IEEE/PES

Transformers

Committee

**Spring 2012**

**Meeting Minutes**

**Nashville, TN**

**March 11-15, 2012**

**Unapproved**

**Table of COntents**

1. **Attendance**
2. **Chair’s Remarks & Report – Bill Chiu**
   1. **Chair’s Remarks**
   2. **Chair’s Report**
3. **Approval of Previous Minutes – Stephen Antosz**
4. **Vice Chair’s Report – Donald Platts**
5. **Secretary’s Report – Stephen Antosz**
6. **Treasurer’s Report – Gregory Anderson**
7. **Standards SC Minutes & Report – William Bartley**
   1. **Standards Subcommittee Minutes**
   2. **Standards Report**
8. **Awards Report – Ed Smith**
9. **Meetings Planning SC Minutes & Report – Gregory Anderson**
   1. **Meetings Subcommittee Minutes**
   2. **Meetings Report**
10. **Administrative SC Minutes – Stephen Antosz**
11. **Minutes of Technical Subcommittees**
    1. **Performance Characteristics SC – Ed teNyenhuis**
    2. **Power Transformers SC – Tom Lundquist**
    3. **Underground Trans & Network Protectors – Carl Nieman**
    4. **Bushings SC – Peter Zhao**
    5. **Dry Type Transformers SC – Charles Johnson**
    6. **Distribution Transformers SC – Steve Shull**
    7. **Dielectric Tests SC – Loren Wagenaar**
    8. **HVDC Converter Transformers & Reactors – Mike Sharp**
    9. **Instrument Transformers SC – Ross McTaggart**
    10. **Insulating FLuids SC – Susan McNelly**
    11. **Insulation Life SC – Bruce Forsyth**
12. **Editor’s Report**
13. **Liaison Reports**
    1. **Standards Coordinating Committee No. 4**
    2. **IEC TC14 Technical Advisor to USNC**
    3. **Cigre**
14. **Unfinished (Old) Business**
15. **New Business**
16. **Meeting Schedule**
17. **Attendance**

The following people signed up to attend this Spring 2012 meeting in Nashville.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Last Name | First Name | Company Name | Membership Type |
| 1 | Abebe | Benjamin | HICO America | Interested Individual |
| 2 | Abochie | Delali | Ministry of Energy | Interested Individual |
| 3 | Ahuja | Raj | Waukesha Electric Systems | Active Participant |
| 4 | Albers | Timothy | ABB Inc. | Interested Individual |
| 5 | Allen | Jerry | Metglas Inc. | Active Participant |
| 6 | Allen | Abbey | Baron USA, Inc. | Interested Individual |
| 7 | Alton | Henry | Triacta Power Technologies | Interested Individual |
| 8 | Amos | Richard | Unifin International | Committee Member |
| 9 | Anderson | Gregory | GW Anderson & Associates, Inc. | Committee Member |
| 10 | Anderson | Jeffrey | Advanced Power Technologies | Interested Individual |
| 11 | Angell | Don | Doble Engineering Co. | Active Participant |
| 12 | Antosz | Stephen | Stephen Antosz & Associates, Inc | Committee Member |
| 13 | Antweiler | James | Schneider Electric/Square D | Active Participant |
| 14 | Armstrong | James | Siemens Energy | Active Participant |
| 15 | Aromin | Venzon | Phoenix Electric Corporation | Active Participant |
| 16 | Arteaga | Javier | ABB Inc. | Committee Member |
| 17 | Arthur | Francis | GRIDCO | Interested Individual |
| 18 | Asano | Roberto | ABB | Active Participant |
| 19 | Atef | Kahveh | San Diego Gas & Electric | Interested Individual |
| 20 | Averitt | Ralph | Reinhausen Mfg. | Interested Individual |
| 21 | Ayers | Donald | Ayers Transformer Consulting | Committee Member |
| 22 | Baldwin | Mark | Dominion | Interested Individual |
| 23 | Ballard | Robert | ABB Inc. | Committee Member |
| 24 | Balma | Peter | Peter M Balma Engr Consulting PC | Committee Member |
| 25 | Bane | William | Nashville Electric Service | Interested Individual |
| 26 | Baranowski | Derek | Baron USA, Inc. | Active Participant |
| 27 | Bartley | William | Hartford Steam Boiler | Committee Member |
| 28 | Bauer | Michael | EFACEC | Interested Individual |
| 29 | Baumgartner | Christopher | We Energies | Interested Individual |
| 30 | Beaster | Barry | Delta Star Inc. | Committee Member |
| 31 | Beauchemin | Claude | TJH2b Analytical Services | Committee Member |
| 32 | Becker | Scott | American JST | Interested Individual |
| 33 | Behrens | Tammy | SPX Transformer Solutions, Inc. | Interested Individual |
| 34 | Bercea | Emil | ABB | Interested Individual |
| 35 | Berler | Zalya | ZTZ Services International, Inc | Active Participant |
| 36 | Bernabeu | Emanuel | Dominion | Interested Individual |
| 37 | Bernesjo | Mats | ABB Inc. | Interested Individual |
| 38 | Bertolini | Edward | Richards Manufacturing Co. | Active Participant, IEEE Life |
| 39 | Berube | Jean-Noel | Neoptix Inc. | Interested Individual |
| 40 | Betancourt | Enrique | Prolec GE | Committee Member |
| 41 | Bhatia | Paramjit | Moloney Electric Inc. | Interested Individual |
| 42 | Binder | Wallace | WBBinder Consultant | Committee Member |
| 43 | Blackmon, Jr. | James | Georgia Power Co. | Active Participant |
| 44 | Blake | Dennis | Pennsylvania Transformer | Interested Individual |
| 45 | Blaydon | Daniel | Baltimore Gas & Electric | Committee Member |
| 46 | Boettger | William | Boettger Transformer Consulting LLC | Committee Member |
| 47 | Bohannon | Benjamin | Middle TN Electric Membership Corp | Interested Individual |
| 48 | Bolliger | Alain | HV Technologies | Active Participant |
| 49 | Borowitz | James | Northeast Utilities | Interested Individual |
| 50 | Botti | Michael | Mitsubishi Electric Power Products | Interested Individual |
| 51 | Bozich | Bradford | EFACEC | Interested Individual |
| 52 | Bradford | Ira | TBEA USA | Interested Individual |
| 53 | Brady | Ryan | Transformer Protector Corp. | Interested Individual |
| 54 | Brafa | John | ABB Inc. | Active Participant |
| 55 | Brasher | Jon | ABB Inc. | Interested Individual |
| 56 | Brauer | Stephan | Morgan Schaffer | Interested Individual |
| 57 | Bray | Frank | Arkansas Electric Cooperatives | Active Participant |
| 58 | Brender | David | Copper Development Assoc. Inc. | Active Participant |
| 59 | Britton | Jeffrey | Phenix Technologies, Inc. | Active Participant |
| 60 | Brodeur | Samuel | ABB Inc. | Interested Individual |
| 61 | Bromley | Adam | Fort Collins Utilities | Interested Individual |
| 62 | Brown | Darren | Howard Industries | Interested Individual |
| 63 | Brush | Edwin | BBF & Associates | Committee Member |
| 64 | Brzoznowski | Steven | Bonneville Power Administration | Interested Individual |
| 65 | Buckmaster | David | Shaw Power Group | Active Participant |
| 66 | Burde | Jagdish | Virginia Transformer Corp. | Active Participant |
| 67 | Bush | Carl | Pemco Corporation | Committee Member |
| 68 | Cai | Jim | JSHP Transformer | Active Participant |
| 69 | Callsen | Thomas | Weldy-Lamont Associates | Committee Member |
| 70 | Campbell | James | Dominion Virginia Power | Interested Individual |
| 71 | Carlson | Todd | ERMCO | Interested Individual |
| 72 | Caronia | Paul | Dow Chemical Company | Active Participant |
| 73 | Carpenter | Kenneth | GE Energy | Interested Individual |
| 74 | Caskey | John | NEMA | Active Participant |
| 75 | Castellanos | Juan | Prolec GE | Committee Member |
| 76 | Castillo | Alonso | EFACEC | Interested Individual |
| 77 | Catugas | Marcelo | Nuclear Elect. Insurance Ltd | Interested Individual |
| 78 | Cayachoa | Carlos | Siemens S.A. | Interested Individual |
| 79 | Chadderdon | Philip | Weidmann Electrical Technology | Interested Individual |
| 80 | Cheatham | Jonathan | GE | Interested Individual |
| 81 | Cheim | Luiz | ABB Inc. | Active Participant |
| 82 | Cherry | Donald | ABB Inc. | Committee Member |
| 83 | Chhajer | Dinesh | Megger | Interested Individual |
| 84 | Chiodo | Vincent | HICO America | Interested Individual |
| 85 | Chisholm | Paul | IFD Corporation | Active Participant |
| 86 | Chiu | Bill | Southern California Edison | Committee Member |
| 87 | Chmiel | Frank | ABB Inc. | Active Participant |
| 88 | Cho | KyungHo | HICO America | Interested Individual |
| 89 | Cho | Eun | HICO America | Interested Individual |
| 90 | Choinski | Scott | NEMA | Active Participant |
| 91 | Christodoulou | Larry | Electric Power Systems | Interested Individual |
| 92 | Chu | Donald | Consolidated Edison Co. of NY | Committee Member |
| 93 | Claiborne | C. Clair | ABB Inc. | Committee Member |
| 94 | Coffeen | Larry | NEETRAC | Active Participant |
| 95 | Colopy | Craig | Cooper Power Systems | Committee Member |
| 96 | Comely | Tracy | Warco, Inc. | Active Participant |
| 97 | Costa | Florian | Corimpex USA, Inc. | Active Participant |
| 98 | Craven | Michael | Patterson & Dewar Engineers | Active Participant |
| 99 | Crotty | John | ABB Inc. | Committee Member |
| 100 | Crouse | John | General Electric | Committee Member, IEEE Life |
| 101 | Cruz Valdes | Juan Carlos | Prolec GE | Interested Individual |
| 102 | Cunningham | Kelcie | EFACEC | Interested Individual |
| 103 | Damico | Frank | TAMINI Transformers USA | Committee Member |
| 104 | Darovny | William | Siemens Canada | Committee Member |
| 105 | Dave | Nikita | EFACEC | Interested Individual |
| 106 | Davis | Eric | Burns & McDonnell | Committee Member |
| 107 | Davydov | Valery | Mr. Valery Davydov | Active Participant |
| 108 | Degeneff | Robert | Utility Systems Technologies, Inc. | Committee Member |
| 109 | Del Rio | J. Arturo | Trench Limited | Active Participant |
| 110 | Dennis | Scott | ABB Inc. | Interested Individual |
| 111 | Denzer | Stephanie | General Electric | Interested Individual |
| 112 | DeVries | Derk | Siemens Energy | Interested Individual |
| 113 | Diaby | Mohamed | EFACEC | Interested Individual |
| 114 | Digby | Scott | Progress Energy | Active Participant |
| 115 | Dix | Larry | Quality Switch, Inc. | Committee Member |
| 116 | Dorpmanns | Luc | SMIT Transformatoren B.V. | Interested Individual |
| 117 | Dorris | Don | Nashville Electric Service | Active Participant |
| 118 | Drees | Terry | Cindus Corp. | Interested Individual |
| 119 | Drexler | Charles | KY Assoc. of Elect. Cooperatives | Active Participant |
| 120 | Duckett | Don | HD Supply Utilities | Committee Member, IEEE Life |
| 121 | Dudash | Douglas | Tennessee Valley Authority | Interested Individual |
| 122 | Dukarm | James | Delta-X Research | Active Participant |
| 123 | Dunn | James | ABB Inc. | Interested Individual |
| 124 | Duval | Michel | Hydro-Quebec IREQ | Active Participant, IEEE Life |
| 125 | Ebbert | Alexander | HICO America | Interested Individual |
| 126 | Edwards | William | Reinhausen Mfg. | Interested Individual |
| 127 | Elder | Lonnie | ABB Inc. | Interested Individual |
| 128 | Elliott | Andrew | Trench Limited | Interested Individual |
| 129 | Ellis | Keith | Electric Connection, Inc. | Committee Member |
| 130 | Fairris | James | Nashville Electric Service | Active Participant |
| 131 | Faulkenberry | Michael | Georgia Power Co. | Committee Member |
| 132 | Faulkner | Mark | Eaton | Interested Individual |
| 133 | Fedor | Ken | SMIT USA | Interested Individual |
| 134 | Fernandes | Tania | EFACEC | Active Participant |
| 135 | Field | Norman | Weidmann Diagnostic Solutions | Active Participant |
| 136 | Flores Garcia | Hugo | Delta Star Inc. | Interested Individual |
| 137 | Foata | Marc | Reinhausen Canada | Interested Individual |
| 138 | Forrest | George | Delta-X Research USA, Inc. | Active Participant |
| 139 | Forsyth | Bruce | Southwest Electric Co. | Committee Member |
| 140 | Fortin | Marcel | BPR Energy | Committee Member |
| 141 | Franchek | Michael | Weidmann Electrical Technology | Committee Member |
| 142 | Frimpong | George | ABB Inc. | Active Participant |
| 143 | Fugate | David | Electric Research & Management | Interested Individual |
| 144 | Gagnon | Jean-Philippe | Nomos Systems | Interested Individual |
| 145 | Gagnon | Jean-Francois | Siemens Transformers Canada | Interested Individual |
| 146 | Galatic | John | HICO America | Interested Individual |
| 147 | Galbraith | Shawn | Nuclear Service Organization | Active Participant |
| 148 | Gamboa | Jose | Siemens S.A. | Active Participant |
| 149 | Ganser | Robert | Transformer Consulting Services | Committee Member, IEEE Life |
| 150 | Ganser Jr. | Robert | OTC Services | Interested Individual |
| 151 | Garber | Matthew | Doble Engineering Co. | Interested Individual |
| 152 | Garcia | Eduardo | Siemens | Committee Member |
| 153 | Gardner | James | NRECA - International | Committee Member |
| 154 | Garg | Trilok | GenOn | Interested Individual |
| 155 | Garland | Jimmie | DuPont | Interested Individual |
| 156 | Garrison | Graham | WEG Electric Corp | Interested Individual |
| 157 | Gauthier | John | JAG Consulting | Interested Individual |
| 158 | Gaytan | Carlos | Prolec GE | Committee Member |
| 159 | Ghafourian | Ali | ERMCO | Committee Member |
| 160 | Ghosh | Saurabh | -- | Committee Member |
| 161 | Gilbertson | John | S. Mississippi Electric | Interested Individual |
| 162 | Girgis | Ramsis | ABB Inc. | Committee Member, IEEE Life |
| 163 | Gonzalez la Vega | Jorge | Orto de Mexico | Active Participant |
| 164 | Goudelock | Stanford | Howard Industries | Interested Individual |
| 165 | Grace | Eugene | Serveron | Interested Individual |
| 166 | Graham | John | Trench UK Limited | Committee Member |
| 167 | Graham | James | Pike Energy Solutions | Committee Member |
| 168 | Graham | Richard | Delta Star, Inc | Interested Individual |
| 169 | Gross | Detlev | Power Diagnostix | Interested Individual |
| 170 | Guilbault | Frank | Cogent Power Inc. | Interested Individual |
| 171 | Gupta | Mukul | Kentucky Copper Inc. | Interested Individual |
| 172 | Hammer | Mark | ALSTOM Grid | Active Participant |
| 173 | Han | Suh Joon | The Dow Chemical Company | Interested Individual |
| 174 | Hanson | David | TJH2b Analytical Services | Active Participant |
| 175 | Harden | Kenneth | Schneider Electric | Interested Individual |
| 176 | Harder | Steven | Siemens Energy | Interested Individual |
| 177 | Hardin | Michael | H-J Enterprises, Inc. | Committee Member |
| 178 | Harley | John | FirstPower Group LLC | Committee Member |
| 179 | Harlow | James | Harlow Engineering Associates | Committee Member, IEEE Life |
| 180 | Harris | David | SPX Transformer Solutions, Inc. | Committee Member, IEEE Life |
| 181 | Hauschild | Wolfgang | Dr. W. Hauschild | Interested Individual |
| 182 | Hayes | Roger | ALSTOM Grid | Committee Member |
| 183 | Heathcote | Martin | Martin Heathcote Associates Ltd | Active Participant |
| 184 | Henning | William | Waukesha Electric Systems | Committee Member |
| 185 | Herron | John | High Volt - Reinhausen | Active Participant |
| 186 | Herz | Josh | Qualitrol | Active Participant |
| 187 | Hinow | Martin | HIGHVOLT | Interested Individual |
| 188 | Hochanh | Thang | Hydro-Quebec IREQ | Committee Member |
| 189 | Hoffman | Gary | Advanced Power Technologies | Committee Member |
| 190 | Holdway | Timothy | Intermountain Electronics | Committee Member |
| 191 | Holifield | Thomas | Howard Industries | Committee Member |
| 192 | Holmes | Jill | Bureau of Reclamation | Interested Individual |
| 193 | Holsomback | Steve | Southern Company Services | Active Participant |
| 194 | Hopkinson | Philip | HVOLT Inc. | Committee Member, IEEE Life |
| 195 | Hunsberger | Adam | IFD Corporation | Interested Individual |
| 196 | Iman | Mike | MGM Tansformer Company | Committee Member |
| 197 | Jakob | Fredi | Consultant | Active Participant |
| 198 | Jakob | Karl | JAKOB Marketing Partners | Active Participant |
| 199 | Jakob | Fredi |  |  |
| 200 | James, Jr. | Rowland | Advanced Power Technologies | Committee Member |
| 201 | Jaroszewski | Marion | Delta Star Inc. | Active Participant |
| 202 | Jauch | Erwin | Beckwith Electric | Active Participant, IEEE Life |
| 203 | Johannson | Larry | T&D Products Ltd. | Active Participant |
| 204 | John | John | Virginia Transformer Corp. | Interested Individual |
| 205 | Johnson | Wayne | EPRI | Active Participant |
| 206 | Johnson | Charles | ABB Inc. | Committee Member |
| 207 | Johnson | Derek | Reinhausen Mfg. | Interested Individual |
| 208 | Johnston | Greg | Nashville Electric Service | Interested Individual |
| 209 | Johnstone | Ted | Cogent Power Inc. | Interested Individual |
| 210 | Jordan | Stephen | TVA | Committee Member |
| 211 | Kampshoff | Ken | Equisales | Interested Individual |
| 212 | Kant Lal | Bijay | SPX Transformer Solutions, Inc. | Interested Individual |
| 213 | Kelley | Bob | North American Substation Services | Interested Individual |
| 214 | Kennedy | Sheldon | Niagara Transformer | Committee Member |
| 215 | Kennedy | Gael | Nebraska Public Power District | Committee Member |
| 216 | Kilgore | James | Tennessee Valley Authority | Interested Individual |
| 217 | Kim | Dong | Southern California Edison | Active Participant |
| 218 | Kim | Raymond | Electrical Technologies | Interested Individual |
| 219 | King | Gary | Howard Industries | Committee Member |
| 220 | Kinner | Robert | First Power Group LLC | Interested Individual |
| 221 | Kiparizoski | Zan | Howard Industries | Interested Individual |
| 222 | Kirchenmayer | Egon | Siemens AG | Interested Individual |
| 223 | Kirchner | Lawrence | Siemens Energy | Interested Individual |
| 224 | Klaponski | Brian | Carte International Inc. | Committee Member |
| 225 | Kornowski | Marek | Polycast International | Interested Individual |
| 226 | Koza | Frank | PJM Interconnection | Interested Individual |
| 227 | Kraemer | Axel | Maschinenfabrik Reinhausen | Active Participant |
| 228 | Kraetge | Alexander | OMICRON | Committee Member |
| 229 | Kriska | Jeremy | Tulstar Products, Inc. | Active Participant |
| 230 | Krump | Reiner | HSP Hochspannungsgeraete GmbH | Active Participant |
| 231 | Kulasek | Krzysztof | ABB Inc. | Interested Individual |
| 232 | Kurth | Bernhard | Reinhausen Mfg. | Active Participant |
| 233 | Kyle | Randall | Southern Company | Active Participant |
| 234 | La Marca | Jeffrey | Luminant Power | Interested Individual |
| 235 | Lachman | Mark | Doble Engineering Co. | Interested Individual |
| 236 | Lackey | Joseph | ABB Inc. | Interested Individual |
| 237 | Ladroga | Richard | Risk Management International | Committee Member |
| 238 | Lau | Michael | Weidmann Diagnostic Solutions | Committee Member |
| 239 | Lawless | Andrew | Siemens Energy | Interested Individual |
| 240 | Lee | Min Jea | Hyosung | Active Participant |
| 241 | Lei | Yun | Salt River Project | Interested Individual |
| 242 | Leinhauser | George | PECO Energy | Interested Individual |
| 243 | Lejay | Olivier | ALSTOM Grid | Interested Individual |
| 244 | Leslie | Brian | General Electric | Interested Individual |
| 245 | Lessa Bressan | Natalia | Siemens Energy | Interested Individual |
| 246 | Levin | Aleksandr | Weidmann Electrical Technology | Interested Individual |
| 247 | Li | Weijun | Braintree Electric Light Dept. | Interested Individual |
| 248 | Lin | Pin | Baoding Tianwei Baobian Electric Co. | Interested Individual |
| 249 | Livingston | Kerry | Great River Energy | Interested Individual |
| 250 | Locarno | Mario | Doble Engineering Co. | Active Participant |
| 251 | Lopes | Ana | EFACEC | Active Participant |
| 252 | Lopez-Fernandez | Xose | Universidade de Vigo | Committee Member |
| 253 | Luksich | John | Cooper Power Systems | Interested Individual |
| 254 | Lundquist | Thomas | Lundquist Consulting Services, Inc. | Committee Member, IEEE Life |
| 255 | Lyke | Richard | AK Steel Corporation | Interested Individual |
| 256 | Mahajan | Satish | Tennessee Tech Univ. | Interested Individual |
| 257 | Mamtora | Jitendra | Transformers & Rectifiers (India) | Active Participant |
| 258 | Mao | Libin | Consolidated Edison Co. of NY | Interested Individual |
| 259 | Marek | Richard | DuPont | Committee Member |
| 260 | Marlow | Dennis | TBEA ShenYang Transformer | Committee Member |
| 261 | Martin | Terence | GridSense | Active Participant |
| 262 | Martinez | Rogelio | GE Nogales Dry Transformers | Active Participant |
| 263 | Matthews | Lee | Howard Industries | Committee Member |
| 264 | Mayer | Robert | San Diego Gas & Electric | Active Participant |
| 265 | McBride | James | JMX Services, Inc. | Active Participant |
| 266 | McCloskey | Scott | Amran Inc. | Interested Individual |
| 267 | McClure | Phillip | Weschler Instruments | Committee Member |
| 268 | McCullough | Douglas | Maxima / Hyundai | Interested Individual |
| 269 | McGrail | Anthony | Doble Engineering Co. | Interested Individual |
| 270 | McIver | James | Siemens Energy | Active Participant |
| 271 | McLaughlin | Richard | KEMA-Powertest LLC | Interested Individual |
| 272 | McNally | Mark | EPS-International | Active Participant |
| 273 | McNelly | Susan | Xcel Energy | Committee Member |
| 274 | McShane | Charles Patrick | Cooper Power Systems | Committee Member |
| 275 | McTaggart | Ross | Trench Limited | Committee Member |
| 276 | Mehrotra | Vinay | Waukesha Electric Systems | Committee Member |
| 277 | Melanson | Joseph | J. Melanson, Inc. | Committee Member |
| 278 | Melle | Thomas | Siemens Energy | Active Participant |
| 279 | Mendez | Victor | Southern California Edison | Interested Individual |
| 280 | Miklius | Leo | Tempel | Interested Individual |
| 281 | Miller | Kent | T&R Electric Supply Co. | Committee Member, IEEE Life |
| 282 | Miller | Michael | We Energies | Interested Individual |
| 283 | Miller | Michael | Siemens Energy | Interested Individual |
| 284 | Millward | Paul | ITEC | Committee Member |
| 285 | Molden | Arthur | AMEESCO | Committee Member |
| 286 | Moleski | Hali | S.D. Myers Inc. | Active Participant |
| 287 | Morales-Cruz | Emilio | EFACEC | Interested Individual |
| 288 | Morgan | Charles | Northeast Utilities | Interested Individual |
| 289 | Mukerji | Amitav | ABB Inc. | Committee Member |
| 290 | Mulkey | Daniel | Pacific Gas & Electric | Committee Member |
| 291 | Mullikin | Randolph | Meramec Electrical Products | Active Participant |
| 292 | Murphy | Jerry | Reedy Creek Energy Services | Committee Member |
| 293 | Musgrove | Ryan | Southwest Electric Co. | Interested Individual |
| 294 | Mushill | Paul | Ameren | Active Participant |
| 295 | Mustacchio | James | NYCO America | Interested Individual |
| 296 | Naderian | Ali | Kinectrics | Interested Individual |
| 297 | Nambi | Shankar | Bechtel Power Corp | Interested Individual |
| 298 | Narawane | Aniruddha | Olsun Electrics | Interested Individual |
| 299 | Nazarko | Jeffrey | Tempel | Interested Individual |
| 300 | Neal | Jason | HICO Amercia | Active Participant |
| 301 | Nicholas | Ray | Schaffner MTC Transformers | Committee Member |
| 302 | Nicholas | Ron | ABB Inc. | Committee Member |
| 303 | Niemann | Carl | Niemann Consulting | Committee Member, IEEE Life |
| 304 | Niemerg | Ryan | Ameren | Interested Individual |
| 305 | Nikoley | Ingo | Siemens Energy | Active Participant |
| 306 | Nims | Joe | Allen & Hoshall | Active Participant |
| 307 | Nordman | Hasse | ABB Oy, Transformers | Active Participant |
| 308 | Nugent | William | SMIT Transformatoren B.V. | Interested Individual |
| 309 | Nunes, Jr | Jayme | Nynas AB | Interested Individual |
| 310 | Nunez | Arturo | Mistras Group Inc. | Interested Individual |
| 311 | Nunn | Shawn | OTC Services | Interested Individual |
| 312 | Ogajanov | Rudolf | ABB Inc. | Active Participant |
| 313 | Olen | Robert | Cooper Power Systems | Committee Member |
| 314 | Oommen | T.V. | ABB Inc. | Committee Member, IEEE Life |
| 315 | Ortiz | Jow | NextEra Energy | Interested Individual |
| 316 | Osborn | Gary | TCI Sales | Interested Individual |
| 317 | Ostrander | David | Ameren | Active Participant |
| 318 | Panetta | Sergio | I Gard Corporation | Active Participant |
| 319 | Parkinson | Dwight | Cooper Power Systems | Active Participant |
| 320 | Patel | Bipin | Consultant | Committee Member,Emeritus |
| 321 | Patel | Sanjay | Smit Transformer Sales, Inc. | Active Participant |
| 322 | Patel | Dhiru | Hammond Power Solutions Inc. | Active Participant |
| 323 | Patoine | Barbara | Weidmann Electrical Technology | Interested Individual |
| 324 | Patterson | Wesley | ABB Inc. | Committee Member |
| 325 | Payerle | George | Carte International Inc. | Active Participant |
| 326 | Penny | Brian | American Transmission Company | Active Participant |
| 327 | Pepe | Harry | Phenix Technologies, Inc. | Interested Individual |
| 328 | Perco | Dan | Perco Transformer Engineering | Committee Member |
| 329 | Pereira | Paulo | EFACEC | Interested Individual |
| 330 | Perjanik | Nicholas | Weidmann Diagnostic Solutions | Interested Individual |
| 331 | Perkins | Mark | ABB Inc. | Committee Member |
| 332 | Perlichek | Robert | Public Service Co. of New Mexico | Active Participant |
| 333 | Peterson | Alan | Utility Service Corporation | Active Participant |
| 334 | Peterson | Chris | Siemens Energy | Interested Individual |
| 335 | Peterson | Michael | Transformer Lifecycle Services, LLC | Interested Individual |
| 336 | Petosic | Branimir | BI&I | Interested Individual |
| 337 | Pezzin | Justin | IFD Corporation | Committee Member |
| 338 | Phelps | Kevin | Nashville Electric Service | Interested Individual |
| 339 | Pink | Tony | Dynamic Ratings, Inc. | Committee Member |
| 340 | Pitts | Chris | Howard Industries | Interested Individual |
| 341 | Platts | Donald | PPL Electric Utilities | Committee Member |
| 342 | Pointner | Klaus | Trench Austria GmbH | Committee Member |
| 343 | Poulin | Bertrand | ABB Inc. | Committee Member |
| 344 | Powell | Paulette | 3P | Committee Member |
| 345 | Prevost | Thomas | OMICRON electronics Corp USA | Committee Member |
| 346 | Prince | Jarrod | ERMCO | Interested Individual |
| 347 | Quandel | Jennifer | Hospitality Performance Network | Interested Individual |
| 348 | Radbrandt | Ulf | ABB | Committee Member |
| 349 | Rahangdale | Ravi | Pennsylvania Transformer | Committee Member, IEEE Life |
| 350 | Raines | Summar | Paradoxe Corporation | Interested Individual |
| 351 | Rasco | Jimmy | Ergon, Inc | Interested Individual |
| 352 | Rashid | Adnan | MeasurementCanada/IndustryCanada | Interested Individual |
| 353 | Rasor | Robert | S.D. Myers Inc. | Active Participant |
| 354 | Rave | Martin | ComEd | Committee Member |
| 355 | Ray | Jeffrey | JLR Consulting, Inc. | Active Participant |
| 356 | Razuvayev | Sergiy | Delta Star Inc. | Active Participant |
| 357 | Recksiedler | Leslie | Manitoba Hydro Int. | Active Participant |
| 358 | Reeves | Jerry | EFACEC | Interested Individual |
| 359 | Rega | Margaret | Roechling Machined Plastics | Active Participant |
| 360 | Reiss IV | Clemens | Custom Materials, Inc. | Active Participant |
| 361 | Rezai | Hossein | The Transformer Consultant | Interested Individual |
| 362 | Riffon | Pierre | Hydro-Quebec | Committee Member |
| 363 | Rinks | Timothy | Reinhausen Mfg. | Interested Individual |
| 364 | Roach | John | Hartford Steam Boiler | Interested Individual |
| 365 | Robalino | Diego | Megger | Interested Individual |
| 366 | Robbins | Kirk | Exelon Nuclear | Committee Member |
| 367 | Roberts | Mark | N. American Substation Services | Active Participant |
| 368 | Rodriguez | Bienvenido | Electric Power Research Institute | Interested Individual |
| 369 | Roman | Zoltan | ALSTOM Grid | Interested Individual |
| 370 | Rose | Bill | ABB Inc. | Interested Individual |
| 371 | Rossetti | John | Memphis Light, Gas & Water | Active Participant |
| 372 | Rotz | Alan | Retired | Interested Individual |
| 373 | Roussell | Marnie | Entergy | Committee Member |
| 374 | Runewicz | John | Weschler Instruments | Active Participant |
| 375 | Sahin | Hakan | ABB Inc. | Active Participant |
| 376 | Saldivar | Juan | Prolec GE | Interested Individual |
| 377 | Salvato | Orlando | Raytech USA | Interested Individual |
| 378 | Sampat | Mahesh | EMS Consulting Inc. | Committee Member |
| 379 | Sankarakurup | Dinesh | Niagara Transformer | Committee Member |
| 380 | Santos | Mario | EFACEC | Interested Individual |
| 381 | Sarkar | Subhas | Virginia Transformer Corp. | Active Participant |
| 382 | Sauer | Daniel | Cooper Power Systems | Committee Member |
| 383 | Sauls | Roderick | Southern Company Services | Interested Individual |
| 384 | Sauzay | Mathieu | JST Transformateurs | Active Participant |
| 385 | Sawant | Anil | Virginia Transformer Corp. | Interested Individual |
| 386 | Schickedanz | Frank | Reinhausen Group | Interested Individual |
| 387 | Schleismann | Eric | Southern Company | Interested Individual |
| 388 | Schneider | Jeffrey | Cooper Power Systems | Interested Individual |
| 389 | Schrammel | Alfons | Siemens Transformers Austria | Interested Individual |
| 390 | Schroeder | Stephen | ABB Inc. | Committee Member |
| 391 | Schweiger | Ewald | Siemens Energy | Committee Member |
| 392 | Scialdone | Mark | DuPont | Interested Individual |
| 393 | Selvaraj | Pugazhenthi | Virginia Transformer Corp. | Interested Individual |
| 394 | Sestito | John | TBEA USA | Active Participant |
| 395 | Sewell | Jeremy | Quality Switch, Inc. | Active Participant |
| 396 | Sewell | Adam | Quality Switch, Inc. | Interested Individual |
| 397 | Shannon | Michael | Rea Magnet Wire | Interested Individual |
| 398 | Sharma | Devki | Entergy | Committee Member |
| 399 | Sharp | Michael | Trench Limited | Committee Member |
| 400 | Sheehan | David | HICO America | Interested Individual |
| 401 | Shem-Tov | Mark | Von Roll Transformers | Interested Individual |
| 402 | Shertukde | Hemchandra | University of Hartford | Committee Member |
| 403 | Shor | Andre | Von Roll Transformers | Interested Individual |
| 404 | Shull | Stephen | The Empire District Electric Company | Committee Member |
| 405 | Siebert | Stefan | BROCKHAUS MESSTECHNIK | Active Participant |
| 406 | Sim | H. Jin | Waukesha Electric Systems | Committee Member |
| 407 | Simmons | Charles | Progress Energy | Active Participant |
| 408 | Sizemore | Thomas | ABB Inc. | Interested Individual |
| 409 | Skinger | Kenneth | Shaw Power | Interested Individual |
| 410 | Smith | Edward | H-J Enterprises, Inc. | Committee Member |
| 411 | Snyder | Steven | ABB Inc. | Committee Member |
| 412 | Solano | William | ABB Inc. | Interested Individual |
| 413 | Som | Sanjib | Siemens Industry Inc | Committee Member |
| 414 | Soni | Mahendrakumar | Virginia Transformer Corp. | Interested Individual |
| 415 | Soundarrajan | Prabhu | LumaSense Technologies | Interested Individual |
| 416 | Sparling | Brian | Dynamic Ratings Inc | Active Participant |
| 417 | Spiewak | Erin | IEEE | Interested Individual |
| 418 | Spitzer | Thomas | City Transformer Service Co. | Committee Member |
| 419 | Stahara | Ronald | Central Moloney, Inc. | Committee Member, IEEE Life |
| 420 | Stank | Markus | Maschinenfabrik Reinhausen | Active Participant |
| 421 | Stankes | David | 3M IPT | Active Participant |
| 422 | Steineman | Andrew | Delta Star Inc. | Active Participant |
| 423 | Stem | Gregory | Cardinal Pumps & Exchangers | Active Participant |
| 424 | Stensland | Leonard | Consultant | Committee Member,Emeritus |
| 425 | Stewart | Jay | Power Partners | Interested Individual |
| 426 | Stretch | Kerwin | SGB USA, Inc. | Interested Individual |
| 427 | Sullivan | Christopher | Heartland Solutions, Inc. | Active Participant |
| 428 | Sullivan | Richard | Heartland Solutions, Inc. | Interested Individual |
| 429 | Sundin | David | SVB Environmental Lubricants, Inc. | Interested Individual |
| 430 | Sundqvist | Pontus | ABB Power Products | Interested Individual |
| 431 | Suresh | Babanna | Southwest Electric Co. | Interested Individual |
| 432 | Swan | Phil | ABB Inc. | Interested Individual |
| 433 | Sweetser | Charles | OMICRON electronics Corp USA | Active Participant |
| 434 | Swinderman | Craig | Mitsubishi Electric Power Products | Committee Member |
| 435 | Szewczyk | Radoslaw | DuPont Poland Sp. z o.o. | Interested Individual |
| 436 | Tafoya | Mauricio | Siemens Energy | Interested Individual |
| 437 | Talassi | Stefano | TES | Interested Individual |
| 438 | Tariq | Humayun | American Electric Power | Interested Individual |
| 439 | Tarlapally | Susmitha | ABB Inc. | Interested Individual |
| 440 | Tendulkar | Vijay | ONYX Power, Inc. | Interested Individual,IEEE Life |
| 441 | teNyenhuis | Ed | ABB Inc. | Committee Member |
| 442 | Termini | Giuseppe | PECO Energy | Committee Member |
| 443 | Thompson | Jim | T&R Service Company | Committee Member |
| 444 | Thompson | Robert | RST Consulting, P.C. | Committee Member |
| 445 | Tillman Jr | Robert | Southern Company Services | Active Participant |
| 446 | Tostrud | Mark | Dynamic Ratings, Inc. | Interested Individual |
| 447 | Traut | Alan | Power Partners | Committee Member |
| 448 | Trimble | Joshua | Xcel Energy | Interested Individual |
| 449 | Trummer | Edgar | VACE | Committee Member |
| 450 | Tuli | Subhash | Electrical T&D Apparatus Consultant | Committee Member |
| 451 | Turvey | Terry | The Specialty Switch Company | Interested Individual |
| 452 | Vailoor | Vasanth | Trantech | Interested Individual |
| 453 | Varghese | Ajith | Waukesha Electric Systems | Active Participant |
| 454 | Vedante | Kiran | ABB Inc. | Active Participant |
| 455 | Veens | Jos | SMIT Transformatoren B.V. | Interested Individual |
| 456 | Verdell | Joshua | ERMCO | Interested Individual |
| 457 | Verner | Jane Ann | Pepco Holdings Inc | Committee Member |
| 458 | Viereck | Karsten | Maschinenfabrik Reinhausen | Active Participant |
| 459 | Vinson | David | ABB Inc. | Interested Individual |
| 460 | Vir | Dharam | SPX Transformer Solutions Inc | Interested Individual |
| 461 | Vogel | Herman | TJH2b Analytical Services | Active Participant |
| 462 | vonGemmingen | Richard | Dominion | Active Participant |
| 463 | Wagenaar | Loren | WagenTrans | Committee Member, IEEE Life |
| 464 | Wallace | David | ABB Inc. | Interested Individual |
| 465 | Wallach | David | Duke Energy | Committee Member |
| 466 | Walls | Albert | Federal Pacific | Interested Individual |
| 467 | Weathington | Larry | N. American Substation Services | Active Participant |
| 468 | Websper | Richard | ALSTOM Grid UK Limited | Active Participant |
| 469 | Werelius | Peter | Megger | Active Participant |
| 470 | White | Leon | GE Energy | Interested Individual |
| 471 | Wicks | Roger | DuPont | Committee Member |
| 472 | Wilks | Alan | Consultant | Committee Member, IEEE Life |
| 473 | Williams | Michael | ABB Inc. | Active Participant |
| 474 | Williams | Joe | Rea Magnet Wire | Interested Individual |
| 475 | Wilson | Gordon | National Grid | Interested Individual |
| 476 | Wimberly | Barrett | ALSTOM Grid | Interested Individual |
| 477 | Wimmer | William | Dominion | Committee Member |
| 478 | Wimmer | Jeffrey | SGB USA, Inc. | Interested Individual |
| 479 | Wright | Melvin | LICA Consulting LLC | Interested Individual |
| 480 | Yalla | Murty | Beckwith Electric | Interested Individual |
| 481 | Yang | Baitun | Pennsylvania Transformer | Interested Individual |
| 482 | Yoon | Junggeun | HICO Amercia | Interested Individual |
| 483 | Young | William | ALSTOM Grid | Interested Individual |
| 484 | Young | Samuel | Reinhausen Mfg | Interested Individual |
| 485 | Yu | Jennifer | Pacific Gas & Electric | Committee Member |
| 486 | Yule | Kipp | Bechtel Power Corp | Committee Member |
| 487 | Zarmandily | Hassan | Sigma Consulting Group | Interested Individual |
| 488 | Zhang | Shibao | PCORE Electric | Active Participant |
| 489 | Zhang | Pengyuan | Baoding Tianwei Baobian Electric Co. | Interested Individual |
| 490 | Zhao | Peter | Hydro One | Committee Member |
| 491 | Zito | Anthony | Siemens Energy | Interested Individual |

1. **Chair’s Remarks & Report – Bill Chiu**
   1. **Chair’s Remarks**

Good Morning Everyone!

