IEEE / PES
Transformers Committee
Meeting Minutes
APPROVED

Dallas, Texas
March 15, 2007
The Minutes of the IEEE/PES Transformers Committee Meeting held March 15, 2007 in Dallas, Texas, USA were officially approved at the Fall 2007 Committee Meeting October 18, 2007 in Minneapolis, Minnesota, USA. Motion Made by Carl Niemann Seconded by Loren Wagenaar The vote was Unanimous

Officially Certified
James Edward Smith
Secretary
IEEE/PES Transformers Committee
IEEE / PES Transformers Committee Meeting

March 15, 2007
Dallas, Texas USA

APPROVED Minutes

Minutes and information available on the Committee Website:

www.transformerscommittee.org
IEEE/PES TRANSFORMERS COMMITTEE MEETING  
Dallas Texas  
March 15, 2007  

ATTENDANCE SUMMARY  
Main Committee Meeting Attendees at the Spring 2007 Meeting

| Allen, Jerry | Dukarm, Jim | Leslie, Brian |
| Amaya, Edilson | Elliott, Fred | Lewis, Timothy |
| Amos, Dick | Fairris, Bruce | Lundquist, Tom |
| Anderson, Greg | Fallon, Don | Luo, Shawn |
| Antweiler, Jim | Foldi, Joe | Marek, Rick |
| Ares, Ignacio | Forsyth, Bruce | Martin, Gary |
| Arpino, Carlo | Fortin, Marcel | Matthews, John |
| Arteaga, Javier | Foster, Derek | Matthews, Lee |
| Asano, Roberto | Ganser, Bob | McCulla, Gary |
| Ayala, Wilington | Garcia, Ramon | McNelly, Susan |
| Baqueiro, Fernando | Garner, Charlie | McShane, Patrick |
| Beaster, Barry | Garnitschnig, Andreas | Mehta, Sam |
| Beckwith, Tom | Garza, Joe | Miller, Jermel |
| Bell, C. R. | Gill, Geoff | Miller, Kent |
| Bello, Oscar | Girgis, Ramsis | Molden, Art |
| Blackburn, Gene | Gomez-Hennig, Eduardo | Morehart, Gene |
| Boettger, Bill | Graham, Jim | Murphy, Jerry |
| Boman, Paul | Haas, Mike | Mushill, Paul |
| Britton, Jeffrey | Haggerty, Kent | Niemann, Carl |
| Burns, Clay | Hanus, Ken | Ogajanov, Rudy |
| Bush, Carl | Hardin, Mike | Olafsson, Gyl |
| Busot, David | Harlan, Jerry | Ortí, Sam |
| Califano, Jeremy | Harley, Jack | Paiva, Gerry |
| Callsen, Tom | Hayes, Roger | Parkinson, Dwight |
| Cancino, Alvaro | Henning, Bill | Patton, Jess |
| Castellanos, Juan | Herz, Josh | Platts, Don |
| Cheatham, Mark | Hochan, Thang | Ploetner, Chris |
| Chiu, Bill | Hoffman, Gary | Poulin, Bertrand |
| Chu, Donald | Hollingsworth, Rich | Prevost, Tom |
| Clark, Colin | Hussain, Iqbal | Pries, Pat |
| Coffeen, Larry | James, Jr., Rowland | Progar, John |
| Colopy, Craig | Johnson, Chuck | Puri, Jeewan |
| Cooper, Tommy | Johnson, Wayne | Raveneau, Francis |
| Corel, Dale | Kalra, C J | Raymond, Tim |
| Corkran, Jerry | Kazmierczak, Jerzy | Rensi, Randy |
| Costa, Florian | Kenarangui, Rasool | Riboud, Jean-Christophe |
| Craven, Mike | Kennedy, Gael | Riffon, Pierre |
| Crouse, John | Kennedy, Sheldon | Robbins, Kirk |
| Darovny, Bill | Kali, Vladimir | Romano, Ken |
| Darwin, Alan | Kim, Dong | Rosselli, Gerry |
| Davis, Eric | King, Gary | Rossetti, John |
| Davydov, Valery | Klaponski, Brian | Rousell, Marnie |
| de la Cruz, Dan | Ko, Chungduke | Sampath, Mahesh |
| Dorris, Don | Kraetge, Alexander | Schuette, Christoph |
| Drexler, Charlie | Lamb, Mike | Schweiger, Ewald |
| Duckett, Don | Lee, Dennis | Shertukde, Hem |
| Dudley, Richard | Lemke, Eberhard | Shor, Andre |
Shull, Steve
Sim, Jin
Simpson, Jr., Bill
Smith, Ed
Smith, Jim
Snyder, Steve
Sparling, Brian
Spurlock, Michael
Stahara, Ron
Stein, John
Stensland, Len
Stiegemeier, Craig
Sturdevant, Ron
Sullivan, John
Swinderman, Craig
Tatu, Val
Termini, Giuseppe
Thierry, Juan-Luis
Thompson, Robert
Tillman, Bob
Tolbert, George
Tong, Lin
Traut, Alan
Trummer, Edgar
Tuli, Subhash
Verner, Jane
Vogel, Herman
Wagenaar, Loren
Watson, Joe
Wicks, Roger
Xu, Shuzhen
Yule, Kipp
Zhao, Peter
IEEE/PES TRANSFORMERS COMMITTEE MEETING  
Dallas Texas  
March 11 - 15, 2007

MEMBERSHIP SUMMARY  
Transformers Committee Members  As of the Spring 2007 Meeting

Aho, David, CM  
Allan, Dennis, CM  
Anderson, Gregory, CM  
Antosz, Stephen, CM  
Ares, Ignacio, CM  
Arteaga, Javier, CM  
Ayers, Donald, CM  
Balma, Peter, CM  
Barker, Ron, CM  
Barnard, David, CM  
Barnes, Michael, CM  
Bartley, William, CM  
Bassett, Thomas, CM  
Beaster, Barry, CM  
Binder, Wallace, CM  
Blackburn, Gene, CM  
Blew, David, CM  
Boettger, William, CM  
Borst, John, CM  
Buchanan, Paul, CM  
Caillien, Thomas, CM  
Chiu, Bill, CM  
Chu, Donald, CM  
Colopy, Craig, CM  
Cooper, Tommy, CM  
Corkran, Jerry, CM  
Crotty III, John, CM  
Crouse, John, CM  
Damico, Frank, CM  
Darovny, William, CM  
Darwin, Alan, CM  
Daubert, Ronald, CM  
Davis, Eric, CM  
Davis, Larry, CM  
Degeneff, Robert, CM  
 dela Houssaye, Kevin, CM  
Dix, Larry, CM  
Dohmal, Dieter, CM  
Duckett, Don, CM  
Dudley, Richard, CM  
Elliott, Fred, CM  
Ellis, Keith, CM  
Fallon, Donald, CM  
Feghal, Pierre, CM  
Ferreira, Marcos, CM  
Fleeman, Jeffrey, CM  
Forsyth, Bruce, CM  
Fortin, Marcel, CM  
Foster, Derek, CM  
Franchek, Michael, CM  
Galloway, Dudley, CM  
Gardner, James, CM  
Gayan, Carlos, CM  
Ghaforian, Ali, CM  
Gimbris, Ram, CM  
Graham, John, CM  
Graham, Richard, CM  
Griesaker, Bill, CM  
Gruber, Myron, CM  
Grunert, Robert, CM  
Guardado, Jeremy, CM  
Haas, Michael, CM  
Hager Jr., Everett, CM  
Hagerty, N Kent, CM  
Hall, A C, CM  
Hammers, Jack, CM  
Hanique, Ernst, CM  
Hansen, Wayne, CM  
Hanus, Kenneth, CM  
Hardin, Michael, CM  
Harley, John, CM  
Hartgrove, Robert, CM  
Hayes, Roger, CM  
Heinzl, Peter, CM  
Hennis, William, CM  
Hoanchan, Thang, CM  
Hollfield, Thomas, CM  
Hollingsworth, Richard, CM  
Hopkinson, Philip, CM  
Hussain, Mohammad, CM  
Iman, Mike, CM  
James Jr., Rowland, CM  
Jhonsa, Virendra, CM  
Johnson, Charles, CM  
Juhlin, Lars-Erik, CM  
Kennedy, Gael, CM  
Kennedy, Sheldon, CM  
Khalin, Vladimir, CM  
Klaponski, Brian, CM  
Kline, Alexander, CM  
Lackey, John, CM  
Ladroga, Richard, CM  
Lau, Michael, CM  
Lewis, Timothy, CM  
Lowe, Donald, CM  
Lundquist, Thomas, CM
Rossetti, John, CM
Russwurm, Dirk, CM
Sampat, Mahesh, CM
Sankar, Vallamkonda, CM
Savio, Leo, CM
Schappell, Steven, CM
Schweiger, Ewald, CM
Sharma, Devki, CM
Shekelton, James, CM
Shertukde, Hemchandra, CM
Shteyh, Ibrahim, CM
Shull, Stephen, CM
Sim, H. Jin, CM
Singh, Pritpal, CM
Smith, Edward, CM
Smith, James, CM
Snyder, Aaron, CM
Snyder, Steven, CM
Spitzer, Thomas, CM
Stiegemeier, Craig, CM
Stoner, Ronald, CM
Swinderman, Craig, CM
Ten Haagen, Christopher, CM
teNyenhuis, Ed, CM
Termini, Giuseppe, CM
Thompson, Jim, CM
Thompson, Robert, CM
Traub, Thomas, CM
Traut, Alan, CM
Trummer, Edgar, CM
Tuli, Subhash, CM
Verdolin, Roger, CM
Verner, Jane Ann, CM
Wagenaar, Loren, CM
Wallach, David, CM
Ward, Barry, CM
Watson, Joe, CM
Weffer, Felipe, CM
Whearty, Robert, CM
Wilks, Alan, CM
Wimmer, William, CM
Woodcock, David, CM
Yule, Kipp, CM
Zhao, Peter, CM
Ziomek, Waldemar, CM
Stewart, Peter, CM - CM
Allustiarti, Raymond, CM - EM
Arnold, James, CM - EM
Kennedy, William, CM - EM
Pierce, Linden, CM - EM
Smith, Jerry, CM - EM
Stensland, Leonard, CM - EM
Vaillancourt, Georges, CM - EM
Aubin, Jacques, CM - LM
Bartnikas, Ray, CM - LM
Benson, Richard, CM - LM
Cash, Donald, CM - LM
Foldi, Joseph, CM - LM
Harlow, James, CM - LM
Jauch, Erwin, CM - LM
Jonnatti, Anthony, CM - LM
Kelly, Joseph, CM - LM
Lindgren, Stanley, CM - LM
Lowdermilk, Larry, CM - LM
Miller, Kent, CM - LM
Moore, Harold, CM - LM
Morehart, Walter, CM - LM
Niemann, Carl, CM - LM
Patton, Jesse, CM - LM
Rahangdale, Ravi, CM - LM
Stahara, Ronald, CM - LM
Sullivan, John, CM - LM
Veitch, Robert, CM - LM
Wiegand, Dave, CM - LM

Membership Code

CM
Committee Member

CM - EM
Committee Member - Emeritus Member

CM - CM
Committee Member - Corresponding Member

CM - LM
Committee Member - IEEE Life Member
IEEE/PES TRANSFORMERS COMMITTEE MEETING
Dallas Texas
March 11 - 15, 2007

MEMBERSHIP SUMMARY
Transformers Committee AM System Roster As of the Spring 2007 Meeting

Abdulsalam, Sami, I I
Abi-Samra, Nick, I I
Aguirre, Samuel, AP
Aho, David, CM
Ahrens, Paul, AP
Ahuja, Raj, AP
Aikens, Thomas, I I
Alfonso, Nelson, AP
Allan, Dennis, CM
Allen Jr, William, I I
Allen, Jerry, AP
Allustiarti, Raymond, CM - EM
Alves, Marcos, I I
Alymmam, Melidia, I I
Amaya, Edilson, I I
Amos, Richard, AP
An, Joy, I I
Anderegg, Don, AP
Anderson, Gregory, CM
Anderson, Thomas, I I
Andersson, Sten, AP
Angell, Don, AP
Antoran, Javier, I I
Antosz, Stephen, CM
Antweiler, Jim, AP
Ares, Ignacio, CM
Aresteanu, Viorika, I I
Armstrong, James, I I
Arnold, James, CM - EM
Aromin, Venzon, AP
Arpino, Carlo, AP
Arteaga, Javier, CM
Asano, Roberto, I I
Ashby, Derek, AP
Ashford, Mark, I I
Astellford, John, AP
Aubin, Jacques, CM - LM
Austin, Peter, I I
Ayala, Wilington, I I
Ayers, Donald, CM
Baldauf, Joao, I I
Baldauf, John, I I
Ballard, Donald, AP
Ballard, Jay, AP
Balma, Peter, CM
Bandow, David, I I

Baqueiro, Fernando, I I
Baranowski, Derek, AP
Barker, Ron, CM
Barnard, David, CM
Barnes, Michael, CM
Barnett, Darren, I I
Barrett, Christine, I I
Barretos-Torres, Israel, AP
Barrington, Gary, I I
Bartek, Allan, AP
Bartels, Terry, I I
Bartley, William, CM
Bartnikas, Ray, CM - LM
Basel, Dana, AP
Bassett, Thomas, CM
Bastarache, Daniel, I I
Basu, Bikash, AP
Bates, Danny, I I
Baumgartner, Christopher, I I
Baumschlager, Rainer, I I
Baur, Martin, AP
Beaster, Barry, CM
Beauchemin, Claude, I I
Beckman, Stephen, AP
Beckwith, Thomas, I I
Bell, Clarence, I I
Bello, Oscar, AP
Benach, Jeff, AP
Benson, Richard, CM - LM
Berger, Zalaya, AP
Bertolini, Edward, I I
Berube, Jean-Noel, I I
Betancourt, Enrique, AP
Binder, Wallace, CM
Bittner, Carlos, AP
Blackburn, Gene, CM
Blackmon, Jr., James, AP
Blake, Dennis, AP
Blew, David, CM
Boettger, William, CM
Boje, George, I I
Bolliger, Alain, AP
Boman, Paul, AP
Bonecutter, Thayer, I I
Bonemann, Dietrich, I I
Borowitz, James, I I
Borst, John, CM
Boston, David, I I
Botti, Michael, I I
Bouffard, Adrien, I I
Brady, Catherine, I I
Brafa, J.D., I I
Branca, Dennis, I I
Bray, Frank, AP
Breckenridge, Thomas, I I
Bredemeier, Troy, I I
Breder, David, AP
Breytenbach, Richard, AP
Britton, Jeffrey, AP
Bronzado, Herivelto, I I
Brown, Kent, I I
Brown, Steven, AP
Brunet, Pierre, I I
Brush, Edwin, AP
Buchanan, Paul, CM
Buckmaster, David, I I
Burns, Clayton, I I
Burns, David, AP
Busch, Michael, I I
Bush, Carl, AP
Busot, David, I I
Cai, Jim, I I
Califano, Jeremy, I I
Callisen, Thomas, CM
Camp, Clyde, I I
Campbell, James, I I
Cancino, Alvaro, AP
Cannon, Michael, I I
Cantrell, Rick, AP
Cardel, Tim, AP
Carlos, Arland, AP
Carulli, Joseph, I I
Caruso, Charles, AP
Carvalho, Carlos, I I
Cash, Donald, CM - LM
Caskey, John, AP
Castellanos, Juan, AP
Chamberlain, Nikki, I I
Chang, Chiahao, I I
Cheatham, Jonathan, AP
Cheim, Luiz, I I
Chen, Yunxiang, AP
<table>
<thead>
<tr>
<th>Membership Code</th>
<th>Committee Member</th>
</tr>
</thead>
<tbody>
<tr>
<td>CM</td>
<td></td>
</tr>
<tr>
<td>CM - EM</td>
<td>Committee Member - Emeritus Member</td>
</tr>
<tr>
<td>CM - CM</td>
<td>Committee Member - Corresponding Member</td>
</tr>
<tr>
<td>CM - LM</td>
<td>Committee Member - IEEE Life Member</td>
</tr>
<tr>
<td>AP</td>
<td>Active Participant</td>
</tr>
<tr>
<td>I I</td>
<td>Interested Individual</td>
</tr>
</tbody>
</table>

Svensson, Marten, CM
Swearingen, Michael, CM
Sweetser, Charles, AP
Swift, Glenn, AP
Swinderman, Craig, CM
Switlishoff, Elroy, CM
Szewczyk, Radoslaw, I I
Tardif, Jean-Pierre, I I
Tarlapally, Susmitha, I I
Tatu, Valeriu, I I
Taylor, Robyn, AP
Teetsel, Mark, AP
Tellez, Richard, I I
Templeton, James, I I
Ten Haagen, Christopher, CM
Tennant, Jeff, I I
teNyenhuis, Ed, CM
Termini, Giuseppe, CM
TestAdmin, Greg, AP
TestMember, Greg, I I
Thaden, Malcolm, AP
Thierry, Juan Luis, AP
Thomas, Michael, I I
Thompson, Jim, CM
Thompson, Robert, CM
Thompson, Steve, I I
Tillman, Robert, AP
Tobin, Thomas, I I
Todd, Brett, AP
Tolbert, George, AP
Tong, Lin, I I
Traub, Thomas, CM
Traut, Alan, CM
Tridon, Florence, AP
Trivitt, Donnie, AP
Troxell, Greg, I I
Trummer, Edgar, CM
Tuli, Subhash, CM
Turcotte, Julie, I I
Twibell, Brian, I I
Tylavsky, Daniel, I I
Upal, Ahsan, I I
Vaillancourt, Georges, CM - EM
Vailoor, Vasanth, I I
Valderrama, Carolina, I I
van der Zel, Gordon, I I
van Kooy, John, I I
Van Neste, Richard, I I
VanHatten, Rick, I I
Vedante, Kiran, I I
Veitch, Robert, CM - LM
Verdolin, Roger, CM
Verner, Jane Ann, CM
Vir, Dharam, AP
Virelli, Greg, I I
Vogel, Herman, AP
Vogel, Susan, I I
vonGemmingen, Richard, AP
Wagenaar, Loren, CM
Wagner, Dieter, AP
Wallach, David, CM
Walls, Albert, AP
Walters, Gary, I I
Walters, Shelby, AP
Wang, May, I I
Wang, Zanji, I I
Ward, Barry, CM
Watkins, James, I I
Watson, Joe, CM
Webb, Geoffrey, I I
Webber, Richard, I I
Weekes, Tony/Mark, AP
Weffer, Felipe, CM
Wegner, Axel, I I
Werelius, Peter, I I
Whearty, Robert, CM
White, Micheal, I I
Whitehead, William, I I
Wicks, Roger, AP
Wiefling, Ronald, AP
Wiegand, Dave, CM - LM
Wilford, Chris, I I
Wilks, Alan, CM
Williams, Michael, AP
Williams, Randy, AP
Wimmer, William, CM
Wiseman, Jim, AP
Wolfe, Frank, I I
Wolter, Steve, I I
Woodcock, David, CM
Woods, Andrew, I I
Wyatt, Hayes, I I
Wyatt, John, I I
IEEE/PES TRANSFORMERS COMMITTEE MEETING
Dallas, Texas
March 11 - 15, 2007

ATTENDANCE SUMMARY
Committee Members and Guests Present at the Spring 2007 Meeting

Aho, Dave
Allen, Jerry
Amaya, Edilson
Amos, Dick
Anderson, Greg
Antosz, Stephen
Antweiler, Jim
Ares, Ignacio
Armstrong, Keith
Arnold, Jim
Aromin, Jack
Arpino, Carlo
Arteaga, Javier
Asano, Roberto
Ashford, Mark
Ayala, Willington
Ballard, Jay
Ballard, Jay
Balma, Peter
Bandow, David
Baqueiro, Fernando
Baranowski, Derek
Barnett, Darren
Barrientos-Torres, Israel
Bartek, Al
Bartley, William
Bartnikas, Ray
Beaster, Barry
Beckwith, Tom
Bell, C. R.
Bello, Oscar
Benach, Jeff
Berler, Zalya
Bertolini, Ed
Betancourt, Enrique
Bittner, Carlos
Blackburn, Gene
Blackmon, Jr., Bo
Blew, Dave
Boettger, Bill
Boje, George
Boman, Paul
Botti, Michael
Brafa, J.D.
Britton, Jeffrey
Brown, Kent
Brush, Ned
Buchanan, Paul
Burns, Clay
Bush, Carl
Busot, David
Cai, Jim
Califano, Jeremy
Callisen, Tom
Camp, Clyde
Campbell, Jim
Cancino, Alvaro
Cancino, Alvaro
Cantrell, Rick
Carlos, Arnold
Carulli, Joe
Carvalho, Carlos
Caskey, John
Castellanos, Juan
Cheatham, Mark
Cheim, Luiz
Cherry, Don
Chiu, Bill
Chmiel, Frank
Cho, Justin
Choi, Ryan
Choiniski, Scott
Chu, Donald
Claiborne, Clair
Clark, Colin
Coffeeen, Larry
Colopy, Craig
Comely, Tracy
Cooper, Tommy
Corel, Dale
Corkran, Jerry
Corsi, Dom
Costa, Florian
Craven, Mike
Crotty III, John
Crouse, John
Damico, Frank
Daniels, Tad
Darovny, Bill
Darwin, Alan
Davis, Eric
Davis, Larry
Davydov, Valery
de la Cruz, Dan
Degeneff, Bob
dela Houssaye, Kevin
Desrosiers, Daniel
Dietrich, Bill
Dix, Larry
Dorris, Don
Drees, Terry
Drexler, Charlie
Duckett, Don
Dudley, Richard
Dukarm, Jim
Dunlap, Dave
Dunn, James
Elder, Lonnie
Elliott, Fred
Ellis, Keith
Fairris, Bruce
Faison, Cleve
Fallon, Don
Faulkenberry, Mike
Fausch, Reto
Feghali, Pierre
Field, Norm
Filer, Doug
Filer, Doug
Foldi, Joe
Foley, Jeff
Forrest, George
Forsyth, Bruce
Fortin, Marcel
Foster, Derek
Foster, Mary
Fradkin, Yuriy
Frichtek, Mike
Frimpong, George
Galbraith, Shawn
Ganser, Bob
Ganser Jr., Bob
Garcia, Eduardo
Garcia, Patricio
Garcia, Ramon
Garcia-Colon, Rodolfo
Gardner, James
Garner, Charlie
Table of Contents


1.0  Chair’s Report, Remarks and Announcements – D. J. Fallon 22

2.0  Approval of Minutes of March 22, 2005- D. J. Fallon 31

3.0  Administrative Subcommittee – D. J. Fallon 32

3.1  Introduction of members and guests 32

3.2  Approval of the Memphis meeting minutes - D. J. Fallon 32

3.3  Additions to and/or approval of the agenda 32

3.4  Meeting Arrangements, Host Report and Committee Finances- GW Anderson 33

3.5  IEEE Staff – Jodi Haasz 34

3.6  Committee Service Awards – K. S. Hanus 34

3.6  Chair’s Report – D. J. Fallon 35

3.7  Vice Chair’s Report – T. A. Prevost 37

3.8  Secretary’s Report – J. Ed Smith 37

3.10  Standards Subcommittee – B. Chiu 40

3.11  New Business 41

3.12  Recognition and Awards – Ken Hanus 43

3.13  Round-Table: Subcommittee Activities – Subcommittee Chairs 44

3.14  Old Business 46

3.15  Adjournment 46

4.0  Vice Chair’s Report – T. A. Prevost 47

5.0  Transformer Standards – Bill Chiu 49

6.0  Recognition and Awards – Ken Hanus 57

6.1  Certificates of Appreciation 57

6.2  Nominations for IEEE, PES and Technical Council Awards 57

6.3  Awards – General 57

7.0  Reports of Technical Subcommittees 58

7.1  HVDC Converter Transformers & Reactors Subcommittee – R.F. Dudley 59

7.2  Instrument Transformers Subcommittee - Jim Smith 61

7.3  Insulating Fluids Subcommittee – Rick Ladroga 65
7.4 Insulation Life Subcommittee – D.W. Platts
7.5 Performance Characteristics Subcommittee – R.S. Girgis
7.6 Power Transformer Subcommittee – T. G. Lundquist
7.7 Underground Transformers & Network Protectors – C.G. Niemann
7.8 Audible Sound and Vibration – J.L. Puri
7.9 Bushings – F. Elliott
7.10 Dry Type Transformers Subcommittee – C.W. Johnson
7.11 Distribution Transformers Subcommittee – K. S. Hanus
7.12 Dielectric Test Subcommittee – L.B. Wagenaar

8.0 Editor’s Report – John Crouse

9.0 Meetings Planning Subcommittee – G.W. Anderson

10.0 Reports of Liaison Representatives
10.1 SCC4 – P.P. Payne
10.2 IEC TC 14 Technical Advisor to USNC - P. Hopkinson
10.3 CIGRE – J.C. Riboud

11.0 Old Business – D. J. Fallon

12.0 New Business – D. J. Fallon

Attachments
- IEEE Patent Information Slides
- Membership Chart
- Prior meeting locations and Chairs
- Standards Status Chart
- Transformers Committee Organizational Chart
- Standards Subcommittee Slide Presentation
- Meetings & Planning Subcommittee Slide Presentation
Forward
The following message was sent by Don Fallon to all meeting registrants and posted on the Transformers Committee website on March 8, 2007 prior to the Spring 2007 Meeting.

Information for all Attendees – IEEE Transformers Committee Meeting, Spring 07

IEEE Patent Requirements for Standards Development Meetings

As discussed during the last several meetings, the Committee continues to be aware of IEEE requirements related to the possibility of inclusion of patents in IEEE Standards. The instances are expected to be rare, and subject to specific review and guidelines. Detailed information on this subject can be found in IEEE website locations listed below. Of present concern to Committee work is the requirement that, at every standards development meeting, a request be made for disclosure of any patents or patent applications any individual believes may be essential to the implementation of the standard. The request, per present IEEE guidelines, is to be made at each WG Meeting, and any responses provided are to be recorded in Meeting Minutes. Positive responses will also prompt a request for documentation on the patent to be supplied to IEEE.

IEEE Instructions for WG Chairs are found on the following 3 slides, available at IEEE web location (http://standards.ieee.org/board/pat/pat-slideset.ppt)

Our WG Meetings are relatively short, and taking the time for the required “call” for patents presents a hardship in our schedule. In order to minimize the impact on WG Meetings, while meeting the intent of the IEEE guidelines, these notes and slides are being provided on the Committee’s website, and all meeting participants are encouraged to review. With this preparation the announcement at WG Meetings, per the following slides, should take no more than a few minutes. For any questions, refer to the following websites, or contact one of the Committee officers.

(http://standards.ieee.org/guides/bylaws/sect6-7.html#6) – Note Clause 6 - Patents

(http://standards.ieee.org/board/pat/guide.html) – Understanding patent issues

Don Fallon, Chair       Tom Prevost, Vice Chair       Ed Smith, Secretary

See Attachment “A” for charts covering the IEEE Patent Requirements for Standards Development Meetings
IEEE / PES Transformers Committee
Spring 2007 Meeting
Dallas, Texas

Meeting Minutes

APPROVED
1.0 Chair’s Report – D. J. Fallon

1.1 PES Technical Council Committees

Technical Council Committees meet at the summer PES General Meeting, so there have been no meetings to report on since the Fall 2006 Transformers Committee Meeting. Next report on Technical Council Committee Meetings will be provided for our next meeting in Minneapolis in October. Several ongoing activities of Technical Council and its Committees are discussed below.

As a general note repeated from the prior report, all our activity leaders (SC and WG Chairs) are reminded that Technical Committees are encouraged to make more effective use of the PES monthly newsletter as a means to provide greater exposure for their activities. Submissions will be considered for publication in virtually any area Committees choose (e.g. pictures, meeting summaries, significant projects completed, awards, etc.). Suggestions for submittals should be forwarded to the Committee officers.

1.2 PES Technical Council Activities

1.2.1 Technical Council Advisory Board

Derek Foster, as a representative of our Committee to the TCAB, provided the following update in January:

The Technical Committee Advisory Board (TCAB) was formed by PES President, John McDonald, with the intention of obtaining input from the Technical Committees regarding their views, needs and plans. The TCAB reports directly to the PES President and currently meets twice a year, prior to the Governing Board Meetings in January and June. The TCAB membership includes representatives of several Technical Committees, including the Transformers Committee.

Some of the issues so far discussed by the TCAB are as follows:

- Technical paper handling, i.e. means by which papers are presented, poster sessions, panel sessions etc.
- Interest in, or support for a second general meeting each year.
- Closer liaison between working groups of different Technical Committees where there are areas of common interest.

If you have any issues you wish to bring to the attention of the TCAB, please contact Derek Foster by email at drfoster@ieee.org.

1.2.2 Policy Development Coordinating Committee (PDCC)

The PDCC developed PES Policy Statement on Energy and Environment has been modified with input from our Committee and others, and has been reviewed and unanimously approved by the IEEE Board of Governors. The Policy Statement, and Background, are repeated here:

IEEE POWER ENGINEERING SOCIETY
POLICY STATEMENT ON ENERGY & ENVIRONMENT
(Prepared by the IEEE-PES Policy Development Coordinating Committee)

This policy statement is concerned with the increase in the production, delivery and use of electrical energy, and its effect on the environment.

Abundant and economic energy is a key part of modern society. The harnessing of energy, and in particular the use of electrical energy to replace human effort, has led to the high standard of living today in the developed countries. Continued growth in the services that energy can provide will allow for new levels of improved quality of life, particularly in developing countries. Because of these factors, energy is a global and commercial priority.

The IEEE Power Engineering Society encourages governments to promote research, development, commercialization, and utilization of energy as parts of comprehensive, national energy strategies based on:

- Developing economic new sources of supply and innovative technologies
- Developing the delivery infrastructure to meet changes in demand and supply
- Improving energy efficiency and reliability in production, delivery, and customer end use
- Having due concern for the environmental impacts of energy developments.

While energy use will grow, prudent development must seek methods to minimize the negative effects of energy production, delivery and use, and must aim to reduce global dependence on fossil fuels. No single solution fits all situations. A comprehensive energy policy must consider all of the available options in an appropriate manner. The role of the customer in energy choice and usage should be recognized. The value of diversity of energy resources and of technologies must be recognized, and over-dependence on any single fuel or energy source should be avoided where reasonable. The finite nature of environmental and ecological resources must also be recognized. These resources must be managed wisely for current and future generations.

This statement was developed and approved by the Technical Council of the IEEE Power Engineering Society, and represents the considered judgment of a group of IEEE members with expertise in the subject field. IEEE Power Engineering Society is an organizational unit of the Institute of Electrical and Electronics Engineers, Inc.

BACKGROUND

For the foreseeable future, fossil fuels will make up by far the greatest proportion of the global energy supply. Burning fossil fuels produces emissions to the atmosphere and water bodies that impact the environment and may affect human health. While the evidence connecting the observed rising concentration of carbon dioxide and the apparent increase in global temperatures is regarded by some as not yet conclusive, it is surely prudent to adopt strategies that strive for balance between carbon dioxide production and its consumption.

Furthermore, fossil fuel reserves are finite and likely to be significantly depleted sometime during this century. The present trend of increase in fossil fuel usage is therefore unsustainable. There is a window of opportunity for a managed transition to reducing global dependence on fossil fuels by increasing non-fossil energy sources.

1. Decision Criteria
Energy decisions should include the evaluation of as many of the life cycle costs and benefits as are reasonably obtainable. These include the fixed and variable costs associated with energy sourcing,
conversion, delivery and usage as well as the benefits to the economy, environment, and well being of society. In addition, environmental impacts, to the extent possible and practicable, should be evaluated on a full life cycle basis and added to these costs. Fuel evaluation should include consideration of abundance and the costs of extraction, procurement, movement, waste disposal, and site restoration. Included in these evaluations should be the risks associated with security breaches and system failures. It must be recognized that some alternatives will be more economical and practical in certain geographical areas. It must also be recognized that priorities in developing countries will differ from those in the industrialized world.

2. Energy Options
The IEEE Power Engineering Society urges support for programs that encourage the development of the following energy sources. The development should focus on options that are economical, practical and have minimal environmental impact such as:

- biomass energy
- "clean" coal
- geothermal energy
- hydroelectric energy
- nuclear energy
- oil and natural gas
- solar energy
- tidal and wave energy
- wind energy

Environmental impact concerns can be a source of disagreement, yet there can be no doubt that a prudent policy towards carbon emissions is appropriate. The issue can be addressed in many ways. We urge that in growing our energy systems, consideration be given to:

- energy efficiency, of both supply and demand, including use of heat and other by-products
- energy use reduction and demand-shifting based on incentives
- distributed resources that are closer to the point of energy usage
- energy storage options, to increase the capability of power systems to absorb the output of intermittent sources, such as wind and solar
- carbon capture and storage, whereby the carbon of fossil fuels is not emitted to the atmosphere
- economic tools such as carbon taxes, emission trading, and customer incentives

Energy storage options, such as hydro inter-seasonal storage, hydro pumped storage, compressed air, flywheels, superconducting magnets, super capacitors, and batteries, should be considered where appropriate and environmentally acceptable. Such systems can increase the capability of power systems to absorb the output of renewable (and intermittent) sources, such as wind and solar, and improve the economy of power system operations. Under the umbrella of energy storage options, research and development of the hydrogen economy and infrastructure is also to be encouraged, with the caution that hydrogen alternatives should be carefully analyzed to ensure that the net environmental (and economic) benefits are positive.

Energy efficiency should be recognized as an effective means of minimizing the needs for new energy sources as well as negative impacts on the environment. Energy efficiency includes supply-side (for example, conversion efficiency, delivery system efficiency and combined heat and power) as well as demand-side end use efficiency improvements.
Customer demand response and customer involvement can only be fully achieved through improved information infrastructure, user-friendly appliances, and market-driven tariffs. If customers can be included in the decision-making process of energy consumption, primarily through incentives to reduce or shift usage to a different time period, then these patterns would contribute to conservation and increased efficiency.

3. Power Delivery Systems
Power delivery systems are already technically advanced, but should not be overlooked in the development of energy resources. Many of the sources of energy that will contribute to future supply are not located close to the places where the energy is needed, so that the energy must be moved, often in electrical form, over sometimes very large distances. (Hydro and wind power, for example, cannot be moved by pipelines.) A well maintained energy transport infrastructure that includes both a power delivery system to connect generation resources with loads and comprehensive monitoring and control systems to manage the power system will generally be needed.

4. Research & Development
Increased funding for research and development (R&D) in both the public and private sectors is needed and strongly recommended. R&D should be focused on accelerating the advancement of technology and environmental solutions for the priority strategies of increasing energy sources, improving delivery performance and improving energy efficiency. This is particularly important for those options that have high commercial potential to improve fundamental energy economics and reduce dependence on fossil fuels.

Renewable energy technologies still need R&D efforts not only for fundamental research, but increasingly for development and implementation issues.

Nuclear energy represents a significant portion of current global energy supply and is one of the most economical energy sources today. In order to improve this source of non-carbon emitting base-load generation, continued research should be committed toward passively safe advanced reactor designs and the long-term management of used nuclear fuel.

Fossil fuel reserves is another research area that is vitally important to energy strategy and the planning of a comprehensive and credible assessment of the remaining global reserves that are commercially viable is critical.

The Chair will review to see if an internet link is available to access IEEE and PES Policy Statements, and will update accordingly.

1.2.3 PES Meeting Schedules

The schedule for upcoming PES General Meetings is as follows:
2007: June 24-28 in Tampa, Florida.
2008: July 20-24 in Pittsburgh, Pennsylvania
2009: July 26-30 in Calgary, Alberta, Canada

PES Conference & Exposition (CE) schedules:
2008: Transmission & Distribution (TDCE), April 22-24 in Chicago, Illinois

PES Joint Technical Committee Meeting (JTCM) schedules:
January 7-10, 2008 in San Antonio, Texas (http://www.pestechnical.org/)
The JTCM schedule has been set up by PES as a winter venue for 3 days of meetings, allowing Technical Committees to schedule individual meetings as needed. Coordination of schedule with PES as early as possible will help assure that room can be found for requested meetings, and our Committee’s activity leaders (SC and WG Chairs) are encouraged to consider making use of these venues if they might allow projects to proceed more effectively between our meetings. To set up participation in these sessions for our Committee, contact should be made with the PES Technical Council (through our Committee officers) and directly with PES meetings coordinator John Paserba (j.paserba@ieee.org).

Additional information on any of the above meetings can be found on the PES website at (http://www.ieee.org/portal/site/pes/)

1.3 Transformers Committee Activities
Updates on activity related to some areas of concern for the Committee, together with notes of Committee interest, follow:

1.3.1 Coordination and Liaison Activities – Progress on PC57.142
Joint discussion and cooperative effort has been ongoing involving Transformers Committee and Switchgear Committee members to move forward on PC57.142 - Guide to Describe the Occurrence and Mitigation of Switching Transients Induced by Transformer, Switching Device, and System Interaction. Work will continue to be guided by the Transformers Committee, as primary sponsor; and in recognition of the crucial and necessary role our colleagues from the Switchgear Committee play in assuring this document meets the needs of our industry, the PAR for this project lists the Switchgear Committee as our joint sponsor. A joint Task Force, with representatives of both Committees, will prepare the document for ballot. A new PAR for this project was submitted in January of this year.

1.3.2 PC57.104 – Draft Guide for the Interpretation of Gases Generated in Oil-Immersed Transformers
Many of you are aware that C57.104-1991 has been officially withdrawn by IEEE based on recommendation by the Transformers Committee at the end of 2005. This was a difficult decision for the Transformer Committee, but it was necessary in order to move forward within the established policy and procedures of the IEEE SA standards development process. As this document is critically needed by our industry, a two step process is planned to restore it – first, to make minor changes to address some of the most pressing issues and to ballot to get the document back into print; and second, to then immediately begin revision to reflect additional advances in current knowledge, and to incorporate relevant material created during the previous effort at revision of the guide. A cover letter has been provided through the IEEE SA Invitation to Ballot process explaining this intended path to restore this Guide to publication.

1.3.3 IEEE/IEC Dual Logo Program
The IEEE/IEC dual logo process seems to have hit a snag, in the Chair’s judgment, with recent concerns from several IEC representatives on the submittal of IEEE C57.123 (Guide for Transformer Loss Measurement) for consideration for Dual Logo status. The subject document has references to several other IEEE documents, and there is reluctance to approve as such approval might imply acceptance of the referenced documents also – and these referenced documents have not been subjected to review by IEC. The concern is perhaps valid, and if valid may apply to virtually any IEEE document submitted, including C57.135 (Phase Shifting Transformer Guide), previously accepted by IEC for dual logo status. We have not yet determined how to reply to these IEC comments, and may need to discuss with IEEE to determine how to proceed.
1.3.4 IEEE SA Financial Reporting Requirements
Since last year, IEEE SA has required all “Standards Developing Groups” to complete annual financial reports submitted in an IEEE SA Template (Form L50-S). Our Meetings Planning SC Chair has maintained financial records for the Committee, and has recently made the effort to modify the financial record spreadsheet he developed to facilitate reporting the Committee budget per the L50-S form. The 2006 financial report will be ready for filing shortly. Based on the ongoing needs for this detail of financial reporting, the Chair feels consideration of a Treasurer’s position for the Committee is appropriate. This topic will be discussed at the Administrative SC Meeting.

