IEEE/PES
Transformers Committee
Spring 2014 Meeting Minutes
Savannah, Georgia, USA
March 23 – 27, 2014

(Technical minutes are on the agenda to be approved at the next meeting in Fall 2014)
# Table of Contents

## Monday Opening Session – March 24, 2014

1.0 Agenda
2.0 Attendance
3.0 Meeting Schedule
4.0 Approval of Agenda and Previous Minutes – Don Platts
5.0 Chair’s Remarks & Report – Don Platts
6.0 Vice Chair’s Report – Stephen Antosz
7.0 Secretary’s Report – Susan McNelly
8.0 Treasurer’s Report – Gregory Anderson
9.0 Awards Report – Bill Chiu
10.0 Administrative SC Meeting Report – Susan McNelly
11.0 Standards Report – William Bartley
12.0 Editor’s Report – Sanjib Som
13.0 Liaison Reports
   - Standards Coordinating Committee No. 4 (Electrical Insulation) – Paulette Payne
   - Standards Coordinating Committee No. 18 (NFPA/NEC) – Ned Brush
   - IEC TC14 Technical Advisor to USNC – Phil Hopkinson
   - Cigre – Raj Ahuja
14.0 Unfinished (Old) Business
15.0 New Business
16.0 Monday Opening Session Adjournment

## Thursday Closing Session – March 27, 2014

17.0 Chair’s Remarks and Announcements
18.0 Meetings Planning SC Minutes & Report – Gregory Anderson
19.0 Reports from Technical Subcommittees (decisions made during the week)
20.0 Report from Standards Subcommittee (issues from the week)
21.0 New Business (Continued from Monday General Session)
22.0 Thursday General Session Adjournment

Minutes of Technical Subcommittees

- **Annex A.** Bushings SC – Peter Zhao
- **Annex B.** Dielectric Tests SC – Loren Wagenaar
- **Annex C.** Distribution Transformers SC – Steve Shull
- **Annex D.** Dry Type Transformers SC – Charles Johnson
- **Annex E.** HVDC Converter Transformers & Reactors – Mike Sharp
- **Annex F.** Instrument Transformers SC – Ross McTaggart
- **Annex G.** Insulating Fluids SC – David Wallach
- **Annex H.** Insulation Life SC – Bruce Forsyth
- **Annex I.** Meetings SC – Greg Anderson
- **Annex J.** Performance Characteristics SC – Ed teNyenhuis
- **Annex K.** Power Transformers SC – Tom Lundquist
- **Annex L.** Standards SC – Bill Bartley
- **Annex M.** Underground Trans & Network Protectors SC – Carl Nieman
MONDAY OPENING SESSION

1.0 AGENDA

Opening Session

Monday, March 24; 8:00 am - 9:15 am

(rosters circulated and attendance recorded as eligibility for Committee membership)

1. Welcome and Announcements ................................................................. Don Platts
2. Approval of Agenda .................................................................................. Don Platts
3. Approval of Minutes from Fall 2013 Meeting ......................................... Don Platts
4. Chair’s Report .......................................................................................... Don Platts
5. Vice Chair’s Report .................................................................................. Stephen Antosz
6. Secretary's Report .................................................................................. Sue McNelly
7. Treasurer's Report .................................................................................. Greg Anderson
8. Awards Report (reported at the Thursday Awards Luncheon) .................. Bill Chiu
9. Report from Administrative Subcommittee Meeting ............................. Don Platts
10. Standards Report .................................................................................... Bill Bartley
11. Editor’s Report ....................................................................................... Sanjib Som
12. Reports from Liaison Representatives
   12.1. Standards Coordinating Committee, SCC No. 4 (Electrical Insulation) Paulette Payne Powell
   12.2. Standards Coordinating Committee, SCC No. 18 (NFPA/NEC) .......... Ned Brush
   12.3. IEC TC-14 Technical Advisor to USNC ........................................... Phil Hopkinson
   12.4. CIGRE ........................................................................................... Raj Ahuja
13. Hot Topics for the Upcoming Week ..................................................... Subcommittee Chairs
14. New Business & Wrap-up ...................................................................... Don Platts
   14.1. Member ballot on WG P&P ............................................................... Don Platts

Closing Session

Thursday, March 27; 11:00 am - 12:00 pm

1. Chair’s Remarks and Announcements .................................................. Don Platts
2. Meetings Planning Subcommittee ......................................................... Greg Anderson
3. Reports from Technical Subcommittees (Minutes will be added as Annex items at the end of the report.)
   14.2. Underground Transformers & Network Protectors ......................... Carl Niemann
   14.3. Bushings ....................................................................................... Peter Zhao
   14.4. Distribution Transformers ............................................................... Steve Shull
   14.5. Dielectric Tests ............................................................................. Mike Franchek
   14.6. Dry Type Transformers .................................................................. Chuck Johnson
   14.7. HVDC Converter Transformers & Reactors ................................... Mike Sharp
   14.8. Instrument Transformers ................................................................. Ross McTaggart
   14.9. Insulating Fluids .......................................................................... David Wallach
   14.10. Insulation Life .............................................................................. Bruce Forsyth
   14.11. Performance Characteristics ....................................................... Ed teNyenhuis
4. Additional Report from Standards Subcommittee (issues from the week) .... Bill Bartley
5. New Business (continued from Monday) and Wrap-up ........................... Don Platts
## 2.0 ATTENDANCE

### 2.1 COMMITTEE MEMBER ATTENDANCE

**Legend:**
- CM: Committee Member
- CM-LM: Committee Member-IEEE Life Member
- CM-EM: Committee Member-Emeritus

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**Totals:** 134 93

% of Members Present: 67% 47%

Quorum achieved at Monday Opening Session
Quorum not achieved at Thursday Closing Session

### 2.2 GENERAL ATTENDANCE

**Legend:**
- II Interested Individual
- II-LM Interested Individual-IEEE Life Member
- AP Active Participant
- AP-LM Active Participant-IEEE Life Member
- PCM-LM Past Committee Member-IEEE Life Member

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<td>Comision Federal de Electricidad (CFE)</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>AP</td>
<td>Zhang, Jim</td>
<td>Arizona Public Service Co.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>Zhang, Pengyuan</td>
<td>Baoding Tianwei Baobian (BTW)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AP</td>
<td>Zhang, Shibao</td>
<td>PCORE Electric</td>
<td></td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>Gentle, Rob</td>
<td>The Impact Paper</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>AP</td>
<td>Inkpen, Jesse</td>
<td>Qualitrol Corp. - Serveron</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

**Total General Attendance:** 247 77

<table>
<thead>
<tr>
<th>Member Type</th>
<th>Name</th>
<th>Company</th>
<th>Mon</th>
<th>Thu</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>381</td>
<td>170</td>
</tr>
</tbody>
</table>

### Meeting Schedule

The meeting schedule is provided at the end of this report.
A motion to approve the Agenda was received from the Don Cherry and seconded by Jerry Murphy. The motion was unanimously approved.

A motion to approve the minutes was received from the Dieter Dohnal and seconded by Joe Watson. The motion was unanimously approved.
5.0 CHAIR’S REMARKS & REPORT – DON PLATTS

The Vice Chair’s Report was presented at the Monday General Session.

5.1 CHAIR’S REMARKS – PRESENTED AT THE MONDAY GENERAL SESSION

Don indicated that this is Transformer Committee Meeting number 53 for him and that he was deeply honored to serve as Chair.

Don encouraged everyone to attend the Thursday Tutorials and to participate and volunteer their time in the development of the Standards and Tutorials. There are also opportunities for panel sessions and paper presentations at the IEEE/PES General Meeting and at the T&D Conference.

5.2 CHAIR’S REPORT – PRESENTED AT THE MONDAY GENERAL SESSION

5.2.1 IEEE Power & Energy Society Technical Council

The Technical Council of the IEEE Power Energy Society (PES) is presently composed of the Chairpersons of the PES Technical Committees, plus the Chairpersons of Standing Committees reporting to it. The Power Energy Society is Division VII of The Institute of Electrical and Electronics Engineers (IEEE). For operating functions it is responsible to the IEEE Technical Advisory Board and for technical activities to the IEEE Technical Activities Board.

The PES Technical Committees report to the Technical Council on matters concerning membership, technical publications, recognition, scope and the coordination of the Power Energy Society generated standards. For standards relating to their technical scope, the Technical Committees work directly with the IEEE Standards Board and the Power Energy Society Standards Coordinating Committee.


5.2.2 Technical Council Officers & Membership

The detail listing of the PES Technical Council Officers was provided in my previous report back in March of 2013. Since that time, Mr. Mani Venkata, the Vice Chair of the PES Technical Council, has announced his resignation effective October 1, 2013. The duties of the Vice Chair are now being handled by the Chair of the Technical Council until the Vice Chair position is filled again in the near future.

The officers and members of the Technical Council are listed below for your reference. Where available, the affiliation of the technical committee chair is also shown in parentheses.

TECHNICAL COUNCIL OFFICERS
Jeffrey H. Nelson, Chair (TVA)
Ken Edwards, Vice Chair (BPA)
Miriam Sanders, Secretary (SEL University)
Damir Novosel, Past Chair (Quanta Technology)

STANDING COMMITTEES
Awards Committee - John Randolph, Chair (PG&E)
Meetings & Marketing Committee - Ken Edwards, Chair (BPA)
Organization & Procedures Committee - Miriam Sanders, Chair (SEL University)
Standards Coordination Committee - Bill Bartley, Chair (HSB)
Technical Sessions Committee - Ken Edwards, Chair (BPA)
IEEE Standards Association (SA) Requirements

IEEE SA’s Role

In the course of developing our standards, we as volunteers while having the best interest of advancing the technical understanding of our industry, are no doubt also influenced by those who sponsored our participation with other interests that potentially could influence our decisions. This is where a good understanding of the IEEE SA’s role and its relevant policy and procedures will help in clarifying some of the dos and don’ts in the process of developing our standards.

IEEE SA is a standards development organization that:

- Develops voluntary standards, recommended practices, and guides
- Uses an accredited process that promotes consensus building among those with material interest in any given technology, and is based on proven imperative principles of openness, consensus, balance, due process, and right of appeal
- Oversees the process by which consensus is reached
- Has standards that are adopted by regulatory agencies and international bodies around the world
- Promotes standards implementation, but does not define laws or regulatory requirements
- Defines technical requirements, not market mechanisms
- Reviews documents based on technical merit, and established scientific findings

IEEE SA does not:

- Test or verify the content of standards
- Assure health or safety
- Make guarantees
- Make warranties
- Establish law or regulation
- Define essential patents, essential patent holders, or licensing terms
- Define commercial terms or market mechanisms
- Infer that an IEEE standard endorses products, services, or companies
Press Releases Policy Relating to IEEE SA Work & Products
Press releases about IEEE standards by outside entities without approval by IEEE:

- Cannot claim that the IEEE standard endorses a product, service, or company
- Cannot claim that the standard establishes requirements based on information in informative text (including informative annexes)
- Cannot include marketing text about IEEE or IEEE-SA that may infer endorsement by IEEE or IEEE-SA
- Must clearly indicate that all statements are that of the entity and does not necessarily represent a position or opinion of either IEEE or the IEEE Standards Association

IEEE SA Disclaimers
A statement, written or oral, that is not processed in accordance with the IEEE-SA Standards Board Operations Manual shall not be considered the official position of IEEE or any of its committees and shall not be considered to be, nor be relied upon as, a formal position of IEEE. At lectures, symposia, seminars, or educational courses, an individual presenting information on IEEE standards shall make it clear that his or her views should be considered the personal views of that individual rather than the formal position of IEEE.

5.2.4 IEEE Code of Ethics
The IEEE Code of Ethics serves as the guiding light to keep us focused on maintaining and evolving our culture that makes the Transformers Committee one of the best technical committees in the Power & Energy Society’s area. Below is the excerpt from the IEEE Policies, Section 7 – Professional Activities.

Affiliation
Given the core objectives of the standards development process to follow the concept of “openness” and “due process” in that it allows for equity and fair play we need to strive to have a balance of interests and not to be dominated by any single interest category. Moving forward, the disclosure of participants’ affiliation shall include not just who you are, but also who is your financial sponsor.

5.2.5 Update on Geomagnetic Disturbance (GMD) Taskforce
The Technical Council Taskforce on GMD has made very little progress on the development of the position paper, since the last Chair’s report in October 2013. The task force was able to complete an initial release of an article entitled Geomagnetic Disturbance and Its Impacts on the Power Grid in the PES Power & Energy Magazine in the July, 2013 edition to coincide with the GDM Super Session planned at the PES General Meeting in July, 2013 at Vancouver Canada. This project continues to fall further behind schedule, primarily due to fundamental differences of opinion of some of the contributors. The IEEE PES Technical Council still maintains strong support for the project and has urged the task force to proceed with the completion, even if the report needs to be a Stage 1 report, subject to revision and additions as time passes and knowledge grows.

5.2.6 Transformers Committee Activities

Officers Progression for the 2014-2015 Period
In accordance with the rules set forth in the Transformers Committee Organization and Procedures Manual, the Committee Officers (the Chair, the Vice Chair, and the Secretary) are recommended by the incumbent Chair of the Committee with the concurrence of the immediate Past Chair and are approved by the Chair of the Technical Council and is expected to serve two years a two-year term, and follows the established progression cycle for the next two-year period. The table below shows the progression of officer's assignment for the next two years beginning January 2014.

<table>
<thead>
<tr>
<th>Officer Role</th>
<th>2014-2015 Term</th>
</tr>
</thead>
<tbody>
<tr>
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<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Committee Chair                                Donald W. Platts
Committee Vice-Chair                         Stephen Antosz
Committee Secretary                         Susan McNelly
Past Chair / Awards Chair                    Bill Chiu
Committee Treasurer*                        Greg W. Anderson
Standards Coordinator*                     William (Bill) H. Bartley

* Treasurer and Standards Coordinator are excluded from the officer progression cycle.

**Subcommittee Chairpersons & Technical Editor**

Our current roster of the Subcommittee Chairs and Editor are:

- Bushings Subcommittee                     Peter Zhao
- Dielectric Test Subcommittee              Michael Franchek
- Distribution Transformers Subcommittee    Stephen Shull
- Dry-Type Transformers Subcommittee        Charles Johnson
- HVDC Converter Transformers and Smoothing Reactors Subcommittee Michael Sharp
- Instrument Transformers                   Ross McTaggart
- Insulating Fluids Subcommittee           Susan McNelly
- Insulation Life Subcommittee              Bruce Forsyth
- Meetings Subcommittee                     Gregory Anderson
- Performance Characteristics Subcommittee  Ed teNynenhuis
- Power Transformers Subcommittee           Joe Watson
- Standards Subcommittee                    William Bartley
- Underground Transformers & Network Protectors Subcommittee Carl Niemann
- Technical Editor                          Sanjib Som

All of them have committed to serve the duration of the calendar year 2014. PES Technical Council was notified of the Subcommittee Chairs and Technical Editor appointments for the calendar year 2014 in accordance with the guideline set forth in our O&P Manual.

**5.2.7 IEEE Membership – Senior Grade**

IEEE membership has several categories, with the senior level being the highest grade which a member can apply. IEEE has developed a streamlined process for members to request elevation of their membership status. The process is simple and can be done entirely online. The Chair strongly encourages everyone that has been an active contributor to the industry for at least five years to apply for this elevation in membership status. The basic qualifications are:

- be engineers, scientists, educators, technical executives, or originators in IEEE-designated fields;
- have experience reflecting professional maturity;
- have been in professional practice for at least ten years;
- show significant performance over a period of at least five of their years in professional practice.

Benefits of becoming a senior member include:

- **Recognition**: The professional recognition of your peers for technical and professional excellence.
- **Senior member plaque**: Since January 1999, all newly elevated Senior members have received an engraved Senior Member plaque to be proudly displayed for colleagues, clients and employers. The plaque, an attractive fine wood with bronze engraving, is sent within six to eight weeks after elevation.
- **US$25 coupon**: IEEE will recognize all newly elevated Senior members with a coupon worth up to US$25. This coupon can be used to join one new IEEE society. The coupon expires on 31 December of the year in which it is received.
- **Letter of commendation**: A letter of commendation will be sent to your employer on the achievement of Senior member grade (upon the request of the newly elected Senior member).
• **Announcements**: Announcement of elevation can be made in section/society and/or local newsletters, newspapers and notices.

• **Leadership Eligibility**: Senior members are eligible to hold executive IEEE volunteer positions.

• **Ability to refer other candidates**: Senior members can serve as a reference for other applicants for senior membership.

• **Review panel**: Senior members are invited to be on the panel to review senior member applications.

• **US$25 referral coupon**: Newly elevated Senior members are encouraged to find the next innovators of tomorrow and invite them to join IEEE. Invite them to join and the new IEEE member will receive $25 off their first year of membership.

**IEEE Membership – Fellow Grade**

The IEEE membership grade of Fellow recognizes unusual distinction in the profession and shall be conferred only by invitation of the Board of Directors upon a person of outstanding and extraordinary qualifications and experience in IEEE-designated fields, and who has made important individual contributions to one or more of these fields. IEEE Fellow nominees are classified into the following four categories:

- Application Engineer/Practitioner
- Educator
- Research Engineer/Scientist
- Technical Leader

IEEE Fellow is a distinction reserved for select IEEE members whose extraordinary accomplishments in any of the IEEE fields of interest are deemed fitting of this prestigious grade elevation.

According to IEEE Bylaw I-305.5, the total number of Fellow recommendations in any one-year must not exceed one-tenth of one percent of the voting membership on record as of 31 December of the year preceding. At the time the nomination is submitted, a nominee must:

- have accomplishments that have contributed importantly to the advancement or application of engineering, science and technology, bringing the realization of significant value to society;
- hold IEEE Senior Member or IEEE Life Senior Member grade;
- have been a member in good standing in any grade for a period of five years or more preceding 1 January of the year of elevation.

For further details please refer to the website [http://www.ieee.org/membership_services/membership/fellows/index.html](http://www.ieee.org/membership_services/membership/fellows/index.html)

**Committee Membership**

All are welcome to participate in the work of the Transformers Committee. Membership in the Committee provides recognition of your peers and indication to your co-workers and management of your active role in Committee work. If you are presently not a Main Committee Member, and you have been actively participating in our work for at least two full year – and can secure the acknowledgement and sponsorship of at least 3 activity Chairs (WGs, but must include at least one Subcommittee Chair) affirming that participation, the Committee will look forward to welcoming you as a member. Membership requirements and application forms can be found in the Organization and Procedures Manual posted on the Committee website.

As our organization is a 100% volunteer based organization, we are very much in need of all of your continued participation and sharing of your expertise towards our world-class standards development efforts. Many of our long-standing committee members have made tremendous contributions towards our standards development effort over the years and their contributions are greatly appreciated.

Respectfully submitted,

*Don Platts*
Chair, IEEE/PES Transformers Committee
6.0 VICE CHAIR’S REPORT – STEPHEN ANTOSZ

6.1 IEEE PES CALENDAR OF UPCOMING EVENTS

Following are upcoming PES sponsored conferences and committee meetings. Please check the PES website at www.ieee-pes.org for further details.

2014 IEEE/PES Transmission & Distribution Conference & Exposition (T&D)
Apr 14-17, 2014, Chicago IL, USA

2014 IEEE/PES General Meeting
Jul 27-31, 2014, National Harbor, MD (Washington, DC Metro Area)

6.2 UPCOMING CONFERENCE PAPERS SUBMITTED

6.2.1 IEEE/PES T&D Conference and Expo

A total of 17 conference papers were submitted. After review, 5 papers were rejected and 8 papers were accepted and scheduled for presentation at the Poster Session. 4 papers were incomplete, as they were referred to revise and resubmit but there was no response from the author. In addition, one Transactions paper was accepted. The papers that were accepted for presentation are:

<table>
<thead>
<tr>
<th>ID</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>14TD0004</td>
<td>PROBABILISTIC TRANSFORMER FAULT TREE ANALYSIS USING BAYESIAN NETWORKS</td>
</tr>
<tr>
<td>14TD0109</td>
<td>Development of Miniaturized AC Reactors with Lower-Losses Using Amorphous Wound Cores in 400-kVA UPS</td>
</tr>
<tr>
<td>14TD0295</td>
<td>Combining dry type Resin Impregnated Fiberglass Paperless Transformer Bushings With Built-in Novel Insulation Monitoring Function</td>
</tr>
<tr>
<td>14TD0298</td>
<td>Practical Aspects of Power Transformer Condition Monitoring</td>
</tr>
<tr>
<td>14TD0331</td>
<td>Advanced Transformer Fleet Monitoring System</td>
</tr>
<tr>
<td>14TD0380</td>
<td>A Process for Evaluating the Degree of Susceptibility of a fleet of Power Transformers to Effects of GIC</td>
</tr>
<tr>
<td>14TD0455</td>
<td>Advanced Tap Changer Control of Parallel Transformers based on IEC 61850 GOOSE Service</td>
</tr>
<tr>
<td>14TD0532</td>
<td>An Innovative Method for Cooling oil-immersed Transformers by Rayleigh-Benard Convection</td>
</tr>
</tbody>
</table>

6.2.2 IEEE/PES 2014 General Meeting

The theme of the meeting is: Charting the Course to a New Energy Future. The Super Sessions planned have the following focus:

- Cyber and Physical Security
- Natural Disaster Preparedness, Planning and Response
- Grid Operations: Practices and Challenges
- Implementation of Smart Grid Projects: Results and Lessons Learned

A total of 27 conference papers were submitted. After review, 15 papers were rejected and 10 papers were accepted and scheduled for presentation at the Poster Session. 2 papers were incomplete, as they were referred to revise and resubmit but there was no response from the author. In addition, one Transactions paper was accepted. The papers that were accepted for presentation are:
<table>
<thead>
<tr>
<th>ID</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>14PESGM0192</td>
<td>An Economic Evaluation Model of Transformers Considering Outage Consequence</td>
</tr>
<tr>
<td>14PESGM0245</td>
<td>A Diffusion-Driven Model for Investigating Moisture Effects on Dielectric Response Measurement of Transformer Insulation</td>
</tr>
<tr>
<td>14PESGM0272</td>
<td>Differential Partial Discharge Extraction Technique for Online Power Transformer Insulation Assessment</td>
</tr>
<tr>
<td>14PESGM0372</td>
<td>Investigating the Sensitivity of Frequency Response Analysis on Transformer Winding Structure</td>
</tr>
<tr>
<td>14PESGM0631</td>
<td>Analysis on the Effects of Energization Mode for Magnetically Controlled Shunt Reactor</td>
</tr>
<tr>
<td>14PESGM0782</td>
<td>Detection of Minor Axial Winding Movement within Power Transformers Using Finite Element Modeling</td>
</tr>
<tr>
<td>14PESGM0871</td>
<td>Application of FRA Polar Plot Technique to Diagnose Internal Faults in Power Transformers</td>
</tr>
<tr>
<td>14PESGM1039</td>
<td>Application of Multifractal Spectrum to the Vibration Analyses of Power Transformer under DC Bias</td>
</tr>
<tr>
<td>14PESGM1539</td>
<td>Performance Evaluation of On-Line Transformer Winding Short Circuit Fault Detection Based on Instantaneous Voltage and Current Measurements</td>
</tr>
<tr>
<td>14PESGM1597</td>
<td>Research on Chaotic Dynamic Characteristics of On-load Tap Changers</td>
</tr>
</tbody>
</table>

6.3 **There will be a Transformers Committee Panel Session at the T&D Conf & Expo.**

**Title:** Transformer Monitoring & Design Update  
**Description:** Update on developments in several areas of monitoring transformers and their accessory components.  
- Monitoring for core saturation during GIC events.  
- Evaluating the susceptibility of a fleet of transformers to effects of GIC  
- Wind Power Transformer Design  
- Monitoring of transformer condition

Gary Hoffman has agreed to Chair this session.

<table>
<thead>
<tr>
<th>Presentation Title</th>
<th>Presenter</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Process for Evaluating the Degree of Susceptibility of a fleet of Power Transformers to Effects of GIC</td>
<td>Ramsis Girgis, ABB</td>
</tr>
<tr>
<td>Wind Power Transformer Design Considerations</td>
<td>Philip J. Hopkinson, HVOLT</td>
</tr>
<tr>
<td>New Techniques for the Monitoring of Transformer Condition</td>
<td>Tom Prevost, Omicron</td>
</tr>
<tr>
<td>Monitoring GMD Events in the Consolidated Edison System</td>
<td>Sam Sambasivan, Con Edison</td>
</tr>
</tbody>
</table>

Respectfully,

**Stephen Antosz**  
Vice Chair  
IEEE PES Transformers Committee  
March 24, 2014
7.0  **SECRETARY’S REPORT – SUSAN MCNELLY**

7.1  **MEMBERSHIP REVIEW**

Voting Committee Members – One new committee members was approved and added at the St. Louis meeting as shown in the table below:

<table>
<thead>
<tr>
<th>Name</th>
<th>Affiliation</th>
<th>Sponsor #1</th>
<th>Sponsor #2</th>
<th>Sponsor #3</th>
<th>Membership Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adam Bromley</td>
<td>Fort Collins</td>
<td>Guiseppe Termini</td>
<td>Ron Stahara</td>
<td>Stephen Shull</td>
<td>User</td>
</tr>
<tr>
<td></td>
<td>Utilities</td>
<td>WG C57.12.24 3 ph Submersible</td>
<td>WG C57.12.34 3 ph Padmount</td>
<td>Distribution Trans SC (2.5yrs)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2yrs)</td>
<td>(2.5yrs)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The Transformers Committee AMS database of people currently has three general categories of participation in our activities. These are: **Interested Individual**, **Active Participant**, and **Committee Member**. Anyone can join our AMS 123 system as the system is designed for self-registration. A new participant will automatically be assigned the role of Interested Individual when they first sign up. Based on the level of participation, the committee administrative staff will upgrade the participation status to “Active Participant” when appropriate. The Committee Member status however, can only be attained through a formal application with the sponsorship of a minimum of three WG or SC chairmanships. Details of the application requirements and approval process by the Administrative Subcommittee are outlined in our O&P manual.

The following table contains a count of the participants grouped by the three general categories.

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Interested Individual</td>
<td>1061</td>
<td>1132</td>
<td>1205</td>
<td>1277</td>
<td>1376</td>
<td>1381</td>
</tr>
<tr>
<td>Interested Individual - IEEE Life Member</td>
<td>4</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>16</td>
<td>12</td>
</tr>
<tr>
<td><strong>Total Interested Individuals</strong></td>
<td>1065</td>
<td>1138</td>
<td>1212</td>
<td>1285</td>
<td>1392</td>
<td>1393</td>
</tr>
</tbody>
</table>

| Active Participant                       | 218    | 232    | 231    | 173    | 178    | 192    |
| Active Participant - IEEE Life Member    | 5      | 6      | 6      | 5      | 5      | 5      |
| **Total Active Participants**            | 223    | 238    | 237    | 178    | 183    | 197    |

| Committee Member                         | 218    | 182    | 182    | 186    | 170    | 166    |
| Committee Member - Emeritus Member       | 8      | 6      | 6      | 6      | 3      | 9      |
| Committee Member - IEEE Life Member      | 31     | 29     | 30     | 31     | 25     | 21     |
| **Total Committee Members**              | 258    | 217    | 218    | 223    | 198    | 196    |

| Past Committee Member                    |        |        |        |        |        | 15     |
| Past Committee Member - IEEE Life Member |        |        |        |        |        | 6      |
| **Total Past Committee Members**         |        |        |        |        |        | 21     |

| **TOTAL IN AMS DATABASE**                | 1546   | 1593   | 1667   | 1686   | 1773   | 1810   |

It is the responsibility of each individual to keep his/her profile updated, (except for the category).

7.2  **NEW MEMBER APPLICATIONS**

Five new applications for Committee Membership has been received since our previous meeting in St. Louis.
The Committee welcomes and encourages active participants to become Members of the Committee. Requirements and application forms can be found in the Organization and Procedures (O&P) Manual, accessible on the Committee website. A copy of the Membership Application is attached as an Annex to this Secretary’s Report. Subcommittee Chairs are encouraged to recommend new members and to communicate the process of attaining membership through active participation and contribution at the WG and SC level. WG and SC Chairs are reminded also that signing an application sponsoring a new member signifies their sponsorship that the applicant has met the requirement of membership and active participation for at least one year in the WG or SC they Chair. New member applications may be submitted to the Committee Secretary’s attention at any time. Applications will be collected for review and approval in batches at each Administrative Subcommittee meeting.

7.3 COMMITTEE, SUBCOMMITTEES, AND WORKING GROUP ROSTERS

In order to provide indemnification to working group and subcommittee members it is crucial that membership lists be maintained. The AM system has these functions built-in to ease these administration tasks. It is important that each subcommittee and working group chair keep the rosters updated so that this information can be provided to the IEEE SA.

A similar main committee roster has also been developed to track attendance for the Main Committee General Session meeting on Monday & Thursday. The data will be used to update participant’s membership profile.

7.4 IEEE/PES AND IEEE/SA MEMBERSHIP REQUIREMENTS

As a reminder, all members of the Transformers Committee must also be members in good standing of the Power & Energy Society (IEEE/PES) and the Standards Association (IEEE/SA). There are a number of Transformers Committee members who have lapsed and must renew their SA and/or PES affiliation. These memberships are renewed annually along with your IEEE Membership renewal, which typically occurs around October/November of each year.

WG Chairs must also be a member of the SC, IEEE, PES, and SA.

There are a number of Transformers Committee Members who are not PES or SA members. They will be sent a reminder to renew required memberships. If they do not comply then they will be dropped as Members. It is not fair to the other Members who adhere to this rule and pay the annual fees. Moreover, a
person CANNOT participate in any ballot activity if they are not an SA member, and this is one of the basic responsibilities of an active member.

7.5 **COMMITTEE MEMBERSHIP MAINTENANCE**

The following members were removed: Barry Ward who retired and requested removal and long standing member and contributor, TV Oommen, who passed away October 30, 2013. In addition, Past Member Don Cash, and Active Participant Dr. Gustav Preininger also passed away in 2013. The status of Emeritus Member was granted to Loren Wagenaar.

7.6 **ESSENTIAL PATENT CLAIMS**

The Transformers Committee asks each participant at the time of meeting registration if they are aware of an essential patent claim, and if so to provide details. An Essential Patent Claim is any Patent Claim the use of which was necessary to create a compliant implementation of the IEEE Standard when there was no commercially and technically feasible non-infringing alternative. In other words, if an IEEE Standard REQUIRES the use of a product or process that is already patented, then this could be an essential patent claim. If they did, they would be instructed to have the patent holder’s legal team file a Letter of Assurance (LOA) with the IEEE-SA Standards Board Patent Committee. There is a link to this information on the transformerscommittee.org website under Patent Disclosure Requirements. For the Savannah meeting, most people indicated No to the Patent question. There were 7 people who answered YES that they were aware of an essential patent claim. Of these, 4 of the 7 provided no details and were therefore not considered any further. The remaining 3 were reviewed: two referred to PC57.139 DGA of LTCs which indicated a LOA dated Jan 2013; and the other referred to a patent on natural esters indicating that the LOA has been refused to be granted. The next steps that should be taken are being reviewed by IEEE.

7.7 **AFFILIATION**

According to the IEEE Standards Board Bylaws, there is a requirement that participants of an IEEE meeting must disclose their employer and affiliation. Consultants must state if they are sponsored, or not. One cannot simply announce that "My name is John Smith, and I'm a consultant." If a client is sponsoring an attendees presence, it must be disclosed. If the consultant does not have a sponsor, the proper introduction is something like."My name is John Smith, I am a consultant, and I represent myself at this meeting."

7.8 **MEETING MINUTES**

The minutes of the St. Louis Transformers Committee fall 2013 meeting were posted to the committee website in January of 2014.

Subcommittee Chairs are requested to submit their SC Minutes for the Savannah meeting by June 1, 2014.

The minutes should be submitted via e-mail to the Committee Secretary, Susan McNelly at [sjmcnelly@ieee.org], who will also make sure that they are posted on the Committee website.

The submittal file should be saved as a Word document formatted Similar to this document. Attendance, indication of quorum, names of members making any motion, seconding any motion, and the result of any votes (affirmative and negative count) for each SC, WG, and TF meeting are to be included in all minutes.

Respectfully submitted,

*Susan McNelly*
Secretary
IEEE PES Transformers Committee
March 23, 2014, Rev 1
8.0  TREASURER’S REPORT – GREGORY ANDERSON

The finances of the Committee are in excellent condition. As of 28th of January 2014 (end of this reporting period), the balance was $72,586.57. FYI: January 28th is essentially a "snap-shot" in time after all income & expenses are resolved from the previous St. Louis Meeting, and before we start spending significant funds for the Savannah Meeting. There were no significant assets (PC projectors, etc.) purchased during this reporting period. The St. Louis Meeting "made" approx $24,000, which helped balance the anticipated loss of approx $26,000 incurred at the Munich Meeting. All is well. See attached summary for balances for this reporting period and the previous periods. Let me know if you have any questions or concerns.

Sincerely,
Gregory W. Anderson,
Treasurer IEEE/PES Transformers Committee
The Awards were presented at the Tuesday Awards Luncheon.

9.1 Committee Membership Certificates

The Transformers Committee welcomes five new full committee members. Each of the following new members was presented with a membership certificate:

<table>
<thead>
<tr>
<th>New Member</th>
<th>Affiliation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diego M. Robalino</td>
<td>Megger</td>
</tr>
<tr>
<td>William J. Solano</td>
<td>ABB</td>
</tr>
<tr>
<td>Susmitha Tarlapally</td>
<td>ABB</td>
</tr>
<tr>
<td>Alexsandr Levin</td>
<td>Weidmann</td>
</tr>
<tr>
<td>Michael Miller</td>
<td>WE Energies</td>
</tr>
</tbody>
</table>

9.2 General Service Awards Certificate of Appreciation

Certificate of Appreciations were presented to the following list of recipients for their contributions to the Transformers committee:

<table>
<thead>
<tr>
<th>Name of Award Recipients</th>
<th>Affiliation</th>
<th>Contributions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jorge O. Guerra</td>
<td>EFACEC</td>
<td>Meeting Host – Spring 2014</td>
</tr>
<tr>
<td>EFACEC Power Transformers, Inc.</td>
<td>EFACEC</td>
<td>Host Company– Spring 2014</td>
</tr>
<tr>
<td>Susan J. McNelly</td>
<td>Xcel Energy</td>
<td>Insulating Fluids Subcommittee Chair (2009–2013)</td>
</tr>
<tr>
<td>Steve Snyder</td>
<td>ABB</td>
<td>Outstanding Contributions to the Transformers Committee</td>
</tr>
</tbody>
</table>

9.3 Special Awards

During the Fall 2013 meeting in St Louis, special recognition was given to Dr. Ramsis Girgis for his role in the presentation of the paper entitled “The Methodology For Evaluating The Impact of GIC and GIC Capability of Power Transformers” at the 2013 IEEE PES General Meeting in Vancouver, Canada. Due to a mis-interpretation on the criteria for the selection of the best paper award, we did not acknowledge the co-author of this paper. At this meeting in Savannah, the Transformers Committee acknowledged and recognized Mr. Kiran Vedante as the co-author of this paper that was selected to be the Best Paper by the PES Technical Council. A special Certificate of Appreciation was also presented to Mr. Kiran Vedante as the co-author of the 2013 PES GM best paper award for the Equipment and Load Characteristic category.

9.3.1 New IEEE Fellow

IEEE Fellow is a distinction reserved for select IEEE members whose extraordinary accomplishments in any of the IEEE fields of interest are deemed fitting of this prestigious grade elevation. This grade elevation is done through a Fellow’s Nomination Process that involves a lengthy nomination documents describing the accomplishments and contributions in details. It requires a number of references, and also a number of endorsers, who each also have to write a separate endorsement that describe why the candidate is deserving of the recognition.
At this meeting, the Transformers Committee is honored to have one of our very own active member and key contributor, Mr. William H. Bartley, to be selected to the 2014 class of IEEE Fellow. Many of our committee members had the privilege of working very closely with Mr. Bartley over the course of past decade and a half and have no-doubt been impressed by his quality of work and his tireless contribution to our Committee. In addition to his active contributions to the Transformers Committee, Mr. Bartley was also actively involved in the Machinery Committee and contributed to the publication of number of key industry standards in both the Transformers Committee and the Machinery Committee in addition to numerous noteworthy industry papers on failure investigation and failure statistics of large machines and transformers, and their life cycle planning and risk assessment.

Mr. Bartley was employed by Hartford Steam Boiler Inspection and Insurance Company and has just recently retired after forty-one years of service in December 2012 where he was the Assistant Vice President and Principal Electrical Engineer, responsible for developing standards, OEM relations, and large failure investigations. Today, he works part-time as a consultant for HSB. He is a registered Professional Engineer in Connecticut, and an IEEE Fellow. At IEEE he serves as an officer on the Transformers Committee in the capacity of Standards Coordinator, and chairs the Standards Coordinating Committee of the Technical Council for IEEE Power & Energy Society. Mr. Bartley earned a B.S. degree in Electrical Engineering from University of Missouri at Rolla.

The Transformers Committee presented a heartfelt congratulatory certificate of merit to recognize and celebrate Mr. Bartley’s achievement.

The list of IEEE Fellows from the Transformers Committee as included below for reference (in alphabetical order the last name).

<table>
<thead>
<tr>
<th>Name of IEEE Fellow</th>
<th>Year</th>
<th>Citation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dennis J. Allan (Life Fellow)</td>
<td>1992</td>
<td>for contributions to the design and development of power transformers</td>
</tr>
<tr>
<td>Peter M. Balma</td>
<td>2013</td>
<td>for leadership in developing technical guides for electric power equipment</td>
</tr>
<tr>
<td>Ray Bartnikas (Life Fellow)</td>
<td>1977</td>
<td>for contributions to the field of dielectric and corona loss mechanisms in electrical insulating systems.</td>
</tr>
<tr>
<td>William H. Bartley (Fellow)</td>
<td>2014</td>
<td>Bartley, William (Fellow) 2014 - for contributions to the development of generator and transformer standards for life cycle planning and risk assessment</td>
</tr>
<tr>
<td>Robert C. Degeneff (Life Fellow)</td>
<td>1993</td>
<td>for contributions to the modeling and computation of transient voltages in transformer windings</td>
</tr>
<tr>
<td>Ramsis S Girgis (Life Fellow)</td>
<td>1993</td>
<td>for contributions to reductions in the losses of large power transformers</td>
</tr>
<tr>
<td>James H. Harlow (Life Fellow)</td>
<td>2013</td>
<td>for leadership in IEEE technical and standardization committees on transformer technology</td>
</tr>
<tr>
<td>Philip John Hopkinson (Life Fellow)</td>
<td>2002</td>
<td>for contributions to the reliability of distribution transformers and the development of related standards for testing and application</td>
</tr>
<tr>
<td>William J McNutt (Life Fellow)</td>
<td>1976</td>
<td>for contributions to the design of power transformers and standardization of test procedures</td>
</tr>
<tr>
<td>Harold R. Moore (Life Fellow)</td>
<td>1997</td>
<td>for leadership in the development, design, and application of power transformers and associated equipment</td>
</tr>
<tr>
<td>Linden W. Pierce (Life Fellow)</td>
<td>2000</td>
<td>for contributions to the understanding of heat transfer and loading of liquid-immersed and dry type power and distribution transformers</td>
</tr>
<tr>
<td>Robert A. Veitch (Life Fellow)</td>
<td>1998</td>
<td>for leadership in the development and design of very large and extra high voltage transformers, shunt reactors and associated equipment</td>
</tr>
<tr>
<td>Loren B. Wagenaar</td>
<td>1996</td>
<td>for contributions to transformer and bushing test standards and</td>
</tr>
<tr>
<td>Name of IEEE Fellow</td>
<td>Year</td>
<td>Citation</td>
</tr>
<tr>
<td>---------------------</td>
<td>------</td>
<td>----------</td>
</tr>
<tr>
<td>(Life Fellow)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dean A. Yannucci</td>
<td>1990</td>
<td>for leadership in the development and manufacture of large power transformers</td>
</tr>
</tbody>
</table>

Committee members are encouraged to nominate our fellow contributors for this distinguished recognition of Fellow. Nominations, including references by at least five present IEEE Fellows and optional additional endorsements, must be completed and submitted by March 1 of each year for the following year’s Class of Fellows.

9.4 IEEE SA STANDARDS BOARD AWARDS

In addition to the Committee Awards above, the IEEE SA SB presents its own Award to the WG Chair upon publication of a new or revised document, and offers the WG Chair the opportunity to nominate significant contributors to the project for an IEEE SA SB Certificate of Appreciation. All Working Group Chairs chose to have their awards sent direct to their residence or place of business. The award recipients were called forward for recognition during our awards Luncheon on Tuesday.

IEEE SA Award Recipients:

C57.12.10 Corrigenda 2, Std Requirements for Liquid Immersed Power Transformers
Correction of A.3.2.13 Autotransformer LTC application considerations

Gary Hoffman – Working Group Chair
James Harlow – Working Group Vice Chair

The following IEEE SA Working Group Awards recipients requested their acknowledgement be postponed to the Fall 2014 meeting in Washington D.C.

*** REQUESTED RECOGNITION AT THE FALL 2014 MEETING ***

Revision of C57.134, Guide for Determination of Hottest-Spot Temperature in Dry-Type Transformers
Paulette Payne Powell - Working Group Chair

IEEE SA Award Recipients
C57.96 Guide for Loading Dry-Type Distribution and Power Transformers
Richard P. Marek – Working Group Chair

IEEE 638, Standard for Qualification of Class 1E Transformers for Nuclear Power Stations
Craig Swinderman – Working Group Chair

*** REQUESTED RECOGNITION AT THE FALL 2014 MEETING ***

9.5 IEEE STANDARDS ASSOCIATION (SA) AWARDS AND RECOGNITION

The IEEE SA sponsors additional awards besides the WG Chair Awards reviewed above. Discussion of these awards can be found on the IEEE SA Awards web pages (http://standards.ieee.org/sa/aw/). Note particularly the IEEE SA Standards Medallion. Excerpting from the website: “The Standards Medallion is awarded for major contributions to the development of standards. Examples of such contributions may include leadership in standardization of new technologies, assuring achievement of standards development goals, identifying opportunities to better serve the needs of standards users or other such contributions viewed as deserving of this award…” Please review, and if you have suggestions for nominations see our Committee Awards Chair.
9.6 IEEE PES AWARDS

The IEEE PES recognizes important technical, educational and service contributions through the conferral of numerous awards. The listing below highlights the various awards that are available through the IEEE PES organization.

- **IEEE PES Award for Excellence in Power Distribution Engineering**
- **IEEE PES A.P. Seethapathy Rural Electrification Excellence Award**
  Nominations due by February 1st
- **IEEE PES Charles Concordia Power Systems Engineering Award**
  Nominations due by January 31st
- **IEEE PES Cyril Veinott Electromechanical Energy Conversion Award**
  Nominations due by February 1st
- **IEEE PES Douglas M. Staszesky Distribution Automation Award**
  Nominations due by January 1st
- **IEEE PES Lifetime Achievement Award**
  Nominations due by February 1st
- **IEEE PES Leadership in Power Award**
  Nominations due by February 1st
- **IEEE PES Meritorious Service Award**
- **IEEE PES Nari Hingorani Custom Power Award**
  Nominations due by January 31st
- **IEEE PES Nari Hingorani FACTS Award**
  Nominations due by January 31st
- **IEEE PES Outstanding Chapter Award**
- **IEEE PES Outstanding Power Engineering Educator Award**
  Nominations due by January 31st
- **IEEE PES Outstanding Young Engineer Award**
  Nominations due by February 1st
- **IEEE PES Prabha S. Kundur Power System Dynamics and Control Award**
  Nominations due by January 31st - Call for Nominations
- **IEEE PES Prize Paper Award**
- **IEEE Power & Energy Society Ramakumar Family Renewable Energy Excellence Award**
- **IEEE PES Robert P. Noberini Distinguished Contributions to Engineering Professionalism Award**
  Nominations due by February 1st
• **IEEE PES G. Ray Ekenstam Memorial Scholarship**
  *Nominations due by June 30th*

• **IEEE PES Scholarship Plus Initiative**
  *Applications due by June 30th*

• **IEEE PES Roy Billinton Power System Reliability Award**
  *Nominations due by February 1st*

• **IEEE PES Student Prize Paper Award in Honor of T. Burke Hayes**
  *Nominations due by December 15th*

• **IEEE PES Uno Lamm High Voltage Direct Current Award**
  *Nominations due by November 30th*

• **IEEE PES Wanda Reder Pioneer in Power Award**
  *Nominations due by January 15th*

• **IEEE PES Working Group Recognition Awards**
  The PES Working Group Recognition Awards recognize “the most outstanding and timely publications” by a PES Working Group (or Committee or Subcommittee) from among the nominations. The PES Recognition Award is divided into two categories: 1) for technical reports; 2) standards and guides. Each Technical Council Committee may nominate one report from each category, published by IEEE, during the previous three year period.” This award consists of a plaque which will be presented to the Working Group Chair at the PES Summer Meeting Awards Luncheon. A framed certificate will be presented to each Working Group member at a designated meeting of the parent Technical Committee.

• **IEEE PES CSEE Yu-Hsiu Ku Electrical Engineering Award**

### 9.7 PES TRANSFORMERS COMMITTEE DISTINGUISHED SERVICE AWARD

We will continue to present our PES Technical Committee Distinguished Service Award each year to one of our members who is recognized by his peers as having contributed significantly and consistently to Committee Standards activities. This personal recognition acknowledges the efforts of those individuals whose sustained performance, over many years, has contributed to the advancement of the committee technology. Please see the Awards Chair if you have suggestions for future recipients. We are always seeking nominations for this award.

