IEEE/PES Transformers Committee

Meeting Minutes
October 18, 2001

IEEE/PES TRANSFORMERS COMMITTEE MEETING

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Orlando, Florida

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ATTENDANCE SUM MARY

MEMBERS PRESENT

Aho, David	Anderson, Glenn	Anderson, Greg	Antosz, Steve
Atout, Khaled	Ayers, Don	Balma, Peter	Barker, Ron
Bartley, Bill	Binder, Jr., Wally	Blackburn, Gene III	Boettger, Bill
Borst, John	Cambre, Jr., Max	Chu, Don	Chiu, Bill
Corkran, Jerry	Crouse, John	Degeneff, Bob	Diamantis, Tom
Dohnal, Dieter	Duckett, Don	Ellis, Keith	Fallon, Don
Foldi, Joe	Franchek, Mike	Galloway, Dudley	Gayton, Carlos
Ghafourian, Ali	Graham, Richard	Griesacker, Bill	Hager, Jr., Red
Hanique, Ernst	Harlow, Jim	Hartgrove, Bob	Hayes, Roger
Henning, Bill	Hopkinson, Phil	Iman, Mike	James, Rowland
Jonnatti, Tony	Kelly, Joe	Kennedy, Sheldon	Khalin, Vladimir
Lau, Mike	Lewis, Tim	Lindgren, Stan	Lundquist, Tom
Marlow, Dennis	Matthews, John	McClure, Phil	McNelly, Susan
Molden, Arthur	Moore, Harold	Morehart, Gene	Mulkey, Daniel
Murray, Chuck	Nicholas, Ray	Niemann, Carl	Patel, Bipin
Payne, Paulette	Pekarek, Tom	Perkins, Mark	Plaster, Leon
Platts, Don	Preininger, Gustav	Prevost, Tom	Progar, John
Puri, Jeewan	Raymond, Charlie	Riffon, Pierre	Robinson, Butch
Sankar, V.S.N	Sampat, Mahesh	Savio, Leo	Shenoy, Vic
Shertukde, Hemchandra	Sim, Jin	Sharma, Devki	Smith, Ed
Smith, Jim	Snyder, Steven	Stahara, Ron	Sullivan, John
Traub, Tom	Tuli, Subhash	Wagenaar, Loren	Ward, Barry
Watson, Joe	Weffer, Felipe	Wilks, Alan	Wimmer, Bill
Zhao, Peter			

MEMBERS ABSENT

Allan, Dennis	Allustiarti, Raymond	Altman, Mike	Arnold, Jr. Jim
Artega, Javier	Aubin, Jacques	Bancroft, Roy	Barnard, Dave
Barnes, Mike	Bennon, Sal	Bertolini, Edward	Bonnuchi, Joe
Brown, Charles	Carter, Bill	Cash, Don	Clark, Tom
Compton, Olin	Dahinden, Vincez	Dix, Larry	Dudley, Richard
Easley, John	Ebert, John	Elliott, Fred	Feghali, Pierre
Fleeman, Jeff	Foster, Sam	Frank, Jerry P.E.	Gillies, Jim
Girgis, Ramsis	Grunert, Bob	Grubb, Bob	Gryszkiewicz, Frank
Haggerty, Kent, P.E.	Hall, Geoff	Hansen, Wayne	Harley, Jack
Haas, Michael	Heinrichs, Frank	Hanus, Ken	Highton, Keith
Hoefler, Pete	Holdway, Tim	Huddleston, Jim	Johnson, Jr., Chuck
Johnson, David	Jhonsa, VJ	Juhlin, Lars-Erik	Kallaur, Gene
Kappler, Cal	Kennedy, Bill	Kim, Dong	Kline, Don
Koenig, E.	Lackey, John Lazar, John	Lewis, Frank	Light, Hal
Long, Leonard	Loveless, Mark	Lowdermilk, Larry	Lowe, Don
Lowe, Richard	MacMillan, Donald	Ma, Joe	Maguire, Willliam
Marek, Rick	Massouda, Tito	McGill, Jack	McMillen, Chuck

McQuin, Nigel
McShane, Patrick
McTaggart, Ross
Sam Mehta
Mitelman, Mike
Papp, Klaus
Pearce, Henry
Miller, Kent
Minkowitz, Russ
Musil, R.J.
Mutschler, Bill
Norton, Ed
Paiva, Gerry
Patterson, Jr., Wes
Patton, Jesse
Perco, Dan
Pierce, Lin
Poulin, Bertrand
Purohit, Dilip
Risse, Peter
Robbins, Chris
Romano, Ken
Rossetti, John
Ruevekamp, Henk
Scheu, Bob
Schweiger, Ewald
Shteyh, Ibrahim
Singh, Prit
Shull, Stephen
Smith, Jerry
Smith, Ray
Smith, Steve
Stewart, Peter
Stiegemeier, Craig
Stein, Werner
Stoner, Ron
Templeton, Jim
Thomas, Ray
Thompson, James
Trummer, Edgar
Vaillancourt, Georges
Veitch, Bob
Whearty, Bob
Woodcock, David
Zhao, Tony

GUESTS PRESENT

Agiurre, Samuel
Antweiller, Jim
Baronski, Derek
Beaster, Barry
Beckman, Stephen
Bello, Oscar
Betancourt, Enrique
Bosiger, John
Britton, Jeffrey
Bush, Carl
Cancino, Alvero
Coffeen, lary
Colopy, Craig
Cooper, Tommy
Corsi, Dom
Darovny, Bill
Darwin, Alan
Daubert, Ron
Davis, Eric
Digby, Scott
De La Houssaye,Kevin
Foster, Derek
Galbraith, Shawn
Ganser, Robert
Garcia, Eduardo
Gardner, James
Garnitschnig, Andreas
Garza, Joseph
Ghosh, Saurabh
Gruber, Myron
Henry, George
Horning, Mike
Humenick, Noelle
Jaroszewski, Marion
Jauch, Tom
Kennedy, Gael
Kiethly, Dave
Klaponski, Brian
Ladroga, Rick
Leuenberger, Boyd
Lu, Frank
Nielsen, Jim
Nols, Ernst
Nordman, Russ
Oommen, TV
Orti, Samuel
Peterson, Alan
Pillitteri, Paul
Raymond, Tim
Reitter, George
Sarkar, Subhas
Schappell, Steven
Smith, Henry
Sparling, Brian
Spitzer, Tommy
Steineman, Andy
Stensland, Len
Swinderman, Craig
Termine, Guiseppe
Toda, Katsutoshi
Traut, Al
Tuohy, John
Von Gemmingen, Rich
Wiefling, Ronald
Ziomek, Waldemar

Contents

CLAUSE PAGE

IEEE PES TRANSFORMERS COMMITTEE MEETING
Thursday, October 18, 2001
Chair: B. K. Patel Vice Chair: H. J. Sim
Secretary: K. S. Hanus

1.0 Chairs's report, remarks & announcements – B. K. Patel

The chair B. K. Patel called the meeting to order at 8:00 A.M. Mr. Patel opened the meeting by covering a few minor announcements. They include:

- John Davis died
- Jim Arnold has been raised to emeritus status
- Emphasize the need to keep e-mail addresses current with IEEE because of electronic balloting, use of IEEE alias (user still needs to be responsible to keep alias current), FYI-At this time registration database & invitation database & IEEE member databases DO NOT share info and so e-mail updates DO NOT migrate across these databases.
- Bill Kennedy being replaced as CIGRE liaison by Stan Lindgren
- Don Fallon new secretary

The current hosts, Jim Hadock & Joe Watson then gave a report on the attendance and other statistics on the meeting. The statistics were:

Registration – 289
Companions – 69
Sunday Evening – 252
Tuesday Luncheon – 149
Wednesday Evening Social – 222
Monday spouses tour #1 – 18
Monday spouses tour #2 – 28
Tuesday spouses tour #1 – 28
Tuesday spouses tour #1 –24

The Committee thanked Jim & Joe with a round of applause.

Bipin then covered the main points of his chair's report shown in full length below

1.1 Report on the Technical Council Meeting, July 15-19, 2001 in Vancouver, B.C.

Attendance for the Summer Meeting stood at approximately 1735 at the time of the Technical Council Meeting.

1.1.1 Chair's Report

The following is a highlight of the report:

Future Meetings

Atlanta, T&D 2001	October 28 – November 4, 2001
New York, WM02	January 27-31, 2002
Chicago, SM02	July 21 – 25, 2002

Future PES General Meeting Structure

As was reported in my report at last meeting, starting in 2003, two traditional PES Winter and Summer meetings will be combined in to one general meeting. It was announced that the first General Meeting will be July 13 – 18, 2003 in Toronto and the second one moving to what is planned as the more usual time of June 6 – 12, 2004 in Denver.

Technical Committee Meetings at General meetings

In efforts to draw more participants at PES General meetings, Technical Committees (TCs) are encouraged to hold their annual meeting concurrent to general meetings. Jim Harlow presented a summary of the concerns from several committees that voiced their opinions against this proposal:

1. Valued committee time will be compromised by external "attractions" drawing manpower from the Working Groups. In large part, these are the committees with the most involvement with standards. In spite of the often-heard complaint of being too slow in that capacity, these committees are very serious as to that purpose. The proposal must assure the committees that their members will not have conflicts during times allocated for committee meetings.

