrical systems in nuclear power generating stations*
- P63160, *Nuclear Power Plants - Instrumentation, Control and Electrical Power Systems Important to Safety - Common Cause Failure Systems Analysis and Diversity*

In addition, our working groups have issued several key nuclear power standards in the past year, including one joint-logo standard with IEC:

- IEEE Std-352, *Guide for General Principles of Reliability Analysis of Nuclear Power Generating Station Systems and Other Nuclear Facilities*
- IEEE Std-383, *Standard for Qualifying Electric Cables and Splices for Nuclear Facilities*
- IEEE/IEC 387-63332, *International Standard for Nuclear Facilities - Electrical Power Systems - Part 387: Diesel Generator Units Applied as Standby Power Sources Diesel Generator Units Applied as Standby Power Sources*
- IEEE Std-420, *Standard for the Design and Qualification of Class 1E Control Boards, Panels, and Rac Used in Nuclear Power Generating Stations*
- IEEE Std-741, *Criteria for the Protection of Class 1E Power Systems and Equipment in Nuclear Power Generating Stations*
- IEEE Std-845, *Guide for the Evaluation of Human-System Performance in Nuclear Power Generating Stations and Other Nuclear Facilities*

- IEEE Std-933, *Guide for the Definition of Reliability Program Plans for Nuclear Generating Stations and Other Nuclear Facilities*
- IEEE Std-1682, *Standard for Qualifying Fiber Optic Cables, Connections, and Optical Fiber Splices for Use in Safety Systems in Nuclear Power Generating Stations*
- IEEE Std-C37.98, *Standard for Seismic Qualification Testing of Protective Relays and Auxiliaries for Nuclear Facilities*

To emphasize the significant contribution of the NPEC nuclear standards, in 2023, a joint effort by the Nuclear Energy Institute (NEI) and the Electric Power Research Institute (EPRI) determined that IEEE NPEC maintains the second largest number of nuclear standards considered critical to the design and construction of nuclear power plants in the U.S.

To be ready for the future of nuclear power standards, NPEC decided as a committee to stay involved with developments in the area of new/advanced reactors. In 2023, NPEC established an official liaison position with the EPRI/NEI Advanced Reactor Codes and Standards Initiative, and NPEC has been a player in this effort throughout the year (more details in Section 6).

NPEC has continued to be proactive in developing joint logo standards with IEC, which will benefit the nuclear industry by providing a common set of standards that will be used around the world. NPEC is leading PES in the number of joint-logo standards under development (see Section 5).

NPEC's IEEE Conformity Assessment Program (ICAP) Steering Committee continued to make significant strides in 2023 to IEEE's goal of having products that are certified to IEEE nuclear standards. Last year, the NPEC ICAP recognized its first group of laboratories and manufacturers. An IEEE Certification provides nuclear power plant designers and owners with a level of confidence in nuclear qualified equipment that has never been available in the past. Equally important to the IEEE is that this is now a new source of revenue that can be used to support our non-profit activities. A detailed description of the IEEE NPEC Conformity Assessment Program (ICAP) and its benefits are provided in Section 2.

## **2. Benefits to Industry and PES Members from the Committee Work:**

In 2023, a joint effort by the Nuclear Energy Institute (NEI) and the Electric Power Research Institute (EPRI) determined that IEEE NPEC maintains the second largest number of nuclear standards considered critical to the design and construction of nuclear power plants in the U.S.

NPEC represented IEEE nuclear power standards at the 2023 U.S. Nuclear Regulatory Commission Standards Forum in Washington, D.C. This was a forum for standards development organizations (ANS, ASME, EPRI, IEEE, NEI) to discuss the present and future of nuclear power standards in the U.S. In the forum, the NPEC Chair made a presentation that emphasized the importance of the NPEC to the SDO community as well as the importance of the IEEE-SA standards making process.

The IEEE NPEC ICAP program and the EQ Navigator process continued to expand in 2023. The NPEC Conformity Assessment Steering Committee was originally formed in 2014. That committee, working with IEEE Conformity Assessment Program (ICAP), began working to develop a conformity assessment program for IEEE 323, *IEEE Standard for Qualifying Class 1E equipment for Nuclear Power Generating*

*Stations.* The steering committee was formed from a diverse group of members representing manufacturers, test laboratories, industry consultants, reactor designers, and utilities. In addition to their diverse technical experience, the committee members represented countries from Asia, Europe and North America. The goal of the steering committee was to provide a high level of assurance that IEEE qualification standards were being complied with during the qualification of components intended for use in nuclear power plants. The NPEC conformity assessment process was based on the recognition of laboratories and manufacturers. Manufacturers could have their products tested at recognized laboratories. After meeting these requirements, manufacturers would then have the ability to submit products for IEEE Certification. An IEEE Certified product would be easily recognizable and traceable to specific test reports. The certification process has since been developed and is identified as the IEEE EQ Navigator. The IEEE EQ Navigator process is intended to help improve quality control, standardize the format for the development of test reports, reduce the use of counterfeit parts and provide 3rd party verification that the testing of equipment met the requirements of IEEE standards. An IEEE Certification provides nuclear power plant designers and owners with a level of confidence in nuclear qualified equipment that has never been available in the past. In 2022, the first laboratories and manufacturers completed the recognition process and the recognition process, and the certification of components continued to expand in 2023.