### 9.8 TRANSFORMERS COMMITTEE MERITORIOUS SERVICE AWARDS

There is also a process of additional recognition for Meritorious Service and Outstanding Contributions to the Committee. Suggested qualifications have been developed from a review of similar awards presented by other IEEE Technical Committees or Societies. General examples for qualification for the awards include the following:

To recognize continuing exemplary service in notable technical contributions to multiple Committee projects/documents over a sustained period of time
To recognize an achievement of major value and significance to the Committee. The achievement can be a specific, concisely characterized accomplishment, as opposed to a collection of different efforts.

As with the IEEE Education Society Meritorious Service Award – “to recognize pioneering contributions to the administrative efforts of the Society over a period of years, as evidenced by dedication, effort, and contributions.”

If you have any additional thoughts on qualifications for Meritorious Service Awards, and if you have potential nominees to suggest, please contact me. Award nominees will be reviewed by the Awards Chair and the SC Officers.

Respectfully submitted,

Bill Chiu
Chair, Awards Subcommittee
10.0 ADMINISTRATIVE SUBCOMMITTEE MEETING REPORT

10.1 INTRODUCTIONS

The attendees were asked to introduce themselves. The chair asked each attendee to state his/her affiliation. If the attendee is a consultant, the attendee must state if he is representing a company other than his own consulting interest. Introductions were made by members and guests.

Attendance

Members Present:
Chair............................................................................................................................ Donald Platts
Vice Chair .................................................................................................................... Stephen Antosz
Secretary..................................................................................................................... Susan McNelly
Treasurer ..................................................................................................................... Gregory Anderson
Standards Coordinator ............................................................................................... William Bartley
Awards/Past Chair ...................................................................................................... Bill Chiu
Bushings ..................................................................................................................... Peter Zhao
Dielectric Tests .......................................................................................................... Michael Franchek
Distribution Transformers ....................................................................................... Stephen Shull
Dry Type Transformers ............................................................................................ Charles Johnson
HVDC Converter Transformers & Reactors ............................................................. Michael Sharp
Instrument Transformers ......................................................................................... Ross McTaggart
Insulating Fluids ......................................................................................................... David Wallach
Insulation Life ............................................................................................................. Bruce Forsyth
Performance Characteristics ..................................................................................... Ed teNyenhuis
Power Transformers .................................................................................................. Joe Watson
Underground Transformers & Network Protectors ................................................ Dan Mulkey for Carl Niemann
IEEE-SA Stakeholder Engagement Liaison............................................................. Jodi Haasz
IEEE Standards Technical Community Program Manager..................................... Erin Speiwak
Guest ......................................................................................................................... Tom Prevost
Guest ......................................................................................................................... Erin Carpenter

10.2 APPROVAL OF PREVIOUS MEETING MINUTES

The Chair asked for comments from the October 20, 2013, St. Louis, Missouri Administrative Subcommittee meeting minutes. Hearing no comments or requests to change the draft minutes, the Chair asked for a motion to approve. A motion to approve was made by Bill Bartley and seconded by Bruce Forsyth. Vote Approved unanimously.

10.3 APPROVAL OF AGENDA

The Chair reviewed the draft agenda with the attendees. No changes or additions were requested.

Agenda

1. Introduction of Members and Guests All
2. Approval of Fall 2013 Minutes from St. Louis D. Platts
3. Additions to and/or Approval of the Agenda D. Platts
4. Chair’s Report D. Platts
5. Vice Chair’s Report S. Antosz
6. Secretary’s Report & New Committee Membership Approval  
   S. McNelly
7. Treasurer’s Report  
   G. Anderson
8. Recognition & Awards Report  
   B. Chiu
9. Standards Report  
   B. Bartley
10. IEEE Staff Update  
    E. Spiewak/J. Haasz
11. Meeting Planning  
    a. Savannah Meeting Update  
    G. Anderson
    b. Future Meetings
12. Old Business  
    a. WG Data – Confidentiality, Storage, Access, & Use  
    S. McNelly/E. Spiewak
    b. Committee P&P  
    B. Bartley
    c. GMD/GIC Position Paper  
    B. Chiu
    d. Meeting Improvement Initiative  
    D. Platts/B. Bartley
13. New Business  
    a. Unwritten Rules for meetings/timeslots (:05)  
    D. Platts
14. Subcommittee Reports – Roundtable (not intended to indicate order of reporting)  
   Bushings  
   P. Zhao
   Dielectric Test  
   M. Franchek
   Distribution Transformers  
   S. Shull
   Dry Type Transformers  
   C. Johnson
   HVDC  
   M. Sharp
   Instrument Transformers  
   R. McTaggart
   Insulating Fluids  
   D. Wallach
   Insulation Life  
   B. Forsyth
   Performance Characteristics  
   E. teNyenhuis
   Power Transformers  
   J. Watson
   Underground Transformers & Network Protector  
   C. Niemann
15. Adjourn

10.4 **Chair’s Report – Donald Platts**

Refer to Main Minutes for a complete “Chair’s Report.”

*Highlights:*

Don gave a report of his attendance at the Tech Council meeting. The Tech Council is looking for a Webinar for what the Tech Council is doing and what the Committees do.

The Smart Grid Roadmap has been completed.

There were a couple of applications for Fellow that have gone through for members of the Transformers Committee. Don congratulated Bill Bartley.

10.5 **Vice Chair’s Report – Stephen Antosz**

Refer to Main Minutes for a complete “Vice Chair’s Report.”

*Highlights:*

Steve reviewed the Calendar of Upcoming Events and the papers that have been submitted. Eight papers were accepted for the poster session at the April IEEE T&D Conference.
There will be a panel session on Transformer Monitoring & Design chaired by Gary Hoffman at the April IEEE T&D Conference.

10.6 SECRETARY’S REPORT – SUSAN MCNELLY

Refer to Main Minutes for a complete “Secretary’s Report.”

Highlights:

There were five new member requests since the fall 2013 meeting. New member requests were received from Aleksandr Levin, Michael Miller, Diego Robalino, William Solano, and Susmitha Tarlapally. A motion to approve the above (pending verification of PES membership status of Michael Miller) was made by Steve Antosz and seconded by Bill Bartley. There was no discussion. The motion was unanimously approved.

10.7 TREASURER’S REPORT – GREGORY ANDERSON

Refer to Main Minutes for a complete “Treasurer’s Report.”

Highlights:

Greg reported that the St. Louis meeting made approximately $24,000. He indicated he would have a 12 month view of the check register available at the fall 2014 meeting.

10.8 RECOGNITION & AWARD’S REPORT – BILL CHIU

Refer to Main Minutes for a complete “Recognition & Award’s Report.”

Highlights:

The Recognition & Awards Chair presented.

Bill discussed the awards structure. He is proposing to add a recognition for members that make significant contribution and based on longevity of service.

A motion was made to do a recognition for significant contribution based on longevity of service. The details and term of service will be worked out by the next meeting. The motion was made by Bill Chiu and seconded by Bruce Forcyth.

10.9 STANDARD’S REPORT – WILLIAM BARTLEY

Refer to Main Minutes for a complete “Standards’s Report.”

Highlights:

The Standard Coordinator presented.

The Standards Report has been posted to the web site. Between October and March 1, there were three new revisions approved. There are two standards on the March REVCOM agenda.

A new format for the Committee PAR and Ballot Status was provided.

There are a number of new PARs that will expire at the end of the year.

A link to the Standards Dictionary has been posted on the Web and is available to all IEEE members.
10.10 IEEE STAFF UPDATE

Jodi Haasz presented on Methods of Engaging with IEC.

Discussion of IEEE/IEC Collaboration and Cooperation

Current Joint Projects:


- IEC/IEEE 65700-19-03 Ed. 1: Standard for Bushings for DC application – The document has completed the IEEE sponsor ballot recirculation comment. Next steps are for IEC to issue the Final Draft International Standard (FDIS) for vote; concurrently, IEEE will submit the document to RevCom for approval.

Potential Future Maintenance Project

- IEEE C57.15/IEC 60076-21 Ed. 1: Power Transformers — Part 21: Standard Requirements, Terminology, and Test Code for Step-Voltage Regulators – A PAR has been submitted for the revision of the standard. IEC TC 14 has issued a Document for Comment (DC) to solicit interest for this project. The DC closes on 9 May.

Potential Future Joint Projects

- Merger of IEEE C57.129-2007 (Standard for General Requirements and Test Code for Oil-Immersed HVDC Converter Transformers) and IEC 61378-2 (Convertor transformers - Part 2: Transformers for HVDC applications) – This will be discussed at the subcommittee meeting this week.

- IEC TC 14 may be interested in merging IEC 60076-7 - Loading guide for oil immersed power transformers– Interest in merging with IEEE C57.91 – IEEE Guide for Loading Mineral-Oil-Immersed Transformers and Step-Voltage Regulators. It was stated that this would not be a good joint project with IEC.

Potential Adoptions of IEEE Standards by IEC

- IEEE C57.142-2010, IEEE Guide to Describe the Occurrence and Mitigation of Switching Transients Induced by Transformer, Switching Device, and System Interaction


Harmonization


- IEC TC 14 is interest in adding the tutorial information from Annex E of IEEE C57.131-2012 (IEEE Standard Requirements for Tap Changers) into the revision of IEC 60214-2, Tap changers - Part 2: Application guide)
IEEE Adoption of an IEC Standard

- A suggestion has been made for IEEE to adopt IEC 60214-1 (Tap Changers – Part 1: Performance requirements and test methods) once it is published by IEC. This adoption will replace IEEE C57.131-2012:IEEE Standard Requirements for Load Tap Changers. A task force under the Powers Transformers Committee will be meeting this week to further discuss.

TC10 expressed interest in jointly developing with C57.147. There is presently a TF to review combining of the various oil guides. If the guides are merged, then this will create problems with a joint development.

Don Platts indicated that there is no responsibility or obligation to harmonize documents. They are opportunities that may be considered.

Don indicated that a meeting with the IEEE Transformers Committee officers was held, discussing how these joint or adopted documents should be handled. The decision made was that the requestor will first go to the SC for a vote on how to proceed. At that point it will be brought back to the Admin SC for review and analysis to determine whether the Admin SC agrees with the approach presented by the SC.

Joe Watson brought up that there is a different meeting philosophy between IEC and IEEE. IEC has full day meetings and typically finish up a standard in a year or year and a half, whereas IEEE allot a 1.5 hour time slot twice a year. He indicated that it may be necessary better align these to be able to do joint documents.

10.11 MEETING PLANNING REPORT – GREGORY ANDERSON

No written report provided.

Highlights:

The Meeting host is Efacec. Erin Carpenter attended for Efacec. Greg reported that this is one of the largest meetings, with St. Louis still being the largest meeting to date. There are 498 registered meeting attendees. He expects there to be some no shows. There were 116 registered spouses.

Greg indicated he has a record attendance for the Monday lunch meeting. The lunch is offered free to all attendees at this meeting.

Greg discussed the status of the upcoming fall 2014 meeting in Washington DC, Metro Area.

The fall 2015 will more than likely be in Memphis, Tennessee.

Dave Wallach suggested rotating the time slot that the SCs are scheduled for on Wednesday so that the same SCs are not always the last meeting of the day. Greg indicated that he will look into this possibility.

10.12 OLD BUSINESS

10.12.1 WG Data – Confidentiality, Storage, Access, & Use – Erin Speiwak and Tom Prevost

Erin Speiwak reported on the status. She indicated the way she envisions it would be there will be two Central Desktop sites. One site would be created for the storage of the data and one which portions of the data can be accessed by people who have been approved to access and use it. There would be separate password and access restrictions for both sites.

There will be two forms, one for those contributing the data and one for those accessing the data.
Tom expressed a concern that the comments that have been received are coming from an entity, not an individual. The concern is that it is not fair as other entities may not have had the opportunity to comment.

Don Platts indicated that perhaps this should be addressed as the first time that this is implemented, you may end up getting similar comments from the other data suppliers.

The data that would be saved would already have been scrubbed of the test lab information, the SN, manufacturer, and customer information. However, access to the data, even the scrubbed version, could someone a definite advantage in the industry.

Sue McNelly made a motion that Adcom proceed with accepting the forms as presented by IEEE without incorporating the comments received by Claude Beauchemin. Steve Antosz seconded. Tom Prevost recommended that at least a round of review and comment be done to determine if any of the comments have merit and should be included. The motion was withdrawn.

Steve Antosz made a motion to take the two confidentiality documents and circulate them to the Admin SC for review and comment. Tom Prevost seconded.

Since Sue McNelly is no longer the Chair of the IFSC, there was a comment that this may now belong in Dave Wallach’s court to compile comments and possible revision. Dave asked whether this could proceed as is and take the lessons learned from it to further improve the forms.

The motion was voted on and was unanimous. The documents will be sent to Sue McNelly for routing to the Admin SC to review and comment. A deadline to review and comment by will be included. The documents will be focused on C57.104 for now as they have the immediate need.

### 10.12.2 Committee P&P

This went to Audcom last fall. It is expected to be approved and would then go to the Standards Board for final approval. The WG P&P will be voted on at the Monday General Meeting.

Steve Shull indicated that the way the WG P&P not is written, it requires a secretary. The Distribution SC WGs typically have a Chair and Vice Chair, but not a Secretary. The Vice Chair acts as a Secretary. It was discussed and the document indicates there should, not shall be a Vice Chair and/or Secretary, so there doesn’t appear to be an issue.

### 10.12.3 GMD/GIC Position Paper

The paper is presently stuck in comment resolution. The group is attempting to resolve the issues. Bill Chiu indicated that he believes that they can now get this moving.

Don indicated that items discussed in SC, WG, and TF meetings need to be documented.

### 10.13 NEW BUSINESS

#### 10.13.1 Meeting Improvement Initiative

No Progress.

#### 10.13.2 Meeting Minutes Discussion

Don asked the SC Chairs to take a look at the WG workloads and make sure that we stay on track for updating documents.

He also asked that the SCs make sure that all issues raised in the SC, WG, and TF minutes are recorded in the minutes. In the future, the SC minutes will be placed in an Annex and will not be approved at the General Session.

A comment that perhaps a suggested format can be provided.
10.13.3 Unwritten Rules for meetings/timeslots

The O&P document should take care of a number of these issues once it is completed.

10.14 Subcommittee Reports

<table>
<thead>
<tr>
<th>Subcommittee</th>
<th>Report/Hot Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bushings – P. Zhao</td>
<td>No Report</td>
</tr>
<tr>
<td>Dielectric Test – M. Franchek</td>
<td>No Report</td>
</tr>
<tr>
<td>Distribution Transformers – S. Shull</td>
<td>No Report</td>
</tr>
<tr>
<td>Dry Type Transformers – C. Johnson</td>
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<td>HVDC – M. Sharp</td>
<td>No Report</td>
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<tr>
<td>Instrument Transformers – R. McTaggart</td>
<td>No Report</td>
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<tr>
<td>Insulating Fluids – D. Wallach</td>
<td>No Report</td>
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<td>Insulation Life – B. Forsyth</td>
<td>No Report</td>
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<tr>
<td>Performance Characteristics – E. teNyenhuis</td>
<td>C57.12.00: Steve Snyder is stepping down Tauhid Ansari will take on this roll</td>
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<td></td>
<td>C57.120: Al Traut is stepping down, no replacement has been selected.</td>
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<tr>
<td>Power Transformers – J. Watson</td>
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<tr>
<td>Standards SC – Bill Bartley</td>
<td>No Report</td>
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</tbody>
</table>

10.15 Adjournment

Bill moved to adjourn the meeting and it was seconded by Chuck Johnson. The motion was unanimously approved. The meeting adjourned at 5:55PM.

11.0 Standards Report – William Bartley

The Standards Report follows on the next page.
To: Members of IEEE Transformers Committee
From: William H. Bartley, Standards Coordinator

Executive Summary
This report covers the Transformers Committee Standards activity for the 5 month period from October 1, 2013 to March 1, 2014. In the last five months, no new Standards, three Revisions and one Corrigenda were approved by Standards Board. In this same period, the Standards Board approved one PAR for a new standard; two PAR modifications and one PAR Extension.

In this Report:
I. Standards approved ...................................... pg 1
II. PARs approved .............................................. pg 2
III. Standards Board 2014 Meeting Schedule ........ pg 2-3
IV. Transformers Committee Ballot & PAR Status .pg 4-6
V. Transformer PARs due to expire in 2014..........pg 7
VI. Transformer Stds Status database............... pg 8-22
VII. Transformer Stds Org Chart ....................... pg 23-24

I. Standards approved since Oct 1, 2014

NEW Transformer Standards Approved
None

Transformer REVISIONS approved
C57.96 - Guide for Loading Dry-Type Distribution and Power Transformers
C57.134 - Guide for Determination of Hottest-Spot Temperature in Dry-Type Transformers
638 - Standard for Qualification of Class 1E Transformers for Nuclear Pwr Gen Stations

CORRIGENDA approved:
C57.12.10 - Corrigenda 2 Std Requirements for Liquid Immersed Power Transformers - Corrigendum 2: Correction of A.3.2.13 (Note: A Corrigenda does not affect Expiration. This standard expires Sept 30, 2020 !)

The following Balloted REVISIONS have been submitted and are on March 2014 REVCOM agenda
PC57.12.44 Revision of “Standard Requirements for Secondary Network Protectors” submitted William Wimmer

PC57.116, Revision of “Guide for Transformers Directly Connected to Generators” submitted by Gary Hoffman
II. PARs approved since Oct 1, 2014

PARs for New Standards and Revisions

PC57.13.8 Standard Requirements for Station Service Voltage Transformers (new)

PAR Modifications approved

PC57.130 Guide for the Use of Dissolved Gas Analysis Applied to Factory Temperature Rise Tests for the Evaluation of Mineral Oil-Immersed Transformers and Reactors (this PAR expires Dec ’14)

PC57.637 Guide for the Reclamation of Mineral Insulating Oil and Criteria for Its Use

PAR Extensions approved

P65700-19-03 Standard for Bushings for DC application ...until Dec 2014

Following PARs have been submitted and are on March 2014 NESCOM Agenda

PAR for New Standard: PC57.163, Guide for Establishing Power Transformer Capability while under Geomagnetic Disturbances, Submitted by Jane Verner

PAR for Revision: C57.15 Standard Requirements, Terminology, and Test Code for Distribution Overhead and Substation Step-Voltage Regulators, Submitted by Craig Colopy

PAR Modification: P1276, Guide for the Application of High-Temperature Insulation Materials in Liquid-Immersed Distribution, Power and Regulating Transformers, Submitted by Mike Franchek

PAR Extension, C57.19.01 Standard Performance Characteristics and Dimensions for Outdoor Apparatus Bushings, Submitted by Shibao Zhang

III. 2013 IEEE Standards Board Meeting Schedule

A. Deadlines for 2014 Standards Board Submissions:

<table>
<thead>
<tr>
<th>Standards Board Meeting</th>
<th>Deadline</th>
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<tbody>
<tr>
<td>March 2014</td>
<td>February 14, 2014</td>
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<tr>
<td>June 2014</td>
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<td>August 2014</td>
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<td>December 2014</td>
<td>October 20, 2014</td>
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### III. 2014 Standards Board Meeting Schedule

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<tr>
<td>January</td>
<td>19-21: SAAS Series, Beijing, PRC</td>
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<td>23-24: CAG, Sicily (post-SIMICelectronics)</td>
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<td>February</td>
<td>01-04: BOG Series, Delhi, India</td>
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<td>25-27: SAAS Series, Piscataway, NJ</td>
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<td>March</td>
<td>01-04: CAG (tentatively Brazil)</td>
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<td>25-27: BOG Series, Piscataway, NJ</td>
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<td>April</td>
<td>01-04: CAG (tentatively Brazil)</td>
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<td>25-27: BOG Series, Piscataway, NJ</td>
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<td>May</td>
<td>07: Awards Ceremony, New Brunswick, NJ</td>
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<td>08-10: SAAS Series, Piscataway, NJ</td>
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<td>June</td>
<td>14-20: SAB Submittal Deadlines:</td>
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<td>02 May 2014</td>
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## IV. Transformer Committee PAR and Ballot Status

*(as of March 1, 2014)*

<table>
<thead>
<tr>
<th>Project Type</th>
<th>Title</th>
<th>PAR Number</th>
<th>Status</th>
<th>Ballot Close Date</th>
<th>Approval Date</th>
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<td>Standard for Distribution Transformers &lt;= 3000 kVA</td>
<td>PS51:12.20</td>
<td>Revisions</td>
<td>5-Jun-2012</td>
<td>6-Mar-2013</td>
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<td>Requirements for Liquid-Immersed Distribution Substation Transformers</td>
<td>PS51:12.31</td>
<td>Revisions</td>
<td>3-Mar-2014</td>
<td>7-Dec-2010</td>
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<td>Requirements for Dry-Type Distribution and Power Transformers</td>
<td>PS51:12.32</td>
<td>Revisions</td>
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<td>7-Dec-2010</td>
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<td>PS51:12.33</td>
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<td>7-Dec-2010</td>
<td>3-Mar-2014</td>
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<td>PS51:12.34</td>
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<td>7-Dec-2010</td>
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<td>PC57.106</td>
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<td>Guide for Acceptance and Maintenance of Insulating Oil in Equipment</td>
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<td>Guide for Acceptance and Maintenance of Less Flammable Hydrocarbon Insulating Liquid in Transformers: Amendment a</td>
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<td>Guide for Acceptance and Maintenance of Natural Ester Insulating Fluids in Transformers and Other Electrical Equipment</td>
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<td>PC57.162</td>
<td>New</td>
<td>Guide for the Interpretation of Moisture Related Parameters in Dry, Gas Insulated and Liquid Immersed Transformers and Reactors</td>
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<td>25-Mar-2010</td>
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<td>30-Sep-2010</td>
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<td>8-Jun-2012</td>
<td>31-Dec-2016</td>
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<td>PC57.32</td>
<td>Revision</td>
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<td>31-Dec-2015</td>
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<td>PC57.120</td>
<td>Revision</td>
<td>Guide for Loss Evaluation of Dist and Power Transformers and Reactors</td>
<td>25-Mar-2010</td>
<td>31-Dec-2014</td>
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<tr>
<td>PC57.136</td>
<td>Revision</td>
<td>Guide for Sound Level Abatement and Determination for Liquid-Immersed</td>
<td>30-Sep-2010</td>
<td>31-Dec-2014</td>
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<td>PC57.159</td>
<td>New</td>
<td>Guide on Transformers for Application in Distributed Photovoltaic (DPV) Power Generation Systems</td>
<td>8-Jun-2012</td>
<td>31-Dec-2016</td>
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<td>PC57.125</td>
<td>Revision</td>
<td>Guide for Failure Investigation, Documentation, Analysis, and Reporting for Power Transformers and Shunt Reactors</td>
<td>2-Feb-2011</td>
<td>31-Dec-2015</td>
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<td>PC57.156</td>
<td>New</td>
<td>Guide for Tank Rupture Mitigation of Liq-Imm Pwr Transformers &amp; Reactors</td>
<td>16-Jun-2011</td>
<td>31-Dec-2015</td>
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<td>Revision</td>
<td>General Requirements for Liq-Imm Dist, Power, &amp; Regulating Transformers</td>
<td>16-Jun-2011</td>
<td>31-Dec-2015</td>
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<td>PC57.12.90</td>
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<td>Test Code for Liq-Imm Distribution, Power, and Regulating Transformers</td>
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<td>Std for Submersible 3ph Transformers, &lt;3750 kVA, HV &lt; 34 500, LV &lt; 600v</td>
<td>9-Nov-2011</td>
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<td>PC57.12.40</td>
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<td>Std for Network, 3ph Transformers, &lt;3750 kVA, HV &lt; 34 500, LV &lt; 600v; Subway and Vault Types (Liquid Immersed)</td>
<td>30-Aug-2012</td>
<td>31-Dec-2016</td>
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IV. PARS DUE TO EXPIRE DEC 2014  
(as of March 1, 2014)

P65700-19-03  Standard for Bushings for DC application
PC57.12.28  Standard for Pad Mounted Equipment - Enclosure Integrity
PC57.12.29  Standard for Pad Mounted Equipment - Enclosure Integrity for Coastal Environments
PC57.12.38  Standard for Pad-Mounted, 1PH Dist Transformers; 250 kVA and Smaller
PC57.13  Standard Requirements for Instrument Transformers
PC57.13/Cor 1  Standard Requirements for Instrument Transformers - Corrigendum 1: Figure 3 Correction
PC57.13.7  Standard for Current Transformers with a Maximum mA Secondary Current of 250mA
PC57.104  Guide for the Interpretation of Gases Generated in Oil-Immersed Transformers
PC57.120  Guide for Loss Evaluation of Distribution and Power Transformers and Reactors
PC57.130  Guide for the Use of DGA Applied to Factory Temperature Rise Tests
PC57.136  Guide for Sound Level Abatement and Determination for L.I. Pwr Transformers >500 kVA
PC57.153  Guide for Paralleling Power Transformers
PC57.155  Guide for Interpretation of Gases Generated in Natural and Synthetic Ester
PC57.637  Guide for the Reclamation of Mineral Insulating Oil and Criteria for Its Use

SC Chairs and WG Chairs Please Take Note: Submission Deadline is October 20th.

If the completed ballots will not be submitted to RevCom by the Oct 20 deadline for the December Standards Board meeting, you must request an extension for the project (PAR). Extension requests are usually granted from one to two years. Significant justification must be provided for an extension request that exceeds two years.

If there is no response to this notification by the 20 October 2014, the NesCom Administrator will recommend an administrative withdrawal at the December 2014 Standards Board meeting.
<table>
<thead>
<tr>
<th>SubCommittee</th>
<th>Chair</th>
<th>Working Group Chair</th>
<th>Phone</th>
<th>Email</th>
<th>Pub Year</th>
<th>Rev Due Dat</th>
<th>PAR Issue Dat</th>
<th>PAR Expiration</th>
<th>Standard Status</th>
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<td><strong>BUSHING</strong></td>
<td>Zhao</td>
<td>Arpino</td>
<td>(417) 345-5926</td>
<td><a href="mailto:peter.zhao@HydroOne.com">peter.zhao@HydroOne.com</a></td>
<td>6/16/2011</td>
<td>12/31/2015</td>
<td>New Project</td>
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<td>C57.19.04</td>
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<td>Standard Performance Characteristics and Dimensions for High Current Power Transformer Bushings</td>
<td>Arpino C.</td>
<td>847 439-4122</td>
<td><a href="mailto:Carlo@astareg.com">Carlo@astareg.com</a></td>
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<tr>
<td>C57.19.01</td>
<td></td>
<td>Standard Performance Characteristics and Dimensions for Outdoor Apparatus Bushings</td>
<td>Zhang S.</td>
<td>585 768 1273</td>
<td><a href="mailto:Shibao.zhang@ieee.org">Shibao.zhang@ieee.org</a></td>
<td>2000</td>
<td>12/8/2010</td>
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<td>PC57.19.01</td>
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<td>Standard Requirements, Terminology, and Test Code for Bushing for DC Applications - Corrigendum 1</td>
<td>Recksiedler</td>
<td>204 474 3192</td>
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<td>3/25/2010</td>
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<td>C57.19.03-19</td>
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<td>IEEEPstandard Performance Characteristics and Dimensions for Outdoor Apparatus Bushings</td>
<td>Zhang S.</td>
<td>585 768 1273</td>
<td><a href="mailto:Shibao.zhang@ieee.org">Shibao.zhang@ieee.org</a></td>
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<td>Recksiedler</td>
<td>204 474 3192</td>
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<td>12/31/2018</td>
<td>12/31/2014</td>
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<tr>
<td>C57.19.100</td>
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<td>IEEEPGuide for Application of Power Apparatus Bushings</td>
<td>Spitzer T.</td>
<td>(817) 215-6457</td>
<td><a href="mailto:Tommy.spitzer@oncorgroup.com">Tommy.spitzer@oncorgroup.com</a></td>
<td>1995</td>
<td>12/31/2022</td>
<td>Approved</td>
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Prepared by W. Bartley, Transformers Standards Coordinator
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<td>SubCommittee: DIELECTRIC TESTS</td>
<td>Guide for DFR Measurements</td>
<td>Naderian A.</td>
<td>8/22/2013</td>
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<td>12/31/2017</td>
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<td>C57.98</td>
<td>C57.98 IEEE Guide for Transformer Impulse Tests</td>
<td>Molden A.</td>
<td>1994</td>
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<td>Pekarek T. J. (330) 761-7800 <a href="mailto:tpekarek@firstenergycorp.com">tpekarek@firstenergycorp.com</a></td>
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<td>PC57.12.39</td>
<td>Standard Requirements for Distribution Transformer Tank Pressure Coordination</td>
<td>Gaytan C. (52) 818 03022 133 <a href="mailto:carlos.gaytan.cavazos@indsys.ge.com">carlos.gaytan.cavazos@indsys.ge.com</a></td>
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<td>Standard Requirements for Overhead Type Distribution Transformers, 500 kVA and Smaller, High-Voltage 34 500 Volts and Below, Low-Voltage, 7970/13 800 Y Volts and Below</td>
<td>Traut A. 706-548-3121 <a href="mailto:atraut@ieee.org">atraut@ieee.org</a></td>
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<td>PC57.12.32</td>
<td>Standard for Submersible Equipment - Enclosure Integrity</td>
<td>Olen R. 414-837-8365 <a href="mailto:robertcoleen3@eaton.com">robertcoleen3@eaton.com</a></td>
<td>2002</td>
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<td>Colopy C.A.</td>
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<td>DRY TYPE TRANSFORMERS</td>
<td>Johnson, Jr. C. W.</td>
<td>IEEE Recommended Practice for Installation, Application, Operation, and Maintenance of Dry-Type General Purpose Distribution and Power Transformers</td>
<td>Stankes S (603) 545-3026</td>
<td>1999</td>
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<td>Standard Requirements for Station Service VTs</td>
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<td>Standard of Performance and Test Requirements for Instrument Transformers of a Nominal System Voltage of 115 kV and Above</td>
<td>Riffon P.</td>
<td>2006</td>
<td>9/11/2019</td>
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<td>Reference Std. 1400 Previously C57.13.5 was a trial use Upgraded to Full Use 3/30/2006</td>
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Prepared by W. Bartley, Transformers Standards Coordinator  Page 14 of 24  March 12, 2014
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<td>Guide for Dissolved Gas Analysis in Transformer Load Tap Changers</td>
<td>Wallach D.J. (980) 373-4167 <a href="mailto:david.wallach@duke-energy.com">david.wallach@duke-energy.com</a></td>
<td>2010</td>
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<td><strong>IEEE Standard Test Procedure for Thermal Evaluation of Liquid-Immersed Distribution and Power Transformers</strong></td>
<td>Wicks, R. C.</td>
<td>1999</td>
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<td><strong>IEEE Guide for Loading Mineral-Oil-Immersed Transformers</strong></td>
<td>Duckett, D. A.</td>
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<td>IEEE Guide for Application of Transformer Connections in Three-Phase Distribution Systems</td>
<td>Patel B. K. (205) 987-8012 bkpatel8012@charternet</td>
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<td>PC57.110</td>
<td>IEEE Recommended Practice for Establishing Transformer Capability When Supplying Nonsinusoidal Load Currents</td>
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<td>IEEE Loss Evaluation Guide for Power Transformers and Reactors</td>
<td>TeNyenhuis E.G. (519) 837-4691 <a href="mailto:edg.tenyenhuis@ca.abb.com">edg.tenyenhuis@ca.abb.com</a></td>
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<td>PC57.136</td>
<td>IEEE Guide for Sound Level Abatement and Determination for Liqui-1mmered Power Transformers and Shunt Reactors Rated Over 500 kVA</td>
<td>Antosz S. (412) 498-3916 <a href="mailto:santosz@comcast.net">santosz@comcast.net</a></td>
<td>2000</td>
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<td>PC57.142</td>
<td>A Guide To Describe The Occurrence And Mitigation Of Switching Transients Induced By Transformer-Breaker Interaction</td>
<td>Degeneff R. C. (518) 276-6367 <a href="mailto:degeneff@rpi.edu">degeneff@rpi.edu</a></td>
<td>2010</td>
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<td>Watson J.D.</td>
<td>Ahuja R. K.</td>
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<td>Hopkinson P. J.</td>
<td>(704) 846-3290</td>
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<td>Sim H.J. (919) 580-3234 Jin <a href="mailto:Sim@ieee.org">Sim@ieee.org</a></td>
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<td>Guide for Application for Monitoring Equipment to Liquid-Immersed Transformers and Components</td>
<td>Chu D. (212) 460-3456 <a href="mailto:chud@coned.com">chud@coned.com</a></td>
<td>2011</td>
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<td>Standard for Control Cabinets for Power Transformers</td>
<td>Watson J.D. 561 371 9138 <a href="mailto:joe_watson@ieee.org">joe_watson@ieee.org</a></td>
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<td>Approved by Std Bd Sept 2011</td>
<td></td>
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<tr>
<td>PC57.150</td>
<td>Guide for the Transportation of Large Power Transformers and Reactors</td>
<td>Anderson G.W. (402) 680-1111 <a href="mailto:gwanderson@ieee.org">gwanderson@ieee.org</a></td>
<td>2012</td>
<td>12/31/2022</td>
<td></td>
<td>Approved</td>
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<tr>
<td>PC57.17</td>
<td>Standard Requirements for Arc Furnace Transformers</td>
<td>Ganser R. (330) 492-8433 <a href="mailto:rganser@aol.com">rganser@aol.com</a></td>
<td>2012</td>
<td>12/31/2022</td>
<td></td>
<td>Approved</td>
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<td></td>
<td></td>
<td>PAR for Revision was approved March 2012</td>
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</tbody>
</table>

Prepared by W. Bartley, Transformers Standards Coordinator

Page 20 of 24

March 12, 2014
<table>
<thead>
<tr>
<th>Subcommittee</th>
<th>Standards Chair</th>
<th>Working Group Chair</th>
<th>Working Group Chair Phone</th>
<th>Working Group Chair Email</th>
<th>Standard Status</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>PC57.163</td>
<td>Bartley W. H.</td>
<td>Verner J. A.</td>
<td>(860) 205-0803</td>
<td><a href="mailto:whbartley@gmail.com">whbartley@gmail.com</a></td>
<td>New Project</td>
<td>PAR is on March 2014 NESCOM agenda</td>
</tr>
<tr>
<td>C57.12.80</td>
<td>PC57.12.80</td>
<td>Chiu B.</td>
<td>(626) 308-6086</td>
<td><a href="mailto:bill.chiu@sce.com">bill.chiu@sce.com</a></td>
<td>Approved std</td>
<td>Amendment PAR approved to add thermally upgraded definition Revision approved Sept 2010.</td>
</tr>
<tr>
<td>C57.12.90</td>
<td>PC57.12.90</td>
<td>Antosz S.</td>
<td>(412) 498-3916</td>
<td><a href="mailto:santosz@comcast.net">santosz@comcast.net</a></td>
<td>Approved</td>
<td>Published Oct 2010 PAR for Continuous Revision approved June 2011.</td>
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<tr>
<td>C57.144</td>
<td>PC57.144</td>
<td>Balma P.M.</td>
<td>(973) 430-8259</td>
<td><a href="mailto:peter.balma@pseg.com">peter.balma@pseg.com</a></td>
<td>Approved</td>
<td>Published 10/22/2004 Reaffirmed March 2010.</td>
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<tr>
<td>Standard</td>
<td>Title</td>
<td>Working Group Chair</td>
<td>Pub Year</td>
<td>Rev Due Date</td>
<td>PAR Issue Date</td>
<td>PAR Expiration</td>
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</tbody>
</table>
12.0 **Editor’s Report**

Between Fall 2013 meeting and Spring meeting of 2014 a total of 94 new & resubmitted papers in the transformer area were submitted to IEEE Transactions on Power Delivery for possible publication. For all of these papers the recommendations were as follows:

- **Accept:** 15
- **Revise and Resubmit:** 38
- **Reject:** 20
- **Under review:** 21

The above numbers include reviews managed by all editors.

The accepted for publication are shown below:

<table>
<thead>
<tr>
<th>Number</th>
<th>Paper ID</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TPWRD-00876-2013.R2</td>
<td>A method for averting saturation from series transformers of dynamic voltage restorers</td>
</tr>
<tr>
<td>2</td>
<td>TPWRD-00841-2013.R3</td>
<td>Accounting for the influence of the tank walls in the transient model of a 3-phase, 3-limb transformer</td>
</tr>
<tr>
<td>3</td>
<td>TPWRD-01417-2012.R2</td>
<td>Detection of Failures within Transformers by FRA using Multiresolution Decomposition</td>
</tr>
<tr>
<td>4</td>
<td>TPWRD-00687-2013.R2</td>
<td>Time-Domain Approach to Estimate Series Capacitance of an Isolated Phase Winding of a Transformer</td>
</tr>
<tr>
<td>5</td>
<td>TPWRD-00380-2013.R2</td>
<td>Wide Band Modeling of Power Transformers Using Commercial sFRA Equipment</td>
</tr>
<tr>
<td>6</td>
<td>TPWRD-00875-2013.R1</td>
<td>Application of Wavelet Transform to obtain the Frequency Response of a Transformer from Transient Signals – Part 2: Practical assessment and validation</td>
</tr>
<tr>
<td>7</td>
<td>TPWRD-00688-2013.R1</td>
<td>Voltage Stress in a Transformer Winding During Very Fast Transients Caused by Breaker Closing Event</td>
</tr>
<tr>
<td>8</td>
<td>TPWRD-00573-2013.R1</td>
<td>A New Method of Current Transformer Saturation Detection in the Presence of Noise</td>
</tr>
<tr>
<td>9</td>
<td>TPWRD-00109-2013.R2</td>
<td>The Moisture in SF6 Insulated CTs Considering Current and Change of Ambient Temperature</td>
</tr>
<tr>
<td>10</td>
<td>TPWRD-00345-2013.R4</td>
<td>Diagnostics of a transformer’s active part with complementary FRA and VM measurements</td>
</tr>
<tr>
<td>11</td>
<td>TPWRD-00193-2012.R6</td>
<td>Rule-Based Charging of Plug-in Electric Vehicles (PEVs): Impacts on the Aging Rate of Low Voltage Transformers</td>
</tr>
<tr>
<td>12</td>
<td>TPWRD-01352-2012.R2</td>
<td>Chromatic optoacoustic monitoring of transformers and their on-load tap changers</td>
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<tr>
<td>13</td>
<td>TPWRD-00643-2013.R2</td>
<td>Assessing the use of natural esters for transformer field drying</td>
</tr>
<tr>
<td>14</td>
<td>TPWRD-00937-2013.R3</td>
<td>Directed Oil Cooling of Disk Windings Using Graph Theory</td>
</tr>
<tr>
<td>15</td>
<td>TPWRD-01259-2013.R1</td>
<td>Contributions to differences between on - site and factory measured noise levels of Power Transformers</td>
</tr>
</tbody>
</table>

I would like to thank all of the reviewers who volunteered for this effort and donated their time, and would like to encourage everyone associated with IEEE Transformers Committee activities to consider becoming a Reviewer. I would like to encourage those Reviewers that already have an account on IEEE Manuscript Central to keep their profile information updated and complete the areas for key words and areas of interest. We need more reviewers and I encourage any of you that have not signed up as reviewers to sign up per the instructions at the end of this document.

It is important for all interested individuals to follow the norm for writing papers as provided in IEEE; the link is http://www.ieee.org/publications_standards/publications/authors/authors_journals.html and the link to upload the paper is http://mchelp.manuscriptcentral.com/gethelpnow/training/author/.
Please inform me at sanjib.som@siemens.com as soon as you do sign up so that we are able to utilize your efforts.

I would also like to take this opportunity to personally acknowledge the reviewers involved in the transformer committee who have been regularly and consistently reviewing papers. This is an important contribution since it maintains the high standards for our papers and it gives back to the industry their expert knowledge.

Special mention must also go out to the editors who have worked hard to make this possible; they are Dr Kulkarni, Dr. Francisco De Leon, Dr. Reza Iravani and Dr. Wilsun Xu.

Respectfully Submitted,
Sanjib Som
Editor, IEEE Transactions on Power Delivery from Transformer Committee

All members and attendees of the IEEE Transformer Committee are invited to review technical papers. Please sign up at: http://tpwrds.ieee.manuscriptcentral.com/
13.0 **LIAISON REPORTS**

13.1 **IEC TC14 TECHNICAL ADVISOR TO USNC – PHIL HOPKINSON**

IEEE Transformers Committee Spring Meeting 2014
Savannah 23rd – 27th March 2014
Paul Jarman Chairman TC14

1. Last meeting

The last TC14 meeting was held in Milwaukee on 17-18th October 2013, the meeting was particularly successful because of the presence of Don Platts who reported on IEEE work, Jodi Haasz who presented on the Dual Logo procedure and Claude Rajotte who presented on CIGRE A2 work.

2. Next Meeting

The next meeting will be held in Tokyo November 10-11 2014 in conjunction with the IEC general meeting at the kind invitation of the Japanese National Committee.

3. Website

Attention is drawn to the TC14 website WWW.IEC.CH/TC14 which gives a summary of projects and publications. Attention is also drawn to the website www.electropedia.org which gives a comprehensive electrotechnical vocabulary reference

4. New Documents published

- **IEC 60076-14 Liquid immersed Power Transformers using high temperature insulation materials**
  - Published September 2013
- **IEC 60076-19 Rules for the determination of uncertainties in the measurement of losses in power transformers and reactors**
  - Published March 2013
  - New technical report based on an existing CENELEC document but significantly revised
  - It is encouraged that this document is used to understand uncertainties in the loss measurement and feedback on its use would be welcomed.
- **IEC 60076-3 Insulation levels, dielectric tests and external clearances in air**
  - Published July 2013
  - Major revision – document made simpler to use and tests rationalised and clarified.
  - Improved alignment with IEEE
  - Three categories <=72.5kV<=170kV >170kV
  - Change in phase to phase requirement for induced test
  - ‘Line terminal AC’ rather than ACSD
  - Switching impulse levels for all >72.5kV as alternative to LTAC
  - PD for all >72.5kV
  - Induced test levels based on rated rather than max voltage
  - Introduction of K factor in impulse wave
  - Chopped waves routine for >170kV
  - Revised test levels
  - Revised dielectric clearance distances
5. New documents in progress
   - **IEC 60076-20 Energy efficiency for transformers**
     - The EU regulation on transformer efficiency was published in January 2014 and is expected to come into force in 2015
     - The first committee draft circulated December 2013 comments closed on 21st March 2014.
     - Reflects 3 world practices for defining energy efficiency
       - Peak Efficiency Index (developed for large transformers)
       - Efficiency at 50%
       - No load and load loss limits
     - Note that following the Milwaukee meeting the two 60076-20 projects for higher and lower voltages have been merged.
   - **IEC 60076-57-1202 Liquid immersed Phase Shifting Transformers**
     - Joint with IEEE – new standard
     - Several meetings held
     - Working towards first committee draft, should be sent to IEC shortly after the Savannah meeting
   - **IEC 60076-22 Power Transformer and Reactor Fittings as IEC documents**
     - 3 parts
       - -1 Protective devices (alarms and trips)
       - -2 Cooling
       - -3 Accessories (passive)
     - Work has started first meeting held in Milan in January 2014.

6. Revisions in progress
   - **IEC 60076-10 Determination of Sound Levels**
     - CDV issued November 2013 closed 14th Feb 2014, positive result will now go to final draft for vote.
   - **IEC 60076-10-1 Determination of transformer and reactor sound levels - User guide**
     - First committee draft issued November 2013 closed 14th Feb 2014, now working on CDV in parallel with 60076-10
   - **IEC 60076-16 Transformers for wind turbine applications**
     - Revision of IEC document with IEEE to produce a dual logo
     - Meetings held in London and Savannah
     - Working on first CD
   - **IEC 61378-3 Converter transformers – Application Guide**
     - CDV has now circulated September 2013 closing date for comments was 6th December 2013, positive result (1 negative) now working on final draft.
   - **IEC 60214-1 Tap changers – performance requirements and test methods**
     - Final draft sent to IEC for publication
   - **IEC 60214-2 Tap changers - Application guide**
     - Work has started on the revision and positive comments were received from the document for comment (DC) asking about revision as a dual logo.
   - **IEC 60076-15 Gas-Filled Power Transformers**
     - The CD was circulated (closing date 15th Feb 2013) the CDV has been sent to IEC and will be circulated soon.
   - **IEC 60076-7 Loading guide for liquid immersed transformers**
     - First meetings have taken place the maintenance team is working on the first draft.

7. New revisions starting
   - **IEC 61378-2 HVDC converter transformers**
     - Positive response to DC on joint work with IEEE to merge two standards into a dual logo.
     - Meeting held to look at feasibility, positive outcome.
     - Anders Lindroth is convenor for IEC
     - Maintenance team is set up but project not officially started.
   - **IEC 60076-21 Standard requirements terminology and test code for step voltage regulators**
     - DC asking about dual logo revision with IEEE sent Feb 2014 closing date for comments 9th May 2014
     - Craig Colopy to convene
   - **IEC 60076-11 Dry-type transformers**
     - DC on revision sent out January 2014 closing date for comments 28th March 2014
• IEC 60076-4 Guide to lightning impulse and switching impulse testing – power transformers and reactors
  – Revision agreed in TC14 meeting but no progress to date, Thang Hochanh to convene

8. Possible New Documents
• IEEE C57.142 Guide to describe the occurrence and mitigation of switching transients induced by transformer switching device and system interaction
  – This document is referred to in IEC 60076-1 and it may be an advantage to make it dual-logo, NCs to be consulted.
14.0 **UNFINISHED (OLD) BUSINESS**

No old business was discussed.

15.0 **NEW BUSINESS**

Member ballot on WG P&P – Bill Bartley

Bill reviewed the purpose of the WG P&P. The WG P&P meets the requirements of the IEEE-SA Audcom document. Bill mentioned that the WG P&P and the Committee P&P templates do not match regarding meeting attendance requirements, but that we are required to meet each of the templates require

The WG P&P was distributed prior to the meeting for members review. A motion to approve the WG P&P as provided was made by Bill Bartley and seconded by Wally Binder.