Welcome to Nashville and special thanks to our host Derek Baranowski and his team for the great evening social event last night. Hope everyone has had an enjoyable evening last night at the receptions.

For those of you who don’t already know me, my name is Bill Chiu, with Southern California Edison and I am the Chair of the Transformers Committee. A very special welcome to all of you for our inaugural General Session for the Main Transformers Committee meeting on Monday.

As you know at our last meeting in Boston, we made the decision to change the meeting format. So let me a brief moment to do a quick run-down of the changes.

Our usual Thursday Main Committee meeting is now being split into two parts. The first of part of the general session, which is the one we’re in now, is intended to cover some of the core committee business and as a way to start off the week by covering some of hot topics for the coming week. The 2nd part of the general session will be taking place on Thursday late morning right after the tutorial sessions. The tutorial sessions that were scheduled on Monday afternoon and Tuesday afternoon has now been grouped back-to-back in Thursday morning. The Meetings Subcommittee led by Greg Anderson and our local host has done a great job of adapting to this new change in meeting format.

This Tuesday luncheon will be a transition meeting from the usual Speakers Luncheon to a dedicated Awards Luncheon starting at our next meeting in Milwaukee, Wisconsin. I said this will be a transitional luncheon meeting because at tomorrow’s luncheon we will have both a formal award presentation to honor Dr. Michel Duval as he is presented with the very prestige IEEE Herman Halpern Award, and an invited speaker, Ms. Carla Nelson, from Nashville Electric Service, the local utility here, to talk about getting ready for Electric Vehicles.

This Thursday’s tutorial is a special engagement where we will be providing comprehensive coverage on the topic of Geo-Magnetically Induced Current: Effects and the Power System; Monitoring, and Potential Mitigation. Due to this extensive coverage, we’re dedicating both tutorial sessions to this topic to provide sufficient time to cover the broad topics.

Before I go into some of the other detail topics, let me also take this opportunity to acknowledge couple of special guests that are with us at this week. We have Al Rotz, who is the immediate past president of PES with us today. Al is actually representing our new IEEE PES President Noel Scholtz to present Herman Halpern Award at tomorrow’s luncheon. We also have Erin Spiewak, our IEEE staff liason for several PES Technical Committees. Erin and Al, would you stand up briefly and be recognized. Please out your hands to together for a warm welcome to both Erin and Al. Thank You.

Due to our schedule and facility limitations, we will have to have a hard stop at no later than 9:30AM this morning, so depending on how we’re doing schedule wise, and given that this is our first attempt with this new format, we may be moving some of the agenda topics around a bit to maximize our use of time this morning.

Now on to my Chair’s report for our Nashville meeting. The detail report is posted on our website so you can read them at your leisure, but I will briefly cover few noteworthy items.

Since our Boston meeting, I have appointed Mr. Sanjib Som to serve the role of Technical Editor, filling in the vacancy left behind with Ed teNyenhuis’ promotion to the Performance Characteristics Subcommittee Chairmanship. Sanjib, would you stand to be recognized? Thank you for taking on this important role.

One of my duties as the Chair of the Transformers Committee is also to serve as the representative to the PES Technical Council. I will brief cover some highlights of activities at the Technical Council.

* PES Scholarship Plus
* Conference Paper Quality
* IEEE Fellow

Now, Last but not least, I will also briefly mention that right in front of the registration desk area where you pick up your name badge, we have a table setup with information about upcoming IEEE PES activities. I encourage you to stop by and take a look at the information there. In addition to information on the upcoming meetings, Al Rotz has informed me that there is also the bio of a prospective candidate for the upcoming IEEE Presidency on that table. This is in no way an endorsement for this candidate, but simply a means to get the word out to our attendees. You’ll need to be your own judge on whether you wish to sign the petition so this candidate can be eligible to participate in the upcoming IEEE election.

Reports on the Administrative Subcommittee

New Business Agenda Items

* 1. Corresponding Members and Quorum (:05) S. Antosz

Recently there was a question from one of the WG Chair on how to deal with the Corresponding Members when it comes to determining whether there is a Quorum or not at the meetings (covers in-person, webex, phone conference, or other electronic means)

The decision for the time being, until further notice, is that Corresponding members will only count in both the numerator and the denominator in the determination of the Quorum when the corresponding member participates in that specific meeting.

* 1. GMD/GIC Position Paper (:10) B. Chiu/D. Platts

Most recently there was an article in the IEEE Spectrum magazine in the February, 2012 issue entitled ***A Perfect Storm of Planetary Proportion*** that greatly exaggerated the facts and provide an almost sensationalistic approach to a dooms day scenario where there will massive global blackouts, and more than 300 large EHV transformers would either fail or suffer permanent damage.

At question was for us, the Transformers Committee, as the leaders of the industry, what should we be doing about it. After some discussion, a motion was made by Steve Shull and Seconded by Tom Lindquist that the Transformers Committee to provide a rebuttal document to IEEE Spectrum to offer our expert opinion. The motion was passed with unanimous approval.

Since then I have reached out to Dr. Ramsis Girgis of the ABB to lead the taskforce in the development of the rebuttal document. Time being the essence here, we’re moving ahead quickly and will be having our initial planning discussion on Tuesday morning at 9:30AM.

* 1. Class I & II Considerations (:05) B. Chiu

Following up on the discussions at the Boston meeting we have decided that the Dielectric Test Subcommittee will take on this topic and provide a recommendation on how to address this issue and provide a recommendation.

* 1. Access to Tutorial Presentations & Copyright release (:05) B. Chiu/S. McNelly

Prior to this meeting, we have posted the tutorial presentations on our website and is available for public access. For the reason of not having copyright release, and to provide value differentiator for the committee members and for those of you who actually attends the meeting in person, we will be moving these tutorial to behind the password protected area of the website. Password information will be provided electronically, with added condition of acceptance for it use that user accept the responsibility in respect the intent of the password protection to limit the distribution to meeting attendees, committee members and their respective sponsoring organization.

* 1. **Chair’s Report**

**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. Please see <http://www.ieee-pes.org/technical-committees/statement-of-purpose-and-scope-of-activities-for-the-pes-technical-council> for further details on the Statement of Purpose and Scope of Activities for the PES Technical Council. The membership of the Technical Council is listed below.

**TECHNICAL COUNCIL OFFICERS**

Damir Novosel, *Chair*Jeffrey H. Nelson, *Vice* *Chair*S. S. (Mani) Venkata, *Secretary*Rick Taylor, *Past* *Chair*

**STANDING COMMITTEES**

Awards Committee - John Randolph, *Chair*

Meetings & Marketing Committee - Jeffrey H. Nelson, *Chair*

Organization & Procedures Committee - Mani Venkata, *Chair*

Standards Coordination Committee - Bill Bartley, *Chair*

Technical Sessions Committee **-** Jeffrey H. Nelson, *Chair*

**COORDINATING COMMITTEES**

Emerging Technologies Coordinating Committee - Branislav Djokic, *Chair*

Intelligent Grid Coordinating Committee - Don Von Dollen, *Chair*

Marine Systems Coordinating Committee - Paul Bishop, *Chair*

Wind and Solar Power Coordinating Committee - Richard J. Piwko, *Chair*

**TECHNICAL COMMITTEES**

Electric Machinery Committee - Mike Sedlak, *Chair*

Energy Development and Power Generation Committee - Om Malik, *Chair*

Insulated Conductors Committee - John Smith, *Chair*

Nuclear Power Engineering Committee - S. K (Satish) Aggarwal, *Chair*

Power System Analysis, Computing, and Economics Committee - Sandoval Carneiro, Jr., *Chair*

Power System Communications Committee - Dan Nordell, *Chair*

Power System Dynamic Performance Committee - Nikos Hatziargyriou, *Chair*

Power System Instrumentation and Measurements Committee - R. Arseneau, *Chair*

Power System Operations Committee - William (Bill) Cassel *Chair*

Power System Planning and Implementation Committee - M. L. Chan, *Chair*

Power System Relaying Committee - Robert D. Pettigrew, *Chair*

Stationary Battery Committee - William (Bill) Cantor, *Chair*

Substations Committee - John D. Randolph, *Chair*

Surge Protective Devices Committee - Dr. A. J. (Tony) Surtees, *Chair*

Switchgear Committee - Ken Edwards, *Chair*

Transformers Committee - Bill Chiu, *Chair*

Transmission and Distribution Committee - S. J. Ranade *Chair*

**PES Technical Council Activities**

The most recent Technical Council meeting took place on January 8, 2012, at the Joint Technical Committee Meeting in Garden Grove, CA. Highlights of several ongoing activities of Technical Council and its Committees are included below.

**IEEE PES Scholarship Plus Initiative**

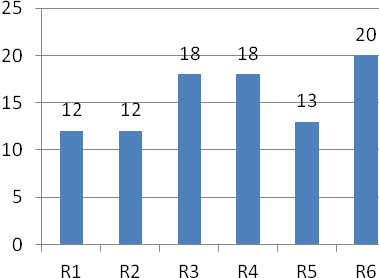
In October 2011, the IEEE PES announced the inaugural Scholarship Plus Initiative™ award recipients. Ninety-Three (93) PES Scholarship recipients have been selected from 51 U.S. universities for the 2011-12 Academic year. These scholarships are being distributed through the IEEE Power & Energy Scholarship Fund which is being used to support the IEEE PES Scholarship Plus Initiative.

The Scholarship Plus Initiative provides multi-year scholarships and career experience opportunities to qualifying U.S. electrical engineering undergraduate students. As long as the scholar continues to meet renewal standards, he or she will receive up to three years of funding — $2,000 the first year, $2,000 the second year and $3,000 the third year — interspersed with up to two much-valued career experiences.

These undergraduate students were selected by industry and academic representatives based primarily upon: academic preparation; extra-curricular activities and leadership; interest in engineering in general, and power and energy engineering in particular; and overall assessment of student's potential for a successful power and energy engineering career.

Six regional committees were formed to review and select the PES Scholarship Plus Scholars in the US by the 6 IEEE defined Regions, and to consult on the program’s implementation. There are approximately 100 volunteers supporting the program through the regional and other committees.

PES Scholars by Regions





21 (22%) of 93 award recipients are female; the number of females is noteworthy as it is a significant proportion relative to the portion in Electrical Engineering programs. This proportion is estimated as roughly twice the typical enrollment of females in EE thus encouraging and supporting greater future enrollments.

Preparations for the second year of the program are underway. Discussions are being held with prospective donors regarding employment recruitment and career promotion strategies, and requesting financial support for the PES Scholarship Plus Initiative. The next scholarship application period will be from March 1 through June 30, 2012.

More information about the PES Scholarship Plus Initiative™ is available at:[www.ee-scholarship.org](http://www.ee-scholarship.org), or contact the program administrator directly via Email: [info@ee-scholarship.org](mailto:info@ee-scholarship.org)

**Conference Paper Quality**

There have been some on-going dialogues at the recent Technical Council meetings regarding conference paper quality and acceptance rate, which directly translates to the number of papers accepted, and indirectly impacts the number of attendees, the available timeslots for the paper sessions, multiple simultaneous paper sessions with potential overlap from both time and subject matter perspective. There are many perspectives discussed during the most recent meeting in January, 2012 and the Technical Council agreed on the following set of tenets moving forward:

* One approach does not fit all and we should accommodate to the needs of various committees. Avoid perceived division between practitioners and academics, as we all have the same goal to help our industry that has been experiencing some real exciting developments.
* There is a need to have consistent criteria in reviewing papers, organizing panels, and avoiding overlaps. It is not appropriate to single out or focus on any committee - Our strength is in applying best practices.
* We want to have output and initiatives of all committees more attractive to as wide of an audience as possible. Our members want to participate on the panel or write a paper that is of interest to our community.

After some deliberation, a motion was made to create a taskforce to develop a set of review and acceptance criteria that can be applied across the all the technical committees. The motion passed and a Paper Acceptance Criteria Taskforce was formed, with volunteers from representatives of the following technical committees:

* Power System Relaying Committee - Robert D. Pettigrew, *Chair*
* Transformers Committee - Bill Chiu, *Chair*
* Transmission and Distribution Committee - S. J. Ranade, *Chair*

The deliverable of this Taskforce is a draft guideline for paper review and acceptance criteria for discussion at the upcoming PES GM meeting in San Diego that is schedule to take place in July, 2012. If you have comments or questions related to this activity please contact the Committee Chair.

**IEEE Fellow Nominations**

The recent statistics of the Fellow nominations have indicated room for improvement for PES to increase the efforts in nominating our significant contributors to the IEEE Fellow membership grade. Currently there are four categories of contributions that senior members with more than five years of service (in any grade of membership) can be nominated towards the Fellow grade. These are:

**Application Engineer/Practitioner**–Responsible for product development, advancement in system, application or operation, project management or construction activity, process development, manufacturing innovation, codes or standards development, or other application of technology.

**Educator**–Responsible to advance electrical engineering and scientific technology through education by the developing curricula and/or courses that are innovative and unique.

**Research Engineer/Scientist**–Responsible for inventions, discoveries or advances in the state of the art technological advances.

**Technical Leader**–Responsible for a managerial, team, or company-wide effort using technical innovation, and resulting in outstanding performance, economic enhancements, or other advantages to benefit society.

The Fellow nominations statistics at the PES level for the Class of 2011 are:

* 49 total nominations received
* 23 were noted as exceptional or highly qualified
* 70% of the nominations exhibit high quality of the preparation
* The remaining 30% of the nominations has shortcomings that included:
* Lack of sufficient description of 1 or 2 distinguished qualifications or contributions to the industry
* Focus on overall individual’s policy level contributions (compared to a balance of technical and business level contributions)
* Insufficient citations for the contributions
* Some of the nominations of lower quality appear to come from local PES Chapters

Overall, IEEE average a bit over 35% of the nominees being elected to the grade of Fellow. PES is slightly below the IEEE average at approximately 30% success rate.

The key focus to increase the number of PES Fellows include

* Increasing the number of nominations
* Improved quality of the submissions
* Assure proper representation and fair process for PES at the IEEE Fellows Committee
* Promote our members to become senior members and eligible for Fellows
* Committee Fellows Coordinators are key to facilitate the process
  + Review of the nominations and assist in the process
  + Help committees without experience and many Fellows
  + Sharing of best practices in some of the Technical Committees (e.g., PSRC), that could be shared with other TC’s.

One thing worth noting here is that any person, including non-members, can serve as nominator, except for the following individuals (for the purpose of avoiding potential conflict of interest)

* Members of the IEEE Board of Directors
* Members of the IEEE Fellow Committee
* IEEE Technical Society/Council Fellow Evaluating Committee Chairs
* Members of IEEE Technical Society/Council Fellow Evaluating Committee reviewing the nomination, or IEEE Staff.

Our website has a listing of our members who have achieved this highest level of membership recognition. As a handy reference, I have included the list below in alphabetical order:

**Dennis J. Allan (Life Fellow)**

1992 - for contributions to the design and development of power transformers.

**Ray Bartnikas (Life Fellow)**

1977 - for contributions to the field of dielectric and corona loss mechanisms in electrical insulating systems.

**Robert C. Degeneff**

1993 - for contributions to the modeling and computation of transient voltages in transformer windings

**Ramsis S. Girgis**

1993 - for contributions to reductions in the losses of large power transformers

**Philip John Hopkinson**

2002 - for contributions to the reliability of distribution transformers and the development of related standards for testing and application

**William J. McNutt (Life Fellow)**

1976 - for contributions to the design of power transformers ad standardization of test procedures

**Harold R. Moore (Life Fellow)**

1997 - for leadership in the development, design, and application of power transformers and associated equipment

**Linden W. Pierce (Life Fellow)**

2000 - for contributions to the understanding of heat transfer and loading of liquid-immersed and dry type power and distribution transformers

**Robert A. Veitch (Life Fellow)**

1998 - for leadership in the development and design of very large and extra high voltage transformers, shunt reactors and associated equipment

**Loren B. Wagenaar**

1996 - for contributions to transformer and bushing test standards and specifications

Most recently, the Transformers Committee volunteers made three nominations for the class of 2012 candidates. We wish them the best in a successful outcome in the upcoming evaluation process.

**Technical Sessions Committee & Upcoming PES Sponsored Conferences**

The Vice Chair’s Report contains information on papers and panel sessions to be presented at the upcoming PES T&D Conference and Exposition (scheduled from May 7 – May 10, 2012 in Orlando, FL) and the PES General Meeting (scheduled from July 22 – July 26, 2012 in San Diego, CA).

The Chair notes with appreciation that several members and active participants in the Transformers Committee have authored papers and will be presenting at the Orlando T&D Conference and Exposition. A noteworthy paper authored by Dr. Ramsis Girgis. et.al. on the *Effects of GIC on Power Transformers and Power Systems* will be presented at the PES T&D Conference and Exposition at Orlando.

Special thanks also goes to the volunteers who devoted significant time over the year-end holiday period to assist in reviewing the submitted papers.

Please refer to the PES website <http://www.ieee-pes.org/meetings-and-conferences/calendar> for additional meetings and conferences sponsored by the PES.

**Transformers Committee Activities**

**Subcommittee Chair Appointment for the calendar year 2012**

Consistent with the Transformers Committee’s O&P manual, the following Subcommittee Chairs were reappointed/appointed for the calendar year 2011.

* Meetings Planning **Gregory Anderson**
* Standards **William Bartley**
* Bushings **Peter Zhao**
* Dielectric Test **Loren Wagenaar**
* Distribution Transformers **Stephen Shull**
* Dry-Type Transformers **Charles Johnson**
* HVDC Converter Transformers & Smoothing Reactors **Michael Sharp**
* Instrument Transformers **Ross McTaggart**
* Insulating Fluids **Susan McNelly**
* Insulation Life **Bruce Forsyth**
* Performance Characteristics **Ed teNyenhuis**
* Power Transformers **Tom Lundquist**
* Underground Transformers & Network Protectors **Carl Niemann**

**Technical Editor**

With Ed teNyenhuis taking on his new role as our Chair of the Performance Characteristic Subcommittee, this change created a vacancy for the role of Technical Editor. On behalf of the Committee, the Chair would like to acknowledge the contributions by Ed teNyenhuis during his tenure as our Technical Editor. To fill this important role, the Chair is pleased to announce the appointment of Mr. **Sanjib Som** as our new technical Editor beginning in March, 2012. Please welcome Sanjib to his new assignment and wishing him success in this new role.

PES Technical Council was notified of the Subcommittee Chairs and Technical Editor appointments for the calendar year 2012 in accordance with the guideline set forth in our O&P Manual.

**Association Management (AM) System**

All Committee members and active participants, and all individuals interested in Transformers Committee activities, are reminded that all communications on Committee meetings and activities are handled through the Committee website (<http://www.transformerscommittee.org/>) and through electronic media. Contact information is self-administered through our Association Management (AM) system, and administration of membership and meeting attendance records is facilitated by the AM System. All Subcommittee and Working Group Chairs are requested to use the AM system for assigning membership within their groups and for communication with their group members. All Committee members, active participants, and interested individuals are reminded also that you are responsible personally for maintaining the accuracy of your contact information, through the AM system, for Committee activities and communication. Updating your contact information in handwriting on a meeting roster does not result in updating your Committee contact information. Keeping your contact information maintained in the AM system assures that the Chair of any Subcommittee or Working Group you are involved with will be able to communicate with you. Details on enrolling and maintaining your contact information in the AM system can be found on the Committee website.

The AM system also allows you to check the Committee record of your membership status in individual Working Groups, Subcommittees, and the Main Committee. This can be done by checking your Personal Profile, and then clicking on Subgroup Details. If the Committee record does not match your record, please review with the appropriate WG or SC Chair.

**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 (WG’s, 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.

**Acknowledgments**

I extend my thanks, and the appreciation of all Committee members and participants, to Ed Smith, for his excellent leadership of the Committee over the past two years, and to Dan Platts, for having successfully completed his term as Secretary. Welcome to Don to his new position as Vice Chair, and welcome also to Steve Antosz as he takes on the new role as our Committee Secretary. On behalf of the Committee officers, I wish to express our appreciation for the opportunity to serve you, and we ask for your continuing support over the next two years. We thank you for the service you perform – through your Committee work – to serve our industry, society, and the communities in which we all live.

1. **Approval of Previous Minutes – Stephen Antosz**

The Minutes from the Boston meeting were approved as written.

1. **Vice Chair’s Report – Donald Platts**

**IEEE PES Calendar of Upcoming Events**

The table below lists the upcoming PES sponsored conferences and committee meetings. Please check the PES website at [www.ieee-pes.org](http://www.ieee-pes.org/) for further details.

[Power Systems Conference and Exposition (PSCE)](http://www.pscexpo.com/)  
*20-23 March 2011, Phoenix, AZ, USA*

[ESMO 2011 Conference & Exposition](http://www.esmoconference2011.com/) *16-19 May 2011, Providence, RI USA*

[2012 Transmission & Distribution Conference & Exposition](http://www.ieeet-d.org/)*7-10 May 2012, Orlando, FL, USA*

[PES 2012 General Meeting](http://pes-gm.org/2012/) *22-26 July 2012, San Diego, CA USA*

**Upcoming Conference Papers Submitted for Review**

**2011 IEEE PES Power Systems Conference & Exposition. (Orlando, FL, May 7, 2012)**

A total of 20 papers have been submitted. After review, 10 were approved and will be presented. In paper sessions. There will be no papers in the poster session.

List of the Papers to be presented.

|  |  |
| --- | --- |
| ID | **Title** |
| 2012TD0052 | [**Low-Cost Amorphous-Metal Rolled-up-Core Distribution Transformer**](http://submissions.miracd.com/TD2012/ChairSubmissionDetail.asp?mode=sbs&sbmID=52) |
| 2012TD0130 | [**Transformer Insulation Dry Out as a Result of Retrofilling with Natural Ester Fluid**](http://submissions.miracd.com/TD2012/ChairSubmissionDetail.asp?mode=sbs&sbmID=130) |
| 2012TD0203 | Measurement and Computation of Transient Recovery Voltage of Transformer Limited Fault in 525kV-1500MVA Three-Phase Transformer |
| 2012TD0261 | [**Gas insulated transformer application for an environmentally-friendly power station upgrade**](http://submissions.miracd.com/TD2012/ChairSubmissionDetail.asp?mode=sbs&sbmID=261) |
| 2012TD0311 | [**Statistical Insights into Furan Interpretation Using a Large Dielectric Fluid Testing Database**](http://submissions.miracd.com/TD2012/ChairSubmissionDetail.asp?mode=sbs&sbmID=311) |
| 2012TD0383 | [**Construction of a High Voltage Test Facility**](http://submissions.miracd.com/TD2012/ChairSubmissionDetail.asp?mode=sbs&sbmID=383) |
| 2012TD0454 | [**Power Grid Stability Protection against GIC Using a Capacitive Grounding Circuit**](http://submissions.miracd.com/TD2012/ChairSubmissionDetail.asp?mode=sbs&sbmID=454) |
| 2012TD0463 | [**Effects of GIC on Power Transformers and Power Systems**](http://submissions.miracd.com/TD2012/ChairSubmissionDetail.asp?mode=sbs&sbmID=463) |
| 2012TD0561 | [**Evaluation of Distribution Network Transformer Dissolved Gas Analysis (DGA) Data**](http://submissions.miracd.com/TD2012/ChairSubmissionDetail.asp?mode=sbs&sbmID=561) |
| 2012TD0590 | [**FEM Analysis of the Transformer Insulation XY Model**](http://submissions.miracd.com/TD2012/ChairSubmissionDetail.asp?mode=sbs&sbmID=590) |

**2012 PES General Meeting (San Diego, CA July 23- 24, 2012)**

A total of 12 papers were submitted. After review, 6 papers are scheduled for presentation in the Paper Session. and there are none in the Poster Session.

List of the 6 papers to be presented in the Paper Sessions.

|  |  |
| --- | --- |
| ID | Title |
| 2012GM0281 | Demagnetization of a Large Power Transformer Based on Calculation of the Flux Linkage |
| 2012GM0693 | Effects of Iron-Core Topology on Inrush Currents in Three-Phase Multi-Leg Power Transformers |
| 2012GM0707 | Interpretation of Dielectric Response Measurements of Transformer Insulation under Temperature Variations and Transient Effects |
| 2012GM1155 | A Study on Suitability of Different Transformer Winding Models for Frequency Response Analysis |
| 2012GM1177 | Multivariate Analysis for Correlations among Different Transformer Oil Parameters to Determine Transformer Health Index |
| 2012GM1440 | Solid State Transformer Specification via Feeder Modeling and Simulation |

1. **Secretary’s Report – Stephen Antosz**

### Membership Review

Voting Committee Members – Three new committee members were approved and added at the Boston meeting as shown in the table below:

| **Name** | **Affiliation** | **Sponsor #1** | **Sponsor #2** | **Sponsor #3** | **Membership Category** |
| --- | --- | --- | --- | --- | --- |
| Stephen M. Schroeder | ABB | Brian Klaponski WG C57.12.40  (5 yrs) | Gary Hoffman  WG C57.12.10  (5+ yrs) | Carl Nieman  Dry Type SC (5+ yrs) | Producer |
| Daniel M. Sauer | Cooper Power Systems | Craig Colopy  WG C57.15  (2 yrs) | Jane Ann Verner  WG PC57.152  (2 yrs) | Bill Bartley Standards SC  (? yrs) | Producer |
| Michael Sharp | Trench Limited | Steve Schappell  WGC57.32 | Richard Dudley | Richard Dudley  HVDC SC  (10+yrs) | Producer |

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**. Any one 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 minimum of three WG or SC chairmanships. Detail of the application requirements and approval process by the Administrative Subcommittee is outlined in our O&P manual.

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Membership Status | Oct-10 | Apr-11 | Oct-11 | Mar-12 |
| Interested Individual | 843 | 997 | 1061 | 1132 |
| Interested Individual - IEEE Life Member \* | 6 | 2 | 4 | 6 |
| **Total Interested Individuals** | **845** | **999** | **1065** | **1138** |
|  |  |  |  |  |
| Active Participant | 227 | 230 | 218 | 232 |
| Active Participant - IEEE Life Member \* | 7 | 5 | 5 | 6 |
| **Total Active Participants** | **234** | **235** | **223** | **238** |
|  |  |  |  |  |
| Committee Member | 211 | 210 | 218 | 182 |
| Committee Member - Emeritus Member \* | 8 | 1 | 8 | 6 |
| Committee Member - IEEE Life Member \* | 26 | 31 | 31 | 29 |
| Committee Member - Corresponding Member | 1 | 1 | 1 | 0 |
| **Total Committee Members** | **246** | **243** | **258** | **217** |
| **TOTAL IN AMS DATABASE** | **1391** | **1478** | **1546** | **1593** |

\* - indicates this member type receives a discounted registration fee.

The participant’s profiles in our AMS 123 system should reflect the correct status. It is the responsibility of each individual to keep his or her profile updated. Here is the link to our AMS 123 system. (<http://www.123signup.com/servlet/com.signup.servlet.org.ALogin?Org=ieee-transformers&Restart=1>)

### 5.2 New Member Applications

Two new applications for Committee Membership have been received since our previous meeting in Boston. They will be submitted for approval at the Nashville meeting on March 11, 2012. Details of the membership applications and sponsors are listed in the following table.

| **Name** | **Affiliation** | **Sponsor #1** | **Sponsor #2** | **Sponsor #3** | **Membership Category** |
| --- | --- | --- | --- | --- | --- |
| Baitun Yang | Pennsylvania Transformer | Pierre Riffon  WG Revision to Impulse Test (2+yrs) | Loren Wagenaar  SC Dielectric Test  (2+yrs) | Stephen Antosz  SC Performance Characteristics  (2+yrs) | Producer |
| Thomas Sizemore | ABB | Thang Hochanh  TF PD in Bushings, PTs, CTs (2 yrs) | Ross McTaggert  SC Instrument Transformers  (1.5 yrs) | Ross McTaggert  WG Requirements for Instrument Transformers  (6 months) | Producer |

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. Subcommittee Chairs are encouraged to recommend new members, and to communicate the process of attaining membership through **active participation** and **contribution** in Committee work 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. For an application to be reviewed at the next meeting, the application will need to be received by the Committee Secretary a minimum of one week prior to the start of the that meeting.

### 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. Our 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 meeting on Thursdays. The data will be used to update participant’s membership profile.

### Meeting Minutes

The minutes of the Boston Transformers Committee meeting Fall, 2011 were posted to the committee website on February 20, 2012.

Subcommittee Chairs are requested to submit their SC Minutes from the Nashville meeting by May 15, 2012.

The minutes should be submitted via e-mail to the Committee Secretary, Stephen Antosz at [santosz@ieee.org], with a copy to Susan McNelly [sjmcnelly@ieee.org] for posting on the Committee website.

The submittal file should be saved as a Word document and should be formatted similar to this report, and as shown in the recent assembled Minutes. *The numbering for your report should match the numbering as indicated in the Main Committee Meeting Agenda*. Please indicate total attendance count for each Subcommittee, Working Group, and Task Force meeting in your Minutes. Please do not send a copy of the attendance listing for this attendance count.

Your full corporation and support in this matter is greatly appreciated.

1. **Treasurer’s Report – Gregory Anderson**

The finances of the Committee are in excellent condition. As of February 22, 2012 (end of this reporting period), the balance was $47,864.80. The only asset purchased during this reporting period was one large Pelican case for the new high-lumen PC projectors, purchase cost = $1,365.00. There was a moderate loss during the past reporting period. This was due in part to the following items:

~$2300 loss: polo shirt sale (subsidized cost of shirts and remaining unsold product)

~$4400 loss: CD-ROMs sold to Committee Members at a discount

I expect a notable gain during the next reporting period. See below "balance sheet" for this reporting period and the previous periods.



1. **Standards SC Minutes & Report – William Bartley**
   1. **Standards Subcommittee Minutes**
2. **Opening Remarks**

The Chair, William Bartley opened the meeting and summarized the recent activities of the Transformer Standards activity for the four-month period of November 1, 2011 through March 1, 2012, no new Standards, six Revisions and one Reaffirmation were approved by RevCom. Also, NesCom approved two PARs for new standards, ten PARs for Revisions, one PAR modification, and no PAR extensions. The Transformer Committee is responsible for almost 100 standards, plus over 55 PARs, projects for new standards and revisions. For the full STANDARDS REPORT see the TC website via the following link:

<http://www.transformerscommittee.org/meetings/S2012-Nashville/Minutes/S12-StandardsReport.pdf>

An overview of the upcoming new 10 year maintenance cycle change presented at the Standards Luncheon was given. The change will extend the revision (reaffirmation) cycle from 5 years to 10 years after the last date of approval or maintenance action. The Chair stressed there would be no extensions. It is suggested to review the full presentation at:

<http://www.transformerscommittee.org/info/F11/F11-IEEE-StndsPolicyChanges.pdf>

1. **Meeting Attendance**

The Standards Subcommittee met on Wednesday, March 14, 2012, at 4:30 PM. A role call showed over 21 members in attendance constituting a quorum at the start of the meeting. Overall there were 93 attendees, with 32 members, with 61 guests, including 6 that requested membership upon tabulation of the circulated rosters.

1. **Approval of previous meeting minutes**

The Chair asked if there were any comments or corrections to the previous meeting minutes, and motioned for approval. There where no comments to the meeting minutes of the Fall 2012 meeting in San Diego, California; and the minutes were approved.

1. **Working group reports.**
   * **Cont. Revision of C57.12.00 – Steve Snyder** reported the following:

This is essentially a working group of one person. There are no meetings.

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.

The PCS Task Force working on stabilizing windings has finished their work, which will result in a small revision to the document. There are three (3) other PCS issues underway at present, although it will require considerable debate and surveys before any of those topics are fully vetted. There were a few negative ballot comments from the prior ballot pertaining to Dielectric Tests, Insulation Life, and Insulating Fluids, that I have not heard were resolved or addressed as yet. I think those items should be completed before we move forward with a new revision.

Late 2012 I plan to solicit input from all the Subcommittees to determine if they have changes ready for inclusion in the next revision cycle.

Respectfully submitted, by Steven L. Snyder, WG Chair, on March 14, 2012

* + **Cont. Revision of C57.12.90-2006 – S. Antosz** reported the status of as:

This is essentially a working group of one person. There are no meetings 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. There has not been much activity since October 2011.

**Future Revisions**

**Changes already approved for the next revision:**

* New Sub-clause 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.
* Revisions to Clause 12 Short-circuit tests and new Annex on Connections diagrams for testing three-phase transformer using alternate single-phase source by Marcel Fortin’s Task Force in the Performance Characteristics Subcommittee. Submitted in Fall 2009.
* Revision to Sub- clause 10.3.2.4 Tap connections during lightning impulse test by Mark Perkins’ WG Revision to Impulse Test in Dielectric Test Subcommittee. Submitted on 10/28/10.
* Revisions to Sub-clauses 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 Clauses 6 & 7 Polarity & Phase-relation and Ratio tests from Pierre Riffon’s PCS WG for Revision of C57.12.90. Final survey circulated in Sept 2011.

**Pending work**

* Revision to Clause 11 Temperature-rise tests by Paulette Payne Powell’s WG in the Insulation Life Subcommittee.
* Revision to Clause 13 Audible Sound by Ramsis Girgis’ TF in the Performance Characteristics Subcommittee.

Respectfully submitted by Stephen Antosz, WG Chair, on March 14, 2012

* **WG on Revision of IEEE PC57.152 (old 62) –Loren Wagenaar reported for Jane Verner** –

The Working Group met on March 13, 2012 and began with introductions of all. A total of 109 people with 64 guests were in attendance, including 45 members. We had a quorum.

The Boston fall 2011 meeting minutes were approved.

Draft 5.0 has been issued and posted on the website.

Kipp Yule led a discussion on the reorganization of the Guide and presented a cross reference chart from IEEE 62 to PC57.152. We have moved away from IEEE 62 format / arrangement to follow a proposed sequence of testing to focus on winding and tests related to the main core and coil then list by Ancillary Equipment, etc. The chart shows how many new clauses have been added to PC57.152 draft that did not appear in IEEE 62. The Chart for commissioning, in-service, after system fault and after internal fault is now Clause 5.

It was agreed to take a survey of the working group members on Draft 5.0. **Comments on Draft 5.0 are due on April 15, 2012.** Due to the number of different Office Word versions when making comments, **please refer to the pdf version for the line and page number and include the clause number.**

Our PAR expires in December 2012. A draft schedule was discussed; we hope to have the Guide balloted this summer. At least three months need to be allocated for ballot resolutions. Volunteers for the ballot resolution committee are as follows:

* David Murray
* Wally Binder
* Eric Davis
* Dick Amos
* Dave Wallach
* Mario Locarno
* Dave Harris
* Jin Sim

Patrick McShane discussed the various nomenclatures used for transformer dielectric coolants throughout all the IEEE transformer standards. We should create uniformity. Clauses where generic oil terms are used should not be limited to mineral oil. Patrick is looking for volunteers to review the C57 series of standards and help to review and get the proper terms for fluids to be used. We will edit PC57.152 except items that would affect the PAR such as the title and scope.

Respectively submitted by Jane Verner – WG Chair

* + **TASK FORCE on IEEE-IEC Harmonization – Bill Bartley reported for Jeewan Puri -**

The Paper on Harmonization of Standards with the IEC was presented and accepted by the Standards Subcommittee. This paper provides an overview of the process for new technical standards, existing standards, items to consider, copyright permissions, Annex A of IEC Technical Committees and Annex B a sample copyright permission request letter. Everyone is encouraged to read the paper, and then apply its recommendations, as appropriate. The paper is available on Standards SC webpage.

* **TASK FORCE on Recommended Terminology for the use of Fluid, Oil, and Liquid across all the Transformer Standards, Guides and Best Practices – P. McShane**

A brief presentation by Task Force Chair P. Mc Shane was given to explain the purpose of the review, and output report of a white paper describing the nomenclature uniformity issues, and identification of clauses that should considered including, or excluding, the various insulating mediums including alternative fluids.

Patrick requested volunteers to contact him

The presentation is on the Standards Subcommittee webpage as given by P. McShane.

1. **Old Business**
   * None
2. **New Business**

* None

1. **Adjournment**

The motion to adjourn by Chair made and hearing no objections; the meeting adjourned around 5:05PM.

Respectfully submitted,

Jerry R. Murphy

Standards SC

* 1. **Standards Report**

1. **Awards Report – Ed Smith**

Herman Halpern Award

Michel Duval will be presented with the Herman Halpern Award at the Tuesday, March 13th 2012 Luncheon. The award will be presented by the immediate past President of the PES, Al Rotz.

Michel Duval is a Senior Research Scientist at the Hydro Quebec Institute of Research (IREQ), in Quebec, Canada. His award is for **“Development and leadership in the condition monitoring of highvoltage power transformers and related equipment”**.

The IEEE Herman Halperin Electric Transmission and Distribution Award was established in 1986 through an agreement between Herman Halperin and the Board of Directors of the IEEE. The funds were contributed by Herman and Edna Halperin and are administered by the IEEE Foundation, Inc.

From 1959 through 1986, the award for outstanding contributions to the field of electric transmission and distribution was named the William M. Habirshaw Award. Herman Halperin was a recipient of the Habirshaw Award in 1962. Mr. Halperin had a distinguished career with the Commonwealth Edison Company over a period of 40 years. Subsequently, he spent 15 years as a consulting engineer. He was particularly noted for his pioneering contributions to the design and operation of electric plant facilities and power cable systems.

Recipient selection is administered through the Technical Field Awards Council of the IEEE Awards Board.

Some specific details surrounding the award itself are . . .

**Sponsors:** Robert and Ruth Halperin Foundation, in memory of the late Herman and Edna Halperin, and IEEE Power & Energy Society

**Presented to:** An individual or team of up to three in number

**Scope:** For outstanding contributions to electric transmission and distribution

**Prize:** The award consists of a certificate and honorarium.

**Basis for judging:** In the evaluation process, the following criteria are considered: technological importance, successful application, originality, leadership, publications, and the quality of the nomination.

**Nomination deadline:** 31 January

**Presentation:** IEEE policy requires that its awards be presented at major IEEE events that are in keeping with the nature of the award and the cited achievement.

**Award Committee Members:** Ralph Samm, Chair, John Densley, Roger C. Dugan, Lauri J. Hiivala, Harry Orton, Tom Prevost and Nirmal Singh

2011 IEEE SA Distinguished Service Award

I’m very pleased to report that Mr. Thomas A. Prevost was presented the 2011 IEEE SA Distinguished Service Award. The award was presented for Tom’s "leadership, long-standing service, process improvements, and national and international representation of the IEEE Standards Association"

The IEEE SA Distinguished Service Award is made annually to current member(s) or past member(s) of the IEEE-SA Standards Board to recognize distinguished service to the IEEE-SA based on major contributions to the standards development process. Major contributions include but are not limited to the following examples:

* Enhancing the process through continued service on its major action committees.
* Leadership in developing new aspects of what the IEEE-SA can do to improve its procedural process.
* Interaction on behalf of the IEEE-SA to promote national and international growth of standards as a product of IEEE.
* Representing the IEEE-SA at various levels within IEEE Societies/Committees and other standards-developing organizations (ASME, IEC, etc.), which encourages the implementation of the IEEE Standards Association mission and its goals.

