IEEE Power and Energy Society
Transformers Committee Annual Report

2018

Entity: Transformers Committee

Chair: Susan McNelly
Vice-Chair: Bruce Forsyth
Secretary: Ed teNyenhuis
Standards Coordinator: Jim Graham
Treasurer: Paul Boman
Past-Chair: Stephen Antosz

1. Significant Accomplishments:

The year 2018 was a centennial milestone year for the Transformers Committee. At the Spring 2018 meeting, the Transformers Committee celebrated 100 years of standards development. A logo for the 100-year celebration, as illustrated below was used throughout the year to publicize the accomplishment of IEEE PES and the Transformers Committee:

The spring 2018 meeting started with a celebration banquet providing meeting attendees a chance to hear and observe the legacy of our 100-year history, to recognize the accomplishments of their peers, and to have fun, be entertained, and enjoy their accomplishments. More than 425 members and guests attended the sold out event, which included as special guests Don Wright president of the IEEE-SA, Patrick Ryan executive director of the PES, and Miriam Sanders PES 2017 vice president Technical Activities. Also attending were the many IEEE-SA Liaisons that have supported the committee over the last several years.

Further highlighting the year and the banquet, a 100-year commemorative booklet was prepared and presented to all banquet attendees. The booklet included a 100-year history, the awards and achievements of the individual committee members over that period, and a pictorial history of the development of transformers from 1885 to present. The booklet was professionally published to capture this important snapshot of history.
In conjunction with IEEE PES, an infographic illustrating the 100 year history of developing standards was created and published on both the PES and Transformers Committee website. Further, a press release was issued after the celebration Banquet.

The committee continues to hold two independent committee meetings each year in the spring and fall. Through a continuous effort to improve meeting content and structure, as well as promoting meetings, meeting participation has grown by 35% in the last 10 years. Current meetings have roughly 600 attendees and 75 guests.

2018 Conference Papers/Panel Sessions:

IEEE PES Transmission and Distribution Conference and Exposition, Denver, CO, April 16 - 19:
Papers: 13 Submittals, 9 Accepted
Panel Sessions: 3 Submittals, 2 Accepted

IEEE PES General Meeting, Portland, OR, August 5 - 9
Papers: 20 Submittals, 11 Accepted

New members In 2018, 18 new voting Committee members were approved. The new members represent manufacturers, product users, labs, and consultants in the industry. Over the last 5 years, the Transformers Committee has added an average of 17 new voting members each year.

The Committee website includes a memorial page honoring long time contributors to the Committee's work that have passed away. In 2018, memorials were added for Stan Lindgren, Sam Mehta, Steve Smith, Tom Golner, Dennis Allen, Heinz Fischer, and Joseph MacDonald.

Standards Activities in 2018

Active PARs: 60

PARs approved by NESCOM: 11 (3 for new individual, 6 for revision, and 2 for new entity)

Stds/Guides moved to inactive: 8 (1 on purpose, 7 expired due to missed deadlines, but have active PARs and work continues)

Approved Standards/Guides: 4 new, 6 revised

Standards/Guides in Ballot Stage: 10 completed ballot, 9 in ballot as of 12/31/2018

Technical Tours

Two technical tours were conducted in 2018, continuing the committee's efforts to combine the theoretical/standardized aspects with the practical requirements of manufacturing transformers and utility equipment.

Pennsylvania Transformer Technology, Inc. provided a tour of their transformer manufacturing facilities providing members with an opportunity to further their understanding of transformer manufacturing and design and the ties to transformer standards and their applications.

ABB High Voltage Breakers and Surge Arresters provided an opportunity to see their manufacturing facilities and to provide technical information on two of the key components adjacent to transformers in utility stations.

Technical Activities

The Transformers Committee sponsors the following twelve technical subcommittees (SC), as well as an Administrative SC and a Meetings Planning SC focused on continuous meeting improvement.