2. The Annual meeting will not be able to provide the requisite meeting space for committee work (and sleeping room requirements).

3. General meetings have tended to be held in high cost venues. Hotel and registration cost is a distinct factor in the planning for several committees, e.g., <$125 per room night and $60 or $80 registration being objectives of two committees. More nights times more per room night plus higher registration fee become a significant factor.

Other concerns have been expressed which may be unique to one or two individual committees. These are not included in this report but will need to be recognized in detailed planning stages.

Alternative schedule formats for general meetings have been proposed to facilitate needs of TCs to make this joint meeting proposal workable. These proposals include combinations of morning and afternoon meetings to separate general meetings sessions from TC group meetings. In these proposals the general meeting runs from Monday through Friday and also involves Sunday and/or Saturday of the week. The hope is that out of these proposals there may emerge a new

format that could be workable for some TCs. For more details refer to the minutes of 2001 Summer Meeting held in Vancouver, Canada.

Hans Puttgen made the following comments on this subject of joint meetings:

Resulting from discussions from high-level executives of industrial organizations and utilities a need to ensure and facilitate inter-disciplinary meetings and discussions has been identified. This has led to the change in meeting format with one general meeting per year with the hope that all technical committees would attend. The vote for this by the PES governing board was unanimous. There is no mandated requirement for all of the technical committees to hold their meetings in conjunction with the general meeting only the desire to make the opportunity sufficiently attractive that all will do so. It is also understood that some of the committees that will meet at the general meeting will need to have a second set of meetings each year. The other objective is to provide a schedule that will allow for attendance at both technical committee work and technical sessions. By holding the meeting in June, giving greater flexibility in choosing cities, and with economies of scale the registration costs can be held steady and perhaps reduced, even with a 5-day format. The change will not be a step function but a gradual one with a number of trials to see what works.

The commitment was made that the proposed schedule for meetings will be reviewed to provide a structure that will be more flexible. A definition of how it will be possible to provide for separation between the needs of technical committee work and the central activities. Details of the logistical support for the Toronto meeting in terms of separate meeting rooms and availability of facilities directly before, during and after the main meeting will be provided. These proposals will be fed to the Technical Activities Department through Jim Harlow.

New Committees

As noted in my last report two new committees were instituted and scopes approved in Columbus: "Emerging Technologies" and "Policy Development" Coordinating Committees. The new structure of "Coordinating" was defined because the committees are not of the form or purpose of the Technical Committees or the Standing Committees. Both committees did meet in Vancouver.

CIGRE/PES Policy for Cooperation

An agreement is being finalized which will establish the means and motivation to accomplish a cooperative effort to pursue CIGRE's and PES' mutual objectives. The agreement is expected to be finalized at the Governing Board meeting this week. The plan is to authorize Study Area Liaisons between the organizations. The structure would consist of three tiers: Executive (the Presidents), the Steering Committee (3 reps from each organization) and the Study Area Liaisons (to perform the liaison function for a selected topic of mutual interest).

Power Quality Issues

Within IEEE, Power Quality related topics are treated by four Societies plus a Standards Coordinating Committee. Many of the non-PES committees meet at PES meetings so PES has proposed to be designated the "host" society for PQ topics. The emerging thought is that this would justify a new Technical Committee to conduct the current business plus coordinate other functions such as technical sessions. There will be considerable discussion in Vancouver.

Conference Manual: The PES will be preparing a "Conference Manual". The present manual for TPC and TCPC will be a portion of it, but much more is required. This will consider all topics relevant to a good PES Conference. Chair Jim Harlow would like to hear from anyone who will volunteer to assist in the Technical Activities aspects of this manual.

IEEE-SA Board of Governors

Tom Prevost is TC's nominee to represent the Profile 3 interests on the Board. Tom is now Vice Chair of PES Standards Coordinating Committee and will become the chair starting January 2003.

IEEE Assessments

The IEEE assesses the Societies for its budget. PES was assessed $1.2 million in 2001 and is projected to be assessed $1.8 million in 2002. PES feels this is exorbitant and is taking a leadership role in challenging the assessment process.

Transactions Papers

Many committees are feeling the pressure of many paper reviews. This is happening because the backlog jam has been broken and many old papers are surfacing. There is indication that the problem is nearing resolution.

Internet Conferencing Service

A demonstration was given of this service available from IEEE and Leonore Johnson, while in Piscataway, showed the ability to interactively revise a standard on line.

IEEE members can create live interactive meetings with anyone at anytime through the use of Internet Conferencing. The only things required are a web browser and a telephone. IEEE offers this service in partnership with PlaceWare, Inc., to all IEEE entities. Internet Conferencing provides the capability to share information over the Internet incorporating PowerPoint presentations, live software demonstrations, web tours and polling while attendees listen in to the audio portion of the meeting via telephone. More information is available at the following web site: http://www.ieee.org/web/webconf.

1.2 Transformers Committee Report to Technical Council

The following is an abbreviated version of my report to Technical Council for the Committee:

Committee Meeting Activities

Our Spring 2001 meeting was held April 8-12, 2001 in Amsterdam, Netherlands. Mr. Ernst Hanique of Smit Transformers Limited was our host. Despite the distant location of the meeting, a moderate total of 187 members and guests attended the meeting. There were 72 companions in attendance at the meeting.
Generally, the Committee meets twice a year - in the fall and spring (usually during the last two weeks of March or first two weeks of April; and the last two weeks of October or first two weeks of November). Typically, our meetings are 3-1/2 days in duration and begin on Sunday evening with a welcome reception and adjourn at noon on Thursday afternoon.
Membership of the Transformers Committee currently stands at 180 members and 21 emeritus members. The regular members consist of 88 producers, 50 users, and 42 general interest. We also have one life member and one corresponding member. Our invitation list consists of approximately 500 engineers and managers in the transformer and utility industry. Attendance at our semi-annual meetings is typically near 350. Anyone with an interest in furthering the technology is welcome at our meetings. With active participation, an invitation is extended to become a member.

The Committee goals are to encourage open participation in transnationalization of transformer standards; to promote technical and educational endeavors such as panel sessions, technical presentations, peer review of technical literature on related subjects; and to support the efforts of the Power Engineering Society.

Future Meetings

Fall 2001:

October 14-18, 2001, Orlando, FL, USA. Contact Joe Watson (Co-host) @ Florida Power & Light + (561) 691-2206, fax (561) 694-4161 or James Hudock (Co-host) @ Ohio Transformer (407) 854-8130, fax + (941) 722-2549 or one of the Committee Officers.

Spring 2002:

April 14-18, 2002, Vancouver, BC, Canada. Contact Mike Lau, Host @ BC Hydro + (604) 528-3201, fax + (604) 528-3347 or one of the Committee Officers.

Fall 2002:

October 20-24, 2002, or November 3-7, 2002, Oklahoma City, OK, USA. Contact Joe Garza, Host @ Southwest Electric Company + (713) 849-9171, fax (713) 849-3958 or one of the Committee Officers.

2001 Summer Power Meeting Technical Sessions

The Transformers Committee is sponsoring two presentation sessions on transformers during the Summer Power Meeting.
Transformer Standards and Coordination Activities

The Transformers Committee takes responsibility for development and revision of IEEE

Standards that fall within its scope. These Subcommittees currently have over fifty Working Groups and Task Forces preparing proposals for standards projects. Information on these standards and projects can be obtained by visiting our WWW homepage:
http://www.Transformerscommittee.org

Links to information on our future meeting sites and other information on Transformer Standards can also be found there.

Our WWW site will link you to the IEEE Standards Status Report that contains titles, abstracts, and names of contacts for each of the IEEE standards. This report is updated quarterly by the IEEE Standards Department. The status of transformer standards that are not listed in the IEEE quarterly report (either because they have been withdrawn, or they are not IEEE standards) are also included on the Transformers Committee Web site.

Transformers Committee officers and Administrative Subcommittee members are also members of the USNC Technical Advisory Group to TC-14 (Transformers and Reactors). We continue to have productive meetings of the TAG at each Committee meeting.

Bipin K. Patel, Chair

2.0 Approval of minutes of April 12, 2001 - B.K. Patel

The minutes of the Amsterdam meeting were approved as written.

3.0 Administrative Subcommittee – Bipin K. Patel

Chairman Patel covered the key points of the Administrative Subcommittee Meeting held on October 14, 2001. See the Administrative Subcommittee Meeting Minutes in full length below for details.

3.1 Introduction of members and guests

Chair Patel called the meeting to order at 2:09 p.m., Sunday, October 14, 2001, in Salons 7/8 of the Rosen Centre Hotel in Orlando, Florida.

The following members of the Subcommittee were present:

K. S. Hanus	B. K. Patel
C. Niemann	D. Platts
R. Hager, Jr.	G. Anderson
D. J. Fallon	T. A. Prevost
W. Patterson	J. Puri
H. J. Sim	J. W. Matthews
E. Smith	J. Smith
L. B. Wagenaar	

The following guests were present:

Naeem Ahmad	Noelle Humenick
Peter Balma	Kieth Ellis
Joe Garza	Jim Harlow
Mike Lau	Jim Hudock
Joe Watson	

3.2 Approval of the Amsterdam AdCom meeting minutes

The minutes of the previous Administrative Subcommittee meeting in Amsterdam were approved as written.