Some specific details surrounding the award itself are . . .

**Award:** This recognition consists of an engraved wooden plaque. There is no honorarium attached to this award.

**Eligibility:** Member(s) of the IEEE-SA Standards Board, or to past member(s) going back as far as five years from the current date. There are no restrictions or preferences as to the nationality, race, sex, creed or age.

**Nomination:** Annual Deadline 31 August

**Sponsorship:** This award is sponsored by the IEEE Standards Association, administered by the IEEE-SA Awards and Recognition Committee.

Transformers Committee Certificates of Appreciation

Transformers Committee Certificates of Appreciation have been obtained, with approval of the PES Awards & Recognition Chair, for the following Award recipients:

**Individual Service Awards**

Stephen Antosz Chair, Performance Characteristics Subcommittee (2010-2011)

Ed teNyenhuis Transformer Committee Editor (2009-2011)

J. Edward Smith Chair, IEEE/PES Transformers Committee (2010-2011)

**Host Service Awards**

Derek Baranowski Host-Spring 2012 Meeting, Nashville. Baron USA

**Working Group, Taskforce and Subcommittee Awards**

**Task Force on Tank Rupture and Mitigations**

Peter Zhou Chair Terry Lee Member

Robert Thompson Secretary Josh Herz Member

Jim Zhang Member Marc Foata Member

Craig Swinderman Member Bill Darovny Member

Guilliaume Pengaud Member Javiar Arteaga Member

Van Nhi Nguyen Member Nick Abi-Samra Member

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.

IEEE SA SB Award Recipients:

**Working Group for C57.100-2011 IEEE Standard Test Procedure for Thermal Evaluation of Insulation Systems for Liquid-Immersed Distribution and Power Transformers**

Roger Wicks Chair C57.100

Thomas Prevost Vice Chair C57.100

Terry Drees Member C57.100

John Luksich Member C57.100

Don Platts Member C57.100

H. Jin Sim Member C57.100

**Working Group for C57.12.70-2011 IEEE Standard for Standard Terminal Markings and Connections for Distribution and Power Transformers**

Stephen Shull Chair C57.12.70

Jerry Murphy Vice Chair C57.12.70

Charles Sweetser Member C57.12.70

**Working Group for C57.12.20-2011 IEEE Standard for Overhead-Type Distribution Transformers, 500 kVA and Smaller: High Voltage, 34 500 V and Below; Low Voltage, 7970/13 800Y V and Below**

Alan Traut Chair C57.12.20

Chuck Simmons Vice Chair C57.12.20

Alan Wilks Member C57.12.20

Marcel Fortin Member C57.12.20

The above groups/individuals have chosen to have their awards sent to their respective Companies and not presented at our meeting. If recipients would like there awards presented at our spring or fall meetings the IEEE SA form should be completed with the “ship to” being your Transformers Committee Awards Subcommittee Chair at the following address: 3010 High Ridge Blvd., High Ridge, MO 63049

IEEE SA Standards Board Awards, 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.

PES Working Group Recognition Awards

In addition to the Technical Committee distinguished service Awards, PES sponsors Working Group Recognition awards. The awards are related to “outstanding and timely” publications of technical reports, or of standards and guides. Excerpting from the PES website (http://www.ieee.org/portal/site/pes/) Awards pages:

“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. Each Technical Council Committee is urged to submit one electronic copy of nominations for each of these awards no later than November 27.

Please forward suggestions for nomination for the next (2011) PES WG Recognition Award to my attention, ASAP, so a nominee can be selected and forwarded to PES.

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.  Excerpting from the PES Awards website: “Each Technical Committee is encouraged to make one award for outstanding service. 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 seeking nominations for this award.

Transformers Committee Meritorious Service Awards

In 2008 we initiated 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.

Member Certificates

We will continue with the process of providing a framed Certificate, certifying Membership in the Committee, to new Members. The intent is to provide a symbol of recognition of Membership status, in a format suitable for display. The Certificate will indicate date of acceptance into the Committee, and will be signed by the Committee Chair.

This program is one small way of recognizing your support for the Committee.  The Certificates represent the appreciation of the Committee, and of your Committee Officers, for your service to the Committee, to IEEE, and to our Industry. We hope you will display your Membership Certificate proudly at your place of business, and encourage others to join us in our work.

Nominations for IEEE, PES, and Technical Council Awards

There are no nominations in these categories at this time. Regarding IEEE Fellow Nominations, we have missed the opportunity for preparation of nominations for the 2011 Class of IEEE Fellows. We need to think about nominations for 2012. Borrowing from the IEEE Awards web pages (<http://www.ieee.org/web/membership/grade_elevation/grade_elevation.html>): “The 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.”  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.

IEEE SA Awards Committee Report

In 2011, the IEEE SA Awards Committee and the IEEE SA Board of Governors approved:

* 7 Standards Medallions, which is the most awarded in any year
* one IEEE Standards Education Award
* one IEEE SA International Award
* one IEEE SA Corporate Award
* one IEEE SA Emerging Technology Award
* one IEEE SA Lifetime Achievement Award
* one IEEE SA Standards Board Distinguished Service Award

<http://standards.ieee.org/develop/awards/>

The nomination period for 2012 begins on 1 February and runs through 31 July.

Again this year, the IEEE Standards Association Awards Ceremony will be held during the December meeting series; this year on 2 December 2012.

1. **Meetings Planning SC Minutes & Report – Gregory Anderson**
   1. **Meetings Subcommittee Minutes**

No Report.

* 1. **Meetings Report**

No Report.

1. **Administrative SC Minutes – Bill Chiu**

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: Members absent:

Gregory Anderson Bruce Forsyth

Stephen Antosz Ross McTaggart

William Bartley Ed teNyenhuis

Bill Chiu

Richard Dudley Guests present:

Charles Johnson Peter Balma

Thomas Lundquist Jin Sim

Susan McNelly Erin Spiewak

Carl Niemann Al Rotz

Donald Platts Barry Beaster (for Bruce Forsyth)

Michael Sharp

Stephen Shull

Edward Smith

Loren Wagenaar

Peter Zhao

* 1. Approval of Previous Meeting Minutes

The Chair asked for comments from the Boston Administrative Subcommittee meeting minutes. Hearing no comments or requests to change the draft minutes, the Chair asked for a motion to approve. Vote Approved.

* 1. Approval of Agenda

The Chair reviewed the draft agenda with the attendees. There were no comments and the Chair declared the agenda approved.

1. Introduction of Members and Guests (:05) B. Chiu
2. Approval of Fall 2011 Minutes – Boston, MA (:03) B. Chiu
3. Additions to and/or Approval of the Agenda (:02) B. Chiu
4. Chair’s Report (:05) B. Chiu
5. Vice Chair’s Report (:05) D. Platt
6. Secretary’s Report (:10) S. Antosz
7. Treasurer’s Report (:05) G. Anderson
8. Awards Report (:10) E. Smith
9. Meeting Planning (:10) G. Anderson
   1. Nashville Meeting Arrangements & Host Update
   2. Future Meetings
10. Standards Report (:20) B. Bartley
11. IEC/IEEE Dual Logo Standards Update (:05) E. Spiewak
12. BREAK (:10)
13. New Business
    1. Corresponding Members and Quorum (:05) S. Antosz
    2. GMD/GIC Position Paper (:10) B. Chiu/D. Platts
    3. Class I & II Considerations (:05) B. Chiu
    4. Committee O&P, WG P&P Manual Update (:15) P. Balma
    5. Access to Tutorial Presentations & Copyright release (:05) B. Chiu/S. McNelly
    6. WG Data – Confidentiality, Storage, Access, & Use (:15) S. McNelly/E. Spiewak
    7. General Sessions Coordination (Mon. & Thr.) (:05) B. Chiu
14. Subcommittee Reports - Roundtable
    1. Bushings (:05) P. Zhao
    2. Dielectric Test (:05) L. Wagenaar
    3. Distribution Transformers (:05) S. Shull
    4. Dry Type Transformers (:05) C. Johnson
    5. HVDC (:05) M. Sharp
    6. Instrument Transformers (:05) R. McTaggart
    7. Insulating Fluids (:05) S. McNelly
    8. Insulation Life (:05) B. Forsyth
    9. Performance Characteristics (:05) E. teNyenhuis
    10. Power Transformers (:05) T. Lundquist
    11. Underground Transformers & Network Protector (:05) C. Niemann
15. Old Business
16. Adjourn
    1. Chair’s Report – Bill Chiu

See Section 2.2 of the Main Committee Minutes.

* 1. Vice-Chair’s Report – Donald Platts

See Section 4.0 of the Main Committee Minutes.

* 1. Secretary’s Report – Stephen Antosz

See Section 5.0 of the Main Committee Minutes.

* 1. Treasurer’s Report – Greg Anderson

See Section 6.0 of the Main Committee Minutes.

* 1. Awards Report – Ed Smith

See Section 8.0 of the Main Committee Minutes.

* 1. Meeting Planning Report – Greg Anderson
     1. Nashville Meeting

No Report.

* + 1. Future Meetings

No Report.

* 1. Standards Report – Bill Bartley

See Section 7.2 of the Main Committee Minutes, and the website.

* 1. IEC/IEEE Dual Logo Status Update – Erin Spiewak

**New Standard for Phase Shifters**

**IEEE Std C57.135-2011 ... IEC/IEEE 60076-57-135**

-This document was adopted by IEC TC14; this supersedes the previous 2001 adoption and the publication is underway.

-This adoption was contingent upon an agreement to do a Revision with IEEE after adoption complete (would become IEC/IEEE 60076-57-135). The WG agreed to remove the tutorial material and place in a separate document or annex.

- There is some discrepancy on the WG meeting minutes on whether the PAR was requested from the Toronto 2010 meeting.

- At the 2011 Boston meeting there was discussion about the PAR and a request being brought forward to undertake the project.

-Bill Bartley received the PAR request, but had to reject it because it did not follow the proper procedures.

-If Raj will remain Chair, Erin and Jodi will assist with the PAR once ready to be submitted (after seeking proper approval).

-The next steps will be to get the PAR approval and work with Raj to get interest in the WG/call for participation.

-Make note that IEEE agreed to do the joint Revision, so if the project doesn't get underway/ WG decides to not pursue the project we will want to handle carefully when bringing this to IEC.

**Proposal for joint project on wind farm transformers**

**IEC 60076-16 and IEEE 57.12.16**

-Both IEC and IEEE were working on similar projects, and Paul Jarman suggested to work together jointly.  However, since IEC was almost complete with their project it was decided for IEC to finish and then possibly work on a revision project together.

-In Boston 2011it was decided to delay the PAR and work to set up a joint WG with IEC, if agreed upon.  Paul met with IEC TC14 and they have sent out a Document for Comment.  This document is asking IEC if they should undertake this joint revision project.  The Document for Comment closes April 13th.

-After April 13th the WG will know if they are going to do a joint project.

-Paul noted that the UK seems to be okay with the revision project, but will need 5 countries total (US also a likely).

-WG can work on developing title/scope and document, however if IEC agrees to joint Revision they should be aware that IEC will need to agree to these.

-If IEC does not agree with joint project the WG will need to seek copyright permission for material used from them.

* 1. Break
  2. New Business
     1. Corresponding Members and Quorum – Stephen Antosz

Corresponding members do not count towards quorum (in numerator or denominator) if not present at a meeting.

Corresponding members do count towards quorum (in numerator or denominator) if present at a meeting.

* + 1. GMD/GIC Position Paper – Bill Chiu / Don Platts

IEEE Spectrum published a paper about widespread xfmr failures to happen. Should IEEE TC sponsor a position paper? as a response to the paper.

Eventually we should develop a Guide on how to specify a xfmr to meet the unusual service conditions related to a geomagnetic disturbance and how much geomagnetically induced currents the unit should be designed for.

A motion was made for the IEEE TC to solicit the IEEE Spectrum editor to ask if they will accept a rebuttal paper. The motion passed. The TC Chair will act on this.

* + 1. Class I & II Considerations – Bill Chiu

Loren gave a report on what has transpired since the last meeting. Bertrand’s WG did a very successful survey for changes to low frequency tests which effectively reduces Class II units down to 69 kV, 15 MVA. It was suggested that the impulse WG follow the same path and send a similar survey. Bill Chiu asked the Dielectric test Subcommittee to take the lead in this effort.

* + 1. Committee O&P, WG P&P Manual Update – Peter Balma
* Working Group Task Force
* A Committee or Subcommittee (Subgroup) Standards Study Group
  + To examine proposal to determine if need for a standard to be developed.
  + Life of Standards Study group is limited to 6 months.
  + If proposal merits formation of project the study group will draft a PAR.
  + Disbanded when PAR approved by IEEE-SA Board
  + <http://standards.ieee.org/board/pro/study-group.doc>
* Can also establish a study group to investigate material within the scope of the Transformers Committee which does not have purpose of developing a guide or standard.
* At every meeting, it is required that everyone introduce themselves and clearly state their affiliation, on whose behalf are you attending.
* P&P and WG P&P procedures are not optional!
* Corresponding membership –current status in P&P Brief discussion if needed?
* Take Patent Disclosure out of meeting Agendas & Slides
* Corresponding membership – future status
  + AudCom has historically not accepted Corresponding Membership
  + Can establish in operating manual and maintain nomenclature, but they will not be part of quorum at meetings, nor officially a voting member of the committee.
* Historical Archives
  + Two valuable tutorials from Transformers Committee (Courtesy Loren Wagenaar):
    - Application of distribution and power transformers / course organizer, W. J. McNutt ≈ 1976
    - Power transformer considerations of current interest to the utility engineer / course organizer, G.W. Iliff ≈ 1984
  + Three option to make available to Transformers Committee members:
    - Investigate "free" protected access for PES members only on PES website
    - Have PES supply them on demand (prices range from $5.00 to $60.00)
    - Post them on Transformers Committee website, with IEEE approved copyright notice, but can only be made available to PES members (will website technology allow this?)
  + Motion or decision from AdCom to proceed and in what direction?
    1. Access to Tutorial Presentations & Copyright release - Bill Chiu / Susan McNelly

Should we give technical presentations to PES website so they can sell? After discussion we decided No. They need copyrighted; plus we lose ownership. We will put on our TC website, behind password protected wall. Greg will send out notification with password and conditions of use.

* + 1. WG Data – Confidentiality, Storage, Access, & Use – Susan McNelly / Erin Spiewak

Data should not identify source. No solution or decision. To be continued…

* + 1. General Sessions Coordination (Mon. & Thur.) - Bill Chiu

The Chair asked each SC Chair to report on hot topics in Part 1 on Monday morning, and full report on Thursday.

* 1. Subcommittee Reports
     1. Bushings – P. Zhao Report: No Hot Topic: Yes
     2. Dielectric Test – L. Wagenaar Report: Yes, acoustic PD Guide to start.

Hot Topic: Yes, Class I/II issue

* + 1. Distribution Transformers – S. Shull Report: No Hot Topic: Yes, DOE

efficiency levels

* + 1. Dry Type Transformers – C. Johnson Report: No Hot Topic: Yes, dry-type PD levels and method for test corrections for altitude to be worked on
    2. HVDC – M. Sharp Report: No Hot Topic: No
    3. Instrument Transformers – R. McTaggart Report: No Hot Topic: No
    4. Insulating Fluids – S. McNelly Report: Yes, TF for combining documents Hot Topic: No
    5. Insulation Life – B. Forsyth Report: Yes, Four new topics – moisture TF, high temperature insulation, wdg temp indictors, heat run Hot Topic: Yes
    6. Performance Characteristics – E. teNyenhuis Report: No Hot Topic: No
    7. Power Transformers – T. Lundquist Report: Yes, New WG’s – C57.93

and C57.135 PST. Hot Topic: No

* + 1. Underground Transformers & Network Protector – C. Niemann Report: No Hot Topic: No
  1. Old Business

None

**10. 15 Minutes of Special Task Force on GIC (Geomagnetic Induced Currents)**

This was an impromptu meeting, not on the Agenda but was put together at the last minute.

**Planning meeting on Effect of GIC on Power Transformers and Power Systems**

*Bluegrass Conference Room, Nashville Renaissance Hotel*

*March 13, 2012 9:30 AM - 10:30 AM*

**Attendees**

Bill Chiu, SCE Brian R Penny, American Transmission Company  
Donald Chu, ConED Donald W Platts, PPL

Emanuel Bernabeu, Dominion Gary R Hoffman, Advanced Diagnostic  
J. Edward Smith, H-J Enterprise James McIver, Siemens  
Kiran Vedante, ABB Loren Wagenaar, WagenTrans Consulting  
Mohamed Diaby, EFACEC Ramsis S Girgis, ABB  
Stephen Antosz, Antosz & Associates Thomas G Lundquist, PTC  
William H. Bartley, Hartford Steam Boiler

**Minutes of Meeting**

The meeting was called and chaired by Ramsis Girgis. After welcoming the attendees, The chair gave a brief context of the purpose of the meeting; namely:

1. Writing a position paper, on behalf of the IEEE Transformer Committee, in response to the IEEE Spectrum article written by John Kappenman; "A Perfect Storm of Planetary Proportions" that appeared in the February 2012 issue.
2. Forming a TF to produce a proposal for an IEEE GIC Guide and identifying the purpose, applications, and scope of this Guide

The Chair then requested, around the table, introductions. Each attendee stated his affiliation and gave a brief statement of his perspective on the issue of GMD and the IEEE Spectrum article.

Paper response to the IEEE Spectrum Article

The Spectrum article had mainly three claims that are not accurate:

1. GIC would fail a very large number of Power Transformers due to damaging overheating
2. Power Utilities have not done much since the 1989 GMD storm to be prepared for the next storm
3. A GIC Blocking device is the only solution to avoid the harmful impact of GIC

All in the room were in agreement that the IEEE Spectrum article went too far and exaggerated the impacts of GMD on power transformers and the power grid. Moreover, The GIC issue is more a Power systems issue rather than a transformer overheating failure issue as the Spectrum article claims. Also, the article stated that utilities were not taking any steps to mitigate effects of GIC on power systems; which is not true. Almost every major utility in North America have taken steps in this direction.

A question was raised in whether any of the attendees was requested to review and provide comments prior to the article being published. Emanuel stated that a representative of Dominion was requested to review the draft article, but was not given sufficient time. The reviewer gave feedback that the article should not be published and that a lot more work needed to be done before such an article would be published, but the feedback was ignored.

The Chair also indicated that the NERC TF on GMD just recently published its report. One of the recommendations of this TF is for the Transformers Committee to develop an industry standard / Guide on GMD and transformers. It was agreed to do that. However, the standard development effort will take much longer to accomplish and that the industry, in the meantime, will need something much faster.

There was also a suggestion that the Transformers Committee considers issuing a "press release" to IEEE and the greater technical community that the Transformers Committee is reviewing the IEEE Spectrum article and plan to present a more balanced view point on this issue. After some discussion, the group decided that the best thing to do is to develop a, say; 4 – IEEE type (2 – column) pages, position paper on GMD and power transformers. The intent of the paper is to provide a balanced view point from the perspective of experts of the transformer subject matter.

It was also agreed that the Transformer Committee Chair will contact IEEE Spectrum to determine the appropriate forum for this position paper. It was also agreed that the proposed position paper should be written for a general audience of the greater public.

A preliminary outline of the paper was developed at the meeting, together with assigned volunteers for the respective sections; as follows:

* Effects on Power Transformers – ***Ramsis***
* Effects on the Power System – ***Emmanuel***
* What transformer manufacturers did and are doing regarding the GMD phenomenon and its effects on Transformers – ***Mohamed and Jim***
* GIC Blocking devices and what some of the issues are – ***Emanuel***
* What Utilities did after the 1989 event.– ***Bill Bartley***
* What Utilities are doing now – ***Bill Chiu***
* What government & regulatory agency are doing – ***Frank Koza***

The Chair will contact the contributors to the paper for more details.

The following action Items were agreed upon:

1. The assigned members are to complete the drafts of their sections of the proposed paper by the end of April.
2. Bill Chiu to reach out to IEEE/PES Tech Council to see if there are other technical committee interested in such an activity, and if no other interests could TC act on its own.
3. Bill Chiu to reach out to IEEE Spectrum to determine the best course of action for publishing an editorial review.
4. The team to continue meeting to complete the position paper and also work on developing a proposal for a Standard / Guide for transformers as relates to GMD.

It was also suggested that the Transformers Committee should reach out to the Power System Relaying Committee to coordinate possible actions by that committee. The Transformers Committee Chair stated that it would be appropriate to reach out to the IEEE/PES Tech Council to determine the level of interest by other parties.

Subsequent to this meeting, Bill Chiu contacted IEEE/PES Tech Council, and with the assistance of Al Rotz, connected with the Editorial staff of the Spectrum that the recommended course of action is as follows:

1. Immediately prepare a one page description of the article IEEE TC would like to publish; including the content, the criticality of timing on the subject, the expertise of the authors, and the need to present readers with a balanced view on the subject.
2. Solicit from PES Technical Council (with the representative leadership of the technical committees) in support of the need for this follow–up article would be desirable. The current PES Tech Council Chair or PES President will consider to provide that in concert with our submission.
3. The editorial staff will review and provide a decision on a go/no go, as well as timing for the article.
4. The Transformer Committee would prepare and forward the final article for review.

Proposed GIC Standard / Guide

The group discussed the possible scope of the proposed GIC Guide. The chair stated the following items as some of the items needed to be developed / agreed upon in such a document:

1. Maximum winding and structural parts hot spot temperatures recommended for high – peak short – duration GIC pulses and base long duration GIC.
2. Standard signature of GIC base and high peak short duration pulses to be used for winding and structural parts temperature calculation when the transformer is subjected to GIC
3. Process of evaluating the risk of power transformers to GIC

It was suggested that:

* A Guide would be a more suitable type of document for such information
* This Guide should include sufficient background of the GMD phenomenon, the GIC issues involved; including its effects on power systems. It may also include effect of GIC on CT (s) and PT (s).
* C57.12.00 would refer to the GIC phenomenon as an unusual operating condition for the transformer.
* The TF to develop this Guide may belong to the Power Transformer SC. However, it was agreed that a scope of this Guide will need to be developed first then a decision can be made as to which SC the TF will belong to.

*Written by:*

Bill Chiu and Ramsis Girgis

1. **Minutes of Technical Subcommittees**
   1. **Performance Characteristics SC – Ed teNyenhuis, Craig Stiegemeier, Secretary**

**Introduction / Attendance**

The Performance Characteristics Subcommittee (PCS) met on Wednesday, March 14, 2012 at 3pm with 60 members and 77 guests present. Prior to this meeting, the total membership of PCS was 103 members; therefore, we did have in excess of 50% of the membership, meeting the requirements for a quorum.

There were 10 guests requesting membership.

**Chairman's Remarks**

Craig Stiegemeier was unable to attend so Steve Snyder was acting secretary for the meeting.

A review of the PCS standard expirations and PAR expirations was reviewed. The majority of the standards do not expire until after 2018.

**Administrative Subcommittee Notes**

Upcoming IEEE – PES Meetings

* IEEE/PES T&D Conference and Exposition, May 7, 2012, Orlando, FL
* PES General Meeting: July 2012, San Diego, California.
* PES General Meeting: July 2013, Vancouver, BC, Canada.
* Next Transformer Committee meetings:
* Fall 2012, Milwaukee, Wisconsin; hosted by Waukesha
* Spring 2013, Munich, Germany; hosted by Reinhausen
* Fall 2013, St. Louis, Missouri; hosted by HJ Enterprises
* Spring 2014, Savannah, Georgia; hosted by Efacec

**Approval of Meeting Minutes**

The minutes of the last meeting in Boston MA were approved as written.

**Working Group (WG) and Task Force (TF) Reports**

**10.4.1 WG on Loss Evaluation Guide C57.120 – Don Duckett, Chair; Alan Traut, Vice-Chair**

There were 13 of the 22 Members in attendance and 52 Guests with 4 Guests requesting membership.

The present PAR is approved and expires on 12/31/2014. The present draft being worked on is D11.

Attendance of membership was taken and a quorum was established.

The minutes of the Spring 2011 San Diego meeting and the Fall 2011 Boston meeting were approved as submitted.

Comment from D. Platts – We should consider modifying this document to recognize that not all utilities are vertically integrated. We should provide a means for non-generating utilities to determine loss evaluation factors.

Comment from S. Shull – We should merge Annex C on transformer losses into the body of the document. There was general agreement to do that.

Comment from B. Klaponski – We should consider making a spreadsheet available through the Transformer Committee website for users to perform these calculations in accordance with this guide.

We reviewed draft D11 and made the following assignments to review these clauses and make a recommendation before the Milwaukee meeting. A. Traut to post D11 on the website and email to those listed below.

• B. Farris – Clause 2

• J. Murphy – Clause 3

• M. Miller – Clauses 4.1 and 4.2

• D. Platts, W. Binder, S. Shull – Clauses 4.3 and 4.4

There was no other new business. The WG adjourned at 12:05 pm.

**10.4.2 PCS WG on “Test Code C57.12.90” – Mark Perkins, Chairman; Craig Stiegemeier, Secretary**

1. Introduction of members and guests

2. Membership review - The chairman reviewed changes to the membership of the working group since the last meeting. After these changes, the Working Group now has 77 Members, 2 Corresponding Members and 257 Guests. Any Member missing the last two Working Group meetings has been moved from Member to Guest status.

A review of the current roster of members was presented to the attendees. After the review, a roll call found that 39 members were present at the meeting, constituting a quorum of 51% of the Working Group membership. The attendance sheets showed that there were actually 42 members present and 50 guests, constituting a quorum of 55%.

3. Approval of minutes from the Fall 2011 Boston meeting - The Chair noted that the minutes from the Boston meeting were distributed to the Working Group before the meeting by E-mail as well as on the Committee website. After a call for comments or corrections and receiving none, Hem Shertukde made a motion to approve the Boston minutes, Steve Snyder seconded the motion, and the minutes were approved by the membership as written.

4. Old Business

* Revision of Section 6 and 7 - The final revised sections 6 and 7, as approved by survey and vote of the last meeting were submitted to the working group on continuous revision of C57.12.90. These will be included on the ballot of the test code, which Steve Antosz reports will happen in about 1.5 to 2 years.
* Revision of Section 8 - Comments from the last meeting on section 8 were agreed to apply mostly to the loss measurement guide, rather than section 8. As a result, the minutes of the Boston meeting, which summarize these comments will be forwarded to the Performance Characteristics subcommittee to be included on the next revision of the guide.

5. New Business - Zero Sequence Impedance measurement on wye wye transformers or autotransformers without a delta tertiary.

The chairman reviewed a motion from V Sankar and K. Vijayan that the working group review section 9.5.3 on zero sequence measurements as it applies to three leg core form transformers with wye wye connected windings. This was based on discussions with a customer where there was confusion on how to represent the Z3 branch as shown in Figure 25 for such transformers. They presented sections from Blume (Table III item 6) and from the Westinghouse Transmission and Distribution reference book Table 5 that the customer was using to argue that the Z3 branch can be ignored.

The chair then discussed section 9.3.5 and the four tests that are to be made on such transformers in order to develop the equivalent zero sequence network shown in Figure 25. He also discussed the need to make measurements at multiple voltage/current levels since the circuit is non-linear and a curve is needed to determine the specific zero sequence impedance values required for a specific fault current or imbalance loading condition. He then summarized some possible additions that could be made to section 9.3.5 to clarify this situation including:

Z3 is very large and the zero sequence impedance is equal to the positive sequence impedance for 5 leg core form and for shell form.

For three leg core form transformers, the Z3 value is typically 5-10 times the Z12 measured value and should be taken into account in short circuit calculations involving the zero sequence impedance.

Measurements should be made at different current levels to establish the non-linear curve for all four different measurements..

Warning should be given regarding overheating of the tank or tank wall shielding.

State that the tanks acts as a one turn phantom tertiary and the Z3 impedance is to this tertiary.

The question was asked if anyone was actually using wye wye transformers with three leg cores or autotransformers without delta tertiaries. The response from several members was that many manufacturers have manufactured such transformers and a number of users specify such transformers for their system.

It was suggested that we coordinate with the task force on stabilizing windings since this same type of subject is being discussed there. The chair agreed to contact the task force chair and make arrangements.

Since there was agreement that section 9.5.3 should have a note included with the information in italics above, a motion was made for the working group to prepare such a note. The chair will present this at the next meeting for review.

The chair asked if there was any other new business items to discuss.

It was requested that the group consider revising the required tolerance on ratio for transformers with reactance type load tap changers. The chair advised that the topic of tolerances is in C57.12.00 not C57.12.90, so it was agreed to forward this question to Steve Snyder.

Phil Hopkinson suggested that a warning be included in the standard on transformer connections regarding potential problems of wye wye or autotransformers without tertiaries when there are unbalanced loads on the system. This question will be referred to the PC subcommittee for consideration since it is outside the scope of our working group.

6. Adjournment - A motion was made, seconded and passed to adjourn the meeting at 12:14am.

**10.4.3 PCS TF on Dielectric Frequency Response – George Frimpong, Chairman; Poorvi Patel, Secretary**

1. Meeting Attendance - The TF on DFR met on Monday, March 12, 2012, at 3:15 PM. 16 members (out of 25) and 61 guests were present.

2. Approval of previous meeting minutes - The minutes of meeting from the Fall 2011 meeting in Boston, MA were approved as written.

3. Presentations of task reports

• George Frimpong presented task force objectives and a summary of the findings of the four sub groups formed to address the objectives. All objectives set for the task force have been met.

• Diego Robalino presented the work by sub group 3 - verification and validation of DFR for moisture estimation. This involved a review of over 29 articles, 19 of which dealt with some comparison of moisture estimation using dielectric response measurements to another form of estimation of moisture (e.g. Karl Fischer titration or moisture equilibrium curves). The measurements involved several transformers and other small scale transformer models and showed quite good agreement between dielectric response measurement and Karl Fischer titration of solid insulation samples from the same transformer. There were three articles that had dielectric response measurements that did not correspond to the comparison moisture measurement used.

• George Frimpong presented how DFR issues submitted by M. Lachman were addressed in the report. No comments were received after the presentation.

4. Discussion to recommend to PCS to form working group to develop guide:

• The chair asked for a discussion to recommend to the performance characteristics subcommittee to form a working group to develop a guide for the use of DFR for estimation of moisture in solid insulation of transformers

• Mark Perkins indicated the best way to quickly generate data on moisture in solid insulation that could eventually be used in other IEEE documents is by developing a guide that will help in the generation of the correct data.

• A motion was proposed by Tom Prevost to recommend to form a working group to work on a guide and this was seconded by Peter Werelius

• We took a vote and 16 of 16 members present voted to approve the motion

5. Next Steps

The next step is to complete the task force report and send it to the task force for comment. After a final review the report will be sent to the PCS chair with a recommendation to form a working group. It was suggested that PCS should transfer the topic to the Dielectric Tests subcommittee since the basis of this test is essentially power factor measurement over several frequencies.

If a working group is authorized at the subcommittee level, the chair recommended that Peter Werelius serve as the chair of that working group. This is based on Peter’s vast experience and knowledge of DFR measurements and analysis.

6. Adjournment - The meeting was adjourned at 4:00 PM

**10.4.4 PCS WG on “General Requirements C57.12.00” – Steve Snyder, Chairman; Enrique Betancourt, Secretary**

The Working Group met at 4:45 PM on Monday, March 12, 2012, with 34 members and 65 guests present. As the current Working Group membership stands at 66 members, we did have a quorum for the meeting. The following six (6) guests requested membership, which will become effective only after confirmation of attendance at two (2) consecutive meetings:

David Ostrander Ameren

Sergiy Razuvayev Delta Star Inc.

Bruce Fairris Nashville Electric Service

Juan Carlos Cruz Valdes Prolec GE

Babanna Suresh Southwest Electric Company

Mahendrakumar Soni Virginia Transformer

Following introductions, the minutes of the October 31 Boston meeting were approved. The meeting agenda as presented was approved with no changes.

Old Business

WG Item 87, Table 15 Short-Circuit Apparent Power of the System

- Discussion on Survey Results

A proposal to modify Table 18, Short-circuit apparent power of the system, was surveyed among PCS and the WG. The results of that survey were reviewed. The response rate was about 31%, with 84% affirmative, 7% negative, and 9% abstention, with several good comments. The next step is to make slight revisions to the table accommodating some of the comments, and then to go out for survey again, per the Working Group request. The chairman will work with the Task Force chairman, Bruce Forsyth, to make those changes and get the survey launched. This should be completed well before the next meeting so that at the next meeting we can close this item.

WG Item 96, Table 18 Resistance Measurements for All Taps on Power Transformers

– Discussion of Proposal

A proposal to require resistance measurements on all taps for power transformers was discussed, with many comments received from the Working Group:

Give consideration to the special case of a series transformer, where all taps would yield approximately equal measurements.

There is a risk of significantly increasing the winding temperature during the test for all taps, making it impossible to reproduce reference measurements in the field.

If the purpose of the proposed test is to identify bad contacts, a “contact resistance measuring instrument” would yield better results.

If the purpose of the test is to measure winding resistance, there is no sense in measuring all taps individually.

Some members were in favor of establishing resistance measurements only on selected taps. At least some bridging and non-bridging tap positions should be involved.

It was pointed out that, for in service transformers, the test can be a good means to check for contact wear. Exercising the tap changer, and control of gases generated in LTC compartment would be helpful.

A participant from the utility side cited a case of a new transformer with a tap changer lead that came loose during transportation, and having detected the problem through the routine use of the winding resistance test, checking all taps.

As the individual leading the proposal, Joe Foldi, was unable to attend the meeting, these comments will be forwarded to him and his study group for further refinement. The refined proposal will then be surveyed among PCS and the WG, with the final discussion and disposition expected at the autumn Milwaukee meeting.

WG Item 97, Table 18 Operational Tests of LTC Equipment

- Discussion of Proposal

The proposal requires detailed operational tests on the LTC equipment. Again, Joe Foldi is the individual leading the effort, and since he was not in attendance, there was practically no discussion on this topic. One question was raised concerning the purpose of the test, if it is to demonstrate the ability of a new tap changer to perform properly, then the test could be carried out before installing it on the transformer. It was clarified also that the proposed test is not addressed in the IEEE standard on LTCs. The next step on this item is to obtain a final proposal from the study group, survey PCS and the WG, and review the results at the next meeting.

New Business

WG Item 99, Clarification of Ratio Requirement in Standard C57.12.00

A clarification was requested from an earlier C57.12.90 meeting concerning the ratio requirements specified in C57.12.00 in regards to the tolerance for ratio. The issue identified pertains particularly to transformers with LTC where the tap sections are not uniform and hence the nameplate voltages at each tap may not be within the 0.50% tolerance, but if based upon the actual turns are within tolerance. Another factor bearing upon the ratio test measurement is the influence of the preventive auto when in the bridging position. There was a lot discussion about possible changes in the standard to recognize these situations, but it will require a lot more work to finalize. Raj Ahuja volunteered to lead a study group to develop a proposal, which will then be surveyed within PCS and the WG before the Milwaukee meeting.

The meeting was adjourned at 6:00 PM.

**10.4.5 WG on “IEEE Standard Requirements, Terminology, and Test Procedures for Neutral Grounding Devices”, PC57.32 – Sheldon Kennedy, Chairman; Fred Elliott, Vice-Chair**

The Neutral Grounding Devices working group was called to order at 3:20 PM on March 13, 2012. There were 22 attendees present.

1. Quorum was established from new membership survey - 12 working group members were present with 10 guests.

2. Minutes were approved from the Fall 2011 meeting.

3. Chairman's Remarks – (Sheldon Kennedy) Chairman presented a brief history of the WG and introduced the new PAR, which will expire December 31, 2015.

4. It was noted that the new PAR does not list a purpose. A motion was introduced to remove the purpose statement from the draft document. The motion was approved.

5. Discussion of Draft 11 ensued by way of a review of the devices included in the document. Discussion centered on the following:

• insulation temperature classes

• the comparison of definitions in the document to IEEE 100

• maximum voltage class levels to be included

• the source of the time factor multipliers from STD-32

• updating test levels to those in the current version of C57.12.00

• test levels for single phase devices

6. Consideration was given to comparing the document to IEC calculations for temperature rise, continuous duty and short time ratings. This will be investigated by Don Ayers.

7. New Business: none

8. Meeting was adjourned at 4:35pm.

**10.4.6 TF on Tertiary/Stabilization WIndings – Enrique Betancourt, Chairman; Steve Snyder, Secretary**

The Chair called the WG meeting to order at 9:50 am on March 12, 2012.

There were 16 members in the meeting, out of 29 counting members, therefore we had a quorum. 56 Guests attended also, and 5 of them requested membership.

As part of the Old Business, the Group was updated on the PAR request approval status. The application has been submitted to the NesCom through MySpace, and a positive response is anticipated by the beginning of June [Thank’s to Bill Bartley and Steve Antosz for their support]. The Title, Scope and Purpose of the new document will be:

TITLE - “Guide for Application of Tertiary and Stabilizing windings in Power Transformers”.

SCOPE - This Guide addresses the application of tertiary and stabilizing windings in liquid immersed power transformers, as covered by IEEE Std C57.12.00, as well as recommendations to evaluate the need or convenience of having such windings. The primary application of this guide is for transformers and autotransformers with wye-wye connected windings, with or without a delta connected tertiary or stabilizing winding. The guide does not address tertiary windings in conventional delta-wye, or delta-delta connected transformers.

PURPOSE - This Guide provides users with a conceptual framework and recommendations for the specification, application, and performance evaluation of tertiary and stabilizing windings.

NEED - There is a great deal of interest in the transformer industry to develop an application guide for tertiary and stabilizing windings. This proposed document is intended to fill a gap in currently available literature, regarding guidance for the need for a tertiary or stabilizing winding in a Y-Y connected transformer or autotransformer; and guidance on the kVA rating of said winding.

Next item on the Agenda: A literature and industry practice survey was performed by TF members in the last months, and samples of the results were presented in form of:

1. A paper by Sanjay Patel: Title “Tertiary Delta Winding for Y-Y Connected Transformers”, which explains some advantages and disadvantages of the use of tertiary windings in Y-Y connected transformers from both technical and commercial point of view.

2. A presentation by Xose Lopez-Fernandez with the title “Transformer Tertiary Stabilizing Windings” touches on the apparent power rating of the stabilizing winding and overheating hazard on tank walls.

3. A short summary of responses from utility participants regarding practices to specify tertiary and stabilizing windings.

The list of references and a full summary of responses will be posted on the web, accessible to WG members.

Several guests attending the meeting provided recommendations to the Group regarding technical aspects to be considered:

Dan D. Perco – On the transformer without tertiary, the zero sequence current will flow in other delta nearby. Are these transformers designed to take the extra current?

Follow up observations by Dan D Perco – specification of tertiary winding to be added to list. Insulation levels required for buried tertiary winding.

Edgar R. Trummer- Observation "3 leg core type transformers do not need a tertiary winding" in a standard or guide is dangerous and must be avoided. In this case the Zero Sequence flux is forced towards to the tank and creates additional losses and hotspots in this area, if the 3-phase system is unbalanced. In this case it would be better to have a 5 leg core since the Zero Sequence flux will mainly be collected in the auxiliary legs and not go through the tank”.

At this point, [the Chair] clarified that our work is precisely to provide recommendations that eliminate risk and ambiguity, and that we will be looking at three different cases:

Transmission and Intertie Transformers and Autotransformers

Wind farm collectors

Primary distribution transformers and autotransformers

As a last item on the Agenda, the Table of Contents of the new document was reviewed and first inputs from the audience included.

There being no new business, meeting was adjourned at 11:05 am.