There was no discussion. The motion was voted on and approved unanimously.

16.0 **MONDAY GENERAL SESSION ADJOURNMENT**

A motion to adjourn the meeting was requested. Jerry Murphy motioned for adjournment and Hemchandra Shertukde seconded the motion. The motion was unanimously approved.
THURSDAY GENERAL SESSION

17.0 CHAIR’S REMARKS AND ANNOUNCEMENTS – DON PLATTS

Don opened with comments on the meeting in general. He indicated that there were some complaints about the brief meetings in some instances and urged WG Chairs to make sure that they are making effective use of the meeting slots that they have been provided. In general, comments on the venue and Savannah were very positive which is a sign of a successful meeting.

Don thanked the host, Efacec, for the job they did at the meeting. Mike Bauer from Efacec addressed the group and on behalf of Efacec thanked everyone for coming. Jane Ann Verner also addressed the group and welcomed everyone to come to the Washington DC Metro Area meeting in October. She provided some transportation details and a brief list of things to see and do.

18.0 MEETING’S PLANNING SC MINUTES & REPORT – GREGORY ANDERSON

Greg gave a brief overview of the meeting logistics. He expressed deep concern about the high number of no-shows at the Monday luncheon. He indicated it is not likely that this will be offered at no charge again as a result.

He talked about the future meeting in Washington DC and indicated that there has been no meeting set up as yet for Spring of 2015. He talked about the possibility of a hostless meeting when necessary to allow us to go to a particular location or part of the country.

Fall of 2015 is pretty firm for Memphis, TN. He also showed a list of several locations as potential future meeting locations.

Greg gave a brief overview of the Committee Finances including existing funds and meeting expenses.

Greg thanked a group of people who helped with making the meeting run smoother. He invited people to contact Tom Prevost if they have ideas for Tutorials for upcoming meetings.

19.0 REPORTS FROM TECHNICAL SUBCOMMITTEES (DECISIONS MADE DURING THE WEEK)

Reports from each Technical SC were provided. Their minutes are included in full in the attached Annexes.

Dan Mulkey reporting for the UG Transformers and Network Protectors SC expressed a frustration on entry of rosters in the AM System. He requested that the default be changed from member to guest. Greg Anderson took that as an action item.

Don Platts indicated that the Administrative SC has been looking at the schedule and is working to manage the workload of the standards that are on the horizon.

20.0 REPORTS FROM STANDARDS SUBCOMMITTEE AND STANDARDS (ISSUES FROM THE WEEK)

20.1 TRANSFORMER STANDARDS /GUIDES ON MARCH 2014 AGENDA

The following REVISIONS were APPROVED by Standards Board this morning, March 27:

- PC57.12.44 Revision of "Standard Requirements for Secondary Network Protectors" submitted William Wimmer
- PC57.116 Revision of “Guide for Transformers Directly Connected to Generators” submitted by Gary Hoffman

Following PARs have been APPROVED by Standards Board this morning, March 27, 2014
20.1.1 **PAR for New Standard:**
- PC57.163, Guide for Establishing Power Transformer Capability while under Geomagnetic Disturbances, 
  *Submitted by Jane Verner*

20.1.2 **PAR for Revision:**
- C57.15 Standard Requirements, Terminology, and Test Code for Distribution Overhead and Substation Step-Voltage Regulators, 
  *Submitted by Craig Colopy*

20.1.3 **PAR Modification:**
- P1276, Guide for the Application of High-Temperature Insulation Materials in Liquid-Immersed Distribution, Power and Regulating Transformers, 
  *Submitted by Mike Franchek*

20.1.4 **PAR Extension**
- C57.19.01 Standard Performance Characteristics and Dimensions for Outdoor Apparatus Bushings, 
  *Submitted by Shibao Zhang*

21.0 **NEW BUSINESS**

No new business was raised.

22.0 **THURSDAY GENERAL SESSION ADJOURNMENT**

The meeting was adjourned at 12:00PM.
**NOTES:** See Page 4 for a key to abbreviations.

<table>
<thead>
<tr>
<th>DATE/TIME</th>
<th>ACTIVITY</th>
<th>SUB-COM</th>
<th>ACTIVITY CHAIR</th>
<th>ROOM CAP/ARR/AV</th>
<th>MEETING ROOM</th>
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<tbody>
<tr>
<td><strong>Friday, March 21</strong></td>
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<tr>
<td>8:00 am - 5:00 pm &gt;</td>
<td>IEEE/IEC WG Wind Transf. P60076-16</td>
<td>PCS</td>
<td>D. Buckmaster</td>
<td>20 US</td>
<td>Academy</td>
</tr>
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<td><strong>Saturday, March 22</strong></td>
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<tr>
<td>&gt; 8:00 am - 12:00 pm &gt;</td>
<td>IEEE/IEC WG Wind Transf. P60076-16</td>
<td>PCS</td>
<td>D. Buckmaster</td>
<td>20 US</td>
<td>Academy</td>
</tr>
</tbody>
</table>
| 7:00 pm until ??? | Early Bird Event: Dinner, music and fun at "Savannah Smiles Dueling Pianos Saloon".  
|-- Indicate your desire to attend when registering on-line for the Committee Meeting.  
|-- Meet in hotel lobby at 6:45 pm. Savannah Smiles is ~8 minute walk from the hotel.  
| **Sunday, March 23** |                                               |         |               |                 |              |
| 9:00 am - 1:30 pm | Technical Tour: Efacec Transformer Facility  
|-- Space is limited; initially only Committee Members and Active Participants.  
|-- Buses depart Marriott Hotel at 9:00 am. Return by 1:30 pm.  
|-- Catered lunch at the factory. Each breakfast before departing in the morning.  
|-- For more details, contact Erin Carpenter at +1.912.754.5435 or <erin.carpenter@efacec.com>. |
| **Monday, March 24 -- Monday Breaks Sponsored by JSHP Transformer** |                                               |         |               |                 |              |
| 7:00 am - 4:00 pm | Meeting Registration                          |         |               |                 |              |
| 7:00 am - 6:00 pm | Internet Cafe’                                 |         |               |                 |              |
| 7:00 am - 7:50 am | Newcomers Orientation                         | S. Antosz | 60 CL (with buffet) | Savannah E    |
| 7:00 am - 7:50 am | Distribution SC Leaders Coordination          | S. Shull | 18 CONF (with buffet) | Academy      |
| 7:00 am - 8:00 am | Breakfast - Attendees (no spouses/companions please) |         | 300 RT (9/tbl) | Savannah A    |
| 8:00 am - 9:30 am | Breakfast - Spouses/Companions (no meeting attendees please) |         | 96 RT (8/tbl) | Atrium & Riverwalk |
| 9:15 am - 3:30 pm | Spouses/Companions Tour: Historic District Tour and Bonaventure Cemetery, and lunch at Pirates House  
|-- Advance registration required. Buses depart the Marriott Hotel at 9:15 am, and return approx 3:30 pm. |
| 8:00 am - 9:15 am > | Opening Session  
|-- All attendees are encouraged to attend  
|-- See separate document for meeting agenda  
|-- Attendance recorded as eligibility for Committee membership |
| 9:15 am - 9:30 am | Break (beverages only)                        |         |               |                 | Ballroom Foyer |

**Contact Joe Watson (joe_watson@ieee.org) if you are interested in sponsoring a coffee-break at a future meeting.**
<table>
<thead>
<tr>
<th>DATE/TIME</th>
<th>ACTIVITY</th>
<th>SUB-COM</th>
<th>ACTIVITY CHAIR</th>
<th>ROOM CAP/ARR/AV</th>
<th>MEETING ROOM</th>
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<tbody>
<tr>
<td>9:30 am - 10:45 am</td>
<td>WG 3-ph UG Dist. Transf. C57.12.24</td>
<td>UTNP</td>
<td>G. Termini</td>
<td>60 MX</td>
<td>Plaza</td>
</tr>
<tr>
<td>9:30 am - 10:45 am</td>
<td>TF Winding Temp. Indicators</td>
<td>IL</td>
<td>P. McClure</td>
<td>80 MX</td>
<td>Oglethorpe AB (2nd floor)</td>
</tr>
<tr>
<td>9:30 am - 10:45 am</td>
<td>WG External Dielectric Clearances</td>
<td>DiTests</td>
<td>E. Davis</td>
<td>100 MX S2</td>
<td>Savannah D</td>
</tr>
<tr>
<td>9:30 am - 10:45 am</td>
<td>TF Consolidation of Oil Guides</td>
<td>IF</td>
<td>T. Prevost</td>
<td>100 MX S2</td>
<td>Savannah E</td>
</tr>
<tr>
<td>9:30 am - 10:45 am</td>
<td>WG Tertiary/Stabiliz. Windings PC57.158</td>
<td>PCS</td>
<td>E. Betancourt</td>
<td>200 MX S3</td>
<td>Savannah B</td>
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<tr>
<td>9:30 am - 10:45 am</td>
<td>WG Failure Analysis &amp; Report. C57.125</td>
<td>Power</td>
<td>W. Binder</td>
<td>200 MX S3</td>
<td>Savannah C</td>
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<tr>
<td>10:45 am - 11:00 am</td>
<td><strong>Break (beverages only)</strong></td>
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<td>Ballroom Foyer</td>
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<tr>
<td>11:00 am - 12:15 pm</td>
<td>TBD</td>
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<td>60 MX</td>
<td>Plaza</td>
</tr>
<tr>
<td>11:00 am - 12:15 pm</td>
<td>WG Moisture in Insulation PC57.162</td>
<td>IL</td>
<td>T. Prevost</td>
<td>80 MX</td>
<td>Oglethorpe AB</td>
</tr>
<tr>
<td>11:00 am - 12:15 pm</td>
<td>WG Overhead Distr. Transf. C57.12.20</td>
<td>Dist</td>
<td>A. Traut</td>
<td>100 MX S2</td>
<td>Savannah D</td>
</tr>
<tr>
<td>11:00 am - 12:15 pm</td>
<td>WG PD Acoustic Detection C57.127</td>
<td>DiTests</td>
<td>D. Gross</td>
<td>100 MX S2</td>
<td>Savannah E</td>
</tr>
<tr>
<td>11:00 am - 12:15 pm</td>
<td>WG PCS Rev. to Test Code C57.12.90</td>
<td>PCS</td>
<td>M. Perkins</td>
<td>200 MX S3</td>
<td>Savannah B</td>
</tr>
<tr>
<td>11:00 am - 12:15 pm</td>
<td>WG Installation of Power Transf. C57.93</td>
<td>Power</td>
<td>M. Lau</td>
<td>200 MX S3</td>
<td>Savannah C</td>
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<tr>
<td>12:15 pm - 1:30 pm</td>
<td>Lunch Meeting: Standards Development Review</td>
<td></td>
<td></td>
<td>280 RT (8/tbl)</td>
<td>Savannah A</td>
</tr>
<tr>
<td></td>
<td>-- Special Presentation: &quot;Review of Association Management System (AMS)&quot;</td>
<td></td>
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<tr>
<td></td>
<td>-- Everyone is welcome to attend. All SC/WG/TF leaders are highly encouraged to attend.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-- Doors actually open ~12:00 pm. Come early, get a good seat, and start eating.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-- Complimentary meal with advance registration. No paper tickets. Admission verified at the door.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1:45 pm - 3:00 pm</td>
<td><strong>Break (beverages only and treats)</strong></td>
<td></td>
<td></td>
<td></td>
<td>Ballroom Foyer</td>
</tr>
<tr>
<td>3:00 pm - 3:15 am</td>
<td><strong>Break (beverages only)</strong></td>
<td></td>
<td></td>
<td></td>
<td>Ballroom Foyer</td>
</tr>
<tr>
<td>3:15 pm - 4:30 pm</td>
<td>SC HVDC Converter Transformers and Smoothing Reactors</td>
<td>HVDC</td>
<td>M. Sharp</td>
<td>60 MX</td>
<td>Plaza</td>
</tr>
<tr>
<td>3:15 pm - 4:30 pm</td>
<td>WG Milli-amp Current Transf. C57.13.7</td>
<td>IT</td>
<td>H. Alton</td>
<td>80 MX</td>
<td>Oglethorpe AB</td>
</tr>
<tr>
<td>3:15 pm - 4:30 pm</td>
<td>WG 3-ph Padmount Dist. Transformers C57.12.38 (12.21 &amp; 12.25)</td>
<td>Dist</td>
<td>A. Ghafourian</td>
<td>100 MX S2</td>
<td>Savannah D</td>
</tr>
<tr>
<td>3:15 pm - 4:30 pm</td>
<td>WG Less-Flammable Hydrocarbon Insulating Liquid Guide C57.121</td>
<td>IF</td>
<td>D. Sundin</td>
<td>100 MX S2</td>
<td>Savannah E</td>
</tr>
<tr>
<td>3:15 pm - 4:30 pm</td>
<td>TF Audible Sound Revision to Test Code</td>
<td>PCS</td>
<td>R. Girgis</td>
<td>200 MX S3</td>
<td>Savannah B</td>
</tr>
<tr>
<td>3:15 pm - 4:30 pm</td>
<td>WG Tank Rupture &amp; Mitigation PC57.156</td>
<td>Power</td>
<td>P. Zhao</td>
<td>200 MX S3</td>
<td>Savannah C</td>
</tr>
<tr>
<td>4:30 pm - 4:45 pm</td>
<td><strong>Break (beverages)</strong></td>
<td></td>
<td></td>
<td></td>
<td>Ballroom Foyer</td>
</tr>
<tr>
<td>4:45 pm - 6:00 pm</td>
<td>WG Dry-Type O&amp;M Guide C57.94</td>
<td>Dry</td>
<td>D. Stankes</td>
<td>60 MX</td>
<td>Plaza</td>
</tr>
<tr>
<td>4:45 pm - 6:00 pm</td>
<td>WG PD in Bushings &amp; PT/CTs PC57.160</td>
<td>DiTests</td>
<td>T. Hochan</td>
<td>80 MX</td>
<td>Oglethorpe AB</td>
</tr>
<tr>
<td>4:45 pm - 6:00 pm</td>
<td>WG Step-Voltage Regulators C57.15</td>
<td>Dist</td>
<td>C. Colopy</td>
<td>100 MX S2</td>
<td>Savannah D</td>
</tr>
<tr>
<td>4:45 pm - 6:00 pm</td>
<td>WG Oil Accept &amp; Maint. Guide C57.106</td>
<td>IF</td>
<td>B. Rasor</td>
<td>100 MX S2</td>
<td>Savannah E</td>
</tr>
<tr>
<td>4:45 pm - 6:00 pm</td>
<td>WG PCS Revisions to C57.12.00</td>
<td>PCS</td>
<td>S. Snyder</td>
<td>200 MX S3</td>
<td>Savannah B</td>
</tr>
<tr>
<td>4:45 pm - 6:00 pm</td>
<td>TBD</td>
<td></td>
<td></td>
<td>200 MX S3</td>
<td>Savannah C</td>
</tr>
<tr>
<td>6:00 pm - 10:00 pm</td>
<td>No Technical Tour. No other evening events planned.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DATE/TIME</td>
<td>ACTIVITY</td>
<td>SUB-COM</td>
<td>ACTIVITY CHAIR</td>
<td>ROOM CAP/ARR/AV</td>
<td>MEETING ROOM</td>
</tr>
<tr>
<td>----------------</td>
<td>---------------------------------------------------------------</td>
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<td>----------------</td>
<td>-----------------</td>
<td>--------------</td>
</tr>
<tr>
<td>7:00 am - 12:00 pm</td>
<td>Meeting Registration</td>
<td></td>
<td></td>
<td></td>
<td>Ballroom Foyer</td>
</tr>
<tr>
<td>7:00 am - 6:00 pm</td>
<td>Internet Cafe’</td>
<td></td>
<td></td>
<td>12 BD</td>
<td>Mercer</td>
</tr>
<tr>
<td>7:00 am - 8:00 am</td>
<td>Breakfast - Attendees (no spouses/companions please)</td>
<td></td>
<td></td>
<td>300 RT (9/tbl)</td>
<td>Savannah A</td>
</tr>
<tr>
<td>8:00 am - 9:30 am</td>
<td>Breakfast - Spouses/Companions (no meeting attendees please)</td>
<td></td>
<td></td>
<td>96 RT (8/tbl)</td>
<td>Atrium &amp; Riverwalk</td>
</tr>
<tr>
<td>7:00 am - 7:50 am</td>
<td>EL&amp;P Delegation (end-users only please)</td>
<td></td>
<td>J. Murphy</td>
<td>60 CL</td>
<td>Savannah E</td>
</tr>
<tr>
<td>7:00 am - 7:50 am</td>
<td>-- Breakfast Meeting; arrive early</td>
<td></td>
<td></td>
<td>(with buffet)</td>
<td></td>
</tr>
<tr>
<td>9:15 am - 3:30 pm</td>
<td>Spouses/Companions Tour: Paula Deen Tour &amp; Tybee Island, and lunch at Uncle Bubba’s Oyster House -- Advance registration required. Buses depart the Marriott Hotel at 9:15 am, and return approx 3:30 pm.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8:00 am - 9:15 am</td>
<td>WG Req. for Instrument Transf. C57.13</td>
<td>IT</td>
<td>R. McTaggart</td>
<td>60 MX</td>
<td>Plaza</td>
</tr>
<tr>
<td>8:00 am - 9:15 am</td>
<td>WG Oil Reclamation Guide PC57.637</td>
<td>IF</td>
<td>J. Thompson</td>
<td>80 MX</td>
<td>Oglethorpe AB</td>
</tr>
<tr>
<td>8:00 am - 9:15 am</td>
<td>WG Enclosure Integrity C57.12.28, C57.12.29, C57.12.31</td>
<td>Dist</td>
<td>R. Olen</td>
<td>100 MX S2</td>
<td>Savannah D</td>
</tr>
<tr>
<td>8:00 am - 9:15 am</td>
<td>TBD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8:00 am - 9:15 am</td>
<td>TF Geomagnetic Disturbances (NEW)</td>
<td>Admin</td>
<td>J. Verner</td>
<td>200 MX S3</td>
<td>Savannah B</td>
</tr>
<tr>
<td>8:00 am - 9:15 am</td>
<td>WG Functional Life Tests, De-energized Tap Changers (DETC) PC57.157</td>
<td>Power</td>
<td>P. Hopkinson</td>
<td>200 MX S3</td>
<td>Savannah C</td>
</tr>
<tr>
<td>9:15 am - 9:30 am</td>
<td>Break (beverages only)</td>
<td></td>
<td></td>
<td></td>
<td>Ballroom Foyer</td>
</tr>
<tr>
<td>9:30 am - 10:45 am</td>
<td>TG Dist. Transf. Bar Coding C57.12.36</td>
<td>Dist</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9:30 am - 10:45 am</td>
<td>TG Committee History</td>
<td>M entropy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9:30 am - 10:45 am</td>
<td>WG 1-Ph Submersible Transformers C57.12.23 (NEW)</td>
<td>UTNP</td>
<td>A. Traut</td>
<td>60 MX</td>
<td>Plaza</td>
</tr>
<tr>
<td>9:30 am - 10:45 am</td>
<td>WG Station Service Voltage Transformers</td>
<td>IT</td>
<td>D. Wallace</td>
<td>80 MX</td>
<td>Oglethorpe AB</td>
</tr>
<tr>
<td>9:30 am - 10:45 am</td>
<td>TBD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9:30 am - 10:45 am</td>
<td>WG Std Require for Bushings C57.19.01</td>
<td>Bush</td>
<td>S. Zhang</td>
<td>100 MX S2</td>
<td>Savannah D</td>
</tr>
<tr>
<td>9:30 am - 10:45 am</td>
<td>WG DGA Natural Ester Fluids PC57.155</td>
<td>IF</td>
<td>P. Boman</td>
<td>200 MX S3</td>
<td>Savannah B</td>
</tr>
<tr>
<td>&gt; 9:30 am - 10:45 am</td>
<td>IEEE/IEC WG Wind Transf. P60076-16 -- will also meet Fri-Sat 21-22 March</td>
<td>PCS</td>
<td>D. Buckmaster</td>
<td>200 MX S3</td>
<td>Savannah C</td>
</tr>
<tr>
<td>10:45 am - 11:00 am</td>
<td>Break (beverages only)</td>
<td></td>
<td></td>
<td></td>
<td>Ballroom Foyer</td>
</tr>
<tr>
<td>11:00 am - 12:15 pm</td>
<td>WG Liquid-immersed Secondary Network Transformers C57.12.40</td>
<td>UTNP</td>
<td>B. Klaponski</td>
<td>60 MX</td>
<td>Plaza</td>
</tr>
<tr>
<td>11:00 am - 12:15 pm</td>
<td>WG Phase Shifting Transformers IEEE/IEC 60076-57-1202</td>
<td>Power</td>
<td>R. Ahuja</td>
<td>80 MX</td>
<td>Oglethorpe AB</td>
</tr>
<tr>
<td>11:00 am - 12:15 pm</td>
<td>WG Impulse Tests C57.138 (Distribution)</td>
<td>DiTests</td>
<td>J. Crotty</td>
<td>100 MX S2</td>
<td>Savannah D</td>
</tr>
<tr>
<td>11:00 am - 12:15 pm</td>
<td>WG GSU Bushings PC57.19.04</td>
<td>Bush</td>
<td>C. Arpino</td>
<td>100 MX S2</td>
<td>Savannah E</td>
</tr>
<tr>
<td>11:00 am - 12:15 pm</td>
<td>WG Guide for DGA in LTCs C57.139</td>
<td>IF</td>
<td>D. Wallach</td>
<td>200 MX S3</td>
<td>Savannah B</td>
</tr>
<tr>
<td>11:00 am - 12:15 pm</td>
<td>WG Loss Evaluation Guide C57.120</td>
<td>PCS</td>
<td>A. Traut</td>
<td>200 MX S3</td>
<td>Savannah C</td>
</tr>
<tr>
<td>12:15 pm - 1:30 pm</td>
<td>Awards Luncheon</td>
<td>B. Chiu</td>
<td>320 RT (8/tbl)</td>
<td>Savannah A</td>
<td></td>
</tr>
<tr>
<td>1:45 pm - 3:00 pm</td>
<td>TF Transf. Efficiency &amp; Loss Evaluation</td>
<td>Dist</td>
<td>Work is complete. DOE has issued its final rule.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1:45 pm - 3:00 pm</td>
<td>TF Fluid Terms Normalization</td>
<td>Stds</td>
<td>P. McShane</td>
<td>80 MX</td>
<td>Oglethorpe AB</td>
</tr>
<tr>
<td>1:45 pm - 3:00 pm</td>
<td>WG Distr. Substation Transf. C57.12.36</td>
<td>Dist</td>
<td>J. Murphy</td>
<td>100 MX S2</td>
<td>Savannah D</td>
</tr>
<tr>
<td>1:45 pm - 3:00 pm</td>
<td>WG Revision to Low Frequency Tests</td>
<td>DiTests</td>
<td>B. Poulin</td>
<td>100 MX S2</td>
<td>Savannah E</td>
</tr>
<tr>
<td>1:45 pm - 3:00 pm</td>
<td>WG DGA Factory Temperature Rise Tests PC57.130</td>
<td>IF</td>
<td>J. Thompson</td>
<td>200 MX S3</td>
<td>Savannah B</td>
</tr>
<tr>
<td>1:45 pm - 3:00 pm</td>
<td>WG DPV Grid Transformers PC57.159</td>
<td>PCS</td>
<td>H. Shertukde</td>
<td>200 MX S3</td>
<td>Savannah C</td>
</tr>
<tr>
<td>3:00 pm - 3:15 pm</td>
<td>Break (beverages and Pretzels!)</td>
<td></td>
<td></td>
<td></td>
<td>Ballroom Foyer</td>
</tr>
</tbody>
</table>

** Contact Joe Watson (joe_watson@ieee.org) if you are interested in sponsoring a coffee-break at a future meeting.
**KEY**

Note: A PC projector will be furnished in each meeting room. Arrive early to ensure that equipment operates/syncs correctly.

Overhead projectors are available from the hotel with advance notice.

> -- activity continued into another session / from another session

++ -- not a Transformers Committee activity

TBD = "To Be Determined"

RT -- multiple roundtables

BD -- boardroom

US -- U-shape table

CL -- classroom seating (w/head table for 2)

TH -- theater seating (w/head table for 2)

MX -- mix classroom & theater (w/head)

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<table>
<thead>
<tr>
<th>DATE/TIME</th>
<th>ACTIVITY</th>
<th>SUB-COM</th>
<th>ACTIVITY</th>
<th>ROOM</th>
<th>MEETING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tuesday, March 25</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>3:15 pm - 4:30 pm</td>
<td>WG Dry-Type Test Code C57.12.91</td>
<td>Dry</td>
<td>D. Foster</td>
<td>60 MX</td>
<td>Plaza</td>
</tr>
<tr>
<td>3:15 pm - 4:30 pm</td>
<td>TF Switching Transients Induced by Transf/Breaker Interaction C57.142</td>
<td>PCS</td>
<td>J. McBride</td>
<td>80 MX</td>
<td>Oglethorpe AB</td>
</tr>
<tr>
<td>3:15 pm - 4:30 pm</td>
<td>WG Test Data Reporting C57.12.37</td>
<td>Dist</td>
<td>J. Crotty</td>
<td>100 MX S2</td>
<td>Savannah D</td>
</tr>
<tr>
<td>3:15 pm - 4:30 pm</td>
<td>WG Application of High-Temp Insulation Materials, IEEE P-1276</td>
<td>IL</td>
<td>M. Franchek</td>
<td>100 MX S2</td>
<td>Savannah E</td>
</tr>
<tr>
<td>3:15 pm - 4:30 pm</td>
<td>WG Revision to Gas Guide C57.104</td>
<td>IF</td>
<td>R. Ladroga</td>
<td>200 MX S3</td>
<td>Savannah B</td>
</tr>
<tr>
<td>3:15 pm - 4:30 pm</td>
<td>TBD</td>
<td></td>
<td></td>
<td>200 MX S3</td>
<td>Savannah C</td>
</tr>
<tr>
<td>4:30 pm - 4:45 pm</td>
<td>Break (beverages only)</td>
<td></td>
<td></td>
<td></td>
<td>Ballroom Foyer</td>
</tr>
<tr>
<td>4:45 pm - 6:00 pm</td>
<td>TF Moisture in Oil</td>
<td>IE</td>
<td>Scope of TF moved to Moisture in Insulation WG.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4:45 pm - 6:00 pm</td>
<td>TBD</td>
<td></td>
<td></td>
<td>60 MX</td>
<td>Plaza</td>
</tr>
<tr>
<td>4:45 pm - 6:00 pm</td>
<td>WG Neutral Grounding Devices PC57.32</td>
<td>PCS</td>
<td>S. Kennedy</td>
<td>80 MX</td>
<td>Oglethorpe AB</td>
</tr>
<tr>
<td>4:45 pm - 6:00 pm</td>
<td>WG Tank Pressure Coordinat. C57.12.39</td>
<td>Dist</td>
<td>C. Gaytan</td>
<td>100 MX S2</td>
<td>Savannah D</td>
</tr>
<tr>
<td>4:45 pm - 6:00 pm</td>
<td>TBD</td>
<td></td>
<td></td>
<td>100 MX S2</td>
<td>Savannah E</td>
</tr>
<tr>
<td>4:45 pm - 6:00 pm</td>
<td>WG Transf. Paralleling Guide PC57.153</td>
<td>Power</td>
<td>T. Jauch</td>
<td>200 MX S3</td>
<td>Savannah B</td>
</tr>
<tr>
<td>4:45 pm - 6:00 pm</td>
<td>WG Revisions to Impulse Test Sections of C57.12.00 and C57.12.90</td>
<td>DiTests</td>
<td>P. Riffon</td>
<td>200 MX S3</td>
<td>Savannah C</td>
</tr>
<tr>
<td>6:30 pm- 10:00 pm</td>
<td>No Technical Tour. No other evening events planned.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Wednesday, March 26 -- Wednesday Breaks Sponsored by Weidmann Diagnostic Services ***

No Meeting Registration, No Technical Tours, No Spouse/Companion Tour

<table>
<thead>
<tr>
<th>DATE/TIME</th>
<th>ACTIVITY</th>
<th>SUB-COM</th>
<th>ACTIVITY</th>
<th>ROOM</th>
<th>MEETING</th>
</tr>
</thead>
<tbody>
<tr>
<td>7:00 am - 6:00 pm</td>
<td>Internet Cafe’</td>
<td></td>
<td></td>
<td>12 BD</td>
<td>Mercer</td>
</tr>
<tr>
<td>7:00 am - 8:00 am</td>
<td>Breakfast - Attendees (no spouses/companions please)</td>
<td></td>
<td></td>
<td>300 RT (9/tbl)</td>
<td>Savannah A</td>
</tr>
<tr>
<td>8:00 am - 9:30 am</td>
<td>Breakfast - Spouses/Companions (no meeting attendees please)</td>
<td></td>
<td></td>
<td>88 RT (8/tbl)</td>
<td>Atrium &amp; Riverwalk</td>
</tr>
<tr>
<td>7:00 am - 7:50 am</td>
<td>SC Meetings Planning</td>
<td>Mtgs</td>
<td>G. Anderson</td>
<td>60 CL (with buffet)</td>
<td>Savannah D</td>
</tr>
<tr>
<td>7:00 am - 8:30 am</td>
<td>IEC TC-14 Technical Advisory Group -- Breakfast Meeting; arrive early -- All interested individuals welcome</td>
<td></td>
<td>++ P. Hopkinson</td>
<td>60 CL (with buffet)</td>
<td>Savannah E</td>
</tr>
<tr>
<td>8:00 am - 9:15 am</td>
<td>SC Instrument Transformers</td>
<td>IT</td>
<td>R. McTaggart</td>
<td>100 MX S2 (add 40 TH)</td>
<td>Savannah D</td>
</tr>
<tr>
<td>8:00 am - 9:15 am</td>
<td>SC Insulation Life</td>
<td>IL</td>
<td>B. Forsyth</td>
<td>350 MX S3</td>
<td>Savannah BC</td>
</tr>
<tr>
<td>9:15 am - 9:30 am</td>
<td>Break (beverages only)</td>
<td></td>
<td></td>
<td></td>
<td>Ballroom Foyer</td>
</tr>
<tr>
<td>9:30 am - 10:45 am</td>
<td>SC Bushings</td>
<td>Bush</td>
<td>P. Zhao</td>
<td>100 MX S2</td>
<td>Savannah D</td>
</tr>
<tr>
<td>9:30 am - 10:45 am</td>
<td>SC Distribution Transformers</td>
<td>Dist</td>
<td>S. Shull</td>
<td>350 MX S3</td>
<td>Savannah BC</td>
</tr>
<tr>
<td>10:45 am - 11:00 am</td>
<td>Break (beverages only)</td>
<td></td>
<td></td>
<td></td>
<td>Ballroom Foyer</td>
</tr>
</tbody>
</table>

*** Contact Joe Watson (joe_watson@ieee.org) if you are interested in sponsoring a coffee-break at a future meeting.
Wednesday, March 26 (continued)

<table>
<thead>
<tr>
<th>DATE/TIME</th>
<th>ACTIVITY</th>
<th>SUB-COM</th>
<th>ACTIVITY CHAIR</th>
<th>ROOM CAP/ARR/AV</th>
<th>MEETING ROOM</th>
</tr>
</thead>
<tbody>
<tr>
<td>11:00 am - 12:15 pm</td>
<td>SC UG Transf. &amp; Network Protectors</td>
<td>UTNP</td>
<td>C. Niemann</td>
<td>100 MX S2</td>
<td>Savannah D</td>
</tr>
<tr>
<td>11:00 am - 12:15 pm</td>
<td>SC Dielectric Tests</td>
<td>DiTests</td>
<td>M. Franchek</td>
<td>350 MX S3</td>
<td>Savannah BC</td>
</tr>
<tr>
<td>12:15 pm - 1:30 pm</td>
<td>Lunch (on your own)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1:30 pm - 2:45 pm</td>
<td>SC Dry Type</td>
<td>Dry</td>
<td>C. Johnson</td>
<td>100 MX S2</td>
<td>Savannah D</td>
</tr>
<tr>
<td>1:30 pm - 2:45 pm</td>
<td>SC Power Transformers</td>
<td>Power</td>
<td>J. Watson</td>
<td>350 MX S3</td>
<td>Savannah BC</td>
</tr>
<tr>
<td>2:45 pm - 3:00 pm</td>
<td>Break (beverages and treats)</td>
<td></td>
<td></td>
<td></td>
<td>Savannah BC</td>
</tr>
<tr>
<td>3:00 pm - 4:15 pm</td>
<td>SC Insulating Fluids</td>
<td>IF</td>
<td>D. Wallach</td>
<td>100 MX S2</td>
<td>Savannah D</td>
</tr>
<tr>
<td>3:00 pm - 4:15 pm</td>
<td>SC Performance Characteristics</td>
<td>PCS</td>
<td>E. teNyenhuis</td>
<td>350 MX S3</td>
<td>Savannah BC</td>
</tr>
<tr>
<td>4:15 pm - 4:30 pm</td>
<td>Break (beverages only)</td>
<td></td>
<td></td>
<td></td>
<td>Savannah BC</td>
</tr>
<tr>
<td>4:30 pm - 5:30 pm</td>
<td>SC Standards</td>
<td>Stds</td>
<td>B. Bartley</td>
<td>350 MX S3</td>
<td>Savannah BC</td>
</tr>
</tbody>
</table>
| 6:00 pm - 9:00 pm  | Dinner Social: Dinner Cruise aboard the "Savannah River Queen".  
|                   | -- The boat is docked directly behind the hotel. Advance registration is necessary.  
|                   | -- Boarding and cocktails 6:00 to 7:00 pm. Embark at 7:00 pm. Return approx 9:00 pm.  
|                   | -- Paper tickets will NOT be provided. Admission will be verified with a registration list as you board the boat.  
|                   | -- It will be cool temperature in the evening, so dress appropriately. |

Thursday, March 27

No Meeting Registration, No Spouses/Companions Tours, No Internet Cafe'

<table>
<thead>
<tr>
<th>DATE/TIME</th>
<th>ACTIVITY</th>
<th>SUB-COM</th>
<th>ACTIVITY CHAIR</th>
<th>ROOM CAP/ARR/AV</th>
<th>MEETING ROOM</th>
</tr>
</thead>
<tbody>
<tr>
<td>7:00 am - 8:00 am</td>
<td>Breakfast - Attendees (no spouses/companions please)</td>
<td>315 RT (9/tbl)</td>
<td>Savannah A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8:00 am - 9:30 am</td>
<td>Breakfast - Spouses/Companions (no meeting attendees please)</td>
<td>80 RT (8/tbl)</td>
<td>Atrium &amp; Riverwalk</td>
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<td></td>
</tr>
</tbody>
</table>
| 8:00 am - 9:15 am | Technical Presentation #1: "Switching Transients", by B. Degenneff, A. Rocha, and others.  
|                   | -- Sponsored by Perform. Characteristics SC. See flyer on website. |         | 250 CL S1 200 TH | Savannah BC  |
| 9:15 am - 9:30 am | Break (beverages only)                       |         |                |                 | Savannah BC  |
|                   | -- Sponsored by Power Transformers SC. See flyer on website |         | 250 CL S1 200 TH | Savannah BC  |
| 10:45 am - 11:00 am | Break (beverages only)                       |         |                |                 | Savannah BC  |
| > 11:00 am - 12:00 pm | Closing Session  
|                   | -- All attendees are encouraged to attend  
|                   | -- See separate document for meeting agenda | D. Platts | 250 CL S1 200 TH | Savannah BC  |
|                   | Lunch (on your own)                          |         |                |                 |              |
| > 1:00 pm - 5:00 pm| WG Phase Shifting Transformers IEEE/IEC 60076-57-1202  
|                   | -- Continued from 11:00 am Tuesday | Power   | R. Ahuja       | 20 US          | Savannah E   |
| 1:30 pm - 4:00 pm | Technical Tour: Gulfstream Aerospace Corporation  
|                   | -- Space is limited; so register early!  
|                   | -- Due to security restrictions, a passport is necessary (passport from US or other country).  
|                   | -- Buses depart Marriott at 1:30 am. Return to hotel at approx 4:00 pm.  
|                   | -- Small fee for cost of bus transportation.  
|                   | -- For more details, contact Erin Carpenter at +1.912.754.5435 or <erin.carpenter@efacec.com>. |         |                | Savannah BC  |

Friday, March 28

No Transformer Committee Meetings, No Internet Cafe', No Social Events or Tours.

*** Contact Tom Prevost (tprevost@ieee.org) if you are interested in making a technical presentation at a future meeting.

FUTURE COMMITTEE MEETINGS

Fall 2014 - October 19-23; Washington DC Metro Area, USA. Hosted by Pepco
Spring 2015 - Dates to be determined; USA location to be determined

page 5
Annex A    Bushings Subcommittee

March 26, 2014
Savannah, Georgia

Chair: Peter Zhao
Secretary: Eric Weatherbee

A.1    Opening of the Meeting

A.1.1    Introductions

The Chair explained that a new policy has been put in place that allows for the usual attendee introductions to be bypassed in favor of time constraints to allow more standards business to be addressed.

A.1.2    Attendance

Membership count was taken with the following results: 26 of 40 members were present and 75 guests for a total of 101 attendees. There were 33 new guests and 9 membership requests. A quorum was reached.

A.1.3    Chairman’s remarks

The Chair reviewed and made comments to the group on the Working Group manual and procedures.

The Chair noted that there have been many bounced communications using the AMS system and asked that people try to keep their information up to date.

The Chair reviewed the WG and TF schedule with the group, see Appendix A of this report.

A.1.4    Working Group and Taskforce reports

A.1.4.1    C57.19.00-2004 – Keith Ellis, Chair

No Meeting was held. Mr. Ellis reviewed the standard and did not find anything in need of updating but asked the group to review and send him anything they deemed necessary to be brought up for discussion as a possible revision. Mr. Sharma informed the SC that IEC has two different standards for dealing with porcelain and composite insulator testing which IEEE should consider during the next revision to this standard. The Chair asked Mr. Ellis to also make note that overload should be addressed within the standard by at least adding some comments in its regard.

A.1.4.2    WG PC57.19.01-2000 – Dr. Shibao Zhang, Chair; David Wallach, Secretary

See complete minutes in Appendix B of this report.

A.1.4.3    C57.19.100-2012 – Tommy Spitzer, Chair, not present

The guide was published February 2013, as such no meeting was held.

A.1.4.4    WG PC57.19.04 – Chair, Open; JD Brafa, Vice Chair; Secretary, Open

Following Mr. Brafa’s meeting summary the Chair asked if there were any volunteers to fill the vacant Chair position. He stressed that active participation is key for this standard to reach completion and the difficulties that may arise while trying to work out the dimension/characteristics between all the manufacturers while giving the end users the interchangeability they desire. See complete minutes in Appendix C of this report.
A.1.4.5  IEC / IEEE 65700.19.03 – Les Recksiedler (IEEE) and John Graham (IEC), Co-Chairs

See complete minutes in Appendix D of this report.

A.1.5  External Liaison reports

A.1.5.1  IEC Bushing Standards Activity – John Graham, IEEE Liaison

Mr. Graham informed the group that IEC will be defining a new term. It will likely be RIS for the new resin impregnated synthetic bushings. Following Mr. Grahams briefing Mr. Sharma noted that IEC seems to have discontinuity in cantilever values listed in their bushing standard and the bushing cantilever values listed in the IEC circuit breaker standard. See complete minutes in Appendix D of this report.

A.1.5.2  IEEE 693 – Eric Weatherbee, IEEE Liaison

Mr. Weatherbee informed the group there has not been any progress since the last SC meeting as IEEE 693 spring meeting had not taken place yet. He informed the group that the next S14 IEEE 693 meeting would be held in San Diego, April 15th through the 16th.

A.1.5.3  WG PC57.160 – Thang Hochanh, Chair; Thomas Sizemore, Secretary

See complete minutes in Appendix E of this report.

A.2  Unfinished Business

A.2.1  Solid Dielectric Bushings – Keith Ellis

Mr. Ellis informed the group that he would like RIP and ERIP defined separately. Several members did not think that RIP and ERIP should be considered solid dielectrics as SDB is defined as having no condensers. Mr. Elliot commented that going that far into the individual chemistries between the two designs is beyond the scope of the standard, unless a reason can be determined to do so.

A.2.2  Oil to SF6 Bushings – John Graham

Mr. Graham asked if the group wants to have this defined in the standard. Mr. Elliot stated the current scope of C57.19.00 and 01 excludes these types of bushings and therefore are the beyond the scope, as such it would require significant revision to include.

A.2.3  Study Report on Distribution Transformer Bushings – Josh Verdell

This report was giving at the end of the SC meeting so that the distribution transformer group that runs in parallel could join the discussion. Following Mr. Verdell’s report of his findings the Chair suggested that Mr. Shaw, Mr. Verdell and himself meet or have a conference call to discuss how best to proceed as significant participation will be required from the distribution side to complete this task and it has been tried several times over the years and has yet to maintain active participation required to succeed.

A.3  New Business

A.3.1  Investigation Report – IEEE C57 Standards for Composite Bushings – Devki Sharma

Mr. Sharma noted that upon his review of the standards he was unable to find any exclusion to composite bushings. He proposed that during the next revision of the standards composites should be included. Mr. Graham commented that IEC’s definition of composite is different than the way it is being used by Mr. Sharma and therefore we need to keep the differences in mind.
A.3.2 PD Test for Shunt Reactors – Egon Kirchenmayer

Mr. Kirchenmayer showed a presentation to the group and also the comments of the other task group members that joined the task group after the St. Louis meeting. In summary, two agreed there is a need for a new special test and two disagreed. Presentation to be available on website for those interested.

A.4 Adjournment – 10:46am
## Appendix A

### IEEE/PES TRANSFORMERS COMMITTEE

**Status Report of Transformers Standards**

March 12, 2014

<table>
<thead>
<tr>
<th>STANDARD PROJECT</th>
<th>TITLE</th>
<th>Working Group Chair</th>
<th>Pub Year Rev Due Dat</th>
<th>PAR Issue Dat</th>
<th>PAR Expiration</th>
<th>Standard Status Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>SubCommittee</td>
<td>BUSHING</td>
<td>(417) 345-5926</td>
<td>2011</td>
<td>5/16/2011</td>
<td>12/31/2015</td>
<td>New Project</td>
</tr>
<tr>
<td>Chair</td>
<td>Zhao P.</td>
<td><a href="mailto:peter.zhao@HydroCone.com">peter.zhao@HydroCone.com</a></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C57.19.00</td>
<td>Standard General Requirements and Test Procedure for Power Apparatus Bushings</td>
<td>Ellis K. P. (615) 847-2157 <a href="mailto:keliscola@aol.com">keliscola@aol.com</a></td>
<td>2004</td>
<td>12/8/2020</td>
<td></td>
<td>Approved</td>
</tr>
</tbody>
</table>

Page 4 of 10
Appendix B

WG Revision C57.19.01 Standard Requirements for Bushings.

MINUTES OF WORKING GROUP MEETING – S14 Savannah, GA

The working group met on Tuesday March 25, 2014, at 9:30 am with a total of 69 participants. Of those, 43 members and 26 guests. Working Group membership is currently 61 members therefore a quorum was achieved.

The following eight guests requested membership and four were granted member status:

<table>
<thead>
<tr>
<th>Name</th>
<th>Number of recent meetings (3 recent for membership)</th>
<th>Member Status Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barry Beaster</td>
<td>2</td>
<td>1 more meeting needed</td>
</tr>
<tr>
<td>Bernard Banh</td>
<td>1</td>
<td>2 more meetings needed</td>
</tr>
<tr>
<td>Neeraj Bhatia</td>
<td>2</td>
<td>1 more meeting needed</td>
</tr>
<tr>
<td>James Fairris</td>
<td>4/5</td>
<td>Granted</td>
</tr>
<tr>
<td>Wayne Johnson</td>
<td>4/5</td>
<td>Granted</td>
</tr>
<tr>
<td>Marek Kornowski</td>
<td>5/5</td>
<td>Granted</td>
</tr>
<tr>
<td>Kerry Livingston</td>
<td>4/5</td>
<td>Granted</td>
</tr>
<tr>
<td>Jim Oribiana</td>
<td>1</td>
<td>2 more meetings needed</td>
</tr>
</tbody>
</table>

1. Introductions and Distribution of Attendance Rosters
   a. The committee officers were introduced.

2. Establishment of Quorum
   a. A slide of WG membership was displayed. A count was performed and a quorum was established.

3. Minutes Approval
   a. F13 St Louis minutes were displayed on screen for a couple of minutes.
   b. F13 St Louis meeting were approved as posted on the website and on the screen.