1.3.5 Meeting Agenda Change – New Business
A change has been made – on a trial basis - in the Agenda arrangement at Dallas for both the Administrative SC and Main Committee Meeting. New Business has been moved forward in the Agenda. With New Business in the typical end of meeting timeslot, and with the time spent on other Agenda items, New Business does not always receive the attention it needs. The time spent on ongoing projects is indeed important, as the Committee deals with many standards documents and substantive issues related to the development and maintenance of those documents – and at times it seems our plates are already so full (recognizing we’re all volunteers) that the ability to take on new issues seems limited. Despite this challenge, we also need to provide sufficient time to raise new technical issues and to address planning and strategy on how the Committee should work. The intent, during this trial, will not necessarily be to debate and discuss each new issue fully within the meeting context, but to at least raise issues, discuss significant points, and suggest course of action.

1.3.6 Association Management (AM) System
All Committee members and active participants, and all individuals interested in Transformers Committee activities, are reminded that virtually all communications on Committee meetings and activities are handled through the Committee website (http://www.transformerscommittee.org/) and through electronic media. Contact information is maintained 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 encouraged 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.

1.3.7 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 one full year – and can secure the acknowledgement of at least 3 Activity Chairs (WG’s, but must include at least one SC 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.

1.3.8 Announcements / Acknowledgments
The Committee notes with sadness that our good friend and colleague Frank Gryszkiewicz succumbed to his long illness and passed away on February 19, 2007. Frank had been an active participant in Committee activities at least since the early 80’s, and he served for many years from the 90’s as our Insulating Fluids Subcommittee Chair. Many of our members and participants knew Frank as a friend and a very capable and knowledgeable Committee Member, and we all benefited from our association with him. The Committee has expressed condolences to Frank’s family on behalf of all our participants. We will remember Frank, and all of our departed colleagues who preceded us in Committee activities.

On a less somber note, Committee Member Ron Stahara has received word from IEEE that his membership classification has been raised to Life Senior Member, effective January 1, 2007. We send our congratulations to Ron. If you are aware of others from within our ranks achieving this distinction, or other IEEE recognition, please advise one of our officers so we can share the good news with all.

Your Committee leadership (past and present) is very proud of all that our Committee accomplishes in service to our industry, and recognizes that without the teamwork and effort of each of our Members and Participants - working as volunteers – none of those accomplishments would be possible. Tom and Ed join with me in sending our thanks to each of you. Keep up the good work!

1.1.4 Chair’s Remarks and Announcements at the Main Committee Meeting

Comments and announcements from the Chair at the start of the Main Committee Meeting on Thursday March 15 included the following:

1) The Chair noted that we are all enriched professionally and personally by those we come in contact with through our Committee activities. Frank Gryszkiewicz, long time Committee member and for many years Chair of the Insulating Fluids SC, recently passed away and will be sadly missed by his friends on the Committee. The Chair asked for a moment of silence to honor the memory of all our Committee colleagues who have passed on.

2) Congratulations to Ron Stahara, whose IEEE membership classification will be raised to Life Senior Member, effective January 1, 2007. Please notify one of the Officers if you or any other of our members reach similar milestones.

3) Thanks and appreciation were provided for the continuing IEEE Staff support at our meetings. Their active and knowledgeable participation in our Monday Standards Luncheon, and their accessibility during our meetings, aids our understanding of IEEE processes and procedures and facilitates our work. There has been one change in our IEEE Liaison Staff with Angela Ortiz’s departure from IEEE to attend to personal business, and the announcement that Matt Ceglia will assume liaison responsibilities at least on an interim basis. Angela’s enthusiastic and energetic support of our Committee was noted, and we look forward to IEEE’s continuing role working closely with us.

4) Thanks were provided to the Technical Tour Host – High Voltage Supply, a Division of Waukesha Electric; and to the Break Sponsors – Omicron, Serveron, and JSHP (Jiangsu Huapeng) Transformers. The Committee recognizes the value of such support in providing learning opportunities and also moderating costs for our attendees.

5) Special thanks and appreciation were also provided to Ken Hanus and TXU Electric for hosting this meeting. Ken and all his TXU colleagues went to great efforts in preparing for this meeting,
and all our participants thoroughly enjoyed the Texas-sized welcome and outstanding hospitality throughout the week.

6) We have continued our practice of providing exceptional Tutorial sessions at our meetings, with sessions in Dallas on Transformer Life Expectancy and Life Extension. The Committee wishes to thank the Authors and Presenters for this meeting’s tutorials — Bill Bartley, Paul Boman, Tom Prevost, Craig Stiegemier, and David Woodcock, and again to acknowledge our appreciation to all prior Tutorial Presenters.

7) Additional Liaison activity is contemplated with the Switchgear Committee as a result of recent NesCom questions on the PAR submittals for the PC57.12.30 and PC57.12.31 Distribution Transformer Enclosure Integrity Guides. These Guides are also used to address enclosure needs for reclosers, sectionalizers, and associated equipment. The PES Technical Council encourages such Liaison work, and our Committee is doing its part.

8) Additional comments were provided on IEEE SA requirements for Financial Reporting. IEEE SA periodically sends out notifications on the financial reporting requirements to a wide range of WG leaders, as requirements are for reporting by all standards development groups. The notifications are sent automatically, and the process does not yet recognize that for the Transformers Committee (and possibly many other Technical Committees), all financial activity is at the Committee level, and no SC’s, WG’s, or TF’s have individual financial activity. If our Activity Leaders receive such requests, they can advise IEEE that all financial reporting for the Transformers Committee will be at the Committee level. No other individual group financial reports are required for our Committee.

9) The Chair noted that under the guidance of our Secretary Ed Smith, and with the assistance of all who contributed their input, the Fall ’06 Montreal Meeting minutes were published less than three months after the meetings, and just under two months prior to this meeting. The timing is appropriate, and sets a standard that had not previously been met in recent years. Well done!

10) At meeting time the invitation to ballot was open for the PC57.104 “Gas Guide”. The cover letter provided some of the history that resulted in this Guide being withdrawn, and the efforts now to restore it to publication with a limited number of critically needed revisions, and then to plan to immediately start on the next revision updating the guide more fully to the current state-of-the-art. Balloters were urged to support this process.

11) Only one new member application was presented for review at this meeting, and as a result of approval of that application the Committee welcomes Marcel Fortin as our most recent new member. The Chair encourages all SC Chairs to review their rosters and to urge active participants to apply for membership.

12) All our members are encouraged to be aware or the IEEE Fellows Program and requirements (see http://www.ieee.org/web/membership/fellows/index.html), and to consider nominating the most accomplished among our ranks for this honor.

13) IEEE Staff was advised at the Administrative SC Meeting that the next major area of concern for which we need to actively work with IEEE is the tremendous burden that the editorial process sometimes turns out to be for our WG Chairs in preparing new and revised documents. Difficulties include:
• Scanning process used to convert standards documents to Word format for use by WG’s in revision leaves much to be desired – many errors must be corrected.
• IEEE present practice of archiving documents for return to WG’s (for next revision) in Word format is very good – but until all documents have gone through this cycle we still will be faced with scanning difficulties.
• PAR submittal and document editing (per the Style Manual) processes can be difficult, as our WG Chairs do not regularly perform these tasks. Additional assistance from IEEE in these processes would be helpful.

The next step is for the Committee to document these concerns in written format to IEEE to initiate further discussion on possible solutions.

14) Technical Tours constitute one of the highlights of our meetings, and our tour hosts go to considerable effort and expense on our behalf. Please value that effort and expense, and if you do sign up for a tour – even if offered at no cost to the participant – honor your commitment to attend. Recent experience included tours with a significant percentage of no-shows, and that can give the impression that we are lacking in professionalism and courtesy. Certainly schedule difficulties or work commitments can arise; in that case please notify the tour host so that their expense will not be wasted, and so perhaps others on a waiting list may be able to attend. Thanks for your consideration in this regard.

15) Our SC and WG Chairs perform invaluable service to the Committee in coordinating and guiding activities on the large number of standards document projects we are working on, and that leadership is greatly appreciated. Progress on projects is enhanced when meetings are held and leadership is present for all active projects at our meetings. It is especially important, once meeting scheduled have been finalized, that individual WG meetings be held as planned. Our attendees schedule their time and costs for attendance based on the schedule of expected meetings. Last minute work or personal needs can result in an activity chair cancelling plans to attend, and so all WG Chairs are urged to appoint a vice chair and/or secretary to help assure continuity of progress if they are unable to attend.

16) In concluding his remarks, the Chair, indicated how proud the Committee Officers were of the tremendous volume and quality of work performed by the members and participants of our Committee, and expressed appreciation to all for their professionalism and dedication to IEEE activities, and for the spirit of friendship that prevails at our meetings. All were encouraged to keep up their great work.

Respectfully submitted,
Donald J. Fallon
Chair, IEEE/PES Transformers Committee
2.0 Approval of Minutes from Fall 2006 Meeting – Donald Fallon

Chair asked that a motion be made to approve the minutes of the Fall 2006 (Montreal, Quebec, CANADA) meeting. A motion was made by Fred Elliott and seconded by Ken Hanus to approve the Fall 2006, Montreal minutes. The Minutes were unanimously approved.
3.0 Administrative Subcommittee – Donald Fallon

Chairman Donald Fallon called the Administrative Subcommittee to order at 2:05pm Sunday March 11, 2007 in Dallas, Texas. Full details of the Minutes of the Administrative Subcommittee Meeting Minutes follow.

3.1 Introduction of Members and Guests

Introductions
Introductions were made by members and guests

The following members of the Subcommittee were present:
- Gregory Anderson
- Bill Chiu
- Richard Dudley
- Donald Fallon
- Ramsis Gergis
- Ken Hanus
- Charles Johnson
- Thomas Lundquist
- Loren Wagenaar
- Donald Platts
- Thomas Prevost
- Fred Elliott
- Edward Smith (Ed)
- Carl Niemann
- Jeewan Puri
- James Smith (Jim)

The following members were absent:
- Richard Ladroga

The following guests were present:
- Jin Sim
- Steve Shull
- Sue McNally (for R. Ladroga)
- Peter Balma
- Jodi Haasz
- Jennie Steinhagen

3.2 Approval of the Montreal, Quebec, CANADA Meeting Minutes

The Montreal meeting minutes were approved as printed. A motion was made by Carl Niemann, seconded by Ken Hanus. The motion passed with no descending votes

3.3 Agenda Review

IEEE/PES TRANSFORMERS COMMITTEE
ADMINISTRATIVE SUBCOMMITTEE MEETING – AGENDA

Hilton Dallas Lincoln Centre Hotel; Dallas Texas, USA – Room Adams A/B
Sunday March 11, 2007 - Call to Order 2:00 pm

1. Introduction of Members and Guests (:05)

2. Approval of Montreal QC Admin SC Meeting Minutes (:05)

3. Additions to and/or Approval of the Agenda (:05)

4. Meeting Arrangements, Host Report, and Committee Finances
   4.1 - S’07 – Dallas – KS Hanus (:05)
   4.2 - Meetings/Finances - GW Anderson (:10)

5. IEEE Staff – Jodi Haasz, Jennie Steinhagen (:20)
   5.1 - IEC Dual Logo concerns (references to IEEE documents)
5.2 - MyProject update (PAR submittals, rosters)
5.3 - IEEE Editorial Coordination Concerns (dialogue)

6. Chair's Report – DJ Fallon (.05)

7. Vice Chair’s Report – T Prevost (.05)

8. Secretary's Report – Ed Smith (.05)
   8.1 - Membership Review (.10)

9. Standards Report - B Chiu (.30)

10. Break (.10)

11. New Business, Committee Planning (.40)
    11.1 - Document Issues: Retention; Figures; Surveys – P Balma
    11.2 - Financial Reporting Requirements – Establishment of Treasurer’s position – D. Fallon
    11.3 - Proposed Revision of PES Standardization Strategy – D Fallon
    11.4 - Reduced registration fee for focused participation – discussion – D. Fallon
    11.5 - Other

12. Committee Service Awards – KS Hanus (.05)


14. Old Business (.20)
    14.1 - Coordination and Jurisdictional Issues (as needed, after status of PC57.142 reviewed)
    14.2 - Committee sponsorship of educational courses/training
    14.3 - Other

Adjourn

3.4 Meeting Arrangements, Host Reports, and Committee Finances – G.W. Anderson

3.4.1 Meetings Arrangements

Meeting attendance (preliminary as of March 11, 2007) for Dallas is:

- Attendance: 396
- Spouses: 38
- No Shows (registered and didn’t attend): 10
- Dallas “walk-up” registration’s: 2
- Sunday Reception: 306
- Monday Standards Luncheon: 119
- Tuesday Speaker Luncheon: 192
- Wednesday Dinner Social: 175
- Sunday Event Museum Tour: 28
- Monday HVS Tour: 59
- Tuesday HVS Tour: 57
- Meeting Minutes: 67

IEEE TC Web access key code is 8006784333
Future Meetings:
F07 (October 14-18, 2007) – Minneapolis, MN, Hilton-Minneapolis hotel, hosted by Xcel Energy
S08 (March 16-20, 2007) – Charlotte, NC, Westin Hotel, hosted by Shaw Electric Delivery Services
F08 (October 5-9, 2008) - Porto, Portugal ... Sheraton Hotel
S09 (April 19-23, 2009) – Southern part of the US

3.4.2 Finances

Meeting Finances:
Balance before the “Fall 2005” Memphis, TN meeting $18,793.02
Balance before the “Spring 2006” Costa Mesa, CA meeting $1,729.81
Balance before the “Fall 2006” Montreal, Canada, meeting $17,014.33
Balance before the “Spring 2007” Dallas, TX meeting $17,751.00

3.4.3 Membership

Greg suggested and requested that we add two new membership groups to the types of memberships listed in our data base.

Interested Individual (current)
Interested Individual – IEEE Life Member (add)
Active Participants (current)
Active Participants – IEEE Life Member (add)
Committee Members (current)
Committee Members – IEEE Life Member (current)
Committee Member – Emeritus Member (current)
Committee Member – Corresponding Member (current)

MOTION
As a result of this request there was discussion about giving all IEEE life members (the two suggested new groups) the same registration discount afforded to Committee Members – IEEE Life Members (registration fee of $50). Greg made a motion, “All IEEE Life Members get a registration discount the same as the current IEEE Life Members that are Committee Members of $50.00”. The motion was seconded by Ken Hanus a ballot was taken and the motion passed with 17 affirmative votes with no negates

Everyone should encourage active participants to become a “Transformers Committee” member. Don strongly suggested that the Subcommittee chairs take an active role in making sure that active members of their Working Groups are encouraged to become Transformer Committee members

3.5 IEEE Staff – Jodi Haasz, Jennie Steinhagen

Don Fallon announced that Angela Ortiz has chosen to leave the IEEE to pursue personal interests. Don also announced that Sue Vogel has appointed Matt Ceglia as our IEEE Liaison.

Representing IEEE at the Administrative Subcommittee Meetings were, Jodi Haasz and Jennie Steinhagen
Jodi Haasz reviewed IEEE Issues
IEEE/IEC dual logo process has hit a snag regarding the referenced documents. This issue currently affects IEEE C57.12.123 (Guide for Transformer Loss Measurement). If these concerns, regarding the potential acceptance of reference documents within a Standard up for dual logo consideration are limiting factors then all future documents will also be affected. Don Has suggested that we might want to get some form of guidance from the IEEE staff regarding a direction.

Don Fallon expressed to the IEEE Staff the level of concern that our Working Group Chairs have for the tedious “editorial process” and focused on how we can make things better. Don specifically referenced Brian Klaponski and Richard Dudley’s Working Groups and the issues, frustrations and struggles they have been experiencing.

Jennie Steinhagen of the IEEE expressed the desire to work with us to improve the process. **ACTION ITEM:** Don Fallon appointed Bill Chiu the focal point for this issue and the IEEE.

Bill Chiu pointed out that the standards template was actually a good document format and he preferred to use it. He indicated that the principal problem was that Engineers, Managers and Executives was not a good and effective use of our talent and resources for converting word documents to the template. Bill will work with Jennie and the IEEE to improve the process.

For additional IEEE Items please see “NEW BUSINESS”

3.6 Chair’s report – Donald Fallon

The Chair’s report in it’s entirety is included in section 1.

**Some of the highlights specifically pointed out are as follows**

**TACB**
Derek Foster, is the representative for our Committee on the TCAB

The Technical Committee Advisory Board (TCAB) was formed by PES President, John McDonald, with the intention of obtaining input from the Technical Committees regarding their views, needs and plans. The TCAB reports directly to the PES President and currently meets twice a year.

Some of the issues so far discussed by the TCAB are as follows:

- Technical paper handling, i.e. means by which papers are presented, poster sessions, panel sessions etc.
- Interest in, or support for a second general meeting each year.
- Closer liaison between working groups of different Technical Committees where there are areas of common interest.

**PDCC**
The PDCC developed PES Policy Statement on Energy and Environment has been modified with input from our Committee and others, and has been reviewed and unanimously approved by the IEEE Board of Governors.

**POLICY STATEMENT ON ENERGY & ENVIRONMENT**
(Prepared by the IEEE-PES Policy Development Coordinating Committee)
This policy statement is concerned with the increase in the production, delivery and use of electrical energy, and its effect on the environment.
The IEEE Power Engineering Society encourages governments to promote research, development, commercialization, and utilization of energy as parts of comprehensive, national energy strategies based on:

- Developing economic new sources of supply and innovative technologies
- Developing the delivery infrastructure to meet changes in demand and supply
- Improving energy efficiency and reliability in production, delivery, and customer end use
- Having due concern for the environmental impacts of energy developments.

Coordination and Liaison Activities
Joint discussion and cooperative effort has been ongoing involving Transformers Committee and Switchgear Committee members to move forward on PC57.142 - Guide to Describe the Occurrence and Mitigation of Switching Transients Induced by Transformer, Switching Device, and System Interaction. Work will continue to be guided by the Transformers Committee, as primary sponsor; and in recognition of the crucial and necessary role our colleagues from the Switchgear Committee play in assuring this document meets the needs of our industry, the PAR for this project lists the Switchgear Committee as our joint sponsor. A joint Task Force, with representatives of both Committees, will prepare the document for ballot.

Concern was also brought up and discussed regarding C57.12.30 (Pole Mounted Equipment – Enclosure Integrity for Costal Environments) and C57.12.31 (Pole Mounted Equipment – Enclosure Integrity). The PAR’s for these two standards have been submitted for co-sponsorship between Transformer and Switchgear Committees. (Don for reference, this would also apply to C57.12.28 (Pad Mounted Equipment – Enclosure Integrity), C57.12.29 (Pad Mounted Equipment – Enclosure Integrity for Costal Environments) and C57.12.32 (Submersible Equipment – Enclosure Integrity). The Switchgear Committee should also play a key roll in this group of standards, I discussed this with Bob Olen.)

PC57.104 – Draft Guide for the Interpretation of Gases Generated in Oil-Immersed Transformers
Many of you are aware that C57.104-1991 has been officially withdrawn by IEEE based on recommendation by the Transformers Committee at the end of 2005. This was a difficult decision for the Transformer Committee, but it was necessary in order to move forward within the established policy and procedures of the IEEE SA standards development process. As this document is critically needed by our industry, a two step process is planned to restore it – first, to make minor changes to address some of the most pressing issues and to ballot to get the document back into print; and second, to then immediately begin revision to reflect additional advances in current knowledge, and to incorporate relevant material created during the previous effort at revision of the guide. A cover letter has been provided through the IEEE SA Invitation to Ballot process explaining this intended path to restore this Guide to publication.

IEEE SA Template (Form L50-S)
Since last year, IEEE SA requires all “Standards Developing Groups” to complete annual financial reports submitted in an IEEE SA Template(Form L50-S). Greg Anderson has made the effort to modify the spreadsheet he developed for tracking the Committee’s budget to facilitate reporting per the L50-S form. The 2006 financial report will be ready for filing shortly. Based on the needs for financial reporting, I feel consideration of Treasurer’s position for the Committee is appropriate, and I’d like to discuss this at the meeting. (SEE ADDITIONAL ACTION UNDER “NEW BUSINESS”)

Proposed revision to the PES Standardization Strategy Comments
Jeff Nelson of the Switchgear Committee has sent a proposed revision to the PES Standardization
Strategy to Technical Council. Comment from the Committee’s representative to Technical Council (our Chair) is due to Technical Council by the end of March. We don’t need to take much time at the Admin SC Meeting on this, but I am attaching the e-mail, together with its attached present and proposed revised strategy statements, for your review. We can discuss briefly at the meeting; if you have comments please forward them to me by March 20 (latest).

3.8 Vice Chair’s report – Tom Prevost

The Vice Chair’s report was distributed prior to this meeting and is included in its entirety in Section 4

Some of the highlights specifically pointed out are as follows

Technical Paper Session at the 2006 PSCE
The IEEE PES Power Systems Conference and Exposition was held in Atlanta, Georgia on October 29-Nov 1, 2006. The venue for this conference was the Sheraton, Atlanta hotel

2007 General Meeting Tampa, Florida
The 2007 IEEE Power Engineering Society 2007 General Meeting will be held 24 – 28 June 2007 at the Tampa Convention Center and the Marriott Waterside Hotel in Tampa, Florida, USA.

The Transformers Committee is sponsoring two paper sessions with a total of thirteen technical papers. Due to the amount of papers presented at the meeting we have agreed to two sessions, however these will be longer sessions so that each presenter will have a thirty-minute allotment for presentation and questions. The paper sessions will be on Wednesday June 27, 2007 in the morning and afternoon.

Committee Organization and Procedures Manual
The Transformers Committee O&P Manual revision is currently in process

Power & Energy Magazine Submission
The Transformers Committee needs to prepare an article for P&E magazine. The Vice-Chair will be looking for topics and volunteers to prepare this article. If you have any thoughts please contact the Vice-Chair

3.9 Secretary’s Report – J. Ed Smith

3.9.1 Membership Review
Voting Members – 16 New Members were approved and added at the Montreal meeting:

- Kevin dela Houssaye - Cooper Power Systems - Producer
- Guy Morissette - Siemens/VA Tech/FP - Producer
- Iqbal Hussain - ABB - Producer
- Chris Ten Hagen - GE - Producer
- Gael Kennedy - NPPD - User
- Paul Buchanan - Moloney Electric - Producer
- Mike Hardin - Kuhlman - Producer
- Charles Drexler - KAEC - Producer
- Al Traut - Kuhlman - Producer
- Jane Ann Verner - PEPCO - User
- Brian Klaponski - CARTE - Producer
Welcoming letters were sent to these new members. Again our aim is to encourage active participation in the work of the Committee, and encourage all participants to become members of the Committee.

We will continue to encourage and work with all Subcommittee Chairs on a new member sign-up campaign.

The Committee notes with sadness that our good friend and colleague Frank Gryszkiewicz succumbed to his long illness and passed away on February 19, 2007.

Ron Stahara has received word from IEEE that his membership classification has been raised to Life Senior Member, effective January 1, 2007. We send our congratulations to Ron.

Membership, including changes made at the Montreal meeting now stands at:

- Members: 195
- Life Members: 19
- Corresponding Members: 1
- Emeritus Members: 7
- Active Participants: 271
- Interested Individuals: 439

Refer to attachment “B” (Membership Chart)
Refer to attachment “C” (Prior Meeting Locations and Transformers Committee Chairman)

3.9.2 New Member Applications

1 New application for Committee Membership have been submitted for:

- Marcel Fortin Consultant/Hydro Quebec User

This applications will be reviewed at the Administrative Subcommittee meeting. 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 to applicants awareness that Membership is a privilege gained through active participation 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 understanding 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 can be forwarded to the Secretary’s attention at any time for review at the next AdsubCom meeting.
3.9.3 Committee and Subcommittee Directory Rosters
In order to provide indemnification to working group and subcommittee members it is crucial that membership lists be maintained. Fortunately the new AM system should make this simple to administer. 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.

3.9.4 Meeting Minutes
The minutes of the Montreal, Quebec CANADA Fall 2006 transformers committee meeting were posted to the committee website on Friday, January 19, 2007.

The minutes of the Montreal, Quebec CANADA Fall 2006 meeting were mailed on Friday, January 19, 2007, to those who ordered printed copies during meeting registration. 65 registrants ordered printed copies of the Minutes. A total of 75 copies were printed and bound. The cost of previous minutes were:

- Raleigh (Spring ’03) $3946.82
- Pittsburgh (Fall ’03) $714.27
- San Diego (Spring ’04) $1481.77 (78 @ $13.60 ea. + $357.17 postage)
- Las Vegas (Fall ’04) $1084.56 (60@ $12.76 ea. + $319.17 postage)
- Jackson (Spring ’05) $661.44
- Memphis (Fall ’05) $643.07 (postage $468.07 + printing $175)
- Costa Mesa (Spring ’06) $723.64 (postage $263.64 + printing $460)
- Montreal (Fall ’06) $1020.19 (postage $291.25 + printing $728.94)

Subcommittee Chairs are requested to submit their SC Minutes for the Dallas, Texas Meeting by May 30, 2007. Minutes should be submitted via e-mail to the Secretary edsmith@ieee.org , with a copy to Susan McNelly sjmcnelly@ieee.org for posting on the Committee website. The submittal should be formatted in Word 2000 (or earlier versions) and should be formatted in the format as shown in the present assembled Minutes, with numbering as indicated in 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. If a SC Vice-Chair, Secretary, or other SC member is preparing the SC Minutes, please let them know these details about Minutes submittals.

A reminder for the May 30th date will be sent to each Subcommittee Chair on Thursday May 15, 2007. I know we are all busy but delaying this task could cause problems in finalizing the publication and posting prior to our next scheduled meeting. In the future all Subcommittee Chairs should plan on completing and submitting your minutes and documents for publication in the posted minutes immediately following the meeting (within several weeks).
3.10 Standards Report:

Refer to Standards Activity since the October 2006 Meeting (Montreal, Quebec, Canada) dated: March 11, 2007 published in the Main Meeting Minutes.

The Standards Subcommittee provides the following Attachments

Attachment “D”
Transformer Standards Development Status

Attachment “E”
Transformer Committee Organizational Chart

Attachment “F”
Standards Subcommittee Main Meeting Slide Presentation
3.11 NEW Business

3.11.1 Document Issues: Retention: Figures: Surveys: - Peter Balma

Peter Balma delivered a power point presentation covering many issues and concerns he and others have regarding the standards development process. Slide topics and points are listed below:

Straw Ballots? or Surveys
- Good idea, but time consuming
- Does not include balloters beyond transformer committee
- Straw ballot, a working group, a subcommittee, or the Transformers Committee?
- Update a draft to include straw ballot comments and distribute
- Should straw ballots only be held for version of document just before formal ballot?
- A common process may be beneficial

Figures & Copyrights
- In many standards, the source of figures is unknown, therefore basis is unknown
- How can figures developed for standards be identified?
- When does a figure need copyright permission?
- Does previous IEEE material need copyright permission? Yes
- How much material requires copyright, a sentence, a modified figure, an individual equation? Answer: gray area
- See style guide for copyright permission letters
- Contact Kim Breitfelder, Manager Standards Editing and Production, IEEE.
  K.breitfelder@ieee.org

Negative Ballots
- Negative Ballots based on editorial comments
- How big of editorial change can be made without recirculation?
- Need to communicate to membership

Records Retention
- What documents have to be maintained in the development of a IEEE Guide or Standard?
- After completion of a standards project what material has to be maintained and for how long? Can everything be destroyed?
- If not where do you keep it? What responsibility does the Transformers Committee, or its members have?
- A tough issue, IEEE is working with their legal counsel on this and has almost completed their examination of this topic. Once complete, it will have to be determined how it applies to the IEEE-SA.

Recognition? Why would you ever want to do that???
- We have volunteers that contribute 100’s of hours each year, doesn’t that warrant recognition?
- When is the last time the Transformers Committee had a fellow, when is the last time we had a nomination?
- Do we need a working group for awards and recognition, We already have a chair every two years?
- The reward for working hard at the Transformers Committee is more work, have you heard that before??????
- Its our committee, what do we want it to be??
3.11.2 Financial Reporting Requirements – Establishment of Treasurer’s Position – Don Fallon
Don Fallon discussed the IEEE SA’s requirement that all “Standards Developing Groups” must complete an annual financial report to be submitted on a specific IEEE SA Template (Form L50-S). Greg Anderson has made an effort to modify the spreadsheet he developed for tracking the Transformer Committee’s budget to facilitate reporting per the L50-S form. The 2005 financial has been completed and submitted, the 2006 financial report will be ready for filing shortly. Based on these specific needs for financial reporting, there is a potential need for a Treasurer’s position for the Committee.

**MOTION**
A motion was made that “The Transformers Committee establish a position of Treasurer”. The motion was made by Don Fallon and seconded by Ken Hanus.

There was discussion regarding if there was a need for a stand alone position (i.e. “treasurer”) or dual roll position (i.e. “Meeting Planner/ Treasurer”) and if it should be an executive level position. It was felt if it was a executive level position it could dramatically affect the way our executive offices are structured. Jodi Haasz pointed out that it DID NOT have to an executive level position and suggested that we table the motion and come up with a guide and outline for the position for consideration. After lengthy discussion it was agreed that the motion should be tabled and a position guide written to describe the details (Greg Anderson offered to structure the position guide).

The motion and second were withdrawn.

3.11.3 Proposed Revision of PES Standardization Strategy – Don Fallon
Don Fallon suggested that all members of the Administrative Subcommittee read through the “Proposed revision of the PES Standardization Guide” and provide him with their comments. He requested that everyone have their comments to him by March 24. **DON CHANGED THE DATE TO MARCH 20 TO AGREE WITH HIS PUBLISHED MINUTES.**

3.11.4 Reduced Registration fees for focused participation - discussion – Don Fallon
This discussion centered around, if there should be reduced registration fees for “focused participation” or persons only attending a specific working group meeting or only a portion of our meeting.

Several specific examples were brought up as examples of these cases i.e. guest speakers, individuals with specific technical knowledge or expertise, coordinating co-sponsored standards participants, and coordinating co-sponsored Co Chairs.

It was pointed out that there are cost associated with anyone’s participation at our meetings. A point was also made that our registration fees are among the lowest of similar organizations. It was also brought up that our registration fees are such a small part of the total expense associated with attending our meetings when considering air fare, hotel cost, and meals.

It was pointed out that most of these specific cases were cases that individuals were “invited” and considered as “guests”

**MOTION**
After lengthy discussion, there was a motion made that: “We establish a “by invitation only” criteria for guest attendance at a working group level meeting that must be approved by the responsible Subcommittee and submitted to the executive committee for final approval on a “case by case” basis”. The motion was made by Tom Prevost and seconded by Tom Lundquist. A ballot was taken and the motion passed with 16 votes in favor of the motion with NO negative votes.
3.12 Committee Service Awards:
Report from Ken Hanus to be published in the Main Committee Minutes

3.12.1 Service Awards
Certificates of Appreciation have been obtained for the following persons:

<table>
<thead>
<tr>
<th>Name</th>
<th>Service Rendered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ken Hanus</td>
<td>Host, Spring 2007 Meeting, Dallas</td>
</tr>
<tr>
<td>Richard Provost</td>
<td>Co-Chair WG on Thermal Evaluation of Dry Type Transformers</td>
</tr>
<tr>
<td>Roland James</td>
<td>Co-Chair, Completion of C57.140</td>
</tr>
<tr>
<td>Bill Bartley</td>
<td>Co-Chair, Completion of C57.140</td>
</tr>
</tbody>
</table>

Discussion was brought up regarding a way to recognize “new Transformer Committee members” and the possibility of some form of retro recognition for existing Committee members (Award certificate, membership certificate, etc.).

**Action Item**: Don Fallon asked Ed Smith to get the following group together to discuss possibilities.

Don Fallon  
Ken Hanus  
Greg Anderson  
Ed Smith

3.12.2 IEEE Fellow Program
During the discussion on recognition and awards, the IEEE Fellow Program and nominating process was discussed. I believe Ramsis asked if SC Chairs should encourage consideration of Fellow nominations at their SC Meetings. Don intends to make this appeal at the Main Committee Meeting. He has forwarded in separate e-mail several links and information from the IEEE Membership web pages on the Fellow Grade and the “Steps to becoming a Fellow”. **Action Item**: Don suggests, in response to Ramsis’ question, is that SC Chairs be aware of the process, encourage your SC members to be aware of the process, and consider whether there may be nominees from within our Committee ranks for this honor.
3.13 Round-Table: Subcommittee Activities - Subcommittee Chairs

3.13.1 Underground Transformers & Network Protectors - Carl Niemann

See Full Report in the Main Committee Minute

3.13.2 Power Transformers – T. Lundquist

See Full Report in the Main Committee Minutes

3.13.3 Insulation Life – D. W. Platts

See Full Report in the Main Committee Minutes

3.13.4 Bushings – Fred Elliott

See Full Report in the Main Committee Minutes

3.13.5 Insulating Fluids – R. Ladroga (Represented by Sue McNelly)

See Full Report in the Main Committee Minutes

3.13.6 Dry-Type Transformers – Chuck Johnson

See Full Report in the Main Committee Minutes

3.13.7 Smoothing Reactors - Richard Dudley

See Full Report in the Main Committee Minutes

3.13.8 Performance Characteristics – R. S. Girgis

See Full Report in the Main Committee Minutes

3.13.9 Audible Sound and Vibration – Jeewan Puri

See Full Report in the Main Committee Minutes

3.13.10 Instrument Transformers - J. E. Smith

See Full Report in the Main Committee Minutes

3.13.11 Distribution Transformers – Ken Hanus

See Full Report in the Main Committee Minutes.

3.13.12 Meetings & Planning - Greg Anderson

See Full Report in the Main Committee Minutes

3.13.13 Dielectric Tests - L. B. Wagenaar

See Items below

3.13.13.1 Dielectric Test Subcommittee Discussion

3.13.13.1.1 There was some discussion at SC meetings a couple of years ago about phase-phase and phase-ground clearances. I am resurrecting the subject at the Dallas meeting by providing historical perspectives concerning the phase-phase clearances placed in C57.12.00 some 20 years
ago. It is my intent to set up a working group to address the new issues that have arisen, and now would be an appropriate time since Jack Harley's WG is almost finished with its work. I propose that this new WG take Jack's WG slot at some future meeting, whenever that WG's work is officially finished. **It was decided that the Administrative Subcommittee does NOT need to approve this request.**

3.13.13.1.2 Another topic originally brought to our attention back in 2002 is that of test levels for repaired transformers, and it kind of fell through the crack. Phil Hopkinson has proposed that this work belongs in his WG on Liquid-Filled Dielectric Test Tables, and I will be asking for agreement of the SC. I mention it to the AdCom since the proposal also includes thermal testing, which I think belongs in the Insulation Life SC.

3.13.13.1.3 The last item is mostly looking ahead. It is my opinion, through various usages of C57.12.00 and C57.12.90 over the years, that these two standards are discombobulated in their structure and organization. This is particularly frustrating to a utility engineer who knows that there is some guidance somewhere in the standards but has to spend four hours looking for it. Sometimes he/she does not have time to spend four hours on finding something, for example, when he/she is witnessing tests or in the middle of a design review at the manufacturer’s location.

For example, the definition of Class I and Class II transformers was originally established in C57.12.00-1987 to designate insulation classes, and that remains it’s main focus today. However, in those 20 years, Classes I and II have crept into measurements for auxiliary losses (Article 5.9 & Note 9 of Table 19), insulation resistance (Note 11 of Table 19), and no-load and excitation current (Note 16 of Table 19). My reference here is the 2000 revision of C57.12.00; I don’t yet have a copy of the latest version. Hence, an engineer who was not around in the mid 80s when the Class definition was introduced may not know to look in Article 5.10, Insulation Levels, for the definitions of Class I and Class II transformers. In reality, while these classes were originally established for insulation classes, they have actually taken on a larger role in standards, and they should be defined in a more general location.

In a recent Dielectric Test Subcommittee survey, I therefore posed the following question, along with several other unrelated questions:

"Should the present information pertaining to dielectric testing, as presently given in C57.12.00 and C57.12.90, be reorganized so as to be presented in a more orderly, less confusing fashion?"

The response so far has been dismal with only about 25 % of the membership responding to date. However, of the 28 responses received, 75 % have responded with a “yes.” To be fair, we should wait for additional responses, but there is strong indication that several members of the Dielectric Test SC feel the same way I do.

I suggest that other SC chairs be asked to consider whether general revisions of these two standards, and in particular, C57.12.00, be started. I realize that such revisions will be a major task, with coordination involving several SCs. However, I think it is something that we should consider in the short range future. **Discussion centered around and there was agreement that these standards were “very large” and “unorganized.”**
3.14 OLD Business
There was not time for Old Business

3.15 Adjournment
Meeting was adjourned by Don Fallon at 5:54pm
4.0 Vice Chair’s Report – T. A. Prevost

The following items report on activities of PES Committees on which the Vice Chair serves as Committee representative.

4.1 Technical Paper Sessions

4.1.1 Technical Paper Session at the 2006 PSCE. The IEEE PES Power Systems Conference and Exposition was held in Atlanta, Georgia on October 29-Nov 1, 2006. The venue for this conference was the Sheraton, Atlanta hotel.

Nine technical papers were presented during the "Transformers" session of the PSCE:

Papers at PSCE:

PAPER-12.1: Time-Domain Analysis of Transformers by Using Modified Nodal Equations
PAPER-12.2: ANN Ensemble and Output Encoding Scheme for Improved Transformer Tap-changer Operation
PAPER-12.3: High frequency power transformer modeling for Power Line Communication applications
PAPER-12.4: Simulation of single-phase nonlinear and hysteretic transformer with internal faults
PAPER-12.5: Estimation of Transformer Inrush Current under Harmonic Source
PAPER-12.6: Furfural Concentration in Transformer Oil as an Indicator of Paper Ageing; Part 1: A Review
PAPER-12.7: A Transformer Thermal Model for use in an on-line Monitoring and Diagnostic System
PAPER-12.8: Researches viewing the loading level on electro insulating oil state from the electric power transformers
PAPER-12.9: An Automated On-line Monitoring and Fault Diagnosis System for Power Transformers

4.1.2 2007 PES General Meeting Tampa, Florida.

The 2007 IEEE Power Engineering Society 2007 General Meeting will be held 24 – 28 June 2007 at the Tampa Convention Center and the Marriott Waterside Hotel in Tampa, Florida, USA. The theme of the meeting is Powering the Future, Today.

The Transformers Committee is sponsoring two paper sessions with a total of thirteen technical papers. Due to the amount of papers presented at the meeting we have agreed to two sessions, however these will be longer sessions so that each presenter will have a thirty-minute allotment for presentation and questions. The paper sessions will be on Wednesday June 27, 2007 in the morning and afternoon.

Transformers I  Wednesday, June 27 8:00AM – 12:00 PM
1) Asymmetry During Load-Loss Measurement of Three-Phase Three-Limb Transformers
2) Analysis of Short Circuit Performance of Split-Winding Transformer Using Coupled Field-Circuit Approach
3) Characteristics of Inrush Current of Present Designs of Power Transformers
4) The Development of a Transformer Paralleling Guide for the IEEE Transformer Committee
5) Analysis of Sympathetic Inrush Phenomena in Transformers Using Coupled Field-Circuit Approach
6) Hybrid Transformer Model for Transient Simulation: Part I - Development and Parameters
7) Hybrid Transformer Model for Transient Simulation: Part II – Laboratory Measurements and Benchmarking
Transformers II  Wednesday, June 27  2:00 PM – 5:00 PM

1) Analysis for Oil Thermosyphon Circulation and Winding Temperature in ON Transformers
2) Increase of Static Electrification in Aged Transformers
3) Thermal Aging of Distribution Transformers According to IEEE and IEC Standards
4) Novel method for detection of transformer winding faults using Sweep Frequency Response Analysis
5) Improved Technique for Fault Detection Sensitivity in Transformer Maintenance Test
6) Optimal Time Selection for the Polarisation and Depolarisation Current Measurement for Power Transformer Insulation Diagnosis

4.2  Committee Organization and Procedures Manual

The Transformers Committee O&P Manual revision is currently in process.