**10.4.7 TF on “Audible Sound Revision to Clause 13”, C57.12.90 – Ramsis Girgis, Chairman**

The TF met at 1:45 PM on Monday, March 12, 2012 with a total of 77 in attendance. There were 18 of 50 members in attendance along with 59 guests. Seven guests requested task force membership. After the introductions of attendees and circulation of attendance sheets the unofficial minutes of the fall 2011 Boston meeting minutes were presented. At the meeting, there was a request for corrections and an unofficial approval of the minutes pending a meeting quorum. Since we did not have a quorum at this meeting, they will remain tentatively approved until a quorum can be established. Prior to the meeting a request for inclusion of a comment from Jeewan Puri was forwarded to the Chairman for review and this comment was added to the minutes.

First, the Chairman shared with the attendees a summary review of the agreed upon additions to Section 13 of C57.12.90. These are:

* Making the Wall sound reflection correction
  + Per IEC but limit correction to 4 dB and test room cases to 4
* Using the “Sound Intensity Method”
  + As an alternative method
  + Use newly developed correction for 4 < (Lp – Li ) < 6 dB
  + Consider method invalid for (Lp – Li) > 6
* Measuring Load Noise
  + When requested by purchaser
  + Can measure at current 60 % < I rated < 130 % and correct per IEC
* Changing the ONAF measuring contour
  + Per IEC, 2 m all around transformer
* Determination of Total Noise level of a transformer
  + By adding Load and No Load noise levels, Per IEC

Next, the chairman reviewed and discussed new text that addressed comments / suggestions that were brought up and agreed upon by the TF in the Boston meeting. Here are the items discussed and the decisions made based on input from the attendees:

Item1: Agreement on environmental corrections

The sound pressure method had a comment regarding the environmental correction to be agreed upon between the manufacturer and the purchaser of the transformer. There were three choices to respond to whether a modification of this statement is needed. The choices were:

• Leave the statement as is.

• Remove the statement completely.

• Agreement needed only if an alternative method is proposed.

A decision was made, based on Pierre Riffon’s suggestion and agreed upon by the attendees, to remove the agreement statement and to have the reported final test report data include the measured noise levels along with the corrections used in determining the final value.

Item 2: Allowing load noise measurement at a current in the 60 – 130% range of full load

The chairman explained that test equipment limitations can dictate measuring at a lower current than rated current and when the ambient noise is not sufficiently lower than load noise of the transformer at full load, it is permissible to measure load noise of the transformer at a higher current than rated current. Data was presented in an earlier TF meeting that showed the error involved in this allowable range is a fraction of a dB. The same is also presented in an IEEE paper on Load noise published 2 years ago.

Item 3: Appropriate Environmental conditions for Sound Intensity Method

It was agreed to add the following text:

“When the environmental conditions are such that LP - LI > 6 dB, using the Sound Intensity method, under these conditions, would be considered invalid. This condition is typically caused by:

1. High ambient noise. In this case, the transformer manufacturer could attempt to reduce the ambient noise.

2. High sound wall reflections. In this case, the transformer manufacturer could, if feasible, move the transformer into a larger test area / room.

Alternatively, the transformer noise could be measured using the Sound Pressure method while following the recommended corrections described in sections 13.5.5.1 and 13.5.5.3 for high ambient noise and / or high sound wall reflections “

Item 4: Near – Field Correction

This correction was suggested in order to compensates for the measuring error caused by the near – field reactive sound power around the transformer. The chairman suggested a 1.5 dB correction for the ONAN measurements and 0.5 dB for the ONAF measurements. Pierre Riffon suggested no correction for the ONAF measurements. The chairman agreed that this was reasonable. The chairman stated that an IEC WG headed by Dr. Chris Ploetner is working in parallel with this TF to update the IEC Standard on measuring transformer noise. He suggested that he will let Chris Ploetner know about this Near – Field correction being adopted by this IEEE TF.

Item 5: Transformer Operating Conditions

It was suggested to replace this present title of section 13.3.3 to read “Determination of Total Noise of a transformer”

Item 6: Determination of total Noise level of a transformer

The chairman reviewed with the attendees the suggested write – up of this section. One item was brought up by B. Poulin on using Lp in this calculation; which referenced in the document as Sound Pressure level. However, noise levels measured using the Sound Intensity Method are referred to as Li. However, the total noise calculation applies to both but the formula is given in terms of Lp only. This possible cause of confusion needs to be resolved.

Another item that causes a little complication in the calculation is that the ONAN measurements are made at the 1/3 m ONAN contour while the ONAF and Load noise measurements are made at the larger 2 m ONAF contour. It was suggested, again in this TF meeting, to consider making all noise measurements at a 1 m contour. The chairman supported for this idea; as it has the following advantages:

1. It would simplify calculations of the total noise level of the transformer (Load + No load noise)

2. It would remove the need to make the near – field correction or reduce it to one value of 1 dB

3. It would simplify the measurement process by using only one contour.

Also, the chairman stated that it is not necessary to be at 2 m from the fans when running if a wind screen is used. The chairman, however, expressed concern that such a change may be difficult to get agreement on from the Transformer committee at large after decades of using two different contours and using noise levels referenced to the present contours. The difficulty in getting consensus from users would be a major hurdle in using only one distance contour.

A couple of utility representatives supported this change. A representative of a transformer manufacturer stated that he measured a 1.5 dB difference between measurements at 1m and 2 m contours. The chairman thought that this magnitude of difference is slightly higher than typical. This representative will send this data to the chairman to examine. A show of hand supporting, or opposing, this proposal did not indicate one way or the other as most attendees refrained from expressing their stand on this issue. This proposal will be revisited again in the fall 2012 meeting of the TF in Milwaukee. More data will be shown then.

After the meeting, a representative from a manufacturer of fans used with power transformers asked whether this change will mean a change in the 2 m contour they use for measuring fan noise. The answer is that what is important for the noise rating of a fan is its sound power level. So, as long as the noise levels of the fans are provided in sound power or in sound pressure levels but with known measuring contour, there will be no need to change the measuring procedure for fan noise.

Finally, in the discussion on the calculation of the total noise level of a transformer, the subject of NEMA TR1 levels was raised. The chairman explained that the NEMA values were provided as a reference of the sound levels of a standard transformer with a non – step lap core made of regular grain oriented steel operating at a core flux of 1.75 Tesla. These typical values would be expected for designs without any special consideration for means to reduce the core noise. So, for the time being, the NEMA TR1 levels should not be used as a reference for total noise levels. Instead, there is a need to develop corresponding Tables for Load noise of transformers of different sizes. Such data is planned to be presented and reviewed at the fall 2012 meeting of the TF.

Steve Antosz suggested that, when all the proposed changes are implemented, the draft of section 13 is circulated for survey at both the TF and PCS levels. This survey should be introduced by a summary of the changes made and why.

**10.4.8 WG on Wind Trubine Generator Transformers. PC57.12.16, – David Buckmaster, Chairman; Vice Chair: Phil Hopkinson; Secretary: John Gauthier**

The Working Group on Wind Power Transformers was called to order at 9:30 AM. Membership are those attending this first meeting and requested membership, and those that responded to a call confirming membership earlier this year.

1. Introductions

Chairman: Dave Buckmaster introduced the other officers of the WG

Vice-chairman: Phil Hopkinson

Secretary: John A. Gauthier, acting

The chairman requested that attendees indicate on a roster circulated at the meeting whether or not they are members or guests to the WG. In a review of the WG roster, a number of attendees expressed the desire to be members. The chairman declared a quorum present.

2. Approval of the agenda

3. Approval of the minutes - The minutes for meeting held 1 November 2011 were approved.

4. Old Business

4.1 It was noted that Paul Jarman, Chairman of IEC TC14, reported that IEC 60076-16 was published in August. TC14 will send a notice to all National Committees seeking approval for an immediate revision to the document, which is unusual for an IEC standard. The justification is a joint revision with IEEE.

4.2 It was reported that the following task assignments have been completed and posted on the IEEE site:

4.2.1 Normative reference research and cross reference – Phil Hopkinson

4.2.2 Transient Switching C57.142 Verbiage to address – Jeewan Puri

4.2.3 NFPA 70E Compliance for Arc Flash – Dave Buckmaster

4.2.4 Stress enhancement points/gas analysis – Ray Bartnikas (Status Unknown and not published)

It was noted that some members do not have the password/ID for access to the IEEE website to review the document. The chairman provided the following: ID: perfsub; password: per-char.

It was noted that the task assignments were intended to address particular concerns within the wind power system: addressing the generation of AC power and invertions and the current trend toward all AC systems. A brief discussion ensued on the task and risks of testing oil samples on wind turbines and the need to address the requirement to turn off an entire circuit.

Mr Hopkinson noted that several issues need to be address: Gusts of wind and their effect on the turbine and its fins, when a generator can become a motor and the influence on other devices in the system. Are there conditions where some wind turbines could become motors? It could occur and become a problem. The BIL for transformer and accessories raise a concern when there are no surge arresters on the wind device. Why flashover when turbine meet BIL? There is always a weak spot: load bearing, bushing. Members engaged in additional technical discussion of bushing and switches and their mutual vulnerability in the wind farm environment . If there is a flashover, switching transients and over-voltages need to be reviewed for adequate protection. Technical discussion ensued on field experiences. It was noted that proper BIL and coordination of insulation are necessary for consideration.

The chairman urged members to review the documents on the IEEE website and provide any comments to him.

It was noted that there seems to be a limited discussion of frequency variation and continuous over-voltage. It was further noted that these are not typically seen though over-currents are experienced.

It was noted that tap-changers are not addressed but there is a willingness to include a reference in the IEEE/IEC document.

It was recommended that acoustic partial discharge detection be included in the list of concerns. It was agreed. To a question about addressing RIV and partial discharge in testing, it was noted that some test both and further noted that setting limits should be considered.

5 New Business:

Call for Task Force (5 – 6 Persons) to attend and interface with the IEC meeting during the week of September 21 in Manchester UK in order to work out a compromised scope statement.

The chairman noted that there was a need to identify a US IEEE member to participate in the TF and to attend the September meeting. Dr H. Shertukde agreed to serve in that capacity.

It was noted that the joint IEEE/IEC develop a common scope for an IEEE/IEC document. That will be an early task of the TF meetings. The chairman noted that in discussion with IEC TC14 representatives, there is a need to alternate meetings in the US and in Europe.

Mr Hopkinson briefly reviewed the contents IEC 60076-16 FDIS which has been published as an IEC standard.

It was noted that a number of issues needed to be considered:

1. Develop formats and scope (See TF verbiage above) as the first priority.

2. Issues that need to be include in the document.

a. Factory Tests including Partial Discharge during Induce Tests

b. Importance of Gas In Oil Tests and Interpretation

c. Loading Expectations and impact on Nameplate Rating

d. Harmonics, their sources and impact on specifications

e. Loss Evaluation techniques to reflect proper importance for relationship between load loss and no load losses

f. Proper BIL for both the transformer and the accessories.

g. Overvoltage due to switching and lightning and proper protection

h. Arc-Flash Prevention by switching sequences or other

There was no other new business.

B. Adjournment

Next in person meeting will be at the Fall IEEE Transformer Committee meetings in Milwaukee, Wisconsin. The meeting adjourned at 10:37 AM.

**10.4.9 WG on “Guide for the Application and Interpretation of Frequency Response Analysis for Oil Immersed Transformers”, PC57.149 – Chairman; Charles Sweetser**

WG PC57.149 met for the development of the Frequency Response Analysis (FRA) Guide in Nashville, TN on March 12, 2012 at 1:45 PM. There were 48 people in attendance. Only 10 of our 32 members were in attendance, and a quorum was NOT established.

The minutes from the Boston meetings were not approved.

This meeting focused on completing the final tasks for ballot recirculation. The deadline for the PAR is October 15, 2012.

All but 5 of 266 comments have been resolved. The breakdown is as follows:

|  |  |  |
| --- | --- | --- |
| Category | Must be Satisfied | # Comments |
| Editorial | YES | 38 |
| General | YES | 5 |
| Technical | YES | 50 |

TOTAL 93

|  |  |  |
| --- | --- | --- |
| Category | Must be Satisfied | # Comments |
| Editorial | NO | 115 |
| General | NO | 32 |
| Technical | NO | 21/26 |

TOTAL 173

Peter Werelius and Mario Locarno provided an update on the status of the 5 unresolved comments that remain. The unresolved comments are Technical. The 5 issues are not disagreement, but failure to respond to the resolution group. The expected completion date is March 23.

All graphical Figures that were submitted as screen shots in color except for A3 and A6 have been updated.

Upon receipt of the remaining unresolved comment, the recirculation will begin.

The meeting was adjourned at 2:25 PM.

**10.4.10 - TF on “Distributed Photo Voltaic (DPV) Grid Transformers”, Chairman Hemchandra Shertukde; Vice Chairman: Mathieu Sauzay; Secretary: Sasha Levin**

The Task Force met in the Ryman room of the Renaissance Nashville Hotel. The meeting was called to order at 8:00 am by Chairman Hemchandra Shertukde. The meeting was convened with 12 (out of current 21 TF members - quorum) and 29 guests present, for a total 41.

Old Business - Boston’s meeting minutes were approved.

New business

1. PAR and WG proposal. - The TF Chair informed on the current status: Task Force issued the Position Paper and, following the poll of the group, submitted proposal for PAR and WG on “IEEE Guide for Transformers for Application in Distribution Photo Voltaic (DPV) Power Generation Systems”.

The Performance Characteristics Subcommittee Chairman Ed teNyenhuis approved the proposal and it’s been submitted to the Admin Subcommittee for NESCOM consideration (June meeting).

- Position paper transformed into IEEE format and will be submitted for publication.

2. Task Force reviewed the Title, Scope and Purpose of the submitted document.

- The words “Smart Grid” has been eliminated from the scope following Admin SC request.

- R. Szevczyk’s proposal to add word “design” to the Scope (“design and application”) has been supported and will be considered for the future revision

- TF discussed the terms “residential, commercial, industrial and utility scale”:

* To define the rated kVA and voltage class of these transformers are more important than above terminology (D. Ayers). H Shertukde commented that there is an indication that 69 kV (and even 115 kV systems) are either under construction or under consideration.
* Residential PV systems might not have any transformers in the system (J. Yu)

- Are there step-down PV transformers? H. Shertukde commented that there might be such cases.

- E. Betancourt mentioned that there are different situations that should be considered, e.g. when regular distribution transformer becomes a part of PV system. Typical system applications should be identified.

- Discussion on the clarification of the scope of the Guide will be continued in a course of the potential Guide development.

3. Discussion on the Contents of the potential IEEE Guide.

Acting on the assumption that PAR will be approved and WG on “IEEE Guide for Transformers for Application in Distribution Photo Voltaic (DPV) Power Generation Systems” will be created, TF started discussion on the Contents of the potential Guide.

- Six Chapters were proposed as an initial skeleton of the Guide:

1) Transformer General Requirements.

2) Specifics of DPV generation systems in relation to the transformers.

3) Transformer construction.

4) Transformer Test.

5) Transformer diagnostics and maintenance.

6) Transformer specification.

B. Bartley noticed that the potential WG shall follow the scope and should not encroach on the system aspects or any other issues under other PES Committees’ jurisdiction.

The following six TFs were formed to work on the Contents of the proposed Chapters

of the Guide:

Chapter 1)

- R. Martinez – leader

- R. Wicks

- E. Betancourt

- J. Gamboa

- V. Tendulkar

Chapter 2)

- J. Yu – leader

- J. Roach

- H. Shertukde

- V. Tendulkar

Chapter 3)

- S. Kennedy – leader

- A. Mukerji

- S. Sarkar

- K. Vedante

- J. Gamboa

- D. Ayers

Chapter 4)

- D. Ayers - leader

- S. Kennedy

- A. Mukerji

- S. Sarkar

- K. Vedante

- K. Stretch

Chapter 5)

- J. Roach - leader

- N. Field

- K. Stretch

Chapter 6)

- M. Sauzay - leader

- J. Nazarko

- J. Yu

- A. Levin

TFs will start an active work after PAR approval.

TF discussed the means of recruiting experts in power electronics and PV generation systems, as well as end users. B. Bartley informed that he is coordinating the standard association activities in IEEE PES and can help in reaching “across the isle” in IEEE PES.

J. Nazarko noticed that there are challenges in obtaining the appropriate information because of the proprietory character.

With no new business the Meeting adjourned at 9:15 AM.

**10.4.11 Special Report**

The C57.142 Switching Transients Induced by Transformer Breaker Interaction was recently published. The Chair thanked Rob Degeneff for his work in bringing this guide to completion.

**10.4.12 Old (unfinished) Business – Proposal for new TF to extend C57.142 to higher voltage classes**

Phil Hopkinson presented a motion to establishment a task force to investigate the interaction between transformers and breakers at higher voltage classes than is covered in the current version of C57.142. The major study in C57.142 has been on Vacuum Breakers and predominantly medium voltage transformers. The work has been excellent and provides a good general guide. As voltage classes increase, the switching device shifts from vacuum to SF6 and the power system uses open lines instead of shielded cables. Often times, bushings for higher voltage class transformers become vulnerable and transformer considerations are shifted to conditions where abrupt line swings are at play. Phil requested to see the scope of investigation to cover HV and EHV applications. The SC discussed this proposal and it was agreed that this was worthwhile to investigate and that a TF should be established. The Chair will request a time slot for the next meeting and prepare objectives for the TF.

**10.4.13 New Business**

There was no new business.

The meeting was adjourned at 4.18pm.

* 1. **Power Transformers SC – Tom Lundquist**

The Power Transformers Subcommittee met on Wednesday, March 14th, 2012 at 1:30 p.m. with sufficient attendance to reach a quorum.

The minutes from the Fall 2011 meeting in Boston, Massachusetts were approved.

* + 1. WORKING GROUP AND TASK FORCE REPORTS
       1. WORKING GROUP FOR REVISION OF C57.17, REQUIREMENTS FOR ARC FURNACE TRANSFORMERS – Robert Ganser, Chairman

No meeting was held.

* + - 1. WORKING GROUP FOR REVISION OF PC57.116, GUIDE FOR TRANSFORMERS DIRECTLY CONNECTED TO GENERATORS – Gary Hoffman, Chairman

1. Roster & Membership  
   Members – 14 of 18 in attendance.  
   Guests – 33  
   Guests requesting membership – 9  
   Total attendance – 56
2. Minutes of Boston Meeting Were Approved
3. Draft D1.1 Review & Recommedation
   1. Clause 2 – Approve
   2. Clause 6 – Motion to approve with amendment withdrawn. Chair has approved a Task Force Chaired by Mark Baldwin with members Peter Balma and Wally Binder to review and make additional changes for review by the WG at our Fall 2012 meeting.
   3. Clause 8 – Motion to accept with restoration of lines 2-3 on page 23 and strike lines 3-6 was Approved
   4. Clause 10 – Motion to accept with deletion of “is not” on line 10 of page 29 was Approved. A second motion to accept Clause 10 with first motion and change of line 18 from 100 deg C to 140 deg C was Approved.
   5. Appendix A, Informative Bibliographical References – Motion to accept with amendment to add C37.102 and Power System Relay Committee, Rotating Machinery Subcommittee, J-5 Working Group, "Coordination of Generator Protection with Generator Excitation Control and Generator Capability" Approved. These references will be added as part of the Clause 6 TF.
4. Backfeed TF report provided by Chair: Work will continue with a goal to have a revised Backfeed Clause by our Fall 2012 Meeting.  
   Peter Balma made a brief presentation to the WG on the history and issues on Backfeed of UT’s and UAT’s.
5. A change in Title from Tom Lundquist was discussed and the Chair did not receive a motion to change therefore the Title remains as is.
6. New Business – None

Motion Approved to Adjourn at 5:57 PM

* + - 1. WORKING GROUP FOR REVISION OF PC57.125, GUIDE FOR FAILURE INVESTIGATION, DOCUMENTATION, ANALYSIS AND REPORTING FOR POWER TRANSFORMERS AND SHUNT REACTORS – Wally Binder, Chairman
      2. Quorum was established - 17 working group members were present.

1. Minutes were approved for the Fall 2011 meeting.
2. Chairman's Remarks – (Wallace Binder) Chairman presented a proposed schedule and discussed key dates of the schedule: Fall 2012 – proposed C57.117 merged document be completed. Fall 2014 – C57.125 document work completed by the working group. Ballot Resolution Committee will be developed at a later meeting.
3. CIGRE Coordination Activities – (John Roach) Working with Christoph Kuen, conveyor of A.2.45. Christoph has interest in sharing information between groups and some information has been exchanged. Currently trying to setup conference call with Christoph.
4. TF Report on Merger of C57.117 – (John Roach) Work to Date - Definitions clause content is acceptable, Figure 2 has been updated, updating Clause 6.5. and converting to table format, numerous minor comments agreed to. Work to be Completed - Incorporate numerous individual proposed modifications to C57.117, update Fig 1, completion of Clause 6.5 update, determine how best to merge into C57.125.
5. TF Report on New Work – (Tom Melle) General work plan for new work was proposed and discussed. References: remove obsolete/dated references. Proofread: contribute to identification of typos, formatting issues, etc. Duplication between guides: study C57.93 and C57.152 for contradictions and overlap. Add references to digital pictures/video. Add reference to IR photos / IR temp gauge.

Add measuring/monitoring references. Add new test technology.

1. Execution of Work Plan: Discussed and requested suggestions to improve document flow. Bruce Farris will take the lead on the bibliography review and update.
2. Meeting was adjourned.
   * + 1. WORKING GROUP FOR DEVELOPMENT OF PC57.131, STANDARD REQUIREMENTS FOR TAP CHANGERS - William Henning, Chairman

**The Working Group on Tap Changer Performance did not meet at this session. The PC57.131/D1.8 document was submitted to RevCom and is on the agenda for its March 28 meeting.**

* + - 1. WORKING GROUP FOR THE REVISION OF PC57.140, GUIDE FOR EVALUATION AND RECONDITIONING OF LIQUID-IMMERSED POWER TRANSFORMERS – Roland James, Chairman

Chair Rowland James called the WG meeting to order at 1:50 pm November 1, 2011.

Vice Chair Paul Boman and WG Secretary Saurabh Ghosh were also present. There were 31 members and 42 guests with 13 guests requesting membership.

The Working Group did not have a quorum and thus no official resolution could be passed.

Vice Chair Paul Boman gave a presentation on CIGRE Working Group A2.34 – “Guide for Transformer Maintenance”.

Discussions on the presentations led to topics on “Asset Management”, minimum amount of maintenance with maximum returns, “Optimization on maintenance practices”, “best practice and common practice”, “condition assessment”, DGA and in service oil testing.

There was a discussion on load levels while performing infrared testing as described in sub clause 5.7”Infrared Inspection”. It was proposed that transformers be loaded higher than 40% of maximum nameplate rating. One argument against this was that transformers may not normally operate at theis level and increasing load may not be practical. Further study of this matter will ensue.

The chair requested volunteers for sections of the guide not yet reviewed. He also requested the working group to review section six “Condition assessment and reconditioning” with intent to determine if this section is philosophically meeting the purpose of this guide.

The meeting was adjourned at 3:01 p.m.

* + - 1. WORKING GROUP FOR DEVELOPMENT OF PC57.143, GUIDE FOR APPLICATION OF MONITORING TO LIQUID IMMERSED TRANSFORMERS AND COMPONENTS – Donald Chu and Andre Lux, Co‑Chairmen

No meeting held.

* + - 1. WORKING GROUP FOR DEVELOPMENT OF PC57.148, Standard FOR Control CabinetS FOR TRANSFORMERS – Joe Watson, Chairman

No meeting held.

* + - 1. WORKING GROUP FOR DEVELOPMENT OF PC57.150, GUIDE FOR THE TRANSPORTATION OF TRANSFORMERS AND REACTORS RATED 10,000 KVA OR LARGER –Greg Anderson, Chairman

No meeting held.

* + - 1. WORKING GROUP FOR DEVELOPMENT OF PC57.153, GUIDE FOR PARALLELING TRANSFOREMRS – Tom Jauch, Chairman

65 total attendees, 23 of 31 members were present (1 corresponding), 42 Guests (21 new)

1 attendee requesting membership had attended the last two meetings and will be upgraded to member status, 3 attendees requesting membership were attending their first meeting and will be added as guests, 1 attendee requested to be moved from member to guest status.

* Minutes from Boston were reviewed and approved
* Jim Harlow – made a motion to revise the definition of “paralleling” to only consider paralleling applications with common source side buses, where both the high side and low side breakers were closed. Applications with separate source buses were proposed to be addressed in a later version of the guide.
* Second for his motion was received
* Motion was discussed.
  + Several utilities present indicated an open high side breaker is a valid operating condition that needs to be addressed.
  + Motion was only to postpone addressing this configuration to a later version of the guide.
  + Following additional discussion amongst members, the working group agreed to form a task force to compare modeling technique results for paralleling operations when operating in a separate source bus configuration.
  + A request will be sent to WG to participate on this task force. Tentative meeting date for this task force is May 4, 2012 prior to the IEEE T&D show.
  + Following the discussion, Jim Harlow withdrew his motion.
* Motion was made to only consider 2 methods – Master Follower and Circulating Current –all paralleling methods would be considered a subset of these two methods. Motion did not receive a second.
* A few minor comments received on the latest draft were shown to the working group but no decisions were made to accept or decline the proposed revisions.
* Presentation by Dr**.** Murty Yalla listed on the agenda was not made due to time constraints

Meeting was adjourned at 4:30pm

* + - 1. WORKING GROUP FOR DEVELOPMENT OF PC57.156, GUIDE FOR TRANSFORMER TANK RUPTURE MITIGATION OF LIQUID-IMMERSED POWER TRANSFORMERS AND REACTORS– Peter Zhao, Chairman

Meeting of the Task Force for Tank Rupture & Mitigation convened Monday morning at 11:00am. Chairman Peter Zhao presided.

Patent policy was displayed and discussed. There were no acknowledgements of patents of concern.

Attendance was 102 (17 members, 85 guests, with 8 guests requesting membership).

Chairman Zhao provided introductory remarks and previewed the agenda to be covered for the meeting. The PAR for the guide has been approved by Ad Com and now will be sent to IEEE for final approval. The objective of the meeting was to make progress on the document in anticipation of PAR approval.

Sections 4.3.1 and 4.3.2 recent additions were reviewed.

Don Chu questioned the basis for the numbers provided for arc voltage and arc energy, and stated that Owner should only be responsible for providing available fault levels and voltages.

Martin Heathcoat stated a significant value of the guide will be as a tool by which design reviews can verify adequacy of manufactures design for withstanding internal faults without rupture. The fact that relevant numbers are hard to derive is all the more reason that the Guide is needed to provide a rational basis for assuring adequate design.

It was suggested that the Guide be segmented: Most of section 4.3, since it is tutorial in nature, should be moved to an annex, to be referenced in the main body of the guide. Don Chu predicted that a draft of the guide that includes such numbers as presently included in the main body of the document will draw strong negative opinion/ballots.

Izyaslav Polishchuk of Hydro One expressed a need for retaining the numbers as charts referenced in an annex.

Several Users agreed that numbers should reflect an assumption that first level breaker protection/isolation fails, taking more time for secondary breakers to operate. Also that a method of deriving relevant numbers must be included in the guide.

Don Chu suggested issuing the document as a ‘trial use guide’, with methodology and equations for deriving results. Dependence should be on formulas, and not tables, which should remain as examples of what others have derived for particular cases.

In regard to the new chart addition to 4.3.4, Martin Heathcoat explained that the unpopulated chart was included to hold the spot for numbers he expects to obtain before the next meeting.

Isy Polishchuk indicated that Hydro One derived a chart many years ago, and has recently revised the numbers.

40% margin included in section 4.3.9 was questioned. Bill Darovny indicated that margins should not be included in this document and that it is the business of manufacturers to add margins according to their own criteria.

Practicality of manufacture’s testing to validate the adequacy of design was discussed and the consensus was that destructive tests for a power transformer of any significant size would be impractical and cost prohibitive. Martin Heathcoat suggested that such a test on a larger transformer may be equated to short-circuit testing. Paulo Avelino of Siemens suggested that a model should be established - then verified by testing.

Tom Lunquist inquired as to whether Hydro One has done such a test. The answer is that actual testing has been done only on distribution –class transformers.

Meeting was adjourned at 12:15pm.

* + - 1. **WORKING GROUP FOR DEVELOPMENT OF PC57.157, GUIDE FOR CONDUCTING FUNCTIONAL LIFE TESTS FOR DE-ENERGIZED TAP CHANGER CONTACTS – Phil Hopkinson, Chairman**
      2. **WORKING GROUP FOR DEVELOPMENT OF PC57.157, GUIDE FOR CONDUCTING FUNCTIONAL LIFE TESTS FOR DE-ENERGIZED TAP CHANGER CONTACTS – Phil Hopkinson, Chairman**

The Working Group on Life Tests, De-energized Tap Changers was called to order at 8:00 AM on March 13, 2012. A quorum was present.

1. Introductions

The chaiman welcomed attendees and introduced the acting secretary. In reviewing the membership roster it was noted that there is confusion concerning the correct listing of members. It was further noted that an oral review of the WG roster indicated that a quorum was not present. It was noted that a new roster has been prepared and those present were requested to sign in and indicate whether or not they were attending as a member or guest. This will be reflected in the minutes..

1. Approve Agenda for the meeting: Since quorum could not be determined, approval of the agenda was deferred.
2. Approve the Minutes from the November 1, 2011, meeting in Boston, Massachusetts. Since a quorum could not be established, approval of the minutes from the previous meeting was deferred until the next meeting.
3. Review of Draft 1 of the Guide for Conducting Functional Life Tests for De-Energized Tap-changer Contacts

The chairman briefly reviewed the status of the project, noting that the group was now a Working Group. A brief discussion ensued concerning using the term “draft” in the title. It was noted that it is appropriate to include the term until the IEEE SB approved the document for circulation.

The chairman engaged in a brief technical discussion of the testing of unstable contacts with the possibility of thermal run-a-way.. It was suggested that a review of the scope of the standard be reviewed. The chairman reviewed the approved scope of the current draft. It was noted that reference should be made to “variables” and not variable since time is one factor. It was recommended that “Switch time temperatures during service life”.. should replace “service time.” It was agreed.

Normative references would include all documents that are cited in the document, so further work on this section will await completion of the first detailed draft.

Attendees engaged in a brief technical discussion of ratings on switches; it was inconclusive.

Clause 4

The chairman reviewed the proposed text in the clause 4 **Accelerated Aging**

Members engaged in a brief discussion of acceleration factor. The factor in the draft remains unchanged.

A member expressed concern with cyclical loading reference and inquired if this matter would be addressed in another clause of the document. The chairman briefly described the empirical experience with the phenomena. A brief additional discussion ensued on experience in a chemical plant and other situation involving transformer loads.

Discussion of the 10 degree rule which the chairman noted as reasonable. It was noted that in simulated testing the objective was to achieve a 150 degree C which would represent the start of the test. Bulk temperature and current would reflect super temperature and, if it stabilized, it would indicate a good value.

Discussion of testing typical daily load cycles. It was noted that variables occurred when the transformer was operating with a stable and not cyclical load.

Discussion of the proposal to add “hottest” in the last sentence of 4.4 before the words temperature of the switch contacts themselves. The proposal was accepted. It was also agree to change to references to temperature to “temperatures.”

Discussion of one day of testing (1000 hours at highest temperature). It was noted that there may be a need to define 30 day cycle. The chairman noted that could be addressed when the clause of definitions is assembled.

The chairman noted Larry Dix should be applauded for the work presented thus far but noted that additional text will be developed for clauses 5 through 8.

1. Adjournment: The meeting was adjourned at 9:15 am
   * + 1. WORKING GROUP FOR REVISION OF IEEE STD 638-1992, IEEE STANDARD FOR QUALIFICATION OF CLASS 1E TRANSFORMERS FOR NUCLEAR POWER GENERATING STATIONS – Craig Swinderman, Chairman

No meeting held.

* + 1. OLD BUSINESS

None.

* + 1. NEW BUSINESS

None.

* + - 1. WORKING GROUP FOR REVISION OF IEEE STD 638-1992, IEEE STANDARD FOR QUALIFICATION OF CLASS 1E TRANSFORMERS FOR NUCLEAR POWER GENERATING STATIONS – Craig Swinderman, Chairman

No meeting held.

* + 1. OLD BUSINESS

None.

* + 1. NEW BUSINESS

None.

* + 1. STATUS OF “INACTIVE” GROUPS

WORKING GROUP FOR THE REVISION OF C57.93, INSTALLATION OF LIQUID-FILLED TRANSFORMERS - Michael Lau, Chairman

This group is not meeting; major work on this document is complete; waiting for publishing.

TASK FORCE FOR WIND FARM TRANSFORMERS – Joe Watson, Chairman

Work of this group is complete; the task force is inactive.

TASK FORCE FOR EVALUATING THE NEEDS OF TRANSFORMERS USED WITH SVC – Peter Zhao, Chairman

Fall 2009 - The work of this task force is concluded. A report was issued and it is being considered if an educational paper should be published.

TASK FORCE FOR WIND GENERATOR STEP-UP TRANSFORMERS – David Buckmaster, Chairman

This task force was moved to Performance Characteristics Subcommittee.

WORKING GROUP FOR REVISION OF C57.12.10, STANDARD REQUIREMENTS FOR LIQUID IMMERSED POWER TRANSFORMERS – Gary Hoffman, Chairman

The standard was published.

WORKING GROUP FOR REVISION OF C57.135, GUIDE FOR THE APPLICATION, SPECIFICATION AND TESTING OF PHASE-SHIFTING TRANSFORMERS – Jin Sim, Chairman

The working group completed its work and the guide was published in 2011.

TASK FORCE FOR DVP-GRID TRANSFORMERS PC57.169, – Hemchandra Shertukde, Chairman

This task force was moved to Performance Characteristics subcommittee.

* 1. **Underground Transformers & Network Protectors SC – Carl Nieman, Dan Mulkey (Vice-Chair)**

**Introduction/Attendance**

The Underground Transformers and Network Protectors Subcommittee met on Wednesday, March 14, 2012, in the Music City room of the Renaissance Nashville Hotel in Nashville, Tennessee, at 11:00 AM with 9 members and 14 guests present.

**Membership**

Quorum was achieved with 9 out of the 12 members attending. One guest was granted membership.

**Approval of Minutes**

The minutes of the November 2, 2011, meeting in Boston, MA were approved as submitted.

**Working Group Reports**

* + 1. **Underground Single Phase Transformers (C57.12.23) – A. Traut, Chairman**

The WG did not meet. The document was published in April 2009 and is valid until 2018. After the WG on Tank Pressure Coordination lead by Carlos Gaytan, concludes this standard will need to be revised. Allan suggested that this group could alternate revision cycles with C57.12.24.

* + 1. **Three-Phase Underground-Type Transformers (C57.12.24) – Giuseppe Termini, Chairman**

The Chairman welcomed members and guests to the meeting which was called to order at 9:45 AM in the Ryman room at the Renaissance Hotel in Nashville on March 12, 2012. George Payerle acted as the recording secretary. An agenda was presented and introductions were made. Cory (Charles) Simmons and Justin Pezzin were made members. The meeting was attended by 8 members and 14 guests. There was a quorum for this meeting. Minutes from the previous meeting in Boston were reviewed and approved.

The Chairman explained that members need to attend 3 consecutive meetings in order to apply and become a voting member of the working group (WG). The expectation is that the guests and members should take an active participation in the proceedings of the working group.

The Chairman explained some recent administrative changes. Standards will now have a life of 10 years and cannot be extended. With the new rule C57.12.24 has a life until 2019. The standard is being considered for revision to include additional mechanical and electrical requirements. The PAR that was previously submitted to initiate the revision of the standard was approved on November 9, 201, and will expire on December 31, 2015. Consultants who attend meetings are now required to disclose who they consult for. The Chairman asked if there were any consultants in the room and there were none.

**Working Group Minutes / Significant Issues / Comments:**

After the last meeting in Boston, a survey was sent out with the help of Christopher Sullivan and Bill Wimmer to approximately 30 end-users. Topics included in the survey were additional requirements for: fusing, pressure relief valves, loadbreak switch, corrosion protection and tank material and size.

Replies were received from 13 end-users. About half of the remaining recipients reported that they do not use submersible transformers and the remaining recipients did not reply. The results of the survey are summarized in the table attached to the minutes. Some end-users did not give permission to publish the name of their company; therefore the survey only listed the number of respondents. The Chairman will contact Bill Wimmer to obtain the name of additional end-users from an intranet group run by Bob Landman. George Payerle volunteered to contact the additional end-users once the survey is sent out to them. The Chairman will report the results of any additional survey responses at the next meeting.

No reporting was made on the task force for Tank Pressure Coordination, now a working group (C57.12.39) and the Tank Rupture & Mitigation working group (C57.156).

One of the guests asked if single phase submersibles were being considered as part of the survey. Since there is a single phase submersible working group (C57.12.23), the C57.12.24 working group will only focus on three phase submersible transformers. The single phase submersible transformers working group will consider the work of this working group to be utilized in future revisions of C57.12.23.

The Chairman presented the results of the survey. The survey also included additional comments made by the end- users to be considered for inclusion in the next revision of the standard (see attached survey for details).

The purpose of the survey was to gain information from the end-users on what additional mechanical and electrical requirements should be included in the next revision of the standard. After the survey presentation, the working group was asked to consider the information received from the survey for inclusion in the next revision. The results of this discussion were as follows:

A motion was made, seconded and approved to investigate the use of natural ester and its effects on gaskets. This motion was made because natural ester fluid may be considered to be included in the standard in addition to mineral oil. Christopher Sullivan volunteered to investigate and he will report back at the next meeting.

A motion was made, seconded and approved to consider the inclusion of a fusing system (BON with CL) along with the loadbreak switch and pressure relieve valve in the next standard revision. Dan Mulkey volunteered to work on this topic and will report back at the next meeting.

A suggestion was made to include specific material requirements in the next standard revision. Dan Mulkey stated that this requirement may be too specific and may not be approved by IEEE. In order to gain a better understanding of the material requirements, Bob Kinner volunteered to give a presentation at the next meeting on material choices for the tanks installed inside manhole (underground vault) where water and other corrosive material may be present.

The tank dimensions were discussed since some end-users specify tank dimensions in their material specifications. It was agreed that the tank dimensions as listed in the standard are adequate and may not need to be changed.

A suggestion was made to have an option to mount various components such as HV bushings and LV terminals and load-break switch on the tank wall besides to the tank cover. This request was deferred for further consideration at the next meeting.

The meeting was adjourned at 11:00 a.m. with the next meeting set for Milwaukee, WI on October 22, 2012

* + 1. **Liquid Filled Secondary Network Transformers (C57.12.40) – Brian Klaponski, Chairman**

The WG met on Monday, March 12, 2012 at 11:15 am with 14 members and 7 guests.

The minutes of the October 31, 2011 meeting in Boston, MA were reviewed and approved. Steve Schroeder made a motion to approve the Meeting Minutes and Carl Niemann seconded the motion.

The Chair gave a brief summary praising the excellent and efficient IEEE editing process after the standard was sent for recirculation. The standard had received a 100% affirmative vote but needed a Recirc due to changes incorporated with balloting comments.

**Working Group Minutes / Significant Issues / Comments:**

1. The Chair stated that a new PAR will be submitted to initiate a new revision to the standard. A motion was made by Ed Bertolini to change the title of the standard to read: IEEE Standard for Network, Three-Phase Transformers, 2500 kVA and Smaller; High Voltage, 34 500 V and Below; Low Voltage, 600 V and Below; Subway and Vault Types (Liquid Immersed). The motion was seconded by John Crouse. The motion was voted on and it was approved. The Chair will submit the PAR with the new title and revised scope to reflect the title change.