4. PAR Extension Request in Review
   a. PAR extension request was submitted to extend until completion to 2017. IEEE will be considering this PAR this week.
   b. A new proposed timeline was presented and discussed assuming the extension request is granted:
      - Spring 2014
        - Identify the issues to be addressed
      - Fall 2014
        - Discuss the proposed solutions
      - Spring 2015
        - Discuss the proposed solutions
      - Fall 2015
        - Discuss the 1st draft of ballot
        - Start 1st ballot after the meeting
      - Spring 2016
        - Discuss the 1st ballot results
        - Start 2nd ballot after the meeting
      - Fall 2016
        - Discuss the 2nd ballot results
        - Start 3rd ballot after the meeting, if necessary
      - Spring 2017
        - Discuss the 3rd ballot results
        - Start final ballot after the meeting, if necessary
      - Fall 2017
5. Old Business
   a. Summary of the Survey Results
      i. Survey results from 2010 asserted the standard should be revised.
         1. Bushing Dimensions of 115 kV to 345 kV to 5000 A
         2. Voltage Class (preferred and supplementary)
         3. RIP power factor limit
         4. Transformer Breaker Interchangeability (TBI)
         5. Cantilever test requirement
   b. The present scope of the PAR was reviewed.
      i. This standard covers electrical, dimensional, and related requirements for
         outdoor power apparatus bushings that have basic impulse insulation
         levels (BILs) of 200, 110 kV and above. It provides specific values for
         dimensional and related requirements that are to be interpreted,
         measured, or tested in accordance with IEEE Std C57.19.00-1991.
         Bushings covered by this standard are 5,000 A or less rated continuous
         current and intended for use in free air as components of oil-filled liquid-
         filled transformers and reactors. For information on ratings not covered by
         this standard and for replacement bushings for oil circuit breakers, refer to
   c. Another survey had been performed and results also asserted the need to revise
      the standard:

   Summary of Survey - 2012

   d. There is a proposal to have preferred voltage classes to continue what was done
      in 2000 but have also supplementary voltage classes to restore requirements for
      those classes.
   e. The need also surfaced to add dimensions through 5000 A rating for the preferred
      and supplementary voltage classes. It was discussed if there is a need for 345
      kV and above at 5000 A and it was agreed the need is not needed above 3000 A
      for 345 kV and above bushings.
   f. Transformer-Breaker Interchangeable (TBI) – if we get rid of the reference to the
      1991 standard, there is still a need to cover TBI as there are still bulk oil circuit
      breakers in service and users need maintenance replacements.
Appendix B (con’t.)

g. Power Factor Limit for Resin Impregnated Bushings: There was an online
discussion in Central Desktop to propose lowering this limit. The debate was
somewhat complete for discussion of terminology of RIP versus ERIP. It has not
been concluded if the power factor limit should be changed.

6. New Business

a. Line to Ground Ratings

i. 88 kV versus 102 kV Maximum line-to-ground voltage for 138 kV bushing
was not transferred to the new standard in 2000. The suggestion was
made that this question to a new survey. The concern is the bushing is
tested at a lower PD level than users had available prior. The suggestion
was made to examine at the history of this decision path for the 2000
standard.

<table>
<thead>
<tr>
<th>Bushing</th>
<th>Nominal System Voltage (kV)</th>
<th>Rated maximum line-to-ground voltage (kV)</th>
<th>Contaminated dry condition min. (psi)</th>
<th>Contaminated wet condition max. (psi)</th>
<th>Withstand tests</th>
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</thead>
<tbody>
<tr>
<td>Cal. 5</td>
<td>86</td>
<td>106</td>
<td>175</td>
<td>40</td>
<td>650</td>
</tr>
<tr>
<td>Cal. 6</td>
<td>92</td>
<td>98</td>
<td>175</td>
<td>40</td>
<td>650</td>
</tr>
<tr>
<td>Cal. 7</td>
<td>94</td>
<td>98</td>
<td>175</td>
<td>40</td>
<td>650</td>
</tr>
<tr>
<td>Cal. 8</td>
<td>86</td>
<td>106</td>
<td>175</td>
<td>40</td>
<td>650</td>
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<tr>
<td>Cal. 9</td>
<td>92</td>
<td>98</td>
<td>175</td>
<td>40</td>
<td>650</td>
</tr>
<tr>
<td>Cal. 10</td>
<td>86</td>
<td>106</td>
<td>175</td>
<td>40</td>
<td>650</td>
</tr>
</tbody>
</table>

b. Loadability: IEC suggests sizing a bushing with 20% margin over maximum
continuous transformer current rating. The resulting discussion suggested
C5719.100 had covered the topic of overload then noted the section was
removed because overload duration was not defined. At the moment bushing
manufacturers would need to offer users guidance on loadability.

c. Task Forces: The chair recommended development of task forces to address
issues. Volunteers were requested. If volunteers are not received then the chair
will appoint members to assist.

i. Scope

ii. Voltage Classes

iii. 5000 A dimensions

iv. Cantilever test

v. Power Factor Test Limits

vi. 88 kV vs 102 kV

7. Adjournment

a. Meeting was adjourned at 10:30 am.

Minutes by: David Wallach, WG Secretary.
e-mail: david.wallach@ieee.org
Savannah, March 25, 2014.
Appendix C

Minutes: WG PC57.19.04 – LV Bushings Rated >5000A and Applied in Metal Enclosures
Date: March 25, 2014 @ 11:00am – Savannah, GA USA

1) Attendance:
   a) 25 Attendees:
      i) 11 of 28 Members were present (<50%). A quorum was not reached.
      ii) 14 Guests
          (1) 8 new, 6 repeat

2) Summary:
   1. This WG has had its second Chair step down and has been operating without a
      Secretary for the past 2 years. First priority moving forward is the nomination
      and approval of a new Chair and Secretary. Volunteers needed/wanted.
      Preference towards end users working in the field of generation.
   2. PAR expires Dec. 31, 2015. The first action item for the new Chair was identified
      as the filing of an extension of the current PAR because it is not believed we will
      have the draft ready for ballot for before Oct. 20, 2015
   3. Review of open items from the F13 meeting in St. Louis:
      o Should OIP bushings with thermally upgraded insulating material have
        %PF criteria which differ from those with standard kraft paper insulation
        the consensus was there should be no difference in %PF.
   4. Other minor discussions:
      o Due to difficulty believed to be faced in dimensionally standardizing the
        idea was proposed to only address the performance characteristics of
        bushings applied in metal enclosed bus (typical of LV side of GSU), but
        due to the title and scope defining this standard as not only performance
        characteristics but also dimensions, this idea had to be dismissed.
      o Question came up whether this standard would also apply to dry
        bushings? This standard would be valid for any type of bushing insulating
        material whether that be oil impregnated porcelain insulated or dry resin
        impregnated core bushings (as examples).
      o Would the temperature rise for these bushings be related to the air
        temperature in the bus or would it be related to the ambient air of the
        environment? There were good points made to support both sides of
        this topic, but a consensus was not reached. Ongoing discussion.
      o The presentation from F11 meeting on differences between bushings
        applied in free air, and those in metal enclosed bus was presented again
        for those new guests to show why this standard is needed.

3) Action Items:
   1. JD Brafa & Van Nhi Nguyen work together to create and distribute to the
      members a copy of draft #1 of this standard for comment at the Fall 2014
      meeting. Soft deadline is set for September 1, 2014.

4) Adjournment: Meeting was adjourned at 12:18p
Appendix D

IEC BUSHINGS STANDARDISATION

IEC Meetings
The IEC bushing committee SC36A met during the IEC General Session in New Delhi, India on October 19th 2013. The next committee meeting is planned for October 2015 in Minsk, Belarus.
Subcommittee Chair – John Graham, Siemens UK.
Secretary – Gian Franco Giorgi, CEDESPEA, IT.

IEC60137 “Insulated Bushings for Alternating Voltages above 1000V”
A revision of the standard is being carried out by SC36A JMT5 with Convenor Lars Jonsson from ABB, Sweden. A kick-off meeting was held in Geneva in January 2014 with 17 members from 7 countries present. The main items for further discussion are;
- Extension of test values to cover UHV bushings.
- Possible extension of routine impulse testing following IEC60076-3
- Thermal classification including introduction of resin impregnated synthetics (RIS) insulation.
- Temperature rise test conditions.
- Altitude correction.
The next meeting is planned for April 2014.

IEC/IEEE6570.19.03 “Bushings for DC Application”
SC36A MT5 is working with the IEEE Bushing subcommittee with a joint working group to produce a dual logo document.
The document is at the final stages with an FDIS prepared by IEC and passed to IEEE for recirculation ballot. The ballot closes March 23rd. Any comment resulting from the ballot will be reviewed before the FDIS is formally circulated to IEC National Committees. Under IEC rules final publication should be around July 2014.
The IEEE PAR has been extended to cover the IEC delay.

IEC61463 “Seismic qualification of bushings”
SC36A MT6 has been formed and held its first meeting in Milan on October 9th 2013 with Paolo Cardano, Aistom P&V as convener. The team will review other existing standards including IEEE693 to strengthen the document. An internal working group draft was circulated in September 2013 and the first CD is expected in April 2014.
Any comments from the IEEE committee would be welcome.

Other Work –
IEC61464 Dissolved gas analysis of oil impregnated paper bushings – IEC TC10 is working on a revision of the main DGA standard IEC60599. The latest CD includes an annex relating to interpretation of DGA in bushings but gives different limits to those in IEC61464 which could cause confusion. After discussions with SC36A, TC10 agreed to revert to the IEC61464 values.
IEC61639 Bushings for direct connection transformer/GIS – this is under review by the switchgear committee SC17C MT27 and has been re-numbered IEC62271-pl211. The CDV included an annex on very fast transient testing after comments from SC36A it was agreed to remove the annex at the FDIS stage. The FDIS has now been circulated with a closing date for comments March 24th.
IEEE Bushing subcommittee is discussing any need for a similar document covering transformer/gas bushings.

Cigré:
Cigré working group A2: 43 Bushing Reliability, chaired by Antun Mikulecky from Hungary, will meet in Madrid in April 2014.
The group has three task forces;
1. Questionnaire on bushing failure rates and data. The questionnaire is completed for circulation.
2. Drafting of technical brochure sections – definitions, failure modes, mechanisms.
3. Drafting of technical brochure sections - diagnostics and monitoring methods, including theory, measurement method and decision criteria.
It is aimed to publish the brochure during 2014.

John Graham
March 18th 2014
Appendix E

Date: 2014-03-24

Working Group for PD in bushings, PTs and CTs – PC57.160

The meeting was mainly focused on the revision of draft 4, following the discussion during the meeting in St-Louis.

1. Revision of the bushing tap representation for the 2 following cases
   a. Bushings tap has only a test tap
   b. Bushings tap has one test tap and a voltage tap

2. Partial discharges pattern or PRPD
   a. The chair recall to the WG, that the most valuable benefit of this guide on PD are the inclusion of a maximum number of patterns, describing the fault conditions encountered during PD measurements. For this reason, the contribution of every member to provide the patterns he has in his database is being the key point.
   b. The chair also mentioned that patterns are used by many laboratories to diagnose problems during PD testing.
   c. 4 patterns are presented and are related to test situations, where the PD are external to the test object. There were discussions relative to each of these cases that happen frequently during PD testing.

3. Verification of the calibrator injection level:
   a. There was discussion about old and recent method introduced in IEC for pico-Coulomb calibration. The “old” method, (where the verification/calibration using an oscilloscope having a math function with integration) is easier to use.
   b. At the next meeting Detlev Gross promised to present the new calibration method from IEC.

4. Draft 5
   a. A copy of this draft will be circulating shortly to the participants and members of the WG.
   b. The chair asks the participants to review draft 5, send the comments for the preparation of draft 6.

5. TF on PTs and CTs
   a. Vladimir Khalin who led this TF will complete with his group, the revision of sections of draft 5 related to PTs and CTs.

6. Discussion on the use of UST (ungrounded specimen under test) and GST (grounded specimen under test).
   a. Discussion was made on the revision of these 2 terms that were used in other measurement than in PD testing. It was agreed that the WG will look at a revision of them.

WG Secretary: Thomas Sizemore
WG Chair: Thang Hochanh
Date: 2014-03-24
Annex B  Dielectric Tests Subcommittee

March 26, 2014
Savannah, Georgia

<table>
<thead>
<tr>
<th>Dielectric Tests Subcommittee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chair: Michael Franchek</td>
</tr>
<tr>
<td>Room : Savannah BC</td>
</tr>
<tr>
<td>Members : 128</td>
</tr>
<tr>
<td>Membership requested during F13 : 10</td>
</tr>
<tr>
<td>New membership requested during S14 : 19</td>
</tr>
<tr>
<td>Membership status changed to Guest : 36</td>
</tr>
</tbody>
</table>

B.1 Chair's Remarks

The Chair briefly highlighted the requirement that while introducing one need to state their employer/company and sponsor if difference from company.

The chair reminded the WG on attendance requirement for new membership and for continuation and touched upon scope of DTSC and requirement to have attendance updated in AM system.

The chair shared details of upcoming PES sponsored meeting as well as details of next transformer committee.

Current Status of PARs were presented. Two new PAR opened for PC57.161 Guide for DFR measurement and C57.127 Guide for the Detection of Acoustic Emissions from Partial Discharges in Oil Immersed Power Transformers. Bertrand Poulin noted that C57.160 was missed on list presented and Title of C57.113 should be recommended practice and not guide.

B.2 Quorum, Approval of Minutes and Agenda

The membership list was shown and a show of hands of committee members present showed that a quorum of members were in attendance at the start of the meeting. 81 out of 128 members were present at time of checking, so there was a quorum.

All attendance is recorded in AM System.

The revised minutes of the Fall 2013 meeting in St. Louis were approved without correction unanimously. Motion for approval was made by Ken Skinger and seconded by Kent Miller.

Chair presented agenda for the meeting. A motion to approve agenda for the meeting was made by Phil Hopkinson and was seconded by Raj Ahuja.
B.3 Working Group Reports

B.3.1 Working Group on External Dielectric Clearances, Eric Davis, Chair; Troy Tanaka, Secretary

The Working Group met on March 24, 2014 at 9:30 am with 54 people attending the meeting; 10 of 15 members, zero of 4 corresponding member, and 44 guests. Six guests requested membership. A quorum was achieved. The full attendance record is available in the AM System.

David Wallace moved that the Spring 2014 meeting agenda be approved as written. Mike Franchek seconded the motion. There was no discussion. The motion passed unanimously.

Eduardo Garcia moved that the Fall 2013 meeting minutes be approved as written. Mike Franchek seconded the motion. There were no revisions or additions to the minutes. The motion passed unanimously.

The WG reviewed the proposed table and notes. It was suggested that there should be a single clearance for each voltage class based on an equivalent BIL. The chair referred to the St. Louis meeting minutes in which the WG discussed this issue and agreed to proceed with clearances based on BIL not an equivalent BIL.

A question was asked as to why there were different clearances between distribution transformers and power transformers. The chair stated that the exact reason for the differences was not known, however the philosophy in the proposed table has not deviated from previous tables.

The proposed table contains multiple BILs for a given voltage. Several people expressed concern that the clearances for a lower BIL (for a voltage) would not be sufficient for 60 Hz clearance. The chair agreed to check into this issue.

As the discussion continued, concern was expressed that this table could be misinterpreted as the minimum for all situations. The chair reiterated that the purpose of proposed table is not intended to cover all situations, but that it is intended to provide guidance on minimum clearances for a transformer that is in operation. The chair reminded the WG that the standard does contain text stating that larger clearances may be required for testing. The chair agreed to send a survey to the Dielectric Subcommittee asking for guidance.

A question was asked regarding how clearances in the CSA compared to IEEE and IEC. The CSA clearances will be included in a survey to the subcommittee.

The proposed dielectric clearances will be sent to the subcommittee for survey.

David Wallace moved to adjourn. Fred Elliott seconded the motion and the meeting was adjourned at 10:45 am.

Respectfully submitted, Troy Tanaka
B.3.2 WG on Dielectric Frequency Response Analysis (DFR)

Ali Naderian, Chair; Poorvi Patel, Secretary
Monday, March 24th, 2014 – (3:15 -4:30PM)

The meeting was called to order by the secretary at 3:15 PM. This was the second Working group meeting. There were a total of 91 attendees; 16 members and 75 guests and 13 requested to become members. All attendance has been recorded in the AM System.

1. The minutes of meeting from the Task Force Fall 2014 meeting in St Louis could not be approved since there was no quorum. To have a quorum we needed 19 members to be present

2. There has been a great progress of the documents between the first meeting in St. Louis and the second meeting in Savannah

3. The chair and vice chair of the WG could not attend this meeting for personal reasons. The leaders of the various task forces covering the chapters of the guide gave updates of their work:
   a) Diego Robalino presented Chapter 3 – DFR measurement overview. This chapter is in good condition and ready for review by the entire WG
   b) Chuck Sweetser presented Chapter 4 – Making a DFR measurement. This chapter is in good condition and ready for review by the entire WG
   c) Nathan Jacob presented Chapter 5 – Test Records. This chapter is in good condition and ready for review by the entire WG
   d) Poorvi Patel presented an update on Chapter 6 – Measurement Analysis, Interpretation and Report. The chapter needs more work and will be completed by the task force members via web conferencing.
   e) George Frimpong presented Annex A – DFR Theory and Validation. This chapter is in good condition. The latest version will be submitted to the entire WG for comment after this meeting.
      o Yang Baitun raised concern about the ability of DFR moisture measurements to be validated by Karl Fischer measurements carried out in the laboratory. George, Mark Lachman, Tauhid Ansari and Tom Prevost discussed the use of Karl Fischer titration for moisture estimation on pressboard samples. The validation of DFR in transformers via Karl Fischer titration and other methods has been included in Annex A. Members were encouraged to review the Annex and comment if more validation information needs to be included.
      o Mark Perkins asked if any measurement had been made on a transformer that is wet at the bottom and drier at the top to see if DFR gives the average of the moisture in the top and bottom. George indicated he was not aware of any such measurements and the expectation is that DFR would give the average of the moisture in the insulation system.
   f) Poorvi Patel presented Annex B – DFR Other Application. This chapter is not yet ready, but the items to be considered were presented. The chapter will be completed by the task force members via web conferencing
   g) Mario Locarno presented Annex C – Typical Measurement Challenges. A large portion of this chapter has been completed. However, Mario asked members to submit challenges they have encountered in the field that could be added to the section.

4. At least one web conference of members of all task forces will be organized before the Fall meeting- Target would be in August

5. The chair and or the secretary will send out the latest version of the Task force documents to all the participants. It is very important that all take a moment to review the documents and get back with comments and remarks to the task force leaders and to be discussed in the Fall meeting.
6. No new business was discussed

7. Meeting was adjourned at 4.15 pm by Tom Prevost and Mario Locarno

Poorvi Patel, Temporary Chair  
George Frimpong, Acting Secretary  
Diego Robalino, Acting Secretary

B.3.3 Working Group for Revision of the Distribution Impulse Test Guide C57.138  

Recommended Practice for Routine Impulse Test of Distribution Transformers;  
John Crotty, Chair
B.3.4 Working Group on Revision of Impulse Tests – Pierre Riffon, Chair; Martin Hinow, Vice-Chair

The WG met on March 25, 2014, from 4:45 pm to 6:00 pm. Twenty-four (24) members and sixty-eight (68) guests attended the meeting. Eleven (11) guests requested membership. The meeting was chaired by Pierre Riffon, chair of the WG. The WG has a new co-chair Martin Hinow.
Attendance has been recorded in the AM system.

The chair thanks the past co-chair Mr. Peter Heinzig for his help and work.

Required quorum was not met, 24 members were present, and presence of 26 members was required. The working group membership will be reviewed and cleaned prior to the next meeting.

The agenda has been reviewed but we were not able to approve it due to the lack of quorum. On New Business, Mr. Ajith Varghese requested to add a new item of discussion regarding a possible modification to the chopping time limit given in clause 10.3.1.3 of C57.12.90.

Minutes of the St-Louis meeting will be sent via email to the WG membership for approval.

The first item of business was related to the second survey made within the Dielectric Tests SC on a revised proposal defining a non-mandatory order for impulse tests. This revised proposal has been already approved by the WG membership during the St-Louis meeting. As also defined by IEC 60076-3, the proposal suggests to perform the switching impulse test after the lightning impulse test. Comments received were discussed. Even if the approval rate within the Dielectric SC was 92.5%, a modified proposal has been presented in order to satisfy some of the comments received. Proposed changes are only editorial and the modified text will be circulated via Email to the WG membership for approval. This approval needs to be obtained fast since the deadline for the next draft of C57.12.90 is approaching. If approve by the WG, the proposal will be sent to Steve Antosz in the upcoming weeks for inclusion in the next draft of IEEE C57.12.90.

The second item of business was related to the survey made within the WG on a new proposal clarifying the maximum tolerance to be specified on the front time during lightning impulse tests. This proposal was based on the actual wording of new edition of IEC 60076-3. Comments received were discussed. From the comments received, two main subjects were discussed: maximum front time limit and application of the test voltage function as defined in IEEE Std. 4-2013.

The chair made a presentation of the basic theory behind the front time adjustment and limits and resulting overshoot. The test voltage function application was also discussed through an example. Even if the proposal was accepted with 87.0% approval, important questions remain, should we prioritize a maximum front time value or maximum overshoot amplitude because both can generally not be met at the same time? Do we need different criteria depending of the winding design?

A questionnaire regarding these questions will be sent to the WG prior to the next meeting.

As a new business, Mr. Ajith Varghese requested to change the requirement regarding the maximum chopping time value of 1 µs given during chopped-wave tests. Since we were running out of time, the subject was not discussed and will be put on the next meeting agenda.

The next meeting is planned to be held in Washington, DC, on October 21, 2014.

The meeting adjourned at 6:00 pm on March 25, 2014.

B.3.5 Working Group on Revision of Low Frequency Tests; Bertrand Poulin

1. There were 72 attendees, 17 members and 55 guests present at the meeting; 7 guests requested membership. 50% of the working group members were in attendance at the meeting, therefore
a quorum was present at the meeting. The meeting attendance has been recorded into the Committee's AM system.

2. The agenda for the meeting was presented and unanimously approved (motion by Sanjib Som, 2nd by Marnie Roussell).

3. A motion was made by David Wallace and 2nd by Dave Murray to approve the minutes from the Fall 2013 meeting in St-Louis. The minutes were approved unanimously.

4. Chair's remarks:
   a. There are no more task forces reporting to this WG. The TF on measurement of pd on bushings, PT's and CT's has been changed to a WG and reports directly to the sub committee.

5. Tap Changer Position During Induced Test – Revision of paragraph 10.8.1 of C57.12.90
   b. Results of Survey: Broad approval was received, 190 out of 259 responded, Approval without comments was 147 or 82 %. Approve with comments was 23 (13%) so total approval was about 94.4%. There were 10 disapprove votes or 5.6%. All comments were presented to the group for information.
   c. Three objections came from manufacturers who claimed not to be in position to test transformers with preventative auto due to insufficient generator capacity. These were not accepted by the group. Most other negative votes and comments concerned the proposed wording of the paragraph and not the concept of testing all internal devices with an overvoltage during the induced test. Finally, 3 people suggested to test transformers with tap changers always in minimum voltage position. This proposal was discussed as there were very diverging opinions about this topic. The meeting ended with no consensus on this proposal.

6. Old Business –
   • Section 10.5. for low frequency tests on transformers that have an internally grounded neutral. The question regarded the reason to the factor 3.46 at induced test on such transformers and why this applies only to single phase transformers.
   • There was no time for addressing this topic.

7. New Business - None

The meeting adjourned at 3:00 p.m.

B.3.6 WG - IEEE Guide for the Detection of and Location of Acoustic Emissions from Partial Discharges in Oil-Immersed Power Transformers andReactors (C57.127)

Chair: Detlev Gross Chairs
Vice Chair: Jack Harley
Secretary: David Larochelle

Savannah, GA, Mars 24th 2014
Room: Savannah E
Meeting Attendance

The working group met at 11 AM. 45 persons were in the room and 16 members were present. Quorum requirement was met. The following guests requested membership for next meeting:

- Robert Brusetti
Discussions

The minutes from St-Louis meeting were approved.

The title of the guide, scope, purpose and table of content were presented as modified from the previous meeting. Discussions on the Title and Scope led to two different suggestions, the first being to replace the words “Partial Discharges” with “Electrical Discharges”. This replacement would not exclude an acoustic test that would be done during the impulse test in a manufacturing environment.

The second suggestion was to add “Interpretation” to the title to include guidance to diagnostic.

The Table of content was then reviewed. There is confusion on how chapters are divided. A suggestion was made to split chapter 10 into two sections, one section on the types of systems and another for types of sources and specific applications of acoustics. It was also suggested to remove terms like “DSP workstations” that are technology specific and less relevant nowadays.

Following the multiple discussions, the request for PAR will be postponed until the next meeting of the working group.

Adjournment

The meeting was adjourned at 12:15 PM.

David Larochelle

B.3.7 Working Group for PD in bushings, PTs and CTs – PC57.160

WG Secretary: Thomas Sizemore
WG Chair: Thang Hochanh

Date: 2014-03-24

The meeting was mainly focused on the revision of draft 4, following the discussion during the meeting in St-Louis.

1. Revision of the bushing tap representation for the 2 following cases
   a. Bushings tap has only a test tap
   b. Bushings tap has one test tap and a voltage tap

2. Partial discharges pattern or PRPD
   a. The chair recall to the WG, that the most valuable benefit of this guide on PD are the inclusion of a maximum number of patterns, describing the fault conditions encounter during PD measurements. For this reason, the contribution of every member to provide the patterns he has in his database is being the key point.
   b. The chair also mentioned that patterns are used by many laboratories to diagnose problems during PD testing.
c. 4 patterns are presented and are related to test situations, where the PD are external to the test object. There were discussions relative to each of these cases that happen frequently during PD testing.

3. Verification of the calibrator injection level:
   a. There was discussion about old and recent method introduced in IEC for pico-Coulomb calibration. The “old” method, (where the verification/calibration using an oscilloscope having a math function with integration) is easier to use.
   b. At the next meeting Detlev Gross promised to present the new calibration method from IEC.

4. Draft 5
   a. A copy of this draft will be circulating shortly to the participants and members of the WG.
   b. The chair asks the participants to review draft 5, send the comments for the preparation of draft 6.

5. TF on PTs and CTs
   a. Vladimir Khalin who led this TF will complete with his group, the revision of sections of draft 5 related to PTs and CTs.

6. Discussion on the use of UST (ungrounded specimen under test) and GST (grounded specimen under test).
   a. Discussion was made on the revision of these 2 terms that were used in other measurement than in PD testing. It was agreed that the WG will look at a revision of them.

WG Secretary: Thomas Sizemore
WG Chair: Thang Hochanh
Date: 2014-03-24

B.4 Liaison Reports

B.4.1 Voltage Test Techniques (HVTT), IEEE Standard 4 - Arthur Molden

There has been no HVTT WG meeting since the one reported on at the St Louise Transformers Meeting last year.

Members of the HVTT WG will be presenting a Panel Session at the PES General Sessions being held at the Gaylord National Resort & Convention Center, Washington DC, July 27th to 31st this year. Our presentation will be on Thursday the 31st and will include and elaborate on the “Standard 4 and k-factor Presentation” made at the Milwaukee meeting in October of 2012. Anyone attending that meeting can take the opportunity to attend our session and participate in the Q&A session that will follow.

Art Molden. 3/26/2014
B.5 Old Business

Results of two Surveys were presented

B.5.1 Survey of Correction for dielectric Table 4 and 5

49 surveys returned with 89% affirmative.

There are 5 negative votes, some of which are minor correction. Negative comments will be discussed with ad hoc WG and if needed will be discussions with negative voters before next meeting.

Based on resolution of negative votes, changes will be recommended Transformer Committee for next Revision of C57.12.00.

B.5.2 Survey for change of definition to class II

49 surveys returned with 98% affirmative.

Based on 98% affirmative votes, changes will be recommended for changes to the Transformer Committee for C57.12.00 along with changes to table 4 and 5.

No other old Business was brought for discussion

B.6 New Business

No new Business was brought for discussion.

B.7 Adjournment

Meeting adjourned 11.45 PM.

Minutes respectfully submitted by:
Ajith M. Varghese
Secretary DTSC.
Annex C  Distribution Subcommittee – Chair: Stephen Shull

March 26, 2014
Savannah, Georgia

Chair: Stephen Shull
Vice-Chair: Jerry Murphy

C.1  General Opening

Steve opened the meeting welcoming everyone to the meeting. Jerry circulated the rosters. To establish a quorum, a list of members were displayed and a count of was made. We did have a quorum with 29 of the 51 members in attendance.

The agenda was reviewed and motion made by Gael Kennedy, seconded by Kent Miller and approved by unanimous acclamation of the members in attendance.

The Fall 2013 meeting minutes were reviewed and motion made by Phil Hopkinson, seconded by Ed Brush and approved by unanimous acclamation of the members in attendance.

C.2  Working Group and Task Force Reports

C.2.1  C57.12.36 – Distribution Substation Transformers – Jerry Murphy

Jerry presented the following minutes from the working group meeting on March 25, 2014 at 1:45 PM in with 49 in attendance.

Jerry called the meeting to order. Introductions were made. The names of the members were projected on the screen. By a show of hands the quorum was reached by having 12 out of the 19 members present.

The minutes of the Fall 2013 meeting in St. Louis were presented. A motion was made by Gael Kennedy and seconded by Ron Stahara to approve the minutes as written. The minutes were approved unanimously.

Jerry informed that he had sent Draft 3 of the standard to all the WG membership encouraging them to review this draft so that any issues could be raised, discussed and resolved. All the changes that had been discussed in the past meetings were already incorporated.

This draft was projected on the screen to show the changes that had been incorporated. Craig Colopy requested the review of this document to the members of the WG C57.15 that were in attendance, considering their work with the joint IEEE/IEC standard process.

Bob Olen explained how the IEEE SA system worked, to ensure that the membership would be included in this system, so that they can receive any future invitation to ballot.

Jerry asked the group for a motion for a straw ballot to proceed to start a ballot process, considering that the document was ready to go through this process. A motion on this regard was made by Ron Stahara and seconded by Gael Kennedy. The motion was approved unanimously.
Jerry then informed that he would send the document to IEEE in April, so that the balloting process could be approved soon, and he once again requested the group to review the document and provide any comments.

There was no additional new business, and the meeting was adjourned at 2:05 PM.

Jerry made a motion before the subcommittee to move the standard to ballot, seconded by Gael Kennedy and the motion was approved by unanimous acclamation of the subcommittee members in attendance without further discussion.

C.2.2  C57.15/IEC 60076-21 – Step-Voltage Regulators – Craig Colopy

Craig presented the following minutes from the working group meeting on March 24, 2014 at 4:45 PM with 41 persons in attendance.

Craig opened the meeting by welcoming everyone. Craig asked the attendees to introduce themselves. Since this task force had just been formed and was working at this time without a PAR, Members are still being added. Those in attendance were asked to approve the agenda for this meeting. It was the general consensus that the agenda was correct. The St Louis unapproved Minutes were presented but because there was no task force at that time, it was determined that no approval was needed. Rosters of interested parties were passed out for additional individuals to sign up for Task Force Membership.

Craig updated the group on the status of PAR and DC (IEC Document for Comment.) Member nations are supposed to respond by May 9th, 2014 to this DC. Jodi Haasz commented that RevCom will meet Wednesday to consider the IEEE PAR request. It is anticipated that this will be approved.

Craig stated that he would like to do some preliminary work in some areas before next meeting which is scheduled in the Fall. The following areas were target and individuals assigned to work on these topics.

- a) Sound Levels as per Brazil (NBR11809) – 2014 - Craig Colopy
- b) C57.12.00 and C57.12.90 Revisions – review changes to see effects on this Standard. The volunteers were Giuseppe Termini and Wally Binder
- c) Investigate the 55 and 65°C Average Winding rise and associated Hot Spot Rise. It was pointed out that IEEE’s ambient is not the same as IEC. Therefore, Craig cautioned the volunteers to be careful in their review The volunteers were Jennifer Yu and Aleksandr Levin,
- d) External Dielectric Clearances harmonization. The volunteers were Dan Sauer and Fred Friend
- e) On-Load Tap Changer Section (IEC 60124-1 & NBR 11809) - The volunteers were Axel Kraemer, Lee Matthews, Chuck Simmons and Craig Colopy.
- f) Develop a Tank Rupture Test and/or Cover retention based on the work being done in PCS57.12.39. The volunteers were Dan Mulkey, Jim Harlow, Justin Pezzin, and Said Hachichi.
- g) Routine and Design Partial Discharge (150 BIL and higher) tests There were no volunteers.
h) Sound Level Requirements and Tests. The volunteers were Lee Matthews and Martin Rave.

i) Control/Apparatus Compatibility tests which could include status, control access, SCADA, etc. The volunteers were Craig Colopy, Dallas Jacobsen, Murty Yalla, Steve Shull, and Anil Dhawan.

j) Universal Interface between the apparatus and control with consideration of Safety, Liability, etc. The volunteers were Steve Shull, Anil Dhawan, Tas Taoussakis, and Craig Colopy.

k) A discussion concerning the topic of “Bypass off Neutral Position” which was to be targeted to an Annex. This annex would consider covering such topics as Safety, equipment failures, determination of neutral position, etc. The volunteers were Craig Colopy, Dan Mulkey, Chuck Simmons, and Mike Miller.

l) An Annex that would discuss overload, probability of different operations, and other no previous covered items. The volunteers were Dallas Jacobsen and Jim Harlow

m) Special considerations for Ester Based fluids. Alan Peterson volunteered to do this.

n) The Control Design and Testing: This currently discussed in section Section 9 of the current standard. Murty Yalla volunteered to do this.

The meeting ran out of time and there was a motion made by Lee Matthews to adjorn with a second by Mike Miller. The motion was carried by unanimous approval.

C.2.3 C57.12.20 – Overhead Distribution Transformers – Alan Traut

Alan presented the following minutes from the working group meeting on March 24, 2014 at 11:00 AM with 53 in attendance.

Al Traut asked for the Introduction of members and guests.

Al Traut provided the Chair’s Report. The current PAR expires December 31, 2016. The 10-year cycle ends December 31, 2021. Al stressed that balloting needs to occur by 2015 or early 2016 to meet the December 31, 2016 PAR expiration date.

A quorum of the working group members was present (26 out of 33 members were present).

The minutes of the fall 2013 St. Louis meeting were discussed and approved.

Al Traut led the first discussion of old business on proposed transformer minimum impedance values. The typical values in his presentation came from the Department of Energy’s recent work on distribution transformer efficiency values. The minimum impedance values were derived based on various panel breaker sizes. Discussion was held on including maximum impedance values, but the working group decided against this. Some felt that the proposed single-phase impedance values should be compared with those of 3-phase padmount transformers as a check. Al Traut will make the meeting slides available to everyone who attended the meeting as well as provide a summary of his approach in deriving the minimum impedance values. Adam Bromley and Chuck Simmons volunteered to assist Al Traut on the wording for the minimum impedance section.
The last item of old business discussed was regarding platforms for mounting overhead type transformers. Some larger transformers may require a platform for mounting due to increases in total weight as a result of the DOE efficiency requirements. The working group feels that the transformer base mounting capabilities need to be addressed in the standard. The group agreed that the standard should include a maximum weight beyond which transformers should be mounted on platforms. Concern on the weight limit of the different types of mounting brackets (adapter plates) was also discussed as some of these limits could be exceeded by future transformer designs. The group agreed that a weight limit needs to be defined for these mounting brackets (adapter plates). The group discussed this information being included in an informative annex. Dan Mulkey, Ali Ghaforian and Chuck Simmons agreed to work with Al Traut on putting together a summary of what some users are doing with platforms and send to the working group.

Under new business, Darren Brown questioned the grounding of the X2 bushing on the top four schematics of Figure 6. His concern was that by showing the X2 grounded, users may interpret this to mean that all X2 bushings should be grounded when it is only required that the X2 bushing be grounded on 120/240 Volt secondary designs. Following discussion, a motion was made (Allen Wilks / Darren Brown) to delete all X2 ground connections from Figure 6. The motion passed with 14 approving and 3 dis-approving.

The last discussion under new business involved which bushing should be grounded on single-phase overhead type transformers with four secondary bushings. Chuck Simmons will add language to the current draft and present to the working group at the next meeting.

Meeting was adjourned at 12:13 PM.

C.2.4 C57.12.34 – Three Phase Padmount Transformers – Ron Stahara

Ron presented the following minutes from the working group meeting on March 24, 2014 at 3:15 PM with 64 in attendance.

Ron Stahara called the meeting to order and introductions were made. The rosters were circulated. The complete detail of attendance is recorded in the AM system. To establish a quorum, a members list was displayed on the screen and those who saw their names were asked to hold up their hand. From this count of hands, it was determined that a quorum was established. A motion was made by Marty Rave and seconded by Ed Smith to accept the minutes of the Fall 2013 meeting as written as well as agenda for this meeting. The motion was pasted unanimously.

The discussion continued on the meaning of “permanently affixed”. The original clause in the document was as follows:

8.8 Instruction nameplate

8.8.1 Location

The instruction nameplate shall be located in the low-voltage compartment and shall be readable with the cables in place. When the nameplate is mounted on a removable part, the manufacturer’s name and transformer serial number shall be permanently affixed to a non-removable part.

After some discussion it was reformed to the following:
8.8.1 Location

The instruction nameplate shall be located in the low-voltage compartment and shall be readable with the cables in place. If the nameplate is mounted on a removable part, the manufacturer’s name and transformer serial number shall be attached to the tank in such a way to have equal or greater life expectancy than that of the transformer.

A motion was made by Jerry Murphy and seconded by Said Hachichi to accept this change. The motion pasted unanimously.

A discussion was continued from the fall meeting concerning the location of the H0 bushing. The group reviewed the drawings showing the H0 bushing as discussed in the last meeting. These were figures 2, 3, 6, 7, 10, 11, 13A, 13B, 14A, 14B, and 14C. After some discussion, it was felt that the all of these were acceptable except the loop feed deadfront units. A concern was expressed that the position of the bushing in the example figure shown below may be in the way of cabling and connections at the higher voltage and current ratings.

Although this location had been shown to work for 200A, 15kV class installations, the higher voltage ratings and the 600A interfaces may be unable to be accommodated when the bushing was at this location. There was a lot of discussion concerning this and the conclusion was that the bushing will be moved to either above the H1A bushing well or the H1B bushing well. The preferred location was to be above the H1B bushing well. A motion was made to this effect by Michael Miller and seconded by Mike Faulkenberry. The motion pasted unanimously. Steve Shull was to make corrections to the affected drawings.

The document was discussed in general as a review of its content. There were a number of items discussed most of which were editorial in nature. Ron brought a comment to the group concerning the footnote b in Table 3. There were questions from the group as to if these footnotes in the Table would be a part of the standard. Steve was to verify that this was the case in that these footnotes provided valuable information to the standard. However, footnote b was a concern for the group. It appears that the technology has been developed to such a point as to allow for a 200 kV BIL separable connector and this statement may need to be corrected. Ron was not sure that the document was written to be used up to this level. After some discussion it was asked that Steve Shull do a minutes search to verify this was the case. As a side note, this was done and the following is an excerpt from the Fall 2006 Minutes:

A discussion ensued concerning the 34,500 Δ BIL level shown in the document as well as associated kVA ranges. It was decided by consensus
that the 34,500 GrdY/19,920 kVA levels would be used for this voltage. Some discussion was followed by a motion made by Iqbal Hussain and seconded by Myron Gruber to change the BIL level to 150kV to match the BIL of the 34,500 GrdY/19,920 kVA. It was further clarified by changing the Table 1 footnote d to the following; “The highest BIL level for separable insulated connectors is 150 kV BIL. If 200 kV BIL level is required, bushings must be used.” The amendment to the motion and the motion both passed.

These notes indicate that this was the intent of the standard.

Steve would investigate this connector. Comments from the group will be solicited to determine the disposition of the information that he hopes to discover.

Alex Macias asked why this document didn’t provide for accessories such as fuses and switches. It was pointed out in the discussion that some of the underground transformers have these items included in their standards. Steve Shull commented that these items have never been in the document since he had been part of the group and he was told by his predecessors that they should not be included. Ron pointed out that Gerry Paiva had work to get these items removed when he was a part of the group. Giuseppe Termimi and Dan Mulky commented that switches and fuses should be considered since these were necessary when applying these units at the higher voltages or when loopfeed designs are required. Brian Klaponski stated that since we were concerned about the unsophisticated user in the document, it appeared to him that a reference to these items should be consider as some part of the document simply as a safety precaution. Ron said that we would get with Gerry and see if Gerry could remember the spirit and intent of why these types of accessories were removed from the standard.

Since the meeting was running low on time, Ron ended the discussion and shared that at the next meeting we would have to move this document to ballot. He said that Steve Shull would be getting the changes made to the document in the next month and would circulated it to the group for comment. He would like to have any changes or corrections finalized by the next meeting. With this a motion was made to adjourn by Paul Chisholm and seconded by Mike Faulkenberry. The motion pasted unanimously.

C.2.5  C57.12.28, C57.12.29, C57.12.30, C57.12.31, C57.12.32 – Enclosure Integrity – Bob Olen

Bob presented the following minutes from the working group meeting on March 25, 2014 at 8:00 AM in with 56 in attendance.

C57.12.28, Standard for Pad-Mounted Equipment – Enclosure Integrity
- Published 9/30/2005, Revision Due date 12/31/2018
- PAR Approved 30-Sep-2010, Expires 12/31/2014

C57.12.29, Standard for Pad Mounted Equipment - Enclosure Integrity for Coastal Environments
- Published 10/11/2005, Revision Due date 12/31/2018
- PAR Approved 30-Sep-2010, Expires 12/31/2014

C57.12.30, Standard for Pole-Mounted Equipment - Enclosures for Coastal Environment
- Published 9/20/2010, Revision Due date 12/31/2020
- PAR Approved N/A, Expires N/A
Meeting Minutes / Significant Issues / Comments:

- Quorum was established
- Ron Stahara motioned, and Justin Pezzin seconded, to approve the minutes of the previous meeting on October 22, 2013 in St. Louis, Missouri. The motion was approved unanimously.

Discussion of C57.12.31 Standard for Pole-Mounted Equipment - Enclosure Integrity:

Bob Olen reported on the ballot for the corrigenda to correct Section 4.5.6, Simulated Corrosive Atmospheric Breakdown (SCAB), on page 8, which should require 10 SCAB cycles not the 15 that is stated in the 2010 Standard.

- The Ballot Results were:
  - 63 Affirmative
  - 4 Negative
  - 94% Affirmative (passed > 75%)

- This corrigenda was submitted to REVCOM on February 21, 2014.

Discussion of C57.12.28 Ballot Standard for Pad-Mounted Equipment – Enclosure Integrity:

- The Re-Circulation Ballot Results were:
  - 97 Affirmative
  - 5 Negative
  - 95% Affirmative (passed > 75%)

- This revision was submitted to REVCOM on February 21, 2014.

Discussion of C57.12.29 Ballot Standard for Pad Mounted Equipment - Enclosure Integrity for Coastal Environments:

- The Re-circulation Ballot Results were:
  - 91 Affirmative
  - 6 Negative
  - 93% Affirmative (passed > 75%)

- This revision was submitted to REVCOM on February 21, 2014.

Discussion of C57.12.32 - Standard for Submersible Equipment – Enclosure Integrity:

The chair noted that the standard will expire in 4 years it is time to take out a PAR for revision. Al Traut motioned and Ron Stahara voted to go forward and submit a PAR for revision. There was much discussion around the Scope and the Purpose. Currently there is confusing language with “enclosure” being used for both the outer skin of the equipment and for the enclosure/vault/box in which the equipment is placed.
A group was formed to work on the scope and par between meetings. The volunteers were: Al Traut, Chuck Simmons, Adam Bromley, Giuseppe Termini, Anil Dhawan, Arvin Joshi, Bill Wimmer, Dan Mulkey, and Bob Olen.

Dan Mulkey will attempt an initial layout of testing sequence for coatings that are on ferrous metal followed by testing for coatings that are on non-metallic or stainless substrates.

Concluding Remarks

The next meeting will be in October 2014 in the Washington, D.C. area.

C.2.6  C57.12.37 – Test Data Reporting – John Crotty

John presented the following minutes from the working group meeting on March 25, 2014 at 3:15 PM.

John made a motion before the subcommittee to move the standard to ballot, seconded by Gael Kennedy and the motion was approved by unanimous acclamation of the subcommittee members in attendance without further discussion.

C.2.7  C57.12.38 – Single Phase Padmount Transformers – Mike Faulkenberry

Mike presented the following minutes from the working group meeting on March 24, 2014 at 1:45 PM in with 51 in attendance.

Ali Ghafourian opened the working group meeting at 1:45 p.m. Twenty-nine of thirty-four working group members were present and a quorum was established. The attendees are recorded in the AM System.

The minutes of the meeting had previously been posted on line and a copy was emailed to the working group members. A motion was made by Ron Stahara to approve the minutes from the fall 2013 meeting, it was seconded by Kent Miller, and the motion was passed unopposed by the working group members.

Ali presented the ballot results. The participation rate was 85% and the approval rate was 98%. There were 32 comments, one of which resulted in a negative ballot.

Mike Faulkenberry led a discussion of only those ballot comments that needed working group approval as follows:

Page 19; Figure 6; NEGATIVE BALLOT

Comment:
My comments are in regard to Figure 6 - Low Voltage Spacing for LV Ratings E, E/E1Y, and E/2E. The illustration for E/2E and the arrangement for the LV bushing terminals X1-X2-X3-X4 are used for either 120/240 V or 240/480 V rated windings. The illustrations in Table 7- Number of low-voltage terminals and arrangement for single-phase transformers in C57.12.20 specify that the LV bushing terminal arrangement X1-X2-X3-X4 are available for 167 kVA and above - up through 500 kVA in the case of C57.12.20. Is this implied in PC57.12.38 D1.4 as well?

Proposed Change:
I would add the following as part of Figure 6 in PC57.12.38:
Four low-voltage external terminals suitable for series, multiple, or three wire operation (120/240 or 240/480) - 167kVA and 250 kVA. Connect X2 to X3 externally for series operation. Connect X2 to X4 and X3 to X1 externally for multiple operation.

Resolution (Agreed to by Working Group Members):
A note will be placed at the bottom of Figure 5, rather than Figure 6 as suggested, that says, “The E/2E Low-Voltage rating with four external terminals, for example 120/240 V or 240/480 V, is suitable for series, multiple, or three-wire service. Connect X2 to X4 and X3 to X1 for multiple operation. Units shall be shipped connected for three-wire operation with X2 connected to X3 and to the tank.” It was agreed that it would be applicable to all kVA sizes since the top cannot be removed from pad-mounted transformers for internal rewiring. So no statement as to kVA size for which it is applicable was necessary.