3.3 Additions to and/or approval of the agenda

The previously communicated agenda was generally followed with no additions.

3.4 Meeting arrangements, host reports, and committee finances – G.W. Anderson

Greg presented his report, which will be included in the Committee meeting minutes.

3.5 IEEE General Meetings – J.H. Harlow

Jim Harlow spoke as a representative of PES management in emphasizing PES's desire and request that Technical Committee meetings be held in conjunction with General Meetings (Winter or Summer Power Meetings, T&D Conference). This request is part of an effort to promote greater interaction and exchange of ideas between Committees. Jim also noted that John Estey, the new head of PES, has indicated his first priority is to reverse the trend of diminishing support of employers for volunteer technical work.

3.6 IEEE delegation report ANSI C57 Committee – J.W. Matthews

3.6.1 Ballots

The Delegation has responded to five ballots since the meeting in Amsterdam, The Netherlands.

Affirmative ballots were returned for the following:

- PC57.119/D14.0 Recirculation: "Recommended Practice for Performing Temperature Rise Tests on Oil Immersed Power Transformers at Loads Beyond Nameplate Ratings"
- PC57.133/D4 Rev.: "Guide for Short-Circuit Testing of Distribution and Power Transformers"
- C57.12. 31- 1996 Reaffirmation, " Pole-Mounted Equipment -- Enclosure Integrity"
- PC57.106/D6.1 Revision: "Guide for Acceptance and Maintenance of Insulating Oil in Equipment"

An affirmative ballot was also returned for the following document, but the ballot was subsequently cancelled by IEEE due to technical difficulties:

- C57.21 Reaffirmation: "IEEE Standard Requirements, Terminology, and Test Code for Shunt Reactors Rated Over 500 kVA"

The following previous ballots were revised from abstention to affirmative:

- C57.12.32/D4 "Enclosure Integrity for Submersible Equipment"

- C57.12.57 "Ventilated Dry-Type Network Transformers 2500 kVA and Below, Three-Phase, with High Voltage 34 500 Volts and below, Low Voltage 216Y/125 and 480Y/277 Volts - Requirements"

These two ballots had been voted as abstention due to the procedural issue of lack of indemnification for IEEE working group members while developing a NEMA copyrighted document. See next item for explanation of new copyright agreement.

3.6.2 IEEE/NEMA Copyright Agreement for C57 Documents

The following announcement was received from Terry deCourcelle, Director, International Standards Programs, on May 29, 2001:

IEEE and NEMA have reached an agreement regarding the NEMA-copyrighted C57 standards.

The agreement notes that:

1) IEEE and NEMA will have joint ownership of the standards listed below.

2) IEEE, "shall have sole responsibility for the maintenance and future reaffirmations or revisions to the jointly owned C57 standards." This means the Transformers Committee can issue PARS for the revision of these standards as needed.

3) The documents will continue to also be balloted by the C57 committee and submitted to ANSI for recognition.

4) The jointly-owned C57 standards shall be designated ANSI/IEEE/NEMA C57.x.x

A big thanks to all who worked so hard to make this happen.

The standards that fall under the agreement are:

ANSI C57.12.10 -- Requirements for Transformers 230 kV and Below; 833/958 through 8333/10417 kVA Single Phase, and 750/862 through 60000/80000/100000 kVA Three Phase

ANSI C57.12.20 -- Transformers--Standard for Overhead Type Distribution Transformers, 500 kVA and Smaller; High Voltage, 34500 Volts and Below; Low Voltage, 7970/13800Y Volts and Below

ANSI C57.12.21 -- Requirements for Pad-Mounted Compartmental-Type Self Cooled Single-Phase Distribution Transformers with High-Voltage Bushings

ANSI C57.12.22 -- For Transformers--Pad-Mounted, Compartmental-Type, Self-Cooled Three-Phase Distribution Transformers with High-Voltage Bushings, 2500 kVA and Smaller; High Voltage, 34 500 Grd Y/19 920 V and Below; Low Voltage, 480 V and Below

ANSI C57.12.24 -- Requirements for Underground Type Three Phase Distribution Transformers, 2500 kVA and Smaller, High Voltage 34500 Grd Y/19920 Volts and Below; Low Voltage 480 Volts and Below

ANSI C57.12.25 -- Requirements for Pad-Mounted, Compartmental Type, Self-Cooled, Single Phase Distribution Transformers with Separable Insulated High Voltage Connectors, High Voltage, 34500 Grd Y/19920 Volts and Below; Low Voltage, 240/120; 167 kVA and Smaller

ANSI C57.12.26 -- Requirements for Pad-Mounted, Compartmental-Type, Self-Cooled, Three-Phase Distribution Transformers for use with Separable Insulated H-V Connectors, H-V, 34 500 Grd Y/19 920 V and Below; 2500 kVA and Smaller

ANSI C57.12.28 -- Pad-Mounted Equipment--Enclosure Integrity

ANSI C57.12.29 -- Pad-Mounted Equipment Enclosure Integrity for Coastal Environments

ANSI C57.12.31 -- Pole-Mounted Equipment-Enclosure Integrity

ANSI C57.12.32 -- Submersible Equipment--Enclosure Integrity

ANSI C57.12.40 -- Subway and Vault Types (Liquid Immersed)--Requirements

ANSI C57.12.50 -- Distribution Transformers 1 to 500 kVA, Single Phase; and 15 to 500 kVA, Three-Phase with High Voltage 601 34500 Volts, Low Voltage 120 600 Volt, Ventilated Dry Type

ANSI C57.12.51 -- Requirements for Sealed Dry Type Power Transformers 501 kVA and Larger, Three Phase with High Voltage 601 to 34500 Volts, Low Voltage 208Y/120 to 4160 Volts

ANSI C57.12.52 -- Requirements for Sealed Dry Type Power Transformers, 501 kVA and Larger, Three Phase and High Voltage 601 to 34500 Volts, Low Voltage 208Y/120 to 4160 Volts

ANSI C57.12.55 -- Dry Type Transformers in Unit Installations, Including Unit Substations--Conformance Standard

ANSI C57.12.57 -- Ventilated Dry-Type Network Transformers 2500 kVA

3.6.3 Present Roster

The present roster of the IEEE Delegation to ANSI ASC C57 is as follows:

- Matthews, J. W., Baltimore, MD - Chair, IEEE Delegation
- Borst, J. D., Jefferson City, MO
- Hanus, K. S. (alternate), Fort Worth, TX
- Patel, B. K., Birmingham, AL
- Prevost, T. A., St. Johnsbury, VT
- Sim, H. J., Goldsboro, NC

- Smith, H. D., Bluefield, VA

3.6.4 Future Roster

The roster of the IEEE Delegation to ANSI ASC C57 **effective January 1, 2002** will be as follows:

- Patel, B. K., Birmingham, AL - Chair, IEEE Delegation
- Borst, J. D., Jefferson City, MO
- Fallon, D. J., Newark, NJ
- Hanus, K. S. (alternate), Fort Worth, TX
- Prevost, T. A., St. Johnsbury, VT
- Sim, H. J., Goldsboro, NC
- Smith, H. D., Bluefield, VA

John W. Matthews, Chair

IEEE Delegation to ANSI ASC C57 Committee

3.7 Committee service awards – J. W. Matthews

John's full report will be shown in the Committee meeting minutes.

3.8 Chair's report – B. K. Patel

Bipin presented his report, which will be included in the Committee meeting minutes.

3.9 Vice Chair's report – H. J. Sim

Jin's full report will be included in the Committee meeting minutes.

3.10 Secretary's report – K.S. Hanus

3.10.1 Membership Review

Voting Members - Eight new members were added at the last meeting in Amsterdam, The Netherlands as noted in the Amsterdam meeting minutes. Also since the Amsterdam meeting Vis Thenappan indicated he no longer wishes to remain a member of the committee, therefore his name has been dropped from the membership.

Following these changes and prior to the addition of new members at this meeting, membership stands at:

Members -			186
Classifications:	Producers -		91
	Users -		51
	General	–	44
Life Members			1
Corresponding Members -			1
Emeritus Members -			20

The invitation list has approximately 442 names on it at this time.

3.10.2 New Member Applications

There were no applications submitted. Jim Arnold requested emeritus status and it was approved.

3.10.3 PES Directory Rosters

The roster is in the process of being updated and will be transmitted to IEEE staff by November 5, 2001.

3.10.4 Meeting Minutes

Minutes of the Amsterdam meeting were reproduced at a cost of $2,137.27 and postage costs were $ 1,449.00 for 348 mailings, which averages $10.31 per mailing. Note that the net cost of the minutes varies for each meeting and the $10 portion of the registration fee is a valid nominal fee.