There was general discussion on the unresolved comments received from the balloting process. In particular, Steve Schroeder will review his ballot comments and raise them in our next meeting. Also other emailed comments received from John Rossetti regarding network protector interface issues will be considered for the next standard revision. Additional comments for inclusion in the next revision were received at this meeting as follows:

* Jeremy Sewell proposed an amendment to Section 6.2.2.2. Jeremy was asked to bring his comment forward at our next meeting once we are working under a new PAR.
* Larry Dix will forward dielectric test level recommendations for inclusion to C57.12.40 regarding any discrepancies due to the latest version of C57.12.00
* A suggestion was made to review (sect 3.6) the Audible Sound Levels and possibly align them with the NEMA TR1 document.
* A suggestion was made to have a second drawing similar to Figure 1 but without a primary switch.

The Chair will table at the next meeting the unresolved comments along with other comments received after the standard was published to the WG for review and consideration.

Bob Kinner agreed to give a brief summary of the tank material presentation at the next meeting. This would be a synopsis of the presentation that he will be giving at the next C57.12.24 meeting in Milwaukee.

The meeting was adjourned at 12:25 pm with the next meeting set for Milwaukee, WI, in October 2012.

* + 1. **Secondary Network Protectors (C57.12.44) – Bill Wimmer, Chairman, Mark Faulkner, Secretary**
* PAR Date: 06/17/2010 PAR Expiration Date: 12/31/2014, PAR Status: Approved
* Current Standard Date: 06/07/2006
* Current Draft Being Worked On: Draft 1 Dated: NA
* Meeting Date: 3 /12/2012 Time: 1:45 – 3:00
* Attendance: Members 7, Guests 3, Total 10
* Guests Requesting Membership 0

**Meeting Minutes / Significant Issues / Comments:**

1. The Boston minutes of October 31st, 2011 were reviewed and approved (Niemann/Morgan).

Discussion on Normative references. The second paragraph of section 2 discusses the issue with dates in normative references. We need to review the references and determine if the latest revision is acceptable prior to changing dates. Dan Mulkey pointed out that any standards referenced in the annex are not part of the standard and just for reference.

Dan reviewed 12.28 and 12.32 and submitted that these were acceptable to be updated to the latest revision. (12.28 – 2005, 12.32 – 2002 reaffirmed). It was determined that 12.40 was acceptable since the reference is to the throat dimensions only. This will need to be reviewed in the next revision as there is discussion in 12.40 that may modify this.

Carl Neman stated that the footnote 2 was not needed in the standard (ANSI publications). C57.12.28 is listed as ANSI should be IEEE.

On design tests – section 5 – Ed Bertolini wanted to modify the wording on the resistance of the conductors to “the resistance of each individual phase shall be measured in its entirety. Dan suggested that we combine the two sentences and eliminate the word “flowing”. This was accepted by the working group.

Mark Faulkner commented on the thermocouple attachment method in section 5. The group decided to change the wording to the “The thermocouple shall be held in intimate contact with the conductor surface.” Eliminating the terms welding, drilling, peening, and cementing.

A final working group ballot was taken to submit the document to IEEE for ballot.

* + 1. **Ventilated Dry-Type Network Transformers (C57.12.57)**

The WG was not scheduled to meet.

**New Business**

Brain Klaponski noted that individuals were being approached about common wording re mineral oil and natural ester use, with the thought that this should be in the realm of the Distributions and UGNTP subcommittees.

Brian also noted concern about overload for 2018. Ten year life is too long and the Transformer Committee should consider working on a shorter time frame – i.e. 5 year cycle.

**Old Business**

None

**Adjournment/Next Meeting**

The meeting was adjourned at 11:28 AM with the next meeting set for Milwaukee, WI, in October 2012.

* 1. **Bushings SC – Peter Zhao, Eric Weatherbee, Secretary.**

**11.4.1 Introduction/Attendance**

Chair opened the meeting at 9:30 AM and welcomed the members and guests. There were 77 attendees, 60 guests with 17 of 39 members present. A quorum was not reached.

Erin Spiewak, IEEE-SA Staff Liaison was introduced to the group.

**11.4.2 Approval of Minutes of Last Meeting**

The minutes of last meeting in San Diego, CA could not be approved as a quorum was not reached.

**11.4.3 Chairman’s Remarks**

1. Next meeting will be held in Milwaukee, WI on October 21st through October 25th hosted by SPX Transformers Solutions, Inc.
2. Reviewed the current status of all bushing WG’s and future dates.

**11.4.4 Working Group (WG) and Task Force (TF) Reports**

**11.4.4.1 WG - Revision of C57.19.00 - Keith Ellis, Chair**

No meeting held, gathering information for futures changes or additions.

**11.4.4.2 WG - Revision of C57.19.01 – Arturo Del Rio, Chair**

The working group met on Tuesday March 13, 2012, at 9:30 am with a total of 56 participants. Of those, 13 members and 43 guests with 3 guests requesting membership.

* The meeting was opened with introductions and the presentation and review of the minutes from the previous meeting.
* The first topic in the agenda was further discussions on the scope of the standard to avoid conflict with the work being done on the standardization of GSU bushings for use in bus-enclosures. A change was proposed to standardize on the use of “liquid-filled” as opposed to “oil-filled” transformer and reactors: guidance is needed since dielectric characteristics may differ.
* Five topics related to the proposed changes to the standard are still under discussion:
  1. Bringing back 25 kV, 115 kV and 161 kV bushings to the preferred ratings: further discussion and user survey is imperative as previous surveys among utilities supported their exclusion.
  2. Taking the listed styles through 230 kV to 5,000 amps: dimensions required for 5000 amps to complete the tables.
  3. Replacing the breaker plate with a smaller connection plate with an integral 2-hole or 4-hole spade: this item is parked as no justification for a change is evident.
  4. The TBI cantilever requirements.
  5. BIL, and Hipot test requirements for bushings for all voltage classes were compared to other existing standards (IEC, CSA). Although some discrepancy is observed, no change to the standard is foreseen at this point.
* New business:
  + In tables 5 and 6, there is no specific reference to epoxy-resin impregnated paper (ERIP) bushing technology. A recommendation was raised to include that terminology to the bushing standards.
  + Clarification on the definition given in C57.19.00 2004 for solid type bushing and cast insulation bushing is needed.
  + Distribution of the 2000-2005 utility survey material among members is needed for information and reference.
* Meeting was adjourned at 10:30 am.

Minutes by: Arturo Del Rio, WG Chair.

e-mail: arturod@ieee.org

Nashville, March 13, 2012.

**11.4.4.3 WG - Revision of C57.19.100 – Tommy Spitzer, Chair**

This working group met on Tuesday March 13, 2012 at 11:00 am with 11 members and 17 guests, a quorum was not achieved. We are in the ballot process with an 88% approval and 218 comments.

We discussed two areas of negative votes:

Shibao Zhang presented documentation of bushing load tests that show the current overload criteria to cause unacceptably high temperatures. This area will be revised to address these concerns.

We also discussed power factor limits. This area will also be changed.

We accepted volunteers for the ballot resolution group. The comments will be addressed and the guide sent for recirculation to complete this par before the dead line.

**11.4.4.4 WG PC57.19.04 – GSU Bushings – Catherine Hurley, Chair**

Minutes: WG PC57.19.04 – LV Bushings Rated >5000A and Applied in Metal Enclosures

Date: March 13, 2012 @ 1:45pm - Nashville, TN

1. Attendance:
   1. 27 Attendees:
      1. 15 of 28 Members were present (quorum was reached)
      2. 12 Guests
         1. 10 New Guests
         2. 2 Repeat Guests
2. Agenda:

* Meeting minutes from Fall 2011 Boston meeting were presented and no objections were noted. Minutes were approved and seconded.
* Title, Scope, and project plan to completion was presented
* Randall Kyle (Southern Company) agreed to act as an unofficial liaison to keep this WG informed of any new business which could affect this our WG as it pertains to IEEE C57.116 Section 10
* The following topics were discussed to determine the consensus of the majority of the membership:
  1. Test tap standardization (against)
  2. Cantilever strength requirements
  3. Partial discharge limits
  4. Power factor and capacitance limits
  5. Standardizing on a set creep for a certain contamination level
  6. CT pocket standardization
  7. Upper and lower terminal design
  8. Current densities as it pertains to terminal design
* Lonnie Elder discussed upper/lower terminal theoretical, calculated current density as it pertains to terminal design

1. Adjournment: Motion was made to adjourn at 2:59pm. Motion was granted.

**11.4.4.5 C57.19.03 – DC Bushing Standard – Les Recksiedler (IEEE) and John Graham (IEC), Chair**

SC36A MT5 is working with The IEEE Bushing subcommittee with a joint working group to produce a dual logo document.

A Committee draft (CD) was circulated in May 2011 for comment to IEC and IEEE members. Comments have been received from both groups, IEC comments were discussed in Melbourne. Most comments from IEEE concerned the presentation of the document in IEC format with mainly IEC references. IEC Central Office and IEEE Program Manager have stated that IEC format takes precedence. Due to work pressures on the joint conveners there has been no recent progress.

No meeting was planned for Nashville.

**11.4.4.6 IEC Bushing Standards Activity - John Graham**

IEC Meetings

The IEC bushing committee SC36A met during the IEC General Session in Melbourne, Australia on October 21st 2011. The next meeting is planned for October 2013 in New Delhi, India.

IEC60137 “Insulated Bushings for Alternating Voltages above 1000V”

In April 2011 on a new revision of the document was started with the main purpose to include test values for UHV bushings (above 800kV rating) in line with the latest edition of IEC60071-1: Insulation Co-ordination. A draft was circulated in May 2011 which provoked more comments than expected concerning possible review of inconsistencies in the test method for temperature rise of external connections – this inconsistency also exists in IEEE C57.19.00 and the calculation of creepage distance in line with IEC60815.

In Melbourne it was decided that a new working group should be formed including experts from TC14 (Transformers). A Request for Experts was circulated by IEC in January 2012 and the new group will be formed shortly.

Other Work –

The stability dates of other standards have been extended.

IEC61463 Seismic qualification of bushings – a call for experts will be made to form a new maintenance committee.

IEC61464 Dissolved gas analysis of oil impregnated paper bushings – no work planned until IEC TC10 completes revision of the main DGA standard IEC60599. The bushing subcommittee will be responsible for interpretation of analysis with TC10 responsible for methods.

Cigré:

There is a Cigré working group A2: 43 Bushing Reliability chaired by Antun Mikulecky from Hungary. The group has held two meetings with the next planned for May 2012 in Dubrovnik, Croatia.

The group has three task forces;

1. Questionnaire on bushing failure rates and data.
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 2013.

John Graham

March 13th 2012

**11.4.4.7 IEEE 693 - Interaction of Bushings and Transformers during Seismic Events – Lonnie Elder**

Next meeting will be held April 24th and 25th in San Diego, CA.

**11.4.4.8 Task Force on PD Measurement on Bushings & CTs - Thang Hochanh, Chair**

The task force on Partial Discharge in Bushings and PTs/CTs met on Monday March 12th, 2012, at 4:45pm with 37 attendees. Of those, 12 members and 25 guests with 6 guests requesting membership.

* The meeting was opened with attendance sheets and introductions.
* The minutes for the F11 Boston meeting were presented.
* The TF Chair presented a draft version of the guide which was distributed by e-mail prior to the meeting.
* The scope for the guide was presented and adjusted based on feedback from the group. It is the intention to present the scope in the application for the PAR, keeping in mind that the document will be a guide. At this time the scope reads: **“**this guide describes the test procedure for the measurement of PD and electrical PD detection, occurring in bushings and instrument transformers during dielectric tests in AC and DC (bushings) applications”.
* Several editorial and contents changes were recommended and the meeting was dedicated to discussions on the body of the document. It is not intended to cover acoustic PD detection.
* It was pointed out that the guide should cover both narrow and wide band measurements. A specification of frequency range should be included in the guide.
* It was discussed whether interpretation of PD patterns should be included in the guide. Although enough material may be available, it may not very clear what the real cause for PD may have been. Perhaps to include basic patterns only.
* The linearity and validity of the calibration between 50% and 200% of the calibration value was discussed. This may be related to the calibrator only. If a switched calibrator is used, the change of capacitance vs voltage change may affect the result of the calibration.
* The uncertainty of the tests should be considered during the test as there are several factors contributing to it including the calibration, test equipment, detecting equipment, etc.
* A revised draft will be circulated for comments. Members are encouraged to send their comments and suggestions to the TF Chair.
* Meeting was adjourned at 5:50 pm.

Minutes by: Arturo Del Rio.

Nashville, March 13 2012.

**11.4.5 Unfinished Business** – none

**11.4.6 New Business**

* Keith Ellis proposed that a definition needs to be added to C57.19.00 for solid dielectric bushings, RIP already exists therefore he would like to develop new nomenclature for epoxy resin impregnated paper bushings. Keith is requesting manufacturers input or anyone has suggestions before the next meeting.
* The Chair opened a request from Steve Shull on a bushing standard that covers only distribution transformers (350kV BIL and below – reference Table 4 in C57.12.00). He was asked if there was any standard for bushings used in distribution transformers, and asked the group if there is a need for one. Loren Wagenaar suggested that it was covered in C57.12.100 and will look up old standard to see if it was removed. The Chair asked anyone with further information to please provide it before the next meeting, and Paul Buchanan from Moloney Electric agreed to do that.
* Oil to SF6 bushings are not covered in current bushing standards, and John Graham from Trench England agreed to collect the information on this type of bushings and have it presented in next meeting for further discussion.
* Tom Prevost – Asked that any ideas for future Tutorials (traditionally held on Thursdays) to be brought to his attention.

**11.4.8 Adjournment**

The meeting adjourned at 10:45 PM.

Minutes submitted respectively by,

Eric Weatherbee

Secretary

Bushing Subcommittee

* 1. **Dry Type Transformers SC – Charles Johnson, Secretary Casey Ballard**
     1. **Introductions and Approval of Minutes**

The Dry Type Transformer Committee meeting began at 1:32pm Wednesday, March 14 in the Music City (2F) Room of the Renaissance Nashville Hotel with introductions of members and guests. There were 13 members (out of 34, therefore a quorum was not reached with only 38% of members in attendance) and 11 guests present. The minutes for the Boston meeting were not approved since there was not a quorum.

* + 1. **Working Group/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:

* + - 1. **IEEE PC57.12.01 - Dry Type General Requirements Chair Tim Holdway**

The working group met in the Belmont 2&3 Room of the Renaissance Boston Nashville Hotel

The meeting was called to order at 1:46 PM by Chairman Tim Holdway

The meeting was convened with sixteen (16) members (out of 22 – therefore a quorum was reached with 73% attending) and 22 guests present with 3requesting membership.

The minutes of the Boston October 31, 2011 meeting were approved.

Motion: Chuck Johnson Second: Rick Marek

Old business

**No Load Loss Correction**

In San Diego a motion carried that all no load losses should be corrected to 20C. After that meeting Casey Ballard questioned how the losses should be corrected. He supplied the correlating calculation from C57.12.90 Section 8.4 for discussion. It was generally agreed that a similar equation should be added to the next revision of 12.91. Casey Ballard made a motion that a footnote be added to

*The no-load losses of power and distribution transformers shall be determined based on a reference temperature of 20°C.*

And it should state:

*Correction of No Load Losses will be required when the top yoke temperature of the core is greater than 40C.*

This motion was seconded by Dhiru Patel passed with 9 in favor, 2 against, and 5 abstentions.

**Altitude Correction**

Tim Holdway made and presented a proposal to keep the same values as currently in Table 1 along with (2) examples to be placed in the Annex. There was a request to add a 3rd example that used 3300ft or below as the tested altitude.

Chuck Johnson then questioned what products, winding techniques, and materials these corrected test values should be applied to. Vijay Tendulkar questioned what test values should be corrected (applied, induced, and impulse) with a suggestion that induced should be corrected. There was a lengthy discussion on the merit of the Table 1 values and how they applied to dry type transformers. Being no consensus on the discussion the chair decided to make a Task Force to deal with this issue.

The members of this new Task force are:

* Aleksandr Levin
* Shankar Nambi
* John K. John
* Arinudha Narawane
* Tim Holdway

This Task Force will be asked to determine the source of the Table 1 values and make a single proposal to the entire Working Group at least (1) month before our Fall meeting

**Proposed Changes by Marcel Fortin**

**Table 5** – Casey Ballard presented a proposed change to Table 5 to include 46 and 69kV classes. This table and its effects on Section 7.3.3.2 will be sent to the Chair for distribution to the WG members

**Table 13** – Marcel proposed to add the Zero Sequence Impedance to the nameplate. No second was made and the membership agreed not to include this requirement since the data can be found in the test report.

**Section 6.3 –** Marcel proposed that all removable panels should weigh less than 50lbs to align with a Canadian standard. No second was made and the membership agreed to leave the weight limit at 100lbs

**Section 7.1 –** Marcel agree to provide a proposal to the Chair since the members were not clear on his requested changes

**Section 7.3.2 -**  Marcel proposed to change the Category I transformers short circuit duration from 2 seconds to:

*Category I:*

*t = 1250 / I^2*

*where t is duration (s)*

*I is symmetrical short-circuit current in multiples of normal base current (see 7.1.5.1)*

No second was made and the membership agreed to leave Category I at 2 seconds.

**Section 7.3.5 –** Marcel proposed to move this text into Section 7.3.3. No second was made and the membership agreed to leave Section 7.3.5 as is.

**New business**

No new business was raised due to time constraints

Next meeting: Fall 2012: Milwaukee, Wisconsin October 21-25

With no further business, the meeting was adjourned at 3:02 PM.

Motion: Bill Bartley Second: John K. John

* + - 1. **IEEE PC57.12.52 - Sealed Dry Type Power Transformers Chair Sheldon Kennedy**

The Working Group met on Monday, March 12, 2012 at 11:15 AM with 8 members and 6 guests present. Sheldon Kennedy chaired the meeting. We did not have a quorum for the meeting.

Minutes of the October 31, 2011 meeting in Boston were reviewed, but could not be approved due to a lack of a quorum.

Draft 5 of the document was balloted.

We had met the requirement for a valid response ballot with 82 % returned. We had 96% approval rate. We have 57 comments to resolve, 9 must be satisfied. There are 3 negative ballots which must be addressed. That is what was reviewed.

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| |  |  | | --- | --- | | Ballot Open Date: | 19-Aug-2011 | | Ballot Close Date: | 18-Sep-2011 | | Type: | New | | Draft #: | 5 | | Comments: | 57 | | Must Be Satisfied Comments: | 9 | |

RESPONSE RATE

This ballot has met the 75% returned ballot requirement.

95 eligible people in this ballot group.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  | | --- | --- | | 73 | affirmative votes | | 3 | negative votes with comments | | 0 | negative votes without comments | | 2 | abstention votes: (Lack of expertise: 2) | | |  | | --- | |  | |  | |  | |  | | 78 | votes received = 82% returned | |  | 2% abstention | |

APPROVAL RATE

|  |
| --- |
| The 75% affirmation requirement is being met. |
| |  |  | | --- | --- | | 73 | affirmative votes | | 3 | negative votes with comments | | |  | | --- | |  | |  | |  | |  | | 76 | votes = 96% affirmative | |

The Working Group reviewed the responses to comments in the CSV and the responses the chair made in Draft 6 to respond to them. After a review of the comments and responses the chair notified the working group that the recirculation process would be started. The one most serious negative ballot has already removed his negative ballot and the two remaining negatives were agreed to with relatively easy modifications. Draft 6 and the CSV file have already been reviewed by Bill Bartley and Erin Spiewak and seem to be in order. The chair will make a few editorial changes to the responses in the csv file and start a formal Re-Circulation Ballot in IEEE.

There were no other comments.

There was no other old business or new business.

The meeting was adjourned at 12:30 PM.

* + - 1. **WG Dry Type Loading Guide C57.96 Chair Rick Marek**

The fifth meeting took place on Tuesday, March 13, 2012 in the Belmont Meeting Rooms at 3:15 pm, at the Renaissance Nashville Hotel, Nashville, Tenn. Introductions were made and attendance sheets were circulated. There were 11 members and 9 guests present at the meeting, and as this was a quorum, the minutes of the prior meeting were approved.

The chair then lead a discussion on the tasks assigned at the prior meeting in Boston. These tasks were the definitions in the front of the document, and then discussion of the equations used in Tables 1, 2 and 3.

For the definitions, the task force members provided input to the chair, which was the basis for the discussion in the meeting. We talked about using the definitions from our other documents, including C57.12.80. After discussing options, the chair made a proposal for the definitions. However, during the discussion of this motion, it was noted that our current IEEE documents no longer cover gas-filled transformers, so a motion was made to modify the chair’s proposal to omit the gas filled transformer definition, and this was agreed to unanimously. The following definitions were finally agreed to:

Dry Type Transformer

Ventilated Dry Type Transformer

Non-Ventilated Dry Type Transformer

Resin Encapsulated Winding

Solid Cast Winding

Sealed Transformer

The next topic was a discussion around the Table 1 equation led by Sanjib Som. He described the method, which appears to have been used to develop this table, and provided his input. He found that he could calculate these values, and suggested rounding the data to three places after the decimal. The chair asked Sanjib to provide an example, which can be placed into an annex.

The last task concerned the Tables 2 & 3 equations. This was led by the chair, based on some research conducted by Dhiru Patel. His research was presented based on a Montsinger paper written in 1924. A question was raised about providing the working group access to a reference document, which carries an IEEE copyright. The chair will discuss this with Erin Spiewak.

During the discussion of Tables 2 & 3 – there was some confusion about both of the tables. The chair asked for an over all example using all of these three of the tables to make sure the information is documented for the future. Dhiru Patel volunteered to prepare example.

The chair proposed introductory wording for the high altitude correction based on the IEC loading guide and Sanjib Som noted that we may need an additional example, which led to discussions related to testing vs. verification. The chair will modify the proposed wording for the high altitude temperature rise correction.

Finally, there was a discussion related to clause 4.3.3 concerning the exclusion of non-ventilated units. All agreed that it should be included. A discussion about what to do with the sealed units resulted in the determination that they would likely need a different factor. The chair proposed to exclude these units since no one knew what factor would be appropriate and the units are now rare. Sanjib Som requested a note explaining why these units are excluded. Dhiru Patel volunteered to provide the wording.

Under new business, Valery Davydov presented a recommendation to include dry-type transformers in his moisture study program. The chair recommended that he review C57.94, the operations and maintenance guide where it would be more appropriate.

* + - 1. **WG Dry Type O&M Guide C57.94 Chair Dave Stankes**

The inaugural meeting for the revision of IEEE C57.94 took place at 4:45PM on Monday, March 12, 2012 in the Belmont Meeting Rooms at the Renaissance Nashville Hotel, Nashville, Tenn. Introductions were made and an attendance sheet was circulated. As this was the initial meeting, requests were made by the chair for working group members in addition to the five volunteers from the Dry-Type SC meeting in Boston. Fifteen of the 18 people who attended asked to be working group members.

The chair described the current status of the document. In June of 2011, a reaffirmation ballot was conducted and a likely successful ballot was obtained with mostly minor editorial and a few technical comments. However, since the document was last revised in 1982, it was decided that this document should be revised to address the minor issues uncovered in the ballot, along with making sure the document is updated based on 30 years of subsequent use of dry type transformers in the industry. A PAR for revision of C57.94 was submitted on September 9, 2011 and approved by REVCOM on November 9, 2011.

The scope in the approved PAR was determined to need some further modification by the five Boston volunteers during a previously held conference call meeting in January. The revised scope borne from this discussion was presented and discussed in the working group meeting. After much discussion, it was agreed that this wording would be included in upcoming Draft2 of the document. The wording for the scope, which was patterned after wording in our current version of IEEE C57.12.01 is as follows:

*This recommended practice covers general recommendations for the application, installation, operation, and maintenance of all single and polyphase ventilated, nonventilated, and sealed dry-type general purpose distribution and power transformers or autotransformers, including those with solid-cast and/or resin encapsulated windings except as follows:*

*a) Instrument transformers*

*b) Step- and induction-voltage regulators*

*c) Arc-furnace transformers*

*d) Rectifier transformers*

*e) Specialty transformers*

*f) Mine transformers*

*g) Testing transformers*

*h) Welding transformers*

The chair will circulate the second draft to the attendees of the meeting and look for input for areas of improvement. It is requested that comments be returned to the Chair by April 29th.

There was a discussion about the referenced documents, most of which have dates in the current draft that are 30+ years old. It was agreed that we should try to have the references undated wherever possible. We also discussed the possibility to place into the standard information such as ANSI/NFPA clearance requirements, since these are from standards that are not always readily available by IEEE members. Erin Spiewak will try to help with obtaining approval once we identify which documents we would use this information from.

We then also discussed the topics referenced in current operating and maintenance documents published by suppliers in the industry, and whether or not these topics are (all) referenced in C57.94. Casey Ballard did a quick internet search and found links to O&M manuals for many Dry-Type manufacturers who regularly attend the IEEE Transformer Committee meetings. He will send these links to chairman, who then in turn will forward to attendees of the WG meeting. These documents can be used as a guide to make sure we are not missing any current topic, but we would need OEM approval to use precise wording from their documents.

Rick Marek raised an issue related to needing a section on how to deal with older transformers, which may need to be different than O&M manuals which typically are shipped with new equipment. This idea/section may need to be run by IEEE legal due to some potential issues. We also discussed the possible need to address issues such as protective apparel that may be referenced in current Operation and Maintenance manuals but not found in C57.94-1982.

* + 1. **Old Business**

Paulette Powell discussed the status of (2) standards being balloted for approval.

* + - 1. **WG Dry Type Transformer Through Fault Current C57.12.59 Chair Paulette Powell**

1. The submittal date for a recertification was not met so this WG will be required to adhere to the new rules for expiring standards
2. Casey Ballard was asked to support the addition of Category III transformers
   * + 1. **WG Dry Type Hot Spot C57.134 Chair Paulette Powell**
3. The submittal date for a recertification was not met so this WG will be required to adhere to the new rules for expiring standards
4. The MEC submittal will be send to the WG again for comments
5. Paulette requested a comment resolution WG
   * 1. **New Business**
6. The chairman commented on the poor attendance of the Sub Committee (8 members have not attended a meeting since 2008)
7. Roger Wicks asked that the error in C57.12.60 be corrected & asked for the proper mechanism to make this correction. The chair will follow up to determine the method.
8. Consultants are asked to identify themselves as representing manufacturers, users, or as an interested party. They are not required to name their sponsors.
9. Voting/Ballot pools cannot have more than 50% in any one group. However, the WG Chair has the ability to make as many different groups as needed to achieve this requirement.
10. Please send all rewards request to Rona

Being no other business, the meeting was adjourned at 2:27pm.

* 1. **Distribution Transformers SC – Steve Shull**

**Chairman: Stephen Shull**

**Secretary: Jerry Murphy**

**Meeting Date: 3/14/2012 Time: 9:30 – 10:45**

**Attendance:**

|  |  |
| --- | --- |
| **Members** | **33** |
| **Guests** | **56** |
| **Guests Requesting Membership** | **12** |
| **Total** | **89** |

**Meeting Minutes / Significant Issues / Comments:**

Steve opened the meeting; rosters were passed out, introductions were made & by a show of hands of members listed on screen showed we had quorum with 25 of the 47 members in attendance at the start of the meeting.

The minutes of the fall 2011 meeting of the subcommittee were presented and a motion was made by Kent Miller, seconded by Ron Stahara to approve the minutes; the motion carried by unanimous acclamation.

The following are the highlights of the reports that were submitted by the Working Groups and Task Forces. For further, detail please consult the individual reports.

* C57.12.36 –Distribution Substation Transformers

The chair opened the meeting at 9:45 AM on Monday March 12, 2012, in the Fisk Room of the Renaissance Nashville Hotel, Nashville, Tennessee; introductions were made, and the attendance roster was circulated. Since this was the first meeting after the PAR was approved, no quorum had to be established, and the people in attendance were asked to indicate on the rosters whether they requested membership for this working group.

Jerry informed about the status of the PAR, which was approved in December 2011, with an expiration date of December 31, 2015.

The next item on the agenda was the discussion about the definitions of Class I and Class II Power transformers, and Jerry mentioned that the definition of the two classes was included only on one IEEE standard, and that this standard for Distribution Substation Transformers had essentially the entire scope of Class I Power Transformers.

Marcel Fortin mentioned that 69 kV transformers, 15 MVA and above were being voted to meet requirements of Class II Power Transformers, but these transformers were out of the scope of this WG.

Several members in attendance considered that even though not many users specified these distribution substation transformers referring to this IEEE Standard, the need existed to keep the document active, so that manufacturers could follow the requirements included on this standard for these specifications.

As the next item on the agenda, the document with the comments from the previous balloting process was reviewed.

The comment about section 5.1.4 Winding temperature indicator was discussed; it questioned if the hot spot temperature was a measurement or an indication. Gary Hoffman volunteered to review sections 5.1.3 and 5.1.4 for liquid and winding temperature indicators, and provide a recommendation to this WG, based on the current requirements of C57.12.10.

Marcel Fortin mentioned that on section 5.9.2 other oil preservation systems, some text was missing after the first paragraph. Jerry mentioned that he would review this for the next meeting.

The next comment discussed was about section 5.9.1 Sealed tank system, related with the temperature range. The agreement was to change this section to reference the operating conditions as per C57.12.00, same as the C57.12.10 document.

The last comment discussed was about section 5.2.3 Electrical characteristics of bushings. The comment described some conflicts with the scopes of the standards referenced on this section. Jerry volunteered to review the bushing standards to address this comment.

Jerry said that he would make available the draft of the standard under revision as well as the file with the comments from the previous ballot, so that the working group can review them for the next meeting in Milwaukee.

The meeting was adjourned at 10:56 AM.

* C57.12.20 – Overhead Distribution Transformers

Introductions of members and guests.

A quorum of the Working Group’s members was present (24 out of 32).

The minutes of the fall 2011 Boston meeting were approved as submitted.

Al Traut reported that the current revision expires in 2021. A PAR is needed by fall of 2012.

Discussion was held on a missing dimension on Figure A.3 of Annex A, but changed to whether hanger and kicker brackets should be included in the C57.12.20 standard at all. The WG suggested that a survey be done on how many, if any, Users still need crossarm hanger and/or kicker brackets. Chuck Simmons will put together a User survey to determine if hangers and/or kicker brackets are still being used with transformers or any other equipment.

Discussion was held on temperature requirements for gaskets. The WG is interested in pursuing some type of further guidance on temperature requirements for gaskets in the C57.12.20 standard. Chuck Simmons will forward results from the 2008 survey of transformer manufacturers and transformer component manufacturers. Additionally, Chuck will perform a survey of the WG to determine what changes are desired and report back at the next meeting.

Gael Kennedy reported to the WG on his research into low voltage ratings not presently in the C57.12.20 standard. He will investigate possible changes to the standard and offer a recommendation at the next meeting.

Discussion was held on the recent activity by the DOE with regard to distribution transformer efficiency - specifically that the DOE is asking for input on the creation of an Equipment Class specifically for overhead type transformers. The possibility of adding maximum weights and dimensions to the standard was also discussed, but didn't receive enough support to go forward.

Discussion was held on the possibility of adding impedance and/or regulation requirements to the C57.12.20 standard. Chuck Simmons will issue a survey to Users asking if they have any specific impedance and/or regulation requirements they may have for 1 and 3-phase overhead type transformers.

Discussion was held on including bushing requirements in the C57.12.20 standard. Marty Rave and Josh Verdell agreed to investigate and offer a proposal at the next WG meeting.

Under new business, Ron Stahara asked if 240/120 and/or 480/240 Volt secondary ratings should be included in the standard. Gael Kennedy agreed to include these ratings in his investigation of low voltage ratings.

Meeting was adjourned at 12:14PM.

* C57.12.38 – Single Phase Padmount Transformers

The meeting was called to order by Ali Ghafourian.

A roll call was conducted to determine if a quorum was present. Twenty of thirty-one working group members were present at the time of the roll call. Therefore, a quorum was present.

The minutes from the October, 2011, meeting in Boston were presented and were approved.

Ali Ghafourian gave the status of the PAR. It is good through 2014.

A review of Draft 1.3 was continued. Changes discussed in the Boston meeting included the following:

A proposed new Figure was presented by Tom Holifield showing low voltage bushing arrangements and dimensions. These are needed as a result of the expanded low voltage ratings that will now be part of this standard. A change to have all the bushings in a line rather than staggered for the Type 2, E/2E drawing was suggested. Tom will revise the figure for further discussion at the next meeting.

A revision to Figure 4 was introduced at the last meeting to specify the stud sizes required for the new low voltage ratings now in the standard. Mike Faulkenberry presented a revision to the figure that corrected concerns from last time. There were no concerns with this new proposed revision, and a motion was made and seconded to approve revised Figures 4 (now Figures 4A and 4B) for inclusion in the standard. The motion was approved.

A discussion took place on the need for changes if, as previously approved, the standard covers units with natural ester fluids. It was suggested that if IEEE C57.12.147 is referenced, that would take care of any requirements we would need to address. This will be reviewed further for discussion at the next meeting.

Carlos Gaytan gave a presentation which first reviewed what had been found by the task group formed to study low voltage bushing cantilever loading. He then went on to address how their findings related to the requirements in IEC standard 60137 that addresses this issue. His conclusion was that if the center of the spade/connector is no more than 12 inches from the tank wall, there should not be any concern with damage to the bushing. His presentation will be posted on the web page. The members were asked to review this presentation and to be prepared to discuss this further at the next meeting. There was some question as to whether a new standard addressing this is required, if it needs to be a part of C57.19.01, or if wording needs to be included in C57.12.38 to address the issue.

Ron Stahara raised a question about the fact that the standard does not address requirements to keep the lid from sliding off when the door is open and the unit is tilted to one side. Proposed wording to address this will be prepared and discussed at the next meeting.

Ali Ghafourian suggested that there needs to be wording in the standard that addresses the safety factor for lifting the unit. Proposed wording to address this will be prepared and discussed at the next meeting.

The meeting was adjourned.

* C57.12.34 – Three Phase Padmount Transformers

Ron Stahara called the meeting to order. To establish a quorum, the member list was displayed on the screen and those who saw their names were asked to hold up their hand. From this count of hands, a quorum was declared. Ron asked that everyone introduce themselves by giving their name, company and location. Also, an attendance roster was circulated. A motion was made by Jerry Murphy and seconded by Kent Miller to accept the minutes of the past meeting. It was approved by acclamation with no corrections.

Ron Stahara made a presentation of the modified figures showing the cabinet depth as referenced to the inside of the door and the modification of the tables in the figures to reflect the 24 inch depth of the cabinet that was determined for the 600A terminations at the last meeting. He reminded everyone that the 24 inch depth was the result of the survey presented at the last meeting by Jerry Murphy. Some discussion ensued with input from the representatives of Progress Energy, PG&E, WEnergy, and MLG&W. The comments pointed to the need for the additional cabinet depth due to the conductor fill at the lower voltages. A motion was made by Dan Mulkey and seconded by Ali Ghafourian to make this dimension 30” rather than 24”. The motion passed by acclamation.

The next order of business was the footnotes which specifically referenced IEEE 386 specific drawings. There was some discussion concerning how to deal with the issue of the 600 A connections. It was finally concluded that these should be changed to only a general reference in the footnotes and exclude the specific figure references. A motion was made to this effect by Jerry Murphy and seconded by Dan Mulkey. The motion passed by acclamation.

It was determined that Steve Shull would make these modifications to the document by the next meeting.

This concluded the meeting.

* C57.12.39 – Tank Pressure Coordination

Carlos opened the meeting at 4:45 PM on Monday March 12, 2010, in the Fisk Room of the Renaissance; introductions were made, and the attendance rosters were circulated. Since this was the first meeting as a Working Group after the PAR was approved, no quorum had to be established, and the people in attendance were asked to indicate on the rosters whether they requested membership for this working group.

Carlos presented the status of the PAR, which was approved on February 6, 2012, with an expiration date of December 31, 2016.

The next item discussed was the review of a summary table of pressure requirements from various standards.

A task force was created to provide definitions for the Pressure Relief Valve and Pressure Relief Devices. The members were:

Chris Sullivan – Heartland

Josh Herz – Qualitrol

Justin Pezzin – IFD Corp.

Adam Bromley – City of Fort Collins

Libin Mao – ConEdison

The group discussed dynamic pressure requirements for submersible transformers. The question was why these transformers should be included in the requirement of the current standards. It was mentioned that it may be related to some designs which used bolted covers.

Dan Mulkey commented that a round tank submersible with a welded lid will still be ejected with an internal fault, even though it is stronger than a bolted cover design. However, square tanks will not experience this because they have the ability to bulge.

Al Traut offered to review the historical development of the submersible standards to see if there is anything relevant for the group to consider.

Carlos reviewed the proposed draft document with the group.

Section 3 comments:  
Definitions may not be necessary for this standard. The definition of Static pressure was too long for a definition. It should only include information about what it is, and not what it is not. Dynamic pressure definition proposed changes: Should the title be transient, or rapid rise? No consensus on this, but Steve Shull mentioned he thought we were heading towards dynamic from previous meetings and should stick with that for now. It should incorporate a reference to the time component associated with the dynamic type of pressure rise…(i.e. rate of rise, or, rapid rise…etc…)

Section 4 comments:  
Include PRV / PRD flow rates in this standard to capture the full requirements for the device in one location. Include negative pressure requirements for transformers in this standard. (i.e. must remain sealed to -8 psig) Use an informative annex to address the difference between the 7 psig value for no distortion of the tank, and the 10±2 psig operating value of the PRV. Include Voltage Regulator pressure requirements in this standard as well; the WG may need to change the scope to include this. A comment was made that it is a common practice to ship some specific transformer designs with a 3 psig blanket from the factory. Libin Mao added that ConEd will pressurize their submersible transformers so they will be at +6psig in the summer to ensure they will never go to a negative pressure in the winter. A comment was made that it might be good to include the rapid rise relay as a reference

Carlos mentioned that the comments would be incorporated in the draft document of this standard, which will be posted on the committee website by April 2012, along with an updated document that would include all the research that had been made since the start of this group as a task force in 2010.

With these documents, the Task Force for PRV/PRD requirements can use them as a guide to work on the assignment and present the progress at the next meeting in Milwaukee.

The meeting was adjourned at 5:47 PM

* C57.12.28, 29, 30 & 31 – Enclosure Integrity
  + C57.12.28

Introductions of members and guests

A quorum of the Working Group's members was present (25 out of 34).

The minutes of the November 1, 2011 working group meeting was approved.

A review of the C57.12.28 standard was then started.

Normative references in Section 2 were reviewed.

Discussed an alternative wording proposal for 4.1.8 but voted to keep the wording as shown in Draft 4

After much discussion, 4.3.6 was revised to:

"Following all of the above tests, the unit shall be lifted at least one meter in accordance with manufacturer’s standard lift instructions and then set again on the flat surface. The doors shall be easily opened, closed, latched and locked without requiring adjustments to the cabinet, latch mechanism and/or enclosure door(s). All of the door latch points must fully engage when the door is closed."

Discussed adding a section with a sunset clause for the design tests - 4.5 currently in draft form as "These design tests shall be repeated whenever the design is changed so as to modify performance, or at least every five years whichever is shorter"

5.5.2 accepted as shown in Draft 4

5.5.5 accepted as shown in Draft 4

5.5.8 changed to the alternative "The rating shall be 4B to 9B per SAE J400 and no rusted chip shall be greater than 3 mm in diameter"

Deleted dates from the Bibliography.