Page 20; Subclause 10.1; Line 4
Comment:
Reference to C57.91 should be changed to C57.12.00

Proposed Change:
IEEE C57.91 include overloads that could result in a transformer not remaining effectively sealed. IEEE C57.12.00 identifies Usual Service Conditions and I believe the expectation for the transformer remaining sealed is based on operating conditions spelled out in C57.12.00. I propose that the last sentence of Section10.1 be changed to read, "The transformer shall remain effectively sealed for a top-oil temperature of -5 degrees C to +105 degrees C continuous and under operating conditions as described in IEEE Std C57.12.00."

Resolution (Agreed to by Working Group Members): This change will be made.

Page 14; Subclause 7.6; Line 11
Comment:
I question the use of the term "lifting lugs" since this is typically accomplished with bolts screwed into female threaded bolt holes.

Proposed Change:
I propose that the last sentence of Section 7.6 be changed to read, "The safety factor is based on using all lifting provisions as instructed by the manufacturer." The company that I work for has encountered issues with bolts being used in the lifting provisions that were too long. Manufacturers should advise customers on the size, grade and length of bolts to be used to lift their specific transformers.

Resolution (Agreed to by Working Group Members): This change will be made.

Page 13; Figure 3
Comment:
Drawing title needs to include the term, "Type 1 arrangement".

Proposed Change:
I propose that the title for this drawing include "Type 1 arrangement" as that is included in the titles for Figures 1A, 1B, 2A and 2B. I propose the title for Figure 3 be changed to, "Figure 3 - Type 1 arrangement, live-front, high-voltage bushings, interchangeability dimensions".

Resolution (Agreed to by Working Group Members): This change will NOT be made as the working group felt that putting “Type 1 arrangement” in the title could lead to confusion.

Page 10; Figure 2A
Comment:
Drawing title needs to include the term, "small interface".
Proposed Change:
I propose that the title for Figure 2A be changed to, "Type 2 arrangement, small interface separable connectors, interchangeability dimensions". The title for Figure 2B includes the term "large interface", so I feel that Figure 2A should include the term "small interface".
Resolution (Agreed to by Working Group Members): After referring to IEEE Std 386, the term “small interface” was not found in the document. Therefore, this change will NOT be made, but it will be tabled until the next revision and researched further.

Page 7; Figure 1A
Comment:
Drawing title needs to include the term, "small interface".
Proposed Change:
I propose that the title for Figure 1A be changed to, "Type 1 arrangement, small interface separable connectors, interchangeability dimensions". The title for Figure 1B includes the term "large interface", so I feel that Figure 1A should include the term "small interface".
Resolution (Agreed to by Working Group Members): After referring to IEEE Std 386, the term “small interface” was not found in the document. Therefore, this change will NOT be made, but it will be tabled until the next revision and researched further.

Page 4; Subclause 4.2; Table 2
Comment:
In Table 2 (Electrical Characteristics and Minimum Electrical Clearances of High-voltage Bushings and Low-voltage Terminals for Live-front Transformers) on page 4, the values for "60 Hz dry 1 min withstand (kV)" associated with 18000 and 25000 Maximum nominal system voltages are different (the value for 18000 Volts is 42kV and the value for 25000 Volts is 60kV). Since the BIL values are the same, shouldn't the 60 Hz dry 1 min withstand (kV) values be the same?
Proposed Change:
I propose that these values be confirmed and changed if listed incorrectly.
Resolution (Agreed to by Working Group Members): Dan Mulkey stated that the 18000 volt entry in the table is not found in other standards and was probably added by someone at some point. Steve Shull made a motion that the 18000 volt line be removed from Table 2. The motion was seconded by Kent Miller, and the working group unanimously approved the motion. The 60 kV entry for the 25000 volt line was called in question, and it will be checked and verified as correct.

Page 3; Subclause 3.0; Definitions
Comment:
Is there a reason that "Ultimate Stress" isn't defined in Section 3 (Definitions)? Since "Working Stress" is defined, I think that "Ultimate Stress" should be defined in Section 3 at the top of page 3.
Proposed Change:
Define "Ultimate Stress" in Section 3 (Definitions).
Resolution (Agreed to by Working Group Members): Dan Mulkey suggested that the definition might already be in the IEEE Definitions. A check will be made before a definition is added to the standard.

Page 2; Subclause 2.0; Normative References
Comment:
I would like to see C57.12.25 referenced somewhere in the standard and its status identified as "unmaintained", or otherwise, and that it has been replaced by the C57.12.38 standard.
My concern is that some Users and possibly others will reference C57.12.25 without knowing that it is no longer maintained.  

**Proposed Change:**  
Include in Section 2 (Normative References) on page 2 and include identification of its status as "NOT MAINTAINED" or something equivalent.  

**Resolution (Agreed to by Working Group Members):** This change will NOT be made for the following reasons:  
1) Since Standard C57.12.25 is not mentioned in the text of the document, it cannot be included as a normative reference.  
2) Standard C57.12.25 should have been withdrawn by IEEE when C57.12.38 was published.  
3) The “Introduction” on Page iv now has this statement:  
   In 2009, the first version of this standard was prepared. It replaced and combined ANSI C57.12.21-1992 and ANSI C57.12.25-1990 and was generally revised to comply with the then approved style for published standards.  

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**Page 20; Clause 10.0; Oil preservation**  
**Comment:**  
Scope indicates liquid filled transformers and in Clause 10, oil is mentioned.  

**Proposed Change:**  
Replace “oil” by “liquid.”  

**Resolution (Agreed to by Working Group Members):** We will consider changing this to “liquid” once the Task Force on the Terms Normalization White Paper has been submitted or until we have direction from the Sub-Committee. Once either of these occurs we will review this request.  

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**Page 8**  
**Comment:**  
I am concerned about the use of the term "Large Interface". I use this term in my company specs and it is generally known in the industry, but I cannot find a formal definition. This may be confusing to the "less experienced users". NOTE: The IEEE entry system prevents me from entering multiple page numbers, etc. but there are two figures that use "Large Interface".  

**Proposed Change:**  
Referring to fig 1C. "Small interface" = Std 386 Fig 7, and "large interface" = Std 386 Fig 8, 9. Maybe changing the Caption on 1B (for example) to "Figure 1B - Type 1 arrangement large interface (IEEE 386 figures 8 and 9) separable . . . " Using similar Captions for other figures.  

**Resolution (Agreed to by Working Group Members):** As with the previous discussion on the “small interface" terminology, this topic will be addressed in the next revision of the standard when more research can be done to determine if the small and large interface terminology is still appropriate.  

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**Page ii; Keywords**  
**Comment:**  
The term "padmounted" isn't used in this standard that I can find, so I question why it is referenced in this section.  

**Proposed Change:**  
Consider deleting "padmounted" from this section.
Keywords are words that users might input when they are searching for a document. It does not necessarily have to be found in the document. So “padmounted” will remain as a keyword.

**Figure 6**
**Comment:**
The terms "ADD" and "SUB" should be identified.

**Proposed Change:**
Figure 5, Column Headers "ADD" and "SUB": I propose that "ADD" and "SUB" be defined as additive and subtractive polarities, respectively. Some may not realize what the terms "ADD" and "SUB" stand for as neither polarity or additive / subtractive is mentioned on this page.

**Resolution (Agreed to by Working Group Members):** This change will be made. The column headings will be changed from “ADD” to “ADDITIVE” and “SUB” will be changed to “SUBTRACTIVE.”

**Page 5; Subclause 6.2 (2 Comments Received)**
**Comment on Line 9:**
Since the applied-voltage test is required on the low voltage winding (as called out on line 13 and 14 in this section), the first sentence of this section should be revised. Otherwise, the first sentence could be interpreted to imply that no applied-voltage test is required for either the high or low-voltage windings.

**Proposed Change for Line 9:**
I propose that the first sentence of Section 6.2 (on line 9) be changed to read, "No applied-voltage test is required on the high-voltage winding." Otherwise, the first sentence could be interpreted to imply that no applied-voltage test is required for either the high or low-voltage windings.

**Comment on Line 13:**
Change the sentence started with "An applied-voltage..." because there is no applied voltage in this case as defined on line 9 of the same subclause.

**Proposed Change for Line 13:**
Instead of "An applied-voltage...." include "The voltage in the induced-voltage test shall be applied on the low-voltage winding".

**Resolution (Agreed to by Working Group Members):** Both changes will be made.

**Page 22; Annex A, Bibliography**
**Comment:**
If the natural ester fluid guide is cited here (C57.12.147), then the mineral oil guide (C57.106) should also be cited.

**Proposed Change:**
Include in Bibliography as an informative reference:
C57.106 IEEE Guide for Acceptance and Maintenance of Insulating Oil in Equipment.

**Resolution (Agreed to by Working Group Members):** This change will be made.

**Page iv; Introduction (2 Comments Received)**
**Comment 1:**
It would be nice to have a few sentences added in the Introduction summarizing what was changed in this edition of the standard.

**Comment 2:**
While not part of the standard the introduction provides a great opportunity to provide a history of the standard for users, and future working groups revising the standard to
understand its development. Since a standard is now active for 10 years, all of those involved in a preliminary revision can be gone before the next revision is made and it is beneficial to have a starting point.

**Resolution (Agreed to by Working Group Members):** This change will be made.

**Figure 4B**
**Comment:**
Table on LV bushing stud sizes lists threads in English unit (inches) but the Note 1 indicates millimeters.

**Proposed Change:**
Indicate that Thread Size is in inches.

**Resolution (Agreed to by Working Group Members):** A line will be added to Note 2 of the Figure explaining that the stud thread sizes are in inches, only.

Ali asked if there was any new business, and none was brought forward.

Ali expressed disappointment that only about half of the working group members voted on the standard, even though an email had been sent reminding the members that the ballot pool was being formed and when the ballot was open. He suggested that the members make sure in IEEE SA that they have set their profile to be notified when there are transformer standards to be balloted.

The meeting was adjourned at 2:45 p.m.

**C.2.8  C57.12.39 – Tank Pressure Coordination – Carlos Gaytan**

Carlos presented the following minutes from the working group meeting on March 25, 2014 at 4:45 PM in with 44 in attendance.

The meeting was called to order at 4:45 PM. Introductions were made. The names of the members were projected on the screen. By a show of hands the quorum was reached by having 22 of the 32 members present.

The minutes of the fall 2013 meeting in St. Louis were presented. Ed Smith moved to approve them as written. Ron Stahara seconded. They were approved unanimously.

The comments received from Draft 2.2 were discussed. There were several comments on the proposed change from static to general transient pressure. Steve Shull moved to change general transient pressure to nominal pressure. Alan Wilks seconded. Under discussion, there were several comments about alternative names such as normal operating pressure, or usual service conditions”, as well as using as a reference the standard dictionary for terms. The motion was then voted on and it passed with one negative vote.

Regarding the change from dynamic to rapid transient pressure, there were comments related with identifying a numerical reference for the rates of rise expected on this condition.

Steve Shull made comments regarding the use of single conversion values for the pressure levels covered in the document.
Regarding PRD definition, Josh Herz said that it was worth rewording how the definition of the pressure and flow conditions are written to address devices that have operating pressures other than 10 psig.

On the definition of slotted plug Chris Sullivan asked how would the ½” definition apply to the general case for all standards, since ¼” was utilized quite heavily in the industry, and that we need to modify the wording so it could be used everywhere and not specifically for a given type of equipment.

Another comments was made about the use of the term “negligible”, that should not be used in the document, as it did not have a quantifiable definition.

On comments to Section 5, Steve Shull commented that it was designed for use with round tanks, and square tanks can see different conditions and should also be addressed as different test procedure to be called out inside this document. He suggested that we coordinated with the tank rupture group to get a copy of their recent paper that describes some test methods for rectangular tanks.

Under new business, Carlos mentioned that the next steps were to address these comments in a new draft 2.3, and adding other pending items such as the informative annex addressing coordination between tank strength and pressure relief, as well as vacuum and positive pressure conditions in transformers in operation. This new draft 2.3 is planned to be sent by June 2014 so that the group could have time to review in detail and provide additional comments to new draft before the Fall 2014 meeting

The Meeting was adjourned at 5:50 pm

C.3 Old Business

Steve presented to the subcommittee the need for involvement by the Distribution SC members with the Distribution Bushing TF for modification. Josh Verdell and Ed Smith will be representing the Distribution Transformer Sub-Committee on a Task Force in the Bushing Sub-Committee.

Steve continued by requesting subcommittee member involvement with C57.105 that will be forming a working group chaired by Adam Bromley.

Steve announced that Al Traut has stepped down as chair of the WG for C57.120 and Michael Miller would assume the role of chairman. Again Steve asked for Distribution Transformer Committee individuals to be involved in this group.

C.4 Chairman’s Remarks and Announcements

The following is a recap of comments Steve made to the SC.

Membership is automatically granted to anyone requesting it at the first meeting of a new WG or TF.

Thereafter, membership is granted after a prospective member attends two consecutive meetings as a guest AND actively participates in the work of the TF/WG/SC. A former member may be reinstated if the same criterion is met.
Ongoing membership is maintained by consistent attendance at TF/WG/SC meetings, participation in internal TF/WG/SC surveys, or technical/editorial contribution to the TF/WG/SC’s document or work.

Membership may be revoked if a member fails to attend two consecutive meetings or fails to respond to two consecutive surveys. The chair has discretion in not removing members who cannot attend but are still participating via survey responses and/or other written contributions.

Another key point not mentioned is that each TF/WG/SC Chair (or Secretary) must keep regular logs of attendance and participation and update the roster after each meeting. This is done in our Transformer Committee AM system. This will be used to determine the Quorum requirement for TF/WG/SC meeting business.

The main benefit of membership is the privilege of voting on TF/WG/SC issues.

C.5 New Business

C.5.1 Eric Davis, secretary of the WG on External Clearances reported on the recent activity to the subcommittee.

The WG and Survey results agreed to use the values contained in NEMA TR1-1980.

The NEMA TR1-1980 lists a single value for each voltage.

C57.12.00-2012, Table 4 lists multiple BILs for each voltage.

This proposed table attempts to merge the NEMA TR1-1980 values with the voltage and BIL.

The WG agreed to increase the Distribution Transformers phase-ground values for 110 and 125 kV BIL by about 10%.

The WG agreed to remove the "Minimum clearance between top shed of insulator of bushings of different phases" since:

* The early bushings had a stud connection and typically had an inch or more of porcelain between the metal stud and the edge of the bushing shed. This is no longer true with the condenser style bushings.

* It was also noted that the critical stress on the metal top cap of a bushing is always higher than the shed to shed stress and that no one had ever seen a flashover from porcelain to porcelain.

C.5.2 Sanjib Som asked how you may comment on a ballot when you cannot attend a WG meeting.

Steve thanked Sanjib for the question and reviewed the SA process to go into MyProject and select the areas of interest so you get notification of ballot pools being formed where you would be able to offer comments to the WG through the ballot mechanism.

C.5.3 Phil Hopkinson gave a heads up to the SC that a request would be made to the Performance Characteristics SC to work on a task force whose goal would be to address partial discharge that is occurring between the core and inner winding in certain winding
configuration. His hope was to add a paragraph to C57.12.00 to address the need for manufacturers to make design compensation to prevent this phenomenon from happening.

C.6 Adjournment

Ron Stahara made a motion and Kent Miller seconded to adjourn the meeting and the SC approve by unanimous acclamation.
Annex D  Dry Type Subcommittee – Chair: Charles Johnson

March 26, 2014
Savannah, Georgia

Chair: Charles Johnson, Jr
Secretary: Robert C. Ballard

D.1  Introductions and Approval of Agenda and Minutes

The Subcommittee met on March 26, 2014 at 1:30 PM. There were 16 of 24 members present (therefore we had a quorum), 1 corresponding member, and 20 guests present, 6 guests requested membership. The attendance roster will be kept in the AMS.

The agenda was approved unanimously after a motion from Tim Holdway and a second from Roger Wicks.

The minutes of the St Louis, MO meeting were approved unanimously after a motion from Sanjib Som and a second from Jewan Puri.

D.2  Working Group and Task Force Reports

The next order of business was the presentation of the reports of the various working groups and task forces. See the following sections for the individual reports:

D.2.1  IEEE PC57.12.01 - Dry Type General Requirements  Chair Tim Holdway

The meeting group met in the Oglethorpe Room of the Savannah Marriott Riverfront Hotel.

The meeting was called to order at 1:45 PM by Chairman Tim Holdway.

The meeting was convened with 19 members (out of 27 – therefore a quorum was reached with 70% attending) and 18 guests present with 5 requesting membership. The attendance was reported in the AMS.

The agenda was approved unanimously.

Motion: Rick Marek
Second: Kerwin Stretch

The minutes of the St. Louis October 21, 2013 meeting were approved unanimously.

Motion: John K. John
Second: Sanjib Som

Old business
- The comments to Draft 3, which was the draft that was balloted, were distributed to the Task Force and their recommendations were submitted to the chair

New business
- Draft 5 was completed by the chair and distributed to the Working Group on 3/10/2014
The chair covered the following updates in Draft 5

- Inclusion of the definition for ‘product standards’ in Section 3
- Rewrite of section 5.10.3.2 Low-frequency tests to add clarity
- Rewrite of section 5.10.3.5 Partial discharge tests to use the terms ‘solid cast’ and ‘resin encapsulated’
  - Don Kline commented that ‘resin encapsulated’ used to mean extra dips of resin in previous decades. He also noted that partial discharge is temperature dependent, but there was no further discussion on the relation of partial discharge and temperature. He then added that old AM radios could be used to locate partial discharge, but conceded that newer radios with noise filtering would not work.
  - Chuck Johnson added that partial discharge testing is required on ‘solid cast’ in IEC and there have not been recent issues with ‘resin encapsulated’ transformers failing due to partial discharge so it was not a required test
  - Phil Hopkinson proposed to change the definitions in 12.01 to be different from 12.80, but no formal motion was made
- Acknowledgement that Table 15 Temperature limits of transformer under short-circuit conditions needed to be updated, but would not be undertaken inside of the current PAR
  - Rick Marek added that the equivalent table in IEC used 350°C for copper and 200°C for aluminum
- Revision of Table 16 Dry-type transformer tests with special attention drawn to notes ‘a’ and ‘c’ relating to resistance and impedance and load losses, respectively.

A revision to Table 5, “Dielectric insulation levels for dry-type transformers used on system with BIL ratings 350kV BIL and below”, to add 75kV BIL for 8.7kV system voltages was made by Carl Bush. He agreed that such a change should be made in the next revision.

- As a response to Carl’s proposal, Chuck Johnson added that it should be considered to move the 15.0kV system voltage BIL minimum from 60kV BIL to 95kV BIL to match 12.00.

A revision was requested to Section 5.10.3.2 Low-frequency tests to include instructions for single phase transformers by Chuck Johnson. He agreed to supply a proposal before the next revision to 12.01.

- The chair reminded the membership what it meant to be a member of the working group and that included participation in balloting, surveys, and attendance at all meetings.
- Rick Marek and the chair reminded the working group that the next balloting cycle was a recirculation and only the sections changed to address the previous comments would be voted on.

Next meeting: Fall 2014, Washington DC, October 19-23, 2104.

With no further business, the meeting was adjourned at 2:51 PM.

Motion: Phil Hopkinson
Second: Dave Stankes

D.2.2  WG Dry Type O&M Guide C57.94 Chair Dave Stankes

The working group met in the Plaza Room of the Marriott Riverfront Hotel.

The meeting was called to order at 4:45 PM by Chairman David Stankes.
The meeting was convened with 12 out of 22 members (enough for a quorum) and 5 guests present with 1 requesting membership.

A motion to approve the agenda was proposed by Carl Bush and seconded Jerry Murphy. Motion was approved by voice vote with no opposing or abstaining.

The minutes of the St Louis (Fall 2013) and Teleconference (January 2014) meetings were approved by unanimous separate voice vote – both proposed by Rick Marek and seconded by Tim Holdway.

The chair discussed the timeline of the PAR leading to the end date of Dec 2015.

**Document Review**

1) Subhas Sarkar made the distinction that repaired units that have new windings need to be tested at full test levels otherwise reduced test levels to be used. Martin Navarro concurred. Since the standard covered the tests and not their levels, Subhas Sarkar’s comment did not affect the standard.

2) Two new tests (Exciting Current and Power Factor Tip Up) were proposed to be added to Section 6 Testing by Jill Duplessis at the January meeting. There was discussion regarding lack of substantial industry use of such testing, after which Casey Ballard proposed to remove the tests from Draft 7. This was seconded by Carl Bush and carried by unanimous vote. The detailed descriptions of these tests were also deleted from Draft 7.

3) In section 6.1, the sentence “Trending tests have no value except as compared to preservice (or previous) tests” was added to reinforce how these tests should be used.

4) In section 6.2.2 recommendation to remove ‘distribution and power’ as part of the Applied Voltage description and reorder test list (interchange (a) and (c)) were proposed by Roger Wicks and seconded by Jerry Murphy. This was approved by unanimous voice vote.

5) In section 6.3.2 resistance measurement was retained as first test, however other tests were arranged as per 6.2.2 and the last sentence at end was deleted. This was proposed by Roger Wicks and seconded By Carl Bush.

6) In section 6.2.1 the wording trending was used in place of comparison. This was proposed by Roger Wicks and seconded by Casey Ballard. This was passed by unanimous voice vote.

7) It was noted that several clauses do not have headers. Volunteers to review missing clause heading and recommend suitable ones included Rick Marek (Section 4.6, Albert Walls (Section 5) and Sanjib Som (Section 8.3.6)

8) Recommended changes to Section 4.10.2 from Rick Marek present in Draft 7 including references to C57.12.01 for temperature class references were approved as written. Motion to approve was proposed by Roger Wicks and seconded by Tim Holdway; this was carried by unanimous vote.

9) The header for 5.1.1.2 was amended to state ‘ ….ventilated and non-ventilated…..”

10) In the body of 5.1.1.2, “dry transformer” was replaced by “dry-type transformer” and the phrase “ventilated” was replaced by “ventilated and non ventilated”.

11) The header for 5.1.1.3 was amended to “Sealed”

12) In 5.1.1.3 the word dry transformer were replaced by dry type transformers.

13) In section 8…. Sanjib Som recommended adding references to the quality of air (clean and dry), but question of how to quantify this was raised. Sanjib will modify the language and this will sent out for email survey and comments. Further, in section 8 Sanjib suggested provide torque mark on hardware, this will also be sent for email survey and comments.
14) Section 3 Definitions was modified to reference C57.12.80. Definitions already referenced in C57.12.80 were removed from this section.

New business:
1) It was pointed out by Chair that the PAR would need to be amended to reflect change in Scope from original PAR. The new PAR will be submitted prior to May deadline in order to be reviewed at June Revcom meeting.
2) Once PAR is approved, it is the WG’s intent that the document go to ballot prior to Fall 2014 meeting in Washington.

The motion to adjourn was proposed by Tim Holdway and was seconded by Casey Ballard. The meeting ended at 6:04 pm.

D.2.3 TF Dry Type Test Standard C57.12.91 - Chair Derek Foster – Acting Chair Casey Ballard

The working group met in the Plaza Room of the Savannah Marriott Riverfront Hotel

The meeting was called to order at 3:15 PM by acting Chairman Casey Ballard

The meeting was convened with 14 people in attendance. As this was the first meeting of the task force, all attendees were able to request membership. 8 people requested membership, 2 requested to be guests, and the remaining attendees did not indicate a preference.

New business
- Discussion of topics for the new PAR
  o No load loss correction for temperature to support 12.01 note 7 on page 3
    ▪ Casey Ballard will make a proposal
  o QC impulse test method to insert into 12.01 Table 16
    ▪ Suggested alternate name was ‘routine impulse’
    ▪ Kerwin Stretch and Tim Holdway agreed to make a proposal
  o Moving the PD Test method from 12.01 into 12.91 Section 10
    ▪ There was general agreement – but nobody took an action item
  o Dielectric testing at a different altitude than the installation altitude – related to 12.01 Table 1 and Annex A
    ▪ Tim Holdway will work with Rick Marek to make a proposal
  o Sound level measurement in Section 13
    ▪ Casey Ballard will contact Ramsis Girgis to determine the status of the sound testing procedure from 12.90 and 60076-10
  o Update all drawings using new CAD software
    ▪ Casey Ballard agreed to support this
  o Inclusion of environmental testing from IEC 60076-11 for E0/E1/E2
    ▪ Martin Navarro agreed to make a formal proposal
  o Inclusion of thermal shock testing from IEC 60076-11 for C0/C1/C2
    ▪ Martin Navarro agreed to make a formal proposal
  o Inclusion of calibration requirements
    ▪ Don Kline suggested that this should be added and will be voted on by the TF and SC
Heat run method with non-sinusoidal loads
   - Tim Holdway brought up a discussion from C57.110 and will be added to the list of items to be voted on

Impulse polarity – positive versus negative
   - Chuck Johnson asked if we should address the impulse polarity for solid cast versus resin encapsulated.

The topics listed above will be sent out for a ballot to the TF and the Dry-Type SC for ranking. Formal instructions and due date will be send by the chair – Derek Foster and will be used to submit a PAR.

Next meeting: Fall 2014, Washington DC, October 19-23, 2104.

With no further business, the meeting was adjourned at 4:15 PM.

D.3 Old Business
There was no old business.

D.4 New Business
The chair noted that C57.96 and C57.134 revisions were approved.

He also noted that the PAR status for C57.12.01, C57.12.59, and C57.94 were expiring on 12/31/2015.

There was a ballot survey on C57.12.59 Through Fault Current Duration circulated with less than expected participation from the SC. The chair reminded those in attendance that membership means you have to participate. If you do not wish to participate then you can choose to be a guest.

Don Kline presented on an alternate way to measure three phase losses using voltage measurements and provided his presentation to the chair who will post it on the website on the recommendation of Rick Marek.

There are (4) documents that are going to expire before the end of 2019 and the chair asked for volunteers to act as the WG chairs. There were three volunteers.
   - C57.12.51 501kVA and Larger                Sanjib Som
   - C57.12.60 Thermal Aging                    Roger Wicks
   - C57.124 Partial Discharge Measurement      Casey Ballard
   - C57.12.58 Transient Voltage Analysis       No Volunteer

D.5 Adjournment
Being no further business, the meeting adjourned at 2:35 PM upon the motion from Jewan Puri and a second from Tim Holdway.
Annex E  HVDC Converter Transformers and Reactors Subcommittee
Meeting Minutes

March 24, 2014, 3:15 pm.
Savannah Marriott Riverfront Hotel, Plaza meeting room
Savannah, Georgia

Chair: Michael Sharp
Vice Chair: Les Recksiedler,
Secretary: Ulf Radbrandt

E.1 Introductions and circulation of Attendance List

Introductions were made and the attendance list circulated.

There were 12 members and 27 guests present. Five of the guests requested membership

The total membership of the SC (not including corresponding members) is 16. We needed at least a total of 8 members (50% of 16) to be present in order to have a quorum. This was achieved.

The agenda for this meeting was approved.

E.2 Approval of the minutes of the October 21, 2013 meeting in St. Louis, Missouri

The minutes from the St. Louis meeting (Fall 2013) were approved.

E.3 Brief report on the meeting of the Administrative SC.

Many of the topics discussed at the administrative Subcommittee meeting on Sunday were already presented at the opening session meeting on Monday.

There was one item from the administrative Subcommittee meetingthat is of particular importance to our Subcommittee at this time. There is one new level for approval for proposals for dual logo standards. After approval by our SC, there must be an approval by the administrative Subcommittee before a PAR is created and submitted for approval.

Our standard for converter transformers (C57.129) will expire in 2018, i.e. within 4 years.

Our standard for smoothing reactors (1277) will expire in 2020, i.e. within 6 years.

E.4 Presentation from the Joint IEC/IEEE meeting, regarding a possible dual logo standard for converter transformers, in London 6-7 February 2014.

Ulf Radbrandt gave a presentation regarding the London meeting about:

- The participants
- The process of the work. The work started with the Excel file, with comparison between the IEEE and IEC standards, that was created by an IEEE group before the previous IEEE meeting in St Louis. The “Comparison” sheet of that Excel file was extended with two new columns, one for comments and one for a complexity level for each clause of the standards. The complexity levels
were 1 to 5 where 1 is “Easy” and 5 is “Very hard”. All clauses were not evaluated due to lack of time. The evaluation was focused on the clauses that were evaluated by IEEE to “Difficult” and “Quite Similar”, which are the clauses that would require most work.

- The findings. The items that were considered to require most work were the different methods for loss measurements and the different reference temperature for loss and impedance determination. The estimated number of clauses for each complexity level (complexity levels are within parenthesis) was 17 (1), 22 (2), 8 (3), 1 (4) and 3 (5).

- The proposed structure of the possible dual logo standard.

- The reference to different standards.
  The IEEE standard refers to a lot of other IEEE standards and the IEC standard refers to a lot of IEC standards. This could be handled in a dual logo in the same way as in other ongoing dual logo standards. The method is that the user must select if the standard is to be used as IEEE or IEC. In the standard there are selections, in several locations, between e.g. IEEE references or IEC references.

- The conclusion from the meeting, which was that it should be possible to resolve the differences and agree on a dual logo standard.
  The presentation will be distributed to all SC members.

E.5 Discussion and finally a decision whether or not we will start a joint WG together with IEC to go for a dual logo standard.

E.5.1 The different methods for IEC and IEEE for measurement of losses

Pierre Riffon pointed out that there had previously been an investigation regarding the different methods of loss measurement. He also said that the IEC method is only accurate for certain ratios between eddy losses and stray eddy losses. The IEEE method, which generally was developed by Alan Forrest at Teshmont, was considered most accurate. The method was developed for the use of a wattmeter but the use of spectrum analyzer is also possible. Peter Heinzig made a presentation regarding the comparison several years ago, but since he has changed employers since then, he doesn’t have access to that presentation. Pierre Riffon said that it should be possible to repeat that comparison based on new data from the different methods. Alan Forrest is probably available for consultation too.

It is possible to have 2 methods for loss measurement but that should, if possible, be avoided since it makes the standard more difficult to use. If we go for 2 methods, then a possibility is to have the method default selected by the selection between IEEE and IEC, which defines which references that should be used throughout the standard. It will probably be very difficult to get acceptance, within IEEE, for a dual logo standard if the IEEE method is removed.

E.5.2 Different reference temperature for losses

IEEE has 85°C and IEC has 75°C as reference temperature for determination of losses. One reason for the higher value for IEEE might be the very common usage of thermally upgraded paper.

At the London meeting there was a proposal to have four alternatives for reference temperature:

1. 85°C (for IEEE)
2. 75°C (for IEC)
3. Selected by the customer
4. Determined by the manufacturer, i.e. calculated for the rated loading of the actual transformer design.

Alternative number 4 could be the most precise method but it might be more difficult for the customers to evaluate different transformer designs (by different manufacturers) with this method. The IEC standard IEC 61803 for determination of HVDC converter station losses does now include this alternative.

**E.5.3 Harmonics for determination of temperature rise and hot-spot temperature**

The harmonics for determination of temperature rise and hot-spot temperature should be given for the worst case operating condition but it should be from an actual operation case, i.e. worst case harmonics should not be taken from different operation cases because the hot-spot factor would then be too conservative. This should be clearer in the standard.

**E.5.4 Harmonics for determination of audible noise**

The harmonics for determination of audible noise should be different from the harmonics for determination of temperature rise. The harmonics for determination of audible noise should not be from worst case but from nominal operation condition.

**E.5.5 The clauses for audible noise**

There has been a lot of work with IEC 60076-10 and IEC 60076-10-1, where Christoph Ploetner has been the convenor.

**E.5.6 Participants from IEEE**

There must be more people from IEEE that participate in the joint review work. Most IEEE participants have problem to travel to Europe. All IEEE SC members are encouraged to send in comments on the work. In the first hand comments can be given on the Excel file. Comments should be sent to all members of this SC.

**E.5.7 Planned coming joint meetings.**

The following meetings are planed together with IEC

- 2014-05-14--15 in Stockholm
- 2014-10-23--24 Washington DC (At the IEEE Transformers meeting).

We should have joint meetings at each coming IEEE meeting, with intermediate meetings elsewhere, until the dual logo draft is finished.

**E.6 Forming of a working group within IEEE, which will work with the dual logo standard**

A motion was put forward by Eric Davis and seconded by Klaus Pointner to go for a PAR, which would include the creation of a new dual logo standard for converter transformers and the formation of a WG
that will work together with the IEC MT to create it. The vote result from SC members was reported at the meeting as 11 for and 0 against. We should therefore start that process.

This PAR will not be approved until after the Stockholm meeting.

A motion was put forward by Eric Davis and seconded by Gene Blackburn to, until the PAR is approved, form a TF that will continue with the preparation work, write up the PAR and join the Stockholm meeting. When the PAR is approved, the TF will be changed to a WG. The vote result from SC members was reported at the meeting as 10 for and 0 against.

**E.6.1 Request for members**

At the meeting, volunteers to join the TF were Eric Davis and Ulf Radbrandt (who will be the chair of the TF). A request was made for all others interested in joining the task force and attending the Stockholm meeting to inform Ulf Radbrandt and Mike Sharp ASAP.

**E.7 Brief review of the slightly modified annex for converter reactors provided by Klaus Pointner**

Klaus Pointner gave a brief presentation of the work with the annex for converter reactors that will be included in IEEE 1277 Smoothing Reactors. The annex has been submitted to SC members prior to this meeting. There were no comments made at the meeting but all SC members were encouraged to review the document again and provide any comments they have before the next meeting.

**E.8 Adjournment**

The meeting was adjourned at 4.17 pm.
Annex F  Instrument Transfomers Subcommittee

March 26, 201
Savannah, Georgia

Chair: Ross McTaggart

F.1  Introductions

F.2  Quorum

16 members + 16 Guests – quorum attained

F.3  Approval of minutes – St Louis meeting

F.4  Approval of Agenda

F.5  Working Group Reports

F.5.1  Working Group on Current Transformers with mA range (WG C57.13.7) - Chair: Henry Alton, Vice-Chair: Adnan Rashid

Introductions

Acceptance of the Agenda

House Keeping - Henry Alton of TRIACTA Power Technologies Inc.

Review actions from the last meeting

Answers to questions from the last meeting

Presentations.

None

Next Steps

Balloting and vote Final revision of document

Embark on the release process

Old Business (House Keeping)

A single piece of old business was to generate a new draft based on comments received since the last meeting.

New Business

A new draft of C57.13.7 was tabled with all of the previous changes implemented. A summary of changes in draft 4 are as follows;
Please find attached the updated version D4 with some inclusions of information as follows;

- Participants
  - Updated the Working Group Members list
- 1.0 Overview
  - Updated commentary to more specifically state the objective in the light of comments that I have received.
- 4.0 Ratings
  - Primary values of 600A and 800A have been added as per the previous draft to make 80mA-100mA equal
- 6.2 Basic Measurement Accuracy Class
  - Item h) slight correction based on comments received.
- 6.4 Requirements for Accuracy and Accuracy of Calibration Systems
  - Added based on comments received

There were no objections to these additions during this meeting.

There was additional change requested by Dr. Eddy So of NRC.

**Introduction**

This introduction is not part of PPC57.13.7/DD4, Draft Standard for Draft Standard for Current Transformers with Maximum mA Secondary Current of 250mA.

This standard was prepared by the Working Group on mA Current Transformers of the Instrument Transformer Subcommittee of the Transformers Committee of the IEEE Power Engineering Society. The purpose of this standard is not only to allow the evaluation, certification and specification of mA current transformers similar to the present process available for 5A secondary output current transformers, since 80mA and 100mA current transformers are now approved in Canada, but also to take into consideration certain applications in the use of the mA CTs that has the advantage of a much lower voltage drop in the secondary leads when the burden is located at a farther distance from where the installed ma CT is located. Also, for the same voltage drop across the burden as that when using a 5 A CT, its power dissipation in the burden is much less than that when using the 5A CT. However, with a mA CT, care should be taken to minimize environmental interference due to the much lower secondary current as compared to that of the 5A CT, since it would be more susceptible to noise/interference, etc.

Ross McTaggart of Trench and Adnan Rashid of Measurement Canada had the following comments for changes to the document during the meeting;

- Figure 2 X axis Scale is not correct
  - Ross McTaggart
- -10 should be -20 -5 should be -10
  - Ross McTaggart
- Header correction for the Standard Title
  - Ross McTaggart
- There needs to be some detail added for the test methods for mA CTs
  - Ross McTaggart
- Participants List had a typo OC 57.13 which should read C57.13.7
  - Adnan Rashid
Actions from this meeting

<table>
<thead>
<tr>
<th>Action</th>
<th>Assigned to</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action 1:</td>
<td>Henry Alton</td>
<td>• Comments should be implemented in a new draft “D5”.</td>
</tr>
<tr>
<td>Action 2:</td>
<td>Dr. Eddy So</td>
<td>• Provide the clauses for test methods in this standard</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Eddy SO will provide a forecasted date of availability of test methods drafting complete for review. The posting with all of the changes will be coordinated with this date.</td>
</tr>
<tr>
<td>Action 3:</td>
<td>Henry Alton</td>
<td>• Post a new draft “D5” when the test methods have been received.</td>
</tr>
<tr>
<td>Action 4:</td>
<td>All Participants</td>
<td>• Provide your IEE Membership numbers to Henry Alton for preparation of the Balloting Roster</td>
</tr>
<tr>
<td>Action 5:</td>
<td>Henry Alton</td>
<td>• Prepare the balloting roster on the eTools “MyProject” account for this working group.</td>
</tr>
<tr>
<td>Action 6:</td>
<td>All Participants</td>
<td>• If there are no further comments after draft 5 the working group will vote to accept that version as final via email or conference call.</td>
</tr>
<tr>
<td>Action 7:</td>
<td>C57.13.7 WG and IEEE</td>
<td>• Formal balloting and vote to accept and release as a new standard</td>
</tr>
</tbody>
</table>

F.5.2 TF on Station Service Voltage Transformers - D Wallace

Introductions

Membership

32 people were in attendance with 19 people requesting membership.

Quorum

Since this was the first official meeting of the Work Group, a quorum was not called for.

Approval of Minutes from the minutes from the St. Louis meeting

Old Business

Protection Schemes: Pressure Relays
Primary Overcurrent
Secondary Overcurrent

Fred Elliot suggested that any information for protection schemes be placed in an Annex.

Insulation Systems:

Pierre Riffon will provide information concerning SF6 insulation

Ross McTaggart will provide information on Non-thermally Upgraded Oil Paper
**Accuracy of Metering Windings:** David Wallace presented an insert regarding accuracy requirements. There was a robust discussion concerning the accuracy requirements. Several topics were covered. Among these were:

1. At what power loading is the metering accuracy guaranteed.
2. Using the metering winding for protection relaying.
3. Should the metering winding be considered an auxiliary winding.

A survey will be sent to the committee to get their input into the direction to proceed with the metering winding.

**New Business**

Patrick Rock suggested looking at C57.12.20 to see if any information from it would be applicable to the C57.13.8 standard.

David Wallace invited the committee to review the current draft of C57.13.8 and provide comments on it. A spreadsheet will be sent out to the committee for the members to enter their suggestions. These spreadsheets will be returned and the data compiled to be discussed at the fall meeting.

**F.5.3 Working Group for Revision of IEEE C57.13 Instrument Transformers - R. McTaggart**

**Introductions**

**Quorum**

14 members + 18 Guests – quorum attained

Approval of minutes – St Louis meeting (PR / DW)

**Approval of Agenda**

Review of schedule and the progress presented.

Review of poll results – decision that multiplier to be used in the 72 kV and lower PD test voltage would be 1.2 as it was the median value.

PAR extension to be applied for prior to October deadline.

**Discussion**

The idea of a meeting or conference call possibly around May 7th was discussed. An update to draft 4 should be available prior to this meeting/conference call. A survey will be sent to determine the best dates and location for this meeting.

A brief review of the next steps was made. This includes a vote of 2/3 of the working group members approving the draft version, submission and a majority approval by the members of the subcommittee and finally a submission to Bill Bartley so the draft can be setup as a project for balloting.

Don Kline made a few comments regarding PD from a historical view point and the early testing of instrument transformers.
Don Kline gave a presentation of two stage CTs and spoke on transducers a demonstration was also made. Vladimir Khalin asked questions regarding the accuracy certification of such a system and also inquired as to how often this arrangement is currently used industry.

Prior to the end of the meeting a further discussion concerning a possible meeting or conference call was brought up again. An emailed survey will be sent out to determine the availability of working group members.

With no additional new business brought up a motion to dismiss was made. David Wallace and Vladimir Khalin provided confirmation of the motion.

F.6 ITSC Adjournm
Annex G  Insulating Fluids Subcommittee

March 26, 2014
Savannah, GA

Chair David Wallach
Vice-Chair Jerry Murphy
Secretary C. Patrick McShane

G.1  Introductions, Roll Call of Members for Quorum, Meeting Agenda Approval, F13 Minutes Approval, and Chair’s Comments

G.1.1  Chair’s comments: The Chair advised the data base policy has progressed, only few issues remain. This mostly affects DGA Guides C57.104 & C57.155. Also, he gave a reminder WG and TF must log in attendance in the TC AMS systems. Because of this policy, having all attendees identify themselves is no longer required.

G.1.2  Roll Call of SC members. >25 Quorum was achieved.

There were 33 SC members and 23 guests in attendance at the meeting. A quorum was achieved. The following guests requested membership in the IFSC


G.1.3  Agenda Approval

- Motioned by: Don Cherry
- Seconded by: Kent Miller
- SC Vote Outcome: Passed unanimously

G.1.4  Corrections and Approval of minutes from Fall 2013, St. Louis, MO

- Motioned by: Sue McNelly
- Seconded by: Tom Prevost
- Outcome: Passed unanimously

G.1.5  WG & TF Reports Presented at the SC Meeting

G.1.5.1  C57.104 – IEEE Guide for the Interpretation of Gases Generated in Oil – Immersed Transformer   WG Chair Rick Ladroga, Vice-Chair Claude Beauchemin

Tuesday, March 25, 2014
Savannah, Georgia
Minutes of WG Meeting

The meeting was called to order by Chair Rick Ladroga at 3:18pm. Vice Chair Claude Beauchemin and Secretary Susan McNelly (writer of Minutes) were also present.

There were 45 of 63 members present. There were 45 guests, and 8 guests requesting membership. A membership quorum was achieved. Guests attending the WG meeting for the first time who request membership or who have not attended 2 meetings in a row (including the present meeting, will be deferred until the next meeting attended.
The following guests requesting membership were (those identified with an asterisk (7 of the 8) will be added as WG members):

Larry Cristodoulou * John John *  
Don Dorris Amitabh Sarkar *  
Rowland James * Alwyn Vanderwalt *  
Thang Hochanh * Leon White *

Agenda
1. Welcome & Introductions
2. Quorum Check
3. Approval of Minutes from Fall 2013 St. Louis Meeting
4. Chair’s Remarks
5. Presentations
   a. Data - Claude Beauchemin – Full presentation was not completed
   b. Case Studies – Paul Boman – Time expired before this could be presented.
6. Adjourn

Introductions of the Chair, Vice Chair and Secretary were made. Attendees were not asked to introduce themselves but instructed that when speaking during the meeting to at that point introduce themselves and their affiliations.

Motion to approve the fall 2013 St. Louis meeting minutes was made by Tom Prevost and seconded by Don. The motion was unanimously approved.

Chair’s Remarks:

The chair indicated that the group has been meeting both at the Transformer Committee Meetings and at least a couple of additional times per year. There is a lot of data involved that has tremendous commercial value. He thanked Luiz Cheim, Claude Beauchemin, and Norm Field for their work.

An update on the data security and confidentiality was given by Sue McNelly and Erin Spiewak. The plan is to store the data using the Central Desktop and using a separate Central Desktop provide access to the data to members approved to access it for WG purposes after completing a confidentiality form. The remaining activity before this can be implemented is to get approval of the forms by the Administrative SC and to specify a format for the data.

Rick restated the WG history, goals and objectives.

TFs

Framework: Jim Dukarm, Dave Hanson, Rick Ladroga  
Data: Norm Field, Luiz Cheim, Claude Beachemin  
Diagnostic Methods: Michel Duval, Dave Wallach  
Case Studies: Paul Boman, Arturo Nunez  
Arc Furnace TRs: Tom Lundquist  
Bibliography: Jerry Murphy, Tom Prevost

Framework

A rough draft of the framework was completed in 2010. It was modified in 2012/2013 by Rick Ladroga. The Draft considers IEC 60599 - 2007
General Structure
- C57.104 Gas Guide Introduction & Overview
- Dissolved Gas Analysis Overview
- WG Data Research & Findings (Statistical Benchmarks)
- Proper Oil Sampling Methods
- Data Qualification
- DGA Diagnostic Methods & Analysis
- Fault Detection & Identification
- Case Studies

57.104 Dissolved Gas Analysis Guide
- Foreward (IEEE PES Narrative, Disclaimers, etc.)
- Introduction (C57.104 Historical Development)
- DGA Overview
- Scope
- Limitations of Guide
- References
- Definitions & Abbreviations
- Mechanisms of Gas Formation

DGA Concept, Purpose, & Application
- Concept of DGA
- Purpose of DGA
- Application of DGA
- Assessment of Individual Unit Health Status
- Risk Assessment & Classification
- Risk Management Strategies (Personnel & Equipment Safety, Owner, Operator, OEM, Transformer Expert, Insurance Company Considerations)
- Data Measurement Qualification & Quality Assurance
- Key DGA Sampling Categories

DGA Data Qualification
- Data Quality Review
- Errors & Omissions
- Missing or Duplicated Data
- Mislabeled or Swapped Samples
- Sample Mishandling
- Air Exposure
- Air Contamination
- Cross Contamination
- Inconsistent Data Values
- Absence of Hydrogen
- Inconsistent O2/N2 Ratio
- Interpretation of DGA Data
- Initial Sample
- Periodic Screening
- Surveillance Sampling
- Fault Monitoring
- Quality Assurance & Verification

Fault Detection & Identification
- Data Variation & Norms for Fault Detection & Risk Classification
- Minimum Interpretation Limits for Gas Concentrations (Overview)
- Baseline for Increments
- Baseline for Rates of Change
- Limits for Combustible Gas Increments (Details)
- Limits for Combustible Gas Average Rates of Increase (Details)
- CO2/CO Ratio
- C2H2/H2 Ratio
- O2/N2 Ratio
- DGA Statistical Benchmark Values
regulations. Instead, a more global statement wording was agreed upon to be sure to have compliance of applicable requirements and regulations.