4.3  Power & Energy Magazine Submission

The Transformers Committee needs to prepare an article for P&E magazine. The Vice-Chair will be looking for topics and volunteers to prepare this article. If you have any thoughts please contact the Vice-Chair.

Respectfully submitted,
T. A. Prevost
Vice Chairman
5.0 Transformer Standards

5.1 Transformer Standards Activity

DATE: March 11, 2007

TO: Members of IEEE Transformers Committee, March, 2007 Meeting @ Dallas, Texas

FROM: Bill Chiu, Standards Subcommittee Chair
IEEE /PES Transformers Committee

SUBJECT: PE/TR Standards Activities since October, 2006 Meeting (Montreal, Canada)

TRANSFORMERS STANDARDS STATUS

The detail status of the Transformers Committee sponsored standards are shown in the attachment entitled IEEE/PES Transformers Committee Status Report of Standards, dated 03/11/2007.

The report is a list of all the transformer related standards under the sponsorship of IEEE Power Engineering Society Transformers Committee (PE/TR). The standards are grouped by Subcommittees and sorted by document numbers. The report also contains the active PARs under the responsible Subcommittee.

IEEE/IEC DUAL LOGO STANDARDS

Currently there is only one document that has obtained the IEEE/IEC dual logo status:

The corresponding IEC document number is:
IEC 62032 Ed. 1: Guide for the Application, Specification, and Testing of Phase-Shifting Transformers

Discussions are under way for the consideration of dual log status for:
C57.123 – IEEE Guide for Transformer Loss Measurement

DOCUMENTS PROCESSED BY THE IEEE STANDARDS BOARD

The following sections list all the PE/TR documents processed by the New Standards Committee (NesCom) and the Standards Review Committee (RevCom) of the Standards Board since the October, 2006 meeting in Montreal, Canada.

NEW STANDARDS COMMITTEE (NesCom)

EXISTING PARS – EXTENSION, MODIFICATION, and WITHDRAWAL

PC57.12.36 Standard Requirements for Liquid-Immersed Distribution Substation Transformers
Recommendation: Approve request for an extension until December 2008.

PC57.12.91a Standard Test Code for Dry-Type Distribution and Power Transformers
Recommendation: Approve PAR withdrawal.

PC57.32 Standard Requirements, Terminology and Test Procedures for Neutral Grounding Devices
Recommendation: Defer target extension request until March 2007 pending the receipt of the appropriate request for an extension.

PC57.139 Guide for Dissolved Gas Analysis in Transformer Load Tap Changers
Recommendation: Defer target extension request until March 2007 pending the receipt of the appropriate request for an extension.

PC57.142 A Guide To Describe The Occurrence And Mitigation Of Switching Transients Induced By Transformer-Breaker Interaction
Recommendation: Approve PAR withdrawal.

PC57.143 Guide for Application for Monitoring Equipment to Liquid-Immersed Transformers and Components [Deferred from September 2006 meeting]
Recommendation: Approve request for an extension until December 2010.

NEW PARS FOR REVISIONS OF STANDARDS OR NEW STANDARDS

PC57.12.24 Standard for Submersible, Three-Phase Transformers, 3750 kVA and Smaller: High Voltage, 34 500 GrdY/19 920 Volts and Below; Low Voltage, 600 Volts and Below
Recommendation: Approve PAR for the revision of a standard until December 2011.

PC57.12.91 Standard Test Code for Dry-Type Distribution and Power Transformers
Recommendation: Approve PAR for the revision of a standard until December 2010.

PC57.16 Standard Requirements, Terminology, and Test Code for Dry-Type Air-Core Series-Connected Reactors

PC57.123 Guide for Transformer Loss Measurement
Recommendation: Approve PAR for the revision of a standard until December 2011.

PC57.135 Guide for the Application, Specification and Testing of Phase Shifting Transformers
Recommendation: Approve PAR for the revision of a standard until December 2011.

STANDARDS REVIEW COMMITTEE (RevCom)

REAFFIRMATION, EXTENSION, and WITHDRAWAL OF EXISTING STANDARDS

Sponsor states that a PAR extension request for PC57.32 will be submitted to NesCom.
Recommendation: Extend until the expiration of the PAR for PC57.32.

1388-2000 IEEE Standard for the Electronic Reporting of Transformer Test Data
Recommendation: Administrative withdrawal. (Note: Replaced by C57.12.37-2006)

C57.12.59-2001 (PE/TR) IEEE Guide for Dry-Type Transformer Through-Fault Current Duration
Recommendation: APPROVE [Vote: Yes=7; No=2 (Goldbach); Abstain=0]

C57.12.91-2001 IEEE Standard Test Code for Dry-Type Distribution and Power Transformers
Sponsor states that a PAR for revision has been submitted to NesCom.
Recommendation: Extend until the expiration of the PAR for PC57.12.91.

C57.94-1982 (R2000) (PE/TR) IEEE Recommended Practice for Installation, Application, Operation, and Maintenance of Dry-Type General Purpose Distribution and Power Transformers
Recommendation: APPROVE [Vote: Yes=7; No=2 (Goldbach); Abstain=0]

C57.105-1978 (R1999) IEEE Guide for Application of Transformer Connections in Three-Phase Distribution Systems
Sponsor states that a reaffirmation ballot has been initiated.

Sponsor states that a reaffirmation ballot has been initiated.

C57.119-2001 IEEE Recommended Practice for Performing Temperature Rise Tests on Oil Immersed Power Transformers at Loads beyond Nameplate Ratings
Sponsor states that a reaffirmation ballot has been initiated.

C57.121-1998 IEEE Guide for Acceptance and Maintenance of Less-Flammable Hydrocarbon Fluid in Transformers
Sponsor states that a reaffirmation ballot has been initiated.

C57.135-2001 IEEE Guide for the Application, Specification and Testing of Phase-Shifting Transformers
Standards Subcommittee Report
March 11, 2007
Dallas, Texas

Sponsor states that a PAR for revision will be submitted to NesCom.
Recommendation: Extend until the expiration of the PAR for PC57.135.

REVISED STANDARDS

None

APPROVAL OF NEW STANDARDS

PC57.140/D18 (PE/TR) Guide for the Evaluation and Reconditioning of Liquid Immersed Power Transformers
STANDARDS DUE TO EXPIRE AT THE END OF 2007

The following projects will be recommended for administrative withdrawn at the December 3, 2007 IEEE-SA Standards Board meeting.

(Note: WG has submitted PAR for revision under PC57.32)

637-1985 (R2002) IEEE Guide for the Reclamation of Insulating Oil and Criteria for Its Use

C57.12.31-2002 IEEE Standard for Pole Mounted Equipment – Enclosure Integrity


C57.12.58-1991 (R2002) IEEE Guide for Conducting a Transient Voltage Analysis of a Dry-Type Transformer Coil


[Also C57.19.03-1996/Cor1-2005]

C57.93-1995 (R2001) IEEE Guide for Installation of Liquid-Immersed Power Transformers

C57.105-1978 (R1999) IEEE Guide for Application of Transformer Connections in Three-Phase Distribution Systems
(Note: Reaffirmation ballot comment resolution)

(Note: Reaffirmation ballot comment resolution)


C57.119-2001 IEEE Recommended Practice for Performing Temperature Rise Tests on Oil Immersed Power Transformers at Loads beyond Nameplate Ratings
(Note: Reaffirmation ballot invitation started 10/18/2006)

C57.121-1998 IEEE Guide for Acceptance and Maintenance of Less-Flammable Hydrocarbon Fluid in Transformers
(Note: Reaffirmation ballot failed in March, 2006 due to low response rate. Requested termination of existing ballot and to restart reaffirmation process)

C57.124-1991 (R2002) IEEE Recommended Practice for the Detection of Partial Discharge and the Measurement of Apparent Charge in Dry-Type Transformers

C57.131-1995 IEEE Standard Requirements for Load Tap Changers
### BALLOT STATUS – SORTED BY INVITATION NUMBER (As of 03/10/2007 from myBallot)

<table>
<thead>
<tr>
<th>PAR or Standards #</th>
<th>Stage</th>
<th>Ballot Close Date</th>
<th># of Balloters</th>
<th>Response Rate %</th>
<th>Approval Rate %</th>
<th>Abstain Rate %</th>
<th># Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1538-2000</td>
<td>Submitted To Revcom</td>
<td>09/17/2005 11:59pm ET</td>
<td>100</td>
<td>76.0%</td>
<td>98.7%</td>
<td>1.3%</td>
<td>14</td>
</tr>
<tr>
<td>638-1992</td>
<td>Submitted To Revcom</td>
<td>12/09/2005 11:59pm ET</td>
<td>49</td>
<td>81.6%</td>
<td>94.7%</td>
<td>5.0%</td>
<td>1</td>
</tr>
<tr>
<td>C57.105-1978</td>
<td>Comment Resolution</td>
<td>02/23/2006 11:59pm ET</td>
<td>139</td>
<td>77.0%</td>
<td>95.2%</td>
<td>2.8%</td>
<td>102</td>
</tr>
<tr>
<td>C57.109-1993</td>
<td>Comment Resolution</td>
<td>02/28/2006 11:59pm ET</td>
<td>122</td>
<td>76.2%</td>
<td>98.9%</td>
<td>3.2%</td>
<td>5</td>
</tr>
<tr>
<td>C57.116-1989</td>
<td>Submitted To Revcom</td>
<td>10/04/2005 11:59pm ET</td>
<td>124</td>
<td>75.8%</td>
<td>98.9%</td>
<td>3.2%</td>
<td>33</td>
</tr>
<tr>
<td>C57.12.59-2001</td>
<td>Submitted To Revcom</td>
<td>09/03/2006 11:59pm ET</td>
<td>74</td>
<td>77.0%</td>
<td>100.0%</td>
<td>3.5%</td>
<td>7</td>
</tr>
<tr>
<td>C57.12.70-2000</td>
<td>Submitted To Revcom</td>
<td>02/24/2006 11:59pm ET</td>
<td>150</td>
<td>84.7%</td>
<td>99.2%</td>
<td>0.8%</td>
<td>3</td>
</tr>
<tr>
<td>C57.120-1991</td>
<td>Submitted To Revcom</td>
<td>07/27/2005 11:59pm ET</td>
<td>131</td>
<td>75.6%</td>
<td>100.0%</td>
<td>6.1%</td>
<td>5</td>
</tr>
<tr>
<td>C57.134-2000</td>
<td>Submitted To Revcom</td>
<td>12/15/2005 11:59pm ET</td>
<td>96</td>
<td>75.0%</td>
<td>98.6%</td>
<td>4.2%</td>
<td>26</td>
</tr>
<tr>
<td>C57.136-2000</td>
<td>Submitted To Revcom</td>
<td>07/21/2005 11:59pm ET</td>
<td>78</td>
<td>75.6%</td>
<td>100.0%</td>
<td>3.4%</td>
<td>5</td>
</tr>
<tr>
<td>C57.19.01-2000</td>
<td>Submitted To Revcom</td>
<td>10/23/2005 11:59pm ET</td>
<td>79</td>
<td>81.0%</td>
<td>93.7%</td>
<td>1.6%</td>
<td>1</td>
</tr>
<tr>
<td>C57.94-1982</td>
<td>Submitted To Revcom</td>
<td>09/17/2006 11:59pm ET</td>
<td>117</td>
<td>78.6%</td>
<td>92.2%</td>
<td>1.1%</td>
<td>3</td>
</tr>
<tr>
<td>InsLife-WGC57.119-2001</td>
<td>Ballot</td>
<td>03/11/2007 11:59pm ET</td>
<td>112</td>
<td>76.8%</td>
<td>96.3%</td>
<td>4.7%</td>
<td>21</td>
</tr>
<tr>
<td>PC57.104</td>
<td>PreBallot</td>
<td></td>
<td>144</td>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>PC57.106</td>
<td>Submitted To Revcom</td>
<td>10/16/2006 11:59pm ET</td>
<td>139</td>
<td>88.5%</td>
<td>95.0%</td>
<td>1.6%</td>
<td>1</td>
</tr>
<tr>
<td>PC57.12.01</td>
<td>Submitted To Revcom</td>
<td>10/06/2005 11:59pm ET</td>
<td>129</td>
<td>84.5%</td>
<td>93.1%</td>
<td>5.5%</td>
<td>14</td>
</tr>
<tr>
<td>PC57.12.36</td>
<td>Comment Resolution</td>
<td>03/17/2006 11:59pm ET</td>
<td>106</td>
<td>77.4%</td>
<td>87.3%</td>
<td>2.4%</td>
<td>56</td>
</tr>
<tr>
<td>PC57.12.38</td>
<td>PreBallot</td>
<td></td>
<td>75</td>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>PC57.127</td>
<td>Submitted To Revcom</td>
<td>02/10/2007 11:59pm ET</td>
<td>95</td>
<td>82.1%</td>
<td>100.0%</td>
<td>6.4%</td>
<td>2</td>
</tr>
<tr>
<td>PC57.129</td>
<td>PreBallot</td>
<td></td>
<td>60</td>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>PC57.130</td>
<td>Comment Resolution</td>
<td>07/26/2006 11:59pm ET</td>
<td>116</td>
<td>85.3%</td>
<td>88.5%</td>
<td>3.0%</td>
<td>60</td>
</tr>
<tr>
<td>PC57.140</td>
<td>Submitted To Revcom</td>
<td>08/04/2006 11:59pm ET</td>
<td>157</td>
<td>88.5%</td>
<td>98.5%</td>
<td>6.5%</td>
<td>13</td>
</tr>
<tr>
<td>PC57.142</td>
<td>Comment Resolution</td>
<td>09/08/2005 11:59pm ET</td>
<td>145</td>
<td>79.3%</td>
<td>79.4%</td>
<td>5.2%</td>
<td>439</td>
</tr>
<tr>
<td>PC57.19.03-1996_Cor_1-20xx</td>
<td>Submitted To Revcom</td>
<td>10/14/2005 11:59pm ET</td>
<td>59</td>
<td>86.4%</td>
<td>100.0%</td>
<td>7.8%</td>
<td>1</td>
</tr>
<tr>
<td>PC57.93</td>
<td>Comment Resolution</td>
<td>11/03/2006 11:59pm ET</td>
<td>154</td>
<td>80.5%</td>
<td>96.6%</td>
<td>4.8%</td>
<td>296</td>
</tr>
</tbody>
</table>
2006 STANDARDS BOARD MEETINGS SCHEDULE AND SUBMITTAL DEADLINES

Meeting Dates
March 20, 2007
June 5, 2007
September 25, 2007
December 3, 2007

Deadline for Submittal of PAR\(^1\) or Draft Standard\(^2\)
February 9, 2007
April 27, 2007
August 17, 2007
October 15, 2007

\(^1\) A PAR must be sent by the Working Group Chair to the NesCom administrator, Sherry Hampton, before the stated deadline to be considered at the next Standards board Meeting. Phone +1 732 562 6003, FAX +1 732 875 0695, email: s.hampton@ieee.org

For current PAR form: https://standards.ieee.org/cgi-bin/NesCOM/myP_par/\start.

Target Extension Request form: http://standards.ieee.org/guides/par/extension.rtf

\(^2\) Draft Standards must be submitted by the Working Group Chair to the RevCom administrator, David L. Ringle, before the stated deadline to be considered at the next Standards board Meeting Phone +1 732 562 3806, FAX: +1 732 875 0524, email: d.ringle@ieee.org
LIST OF ALL OPEN STANDARDS PROJECT (as of 03/10/2007)
http://standards.ieee.org/board/nes/C2-C136.html
Only PARs submitted electronically and approved since the December 1998 Standards Board meeting are listed
(There are currently 46XX active PAR)

PC57.12.10 (PE/TR) Standard Requirements for Liquid-Immersed Power Transformers

PC57.12.20 (PE/TR) Standard for Overhead Type Distribution Transformers, 500 kVA and Smaller: High Voltage, 34 500 Volts and Below; Low Voltage, 7970/13 800Y Volts and Below

PC57.12.23 (PE/TR) Standard for Submersible Single-Phase Transformers; 167kVA and Smaller; High-Voltage 25 000 Volts and Below; Low Voltage 600 Volts and Below

PC57.12.24 (PE/TR) Standard for Submersible, Three-Phase Transformers, 3750 kVA and Smaller: High Voltage, 34 500 GrdY/19 920 Volts and Below; Low Voltage, 600 Volts and Below

PC57.12.28 (PE/TR) Standard for Pad Mounted Equipment - Enclosure Integrity

PC57.12.29 (PE/TR) Standard for Pad Mounted Equipment - Enclosure Integrity for Coastal Environments

PC57.12.34 (PE/TR) Requirements for Pad-Mounted, Compartmental Type, Self Cooled; Three Phase Distribution Transformers, 5 MVA and Smaller; High Voltage, 34.5kV Nominal System Voltage and Below; Low Voltage, 15kV Nominal System Voltage and Below

PC57.12.35 (PE/TR) Standard for Bar Coding for Distribution Transformers and Step-Voltage Regulators

PC57.12.36 (PE/TR) Standard Requirements for Liquid-Immersed Distribution Substation Transformers

PC57.12.38 (PE/TR) Standard for Padmounted Type, Self-Cooled, Single Phase Distribution Transformers; High Voltage, 34500 GrdY/19920 Volts and below; Low voltage, 480 Volts and below; 167 KVA and smaller

PC57.12.51 (PE/TR) Ventilated Dry-type Power Transformers, 501 kVA and Larger, Three-Phase, with High-Voltage 601 to 34500 Volts; Low-Voltage 208Y/120 to 4160 Volts

PC57.12.60 (PE/TR) Standard Test Procedure for Thermal Evaluation of Insulation Systems for Dry Type Power and Distribution Transformers, Including Ventilated, Solid-Cast and Resin Encapsulated Transformers

PC57.12.80 (PE/TR) Standard Terminology for Power and Distribution Transformers

PC57.12.80a (PE/TR) Standard Terminology for Power and Distribution Transformers - Amendment 1: Definition of Thermally Upgraded Paper

PC57.12.91 (PE/TR) IEEE Standard Test Code for Dry-Type Distribution and Power Transformers

PC57.13 (PE/TR) Standard Requirements for Instrument Transformers

PC57.13.1 (PE/PSR) Guide for Field Testing of Relaying Current Transformers

PC57.13.5 (PE/TR) Standard of Performance and Test Requirements for Instrument Transformers of a Nominal System Voltage of 115 kV and Above


PC57.16 (PE/TR) Standard Requirements, Terminology, and Test Code for Dry-Type Air-Core Series-Connected Reactors

PC57.18.10a (PE/TR) Standard Practices and Requirements for Semiconductor Power Rectifier Transformers - Amendment 1: Technical and Editorial Corrections

PC57.19.100 (PE/TR) Guide for Application of Power Apparatus Bushings
PC57.21 (PE/TR) Standard Requirements, Terminology, and Test Code for Shunt Reactors Rated Over 500 kVA
PC57.32 (PE/TR) Standard Requirements, Terminology and Test Procedures for Neutral Grounding Devices
PC57.91 (PE/TR) Guide for Loading Liquid Immersed Transformers and Voltage Regulators
PC57.93 (PE/TR) Guide for Installation and Maintenance of Liquid-Immersed Power Transformers
PC57.98 (PE/TR) Guide for Transformer Impulse Tests
PC57.100 (PE/TR) Standard Test Procedure for Thermal Evaluation of Insulation Systems for Liquid-Immersed Distribution and Power Transformers
PC57.104 (PE/TR) Guide for the Interpretation of Gases Generated in Oil-Immersed Transformers
PC57.106 (PE/TR) Guide for Acceptance and Maintenance of Insulating Oil in Equipment
PC57.110 (PE/TR) Recommended Practice for Establishing Liquid-Filled and Dry-Type Power and Distribution Transformer Capability When Supplying Nonsinusoidal Load Currents
PC57.119 (PE/TR) Recommended Practice for Performing Temperature Rise Tests on Oil Immersed Power Transformers at Loads Beyond Nameplate Rating
PC57.123 (PE/TR) Guide for Transformer Loss Measurement
PC57.127 (PE/TR) Guide for the Detection and Location of Acoustic Emissions from Partial Discharges in Oil-Immersed Power Transformers and Reactors
PC57.129 (PE/TR) Standard for General Requirements and Test Code for Oil-Immersed HVDC Converter Transformers
PC57.130 (PE/TR) IEEE Trial-Use Guide for the Use of Dissolved Gas Analysis During Factory Temperature Rise Tests for the Evaluation of Oil-Immersed Transformers and Reactors
PC57.131 (PE/TR) Standard Requirements for Tap Changers
PC57.133 (PE/TR) Guide for Short-Circuit Testing of Distribution and Power Transformers
PC57.135 (PE/TR) Guide for the Application, Specification and Testing of Phase Shifting Transformers
PC57.139 (PE/TR) Guide for Dissolved Gas Analysis in Transformer Load Tap Changers
PC57.143 (PE/TR) Guide for Application of Monitoring to Liquid-Immersed Transformers and Components
PC57.147 (PE/TR) Guide for Acceptance and Maintenance of Natural Ester Fluids in Transformers
PC57.148 (PE/TR) Standard for Control Cabinets for Power Transformers
PC57.149 (PE/TR) Guide for the Application and Interpretation of Frequency Response Analysis for Oil Immersed Transformers
PC57.150 (PE/TR) Guide for the Transportation of Transformers and Reactors Rated 10,000 kVA or larger
PC57.151 (PE/TR) PC57.151 - Sound Level Measurement Guide for Liquid Filled and Dry Type Transformers and Reactors

The Standards Subcommittee provides the following Attachments
Attachment “D” - Transformer Standards Development Status
Attachment “E” - Transformer Committee Organizational Chart
Attachment “F” - Standards Subcommittee Main Meeting Slide Presentation
6.0 Recognition and Awards – Chair: Ken S. Hanus

6.1 Certificates of Appreciation

Certificates of Appreciation have been obtained for the following persons:

Name                              Service Rendered
--------------------------------------------------------------------
Ken Hanus                        Host, Spring 2007 Meeting, Dallas
Richard Provost                 Co-Chair WG on Thermal Evaluation of Dry Type Transformers
Roland James                    C-Chair, Completion of C57.140
Bill Bartley                    C-Chair, Completion of C57.140

6.2 Nominations for IEEE, PES, and Technical Council Awards

None at this time.

Ken Hanus, Chair
Awards Subcommittee
Reports of the Technical Subcommittees

APPROVED
Minutes
7.1 HVDC CONVERTER TRANSFORMERS Subcommittee  
Richard Dudley, Chair


The HVDC Converter Transformers and Smoothing Reactors S.C. met on Mar. 12, 2007 at 1:45 p.m. in the Adams Meeting Room of the Hilton Dallas Lincoln Centre Hotel with 9 members and 8 guests present. One of the guests requested membership. The following are the highlights.

7.1.1 Introductions were made.

7.1.2 IEEE patent policy was reviewed and no issues were raised.

7.1.3 The minutes of the Montreal meeting of the S.C. were approved.

Note: The minutes of the Dallas meeting won’t be approved until the meeting of the S.C. in Minneapolis, Minnesota.

7.1.4 The Chairman briefed S.C. members on the meeting of the Administrative S.C.

7.1.5 The Chairman stated that the invitation to ballot process for PC 57.129 had been initiated. The MEC response had been received from IEEE and circulated to S.C. members. The Chairman stated that he would prepare Draft #9 of the revision of IEEE C57.129 based on the MEC and any input from S.C. members re editorials. Draft #9 will be the version that will be submitted to formal IEEE ballot once the ballot group is formed.

7.1.6 The remainder of the S.C. meeting was spent discussing Draft #1 of the Revision of IEEE 1277 prepared by the Chairman. The following are the highlights discussed.

(i) Bill Chiu will be contacted re whether the revision will be given a C57 designation; IEEE C57.1277? Will the PAR have to be changed?

(ii) The Chairman requested input on Annex E that he drafted re the use of smoothing reactors in VSC HVDC schemes. Input was requested from Peter Heinzig, Pierre Riffon and Christoph Ploetner. Input will also be requested from Lars-Erik Juhlin and Ulf Radbrandt.

(iii) Resistivity or conductivity of transformer oil is critical. The content of Note 10 of Table 1 should be included in Clause 8.1 “General” of Section 8 “Tests”. As for converter transformers it is crucial that the transformer oil used for the dielectric tests of oil immersed smoothing reactors should be of the same conductivity as the smoothing reactors will be filled with during service.

(iv) HQ have two new HVDC projects. Feedback will be available re the use of the existing version of IEEE 1277.

(v) Annex D on overloads requires input from system designers and end users. Les Reckseidler will provide input and distribute to S.C. members for further input/comment.
(vi) The current draft material re seismic is satisfactory. IEEE 693 is most appropriate for smoothing reactors although local regulations may require the application of building codes.

(vii) Sound measurement was discussed. The “walk around” methodology uses an integrating sound level which was deemed to be the current most appropriate approach. It will be given preference with specific point measurement as an alternative. More background information and detailed methodology is required; Christoph Ploetner with assistance from Klaus Papp will provide input. Recent material on harmonics and filter reactors etc. developed for the revision of IEEE C57.16 will be reviewed for applicability.

(viii) The Chairman agreed to produce Draft #2 prior to the next meeting of the S.C.

The meeting adjourned at 3:00 p.m.
R. Dudley
7.2. Instrument Transformers Subcommittee
Jim Smith, Chair

7.2 C57.13 Instrument Transformers – J. Smith – Unapproved Minutes

Chair’s Remarks & Announcements

The Instrument Transformer Subcommittee met on Tues, Mar 14 at 8:00 AM. 10 members and 8 guests attended. Two of the guests requested membership.

The previous meeting’s minutes were approved as written and there were no Patent issues.

7.2.1 Working Group Reports

7.2.1.1 Working Group on Test Requirements for High Voltage Instruments Transformers Rated 115 kV and above

The WG met on March 13, 2007. Five members and six guests attended the meeting. The meeting was co-chaired by Mr. P. Riffon and Mr. R. McTaggart.

The agenda was approved as written.

Minutes of the Montreal meeting were approved as written.

The IEEE patent disclosure requirement policy was discussed. None of the members and guests present during the meeting were aware of any patents related to the work of the WG.

No feedbacks were reported regarding the application of C57.13.5.

The first technical subject on the agenda was the review of dissipation factor of gas-insulated instrument transformers. R. McTaggart reported that measured values for SF6 insulated instrument transformers are generally less than half of the maximum limit of 0.15% as stated in the actual edition of C57.13.5. After discussion, it has been decided to keep the actual value of 0.15%.

The second subject was the review of the test voltage for the endurance chopped-wave test. Pierre Riffon presented the background of the actual value which is 80% of the rated BIL level. This voltage has been derived from the surge arrester protective level under switching surge condition (SIPL). The resulting maximum voltage excursion that an instrument transformer will see during a close-by disconnector operation is estimated to be 2 times the SIPL. When considering a margin of 20% over the SIPL, the resulting values of the test levels are: 69% of the rated BIL for 362 kV maximum system voltage, 73% of the rated BIL for 550 kV maximum system voltage and 82% of the rated BIL for 800 kV maximum system voltage. After discussion, it has been decided to keep a single and unified value of 80% of the rated BIL. The alternative IEC testing method consisting of 100 applications will be added as
an alternative method if agreed upon between the user and the manufacturer. An informative annex will be added and will explain how the test level value was derived.

The remaining part of the meeting was devoted to the review clause by clause of the actual C57.13.5 document. During this review the following changes were agreed upon:

- Because the PAR is for a full-use standard, all references to Trail-use will be deleted;
- The scope and the purpose will be changed and have to be identical to the PAR;
- References will be updated;
- Only the definitions needed for the document will be shown. Definitions already given in IEEE Std. 100 or IEEE C57.12.80 or C57.13 will be deleted.
- Test levels for capacitance and dissipation factor measurements will be repeated in clause 4.12;
- The oil used in instrument transformers shall fulfill the criteria for non corrosive oil in accordance with the extended ASTM test, ASTM D1275 Method B. This additional requirement will be added in clause 4.2;
- The accuracy requirements of accuracy measuring systems will be modified to be in line with what has been decided for optical instrument transformers e.g. 5 times better than the guarantied accuracy for the ratio and ± 1 minute for the phase angle. Moreover, the calibration interval for electronic devices will be reduced from 2 years to 1 year;
- Manufacturer representatives were asked to review the tightness test procedure and to report to the WG co-chairs.
- U.S. pressure vessel code requirements for gas-insulated instrument transformers will be checked. R. McTaggart will report at the next meeting.
- Instead of specifying in clause 4.4.2 an earthquake acceleration of 0.2 g, a reference to IEEE Std. 693 will be made and a minimum level, in line with the levels stated in IEEE Std. 693, will be given;
- Clause 4.5 on temperature rises will be updated according to the proposal discussed in the previous meeting.

A first draft including the agreed changes and the new annexes will be circulated to the membership prior to the next meeting.

The meeting adjourned at 9:15 am on March 13, 2007
7.2.1.2 WG on C57.13 Revision – Tom Nelson

This WG had not met because the current draft (D8) is in the process of balloting. The changes from D7 to D8 were editorial but it is still not fully compliant with the new Standards template, which was explained by Jim Smith. Negative ballots are expected and volunteers were solicited to address them.

7.2.1.3 PAR P1601 Optical Current and Voltage Sensing Systems - F. Rahmatian (TC/ITSC) and H. Gilleland (PSIM)


- IEEE disclosure requirements regarding patent issues related to the WG work were presented
  - The participants were asked if anyone is aware of patents relating to the content of PAR 1601 work. There were no responses. It was noted that no patent or IP was disclosed or identified as relevant to P1601 work.
- Meeting agenda was reviewed and accepted.
- Minutes of meeting #15 of P1601, Oct 23, 2006, Montreal, Quebec, were reviewed and approved.
- Update on other standards/industry Activities was given:
  - IEC 61869-x series –new IEC instrument transformer standards, mostly editorial re-organization of 60044-x series. Next meeting of WG37 (61869-7/8/9/10) on non-conventional IT is in April 2007 in Paris, France.
  - CSA standards for instrument transformers are balloted and approved. Publication in March 2007.
  - CIGRE WG A3.15 on non-conventional instrument transformers, reports due soon.
- IEEE/PES PSRC WG I8 on application of optical instrument transformers for protection application. The working group meets at the PSRC meetings three times a year. Details can be found at [http://www.pes-psrc.org/i/I08.html](http://www.pes-psrc.org/i/I08.html).

**Update on activity and status of the draft:**
- The latest draft, D08 (March 2007), was discussed – it includes updated figures.
- With regards to testing details, it was decided not to include details in the first release of this standard. References will be made to C57.13 and other publications in biography – future editions may include specific info.
- It was decided to add a short note in the appendix on possible impact of noise during accuracy testing.
- It was decided to initiate a survey in anticipation of starting the balloting process in June 2007.
  - Draft 8 to be circulated to members for survey by J. Smith.
7.2.2 Old Business

7.2.2.1 Transformer Monitoring Std PC57.143

V. Khalin reported that this standard is at the balloting stage. In order to add clauses for instrument transformers it was agreed that the ITSC members would make proposals and comments on the ballot.

7.2.2.2 Partial Discharge Test Requirements

The possibility of adopting C57.113 for Instrument Transformers was discussed. A motion was made to submit a proposal to the Dielectric Test SC. After a discussion of alternatives it was recommended by Bernhard Lemke that this should take the form of a separate document based on C57.113 but with the clauses specific to Power Transformers and Reactors removed and clauses specific to Instrument Transformers added (eg Balanced Bridge method). There was consensus on this and volunteers were solicited to work on it.

7.2.3 New Business

7.2.3.1 Rogowski Coil Std PC37.235D4

This standard was developed in the Relay Committee and it has been questioned whether it should really be an instrument Transformer Std. P. Riffon stated that these devices are rarely used and that he didn’t think we should spend time on this.

7.2.4 CT Reclassification

7.2.4.1 CT Reclassification

C. Burns (National Grid) brought this subject up and offered to do a presentation at the next meeting. One of the issues is the question of whether it is necessary to calibrate at the load extremes (which means off-line) or if extrapolation from real load conditions is adequate. Since this involves both the CT and the meter, it is not clear where the responsibility for developing a standard would lie.

7.2.4 Adjournment

The meeting was adjourned at 9 AM.
7.3. **Insulating Fluids Subcommittee**  
R.K. Ladroga, Chair

7.3. **Insulating Fluids Subcommittee** (R.K. Ladroga, Chair; Susan McNelly, Secretary)

7.3.1. **Introduction/Attendance**

The Insulating Fluids Subcommittee met in Dallas, Texas on Wednesday, March 14, 2007 with 19 members and 41 guests present. The following 9 guests requested membership:

- Roberto Asano Jr.
- Shawn Galbraith
- Mark Cheatham
- Robert Ganser
- Luiz Cheim
- Andreas Garnitschnig
- Don Duckett
- Jeremy Kriska
- Norman Field

**Meeting Agenda**

1. Introductions
2. Patents
3. Minutes Approval
4. WG Reports
5. New Business
6. Old Business
7. Adjourn

Introductions were made.

Sue McNelly informed the group of the sad news of Frank Gryszkiewicz’s death on February 19th.

7.3.2. **Approval of Meeting Minutes and Patent Disclosure**

As required in IEEE SA Standard Boards by-law, Section 6.3.2, the IEEE patent disclosure requirements were discussed and a request was made for disclosure of any patents that may be related to the work of the WG. No new disclosures were forthcoming.

The Minutes of the Montreal, Quebec, Canada meeting were approved as written.
7.3.3. Subcommittee Membership

There were no changes to report in the Subcommittee Roster

7.3.4. Current Subcommittee Business

7.3.4.1. C57.104 – IEEE Guide for the Interpretation of Gases Generated in Oil – Immersed Transformers

Tuesday, March 13, 2007

Dallas, Texas

The meeting was called to order by Secretary Susan McNelly at 1:50 pm, Tuesday, March 13, 2007. Rick Ladroga the Chair and William Bartley the Vice-Chair were unable to attend. There were 29 members, 61 guests, and 15 guests requesting membership.

Guests requesting membership were:

Jim Antweiler    Dong Kim
Ray Bartnikas    Alexander Kraetge
Luis Cheim       Tom Lundquist
Alan Darwin      Paul Mushill
Norman Field     Scott Reed
Mary Foster      Kirk Robbins
George Frimpong  Jim Thompson
Robert Ganser Jr.

Approval of minutes from the Fall 2006 meeting in Montreal, Quebec, Canada was requested. The minutes were approved as written.

Introductions of attendees were made.

The IEEE Patent disclosure requirements were discussed and a request was made for disclosure of any patents that may be related to the work of the WG. There were no responses to the request for disclosure.

Susan updated the Working Group on the status of the present C57.104 Ballot process. The document was updated as discussed at the last meeting, sent through editorial review, and submitted to IEEE for ballot. The ballot pool process is now complete and the Guide should be out for ballot shortly.

As background, the PAR for revision was established in 1996, and was extended in 2000, 2002, and 2004. There were some significant negative ballots during the balloting process. Due to the comments that were outstanding, a decision was made at the Memphis meeting to withdraw the standard. A decision to withdraw the 1991 Guide was made at the same time because of the disagreement over the values and to
stress the importance of moving ahead. Therefore, at this time, there continues to be no approved guide available. The intent of the impending Ballot is to get a valid Guide out and available for use in the interim while work on more complete revisions is underway.

A new PAR will be filed to start over with an immediate revision to the guide to address the remaining issues that have been raised as soon as the ballot process with the existing document is complete.

At the Montreal meeting, several Task Forces were formed to begin the work on the next revision to the Guide. Those Task Forces were:

1. Framework
   Jim Dukarm - Chair
   Tim Raymond
   Dave Hanson
   Jim Graham

2. Data
   Tom Prevost – Chair    Claude Beuchemin
   Dave Hanson    Jim Dukarm
   Paul Boman    Dave Wallach
   Paul Mushill    Jim Graham
   Bob Ganser Jr    Joe Kelly

3. Case Studies
   Brian Sparling – Chair    Jim Graham
   Kent Haggerty    Paul Bowman
   Dave Wallach    Bob Ganser Jr.
   Dave Hanson    Paul Mushill
   Tim Raymond    Joe Kelly
   Norman Field

4. Diagnostic Methods
   Tim Raymond – Chair    Lance Lewand
   Michel Duval    Joe Kelly
   Jerry Corkran    Norman Field

**Status reports from Task Forces:**

**Framework:**

Presentation by Jim Dukarm – “A revised framework for the transformer DGA Guide.

General consensus was that this was a good approach to revising the Guide.

**Data:**

Tom reported that work is in progress and he requested that anyone that has data to send this data to him. He was requested to provide a format for which he would want the data provided.
Other Business:

Acknowledgement was given to Paul Boman for the thirteen gas profiles that he recently provided.

Arc Furnace Transformers – Tom Lundquist indicated that he is collecting data for Arc Furnace transformers for inclusion most likely as an Annex to the revised guide. The issue is that the manufacturers of Arc Furnace transformers are concerned that what is considered normal for these types of transformers is considered abnormal for normal power transformers. Jim Dukarm indicated that he would not rule out that this information could be within the Guide itself rather than as an Annex. Tom indicated that he had three labs providing data and that anyone else with data should please contact him.

The meeting was adjourned at 3:05 pm.

Susan McNelly
PC57.104 Working Group Secretary

7.3.4.2.C57.106 – IEEE Guide for Acceptance and Maintenance of Insulating Oil in Equipment

The Working Group for the revision of the IEEE Guide for Acceptance and Maintenance of Insulating Oil in Equipment (or IEEEC57.106) did not meet in Dallas.

The PC57.106/D6 document was successfully re-balloted in October, 2006 and then approved by the IEEE Standards Board in December, 2006. Michelle Turner, IEEE Standards Activities, reported to the Chair that the document is currently going through a copy editor for review according to the IEEE Standards Style Manual. Publication of the revised standard is projected for June 2007.

James A. Thompson

PC57.106 Working Group Chair

7.3.4.3.C57.139 - Draft IEEE Guide for Dissolved Gas Analysis Of Load Tap Changers

Tuesday, March 13, 2007

Dallas, Texas

Fredi Jakob called the WG meeting to order at 11:05 am, Tuesday, March 13, 2007. WG Secretary Susan McNelly was also present. There were 27 members and 40 guests present with 4 guests requesting membership.

Guests requesting membership were:

Norman Field
Robert Ganser Jr.
Rowland James
Jim Thompson
Agenda:
1. Welcome and Introduction
2. Patent considerations
3. Approval of Fall 2007 minutes
4. Update on LTC-DGA data Analysis – by Dave Wallach
5. Adjourn

The IEEE Patent disclosure requirements were discussed and a request was made for disclosure of any patents that may be related to the work of the WG. There were no responses to the request for disclosure.

Approval of minutes from the Fall 2007 meeting in Montreal, Quebec, Canada was requested. The minutes were approved as written.

An announcement was made regarding the passing of Frank Gryszkiewicz on February 19, 2007. He will be missed.

Update on LTC-DGA Analysis – by Dave Wallach, Jim Dukarm, and Shuzhen Xu

Dave presented a report of the work that he and a subcommittee also made up of Jim Dukarm, and Shuzhen Zu have done to date.

Shuzhen Xu presented the preliminary results of the LTC DGA data analysis that she had performed. She reviewed her statistical analysis on the Ethylene/Acetylene ratio, discussed issues with the collected data, and the statistical methodologies used.

Conclusion is that we may be able to lump several models together into one basket. More detailed review would be required to determine this.

Fredi indicated that we should wait to see what numbers (quantity of data) that we have by the Fall 2007 meeting. If we do not have enough, then move forward with a generic guide to provide direction on how users can obtain the data and how to evaluate it.