The meeting came to a conclusion at 9:18 AM

* + C57.12.29

All of the enclosure integrity tests and requirements included in the C57.12.29 Standard were covered during the review of the C57.12.28 standard. These two standards are very closely related and share many of the same features.

In 5.3.2 agreed to change the test rate cycle from 2 to 4 years for the Exposure Test

There was insufficient time to review the remainder of this standard. Chairs will update 12.29 to match the agreed changes in 12.28

The meeting came to a conclusion at 9:18 AM.

* C57.12.35 – Distribution Transformer Bar Coding

The WG met on Tuesday, March 13, 2013 at 9:30 am in the Fisk Room of the Renaissance Hotel in Nashville, TN.

An agenda was presented and introductions were made. There was a quorum present at this meeting. The meeting minutes from the San Diego and Boston meetings were approved.

The note under section 4.1.6 of the standard was reviewed and it was agreed to leave it as it is in Draft 2.

The Chair reviewed the suggestion to increase the minimum height requirement of the bar code on the temporary bar code label from 0.24" to 0.50". The Chair stated that if the size is increased it may require the manufacturers to install two labels for customers that require more than the standard information.

A suggestion was made for customer labels that require more than the standard information to have first part of the bar code that contains Mfg, I.D. Code and S/N to be 0.5" and the remainder of the bar code to be negotiated between the end user and the manufacturer.

After some discussion, a motion was made to modify Section 4.2.4.5 to increase the height of the bar code on the temporary label to no less than 1.27 cm (0.5"). After a discussion, the motion was amended to state: "The height of the bar code symbols for the label as defined in 4.2.2.1 shall be no less than 1.27 cm (0.5")". The motion was approved.

A draft with the proposed revisions will be created for review at the next meeting.

Meeting was adjourned at 10:10 am.

* C57.12.37 – Electronic Test Data Reporting

The meeting was called to order at 4:45pm and Introductions were done.

Roster was taken, and a quorum was met.

Minutes from the meeting on 11/2/2011 in Boston, MA reviewed and approved.

Old business:

1. PAR was approved

2. Reviewed again the proposed changes for the DOE. It was decided that we will wait to finalize the DOE changes for the final rule making 10/1/2012 of the new DOE guidelines. So it will be discussed at the next meeting.

New Business:

1. New scope and purpose was reviewed from the PAR

2. Issues from the current standard besides DOE were requested. None were mentioned. The chair asked that this is reviewed before the next meeting and will put it on the website.

3. The users were surveyed about the use of this standard. 3 users said they are presenting using the electronic data formatted to this standard. The other users in the room expressed interest in having a tutorial on how to use the data. Dan Mulkey to conduct a brief tutorial on how to use the electronic data at the Fall 2012 meeting in Milwaukee.

Adjourned at 5:10pm

* TF – Transformer Efficiency and Loss Evaluation (DOE)

The Task Force on DOE Energy Efficiency of Transformers was called to order and a quorum was present. The agenda was presented and the agenda was approved. The chairman reviewed briefly the contents of the previous meeting minutes. A motion was made and seconded to approve the minutes. The motion was approved by acclamation.

The chairman noted that an NOPR has been issued by Department of Energy. He noted that he has prepared a tutorial on the NOPR that will appear on his website that is available to TF members. He further highlighted key elements. He noted in the new NOPR the reference to TSL is not the same as efficiency level and that Table 3 is not the same as appears in the 2010 law, particularly separating single phase (reducing losses from 6.2% to 12%) and three phase (reducing losses from 5.2% to17%) transformers and reducing losses in liquid and low voltage dry type transformers. He also noted that the closing date for public comment on the NOPR is April 18, 2012.

In further discussion he noted the disparity in the calculations used in determining the payback period outlined in table 6 of the presentation. It was noted that Lawrence Berkley Laboratories assumed incorrect material costs in their analysis, costs that are lower than manufacturers experienced.

At the last public meeting of DOE prior to the issuance of the NOPR, there was general acceptance of the efficiencies and data in the report, but on second look, it was felt that additional consideration should be given to the data to more accurately reflect real material costs. Energy prices used in the NOPR is twice that used by utilities today. It was noted there was a miscalculation of the loading values of low voltage and medium and dry transformer at 15% and 35%, respectively. (This may be the result of a misunderstanding amorphous core data.) A comparison of OPS data with known data, suggested a number of errors, though corrected in many case, they still remain in the low voltage dry transformer product.

It was noted that not all interests participated in the NOPR, particularly the production experts so their view was not included.

There is a view that DOE’s proposal goes further than necessary. It is necessary that if there is agreement within the industry that those interested and/or affected by the DOE action should present their views as a response to the NOPR.

Discussion of comparison of efficiencies between M3, M2 and HiB and amorphous core transformers and the broad impact of their efficiency levels on the costs of transformers and their effect on the industry.

The chairman briefly reviewed loss data and noted that the DOE proposal comes extremely close to the crossover between M3 Core Steel and Amorphous. He noted that in discussions at DOE, proponents for greater losses have been challenged for the adverse effects the promotion of amorphous core transformers would have on the US steel industry. DOE still has to justify the impact of the loss levels on small manufacturers. This is an area the small manufacturers can provide information. The chairman volunteered to be the conduit for such information being passed on the DOE.

The chairman noted that comments to DOE should arrive by 18 April (copy Hopkinson for info) and a final rule is expected by October 2012.

It was noted that DOE raised 30 questions concerning this product area and requested replies.. NEMA is preparing a response. The chairman recommended individual companies may want to reply to those and provide him with an info copy as well. The questions are also included in the PowerPoint presentation he prepared.

The chairman assured members that he will post any material provided him and notify members of any DOE decisions. It was noted that emphasis should be on the economic impact of those decisions on the industry and its member companies.

In a question about the impact of loss values that impact US steel companies and whether or not they would provide steel for distribution transformers, it was noted that the steel companies would likely focus on the steel cores for power transformers. The NOPR does not change the rulings of 2010.

It was noted that Canada has adopted the 2010 efficiency levels, up to 7500 kVA. Both Canada and Mexico are seeking to follow US initiatives, so eventually, what is proposed is likely to impact those countries at some point. It was noted that DOE has indicated it would not regulate step-up transformers but may include wind power transformers up to 400 MVA; these are still under development.transformers and transformers for solar applications. (It was pointed out that solar transformers are included in the current NOPR.) It was noted that the IEC is looking to efficiencies for

There was no new business and the meeting was adjourned at 3:07 PM.

Old Business:

Steve asked if there was any old business to review and none was presented.

New Business:

Of interest to the Distribution Transformers SC the EL&P (user only) meeting may move again as the Sunday’s meeting facilitated by Jerry Murphy was not attended as well in the past. Jerry advised the users to be on the lookout.

Bill Bartley suggested to the WG chairs to improve participation by WG members to send a separate e-mail advising members once the ballot is open.

Steve brought a request to the group from Tom Prevost for any tutorial topics that could be done during our Thursday morning time slot. He asked that those with any ideas to contact Tom directly.

Steve adjourned the meeting with unanimous consent at 9:53am.

* 1. **Dielectric Tests SC – Loren Wagenaar, Thang Hochanh, Vice-Chair; Dennis Marlow, Secretary**

The Dielectric Tests Subcommittee (DISC) met on Wednesday, March 14 at 11:00 am with a record 191 persons in attendance. There were 72 of 123 members, and 46 of the 119 guests present were new. 10 of the 73 returning guests requested membership and will have their participation status reviewed prior to acceptance

**11.7.1 Chair’s Remarks**

1. The Chair briefly reviewed highlights of the Administrative Subcommittee meeting held on Sunday afternoon. The main points have already been discussed in the Main Committee meeting on Monday and were not repeated
2. The following meetings of the TC are:
   * 1. Fall Oct 21-25 2012 – (Hilton Hotel $149)-Milwaukee, WI – hosted by SPX Transformer Solutions
     2. Spring March 17-21,2013 – (Dolce Munich ($190, £142 with breakfast) Munich, Germany – hosted by Reinhausen

Additional meeting sites are listed on the main committee website.

**11.7.2 Quorum and Approval of Minutes**

1. 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.
2. The minutes of the fall 2011 meeting in Boston were approved without correction.

**11.7.3 Working Group Reports**

**11.7.3.1 Working Group on External Dielectric Clearances, Eric Davis, Chair; Dennis Marlow, Secretary**

The WG for the revision to external dielectric clearances met on Monday March 12 at 9:45 with 9 of 24 members and 26 guests present. 3 returning guests requested membership. A quorum was not obtained. All members and guests will have their participation status reviewed before the next survey is issued. The minutes from Toronto will be sent to active members for approval by email.

The results of the 3 questions and comments from the last survey were reviewed. The results of the survey were distributed by email and are posted on the DI SC website

The survey showed that the majority agreed with using the NEMA TR1 clearances values for 230 kV and below. The values should be presented by both voltage and BIL.

A sample table was reviewed in the meeting. The proposed clearance table was reviewed and discussed. The revised clearance table will have format similar to the existing dielectric test tables 4 & 5 in C57.12.00-2012 for consistency. This table will be filled in and distributed for review prior to the next meeting.

We also discussed the clearances for voltages greater than 230 kV. Since the existing literature is clear that clearances above 230 kV are controlled by BSL, we felt that the clearance table should provide a single value based on BSL for 345 kV and above.

We will be sending out background information and a survey to verify that the DI SC agrees with this approach and to determine the appropriate BSL method to be used to determine these clearances.

Meeting adjourned 11:00 am

Respectfully submitted by Dennis Marlow

* + - 1. **Working Group for Revision of the Distribution Impulse Test Guide C57.138, Recommended Practice for Routine Impulse Test of Distribution Transformers; John Crotty, Chair**

The meeting started at 11:00 AM on Tuesday March 13, 2012. Introductions were made of the attendees. There being only 5 of 14 members present a quorum was not obtained and the minutes of the fall 2011 meeting in Boston could not be approved and will be resubmitted for approval at the next meeting.

Old Business: None

New Business:

* 1. The PAR has been approved
  2. A review of the SCOPE was presented to the group. Standard dates in the SCOPE were removed so that it refers to the latest standards. There were no further objections to the SCOPE
  3. This guide was reaffirmed in 2005 and the first step will be to review the comments from that reaffirmation
     + - 1) “Update the standard with the latest dates”. The Chair recommended to refer to the latest version of the standard. The Chair will review C57.138 and will update the document to refer to the latest versions by the next meeting for review by the members.
       - 2) “Tolerances for voltage reviewed” Technical comment from Marcel Fortin re section 5.1.1

Comment: There is always a variation in the applied impulse and uncertainties in measurements. To state that the crest value shall be equal to the BIL is excessive and unpractical. A tolerance shall be stated, and due consideration shall be made that this is a production test, not a type test. A type test typical tolerance would be -0, +10%. For production test, a tolerance of -5% would be acceptable.

Suggestion: Reword the first sentence as follow:   
The full-wave impulse shall have a crest value **of not less than 95% of** the rated BIL of the terminal …

The standard already refers to C57.12.90 in section 5.1.2. Many members suggested we follow C57.12.90. Tolerance s section5.1.2 needs to be reviewed. Probably we need to vote on removing section 5.1.2 and refer to only C57.12.90. Further discussion is needed on this subject

* + - * 4) Rf should be corrected to RT. Chair will update the figures.
      * 5) Review the figures for the generator design from the latest generator design
      * 8) A technical comment was received from Marcel Fortin re section 7.3.1 fig 24 “Are these vacuum tubes still available?"

Some members suggested that vacuum tubes may not be available now. We may obtain a used one. Members were not sure if the analog section is even needed in the standard. This will be reviewed before the next meeting by the members.

Meeting adjourned .Respectfully submitted by John Crotty

* + - 1. **Working Group on Revision of Low Frequency Tests; Bertrand Poulin, Chair; Bill Griesacker, Secretary March 13, 2012, 1:45 pm**

1. There were 62 attendees, 20 members and 42 guests; there were more than 50 % of the working group members present at the meeting, therefore there was a quorum present at the meeting.
2. The minutes from the fall 2012 meeting in Boston, MA were brought to the table; the minutes were approved.
3. TF – PD in Bushings: Thang Hochanh presented the minutes for the Task force for PD in PTs, CTs and Bushings. A first part of a draft has been sent to a limited number of participants to the TF. Comments have been received and more are expected. These will be circulated in the upcoming months. The administrative work for requesting a PAR will be initiated as soon as the Scope and Purpose of the document are finalized by the TF and WG Chairmen.
4. The topic of induced testing on 69 kV transformers was discussed. The results of a modified survey were presented by the Chairman. The proposal was to apply a Class II induced test to power transformers with a high voltage rating of 69 kV and above and a maximum nameplate rating of 15 MVA and above for three-phase transformers or 10 MVA for single-phase transformers. The results were as follows:

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
|  | **Summary of responses** |  |  |
|  | Sent | 117 |  |
|  | No of responses | 105 | % |
|  | Approve | 82 | 78.1 |
|  | Approve with comments | 15 | 14.3 |
|  | Disapprove | 2 | 1.9 |
|  | Abstain | 6 | 5.7 |
|  | Return rate | | 89.7 |
|  | Approval rate | | 98.0 |

The approval rate was almost unanimous. Several responses were originally received as negative. The reason for voting negative was always related to not applying the proposed test to all 69 kV transformers. After brief discussions with the Chairman, voters changed their vote to approve with comments provided that this is only a first step in the direction of revising testing of smaller 69 kV transformers later in time. The next step in this topic is to review applicable IEEE standards and propose appropriate changes to incorporate the proposed test. Loren Wagenaar and Subhash Tuli volunteered to do this task.

Questions were raised about 69 kV transformers below the specified MVA limits? The Chairman's answer was that this will be discussed in the future, once this first step is fully approved and incorporated into the Standards.

One question was asked about how this survey fits with the discussions about redefining Class I and Class II transformers. The SC Chairman responded that this topic would be discussed and handled at the SC level.

A proposal was made to have pd tests for transformers at lower voltage classes (15 kV, 25 kV…) be made mandatory as type test. Also, pd test levels should be included in dielectric test tables.

A proposal was made by Hemchandra Shertukde to add acoustic detection of pd with correlated levels with electric pd detection. Mr. Shertukde promised to send literature showing the relevance of the measurements.

1. Old business

The question of tap changer position during induced test need to be surveyed within the DI Test SC. The Chairman agreed to conduct the survey before the next meeting.

The meeting adjourned at 3:00 p.m. Respectfully submitted by Bertrand Poulin

**11.7.3.3.1 TF on Partial Discharge in Bushings and PTs/CTs, Chair Thang Hochanh; Arturo Del Rio, Secretary**

The task force on Partial Discharge in Bushings and PTs/CTs met on Monday March 12th, 2012, at 4:45pm with 37 attendees. Of those, 12 members and 25 guests with 6 guests requesting membership.

* The meeting was opened with attendance sheets and introductions.
* The minutes for the F11 Boston meeting were presented.
* The TF Chair presented a draft version of the guide which was distributed by e-mail prior to the meeting.
* The scope for the guide was presented and adjusted based on feedback from the group. It is the intention to present the scope in the application for the PAR, keeping in mind that the document will be a guide. At this time the scope reads: **“this guide describes the test procedure for the measurement of PD and electrical PD detection, occurring in bushings and instrument transformers during dielectric tests in AC and DC (bushings) applications”.**
* Several editorial and contents changes were recommended and the meeting was dedicated to discussions on the body of the document.
* The TF work will not cover acoustic PD detection.
* It was pointed out that the guide should cover both narrow and wide band measurements. A specification of frequency range should be included in the guide.
* It was discussed whether interpretation of PD patterns should be included in the guide. Even if PRPD (phase resolve PD) patterns are not available from many TF members, it was concluded that PRPD patterns will be included in the guide, particularly basic patterns.
* The linearity and validity of the calibration between 50% and 200% of the calibration value was discussed. This may be related to the calibrator only. If a switched calibrator is used, the change of capacitance vs. pico-Coulomb output may affect the result of the calibration.
* The uncertainty of the tests should be considered during the test as there are several factors contributing to it including the calibration, test equipment, detecting equipment, etc.
* A revised draft will be circulated shortly for comments. Members are encouraged to send their comments and suggestions to the TF Chair.
* Meeting was adjourned at 5:50 pm.

Minutes by: Arturo Del Rio.

Nashville, March 13 2012.

**11.7.3.3.2 TF on Electrical Partial Discharge Measurements Guide**,  **C57.113, Eberhard Lemke Chair**

The TF did not meet as the document was published on August 20, 2010.

**11.7.3.4 Working Group on Revision of Impulse Tests – Pierre Riffon, Chair; Peter Heinzig, Vice-Chair**

The WG met on March 13, 2012, from 3:15 pm to 4:30 pm. Fifteen members (15) members and seventy (70) guests attended the meeting. Required quorum was met. Nine (9) guests requested membership. The meeting was chaired by Pierre Riffon, chair of the WG.

Because of the last minute cancellation of the Boston WG meeting due to lack of quorum, WG Chairman did review the WG membership. The membership for the Nashville meeting was decreased from 57 members to 27 members. By revising the membership, chances of getting the required quorum are much better. Strict rules for keeping WG membership has been introduced by the WG Chair. Members shall have attended the last meeting or shall have replied to the two last surveys. For guests requesting membership, they will become member only if they have participated to the last three surveys. The Chairman will keep a close control on the WG membership.

The agenda has been reviewed and one New Business was added. The agenda has been approved as modified.

Minutes of the San Diego and Boston meetings were approved as written.

The first technical item of business was to discuss the results and comments received from the survey made within the WG on clause 5.10.7.2 of IEEE C57.12.00. The aim proposal was to add a simple reference to Table 18 which defines the conditions for performing a switching impulse test. Even if the survey approval rate was 95,9%, discussions at the WG meeting showed that this change is not required and WG members agreed to withdraw this proposal.

A negative vote from Bertrand Poulin pointed out an error in the last paragraph of this clause. The word "greater" shall be changed to "lower". This paragraph refers to cases where when performing switching surge to the HV winding at the rated BSL level, if the resulting induced switching surge on the LV winding is lower than its rated BSL value. Then, additional tests are not required since the switching impulse applied on the HV winding is controlling the resulting induced voltages on the other windings. A revised proposal taking into account Bertrand Poulin’s proposal will be surveyed within the WG and the Dielectric Tests SC prior to the next meeting.

The second technical item of business was to discuss the results and comments received from the survey made within the WG and Dielectric Tests SC on clause 10.3.2.5 of IEEE C57.12.90 (clause related to the impulse test sequence to be used for windings equipped with protective devices which are an integral part of a transformer). The purpose of the proposal was to align the number of full impulses to the same number as agreed upon for the normal cases (three full impulses). The average approval rate was 88%. Comments received were reviewed during the meeting. Three negatives were received and discussed during the meeting. None of them were accepted. The proposal will be sent to Steven Antosz for inclusion in the next ballot of C57.12.90.

On new business, introduction of impulse tests as routine tests for all power transformers (Class 1 and Class II) has been slightly discussed. A survey will be sent to the WG membership. This survey will be based on the same basic proposal as discussed within the WG on Low Frequency Tests e.g. requiring Class II testing regime for all transformers having a rated voltage of 69 kV and a **maximum nameplate** rated power of 15 MVA (3φ) or 10 MVA (1φ). For other Class I transformers, alternative routine impulse test using only full waves will be proposed and surveyed. This will ensure that all transformers from distribution levels to power transformers will be subjected to a routine impulse test.

The meeting adjourned at 4:30 pm on March 13, 2012. Pierre Riffon P. Eng WG Chair.

**11.7.4 Liaison Reports**

**11.7.4.1 High Voltage Test Techniques (HVTT), IEEE Standard 4 - Arthur Molden**

As some of you may already know Standard 4 has just finished its first ballot. The ballot results were very positive, of 267 eligible voters there were 207 votes received: 180 affirmative: 9 negative and 18 abstentions, that’s a 95% affirmative vote. Not bad for a first ballot on this document. There is therefore, still a little work to be done by the working group but we fully expect the standard to be ready for publication in the very near future. There has been a lot of extra material added to the new revision and it is now more aligned with the IEC 60060 series of standards.

The working group members toiled long and hard on this revision but, what we achieved pales in comparison to what was achieved by our Secretary Jeff Britton who almost single handedly editing and formatting the entire document. I’d like to take this opportunity as Liaison between our Committee and HVTT, to thank Jeff for his efforts and to congratulate him for providing the “spit and polish” that makes this revision what I’m sure we will all find to be the most informative revision of this standard to date. Please join in a round of applause for Jeff.

Art Molden 03/14/2012

**11.7.4.2 PCS TF on Dielectric Frequency Response Testing – George Frimpong Chair**

1. **Meeting Attendance**

The TF on DFR met on Monday, March 12, 2012, at 3:15 PM. 16 members (out of 25) and 45 guests were present.

1. **Approval of previous meeting minutes**

The minutes of meeting from the Fall 2011 meeting in Boston, MA were approved as written.

1. **Presentations of task reports**

* George Frimpong presented task force objectives and a summary of the findings of the four sub groups formed to address the objectives. All objectives set for the task force have been met.
* Diego Robalino presented the work by sub group 3 - verification and validation of DFR for moisture estimation. This involved a review of over 29 articles, 19 of which dealt with some comparison of moisture estimation using dielectric response measurements to another form of estimation of moisture (e.g. Karl Fischer titration or moisture equilibrium curves). The measurements involved several transformers and other small scale transformer models and showed quite good agreement between dielectric response measurement and Karl Fischer titration of solid insulation samples from the same transformer. There were three articles that had dielectric response measurements that did not correspond to the comparison moisture measurement used.
* George Frimpong presented how DFR issues submitted by M. Lachman were addressed in the report. No comments were received after the presentation.

1. **Discussion to recommend to PCS to form working group to develop guide:**

* The chair asked for a discussion to recommend to the performance characteristics subcommittee to form a working group to develop a guide for the use of DFR for estimation of moisture in solid insulation of transformers
* Mark Perkins indicated the best way to quickly generate data on moisture in solid insulation that could eventually be used in other IEEE documents is by developing a guide that will help in the generation of the correct data.
* A motion was proposed by Tom Prevost to recommend to form a working group to work on a guide and this was seconded by Peter Werelius
* We took a vote and 16 of 16 members present voted to approve the motion

**5. Next Steps**

The next step is to complete the task force report and send it to the task force for comment. After a final review the report will be sent to the PCS chair with a recommendation to form a working group. It was suggested that PCS should transfer the topic to the Dielectric Tests subcommittee since the basis of this test is essentially power factor measurement over several frequencies.

If a working group is authorized at the subcommittee level, the chair recommended that Peter Werelius serve as the chair of that working group. This is based on Peter’s vast experience and knowledge of DFR measurements and analysis.

**6. Adjournment**

The meeting was adjourned at 4:00 PM

George Frimpong, Chair

**11.7.5 Old Business**

**11.7.5.1** Phil Hopkinson reported on the status of comment resolution on the dielectric tables in C57.12.00. He has recruited Subhash Tuli to resolve the outstanding issues

He noted that the test tables were based on expected deviations of the neutral during faults for different types of grounding. He thanked Bipin Patel and Subhash Tuli for their help in preparing the test tables.

**11.7.5.2** Front of Wave Test Survey results. A survey of the SC was made regarding comments made by Joe Melanson proposing changes to Annex A in C57.12.00. The following are the results of that survey:

Proposal 1: Modify table sub header…. not accepted

Proposal 2: Modify last sentence of text… not accepted

Proposal 3: Remove the Rate of Rise column in the table: accepted

Proposal 4: Add the “time to flashover” tolerances: …. accepted

This Annex will remain informative and is included for historical purposes.

Based on the results of the survey and comments received, a new version of Annex A incorporating changes to the text will be drawn up and re-surveyed as a single proposal within the DI SC. It was noted that the 1980 version of Table 4 of C57.12.00, which at the time included the front-of-wave test levels, included power transformer BILs from 95 through 1175 kV, whereas Annex A of the 2010 revision includes distribution and power transformers from 30 through 1175 kV BIL. Since comments from the survey indicate a strong preference for historical preference, the table will contain only the levels included in the 1980 version

**The DI SC Chair will advise the WG Chair for revision to C57.12.00 Annex A for inclusion in the next ballot**

**11.7.5.3** Revision of C57.127-2007, Guide for the Detection of Acoustic Emissions from Partial Discharges in Oil-Immersed Power Transformers. T

**T**he Standards SC indicates that under the new rules this does not have to be revised until the end of 2018. The Admin SC has approved for this standard to be revised and Jack Harley has agreed to Chair this WG. There is ample time to revise this document in a timely fashion and it will be scheduled appropriately.

**11.7.5.4**  Tutorial on IEEE 4 Revision. In view of the several changes made in the latest revision of IEEE 4, Art Molden has suggested that a tutorial be given to the TC and he and Tom Prevost will gather a team of presenters and prepare the presentation. Tom Prevost, the Tutorial co-coordinator will confirm a date for this tutorial which most likely will be at the next meeting. Tom Prevost also requested to the SC for other topics at future tutorials.

**11.7.5.5** Class I/Class II Classification for Transformers.

The Chair initiated a discussion regarding requirements for the following tests for transformers presently tested as class I transformers as indicated in Table 18, C57.12.00-2010:

* + Winding insulation resistance
  + Core insulation resistance
  + Insulation power factor and capacitance
  + Low frequency withstand tests on auxiliary devices, control and CT circuits

There were various comments from the floor regarding a MVA limit, voltage class 69 kV or below and whether the transformer was for distribution or transmission service. Kipp Yule indicated that IEC and ANSI installation guides require these acceptance tests during installation

A Proposal was made by Don Platts and seconded for the following:

“**That all Class I transformers have the above 4 tests performed as routine tests and that table 18 C57.12.00-20xx be changed .”**

The vote was unanimous in favor of this proposal. No negatives.

**The DI SC Chair will advise the WG Chair for revision to C57.12.00 for inclusion of these changes to table 18 in the next ballot**

**11.7.6 New Business**

None

**11.5.7 Meeting adjourned 12.10 PM.** Minutesrespectfully submitted by Dennis Marlow

* 1. **HVDC Converter Transformers & Reactors – Mike Sharp**

On March 12, 2012, the HVDC Converter Transformers and Smoothing Reactors S.C. met at 3:15 p.m., in the Belmont 2 & 3 Meeting Room of the Renaissance Hotel, in Nashville, Tennessee. There were 7 members and 18 guests present. The following are the highlights of the meeting:

1. Introductions were made and the attendance list circulated.
2. The total membership of the SC is 24, but currently includes 6 corresponding members. If there are no corresponding members present at the meeting, they are not included in the evaluation for a quorum. That means that at least 9 members (50% of 18) should have been present in order to get quorum. Therefore there was no quorum. Since no quorum was established, no decisions could be taken at the meeting. (i.e. the minutes from the Boston meeting could not be approved.) It was suggested that the membership list be reduced further in order to only include members that attend the SC meetings (except for the corresponding members). The chairman will resend minutes of the Boston meeting to all subcommittee members to obtain approval prior to the next meeting in Milwaukee.
3. The Chairman provided a summary of the following key issues discussed at the Administrative SC meeting: Effective Jan. 1, 2012;
   1. The lifetime of a standard is now increased from 5 to 10 years.
   2. The possibility to extend the lifetime of a standard has been eliminated.
   3. The option of reaffirming a standard has been removed.
   4. A PAR life is still four years and it can be extended if necessary.
   5. IEEE C57.129 will expire in 2018.
   6. IEEE 1277 will expire in 2020.
4. The question, if an annex for converter reactors for voltage source converters (VSC) should be included in IEEE 1277 (smoothing reactors), was discussed. Following are the highlights from that discussion:
5. An annex for converter reactors might be more appropriate in IEEE C57.16 (series reactors).
6. We should produce an annex and later decide in which standard it should be included.
7. Klaus Pointner, with help by Ulf Radbrandt, will prepare input to such an annex.
8. Members are encouraged to do presentations in future meetings regarding possible update work for the standards within this SC. At the meeting nobody volunteered to do any such presentations.
9. Ulf Radbrandt had prepared an annex on insulation coordination prior to this meeting. Les Recksiedler was the only one that had given comments to the annex before the meeting. Those comments, and a few that come up during the meeting, were discussed and below are the highlights from that discussion:
10. The editorial proposals were all accepted.
11. The proposed adding of “lightning” was not accepted since “impulse protective levels” also includes “switching”.
12. The proposed new item regarding special arrester design due to ac filters, will be rephrased to include the wording “high energy” and “several parallel columns of matched arresters”.
13. The proposed new item regarding same insulation levels if the HVDC system shall be capable of reversing the power will be modified. The reason is that the reverse power capability for large bulk transmission often is the inherent capability. i.e. all equipment is designed for normal power direction and the dc voltage is reduced during reversed power operation in order to not over-stress any equipment.
14. The proposal to add that firing angles are also used to control the dc voltage was accepted.
15. The proposal to add the word “can” in the phrase “Very short distances between equipment and surge arresters can justify lower insulation margins” was accepted.
16. The proposal to add that the arresters also can be placed on the transformer was accepted.
17. The proposal to add the word “dc” in the phrase “the station with the highest dc voltage rating” was not accepted since the voltage rating for much of the equipments is a combination of both ac and dc voltage.
18. The proposed text about reverse power in the conclusions was rejected since it will be written earlier in the annex and does not have to be repeated in the conclusions.
19. At the reference to IEC 60071-5 regarding insulation margins, those margins (ratios) should be repeated in the annex together with the information that the margins for HVDC projects can be both higher and lower.

1. Something regarding insulation levels related to dc grids should be given even though dc grids mainly are intended for voltage source converters and our standards in general only cover line commutated converters.
2. Ulf Radbrandt will produce a new annex draft including the changes noted above, that will be sent to all SC members prior to our next meeting.
3. Are there any other changes recommended to IEEE 1277 and IEEE C57.129 that should be made in light of UHVDC projects energized or in progress at 660 kV and 800 kV? The conclusion was that these standards are “neutral” in regards to voltage levels. i.e. No tables with test levels are given. The equations provided are valid for all voltage levels. Therefore, we don’t see any need for modifications at this time but SC members should consider if there are issues for UHVDC, which differ from lower voltage levels, which should be stated in the standards.
4. Output of the Cigré WG A2/B4-28 was the Cigré brochures 406 " Design review, test procedures, Aging Evaluation and Reliability in Service " and 407 "Guidelines for Conducting Design Reviews". Our standards should refer to those brochures. We should also copy the highlights since not everyone has access to the Cigré brochures. The chairman will check to determine what procedures should be followed in order to include sections of the Cigré documents in an IEEE standard.
5. The SC will consider creation of a guide on life assessment & life extension for converter transformers. Les Recksiedler will check if the Cigré guide 406 covers this.
6. The SC will continue to follow the works of Cigré Joint Working Group A2/D1.41 "HVDC transformer insulation - Oil conductivity.". Progress there has been in defining a test procedure that is both simple and relevant to transformer operation. That group decided to gather experience with this approach from measurements with two different oils: a low-conductivity new oil and a more highly conductive aged oil from a transformer. The Cigré group is looking for highly conductive oil from an aged HVDC transformer. If anybody can provide such an oil, then please contact the group chairman Prof. A. Küchler (Andreas.Kuechler@fhws.de).
7. We should aim for harmonization between the standards for converter transformers, i.e. for IEEE C57.129 and IEC 61378-2 and even evaluate if it is possible to go for a joint standard (dual logo). As a first step we will start to list differences between those two standards. The SC members should start to consider in what areas this evaluation can be divided into, e.g. “rating”, “dielectric tests”, “other tests”, etc. At the Milwaukee meeting we should have a list of areas ready and to divide that list among the SC members to perform more thorough evaluations.
8. The meeting was adjourned at 4 p.m.

Mike Sharp, Chairman Les Recksiedler, Vice Chairman Ulf Radbrandt, Secretary

* 1. **Instrument Transformers SC – Ross McTaggart**
* The Instrument Transformer Subcommittee met on Wed March 14 at 8:00 AM.
* 11 of the 20 members plus 15 guests attended
* 5 guests requested membership

**Chair’s Remarks & Announcements**

* The schedule for future meetings was presented
* The previous meeting’s minutes were approved as written
* The status of all C57.13 standards was reviewed
  + 1. **Task Force Report: PARTIAL DISCHARGE IN BUSHINGS AND VTs/CTs**

The task force on Partial Discharge in Bushings and PTs/CTs met on Monday March 12th, 2012, at 4:45pm with 37 attendees. Of those, 12 members and 25 guests with 6 guests requesting membership.

* The meeting was opened with attendance sheets and introductions.
* The minutes for the F11 Boston meeting were presented.
* The TF Chair presented a draft version of the guide which was distributed by e-mail prior to the meeting.
* The scope for the guide was presented and adjusted based on feedback from the group. It is the intention to present the scope in the application for the PAR, keeping in mind that the document will be a guide. At this time the scope reads: **“this guide describes the test procedure for the measurement of PD and electrical PD detection, occurring in bushings and instrument transformers during dielectric tests in AC and DC (bushings) applications”.**
* Several editorial and contents changes were recommended and the meeting was dedicated to discussions on the body of the document.
* The TF work will not cover acoustic PD detection.
* It was pointed out that the guide should cover both narrow and wide band measurements. A specification of frequency range should be included in the guide.
* It was discussed whether interpretation of PD patterns should be included in the guide. Even if PRPD (phase resolve PD) patterns are not available from many TF members, it was concluded that PRPD patterns will be included in the guide, particularly basic patterns.
* The linearity and validity of the calibration between 50% and 200% of the calibration value was discussed. This may be related to the calibrator only. If a switched calibrator is used, the change of capacitance vs. pico-Coulomb output may affect the result of the calibration.
* The uncertainty of the tests should be considered during the test as there are several factors contributing to it including the calibration, test equipment, detecting equipment, etc.
* A revised draft will be circulated shortly for comments. Members are encouraged to send their comments and suggestions to the TF Chair.
  + 1. **Working Group on Current Transformers with mA range (PE/TR/PE/TR/Instrument-WG C57.13.7) -**  **Henry Alton**

Following introductions, the agenda was presented and accepted. The agenda was as follows.

1. *Introductions*
2. *Acceptance of the Agenda*
3. *House Keeping -* ***Henry Alton of Triacta Inc.***
   1. *Review actions from the last meeting*
   2. *Answers to questions from the last meeting*
4. *Presentations*.
   1. *NRC Testing - Test result summary 0.15 Class against standard*
   2. *Thomas Sizemore - test result summary*
   3. *Paul Millward - test result summary*
5. *Next Steps*
   1. Final review round of document
      1. No new input for document
         1. Clean-up comments submit existing content
   2. Standard publication Process
      1. Wide IEEE review of this new standard
   3. Closure of this phase of Working Group activities
   4. Propose a Ph II initiative by this working group to investigate CT Burdens 5A & mA

**Old Business (House Keeping)**

There was only one piece of old business.

1. ***Henry Alton*** to provide some background clarifying the standard burden numbers will be given to support the previous action. *Working Group* to provide some more clarity on the burdens and make them more “Real World. There will be an update to this to reflect sources and approach.
   1. The burdens were initially taken from Measurement Canada LMB-EG-07 Table 21and calculated back to 80mA and 100mA secondary.
   2. Considers wire and meter impedance.
   3. The historical start-up of this project was entirely predicated on the mA CT family being treated in the field, the same way that the 5A is.
   4. This became a discussion of the Bx.x values not being desirable and a suggestion from Randy was to use the VA ratings across the board. This was discussed further. Please see New Business for more details.

**New Business**

A brief view of the NRC test report was given by Henry Alton as an example of how the mA CT samples performed as expected against the draft standard which, as content, is also the

S-E-09 regulatory requirement for Canada. Some approvals have already been conducted against in Canada.

A review of testing of similar components was given by ABB Inc. Thomas Sizemore. This testing reflected a wide range of burden i.e. very low burdens to very high burdens beyond the low and high limit of the CT. This was their approach to establishing what kind of characteristics this CT type has. There were no specific parameters given or requested. The components did again appear to be within the limits of the proposed standard, even though he exact value of burden was not requested.

A review of testing of the identical components as tested by ABB Inc. was also tested by Paul Millward of ITEC. Paul did ask what the burden of the component was and was given B0.005 as indicated in tables2 & 3. The results given here were also found to be within the limits of the standard. Adnan Rashid from Measurement Canada commented that the ITEC report seemed unusually accurate and requested that the test setups be explained to understand the results better. An action will be taken to clarify this. Please see the action section for further details.

Randy Mullikin of MERAMEC Electrical Production had the following last minute questions as email and repeated his position on the dislike of the Bx.x again in the meeting. The questions were as follows;

***5.0 Ratings.***

*Currently two tables, 80mA and 100mA.  What if there is an addition of say yet another secondary current, say 150mA or 200mA or even 50mA.  Does that mean that every time a new secondary is developed for whatever purpose, a new table must be generated??  I guess the question is, Is a table really required here??  Are we saying these are the only primary currents for each secondary??*

***6.0 Rated Burden.***

*I am totally against the use of Bx.x derived from a 5A basis, they are totally confusing.  For example, B0.01 = 39 Ohm impedance – I can see that just by looking at it (NOT).  What is wrong with going to a different system, say VA when non-5A designations are involved??  Makes better sense to me, the burden has meaning based on the secondary current, and again eliminates multiple tables.  Especially if new currents evolve – does that mean a whole new set of burdens??*

*I for one would be in favor of a uniform burden across the board not dependent on ratio or secondary current.   Perhaps some combing of burdens in Tables 3 and 4 to create one uniform table based solely on VA.  Maybe a better understanding of how these burdens came to be -  How did 39 Ohms evolve??  Who derived them??*

*And why 0.9PF??  IEC permits burdens less than 1VA to be up to unity PF.*

*The answers given;*

* ***5.0 Ratings***
  + *Different secondary currents, does mean that there will be different rating tables at this time. This is intended to reflect burdens that can be met with these specific secondary currents and through compliance testing, using the same methodology as 5A secondary devices.*
* ***6.0 Rated Burden***
  + *The entire project for a standard was based on “CTs with mA secondary Currents” being treated the same as 5A secondary, to afford them the same ability to be left in a panel and have only the meter equipment pulled for re-verification. These are the rules in Canada for 5A secondary CTs today. The desire is to have a spec. and a standard that allows the “mA CT” to be treated the same as a 5A secondary CT against the relative burden that a mA category can handle thus the 5A comparison.*
  + *The Bx.x is burden development is the same rational that was used for the 5A secondary for the purpose of affording them the same treatment.*
  + *Any desire to change this approach as modelled after the 5A process should be starting with the 5A process.*
* ***PF .9 vs 1.0***
  + *The values given were from LMB-EG-07 Measurement Canada regulatory requirement.*
* ***C57.13.6***
  + *The original seed for “CTs with mA Secondary Currents” was from this standard. If this standard is becoming obsolete, please state the reference of the replacement standard.*

Randy would really like to see the Bx.x dialogue go away entirely however there was commitment to leaving the standard as is provided that there would be some notes clarifying the meaning of the same Bx.x number in the context of a “mA CT”. Please see the motion made today for further details on this point. Randy also asked whether one CT could cover all burden ratings. The answer from Adnan was “No”.

Motions

* Proceed with the existing content, in context with the meeting today, after a 2 week final review period and addition of some clarifying commentary and removal of some items no longer in scope and closure of any remaining actions.
  + Voltage TXs are now out of scope for this 1st release
  + State the Max. system voltage
  + Provide a foot note clarifying the use of the Bx.x terminology in context with this standard. **Accepted**

Actions

* ***Thomas Sizemore & Paul******Millward*** to provide some details on the test setup used to perform the testing in each of the test cases where test results were given.
* ***Henry Alton*** Provide a foot note for the Burden differences.
* ***Henry Alton*** Provide a final version standard draft, considering the Motion and Actions.
  + 1. **Working Group for Revision of IEEE C57.13 Instrument Transformers**

**R. McTaggart**

The WG met on Tues March 13 with 13 of the 19 members present (Quorum attained) along with 14 guests - 4 of whom requested membership. This will be dependent on participation. Of the members present, approx ½ had downloaded the draft std from the website.