I request Subcommittee Chairs to submit their minutes by December 31, 2001 for this meeting. The submittal should be an electronic file via e-mail, formatted in Word 97 (or earlier versions) and it would be appreciated if the minutes are put in the format (numbering, etc.) as shown in the minutes. Please indicate total attendance count for each subcommittee, working group, and task force meeting in your minutes. Please do not send me a copy of attendance listing for this attendance count. If someone is preparing minutes for you please let them know these details about submitting the minutes for publication.

3.11 IEEE Standards Activities – Naeem Ahmad

3.11.1 ITEMS OF INTEREST

- **Electronic Balloting is recommended choice now**. All members of the balloting group must have access to web and e-mail address. **Please do not send me draft as attached file**. Contact me when your draft is ready and I will provide you instruction and location to ftp the draft. We are upgrading the balloting process and shortly you will receive more information.

Useful training modules in Microsoft PowerPoint can be obtained at ftp://stdsbbs.ieee.org/training/. See http://standards.ieee.org/faqs/ltpres.html for more information. Working Group chairmen and members will find one or more modules of interest.

- A web page Standards-Process-at-a -Glance is available to help WG>>Chairs/Sponsor Chairs on each step of the standard process and a simple page of links to help them along the process. Go http://standards.ieee.org/ and select Standards-Process-at-a -Glance under Standards Development.

- The *Standards Board Operations Manual* and *Standards Companion Manual* can be obtained at http://standards.ieee.org/resources/index.html#guides. Working Group chairmen will find helpful information on development of standards, balloting and submission to the Standards Board in both publications.

- The PAR form and instructions are available, at http://standards.ieee.org/guides/par/index.html. You can submit html/ text file. A PAR has a four-year life. Extensions are requested by submitting a "Target Extensions Request Form" at http://standards.ieee.org/guides/par/extension.html.

- Style Templates for IEEE Standards and **recently revised copyright statement** can be obtained at **http://standards.ieee.org/resources/spasystem/index.html**

- Standards Home Page **http://standards.ieee.org/db/balloting/** can provide you; Balloting Status Reports and Sign-up to join Balloting Pool.

- Draft standards are submitted to the Standards Review Committee (RevCom) of the Standards Board. For RevCom conventions see http://standards.ieee.org/board/rev/revconventions.html For the Guide for Submittal of Proposed Standards see http://standards.ieee.org/guides/revguide.html Form for Submittal of proposed Standards, http://standards.ieee.org/board/rev/submitform.doc or http://standards.ieee.org/board/rev/submitform.pdf depending on your choice of a doc or pdf.

- For project Authorization Request (PAR) and questions contact **Jodi Haasz** (732-562-6367/j.haasz@ieee.org).

- For Editorial review of the draft and questions contact **Yvette Ho Sang** at 732-562-3814/ y.hosang@ieee.org). It is best to do editorial review in early stage of standard development.

- For Balloting questions contact **Carol Buonfiglio** at 732-562-3834/c.buonfiglio@ieee.org).

- For Review Committee Submittal contact **David Ringle** (732-562-3806/d.ringle@ieee.org).

3.11.2 Paper Balloting of Standards

The IEEE Standards Department can assist you in conducting your sponsor level ballot. Following checklist will assist you in providing us with the complete package of materials. Please mail this package to your Standards Staff Liaison. **Please do not send me draft as attached file.**

- **Two copies of the draft on 8-1/2 x 11" paper.**

  (Copies of the draft are not required for reaffirmation ballot.)
  - Each page must be numbered in the proper order.
  - Each page must have project # and draft #. (Example: C57.12.00/D5)
  - Each page must have current date.
  - Complete IEEE copyright statement with current year on the first page is a must.
  - Short IEEE copyright statement with current year in a "footer" on each page is a must.
  - Title must be same as on approved PAR and must have the word "Draft" (Draft: Title)
  - Complete figures, tables and annexes at proper place.
  - Only metric units are allowed in the normative portion of the standard. Inch-pound data may be included in footnotes/annexes. Submit necessary exception request to Bruce Barrow of SCC14 (301-493-4374; b.barrow@erols.com).

- **A balloting letter addressed to the balloters explaining the purpose of the ballot.** *(Refer to Annex A of the IEEE Standards Companion for sample correspondence. This document is also available on the Standards home page* http://standards.ieee.org*. Go to policies and procedures under* Standards Development.*)*
  - The person who will receive the ballot summary upon completion of the ballot will write this letter. This is usually the Working Group Chair.
  - This letter will include address, telephone and fax numbers, and e-mail address.

Upon receipt of the above, The Balloting center will:

1. Conduct an invitation-to-ballot to form your balloting group.
2. Prepare a ballot form, which will be read by optical mark reader.
3. Duplicate your draft, send to the balloters /coordination contacts listed on the PAR.
4. Enter names and Interest Categories into database for all balloters.
5. Mail out the ballot form, cover letter and draft, and record responses.
6. Approximately 10 days before the ballot closing, will provide you with contact information for those persons who have not returned their ballots.

7. Provide you ballot summary and comments received, after the ballot has closed.

8. Conduct a recirculation ballot when necessary.

3.11.3 How to ftp/upload drafts to IEEE for Electronic balloting

A directory called "drafts" has been created in the ftp/uploads area. You can use this area for uploading files of the drafts. The instructions are below.

1. Please check your draft for the following:

- Each page must be numbered in the proper order.
- Each page must have project # and draft #. (Example: C57.12.00/D5)
- Each page must have current date.
- Complete IEEE copyright statement with current year on the first page is a must.
- Short IEEE copyright statement with current year in a "footer" on each page is a must.
- Title must be same as on approved PAR and must have the word "Draft" (Draft: Title)
- Complete figures, tables and annexes at proper place.
- Only metric units are allowed in the normative portion of the standard. Inch-pound data may be included in footnotes/annexes. Submit necessary exception request to Bruce Barrow of SCC14 (301-493-4374;b.barrow@erols.com).

2. Convert your draft file to PDF.

3. Send files via anonymous ftp to stdsbbs.ieee.org/uploads/drafts

*Note 1: Please **do NOT** put spaces or special characters, such as;*

(@#$%^&()/?,etc.) in the filenames.*

Note 2: If you have many files or directories/subdirectories to upload,

please zip them into one file (following the naming convention

of Note 1).

Note 3: The uploads/drafts directory is not readable, so you will not

Be able to see the contents.

4. Send an email to spa-admin@ieee.org and a copy to your staff liaison

(n.ahmad@ieee.org) specifying the names of the files(no draft as attached file).

Note 1: Uploaded and where they belong, i.e., for balloting use.

Note 2: When spa-admin gets the email he will transfer the files to a

directory on the home server. He will specify the directory name at transfer time.

General Information

1. If you are not familiar with ftp, software is available at

   http://cws.internet.com/ftp-price.html

   Netscape version 4.0 and greater also has ftp capability.

2. Most ftp software requires the following information:

   Host: stdsbbs.ieee.org

   Username: anonymous

   Password: <put your email address here>

   Directory: /uploads/drafts

3. If using Netscape browser, the URL is

   ftp://stdsbbs.ieee.org/uploads/drafts/

   Then click on "File", "Upload file" from the menu items

Naeem Ahmad, P. E.

Staff Engineer, Technical programs

IEEE Standards Activities, 445 Hoes Lane, P. O. Box 1331,Piscataway NJ 08855-1331, USA

PH: +1 732-562-3931 ;FX: +1 732-562-1571;e-mail: n.ahmad@ieee.org

October 12, 2001

3.12 Standards subcommittee - T. A. Prevost

3.12.1 Standards and coordination activities

Tom Prevost reviewed his report, which will be included in the Committee meeting minutes.

3.12.2 Documents submitted to the Standards Board

See the status reports starting on page 110.

3.13 Subcommittee Activities - Subcommittee Chairs

3.13.1 Audible Sound and Vibration - Jeewan Puri

Jeewan noted the loss of European experience at the meeting due to many cancellations and expressed concern this may extend to future meetings.

3.13.2 Bushings - F. E. Elliott

No Report.

3.13.3 Dielectric Tests - L. B. Wagenaar

No report.

3.13.4 Distribution Transformers – E. Smith

No Report.

3.13.5 Dry-Type Transformers - W. Patterson

No report.

3.13.6 HVDC Converter Transformers & Reactors - Richard Dudley

No Report.

3.13.7 Instrument Transformers - J. E. Smith

No report.

3.13.8 Insulating Fluids - F. J. Gryszkiewicz

No report.

3.13.9 Insulation Life – D. W. Platts

No Report.

3.13.10 Performance Characteristics - D. J. Fallon

Don Fallon received a copy of a letter from Mel Smith of the Switchgear Committee. Mr. Smith is WG Chair for update of C37.06 on Ratings and Required Capabilities for AC High-Voltage Circuit Breakers, and is looking to include some discussion on the influence of transformer design factors on the required breaker TRV capability for low side transformer faults. The

letter will be forwarded to appropriate members of the Administrative Subcommittee for review.

3.13.11 Power Transformers - E.G. Hager

I have received a phone call from Rulon Fronk a few weeks ago wanting to know where he could get a large empty transformer tank for testing 230 & 500 kV bushings on a shake table. Rulon is chairman of the IEEE 693 WG, which is being revised. IEEE 693 covers substation design including foundations, structures & equipment, for seismic withstand. He has a limited budget and is looking for a contribution. A single phase tank would be desirable due to size limitations. The shake table is located at the University in San Diego.