Fredi agreed to send out a letter to the utilities requesting data be submitted. Comments were made that many utilities just don’t have the data or the manpower to extract the data from the records that they do have.

The meeting was adjourned at 12:19 pm.

Fredi Jakob
Chair
The WG meeting was called to order at 8:00 am, on Tuesday, March 13, 2007 by the working group Chair, Patrick McShane. Vice Chair, Clair Claiborne, and Secretary, Susan McNelly were also present. There were 16 members present and 50 guests, with 3 guests requesting membership. Since the Guide is essentially complete and ready for ballot, no additional membership requests will be entertained.

Meeting Agenda
1. Introductions
2. Patents
3. Minutes
4. Update
5. Review last revisions
6. Vote to Submit for Balloting
7. New Business
8. Adjourn

As required in IEEE SA Standard Boards by-law, Section 6.3.2, the IEEE patent disclosure requirements were discussed and a request was made for disclosure of any patents that may be related to the work of the WG. No new disclosures were forthcoming.

The minutes for the Fall 2007 meeting were approved as submitted and recorded on the website.

Patrick McShane announced the sad news of the passing of Frank Gryszkiewicz on February 19, 2007.

Update:

There are only a few updates, primarily editorial, that were made since the Montreal meeting.

Main changes to the Guide since the Fall 2006 meeting:

- NRTL was removed from the list of acronyms and abbreviations.
- Oxidation Inhibitor – added note that the user is to contact the specific fluid manufacturer for oxidation inhibitor content. Question was raised as to how does a user necessarily know years later whose oil was used. This could probably be more effectively dealt with in the new application guide that will be proposed at the Fluids SC meeting on Wednesday.
- Corrosive Sulfur – added a section indicating a corrosive sulfur test and that Natural Ester Fluids naturally do not contain corrosive sulfur. Question was raised as to whether this should be included in Table 2. Again this is probably more appropriate in an application guide.
- Discussed the removal of the “sampled from bulk tanker” and “sampled from drums or totes” levels from Table 2. It was decided to leave it as shown in the Draft 10 that was posted.
Table 3 – Patrick suggested that we should consider making the Water Content (mg/kg value) 150 for both less than or equal to 69 kV and for greater than 69kV but less than 230 kV. There was discussion and it was decided to leave the levels as shown in Draft 10 as 300 and 150 respectively.

Annex B – reviewed the additions. Suggestion was made that since the figure for dielectric strength was left out maybe a note indicating that there would be no change in dielectric strength values in B5, Examples of key properties of mixtures of a new natural ester with a new mineral oil should be added. Discussed if any other key properties needed to be considered.

Additional comments received from the floor:

Volumetric expansion rate, etc. – In Annex B there will be comments on thermal properties added.

Low temperature viscosities should be extended to lower temperatures in Table 2. Note: ASTM D3487 does not have properties for viscosity below 0 Celsius.

Table 2 – harmonize the order of Table 2 with C57.106. This was previously discussed and deemed not necessary.

Clause 4.4 defined the word “longer” in the last paragraph. The words “(equal to or greater than 15 minutes at room temperature)” after the word “longer.” Also add the words “at room temperature” to Clause 4.3.

Percentages of efficiency and cooling - Not identified in the oil guide, so why would we include in this guide? These are design issues.

ASTM is working on an oxidation stability test that is more suited for natural ester fluids.

This concluded the review of Draft 10. The WG officers will review the discussion and make revisions as appropriate. The revised draft will be submitted for formal balloting as soon as possible.

The Chair thanked all the WG and other participants contributing to this proposed guide. With a successful balloting, the work of this WG is deemed finished.

The Chair mentioned that there was discussion at the Fall 06 meeting for the possible formation of TF/WG for initiating DGA and Retrofill Guides for Natural Esters, and will be subjects of new business at the Sub Committee meeting.

The meeting was adjourned at 9:00am.

Respectfully Submitted,

Patrick McShane - PC57.139 Working Group Chair

Clair ClaibornePC57.139 - Working Group Vice-Chair

7.3.5. Old Business

C57.130 – IEEE Trial-Use Guide for the Use of Dissolved Gas Analysis During Factory Temperature Rise Tests for the Evaluation of Oil-Immersed Transformers and Reactors
- The PAR expires at the end of this year. Tom Prevost and Rick Ladroga will work together to will try and obtain the ballot resolution information and to determine what is required to move forward with this Guide.

7.3.6. **New Business**

The Insulation Life SC had a discussion regarding the creation of a Task Force to determine whether a new Guide for Furan Testing is needed. There was some discussion as to whether this TF would better belong under the Insulation Life SC or the Insulating Fluids SC. A motion was made to start a TF to study the Furan issue with Kent Haggerty as Chair and passed. The two SC Chairs will make a decision as to which SC this will reside under, however, the general consensus of the Insulating Fluids SC members was that it belonged under the Fluids SC.

Two new orders of business in regards to Natural Ester fluids were also raised. A motion was made for the creation of a TF to determine the need and scope of a Guide for the interpretation of DGA in transformers filled with Natural Ester fluids. The motion passed, however, no Chair was assigned.

A second motion was made to form a TF to investigate the need for an application guide for NE fluids. The motion passed, however, no Chair was assigned. The TF force would investigate, among other things, retro fill of transformers with NE fluids.

Jim Thompson brought up that the IEEE Std 637 – IEEE Guide for the Reclamation of Insulating Oil and Criteria for its Use is due for either revision or reaffirmation. He volunteered to Chair a WG for reaffirmation of this Guide. The exact Standard number was not known during the meeting, therefore a motion for this was not made, however, Jim is requesting the he be allowed to begin this process.

7.3.7. **Adjournment**

The Subcommittee adjourned at 12:00 pm.

Next Meeting:

The Insulating Fluids Subcommittee and its Working Groups will next meet in Minneapolis, Texas during the period of October 14 – 18, 2007.

Respectfully Submitted

Susan McNelly

Fluids SC Secretary
7.4 **Insulation Life Subcommittee**  
Don Platts, Chair

Insulation Life Subcommittee - Un-Approved Meeting Minutes  
March 14, 2007 – Dallas, Texas

7.4 *Insulation Life Subcommittee – Don Platts, Chairman*

The Insulation Life Subcommittee met in Dallas, Texas on March 14, 2007 at 8:00 AM. There were 50 members and 68 guests present, with 13 guests requesting membership in the subcommittee.

The minutes of our meeting in Montreal, Quebec, Canada on October 25, 2006 were approved as submitted.

7.4.1 **Chair’s Report**

7.4.1.1 The IEEE Transformers Committee Meeting schedule is listed on the Transformers Committee website.

7.4.1.2 All members are encouraged to verify their Subcommittee and Transformer Committee membership. Please let the Committee know if you think there is a mistake.

7.4.1.3 Fellow nominations are being accepted by the Committee Officers. Please provide names of potential nominees to them as soon as possible.

7.4.1.4 The Committee is continuing discussions with IEEE regarding the conversion of old documents.

7.4.1.5 Working Groups that need additional meeting time may want to consider holding meetings at the PES Technical Meetings held in January each year.

7.4.1.6 Testing of repaired transformers is becoming as major point of discussion. Both the Dielectric and Insulation Life Subcommittees will begin investigating this topic.

7.4.2 **Project Status Reports**

7.4.2.1 **Reaffirmation Ballot C57.119, IEEE Recommended Practice for Performing Temperature Rise Tests on Oil-Immersed Power Transformers at Loads Beyond Nameplate Ratings**

The reaffirmation ballot had 78% participation and achieved 96% approval. Several negative comments were received. Subhash Tuli will be initiating the effort to resolve the negative comments in the next few weeks.

7.4.3 **Working Group and Task Force Reports**

7.4.3.1 **Working Group for the Revision to C57.91 Loading Guide - Tim Raymond**

Meeting Minutes not received.
7.4.3.2 Working Group On Thermal Evaluation Of Power And Distribution Transformers (C57.100) – Roger Wicks

7.4.3.2.1 Introduction and Rosters
The working group met on Monday, March 12, 2007 at 11:00 AM with 11 members and 47 guests attending, with three guest requesting membership. This brings the number of members to 54.

7.4.3.2.2 Approval of minutes from March 20, 2006 meeting
The minutes of the October 23, 2006 meeting in Montreal were approved as written.

7.4.3.2.3 Patent Disclosure
The chairman asked if anyone knew of any patents that could pertain to this project. There were none.

7.4.3.2.4 Discussion of DuPont-Weidmann test of power transformer model.
The chairman gave a presentation to the working group of the dual temperature aging model. He gave a brief background of the model and then proceeded to present some of the recent test results. A copy of the presentation will be posted on the IEEE PES transformers committee website. Some specific topics were presented with the data that has been collected so far. These include:
- Testing of “wet” vs. “dry cells
- Furan Testing update (including wet vs. dry)
- Arrhenius data for non-upgraded vs. three levels of upgrading
- Additional data for areas covered in the past

7.4.3.2.5 Following the presentation the chair opened the floor for discussion and comments:
- Both Jin Sim and Geoff Gill provided input prior to the meeting related to the document test methods and organization, which were discussed during the meeting.
- The Chair provided input related to test times, temperature ranges, sample numbers within the document. Additional topics included how the document should specify a “control” system for the basis of the comparison when a new system is evaluated. In general the working group agreed that there needs to be established minimum/maximum times for the aging (such as one point >5000 hours and one point above 100 hours and one between), but that the temperature spread needs to be a minimum (not too close together). It was also noted that if oxygen and moisture are considered in the “control” system, that the aging times vs. temperature may be more reasonable than that predicted with “dry” testing seen in the DuPont-Weidmann testing. One example was to select the hottest temperature based on the loading guide short-term overload temperature, and a second point based on long-time emergency temperature. (Note – this may not work with materials of thermal capability different that thermally upgraded kraft).
- Jin Sim proposed that the dual temperature model should be the test method of choice and to include both the Lockie test and sealed tube tests into the annex. After a spirited discussion, Jin revised his proposal to include both the dual temperature model (for power) as well as the Lockie test (for distribution) in the body of the document, and to leave the sealed tube method in the Annex. The working group agreed with this proposal.
- Tom Prevost noted that he would be looked to discuss at Tim Raymond’s loading guide meeting the possibility of using only a single curve (based on the near overlap of the DP 200 data with the 50% tensile data). Tim will try and provide 15 minutes for his meeting.
- Don Platts reminded the working group that this work is part of a sequence started by the task force to define thermally upgraded kraft, followed by the inclusion of a requirement in C57.12.00 to meet curves in C57.100, and finally our work to have the curves consistent with those requirements.
The chair closed the meeting by noting that there are five main bodies of work required to complete this document. These are:

- Distribution Transformer Testing (Lockie)
- Dual-Temperature Aging (IEC 62332)
- Sealed Tube Test (Annex)
- What test to run under which conditions (certain changes may be single point test, others – full aging curve, etc.)
- What should the “standard” conditions be for the control test (for each of the three methods).

The chair is looking for volunteers to help with each of these sections.

Adjournment

The meeting adjourned at 12:10 PM

**7.4.3.3 Working Group for Temperature Rise Test Procedures Section 11 of C57.12.90 - Paulette Payne**

The Working Group met at 8:00am March 13, 2007 in Lincoln 1 of the Hilton Dallas Lincoln Centre Dallas, Texas. In attendance were thirteen members and thirty-three guests. There were no patent disclosures.

The minutes of the October 24, 2006 meeting were approved as written.

The major topics of discussion were hot resistance measurements: re-stabilization and statistical accuracy, and cooling curve methodology.

Hot resistance measurements: re-stabilization – A recap was given on the WG position on to return to the top oil temperature rather than resuming the heat run for one hour when needed to meet the time limit established. A subsequent proposal has been made by Jerry Corkran to stabilize the winding gradient and correct the top oil temperature to time of shutdown. There was no additional discussion of the topic at this meeting.

Hot resistance measurements: statistical accuracy - Mark Perkins gave a presentation for a large GSU showing good curve fitting for exponential and polynomial methods with readings initiating before 4 minutes, and the effect on curve fitting of readings initiating after 4 minutes of shutdown. The curve for readings initiated after 4 minutes of shutdown resulted in higher resistance at shutdown compared with the curve of readings initiated before 4 minutes. Concerns were raised that saturation is not achievable for some winding configurations and test systems within 4 minutes of shutdown. Mark Perkins and Bob Ganser will provide a proposal for the timing of readings and Sam Mehta will augment the proposal as to how saturation can be achieved in a shorter time frame. Mark Perkins suggested a 10 minute time period for recording measurements which agrees with Bob Ganser’s original proposal.

Cooling Curve Methodology – Sam Mehta briefly discussed the methodology used by Bertram Poulin. The methodology based on Montsinger, necessitates an accurate average oil temperature. A cross-check of the Hot Resistance – Heat Run method of IREQ and Montsinger’s methodology was performed by Bob Ganser achieving good results. Thang Hochang gave a presentation indicating good curve fitting for data provided by WG members using the Hot Resistance – Heat Run methodology.

Old Business – A recap was given of the discussion of temperature rise at constant current. Core heating increases losses resulting in inaccuracy of top oil temperature. Pennsylvania Transformer
compensates the current for core losses to mitigate this effect. As Subash Tuli was unavailable for discussion, the Chairperson will follow up with him.

New Business – Hasse Nordman has found for bottom oil measurement of distribution transformers “average winding temperature to average oil temperature” to differ significantly from both IEEE and IEC. Hasse will make a presentation at the next WG meeting. Marcel Fortin discussed that for the back-to-back method, it is not necessary to have duplicate transformers. An auxiliary transformer with the same voltage ratings and KVA equal or higher than the test unit is adequate. Marcel will make a presentation at the next WG meeting.

Respectfully submitted,

Paulette Payne Powell, Chair
Juan Castellanos, Co-Chair

7.4.3.4 Task Force: on Moisture Estimation in Transformer Insulation – Jin Sim

TF Moisture Estimation did not meet. Chairman Jin Sim reported that Jacque Aubin of GE was conducting experiments this summer regarding moisture estimation in transformer insulation. The Task Force would evaluate the results when they were available.

7.4.4 Old Business:

Phil McClure provided an update on the privatized paper on Winding Temperature Indicators (WTI). Additional testing is required to determine the response time of the WTI. The paper will be completed as soon as possible after obtaining this information.

Joe Foldi presented his concerns about the improper calibration of the WTI for the ONAN/ONAF/Odaf type units. The WTI is normally calibrated for the top rating of the transformer, which is the Odaf cooling mode in this case. This calibration will indicate the winding hot spot temperatures that are lower than the actual winding hot spot temperatures for the ONAN and ONAF cooling modes. This leads to delayed operation of the second forced stage fans and the pumps, causing premature ageing of the transformer insulation. The figures presented by Joe Foldi are attached.

Joe Foldi proposed that the Insulation Life Subcommittee set up a Task Force to deal with this issue and other issues related to the determination of Winding Hot Temperature Rise during testing. No action was taken pending the issue of the paper by the Task Force on WTIs.

7.4.5 New Business:

Tom Prevost proposed that a Task Force be formed to investigate the use of Furan testing as a tool to determine and track insulation aging. His proposal was approved unanimously. Kent Haggerty will be the Task Force Chair.

7.4.6 The meeting adjourned at 9:10 AM

Don Platts
Chair, Insulation Life Subcommittee
Presented at the IEEE Transformer Committee Meeting in Dallas, March 14, 2007 by Joseph Foldi, Foldi & Associates, Inc.
7.5 Performance Characteristics Subcommittee  
R. S. Girgis, Chair

7.5 Performance Characteristics Subcommittee – Ramsis Girgis, Chairman; Stephen Antosz, Secretary

7.5.1 Introduction/Attendance

The Performance Characteristics Subcommittee (PCS) met on Wednesday, March 14, 2007 with 65 members and 47 guests in attendance. 5 of those guests requested membership in PCS. See last page of these minutes for attendance summary.

7.5.2 Approval of Meeting Minutes

The minutes of the last meeting in Montreal, QC, Canada were approved as written.

7.5.3 Chairman’s Remarks

7.5.3.1 Administrative Subcommittee Notes

- Next Transformer Committee meeting dates and locations are as follows:
  § Fall 2007, October 14-18, Hilton Minneapolis Hotel, Minneapolis, MN
  § Spring 2008, March 16-20: Westin Hotel, Charlotte, NC
  § Fall 2008, October 5-9: Sheraton Hotel, Porto, Portugal
  § Spring 2009, April 19 -23, Southern US location
- IEEE PES Meeting: June 24 – 28, Tampa, Florida. There will be 2 transformer sessions on Wednesday, June 27.
- The PAR for updating / revising the “Loss measurement and tolerances” Guide C57.123 has been approved with a completion date of December 2011.
- IEC committee expressed concern regarding the IEEE references in the dual IEEE / IEC Logo of the “Loss measurement and tolerances” Guide C57.123. The Administrative Subcommittee suggested reviewing the technical differences between the IEEE references and the IEC Standards before deciding whether to continue with the dual Logo for this Guide.
- Those who are active in the SC and still not members of the committee are encouraged to apply for membership.

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

7.5.4.1 PCS WG on Test Code C57.12.90 – Mark Perkins, Chairman; Gerry Rosselli, Secretary

There were 73 persons in attendance, 32 members and 41 guests.

After introductions, Mark asked if there were any patent issues relating to this standard. Being none, this discussion was closed.

The minutes from the last meeting were then reviewed and approved as written.
Mark presented Gerry Rosselli as the new secretary and also thanked Rowland James for his role as past secretary of the WG.

Task Force Reports

1. Gerry Rosselli reported on the final survey that was conducted of the PCS subcommittee on Zero Sequence Test for Interconnected Winding Transformers. There were 26 responses, 20 approved, 4 approved with comments, zero disapproved and 2 abstained. The suggested comments were implemented in the final draft and then it was sent to Mr. Stephen Antosz for inclusion in the next issue of the Standard.

2. Gerry Rosselli presented test results on 2 transformers with interconnected windings with very low zero sequence impedance values and some of these values were negative. These values were not expected to be this low and after some discussion with the group, it was decided to look at all the test data to determine the validity of the numbers. Gerry asked the group for help. Several members / guests promised to check the numbers and report the findings before the next meeting. Subhash Tuli suggested that we did not have enough test data to move the documents for print, but Gerry responded that the test done on the previous four transformers with interconnected windings and additional tests on several other types of Delta Wye transformers proved the test method to be correct and suggested that there was no need to hold the document. Also, Dr. Ramsis Girgis suggested that the document proves that the method works and there was no need to put it on hold. Some members suggested that based on design these numbers may be correct within the instrumentation error and low zero sequence impedances values or negatives may be correct.

3. Marcel Fortin’s report on Short-circuit test revision was not given since the meeting was held later in the week. WG met on Tuesday 12 March from 11h to 12h15.

CIGRE and WG surveys show a high failure rate of transformers on short circuit tests, particularly for higher ratings; in the range of 50 to 60%. The short circuit application methods have been extensively discussed. The pre-set method is the preferred if not the only method. Their may be some inrush current, particularly for auto-transformers, axial split transformers and when the power source is from the inner concentric winding. Text will be proposed, including some wording from the actual IEC CDV before the next meeting. DGA will be included in diagnostic measurements and FRSL, FRA and TOP will be mentioned as additional diagnostic tools.

Some text should be added to C57.12.00 regarding inrush currents when a short-circuit fault occurs on an autotransformer or an axial-split winding transformer.

4. Mark Perkins reported on the TF on Resistance Measurements (section 5 of C57.12.90) He discussed the need to de-magnetize the core after the resistance measurement and provided three methods to do it. Some discussion on how to demagnetize a D - Y transformer followed with comments and suggestions from the group.

5. Mark asked if a tutorial on short circuit test was beneficial to members and the majority of the group responded with a positive yes.

6. Subhash Tuli provided information about Wye-Zig Zag phasor diagram that is missing from Figure 7, and should be included.
7.5.4.2 PCS WG on General Requirements C57.12.00 - Steve Snyder, Chairman; Enrique Betancourt, Secretary

The WG met on Monday, March 12 at 1:45 PM. There were 18 members and 47 guests present. No guests requested membership, leaving the WG membership at 69 members.

The new WG Secretary, Enrique Betancourt, was introduced, replacing Dennis Marlow, who has served as secretary since 2001.

Following introductions, the minutes of the October 23, 2006 Montreal meeting were approved as submitted. WG members were then asked about any applicable patents pertaining to our work. No patents were disclosed by anyone.

The chairman then promoted the upcoming meeting of the PCS “Core Over-Excitation Task Force” chaired by Craig Stiegemeier. The work of this task force is reaching a conclusion, and their recommendations will be forwarded to this WG for consideration. It is expected that a survey will be conducted at the PCS Subcommittee level on this topic prior to the next meeting.

Old Business:

The chairman presented a new version of Table 21 - Draft 5 - (Routine, design, and other tests for liquid-immersed transformers) that incorporates all the previous changes agreed to by this WG. Since the table is now structured along the lines of Distribution, Class I, and Class II Power Transformers, the new format exposes the ambiguity of just what constitutes a distribution class transformer. This is particularly true today now that transformers rated up to 10 MVA can be considered distribution class (see scope of C57.12.36), although many may be Class I power.

A question was raised if the notes of Table 21 are “informative” or “normative”. The chairman explained that from the context, the notes are normative, as they add critical information necessary to properly interpret the table and conduct the tests.

Even with the new table format, the WG was still not completely satisfied with this structure. Some suggested a separate table for distribution and another for power. Other suggestions were to “landscape” the present table and add a column for comments, thereby eliminating the notes. Another concept proposed would create a “hybrid” table. The chair will study these proposals and offer some new options before the next meeting.

Details of changes to Table 21:

Resistance measurements: The WG felt that additional work is needed to better clarify the difference in the resistance measurement requirements between the three transformer classes. The chairman will work on this.

Ratio tests: It was agreed to change the statement “all tap connections” to “all tap positions as listed on the nameplate” to ensure that sufficient tests for multiple winding and dual voltage units were performed.

Insulation power factor testing: It was agreed to include capacitance measurements too since this data can be valuable and is available from the same instrument at the same time that the power factor is measured.
Zero-phase sequence impedance voltage and load loss: This will be expanded to state “on the rated tap connection”, as is the current practice during factory testing.

No-load loss and excitation current: The test at 110% will be a routine test for Class I and Class II Power transformers. This is a change from the present requirements.

A suggestion was made by Loren Wagenaar to move the induced test in the table so that it immediately precedes the partial discharge test. At the same time, another suggestion was made to add a statement in the section immediately before Table 21 stating that the order the tests are listed does not imply the sequence they must be conducted.

7.5.4.3 WG on Loss Tolerance and Measurement - Ed teNyenhuis, Chairman; Andy Steineman, Secretary

§ 19 members and 11 guests attended

§ IEEE Patent Policy - The policy was reviewed by the WG and an opportunity was provided for WG members to identify or disclose patents that the WG member believes may be essential for the use of that standard. No responses were given.

§ Minutes from the Montreal Meeting held on Oct 24th, 2006 were read and approved.

§ There was no report from TF for “Guide for Low Power Factor Power Measurements” as no meeting was held this time. There was discussion on how to proceed with the issuing of the Low PF Power Factor Guide since it is proceeding slowly.

§ Frequency Conversion Factors of Transformer Performance Parameters - The final wording for C57.12.00 and C57.12.90 is ready for submittal. Ramsis Girgis presented changes / additions made to the sound level frequency conversion part of this document and agreed upon at the Audible noise WG. These are:

§ Added conversions for conversion of Load Noise
§ Added conversions for the frequency spectrum of Core noise
§ Added “winding resonance” to the types of resonance a transformer can have
§ Removed the part on resonance under rated frequency and added a sentence for resolution of that situation
§ Editorial improvements - This part of the document will be sent for Survey at the Audible noise SC level. Based on the feedback from this Survey, the document will be revised and finalized before it is sent for ballot with the rest of the C57.12.90 early in 2008.
§ The chairman is to prepare the introduction on the frequency conversion factors to send along with the wording.

§ C57.123 -2002 – Guide for Transformer Loss Measurement – The PAR for the revision was received in Feb 2007. The guide was submitted to IEC for potential dual logo IEEE/IEC status. The WG went through all the comments and agreed upon changes. The WG also reviewed comments received from the WG and TC members. Below are the items that were discussed and agreed upon:

§ The bridge method will be moved from 5.3 into 4.5. A note will be added that this method is only occasionally used to measure transformers and shunt reactors with very low power factor.
§ Further information on amorphous core steel will not be added (it is mentioned in 3.2 under core material)
§ The words “full voltage” in 3.2.11 will not be added (test can be done at any voltage)
§ The year of issue is not necessary to have in the IEEE references
§ TM should be added to all IEEE references
§ Chairman will check what IEEE references are necessary for the Guide otherwise these references could be moved to the bibliography. This is expected to help resolve issues the IEC members raised regarding the Dual Logo of this Guide.
§ WG agreed to proceed to ballot with the agreed upon changes since none of the revisions is of a critical technical nature. Even the removal of the 2 – Wattmeter method from the Guide follows removing it from the balloted C57.12.90 Test Standard. The introductory paragraph in the Ballot letter needs to state this clearly to avoid negative votes.

7.5.4.4 WG on Switching Transients Induced by Transformer / Breaker Interaction, PC57.142 - Robert Degeneff, Chairman; Peter Balma, Secretary

The WG was called to order at 8:01 AM on March 13, 2007. There were 56 attendees, 17 members and 37 guests, 2 requesting membership. The minutes from the October 24, 2006 meeting in Montreal, Canada were approved, and copies of the minutes and Draft 2.1 of the guide, were distributed.

1) IEEE patent policy was reviewed and the group was asked if there were any disclosures. There were none.

2) The old PAR for this project was withdrawn and a new PAR application, with joint sponsorship with the Switchgear Committee, has been submitted. It is expected the PAR will be approved in the next several weeks. Furthermore, it has been requested that we maintain the existing standard number of C57.142.

3) Peter Balma then provided a general overview of all the changes made to this revision of the document. The purpose of this revision was to capture all of the comments made during the balloting process. This included updating the style of the document, embedding the figures in the text, clarifying equations and figures, editorial comments, and content change to address many of the concerns of negative balloters.

4) There was discussion on how to proceed with the document, and it was recommended that the efforts of the group continue to finalize the document, prepare a ballot letter, and to take the required steps to go to ballot.

5) Under old business, Bob Degeneff described his efforts to coordinate this work with that of the FRA group. The coordination has been achieved, however although prepared, a possible future annex will be held for a future version of this document.
6) Under new business Phil Hopkinson presented some additional information on this interaction problem, and suggested a possible explanation for the transformers response. One possible explanation is that the complex waveform that results during switching and re-ignition of the switching device consists of two critical frequency components. One is that typically seen in transient recovery voltages and the other, is that produced by the circuit frequencies that develop due to the traveling waves on the cable connected between the switching device and the transformer. There was further discussion, as to whether it was even possible to define this complex function.

7) The group then had a discussion on the overall philosophy of the document and its user. Bob Degeneff reiterated that the intent of this document was to make the user and industry more aware of this potential problem. The document tries to strike a balance for all the potential users of this document, as a result not all of the material will be of use to each of its readers. The problem is complex and it is extremely difficult if not impossible to succinctly define all of the variables.

There was no other new business brought before the group.

7.4.5.4 WG on Revision of C57.21- Standard Requirements, Terminology, and Test Code for Shunt Reactors over 500 KVA – Richard Dudley, Chairman

The WG met in Dallas, Texas on March 12, 2007 from 11:00 a.m. to 12:15 p.m. There were 13 members and 16 guests present. The following are the highlights.

1. Introductions were made.
2. The minutes of the W.G. meeting in Montreal were approved.
   Note: The minutes of the Dallas W.G. meeting will not be formally approved until the next meeting of the W.G. in Minneapolis, Minnesota.
3. IEEE patent policy was reviewed and no patent issues were identified.
4. The remainder of the meeting was devoted to discussing Draft #9 of the Revision of IEEE C57.21. The following are the highlights.
   (i) Draft #9 was submitted for Mandatory Editorial Coordination and the chairman has now received feedback from IEEE; MEC has been distributed to W.G. members. The chairman will prepare Draft #10 and include the MEC results. Input from W.G. members re the MEC results was requested.
   (ii) Draft #10 will be balloted. Other editorial input will be included in Draft #10; Gene Blackburn etc. The chairman requested input from other W.G. members re any editorial issues.
   (iii) Annex B was discussed regarding any possible issues with IEEE Switchgear Committee members during the balloting process. Coordination with IEEE Switchgear Committee was achieved several years ago. The purpose of the annex is to support the elimination of reduced BILs from Table 5 and to address dielectric stresses seen by shunt reactors during switching. The focus is on the shunt reactor and not the switching device. The annex will again be reviewed from this perspective to ensure that the focus is on the shunt reactors; switching dielectric stresses.
(iv) The Chairman will discuss with IEEE staff the “References” in Annex A and “Bibliography” in Annex B; is this practice acceptable? The W.G. feels that the references and bibliography should be in the annex to ensure that the reader’s attention will be focused. If the material has to be included in the “Reference” clause and in the Annex D “Bibliography” then a note may be added to Annex A and B drawing attention to the material. Is this acceptable? The Chairman will discuss with the IEEE editor.

(v) The usage of maximum system voltage vs 105% nominal voltage was discussed. The W.G. again endorsed this as the correct approach; except as documented in the revision.

(vi) The Chairman stated that his plan was to complete Draft #10, initiate the invitation to ballot process and complete the formal ballot process by May. The focus of the Minneapolis meeting should be issues, if any, resulting from the IEEE formal ballot process.

(vii) Specific editorial comment; remove reference to Pierre Riffon from Clause 10.9.

7.5.4.6 WG on Revision of C57.110 – IEEE Recommended Practice for Establishing Liquid-Filled & Dry-Type Power & Distribution Transformer Capability When Supplying Non-Sinusoidal Load Currents – Rick Marek, Chair; Kent Haggerty, Co-Chair

The meeting opened on Tuesday at 1:45 PM with 14 members and 13 guests present. Following introductions, the minutes from the October 24, 2006 meeting in Montreal, Quebec, Canada were approved as submitted.

No guests or members present indicated knowledge of any patent activity applicable to the work at this meeting.

The WG members were requested to carefully review the draft, since the next step will be to ballot this version of the document. No comments have been received on this draft to date. The group agreed that surveys of the WG and the Subcommittee were unnecessary and draft 3 will proceed directly to a formal ballot.

It was previously agreed that the flux plot in the tutorial Annex D is outdated and should be improved. The plots from IEC 61378 were suggested as replacements, but rejected by the chairman, since they all refer to three-winding rectifier transformers. This type of transformer is specifically excluded from the scope of the document. A volunteer was proposed to provide replacement plots that would demonstrate the different patterns for the fundamental and higher harmonics. This resulted in a lengthy discussion concerning the accuracy of the selected plots. The concerns were that the reader might be misled and that the topic was far too technical for the scope of this document. Accordingly, a
A team of four was selected to review the proposed replacement figure to insure technical accuracy. However, revision of this figure will not delay the balloting process.

Dr. R. Hasegawa presented the results of a technical paper by ERDA (Electric Research Development Association) in India, which compared the no load losses of mechanically scribed grain oriented wound core transformers with amorphous wound core transformers. Two sets of 25 kVA and 250 kVA transformers were compared. According to the ERDA study, both cores had significantly higher core losses due to the very high harmonic load current. Dr. Hasegawa suggested modifying the equations in the C57.110 document to account for this extra loss. However, WG members pointed out that the magnetic loss equation in the ERDA paper is not totally accurate as the current harmonics will cause only minor changes in the core loss. While the study indicates that these losses are indeed lower for the amorphous core, the additional losses measured are actually stray losses, not true core losses and stray losses are already accounted for in the C57.110 document. This topic of increased core losses due to current harmonics has been discussed before and the group concluded that the effect is too small to warrant any elaboration in this document.

Sheldon Kennedy suggested a paper that will be added to the bibliography before the document is submitted for ballot.

### 7.5.4.7 TF on Semi-Conductor Rectifier Transformers, C57.18.10 – Sheldon Kennedy, Chairman

The WG met on Tuesday, March 13, 2007 at 3:15 PM with 9 members and 6 guests present. Sheldon Kennedy chaired the meeting.

The IEEE disclosure statement was discussed. There were no patents pertaining to this standards work for which any members had awareness.

The minutes of the October 24, 2006 meeting in Montreal were approved.

The Chair announced that the Amendment, C57.18.10a/D2, had been put out for a survey in the WG. Only 10 votes were received to date. They were all positive with no comments. It is not expected that there will be any negatives to Draft 2. Draft 2 will either be surveyed with the Performance Characteristics Subcommittee next or sent on to ballot based on direction from the Performance Characteristics Subcommittee.

The Chair reminded the WG that IEEE had published an Errata in January 2006, correcting some of the problems that occurred when the Word copy was converted to a PDF file. Also, with this Amendment, the standard cannot be reaffirmed in 2008. When it comes due it will have to go to a full revision. The Chair discussed some of the tabled topics from the reaffirmation and previous work and asked members to begin to think about things they would like to work on for the next revision. The Chair also expressed concern for all of the work that will be needed to bring this document into the new IEEE format. This standard contains many tables and formulas which will be a lot of work to convert.

### 7.5.4.8 WG on IEEE Standard Requirements, Terminology, and Test Procedures for Neutral Grounding Devices, PC57.32 – Steve Schappell, Chairman

The WG was called to order at 9:32AM on Tuesday March 13th by Peter Balma. There were 11 attendees. Minutes from the previous meeting were unavailable.
1) IEEE patent policy was reviewed and the group was asked if there were any disclosures. There were none.

2) The progress and history of the WG was reviewed, and the meeting was opened to New Business. There was good discussion from the attendees and the follow items summarize the salient points discussed:
   · The continuous current ratings for neutral grounding devices is unclear, can the document clarify this requirement.
   · How can the testing of these devices be coordinated with testing these devices as part of a system, e.g., how should testing of a transformer proceed when a neutral ground device is attached to the transformer. Can this guide provide some guidance or considerations that could be made?
   · As previously discussed, short circuit currents in this document are calculated differently than indicated in C57.12. Richard Dudley indicated that both are correct, but start from different base assumptions. An explanation of this will be placed in the standard.
   · It was pointed out that the resistor section of the document does not consider stainless steel resistors; only copper and aluminum. The resistor industry makes extensive use of stainless steel, and guidance is needed in this area for both the users and manufacturers. Many types of stainless steels are utilized and their characteristics vary substantially.
   · It was suggested that an informative tutorial annex and a more extensive bibliography on neutral grounding would be beneficial to this document and users.
   · Another question was raised on the insulation levels for the ground terminal of neutral resistors, and the validity of these requirements. This area will require investigation by the WG.
   · Sergio Panetta, offered to the group a draft guide for Proposed Requirements for Neutral Grounding devices. He will send an electronic copy for the WG’s use.

7.5.4.9 WG on the Guide for the Application and Interpretation of Frequency Response Analysis for Oil Immersed Transformers, PC57.149 — Chairman; Charles Sweetser

The WG met for the development of a guide for Frequency Response Analysis (FRA) in Dallas, TX on March 12, 2007 at 1:45 PM. There were 55 persons in attendance, 27 members and 28 guests of which 3 guests requested membership.

The first order of business was to show the two slides regarding patents and inappropriate behavior. The minutes from the last meeting were presented and approved without comment. The WG Chair presented a brief report on what had been done in the last six months. It was estimated that the document is over 94% complete. The latest contributions were identified and discussed.

Edits to Section 1: Scope and Application George Frimpong completed reviewing and editing the “Definitions” section.
Edits to Section 3: Making an FRA Measurement

Richard Breytenbach was unable to contribute to this section for this meeting, however has agreed to supply the alternate connection instructions, including a purpose, description, and terminal connection table as soon as possible.

A statement was included by the WG chair stating, “Test connection variations on the basis test sequence and polarity are acceptable if specified by the end user.” This statement will be removed once Richard Breytenbach’s contribution has been submitted and approved by the WG.

Edits to Section 5: Analysis and Interpretation

Larry Coffeen provided several comments to Section 5. He proposed the following:

a.) Adding winding looseness and insulation degradation as additional failure modes detected by FRA to 5.2.1 (Open Circuit Test).

b.) Adding information regarding asymmetry techniques to 5.3.3 (Phase Comparison)

c.) Adding the statement “Plots can also be graphed as impedance or admittance versus frequency; either linear or logarithmic scales can be applied” to 5.3 Trace comparisons.

The rest of the meeting focused on reviewing the work required to finish each section.

• Section 1: Scope and Application - Two definitions, 1.2.8 Winding Self Admittance and 1.2.9 Inter-Winding Admittance will be edited by the chair for clarification. Also, all other definitions will be modified to remove the constricting meaning of “admittance” and refer more generically to the test setup.

• Section 2: FRA Test Parameters – The WG agreed to add the statement, “Plots can also be graphed as impedance or admittance versus frequency; either linear or logarithmic scales can be applied.”

• Section 3: Making a FRA Measurement – If Richard Breytenbach is unable to provide the information, Larry Coffeen will provide the necessary contribution. The FRA WG will review this contribution at the next meeting.

The WG decided to not include online FRA discussion in this document.

• Section 4: Test Records – The WG requested and received 4 volunteers (Paulette Payne Powell, Alexander Kraetge, Kurt Robbins, Greg Anderson) to provide recommendation regarding required and optional fields for test records. The WG chair recommended that “special ID” be included as a required field.

• Section 5: Analysis and Interpretation – The discussions focused on failure modes and trace comparison strategies. Jeff Britton offered to edit Section 5.3.3 Phase Comparison for clarification. Alexander Kraetge also offered to do a general review of Section 5.

A discussion occurred regarding what qualifies a transformer to be similar or identical in design. Joe Watson offered to provide a description to be offered at the next meeting.
Section 6: Appendix FRA Theory – Alan Darwin started a short discussion regarding FRA theory. This discussion focused on the modeling work done by Dr. Zhongdong Wang from the University of Manchester. Alan Darwin submitted this work for inclusion in the next draft D4.

The PC57.149 FRA WG plans to have an updated draft D4 at the next meeting.

7.5.4.10 TF on Core Overexcitation – Craig Steigemeier, Chairman; Tim Raymond, Secretary

The seventh meeting of the Core Over-Excitation TF authorized by the Performance Characteristics Subcommittee took place at 3:15pm on Monday, March 12, 2007 in Dallas. This TF is charged with the identification of limits for core over-excitation and development of suggestions for modification of appropriate standards. There were 70 attendees – 25 members and 45 guests. Twenty-six (26) of the 70 attendees were first time attendees. Two (2) attendees requested membership and will be added to the TF membership roster.

Attendees were reminded of the need to adhere to the IEEE patent policy and the chair asked for anyone aware of patentable situations to bring it before the group. No one offered the chairman suggestions during or after the meeting of patentable work or identified any inappropriate topics covered during the meeting.

A discussion was opened to review the minutes from the fall 2006 Montreal meeting published on the Committee website. A vote was taken and the Montreal meeting minutes were approved as reported.

It was noted that the purpose of this TF is to clarify and remove ambiguity concerning the over-voltage capability of large power transformers, primarily used at generating facilities.

The text developed to aid in improving the alignment between users and producers was reviewed at the meeting. After the Montreal meeting, an additional clause (4.1.6.4) was added to the proposed text:

4.1.6.4 Metallic surface temperature limit
The core surface temperatures, including interior cooling ducts and the surface temperature of all metallic parts shall be limited by the temperature capability of the insulation materials in contact with the metallic surface. For non-thermally upgraded pressboard, this limit would be 95°C.