The Minutes (unapproved) of C57.106 WG Meeting as Submitted:

The meeting was called to order by Chair Bob Rasor at 4:50PM. To save time, introductions were skipped. There were 53 attendees. The four individuals that requested membership in St. Louis (Fall 2013) did not attend therefore will not become members until they attend two consecutive meetings. Quorum was reached as 19 of the 36 members were present.

Attendees requesting membership were:

1. Paul Boman
2. Don Dorris
3. Oleg Roizman
4. Eduardo Garcia
5. Arturo Nunez
6. Art Lemm
7. Mohamed Diaby
8. Omar Ahmed

Again, those above will become members when they attend the next conference meeting.

Agenda for the meeting was reviewed. Sections of the guide had been assigned in conference calls prior to the meeting. Several members have submitted their revision. The draft guide with track changes was displayed to show what has been changed so far.

Discussion took place on the schedule for completion of the guide. It was noted that the PAR expired Dec 2015. The schedule was explained by chair Bob that the draft document should be complete by May. Only a few sections remain to be revised by the assigned section leads. Once comments are received back it was thought a final draft and ballot could take place yet this year. Bob commented however that there are a few discussion areas yet for today’s meeting that could take the completion date out a bit longer.

In prior conference calls, it was confirmed that LTC and circuit breaker oil qualities were not covered in other Transformer Committee guidance documents.

The question was raised as to whether circuit breakers belong elsewhere. Don Platts suggested that the circuit breaker information (section 8) be removed from this guide and handed over to the switchgear committee. Chair Bob will draft a letter and send to Tom Prevost to review before sending to David Wallach and the switchgear committee. This may simplify the work of the TF on Combination of Oil Guides as well.

There were no questions on previous minutes from St. Louis (Fall 2013).

Discussion on the draft guide followed:

- Table 1- Test Limits for shipments of new mineral insulating oil as received from the oil supplier
Dielectric ASTM D877 is currently being voted on in ASTM. They will have a meeting in May to determine if they will remove. If so, the WG will adjust Table 1 to follow ASTM as it is for new oil as received from the oil supplier.

Neutralization number will be 0.03 to follow ASTM and is because the reproducibility is plus or minus 0.015. It was also voted to keep Table 1 in-line with ASTM in Milwaukee. There was concern that it had been at 0.015 for years with no issue, so why was there need to change. It was stated again that the table is for new oil as received from the oil supplier, therefore the supplier follows ASTM.

- Tables 2 and 3-Test limits for new mineral insulating oil processed for new equipment prior to energization

Neutralization number will remain as 0.015 because this is IEEE stance and not a new oil specification.

- There are some additional changes to the document based on the straw ballot, but most have been made.

- Clair Claiborne still agreed to review Sections 2 and 3 – references and definitions.

- Section 6 minor revision to add sentence on tanker cleanliness and continuity ground on transfer hoses.

- Dave Hanson is working on a draft of Section 4.5 and will give to the chair in a few days. Discussion followed that the flow of the document could be improved. If a section on how oil is contaminated (what is behind oil contamination) is added, it could help bridge the gap between sections 4.4 and 4.5. So the thought was to add a section and modify 4.5.

- Chair Bob read the scope and it was asked if 106 should be evaluated and possibly expanded (section added and structure change) before it is used in the Combination of Oil Guides TF. Vice Chair Claude asked that if the flow needs corrected, someone could suggest an outline. Then if time permits, the WG will address it. The PAR was displayed. Tom Prevost said the PAR is written generic enough that it would not need to be changed.

- The question was clarified and Tom Prevost made a motion to ‘improve the structure of the document to a more logical order, including additional background information where appropriate’. The motion was seconded by Don Cherry. A vote was taken and the motion was unanimously approved.

- Don Cherry made a motion to approve the minutes from St. Louis. The motion was seconded by Dave Hanson. A vote was taken and the motion was unanimously approved. It was mentioned that this vote may affect the completion timing of the document and that all would be done to expedite its completion.

- Section 7 minor revision was made to update terminology ‘filter press’ meaning mechanical filtering media. Question was raised as to if the guide should discuss processing, or if it should move to Reclamation Guide 637. Several agreed that processing must be mentioned because Class I, II and III are defined by how much processing is needed. Also that it is more useful in 106 as it is needed to know if reclamation is needed. The title of the guide ‘maintenance’ also suggests it has a place in 106. Tom Prevost stated that Table 5 conflicts with a table in 637. Bob Rasor said the voltage class divisions also conflict with those in 637.

- Section 10 was reviewed by Stephanie Denzer. Claude posed the question of what to do in case of a spill suggesting that reference to local codes could be an issue for several reasons

- US only, not international
- Regulations change
- Legal impact for IEEE?

It could be written very generic with something like ‘applicable regulations’. Don Platts said IEEE PES Substation Committee has a document already with this information and that it could just be referenced. IEEE Explore has a search function to search for key words. Stephanie agreed to look into this.

• Tom Prevost made a motion to adjourn. The motion was seconded by Don Cherry. Meeting was adjourned at 6 PM.

G.1.5.3  WG C57.121 – IEEE Guide for Acceptance and Maintenance of Less-Flammable Hydrocarbon Fluid in Transformers

Chair: David Sundin

The WG Report at the Sub-Committee Meeting: Presented by David Sundin

Dave Sundin presented. He stated that it was decided that the WG will be disbanded. He made a motion to contact IEEE SA with the request to withdraw the PAR.

The Minutes (unapproved) of C57.121 WG Meeting as Submitted:

Unapproved Minutes:  WG for Revision C57.121
March 24, 2014
Savannah, GA
Working Group:
Chair David Sundin
Secretary David Sundin
There were 4 Working Group members and 18 guests in attendance at the meeting. A quorum was achieved.
Approval of minutes from fall 20132, St. Louis
• Motioned by:  Don Cherry
• Seconded by: Clair Claiborne
• WG Vote Outcome: Passed Unanimously

Old Business:

David Sundin reiterated the proceedings of the first WG meeting; that the WG had been formed in order to change the IFT value given in C57.121. David Sundin had been advised to present the need for the change in IFT value, and recommended new values, to ASTM D27. In the intervening 6 months since this initial meeting, the sole North American manufacturer of HMWH fluid has decided not to pursue a change in the ASTM or IEEE Specification value.

David Sundin asked for a motion to disband the WG and withdraw the PAR. Motion was made by Don Cherry and seconded by Larry Christodoulou. There was discussion with regard to the need for a super-majority to disband the WG. Bill Bartlett affirmed that 60% of WG attendees needed to vote to disband the WG for this to occur. The vote was unanimous and the motion carried.

New Business:
There was no new business for the WG.
Don Cherry motioned that the meeting be adjourned. Seconded by Clair Claiborne. Passed unanimously. Meeting adjourned.

Respectively Submitted, David Sundin, WG Secretary
Quorum achieved. Tom Prevost there only remains just a couple of item, with should be resolved by email ballots. After items are resolved by email ballot, then to SCIF for approval, all scheduled to occur before F14 DC meeting. He mentioned three motions made at the meeting:

1. Revise Table 1 to cover values for ppm per hour for condition levels 1, 2 and 3. The motion passed.

2. A motion against the first motion of having 3 levels of condition to a pass/fail criteria The motion did not pass.

3. Jin Sim made a motion to remove one gas from the table, hydrogen. The motion was approved

4. The values of the remaining gases in the table will remain the same.

The Minutes (unapproved) of C57.130 WG Meeting as Submitted:

The Working Group met in the Savannah B room of the Marriot Riverfront Hotel in Savannah, GA on Tuesday March 25, 2014 at 1:45 PM. Present were seven (7) members and forty-three (43) guests. The acting Chair (Mr. Tom Prevost) removed three persons from membership due to lack of attendance at the last two meetings (Mr. Barry Beaster, Mr. William Darovny and Mr. Robert Tillman). The group now has 12 members, so a quorum was achieved.

The minutes from the previous meeting in St. Louis were approved as written.

The business order was to review the negative votes from the last straw ballot of draft 3, and confirm the resolution was acceptable:

1.- The paragraph requesting the limit of 2 000 ppm of oxygen was deleted from section 3.0 of draft 4. Resolution was accepted.

2.- There was discussion regarding changing the scope and including gas limits for overload heat runs, but no motion was done from any WG member in order to do so (change the scope of the guide), so it remains applicable for standard heat runs per C57.12.90.

3.- The resolution of limiting the application of this guide to transformers of 10 MVA and above, and 69 kV and higher was accepted, as included in section 7.3 of draft 4.

4.- There was a motion by Mr. Don Platts proposing to include in the document the detection limits as to be defined by the WG (references discussed were ASTM D3612 and IEC 61181), Mr Jin Sim seconded and there were no negatives, so the motion passed.

5.- Mr. Don Platts did another motion asking to remove condition III of table 1. No one seconded the motion.
6.- Mr. Jin Sim moved to remove C2H2 from table 1, and left the note below the table which limits the amount of acetylene to non-detectable. Mr. Mark McNally seconded the motion and there were no negatives, so the motion passed.

7.- There was a final motion to accept the numbers in table 1 as they are, except for the acetylene. The motion was done by Mr. Jin Sim, and seconded by Mr. Scott Digby, There was a ballot within WG members with 5 in favor and 1 disapprove. The motion passed.

Having no other new business, the meeting adjourned at 3:00 PM.

Respectfully submitted,

Juan Castellanos, Secretary

G.1.5.5 IEEE C57.139 IEEE Dissolved Gas Analysis in Load Tap Changers

Tuesday, March 25, 2014
Savannah, Georgia
Minutes of WG Meeting

Chair Dave Wallach called the WG meeting to order at 11:02 am. Vice-Chair Mark Cheatham and Secretary Susan McNelly (minutes written by) were also present. There were 38 of 63 members present (Quorum requirement was met). There were 60 guests present with 8 guests requesting membership. At this point, new members will not be considered unless they substantially contribute such as participating on the ballot resolution group. The membership roster and attendance will be recorded in the Committee AM System.

The following guests requested membership in the WG but as mentioned above only those that substantially contribute at this point will be added (*).

Marten Almkvist Thang Hochanh
Javier Arteaga Arthur Lemm
Bernard Banh Kevin Sullivan
Emelio Morales-Cruz * Alwyn VanderWalt

Agenda:
1. Introductions/Member Roll Call
2. Approval of minutes from the fall 2013 meeting
3. Milestones
4. Document Status/Discussion
5. Old Business
   - Revision of text in Clause 5.3.3
   - Comments from attendees on latest draft
   - Volunteers needed for ballot resolution committee
6. Old Business
7. New Business
8. Adjourn

Attendees

Introductions of the Chair, Vice Chair and Secretary were made. Attendees were not asked to introduce themselves but instructed that when speaking during the meeting to at that point introduce themselves and their affiliations.

Motion to approve the fall 2013 St. Louis, Missouri meeting minutes was made by Craig Colopy and seconded by Paul Boman. The motion was unanimously approved.
Milestones

Straw Ballot between meetings
Begin Ballot process – Mid 2014
  - Mandatory Editorial Review
  - Ballot
  - Ballot Resolution
PAR Expiration December 31, 2015
  - Submit Balloted document to REVCOM by October 2015

Document Status/Discussion

Dave Wallach indicated that Rainer Frotscher, Michel Duval, and others have been working on text for Section 5.3.3. A presentation was given by Rainer Frotscher on arcing patterns for (resistive) oil-switching LTC types. A Standard Pattern “A” mainly C₂H₂ accompanied by C₂H₄ and a new Pattern “B” with (much) more C₂H₄ than C₂H₂ were discussed. Pattern “B” appears to be based on aging of oil, not the type of breaker. Javier Arteaga asked what conditions in the oil were considered to be aged. Rainer commented that it appears to be based on carbonization of the oil especially when combined with humidity.

The first theory is due to carbonization of the oil (the lower the resistivity the higher the ethylene/acetylene ratio). The second theory is due to contact heating. A third theory is that carbon sludge deposits worsen the cooling of transition resistors.

Fredi Jakob asked if there was a difference between filtered or unfiltered oil. Rainer indicated that they had not filtered the oil.

Norm Field asked about the rate of change over time of gas ratio. Rainer indicated that this is very difficult to determine. The assumptions are based on spot measurements. There are very few cases where the device was monitored over years. The curve of resistivity was based on a single measurement not a trend.

- Document is ready for a straw ballot with this WG as well as IFSC
  - Should we consider also Insulating Fluids Subcommittee? Sue McNelly commented it would be best to have a bigger audience review the document as they would likely be balloting on it as well.
- Resolve straw ballot comments
- Mandatory Editorial Review
- Prepare ballot pool
- Ballot

Volunteers will be needed for ballot resolution. Tad Daniels and Mike Lau volunteered to serve on a ballot resolution group. After the meeting, Emelio Morales-Cruz also volunteered.

Dave went through recent changes to the guide that have been made.

There was wording added that there is still value to doing DGA on units, even if the LTC has been blocked from operation, unless the contacts are totally bypassed.

One of the goals coming to this revision was could norms be developed. It was determined to be somewhat impossible without identifying manufacturer, along with loading practices and switching practices. A statement to this effect was added to Appendix B.
Old Business
No old business was discussed.

New Business
No new business was raised for discussion.

The meeting was adjourned at 11:35m.
Dave Wallach
Chair
Mark Cheatham
Vice-Chair
Susan McNelly
Secretary

G.1.5.6 IEEE C57.147 Guide for Acceptance and Maintenance of Natural Ester Fluids in Transformers

WG Chair: Patrick McShane, Vice-Chair: Clair Claiborne, Secretary: Jim Graham

The WG Report at the Sub-Committee Meeting: Presented by Patrick McShane:

A preliminary draft has been created based on the input from the TFs, but some TFs have yet to submit their assignments. Also some of the subjects (items of interest) for possible inclusion in the revised standard have not been fully addressed. At the meeting the items were prioritized as to their relative importance to be address. Several were removed from the list. The TF Chairs will be contacted to urge completion of the assignments so a draft can be developed for a straw vote. The PAR expires end of 2016, but due to the consolidation TF requires this Guide to be approved before they can issue a draft of a consolidated guide.

The Minutes (unapproved) of C57.147 WG Meeting as Submitted:

March 24, 2014
Savannah, GA

Chair: Patrick McShane, Vice-Chair: Clair Claiborne, Secretary: Jim Graham

• Call to Order was made at 3:15 PM.

• Introductions/Membership Attendance/Quorum Check

• Attendance
  o 22 of 36 members present, quorum was achieved
  o 56 guests
  o total attendance = 78
  o 5 guests requested membership

• There were no changes or objections to the Fall 2013 Minutes, so these were unanimously approved.

• There being no changes or objections to the proposed agenda, the agenda was unanimously approved.
• Chair's Remarks, Patrick McShane:
  o Welcome of new members
  o Discussion of a new task force established by the Insulating Fluids Subcommittee for the consolidation of the insulating liquids maintenance guides, including C57.147.
  o Review of the time line goals for completion of the guide revisions

1. All outstanding TF assignments will be dealt with asap

2. If TF assignments are not completed by May 15, the WG officers will review assigned sections and edit as needed in current guide

3. Second draft to be reviewed at F14

4. To assist in insulating fluids guide consolidations project, the SA approval target is Q4, 2015; 5 quarters prior to PAR deadline

• Task Force Reports
  o No task force reports were presented at this meeting.
  o The Chair again emphasized task forces which have not completed their respective assignments need to do so by May 1, 2014.

• Old Business
  o The list of items of interest that have been compiled over the few years were reviewed and prioritized or eliminated from TF assignments.

• New Business
  o Draft 1 of the revised guide was presented, and proposed revisions were reviewed. Draft 1 will be posted on the website by July 15, 2014 for the working group to review.

• The meeting adjourned by acclamation at 4:35 pm.

Respectively submitted,

Jim Graham, Secretary

Task Force Items of Interest Assignments

**TF 1: Section 4 – Insulating Liquid Tests & Significance for NE**

New Chair: David Sundin

• Low Temperature Properties TF1 & TF2
• Particle Count limits - statement addressing lack of data by TF1
• Partial discharge inception TF1 & TF2
• Furan analysis TF1
• DGA (coordination with NE DGA WG) TF1

**TF 2: Section 6 - Handling & Evaluation of NEF used in field filling**

New Chair: Roland James

• Testing evaluating oxidation stability - TF2
• Dielectric performance. (Is ASTM D6871 sufficient?) TF2
• Large Gap and Creep Withstand TF2
• Highly non-uniform fields TF2
• Low Temperature Properties TF1 & TF2
• Different minimum values of dielectric breakdown for totes and drums as received vs. bulk shipments TF2
• Flash point limits for vapor phased and retro filled transformers TF2
• Partial discharge inception TF1 & TF2

**TF 3:** Compatibilities of NE Fluids with Components & Accessories
(includes Section 7 - Evaluation of NEF in New Equipment)
• No section on load tap changers (unlike C57.106) TF3

**TF 4:** Section 8 - Maintenance of NEF
• Additive level evaluation

**TF 5:** Annex B (Misc. Technical Issues)

**TF 6:** Field Application Guide & Equipment Evaluation
• Determining new loading limits for retro filled xfmrs - TF6.
• Online monitoring/diagnostics sensors (dissolved gas, moisture, temperature)
• NE Fluid Handling vs. Mineral Oil
• Transportation and Storage Requirements for NE Fluids vs. Mineral Oil
• Retro-Filling Existing Equipment
  a. NE Fluid Filling Procedures
  b. Post Fill Procedures – Recommended Tests *
  c. Start-Up Procedures
  d. Key Properties Change of NE fluid as it ages
• Filling New Equipment
  a. NE Fluid Filling Procedures
  b. Post Fill Procedures - Recommended Tests *
  c. Start-Up Procedures
  d. Key Properties Change of NE fluid as it ages
• Cold Start Operations
• Recommended Monitoring
• Proper NE Fluid Disposal Procedures
• Nameplate changes and/or informational labels
* May need to bring in relevant transformer subcommittees

**TF 7:** All other sections - Miscellaneous
• Consolidation SC IF Fluids Guides impact on revision process.- TF7
• Should guide include environmental values - TF7
• Joint participation with IEC TC10 / TC14 TF1 & TF2
• Research relevant published papers & update bibliography
Additional Fire, Health, Environmental and Sustainability Considerations

**G.1.5.7** IEEE C57.155 DGA in Natural and Synthetic Based Ester Fluids

The WG Report at the Sub-Committee Meeting: Presented by Paul Boman:
A new draft based on the comments received during the last straw vote was discussed and the consensus is that is pretty good. It has been sent to the WG for another straw vote, which has a deadline to be established for early April. The PAR expires this year.

The Minutes (unapproved) of C57.155 WG Meeting as Submitted:
WG Chair Jim Thompson

The WG Report at the Sub-Committee Meeting: Presented by Dave Sundin:

The PAR is expiring end of this year. There was a lot of discussion regarding the need for Table 1, Criteria for Acceptance. Since this is addressed by C57.106, the WG decided to remove the Table. A reference to US documents on reference to US laws and rules on handling, spills, or disposal of oil rules were replace by verbiage advising the user to research and adhere to all applicable regulations.

It was decided to remove Table 4, which lists limits after filling but before energization, as it was determine to be outside the Guide’s scope. Also, it was approved at the meeting to change the reference of ASTM D1275-B to simply ASTM D1275 because ASTM has consolidated the (A) and (B) parts of that method.

The WG resolved all the issues brought up by the straw ballot by the “super majority” of the WG. Dave Sundin made a motion to the SCIF requesting that the current draft be approved for balloting. Don Cherry seconded the motion.

The discussion on the floor began with Tom Prevost advising on the need to be sure that the draft is ready to go to IEEE SA for editorial review and a ballot pool formed. Tom and Jodi state the time frame is very tight as it must go to ballot and be approved before end of this year. Tom mentioned that up to now, Jim Thompson has done most of word processing of the drafts. Tom Prevost and Dave Hanson volunteered to proof the draft. With no further comments the SCIF member attendees unanimous approved the motion. Jodi IEEE staff mentioned that the document with a favorable voting outcome must be submitted to Oct REVCOM by October 20. She stated that IEEE has approximately 30 days to edit the draft, and it typically requires 30 days to form the ballot pool, and they can be done concurrently.

The Minutes (unapproved) of Revision C57.637 WG Meeting as Submitted:

March 25, 2014
Savannah, GA

Working Group:

David Sundin acting WG Chair, standing in for Jim Thompson

There were 9 Working Group members and 17 guests in attendance at the meeting. A quorum was achieved.

Approval of agenda:

- Motioned by: Don Cherry
- Seconded by: Claude Beauchemin
- WG Vote Outcome: Passed Unanimously

Approval of minutes from fall 2013, St. Louis:

- Motioned by: Don Cherry
- Seconded by: Claude Beauchemin
- WG Vote Outcome: Passed Unanimously
Old Business:

The WG reviewed the straw ballot that had been distributed. Jim Thompson had worked with individual WG members to resolve their negative votes.

Claude Beauchemin had several negative votes that had been resolved by changes that Jim Thompson made in the Guide.

Bob Rasor questioned the need for Table 1 because the same data is covered by C57.106, and that the two tables would be difficult to keep in sync whenever one of the Guides was updated. After a great deal of discussion within the WG, Claude Beauchemin made a motion to "Remove Table 1 and replace it with a reference to C57.106." Don Cherry seconded the motion. After more discussion, a vote of the WG members was taken. 9 members approved, there were no dissenting votes. The motion passed.

The ensuing discussion revolved around phrases advising the user to heed US laws regarding disposal and spills of transformer oils. The feeling of the WG was that mention of US law or regulations was not appropriate and should be replaced with more generic warnings that the user should obey all applicable laws regarding handling, spills or disposal of oil. Claude Beauchemin made a motion that "All references to US laws or regulations be replaced with a generic phrase that the user should obey applicable laws or regulations". Don Cherry seconded the motion. Vote was 9 for, 0 opposed. The motion passed.

The next discussion revolved around the need for Table 4, "Suggested Test Limits for Reclaimed Oil in Transformers and Reactors After Filling but Before Energizing". The WG discussed in depth the values shown in Table 4 and whether the inclusion of this table went beyond the scope of the Guide. Don Cherry made the motion that "we remove Table 4 and all references to it as it is not necessary due to C57.106 having all of this information and because Table 4 is beyond the scope of the Guide". The motion was seconded by Claude Beauchemin. After more discussion, a vote was taken, with 8 affirmative votes, and one negative (Bob Rasor). The motion carried.

Art Lemm made a motion that "References to method ASTM D1275(B) be changed to simply reference method ASTM D1275, as ASTM had recently removed the method B suffix". There was discussion regarding the need for reference to the date of any ASTM test methods, and was decided that IEEE preference was that no date reference be made, so that any referenced documents would automatically reference the most recent version. Claude Beauchemin seconded the motion. There were 9 affirmative votes, and no negatives. The motion carried.

After discussion of the procedural next step for this document, Ed teNyenhuiss made a motion that "We incorporate all changes that we voted on by the working group and request approval for balloting by the Insulating Fluid Subcommittee." Jim Thompson seconded the motion. Vote was 9 affirmative, and 0 negative. The motion carried.

New Business:

There was no new business for the WG. Don Cherry motioned that the meeting be adjourned. Seconded by Jim Thompson. The motion passed unanimously. The meeting was adjourned.

Respectively Submitted, David Sundin, acting WG Secretary
• A summary of the discussion and comments.
• Minutes should be submitted by April 9, 2014

The Chair reviewed the process to submit documents for Sponsor ballot. Working Groups must have a 2/3 majority to submit the document for Sponsor ballot. The Subcommittee must achieve a simple majority to submit a document for Sponsor ballot.

The Chair welcomed the following new members of the Insulation Life Subcommittee:

Jeffrey Britton    Jeffery Golarz    Peter Heinzig    John John
Zan Kiparizoski   Mario Locarno     Ali Naderian    Mark Perkins

H.2  Project Status Reports

H.2.1  C57.91 IEEE Guide for Loading Mineral-Oil-Immersed Transformers

C57.91 is valid until 2021.

H.2.2  C57.100 IEEE Standard Test Procedure for Thermal Evaluation of Liquid-Immersed Distribution Transformers

This standard is valid until 2021.

H.2.3  C57.119 IEEE Recommended Practice for Performing Temperature Rise Tests on Oil-Immersed Power Transformers at Loads Beyond Nameplate Ratings

C57.119 is valid until 2018.

H.2.4  C57.154 Design, Testing and Application of Liquid-Immersed Transformers with High-Temperature Insulation

C57.154 is valid until 2022.

H.2.5  C57.162 - Guide for the Interpretation of Moisture Related Parameters in Dry, Gas Insulated and Liquid Immersed Transformers and Reactors

The C57.162 PAR expires December 31, 2017. The standard is valid until 2018.

H.2.6  1276 Guide for the Application of High Temperature Insulation Materials in Liquid-Immersed Power Transformers

The 1276 PAR expires December 31, 2016. The standard is valid until 2018.

H.2.7  12.8.2.7  1538 IEEE Guide for Determination of Maximum Winding Temperature Rise in Liquid-Filled Transformers

1538 is valid until 2021.
G.1.5.9  TF on Consolidation of Insulating Fluid Guides

Chair: Tom Prevost

The TF Report given at the Sub-Committee Meeting by Tom Prevost:

Tom Prevost stated that the goal is to look at the process of combining the existing guides. Currently there are four insulating liquid guides, 2 of which are in revision process. The timing of the WG to issue its first draft will be dependent on C57.147 approval. The proposed scope will not include circuit breakers since they are covered in the C57.106 revision.

There was discussion regarding the mixing of insulating liquids. There appears to be, some confusion on definition of “mixing”. The idea is not the intention to purposely mix to make new hybrid insulating liquids with certain properties. The mixing issue is not related to planned retrofills, since there will be some mixing. Tom stated the TF needs to look on how mixing does occur including potential issues. For example silicone contamination in mineral oil that goes through degassing has caused problems.

Don Cherry reviewed the current insulating liquid guides regarding which ASTM test methods are used for acceptance values, and the listed values for each for new liquid as received, installed, and service aged. The differences were much less than anticipated, only about 3 of 50 and those primarily involved on one type of insulating liquid.

New Business, Tom asked about inclusion of other types of insulating liquids other than the current four with existing guides. This subject will be brought up next TF meeting

The Minutes (unapproved) of TF on Consolidation of IF Guides as Submitted:

Combination of Oil Guides Notes

Meeting time: Monday March 24th, 2014 @ 0930

**TF Highlights:**

- Second Meeting

- Discussions started with updates on the oil guides that ultimately will be combined. The goal is for the individual guides to complete their processes and then flow into the new combined document.

- C57.106 is hoping to vote by End of Year 2014

- C57.111 has a minor change

- C57.147 has the greatest movement and longest revision time with a Par Exp of 2016.

**Subtask Force Highlights**

- There was discussion on removal of the oil parameter table for circuit breakers with most members in agreement to remove it due to no scope. However, the Task Force will make a formal inquiry to the circuit breaker committee if they want the data to incorporate into their document which is currently under revision.

- A section on mixing of fluids was generally desirable to be included in the combined guide. However this discussion led to this section as a cautionary statement against mixing as a general recommend practice.
Don Cherry presented tables comparing fluid types versus ASTM test methods. This prompted a discussion that each fluid may have data table structures that would provide guidance at different stages – NEW Oil, Installed Oil, and Service Aged Oil. The Task Force will continue to evaluate this approach.

New Business

Tom Prevost asked for discussion on the inclusion of new liquids such as Synthetic Esthers. There was discussion for and against new fluids with time expiring. Additional Discussion will be prompted in Washington.

Adjournment at 10:45 am

G.1.5.10 TF on Particle Count Limits in Mineral Oil

Chair: Mark Scarborough, Secretary: Paul Boman

A meeting of this TF was not held. Several weeks ago the TF Chair, Mark Scarborough, advised that it will be unlikely for him to attend future TC meetings. He write up a report for the SCIF on background and status of the TF’s work to date. This has been a controversial issue regard a need for a guide on particle count. Tom Prevost stated that he has expressed his reservation in the past based on the difficulty of the methodology to determine particle values. He state that there is a discussion of particles in the insulating liquid in an Annex I of C57.152, including table 11, In-service transformer suggested particle count action points in particles per mL by µm.

David Wallach will contact Mark whether the TF would like to:

1. Generate a Task Force Report as it would be a shame to lose the information collected then bring forth a TF Report at the F14 SCIF meeting and the recommendation to disband. The final TF Report presented can be placed on the committee website for future reference.

2. TF can examine the collected information and TF resources and determine there is not interest in generating a TF Report and simply bring this TF decision to SCIF during the F14 SCIF meeting to disband without a TF Report.

David will contact Mark to discuss further.

G.2 New Business

As a Dual logo request received by IEEE from IEC TC 10 member for natural esters because IEEE has a standard and working on a revision and IEC is forming a WG to develop their first guide The consensus of the SCIF is that it is not interested in dual logo for C57.147. Jodi will advise the submitter of the decision.

G.3 Adjournment

Don Cherry made the motion to adjourn, seconded by Claude Beauchemin, and unanimously approved.

Respectively Submitted, Patrick McShane, Secretary SCIF
Annex H    Insulation Life Subcommittee - Unapproved Meeting Minutes

March 26, 2014 – Savannah, GA

Chair: Bruce Forsyth
Vice-Chair: Barry Beaster
Secretary: Eric Davis

The Insulation Life Subcommittee met in Savannah, GA on March 26, 2014 at 8:00 AM.

A hand count of the members at the beginning of the meeting revealed that 58 of 98 members and 0 of 3 corresponding members were present. A quorum was present.

K. Miller made a motion to approve the St. Louis Meeting minutes as written. D. Duckett seconded the motion. There was no discussion on the minutes. It was unanimously approved.

The agenda was reviewed. D. Platts made a motion to approve the agenda. T. Prevost seconded the motion. There was no discussion on the agenda. It was unanimously approved.

The attendance rosters show that the meeting was attended by 198 people, 65 of 98 members and 133 guests. 16 guests requested membership. 10 of these guests meet the membership requirements. The complete attendance is recorded in AMS.

H.1  Chair’s Report

The Chair reminded everyone that this is a volunteer organization and thanked the members and activity leaders for their participation and efforts.

The Fall 2014 IEEE Transformers Committee Meeting will be held October 19, 2014 through October 23, 2014 in the Washington DC area.

Due to the size of the group, general introductions will not be made. Please state your name and affiliation when you address the subcommittee.

The Chair reviewed the purpose and scope of the Subcommittee and encouraged the Task Forces and Working Groups to review their purpose and scope at the beginning of every meeting.

The minutes for Activity Groups should record:

- The attendance including the number of members, the number of guests, and if a quorum was present
- Include a statement that the full attendance record is available in AMS.
- The Chair or Acting Chair
- The Secretary or Acting Secretary
- The name of the member who makes a motion, the name of the Member who seconds the motion, a restatement of the motion and if the motion carried or was defeated.
H.3 Working Group and Task Force Reports

H.3.1 Task Force on Winding Temperature Indicators - Phil McClure

Chair: Phil McClure, Vice Chair: Bob Thompson
Monday, 03/24/14 Savannah, GA
The meeting was called to order at 9:30am.

Members and guests introduced themselves.

Members in attendance were identified and to document a quorum, a roster was circulated. There were 9 members and 22 guests in attendance. There are 11 members in the Task Force, and therefore a quorum was achieved. Three guests requested membership. The full attendance roster is available on the association management system (AMS) website.

Minutes of the Fall 2013 meeting in St Louis were presented and discussed. After discussion, a motion was put forward by Josh Herz to approve the minutes. The motion was seconded by Jean-Noel Berube and the minutes were then unanimously approved by vote of the members present.

Chairman McClure briefly reviewed progress and the current state of our efforts toward completion of the experiment report and technical paper. He had circulated revision 5 of the report and draft 12 of the paper to members for review prior to the meeting.

Discussion began with the report of the experiment. Noting the title had been changed as previously requested to include the words “Task Force Report”, Bruce Forsyth clarified that his advice at our previous meeting in regard to the necessity of those words was in regard to the fact that this was not a Task Force experiment, but the report on the experiment is a Task Force document. The clarification was acknowledged and discussion of the test report continued.

Dave Wallach indicated that the reference to Cooper Power in the material and equipment table should be revised to indicate the new owners of this company –Cargill

A misspelling was found and that concluded discussion on the experiment report.

A motion was put forward by Dave Wallach to approve the test report with corrections as described in the meeting. The motion was seconded by Jorge Gonzalez de la Vega and approved by unanimous vote of the members present.

The report will be corrected as approved and circulated to the members of the Task Force for ballot as revision 6 in the time between meetings.

At this point general discussion was continued by Chairman McClure in regard to transformers with OF, non-directed cooling and why when the pumps are activated it results in top oil temperatures that are significantly cooler than transformers with ON oil circulation. Jean-Noel Berube said that he had data that illustrates this phenomena and offered it to the Task Force. One of the group asked if the data could be made available by the Task Force, whereupon Bruce Forsyth indicated that such data would not be made public by the Task Force, but interested parties could contact Jean-Noel privately.

Chairman McClure continued the discussion with a review of the most recent changes in the paper, as presented in draft 12. He explained that draft 12 comprised major parts of revision 9, which were brought forward and heavily edited to condense them into the most pertinent content.
Discussion of the paper included:

- List of members
- Contents section (particularly section title revisions)
- A brief discussion of all newly added and/or edited sections

It was noted that section additional contributions for section 5.1 were submitted just after the cut-off for material for the meeting and what was there, was not quite ready for review. It will be added and circulated in between meetings.

Upon reading of the conclusions section, several attendees objected to some statements that were not supported by evidence in the document. While acknowledging that the statements may be true, it was decided to strike them rather than search out supporting documents, since that may be beyond the scope of the document.

It was stated that the changes noted during the meeting would be made, the new version of section 5.1 would be added to the technical paper and it would be circulated as draft 13 to the members in the time between meetings.

Jean-Noel raised a question as to whether an existing heated well can be used with a new probe which requires an unheated well, by simply disconnecting the heater. Phil said he had experience adjusting the probe depth to locate the hottest position and leaving the probe at that depth. Several other attendees nodded agreement and one commented that some installation instructions require a specific insertion depth.

Old Business: No old business

New business: No new business

Having no more business to cover, Dave Wallach moved to adjourn and Jean-Noel Berube seconded, followed by a unanimous vote of the members present to approve the motion. The meeting adjourned at 10:32 am.

Written and Respectfully Submitted by,

Bob Thompson, Vice Chair


While the TF did not meet during the Transformers Committee meeting, the TF investigated the options according to the IEEE Standards Association Policies and Procedures which define the development process for four types of document development: New, Revision, Amendment, Corrigendum and Erratum. The TF agreed that Amendment was the correct process. A scope and purpose were determined with all in favor as determined by email vote. According to the charter of the TF, the chairman agreed to present the findings to the IL SC and request authorization to submit a PAR request.

Rick Marek moved that the Subcommittee approve the following scope and purpose for a PAR for the Amendment of IEEE 1538.
Scope: This amendment will expand the clause that addresses direct measurement by fiber optic detectors and will also add an annex detailing installation techniques for fiber optic probes. References will also be updated.

Purpose: The state of the art has improved over the years since the last reaffirmation of this guide. This amendment adds substantial detail and general recommendations for sensor location, based on the historical experiences of many fiber optic measurements, providing sufficient detail for everyday use on common designs. Information is also provided on proper sensor installation that was missing from the current guide.

Tom Prevost seconded the motion. After a brief discussion it was approved unanimously.

The Chair appointed Rick Marek as the Chair of the new Working Group.

H.3.3 Working Group on PC57.162 - Guide for the Interpretation of Moisture Related Parameters in Dry, Gas Insulated and Liquid Immersed Transformers and Reactors – Tom Prevost

Attendance Members 34 out of 66
    Guest 72
    Guests Requesting Membership 10

Meeting Minutes

Tom Prevost, discussed at the first meeting that if you ask for membership you were granted membership, but from now on you will need to be at two consecutive meetings after requesting membership. Please if you do have comments or questions please introduce yourself and your affiliation to meet the rules.

Tom Prevost, chair, introduced himself, Valery Davydov, vice chair, and Deanna Woods, secretary, of the working group and to save time members and guests introduction was skipped.

A quorum of the working group members were present 34 out of 64.

The first meeting minutes approved with Don Cherry making a motion and Emilio Morales seconding the motion.

Tom Prevost then reviewed the scope and the purpose of the working group and then a slide of PAR was shown. Tom Prevost also called for any literature or papers for use while working in this group. (Bibliography for reference) In order to obtain the goal of this working group within four years, the group has been broken down into eight task forces. He then mentioned he sent the agenda to the members and guests. Tom Prevost talked about the break out of the group into task force and would like to see three to five volunteers on each task force so the work can get done.

H.3.3.1 Task Force 1 Terminology and Definitions
Task Force Leaders - Jeff Golarz jgolarz@lumasenseinc.com

This section will list and define the terminology for moisture related phenomena in solid, liquid and gaseous insulating materials used in transformers and reactors.

Tom Prevost ask Jeff Golarz to come forward and discuss his task force and go over the scope.
Volunteers – Please forward your information to Jeff

H.3.3.2 Task Force 2 Measurement and evaluation of moisture-in-gas insulation parameters
Rich was not present for the meeting, therefore Tom Prevost described the task force.
Task Force Leaders - Rich Simonelli rich.simonelli@spx.com

This section describes existing measurement, evaluation and methods of moisture and other relevant parameters in a gaseous medium. It would great to someone from the transformer manufacturers

Volunteers – Please forward your information to Rich

H.3.3.3 Task Force 3 Measurement and evaluation of moisture-in-liquid insulation parameters
Task Force Leaders- Claude Beauchemin beauchemin@tjh2b.com

Claude came forward and described what the task force scope entailed.

This section describes the existing measurement and evaluation methods of moisture parameters and other relevant parameters in the liquid medium of a transformer or reactor for sequential or continuous on-line moisture assessments.

- Karl Fisher Methodology
- Consider effect of chemical solutions used for new aged and contaminated insulating liquids
- Consider types of insulating liquid
- Relative Saturation
- Consider measurement method
- Capacitive probe
- Derived from Karl Fisher
- Effect of aging (contamination) on water solubility

Volunteers – Please forward your information to Claude

Tom Prevost mentioned that with a group of this size that these meeting will detail updates on the task force progress and presentations of interest during the meetings. Also, the evolution of the guide will be given as part of the update at the meetings.

H.3.3.4 Task Force 4 Measurement of moisture in solid insulation
Task Force Leader - Paul Griffin pgriffen@doble.com

Paul was not present at the meeting therefore, Tom Prevost described the task force.

This section describes the methods of measurement of moisture in solid insulation using a balance, for un-oiled insulation and a Karl Fisher method using solvent extraction or vapor extraction for oiled insulation.
I don’t know if anyone is using balances but we can find out at the meeting. I think many today are using ovens attached to a Karl Fischer titration instrument or solvent extraction. Once the group is together we can develop the scope but I would think there would be key areas that needed to be covered. For both non-oiled and oil-impregnated insulation things to explore are:

1. How to acquire samples and retain them for moisture measurements
2. Methods of measurement and specific details if outside of standard methods
3. Repeatability and accuracy of measurements

Volunteers – Please forward your information to Paul

H.3.3.5 Task Force 5 Evaluation of moisture in solid insulation using dielectric response methods
Task Force Leader - George Frimpong george.k.frimpong@us.abb.com

George came forward as described the task force, he did rewrite the scope to include (DFR< power frequency power factor). The topic to be stricken from the task force is to include DFR since there is a group already working on this topic and stick with the frequency domain. Struck out temperature distribution there is not temperature probes in the insulation so there is no way to do this prescribe method. Moisture distribution was also taken out due to the fact that these are all bulk moisture measurements. This section describes the methods of measurement of moisture in solid insulation using dielectric response methods.

Consideration will be given to methods that analyze dielectric response in the frequency domain (DFR< power frequency power factor)

Consideration of the following parameters needs to be included:

1. changes in temperature during the test
2. acid content of the paper (from oil acidity)
3. Geometry of insulation

Any comments- Valery Davydov is not sure if we only need to leave this in the frequency domain but I will leave this to the task force to decide. Valery main concern is the distribution of the moisture. George is relying on DFR working group. The group needs to discuss the effect of moisture and the effect of other contaminates on the DFR. The TF needs to have the discussion to include DFR.

Volunteers – Please forward your information to George

H.3.3.6 Task Force 6 Inferring of moisture in solid insulation from measurements conducted in liquid or gaseous medium
Task Force Leader - Valery Davydov valery.davydov@ieee.org

This section describes methods of inferring moisture in solid insulation from that measured in the liquid or gaseous medium for both sequential and continuous on-line measurements.

For equilibrium methods this section will discuss errors introduced due to moisture diffusion time constants and temperature measurement accuracy.

Valery Davydov gave presentation on is task force in detail.
Distribution of temperature and distribution of moisture must be considered. Valery stated his proposed suggestions of the direction of his task force but he also stated that these are not necessarily the final product of the guide.

Tom Prevost then gave a summation of Valery presentation and describes the scope of the task force. The goal of the task force is to combine what we are measuring and in each of these phases and infer what the moisture is solid insulation.

Don Platts then had a question about a procedural occurrence. He wanted to know the direction of the task force. Don Platts wants to make sure everyone has an input even at the task force level. Tom Provost hope and desire is that Valery has a starting point but it is far from concluding what the outcome that will be finalized with the task force.

Volunteers – Please forward your information to Valery

H.3.3.7 Task Force 7 Evaluation of aging and end of life of solid insulation parameters
Task Force Leader- Roger Wicks roger.c.wicks@usa.dupont.com

This section describes approaches for evaluation of parameters of end of life of solid insulation affected by moisture.

The consideration of the effects of moisture, oxygen and aging byproducts in transformer aging tests is the purpose of this task force.

Roger came forward to describe the scope of the task force he will be leading for the working group. Roger stated he can easily document from literature that is sent to Deanna but not sure of a good test one could use in dry applications.

Tom Prevost agreed with the point of gas or air insulated equipment could be difficult to get a good method that can be used for that and if not define the scope that will not be addressed.

Volunteers – Please forward your information to Roger Wicks

H.3.3.8 Task Force 8 Factory/workshop application of knowledge on moisture; establishing baselines
Task Force Leader - Poorvi Patel poorvi.patel@us.abb.com

This section describes a factory/workshop approach to the establishment of a baseline for each important moisture related parameter

Poorvi Patel came forward to describe the task force.

What is already used to establish a baseline in the industry will be convenient to use (i.e. dew point, DFR) and discussion on other oil test used already in a factory to determine dryness of the insulation.

Volunteers – Please forward your information to Poorvi

H.3.3.9 Task Force 9 Field application of knowledge on moisture
* Note: This section lists the risks associated with moisture
Task Force Leader - Jim Thompson servel@svtv.com

Jim was not in attendance at this meeting
Tom Prevost describes the scope of this task force. This is the document the risk and the effect of having high moisture in your transformers. Help with any ideas on how to mitigate the moisture and looking at absolute but also rate of change as well. Then the values will be used as risk assessment for those values.

Volunteers – Please forward your information to Jim.

H.3.4 Working Group for Application of High-Temperature Materials IEEE P-1276 – Mike Franchek

Tuesday, March 25, 2014
Savannah E, 3:15 pm – 4:30 pm
Marriott Riverfront Savannah GA, USA

H.3.4.1 Welcome & Chairman's Remarks M. Franchek

The Chair opened the meeting at 3:16pm, with comments related to the work of this group.

H.3.4.2 Circulation of Attendance Rosters R. Wicks

The Secretary circulated the attendance rosters. By the end of the meeting, there were 13 members and 42 guests in attendance with 4 repeat guests requesting membership. After addition to the membership list, this would increase our membership to 30 members. Full attendance has been included in the AM System.

H.3.4.3 Attendance for Quorum R. Wicks

Three quorum calls were made. At the start of the meeting there were only 10 members in attendance. Midway through the meeting there were twelve, and finally at the end of the meeting there were the requisite 13 members in attendance.

H.3.4.4 Approval of Fall 2013 Meeting Minutes – St. Louis, MO R. Wicks

At the end of the meeting, Dave Sundin made a motion to approve the minutes, Bruce Forsyth seconded and the minutes were approved unanimously.

H.3.4.5 Approval of Meeting Agenda M. Franchek

At the end of the meeting, Raj Ahuja made a motion to approve the agenda, John Luksich seconded and the agenda was approved as used in the meeting.

H.3.4.6 Status of PAR Revision to change scope M. Franchek

The chair reviewed the status of the PAR revision, noting that NESCOM will be meeting on 3/26/2014 (tomorrow) to approve the PAR revision. There were a number of questions asked prior to this meeting, which the chair responded to with no issues, so the approval is expected. Questions included concerns about timing, the omission of specific temperatures in the scope, etc., and these were addressed in the response.

The chair then finished this section of the meeting by reminding the members and guests the final scope and purpose that were submitted to NESCOM. The key differences between the revises scope and the 1997 version are the addition of distribution and regulating transformers as well as a reference
to temperatures outside the scope of C57.12.00. The revised purpose was simplified vs. the prior document.

H.3.4.7 Review of IEEE 1276 - 1997 Table of Content / Changes All

The chair provided an overview of the difference between a guide and a standard. The guide allows introduction of tutorial type information not appropriate for a standard such as ways to apply high temperature materials (design and usage) and to provide examples of these by application.

The chair noted that this document will include distribution transformers, which have different insulation systems and winding types than those used in the power transformer specific 1997 version, so examples and temperature classes will need to be provided. This document should not be a duplicate of C57.154. Since this is a guide, the document can provide informative information in the body of the document rather than only in an appendix – since a guide by nature is all “informative”.