3.13.12 Underground Transformers and Network Protectors – C. Niemann

No Report

3.13.13 Meetings & Planning - Greg Anderson

Greg presented his report, which will be included in the Committee meeting minutes.

3.14 Old Business

3.15 New Business

Jin Sim noted that recently there have been occasions where Frequency Response Analysis (FRA) testing has been required in user specifications, both at the factory and upon arrival at the rail siding. In some cases this testing is required in the context of an acceptance test. The concern expresses is that acceptance criteria do not appear to be clearly defined. Jin asked for discussion, particularly in PCS and in the Dielectric Test and Power Transformer SC's, on whether there is sufficient support, based on available knowledge, to form a WG to develop standard or guide material related to FRA testing and possible acceptance criteria. This topic will be covered in the New Business section of the PCS meeting

3.16 Adjournment

Bipin adjourned the meeting at 5:05 p.m.

Respectfully submitted,

K. S. Hanus, Secretary

AdSub Attachment 3.4

IEEE/PES Transformers Committee Meeting Locations

Year	Spring	Fall	Committee Chair
2002	Vancouver, BC, Canada	Oklahoma City, OK	Sim
2001	Amsterdam, The Netherlands	Orlando, FL	Patel
2000	Nashville, TN	Niagara Falls, ON, Canada	Patel
1999	New Orleans, LA	Monterey, Mexico	Matthews
1998	Little Rock, AR	Guanajuato, Mexico	Matthews
1997	Graz, Austria (summer)	St. Louis, MO	Binder
1996	San Francisco, CA	Burlington, VT	Binder
1995	Kansas City, MO	Boston, MA	Harlow
1994	Dallas, TX	Milwaukee, WI	Harlow
1993	Portland, OR	St. Petersburg, FL	Borst
1992	Birmingham, AL	Cleveland, OH	Borst
1991	Phoenix, AZ	Baltimore, MD	Veitch
1990	Denver, CO	Montreal, PQ, Canada	Veitch
1989	Chicago, IL	Charlotte, NC	Veitch
1988	Washington, DC	Long Beach, CA	Compton
1987	Ft. Lauderdale, FL	New Orleans, LA	Compton
1986	Little Rock, AR	Pittsburgh, PA	Yannucci
1985	St. Louis, MO	Toronto, ON, Canada	Yannucci
1984	Vancouver, BC, Canada	Boston, MA	Savio
1983	Atlanta, GA	Detroit, MI	Savio
1982	Los Angeles, CA	Philadelphia, PA	McNutt
1981	Portland, OR	Phoenix, AZ	McNutt
1980	Williamsburg, VA	Milwaukee, WI	Bonucchi
1979	San Diego, CA	Houston, TX	Bonucchi
1978	Miami, FL	Chattanooga, TN	Bennon
1977	Charlotte, NC	Montreal, PQ, Canada	Bennon
1976	New Orleans, LA	San Francisco, CA	Honey
1975	Lakeland, FL	Denver, CO	Honey
1974	Pittsburgh, PA	Scottsdale, AZ	Alexander

4.0 Editor's Report – M. Christini

Since January of this year, a total of 51 Transactions on Power Delivery papers have been submitted for review to the IEEE Transformers Committee. At this time, 27 reviews have been completed and 24 reviews are in-progress. For the completed reviews, the recommendations were: Accept without changes (2), Accept with mandatory changes (18) and Reject (7). The backlog of papers at IEEE from 1999 and 2000 has been completely caught up.

The transition to Online Review of papers has been completed. This will greatly speed up the review process for all future papers. Also, previous reviewers have been setup with an online account at: http://tpwrd-ieee.manuscriptcentral.com/. A tutorial describing the online review system is being planned for the Vancouver meeting in April.

Mark Christini

10/1/ 2001

Accept without changes

2000TR464	On-Line Detection and Location of Low-Level Arcing in Dry-Type Transformers	Sidhu
2000TR573	Determining Ideal Impulse Generator Settings from a Generator-Transformer Circuit Model	Del Vecchio

Accept with mandatory changes

TR12 004 1999	Instability of the Machine-Transposed Cable under Axial Short Circuit Forces in Large Power Transformers	Patel
TR12 015 1999	Transformer Phase Coordinate Models Extended for Grounding System Analysis	Svenda
TR12 029 1999	A Power Electronic Based Distribution Transformer	Ronan
TR12 040 1999	Impedances for the Calculation of Electromagnetic Transients within Transformers	Mombello
2000TR093	Accurate Modeling of Core-type Distribution Transformers for Electromagnetic Transient Studies	Noda
2000TR166	Recognition of Impulse Fault Patterns in Transformers Using Kohonen's Self-Organizing Feature Map	De
2000TR222	Harmonic Study of Le Blanc Transformer for Taiwan Railway Electrification System	Huang

2000TR290	Modified Disruptive Effect Method as a Measure of Insulation Strength for Non-Standard Light	Savadamuthu
2000TR312	Unit Commitment of Main Transformers for Electrified Mass Rapid Transit Systems	Chen
2000TR428	How to Avoid Unstable Time Domain Responses Caused by Transformer Models	Henriksen
2000TR434	Using Kohonen Self Organizing Map (KSOM) to Monitor the Transformer Condition by Oil Test	Lim
2000TR467	A Novel Autotransformer Design Improving Power System Operation	Andrei
2000TR527	Dynamic Modelling of Transformer Core from Experimental Hysteresis Data	Akcay
2000TR537	Thermal Overload Tests on a 400 MVA Power Transformer with a Special 2.5 pu Short Time Loading Capacity	Nordman
2000TR595	Distribution Transformer Load Modeling Using Load Research Data	Chang
2000TR610	Transformer Diagnosis and Monitoring	Bolhuis
2001TR012	Calculation of Core Hot-Spot Temperature in Power and Distribution Transformers	ABB – teNyenhuis
2001TR077	Geomagnetically Induced Current Effects On Transformers	The National Grid Company – Price

Reject

TR12 053 1999	Experimental Investigation into the Propagation Characteristics of Partial Discharge Pulses in Power Transformers	Wang
2000TR217	A Simple Method for Calculating Winding Temperature Gradient in Power Transformers	Ryder
2000TR261	Applicability of the Traditional Unbalance Estimating Formula on the Utility System from Differently Connected Transformers	Chen
2000TR282	High Frequency Theory of Power Transformers	Luff
2000TR491	The Comparison of Unbalance Reduction Due to Differently Connected Transformers Used in Railway	Chen
2000TR697	Calculation of Transient Voltage Distribution in Transformers Using Bergeron's Method	Xuechang
2000TR807	Transfer Function Method to Diagnose Axial Displacement and	Rahimpour

	Radial Deformation of Transformer Windings	

In Progress

2000TR609	Measurement of Lambda-I Characteristics of Asymmetric Three-Phase Transformers and Their Applications	Fuchs
2001TR012RA1	Calculation of Core Hot-Spot Temperature in Power and Distribution Transformers	ABB – teNyenhuis
2001TR027	Sensitivity of Transformer's Hottest-Spot and Equivalent Aging To Selected Parameters	Kansas State University – Anil
2001TR033	Leakage Inductance of A Distribution Transformer With Two Symmetrical Windings	Public Power Corporation of Greece – Raissios
2001TR066	Structure of Transfer Function of Transformers With Special Reference To Interleaved Windings	Indian Institute of Science - Satish
2001TR178	Estimating Overpressures in Pole-Type Distribution Transformers Part I: Tank Withstand Evaluation	Hydro-Quebec – Hamel
2001TR182	Estimating Overpressures in Pole-Type Distribution Transformers Part II: Prediction	Hydro-Quebec/ IREQ – Dastous
2001TR198	No-Load Losses in Transformers Revisited: Tests and A New Model	Hydro-Quebec/ IREQ Andre
2001TR217	Three-Phase To Four-Phase Transformer For Four-Phase Power Transmission Systems	Hunan University - Liu Guangye
2001TR244	Condition Assessment of Power Transformer On-Load Tap-Changers Using Wavelet Analysis	Queensland University - Birtwhistle
2001TR253	Design of A High Power Brushless Linear Variable Transformer	University of Tehran – Faiz
2001TR267	Modeling Transformers With Internal Incipient Faults	Texas A&M University – Butler
2001TR274	A Harmonic Model For the Non-linearities of Single-Phase Transformer With Describing Functions	Feng Chia University - Huang
2001TR282	Experience With Return Voltage Measurements For Assessing Insulation Conditions	University of Queensland – Saha
2001TR382	A Reliable and Transparent Expert System For Impulse Fault Diagnosis in Transformers	Jadavpur Univ. India – Chakravorti
2001TR394	Reducing Losses in Distribution Transformers	Virginia Tech. – Olivares

2001TR411	Thermal Aging Prediction of Transformer Oil and PVC of High Voltage Cables Using Neural Networks	West Virginia Univ. – Feliachi
2001TR419	A Newly Modified Forced Oil Cooling System and Its Impact On In-Service Transformer Oil Characteristics	Minia University, Egypt – Wahab
2001TR430	Thermal Behavior of A Toroidal Transformer Through A Mixed Model	Sharif University of Tech, Iran – Oraee
2001TR443	Measurement and Modeling of Hysteresis Loops of Steel Running Rails Used in Railway Power Systems	National Yun-Lin Univ. of Science & Tech, Taiwan – Wang
2001TR452	Study of Abnormal Electrical Phenomena Effects On GSU Transformers (Part 1 of 2: Effects of Switching Transients)	Virginia Tech. – Yilu Liu
2001TR453	Study of Abnormal Electrical Phenomena Effects On GSU Transformers (Part 2 of 2: Effects of SFC Operation & Lightning)	Virginia Tech. – Yilu Liu
2001TR454	New Solid-State On-Load Tap-Changers Topology For Transformers	University of Tehran – Faiz
2001TR466	Real-Time Dynamic Loading and thermal Diagnostic of Power Transformers	Doble Engineering – Lachman

5.0 Vice Chair's Report – H. J. Sim

The vice chair covered the main points of his report shown in full length below.