- Bushings
- Dielectric tests
- Distribution transformers
- Dry-Type Transformers
- HVDC Converter Transformers and Smoothing Reactors
- Instrument transformers
- Insulating Fluids
- Insulation Life
- Performance Characteristics
- Power Transformers
- Standards
- Subsurface Transformers and Network Protectors

Other Committee and Subcommittee Activities:

There were a total of **165** committee meetings in 2018, not including electronic meetings held to further work between the main meetings. Attendance at these meetings is excellent, and usually with a quorum of members to facilitate major technical and procedural decisions requiring approvals. The meetings illustrated below, in addition to the above listed SCs, indicate the large volume of meetings and the breadth of the ongoing Transformers Committee work. The committee also supports meetings for NEMA, IEC TC 14 and the Electric Power & Light Delegation (EL&P). All meetings provide a forum for meeting participants to conduct their work, have meaningful dialog, resolve technical issues, and plan for the future direction of the committee.

GENERAL:

- Administrative SC
- Transformers Committee Main Meeting
- Newcomers Orientation
- Meetings Planning SC

WORKING GROUPS:

- Tertiary/Stabilizing Windings PC57.158
- Bushings General Requirements C57.19.00
- Control Cabinets PC57.148
- Ventilated Dry Type PC57.12.51
- Overhead Distribution Transformers C57.12.20
- Moisture in Insulation PC57.162
- Installation of Power Transformers C57.93
- Dry Type General Requirements C57.12.01
- 1-Phase Padmount Distribution Transformers C57.12.38
- Through-Fault Current Duration PC57.109
- Transformer Monitoring C57.143
- 3-Phase Padmount Distribution Transformers C57.12.34
- Bushing Application Guide C57.19.100
- Neutral Grounding Devices PC57.32a
- Dry Type Reactors PC57.16
- Secondary Network Protectors C57.12.44
- Step-Voltage Regulators C57.15 / 60076- 21
- Dry Type Partial Discharge Detection PC57.124
- Station Service Voltage Transformers C57.13.8
- Enclosure Integrity C57.12.28, C57.12.29, C57.12.31, C57.12.32
- Wind Turbine Generator Transformers P60076-16
- Shunt Reactors C57.21
- 1-Phase Submersible Transformers C57.12.23
- Tests for Instrument Transformers C57.13.5
- Temperature Measurement PC57.165
- Semiconductor Power Rectifier Transformers C57.18.10
- Distribution Transformer Bushings PC57.19.02
- Power-Line Carrier Coupling Capacitors and Coupling Capacitor Voltage Transformers PC57.13.9
- Partial Discharge Acoustic Detection C57.127
- Transportation Issues C57.150
- Thermal Evaluation of Insulating Systems, Dry Type C57.12.60
- Instrument Transformer Tests PC57.12.2
- 3-Phase Transformer Connections PC57.105
- Tap Changer Application Guide 60214- 2
- Gas Interpretation Guide C57.104
- Standard Terminal Markings C57.12.70
- High-Temp Insulating Materials P- 1276
- Switching Transients Induced by Transformer/Breaker Interaction PC57.142
- Dry Type Test Code C57.12.91
- Standard Transformer Terminology C57.12.80
- Transformer Loading Guide PC57.91
- Short Circuit Withstand PC57.164
- Distribution Transformer Tank Pressure Coordination C57.12.39
- Frequency Response Analysis for Liquid Filled Transformers C57.149
- Instrument Transformer Tests PC57.13.2

NEW WORKING GROUPS IN 2018:

- Consolidating Insulating Fluid Guides PC57.166
- Loss Measurement C57.123 2
- Thermal Evaluation C57.100
- Load Tap Changer C57.131/60214-1
- Working Group on Liquid-Immersed Secondary Network Transformers C57.12.40
- Submersible Transformers C57.12.24
- Partial Discharge Tests C57.113
- Transformer Impulse Test Guide PC57.98
- High Temperature Liquid Temperatures C57.154
- Monitoring Distribution Transformers PC57.167

TASK FORCES:

- External Dielectric Clearances
- Transformer Efficiency & Loss evaluation (DOE) Activity
- Performance Characteristics Revisions to Test Code C57.12.90
- Audible Sound Revision to Test Code
- Partial Discharge Limits for Factory Tests
- Performance Characteristics Revisions to C57.12.00
- Winding Insulation Power Factor
- IEEE-IEC Cross Reference

NEW TASK FORCES IN 2018:

- Bushing Overload
- Low Frequency Test Guide
- Condition Assessment Guide
- Impact of Different Oils on TR Performance
- Continuous Revision to Low Frequency Tests
- Volts/Hertz Requirements
- Revisions to Impulse Test Sections of C57.12.00 and C57.12.90
- Monitoring Distribution Transformers
- High Temp Liquid Transformers C57.154
- LTC Field Tests
- LTC Diagnostics

The Transformers Committee revised and approved a new Sponsor Policies and Procedures for Standards Development, which has been submitted to IEEE-SA AudCom for review. As we move into 2019, the committee has started work on revision of its Policies and Procedures for Individual Working and Entity Working Groups. Completion of these documents will better position the committee to continue its standards developing activities for the next five years.

The Committee has agreed to sponsor two entity WG projects which will be getting underway in 2019. The two WGs are PC57.12.200, IEEE Guide for Frequency Domain Spectroscopy of Bushings for Transformers and PC57.32.10, Guide for the Selection of Neutral-Grounding Devices for HVDC Converter Transformers.

Paper Submissions for the 2019 GM:

22 Total Submittals
15 Accepted
2 Withdrawn
5 rejected

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

Participation in the Committee meetings provides opportunities for networking with industry experts around the world and this collaboration/dialog is key to the globalization of industry standards.

Review of paper submittals helps ensure that papers presented at the various IEEE PES conferences are of high quality and contain valid technical content.

The committee continues its efforts to present high quality Tutorials to assist in the education of its membership and to keep them abreast of continuing developments in the industry. In 2018, four tutorials were presented.

- Statistical Methods for Transformer Condition Assessment
- Distribution Transformer Quality Assurance
- Tutorial on the Guide for Application of Tertiary and Stabilizing Windings
- Condition Assessment of Power Transformers and Assessment Indices Cigré WG A2.49

Tutorials presented since 2001 are published on the Transformers Committee website, many of which include both presentation materials and actual recordings of the tutorials. This collection provides a valuable resource for Committee participants and their employers.

3. Benefits to Volunteer Participants from the Committee Work:

Tutorials provide Professional Development Hour (PDH) certificates to assist members with professional engineering education requirements.

Participants are able to build a strong network of industry experts, learn through paper review opportunities, and develop presentation, speaking, and negotiation skills through participation and exchange of technical concepts and ideas with others.

4. Recognition of Outstanding Performance:

There was significant recognition of transformer committee members throughout the year, and the Committee had the honor of seeing one of its members be elevated to the Fellow Class of 2019. C. Patrick McShane was elevated to fellow for leadership in safety, performance, and sustainability of power transformers in 2018.

Although they were received at the end of 2017, IEEE-PES Transformers Committee members received an unprecedented five major IEEE Standards Association Awards. The awards were presented by the President of the IEEE Standards Association at the 2018 100-Year Celebration so that the members could be congratulated and recognized by their peers. Each award demonstrates the commitment of Transformer Committee members to the development of others in the industry through education and for standards that represent the state of the art of the technology on a national and international level.

- IEEE-SA Medallion Charles Johnson. for his leadership in advancing the state of the art in dry-type transformer standards
- IEEE-SA Medallion Bertrand Poulin, for sustained technical contribution to developments of transformer dielectric test standards
- IEEE-SA Standards Education Award Hemchandra Shertukde for effectively integrating power systems and transformer standards into academic and professional development programs and for his active encouragement of IEEE student membership
- IEEE-SA International Award Craig Colopy for his selfless dedication to worldwide step-voltage regulator and on-load tap changer standards as IEEE, IEC and NBR (Brazilian) standards
- IEEE-SA Lifetime Achievement Award Phil Hopkinson for his national and international leadership through 45 years of continuous development of transformer standards providing for new technologies and the implementation of energy efficiency

An additional IEEE-SA Standards Medallion Award was presented in 2018 to Stephen Shull for his leadership in advancing and maintaining the state of the art for distribution transformer standards.

In 2018, eight Outstanding Service Awards for long-term commitment, dedication, and contributions to the Transformers Committee were presented to Harold Moore, Kent Miller, Fredi Jacob, James Harlow, Wally Binder, Jack Harley, Dan Mulkey, and Steve Shull.