The chair provided an outline of a timeframe he would like to meet in order to complete this work prior to the PAR deadline of the end of 2016. To do this, he has proposed completing a table of contents by June of 2014 with a ballot of the document by the fall of 2015.

The chair noted that he has sent copies of the background paper, the 1997 version of 1276 and IEEE C57.154 to the working group members to help with the development of the standard. This has not gone out to the guests at this time. The chair noted that there is a similar document to C57.154 (IEC 60076-14), but he will not circulate this to the members.

John Luksich asked about a dual logo approach for this guide, however Rick Marek noted that there is a difference between the two standard documents due to the differences in the ambient temperatures between IEC and IEEE, which might make creating a dual logo version of the guide difficult.

The chair then reviewed the current table of contents from the 1997 version as a way to get the attendees thinking about the work needed for this revision. This lead to discussions on some of the sections which will be outlined below:

The past document contained at one and one-half long introduction which outlined some history and the rationale for the document. There was discussion from John L., Roger Wicks, Rick Marek, Raj Ahura and Radek Szweczyk along with the chair. At the end of the discussion, the consensus of those in attendance would be that there should be a short discussion in the revised introduction regarding the change from 1997 to the new version, and then the historical aspects of this introduction could become part of an expanded discussion on history (Editor’s note - need to consider that we already have a background paper with some detail).

The chair then went over the reference/definitions (noting will need to be updated, especially considering the expanded scope).

The chair discussed merits of high temperature operations and this was agreed to be kept.

The chair discussed insulation systems (noting that there are differences between power and distribution that will need to be discussed). Roger Wicks noted that there are inconsistencies between this document and IEEE C57.100 that will have to be rectified (from a draft version of IEEE C57.100 that never made it into the 1999 version). Roger also noted that wire enamel insulation testing will need to be expanded, as this was not listed in detail in IEEE C57.100, though he has added some on
this in a similar IEC document (IEC 62332-2), and that this will be one area where volunteers will be needed.

The loading guide section will likely need to be renamed as loading guidelines for high temperature transformers. This will need to be expanded with the different types of insulation systems (distribution and power) as well as types of systems (hybrid, high temperature (solid and liquid), etc.

The chair noted that the original document was mostly disk work power transformers (hybrid) so a lot of work and volunteers will be needed in these last two sections.

Rick Marek (Chair of the C57.154 document) reminded those in the audience that the merits of high temperature might be different for wider range of applications due to the expanded scope. The 1997 document noted future revisions would expand to cover new areas once applications were more broadly used beyond power and mineral oil, and this is now the case with current practices. Rick also mentioned that there is a new work proposal within Cigre (Hans Peter Gasser) to develop a thermal qualification method for fluids to determine thermal class of fluids (Radek mentioned this will be at the Cigre D1 materials session in August.

The chair continued with the old table of comments including a description of high temperature transformers, nameplate and heat run. He noted that a word version of the document has been promised by IEEE within a week to assist in this work. He finished the discussion of the old document by noting that there was an annex A related to gas analysis which likely will need to be expanded with new fluids, etc. and finally there was a bibliography which will need to be expanded.

Rick Marek noted that the nameplate information is in C57.154, and that the heat run might not need to be covered, however Radek noted that in from discussions in the DGA for factory heat run meeting that this might actually provide a lot of good information. John Luksich reminded that there is a difference in hottest spot vs. average winding with higher temperature transformers, as well as direct membership and the chair agreed, but thought it was already in the 1997 version for power units at least. Radek reminded that winding styles can be different (such as a semi-hybrid HV winding and full-hybrid LV winding) and this will need to be addressed in portions of the document (may affect loading, gassing, etc.).

The chair solicited volunteers for the TOC revision by June and the volunteers are Mike Franchek, Roger Wicks, John Luksich, Kurt Kaineder, and Mike Shannon. They will need to get this back to the chair by June by meeting with conference call, etc.

H.3.4.8 Old Business

There was no old business

H.3.4.9 New Business

The chair solicited volunteers for secretary, so that Roger could become Vice Chair (as the Adcom would like to see all three positions in working groups if possible).

H.3.4.10 Adjournment

A motion to adjourn the meeting was offered by Dave Sundin and seconded by John Luksich and passed unanimously, and the meeting was adjourned at 4:00 pm.

Secretary
Roger Wicks.

H.4 Old Business:

No old business.

H.5 12.8.5 New Business:

IEEE C57.119-2001 (Reaffirmed 2008) – The Chair stated that C57.119 expires in 2018. He suggested that we reaffirm or revise this document.

There was general discussion about this topic. The key points of the discussion are shown below.

- We can no longer reaffirm standards. We can submit a revision without any changes but is must be balloted.
- A new bushing document has been approved. Is C57.119 in sync with it?
- Some folks felt that this document was not used while others stated that it was used.
- It was suggested that we survey the Subcommittee for comments and have a working group resolve them. Several people felt this would take too long.
- The intention is to ballot the document as is and address any comments that are submitted. If significant comments are submitted a working group will have sufficient time to resolve them before the standard expires.

T. Prevost made the following motion:

Submit a PAR for the revision of C57.119 with the intention to ballot as it stands and deal with the resulting comments.

D. Platts seconded this motion. During discussion, B. Bartley suggested revising the motion to include “with minor editorial changes.” D. Platts and T. Prevost both accepted this amendment. The Subcommittee voted on the following amended motion:

Submit a PAR for the revision C57.119 with the intention to ballot with minor editorial changes.

This motion received no negative votes and 3 abstentions. The motion was approved.

H.6 Adjournment

P. McClure made a motion to adjourn. K. Miller seconded this motion. The meeting adjourned at 8:45 AM.

Respectfully submitted,
Eric Davis
Secretary, Insulation Life Subcommittee
Annex J  Performance Characteristics Subcommittee

March 26, 2014
Savannah, Georgia

Chair: Ed teNyenhuis Craig Stiegemeier
Vice Chair: Craig Stiegemeier
Secretary: Sanjib Som

J.1  Introduction / Attendance

The Performance Characteristics Subcommittee (PCS) met on Wednesday, March 26th, 2014 at 3pm with 155 people attending. Of these, 71 were members and 84 were guests. Prior to this meeting, the total membership of PCS was 115 members; therefore, quorum was achieved. There are also 11 corresponding members.

There were 13 guests requesting membership.

The vice chair distributed four rosters for four columns of seating arrangement in the room.

J.2  Approval of Agenda

The Chair presented the agenda. A motion to accept this as proposed was given by Steve Snyder. Hemchandra Shertukde seconded it. It carried by unanimous vote.

J.3  Approval of Last Meeting Minutes

The chairman presented the minutes of the last meeting in St Louis, USA – Oct, 2013. This was proposed by Kenneth Skinger to be accepted as is, which was seconded by Jeevan Puri. The minutes were passed by unanimous vote.

J.4  Chairman’s Remarks

New WG Chairs were presented as below:

- WG on PCS Revisions to C57.12.00 – Tauhid Ansari
- WG on Loss Evaluation Guide C57.120 – Mike Miller
- C57.110 - Nonsinusoidal Load Currents – Rick Marek
- C57.109 - Through-Fault-Current Duration - Vinay Mehrotra
- C57.105 - Transformer Connections in Three-Phase Distribution Systems - Adam Bromley

A new WG Chairman is needed for C57.21 - IEEE Standard Requirements, Terminology, and Test Code for Shunt Reactors Rated Over 500 kVA

PCS is sponsoring a technical presentation “Tutorial on Transformer Interaction with switching of vacuum and SF6” on Thursday 27th March 2014. This is being presented by Dr. Robert Degeneff and Angelica Rocha.

The Chairman thanked the PSC for the great response on the surveys sent out since the last meeting.

The attendance requirement to be used by PCS is that members missing 3 or more of the last 5 meetings will be been moved to “Guest” status.
The following WG and Task Force reports were received next (the reports are below):

- WG on Tertiary/Stabilization Windings PC57.158 E. Betancourt
- WG on PCS Revisions to Test Code C57.12.90 M. Perkins
- TF on Audible Sound Revision to Clause 13 of C57.12.90 R. Girgis
- WG on PCS Revisions to C57.12.00 S. Snyder
- WG on Distributed Photo-Voltaic Grid Transformers C57.159 H. Shertukde
- IEEE/IEC WG Wind Turbine Generator Transformers, P60076-16 D. Buckmaster
- WG on Loss Evaluation Guide C57.120 A. Traut
- TF on HV & EHV Transients C57.142 J. McBride
- WG on Neutral Grounding Devices PC57.32 S. Kennedy
- TF on Nonsinusoidal Load Currents C57.110 R. Marek

**J.5 Unfinished (Old) Business**

None

**J.6 New Business**

A motion was received to appoint a Task Force to prepare text to insert into C57.12.00 to specify that core grounding or shielding of medium voltage transformers shall be applied to prevent electrostatic coupling with the medium voltage winding.

Philip Hopkinson made the above motion seconded by Hemchandra Shertukde. Bertrand Poulin cautioned that we should not specify how to design the transformer but to state the requirement for form fit and function.

It was voted upon and 26 members voted for it and 3 were against it. Thus it was passed.

Adjournment was proposed by Hemchandra Shertukde and seconded by David Buckmaster.

Meeting was adjourned at 4.15 pm.
10.4.1 PC57.120 LOSS EVALUATION GUIDE FOR DISTRIBUTION AND POWER TRANSFORMERS AND reactors

Attendance:
- Guest: 60
- Members: 17
- Guest Requesting Membership: 6
- Total: 83

Notes:
- Chair Report - Al Traut will be stepping down and Mike Miller will replace as chair. Mike will be looking for a new secretary.
- Quorum was achieved (17 members)
- Ron moved to approve minutes Steve seconded. Minutes were approved.
- Reviewed notes from the draft.
- Need to get up to new style guide for IEEE.
- Discussion about IEEE getting rid of currency in our document. Don’t think we will get an exemption. Options would be to make a companion document with the examples. There is a universal sign for currency that we might be able to use.
- Don Platt discussed how deregulation affects the evaluated cost. Need to include cost for generation not fuel. If your company never owns the energy this guide may not be valid. He has added notes to warn the user.
- Jane Ann (Pepco) stated that they don’t get charged for energy so when they did their calculation without generation cost they got really low numbers. Pass through companies don’t have a good way of calculating what there evaluation should be.
- Don made a motion that the working group adopt the issue with deregulation and use Don’s notes as a new clause 4 in the body of the standard. Seconded by Wally. There was a comment that he would rather see it as a preface to clause 5 or make clause 5 into clause 6 as the physics of losses are not changed by the economics. This was voted with 13 in favor and 1 opposed. Motion carried to include it as a new clause 4.
- Mike Miller discussed his comments made to the draft standard.
- Is loss multiplier part of A and B factors or separate. We want A and B factors to include multiplier so example should match the A and B equations above.
- Motion to adjourn at 12:00 Don and seconded by Don.

10.4.2 Working Group on PCS Revisions to C57.12.90

1. Introduction of members and guests
Mark Perkins presided over the meeting as Chair. Craig Stiegemeier was secretary. Attendance rosters were circulated for those in attendance to record their presence and confirm their membership or guest status.
An introduction of members was conducted.

A motion was made by Joe Melanson to put consideration of a gas injection test be included in today's agenda as a new item. Ajith Varghese seconded the motion. Bertrand Poulin suggested this may not belong to PCS. A vote was taken on the motion, and it passed 22-0.

After a review of the attendance sheets, 36 of the 54 active members of the WG were in attendance. This resulted in a quorum of 66% of the membership, making this meeting “official” as a quorum was reached. There were also 62 guests present, making a total attendance of 98.
2. Patent issue review - skipped, handled in registration process and main meeting this morning

3. Minutes of the St. Louis meeting
   A review of the Fall 2013 St. Louis meeting was conducted. Motioned by Joe Melanson, seconded by Marnie Roussell and was voted on with unanimous approval.

4. Old Business
   Draft Clause 9.5.3 Zero Sequence Testing has been completed and sent to Standards Subcommittee. This will be balloted in the next revision of C57.12.90.

5. New Business
   - Thang Hochan suggested changes to Section 9.3.1. Mark reviewed those changes to section 9.3.1 and 9.3.2
     - 9.3.1 Wattmeter voltmeter ammeter method
       - Requires phase angle correction, an AC source to provide full current and voltage, wattmeter, capacitors on source side, often requires large & expensive system, and is impractical for field test systems.
       - The proposal is an alternative method. Mark presented a circuit:

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AC SOURCE

CT

W

V

HV

BUSHING

CT

LV

CAPACITOR

A
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   - This can be done either single or 3 phase, requires no phase angle correction, source supplies only the real power (0-50A), capacitors used on load side must be tuned to ZL, can use less expensive elements, practical for field test systems. Mark went through the steps of making measurements using the proposed alternate.
     1. Tune the capacitor to the transformer impedance
     2. Apply impedance voltage with source
     3. Power Factor will be in the range of 0.9 to 1.0
     4. Set the current with Ammeter on Bushing CT
     5. Measure real power with the wattmeter
     6. Measure Impedance with voltmeter and Bushing CT and Ammeter
     7. Subtract the loss of capacitor bank (typical 2-5% of LL)
     8. Can also be used to determine the phase angle error in loss measurement system.

   - Mark reviewed some details showing the benefits of the alternate method.
   - An extensive discussion of this proposed addition ensued. Capacitor manufacturer information was reviewed, with some arguing that the loss assumption 0.5 W/kVAR was too high for modern capacitors. The 0.5 w/kVAR was given by a capacitor manufacturer. Bertrand and others recommended using a lower value of watts for capacitors such as 0.2 or 0.3 W/kVAR.
   - Tauhid Ansari made a motion, seconded by Ramsis Girgis that the information for the alternate test be circulated and comments collected before the next meeting. The vote was unanimous in the affirmative.

   - The working group considered the gas detector relay gas injection test that was added to the agenda. Ed teNyenhuis believes that this would fit under PCS, and it should be presented at the subcommittee. A suggestion was made that this might be developed by a joint task force of PCS WG C57.12.00 and C57.12.90. This will be considered for future meetings.
6. Attendance roll call (see results above) – Before the meeting, the Working Group had 58 members, broken down as the following:
   - 54 Members
   - 4 Corresponding Members
   - >300 Guests

7. Adjournment – Meeting adjourned at 12:13 pm

10.4.3 PCS WG on “General Requirements C57.12.00” – Steve Snyder, Chairman; Enrique Betancourt, Secretary

The WG met with 44 members and 68 guests present. As the Working Group membership stands at 80 members, we did have a quorum and were able to conduct official business.

The following 18 guests requested membership, which will become effective only after attending two (2) consecutive meetings:

- Alan Traut Power Partners
- Aniruddma Narawane ABB
- Daniel Blaydon Baltimore Gas & Electric
- Emil Bercea ABB
- Jarrod Prince ERMCO
- Javier Arteaga ABB
- Jeff Golarz Lumasense
- John John ABB
- Juan Saldivar Prolec GE
- Mario Locarno Doble
- Mark Lachman Doble
- Leopoldo Rodriguez Efacec
- Paul Morakinyo PSE&G
- Rebecca Smith Schneider Electric
- Rhett Chrysler ERMCO
- Sarkar Amitabh CG Power
- Shaman Karim CG Power
- Victor Garcia Siemens

The Chairman opened the meeting by stating the purpose of the Working Group, that is to address matters pertaining only to performance characteristics in standard C57.12.00.

Following introductions and circulation of the attendance sheets, the new Chairman, Tauhid Ansari, was introduced.

Next, the proposed Agenda was accepted by the members present and the minutes from the St. Louis meeting were approved as submitted (Kenneth Skinger and Joe Melanson).

Discussion on Old Business topics

A. WG Item 99 - Clarification of Ratio Requirement for LTC in Bridging Position.

This item arose as a topic for discussion due to issues when measuring turns ratio of transformers with reactance type tap changers when in the bridging position, since the excitation current drawn by the reactor can load the test circuit and cause misinterpretations in the measurement. A clause to address this matter was proposed in the previous meeting and surveyed among the PCS / WG membership.

141 Sent
62 Responses (44.0%)
54 Affirmative (91.5 %)
5 Disapprove ( 8.5%)
3 Abstain
The Chairman presented a slightly revised version of the proposed paragraph incorporating a couple editorial suggestions from the Approval Comments, and then what next steps should be taken:

1) Resolve what to do with existing proposal – accept, modify for text changes as indicated, or reject.

Discussion

M. Perkins stated that it is not necessary to add clarification, as appropriate test equipment should be used instead. (This was the basis for 2 of the negative votes). With no further comments, the motion was made (Ajith Varghese, Ewald Schweiger) to send the proposed new text as presented to the Standards Committee, with results of 30 members in favor, and one against (M. Perkins).

The following two items did not raise any discussion to support a motion and were not further considered.

2) Should another WG item be initiated to address the objections from one negative voter and one approval with comments regarding issues they have regarding the preceding clause?

3) Should another WG item be initiated to address the approval comment about nameplate voltages being based upon equal step voltages, while in actuality it is common that turns per tap may be unequal?

Next Agenda Item was presented for discussion.

B. WG Item 97, C57.12.00-2010 Table 18 Routine, design, and other tests

Change requested to provide details for the operational tests on the LTC equipment, under full voltage (during No-Load test) and under full current (during Load loss test) be described in C57.12.00. The details of the LTC operational test should be described in C57.12.90, but the requirement for the test itself needs to be added here. A “study group” consisting of Joe Foldi, Tauhid Ansari, and Rainer Frotscher have been working to refine a proposal for the operational test requirements for the LTC in C57.12.00, Table 18. As part of the WG session, a presentation was given by Rainer (from Reinhausen), related to Load Tap Changer testing in the transformer factory. This presentation will be posted on the WG website.

At the conclusion of the presentation it was stated that

a) DGA is not a generally applicable method to monitor tap changer performance during factory functional tests, as different types of tap changers have different gas generation characteristics. Only some basic control tests, as for example monitoring of gases in the main tank, before and after the functional tests of resistive tap changers, can be considered for recommendation at this stage.

b) Static resistance measurement of windings for each tap changer position is a feasible, meaningful test to perform in the transformer factory, with some impact on manufacturing cycle. It can detect electrical contact problems.

c) Dynamic resistance measurement (DRM) can provide factory reference fingerprints, to detect future tap changer issues by changing taps. However, for application on the transformers test floor it requires an expert view to interpret resultant charts, therefore it is considered more appropriate for field testing.

The following arguments were raised during intensive discussion within the WG session:

- Load tap changer devices are fully tested before leaving the tap changer factory and, in general case, it should not be necessary to test them again at the transformer factory.

- For application of DGA, would it even be possible to provide some threshold values for bad gas data?

- It was pointed out that operational tests for transformer auxiliary devices are already stated on
Table 18 of C57.12.00; however, how to perform the tests is not clear from present text.

- WG C57.12.90 is responsible for describing test procedures, but C57.12.00 has to define which specific tests have to be performed.

The Chairman recommended that the Study Group add a representative of (at least) one more manufacturer of on-load tap changers. The Study Group must first determine the need and feasibility of the functional test, and then provide recommendation on how to proceed with minimum impact to transformer test time. Once these requirements are known and approved, a request will be made for the PCS WG C57.12.90 to develop the test procedures.

As time was expiring, the meeting was adjourned at 6:00 PM with Kenneth Skinger and Phil Hopkinson, as first and second in this motion.

### 10.4.4 WG for IEEE Standard Requirements, Terminology, and Test Procedures; for Neutral Grounding Devices, PC57.32;

1. Quorum was established by a head count and confirmed by the attendance rosters after the meeting – 9 working group members were present with 21 guests.
2. Agenda reviewed and approved.
3. Minutes from last meeting approved. Motion to approve was by Mike Sharp. It received a Second by Don Ayers. Minutes were approved unanimously.
4. Tom Melle (vice chair) is maintaining the official draft document. Draft 12 was issued prior to the meeting.
5. Sheldon Kennedy summarized the present status of the Draft 12. There are still some general clauses that contain technical material which should to be moved to specific equipment clauses and updated. Then the general clause information can be deleted.
6. Test code clause 15 contains obsolete test information from old standards. This clause will be removed after any significant information has been moved to the relevant equipment clauses. The equipment clauses will also use references to other standards as needed to keep the information current.
7. Mike Sharp reported that the Neutral Grounding Reactor clause will be complete after verification of the test information.
8. Sergio Panetta reported that the Grounding Resistor and Combination Devices clauses will be complete after verification of the test information.
9. Sheldon Kennedy reported that the Grounding Transformer clause had made significant progress and should be finished after verification of the test information and clean up of other conflicts with general clauses.
10. Clause numbering issues will be corrected.
11. Motion: Don Ayers moved that Grounding Transformers BIL levels should line up with power class C57.12.00 BIL levels with a note that system insulation coordination must also be considered. Sergio Panetta seconded. The vote was 6 Yes and 1 No and 2 abstained. The motion passed.
12. Table 5 in the general clauses will be removed after the BIL information is moved.
13. Schedule: Completed draft sections need to be sent to Tom Melle by the end of April 2014. Monthly phone calls and web meetings will be used to finalize the draft. A working group survey will be done after this. A Subcommittee Survey will be done before the Fall 2014 Meeting. This document must be approved by the end of 2015.

### 10.4.5 WG on Tertiary/Stabilization Windings PC57.158 – Enrique Betancourt, Chairman; Steve Snyder, Secretary

The Chair Enrique Betancourt called the WG meeting to order at 9:30 am on March 24, 2014. Vice-Chair Brian Penny was also present. A statement was made as to the Working Group’s purpose for preparing this Guide for publication and the meeting agenda was presented with no additions.
Introductions and a member roll call were taken. As of this meeting the Working Group consists of 29 regular members and 18 corresponding members. 22 Members and 3 corresponding members were present, thus a quorum was attained. 46 Guests were present, and 11 of them requested membership to the WG:

- J.Lee Cox - Efacec
- Kipp Yule - Bechtel
- Kiran Vedante - ABB
- Mark McNally - KCBPU
- Michael Botti - Mitsubishi Electric
- Omar Ahmed - Transformer Protector C.
- Paul Morakinyo - PSE&G
- Richard von Gemmingen - Dominion
- Raj Ahuja (CM) - SPX
- Sukhdev Walia - Brookfield Renewables
- Waldemar Ziomek (CM) - CG Power

There were no comments to the minutes from the St. Louis meeting and a motion to approve the minutes from both the St. Louis and Munich meetings was made by Dr. Hemchandra Shertukde and seconded by Marnie Roussell and approved.

A. Old Business

The Chairman encouraged the working group members to read the background materials that have been provided, on which the sections of this guide are being based.

New contributions were received on shell form designs (Dr. Lopez-Fernandez) and symmetrical components (Dr. Shertukde), and new contributors are being sought to write sections on the thermal effects on transformers with and without stabilizing windings.

The Chairman further expanded on the multiple uses of stabilizing windings and its difference versus tertiary windings, which may not automatically be connected in delta for 3 phase connections. The Group was reminded that, in the scope of our Guide we have not only transmission transformers, but also primary distribution transformers and wind farm collector transformers, and that, about the latter no comments or discussion has been received or conducted so far. The Chairman will provide WG members with reference of papers on Windfarm collector transformers.

Next Agenda Item.- Review of the comments received from Draft 2

The first comment submitted by Vijayan Krishnamurthy concerned the establishment of the minimum MVA rating when a stabilizing winding would be required for a three phase transformer. This led to a lengthy discussion as to why there should be any reference to MVA and requirements for a stabilizing winding and are not required if zero sequence impedance is low. Sanjay Patel stated that system conditions are the driver and along with Raj Ahuja cited examples of large MVA designs (in range of 600 to 800MVA) without stabilizing windings and no changes required to the design to accommodate the absence of a stabilizing winding. David Ostrander supported this position based on large transformers purchased and in service.

A motion was made by Dr. H Shertukde proposing to move this subject matter to an annex verses keeping it in the main section of the guide. The motion was defeated by a vote of three in favor, nine against and the remainder abstaining.

A second comment also submitted by Vijayan Krishnamurthy was resolved with additional explanation.

The discussion focused on a disagreement whether a stabilizing winding is required for 5 legged/shell form designs on the basis that this is a system issue driven by the users and not manufacture design issue. Sanjay Patel pointed out that three legged core construction with high impedance to the stabilizing winding may behave as if there were no stabilizing winding. Examples of utilities specifying all
transformers without stabilizing windings, on one side, and utilities specifying all transformers with stabilizing windings, on the other side, were again cited with no reference to the criteria used to develop those practices. The Chair cited again some reference literature, as the papers from Cogbill, and McNutt-Alexander, frequently cited in our document.

The third comment by Vijay Tendulkar requested more clarification on 5 legged core designs pertaining to how the core and windings provide two different functions. Vijay Tendulkar also provided the fourth comment relating to small transformers outside of the scope of this document and if the experience from these designs can be translated to the larger sizes. A reference was made to IEEE C57.105 “Three Phase Connections in Distribution Systems” and a request for volunteers to review this guide to find possible applications to the stabilizing winding guide.

Motion was made to adjourn and the meeting was concluded at 10:45 am.

**10.4.6 TF on Revision of Section 13 of C57.12.90, Sound Level Measurement**

The TF met at 1:45 PM on Monday, March 24, 2014 with a total of 90 in attendance. This breaks down to 18 Members, 7 Corresponding Members, and 65 Guests. There were nine requests for membership. Prior to the meeting, the membership had been adjusted to 30 members and an agenda with the unapproved minutes were circulated to all members and corresponding members for review.

At the start of the meeting, a request for corrections or comments to the unapproved minutes of the fall 2013 Saint Louis meeting was made without objection. An updated agenda with 2 additional items was presented. A quorum had been established after reviewing the signup rosters. The minutes of the fall 2013 TF meeting stand approved.

After introductions, Chairman Dr. Ramsis Girgis presided over the technical portion of the meeting. The TF and PCS Subcommittee were surveyed prior to the meeting with the proposed revision of section 13 of C57.12.90 and associated proposed additions / modifications to Table 18 in C57.12.00. The chairman reviewed the results of the survey and commended the excellent feedback and comments received; many of which have been implemented. He stated that he personally responded, by return e mail, to many of those who provided comments and suggestions.

First was the response of the survey of the revision of the whole of section 13. Out of the 49 responses, 31 approved with no comments, 14 with comments, 2 disapproved with comments, and 2 abstained. On Tables 31-34, of the 44 respondents, 27 felt there was no need for these tables, 15 expressed the need to expand the tables, and 2 abstained. On Annex B.5, of the 47 respondents, 43 approved with no comments, 2 approved with comments, and 2 abstained. On Table 18, of the 47 respondents, 42 approved without comments, 3 approved with comments, and again 2 abstained. The Chairman then made a brief review of those aforementioned focus areas and asked for comments from the floor.

As a follow – up of the Survey, four specific areas were discussed. The first was the sound wall – reflections correction for test rooms with one side open. The Chairman presented two alternatives for arriving at this factor:

1. Using a 0.5 value for the Acoustic Absorption Coefficient for the area of the ‘closed room’; as understood to be used by the new revision of the IEC Standard.
2. Determine the wall – reflections correction for the area of the closed room and then multiply it by the ratio of the closed surface area to the total area of the test room including the open side.

The first method gave a 1.3 dB correction while the second method gave a 2.0 dB correction.

When Dr. Chris Ploetner (Chairman of the IEC WG revising the Sound measuring Standard) was asked to comment on this correction, he stated that in IEC the 0.5 value is used for the open side area only. The chairman proposed using the same correction method proposed by the IEC WG, for two reasons:

1. It more closely represents the situation with the open side with a large room behind it.
2. Serves the objective of having better alignment between the IEEE and the IEC Standards.

No comments or objections were received from the attendees on this proposal.
A question was then raised from the floor on the possibility of using factory vs. field noise measurements to verify these corrections. Dr. Girgis explained that there are many factors that contribute to sometimes significant differences between factory and on-site noise measurements. He announced that a new IEEE Transactions paper, authored by him and his team to be published soon, presents many of these factors. The paper includes comprehensive measurements supporting the contribution of these factors.

The next item presented was the Proposed Tables 32 and 33 to be used for presenting the noise measurements; Table 32 for measurements using the “Sound Pressure Method” and Table 33 for measurements using the “Sound Intensity method”. No comments or objections were made on the proposed Tables.

The next item presented was text to be added in Annex – B.5 of C57.12.90, explaining the basis for the value of 3.6 dB used for the 50 / 60 Hz conversion of the core noise level. This was in response to a request by Jeewan Puri in the Survey.

The next item presented was adding a new Annex – B to C57.12.00 that will include text on reference levels to be used for Load noise. This Annex will be referenced in Table 18 in the same manner NEMA Table TR1 is referenced for no-load noise. For the load noise reference levels, the chairman suggested using the same formula used in IEC (Reiplinger’s equation); which, according to the text in IEC, and supported by test data, gives rough estimates of load sound power of 3-phase transformers. According to this equation, the Sound power level of a 60 Hz transformer is determined by the equation 43.6 + 18 x Log (MVA); where the MVA is the top power rating of the transformer. The added text will state that:

“For Auto – Transformers and 3 – Winding transformers, the equivalent 2 – Winding Rated Power is to be used instead. Single – Phase transformers will correspondingly have a few dB (s) lower Load Sound levels. Test data, however, has shown that actual load sound power levels can vary mostly between +12 dB to -6 dB from the levels calculated using above equation”.

The chairman stated that above is based on test data collected on a large number of power transformers produced by 4 different manufacturers and cover a very wide range of MVA ratings. This data was presented at this TF meeting.

A question on the reason for eliminating the parameter “S0” in the reference equation was answered by the Chairman as being not necessary since its value is 1.0.

A question was raised by Sanjay Patel as to why not use the TR1 Table levels as reference levels for the total noise levels of transformers. The Chairman answered that the TR1 levels are based on no load noise performance of transformers when no special noise reduction features are used in the design. Load noise, however, adds to no load noise and is typically lower, or much lower, than no load noise for smaller power transformers and higher, or much higher, than no load noise for large power Transformers. Therefore, there is a need for separate reference levels for load noise.

Jeewan Puri stated that Load noise is different from different manufacturers because of different clamping, design, etc., so, why do we need to have reference load noise levels? He also suggested that the reference levels could belong to a Guide. The chairman responded that the dependence of noise level on the design, and the manufacturer, is true for no-load noise too. Also, differences in design and manufacturing parameters are the reason for the variability between the levels estimated using the IEC equation and test data as was presented.

The chairman stated that it is the plan for this TF to develop a Table of reference levels of Load noise of power transformers paralleling those in NEMA TR1 Table for no-load noise. In the TF meeting, Raj Ahuja reported that, upon the Chairman’s request, he notified the NEMA group in their meeting a day earlier that this Audible Sound TF is developing such a Table. Raj reported that NEMA was interested in receiving such a Table.

A suggestion was made by Jeewan Puri to add text that when making “1/3 Octave” or “Narrow band Octave” measurements, stated conditions for sound measurements using the “Sound pressure method” or the “Sound Intensity method” only apply to the main frequency components of core noise; namely 100 / 125 Hz, 200 / 250 Hz, 315 / 400 Hz, and 400 / 500 Hz and the 100 / 125 Hz components when measuring load noise. The chairman praised this suggestion and stated that this statement will be added to the text of revised section 13.
Jeewan Puri expressed his thanks to the chairman for explaining the several concepts that are the basis for the proposed revisions and for the theoretical and testing basis of the additions in this revision. These were presented by the Chairman at the TF meetings over the past few years; which aided in this discussion. Jeewan expressed interest in a deeper study made on the magnitude of the near – field effect and urged suppliers to inform their customers what their typical (P – I) index is. The Chairman responded that the near – field correction was based on comprehensive measurements and studies presented in 3 IEEE papers and was presented, and discussed in length, at the TF meetings over the past few years and was agreed upon by TF members. The chairman also showed in this TF meeting data of 6 large power transformers tested in a semi – sound room that demonstrated that the near – field effect is truly very close to 1.0 dB as proposed in this revision. The chairman thanked Jeewan for his input and that 3 of 4 of his suggestions during this revision have already been incorporated which contributed to a very good and complete revision.

The chair then asked Chris Ploetner whether IEC is correcting for the near – field effect. He stated that it is not doing that because IEC is pushing users towards using the “Sound Intensity measuring method” for being the more accurate method of measuring transformer noise levels. When asked about the status of the IEC revision, Chris stated that the WG is presently in the process of closing the comments and hoping to publish the revision next spring.

Steve Antosz (Chairman of the main C57.12.90 Revision) stated that the goal is to implement all revisions in C57.12.90 and C57.12.00 for this year’s balloting that should start in the next 1 – 2 months.

During the discussion of “future items” on the agenda, the question on the IEEE “Noise Abatement Guide” was raised as to what its future should be. Since the PAR is about to expire at year end, it was proposed to ask for an extension of the PAR for two years. Since this Guide addresses sound abatement methods that are not within C57.12.90, the Guide still has some value. However, most of the material in the Guide is believed to be outdated and would need updating and revising. The chairman suggested to review the original Guide and to discuss the next step in the fall meeting of the TF in order to determine how much of the Guide we still need and what updates are needed. The plan for the fall meeting is for the chairman to present an overview of both the present IEEE Guide and the revised IEC Application Guide.

The meeting ended with a remark by the chairman recognizing his associate Mats Bernesjo’s significant help with the works of this TF and the extensive effort put producing this Revision of the noise Standard.

As time had expired, the meeting adjourned at 3:00 PM

10.4.7 WG P60076-16 Standard Requirements for Wind Power Generator Transformers

Chairman: David Buckmaster; Vice Chair: Phil Hopkinson; Secretary: Donald Ayers

First meeting of joint IEEE-IEC Working Group

The initial Joint Working Group on Wind Power Transformers was held Friday and Saturday, March 21 & 22, 2014 in the Pulaski room, at the Savannah Riverfront Marriott, Savannah, Georgia with representatives from both IEEE and IEC present. Since this was first joint meeting, all attendees are considered members of the working group. For the eight hour meeting on Friday, 10 IEEE members, 2 IEC members, 2 IEEE/IEC members and 1 guest attended. For the four hour meeting on Saturday, 12 IEEE members, 2 IEC members, 2 IEEE/IEC members and 2 guests attended

The attendees proceeded to discuss the existing draft paragraph by paragraph with the intent of harmonizing the wording to be acceptable to both IEC and IEEE. The entire document was covered and many changes were proposed and entered into the draft. The draft will be submitted to the full committee for comments. The PAR expires December 2016.

The next joint IEEE/IEC meeting will most likely be held in either Berlin or Nuremburg, Germany about June 23 and 24, 2014. Members will be notified once final arrangements have been made. All committee members are invited to attend.
The Working Group on Wind Power Transformers was called to order at 9:30 a.m. EST on Tuesday, March 25, 2014 at the Riverfront Marriott Hotel, Savannah, Georgia. There were 98 attendees, 42 members present of a membership of 65 and 56 guests. A quorum was present.

The following guests requested Membership on the Working Group:

- Patrick McShane, Cargil, Inc., Waukesha, WI
- Arturo Nunez, Mistras Group, Princeton Junction, NJ
- Rogerio Verdolin, Teshmont Consultants, Calgary, Alberta, Canada
- Dieter Dohnal, Maschinenfabrik, Regensburg, Germany
- Javier Arteaga, ABB, Inc., South Boston, VA
- Phil Ghaforian, ERMCO, Athens, GA
- Jeff Golarz, LumaSense Technologies, Santa Clara, CA
- Rhett Chrysler, ERMCO, Dyersburg, TN
- Wayne Dilling, Mortenson Construction, Minnetonka, MN
- The following guest requested Corresponding Membership on the Working Group:
  - Kipp Yule, Bechtel Power Corp., Frederick, MD

This will bring membership of the committee to 71 Members and 9 Corresponding Members.

Chuck Johnson made a motion to accept the agenda for the meeting and was seconded by Craig Colopy. The motion passed unanimously.

Chuck Johnson made a motion to accept the minutes from the Fall 2013 meeting and was seconded by John John. The motion passed unanimously.

It was announced that the second joint IEEE/IEC meeting on the standard would be held in either Berlin or Nuremburg, Germany about June 23 and 24, 2014. An announcement will be sent out once the exact location and time have been confirmed.

A general discussion was held covering the details of the work done by the joint IEEE/IEC meeting on March 21 and 22, 2014. It was indicated that the most recent working copy of the joint IEEE/IEC Committee was sent to the mailing list on March 22, 2014 requesting comments back by May 23, 2014 so to have available for the June joint meeting in Germany.

A request was made to Jody Haase, IEEE to obtain copies of pertinent existing standards that cover motor/generators or wind turbine generators.

A discussion was held on sizing wind turbine transformers to the capability of the wind turbine. Phil Hopkinson agreed to collect information and develop an informative annex to the document to cover this subject.

It was announced that there would be another joint IEEE/IEC meeting on Friday and Saturday, October 17 and 18, 2014 before the next IEEE Transformers Committee meeting in Washington DC. The chairman requested that interested parties that plan to attend this meeting to notify him by the end of April, 2014.

The meeting was adjourned at 10:45 EST.

10.4.8 – WG on “Distributed Photo Voltaic (DPV) Grid Transformers” PC57.159, Chairman Hemchandra Shertukde; Vice Chairman: Mathieu Sauzay; Secretary: Sasha Levin

The Working Group met in the Savannah C room of Savannah Marriott Riverfront hotel. This was a fourth meeting of the WG.
The meeting was called to order at 1:45 pm by Chairman Hemchandra Shertukde.

The meeting was convened with 41 participants present, 13 of them are members (that constitutes a quorum out of 27 current members in the roster minus 3 absent corresponding members), 11 participants requested a membership.

**Old Business**

Fall 2013 St. Louis Meeting Minutes were approved.

**New business**

Meeting Agenda was approved.

Chairman has described the current status of the Guide and ask P. Hopkinson to present the planned topic on “Potential PD generation and gassing in the transformers with wound shell type cores and outside grounding”.

1) P. Hopkinson described the phenomena and said that this problem is pervasive and not just limited to Wind Power Transformers. It is a safety matter and large amounts of hydrogen could be collected in the air spaces. P. Hopkinson is aware of at least 2 catastrophic tank ruptures when arcing occurred in the hydrogen and oxygen atmosphere.

The transformers that are most at risk are:

1. Any 3-Phase with wound 5-leg cores using outside core grounds with Low-High construction and generally greater than 15 kV class.

2. Any Single Phase with Shell Form Construction using outside core grounds with Low-High construction and generally greater than 15 kV class.

3. Three Phase transformers that could be impacted are:
   a. Network transformers
   b. Pad mounted transformers
   c. Substation Transformers
   d. Wind Power Transformers
   e. Solar Power Transformers
   f. Data Center Transformers
   g. Auto transformers

4. Single phase transformers that could be impacted are:
   a. Pole type transformers
   b. Pad mounted transformers
   c. Shovel Transformers
   d. Station Transformers
   e. Auto Transformers

P. Hopkinson thinks and proposed that this issue should be mentioned in IEEE C57.12.00 and repeated in the respective product standards of the C57.12.20, 30, and 40 series.

P. Hopkinson now has data from multiple sources which corroborates his position. He has worked on the fixing gassing problem with several customers. Hydrogen levels on 34.5 kV class transformers with wound cores and outside core grounds often reaches 40,000 parts per million or higher levels. The accompanying gases of Methane, Ethane, and Ethylene are of the same concern. Hydrogen forms at 700 deg. C temperatures and is always a sign of discharges. Methane forms at 120 deg. C and is related to heating from static charges flowing down through the cores. Ethane forms at 250 deg. C and Ethylene at
350 deg. C. After installing core shields and monitoring transformers back in service, all of the gases are
down to trace levels.

He has data on 41 transformers that have been retrofitted with shields and placed back in service (new
service on the oldest units has exceeded 9 months) and no gassing on any of them. Phil also has feedback
on 400 transformers, that were purchased with shields from the beginning, with again no gassing.

A motion will be made at the PC Subcommittee for form a TF to recommend wording and appropriate
standards about this phenomenon.

John Crouse commented that, in his practice, there was not high potential voltage drop on the wound core
leg as long as the core wound tightly – no high resistance. He can see this might happen in loosely wound
core, but 800 V voltage drop is still looks too high.

P. Hopkinson responded that the modern steel laminates insulation is much better than it was in the past
creating higher overall voltage drop on the core stack.

IEEE PC57.159 Draft 2 of the Guide describes this phenomenon. WG asked P. Hopkinson to propose the
wording for the Guide – see current page 15, lines 31-34 (ACTION).

2) Chairman asked Secretary S. Levin to make a more detailed review of the Draft 2 of the Guide and
discuss the open topics and questions (indicated in red color in the Draft 2 of the Guide). The following
was discussed and the following participants have volunteered to develop these topics for the Guide (all
comments and input should be provided by end of May 2014):

Section 1.1 - page1

WG decided to reduce the WG scope by excluding the consideration of the residential transformers
because they are not specifically addressed in the Guide – S. Levin (ACTION)

Section 3 – page 2

Definition of:

inverter transformer – S. Kennedy, S. Walia (ACTION)
substation collector transformer – J. Schneider (ACTION)
Section 4.1 – page 3 and page 4
highest DC voltage on the DC terminals of the inverter – 1100 V
highest AC inverter output voltage – 1100 V
highest AC transformer secondary (HV) voltage – 36000 V

WG discussed the variety of configuration of the DPV systems.

J. Yu – discussed this topic with system developers: transformer design is dictated by the inverter design.
Inverter Instructions (for example, SMA and Power One) contains a good explanation on the reasons of
the transformer properties selection. Please try to obtain these Instructions from the inverter
manufacturers for the review of our WG.

WG group spent some time discussing what DPV system configurations shall be presented in the Guide
(see current Fig. 1). WG asked to include a system with 2-winding transformer configuration along with
3-winding shown in Fig. 1 – S. Levin (ACTION).

J. Yu mentioned that there is also so-called isolation transformer is used in these systems. These
transformers often are inside of the inverter and majority of the group agreed that these transformers are
not a subject of the Guide.
D. Ayers commented on the lines 27-30, page 3 of the Draft 2 - he asked whether an inverter transformer ever works as a step-down transformers. J. Schneider noted that in some regimes – yes. The indication on the Fig.1 shall be changed from MV transformer to the inverter transformer – S. Levin (ACTION).

3) WG discussed the timeline of the Guide Preparation and Ballot:

**10.4.9 TF to Investigate the Interaction between Substation Transients And Transformers in HV and EHV Applications Chairman Jim McBride**

Task Force Meeting took place on Tuesday at 3:15pm in Oglethorpe A&B.

The chair opened the meeting with a brief introduction to the objectives and goals of the task force.

The below goals for the group were reviewed for those not present at our first three meetings.

Goal: Prepare a TF report on the need to revise the C57.142 guide to extend to HV and EHV applications.

Deliverables: TF report and recommendation on forming a WG to revise the guide (or not)

**TF Objectives**

- Establish the present target voltage class range of the C57.142 guide
- Gather field data, reports and literature on HV and EHV failures related to substation transients and transformer interaction
- Get input from the other technical committees concerning the interactions between substation transients and transformers at HV and EHV applications
- Review IEC and CIGRE standards
- Recommend if there is sufficient need to revise the guide and if WG should be formed.
• Recommend high level changes to the guide (if it should be revised)
• Prepare final report to the SC and present work in SC or tutorial session

A quorum was not present.

71 people in attendance
14 members present (quorum was reached)
3 people requested membership

The approval of the minutes from the St. Louis meeting will be sent handled by email.

Angelica Rocha made a presentation on the work done in a brochure entitled “Electrical Transient Interaction between Transformers and the Power System”. She described work completed and is ongoing within CIGRE on HV and EHV transients and their interactions with power transformers. She outlined several different methods of modeling power transformers that are included in the brochure. She presented some data from various modeling methods and modeling software packages. She presented results of a modeling software comparison done on a fictitious transformer designed for this comparison study. The study resulted in terminal transients that matched well, but the simulation results for points inside the transformers had variations between different packages.

A method of assessment of transformer voltage stress was described. This method is called Frequency Domain Severity Factor. This is a numeric factor developed to help in assessing whether possible transients are below or above the stresses covered by the existing factory acceptance tests. It was noted that time domain stress factors must also be considered.

Some controversial results were presented that indicate that repetitive high frequency pulse voltage applications can cause a decrease in insulation breakdown voltage.

Several case studies and modeling examples of transformer failures on HV and EHV systems were presented. There are approximately 12 cases in the brochure that involve HV and EHV systems.

There were several good questions and comments presented at the conclusion of her presentation. Some are outlined below:

1) Sanjib Som commented on some of the repetitive voltage application margins and that the units should have survived based on the line insulation.
2) Jin Sim noted that analysis should be done early in the transformer specifications process and that many transformer users may not have the expertise to supply transients for the FDSF calculations.
3) Bertrand Poulin indicated that some transformer users do provide special waveforms for manufacturers to design the transformer to withstand.
4) Phil Hopkinson noted that of the cases presented, there were no failures attributed to devices which incorporate closing resistors.
5) Pierre Riffon indicated that he has seen instrument transformer failures attributed to disconnector switch operations similar to those presented.

The chairman presented the voltage transfer characterization obtained from the energization transients on a 230 / 20 kV 60 MVA transformer through a circuit switcher. The transfer ratio at the internal resonant frequency of 41kHz was approximately 4 times smaller than the 60 Hz transfer ratio. This indicates that 41kHz voltages on the high voltage terminals which are below the surge protect level can produce damaging voltage levels on the low voltage terminals.

The chairman also indicated that several large auto-transformer failures that have been attributed to internal resonant frequencies excited by faults on the transmission system. The chair presented a transformer terminal fault transient measured 3.1 miles from the fault location. The transient was 120kV p-p at 12kHz.
The chairman presented waveforms provided by Loren Waggner. These waveforms provided per unit peak voltages excited by the energization through a circuit breaker. The waveforms were captured by a high speed acquisition system developed and installed at AEP. Several of the transients on the low voltage terminals were near or above 1.5 pu.