### **3. Benefits to Volunteer Participants from the Committee Work:**

The committee is comprised of an international group of technical experts from nuclear utilities and plant owners, vendors, architecture engineers, and regulators representing a wide cross-section of the nuclear industry. The committee currently has 48 active members. NPEC, subcommittee and working group meetings provide the opportunity for this diverse set of volunteers to work together and learn from each other's perspectives regarding standards development. NPEC and its subcommittees and working groups held two in-person meetings during 2023. The January meeting was held in Orlando FL. and the July meeting was held in Buffalo, NY.

### **4. Recognition of Outstanding Performance:**

In 2023, NPEC awarded the PES Technical Committee Distinguished Service Award to:

- Yvonne Williams (retired), *for many years of dedicated service to the IEEE PES Nuclear Power Engineering Committee; as an officer of an NPEC subcommittee and several working groups; as a retiree for stepping-up to fill vacant roles including chairing another working group, and most recently, for skillfully leading efforts with the nuclear industry regarding NEI objections to NRC endorsement of IEEE Std-1819.*

In 2023, NPEC awarded the following PES Outgoing Committee/Subcommittee Chair Awards:

- John White (True North Consulting): NPEC Chair
- Eric Rasmussen (RSCC Wire and Cable): Subcommittee 2 Chair
- Mitch Staskiewicz (Mirion Technologies): Subcommittee 4 Chair
- Chris Lamb (Sandia National Labs): Subcommittee 6 Chair

## 5. Coordination with Other Entities (PES Committees, CIGRE, standards, etc.):

NPEC maintains liaisons with the American National Standards Institute (ANSI), American Society of Mechanical Engineers (ASME), American Nuclear Society (ANS), American Society for Testing and Materials (ASTM), Instrument Society of America (ISA), The Nuclear Energy Institute (NEI), U.S. Nuclear Regulatory Commission (NRC), Committee of Nuclear Regulatory Activities (CNRA) as well international organizations International Electrotechnical Commission (IEC) and International Atomic Energy Agency (IAEA) regarding all nuclear power plant matters.

For 2023, NPEC is leading all of PES in the number of IEC joint-logo projects underway. These are:

- P63332-387, *Nuclear Facilities – Electrical Power Systems – Part 387: Diesel Generator Units Applied as Standby Power Sources*
- P62671, *Nuclear Power Plants - Instrumentation and Control Important to Safety - Selection and Use of Industrial Digital Devices of Limited Functionality*
- P60780-323, *IEC/IEEE International Standard - Nuclear facilities -- Electrical equipment important to safety – Qualification*
- P62582-1, *Nuclear power plants - Instrumentation and control important to safety - Electrical equipment condition monitoring methods - Part 1: General*
- P63160, *Nuclear Power Plants - Instrumentation, Control and Electrical Power Systems Important to Safety - Common Cause Failure Systems Analysis and Diversity*
- P62582-3, *Nuclear Power Plants - Instrumentation and control important to safety - Electrical equipment condition monitoring methods - Part 3: Elongation at break*

## 6. New Technologies of Interest to the Committee:

As a committee, NPEC is committed to assuring that our standards are applicable to advanced reactor types (other than light water reactors) and applicable to advanced reactor standards development as it evolves. In the nuclear power industry, the Nuclear Energy Institute’s NEI 19-03 "Advanced Reactors Codes and Standards Needs Assessment” is considered one of the initial steppingstones to answer that question. In that report, a DOE-sponsored review documented that of the 43 IEEE standards that were reviewed, all were deemed to be technology-neutral enough for the advanced reactor community. While that is indeed a testament to the technical quality of our standards, NPEC decided as a committee to stay involved with developments in the area of new/advanced reactors. In 2023, NPEC established a official liaison position with the EPRI/NEI Advanced Reactor Codes and Standards Initiative, and NPEC has been a player in this effort throughout the year. As expected, results of the initiative continue to show that NPEC standards are largely acceptable “as-is” (or technology-neutral), but some minor changes have been identified in two standards, IEEE Std 317, *Electric Penetration Assemblies in Containment Structures for Nuclear Power Generating Stations*, and IEEE Std 603, *Standard Criteria for Safety Systems for Nuclear Power Generating*. The committee plans to address those changes in the future, as needed. But more importantly, we are seeing that our working groups are getting more and more populated by members of the advanced reactor community, which is further driving needed changes as these emerging designs evolve. In short, the NPEC standards and our working groups appear strong and ready to meet the needs of the future.

**7. Global Involvement**

PES is looking to increase involvement with members from Regions 8, 9 and 10 (Africa, Europe, Middle East, Latin America, Asia and Pacific). Please provide the following information.

Total Number of committee members	Officers from regions 8,9 and 10	Subcommittee officers from regions 8, 9 and 10	Subcommittee members from regions 8,9, and 10
48	0	0	7

**8. Problems and Concerns:**

In 2022, NPEC achieved its years-long goal towards meeting the IEEE financial expectation of having sufficient funds to cover two “failed meetings”.

There are no other problems or concerns.

**9. Significant Plans for the Next Period:**

NPEC will continue its standards development activities through its subcommittees and working groups.

In a deliberate effort be more in-tune with PES initiatives and better coordinate with other committees, NPEC has decided to hold its winter meetings (for the foreseeable future) as part of the PES Joint Technical Committee Meeting (JTCM). This will include most of the NPEC subcommittees and working groups.

We plan to honor the decision by the State of California to extend plant operations for Diablo Canyon Power Plant by holding our Summer 2024 meeting in the nearby area. Hopefully we can help in a small way to support the local economy as well as those engineers and engineering contractors that help keep it operational.

**Submitted by: Mark Bowman**

**Date: 01/30/24**