The revised table 2 showing dielectric test levels was discussed . No objections were raised so it will remain as-is for now. There were also no objections to the elimination of the original table 3.

The new table 3 showing creepage distances was reviewed. Some suggested adding more classifications but most agreed 2 is enough.

The Partial Discharge requirements were discussed at length. The key issue was prescribed extinction voltage (PDEV) requirements. The present draft is consistent with C57.13.5 and similar to IEC but many believe these values are too high, particularly for voltages below 115 kV. The rationale for this is that NA systems are effectively grounded as a rule. The opposing arguments included the conclusions of the EPRI study which recommended higher levels and the concern that if the IEEE levels are lower than IEC it could be perceived that the NA instrument transformers are of lower quality. Many options were discussed:

* + - Leave as-is
    - Reduce PDEV to 1.2 x max system V / sqrt 3
    - Reduce PDEV to 1.2 x max system V / sqrt 3 for < 115 kV only
    - Reduce PDEV to 1.35 x nominal system V / sqrt 3

If levels are to be reduced then an informative note is to be added regarding considerations for ungrounded systems.

In response to a suggestion that the pre-stress voltages should be lower, it was pointed out that the prestress voltage is meant to simulate switching surges which might initiate PD and that 80% of Applied Voltage is representative.

It was agreed that formulae would be included to allow calculation of levels for unlisted voltages.

As there were too many issues to resolve in the meeting, it was agreed that an Email survey would be done.

The clauses on CT & VT Accuracy measurement methods were discussed and it was agreed that they are no longer relevant and that they should either be removed or moved to an appendix.

The new draft Appendix for SubStation Voltage Transformers (SSVTs) was distributed and discussed. Comments included the need to clarify chopped-wave voltages and the specification of Partial Discharge requirements to be specified. The draft will be reviewed and revised by a small group led by Dave Wallace and then emailed to WG members for comment.

The plan is to produce the next draft and receive comments before Fall 2012 meeting (Oct 23, 2012)

Old Business: none

New Business:

Tom Prevost explained the Transformers Committee plans to offer tutorials at each meeting. Attendees were encouraged to provide possible subjects to the SC Chair. One suggested possibility is the specification and applications of SSVTs

Adjournment

* 1. **Insulating Fluids SC – Susan McNelly**

**Insulating Fluids Subcommittee**

**Chair: Susan McNelly**

**Vice-Chair: Jerry Murphy**

**Secretary: C. Patrick McShane**

**Introduction/SC Member Roll Call/New SC IF Members**

The Chair started the meeting with welcoming and asking the attendees to state their names and affiliations. The member roll call was made. The quorum requirements were exceeded with 30 of 43 members present.

Five new SCIF members were recognized:

Stephan Brauer

Paul Caronia

Larry Christodoulou

Stephanie Denzer

George Forrest

Guest requesting membership for first time (at least recent years):

Gregory Stem

Anthony McGrail

Paul Mushill

Nicholas Perjanik

Melvin Wright

Shawn Galbraith

Ken Kampshoff

Jayme Nunes Jr.

Four additional names have previously requested membership, pending meeting the activity/participation requirements.

**Approval of the posted minutes from Fall 2011, Boston**

A motion was made, seconded and approved.

**Working Group and Task Force SC Reports and Submitted Unapproved Minutes**

**C57.104 – IEEE Guide for the Interpretation of Gases Generated in Oil – Immersed Transformers**

**WG Chair Rick Ladroga, Vice-Chair Claude Beauchemin**

**The WG Report Given at the Sub-Committee Meeting, presented by Rick Ladroga:**

Rick presented. The WG had a quorum. Rick singled out Claude Beauchemin’s presentation. Collected ½ million data points, may use statistician to confirm massage the data. One of the TF chair is Jerry Murphy, 187 references used. New business issue of data security from number of different sources is valuable data, not for commercial use. Like a formal process to safely archive data with access control. This will help future revision to know bases of change.

Looking for offsite meeting to make most sense of the data collected. Probably will hold the meeting the 3rd week in May in Montreal.

No questions.

**The Minutes (unapproved) of C57.104 WG Meeting as Submitted:**

**Tuesday, March 13, 2012**

**Nashville, Tennessee, USA**

**Minutes of WG Meeting:**

The meeting was called to order by Chair Rick Ladroga at 3:15pm. Vice Chair Claude Beauchemin and Secretary Susan McNelly were also present.

There were 47 of 83 members present. There were 44 guests, and 7 guests requesting membership. A membership quorum was achieved. Guests attending the WG meeting for the first time who request membership will be deferred until the next meeting attended.

Guests requesting membership were (those identified with an asterisk (5 of the 7) will be added as WG members):

Jagdish Burde Anthony McGrail**\***

Frank Damico**\*** Nicholas Perjanik**\***

Shawn Galbreath**\*** Pugal Selvaraj

Rowland James**\***

Agenda

1. Welcome & Introductions
2. Quorum Check
3. Approval of Minutes from fall 2011 Boston meeting.
4. Status
5. Presentation by Claude Beauchemin on Data
6. New Business
7. Adjourn

The minutes from the fall 2011 Boston, Massachusetts meeting were approved as written.

**Review of recent activities:**

Rick gave a summary of recent activities and indicated that offsite meetings/webinars will be held between TR Committee meetings. He is tentatively looking at the 3rd week in May.

The framework, case work, and bibliography have been done or are in progress. The intent is to provide recommendations at the fall 2012 meeting in Milwaukee for the WG to discuss.

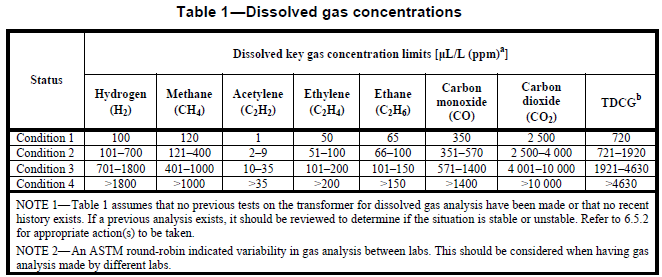
Rick requested case study information from utilities.

**Presentation by Claude Beauchemin - Analysis Preview - Review of results to date from analysis of DGA database**

Claude extended a thank you to the following people for their efforts:

* Michel Duval
* Norman Field
* Luiz Cheim
* Lan Lin - for the tremendous work done to date on data analysis
* All anonymous data suppliers - To give us the opportunity to answer old questions

C57.104 Table1 What was the choice for limits?



* Personal Experience ?
* One user database analysis ?
* Consensus from early users ?
* Lab recommendation ?
* Early mention in 1978 of 90% “probability norms” for some levels (now limit condition 1)
* 1991 mention for table 1 “Consensus values based on the experience of many company”
* Condition 1: < 90% of DGA population?
* Condition 2: 90% to 95% ?
* Condition 3: 95% to 99% ?
* Condition 4: > 99% ?

We are using these values for analysis purpose only

Process of data analysis:

* Database filtered to remove inconsistent entries
  + Obvious error
  + Missing important information
  + Non transformer
* Population curve computed for each gas and each studied condition
  + 90% to 99.5% population value used for evaluation

Source of data (479,191Samples)



Data Analysis:

* Values proposed need to be sound from a statistic point of view
* Original data used to set table 1 is unavailable
* Comparison between table 1 and actual data indicate a mix of good and poor correlation using the 90, 95 and 99% hypothesis
* CAUTION: LARGE DISPERSION OF RESULTS

Table 1 VS Percentile, All data



Example of data dispersion



Problematic of data analysis:

* Dispersion between sources is large
  + Different Network?
  + Different History?
  + Different Utilisation?
  + Different Laboratories?
* This fact must be taken into account during the analysis process

What parameters influence DGA levels ?

* Age ?
* Size ?
* Voltage Class ?
* Sealed / open ?
* Energized TC VS Non-Energized TC ?
* GSU / Transmission / Distribution ?
* North / South (Weather) ?
* Utility / Industrial ?
* Laboratories used ?
* Other?
* Each individual parameter have to be studied to see if it has an influence
* Each influence has to be properly isolated
* Quantification of influence has to be statistically sound and documented

Example of a possible influential parameter: Age



**Influence of Rating:**



Influence of voltage class:



Open or Closed:



Suspicious VS All



Rate of rise (ppm/day)



**Discussion:**

*Question:* Fredi Jakob – Regarding Table 1 vs Percentile slide – He indicated he wonders that if Table 1 was from late 80s and 90s, they were pretty young. If still in service, twenty years later, is the difference due to age? Certainly on the CO and CO2 values. *Response:* Beauchemin - Age is likely influencing the difference. If this is the case, it will show up in the slide on age. If an influence is seen, it will be identified.

*Question:* Jin Sim – Utilities have started measuring DGA on smaller transformers such as layer type transformers. This also could be influencing the data. *Response:* Beauchemin - Yes, this could be influencing the data.

*Question:* Juan Castellano – Was the type of TR compared?  *Response:* Beauchemin – It was not. A very small percent of the data population included this information and what we have we will look at.

*Question:* Fredi Jakob – In his opinion Table 1 should only be used to give an idea of when a next sample should be taken. He recommends that Table 1 provide direction on what to do in this regard. *Response:* Beauchemin – There are instructions to this effect already there, but unfortunately, it is often not read. Ladroga – Whether the table will be kept or not is being looked at. The challenge is make the guide simple and useful. The intent is to gear the guide more toward how things are really done.

*Question:* Jin Sim – Does the core group feel the values in Table 1 should be erased.? Depending on the volume should there be correction? *Response:* Beauchemin – He indicated that the statistics will dictate, not the core group. Sim – Disagreed, indicating that there are many of the data that are not valid. *Response:* Beauchemin – That is why there is statistical analysis done to remove some of these outliers. He indicated he also would like to see a resolution to this. Luiz Cheim – We expect that the data is representative. Outliers and cases that could confuse the data needs to be removed, however this is not simple. Better tools and people with time to analyze the data are needed. One thing that may be looked at is making the table more of a matrix to look at the level along with the rate of increase. The goal is to come up with something helpful to the industry.

Fredi Jakob – Paper in IEEE Journals for Power Delivery – There is emphasis on TCGs, which doesn’t make much sense. Rick Ladroga requested a copy of the paper.

*Question:* Anthony McGrail – Indicated he is disturbed that we are having this conversation at all. He indicated that we need to be very careful that the 99 percentile does not indicate a condition. *Response:* Ladroga – It is very much indicative of the data distribution. The goal is to determine if we can correlate.

*Question:* - Indicated that the Table is used by his insurance company to tell them what maintenance needs to be done.

*Question:* Doug McCullough – Have we asked the manufacturers to give a table on the gas concentrations on materials used in the transformers. This may help to draw correlations. *Response:* Ladroga – That is a good suggestion and if the manufacturers can provide this information, it will be reviewed.

*Question:* Leon White – Samples were not always taken properly. Is there any thought on using only samples taken in the last 10 years now that people are more aware of how to properly take the samples? *Response:* Beauchemin – Yes, the data could be reviewed based on the date of samples to see if there is an evolution in this regard. Mel Wright - Looking at the total dissolved gas and the ratio of oxygen and nitrogen can tell you if the sampling is consistent and if it was properly obtained.

Rick indicated that there has been a concern raised about the quality of the data and the security of the data. He is hoping to keep the data with IEEE for future use and limit the access to the data.

The meeting was adjourned at 4:30 pm.

Rick Ladroga

WG Chair

Claude Beauchemin

WG Vice-Chair

Susan McNelly

WG Secretary

**C57.106 - Guide for the Acceptance and Maintenance of Insulating (Mineral) Oil - Chair: Bob Rasor**

**The WG Report Given at the Sub-Committee Meeting, presented by Bob Rasor:**

A new Par was approved so the 4 year clock has started. Jim Thompson accepted the position of Vice Chair and Claude Beauchemin the position of secretary. A presentation on moisture was made by Jim Thompson. The WG will look at data and original substantiation of current standard.

No Questions

**The Minutes (unapproved) of WG Meeting as Submitted:**

**Monday, March 12th, 2012 4:45 PM**

The meeting was called to order by Chair Bob Rasor at 4:50PM. There were 39 attendees (42 including chair, vice chair and secretary). This is the first meeting, and 21 attendees requested membership.

Attendees requesting membership were:

1. Ken Kampshoff
2. Shawn Galbraith
3. Zan Kiparizoski
4. Nick Perjanik
5. Ryan Niemerg
6. Roger Hayes
7. Stephanie Denzer
8. Bob Ganser Jr.
9. Don Platts
10. James Gardner
11. Gordon Wilson
12. Alan Peterson
13. Hali Moleski
14. Pugazhenthi Selvaraj
15. George Leinhauser
16. Dave Hanson
17. Tom Prevost
18. Clair Claborne
19. Juan Castellanos
20. Jimmy Rasco
21. Don Cherry
22. Agenda was reviewed
23. Roster was circulated
24. Introductions given

Chair: B Rasor

Vice Chair: J Thomson

Secretary: C Beauchemin

1. Par status provided

Approved 9 Nov 2011

Expiration 31 Dec 2015

1. The overview of scope and purpose were read

Overview:

**1.1 Scope**

Scope: This guide applies to mineral oil used in transformers, load tap changers, voltage regulators, reactors, and circuit breakers. The guide discusses the following: a) Analytical tests and their significance for the evaluation of mineral insulating oil. b) The evaluation of new, unused mineral insulating oil before and after filling into equipment. c) Methods of handling and storage of mineral insulating oil. d) The evaluation of service-aged mineral insulating oil. e) Health and environmental care procedures for mineral insulating oil. The characteristics of the oils discussed in this guide do not include oil that is in factory fill lines, nor does this guide cover reclaimed oil installed in new equipment. The qualities of such oil, if used, should be agreed upon by the manufacturer and the user of the equipment.

**1.2 Purpose**

Purpose: This guide is to assist users of the equipment in evaluating the serviceability of new, unused oil being received in equipment; oil as received for filling new equipment at the installation site; and oil as processed into equipment. It also assists the operator in maintaining the oil in serviceable condition.

Comments followed:

* Sue McNelly: Document will need to be reviewed for terminology to keep consistent.
* Valery Davydov: Title states Insulating Oil, this might be revised to Insulating Mineral Oil?
* Sue McNelly: Yes, P. McShane does this kind of review.

Jim Thompson requested that he present the history of C57.106 (i.e. revisions made during 2002-2006). This presentation addressed the moisture section. He noted that the presentation he gave was based on a previous tutorial given (during the last revision to the guide) at the 2004 San Diego Transformers Committee Meeting and it is archived on the IEEE Transformers Committee website. He also mentioned his recently published paper presented at the IEEE PES General Meeting in July, 2011 regarding a moisture diffusion model for transformer oil and paper. Jim Thompson expressed that section 4.5 was changed in 2006 to correct serious errors in the C57.106-2002 document. It should not be changed now because the thermodynamics of an operating transformer are such that there is never equilibrium. The moisture in the paper is a distributed parameter rather than a lumped parameter. Also this moisture distribution in the paper is dynamic with regards to time. Bob replied that each section of the Guide is open to review and none are to be excluded.

Bob Rasor presented the various sections of C57.106. He asked that volunteers sign up for sections that they felt needed modified. Volunteers were to sign up at the end of the meeting.

There was discussion on what section revision might require PAR change. Tom Prevost clarified that a change in title, scope or purpose will require a revision of the PAR. Sue McNelly agreed and said that is it OK if that is needed. It was suggested to wait until further into the document revision to avoid multiple PAR change.

Sue McNelly asked if there were specific sections that those present felt the need to review.

Tom Prevost questioned the origin of some of the content and values: i.e. should circuit breakers still be part of the guide ; are both 1 and 2 mm gap Dielectric D1816 values needed anymore; should corrosive sulfur be included? The origin of some of the values was questioned. Some comments were raised asking if Dielectric D877 should be put back in Table 1. Jim Thompson commented that ASTM D877 is used for new oil refinery tests and is still an ASTM standard and should be included. Also there are many users that still use their own test sets for D877 mineral oil dielectric breakdown voltage tests.

T.V. Oommen said the moisture values were not based on consensus values, but scientific based. T.V. Oommen suggested a seminar be held to show this. An attendee commented that many are confused with the moisture section in the guide and how it addresses moisture in oil with moisture in the paper insulation. Brian Sparling suggested the section be removed. Jim Thompson stated it is based on four years of meetings with power points and a tutorial and it is written in understandable language for the general transformer user reading the document.

Valery Davydov suggested consideration needs to be given as to the overlap of moisture in several guides and if this section should be kept in C57.106. Jim Thompson said the section was written (in 2006) to remove interpretation for moisture in paper that was in the previous section (2002). Jim Thompson said that if the moisture section is to be revised it must align with other documents such as the reclamation guide C57.637. Jim Thompson questioned if service-aged limits belong in C57.106, and suggested that they are covered in C57.637. Valery Davydov noted that the scope of C57.106 clearly covers service-aged mineral oil. Note: The C57.637 reclamation guide is currently in revision.

Tom Prevost asked the group if data and statistical analysis would be beneficial to back up the existing table values, like what is underway in C57.104 revision and suggested the TF to gather data to review limits. TV Oommen indicated that the C57.104 numbers a based on scientific reasons. Jim Thompson added that the value were consensus value generally accepted and that there were no objections to them. Brian Sparling mentioned that none present knew of the origin of these values (in C57.104). Jim Thompson mentioned that the 1977 data for C57.104 was based on a survey utilizing a 90% value statistic.

Additional comments were raised as to the origin of the values in C57.106 and if changes in industry and oil (i.e. refining of crude oil) would suggest that data be collected to validate these existing values. Jim Thompson mentioned that since oil has not changed, there is no need to revise numbers. A comment was made from a refinery representative that since 1977 changes in oil refining has improved the qualities of the oil. Jim Thompson suggested that data quality is an issue if data collection is used to define limits. Sue McNelly said that it can be done as was shown in the C57.104 gas guide revision.

Bob Rasor agreed a basis for the values would be beneficial. He stated as sections are being reviewed, that it be recorded on a master list of what is being reviewed and who is responsible.

Meeting was adjourned at 6:00PM

**C57.130 Trial-Use Guide for Dissolved Gas Analysis During Factory Temerature Rise Tests for the Evaluation of Oil-Immersed Transformers and Reactors. WG Chair Jim Thompson**

**The C57.130 WG Report Given at the Sub-Committee Meeting:**

Jim Thompson presented: Met on March 13, no quorum. A new PAR Approval was issued. Current draft designated as Draft 19. The new draft now includes the term “Mineral” in the title. A standard status vs. a *guide* was proposed by Tom Prevost.

Reviewed the IEC equivalent guide. The 90% threshold is only listed as *informative* data, not *reference* data.

No Questions.

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

March 13, 2012

Unapproved Minutes Working Group Meeting for IEEE PC57.130

IEEE “Trial-Use Guide for the Use of Dissolved Gas Analysis Applied to Factory Temperature Rise Tests for the Evaluation of Oil-Immersed Transformers and Reactors”

Chair Jim Thompson

The working group meeting was conducted on March 13, 2012 at Nashville, Tennessee with 23 people in attendance, including 7 of the 30 working group members.

This document was in draft 18 when the decision was made to let the PAR expire in 2009. A new PAR was approved on June 17, 2010 and is labeled draft 19.

Tom Prevost’s previous meeting motion was to change the guide from a trial use guide to a guide and the word mineral to the title so the phrase reads mineral oil was discussed and will be sent to the working group members this summer for approval.

Data was presented and discussed for gas (ppm/hr) generation rates for a 1 per unit factory load tests. This guide is for 1.0 per unit testing only. A request was made by the chair for comments regarding objections to the values in table 1 in the draft document. There were none offered. A note in draft 19 uses zero as a value in the text and the wording will be changed to “non detectable.”

Then discussion included precision statements from ASTM 3612, Standard Method for Analysis of Gases Dissolved in Electrical Insulating Oil by Gas Chromatography. This guide does not appear to have precision statements yet--although there is a round robin reported in the 2011 document.

Other discussion included IEC 61181. This guide does not use a table of values of gassing rates for recommended actions. The 90 percent typical values in IEC 61181 are listed only in the appendix as informative data only. Another suggestion was made to add a note to take backup samples. And finally, a suggestion was made by Sue McNelly to include minimum data in factory test reports so that the gas generation rates can be determined from the information provided.

Respectfully submitted,

Chair Jim Allen Thompson

**C57.139 WG - Guide for Dissolved Gas Analysis of Load Tap Changers**

**Chair David Wallach, Secretary Sue McNelly**

**The C57.139 WG Report Given at the Sub-Committee Meeting:**

Sue McNelly presented. No quorum. Ten new members were added to the WG. There is progress, a straw ballet is planned for mid – 2014. The current par expires in 2015. TF Jim Dukarm, Fredi Jacob and Michael Duval presented at meeting.

**The Minutes (unapproved) of WG Meeting as Submitted:**

**Tuesday, March 13, 2012**

**Nashville, Tennessee, USA**

**Minutes of WG Meeting**

Chair Dave Wallach called the WG meeting to order at 11:00am. WG Secretary Susan McNelly was also present. There were 23 of 50 members (Quorum requirement was not met). There were 64 guests present with 15 guests requesting membership. Guests attending the WG meeting for the first time who request membership will be deferred until the next meeting attended.

Guests requesting membership were (those identified with an asterisk (10 of the 15) will be added as WG members):

Jonathan Cheatham**\*** Nicholas Perjanik**\***

Frank Damico**\*** Markus Stank\*

Norman Field**\*** Kjell Sundkvist**\***

Marc Foata Humayun Tariq\*

Shawn Galbraith Mark Tostrud**\***

Soni Mahendra Kumar Ajith Varghese

Anthony McGrail**\*** Melvin Wright**\***

Amit Mukerji

**Agenda:**

1. Introductions/Member Roll Call
2. Approval of minutes from Fall 2011 meeting
3. PAR & Schedule Review
4. Task Force Focus Areas
5. New Business
6. Adjourn

Minutes from the fall 2011 Boston, Massachusetts meeting were not approved due to a lack of quorum.

**Schedule**

1. Working group meetings until next revision needs to begin ballot:
   * 1. Spring 2012 (this meeting)
     2. Fall 2012
     3. Spring 2013
     4. Fall 2013, and
     5. Spring 2014
2. Working group needs to plan to begin Balloting process – Mid 2014
   1. Straw Ballot
   2. MEC
   3. Form Ballot Pool
   4. Ballot
   5. Ballot Resolution
3. PAR expiration – December 31, 2015

Submit balloted document to REVCOM by October 15, 2015 deadline

**Task Forces**

The following task forces were developed for work on revision of the Guide.

* **Data Analysis**, Chair: Jim Dukarm

**Members:** Shuzhen Xu, Tony McGrail, Mark Tostrud, Luiz Cheim, Prabhu Soundarrajan, and Stephanie Denzer

* + Develop generic design category norms for Appendix A LTC Types
    - * Gather data by type and operating conditions
      * Begin attempts to develop generic design category norms
  + Variation of norms between users due to loading, maintenance, temperatures

STATUS:

* + - No off-line meetings have been conducted since the fall meeting. Jim Dukarm plans to complete a list of data fields that are needed to complete the next activity of data collection for analysis. Jim plans to contact the members of the Data Analysis TF in the coming weeks.
    - David Wallach also contacted Erin Spiewak at the suggestion of Fredi Jakob to inquire if this Working Group can contact purchasers of C57.139 to inquire about collecting data. Erin thinks there would be some legal and policy challenges with this request but will check with IEEE SA staff.

**Dukarm/Jakobs Presentation: Gas Ratio Nomograms for LTC DGA**

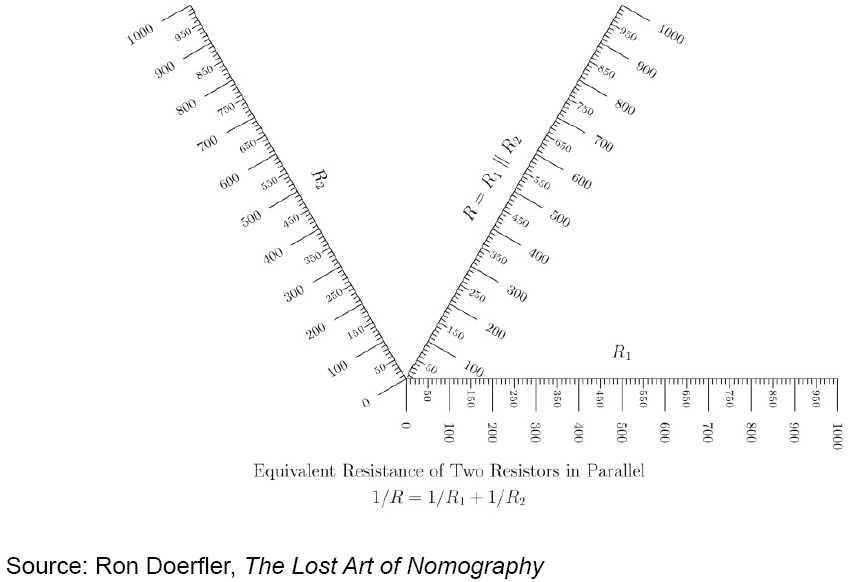
What is a nomogram? A nomogram is a carefully aligned arrangement of numerical scales. Each scale represents one variable in an equation or set of equations.

A line drawn through the scales of the nomogram represents a solution of the nomogram's equation, i.e., an assignment of values to the variables (points where the line crosses the axes) that satisfies the equation. (Such a line is called an isopleth.)

Generally some of the line-crossing points represent known values of certain variables, and the others represent the "missing" values.

In other words, a nomogram is a diagram which can be used to do complex calculations graphically.

Equivalent resistance of two resistors in parallel



Nomogram Features

* + - * + Calculate a ratio and evaluate its significance visually by drawing a line.
        + Borderline cases are easily noticed and interpreted.
        + A series of samples can be plotted on one nomogram to visualize fault evolution

Because of its complexity, a pre-printed template is required for drawing the nomogram.

**Discussions on Dukarm/Jakob Presentation**

The TF will be looking to collect more on-line monitoring data.

* **Other Diagnostic Methods**

**Members:** Fredi Jacob, Tony McGrail, Arturo Nunez

* + Triangle (Duval)
  + Nomograms (e.g. Jakob, Dukarm efforts)

**Michel Duval Presentation: Application of Duval Triangles 2 to DGA in LTCs**

Normal operation of LTCs may involve:

* + - * + arc-breaking-in-oil between contacts, producing arcing gases D1.
        + switching of selectors and valves, also producing sparking discharges D1.
        + current dissipation in resistors, increasing their temperature and producing hot spot gases T3, T2 or T1.
        + combinations of the above, producing mixtures of the corresponding gases

Faulty operation of LTCs may involve:

* + - * + an increase in the resistance and temperature of contacts, with the production of hot spots T3 and T2, and coking on contacts, through carbonization of oil.
        + abnormal arcing D2 or D1 on metallic parts of the LTC.

To be able to distinguish between normal and faulty operation of LTCs:

* + - * + gases formed as a result of normal operation should be identified as precisely as possible under different power operating conditions.
        + deviation from normal operation will indicate faulty operation.

Mostly arcing gases are formed during normal operation of a large majority of LTCs, such as:

* + - * + LTCs of the reactive-type in oil or vacuum from:

-Westinghouse: UN, UR, UV series, UTS, UTN, UTT.

-Cooper, McGrawEdison: series 394, 396, 494, 550, 995, 996.

-General Electric: LR and LRT series.

-Reinhausen: RM series.

-Allis Chalmers, Siemens: TLH series.

-Federal Pacific: TC series.

-Ferranti Packard: RT series.

* + - * + also, in LTCs of the resistive-type in oil or vacuum from:

-ABB: UB, UC, UZ series.

-Reinhausen: OilTaps C, R, V, Y.

-Westinghouse: UTH.

Duval Triangle 2 can be used for all these types of LTCs, with:

* + - * + arcing gases D1 appearing on the left side of the Triangle,
        + hot spot gases T3, T2 and T1 on the right side.
        + Hyundai: RS series

Other types of normal operation

* + - * + Some resistive LTCs such as OilTaps Y and M and VacuTaps VV operate normally in either zone N or zone T3 or zone T2, depending on operating conditions.
        + The use of methane in addition to acetylene and ethylene allows to distinguish between faulty and normal operation in such LTCs.

A few other resistive LTCs such as OilTaps G and some UZBs of ABB (ref.John Pruente) operate normally in zone X3 (mixture of arc-breaking-in-oil and high-temperature operation of resistors), depending on operating conditions.

HQ data - OilTaps G:

OilTaps G are high-currents application models. Normal gases occur in zone X3 (mixture of arcing and hot spots).

Different versions of Triangle 2 should therefore be used for some LTCs, indicating the normal zone(s) of operation depending on power operating conditions:

* + - * + Triangle 2a and 2b for OilTaps M-Y and VacuTaps VR-VV.
        + Triangle 2c for OilTaps G and some UZBs.

Finally, reactive LTCs of the vacuum-type:

* + - * + Arc-breaking activity occurs in the vacuum bottle only. Normal operation in the surrounding oil used for cooling the bottle does not involve sparking of selector or resistor heating.
        + Triangle 1 should be used for these LTCs.

**Discussions on Duval Presentation**

*Question* by Fredi Jacob: What do the red lines on slide 23 mean? *Response*: Jim Dukarm responded that due to a lucky mathematical accident, that values of certain gas ratios can be represented on the graph as a straight line. The statistical limits for various ratios were calculated. The combination of the triangle itself and the application of these statistical limits can better let you see what is outside of a somewhat normal/usual zone or area of the triangle.

*Question* by Dave Wallach: is this as another method or way to show more normal areas for the different LTC types? Do you envision this being able to be incorporated into the guide? *Response*: Michel indicated that this is just a graphical representation, perhaps a visual representation of a unit progressing from one area to another on the triangle. He indicated that this could be done.

*Question*: Is there a statistical upper and lower bound? *Response*: Michel indicated it will be dependent on users maintenance guidelines to decide at what point they would want to do maintenance and what risk they would be willing to take. A good database of normal operation needs to be built by the user to determine what is considered normal or not.

The number of operations has a direct effect on the amount of gas in the oil. Higher levels may not necessarily indicate faulty operation. Number of operations should also be considered when evaluating levels.

*Question:* Any difference on the data base with or without filtration system? *Response:* Michel indicated that he did not know. He indicated that the filtering would affect the levels, but should not greatly affect the ratios.

Dave Wallach asked the group if there was interest in preparing examples and text for inclusion in the guide. The general consensus was yes, this would be of interest. Dave Wallach requested that Michel Duval develop some suggested text and graphics for consideration by the Working Group for inclusion in the next revision. Placement in the main body or an annex can be determined at a later date.

**Other Topics for possible future TF**

* + Presence of Benzene and Toulene (Vijayakumaran Moorkath) – no discussion this meeting
  + Use of word “fault” with DGA (Kent Brown) – This may be an issue to take up at the IFSC meeting to make sure that we are aligned with terminology used in C57.104 and other documents. – no discussion this meeting

The meeting was adjourned at 12:15pm.

Dave Wallach, Chair

Susan McNelly, Secretary

**Working Group PC57.147, Guide for the Acceptance and Maintenance of Natural Ester Fluids in Transformers**

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

**The Group Report Given at the Sub-Committee Meeting:**

Presented by Patrick McShane. The PAR application for revision of the current Standard Guide was approved by IEEE SA. 26 members signed on, several task forces were created and chairs selected and all have one or more additional volunteers. Expanded list of topics to be addressed during the revision process were recommended by attendees and listed in the minutes. Additional topic suggestions are welcome. The Chair announced that to remain a member of the WG.

**Minutes (unapproved) of the PC57.147 WG meeting as submitted:**

The **March 12, 2012**

**Nashville, TN**

* Call to Order was made.
* Introductions/Membership Attendance/Quorum Check
* Attendance
  + 1st Meeting Since PA, so a call for membership was made.
  + 26 members of the 60 present at the meeting enrolled as members
* Chair Report, Patrick McShane:
  + Welcome of new members and guests
  + WG Membership requirements & responsibilities
  + Review of the approved PAR - minor editorial revisions to the scope & purpose by the standards coordinator were adopted
  + Brief review of the proposed consolidation of the fluids guides
* The Fall 2011 Minutes were approved
* Task Force Reports
  + All task force chairs reported no work was initiated
  + Volunteers solicited to support each task force
* Additional Items of Interest to be addressed by this revision
  + Clarify & define acid limits
  + Interfacial tensions
  + DGA values for natural esters - referred to PC57.155 Working Group
  + Power factor values - referred to PC57.152 working group
  + Low temperature properties, especially the effects of separation of fluids from semisolids
  + Material compatibilities for retrofilling applications
  + Compatibilities of mixed natural ester fluid types
  + Compatibilities if natural esters with components/accessories
* Old Business
  + All WG members are required to become a TF active participant
  + Some reassignments of theTF Chairs were discussed and made.
  + Each member was assigned one or more TFs per annex.
* New Business (none)
  + Rosters of task force volunteers will be forwarded to the TF chairs for review
  + TF volunteers will be contacted by the TF chair and advised of upcoming TF meetings
* Adjournment

Respectively submitted,

Jim Graham, Secretary

**C57.147 Task Force Rosters**

As of March, 2012:

**TF 1: Section 4 - Fluid tests & Significance**

**Chair: Don Cherry**

Members: Dave Hanson Jimmy Rasco

Mel Wright Paul Caronia

Mark Scialdone

**TF 2: Section 6 - Handling & Evaluation of NEF used in field filling**

**Chair: Lance Lewand**

Members: Clair Claiborne Derek Baranowski

Juan Castellanos James Gardner

**TF 3: Compatibilities of NE Fluids with Components & Accessories (includes Section 7 - Evaluation of NEF in New Equipment)**

**Chair: Jerry Murphy**

Members: Tony Reiss Sheldon Kennedy

Marshall Stewart Greg Stem

James Gardner Dave Harris

Christopher Sullivan

**TF 4: Section 8 - Maintenance of NEF**

**Chair: Stephanie Denzer**

Members: Libin Mao Nick Perjanik

Mel Wright

**TF 5: Annex B**

**Chair: David Sundin**

Members: S. Joon Han Dave Hanson

Paul Caronia Bob Kinner

Mark Scialdone Jesse Inkpen

**TF 6: Field Application Guide & Equipment Evaluation**

**Chair: John Luksich**

Members: Roberto Asano Dave Harris

Jane Verner Scott Reed

Thomas Spitzer

**TF 7: All other sections - Miscellaneous**

**Co-Chair: Patrick McShane**

**Co-Chair: Jim Graham**

Members: Sue McNelly

**WG PC57.155 Natural Ester and Synthetic Ester DGA Guide**

**Chair: Paul Boman, Secretary: John Luksich**

**Report given at the Sub-Committee:**

John Luksich reporting as Paul unable to attend. The meeting was held with John as acting chair. Did not have a quorum but had record 77 attendees. Jim Dukarm presented his data analysis. The data population is relatively younger units, so the percentiles will change in future as data set gets bigger and older.

**Minutes (unapproved) of the WG meeting as submitted:**

**John Luksich – Presiding Officer**

**Meeting Date: March 13, 2012 Time: 9:30 AM**

**Attendance: 23 members out of 56 members were in attendance, total attendance was 73 and 4 people requested membership.**

- Quorum not present (determined at the end of the meeting using the completed attendance sheets).

- Fall 2011 minutes unofficially approved

**Continued business**

1) Joon Han report

A task force was formed to obtain and chart the DGA data for ester fluids. Over 1,200 DGA records for both synthetic and natural esters were collected. Claude Beauchemin, Jerry Murphy, Roberto Asano Jr. and Joon Han volunteered.

2) Dr. Jim Dukarm presentation:

Jim Dukarm volunteered to do a statistical analysis of the collected C57.104 data. The records (800,000 sets) included many types of insulating liquids. He extracted the 5,000-odd natural and synthetic ester sets for separate study.

Jim discarded 50 sets as post-failure data. The number of samples was too small to separate into voltage class subgroups. He went into detail how he factored in the variability factor. The volume range per type of combustible gases is quite similar for synthetic and soy esters. The high oleic ester gas volume range is much bigger in variability.

Q: Fredi Jacobs: Why the high low designation of the natural esters?

A: Jim termed the soy fluid as low oleic and the sunflower/safflower fluid as high oleic because of manufacturer statements.

Q: Luiz Cheim: Why was 10,000 ppm total for selected combustible gases as the threshold for assuming

A: The intent was to remove obvious post-failure data, not statistical outliers.

Q: Bob Kinner: He has found that at 240°C, that there can be a stripping of carboxyl group resulting in the formation of CO2 from other than degrading cellulose. Could the CO2 be an arcing indicator?

A: unknown

Q: Valery Davydov: He has determined that the oxygen level can influence gas formation. Also the temperature of the sample is important, as the dissolved oxygen and nitrogen move in and out of cellulose factor. Did the TF factor in oxygen content in the study?

A: No

Statement by Mel Wright: We found that the DGA analysis of silicone fluid samples dependent significantly on whether or not the silicone was degassed in regards to CO2 levels.

Statement by Dr. Dukarm: Would like to have the limit range justified so that up to 90 percentile is non-actionable and taking action below that would typically be non cost effective.

An excellent presentation by Jim (as usual). The WG showed its appreciation with applause.

3) New Business

Question to WG by John Luksich: Should the work of this working group include a Dual logo with IEC?

Jim Dukarm stated that Dr. Duval mentioned that the CIGRE technical bulletin 443 is on the subject of non-mineral oil DGA and that there hasn’t been much activity since. Jim suggested that we consider sharing the work of the WG with CIGRE.

4) Miscellaneous

Q: Why is the data base on the web password protected?

A: The data was for the use of the TF to develop their report and presentation. Some of the data is confidential. There are some copy right issues as well.

**End of meeting.**

* + - 1. **WG PC57.637 Guide for the Reclamation of Insulating Oil and Criteria for Its Use**

**WG Chair Jim Thomson, Vice-Chair TV Oommen**

**Report given at the Sub-Committee Meeting:**

Jim Thompson presented. 23 attended the meeting. The Guide revision PAR expires in December so a Par Extension will be submitted. The next draft will eliminate dates of referenced standards in accordance IEEE rules.

Sue McNelly’s question: Was it withdrawn, two doc in new oil specs ASTM

Valery Davydov’s suggestion: Should consider adding the word “mineral” to the title.

**The Minutes (unapproved) of the WG Meeting as Submitted:**

March 14, 2012

Unapproved Minutes Working Group Meeting IEEE PC57.637

IEEE PES, Transformer Committee, Insulating Fluids Subcommittee, Working Group for the “IEEE Guide for Reclamation of Insulating Oil and Criteria For Its Use”

Chair Jim Thompson  
Vice-Chair TV Oommen

The working group meeting was conducted at 8 am on March 13, 2012 at Nashville, Tennessee with 23 people in attendance and with 9 of the 19 current working group members present. This document was reaffirmed in 2007 and the PAR for revision was approved December 10, 2008. A PAR extension request will be submitted next month. Working Group member Jim Thompson (chair) conducted the meeting.

Sue McNelly will be sent a copy when the final sections are submitted by the volunteers. The ASTM document text in this document will be revised to eliminate the dates of revision. The DBPC document reported by Mark McNally has no current document number in the 2011 ASTM D27 series document. This will be looked at so another ASTM document number will be included in the draft for DBPC testing.