5.1 PES Technical Council Committees

The following are reports on activities of PES Committees on which the Vice Chair serves as Committee representative. All of the meetings reported were held at the 2001 Summer Meeting in Vancouver, BC, Canada on July 15 – July 19, 2001.

5.1.1 Technical Sessions

Here are the high points of the discussions held and the report presented at the meeting:

a. Power Engineering Review will continue to publish Technical Committee promotional articles. The emphasis should be on present and future activities. The length of the article is at the discretion of the author. It may include: technical information, announcement of new working groups and task forces, membership information, and recruitment's for new members. Each committee will submit their material by their due date as scheduled. The PER coverage of the Substations Committee annual meeting and awards received several accolades and was to be brought to the attention of other technical committees to use in preparation of their submittals.

b. A rumor that Power Engineering Letters were being dropped from the PE Review was discussed. This rumor was based on a proposal to merge the PE Review and the CAP magazines, with time sensitive material being moved to the PES Website. The resulting magazine would contain advertising that, according to IEEE policy, would preclude the publication of PE Letters in it. The options being reviewed are to publish PE Letters on the Web, in the appropriate Transactions, or both.

c. Hans (Teddy) Pűttgen, Vice President – Meetings, gave a short presentation on the proposed change in meeting format with an emphasis on getting the Technical Committees to hold their meetings concurrently with the new PES Annual Meeting. A spirited discussion followed. The possibility of holding additional sessions at 7:00 am – 9:00 am and 5:30 pm – 7:30 pm during the meeting was included in the discussions.

d. Kara Clark, TPC for the 2001 T&D Conference gave a report on the technical program for the meeting to be held in Atlanta. Kara stated that everything is in order and that the program tracks were based on deregulation and e-commerce.

e. John Paserba. TPC for the 2002 Winter Meeting gave a report on the technical program for the meeting to be held in New York. John Paserba. TPC for the 2002 Winter Meeting gave a report on the technical program for the meeting to be held in New York. (Refer to the previous Vice Chair's report for the Theme and Tracks of this meeting.)

f. Carey Cook, TPC for the 2002 Summer Meeting gave a report on the technical program for the meeting to be held in Chicago. Carey stated that his program would be based on six tracks which included new technologies in the areas of alternate energy supplies, power quality, and distributed generation. As of this writing, the latest theme and tracks for SM2002 is as below.

2002 IEEE PES Summer Meeting

Call for Papers

Full paper deadline: 4 February, 2002

The IEEE Power Engineering Society 2002 Summer Meeting will be held 21-25 July at the Palmer House Hilton Hotel in Chicago, Illinois. This premier power engineering conference will bring together power engineering practicing engineers and academics from all over the world. The aim of the conference is to provide an international forum for these experts to promote, share, and discuss various issues and developments in the field of electrical power engineering.

The theme of the meeting is ***Taking Technology to New Heights***. The preferential topics for the meeting are as follows.

Track 1: Securing New / Alternate Sources of Energy, covering such topics as:

- Inherently safe nuclear reactors, clean coal technologies, gas turbine peaking units
- Solar, wind, tidal, geothermal, biomass
- Dispersed generation

Track 2: Improving Power Delivery, covering such topics as:

- Line loading and other interconnect issues
- Economic dispatch, operating under reduced generation availability
- Releasing excess capacity through VAR control

Track 3: Advancing Reliability and Power Quality, covering such topics as:

- Power electronic switching (sub-cycle source transfer, plant-wide UPS units)
- Advances in SCADA systems (closed loop systems, advanced communications)
- Super-conducting energy storage

Track 4: Improving Customer Service Using Innovative Measurement, Control and Computational Technologies, covering such topics as:

- Fault locating, down conductor detection
- Optical sensing, non-standard instrument transformers
- System modeling (EMTP)

Track 5: Surviving New Markets and New Structures, covering such topics as:

- Software tools (load flow, fault analysis, risk assessment, economic analysis)
- Bundled services and other new post-deregulation economic models
- Improving power engineering education

Submission Requirements: Papers must be prepared in accordance with the procedures outlined in PES Publications Guide and be submitted with the "Proceedings Paper Submission Cover Sheet" and "IEEE Copyright form." These documents are part of the PES Author's Kit and can be downloaded from the Web (http://www.ieee.org/power) or requested from the PES Executive Office (pes@ieee.org). Candidate Proceedings papers must be submitted (full papers, not abstract) in time to be received at the PES Executive Office by the cut-off date of 4 February, 2002. Authors will be advised of Acceptance or Rejection of the paper by 25 April, 2002. At least one author of each paper must register for the meeting and pay the appropriate fee before an accepted paper will be released for publication in the *2002 PES Summer Meeting Proceedings or scheduled for presentation during a technical session.* Prospective authors who wish to submit a Proceedings paper (preferably relating to one of the preferential subjects) for consideration for presentation at the meeting are invited to submit the paper to SM2002 Proceedings, IEEE PES Executive Office, 445 Hoes Lane, Piscataway, NJ 08855-1331 USA.

For more information, refer to the PES Web site,

http://www.ieee.org/power.

5.1.2 Organization and Procedures Committee

5.1.2.1 Technical Committee Activity Reports

No major discussion during the individual TC report.

5.1.2.2 Revision of the Technical Council Organization and Procedures Manual

Our committee O&P Manual has been updated to reflect several changes we have made and submitted to the Technical Council O&P Committee for approval. I expect that this will be approved during the next PES meeting in New York next January.

5.2 Technical Paper Reviews

5.2.1 Technical Paper Review Summary

Since January of this year, a total of 51 Transactions on Power Delivery papers have been submitted for review to the IEEE Transformers Committee. At this time, 27 reviews have been completed and 24 reviews are in-progress. See Mark's full report for details.

5.2.2 Technical Paper Session at 2002 General Meeting

One transformer session is planned for the New York, NY meeting, January 27 – 31, 2002. There are five proceedings papers.

5.2.3 Technical Paper Session at PES T&D Conference

We will have two paper sessions for 8 proceedings papers and one panel session on "Coating radiators for corrosion resistance: Galvanized v.s. Painted" during the IEEE/PES T&D Conference in Atlanta, GA, October 28 – November 2, 2001.

Respectfully submitted,

H.J.Sim, Vice Chair

6.0 Transformer Standards - T. A. Prevost

Standards Sub Committee met on Wednesday October 17, 2001 with 18 members and 29 guests.

6.1 Report of WG

- Subhash Tuli's report - Next cutoff for C57.12.00 and C57.12.90 changes is March 15, 2003
- C57.12.80

  Tom Traub
  - 8 negatives on second re-circulation
  - Sauraub Gosh will work with Tom Traub to resolve negative
  - We will start a WG for continuous Revision of C57.12.80 Definition and Terms after C57.12.80 is approved.

-TF on Guide for Metrification of Transformer Standards

- Will post guide on Transformer Comm Web Site
- Will establish a WG site for "Drawing Library Site"
- Will elevate TF to WG status and request a PAR.

6.2 Status of Standards

We have 70 Standards in Transformer Committee

Based on a 5 Year cycle this means that 14 Standards need to be reviewed each Year.

Presently we have 22 Active Projects. 11 for New Standards, 11 for revision of existing standards.

6.3 Electronic Balloting

We will be doing all future ballots electronically. This requires that everyone who woul;d like to participate in Transformer Committee ballots have their correct information (particularly e-mail address) in the IEEE balloting database. This can be done by accessing the IEEE web site below:

http://standards.ieee.org.//dblballoting/ballotform.html - will put on Web Site

6.4 C57 Collection / Phone book

- Still available however, 1998 version
- -C57 collection is available online $515/year. This contains:
  - Continuously update

- Draft standards
- Withdrawn/superceded standards
- Concept of hard copy collection was to revise every two years. (Has not happened)
- Other discussion & straw vote decided to work with PES/Jim Harlow and other committees who have collection.