A discussion of the proposed text was taken. The significant item taken from that discussion, as suggested by Donald Chu, will be the incorporation of text to highlight that the full insulation system must be considered in the surface temperature limit.

The TF believes that it is time to take the various text developed in this TF to the WGs responsible for revising C57.12.00, C57.91 and C57.104. The details of those are:

WG revising C57.12.00 (PCS) – Steve Snyder:
1. Improved wording for section 4.1.6.1, which will aid in the clarification of the over-voltage capability of the transformer.
2. Addition of section 4.1.6.3, which provides new limits to the core hot-spot temperature to avoid gassing due to mild core overheating.
3. Note that the limit applies only to mineral oil insulated transformers.
4. Capacity limits or capabilities should be included on the nameplate that makes the transformer design unique.

WG revising C57.91 Loading Guide (Insulation Life SC) – Tim Raymond:
1. Inclusion of core hot spot temperature limit in C57.91.
2. Addition of sections 4.1.6.3 and 4.1.6.4

WG revising C57.104 Gas Guide (Insulating Fluids SC) – Rick Ladroga:
1. Text should be included to note that moderate core overheating doesn’t place the transformer at risk.
2. A guideline for low levels of gas generation with a H₂/CH₄ (hydrogen to methane) ratio in the range of 6-8 should be considered for incorporation into a future revision of C57.104.

Don Platts questioned the proper way to use these limits in C57.91. Ramsis disagreed, suggesting that the limits were needed to improve the producer/user understanding. Don clarified that temperature limits in C57.91 require some method for users to assess the temperature for various conditions. Tim Raymond reiterated this and added that he believes core temperature limits are design criteria and belong in C57.12.00, though he is not opposed to adding information wording to the loading guide.

The TF does not plan to meet again. It will be resurrected only if questions or modification suggestions are received from any of the three WGs after they review the improved and new text provided by this TF.

7.5.4.11 WG for Revision of Short-Circuit Test Codes, C57.12.90 and PC57.133 – Marcel Fortin, Chairman

The WG met from 11h to 12h15. 40 persons attended the meeting; 14 members and 26 guests, 2 guests requested membership and are welcome as new members. The minutes of the Fall 2006 Montreal meeting were presented and approved. The IEEE patent slides were presented. The attendees have no patent issues to report.

Clause 12 of C57.12.90: Short-circuit test code
Two members sent late comments. Those are not included in Draft 3, but will be considered for Draft 4.

CIGRE and WG surveys show a high failure rate of transformers on short circuit tests, particularly for higher ratings; in the range of 50 to 60%.

Pierre Riffon’s contribution on axial- split coils have been included. The short circuit application methods have been extensively discussed. The pre-set method is the preferred if not the only method. The post set method requires laboratory capability of 10 times or more the transformer kVA rating.
There may be some inrush current, particularly for auto-transformers, axial split transformers and when the power source is from the inner concentric winding. Text will be proposed, including some wording from IEC 60076-5 2006 before the next meeting. DGA will be included in diagnostic measurements and frequency response of stray losses (FRSL), frequency response analysis (FRA), and transient oil pressure (TOP) will be mentioned as additional diagnostic tools. Papers will be proposed to be added to the bibliography.

Some text should be added to C57.12.00 regarding inrush currents when a short-circuit fault occurs on an autotransformer or an axial-split winding transformer.

**Course of Action**

- The Chairman will produce Draft 4, review it with some key members, and then survey the WG before the Fall 2007 meeting.
- The Chairman will contact some labs to get more data.

**PC57.133: Short-circuit test guide**

Time did not allow starting discussion on the guide and we should resolve clause 12 of C57.12.90 before extensive work on this guide.

**Course of Action**

- The Chairman will produce a table of contents and survey the WG for opinions on what should be included, or which sub-clauses of 12.90 need to be in the guide.

### 7.5.5 Old Business

None

### 7.5.6 New Business

None.

**Attendance at this Meeting**

**MEMBERS**

1. David Aho
2. Stephen Antosz
3. Jim Antweiler
4. Javier Arteaga
5. Barry Beaster
6. Enrique Betancourt
7. William Boettger
8. Jeffrey Britton
9. Carl Bush
10. Alvaro Cancino
11. Arnaldo Carlos
12. Donald Chu
13. Larry Coffeen
14. Craig Colopy
15. John Crouse
16. Robert Degeneff
17. Dan de la Cruz
18. Richard Dudley
19. Fred Elliott
20. Reto Fausch
21. Joseph Foldi
22. Bruce Forsythe
23. Marcel Fortin
24. Robert Ganser
25. Charles Garner
26. Ramsis Girgis
27. E. Gomez-Hennig
28. Roger Hayes
29. Bill Henning
30. Virenda Jhonsa
31. Sheldon Kennedy
32. Vladimir Khalin
33. Richard Marek
34. John Matthews
35. Gary McCulla
36. Gylfi Olafsson
37. Samuel Orti
38. Mark Perkins
39. Don Platts
40. Christoph Ploetner
41. Bertrand Poulain
42. Paulette Powell
43. Jean-Chris Riboud
44. Girolamo Rosselli
45. Marnie Roussell
46. Mahesh Sampat
47. Devki Sharma
48. H. Shertukde
49. Jin Sim
50. Steven Snyder
51. Andy Speegle
52. Andy Steineman
53. Craig Stiegemeier
54. Craig Swinderman
55. Valeriu Tatu
56. Ed teNyenhius
57. Juan Luis Thierry
58. Robert Thompson
59. Robert Tillman
60. George Tolbert
61. Subhash Tuli
62. Dharam Vir
63. Loren Wagenaar
64. Jim Zhang
65. Peter Zhao
GUESTS

1. Geore Frimpong **
2. Kipp Yule
3. Jerry Kazmierczak
4. Hasse Nordman
5. Jim Campbell
6. Robert Perlchek
7. Herman Vogel
8. Gene Blackburn
9. Randy Rensi
10. Wilington Ayala
11. Mark Ashford
12. Edilson Ayala
13. Val Tatu
14. C.J. Kalra
15. Jermel Miller
16. Rudolf Ogayanov
17. Terry Rennich
18. Carlo Arpino **
19. Alan Traut **
20. Dave Ostrander
21. Clarence Bell
22. Mike Craven
23. Tom Lundquist
24. Larry Davis
25. Pierre Riffon **
26. Alexander Kraetge**
27. Ramon Garcia
28. Richard Graham
29. Arthur Molden
30. Jerry Harlan
31. Sanjay Patel
32. Shinish Mehta
33. Tony Reiss
34. Edgar Trummer
35. Nicolas Jacquenet
36. Lin Tong
37. Rick Ryman
38. Jurgen Gerth
39. Dale Corel
40. Shawn Patterson
41. Michael Spurlock
42. Jane Ann Verner
43. Matthew Kennedy
44. E. Tom Jauch
45. Paul Mushill
46. John Progar
47. Greg Anderson

** Guests requesting Membership.
7.6 Power Transformers Subcommittee  
Tom Lundquist, Chair

The Power Transformers Subcommittee met on Wednesday, March 14th, 2007 with 44 members and 61 guests; 19 guests requested membership.

The minutes from the Montreal, Canada meeting were approved with no changes or corrections.

The chairman asked if anyone was aware of any patent conflicts, none were voiced.

7.6.1 WORKING GROUP AND TASK FORCE REPORT

7.6.1.1 TASK FORCE FOR REVISION OF C57.17, REQUIREMENTS FOR ARC FURNACE TRANSFORMERS – Dominic Corsi, Chairman

Dom Corsi, called the Working Group to order at 8:00 am on Monday, March 12, 2007. There were 10 persons present.

The IEEE/SA Standards Board By-laws on Patents in Standards and a review of Inappropriate Topics for Working Group Meetings were presented to all those present. No exceptions to those topics were presented to the Chair.

The minutes from the Montreal meeting were presented and approved by the members. It was noted that the minutes from that meeting were not included in the Power SC minutes due to a communication error resulting from the absence of both Mr. Corsi and Mr. Ganser.

Dom Corsi announced that the PAR has been submitted and approved. Tom Lundquist affirmed that the former Task Force was now a Working Group. Important target dates for the Working Group are set as:

- Submission for Initial Sponsor Ballot: May 2009;

Under Old Business, Mr. Frank D’Amico stated that in his opinion Appendix B, the Section on Construction was in need of expansion to include areas of increased protection using schemes with Bucholz Relaying and Pressure Relief Devices. The WG will review proposed changes and additions to the present Appendix B.

Comments from Mr. Axel Kramer were distributed to the group for consideration and will be incorporated for discussion and resolution if necessary at the October meeting.

Continuing under Old Business: the proposal to involve the Fluids Sub Committee in a review of Appendix A “Guide for the Interpretation of Gasses Generated in Electric Arc Furnace Oil – Immersed Transformers was discussed. The discussion centered on 2 main points:

- Electric Arc Furnace Transformers are “specialty transformers subjected to unusual and harsh duty;
- Dissolved gassing patterns in Electric Arc Furnace Transformers exhibit patterns that are specific to these transformers and can be beyond the limits considered acceptable for Power Transformers covered under, for example, C57.12.00.
Attendees representing manufacturers were emphatic that EAF’s be represented as having these different yet “normal” gassing patterns. Recognition of this would increase the confidence level of the user for continued operation and perhaps avoid unnecessary out of service time for investigation of gassing sources that would be abnormal using present gassing rules.

It was agreed that this representation is more appropriately addressed by the WG for Revision to C57.104, Gas Guide, perhaps in a separate Appendix for EAF’s and other specialty transformers. The Working Group also agreed to include a paragraph in the C57.17 Standard explaining that the gassing patterns would be different than power units. Further to this point, it was agreed to not pursue placing dissolved gas limits during factory testing (particularly thermal) into this standard. Instead, it was agreed to place a statement in this standard that cites C57.104 as a guide to the Interpretation.

There were no proposals to be carried under New Business.

The meeting was adjourned at 9:15 a.m.

7.6.1.2 WORKING GROUP FOR DEVELOPMENT OF PC57.143, GUIDE FOR APPLICATION OF MONITORING TO LIQUID IMMERSED TRANSFORMERS AND COMPONENTS – Donald Chu and Andre Lux, CoChairmen

Meeting started at 8 AM. There were a total of 122 attendees, 35 members and 87 guests. 12 guests requested membership.

The latest draft (number 18) was circulated to 73 WG members prior to the meeting for the purposes of a straw ballot.

The results were 13 approved, 3 disapproved, 3 with comments but no vote one way or the other. This represents a 26% response rate.

The comments were reviewed and discussion on some of the points raised;

1) More work needs to be done on OLTC diagnostics, will needs some volunteers to undertake this portion.
2) The is a perceived need to bring up to date of the sections, with respect to advances made in recent years about technology that is now available, when it was not available in 1997 when this effort started.
3) Much more work needs to be done with respect to the moisture in the insulation system. Suggested we follow the lead of the latest C57.106 Guide in this area. Brian Sparling and Jim Thompson volunteered to undertake this effort.
4) A new item was raised, with respect to some wording to alarms that will be generated from a monitoring system. Wording to be kept to warning that alarms must be taken seriously, and an appropriate response procedure to be added to the exiting alarm response procedures, existing with most transformer owners.

New Business:

The next meeting of the WG will be held during the Doble Conference in Boston the week of March 26th, on Monday Tuesday and Wednesday (8:00 AM to 12:00 noon each day) in the ‘Board Room’ 7th floor of the Westin hotel. Please RSVP to Tony Pink and/or Andre Lux to confirm that you will participate.
The objective is to sort through all the comments and assign volunteers to address the comments and additional material.

Once all comments are addressed, and then another draft (number 19) will be circulated for straw ballot prior to the next meeting in October 2007 in Minneapolis.

Meeting adjourned at 8:45 AM.

7.6.1.3 WORKING GROUP FOR DEVELOPMENT OF PC57.148, STANDARD FOR CONTROL CABINETS FOR TRANSFORMERS – Joe Watson, Chairman

The Working Group for a Standard for Control Cabinets for Power Transformers met Monday, March 12, 2007 at 11:00 am.

The group reviewed the revised control drawings for ONAN/OFAF/OFAF cooling transformers equipped with a load tap changer.

The drawings will be revised to be consistent with C57.12.10 with regards to the number of contacts on gauges and relays. Where additional contacts are commonly available, these will be shown as optional, and the wiring terminals will provide enough terminals to accommodate additional contacts on the same terminal block. For example, a winding temperature gauge is required to have 3 sets of contacts in C57.12.10, but can be ordered with 4 sets of contacts. The terminal block for the winding temperature gauge contacts would be a 12-point terminal block with terminals 1-9 assigned to the 3 required sets of form-C contacts but terminals 10-12 available for a fourth set of contacts.

Terminal block designations were also discussed. Rather than sequentially numbering all terminal blocks A, B, C… or T1, T2, T3… we will assign a designation for common circuits and number those terminal blocks. For example, if CT terminal blocks are assigned as the “X” terminals, the terminal blocks for CT’s would be numbered X1, X2, X3, etc., with as many as are required.

We will add an option for a main breaker in the transformer for cooling and control power circuits.

The GFI outlet was separated from the heater and lights and protected with another circuit breaker.

We currently plan to provide drawings for 6 different transformer designs, ONAN, ONAN/ONAF/ONAF and OFAF. We may need to double the number of designs to cover single-phase or three-phase power supplies, but we are hoping to minimize the number of different types of drawings required and will work on consolidating the drawings.

7.6.1.4 WORKING GROUP FOR DEVELOPMENT OF PC57.131, STANDARD REQUIREMENTS FOR TAP CHANGERS - William Henning, Chairman

The Working Group on Tap Changer Performance met on Monday, March 12, 2007 with 10 members and 28 guests present.

The working group chairman asked if anyone had information on patents related to the working group. It was noted that no one present at the meeting expressed knowledge of patents related to our document.

Next, the minutes of the previous meeting in Montreal were approved.
Since the last meeting, a draft numbered 1.2 was created. The changes in this draft were:

CHANGES IN DRAFT

1. The definition of the term “step voltage” was changed to make it clear that it applies only to LTCs and not to de-energized tap changers

2. The requirement to assign a step voltage rating to a de-energized tap changer was removed from the list of required ratings

3. In the section on dielectric tests for de-energized tap changers, corrections were made to the table that defines the five tests

4. Material was added in several places to recognize the asymmetrical pennant cycle switching method.

Most of the meeting time was devoted to a discussion of the temperature rise limits specified for contacts in LTCs as compared to the temperature rise limits specified for DETCs. A comparison of the two sets of requirements is listed below. The first list shows where the requirements for LTCs are the same as the requirements for DETCs

TEMPERATURE RISE REQUIREMENTS THAT ARE THE SAME FOR LTCs AND DETCs

1. A note indicates that meeting the requirements of the temperature rise test demonstrates the thermal overload capacity referred to in 4.3 for both LTCs and DETCs.

2. The temperature rise limits correspond to a test current of 1.2 times the rated through-current for both types of tap changer.

3. Both LTCs and DETCs have temperature limits for air and liquid, although the limit values are different.

4. Identical text, “The temperature shall be measured by thermocouples or other suitable means positioned on the surface of the contacts as near the point of contact as is practicable” applies to both types of tap changer.

5. Identical text, “The temperature is considered to be steady when the difference of the temperature between the contact and the surrounding medium does not change more than 1K over an hour” applies to both types of tap changer.

6. An identical note is given for both types of tap changer: “NOTE – The cross section and insulation of the conductor carrying the current into the tap changer or components should be stated.”

The six items of the list above point out that, for the most part, the requirements for the two types of tap changers are the same, regarding test method and transformer loading capability.

The following list indicates where the LTC and DETC contact temperature rise requirements of the standard are different:

TEMPERATURE RISE REQUIREMENTS THAT ARE DIFFERENT BETWEEN LTCs AND DETCs
1. For LTCs with contacts immersed in liquid, the temperature rise limit is 20 °K. For DETCs with contacts immersed in liquid, the temperature rise limit is 15 °K.

2. For LTCs a note says, “Where contacts remain in one position for long periods of time, pyrolytic carbon formation may occur.”

3. A related note for DETCs says, “The above values (referring to the temperature rise limits of 15 °K for DETCs in liquid, 25 °K for copper contacts in air, and 40 °K for silver-faced contacts in air) are lower than for on-load tap changers to guard against pyrolytic carbon formation, which can occur when contacts remain in one position for long periods. The temperature rise of 15 °K at 1.2 times the maximum rated through current approximate to a temperature rise of 11 °K at 1.0 times the maximum rated through current.”

The main difference is in the values specified for contact temperature rise limits. Item 3 above explains why they were chosen to be different.

During the working group meeting, a discussion was held to understand where the specific value of 15 °K came from and to evaluate how well this assures prevention of pyrolytic carbon formation.

The following summarizes the discussion points made during the meeting:

1. Load tap changers and de-energized tap changers have different applications, they can reside in different parts of the transformer, and operation is different. So we need to distinguish the differences in the requirements of the two devices.

2. It was established that the only reason for the difference in temperature rise limit values is the concern over pyrolytic carbon formation. Except for this concern over contact thermal stability, no one present indicated any other reason why the temperature rise limits should be different between LTCs and DETCs, in spite of differences in function and application for the two tap changer types.

3. Regarding the ability of the lower temperature rise limit to assure thermally stable contacts, it was agreed that you can have tap changers rated on a 20 °K rise basis, and some will exhibit stable long-term performance, and others may exhibit unstable behavior.

4. It was also agreed that even with the lower 15 °K rise limit, it is true that you can have some tap changers that exhibit stable long-term performance, and others may become unstable.

5. The temperature rise test was never intended to predict long-term, thermal stability. You need another test for that.

6. The reduction in temperature rise limit from 20 °K to 15 °K does reduce the value of rated through-current that can be assigned to a given design.

To settle the question of what temperature rise limit should be specified in the draft, the working group chairman will conduct a working group survey on the subject.

The meeting ended at about 2:30 pm.
7.6.1.5 WORKING GROUP FOR THE REVISION OF C57.93, INSTALLATION OF LIQUID-FILLED TRANSFORMERS - Michael Lau, Chairman

No meeting held.

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

Greg Anderson, Chair of the Working Group for Transportation Issues Guide, PC57.150, called the meeting to order at 3:15 pm, Tuesday, March 13, 2007. Also present were the Vice-Chair, Ewald Schweiger and Secretary, Susan McNelly.

There were 21 members present with 33 guests and 6 guests requesting membership in the WG.

The IEEE Patent disclosure requirements were discussed and a request was made for disclosure of any patents that may be related to the work of the WG. There were no responses to the request for disclosure.

Approval of minutes from the Fall 2007 Montreal meeting was requested. One correction was made regarding submittal of information for Clause 4. The Fall 2006 minutes incorrectly indicated that Bob Tillman instead of Bob Thompson was to provide information for this section. A motion was made and seconded. The motion was approved.

Greg reviewed the purpose of the guide and thanked those that have already provided information that has been input into the guide to date.

Submittals have been received from:

1. Jane Verner
2. Doug Filer
3. Bill Darovny
4. Bipin Patel
5. Marnie Roussell
6. Robert Thompson
7. Kipp Yule

Assignments:
1. RFQ, Specification
   Transportation relevant data:
   UCC vs Incoterms 2000 - see Installation Guide and make match. Incoterms 2000 are proper international terms for transportation responsibilities. The new UCC version no longer uses terms like FOB, and now uses the terms in the Incoterms 2000. Each individual state has to approve the UCC and may not yet have accepted the most recent version. Ewald Schweiger will provide information for this section. Both UCC and coterms 2000 will be referenced in the document.
Exact address, contacts, status of site (existing, under construction). Complete, information provided by Marnie Roussell and Robert Thompson.

2. Design
Criteria on bracing. Ron Barker had agreed previously to provide some wording on this.

3. Shipping:
Air shipment – Ewald Schweiger will provide input for this section.
Forwarder – Selecting subcontractors, checklist. Greg has two forwarders that have agreed to provide information.
Oil – Dave Wallach will provide information for this section.

4. Clause 6.1 should be reviewed with what has been provided in C57.93 and they should not conflict.

5. Greg requested input for the impact recorder section. Gael Kennedy volunteered to provide some information for this section.

6. Coordinate the receipt inspection section with C57.93.

7. Combine clauses 6.2 and 11.3 on impact recorders.

8. Combine clauses 5.0 and 9.8.

9. Check points – Would like a check list for what to check when a transformer arrives at the dock or site. Peter Zhao and Paul Pillitteri, Sam Mehta, and Sanjay Patel volunteered to provide information for this section.

10. Figures on types of trailers etc – Contact railroad company or manufacturers for figures or drawings. Paul Pillitteri will work on this section.

11. A comment was made that there may be resistance to the guide being mis-used as a standard and that not all users are doing all of the tests listed on receipt, such as at the port. We need to be sure that it is clear that the tests listed are not necessarily required. Provide more if/then instructions for issues that arise during transport.

In general, good progress is continuing to be made on the document. A revised draft with the latest input will be sent out in the next several weeks for review.

Meeting was adjourned at 4:25 pm.

7.6.1.7 TASK FORCE FOR FUNCTIONAL LIFE TESTS OF DE-ENERGIZED TAP CHANGERS
– Phil Hopkinson, Chairman

The Task Force on Life Tests, De-energized Tap Changers was called to order at 9:30 AM on March 13, 2007. There were 31 attendees, 16 members, and 15 guests with 1 requesting membership. Reviewed the agenda for the meeting, and the Minutes from the October 24, 2006, meeting in Montreal, Canada were approved.
1. Mission – Develop Functional Life Test and Supporting Technical Paper for De-energized Tap-changers. Reminder that the goal is to develop the test and have a paper that supports the test. Test will ultimately be included in C57.131.

2. Reports from Reinhausen, Central Moloney, Quality Switch/Cooper and others on test results. No new data to report. Reinhausen, Quality Switch and Central Moloney should have data to report for the next meeting.

3. Document Status and Future Planning
   - Proposals were discussed to publish the document as a stand-alone guide or a trial use guide instead of incorporating into C57.131.
   - Motion: Make document a trial use guide
   - Approved with unanimous support
   - WG Chair will submit the PAR. Title, scope and purpose are required

   - Proposals were discussed to change name of document to Accelerated Aging Test or Thermal Stability Test for De-energized Tapchanger Contacts.
   - Motion: Change the document title to Thermal Life Test for De-energized Tapchanger Contacts in Insulating Fluid
   - Approved with unanimous support.

   Future Planning
   - Modified tests for other currents and bath temperatures
   - Unified definition of the Functional Life Test
   - Agree on Technical Paper
   - Transmit materials for inclusion in C57.131

   Recommendations
   - Stop data quest in 2 more meetings - Spring 2008
   - Freeze test at present definition - Completed now
   - Agree on Technical Paper - Fall 2008
   - Transmit materials for inclusion in C57.131 - Spring 2009

   The WG Chair accepted the timeline proposed.

4. New Business

The meeting adjourned at 10:45 AM.

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

The Working Group for revision of C57.12.135, the “IEEE Guide for the Application, Specification and Testing of Phase Shifting Transformers” met on Tuesday, March 13, 2007 at 11:00 am.

Comments were reviewed from Gustav Preininger and corrections were made to some formulae and figures.

Comments from the original Working Group were forwarded by Tom Lundquist and reviewed during the meeting. Sections 3.17, 5.3.3, 5.3.4 and 7.2.1 were modified to address those comments.
Joseph Foldi and Jim McIver will revise section 4.5.2 which covers single core designs where the location of LTC’s at the line ends exposing it to the system short-circuit current and overvoltages. Input is scheduled by May 1st.

Tom Lundquist will be asked to review and revise, if necessary, Section 12.2.3 which covers tap changer requirements.

A comment to consider including phase-shifting methods using power electronics was discussed by the group but rejected as being a special LTC design, not specific to phase-shifting transformers.

Sanjay Patel and Jim McIver will confer with phase shifting transformer users’ System Planning engineers to discuss the impacts on the system and relay protection from impedance swings over the phase-shift range. Sanjay and Jim will draft a new section to cover these issues by the end of April ’07.

Jim McIver and Joseph Foldi will also draft a new section to discuss the relative merits of single tank or dual tank designs.

7.6.1.9   WORKING GROUP FOR REVISION OF C57.12.10, STANDARD REQUIREMENTS FOR LIQUID IMMERSED POWER TRANSFORMERS - Javier Arteaga, Chairman

The WG met on March 12, 2007 from 9:30 AM to 10:45 AM. In attendance were 13 members and 31 guests, 8 requested membership.

Patent Review:
Per the IEEE Patent Requirements, the chairman asked if anyone needed to disclose any issues pertaining to the development of C57.12.10, none were identified by those in attendance.

Minutes from Fall 2006:
Minutes from the meeting held in Montreal were modified with comments form the WG and approved.

Draft 3.1 Review:

Autotransformers with LTC Section
Current document still needs additional information regarding the application of LTCs in autotransformers and the effects of its location in the windings on the characteristics of the transformer like impedance, losses, noise, etc. Dave Harris volunteered to improve this section.

DETC Section
Don Platts volunteered to rewrite this section to indicate that if a transformer has an LTC, then the HV DETC is not required.

Impedance for BILs larger than 1050 kV
Jane Ann Verner provided standard impedances for transformers with high impedance and after its review, Jin Sim proposed to add the impedances for each BIL above 1050 kV in increments of 0.5%. By a vote of 13 in favor and 2 against it was decided to do this.

Standard BILs Table
Chair noted that current document indicates 1800 kV BIL for 765 KV units, but new revision of C57.12.00-2006 only lists 1925 kV and 2050 kV, so the current table was updated to reflect 1925 kV instead of 1800 kV.
LTC Equipment, section 6
Jim Harlow pointed out that the voltages in table for tests for errors in voltage levels had incorrectly 120.6 volts and it should be 119.4 volts. The value was corrected as noted.

Section 6.6 for other construction features, which includes only the circulating current for paralleling transformers was deleted and a new section 6.6 will be created by Tom Beckwith to briefly describe the different current methods available to parallel transformers with LTC.

Old Business
Tom Jauch presented the initial outline for a new guide for Transformer Paralleling and it is expected that for the next meeting a formal meeting will be scheduled for this new WG.

New Business
Chair indicated that the new revision of C57.12.00-2006 in its table 4 shows in bold typeface BILs that are referenced products standard like C57.12.10, but this table does not show the correct BILs indicated in C57.12.10. Chair will request the proper correction to the appropriate SC.

Meeting adjourned at 10:45 AM.

7.6.1.10 TASK FORCE FOR THE REVISION OF IEEE STD 638-1992, IEEE STANDARD FOR QUALIFICATION OF CLASS 1E TRANSFORMERS FOR NUCLEAR POWER GENERATING STATIONS – Craig Swinderman, Chairman

Attendees: 2 members + 3 guests

The meeting began at 1:45 pm.

The meeting minutes from October 2006 meeting were approved.

The IEEE patent policy slides were shown. An opportunity was provided for the attendees to identify or disclose patents that may be essential for the use of the standard. No responses were given by the attendees of the meeting.

Topics discussed:
In our last meeting in Oct 2006, it was decided that the group should proceed with applying for a PAR to revise the existing document, keeping the same scope as the original document, but updating the content as necessary. A PAR was recently submitted to IEEE in order to begin a working group for revising this document.

The working group is now in the process of creating a draft document of the revision to the standard.

Several areas of the existing document that need revision were highlighted in the meeting and were discussed. Proposed changes to the document have been discussed among the members, and agreement was reached as to how to address these revisions in the new document.

In addition, some of the values in the existing standard that are used for qualification test acceptance criteria were reviewed to see if they were still valid. Generally, the group felt that the values were still valid, but an action will be to verify with users and latest standards to make sure that the acceptance criteria values are indeed still valid.
A few members volunteered to provide input for writing specific sections of the draft of the updated document.

An additional topic of discussion was the Annex A contained in the existing IEEE 638-1992 document. Annex A is used to demonstrate the transformer life expectancy based on loading guides C57.96 and C57.91. Annex A also describes thermal ageing procedures for aging of the transformer insulation materials prior to the seismic test required on prototype units.

This Annex A has been compared to the latest version of C57.96-1999, and it was found that the Annex and associated figures do in fact need updating to match the latest standards. A member volunteered to update Annex A accordingly.

In addition, the working group chair for C57.12.56, C57.12.60 and C57.100 has volunteered help in providing contacts that can assist in reviewing the thermal ageing procedures in Annex A and bring them up to date.

It was noted that the existing annex A does not take into account for the case of nonlinear loads, and no reference to C57.110 is made in the existing document. This item will need to be discussed and evaluated further to make sure that the revision to the document will adequately cover this case.

In addition, the working group is now reviewing the latest versions of IEEE 323 “Qualification of Class 1E Equipment for Nuclear Power Generating Stations” and IEEE 344 Recommended Practice for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations in order to be sure that the latest requirements of these standards are covered in our revision of IEEE 638.

The goal of the working group is to have the draft of the updated document completed by the Fall 2007 meeting in Minneapolis.

The meeting adjourned at 3:00 pm.

7.6.1.11 TASK FORCE FOR WIND FARM TRANSFORMERS – Joe Watson, Chairman

The Task Force for Transformers for Windfarm Applications met on Tuesday, March 13, 2007 at 9:30 am.

The group discussed the latest revision of the paper. The paper was consolidated into a common format and rearranged into different sections covering the following topics:

- Transformer types
- Electrical considerations
- Environmental considerations
- Effects of harmonics, load cycles, erratic generation, transformer sizing and de-energized taps
- Fire protection considerations

The transformer types section will be revised to include grounding transformers. Iqbal Hussain will write a brief description of their application.

The electrical considerations section will be revised to include a brief discussion on lightning protection.
The environmental considerations and effects of harmonics..... sections will be revised to include more details on oil-filled transformers. The sections currently cover air-cooled transformers in great detail.

The fire protection considerations section will be revised to only discuss methods of fire protection at windfarm sites.

An introduction section will be added to discuss the need for the paper and to include some failure numbers. Terrence Lee will provide the failure data. Greg Anderson will develop the introduction.

The paper is nearly complete. The TF does not need to meet again. A small group of editors was assembled to review the final changes and put the document in the right format for an IEEE paper. After the editing group has completed the final revisions, the TF members will take a straw poll on the paper. This should all be complete by August 1, 2007.

7.6.1.12 TASK FORCE FOR TRANSFORMER TANK RUPTURE AND MITIGATION – Peter Zhao, Chairman

The chair opened the meeting at 11:00AM, and welcomed the members and guests. There were 46 attendees in total which included 16 members and 30 guests. Four (4) guests requested the membership to the TF.

IEEE patent policy was addressed and no patent conflicts were reported.

Montreal meeting minutes was approved as written.

This is our 3rd meeting, ending Phase I- Review session and entering Phase II- Recommendation session.

During Phase I session, ten presentations were made on the tank rupture and mitigation, which are essential information to start with Phase II session – writing Recommendations.

After Montreal meeting, the members were starting to work on the task with communication through e-mails and phone conferences, and the assignments included:

- Drafting TF Recommendations
- Preparing a Technical Paper

Following activities were carried out during the meeting:

- Bill Darovny presented his presentation: Tank Rupture – A Manufacturer’s Perspective
- Reviewing the TF Recommendation – Part I. Definitions

During the review session, the definitions collected from the members were discussed. However, the progress is slow and the wordings for some of definitions are hardly to reach a consensus. Don Fallon suggested a clear scope of work would help to resolve the differences.

We are going to work together to have the Scope of Work done before next meeting.

The meeting adjourned at 12:15 PM.
7.6.1.13 TASK FORCE FOR EVALUATION OF PARALLELING TRANSFORMER CONTROLS AS RELATED TO UPDATING C57.12.10 – Tom Jauch, Chairman

No meeting held.

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

This is to report the investigation results from the team and no actual TF mtg was arranged during the Dallas mtg.

Team Members: Loren Wagenaar, Dong Kim, Alan Darwin, Flavio Neuls, Christoph Ploetner, Michael Craven, Peter Zhao.

Summary of the Findings

Performance:

1. Load Condition: 100% inductive, or 100% capacitive, or any combination of both real power and reactive power with the total sum limited to the rated MVA of the transformer.
2. Large Voltage Variations on both LV and HV windings.
3. DC Component: transformer shall operate under normal operating conditions with DC current (amp range varies)
4. Harmonic Requirements
5. Both step up and step down operation

Designs:

1. Low normal flux density design to allow an overflux condition. Core saturation to be achievable when transformer is subject to simultaneous AC and DC excitation currents.
2. Overexcitation and hot spot considerations
3. Harmonics from the electronics had to be taken into account for cooling.
4. Winging arrangements

Constructions: In general, the same as other power transformers.

Tests: More work needs to be done.

Question: Have any of the users experienced any problems using the SVC transformer?

Actions before next mtg: Draft the proposal based on the investigation results.

7.6.2 OLD BUSINESS

No old business.

7.6.3 NEW BUSINESS

No new business.
7.7 Underground Transformers & Network Protectors Subcommittee
Carl Niemann, Chair

Meeting Minutes – Dallas Texas

7.7.1 Introduction/Attendance
The Underground Transformers and Network Protectors Subcommittee met on Wednesday, March 14, 2007, in the Lincoln East room of the Hilton Lincoln Centre Hotel at 9:30 AM with 9 members and 9 guests present.

7.7.2 Approval of Minutes
The minutes of the October 24, 2006 meeting in Montreal, Quebec were amended to correct the spelling of a name and approved as amended.

7.7.3 Membership
Membership stands at 16 members. No new memberships were requested.

7.7.4 Chairman’s Remarks
The following Administrative Subcommittee notes were reported to the subcommittee:

· The attendance statistics and future meeting locations
· The Committee is looking at the standards update process for working groups. The Committee is aware that WGs are looking for editorial staff support from IEEE.
· The Committee is looking at citing sources for statistics that have been published.
· The Committee is considering creating a Treasurer officer position to comply with IEEE requirements.
· The Committee is evaluating a reduced registration fee for guest speakers and guest attendees.

7.7.5 Working Group Reports
7.7.5.1 Underground Single Phase Transformers (C57.12.23) – A. Traut, Chairman
1. There were 11 members and 8 guests for a total of 19 in attendance. The total membership of the WG stands at 27.
2. The chair requested disclosure of any patents that might impact this standard. There were no patents disclosed at this meeting.
3. The minutes of the March 2006 meeting in Costa Mesa were approved as submitted.
4. The chair reported that the PAR has an expiration date of 12/31/2009 and that the exiting document published in 2002 is valid to that date.
5. The WG agreed to make the following changes to Draft 5 of the document.
7. Discussed the reference to fault current tests in clause 7.5. Discussion on whether the fault current (arc under oil) test has the same importance in a welded cover round tank. All agreed that the test is valid and should be retained.
8. Clause 7.3 – Remove the word ‘minimum’ from the last sentence on the pressure relief fitting. Also change the word ‘An’ to ‘A’ in the last sentence regarding liquid level indicator.
9. Clause 7.1 add a sentence to specify that high-voltage connectors and low-voltage terminals are welded to the tank or cover.
10. Fig 1 – Show the low-voltage terminals as bushings in the figure.
11. Fig 2 – clean-up the drawing for better legibility.
12. With these changes in place, the document will proceed to the sponsor ballot.

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

1. The meeting was called to order by the Chairman at 8:00 a.m. on Monday, March 12, 2007 in the Washington Room of the Hilton Hotel in Dallas, Texas.
2. Introductions were made. The meeting was attended by 13 members and 8 guests.
3. The Chairman opened the meeting by asking if anyone in the Working Group knew or had knowledge of any existing or pending patents that may affect the work on this standard. All responses were negative.
4. The Meeting Minutes from the previous meeting in Montreal, Québec, CANADA, were reviewed and approved. The status of the PAR was discussed. The PAR was approved by the IEEE-SA Standards Board and it is valid until 31 December 2011.
5. The rest of the meeting consisted of a review of the changes in Draft D of the standard.
6. Two comments were received:
   A. Section 1.3 Word Usage - A suggestion was made to delete this section if the definition for the words “shall”, “should” and “may” already exist in the IEEE definition standard. The WG Chair will investigate and make a recommendation.
   B. Figure 1 - The tank dimensions for 3750 KVA rated transformers will be added to the 125 kV BIL Table. This change was not carried out when standard was changed from Draft B to Draft C.
7. A motion to take Draft D of the standard, as amended by the comments received at this meeting, to balloting. The motion was voted on and was approved.
8. The meeting was adjourned at 8:35 a.m.

7.7.5.3 Liquid Filled Secondary Network Transformers (C57.12.40) – B. Klaponski, Chairman

1. The WG met on Monday, March 12, 2007 at 09:30 am with 14 members and 4 guests.
2. The chairman reviewed the patent legal issue and asked whether there were any patents or patents pending that would affect the WG or standard. None were identified.
3. The minutes of the October 23, 2006 meeting in Montreal, Quebec were amended to include an additional attendee. The minutes were approved as amended.
4. D. Blew gave an update on PAR status. New PAR was submitted in February 2007 and approval is pending. Should be approved in March 2007. He will send confirmation number to all members so they can review on the IEEE website.
5. B. Klaponski reiterated the comments made at the October meeting that the procedures for a Working Group to update a standard are overly complicated and too much administrative work is required from the WG. This places a huge burden on the WG chairs. There is a lot of opportunity for improvement in the process. This issue is being reviewed by the Transformer Committee officers and was discussed at the Administrative SC meeting.
6. L. Dix made a presentation on Switch Testing DC vs. AC. L. Dix had received info from a few utilities regarding typical network circuit relay protection settings to assist the WG in establishing the proper short circuit ratings of the high voltage switch. After discussion it was agreed that the WG would add this information as an informative appendix to the standard. L. Dix also made a presentation on short circuit requirements for switch testing. In summary, the intent is for the standard to define switch requirements, which at present are not well defined. L. Dix agreed to prepare draft wording and send to WG by June 07. Copy of the presentation and working draft will be sent to all WG participants.
7. B. Klaponski discussed changes to standard that he feels are needed. He will send proposed changes to WG soon for review.
8. D. Blew agreed to prepare draft wording for informative annex on DC cable testing to include the history of in-service DC cable testing.
9. The WG had a brief discussion regarding the impact of proposed DOE efficiency standards and the possibility of larger submersible transformers.
10. The meeting was adjourned at 10:50am with the next meeting in Minneapolis, MN.

7.7.5.4 Secondary Network Protectors (C57.12.44) – D.H. Mulkey, Chairman
1. This working group did not meet.

7.7.6 Old Business
1. None

7.7.7 New Business
1. The proposed DOE efficiency standards were discussed briefly.
2. A member requested clarification on requirements for becoming a Life Member of the Main Committee.
3. The cost of the Standards Association membership was discussed. Present annual cost is $37. One member stated that he felt it was unfair to charge WG members who volunteer their time to update standards.

7.7.8 Future Meetings
The location and dates for future meetings are as follows:
· October 14-18, 2007 Minneapolis, Minnesota
· March 16-20, 2008 Charlotte, NC
· October 5-9, 2008 Porto, Portugal
· April 19-23, 2009 (tentative) Southern USA location

7.7.9 The Subcommittee adjourned at 10:06 AM.
7.8 Audible Sound & Vibration Subcommittee
J. L. Puri, Chair

AUDIBLE SOUND AND VIBRATION SUBCOMMITTEE

Meeting Minutes
Dallas, Texas
March 14, 2007
Chairman: Jeewan Puri

7.8.1 The Subcommittee met at 8:00 AM with twelve members and six guests present.

7.8.2 WG for writing Audible Sound Measurement Guide reported that:
  o A permission request has been sent to IEC for obtaining their permission to use text
    from their document IEC 60076-10-1 in writing Draft4 of this guide. We will wait for
    their decision before publishing our guide.
  o An objection was raised regarding the minutes of the last meeting of this WG. These
    minutes referred to the sound intensity measurements made by Mr. Girgis as more
    accurate as compared to sound pressure measurement. It was agreed to change this
    statement to state that sound pressure measurements can be influenced by the
    measurement environment. However, these measurements can be made to yield as
    accurate results if they are corrected for the measuring environmental influences.
  o The WG resolved four comments submitted on draft3 of C57.12.90. These changes
    will be implemented in the next revision of this standard.
  o It was agreed to include the sound level conversion procedure for measurements made
    at 50 Hz to 60 Hz and vice versa, in the next revision of C57.12.90 and C57.12.91. The
    WG also agreed to revisit the present proposal for Section 13 of C57.12.90 and
    C57.12.91 for sound level measurements. This change will appear in the next revision
    of these standards.