Respectfully submitted,

Chair Jim Allen Thompson

Vice Chair TV Oommen

**TF on Particle Count Limits in Mineral Oil**

**Mark Scarborough– Chair, T.V. Oommen- Vice-Chair , Paul Boman - Secretary**

**The Report given at the Sub-Committee Meeting:**

Sue McNelly presented for Mark. No meeting was held at S12.

Tom Prevost’s question: Wasn’t it (the TF) discontinued at the last meeting? Sue McNelly responded that it was not, but that no meeting was scheduled at the S12 meeting week. There is some interests in continuing to gather information on the issue.

Patrick McShane stated that he recently peer reviewed a technical paper proposed for publication by IEEE on the impact of particle contamination on dielectric strength. He believes that the paper will generate increase interest in the subject.

**TF on Moisture in Oil**

**Chair: Bob Rasor**

**The TF Report given at the Sub-Committee Meeting presented by Bob Rasor:**

Bob explained that the TF was created to provide guidance on determining a relationship between moisture in the insulating liquid and the solid insulation. This was the 6th meeting. He stated that ppm (of water) has little value unless temperature is given with it. At the TF meeting, the highlights from previous meetings were reviewed since there were many new attendees. Valery Davydov and Claude Dukarm made presentations. Claude’s presentation focused on a recent power transformer failure.

Bob would like to set the direction of future work for the task force. They are considering issuing a survey. The TF would like to have more folks participate in discussions.

**The TF Meeting Minutes (unapproved) as Received:**

**Tuesday March 13th, 2012 4:45 pm**

**Nashville, Tennessee USA**

The meeting was called to order by Chair Bob Rasor at 4:55pm. There were 90 attendees. 23 of the 49 members were present. Five requested membership.

Members attending were:

Claude Beauchemin

Luiz Cheim

Donald Cherry

Dinesh Chhajer

Valery Davydov

Stephanie Denzer

Eduardo Garcia

James Gardner

David Hanson

Rowland James, Jr.

Zan Kiparizoski

Libin Mao

Terence Martin

Thomas Melle

Tony Pink

Donald Platts

Thomas Prevost

Subhas Sarkar

Pugazhenthi Selvaraj

H. Jin Sim

Brian Sparling

Jim Thompson

Mark Tostrud

Attendees requesting membership were:

Prabhu Soundarrajan

Ajith Varghese

Arturo Nunez

Tony McGrail

C. Clair Claiborne

**Agenda**

1. Roster was distributed
2. Introductions were given
3. Minutes to last meeting were approved
4. Scope was reviewed with a brief history of the TF
5. A review of past data was given – 6 slides

Comments/questions on the past data include the following:

Slide1: JS asked how the 4% moisture in the solid insulation was obtained.

Valery D said DFR, so they believe it is the bottom of the transformer. Top windings were estimated at 3%. He clarified the water content (ppm) was calculated from the relative saturation. After a question was asked about moisture distribution throughout the paper, Valery indicated that the DFR measures only a lumped parameter value.

Slide2: Bob commented that the question is at what temperatures do the water content (ppm) values as listed in C57.106 have meaning. Jim Thompson asked Bob Rasor how the “average temperature” in the slides was obtained. Bob replied that the bottom oil sample valve temperature was taken then they added 5 degrees C to that temperature to estimate the “average” transformer temperature.

Slide3: Shows fluctuation of ppm values in winter vs. summer. Data is based on KF, with percent saturation being calculated.

Slide4: Again, shows seasonal variation of KF but with more than 20,000 sample points.

Slide5: Shows response of relative saturation of the oil with two different percent moisture in solid insulation examples. Data was done in a test laboratory, not a transformer. Percent moisture in the solid insulation was done by pulling paper samples. The idea was to show if temperature is constant, equilibrium may be near and equilibrium curves may apply.

Slide6: BR stated the Classification Chart is just one example of methods to estimate moisture in a transformer. VD clarified this chart is only for Karl Fischer samples and only for like new oil. There are different equations for used oil.

Bob reiterated that there are tools to estimate moisture. They may not be perfect, but can give indication – especially for transformer owners than cannot put an online monitor on each transformer and can only pull samples for KF analysis.

1. New case study was presented by Claude Beauchemin.

Moisture is most controversial as he has seen in the past years. C57.106 has room for improvement. Data examples provided in the past and today all try to explain there is relation between moisture in oil and paper.

Case study was of a failed transformer due to moisture ingress from a leak. Transformer was energized in past, but taken out of service for many months. DGA was run prior to maintenance and oil screen was run after maintenance on this transformer. All data looked ok. Maintenance and installation of an online monitor was performed while de-energized. Before energizing, a KF sample was also drawn. Temp was very low at 1°C with 11pm water content. Percent saturation calculated from the KF and measured by the online monitor indicated around 40 percent saturation. However, the water content was below the value given in C57.106. The customer energized the transformer and temperatures increased – within 2.5 days, the transformer failed. If the correlation between moisture in oil and moisture in the paper is ignored, vital information may be thrown away. There is a need for some correlation, despite not being at equilibrium. The transformer should not have been put back in service.

Many questions/comments followed. Names were not provided by all those that spoke.

Q: Was transformer oil filled? A: Yes, was filled 4 months prior to start up.

Q: Was there nitrogen or conservator tank? A: Unknown, but suspect a free breather based on DGA data.

Comment: Laboratory experiments have shown bubble temperature can be very low.

Q: Why was dielectric good with reasonably wet transformer? A: Dielectric test was different than standard methods and moisture only a factor in dielectric.

Q: Why was DGA run before maintenance – this does not show condition after maintenance?

A: Yes DGA was before processing. Last KF and online monitor data was after maintenance. PPM was 11 at 1C and that is the point.

JT: Stated that the warning box in C57.106 pertains to percent saturation. He said the guide says to do calculation for cold start up.

CB: The curve is not provided in the standard. Failure was due to bubbling, not dielectric loss. Guide needs improvement.

BR: Agrees that work needs to be done.

JT: Indicated that there are serious errors in this case history analysis. He indicated that one is the lack of looking at the cold startup warning in regards to the dielectric breakdown strength of the oil, and another even more important was the lack of using proper solid insulation testing prior to energizing of the transformer.  He indicated that there should have been a Doble test performed on the solid insulation prior to energization.

DP: Have to disagree with CB conclusion. Suggests all test data was invalid because not taken when the unit failed. They didn’t retest before putting back in service.

CB: Agrees that test after would have helped.

Q: What is definition of cold? JT: Most manufacturers recommend 50F warm up of oil prior to energizing.

CB: Are you saying everyone does this?

JT: Need to warm until 50F, this is standard procedure for his company.

CB: Temperature was above this temperature when the unit failed, so he doesn’t understand.

JT: C57.106 is for fluid oil quality only. Power factor (electrical testing) should have been checked.

Time ran out – so discussion was halted.

1. At least once formally in the meeting and in other discussions before and after the meeting Sue, Dave, Bob, Claude, Hali and others thought about where the group was going - what might be the endpoint of our data and some of the solutions that have been introduced or could be introduced. Bob's note: the idea of doing a group of questions to the members may give us some additional ideas, or at least see how everyone is thinking on certain topics. This may be done between meetings and ready for Milwaukee.
2. Meeting was adjourned at 4:55pm

**TF on Consolidation of Insulating Fluid Guides - Chair: Tom Prevost**

**The TF Report given at the Sub-Committee Meeting presented by Bob Rasor:**

Tom Prevost presented. No TF meeting was held as the member recruitment was not initiated. Tom then asked for volunteers at the SC IF meeting. The following volunteered:

Claude Beauchemin, Paul Caronia, Clair Claiborne, Jim Graham, David Hanson, Rick Ladroga, John Luksich, Hali Moleski, Tony McGrail, Patrick McShane, Jim Thompson, Jerry Reeves, Jimmy Rasco, Bob Rasor.

Question: What is the purpose of the proposed consolidation? Answer: Many IF guides refer to same ASTM Tests, mostly a repeat of same information. Purpose is for the task force to make a recommendation for how this is to be done. Tom Lundquist made a report that resulted in forming a TF, which was approved at last meeting. So need to form a scope and purpose.

Sue McNelly: The previous TF recommended that consolidation of these standards be would be desirable and recommended going forward on the project, while the purpose of the new TF, is to determine if such a consolidation can be a practical endeavor (not a given) and if so, how best to do it. This would be a relatively lengthy project.

Dave Hanson: It was mention at last meeting; current PARs involving any of these standards are to continue. Will not impact, not stop current activities. The consolidation issue is looking far out.

**Old Business:**

**New TF of the Standards Subcommittee has been formed to study and report on Nomenclature Consistency for Insulating Fluids. Chair: Patrick McShane**.

**Presented by Patrick:** The Standards SC approved the formation of a TF to issue a white paper to identify and suggest solutions to the various forms of referring to dielectric liquids and gases within the entire C57 standard set. Patrick requested volunteers from the SCIF to partner with volunteers from the Standards Subcommittee to review and make suggestions to be included in a white paper. After approval of the white paper by the SC Stds, the paper will be distributed to chairs of all the subcommittees for consideration for the next revisions of standards under their jurisdiction.

**New Business:**

Sue McNelly mentioned that she encourages SCIF members to consider participating in the Technical Tutorials for future TC Thursday Meetings. Tom Prevost is the TC officer responsible for the Tutorial schedule and selection process.

Sue also brought up the topic of data base issues: How to store and security that would be needed to ensure that the data bases used to develop or revise standards are not used for other than for development or update of the Transformer Committee Standards or Guides.. Other groups will have similar issues. The issue will be reviewed by the Admin SC. The need has been identified due to recent revision activities have had difficulties obtaining the data used for the existing standards, which makes it difficult to judge if the data used to substantiate the standard is still valid.

Valery Davydov indicated that people have asked for copies of his moisture presentation given at the insulation life subcommittee meeting. Sue indicated that she can post this, but suggested he go through the insulation life SC for approval first.

**SC IF Adjournment 4:15PM**

* 1. **Insulation Life SC – Bruce Forsyth**

**11.11** I**nsulation Life Subcommittee – Bruce Forsyth, Chairman**

The Insulation Life Subcommittee met in Nashville on March 14, 2012 at 8:00 AM.

Bruce Forsyth was not able to attend this meeting. Barry Beaster, the Vice-Chair, conducted the meeting.

A hand count of the members revealed that a quorum was present. The minutes of our meeting in Boston, MA meeting on November 2, 2011 were approved as written.

The attendance rosters show that the meeting was attended by 195 people, 59 of 95 members and 136 guests. 19 guests requested membership.

**11.11.1 Chair’s Report**

The requirements to be an IEEE Transformer Committee Member were reviewed. Members must be a member of the PES and SA.

The PAR report lists the expiration dates of Standards and PAR. Bill Bartley clarified that PARs can be extended but the standards would still expire.

This is the first meeting with the revised meeting format. In addition to these changes, it has been proposed to make the Tuesday Luncheon an awards lunch.

The recent Spectrum contained an article on geomagnetic effects, “A Perfect Storm of Planetary Proportions.” This article indicated that hundreds of EHV transformers would probably fail during an extreme event. The Transformers Committee disagrees and will provide a formal response.

Tutorials presented at the Transformers Committee are being provided to the IEEE Technical Resource Center. Due to copyright issues, these tutorials are being moved to the password protected area of the Transformers Committee’s website.

Fluids have been described using various terms in the standards. The use of these terms will be normalized through the standards.

People making comments during the meeting should use the microphones and state their name and affiliation.

**11.11.2 Project Status Reports**

**11.11.2.1 C57.91 Loading Guide**

C57.91 was sent to the printers on March 7, 2012.

**11.11.2.2 1276 Guide for the Application of High Temperature Insulation Materials in Liquid-Immersed Power Transformers**

The first meeting of this Working Group will be held at the next meeting in Milwaukee, WI.

**11.11.3 Working Group and Task Force Reports**

**11.11.3.1 Task Force on High Temperature Liquid-Immersed Transformers (PC54.154) – Richard Marek**

The eighth meeting took place on Monday, March 12, 2012 in the Ryman Meeting Room at 3:15 pm, at the Renaissance Nashville Hotel, Nashville, Tenn. Introductions were made and attendance sheets were circulated. A quorum call was made at the beginning and end of the meeting, and as only 17 members were present, the minutes from the Boston meeting will be circulated to the members for approval. In addition to the 17 members, 39 guests were present.

The chair provided the attendees with an update on the status of the document. A survey ballot of Draft 8.2 was sent to the working group, requesting approval to submit the document for ballot. 100% of the working group members responded, with comments from four individuals. The chair then noted that he modified the document to incorporate these editorial comments, along with new curves for Annex B provided by John Luksich plus the MEC comments from IEEE. The document was submitted for ballot as Draft 9.

Concurrent with this revision, a ballot pool was formed, with 142 signed up to vote on the document. The pool has a good split of groups, with the largest group at 33.1%, which was less than the 50% limit for ballots opened before April 1. Some working group members had issues with not receiving notification of the opening of the ballot pool, and the chair assisted them with resolving this issue by contacting Erin Spiewak. The ballot opened on March 3rd, and will close on April 1st. The chair strongly urged all to vote on the document to help with a successful ballot. As of the meeting time, 29 ballots had been returned, with 27 approved, 2 abstained and no comments.

The chair completed the meeting by asking for volunteers from the working group to become members of a ballot resolution group, in case they are needed to help with resolving comments. Members who volunteered are:

Roberto Asano, Terry Drees, Bill Henning, Gary Hoffman, Marion Jaroszewski and John Luksich

The chair outlined the need for this resolution work after the completion of the ballot so that the document can be completed prior to the next meeting in Milwaukee. There was no new business, and the meeting adjourned early at about 3:45 pm.

**11.11.3.2 Working Group for Temperature Rise Test Procedures Section 11 of C57.12.90 - Paulette Powell**

The Working Group met in the West Ballroom of the Renaissance Nashville Hotel in Nashville, TN on Tuesday March 13, 2012 at 11am. Present were fourteen (14) members and forty-seven (47) guests.

There were no corrections to the Minutes of the previous meeting, but as the WG did not have a quorum, the request for approval by the WG will be conducted via an email survey.

There was considerable discussion on clause 11.1.2.2 loading back method at the last meeting concerning that both transformers, supply and under test, be identical. Mr. Bertrand Poulin agreed to prepare a new proposal, but was unable to complete it in time this meeting.

The chair noted that the completed survey for clause 11.2.2 was posted on the webpage prior to the last WG meeting. Steve Antosz asked about the procedure for the WG in forwarding completed proposals for inclusion in C57.12.90. The Chair stated that there is an editorial correction to be made on 11.2.2 before the proposal can be forwarded to the Chairperson for C57.12.90 WG and that the issue concerning the loading back method is the only item to be resolved to finalize clause 11.1.2.2.

There was no new business. Being no other business, the meeting adjourned at 11:20am.

Respectfully submitted,

Paulette Powell, Chairperson

Juan Castellanos, Vice-Chair

**11.11.3.3 Task Force on Furan Testing – Shuzhen Xu**

This Task Force did not meet in Nashville.

**11.11.3.4 Task Force on Moisture Estimation in Transformer Insulation – Jin Sim**

Monday, March 12, 11:15 AM at the Music City Room, Renaissance Nashville Hotel.

Meeting started with an establishment of a quorum: 7 of the 11 members of the TF were in attendance, so a quorum was established. This TF meeting was attended by 89 people.

A presentation made by Tom Prevost on a proposed outline based on the latest Draft 3 of the document was made. Highlighting the changes suggested from previous meetings, the next draft will have the following structure.

1 Introduction

1.1 Moisture Sources in Transformer Insulation

1.2 Hazards of High Moisture levels

1.2.1 Reduction in Dielectric Breakdown Strength

1.2.2 Bubble Generation from Overload

1.2.3 Partial Discharges

1.2.4 Power Factor of Insulation

1.2.5 Loss of Life

1.2.6 Historical Background

2 Direct Moisture Measurement by Karl Fischer Titration

3 Indirect Methods of Moisture Estimation

3.1 Power Factor Measurements and Loss Measurements

3.2 Vapor Pressure Piper Charts

3.3 Moisture Equilibrium Curves for Oil and Paper

3.4 Moisture Assessment under Dynamic Conditions

3.5 Advanced Treatment of Moisture Equilibrium in Paper – Oil System in Transformers

3.5.1 Distribution of Moisture between Paper, Oil and Gas Components

3.5.2 Distribution of Moisture in Transformers with Natural Oil Flow

3.5.3 Distribution of Moisture in Transformers with Forced Oil Flow

3.6 Dielectric Response Methods for Moisture Determination

3.6.1 Recovery Voltage Method RVM

3.6.2 Polarization and Depolarization Currents PDC

3.6.3 Dielectric Response in Frequency Domain

3.6.4 Modeling of the Dielectric Response by the XY-Model

3.7 Infrared Spectroscopy to Measure Moisture Content

3.8 Method Accuracy

4 Case Studies

4.1 Drying of a Power Transformers

4.2 Moisture Determination in a Heavily Aged Transformer

4.3 Assessment of New Transformers in the Factory

5 Special Reports on Moisture Evaluation in Transformers

5.1 CIGRE Working Group A 2.30 (2007) Moisture in Transformers

5.2 EPRI Workshop on Moisture Management in Transformers

5.3 Panel Session of IEEE Transformer Committee

5.4 EPRI Project on Moisture Management in Transformers

5.5 CIGRÈ Task Forces on Dielectric Response Methods D1.01.09 and D1.01.14

5.6 Doctoral Thesis "Reliable Moisture Determination in Power Transformers"

6 References

7 Bibliography of Moisture in Transformer Insulation

Questions and Comments:

a) There is a need to make recommendations of what method to use and when.

b) What is the impact of temperature based on the technique used?

c) Will it address only mineral oil and paper insulation? ANSWER.. YES, only paper (cellulose)/oil insulation systems

d) Motion put forward to the members of the TF, Will you approve the proposed outline for re-organization of the contents, based on this presentation, and forward it to the TF members and ILSC for review and comments? ANSWER Yes majority 6 of 7 voted YES.

Once the new draft is completed, it will be circulated to the TF and members of the ILSC for their review and comments. Publication of the document will be based on the procedures for an IEEE Special Publication.

Presentation by Valery Davydov, Proposal for a New Reference Document:

“Moisture Phenomena in Insulating Systems of Dry, Gas Insulated and Liquid Immersed Transformers & Reactors”

A presentation that proposes an in depth investigation of the moisture issues in the ‘whole’ of the transformer, looking into aspects of moisture in the gas phase, all parts of the solid insulation, and all commonly used dielectric fluids.

Copies of the presentation will be on the Committee web site.

After the presentation, a proposal was made to those in attendance;

“Do we as a group wish to propose to the ILSC to proceed with development of the Title, Scope and Purpose of a new guide following the concepts presented in this presentation?”

By show of hands, the majority agreed and the proposal carried. Tom Prevost will be recommended to the ILSC as the Next Chairman of this TF, to carry this work forward.

Recorded by Brian Sparling

Respectfully submitted by H. Jin Sim, Chair of the TF

**11.11.3.5 Task Force on Winding Temperature Indicators - Phil McClure**

The meeting was called to order at 9:45am and the members and guests introduced themselves. There were 4 members and 38 guests present. This was the first official meeting since Spring of 2006, although there was a break-out meeting at the Spring 2011 meeting in San Diego.

Thirteen guests requested membership at this meeting. Presently there are 15 members on the roster, but many of them were inactive even in 2006. Historically it has been difficult to achieve a quorum in this group and not all members have contributed materially to the group’s work. Adding more members immediately might make the task of achieving a quorum even more difficult. After the next meeting the existing membership list will be trimmed and guests will be required to attend at least three meetings and contribute materially to the effort prior to becoming members.

That being said, three persons who have contributed materially to the group’s efforts over the past 18 months; Jorge Gonzalez de la Vega, Josh Herz and Tim Rinks, will be granted membership at the next meeting.

The minutes of last meeting on March 21, 2006 meeting in Costa Mesa, CA were distributed to the members, but since there was not a quorum, they could not be approved.

A brief discussion of the group’s history was given to familiarize attendees with how the group arrived at this point in time.

In support of the primary objective of the group, an experiment has been undertaken to test the response times of several types of heated-sensor simulating (HSS) WTI’s in several simulated operating conditions, including overload. The experiment required the collection of test subjects and measurement standards and design and fabrication of a test tank with variable circulation and heat and a means of installing baffles to direct fluid flow.

The experiment was begun two weeks ago. Several sequence changes were incorporated as a result of detailed review of the procedure while preparing data sheets. The changes resulted in a more intensive workload, but much more useful data. Changes to the experiment and preliminary results were presented for the first two of three objectives of the experiment in a document that was circulated to the members. The document was screened and discussed for the attendees at the meeting.

The preliminary results suggest that the response times of HSS WTI’s are much faster than some have maintained. In addition, the data suggests that the response times may be highly independent of initial thermal conditions when those initial conditions are within “normal” operating temperatures of 25 and 60 °C.

It was stated that the experiment would be completed, with data and conclusions, within eight weeks. The experiment would then need to be edited into a form that would be suitable for publishing in a trade magazine, technical journal or other peer-reviewed media. Volunteers with experience publishing technical papers were solicited, but no persons with actual experience came forward.

A Q&A period was had after the experiment was discussed.

The first question asked was why there were steps that called for applying twice the thermowell current signal rating during response time testing. It was explained that the purpose was to simulate a condition in which one of a pair of tandem transformers that were sharing full capacity loads had to be removed from service and the remaining transformer had to carry 200% capacity.

The second question asked was if we planned to test with mineral oil in addition to the Envirotemp FR3 that the experiment was presently being conducted with. It was explained that the high flash point made it safer for testing in the confines of our small chemical lab and the low odor reduced the objections of personnel working next to the lab. In addition, similar thermal properties make testing with another fluid unnecessary.

The final question asked was if we planned to test for only liquid immersed transformers or if we had considered testing dry type transformers as well. The answer was that our charter only applied to liquid immersed transformers.

We had planned to discuss the direction of the group beyond publishing the paper, but there were too few members present and no quorum to make a decision for recommendation to the subcommittee. At the Spring 2006 meeting in Costa Mesa both the Task Force and Subcommittee thought that a WTI guide was preferred, but that was six years ago and the choices of that time need to be reviewed.

The choices at this time, as in 2006 are to continue the work of the group to produce a standard, to produce a guide or stop work where we are.

With no more business to conduct, the meeting was adjourned at 10:35.

***Adjourn***

**11.11.4 Old Business:**

No old business.

**11.11.5 New Business:**

**11.11.5.1 Proposal for a new Task Force on Moisture Estimation:** Jin Sim proposed that a new Task Force should be formed to prepare a Title, Scope, and Purpose for a new document on moisture. This motion was seconded. After discussion, 29 people voted for this proposal and 9 people voted against it. The motion passed and will be brought to the Administrative Subcommittee.

**11.11.5.2 C57-100:** Roger Wicks presented preliminary results of the sealed tube tests. His presentation is available on the Insulation Life Sub-Committee website.

**11.11.5.3 Tutorials:** Tom Prevost reminded everyone that tutorials are presented at every Transformers Committee meeting. Topics for tutorials should be presented to the SC Chair.

**11.11.6 The meeting adjourned at 9:00 AM.**

Barry Beaster

Vice-Chair, Insulation Life Subcommittee

1. **Editor’s Report – Ed teNyenhuis**

Between November 4, 2011 and March 15, 2012 a total of 87 new & resubmitted papers in the transformer area were submitted to IEEE Transactions on Power Delivery for possible publication. For the 68 reviews completed during this period, the recommendations were:

Accept without changes: 19

Revise and Resubmit: 29

Reject: 20

Another 19 papers are under review the review process. The above numbers include reviews managed by Dr Francisco De Leon of Polytechnic Institute of NYU and myself.

The 19 papers accepted for publication are shown below:

|  |  |  |
| --- | --- | --- |
| **Number** | **Paper ID** | **Title** |
| 1 | TPWRD-00443-2011.R3 | A Resonant Tertiary Winding Based Novel Air-Core Transformer Concept |
| 2 | TPWRD-00395-2011.R2 | Determination of Geomagnetically Induced Current Flow in a Transformer from Reactive Power Absorption |
| 3 | TPWRD-00494-2011.R1 | Analysis of the Characteristics of the New Converter Transformer Based on Matrix Model |
| 4 | TPWRD-00301-2011.R1 | A Novel On-Line Technique to detect Power Transformer Winding Faults |
| 5 | TPWRD-00661-2011.R2 | Accurate Measurement of Fault Currents Contaminated with Decaying DC Offset and CT Saturation |
| 6 | TPWRD-00732-2011.R0 | Construction of Equivalent Circuit of a Single and Isolated Transformer Winding from FRA Data Using ABC Algorithm |
| 7 | TPWRD-00840-2010.R3 | Wide Frequency Operation of the Inductive Current Transformer with Ni80Fe20 Toroidal Core |
| 8 | TPWRD-00980-2010.R3 | Response of EHV Grid Transformers to System Originated Oscillatory Switching Transients |
| 9 | TPWRD-00185-2011.R2 | Electromagnetic Vibration Analysis of the Winding of a New HVDC Converter Transformer |
| 10 | TPWRD-00546-2011.R1 | A mono-voltage equivalent model of bi-voltage autotransformer-based electrical systems in railways |
| 11 | TPWRD-00546-2011.R1 | CCVT Failure due to Improper Design of Auxiliary Voltage Transformers |
| 12 | TPWRD-00234-2011.R1 | Statistical Machine Learning and Dissolved Gas Analysis: A Review |
| 13 | TPWRD-00913-2010.R1 | Modeling Impact of CLPU on Transformer Aging Using Ornstein-Uhlenbeck Process |
| 14 | TPWRD-00451-2010.R1 | Modeling of Replacement Alternatives for Power Transformer Populations |
| 15 | TPWRD-00390-2011.R1 | Heat Transfer Model for Toroidal Transformers |
| 16 | TPWRD-00125-2011.R2 | Diagnosis of Technical Condition of Power Transformers Based on the Analysis of Vibroacoustic Signals Measured in Transient Operating |
| 17 | TPWRD-00515-2010.R5 | Methanol: A Novel Approach to Power Transformer Asset Management |
| 18 | TPWRD-00540-2011.R1 | Diagnosing faults in power transformers with autoassociative neural networks and mean shift |
| 19 | TPWRD-00533-2011.R2 | Low Voltage Transformer Loss of Life Assessments for a High Penetration of Plug-in Hybrid Electric Vehicles (PHEVs) |

Also for Letters, there is was 1 letter submitted for review and 1 letter was rejected.

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 below.

This will be my last report as Editor, which I have been doing now for 3 years. During that time 320 papers have been reviewed. I will be following through on 9 remaining papers under my review but all new papers going forward will go to the new editor, Sanjib Som.

Lastly, I want to personally acknowledge some key reviewers involved in the transformer committee who have been regularly and consistently reviewing papers during my term. This is an important contribution since it maintains the high standards for our papers and it gives back their expert knowledge to the industry. I realize there is a risk that I miss someone but nonetheless I want to take this opportunity. These persons are:

* David Sundin
* George Frimpong
* Clair Claiborne
* Phil Hopkinson
* Ramsis Girgis
* Bertran Poulin
* Hasse Nordman
* John Crouse
* Sheldon Kennedy
* Luiz Cheim
* Juan Castellanos
* Jack Harley
* Xose Lopez-Fernandez
* Robert Del Vecchio
* Charles Sweetser

All members and attendees of the IEEE Transformer Committee are invited to review technical papers. Please sign up at: <http://tpwrd-ieee.manuscriptcentral.com/>

INSTRUCTIONS FOR SIGNING UP TO REVIEW IEEE TRANSACTIONS PAPERS

1. Before you create a new account, please check for an existing account by clicking on: "Check for Existing Account"
2. Assuming that you do not get an existing account notification email, click on "Create New Account" and enter in your information.
3. Please specify any “Specialty / Area of Expertise” according to the 5 numerical codes below:

13a: Power and Instrument Transformers

13b: Insulating fluids category

13c: Dielectric Testing

13d: Audible Noise and Vibration

13e: Transformer Modeling Techniques

1. Please specify any “Key Words” such as: distribution transformers, core losses, oil DGA, or thermal, for example.
2. Submit your information.
3. Click on "Request Reviewer Status" to be enabled as a reviewer.
4. **Liaison Reports**
   1. **Standards Coordinating Committee on Electrical Insulation No. 4 (SCC 04)**

**Scope:**

* To formulate guiding principles for the evaluation of insulation materials and systems for electrical and electronic applications.
* To formulate principles for the identification of insulation materials and systems based on functional tests and/or experience.
* To coordinate the preparation of standards for functional test programs and diagnostic methods for the evaluation of insulation materials and systems.

**Standards:**

* IEEE 1-2000 (R2011) Recommended Practice – General Temperature Limits in the Rating of Electrical Equipment and for the Evaluation of Electrical Insulation
* IEEE 98-2002 (R2007) Standard for the Preparation of Test Procedures for the Thermal Evaluation of Solid Electrical Insulating Materials
* IEEE 99-2008 Recommended Practice for the Preparation of Test Procedures for the Thermal Evaluation of Insulation Systems for Electrical Equipment

**Current Activities:**

**IEEE 98** – To revise standard; PAR expires December 31, 2015.

Anyone interested in joining the SC or WG for revision of IEEE 98 should contact:

Paulette Payne Powell

Chairperson SCC 04

[papayne@ieee.org](mailto:papayne@ieee.org)

* 1. **IEC TC14 Technical Advisor to USNC**

**U.S. National Committee of the International Electrotechnical Commission,**

**A Committee of the American National Standards Institute**

**Technical Advisory Group for IEC TC 14**

**TAG Administrator:**

***National Electrical Manufacturers Association***

*1300 North 17th Street, Suite 1752, Rosslyn, VA 22209*

*Tel: 703-841-3252, fax: 703-841-3353*

**---------------------------------------------------------------------------------------------------------------------MINUTES**

|  |  |  |  |
| --- | --- | --- | --- |
| **Document #:** | **NA** | **Current Standard Date:** | **NA** |

|  |  |
| --- | --- |
| **Document Title:** | **IEC TC 14 TAG** |

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| --- | --- | --- | --- |
| **Chair:** | Phil Hopkinson | **Vice-Chair** |  |
| **Secretary** | John A. Gauthier |  |  |

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| --- | --- | --- | --- | --- | --- | --- |
| **PAR Date:** | **NA** | | **PAR Expiration Date:** | | **NA** | |
| **PAR Status:** | **NA** | | | | | |
| **Current Draft Being Worked On:** | | **NA** | | **Dated:** | | **NA** |

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| --- | --- | --- | --- |
| **Meeting Date:** | **March 13, 2012** | **Time:** | **4:45 – 6:00pm** |

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| --- | --- | --- |
| **Attendance:** | **Members** |  |
| **Guests** | |  |
| **Guests Requesting Membership** | |  |
| **Total** | | **0** |

PLACE OF MEETING: Renaissance Hotel,

Nashville, Tennessee

Room: West Ballroom

DATE AND TIME: **Tuesday, March 13, 2012,** 4:45 PM

PRESIDING OFFICER: P. Hopkinson, Technical Advisor

|  |  |
| --- | --- |
| Members Present: |  |
| C. Colopy | Cooper Power Systems |
| J. Foldi | Foldi & Associates |
| P. Hopkinson | Hvolt, Inc., Technical Advisor |
| M. Kennedy | Doble Engineering |
| S. Kennedy | Niagara Transformer |
| M. Locarno | Doble Engineering |
| R. Marek | Dupont Advanced Fibers Systems |
| J. Puri | Transformer Solutions, Inc. |
| H.J. Sim | Waukesha Electric Systems |
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| --- | --- |
| Members Absent: |  |
| R. Ahuja | Waukesha Electric Systems |
| J. Corkran | Cooper Power Systems |
| L. Dix | Quality Switch |
| J. Rickmann | Phenix Technologies |
| M. Sampat | EMS International Consulting, Inc. |
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| Others present: |  |
| D. Brender | Copper Development Assn |
| J. Britton | Phenix Technologies |
| N. Brush | BBF & Associates |
| C. Bush | Pemco |
| K. Ellis | Electric Connection |
| A. Gao | ABB |
| J. Garland | DuPont |
| J. Haasz | IEEE |
| W. Hauschild | Consultant (HighVolt) |
| M. Hinow | HighVolt |
| P. Jarman | National Grid, Chair IEC TC14 |
| C. Johnson | ABB |
| A. Kraemer | Reinhausen |
| E. Lemke | Doble Lemke |
| R. Lyke | AK Steel |
| H. Nordman | ABB Oy, Transformers |
| S. Oakes | CG Power Systems |
| W. Patterson | ABB |
| H. Pepe | Phenix Technologies |
| H. Shertukde | Hartford |
| S. Siebert | Brockhaus Measurement |
| T. Turvey | Specialty Switch |
| J. C. Cruz Valdes | Prolec GE |
| L. Wagenaar | WagenTrans |

1. CALL TO ORDER

The meeting was called to order, meeting guidelines reviewed and attendance recorded. A quorum was present.

1. APPROVAL OF THE AGENDA

The Agenda was approved as written.

4. APPROVAL OF THE PREVIOUS MINUTES

Minutes of the meeting held October 31, 2011, in Boston, Massachusetts were approved as written.

5. REVIEW AND UPDATE OF USNC ROSTERS FOR TC 14

Members reviewed the TAG roster and made necessary corrections.

1. STANDARDS ACTIVITIES

Mr Hopkinson briefly reviewed the status of the following IEC TC14 standards

* 1. IEC 60076-1 Ed. 3.0 - Power transformers - Part 1: General (MT5 Convenor: P. Hopkinson)

This document has been published.

* 1. IEC 60076-2 Ed. 3.0 - Power transformers - Part 2: Temperature rise for oil-immersed transformers (MT6 Convenor: A. Bossi)

Project complete

* 1. IEC 60076-3 Ed 3.0: Power transformers - Part 3: Insulation levels, dielectric tests and external clearances in air: (MT 60076-3 Convenor: Yukiyasu Shirasaka)

Project has been moved to the CDV stage.

* 1. IEC 60076-4 Ed. 1.0 (2002-06-06): Power transformers - Part 4: Guide to the lightning impulse and switching impulse testing - Power transformers and reactors

No current maintenance activity for this standard.

* 1. IEC 60076-5 Ed. 3.0 (2006-02-07): Power transformers - Part 5: Ability to withstand short circuit

No current maintenance activity for this standard.

* 1. IEC 60076-6 Ed 1.0 (2007-12-13): Power transformers - Part 6: Reactors

No current maintenance activity for this standard.

* 1. IEC 60076-7 Ed 1.0 (2005-12-15): Power transformers - Part 7: Loading guide for oil-immersed power transformers (Loading Guide)

No current maintenance activity for this standard.

* 1. IEC 60076-8 Ed 1.0 (1997-10-01): Power transformers - Part 8: Application guide

No current maintenance activity for this standard.

* 1. IEC 60076-10 Ed. 2.0 - Power transformers - Part 10: Determination of sound levels (MT 60076-10 Convenor: Dr. C. Ploetner)

It was reported that it is uncertain that the meeting scheduled for Osaka was held.

* 1. IEC 60076-10-1Ed. 1.0 (2005-10-17): Power transformers - Part 10-1: Determination of sound levels - Application guide

It was reported that it is uncertain that the meeting scheduled for Osaka was held.

* 1. IEC 60076-11 Ed. 1.0 Power transformers - Part 11: Dry-type transformers

Consideration for issuing a new amendment remains active..

* 1. IEC 60076-12 Ed. 1.0 (2008-11-05): Power transformers - Part 12: Loading guide for dry-type power transformers

No current maintenance activity for this standard.

* 1. IEC 60076-13 Ed 1.0 (2006-05-24): Power transformers - Part 13: Self-protected liquid-filled transformers

No current maintenance activity for this standard.

* 1. IEC 60076-14 Ed.1.0 - Power transformers - Part 14: Design and application of liquid-immersed power transformers using high-temperature insulation materials (MT4 Convenor R. Marek)

Mr. Marek is the US Expert and reported that he expected a CDV to be issued shortly.

* 1. IEC 60076-15 Ed 1.0 (2008-02-27): Power transformers - Part 15: Gas-filled power transformers

A revision is under consideration.

* 1. IEC 60076-16 Ed. 1.0 - Power transformers - Part 16: Transformers for wind turbines applications (WG31 Convenor M. Sacotte)

Project complete, published 2011-08-25.

Dr H. Shertukde has agreed to serve on the IEEE/IEC task force. It is expected that once approved meeting will be held alternately in the US and in Europe.

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* 1. IEC/TR 60076-17 Ed. 1.0 - Evaluation of electromagnetic fields around power transformers

Draft approved for publication

* 1. IEC 60076-18 Ed. 1.0 - Power transformers - Part 18: Measurement of frequency response (PT 60076-18 Convenor: Patrick Picher)

Sheldon Kennedy reported that the meeting held earlier this year was both productive and successful

* 1. IEC 60076-19 TS Ed.1.0 - Rules for the determinations of uncertainties in the measurement of losses in power transformers (PT 60076-19 Convenor A. Bossi)

No US expert identified.

* 1. IEC 60076-20 Power Transformers Part 20: Energy Efficiency (PT 60076-20 Convenor: M. Sacotte)

Mahesh Sampat is the US expert. First meeting held 2011-05, second meeting to be scheduled.

* 1. IEC 60076-21/IEEE C57.15 - IEEE Standard Requirements, Terminology, and Test Code for Step-Voltage Regulators

This is a dual logo standard (IEC/IEEE). It has been approved for publication.

* 1. IEC 60214-1 Ed.2.0 - Tap changers - Part 1: Performance requirements and test methods (MT 60214-1 Convenor A. Kraemer)

Craig Colopy is the US expert. CD expected in October 2011 has been postponed due to delays in the revision work on IEC 60076-3.with a CDV which is now planned for 2012-08.

* 1. IEC 60214-2 Ed. 1.0 (2004-10-14): Tap-changers - Part 2: Application guide

No current maintenance activity for this standard.

* 1. IEC 61378-1 Ed. 2.0 - Convertor transformers - Part 1: Transformers for industrial applications (MT7 Convenor U. Piovan)

Project complete, published 2011-07-26.

* 1. IEC 61378-2 Ed. 1.0 (2001-02-08): Convertor transformers - Part 2: Transformers for HVDC applications

Work is starting on a revision to this standard. A call for experts will be circulated by TC14.

* 1. IEC 61378-3 Ed. 1.0 (2006-04-27): Converter transformers - Part 3: Application guide (MT 61378-3 Convenor U. Piovan)

Rick Merick reported that work on the document in underway.

* 1. IEC 62032/IEEEC57.135 (Guide for the application, specification, and testing of phase-shifting transformers)

Raja has replaced Jin Sim for this work.

1. OTHER ISSUES
   1. Scope change for TC14

A proposed revised scope that was approved by TC14 was approved by the SMB.

* 1. Establishment of Liaison with IEEE

Establishing Cat D liaison as the WG/MT level of TC 14 remains under consideration. It was noted that under IEC rules such liaisons are initiated by the WG.MT.

It was noted that more US participation in IEC is needed for more harmonization of IEC and IEEE standards.

9. DATE AND PLACE OF THE NEXT MEETING

The next meeting will be held in October 2012, in Milwaukee, WI, during the IEEE Transformer committee meetings.

1. ADJOURN

Meeting adjourned 6:15 pm

|  |  |  |
| --- | --- | --- |
| **Reported By:** | John A. Gauthier | 13 March 2012 |

* 1. **Cigre**

No Report.

1. **Unfinished (Old) Business**

None

1. **New Business**

None

1. **Meeting Schedule**