The next steps are to survey members in consideration of the data and case studies gathered to this point and attempt to make a decision on appropriated recommendations to the main subcommittee.

The meeting was adjourned at 4:35 pm.

10.4.10 Task Force for revision of IEEE Std. C57.110 “IEEE Recommended Practice for Establishing Liquid-Filled and Dry-Type Power and Distribution Transformer Capability when Supplying Non-sinusoidal Load Currents”

Date: 25 Mar 2014, 11:00 – 12:15
Chair: Richard Marek
Vice-chair/secretary: Radoslaw Szewczyk

This unofficial Task Force meeting was called by the chairman to review the current document and to decide on what revisions should be made. Invitations were sent out before the meeting to a selected group of individuals representing different groups of users and equipment suppliers. A group of eleven persons participated in this initial meeting and all requested membership in the working group.

Introductions were made.

A history of the document was presented by chairman, including the main items covered in each previous revision.

A formal request for interpretation from late 2012 was presented along with the responses. It will be distributed to the task force for review.

Then, the existing document was reviewed to identify items possibly requiring revising. It was agreed that the chairman would send out the current document dated 2008 to the task force for review. A similar document, IEC 61378-1 will also be distributed to the participants for review to evaluate the need for harmonization.

The Title of the existing document was reviewed and it was agreed that it does not require modification.

The current Scope: “This recommended practice applies only to two winding transformers covered by IEEE Std. C57.12.00, IEEE Std. C57.12.01, and NEMA ST20.1. It does not apply to rectifier transformers.”

The restriction to only “two winding” transformers in the Scope was questioned and discussed at length. The scopes of the previous revisions were reviewed for reference and it was agreed that limiting the Scope to two winding transformers is not necessary, and it would then be deleted.

The current Purpose: “The purpose of this document is to establish uniform methods for determining the capability of transformers to supply nonsinusoidal load currents of known characteristics.”

A request was made to modify the purpose to match the title and all agreed. The phrase “to supply” was changed to “when supplying”.

The chairman will submit the PAR request based on the results of this meeting so that a full working group can meet in the fall in Washington, DC.

The meeting adjourned at 12:15.
Annex K   Power Transformers Subcommittee

Date March 26, 2014
Savanah Georgia

Chair: Joe Watson
Vice Chair: Bill Griesacker
Secretary: Kipp Yule

K.1 Meeting Attendance

The Power Subcommittee met on Wednesday, March 26, 2014, at 1:30 PM. A role call showed 57 of 76 members in attendance achieving quorum at the meeting, without the 5 corresponding members. Overall, there were 173 attendees, 57 members, 116 guests, including 20 that requested membership upon tabulation of the circulated rosters.

K.2 Approval of previous meeting minutes, and meeting agenda

The Chair noted the agenda had some additional items as displayed, and the updated agenda, Attachment K.2 was approved following a motion by Craig Colopy, with a second by Dieter Dohnal.

The Chair explained the corrections / clarifications to the previous meeting minutes of the Fall 2013 meeting in St. Louis, Missouri, adding a brief statement to the Fall ’13 minutes in the last paragraph of Section 7.6.3 (New Business), that stating we discussed adopting IEC 60214 as a joint document to cover both C57.131 and IEC 60214, and the consensus was to wait until the latest revision of IEC 60214 is completed and to then review the document, and vote on the question.

There will be a new Task Force lead by Craig Colopy to review the IEC 60214 parts 1 and 2, and C57.131 once issued, and create a recommendation as to align, or move towards becoming a joint standard.

The motion to approve the corrected meeting minutes; Wally Binder moved for approval and Axle Kramer seconded, then the minutes were approved by unanimous vote; provided the corrections were incorporated as explained.

The corrected Fall 2103 Power Subcommittee meeting minutes have been submitted and posted.

K.3 Chair’s Remarks

At the Administrative SC meeting it was stressed the importance of recording discussions and maintaining the attendance records in the AM System for all WG and TF meetings. The Chair offered support to anyone that is working in the attendance module of the AM System. This is important to track membership attendance and adjust roster role to better achieve quorum requirements.

Regarding Introductions, this is best when time permits, however it not mandatory provided name and affiliation is stated when speaking.

Also, The Chairs reminded the group that the duty of the Chair is to act as the meeting facilitator, and to remain impartial and not steer the meeting. Roles should be considered for adjustment to
allow the technical experts to contribute, and not necessarily be restricted by serving in an officer role. The Chair indicated openness to adjusting roles when appropriate.

K.4 **Working group reports**

K.4.1 **Revision of C57.93 IEEE Guide for Installation and Maintenance of Liquid-Immersed Power Transformers** – Mike Lau

See Attachment K.4.1 for the detailed discussions regarding Vacuum Hold Time, Set Time (rest time after oil fill), and Soak Time (energized without load), static electrification, pump run time.

K.4.2 **Revision of C57.125 Guide for Failure Investigation, Documentation, Analysis and Reporting for Power Transformers and Shunt Reactors** – W. Binder

See Attachment K.4.2 for the detailed discussions of motions regarding the following:

- **Passed** - Use term “insulating liquid” in place of other forms, accept bibliography & references,
- **Passed** - Safety clause from C57.152 into C57.125 document in its entirety,
- **Passed** - To remove Annex A – Testing and replace with Proposal, Motion not recognized due to (Annex A removed) - Revise Draft to include reference to PD Measurement,
- **Passed** - Dissolve “TF on Merger of C57.117 into C57.125”, **Passed** - Go to ballot with Draft 5.1, and **Passed** - Form an Editorial Review / Ballot Resolution TF. There was a report on Coordination Activities with CIGRE given.

Wally Binder requested the Power SC acceptance and concurrence to go to ballot and requested a motion be made. Bill Bartley motioned that PTSC vote for PC57.125 to go to Ballot with Second by Dave Wallach. PTSC Chair asked for discuss and questioned if all the work was complete based on WG Chair report. Wally Binder explained only editorial changes to Draft 5.1 are required and those would be made prior to submitting for IEEE editorial review. With that understanding the PTSC Chair asked for a vote. There were no objections, and no one abstained. PC 57.125 **Passed** to Go to Ballot.

K.4.3 **Development of PC 57.153 Guide for Paralleling Transformers** - Tom Jauch

See Attachment K.4.3 for the detailed discussions of motion to go to Ballot and formation of Ballot Resolution Group.

Tom Jauch requested the Power Transformers SC acceptance and concurrence to go to ballot. The WG Chair motioned that PTSC vote for PC57.153 to go to Ballot with Second by Dave Wallach. PTSC Chair asked for discussion, there was none There were no objections, and no one abstained. PC 57.153 **Passed** to Go to Ballot.

K.4.4 **Development of PC57.156 Guide for Transformer Tank Rupture Mitigation of Liquid-Immersed Power Transformers and Reactors** - Peter Zhao

See Attachment K.4.4 for the detailed discussions.
K.4.5 Development of PC57.157 Guide for Conducting Functional Life Tests for De-Energized Tap Changer Contacts - Phil Hopkinson

The WG Chairman brought up Draft 5.1 of the PC57.157 Guide and began reading through the draft and discussing comments from the group.

Comments that were received from Draft 5 / 5.1 were reviewed. There were still comments with no resolution due to time constraints of the meeting, so they will be reviewed by TF after this meeting. 12 of the 37 comments for review from Draft 5 were discussed and resolved (see chart at end of minutes).

It was suggested to use a task force to review the comments received. Representatives from several switch manufacturers were suggested by the chairman to be a part of this task force.

The plan is to have open comments reviewed/implemented and then the Draft 6 will be created and circulated through the WG for ballot by the Fall 2014 meeting.

See Attachment K.4.5 for the details.

K.4.6 Development of Standard Requirements for Phase Shifting Transformers - IEEE/IEC 60076-57-12 - Raj Ahuja

See Attachment K.4.6 for the details.

WG Chair requested PTSC To move forward with submitting Draft#6 of IEEE/IEC 60076-57-1202 Standard on Phase Shifting Transformers for IEEE sponsor ballot.

PTSC Chair asked for discussion, and Jodi explained the IEEE / IEC process regarding moving forward in the approval process. There were no objections, and no one abstained with respect to IEEE / IEC 60076-57-12 proceeding with the process of approval and balloting.

K.5 Old Business
None

K.6 New Business

K.6.1 IEEE 638 Revision of IEEE Standard for Qualification of Class 1E Transformers for Nuclear power Generating Stations

Standard was approved in December 2013

K.6.2 Three Working Groups ready to go to Ballot once POWER SC approval achieved.

Results of proceeding to ballot are list with each Working Group.

K.6.3 New Task Force to consider IEC / IEEE Tap Changer harmonization - Craig Colopy

The goal is to bring the IEEE and IEC documents into similar updating timing to avoid the leapfrog revisions that have been occurring by IEEE adopting IEC or . There are different options, which will be the task force’s purpose to review and recommend an appropriate means to bring the updating similar or identical time periods.

Discussion points – TC Chair asked what would be the improvements. Axle explained the IEC has Part 1 and Part 2. The IEEE does not have the application guide. If IEC part 1 is adopted the content of Part 2 would be excluded, we should strive to include both parts.
A motion to form a Task Force to study how best to create application guide for tap changers, in conjunction with IEC, was made by Craig Colopy, Seconded by Dieter Dohnal. Motion passed with one SC member abstaining.

K.7 Adjournment
The meeting adjourned as scheduled.

K.8 Attachments –Working Group Meeting Minutes and Agenda
Attachment K.4.1 – PC57.93 Installation Guide
Attachment K.4.2 – PC57.125 Failure Investigation
Attachment K.4.3 – PC57.153 Paralleling Guide
Attachment K.4.4 – PC57.156 Tank Rupture Guide
Attachment K.4.5 – PC57.157 Functional Life DETC Guide
Attachment K.4.6 – IEEE / IEC 6076-57-12 Phase Shifting Transformers
Attachment K.6.3 – TF IEC / IEEE Tap Changer harmonization
Attachment K.2 – S14 PTSC Agenda
Minutes of the Working Group Meeting
Chair Mike Lau called the WG meeting to order at 11:00 am on March 24, 2014. 15 of 28 members were present, so a quorum was achieved. 28 guests also attended, for a total attendance of 43. 5 guests requested membership.

A motion to approve the agenda was made by Dieter Donhal, seconded by Mike Miller. The agenda was approved unanimously. The Fall 2013 meeting minutes were approved by acclimation.

Chair Mike Lau presented a summary of comments received re the vacuum processing tables.

The following tables were discussed:

- **Vacuum Hold Time**

  It was noted the oil temperature must remain high enough to prevent moisture from freezing for vacuum processing to be effective. Mike Lau suggested the existing vacuum hold times be retained, but with periodic heating cycles to address the heat of vaporization issue. This suggestion was accepted by the working group.

- **Hold and Set Times**

  It was agreed the title should be change to Set Time (The Doble guide refers to this as Stand Time). It was asked why different hold times were recommended for new units versus serviceaged units. It was agreed that the set times for new and old/reprocessed units should be combined into a single table with common values.

  Tom Melle made a motion to survey the working group asking what set times are typically used, seconded by William Solano. An amendment to the motion was proposed by Joe Watson to include all vacuum processing criteria in the survey, but there was no second. The original motion was passed unanimously. Tom Melle will submit the survey request to the officers for distribution to the working group.

- **Hold and Set Times – Running Pumps**

  The Doble guide recommends different stand (set) times when pumps are running or not running. The issue of static electrification was raised and there was agreement this issue needs to be addressed. Static electrification may occur with high oil velocity through the winding and is not proportional to pump capacity. It affects primarily units with directed oil flow designs. Joe Watson agreed to draft a clause for the guide which will address the dangers of static electrification.
Soak Time

The discussion focused on why soak times are necessary. It was suggested soak times offer no value to ensuring the integrity of the transformer. Users responded soak times were used to check for initial gas accumulation, warm the unit prior to cold load pick up, and to reduce switching loads due to a failure. Soak times, if used, will depend on why the transformer is being filled (i.e. bushing change out, retrofilling, unit failure) and how long the active parts were exposed to air. The question of the need for soak times was not resolved.

The chair proposed to combine the set time tables for new and old units into one table. This proposal was accepted with no objections.

It was affirmed again that the manufacturer’s installation procedures will take precedence over this guide’s recommendations.

Ewald Schweiger volunteered to draft a proposal to remove the shipping and handling clauses, and refer instead to C57.150, the new transportation guide.

Stephanie Denzer and Jim Graham agreed to draft a proposal for installation of transformers filled with natural ester insulating liquids.

The working group meeting was closed by acclimation at 12:15 pm.

Respectfully submitted

Mike Lau  Saurabh Ghosh  Jim Graham
WG Chair  Vice Chair  Secretary
March 24, 2014
1. Introductions – Identify Representation and Determination of Quorum By Roll Call

Attendance was taken and quorum was established. There were 23 Members and 4 Corresponding Members present at the meeting; 16 members were required for quorum.

2. Presentation of Agenda / Revisions to Agenda Approval of Agenda

Motion was made to approve the meeting agenda and seconded. The motion passed, the agenda was approved.

3. Approval of Previous Meeting Minutes

Milwaukee (Motion to Approve)
Munich (Motion to Approve)
St. Louis (Motion to Approve)

Motion was made by Ken Skinger to approve the three meeting minutes and seconded. The motion passed, the meeting minutes were approved.

4. Chairman's Remarks – Wallace Binder

WG P&P and Transformer Committee P&P Manual(s) Changes

This manual was discussed and approved at the main committee meeting. No additional discussions were held.

Membership Changes

1. Roster cuts (21 changed to Guest or Corresponding)
2. Welcome New Members (Membership now @ 28)
   Adam Sewell
   Jeremy Sewell
   Chuck Sweetser

Membership was discussed and the above three new members were introduced.

Schedule for Revision of C57.125

Schedule was discussed: PAR expires 12/31/2015; RevCom submission date 10/19/2015; Document completion date 09/01/2015.

5. Old Business

- Surveys -Draft 4 Comment Resolution (No quorum on survey return)
- Motion to use term “insulating liquid” in place of other forms (discussed at Milwaukee included in Survey D4).
  Ken Skinger proposed this motion, xx seconded the motion, motion passed
• Motion to accept bibliography & references (discussed at Milwaukee).
  Bruce Farris proposed this motion, Ken Skinger seconded the motion, motion passed

• Motion to add Safety clause from C57.152 into C57.125 document in its entirety (approved in Munich, recorded as short of quorum).
  Ken Skinger proposed this motion, Kipp Yule seconded the motion, motion passed

• Motion (Tabled at St Louis) to remove Annex A – Testing and replace with “Proposal A”
  Jin Sim discussed his comparison of Annex A to C57.152. Jin proposed that a Annex A be removed from C57.125 and a Task Force be formed to identify and include any testing information from C57.125 Annex A into C57.152. Ken Skinger seconded this motion, the motion passed.

• Motion to Revise Draft to include reference to PD Measurement (discussed in St. Louis, Shown on “Proposal B”)
  Because Annex A will be removed, this motion is not necessary and was not recognized.

6. Report on Coordination Activities with CIGRE – Thomas Melle
  The minutes from the last CIGRE meeting will be posted on the Transformer Committee web page under this Working Group.

7. New Business
• Motion to Dissolve “TF on Merger of C57.117 into C57.125” (Task complete – housekeeping)
  John Roach made this motion, Bruce Farris seconded the motion. The motion passed.

• Draft 5.1 (Issued to members 2014/03/02 & posted on Web Page since 2014/03/04)
• Motion to go to ballot with Draft 5.1 (Requires 2/3 Majority)
  Adam Sewell made a motion and Kipp Yule seconded the motion. The motion passed: (15) Yes votes, (3) No votes; and (2) Abstentions

• Motion to Form an Editorial Review / Ballot Resolution TF
  Ken Skinger made this motion and Diego Robalino seconded the motion. The motion passed.

• Other New Business
  Matt Lawrence discussed the failure population database being developed by Doble Engineering. Mark Rivers of Doble will be invited to the Fall 2014 meeting to speak in greater detail on the subject.
8. Announcements

    No announcements were made.

9. Adjournment

    Greg Anderson made a motion to adjourn the meeting and Ken Skinger seconded the motion. The meeting was adjourned.

Respectfully Submitted,
John Roach,  WG Secretary
Wallace Binder, WG Chair (2014/05/15)
Minutes from WG Transformer Paralleling Guide PC57.153

Savannah
Tuesday, March 25, 2014
4:45-6:00pm
Chair – Tom Jauch
Secretary – Mark Tostrud
Vice Chair – Jim Graham
Total attendees - 57
  24 of 33 members were present
  1 corresponding member was present
  32 Guests (16 new)
Attendance was recorded in AMS
New members are not being added since we are in the balloting process.

• Introductions
• Quorum was achieved
• Motion to approve the minutes from St. Louis
  o 1st Sanjib Som
  o 2nd Roland James
  o Vote
    ▪ Yes - unanimous
• Motion to approve the agenda for this meeting
  o Hemchandra Shertukde
  o Marnie Roussell
  o Vote
    ▪ Yes - unanimous
• Results of the vote to go to ballot on rev 9.1
  o Results of the vote
    ▪ Yes – 19
    ▪ No – 10
    ▪ Abstain – 1
  o Fast response group was formed to resolve comments
• Results of the vote to go to ballot on rev 9.2
  o Results of the vote
    ▪ Yes – 23
    ▪ No – 6
    ▪ Abstain – 2
• Comments on the vote to go to ballot
  o Bill Bartley/Erin Spiewak/Don Plaatz commented on the balloting process
  o Working group officers recommend we go to ballot
  o Members are working to resolve some of the comments that we expect to receive during ballot
• Jim Graham was appointed to lead the ballot resolution committee
  o Requested members send an email if they want to join the ballot resolution committee
  o Ballot resolution committee needs to contain a balanced interest of members, manufacturers and consultants
  o Plan to have one ballot resolution committee but will divide the document into sections and assign resolution committee members to expedite the resolution of comments
• Discussion of comments that were submitted on the last draft 9.2
• Meeting was adjourned at 6:00pm
The meeting of the Working Group for the Guide for Tank Rupture Mitigation convened Monday afternoon at 1:45pm. Chairman Peter Zhao presided.

Attendance was 63 (17 members, 46 guests). Membership is 44. Therefore a quorum was not achieved. As a result, we were not able to approve the agenda nor actions discussed in regard to the Guide.

Chairman Zhao provided introductory remarks and previewed the agenda to be covered for the meeting.

After introductions and distribution of rosters, a discussion ensued in regard to responses received from Jos Veens and Matthew Brien. Jos and Matthew had agreed to check with their reviewers in regard to comments/recommendations originally submitted. Vice Chairman Thompson led a review and discussion of items for change and for the one remaining open item remaining from the original list of comments/suggestions.

General Source Items for which revisions are planned:

The latest changes to the guide were reviewed for information and discussion.

Matthew Brien new Items (Matthew not present):

- Matthew suggested that the title of the guide should be changed if scope includes prevention of rupture as well as mitigation of rupture and thought it unclear as to what scope is.
- Under 4.1 “Conventional Tank construction, Matthew objects to the wording referring to a ‘slow rate of increase in pressure” as such a case for which the pressure relief device(s) would not suffice to protect are rare.
- Under 4.2 “Improved Tank Strength”, Matthew disagrees with recommendation that rupture would be prevented or mitigated by corner reinforcement, but suggested that it would simply move the problem to another location.
- In clause 4.2, “Improved Tank Strength”, Matthew suggests that general guidelines be provided as to best locations of PRD’s.
- Matthew suggests that the entire section on TTPRS and Design Review be moved out of the document, as they constitute disproportionate portions of the guide.
- Matthew suggests removal of section 7.4 “Tank Deflection Test” as it would be difficult to consistently measure in all areas and may not provide useful information to the User.
- Matthew suggests addition to section 7.5 “Tank Pressure Test” to add verbiage in regard to system mitigation measures such as fault limiting, surge protection, etc., which may prevent internal transformer faults.

Jos Veens Items:

- Agreed to add to the sentence under “Design Review” (clause 7.1) “The welding procedure should be reviewed, along with the results of strength tests on sample welds” – “if available”.
- Agreed to merge section 7.4 “Tank Deflection Test” and 7.5 “Tank Pressure Test” and rewrite on the basis of testing in the elastic region by agreement between Owner and Manufacturer.
- Discussed balance between Owner’s desired information/testing versus Manufacturer’s reasonable capability/willingness. Jin Sim suggested that a reasonable expectation of the Owner would be similar to what is provided in regard to proving/justifying the hot spot for a proposed transformer. Jin suggested that what is unreasonable is to require dynamic testing.

This issue caused considerable discussion of the issue of ‘reasonable expectations of the Manufacturer by the Owner. It was suggested that the manufacturer should be expected to develop his own methods for adequately validating the transformer’s capabilities by the use of type testing and calculations.

There was discussion of a paper published around reduction of fault current, but design of protective relaying systems, etc. to control not only fault current, but duration of fault currents.

Mike Spurlock or AEP stated that most utility installations have already done about all they can to practically to minimize stresses that lead toward transformer failures.
Chairman Zhao concluded the meeting by informing that plan to proceed to ballot/review within the membership in lieu of general balloting, and that no more informal comments will be accepted.

As our allotted time had run out the meeting was concluded.

Meeting was adjourned at 3:00pm.

Respectfully,
Robert Thompson, V Chair
Working Group for
Standard Requirements for Phase Shifting Transformers
WG IEEE/IEC 60076-57-1202

Meeting Minutes –March 25, 2014

K.9 Savannah, Georgia USA

K.10 Raj Ahuja, Chair; Paul Jarman, Vice-Chair; Stephen Antosz, Secretary

The WG met from 11:00 AM to 12:15 PM at the Marriott Hotel.

Welcome announcements were made. Introductions of all in attendance were done. The St Louis minutes of the previous meeting were approved. The Agenda was presented and approved.

Agenda:
- Introduction of members & guests
- Roll call for quorum
- Approval of Fall 2013 minutes
- Report on the working Draft prepared after Fall 2013 meeting
- Update on comments received from WG members on draft dated 021514
- Input from WG members on any comments on the Draft
- Target Dates, Meeting Schedule
- Adjourn

There were a total of 60 in attendance. 24 members and 36 guests. 8 guests requested membership. 4 were accepted since they attended a previous WG meeting. There were 24 of 32 members in attendance, so we had a quorum, and a 2/3 majority.

The attendance roster was circulated. The Chair gave a report on a summary of the WG activities done so far and planned activities for future schedule.
Work done after St Louis Meeting

- WG meeting on Jan 22nd and 23rd 2014 at Nijmegen, hosted by Smit, reviewed comments received on Draft, and continued working
  - Section 3: Terms and Definitions – modified few terms used in the existing guide and added new definitions
  - Section 6: Rating and General Requirements – Revised/Updated
  - Section 9: Connection and Phase displacement Symbols
  - Section 10: Rating plates
  - Section 11: Terminal Markings and phase rotation
  - Section 12: Information to be provided by manufacture
  - Section 13: Tests
  - Section 14: Tolerances

Work done after St. Louis meeting

- Annex A: Check list of information to be provided with enquiry and order – Draft Completed
- Annex B: Behaviour of a Phase Shifting Transformer with non-symmetrical fault currents – Draft Completed
- Annex C: Specification of buck capability – Draft Completed
- Annex D: Additional noise measurements – Draft Completed
- Annex E: Calculation of phase angle under load – Draft Completed
- Annex F: Additional Phase Shifter Connections

- Circulated 5th Draft to all WG members in Feb. 2014
- Received 56 comments from 8 members till 3/22/14, reviewed comments on 3/24/14, from 6 PM to 9:30 PM, reviewed remaining technical comments at WG meeting on Tuesday 3/25/14.
- Draft will be updated for these and Editorial/General comments on Thursday 3/27/14.

WG Meeting Update

- On Tuesday March 25th WG members approved a motion
  - to move forward with a motion to PT SC for submitting Draft#6 for IEEE Sponsor Ballot
  - The vote was unanimous in support. And we had better than a 2/3 majority of members in attendance.
Motion for Sponsor ballot

Motion for Subcommittee members

To move forward with submitting Draft#6 of IEEE/IEC 60076-57-1202 Standard on Phase Shifting Transformers for IEEE sponsor ballot

Future Planned Activities

- Circulate Draft to IEC member countries
- Initiate sponsor Ballet to IEEE Members
- Due date for Comments -- Mid July 2014
- Compile Comments -- August 2014
- Discuss comments and revise CD to CDV
- Plan for CDV - Dec. 31st 2014
- IS/TS March 31st 2015, 1 Year Extension will be required

IEEE

PAR Expires 12/31/2016

The meeting adjourned.

Respectfully submitted,
Stephen Antosz
IEEE WG Secretary
Power Transformer Sub Committee New Business

New Task Force to consider IEC / IEEE Tap Changer harmonization - Craig Colopy

1.) Introduce IEC On Load Tap Changer Team (below).
2.) Propose to SC to have an Application Guide for ON Load Tap Changers
3.) If approved, propose to SC to have a joint revision of IEC 60214-2 for dual logo process
4.) If approved have Joe Watson appoint Chair and Vice Chair and issue directions to create a PAR
5.) PAR to be approved at June SASB
6.) Two day WORK Meeting in Montreal in July for joint revision of IEC 60214-1
7.) Propose to SC to start process of adopting IEC 60214-1 to replace C57.131 by establishing a task force to review Published version. Appoint Task Force Chair and Vice-Chair
AGENDA

IEEE Transformers Committee / Power Transformers Subcommittee
Wednesday, March 26, 2014, 1:30-2:45 PM
Savannah ICC Room, Savannah Marriott Riverfront Hotel, Savannah, GA
Joe Watson – Chair, Bill Griesacker – Vice Chair, Kipp Yule – Secretary

1. Call to order
2. Introduction and distribution of attendance sheets
3. Determination of a quorum
4. Approval/correction of the fall 2013 minutes
   a. Add C57.131/IEC 60214 discussions
5. Report from the Administrative Subcommittee meeting
6. New Business
   a. A new IF to prepare a comparison of C57.131 and IEC 60214 and present a recommendation on whether we should or should not merge both documents into a joint logo document
7. Working Group and Task Force reports

<table>
<thead>
<tr>
<th>Project or Standard Number</th>
<th>Title</th>
<th>Chair</th>
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<tbody>
<tr>
<td>C57.12.10</td>
<td>Revision of IEEE Standard Requirements for Liquid-Immersed Power Transformers*</td>
<td>Gary Hoffman</td>
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<tr>
<td>C57.17</td>
<td>Revision of Requirements for Arc Furnace Transformers*</td>
<td>Robert Ganser</td>
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<tr>
<td>C57.93</td>
<td>Revision of IEEE Guide for Installation and Maintenance of Liquid-Immersed Power Transformers</td>
<td>Mike Lau</td>
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<tr>
<td>PC57.116</td>
<td>Revision of Guide for Transformers Directly Connected to Generators*</td>
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<tr>
<td>PC57.125</td>
<td>Revision of Guide for Failure Investigation, Documentation, Analysis and Reporting for Power Transformers and Shunt Reactors</td>
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<tr>
<td>PC57.140</td>
<td>Revision of Guide for Evaluation and Reconditioning of Liquid-Immersed Power Transformers*</td>
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<td>Raj Ahuja</td>
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* No meetings were scheduled in Savannah for these documents

8. Old Business
9. Collection of Attendance Sheets
10. Adjournment
Annex L   Standards Subcommittee – Unapproved Minutes

March 26, 2014
Savannah, Georgia

Chair:  William Bartley
Vice Chair:  Kipp Yule
Secretary:  Jerry Murphy

The Chair, William Bartley opened the meeting calling a show of members to establish quorum which was met.

Bill then requested a review of the Agenda; Bob Thompson moved for approval and Jim Graham seconded then the agenda was approved by unanimous vote.

L.1   Meeting Attendance

The Standards Subcommittee met on Wednesday, March 26, 2014, at 4:30 PM. A role call showed 28 of 50 members in attendance achieving quorum at the meeting. Overall there were 87 attendees, 28 members, 59 guests, including 6 that requested membership upon tabulation of the circulated rosters with 4 meeting the established criteria.

L.2   Approval of previous meeting minutes

The Chair asked if there were any comments or corrections to the previous meeting minutes of the Fall 2013 meeting in St. Louis, Missouri. There were no comments to the meeting minutes; Bruce Forsyth moved for approval and Steve Snyder seconded then the minutes were approved by unanimous vote.

L.3   Chair’s Remarks

Bill summarized the recent activities of the Transformer Standards activity for the six-month period October 1, 2013 to March 1, 2014. In the last five months, no new Standards, one Revision and one Corrigenda were approved by Standards Board. In this same period, Standards Board approved one PAR for a new standard, two PAR modifications and one PAR extension. The Transformer Committee is responsible for almost 100 standards, plus over 55 PARs, projects for new standards and revisions. The full Standards Report is available on the Transformers Committee website at the following link:


Bill shared the following reminders with the subcommittee from the Administrative Subcommittee.

a.  Agendas must be approved and recorded in minutes as do the minutes.

b.  Standards procedurally must be approved by the SC to proceed to SA ballot. This is not a technical review, but required to make advisement to all SC members.

c.  Steve Antosz asked, “How do working groups of one get 2/3 approval?” Bill will take this to the AdCom and ask.
L.4 Working group reports

L.4.1 Continuous Revision of C57.12.00

The purpose of this WG is to compile all the work being done in various TF/WG/SC’s for inclusion in the continuous revision of C57.12.00 in a consistent manner. This WG coordinates efforts with the companion Standard C57.12.90 so that they publish together. The goal is to issue new Standards every 2 to 3 years.

Standard C57.12.00 was published September 2010. A new PAR was requested in April 2011 and approved June 16, 2011 to cover the ongoing work for the continuous revisions. This PAR is good through December 31, 2015.

At this point several changes / additions to the standard have been approved by the respective subcommittees and have been placed into the document. The Dielectric Tests Subcommittee is finishing work on revisions to Tables 4 and 5, which I deem critical to have included in this next revision. There also is an issue concerning an equation error in section 7.4 that needs corrected. Two weeks following the conclusion of this meeting I will solicit input from all subcommittees for any additional changes that they may have ready for inclusion in the next ballot.

Subject to the successful outcome of the preceding statements, I expect in mid-2014 to form the ballot pool and launch the ballot.

Respectfully submitted, by Steven L. Snyder, WG Chair, on March 26, 2014

L.4.2 Continuous Revision of C57.12.90-2006

This is essentially a working group of one person. There was no meeting held. The purpose of the WG is to keep track of the work being done in various TF / WG / SC for inclusion in the continuous revision of C57.12.90 in a consistent manner.

Summary

The new PAR was approved on June 15, 2011. It is valid until Dec 31, 2015.

Future Revisions

Changes already approved for the next revision:

- New subclause 10.2.5 Connection of neutral terminal during switching impulse tests by Pierre Riffon’s WG Revision to Impulse Test in Dielectric Test Subcommittee. Submitted on 4/27/09.


- Revision to subclause 10.3.2.4 Tap connections during lightning impulse test by Pierre Riffon’s WG Revision to Impulse Test in Dielectric Test Subcommittee. Submitted on 10/28/10.

- Revisions to subclauses 10.2.1, 10.3 and 10.3.3 which increases the number of full wave impulse waves applied from one to three. This is the same as IEC

• Revisions to Temperature-rise tests by Paulette Payne Powell’s WG in the Insulation Life Subcommittee
  o Subclause 11.1 which reversed the order of appearance of the two methods of simulated loading for temperature test. Submitted in January 2013.
  o Subclause 11.2.2 which revised items “a” through “f” of the hot resistance measurement procedure for temperature test. Submitted in January 2013.
  o Revision to subclause 9.5 Zero Phase Sequence Impedance from Mark Perkins’ PCS WG for Revision of C57.12.90. Final survey circulated in 2013; submitted in Feb 2014.

pending work

• Revision to Clause 13 Audible Sound by Ramsis Girgis’ TF in the Performance Characteristics Subcommittee. TF and SC surveyed in March 2014.

• Other possible revisions to subclauses 10.2 to 10.4 from Pierre Riffon’s WG for revision of impulse tests. Ongoing work continues…

• Other possible revisions to subclauses 10.5 to 10.10 from Bertrand Poulin’s WG for revision of low frequency tests. Maybe some change due to Class II PD testing on 69 kV, xfmrs >15 MVA. Ongoing work continues…

Respectfully submitted by Stephen Antosz, WG Chair, on March 2014

L.4.3  WG on Revision of IEEE PC57.152 (old 62) – Jane Verner

The Working Group has completed its work and the standard has been published in 2013.

L.4.4  TASK FORCE on Recommendations to the IEEE Transformer Committee (TC) on Recommended Changes, Deletions, and Insertions Related to Normalizing the References of Insulating Liquids Throughout the IEEE TC Standard Series

P. McShane–TF Chair

Patrick McShane reported for the task force.

Annex of subject matter experts was removed.

L.4.5  TASK FORCE for Comparison of IEEE & IEC Standards for Cross Reference

The task force for IEEE-IEC cross reference was formed in October 2013 at the St Louis meeting.
The task force did not schedule a meeting at Savannah and will have the first meeting at Washington DC in October 2014.

Completed the comparison of the IEEE C57.12.00 with the IEC 60076-1 and the updated comparison is attached. The earlier comparison was done to the CDV document available at that time. This comparison will be updated in next few months.

Ajith Varghese is currently working on the comparison of transformer testing requirements in documents C57.12.00-2010 sections 8 & 9 and C57.12.90-2010 with IEC 60076-1(2011) and IEC 60076-3.

Both of the above comparisons will be crosschecked by another member and will be available on SC Standards web page and presented to the members at the next meeting.

Respectfully submitted by Vinay Mehrotra on March 24, 2014

L.5 Old Business

None

L.6 New Business

None

L.7 Adjournment

The meeting was adjourned by Chair without objection; the meeting adjourned around 5:10pm.

Respectfully submitted by Jerry R. Murphy, Standards SC Secretary
Annex M  Underground Transformers & Network Protectors SC – Chair:
Carl Niemann
March 26, 2014
Savannah, Georgia

Chair:  Carl Niemann
Vice-Chair: Dan Mulkey

M.1  Meeting Administration

Dan Mulkey chaired as Carl Niemann did not attend this meeting due to personal issues, and with George Payerle acting as secretary.

Introductions – The meeting was called to order. In the interest of time, introductions were not made.

Quorum – The members were listed on the screen and by a show of hands, it was determined that there was a quorum with 10 of the 13 members in attendance.

Approval of Minutes – The Fall 2013 minutes were amended to correct various spelling errors. They were motioned for approval by Alan Traut and seconded by Said Hachichi. The subcommittee approved these without opposition.

Members in Attendance:

Adam Bromley - Fort Collins Utilities
Said Hachichi - Hydro-Quebec
Brian Klaponski - Carte International Inc.
Daniel Mulkey - Pacific Gas & Electric
George Payerle - Carte International Inc.

Jeremy Sewell - Quality Switch, Inc.
Adam Sewell - Quality Switch, Inc.
Giuseppe Termini - PECO Energy
Alan Traut - Power Partners
William Wimmer - Dominion

Guests in Attendance:

Kevin Biggie - Weidmann Electrical Technology
Richard Cantrell - Doble Engineering Co.
Jermaine Clonts - Power Partners
Valery Davydov - Mr. Valery Davydov
Anil Dhawan – ComEd

* Larry Dix - Quality Switch, Inc.
Fredric Friend - American Electric Power
* Carlos Gaytan - Prolec GE
Robert Kinner - FirstPower Group LLC
Lalin Kothalawala - Manitoba Hydro
* Alejandro Macias - CenterPoint Energy

* Charles Morgan - Northeast Utilities
Martin Navarro - Siemens Ltda
Robert Olen - Cooper Power Systems by Eaton
Barbara Patoine - Weidmann Electrical Technology
* Justin Pezzin - IFD Corporation
Russell Sewell - Quality Switch, Inc.
Stefan Siebert - BROCKHAUS MESSTECHNIK
Richard Smith – Eaton
* Anastasios Taousakis - Pepco Holdings Inc.

* Requested and was granted membership in the Subcommittee
M.2 Each of the working groups that met reported as follows:

M.2.1 C57.12.23 Single-Phase Submersible Transformers – Alan Trout, Chairman, Adam Bromley, vice-chair.
Revision due date: 3/19/2019
PAR Expiration Date: NA

The meeting was called to order and everyone was asked to introduce themselves. Blank rosters were sent around as this is a new WG.

We did not need to establish a quorum as this is the first meeting and we will be establishing the group of members after this meeting. We had 40 attendees with 29 requesting membership.

Approval of minutes – There are no previous minutes as this is a newly formed working group.

Old business – none as this is a new WG

New Business - Title was modified to include 34500GrdY/19920 V instead of 25000 V. The low voltage rating did not change and was kept at 600 V. Ron Stahara asked if the 35 kV level was feasible and the consensus was that it is.

There was some discussion about changing the largest kVA size. Some customers’ largest size is 250 or 500 kVA. There was a comment about the biggest unit used in a manhole might be 250 kVA. Giuseppe Termini and Dan Mulkey recommend that we go to 250 kVA; Said Hachichi wanted to know why we wouldn’t go bigger (he buys 333 kVA and a few 500 kVA). There was another comment that a 333 kVA would be limit of the current standard stud size. Brian Klaponski recommended that we keep the maximum size at 250 kVA; there seemed to be consensus surrounding that suggestion.

Al Traut and Adam Bromley will ensure that the entire document is updated with new kVA, voltage ratings, etc.

Title and Scope - While reviewing the three phase submersible standard it was noted that the scopes are very similar except that 12.23 has the following paragraph: “This standard does not cover the electrical and mechanical requirements of any accessory devices that may be supplied with the transformer.” It was decided to delete the sentence because we don’t want to state what the scope isn’t.

Ron Stahara made a motion to accept the changes to the Title and Scope; Rich Smith seconded that motion. The motion was unanimously approved and will be used for our PAR application.

Dates - Al asked if we wanted to keep dated references to other IEEE standards in this standard. Ron Stahara mentioned that we want to keep them generic. Brian Klaponski mentioned a concern that when something changes we might easily have an outdated reference. If we are referencing a specific section, it might make sense to use the date. It was decided that we want to use generic references as much as we can, and only use specific references when we have to. Al Traut and Adam Bromley will check all references and update references that need to be changed.

Consistency - There was a comment made regarding the need to keep consistent with submersible enclosure integrity and three phase submersible standards on definitions of submersible, submerged operation, etc.
Brian Klaponski asked if we wanted to keep the 55°C winding rise as a standard. Dan Mulkey stated that the insulation system is based on 65°C, but when we put in a submerged environment, the expectation is to have the 10°C cushion for when air circulation is non-existent.

Al Traut and Adam Bromley will update the document with the proposed changes. We will also submit a PAR application for this standard for approval at NESCOM prior to the October 2014 meeting.

Adjournment – The meeting was adjourned at 10:25 am. The next meeting will be in the Washington D.C. area in October 2014.

M.2.2 C57.12.24 Three-Phase Submersible Transformers working group – Giuseppe Termini, Chairman
Revision due date: 6/17/2019
PAR Expiration Date: 12/31/2015

Introductions – the meeting was called to order at 9:45 and introductions were made. George Payerle acted as recording secretary.

Quorum - The meeting was attended by 14 members and 33 guests. A quorum was achieved with 14 out of 17 members present. Six (6) guests requested membership. Under the new guidelines, guests must attend two (2) consecutive meetings before they can qualify for membership.

Approval of Minutes - The minutes from the St. Louis meeting were reviewed. Dan Mulkey made a motion to accept the minutes as submitted, Adam Bromley seconded the motion. The motion was approved unanimously.

Discussion - The chairman then moved to discuss the most recent draft revision of the standard which is D1. Sections 7.3.2 (Pressure Relief) and 7.3.3 (Loadbreak Switch) were reviewed.

After some discussion, the following sub-sections under pressure relief were changed:

1. A minimum ½ inch NPT or UNC fitting shall be located on the transformer cover and used for mounting a manual pressure relief plug or an automatic pressure relief valve.

2. The manual pressure relief plug shall allow slow release of pressure without completely removing the plug.

3. If an automatic pressure relief valve is specified, the fitting shall be sized for the flow rate of the valve and it shall be operable by using a standard hot-line tool.

Brian Klaponski moved to approve the new wording and Dan Mulkey seconded the motion. The motion was approved unanimously. There was additional discussion about adding information, perhaps in the appendix that would explain to the user the need for pressure relief. It was agreed to hold that discussion until after the next meeting. Carlos Gaytan volunteered to provide wording, based on his work in C57.12.39, to use in an appendix and report back at the next meeting.

Load break - The following sub-sections under load break switch were also discussed and revised:

1. A two-position loadbreak switch shall be provided to energize and de-energize the transformer’s high voltage windings.
2. The switch shall be labeled as “OPEN” and “CLOSED” and shall be distinctly observable at a
distance of 2.44 m (8 ft) from the transformer by the position of the handle.

3. The switch operating handle shall be located on the transformer cover and shall be operable by
using a standard hot-line tool.

4. The switch rotation shall be clockwise to close, to energize the high-voltage windings, and
counterclockwise to open, to de-energize the high voltage windings.

5. The minimum current-carrying capabilities of the switch shall be 200 A (continuous current
rating) and 10 kA rms symmetrical for 0.17 s (short-time current rating).

6. All parts of the loadbreak switch external to the tank shall be of corrosion resistant material
other than aluminum and plastic.

Dan Mulkey moved to approve the aforementioned changes and Adam Bromley seconded the motion.
The motion was approved unanimously.

Discussion – Giuseppe Termini noted that progress needs to be made on 12.24 so that it can go to
ballot at the next meeting. Dan Mulkey moved to approve the aforementioned changes and Adam
Bromley seconded the motion. The motion was approved unanimously. Bill Wimmer and Dan
Mulkey volunteered to work with the chairman to review Section 7.3.4 Overcurrent Protection and
make any necessary changes prior to the next meeting.

The chairman stated that the remaining changes in the draft will be reviewed at the next WG meeting
and encouraged the WG to provide additional input prior to the meeting so that the changes can be
included in the next draft revision. The meeting was adjourned at 10:45 with the next meeting
scheduled for October 20, 2014 in Washington D.C.

M.2.3 57.12.40 Secondary Network Transformer working Group – Brian Klaponski,
Chairman
Revision due date: 12/31/2021
PAR Expiration Date: 12/31/2016

Introductions – The WG met on Tuesday March 25, 2014 at 11:00 a.m. with 10 members and 15
guests. An agenda was presented and introductions were made.

Minutes - The minutes of the October 22, 2013 meeting were reviewed and modified as follows:
Added Bill Wimmer and Mark Faulkner to the attendance list. Corrected the meeting location to
Renaissance Grand hotel in St. Louis MO. Corrected the name of a company from Center Point
Energy to CenterPoint Energy. Corrected the name of one attendee from Marcias to Macias. George
Payerle made a motion to approve the minutes as amended above. Jeremy Sewell seconded and the
minutes were approved unanimously.

Document review - The meeting consisted of the review of the proposed changes made at the
previous meeting. Additional changes to the following table and figures were suggested:

a) Table 9 – Change the dropout voltage values to the following:

<table>
<thead>
<tr>
<th>Dropout voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 to 75</td>
</tr>
<tr>
<td>33 to 166</td>
</tr>
</tbody>
</table>
The chairman will forward the changes to the table to Dan Mulkey and Mark Faulkner for review. Dan Mulkey will also solicit input from other end-users.

c) Correction to title for figure 1(b) to add: “Configuration without switch and terminal chamber”

b) Change title to figure 1(c) as follows: “Configuration with or without internal switch”

Discussion - Jeremy Sewell and Tas Taousakis volunteered to work with the chairman to rewrite the clauses in the body of the standard to allow for the introduction of the new figures: 1(b) and (c).

It was suggested that additional grounding (this is safety grounding that is normally provided through the primary network switch so it becomes an issue if there is not a primary network switch) would be required if suggested changes discussed in our meeting in regards to Figures 1(b) and (c) were adopted.

Tas Taousakis stated that 90% of network transformer failures occur in the termination chamber.

Adjournment - The meeting was adjourned at 12:15 pm with the next meeting set for Washington D.C. in October 2014

M.2.4 C57.12.44 Secondary Network Protectors working group – Bill Wimmer, Chairman, Mark Faulkner, Secretary
Revision due date: 12/31/2018
PAR Expiration Date: 12/31/2014

No meeting – Bill Wimmer reported that the document has been balloted and is probably before RevCom today so C57.12.44 did not meet.

M.3 Chairman’s Comments: Based on the new Practices and Procedures, Membership in a WG is granted if you are either at the first meeting or you can request membership after you have attended 2 consecutive meetings. Membership retention is in jeopardy if you miss 2 consecutive meetings without a good reason.

We are supposed to vote on the agenda and vote on the minutes. There needs to be a 2/3 majority to go to ballot followed by a simple majority vote at the subcommittee level. WG chairs need to keep track of attendance in the AM system.

PARs have a life of 4 years and expire on December 31. Standards are good for 10 years from the date they are approved by RevCom.

M.4 Old Business: None

M.5 New Business -

M.5.1 AM System discussion - Brian Klaponski noted that the AM system software is not at all intuitive or user friendly, especially for those who only need to use it every 6 months. Brian moved to ask the committee to request modification of the AM system to make it easier to make changes. Alan Traut mentioned that if someone requests membership, we have to keep track of it ourselves. Our purpose is to discuss the technical aspects of
transformers and it is not a good use of our time to be dealing with difficult software. Adam Sewell seconded. The motion was approved unanimously.

**M.5.2 Membership** - Brian Klaponski noted that membership in the committee is small (13) compared to the number of the people who attend (32 at this meeting) and he encouraged more people to request membership. A number of people did.

**M.6** The meeting was adjourned at 11:25. The next meeting will be in the Washington D.C. area in October 2014.