7.8.3 The sound level conversion procedure for measurements made at 50 Hz to 60
Hz and vice versa, as proposed by Ramsis Girgis will be circulated among ASV
Subcommittee membership for comments.

7.8.4 The Sound Abatement Guide C57.136 is due for revision in 2010. A proposal
was made by Mr. Alan Darwin to remove some of the material from this guide to
the sound level measurement guide and focus C57.136 more on the noise
abatement issues. A survey was sent out to the SC membership to obtain input
on this subject. The committee was asked to respond before the next meeting.
Jeewan Puri will keep Mr. Darwin informed regarding the progress on the sound
measurement guide.

7.8.5 Jeewan Puri reported that the extended standard sound level table has been
given to Mr. Steve Snyder for inclusion in C57.12.00. This table was also posted
on the SC website for comments. No comments were received. It was agreed
that this table should be placed in the sound level measurement guide for
reference only. A statement should be placed in C57.12.00, informing the users
to use this table for reference only and specify appropriate sound levels as
needed.
7.8.6 Meeting adjourned at 9:10 AM.

Jeewan Puri
Chairman ASVSC
7.9 Bushing Subcommittee
Fred Elliott, Chair

MINUTES OF MEETING
BUSHING SUBCOMMITTEE
OF THE
IEEE/PES TRANSFORMER COMMITTEE
DALLAS, TX
MARCH 14, 2007

7.9 Bushing Subcommittee – Fred Elliott, Chair

7.9.1 Introduction/Attendance
Fred Elliott - Chair opened the meeting at 3:00 PM and welcomed the members and guests. There were 55 attendees with 12 members and 43 guests present.

IEEE patent policy was addressed and no patent conflicts were reported. The Chair informed the participants please review information on Transformers Committee website for details.

7.9.2 Approval of Minutes of Last Meeting
The minutes of last meeting in Montreal, TX were approved as written.

7.9.3 Chairman’s Remarks
The chair made the following remarks after attending the Administrative Subcommittee.

- Next meeting will be held in Minneapolis, Minnesota on October 14-18, 2007.
- In future meetings, personal introduction will be re-enforced.
- Is looking for a volunteer to chair the TF – GSU Bushings. Les Recksiedler - the present chair is going to take the lead on DC Bushing Standard.

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

7.9.4.1 WG - Revision of C57.19.00 - Keith Ellis, Chair

No meeting was scheduled.

7.9.4.2 TF - Revision of C57.19.100 – Tommy Spitzer, Chair

The working group met in Dallas at 3:15 pm on March 13, 2007. After introductions the patent disclosure information was requested and there were no known issues. The chair covered the status of the PAR which has been approved to be completed by 2010. The chair believes he have received the information that the group were tasked with clarifying. There were no additional issues brought
up at the meeting. The chair plans to incorporate the changes and get the revised document to the membership before the next meeting. We will try to resolve any issues at the next meeting and have the document ready to ballot.

The meeting was adjourned at 3:45 pm.

7.9.4.3 TF – GSU Bushings – Les Recksiedler, Chair

L. Recksiedler reported as follows:

Task Force – GSU Bushings Standardization
9:30 – 10:45 AM, Tuesday, March 13, 2007
Lincoln East, Dallas, Texas

1. Introduction – Everyone
2. Sign in Lists – Attendance 27
3. Discussion of bushing problem by L Recksiedler
   · 2 defective 15 kV, 16000 Amperes bushings
   · OEM out of business
   · Diameter of replacement bushing and length on IPB side were issues
   · Bushing manufacturer modified to fit
4. Benefits of Standardization
   · More than one supplier
   · Bushing interchangeability
   · Ensure spare fit, fewer spares
   · Fewer types possible
   · Lower overall costs
5. Issues- Managing change
6. Does anyone know if IEC has a standard to address similar issues? IEC 60137 bushing standard is a performance standard and doesn’t give dimensions.
7. Discussions overall there appeared to be agreement that a new standard was necessary but realized there were complete issues to be resolved.
   · M. Foster of Boble is informing about bushing replacement tutorial which will include GSU bushings as they realize the need for this
   · The group agreed to work by e-mail between meetings
   · L. Recksiedler to prepares draft of title, scope and purpose for comments by the group
   · Like to have representation from users, bushing manufacturers and transformer manufacturers.
8. Issues
   · Thermal requirements in IPB
   · Existing Standards C57.19.01
   · Large population of existing bushings
   · Consider condenser type only not bulk bushings
   · Interchangeability
   · Fewer type
   · Connection to be a NEMA standard
   · Airside dimensions could be a concern
   · Limited to low voltage high current

7.9.4.4 C57.19.03 – DC Bushing Standard – Fred Elliott, Chair

No meeting was scheduled.
7.9.4.5 IEC Bushing Standards Activity - John Graham of Trench Ltd., UK

John Graham reported through his e-mail as following;

For my contribution to the meeting, there has been little progress with the IEC60137 revision. A final draft was sent to IEC Central Office in December 2006 and is now with the French National committee for translation before circulation as a Final Draft International Standard (FDIS). This should be done in April and the document should be approved and published this year. There is no indication yet how the IEC transformer committee will react and whether we will have to restart work immediately.

7.9.4.6 IEEE 693 Seismic Guide Development Activity - Lonnie Elder of ABB.

Lonnie presented an update on the upcoming shake table testing being conducted to study the interaction between transformers and bushings during seismic events.

An advisory committee has been formed by Dr. Anshell Schiff for input and advice on the testing program.

Lonnie’s update and documents from the advisory committee are posted in the Bushing Subcommittee portion of the IEEE Transformers Committee Website.

7.9.5 Old Business

No discussion was reported on the businesses.

7.9.6 New Business

No new business was reported.

7.9.7 Technical Papers

No activity was reported for this mtg.

7.9.8 Adjournment

The meeting adjourned at 4:15 PM.

Minutes submitted respectively by,

Peter D. Zhao
Secretary
Bushing Subcommittee
7.10 Dry Type Transformers Subcommittee  
C. W. Johnson Jr., Chair

7.10.1 Introductions and Approval of Minutes

The Dry Type Transformer Subcommittee met in Dallas, Texas on Wednesday March 14, 2007 with 13 members and 10 guests present. Introductions were made and the attendance roster was circulated. Minutes from the October 25, 2006 Montreal, Canada meeting were reviewed and approved.

The chair reminded the attendees that the minutes posted after each meeting were unapproved and would not be approved until the next meeting.

7.10.2 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:

7.10.2.1 WG Dry Type Test Code C57.12.91 Chairman Derek Foster

1. The working group met at 3:15 pm with 13 members and 5 guests present.

2. There were no comments regarding the minutes from the October 23, 2006 meeting in Montreal. The minutes were approved as written.

3. The Chairman asked if anyone present had any information regarding patent issues, which may affect the work of the group. No replies were received.

4. Old Business

The Chairman informed the Working Group that the PAR for revision of this standard has been approved until December 2010.

Section 11 of the Standard, relating to the Temperature Test, was reviewed during the meeting. Martin Navarro had provided comments on three clauses of this section, which were the subject of negative comments during the last ballot:

Clause 11.2 Regarding ambient temperature measurement. Martin proposed that the dimensions of 0.91-1.83m, for the distance of sensors from the transformer, be revised to 0.9-1.8m. This proposal was accepted by the working group.

Clause 11.3 Regarding surface temperature measurements of metal parts surrounding or adjacent to terminals carrying currents in excess of 4000 A. After some discussion, it was decided to propose revised wording, omitting the value of 4000 A and to simply state that measurements of surface temperature should be made. Dhiru Patel agreed to provide proposed wording.

Clause 11.5 Regarding hot resistance measurement and specifically, the use of the data from one phase to obtain cooling curves for the other two phases. Martin had proposed an additional statement in this clause suggesting that the data from the center phase be used to obtain cooling curves for the other two phases. This clause is also being revised in C57.12.90, and it was decided to obtain input from that working group, before proposing revised wording for this clause.

In addition to the above, clauses 11.6 and 11.7.1 contain a note to equations (22) and (23) referring to the value to be used for $T_k$ for aluminum windings. This note differs from the note
to equation (13) and it was decided to adopt the note to equation (13) for equations (22) and (23) also.

A copy of the proposed revised section 13 on audible sound-level measurements, prepared by Jeewan Puri, will be sent to members of the working group after this meeting and this section will be reviewed at the next meeting.

A discussion was held regarding the need to expand clause 10.10, relating to partial discharge tests. The Chairman will attempt to arrange for Professor Lemke to give a short tutorial at the next meeting, on the subject of partial discharge measurement, and the relevance of C57.113, The Partial Discharge Measurement Guide, to dry-type transformers.

5. There being no new business, the meeting was adjourned at 4:10 pm.

7.10.2.2 WG Dry Type Thermal Evaluation C57.12.56/60 Chairman Roger Wicks

The working group met in Dallas at the Hilton Dallas Lincoln Centre at 1:45 PM on Monday, March 12, 2007 with 9 members and 5 guests present. Attendees introduced themselves and signed a roster.

The Chair reviewed the minutes from the last meeting, which were approved as read. The chair reviewed the patent documents for our meeting, and no patent related issues were noted for the work of this working group.

The bulk of the meeting was spent discussing Clause 4.2 Test Models, and Clause 4.8 Dielectric Tests.

The following changes were discussed and agreed to during the meeting:

1. Replace the number of samples required for model testing from 12 samples to “four or more samples” to be the same number as those used in the full-sized coil tests.

The working group noted that the thermal stresses can be more of an issue with full size coils than with model coils.

2. It was agreed that the drawings present in the existing documents should be placed in the Annex and that new “simplified” drawings which outline each of six test areas should be incorporated into the document:

   a) Turn-to-turn;
   b) Layer-to-layer;
   c) Disk-to-disk;
   d) Section-to-section;
   e) Winding-to-winding;
   f) Winding-to-ground.

This way no one specific winding style would be pictured, but rather the components for a style which are used by all would be used as examples. The Chair will solicit drawings from members for this document.

3. Rick Marek noted that with today’s test equipment, this test method should require the standard 1.2 x 50ms positive impulse wave. It is recommended to move the “simulated impulse” testing using 50/60 Hz tests to an Informative Annex. It was agreed that Rick will work with the Chair to identify locations within the document where this change should be made. The Chair noted that
a historical discussion of the simulated test (and the fact that most of the systems covered under this test protocol used this method) should be included in the Annex.

4. The group requested a statement be added to the dielectric failure discussion in Clause 4.8. A proposed statement says: Visual cracks which do not cause dielectric failures are acceptable.

Finally, it was discussed that these tests are really coil tests. For each winding (primary and secondary) there may be different thermal classes of materials in use. The document will likely need to address how testing for such “mixed” insulation systems will be addressed.

Upon identification of the locations of the simulated impulse test and receipt of new simplified drawings, the chair will circulate the draft to the working group for comment. The goal is to complete this by the end of April. After comments from the working group, the chair intends to submit this document to the dry-type subcommittee for a survey ballot in time to get results back prior to our next meeting in Minneapolis.

Meeting adjourned at 3:15 PM.

7.10.2.3 WG for Revision of IEEE C57.16: Dry Type Reactors Chairman Richard Dudley

The W.G. for the Revision of IEEE C57.16 met in the Adams Meeting Room of the Hilton Lincoln Centre Hotel in Dallas, Texas on Mar. 12, 2007 from 8:00 a.m. to 9:15 p.m. There were 10 members and 3 guests present. The following are the highlights.

1. Introductions were made.

2. The minutes of the W.G. meeting in Montreal were approved.

Note: The minutes of the Dallas meeting will not be formally approved until the next meeting in Minneapolis, Minnesota.

3. IEEE patent policy was reviewed and no patent issues were identified. A discussion took place re patents on products covered by IEEE C57.16 (not an issue) vs patents that might impact the implementation of the standard.

4. The remainder of the meeting was devoted to the revision of IEEE C57.16; including new material drafted by and sent out by the Chairman to W.G. members. The following are the highlights.

   (i) The Chairman informed W.G. members that he had not yet received a WORD version of the existing version of IEEE C57.16 from IEEE. Once this is received the Chairman will correct the WORD version, OCR problem, and produce Draft #13 which will include already drafted material; Annex E on CB TRV, sound measurement of FRs, reactors in enclosures.

   (ii) Annex E was discussed re co-ordination/issues with the IEEE Switchgear Committee. Again W.G. members, especially utility engineers such as Pierre Riffon and Peter Zhao, deemed this informative annex very necessary. Pierre Riffon noted that he is chairing a W.G. co-coordinating input from the IEEE Switchgear Committee on the document being prepared by Bob Degeneff’s W.G. and that he was having difficulty getting input from the IEEE Switchgear Committee; Circuit Breaker S.C. It was agreed that ANNEX E was also applicable to CB TRV issues associated with the application of reactors to shunt capacitor banks; fault between the reactor and the capacitor bank. A note will be added in the annex on shunt capacitor reactors.
explaining the issue and referencing ANNEX E. The Chairman will prepare Draft #6 of ANNEX E with the objective of ensuring the annex is reactor application focused and thus acceptable to the IEEE Switchgear Committee. The Chairman requested input from W.G. members re this strategy.

(ii) The situation of shunt capacitor banks when no reactors are employed was discussed. In this case a situation could occur where there is high frequency restriking of the CB; high capacitance and low stray inductance ("dual" of the TRV problem). It was deemed by the W.G. that this is a CB problem and not part of the scope of the revision of IEEE C57.16.

(iv) Sound tests on FRs were discussed; RFD draft material.

- Christoph Ploetner suggested that the latest revision of the IEC reactor standard should be consulted re possible material for inclusion.

- The IEEE sound measurement guide under preparation (and the IEC sound measurement guide which is published) should be referenced.

- A note or text in Clause A.5.6.3.1 “General” should emphasize that it may not be possible to test FRs with full harmonic current; lower current test and calculation. It is also not possible to carry out sound tests with simultaneous harmonic current spectrum.

- The main purpose of sound measurement on FRs is to demonstrate the accuracy of the manufacturers sound modeling software. In practice the sound level at the “fence” is most important.

- Information should also be included on the acoustic basics re filter reactors; multiple harmonics and resulting forcing functions, directivity, etc. This could be included in the Clause A.5.6.3 “General” or a new clause on “background” information.

- The Chairman will produce a new draft of material on sound measurement of FRs with input from W.G. members; especially Klaus Papp and Christoph Ploetner.

(v) The draft material on “de-Q’ing” of FRs prepared by the Chairman, was discussed.

Les Reckseidler has prepared material on the subject and will send it to the Chairman as comments to the draft material.

- The impact of the various methods of “de-Q’ing” on the temperature rise type test will be presented in more detail; explanations. One issue is that a temperature rise test at an equivalent 60 Hz current that may be satisfactory re winding temperature may not reflect the operating temperature of a “de-Q’ing” methodology in service. The temperature rise test details on FRs “including de-Q’ing” should be a matter for agreement between the manufacturer and “end user”.

- The Chairman will produce a new draft of the material on de-Q’ing including the above “actions”/“inputs”.

(vi) The draft material on reactors in enclosures was discussed.

- The material should be included in an annex; normative.
- Per Pierre Riffon comments this annex should emphasize that type tests should be carried out with reactor(s) in the enclosure; S.C. test, temperature rise test, dielectric tests. Routine tests can be carried out on the reactor(s) only. A note will be added re the test cost issues associated with this strategy. However waiving tests on the reactors in enclosures will be a matter for agreement between manufacturers and purchaser.

- Suitable reference papers will be included in a bibliography; action Chairman.

- A note will be added that the material in the annex is not directly applicable to reactors installed in “cells” (enclosures) constructed by the “end user”. In this case there are cooling issues; magnetic clearance issues to be addressed. The reactor manufacturer may be able to provide guidance.

- The Chairman will produce a new draft of the annex. Input from W.G. members is requested.

(vii) RI filter reactors for HVDC were discussed. After discussion the Chairman deemed that these would be best covered in the ANSI LT standard. He would discuss this issue with one of his engineers who is on the LT standard W.G. However a note could be added in the FR annex of IEEE C57.16 re RI filter reactors; ANSI LT standard main reference document but that material in IEEE C57.16 is also applicable. The Chairman will draft the note.

The meeting adjourned at 9:15 a.m.

7.10.2.4 Dry Type General Requirements  
Chairman John Sullivan

The working group met in the Washington room of The Hilton Dallas Lincoln Centre

The meeting was called to order at 11:00 AM by Chairman John Sullivan

The meeting was convened with eleven (11) members and four (4) guests present. One (1) guest requested membership.

Introductions were made and the minutes of the last meeting held in Montreal, Quebec Canada October 23, 2006 were approved.

Task force reports discussion and working group action:
Table 5 – John Sullivan

The discussion of table 5 concerned Footnote a and the standard and alternate test values allowed under the right side of the table. The working group also discussed using two times nominal voltage plus one thousand versus peak values in column two (2).

The working group consensus was to revise Table 5 to consist of four (4) columns. The first two columns for nominal system voltage and low-frequency voltage insulation levels would remain. Peak values will be used in column two (2). The right side of the table will be condensed to two (2) columns. The intent is to remove the conflict with Footnote a and to simplify table references to alternate test values.

Suitable tutorial information regarding alternate test values will be developed and included within the standard. A footnote mentioning the availability of alternate test values as agreed to between the manufacturer and user will be included with the table.
Chuck Johnson will prepare a draft of the revised table. Rick Marek will assist. The draft will be circulated within the taskforce and then the working group for input.

Partial Discharge – Chen Xuaxiang
The consensus of the working group was that 100 pC requirements in Table 6 are too high. The working group also recognized that encapsulated cores were a special case to be addressed. The task force will revise Table 6 and supporting documentation to address these issues.

Short Circuit Clause – Dhiru Patel
The Working Group discussed changes to Table 16 at the spring 2005 meeting in Jackson, MS. The Working Group decided to leave the table unchanged in the D5 revision and revise it during the next revision. See the Jackson minutes for details.

The working group has discussed the following revisions to Table 16.
Temperature limits during short circuit must be limited:
1. So the conductor does not anneal. The limit for copper is 450° C and for aluminum 300° C
2. So the material used on conductor and interlayer insulation does not get damaged during short circuit that could result in an internal turn to turn or layer to layer fault.
3. For different temperature classes of insulation, different materials are used. Limiting temperatures must correspond to the material used for these insulation temperature classes.
4. Table 16, does not differentiate between Cu and Al.
5. Table 16 gives winding temperature rise instead of insulation temperature class.

An effort will be made to coordinate with liquid standard.

Dhiru Patel will send revision proposals to task force members in April or May.

Task force activity should be handled through e-mail. The working group chair will post appropriate documents to the Transformers Committee web site as progress warrants.

Next meeting: Fall 2007 October 14-18 — Minneapolis, Minnesota

With no new or old business the meeting was adjourned at 12:15 PM.

7.10.2.5IEEE PC57.12.51

The copyright has been transferred from NEMA to IEEE. Paulette Payne Powell is the Chairperson of the Working Group that will update the document and issue it as an IEEE publication. The PAR for this project is approved. Draft 1 was prepared and submitted to the subcommittee for review. Comments received from Carl Bush were incorporated and Draft 1.1 was electronically distributed for discussion at the subcommittee meeting. Several editorial and technical issues were brought up, the most significant being duplicity with C57.12.01 Dry Type Transformer General Requirements. Based upon the discussion, the draft will be revised resolving Rick Marek’s and Martin Navarro’s comments. Subcommittee members were encouraged to review the draft and forward any comments as the draft will be revised and submitted to IEEE for balloting. The outcome of balloting will determine necessity for a formal WG meeting in Minneapolis; the WG Chairperson agreed to

Chairman Paulette Powell
timely inform Greg Anderson for a meeting slot, if needed. The following individuals volunteered to be WG members: Rick Marek, Charles Johnson, Sheldon Kennedy and Derek Foster.

7.10.4 Chairman's Remarks and Announcements

Charles Johnson

The SC Chair discussed a number of issues from the Administrative Subcommittee Meeting.

The SC was informed that the due date for C57.124, “IEEE Recommended Practice for the Detection of Partial Discharge and the Measurement of Apparent Charge in Dry-Type Transformers” was Dec 2007 and that he would submit the document to the IEEE for reaffirmation. Ray Bartnikas questioned that as the document had not been updated since 1991, it might be out of date. He volunteered to review the standard to assess the document against the present state of the technology. We will proceed with reaffirmation, but will consider future revision based on Mr. Bartnikas’ review.

7.10.5 New Business

Joe Foldi questioned the pass-fail criteria for the impulse test. Joe stated that he had seen dry units that under impulse had instances of arcing (flashing). As the flashing was at random locations, would this be considered as a dielectric failure? The consensus of the SC was that a flashover on the first test followed by no further flashovers of the same connection could be considered as acceptable, but the condition he described required further evaluation. It was suggested that he review the impulse test guide C57.98 for further information.

There being no further business, the subcommittee meeting adjourned at 2:45 PM.
7.11 Distribution Transformers Subcommittee  
Ken Hanus, Chair

7.11.2 Distribution Transformer Subcommittee Report  
Ken S. Hanus - Chairman  
ken.hanus@ieee.org

The Distribution Transformer Subcommittee has a total of 8 active working groups, 7 of those met in Dallas.

Subcommittee Meeting Wednesday March 14, 2007 at 3:00 pm  
34 Members  
24 Guests  
58 TOTAL  
4 Requests for membership

7.11.2.1 Chair’s Remarks & Announcements:  
Review of Administrative Committee meeting highlights  
• Future Meetings  
• The Unapproved Montreal minutes were approved with no corrections.

7.11.2.2 Working Group Reports

7.11.2.2.1 C57.12.20 Overhead Distribution Transformers  
Alan Wilks & Tommy Cooper Co Chairs  
awilks@ermco-eci.com & Tommy.cooper@faypwc.com

PAR Status: Approved 9/15/2006  
PAR Expiration Date: 12/31/2010, Current Standard Date: 2005  
Current Draft Being Worked On: D1  
Meeting Time: 9:30 am, Monday, March 12, 2007  
Attendance: 42 Total  
23 Members  
19 Guests

Alan Wilks called the WG C57.12.20 meeting to order at 9:35, introductions were made and rosters were circulated. The unapproved minutes of the fall 06 meeting in Montreal were reviewed and approved. Alan then reminded everyone of the IEEE policy on patents and asked if anyone had any patents to declare, none were declared.

Old Business: Alan explained the paragraph on the induced voltage test was to be inserted in C57.12.90, only since that is the only standard that is applicable.

Alan then went over results of the WG ballot on Marcel's proposal for Section 9. Out of 33 members polled he received only 7 positive responses, 2 with comments. He then passed out copies of the comments and results. On one of the comments Alan explained that we only need to look at the technical aspects now and change to proper English later. Marcel went over the comments and the WG voted to maintain the 1 liter of oil expulsion as criteria #3. Marcel then explained the difference in the amount of energy of the fault depending on the arc starter wire size. The section presently states a wire size of 14.5 AWG or smaller shall be used. There is a multiple of approximately 2 in the energy produced between using a 30 gauge wire and doing the test with a 14.5 gauge wire, as the arc starter. Marcel also went over the fact arc time length (0.5 cycle vs a 1.0 cycle) would almost double
the amount of energy in the fault. Marcel pointed out the fact that these differences in test procedures would give varying results based on how you ran the test. He recommended we tightened up the requirements. Alan then offered to do another survey of the WG due to the response of the first survey on two questions. The questions on the survey would be - 1. To determine the wire size to be used for testing, and 2.- determine the length of time for the arc – ½ or 1 cycle.

The meeting was adjourned at 10:45 with the rest of the agenda carried over to the fall meeting.

7.11.2.2.2 C57.12.38 Single-Phase Padmounted Distribution Transformers
Combined C57.12.25 & C57.12.21
Ali Ghafourian & Ignacio Ares Co Chairs
aghafourian@ermco-eci.com & Ignacio_ares@fpl.com
PAR Status: Approved 12/08/1998 (For combining Standards C57.12.25 & C57.12.21)
PAR expiration Date: 12-31-2009
Current Standard Date: 1995
Current Draft Being Worked on: D6.1, Dated: March 2006
Meeting Time: 11:00am, Monday, March 12, 2007
Attendance: 35 Total
27 Members
8 Guests
1 Request for membership

Introductions were made and roster was circulated. The IEEE Patent disclosure was discussed and there were no patents noted that pertain to these standards.
The unofficial minutes of the last meeting held in Montreal in October, 2006 were approved with no corrections. The following handouts were given:
Meeting Agenda
Unapproved minutes of October, 2006 WG meeting
Draft D1.1 of C57.12.38

There are currently two drafts of the standard. Draft D6.1, which was circulated for editorial comments to IEEE (MEC) to then go for balloting, and draft D1.1 which was to incorporate future revisions. A comment was made that IEEE requires that the scope on the PAR must be the same as the purpose of the standard. There was also a comment from M. Fortin about the standard presently does not cover 480 secondary volt units.

The group then discussed the various options of making the standard cover various voltages: 600V, 480V or 240/120V as it stands today. The point was made that the PAR will have to be changed if the scope of the standard changes. A motion was then made to change the scope of the standard (which will require a PAR change) to 600V with 19 members voting for the change and 1 against. The motion to change the scope of standard to cover secondary volts 600V and below was then passed. The comment was then made whether the tables should address the inclusion of the new voltages, specifically 480V. A comment was made by Brian Kaplonski that introducing 600V and below into the standard does not necessarily force the standard to cover them in the tables, etc. The group finally discussed incorporating the 600 V change into draft D6.1 which will then be balloted. This will require changing the PAR to match the new scope of the standard. The WG will continue working on draft D1.1. for any future changes.
The meeting was adjourned at 11:55 a.m.
7.11.2.2.3 C57.12.28, C57.12.29, C57.12.31 & C57.12.32 Cabinet integrity Standards

Bob Olen & Dan Mulkey Co Chairs
boen@cooperpower.com & dhm3@pge.com
Meeting Time: March 13, 2007 Time: 8:00 AM
Attendance: 38 Total
21 Members
16 Guests
1 Request

The PAR for the C57.12.31 was submitted in January 2007. A NESCOC member noted that Switchgear and Capacitor products are included in the standards. Following communications with the Switchgear Committee leadership a joint sponsorship was agreed upon. Therefore, the C57.12.31 standard will be developed under a joint between the Transformer and Switchgear Committee.

Draft 1.0 was then presented to the working group. Changes made to the existing standard were highlighted along with sections that will require Working Group action at future meetings.

7.11.2.2.4 C57.12.34 Three-Phase Padmounted Distribution Transformers
Ron Stahara & Steve Shull Co Chairs
rstahara@msn.com & sshull@empiredistrict.com
PAR Status: New PAR required for next revision
PAR expiration Date: N/A
Current Standard Date: Published March 8, 2005 (2004 date on document)
Current Draft Being Worked On: D1
Meeting Time: March 12, 2007 Time: 1:45 PM
Attendance: 39 Total
12 Members
27 Guests
7 Guests Requesting Memberships

Meeting Minutes / Significant Issues / Comments:
Ron Stahara called the meeting to order, introductions were made, and an attendance roster was circulated. Ron reviewed the IEEE Patent Policy and asked the group if there were any patents that needed to be disclosed. None were announced to the group. The minutes were reviewed. A motion was made to accept the minutes by Jerry Murphy and seconded by Gerri Paiva and accepted by acclamation.

Jerry Murphy reported that the task force has reviewed the issue of voltage taps and percentage taps. His report is shown in Appendix A, with the consensus being that the taps should be percentage taps. After some discussion, Jerry made a motion that Table Two should be eliminated and replaced with a statement in article 4.3 to specify the taps as percentage taps and add the footnote to the body of this article that is shown in Table 2. It was seconded by Iqbal Hussain. More discussion followed concerning the voltage taps of 13800 GrdY/ 7970 and 16340 Ä. John Rossetti discussed how these values got there sighting the NEMA document that pertained to these voltage tap settings. Some utilities discussed their use of these transformers and how their specifications called these taps out. The consensus was that if a company needed this they could call them out in their specification but the vast major of users are using percentage taps. A vote was taken with 24 being for and 1 opposed. The motion passed to use percentage taps in this document.
Iqbal Hussain stated that his task force had reviewed the drawing set and had turned these back to Steve Shull. Steve stated that he had incorporated these changes into the current drawings. At this point Steve handed out draft 2 to the group.

Giuseppe Termini pointed out that the title on the minutes did not match the title in the draft. Brian Kaplaski commented that that the scope and purpose of the PAR must to be reviewed to verify that they match our proposed document. John Rossetti stated that the drawings needed to be reorganized to allow for secondary voltages greater than 480 volts since this document would provide for stepdown units and the current cabinet configurations as specified might not work with these new layouts. He also pointed out the separable interfaces need to be reviewed because they could limit the maximum kVA to which the transformer could be design. With this reorganization, He pointed out that the drawing references included in the drawings must be reviewed for correctness. Steve volunteered to make these reviews and return to the next meeting with a better draft for review. With this, the meeting was adjourned.

Appendix A Comments on C57.12.34 - Taps (Table 2)

Iqbal Hussain – ABB
Clause 4.3 refers to table 2. I suggest that all standard taps should be at 2 @ 2.5 % above and 2 @ 2.5 % below normal voltage. There a very few customers who want 14400 taps at 13800 delta and 17200 at 16340 volt ratings. Majority accepts straight 2.5 % taps as stated above.

John Rossetti – MLGW
The best information I could find was copied from the EEI-NEMA Joint Committee Distribution Transformer application Charts.

Look at Application CHART S1-C page 37. This may explain where the taps came from for 13800. The chart shows HV taps at 13200,13500,13800, 14100 and 14400 for 120/240 (167 kVA), 240/120 (250-500 kVA) and 240X480 (167-500 kVA). I think this allowed the transformer to provide the LOW VOLTAGE REQUIRED from the ACTUAL OPERATING VOLTAGE as shown in the graph on page 41. I think the intent here is for a given tap setting to set the low voltage in a 120-125 volt window on a 120 volt base.

The 16340 may at one time have been a transmission voltage. The 23kV distribution system here at MLGW was at one time used for transmission. The ratio between 4160 and 16340 is approximately 3.9/1. MLGW’s 23/4.16 had a ratio of 5.5/1.

Jim Arnold related this comment to John & me in Montreal
“The “E” taps 14400/14100/13800/13500/13200 allow for connection on a 13800 volt system or a 23900 GrdY/13800 system. This would allow for three single phase transformers to be connected delta (three-wire) or WYE for the 23900 GrdY/13800 system. This was also used with a 24940 GrdY/14400 system with the taps set for 14400/14100/13800/13500/13200.

Essentially this would provide a dual voltage function by using either a Delta or WYE connection.”

Mike Culhane by Dwight Parkinson – Cooper Power Systems
“The 13800 spread makes some sense because it includes two other common nominal voltages; 13200 and 14400. These used to be called “NEMA taps” and must have their origin in an old NEMA standard. I support standardizing on 2.5% steps.

I have no clue where the unusual spread came from for 16340. It’s such an unusual nominal rating that I would argue that it does not belong in the table. One possibility is that it originated from the same NEMA document as the 13800 spread.”
Dwight Parkinson – Cooper Power Systems
I also support standardizing on 2.5% taps. Based on the units that we’ve built for that voltage, the vast majority are built with +/- 2.5% taps, and not to the specific taps listed in the table.

Consensus:
Table 2 should be consistent and all voltages should by standard be +/- 2.5% taps.

7.11.2.2.5 C57.12.35 Bar Coding For Distribution Transformers
Lee Matthews & Giuseppe Termine Co Chairs
lmatthews@howard-ind.com & Giuseppe.termine@peco-energy.com
PAR Status: APPROVED Dated: March 4, 2005
PAR expiration Date: December 31, 2009
Current Standard Date: 1996 (R2004)
Current Draft Being Worked On: Draft #6, Dated: 2007
Meeting Time: March 13, 2007, 3:15 PM
Attendance: 24 Total
10 Members
14 Guests

The meeting was called to order on March 13, 2007 at 3:15 p.m. in the Lincoln 2/3 Room of the Hilton Hotel in Dallas, Texas.

The meeting began with introductions of those in attendance.

The chairman asked if anyone was aware of any patents that might affect the development of this standard. No patent claims were made.

The minutes of the previous meeting in Montreal, Quebec, Canada were reviewed and approved.

The remainder of the meeting consisted of a review and commentary on Draft D6-2007, dated February 16, 2007 of the document. No comments were received. This Daft will submitted for balloting.

The chairman advised that the invitation to ballot is presently open and will close on April 6, 2007.

The meeting was adjourned at 3:30 p.m.

7.11.2.2.6 C57.12.36 Distribution Substation Transformers
John Rossetti & David Aho - Co Chairs
jrossetti@mlgw.org & daho@cooperpower.com
PAR Status: PAR Approved June 2002
PAR expiration Date: December 2008
Current Standard Date: NEW Standard Under Development
Current Draft Being Worked On: D11
Meeting Date: March 13, 2007  Time: 11:00AM
Attendance: 34 Total
21 Members
13 Guests

The unapproved minutes from the F06 Montreal meeting were approved without changes. The patent policy was discussed and no issues were identified.
The administrative issues covered included a PAR extension until December 2008 and a review of the proposed Scope change. The WG agreed with the changes and these will be submitted directly following the committee meetings. The changes include adding 50 Hz back in and removing a statement regarding safety considerations.

Regarding the draft document, the remaining 5 items from the ballot process were reviewed. Ray Nicholas will review some flange dimensions provided in Annex A and will also consider providing a drawing. Ray also volunteered to develop a bibliography. A few general editorial and figure changes were also reviewed. The only technical item reviewed related to a comment defining sealed tank requirements. No changes were determined necessary.

Draft 11 will be submitted to Sue McNelly for posting to the website. All comments and negative ballots have been addressed with the agreed upon changes incorporated into Draft 11. A few minor editorial issues will be cleaned up shortly and then the document can be uploaded with the comment resolution form to initiate a ballot recirculation.

A list of ideas is being developed for future change consideration. We briefly reviewed one item submitted by John Rossetti related to testing. Members were asked to review the draft and submit thoughts for improvement.

The meeting adjourned at 11:45am.

Additional Meeting Details:
The scope changes were reviewed for approval by the WG. Scopes for the original PAR, Draft 10, and Draft 11 were compared during the meeting. Shown below are scopes from the original Par and Draft 11.

Original Scope:
This project is to develop a standard for 50 and 60 Hz liquid distribution substation transformers with ratings of 10 000 kVA and below three phase, 6667 kVA and below single phase with a primary voltage 69 000 and below, and a secondary voltage of 34 500 and below. The standard will cover indoor/outdoor application, cover/sidewall terminations and switchgear coordination issues.

Draft 11 & Proposed Revised Scope:
This standard covers certain electrical, dimensional, and mechanical characteristics of 50 and 60 Hz, two winding, liquid immersed distribution substation transformers. Such transformers may be remotely or integrally associated with either primary and secondary switchgear or substations, or both, for step-down or step-up purposes rated as follows:

1. 112.5 through 10 000 kVA three-phase
2. 250 through 6667 kVA single-phase
3. high voltage 69 000 V and below, and a low voltage of 34 500 V and below

It is not intended that this standard shall apply to dry-type, regulating, pad-mounted, secondary-network, furnace, rectifier, mobile, railway, or mine transformers.

? Comment Review & Assignments
  • Of the 90 comments received during the original ballot process, 5 items remain.
  • Annex A - Section 6.0 (option 2), Verify dimensions and add diagram. – R. Nicholas
  • Section 5, figure 5.1, editorial cleanup – D. Aho
  • General Editorial, add WG member list – D. Aho
* Section 5.9.1, Verify wording okay. Add statement to response for negative ballot regarding 200°C reference. Discussed and developed a response to ballot comment. No document change was determined necessary.
* Annex B (Bibliography), Add bibliography for cited documents. Refer to C57.12.00 as reference. – R. Nicholas Volunteered to write.
* Re-circulate the ballot with suggested changes
* No reason to wait for the scope revision approval.
* All changes have been incorporated.

* New Business
  • New requests for Standards Development
    “All tests shall be performed in accordance with IEEE Std C57.12.00-1993 and IEEE Std C57.12.90-1999.”

C57.12.00 has two categories for testing. One above 500kVA and one below. We then have tests labeled as “Routine”, Design” and “Other”. No order is given for testing. This is a minimum. Testing was spelled out in greater detail in an old issue of NEMA Standards for TRANSFORMERS PUB. NO. TR 1-1954.

In a book published by the Power Transformer Division of Westinghouse “TRANSFORMERS for the Electric Power Industry” authored by Harold Moore, Richar Bean, Nicolas Chackan, jr. and Edward Wentz provided a recommended test schedule (page 313). Test Schedule.

1. Ratio, polarity (1-ph), winding connections
2. Resistance measurements
3. Impedance, regulation, load loss
4. No-load loss, exciting current
5. Dielectric tests

The book states, “The order of tests is not in the order of importance, but in the reverse order of their possible effect upon the transformer characteristics.”

Two areas of concern on testing in PC57.12.36;
1) C57.12.00 Table 17 note (3) references a routine impulse test for distribution transformers. We need to make sure PC57.12.36 Distribution Substation Transformers requires an impulse test as part of “routine” testing.

2) Need to look at making zero-phase sequence impedance voltage test routine for transformers with WYE-WYE connected windings. This is needed for WYE connected transformers with switchgear integrally connected in a unit substation configuration with over current protection. The zero-phase sequence impedance is needed to calculate 1-phase to ground and 2-phase to ground fault current magnitude.

The meeting adjourned at 11:45 am
Submitted by: Dave Aho
7.11.2.2.7 C57.15 Step-Voltage Regulators
Craig Colopy & Gael Kennedy Co Chairs
cocolony@cooperpower.com & grkennedy@nppd.com
PAR Status: APPROVED Date: June 9, 2005
PAR Expiration Date: December 31, 2009
Current Standard Date: C57.15 – 1999 – Published April 2000
Current Draft Being Worked On: Draft 5.1 Dated: October 2005
Meeting Date: March 13, 2007, 1:45 pm
Attendance: 40 Total
35 Members
4 Guests
1 Guest Requesting Membership

Minutes of the Montreal meeting were approved (moved Lee Matthews, 2nd by Steve Shull, Passed with no objections)
IEEE Patent Policy conflict or infringements given to group – No responses
Discussion by Craig on the Dual logo status and requirements for references IEEE\IEC.
IEC 60214-1 Performance Requirements and Test Methods and 60214-2 Application Guide are the two most applicable. May be a good use of a Reference section as a means of showing the applicable standards.
IEC Control Standards which relate:

**Electrical Transient, Impulse & Surge Tests plus Emissions and Immunity**
- EN61000-6-4 RF Conducted and Radiated Emissions
- EN61000-6-2 ESD & RF Radiated Immunity Enclosure Tests, EFT and RF Immunity Tests,
- EN61000-4-5 Surges
- EN61000-6-11 Voltage Dips & Dropouts
- EN61000-4-8 HV Impulse Wave
- EN60255-5 HV Impulse Wave, Dielectric Withstand Voltage Test and Insulation Resistance Test

**EMC Environmental Tags**
- 60068-2-6 Swept Sine Vibration
- 60068-2-1 Low Temperature & High Temperature Storage
- 60068-2-30 Temperature & Humidity Cycling

Comments were basis on the C57.15 being designed to stand by itself.