A CIGRE best Paper Award – Paris 2018 was presented to Luiz Cheim, for his paper on Machine Learning Tools in Support of Transformer Diagnostics.

The wide-ranging contributions of Transformer Committee members to working group activities throughout the years was recognized with IEEE PES Technical Committee Certificates of Appreciation awards, which were presented to the leaders at the Spring and Fall meetings.

- C57.12.36 WG Chair Jerry Murphy. IEEE Standard Requirements for Liquid-Immersed Distribution Substation Transformers. Carlos Gaytan Vice-Chair.
- C57.12.39 WG Chair Carlos Gaytan. Standard Requirements for Distribution Transformer Tank Pressure Coordination. Carlos Gaytan, Jeremy Van Horn Secretary.
- C57.12.58 WG Chair - Roger Wicks. Guide for Conducting a Transient Voltage Analysis of a Dry-Type Transformer Coil. Roger Wicks.
- C57.19.01 WG Chair Shibao Zhang. Standard Performance Characteristics and Dimensions for Outdoor Apparatus Bushings. Shibao Zhang, David Wallach, Secretary.
- C57.119 WG Chair Gael Kennedy. Recommended Practice for Performing Temperature Rise Tests on Oil-Immersed Power Transformers at Loads Beyond Nameplate Ratings. Gael Kennedy, Tom Prevost.
- C57.147 WG Chair Patrick McShane. Guide for Acceptance and Maintenance of Natural Ester Insulating Liquid in Transformers. WG Chair Patrick McShane; Vice-Chair Clair Claiborne; Secretary Jim Graham.
- C57.158 WG Chair Enrique Betancourt, Guide for the Application of Tertiary and Stabilizing Windings in Power Transformers. Enrique Betancourt, Brian Penny Vice-Chair, Marnie Roussell Secretary.
- C57.12.40 WG Chair Brian Klaponski. Standard for Network Three Phase Transformers, 2500 kVA and Smaller, High-Voltage 34,500 V and Below, Low Voltage 600 V and Below, Subway & Vault Type (Liquid Immersed). Brian Klaponski, Giuseppe Termini Secretary.

- C57.106 WG Chair - Bob Rasor. Guide for Acceptance and Maintenance of Insulating Mineral Oil in Electrical Equipment.
- C57.12.10 WG Chair Gary Hoffman, Standard Requirements for Liquid-Immersed Power Transformers.
- C57.13.1 WG Chair Bruce Magruder. Guide for Field Testing of Relaying Current Transformers.
- C57.12.20 WG Chair - Alan Traut. Standard for Overhead-Type Distribution Transformers 500 kVA and Smaller: High Voltage, 34 500 V and Below; Low Voltage, 7970/13 800Y V and Below.
- C57.120 WG Chair – Rogerio Verdolin. Guide for Loss Evaluation of Distribution and Power Transformers and Reactors.
- 60076-57-129 WG Chair – Ulf Radbrandt. Standard for General Requirements and Test Code for Oil Immersed HVDC Converter Transformer.

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

The Transformers Committee coordinates with several other PES committees; national and international technical committees; and national and international standards development organizations (SDO's), including ASTM, CIGRE, IEC, CSA, NFPA, NEC, SCC4, SCC18, Doble, NERC/FERC, and EPRI. This effort includes joint sponsorship of standards with IEC, and established liaisons with CIGRE, IEC TC14, ASTM D27, SCC18, and SCC4 to support significant activity and the exchange of technical information and keeping each other informed of the latest technology advancements.

In addition to the above, the Committee's acceptance of the entity balloting process will further help in producing globally accepted standards.

6. New Technologies of Interest to the Committee:

The major new technologies of interest to the transformers committee include solid state transformer technologies and the continued growth in monitoring systems and their application in relation to the transformer industry.

7. Significant Plans for the Next Period:

The Committee is in the process of transitioning its website to the new IEEE PES supported Word Press platform. This will involve a significant amount of work due to the size of the existing website so that historical information is not lost and the functionality of the site remains useful to the Committee participants.

The Committee will continue to evaluate the use of RFID technology for meeting attendance and quorum determination during meetings and look at whether further expansion of its capabilities with ties into the 123Signup AMS are worthwhile.

Submitted by: Susan McNelly **Date: 1/13/2019**