Our preference is a choice of:

- C57 Paper Collection }
- C57 Collection on CD Rom } Should be same price
- C57 On-Line }

TAP/ms0211/vds

7.0 Recognition and awards – J. W. Matthews

7.1 Certificates of Appreciation

Certificates of Appreciation have been obtained for the following persons:

Name Service Rendered

Tom Diamantis Chair, Working Group for Revision of C57.15 - Requirements, Terminology, & Test Code for Step-Voltage Regulators

Tom Diamantis Long-standing and Notable Contributions to the Transformers Committee

James Hudock Host, Orlando Meeting, October 2001

William N. Kennedy Chair, HVDC Converter Transformers and Smoothing Reactors Subcommittee

Bipin K. Patel Chair, Transformers Committee

Linden W. Pierce Chair, Insulation Life Subcommittee

Donald W. Platts Chair, PCS Working Group For Revisions to C57.12.00

Donald W. Platts Chair, Task Force Guide For Determination of Maximum Winding Temperature Rise in Liquid Filled Transformers

Bertrand Poulin Chair, Dielectric Tests Working Group for Revisions of Transient Tests

Joe Watson Host, Orlando Meeting, October 2001

All of these awards, except for Bertrand Poulin and William N. Kennedy, will be presented at the main Committee meeting on October 18, 2001. Neither of them will be able to attend this meeting. Bertrand's award will be presented at the Vancouver meeting. Please let me know if anyone is able to personally deliver the award to Bill Kennedy.

7.2 Technical Committee Distinguished Service Award

Each Technical Committee is encouraged to make one annual award for outstanding service. This personal recognition acknowledges the efforts of those individuals whose sustained performance, over many years, has contributed to the advancement of the committee technology. This award consists of a plaque with a suitable inscription.

The name of the Outstanding Service Award recipient must be submitted to the Technical Council Awards Committee Chair by November 1 of each year. The award will be available and distributed to our representative at the Technical Council Meeting during the following Winter Meeting. It would be available for presentation to the individual at our Spring Committee Meeting.

I would like to suggest that we use this award in the same manner as the Substations Committee. Their practice is to present this award to outgoing Committee Chairs. Every other year, where there is no outgoing Committee Chair, it is presented to another deserving individual. I suggest that the Administrative Subcommittee be designated as the group to make the selection of the deserving individual. The "Procedure for Selection of Individuals Who Have Performed Outstanding Service for Recognition by the Committees of the Technical Council" is shown below:

PROCEDURE FOR SELECTION OF INDIVIDUALS WHO HAVE PERFORMED OUTSTANDING SERVICE FOR RECOGNITION BY THE COMMITTEES OF THE TECHNICAL COUNCIL

To recognize individual achievement, distinction must be drawn between the contribution of the individual and the papers individuals have written. Specific technical high points are recognized by separate procedures. Personal recognition acknowledges the efforts of those individuals whose sustained performance over many years has contributed to the advancement of committee technology. The Technical Committee may select annually an individual to be recognized.

Procedure:

1. The individual to be recognized is to be selected by a Recognition Working Group. The Working Group should be chaired by a member of the designated responsible committee or subcommittee appointed by the chair of that committee or subcommittee and shall consist of one member from each of the major subcommittees of the Technical Committee. It is preferable that these members be past chairs of their respective subcommittees or alternatively have been a member of their respective subcommittees for at least five years.

2. The Working Group shall be appointed at the fall or winter meeting of the Technical Committee. They shall make their determination and present the report by the following spring or summer meeting so that the individual who is to be recognized may be honored at a luncheon or dinner meeting at the succeeding winter or spring meeting of the Technical Committee.

3. The recognized individual and any of the other candidates may be suggested by this committee for nominations to one of the Institute awards. The credentials of the individual shall be gathered on a suitable form.

4. The Technical Committee shall forward the name of the individual to be recognized to the T.C. Award Chair by November 1 of each year.

Award:

The award is to consist of a medallion mounted plaque with an inscription in recognition of distinguished service to the Technical Committee. This award will be as prescribed by the Technical Council.

Selection:

In the selection of the individual, the integrated contribution must be considered. For example:

1. Committee and/or subcommittee chairing. Working Group activities and general participation in Technical Committee affairs.

2. Continued and sustained publication of worthwhile technical papers.

3. Significant contribution as a spokesman for the industry to the world at large. (This might be testimony before government bodies or acting as spokesman to the general public and interface problems within the industry).

4. Sustained leadership in getting technology into fields of interest previously not adequately covered.

5. A combination of the above which sets the individual apart as one who is a mover in our field.

7.3 Nominations for IEEE, PES, and Technical Council Awards

Two working groups have been recommended for nomination to receive PES and Technical Council Working Group Awards. These are:

Bushings Subcommittee - Working Group on Performance Characteristics and Dimensions for Outdoor Apparatus Bushings (C57.19.01-2000)

HVDC Converter Transformers and Smoothing Reactors Subcommittee – Working Group on General Requirements and Test Code for Dry-Type and Oil-Immersed Smoothing Reactors for DC Power Transmission (IEEE 1277-2000)

Nominations for these awards must be submitted as shown on the attached chart of the PES and IEEE awards available to PES Technical Committees.

PES TECHNICAL COMMITTEE AWARDS

AWARD	NOMINATION DEADLINE	NOMINATION SENT TO:
I. PES Prize Paper Award	October 25	Ed Guro
II. (a) PES Working Group Award - *Technical Report* (b) PES Working Group Award - *Standard or Guide*	October 25 October 25	Ed Guro
III. "High Interest" Paper to be published in *PES Review*	October 25	Noel Schulz
IV. Alfred Noble Intersociety Award	October 25	Noel Schulz
V. Technical Committee Prize Paper Award	November 1	Noel Schulz
VI. Technical Committee Distinguished Service Award	November 1	Noel Schulz
VII. Technical Committee Working Group Recognition Award	November 1	Noel Schulz
VIII. IEEE Prize Paper Awards - (a) *W. R. G. Baker* (b) *Donald G. Fink* (c) *Browder J. Thompson*	April 1	Ed Guro

PES Awards Committee Chair	Technical Council Awards Chair
Ed Guro	Dr. Noel Schulz
PPL Electric Utilities	Mississippi State University
Two North Ninth St., Genn4	216 Simrall Eng. Bldg., P. O. Box 9571
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8.0 Meeting Planning Subcommittee -- G. W. Anderson

The Meetings Planning SC holds an open meeting at each TC meeting to plan future meetings and to assist future hosts by education, mixing of ideas, and lessons-learned. The meeting is attended by at least the SC Chair, the present meeting host, future hosts, and hosts from past meetings. Others interested in hosting a future meeting, or assisting with meeting planning are encouraged to attend.

The Meeting Planning Subcommittee meeting began at 3:00 p.m., Wednesday, October 17, 2001 in the Rosen Centre Hotel in Orlando. Seventeen (17) people were in attendance. Greg Anderson, SC Chair facilitated. The meeting began with introductions by the attendees.

8.1 Committee Finances

Committee funds are presently (as of August 6, 2001) $8066.23. It is expected that the funds will remain approximately the same after the Orlando Meeting.

8.2 Past & Present Meetings

8.2.1 Past Meeting - Amsterdam, The Netherlands

Ernst Hanique and his SMIT Host Team did an excellent job of planning and implementing the previous meeting. The attendance was good despite the necessary overseas travel and the lack of attendance of those working on Distribution Subcommittee activities. The facilities of the Hilton Amsterdam were excellent. SMIT hosted a relaxing and scenic trip to Nijmegen on a train pulled by a classic steam-train for a tour of their factory and dinner in a medieval castle. Companion tours included excursion to Province of West Friesland and an excursion to Gouda & Schoonhoven. The speaker at the Tuesday luncheon was Mr. Menno de Vries from KEMA Laboratories. The Wednesday evening event consisted of a dinner cruise on the luxury saloon steamer, "Prins van Oranje". After the meeting, KEMA Laboratories hosted an interesting tour of their test facilities in Arnhem.

8.2.2 Present Meeting - Orlando, Florida, USA

Despite the tragic events on September 11th, just five weeks earlier, there was a worthwhile attendance at this meeting. Many other conferences across the country were cancelled due to the events and Joe Watson praised the bravery of those who attended. Greg thanked Joe & Jim Hudock for their work. Due to the many fixed expenses, a close vigilance to the food & beverage expenses and audio/visual services was necessary. Joe was commended also for his hard work in reducing the expenses of the meeting especially by providing all the overhead projectors and screens for the event (a huge physical effort). Grand Eagle hosted a nice luncheon and a tour of their repair facility on Sunday morning. Overall, the Orlando Meeting was a success.

8.3 Future Meetings

8.3.1 Summary

The following dates, locations and respective hosts for future meetings were reviewed.

- April 14-18, 2002 -- Vancouver, B.C, at the Westin Bayshore Resort & Marina, hosted by Mike & Nancy Lau (BC Hydro).
- October 20-24, 2002 -- Oklahoma City, Oklahoma, at the Renaissance Hotel, hosted by Joe Garza (Southwest Electric).
- Spring 2003 -- open for US meeting; contact Greg Anderson for if interested in hosting a meeting.
- Fall 2003 -- open for US meeting.

Possible locations for future meetings include: New York or New Jersey (near IEEE HQ), Minneapolis, Denver, Indianapolis (with the PES Insulation Committee), Biloxi or Jackson, Montreal, Charlotte or Raleigh, Springfield or Branson, and Edinburgh, Scotland to name a few.