NEW DISCUSSIONS ON SUBJECTS:

IEEE T-SA Template was reviewed Monday at the SA Luncheon Meeting and we will let the Standards association fit the standard into the template when we go out for ballot.

The draft of the C57.15 has been sent to the SA for a pre-ballot review and comments were received and have been inserted into the next draft. C57.12.00 and C57.12.90 have a 2006 date on them and Craig is reviewing them to check for any changes which may affect the C57.15 Standard.

Last meeting assignment of a Task Force headed by Tom Jauch was charged with looking at the consistency between the coverage noted in C57.12.10 and C57.15, paralleling units, and he presented the present position and results. Much work to be done.

From the last meeting, the short circuit-withstand task force working group had input from the following:
- Wallace Binder – Application Spreadsheet
- Stephen Shull – Tap Voltages
Marcel Fortin – Rated Currents
James Harlow - Summary

James Harlow proposed a revision to Clause 5.8.1, Clause 7.2 Short Circuit, Clause 6.4 Nameplates, appendix b to be changed appendix c, and a new appendix b be substituted.
He also noted the problems with the X/R ratio asymmetrical offset factor. See the attached comments.
Marcel Fortin discussed some of the comments that James had presented.

Problem in ratings: Nameplate current @55C, Nameplate currents @ 55/65C, Supplementary current rating @7200 for 7620 volt rated regulators, and Add - Amp Bonus.

Clause 3 Definitions:  add **Base Rated Load Current**: The rms symmetrical rating, expressed in amperes, of the step-voltage regulator when operating continuously at its rated range of regulation.

It was suggested by Marcel that an alternate to the Short Circuit Withstand could be to divide it into categories. See Slides attached to this report.

Discussion of the 25X and 40X notations on the regulators and where these may lead. Comments were made that they were not needed by the utilities. General chaos during the discussion by the group. Marcel suggested that we mark the “actual top capacity” on the nameplate.

Much work needs to be done yet and Craig will place an update on the Web site for review. Any comments would be appreciated.

Motion was made to adjourn, 2nd, ed, and passed with no objection. Meeting over at 3:00PM Tuesday 13 March 2007.

Attachment: Comments from James Harlow:

**Recommended changes to C57.15-1999 on matter of Short-circuit capability**

My sense is that the standard as now written and as we have introduced suggested changes unnecessarily overcomplicates the matter. I propose the following (items enclosed [xxx] are to clarify only and are not to be in the standard):

1. **Clause 3 Definitions**

Add **base rated load current**: The rms symmetrical rating, expressed in amperes, of the step-voltage regulator when operating continuously at its rated range of regulation.

2. **Clause 5.8.1 General** [This under 5.8 Short-circuit requirements]

Step-voltage regulators shall be designed and constructed to withstand the mechanical and thermal stresses produced by external short circuits of a maximum value of 25 times the base rated load current.

   a. The short-circuit current shall be assumed to be displaced from zero insofar as determining the mechanical stresses. The maximum peak value of the short-circuit current that the regulator is required to withstand is equal to 2.26 times the required rms symmetrical short-circuit current.

   b. The short-circuit current shall be assumed to be a duration of 2 s to determine the thermal stresses.
Short-circuit withstand capability can be adversely affected by the cumulative effects of repeated mechanical and thermal over-stressing, as produced by short-circuits and loads above the nameplate rating. Since means are not available to continuously monitor and quantitatively evaluate the degrading effects of such duty, short-circuit tests, when required, should be performed prior to placing the regulator in service.

3. Clause 7.2 Other short-circuit capability [This under 7. Other requirements]

When specified and so designated by the supplier the dictate of Clause 5.8.1 is changed to a maximum value of 40 times the base rated load current, or 16,700 A, whichever is less. [668 A (from clause 5.4) x 25 = 16,700 A] This short-circuit current shall be assumed to be a duration of 0.8 s to determine the thermal stresses.

See Annex C for discussion of short-circuit concerns for a typical substation application.

NOTE – Technical considerations for the regulator design, especially at larger ratings, may make it cost effective to simply specify a larger kVA rated regulator rated at the standard 25 times the base rated current in order to obtain the required short-circuit capability.

4. Clause 6.4 Nameplates

k) Short circuit capability multiple of base rated load current

[Plate stamped 25x or 40x. Other items below “k” are incremented]

Annex C
(informative)

Short-circuit capability requirement

C.1 Background

For line feeder applications it is usual that the available short-circuit current is diminished by the impedance of the line to the extent that 25 times the regulator base rated current for short-circuit capability will be adequate. The short-circuit capability of the regulator may need special consideration for some substation applications.

One common substation application involves a delta-wye power transformer, the neutral of the wye being grounded, supplying a secondary bus from which multiple three-phase feeders emanate. As the number of feeders increases it is expected that each feeder will represent a lessor portion of the load on the transformer. If the user installs a new regulator considering only the anticipated feeder loading, that regulator may be too small from a short-circuit capability standpoint. See Figure C.1

C.2 Short-circuit capability of standard regulator in substation of Figure C.1

Table C.1 shows the available short-circuit current as a function of power transformer rating and impedance for a typical 12.47 kV installation. The nominal transformer impedance of 8.0% is extracted from C57.12.10-1997, Tables 8 and 10, for a 350 kV BIL (69 kV primary rating) transformer. Also shown are cases where the impedance is 7% and 10%.
Table C.1 - Minimum kVA rating of single-phase regulator to be applied in substation with transformer of rating and impedance shown. Circuit for consideration per Figure C.1.

<table>
<thead>
<tr>
<th>Transformer (MVA)</th>
<th>12</th>
<th>20</th>
<th>30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transformer Name Plate impedance (%) (positive sequence)</td>
<td>7.0</td>
<td>8.0</td>
<td>10.0</td>
</tr>
<tr>
<td>8.0</td>
<td>10.0</td>
<td>7.0</td>
<td>8.0</td>
</tr>
<tr>
<td>10.0</td>
<td>7.0</td>
<td>8.0</td>
<td>10.0</td>
</tr>
<tr>
<td>Available 3-phase fault current (kA)*</td>
<td>7.94</td>
<td>6.94</td>
<td>5.56</td>
</tr>
<tr>
<td>9.26</td>
<td>19.84</td>
<td>17.36</td>
<td>13.89</td>
</tr>
<tr>
<td>Minimum 1-phase regulator kVA if of 25x normal sc capability</td>
<td>250</td>
<td>167</td>
<td>416</td>
</tr>
<tr>
<td>250</td>
<td>167</td>
<td>416</td>
<td>500</td>
</tr>
<tr>
<td>Minimum 1-phase regulator kVA if of 40x normal sc capability</td>
<td>167</td>
<td>167</td>
<td>114.3</td>
</tr>
<tr>
<td>250</td>
<td>167</td>
<td>416</td>
<td>333</td>
</tr>
</tbody>
</table>
**Table C.1 - Minimum kVA rating of single-phase regulator to be applied in substation with transformer of rating and impedance shown. Circuit for consideration per Figure C.1.**

<table>
<thead>
<tr>
<th>Transformer (MVA)</th>
<th>12</th>
<th>20</th>
<th>30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transformer Name Plate impedance (%) (positive sequence)</td>
<td>7.0</td>
<td>8.0</td>
<td>10.0</td>
</tr>
<tr>
<td>Transformer Name Plate impedance (%) (positive sequence)</td>
<td>7.0</td>
<td>8.0</td>
<td>10.0</td>
</tr>
<tr>
<td>Transformer Name Plate impedance (%) (positive sequence)</td>
<td>7.0</td>
<td>8.0</td>
<td>10.0</td>
</tr>
<tr>
<td>Available 3-phase fault current (kA)$^a$</td>
<td>7.94</td>
<td>6.94</td>
<td>5.56</td>
</tr>
<tr>
<td>Available 3-phase fault current (kA)$^a$</td>
<td>13.23</td>
<td>11.57</td>
<td>9.26</td>
</tr>
<tr>
<td>Available 3-phase fault current (kA)$^a$</td>
<td>19.84</td>
<td>17.36</td>
<td>13.89</td>
</tr>
<tr>
<td>Minimum 1-phase regulator kVA if of 25x normal sc capability</td>
<td>250</td>
<td>250</td>
<td>167</td>
</tr>
<tr>
<td>Minimum 1-phase regulator kVA if of 25x normal sc capability</td>
<td>416</td>
<td>416</td>
<td>333</td>
</tr>
<tr>
<td>Minimum 1-phase regulator kVA if of 25x normal sc capability</td>
<td>667</td>
<td>500</td>
<td>500</td>
</tr>
<tr>
<td>Minimum 1-phase regulator kVA if of 40x normal sc capability</td>
<td>167</td>
<td>167</td>
<td>114.3</td>
</tr>
<tr>
<td>Minimum 1-phase regulator kVA if of 40x normal sc capability</td>
<td>250</td>
<td>250</td>
<td>167</td>
</tr>
<tr>
<td>Minimum 1-phase regulator kVA if of 40x normal sc capability</td>
<td>416</td>
<td>333</td>
<td>250</td>
</tr>
</tbody>
</table>

$^a$ – Magnitude presumes an infinite bus behind the transformer. For single-phase regulators where L-G magnitude is of concern, value will differ if 1) transformer zero-sequence impedance is not equal to positive-sequence impedance and if 2) transformer neutral grounding reactor is used.

**Figure C.1.** Substation circuit for consideration
a – Magnitude presumes an infinite bus behind the transformer. For single-phase regulators where L-G magnitude is of concern, value will differ if 1) transformer zero-sequence impedance is not equal to positive-sequence impedance and if 2) transformer neutral grounding reactor is used.

Power Transformer
Feeder 1
Feeder 2
Feeder n
Three single-phase regulators per feeder
**Figure C.1. Substation circuit for consideration**

**Suggested change for future consideration**

1. The matter of the system X/R ratio, and the resulting asymmetrical offset factor of 2.26 needs evaluation. It is too low for the substation case where the whole matter of short-circuit current is of concern. I agree with Marcel Fortin’s suggestion of X/R of 17 leading to the asymmetry factor of 2.6.

It is not realistic to immediately impose this on the regulator OEMs. I’d like to have it be a consideration for the next revision of C57.15 with the buy-in from the suppliers that it will be a requirement after, say, 2012.

J. H. Harlow 12/30/2006

**7.11.2.2.8 C57.12.37 Electronic Reporting of Test Data (formerly P1388)**

Richard Hollingsworth & Thomas Callisen Co Chairs
rhollin@howard-ind.com & Thomas.Callisen@ExelonCorp.com
PAR Status: Need to submit PAR for next revision
PAR Expiration Date: N/A
Current Standard Date: July 2005
Current Draft Being Worked On: N/A

Did not meet. Will need a Fall 07 time slot.

**7.11.2.3 Subcommittee Old Business:**
*None reported*

**7.11.2.4 Subcommittee New Business:**

A motion to form a TF on Transformer Efficiency & Loss evaluation was made and passed 28 to 1. This TF would look into issues associated with proposed DOE Efficiency regulations and would be chaired by Phil Hopkinson.

There were many comments and suggestions on how to address the issues members have with the proposed DOE legislation and the particular level of efficiency they decide on.

The meeting adjourned at 4:00 pm.
7.12 Dielectric Test Subcommittee  
L. B. Wagenaar, Chair

7.12 Dielectric Test Subcommittee – Loren Wagenaar, Chairman; Stephen Antosz, Secretary

The Dielectric Test Subcommittee (DTSC) met on Wednesday, March 14, 2007, in Dallas, TX with 67 of 118 members, and 71 guests present. 9 of the guests requested membership and are welcomed into the Subcommittee. See the last page of these minutes for attendance list.

7.12.1 Chairman’s Remarks

1) The Chair reviewed highlights of the Administrative Subcommittee meeting held on Sunday:

   a) The next meetings:
      1) Fall 2007, October 14-18, Minneapolis, MN
      2) Spring 2008, March 16-20: Westin Hotel Charlotte, NC
      3) Fall 2008, October 5-9: Sheraton Hotel Porto, Portugal
      4) Spring 2009, April 19-23, Southern US location

   b) It was noted that Steve Snyder’s PCS WG on Revision to C57.12.00 is revising Table 21 Required Tests. Since some of these are dielectric tests, then this Dielectric Test Subcommittee must be involved.

   c) The very low response rate on several recent surveys of the Dielectric Test Subcommittee is cause for concern. The Chair reminded all present that it is a professional obligation of SC membership to participate in these surveys. The survey will remain open for the next several weeks to give members an extended opportunity to respond.

2) The minutes of the Fall 2006 meeting in Montreal, Canada were approved as written, and are available on the IEEE Transformers Committee Web Site.

7.12.2 Working Group Reports

7.12.2.1 Working Group on Acoustic Partial Discharge Tests in Transformers - Jack W. Harley, Chair; Alan Darwin, Secretary

Attendance: 20 members and 45 guests. Attendees introduced themselves.

The minutes from the 23 October 2006 Montreal, Canada meeting were approved.

IEEE Patent disclosure requirements were discussed and a request was made for attendees to identify or disclose any patents that may be related to the work of the WG. There were no responses.

The results were given for the Recirculation Ballot of PC57.127 Draft Guide for the Detection and Location of Acoustic Emissions from Partial Discharges in Oil-Immersed Power Transformers and Reactors.
1. The Recirculation Ballot was open from January 31, 2007 to February 10, 2007. There were 95 eligible people in the ballot group, 73 affirmative votes, 0 negative votes and 5 abstention votes. This gave us an 82% return, which exceeded the 75% requirement, and 100% affirmation.

2. The Guide has been submitted to RevCom and is scheduled for review at its March 21 meeting.

3. One of the figures in a Case Study in Annex D does not print well. The possibility of enhancing the figure is being discussed with a member of the WG and the IEEE editor. If the figure cannot be improved, the WG has agreed that the Case Study should be deleted so that the approval process can continue.

Bob Langan made a presentation and led a WG discussion about trends in acoustic monitoring. It was noted during the discussion that signal processing methods have improved substantially. This is sometimes allowing detection of signals deep within windings that previously was not possible. Also, acoustic emissions have been used to identify non-PD problems such as bubbles from overloading and structural movement caused by loose bolts.

SC Chair’s note: WG Chair Jack Harley received notice that the revision of PC57.127/D10.0, Guide for the Detection and Location of Acoustic Emissions from Partial Discharges in Oil-Immersed Power Transformers and Reactors, was approved by the IEEE SA Standards Board on March 22. The document will be sent for publication.

Unless something new arises with this document, this WG will not meet at the Minneapolis meeting. The Chair wishes to thank Jack Harley and his WG for their persistent efforts on this document.

7.12.2.2 Working Group on Revision of Low Frequency Tests – Bertrand Poulin, Chair; Bill Griesacker, Secretary

The meeting was held on Monday March 12th at 11h00 am. After the usual introduction and display of IEEE’s Patent policy, the minutes of the previous meeting were approved as written. A new secretary for the WG was appointed – Bill Griesacker

Next, Dr. Lemke presented his report on the task force meeting for the revision of C57.113 (IEEE Recommended Practice for Electrical Measurements of Partial Discharges in Transformers). The minutes of this meeting are found in Appendix 1. The main topics are:

I. The process of revision of the guide is going well. Comments and suggestions after draft 5 were incorporated in draft 6, circulated in the last several weeks and reviewed at the meeting.

II. The document will be circulated at the subcommittee level before a formal ballot according to IEEE’s procedures.

III. The PAR has been submitted to IEEE and should be approved before the next meeting.

The rest of the meeting was devoted to the review and discuss a proposal for modifications to C57.12.90, sections 10.5 to 10.11 related to low frequency dielectric testing. The
proposed new sections have been circulated within the WG in the last several weeks. No comment of technical content was received - only editorial.

The proposed revisions were based on Draft 3 of the last revision of C57.12.90 because the 2006 revision was not published until very recently. Proposed sections 10.5 to 10.11 will be reviewed once more based on the 2006 revision and if necessary, the numbering will be adapted to reflect the current status of C57.12.90-2006. One more circulation will take place at the subcommittee level before the next meeting.

Several meetings ago, it had been agreed to add a section to the standard concerning transformers with a neutral terminal permanently connected to ground internally. These transformers cannot receive an applied test. This request was accidentally forgotten. It has been added now to section 10.5.

Once more, the issue of lowering the acceptance criteria for pd level was discussed. One suggestion was made at 300 pC. 250 pC was also proposed. It was finally proposed to give a chance to the newly published standard a chance with the current levels. There was no resolution of this topic at the meeting.

Finally, a proposal from Joe Foldi concerning the addition of a criteria for PD at level voltage for class II transformers. He will submit his proposal to the chairman before the next meeting.

Appendix 1

Unapproved Minutes of the Task Force Meeting
Electrical Partial Discharge Measurement
Chairman – Eberhard Lemke

1. Introduction - The Chairman opened the meeting at 8:00 a.m. and welcomed the members and guests. There were 57 attendees present, 22 of them TF members and 35 guests; 4 requested for membership.

2. IEEE Patent Policy - The IEEE Patent Policy was discussed based on the submitted transparencies. There were no patent issues to be discussed.

3. Approval of Agenda - The tentative agenda was approved as submitted.

4. Approval of Minutes of the previous Meeting - The minutes of the previous TF meeting in Montreal were approved as written.

5. Recent Activities for revision the IEEE Guide C57.113
1. The comments and suggestions submitted to Draft 05B were incorporated in the Draft 06, which was circulated prior this meeting and reviewed today.
2. Few parts of sub-section “4.4 PD Calibrator” were moved to section “7.0 Appendices”, were a new sub-section “7.3 Fundamentals of the PD calibration procedure” was added.
3. The former sub-section “7.5 Evaluation of the virtual test object capacitance was incorporated in sub-section “7.4 Basic sensitivity check”
4. A new sub-section “5.7 Maintaining the PD measuring characteristics” was added to section “5.0 Specification of PD measuring circuits”.
6. **Future work** - The comments and suggestions submitted during the TF meeting will be incorporated in the Draft 06A. A PAR was requested. It is expected that this document expires at the end of this year. The PAR activities will concentrate on writing the final draft according to the IEEE Templates. A pre-ballot editorial review of the Study Committee is recommended before starting the official balloting process.

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

The WG met on March 13, 2007, from 3:15 pm to 4:30 pm. Eighteen members and thirty-one guests attended the meeting. Nine guests requested membership.

The agenda was accepted as written. The Montreal minutes were approved as written.

The IEEE patent disclosure requirement policy was discussed. Reference to the package posted on the IEEE Transformers Committee Web site was made. None of the members and guests present during the meeting were aware of any patents related to the work of this WG.

1. The first item of business was the status of the proposal related to the lightning impulse test procedure (tail time). The latest proposal surveyed within the WG was sent to Stephen Antosz on February 17, 2007 for implementation in the next C57.12.90 draft for ballot. For the time being, the proposal is put on hold and we are waiting if we need to survey it once more within the SubCommittee.

2. The second item of business was the results of the survey made on a proposal modifying Clause 10.2.2.1 “Switching impulse waves”. The proposal was surveyed within the WG and within the Dielectric Tests SC membership. The return rates were 32% in the SC and 29% in the WG. Out of these returned surveys, 95% were affirmative within the SC membership and 100% affirmative within the WG. No negative surveys were received. Two abstained within the SC. Two comments were received, one was mainly editorial in nature and the other one was from Bertrand Poulin who did want to not invalidate positive polarity switching impulses. After discussion it has been decided that the proposal will be modified as follows:

- The main text will consist of only one sentence requesting negative polarity waveshapes to be used.
- A first note will be added and will explain that reverse polarity impulses up to 70% of the full test level are needed in between full-wave tests for the purpose of biasing the core in order to avoid saturation.
- A second note will be added and will explain that negative polarity impulses are specified for avoiding the risk of erratic external flashovers. This note will also say that positive polarity impulses are also valid for the demonstration of the internal insulation voltage withstand capability.

A revised proposal taking into account the decisions made during the meeting will be surveyed once more within the WG and SC prior to the next meeting.

3. The third technical subject on the agenda was the results of the survey made on a proposal modifying Clause 10.3.1.3 “Chopped-wave Test”. The proposal was surveyed within the WG and within the Dielectric Tests SC membership. The return rates were 34%
in the SC and 26% in the WG. Out of these returned surveys, 88% were affirmative within the SC membership and 92% affirmative within the WG. One negative survey was received. Four abstained within the SC and one within the WG. Thirteen (13) comments were received. Several of the technical comments were related to the minimum limit of overswing in opposite polarity when a resistor is added to limit the overswing amplitude. The negative ballot was also related to the level of the overswing in opposite polarity. An other important technical comment was from Joe Foldi and was related to the maximum allowed time interval of the first voltage zero after chopping instant (e.g. rate of voltage collapse after chopping). After discussion, it has been decided:

- to keep the minimum limit of overswing in opposite polarity to 30% when a resistor is added in the chopping circuit;
- to specify that the time interval from chopping instant to the first voltage zero shall be as short as possible and shall not exceed 1,0 μs when the position of the chopping gap is as described in the proposal. A note will be added that for some winding designs, it is possible that the circuit response after chopping is not oscillatory but over-damped and for such cases, the time interval to the first voltage zero after chopping may be significantly greater than 1.0 μs.

Because the WG meeting was running out of time, the remaining comments received on the survey on Chopped-wave tests were not discussed. A revised proposal taking into account the decisions made during the meeting will be surveyed once more within the WG and SC prior to the next meeting.

7.12.2.4 Working Group for Revision of the Impulse Test Guides C57.98 and C57.138 – Art Molden, Chair; Joe Melanson, Secretary

The meeting opened at 3:15PM on Monday March 12, 2007 with 36 attendees present, of which 9 were members and 27 were guests.

In keeping with the IEEE patent policy the members were asked if they were aware of any patent or copyright infringement issues in the present draft of the Impulse Guide. No issues were identified and the meeting proceeded with group introductions.

A motion to approve the fall 2006 minutes was made by Pierre Riffon and seconded by Bob Ganser. The 2006 fall minutes were approved.

The members were asked for comments on the latest draft of the Impulse Guide and the following comments were made:

- Pierre Riffon indicated the he had a comment about the impulse test sequence coordination between the Impulse Guide and the WG for Revision of the Impulse Tests. Pierre noted that the sequence of impulse tests on transformers with non-linear devices, as listed in the present draft of the Guide was not in agreement with the sequence included in the Revision of Impulse Tests. He indicated that his WG had agreed to include a full wave before the chopped waves. Art agreed to update the procedure included in the Impulse Guide so as to comply.
- Pierre Riffon also mentioned that the present undershoot for chopped waves was being reviewed and a possible tolerance of 3% was being proposed. The present 30% may become 27% to 30%. Art agreed to note that fact and await the outcome of the
Pierre Riffon and Art Molden had some discussion about the need for a table of Minimum Energy Requirements in the Guide. Chairman Art postulated that a calculation of the minimum capacitance required to produce an appropriate tail duration should be determined on the basis of a given transformer parameters; whereas, Chairman Pierre postulated that a table provided a guide to the minimum energy required to produce the tail duration for a range of transformers. Both Chairs agreed on the addition of a table, and that a table would provide an informative addition to the Guide but, that the object of the table should be to provide what we can call typical IG “nameplate” parameters, that is, rated voltage and energy per stage, rather than a minimum energy based on test voltage levels. Chairs Pierre and Art will table a new table format for the Impulse Guide.

With the inclusion of the above mentioned table and the Bibliography, the Guide will be ready to ballot within the Dielectric Test SC, hopefully before the next meeting.

An anticipated section on Transfer Function and additional, more appropriate digital impulse records have not been included in this revision of the Impulse Guide and will require more cooperative input from the members if such information is to be included in the future.

The Minutes of the fall, 2006 meeting and the present draft 2 of the Guide have been included on our grouper site.

7.12.2.5 Working Group on Liquid-Filled Transformers Dielectric Test Tables – Phil Hopkinson, Chair; Scott Choinski, Secretary

The WG was called to order at 1:45 PM. There were 54 attendees, 20 members, and 34 guests with 6 requesting membership. Reviewed the agenda for the meeting. The Minutes from the October 24, 2006, meeting in Montreal, Canada were approved.

Comments to the revised tables were received from Bipin Patel, and were reviewed. WG members reviewed the tables and recommended the following changes:

Class I Table:
- Delete note 9
- Add the following to note 1: “Minimum Phase-to-Phase Induced test levels for 3 phase Distribution Transformers shall be not less than 2.0 times nominal system voltage.”
- Add the following to note 5: “Induced tests shall be conducted at twice rated voltage.”
- Induced test column, values 17 and above were rounded to the nearest whole number.
- Removed text “Applied test from C57.12.00 table 7
- Delta changed to Delta/fully insulated
- Delete note 7
- Change Basic Insulation Level to BIL
- Change V to U

Class II Table:
- Remove * from body of table
- Headings should match those in the Class I table as much as possible

Proposed Dielectric Test Tables
- Delete "Hopkinson" from the table
- Change units to is
- Change “X” to “/” for BIL kV Crest
- Change “*” to “X” for Chopped wave and Switching Impulse kV Crest

Old material on Steep Front to be moved to the Appendix for reference purposes

Proposed Test Levels For Repaired Unit

The following is from an e-mail from Mark Perkins dated February 20, 2007, was discussed:
In my minutes of the working group October 2001, I have the following note on this subject:

“Item 3 on the tests for repaired or rebuilt transformers, the survey results were 25 yes, 4 no, and 2 abstained. Based on negative votes, it was proposed to change the recommended test levels from “a range of 75 to 85%” to “85%” . It was also agreed to place this section in an annex rather than in the body of the standard since it is more of a guide than a standard.”

We did a survey that included changes on the wording of C57.12.90 for tests on repaired or rebuilt transformers and this was the response from the survey. Subhash voted negative on this proposal, indicating that it should be in the main body of the standard. The new proposed text was as follows:

Annex__ Factory dielectric tests on repaired or rebuilt transformers:

Factory dielectric tests on transformers that have been repaired or rebuilt are dependent on the nature of the repair and the amount, age, and condition of original insulation that was used in the repaired or rebuilt transformer. The tests are also dependent on the original design of the transformer and the applicable test standards at the time of the transformer design. As such, this section only gives general guidelines for selecting tests and test levels, and the actual tests and test levels should be mutually determined by the manufacturer and the purchaser.

Agreement of the WG: Transformers with all new insulation should be tested at 100% test levels. When all or a portion of the insulation is re-used, the recommended test level is 85% of the full dielectric test levels.

Not discussed but proposed: In some instances, the purchaser may wish to test the transformer at 100% test levels even though the original insulation was used in the repair or rebuilding. In this instance the manufacturer and purchaser should carefully consider the higher risk of insulation failure in what might otherwise be an acceptable transformer versus the benefits of testing at the higher level.

Hopefully this gives you a better starting point to get something added to the standard. But you can see from the voting response, you might have some difficulty getting consensus.

7.12.3 Liaison Reports

7.12.3.1 Status of C57.12.00 – Dong Kim; and C57.12.90 – Stephen Antosz

Both documents have been published in mid February 2007, with a 2006 approval date. The next cycle of continuous revision will begin immediately, since there are already new clauses.
ready to go. There will be a short time in 2007 for any additional approved work that is ready to be added to the next official ballots. Send this information to Dong Kim or Stephen Antosz.

7.12.3.2 High Voltage Test Techniques (HVTT), IEEE Standard 4 - Arthur Molden

Editorial work on the new revision of High Voltage Testing Techniques, IEEE Standard 4 continues. We had a meeting in November of 2006 in Lake Placid, NY during which our Chairman and various members drove our Vice-chair Jeff Britton to distraction, force-feeding him on nothing more than clause amendments and editorial comment over a period of three long days. Jeff probably knows more about the new IEEE MS Word Template now than does the IEEE or Bill Gates himself. It is hoped that the first draft of this revision will be ready later this year.

7.12.4 Old Business

7.12.4.1 Phase-to-Phase and Phase-to-Ground Clearances

Prior to the meeting, the Chair issued a memo explaining the historical aspects of how the values in Table 14 of C57.12.00-2006 were established about 25 years ago. The Chair asked if a Task Force should be established to evaluate the existing table and/or develop new tables for C57.12.00 setting minimum clearances. It was agreed that there is much discrepancy between various sources; IEEE, IEC, CSA, etc. A hand survey was taken of those present; 5 in favor, 1 opposed. This was a very poor response considering the room contained 67 members and 71 guests. The Chair will consider the next step.

7.12.5 New Business

7.12.5.1.1 Electrical PD – Vladimir Khalin

Vladimir asked the question whether it is helpful for this group to develop a document discussing electrical PD in CT’s and bushings. Discussion established that instrumentation for measuring PD in these apparatus is somewhat different than for transformers and shunt reactors. This aspect is actually an extension of the TF on Electrical Partial Discharge Measurement, and the Chair will speak to Dr. Lemke and Bertrand Poulin about continuation of the TF on these topics after the current work on transformer measurement is completed.

Attendance at this Meeting of the Dielectric Test Subcommittee:

MEMBERS

1. Stephen Antosz
2. Carlo Arpino
3. Javier Arteaga
4. Roberto Asano
5. Barry Beaster
6. Oscar Bello
7. Enrique Betancourt
8. William Boettger
9. Jeffrey Britton
10. Carl Bush
11. Scott Choinski
12. Donald Chu
13. Craig Colopy
14. John Crouse
15. Alan Darwin
16. Eric Davis
17. Robert Degeneff
18. Fred Elliott
19. Don Fallon
20. Reto Fausch
21. Joseph Foldi
22. Bruce Forsythe
23. George Frimpong
24. Robert Ganser
25. Ramon Garcia
26. Charles Garner
27. E. Gomez-Hennig
28. David Goodwin
29. Bill Griesacker
30. John Harley
31. Roger Hayes
32. Bill Henning
33. Thang Hochanh
34. Phillip Hopkinson
35. Vladimir Khalin
36. Dong Kim
37. Eberhard Lemke
38. Richard Marek
39. John Matthews
40. Susan McNelly
41. Joseph Melanson
42. Kent Miller
43. Arthur Molden
44. Gylfi Olafsson
45. Sanjay Patel
46. Mark Perkins
47. Don Platts
48. Bertrand Poulin
49. Jean-Chris Riboud
50. Pierre Riffon
51. Mahesh Sampat
52. Devki Sharma
53. H. Shertukde
54. H. Jin Sim
55. Steven Snyder
56. Andy Speegle
57. Michael Spurlock
58. Andy Steineman
59. Craig Stiegemeier
60. Valeriu Tatu
61. Juan Luis Thierry
62. Robert Thompson
63. George Tolbert
64. Subhash Tuli
65. Loren Wagenaar
66. Jim Zhang
67. Peter Zhao

**GUESTS**

1. Ed teNyenhuis
2. Kipp Yule
3. Larry Davis
4. Andre Shor
5. Gary King
6. David Wallach
7. David Bandow **
8. Chungduck Ko
9. Mike Goaltieri
10. Larry Coffeen
11. Rowland James
12. Wilington Ayala
13. Mark Ashford
15. Mark Gromlovits **
16. Robert Perlichek
17. Alvaro Cancino
18. C. J. Kalra
19. Terry Rennich
20. Paulette Powell
21. Colin Clark
22. Arnold Carlos
23. Shawn Patterson
24. John Stein
25. Samuel Oriti
26. Mark Meyer
27. Ray Bartnikas **
28. Clarence Bell
29. Mike Craven
30. Gerry Rosselli
31. Catherine Hurley
32. Francis Raveneau
33. Kent Haggerty
34. Rick Ryman
35. Francesco Rebordao
36. Alexander Kraetge **
37. Marcel Fortin
38. Juan Castellanos
39. Shuzhen Xu
40. Jim Graham **
41. Stan Linsenbardt
42. Bob Ganser Jr.
43. Don Dorris
44. Jerry Harlan
45. Sergiy Razuvayev
46. Jermel Miller
47. Virendra Jhonsa
48. Jane Ann Verner
49. James Gardner
50. Dharam Vir **
51. Charles Drexler
52. Greg Anderson **
53. Lin Tong
54. Dale Corel
55. David Buset
56. Les Recksieder **
57. Dwight Parkinson
58. Paul Mushill
59. Jerry Allen
60. Brian Leslie
61. Jeewan Puri
62. Kent Brown
63. Wayne Johnson
64. Gael Kennedy
65. Edgar Trummer
66. Gary McCulla
67. Dan de la Cruz
68. Tom Lundquist **
69. Barry Ward
70. Jim Thompson
71. Juergen Gerth

** Guests Requesting Membership
8.0 Editor’s Report – Spring 2007  Dallas, Texas  Meeting

Between and October 20, 2006 and March 10, 2007 a total of 43 papers in the transformer area were submitted to IEEE Transactions on Power Delivery for possible publication. Many of the papers in this rotation have been revised and resubmitted at least once. For the 46 reviews completed during this period, the recommendations were: Accept without changes: 7, Revise and Resubmit: 27, and Reject - 9. A summary of the accepted papers is at the end of this report.

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. The comments and suggestions of the reviewers improve the quality of the papers that are published and we need the help of all of you to ensure that we continue to have quality papers that benefit all of us.

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.

Respectfully Submitted,  
John Crouse  
Editor, IEEE Transactions on Power Delivery  
john.crouse@ieee.org

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  
4. Please specify any “Key Words” such as: distribution transformers, core losses, oil DGA, or thermal, for example.
5. Submit your information.
6. Click on "Request Reviewer Status" to be enabled as a reviewer.
<table>
<thead>
<tr>
<th>Number</th>
<th>Title</th>
<th>Key Words</th>
<th>Lead Author</th>
<th>Decision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mitigating Ferroresonance in Voltage Transformers in Ungrounded MV Networks</td>
<td>Ferroresonance, Modeling, Voltage transformers</td>
<td>Dr. Wojciech Piasecki</td>
<td>Accept 01/05/07</td>
</tr>
<tr>
<td>2</td>
<td>Impulse Strength of Transformer Insulation with Non-standard Waveshapes</td>
<td>Disruptive Effect, Non-standard impulse, Unconditionally sequential approach</td>
<td>Mr. S Venkatesan</td>
<td>Accept 01/24/07</td>
</tr>
<tr>
<td>3</td>
<td>Comparison of known PD signals with the developed and commercial HFCT</td>
<td>Condition monitoring, HFCT, partial discharge, wave shape of single PD, high frequency CT</td>
<td>Prof. SIVASWAMY BIRLASEKARAN</td>
<td>Accept 11/01/06</td>
</tr>
<tr>
<td>4</td>
<td>An Accurate Current Transformer Model Based on Preisach Theory for the Analysis of Electromagnetic Transients</td>
<td>Current Transformer, Hysteresis, Preisach Theory, Remnant flux, Auto-recloser</td>
<td>Mr. Afshin Rezaei-Zare</td>
<td>Accept 1/3/2007</td>
</tr>
<tr>
<td>5</td>
<td>Solid-State Tap Changers: New Configurations and Applications</td>
<td>Tap changer, solid-state switches, distribution transformers, voltage regulators</td>
<td>Prof. Antonio Gomez-Exposito</td>
<td>Accept 01/03/07</td>
</tr>
<tr>
<td>6</td>
<td>Acceptability of Four Transformer Top-Oil Thermal Models: Pt. 1: Defining Metrics</td>
<td>Transformer, Top Oil Temperature, Thermal Modeling</td>
<td>Ms. Lida Jaregui-Rivera</td>
<td>Accept 02/19/07</td>
</tr>
<tr>
<td>7</td>
<td>Acceptability of Four Transformer Top-Oil Thermal Models: Pt. 2: Comparing Metrics</td>
<td>Transformer, Top Oil Temperature, Thermal Modeling</td>
<td>Ms. Lida Jaregui-Rivera</td>
<td>Accept 02/19/07</td>
</tr>
</tbody>
</table>
9.0 Meetings Planning Subcommittee – G.W. Anderson

9.0.1 Meetings Arrangements

Meeting attendance (preliminary as of March 11, 2007) for Dallas is:

- Attendance: 396
- Spouses: 38
- No Shows (registered and didn't attend): 10
- Dallas “walk-up” registration's: 2
- Sunday Reception: 306
- Monday Standards Luncheon: 119
- Tuesday Speaker Luncheon: 192
- Wednesday Dinner Social: 175
- Sunday Event Museum Tour: 28
- Monday HVS Tour: 59
- Tuesday HVS Tour: 57
- Meeting Minutes: 67

IEEE TC Web access key code is 8006784333

Future Meetings:

- F07 (October 14-18, 2007) – Minneapolis, MN, Hilton-Minneapolis hotel, hosted by Xcel Energy
- S08 (March 16-20, 2007) – Charlotte, NC, Westin Hotel, hosted by Shaw Electric Delivery Services
- F08 (October 5-9, 2008) – Porto, Portugal ... Sheraton Hotel
- S09 (April 19-23, 2009) – Southern part of the US

9.0.2 Finances

Meeting Finances:

- Balance before the “Fall 2005” Memphis, TN meeting: $18,793.02
- Balance before the “Spring 2006” Costa Mesa, CA meeting: $1,729.81
- Balance before the “Fall 2006” Montreal, Canada, meeting: $17,014.33
- Balance before the “Spring 2007” Dallas, TX meeting: $17,751.00

9.0.3 Membership

Greg suggested and requested that we add two new membership groups to the types of memberships listed in our data base.

- Interested Individual (current)
- Interested Individual – IEEE Life Member (add)
- Active Participants (current)
- Active Participants – IEEE Life Member (add)
- Committee Members (current)
- Committee Members – IEEE Life Member (current)
- Committee Member – Emeritus Member (current)
MOTION
As a result of this request there was discussion about giving all IEEE life members (the two suggested new groups) the same registration discount afforded to Committee Members – IEEE Life Members (registration fee of $50). Greg made a motion, “All IEEE Life Members get a registration discount the same as the current IEEE Life Members that are Committee Members of $50.00”. The motion was seconded by Ken Hanus a ballot was taken and the motion passed with 17 affirmative votes with no negates.

Everyone should encourage active participants to become a “Transformers Committee” member. Don strongly suggested that the Subcommittee chairs take an active roll in making sure that active members of their Working Groups are encouraged to become Transformer Committee members.

9.0.4 Meetings Planning Subcommittee Presentation

Meetings Planning Subcommittee presentation at the main committee meeting on Thursday March 15, 2007 (See Appendix G)
10.0 Reports of Liaison Representatives

10.1 Standard Coordinating Committee SCC 04

10.1.1 Standards Coordinating Committee on Electrical Insulation – SCC 04 - (Paulette Powell)

10.1.1.1 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.

10.1.1.2 Activities:


10.1.1.3 Participation:

Anyone interested in joining the Subcommittee or the Working Group revising IEEE 99 should contact:

Paulette Payne Powell
Chairperson SCC 04
papayne@ieee.org
202-388-2335 (o)
202-497-9057 (c)

Respectfully submitted,
Paulette Payne Powell
10.2 IEC – TC Technical Advisor to USNC

10.2.1 IEC TC-14 Technical Advisory Group Meeting Minutes

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

PLACE OF MEETING: Hilton Dallas Lincoln Centre
777 University Street
Montreal, Quebec, Canada

DATE AND TIME: Monday, March 12, 2007
8:00 AM

PRESIDING OFFICER: P. Hopkinson, Technical Advisor

Members Present:
S. Choinski NEMA Staff, TAG Administrator
C. Colopy Cooper Power Systems
J. Foldi Foldi & Associates
P. Hopkinson Hvolt, Inc., TA
R. Marek Dupont Advanced Fibers Systems
P. Powell PEPCO
H.J. Sim Waukesha Electric Systems
B. Simpson Innovative Paper Technologies

Members Absent:
D. Aho Cooper Power Systems
J. Corkran Cooper Power Systems
D. Foster Olsun Electrics Corporation
R. Girgis ABB
S. Kennedy Niagara Transformer Corporation
J. Lackey PowerNex Associates Inc
G. Morehart ACME Electric Corporation

Others present:
A. Cancino ITEM-Mexico
D. Corel Sola/Hevi-Duty
J. Crouse GE
1. CALL TO ORDER

The meeting was called to order, meeting guidelines reviewed and attendance recorded.

2. APPROVAL OF THE AGENDA

The Agenda was approved as written.

3. APPROVAL OF THE PREVIOUS MINUTES

Minutes of the meeting held October 25, 2007 in Montreal, Canada were approved as written.

4. REVIEW AND UPDATE OF USNC ROSTERS FOR TC 14

A roster was circulated and corrections were annotated.

5. REVIEW OF PLENARY MEETING TO BE HELD IN MEXICO CITY JUNE 7-8, 2007

Meeting announcement, draft agenda and logistics for the meeting have been posted on the IEC website. This will be posted on the IEEE website and circulated to the TAG members.

Topics to on the agenda are:

14/459/DA Draft Agenda
14/548/INF Meeting Invitation and Announcement
14/545/CD Dry Type Loading Guide: Revision in progress, headed by Michelle Sacotte
14/550/INF IEC/CIGRE UHF Symposium
14/531/A/CC Gas-Filled Transformers
14/526//MCR 76-2 Transformer Temperature Rise
14/547/INF Reactors
14/546A/INF Supplement for Dual Logo
14/551/INF CIGRE Report A2
14/507/MCR High Temperature Insulation Materials in Liquid Transformers: IEC 60076-1 TS Ed. 2 to be revised by convener, Rick Marek of the US

MT on wind turbines may be added to the agenda.
6. IEC-IEEE DUAL LOGO PROCESS

J. Haasz briefed the members on the dual logo process. The US is permitted to adopt IEC standards as a US national standard. A PAR is to be filed, and standard copyright law applies for content. One issue with IEEE transformer standards is that the reference section tends to be long. They tend to list all transformer standards and not only those actually referenced. The standards not actually referenced could be moved to a bibliography.

It was noted that adopting an IEC standard with pages for exceptions makes the document unuseable – in effect, the result is one has two documents).

J. Puri’s sound level document and C. Colopy’s tap changer document are candidates for the adoption of IEC documents as IEEE documents. It was suggested that formally establishing joint development of the standards with IEC be considered.

7. MT5 REVISION OF IEC 60076-1 – POWER TRANSFORMERS - PART 1: GENERAL. P. HOPKINSON, CONVENOR

This is a much larger project than expected. Clause-by-clause review to prepare for first CD continues. There are changes to virtually every paragraph, and there are too many changes to use “track changes.” The revised document will look like a new standard.

8. IEC 60076-1 TS ED. 2: HIGH TEMPERATURE INSULATION MATERIALS IN LIQUID TRANSFORMERS. R. MAREK, CONVENOR

A TS has a two-year life and a revision effort was started. There has been resistance to the revision from CIGRE.

9. IEC 60076 POWER TRANSFORMERS – PART 12 - LOADING GUIDE FOR DRY-TYPE POWER TRANSFORMERS

Revision in progress. 27 pages of comments to first CD, so quite a lot of work remains. Patterned after US loading guide style, but is missing a test. Convenor states this test is out of the scope, but it will need to be addressed.

10. OTHER BUSINESS

There was no other business

11. DATE AND PLACE OF THE NEXT MEETING

The next meeting will be held October 15, 2007 in Minneapolis, MN

12. ADJOURN

The meeting adjourned at 10:38 AM.

Reported By: S. Choinski March 12, 2007
10.3  CIGRE liaison report JC Riboud
Most of the following text is part of the report made by Pierre Boss to the IEC TC 14

10.3.1. Highlights
In 2006 activities were related to the problem of oil corrosivity, data management, condition assessment, and reliability issues. A new advisory group “UHV AC & DC Transformers” has been created to cover some specific aspects in relation with the development of 1000 kV equipments. In 2006, three new working groups have been created in the domain of: fire behavior, maintenance and experience with new insulating fluids.

10.3.2. Main technical directions pursued
The two strategic directions of SC A2 are:
• To continue on transformer technology issues and to consider new information technologies (data, communication, web services)
• To provide services to CIGRE customers (reliability and availability including impact of accessories, life management, economical issues, tutorials, etc).

10.3.3. Working group and task force reports
Full progress report, scope and membership of the different groups are on the WEB site of A2

WG A2-23 - Lifetime data management for transformers (N. Fantana) has issued the brochure n° 298 with a summary in Electra n° 227 August 2006. The WG is disbanded.

WG A2-25 - Bushing reliability (G. Polovick). The aim of the WG was to improve the bushing reliability or at least to prevent the decrease of the bushing performance. This item was covered within the workshop on Reliability during the 2006 SC meeting. The WG is disbanded.

TF A2-29 - Reliability Survey (K. Ryen). Prepare a reliability survey in conjunction with A3/B3. The main objective was to check the format of the survey prepared by A3/B3. As the survey A3/B3 has already been issued, no formal activity in the field of “Reliability Survey” has been undertaken. This item was covered within the workshop on Reliability during the 2006 SC meeting. The TF is disbanded.

WG A2-24 - Thermal performances (J. Declerq) created in 2003. The WG is considering: fundamentals of thermal ageing of insulation system, thermal modeling of transformers (for monitoring system) and thermal testing of transformers (contribution to measuring uncertainties at heat run tests). The work has been reactivated recently. We expect a closing of this group in 2007.

WG A2-26 - Mechanical condition assessment of windings (P. Picher) created in 2004. The CIGRE Working Group A2.26 main objective is to develop a guide on the mechanical condition assessment of transformer windings using the Frequency Response Analysis (FRA) method. The working group is divided in three task forces: 1-Guidance and introduction to FRA, 2-Techniques and 3-Interpretation.
The WG should deliver a final report in 2007 before to be disbanded.

WG A2-27 - Recommendations for condition monitoring facilities (P. Jarman) created as TF in 2003 and as WG in 2005.
A definite pattern and commonality to the requirements of the diverse monitoring systems has emerged. Communication protocols were not be considered, but the WG output may help to guide transformer data requirements for example for IEC 61850 application.
The final report has been circulated within the SC and a final brochure will be issued during the first part of 2007.

TF A2-30 - Moisture in transformer (V. Sokolov) created in 2004.
This TF shall prepare a report (brochure) on moisture in transformers to support the understanding of moisture mechanism in transformer.
A draft of the report has been circulated and will be finalized as a brochure before 2007 SC meeting next October.

WG A2-32 - Copper sulphide in power transformer insulation (M. Dahlund) created in 2005.
The WG is spited presently in tasks forces: a) Test and specification and b) “Metal passivator long term stability study”. IEC TC 10 has created the WG 35 to work in close relation with CIGRE WG A2-32 for the preparation of a new standard to check the corrosivity of insulating oil. WG A-32 has issued his recommendation to IEC at mid May 2006.
This recommendation has been posted on the A2 WEB site and a summary has been sent to Electra for a publication at the beginning of 2007.

WG A2-33 - Fire Safety (A. Petersen/AU)
The aim is to prepare recommendations for transformer fire safety practices that will help transformer designers and users to define and apply best practices in the domain of transformer fire. The scope shall cover different parts, mainly: a) Avoidance of tank rupture, b) Precaution to fire victim and c) Precautions to fire origin

WG A2-34 Guide for Transformer Maintenance (C. Rajotte/CA)
The aim is to prepare a guide for transformer maintenance that will help transformer users to define and apply best practices for transformer maintenance. The Scope shall: a) define a best practices list of periodic actions applied on line or off line, b) address condition based maintenance and c) human and material aspects of transformer maintenance, with maintenance planning, maintenance tasks tracking, maintenance resources, cost references, level of competences required for different tasks, training, on-site repair, etc.

WG A2-35 Experiences in service with new liquids (R. Martin/UK)
The aim is to collate and review the in-service experience of using the new fluids in a way which is relevant and beneficial to the electrical industry. Domains to be covered are : a) Basic properties like physical and chemical and electrical differences between the new fluids and mineral oil, fire safety, toxicity, etc. b) Design considerations, c) Maintenance, Retro filling practice, Handling, experiences of these new fluids with cellulose, d) Standards: Review what standards exist for these fluids, highlight deficiencies, propose remedies and e) Further work: identify the knowledge gaps/concerns and propose solutions, or work for other groups.

JWG A2/B4-28 - HVDC Converter Transformers (M. Saravolac) created in 2004.
The design review guide will address specific aspects of HVDC transformers and their application. Concerning test specification, some new recommendations for test requirements and procedures covered will be issued in order to ensure higher reliability in service.
One of the areas under consideration is the duration of the Polarity Reversal test.
10.3.4. **Publications**

- Final report of TF A2-3 1 “Copper Sulphide in transformer insulation”
  — Electra N° 224 - February 2006


- Intermediate report of WG A2-26 “Mechanical condition assessment of transformer windings” — Electra N° 228, October 2006

  — January 2007

- Intermediate report of WG A2-32 “Copper sulphide in power transformer insulation”
  — to be published in Electra - first part of 2007

- State-of-the-art report on ‘Fire Avoidance in Transformer Substation’, prepared by Prof. D. Allan with the support of J. Declerq and A. Petersen
  — to be published in Electra — April 2007.

- Final report/brochure of WG A2-27 — “Recommendations for condition monitoring facilities” — to be published in Electra - second part of 2007

- Final report/brochure of TF A2-30 — “Moisture in transformer”
  — to be published in Electra - second part of 2007

10.3.5. **next meetings**

In 2007, the SC meeting will take place in Bruges/Belgiu
11.0 Old Business

There were no items of Old Business brought up
12.0 New Business
IEEE / PES Transformers Committee
Meeting Minutes
Attachments

APPROVED
IEEE / PES Transformers Committee
Meeting Minutes

Attachment A

General Attachment
IEEE Patent Requirements for Standards Development Meetings

APPROVED
Instructions for the WG Chair

- At Each Meeting, the Working Group Chair shall:
- Show slides #1 and #2 of this presentation
- Advise the WG membership that:
  - The IEEE’s patent policy is consistent with the ANSI patent policy and is described in Clause 6 of the IEEE-SA Standards Board Bylaws;
  - Early disclosure of patents which may be essential for the use of standards under development is encouraged;
  - Disclosures made of such patents may not be exhaustive of all patents that may be essential for the use of standards under development, and that neither the IEEE, the WG, nor the WG Chairman ensure the accuracy or completeness of any disclosure or whether any disclosure is of a patent that, in fact, may be essential for the use of standards under development.
- Instruct the WG Secretary to record in the minutes of the relevant WG meeting:
  - That the foregoing advice was provided and the two slides were shown;
  - That an opportunity was provided for WG members to identify or disclose patents that the WG member believes may be essential for the use of that standard;
  - Any responses that were given, specifically the patents and patent applications that were identified (if any) and by whom.

IEEE-SA Standards Board Bylaws on Patents in Standards

6. Patents

IEEE standards may include the known use of essential patents and patent applications provided the IEEE receives assurance from the patent holder or applicant with respect to patents whose infringement is, or in the case of patent applications, potential future infringement the applicant asserts will be, unavoidable in a compliant implementation of either mandatory or optional portions of the standard [essential patents]. This assurance shall be provided without coercion. The patent holder or applicant should provide this assurance as soon as reasonably feasible in the standards development process. This assurance shall be provided no later than the approval of the standard (or reaffirmation when a patent or patent application becomes known after initial approval of the standard). This assurance shall be either:

a) A general disclaimer to the effect that the patentee will not enforce any of its present or future patent(s) whose use would be required to implement either mandatory or optional portions of the proposed IEEE standard against any person or entity complying with the standard; or

b) A statement that a license for such implementation will be made available without compensation or under reasonable rates, with reasonable terms and conditions that are demonstrably free of any unfair discrimination.

This assurance is irrevocable once submitted and accepted and shall apply, at a minimum, from the date of the standard's approval to the date of the standard's withdrawal.
Inappropriate Topics for IEEE WG Meetings

- Don’t discuss the validity/essentiality of patents/patent claims
- Don’t discuss the cost of specific patent use
- Don’t discuss licensing terms or conditions
- Don’t discuss product pricing, territorial restrictions, or market share
- Don’t discuss ongoing litigation or threatened litigation
- Don’t be silent if inappropriate topics are discussed… do formally object.

If you have questions, contact the IEEE-SA Standards Board Patent Committee Administrator at patcom@ieee.org or visit http://standards.ieee.org/board/pat/index.html

This slide set is available at http://standards.ieee.org/board/pat/pat-slideset.ppt
IEEE / PES Transformers Committee Meeting Minutes

Attachment B

Secretary’s Report
Membership Chart

APPROVED

IEEE/PES
TRANSFORMERS COMMITTEE
MAIN MINUTES
## Membership Summary for 28-FEB-2007

<table>
<thead>
<tr>
<th>Type</th>
<th>Active</th>
<th>Expired (within grace period)</th>
<th>Expired (past grace period)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active Participant</td>
<td>271</td>
<td>0</td>
<td>0</td>
<td>271</td>
</tr>
<tr>
<td>Committee Member</td>
<td>176</td>
<td>0</td>
<td>0</td>
<td>176</td>
</tr>
<tr>
<td>Committee Member - Emeritus Member</td>
<td>7</td>
<td>0</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>Committee Member - IEEE Life Member</td>
<td>19</td>
<td>0</td>
<td>0</td>
<td>19</td>
</tr>
<tr>
<td>Committee Member - Corresponding Member</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Interested Individual</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>439</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>474</strong></td>
<td><strong>0</strong></td>
<td><strong>0</strong></td>
<td><strong>913</strong></td>
</tr>
</tbody>
</table>

### Total Members

- Active Participant: 57.2%
- Committee Member - Corresponding Member: 2.9%
- Committee Member - Emeritus Member: 0.5%
- Committee Member - IEEE Life Member: 4.0%
- Committee Member: 37.1%

### Current Membership

- Active Participant: 57.2%
- Committee Member - Corresponding Member: 2.9%
- Committee Member - Emeritus Member: 0.5%
- Committee Member - IEEE Life Member: 4.0%
- Committee Member: 37.1%

---

Membership: Summary
IEEE / PES Transformers Committee
Meeting Minutes

Attachment C

General Attachment
Prior Meeting Locations
&
Committee Chairs

APPROVED

IEEE/PES
TRANSFORMERS COMMITTEE
MAIN MINUTES
# Previous Meeting Locations & Chair

<table>
<thead>
<tr>
<th>Year</th>
<th>Spring Location</th>
<th>Fall Location</th>
<th>Chairman</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>Costa Mesa, CA</td>
<td>Montreal, PQ Canada</td>
<td>Fallon</td>
</tr>
<tr>
<td>2005</td>
<td>Jackson, MS</td>
<td>Memphis, TN</td>
<td>Hanus</td>
</tr>
<tr>
<td>2004</td>
<td>San Diego, CA</td>
<td>Las vegas, NV</td>
<td>Hanus</td>
</tr>
<tr>
<td>2003</td>
<td>Raleigh, NC</td>
<td>Pittsburgh, PA</td>
<td>Sim</td>
</tr>
<tr>
<td>2002</td>
<td>Vancouver, BC, Canada</td>
<td>Oklahoma City, OK</td>
<td>Sim</td>
</tr>
<tr>
<td>2001</td>
<td>Amsterdam, The Netherlands</td>
<td>Orlando, FL</td>
<td>Patel</td>
</tr>
<tr>
<td>2000</td>
<td>Nashville, TN</td>
<td>Niagara Falls, ON, Canada</td>
<td>Patel</td>
</tr>
<tr>
<td>1999</td>
<td>New Orleans, LA</td>
<td>Monterey, Mexico</td>
<td>Matthews</td>
</tr>
<tr>
<td>1998</td>
<td>Little Rock, AR</td>
<td>Guanajuato, Mexico</td>
<td>Matthews</td>
</tr>
<tr>
<td>1997</td>
<td>Graz, Austria (summer)</td>
<td>St. Louis, MO</td>
<td>Binder</td>
</tr>
<tr>
<td>1996</td>
<td>San Francisco, CA</td>
<td>Burlington, VT</td>
<td>Binder</td>
</tr>
<tr>
<td>1995</td>
<td>Kansas City, MO</td>
<td>Boston, MA</td>
<td>Harlow</td>
</tr>
<tr>
<td>1994</td>
<td>Dallas, TX</td>
<td>Milwaukee, WI</td>
<td>Harlow</td>
</tr>
<tr>
<td>1993</td>
<td>Portland, OR</td>
<td>St. Petersburg, FL</td>
<td>Borst</td>
</tr>
<tr>
<td>1992</td>
<td>Birmingham, AL</td>
<td>Cleveland, OH</td>
<td>Borst</td>
</tr>
<tr>
<td>1991</td>
<td>Phoenix, AZ</td>
<td>Baltimore, MD</td>
<td>Veitch</td>
</tr>
<tr>
<td>1990</td>
<td>Denver, CO</td>
<td>Montreal, PQ, Canada</td>
<td>Veitch</td>
</tr>
<tr>
<td>1989</td>
<td>Chicago, IL</td>
<td>Charlotte, NC</td>
<td>Veitch</td>
</tr>
<tr>
<td>1988</td>
<td>Washington, DC</td>
<td>Long Beach, CA</td>
<td>Compton</td>
</tr>
<tr>
<td>1987</td>
<td>Ft. Lauderdale, FL</td>
<td>New Orleans, LA</td>
<td>Compton</td>
</tr>
<tr>
<td>1986</td>
<td>Little Rock, AR</td>
<td>Pittsburgh, PA</td>
<td>Yannucci</td>
</tr>
<tr>
<td>1985</td>
<td>St. Louis, MO</td>
<td>Toronto, ON, Canada</td>
<td>Yannucci</td>
</tr>
<tr>
<td>1984</td>
<td>Vancouver, BC, Canada</td>
<td>Boston, MA</td>
<td>Savio</td>
</tr>
<tr>
<td>1983</td>
<td>Atlanta, GA</td>
<td>Detroit, MI</td>
<td>Savio</td>
</tr>
<tr>
<td>1982</td>
<td>Los Angeles, CA</td>
<td>Philadelphia, PA</td>
<td>McNutt</td>
</tr>
<tr>
<td>1981</td>
<td>Portland, OR</td>
<td>Phoenix, AZ</td>
<td>McNutt</td>
</tr>
<tr>
<td>1980</td>
<td>Williamsburg, VA</td>
<td>Milwaukee, WI</td>
<td>Bonucchi</td>
</tr>
<tr>
<td>1979</td>
<td>San Diego, CA</td>
<td>Houston, TX</td>
<td>Bonucchi</td>
</tr>
<tr>
<td>1978</td>
<td>Miami, FL</td>
<td>Chattanooga, TN</td>
<td>Bennon</td>
</tr>
<tr>
<td>1977</td>
<td>Charlotte, NC</td>
<td>Montreal, PQ, Canada</td>
<td>Bennon</td>
</tr>
<tr>
<td>1976</td>
<td>New Orleans, LA</td>
<td>San Francisco, CA</td>
<td>Honey</td>
</tr>
<tr>
<td>Standard</td>
<td>Project</td>
<td>Title</td>
<td>Pub Year</td>
</tr>
<tr>
<td>----------</td>
<td>---------</td>
<td>----------------------------------------------------------------------</td>
<td>----------</td>
</tr>
</tbody>
</table>

Prepared by B. Chiu, IEEE PES TR Std Coordinator
<p>| SubCommittee | TITLE | Working Group Chair | Phone | Email | Pub Year | Rev Due Date | PAR Issue Date | PAR Expiration | Standard Status | Remark |
|--------------|-------|---------------------|-------|-------|-----------|--------------|---------------|----------------|----------------|-----------|--------|
| SubCommittee Chair | Project | Title | Working Group Chair | Phone | Email | Pub Year | Rev Due Date | PAR Issue Date | PAR Expiration | Standard Status | Remark |
|--------------------|---------|-------|---------------------|-------|-------|----------|--------------|----------------|----------------|----------------|----------|--------|
| <strong>PC57.12.30</strong>     |         |       | Hanus, K. S.        | (817) 215-4444 | <a href="mailto:ken.hanus@ieee.org">ken.hanus@ieee.org</a> | 3/11/2007 | 12/31/2007 | 12/31/2007 | Approved | Active PAR Std under development |</p>
<table>
<thead>
<tr>
<th>SubCommittee</th>
<th>DISTRIBUTION TRANSFORMERS</th>
<th>Working Group Chair Phone Email</th>
<th>Pub Year</th>
<th>PAR Issue Date</th>
<th>PAR Expiration</th>
<th>Standard Status</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>Project</td>
<td>Title</td>
<td>Working Group Chair</td>
<td>Pub Year</td>
<td>PAR Issue Date</td>
<td>PAR Expiration</td>
<td>Standard Status</td>
</tr>
<tr>
<td>----------</td>
<td>---------</td>
<td>-----------------------------------------------------------------------</td>
<td>----------------------</td>
<td>----------</td>
<td>----------------</td>
<td>----------------</td>
<td>----------------</td>
</tr>
<tr>
<td>C57.12.01</td>
<td>DRY TYPE TRANSFORMERS</td>
<td>IEEE Standard General Requirements for Dry-Type Distribution and Power Transformers Including Those with Solid Cast and/or Resin Encapsulated Windings</td>
<td>Sullivan J. C.</td>
<td>(813) 884-5424 <a href="mailto:jesullivan@ieee.org">jesullivan@ieee.org</a></td>
<td>2005</td>
<td>12/31/2010</td>
<td>Approved</td>
</tr>
<tr>
<td>C57.12.56</td>
<td>DRY TYPE TRANSFORMERS</td>
<td>Standard Requirements for Sealed Dry-Type Power Transformers, 501 kVA and Larger, Three-Phase, with High-Voltage 601 to 34 500 Volts, Low-Voltage 208Y/120 to 4160 Volts</td>
<td>Kennedy S. P.</td>
<td>(716) 896-6500 <a href="mailto:skennedy@niagaratransformer.com">skennedy@niagaratransformer.com</a></td>
<td>1981</td>
<td>12/31/2005</td>
<td>Approved</td>
</tr>
<tr>
<td>C57.12.50</td>
<td>DRY TYPE TRANSFORMERS</td>
<td>IEEE Guide for Conducting a Transient Voltage Analysis of a Dry-Type Transformer Cell</td>
<td>Kline A. D.</td>
<td>(943) 705-2698 <a href="mailto:AKLINE1490@AOL.COM">AKLINE1490@AOL.COM</a></td>
<td>12/31/2007</td>
<td>Approved - Active</td>
<td></td>
</tr>
<tr>
<td>C57.12.124</td>
<td>DRY TYPE TRANSFORMERS</td>
<td>IEEE Recommended Practice for the Detection of Partial Discharge and the Measurement of Apparent Charge in Dry-Type Transformers</td>
<td>Kline A. D.</td>
<td>(943) 705-2698 <a href="mailto:AKLINE1490@AOL.COM">AKLINE1490@AOL.COM</a></td>
<td>1991</td>
<td>12/31/2007</td>
<td>Approved</td>
</tr>
<tr>
<td>Standard Project</td>
<td>Title</td>
<td>Working Group Chair</td>
<td>Pub Year</td>
<td>PAR Issue Date</td>
<td>PAR Expiration</td>
<td>Standard Status</td>
<td>Remark</td>
</tr>
<tr>
<td>------------------</td>
<td>----------------------------------------------------------------------</td>
<td>---------------------</td>
<td>----------</td>
<td>----------------</td>
<td>----------------</td>
<td>----------------</td>
<td>--------</td>
</tr>
<tr>
<td><strong>Dry Type Transformers</strong></td>
<td><strong>C57.94</strong> IEEE Recommended Practice for Installation, Application, Operation, and Maintenance of Dry-Type General Purpose Distribution and Power Transformers</td>
<td>(276) 688-1512</td>
<td>T. D. Lewis</td>
<td>1992</td>
<td>12/31/2010</td>
<td>Approved</td>
<td>Reaffirmation approved 12/5/2006</td>
</tr>
<tr>
<td><strong>IEEE 259</strong> IEEE Standard Test Procedure for Evaluation of Systems of Insulation for Dry-Type Specialty and General-Purpose Transformers</td>
<td>(802) 751-3458</td>
<td><a href="mailto:tprevost@ieee.org">tprevost@ieee.org</a></td>
<td>1999</td>
<td>12/31/2009</td>
<td>Approved</td>
<td>9/22/04 - RevCom approved reaffirmation</td>
<td></td>
</tr>
<tr>
<td><strong>P1277</strong> IEEE General Requirements and Test Code for Dry-Type and Oil-Immersed Smoothing Reactors for DC Power Transmission</td>
<td>(603) 286-4362</td>
<td><a href="mailto:bsimpson@quin-t.com">bsimpson@quin-t.com</a></td>
<td>2000</td>
<td>11/10/2005</td>
<td>Approved. Active PAR for revision</td>
<td>Active PAR for revision.</td>
<td></td>
</tr>
<tr>
<td><strong>C57.13.2</strong> Conformance Test Procedure for Instrument Transformers</td>
<td>(301) 975-2986</td>
<td><a href="mailto:thomas.nelson@nist.gov">thomas.nelson@nist.gov</a></td>
<td>2006</td>
<td>12/31/2010</td>
<td>Approved</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>C57.13.5</strong> Standard of Performance and Test Requirements for Instrument Transformers of a Nominal System Voltage of 115 kV and Above</td>
<td>(514) 840-3000 x3424</td>
<td><a href="mailto:riffon.pierre@hydro.qc.ca">riffon.pierre@hydro.qc.ca</a></td>
<td>2008</td>
<td>12/31/2009</td>
<td>Approved - Active PAR for Revision</td>
<td>Reference Std. 1400; Previously C57.13.5 was a trial use Upgraded to Full Use 3/30/2006</td>
<td></td>
</tr>
<tr>
<td><strong>C57.13.6</strong> Standard for High Accuracy Instrument Transformers</td>
<td>(603) 749-8433</td>
<td><a href="mailto:chris.tenhaagen@indsys.ge.com">chris.tenhaagen@indsys.ge.com</a></td>
<td>2006</td>
<td>12/31/2010</td>
<td>Approved</td>
<td>Document published in 12/9/2005</td>
<td></td>
</tr>
<tr>
<td>SubCommittee</td>
<td>PROJECT</td>
<td>TITLE</td>
<td>Working Group Chair</td>
<td>Phone</td>
<td>Email</td>
<td>Pub Year</td>
<td>Rev Due Date</td>
</tr>
<tr>
<td>--------------</td>
<td>---------</td>
<td>-------</td>
<td>---------------------</td>
<td>-------</td>
<td>-------</td>
<td>----------</td>
<td>--------------</td>
</tr>
<tr>
<td></td>
<td>PC57.147</td>
<td>Guide for Acceptance and Maintenance of Natural Ester Fluids in Transformers</td>
<td>McShane C. P.</td>
<td>(262) 524-4591</td>
<td><a href="mailto:cpmcshane@cooperpower.com">cpmcshane@cooperpower.com</a></td>
<td>12/10/2003</td>
<td>12/31/2007</td>
</tr>
<tr>
<td></td>
<td>C57.111</td>
<td>IEEE Guide for Acceptance of Silicone Insulating Fluid and Its Maintenance in Transformers</td>
<td>Gryszkiewicz F. J.</td>
<td>(617) 393-3161</td>
<td><a href="mailto:frankg@ieee.org">frankg@ieee.org</a></td>
<td>2003</td>
<td>12/31/2008</td>
</tr>
<tr>
<td></td>
<td>IEE 637</td>
<td>IEEE Guide for the Reclamation of Insulating Oil and Criteria for Its Use</td>
<td>Verner</td>
<td>202 872-2812</td>
<td><a href="mailto:javerner@pepco.com">javerner@pepco.com</a></td>
<td>1985</td>
<td>12/31/2007</td>
</tr>
<tr>
<td>SubCommittee</td>
<td>INSULATION LIFE</td>
<td>Working Group Chair Phone Email</td>
<td>Pub Year</td>
<td>PAR Issue Date</td>
<td>PAR Expiration</td>
<td>Standard Status</td>
<td>Remark</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------------</td>
<td>---------------------------------</td>
<td>----------</td>
<td>---------------</td>
<td>----------------</td>
<td>----------------</td>
<td>--------</td>
</tr>
<tr>
<td>Chair</td>
<td>Platts D. W.</td>
<td>(610) 774-4686 <a href="mailto:donplatts@ieee.org">donplatts@ieee.org</a></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PC57.100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PC57.91</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Prepared by B. Chiu, IEEE PE/TR Std. Coordinator
<table>
<thead>
<tr>
<th>STANDARDS PROJECT</th>
<th>TITLE</th>
<th>Working Group Chair Phone Email</th>
<th>Pub Year Rev Due Date</th>
<th>PAR Issue Date</th>
<th>PAR Expiration</th>
<th>Standard Status</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>SubCommittee Chair</td>
<td>PERFORMANCE CHARACTERISTICS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PC57.133</td>
<td>A Guide To Describe The Occurrence And Mitigation Of Switching Transients Induced By Transformer-Breaker Interaction</td>
<td>Fortin M. 450-922-0925 <a href="mailto:fortin.marcel@ieee.org">fortin.marcel@ieee.org</a></td>
<td>12/31/2006</td>
<td></td>
<td></td>
<td>New Project - Active PAR Std under development</td>
<td>PAR extension granted 9/23/2004 - new expiration @2006</td>
</tr>
<tr>
<td>PC57.149</td>
<td>IEEE Guide for Application of Transformer Connections in Three-Phase Distribution Systems</td>
<td>Sweetser C.L. (617) 393-2966 <a href="mailto:csweetser@doble.com">csweetser@doble.com</a></td>
<td>12/31/2008</td>
<td></td>
<td></td>
<td>Std under development</td>
<td></td>
</tr>
<tr>
<td>C57.18.10</td>
<td>IEEE Standard Practices and Requirements for Semiconductor Power Rectifier Transformers</td>
<td>Kennedy S. P. (716) 896-6500 <a href="mailto:skennedy@niagaratransformer.com">skennedy@niagaratransformer.com</a></td>
<td>12/31/2008</td>
<td>12/31/2009</td>
<td></td>
<td>Approved - Active PAR for Amendment</td>
<td>Replaced the C57.18-1964 for pool cathode mercury-arc rectifiers. New PAR for Amendment 1: Technical and Editorial Corrections was approved 2/22/05</td>
</tr>
</tbody>
</table>

Prepared by B. Chiu, IEEE PE/TR Std. Coordinator
<table>
<thead>
<tr>
<th>STANDARD PROJECT</th>
<th>TITLE</th>
<th>Working Group Chair</th>
<th>Pub Year Rev Due Date</th>
<th>PAR Issue Date</th>
<th>PAR Expiration</th>
<th>Standard Status</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>STANDARD</td>
<td>TITLE</td>
<td>Pub Year</td>
<td>PAR Issue Date</td>
<td>Rev Date Date</td>
<td>PAR Expiration</td>
<td>PAR Status</td>
<td>Remark</td>
</tr>
<tr>
<td>----------</td>
<td>-------</td>
<td>----------</td>
<td>----------------</td>
<td>---------------</td>
<td>----------------</td>
<td>------------</td>
<td>--------</td>
</tr>
<tr>
<td>C57.144</td>
<td>Guide for Mark Conversion of Transformer Standards</td>
<td>1999</td>
<td>12/31/2010</td>
<td>12/31/2010</td>
<td></td>
<td>Reaffirmation was successful. Approval by RevCom on 7/19/05.</td>
<td></td>
</tr>
<tr>
<td>SubCommittee</td>
<td>PROJECT</td>
<td>TITLE</td>
<td>Working Group Chair</td>
<td>Pub Year</td>
<td>PAR Issue Date</td>
<td>PAR Expiration</td>
<td>Standard Status</td>
</tr>
<tr>
<td>--------------</td>
<td>---------</td>
<td>-------</td>
<td>----------------------</td>
<td>----------</td>
<td>----------------</td>
<td>----------------</td>
<td>----------------</td>
</tr>
</tbody>
</table>
IEEE / PES Transformers Committee
Meeting Minutes

Attachment E

Standards Subcommittee
Transformer Committee
Organizational Charts

APPROVED

IEEE/PES Transformers Committee
MAIN MINUTES
IEEE / PES Transformers Committee
Meeting Minutes
Attachment F

Transformer Standards Subcommittee
Standards Presentation presented at the
Main Committee Meeting
Thursday, March 15, 2007

APPROVED
Standards Subcommittee Update

- New WGs
  - PC57.12.70 (S. Shull)
  - IEEE 62, will have a new PAR number PC57.152 (J. Verner)
  - PC57.12.80a (T. Raymond) – in editorial coordination

- TF on IEC/IEEE Cross Reference
  new TF Chair – J. Sim
Standards Subcommittee Update

- IEC/IEEE Dual Logo issues:
  - Currently only one - C57.135 (phase shifter)
  - Currently responding to comments on C57.123
  - If possible: use informative reference as Bibliography instead of normative reference

- Working with IEEE to develop a new CD collection for our next meeting

---

Standards Subcommittee Update

- C57.12.00 & C57.12.90-2006
  - Officially published
  - Sufficient changes in the pipeline ready for next revision
  - To collect all ready changes by end of April
  - Performance Characteristics Subcommittee
    - PCS WG on General Requirements (12.00)
    - PCS WG on Test Codes (12.90)
  - Standards Subcommittee
    - Std. WG on Cont. Revision of C57.12.00
    - Std. WG on Cont. Revision of C57.12.90
Transformer Standards Update
PE/TR

PE/TR Sponsored Standards

- Currently there are total of 93 standards or active projects:
  - the development of new documents
  - revision/reaffirmation of existing documents
  - additional TFs
- Standards Activities & Status Report available on TC website:
  - Status of IEEE PE/TR Standards – Attachment 1
    - pdf format - grouped by Subcommittees
- Standards activities org chart
Reaffirmed Standards since Oct., ‘06

- **C57.12.59-2001**
  "dry-type through-fault current duration"

- **C57.94-1982 (R2000)**
  recommended practice for installation, application, O&M of dry-type

New & Revised Stds. Approved Since Oct., ‘06

Withdrawn:

- **1388-2000**
  electronic reporting of xfmr test data (Note: Replaced by C57.12.37-2006)

New document Approved:

- **PC57.140/D18**
  guide for the eval. & recond. liq. immersed power xfmr
NEW PARS – REV. OF EXISTING STANDARDS

- **PC57.12.24** submersible, 3-φ  ➔ *Dec. 2011*

- **PC57.12.91** test code for dry-type dist & power xfmrs ➔ *Dec. 2010*

- **PC57.16** dry-type air-core reactors ➔ *Dec. 2010*.

- **PC57.123** loss measurement ➔ *Dec. 2011*.

- **PC57.135** phase shifter ➔ *Dec. 2011*.

---

Historical Status of PE/TR Standards

- Link to IEEE official status of all PE/TR standards
    - key words: Power Engineering Society/Transformers

- **This link is available on the TC website**
  - A complete listing of the abstracts of IEEE Standards sponsored by the Transformers Committee
2007 SA Board
Meeting Dates & Submittal Due Dates

<table>
<thead>
<tr>
<th>Meeting Dates</th>
<th>Submittal Deadline</th>
</tr>
</thead>
</table>

IEEE SA - Electronic Balloting System

- myBallot™
  - https://balloting.standards.ieee.org/my-site
- To participate in the myBallot™ system, you need:
  - Be an IEEE-SA Member
  - Have an IEEE Web Account w/ log-in ID and password
    http://services1.ieee.org/membersvc/registration/intro.htm
  - Do not create multiple webaccounts

- WG Chairs – you must be an IEEE SA members
  - Prerequisite to participate in myBallot system
  - Please update your IEEE membership profile
  - Update your IEEE email alias
IEEE / PES Transformers Committee
Meeting Minutes

Attachment G

Meetings and Planning Subcommittee
Presentation

APPROVED

IEEE / PES Transformers Committee Main Minutes
Spring 2007
SC MEETINGS PLANNING
Spring 2007 Meeting
Dallas, Texas USA
14 March 2007
COMMITTEE FINANCES

Existing funds
... before break sponsor contributions
... before cost of printing & mailing minutes from previous meeting

Before Fall 2006 Meeting in Montreal
-- $17,014.33 (as of 1 September 2006)

Before this meeting
-- $17,751.87 (as of 12 February 2007)

MEETING ATTENDANCE

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Attendees</td>
<td>346</td>
<td>352</td>
<td>325</td>
<td>382</td>
<td>369</td>
<td>403</td>
<td>** 390</td>
</tr>
<tr>
<td>Companions</td>
<td>74</td>
<td>92</td>
<td>22</td>
<td>83</td>
<td>85</td>
<td>86</td>
<td>** 38</td>
</tr>
</tbody>
</table>

** -- tentative
FUTURE MEETINGS

• Fall 2007 (14-18 October) – Minneapolis; hosted by Susan McNelly and Xcel Energy; Hilton Minneapolis (US$149/149)

• Spring 2008 (15-20 March) – Charlotte, NC Hosted by Robert Thompson; The Westin Charlotte (US$159/159)

• Fall 2008 (5-9 October) – Oporto, Portugal; hosted by EFACEC; Sheraton Oporto

OTHER POTENTIAL MEETING LOCATIONS

Miami, Phoenix, San Antonio, Winnipeg

Others ... Kansas City, Little Rock, Mexico City ... Asia (perhaps in 2014-16)
WORKING GROUPS

- **WG Web-site Development**
  -- did not meet this meeting
  -- password for restricted areas (effective until Oct ’08)
    Username: xfmrcom (no change)
    Password: Trcom4acc (case sensitive)

- **WG Educational Development**
  New WG for Educational Development to promote educational content and coordinate presentations & tutorials. Kent Haggerty is WG chair and focal-point for presentations & tutorials (n.kent.haggerty@ieee.org).

UPCOMING PRESENTATIONS/TUTORIALS

- Ferroresonance (Fall 2007)
- FRA
- Wind Farms
- National Energy Policy, Phil Hopkinson
- Loss Tolerance & Measurement, Ramsis Girgis
- Evaluation of Core Losses by Applying Fundamental Frequency and Harmonic Sine Waves
MISCELLANEOUS

Coffee-break Sponsors (or “Patrons”)
• Expenses – approx. $4000-5000/day for breaks!
• Goals are three-fold:
  -- Help maintain a low meeting registration fee
  -- Foster relationships between meeting attendees and manufacturers
  -- Provide technical and educational focused material
• Low-key & discreet ... passive & receptive (minimize sales attitude)
  -- suggest wear logo-wear
  -- stand-there, let attendees come to you ... don’t walk-around, shaking hands
  -- don’t pass-out flyers, simply leave info on table
  -- recommend leave copies of educational/technical reports on table too
• Present Cost
  -- Mon, Tues, Wed (4 breaks/day) - $1000/day
• See Joe Watson, Break Sponsor Coordinator (joe_watson@ieee.org)

MISCELLANEOUS

• IEEE S50L Forms
• Audit of Finances (~April)
• Wireless LAN ... Internet Cafe (mixed results)
• Internet Meetings
• Still looking for a “Committee Historian”

AM SYSTEM – recent problems:
Down for nearly 48 hours (Friday-Sunday)