8.3.2 Upcoming Meeting -- Vancouver, B.C.

Mike Lau made a brief report. Meeting rooms and guest rooms have been reserved at the Westin Bayshore Resort & Marina, adjacent to Stanley Park. Room rate will be CAN$180 (approx. US$130, without taxes), single or double occupancy. The Wednesday Evening Dinner Social will be held at the new Vancouver Aquarium. There will also be two identical technical tours of Powertech's laboratories. Mike Lau can be reached at (604) 528-3201 or mike.lau@bchydro.bc.ca.

8.3.3 Upcoming Meeting -- Oklahoma City, Oklahoma

Joe Garza reported that a contract has been signed for the meeting at the new Renaissance Hotel. The basic room rate (single or double occupancy) will be US$130. Joe is working closely with a local professional meeting planner and they are looking at some events with a Southwest or Western feel.

8.4 Working Group Reports

8.4.1 Working Group on Web-Site Development

The first session of the Web-Site Development Working Group met on Wednesday, October 17th, at 1:30pm. There were 24 attendees present at the meeting. A membership list (members & guests) will be developed at the next meeting in Vancouver.

WG Co-Chair Susan McNelly made a presentation of the existing web-site features. Co-Chair Georges Vaillancourt was unable to attend the Orlando meeting.

There were discussions regarding the purpose and direction of the WG including what types of information should be on the individual subcommittee web pages. The issue of security access

was also discussed as draft Standards cannot be put on-line with out limiting access to the information to Committee members.

There were also discussions on the policy that needs to be developed regarding commercial content of items placed on the site.

Lastly, the group supported the costs associated with getting software purchased to allow Susan McNelly access to the web-site as co-webmaster.

8.5 New Business

8.5.1 New Meeting Schedule

The new longer (3-1/2 day) meeting schedule was introduced at this Orlando Meeting. This new schedule will begin Sunday evening with the usual Hospitality Reception. Individual "break-out meetings" will begin on Monday morning and will continue through Wednesday afternoon. The wrap-up "Full Committee Meeting" will be Thursday morning. The following criteria are used for the longer schedule.

- Only one timeslot for each SC meeting (generally held on Wednesday).
- No more than two timeslots for each WG or TC activity.
- A target maximum of 5-6 meetings per timeslot.

The longer schedule also includes a couple of time slots on Monday & Tuesday afternoon dedicated specifically for educational content (tutorials and presentations).

8.5.2 TC Web-Page

Continued thanks to Georges Vaillancourt for maintaining the web-site. The site contains complete minutes from recent past meetings and information about upcoming meetings. Susan McNelly has joined Georges as our "Co-Webmaster".

A new working group called "WG Web-site Development" was developed and had its first meeting in Orlando (immediately preceding this SC meeting). The new WG will further develop the TC web-site, encourage productive use of the site (bulletin boards, etc), determine web-content, and develop procedures for adding material to the web-site. A representative from each subcommittee is encouraged to attend the meeting.

Additionally, a "WG for Educational Development" is being considered to promote educational content and coordinate presentations and tutorials. The proposed WG would attempt to certify certain tutorials for continuing education units (CEUs) for professional development.

8.5.3 Golf Shirts

The first 200 people that pre-registered for the Orlando Meeting with the on-line registration system received a nice complimentary polo/golf shirt embroidered with the Committee's logo. The remaining 50 shirts (250 shirts were ordered) will be sold at the subsequent meetings.

8.5.4 Tutorials, Presentations and CEUs

Four tutorials/presentations were presented at this Orlando Meeting. The response of these presentations "exceeded all expectations". Attendees could also apply for accredited continuing educational units (CEUs). Approximately 26 individuals applied for CEUs. Material from each of the presentations is now available on the web-site.

The following is a summary of the attendance at the presentations:

- "Inrush Currents, Characteristics & Effects" (P. Hopkinson, G. Kobet, G. Swift, et al) - 126 attendees, 14 applied for CEUs.
- "Guide to Metric Conversion" (D. Galloway) - 37 attendees, 8 applied for CEUs
- "Standard, Specifications, and Designs: Their Relationships" (V. Sankar) - 170 attendees, 9 applied for CEUs.
- "Internal Fault Detection in Distribution Transformers" (N. Cuk) - 78 attendees, 10 applied for CEUs.

Future candidate presentations include: Net Meetings (On-line Meetings and Remote Conferencing), Frequency Response Analysis (FRA), Switching Transients (a summary of work by Bob Degeneff's WG), Web-based Review of PES Technical Papers, Loss Tolerance & Measurement (by Ramsis Girgis), and National Energy Policy (by Phil Hopkinson).

Greg is still looking for someone to assist him with planning and administrating the presentations.

8.5.5 Miscellaneous

Additional topics were discussed:

Note that a table was set-up at this Orlando Meeting to promote membership of IEEE and PES. Thanks for Vita and Jennifer from IEEE for providing the promotional information.

The e-mail reflector service continues to be successful in helping disseminate Committee news and information. Information about the reflector can be found on the web-site. It was determined in the earlier Web-site Development WG to add everyone who has attended the last 2-3 meetings to the service, and allow them to cancel subscription if they choose.

We are still investigating creating an "anniversary CD" that will contain an assembly of documents and meeting minutes from the past 5-10 years. The CD could perhaps be presented as a gift to all Committee Members and made available to meeting guests and other interested individuals.

We are still investigating a way of coordinating and consolidating our databases. Greg is looking at several outside companies that provide such services. Presently we use no less than five non-relational databases: the TC "mailing list" maintained by SC Secretary, the attendee list for each TC meeting, the standards ballot lists, SC & WG membership lists maintained by chairs, and the large IEEE membership list. It would be helpful if databases used by the Committee were relational, centrally-located, and the contact information was self-maintained by the members.

Greg encouraged everyone to create their own "e-mail alias address" - an excellent service provided free of charge by IEEE. An alias is a permanent e-mail address that remains the same, even if the user moves to a different company or ISP. For instance, Greg uses "gwanderson@ieee.org" and has used that same address for years, even though he has changed employers twice. A message sent to an individual's alias is immediately re-directed to an e-mail address chosen by the individual. For instance, an e-mail sent to Greg's alias is forwarded to his HDR address. The alias service also provides excellent virus filtering and often, a person can create a much simpler (shorter) e-mail address than the one provided by their employer. A link to the IEEE e-mail alias service is provided within the Committee's web-site.

The meeting was adjourned.

9.0 Reports of Technical Subcommittees

The following reports are those of the technical subcommittees of the Transformers Committee. In most cases they are the complete minutes of meetings held earlier and they are identified as minutes.

Secretary's Note: The subcommittee reports have been edited to the format of the IEEE Style Manual. No changes have been made to the content of these reports except for typographical errors and obvious improvements (removal of attendance lists and general items covered elsewhere).

9.1 HVDC Converter Transformers & Smoothing Reactors S. C. - Richard Dudley

The HVDC Converter Transformers and Smoothing Reactors subcommittee met in Salon 8 of the Rosen Center Hotel in Orlando, Florida, on October 17, 2001. Two members and five guests attended the meetings. The meeting was chaired by Mr. P. Riffon since R. Dudley was not able to attend the meeting.

The minutes of the Amsterdam meeting were approved as written.

The following are the highlights:

1- IEEE 1277-2000 "Trail-Use Standard General Requirements and Test Code for Dry-Type and Oil-Immersed Smoothing Reactors for DC Power Transmission" and C57.129-1999 "Trail-Use Standard General Requirements and Test Code for Oil-Immersed HVDC Converter Transformers" are reaching the end of their two years period life time.

Because HVDC projects are not as frequent as AC projects, the feedback received up to now is somewhat limited. Nevertheless, several positive feedbacks were received on the various requirements and tests outlined in these two documents. No major negative comments have been received yet.

A survey has been made by Email within the subcommittee membership and none of the members did oppose to move these documents to a "full-use" status. This subject have been also discussed during the subcommittee meeting and none of the members and guests present did oppose to such a move.

An official recommendation from the subcommittee chair will be sent to upgrade IEEE Std. 1277-2000 and C57.129-1999 to "full-use" status.

2- M. Sharp from Trench Ltd. did present Trench experience regarding the use of the audible sound test procedure outline in IEEE Std. 1277-2000 for smoothing reactors (superimposed DC and AC currents). The outcome of their experience has been positive and they recommend to keep the test procedure as specified.

The meeting adjourned at 11:20 AM on October 17, 2001 .

Pierre Riffon P. Eng.

October 19, 2001

9.2 Instrument Transformers - J. E. Smith, Chair

9.2.1 Chair's Remarks & Announcements:

The Study Group for Standard C57.13.2 "Conformance Test Procedures for Instrument transformers" recommended that the document should be sent to the members of IT Subcommittee for a survey.

9.2.2 Topics of Discussion:

New Task Force on C57.13.5 - Test Requirements for High Voltage Instrument Transformers 115 kV Nominal System Voltage and above

A mandate for the new task force on the revision of C57.13.5 was developed and voted on. The stated objectives are: To prepare for the first revision of C57.13.5 based on feedback from users, including the addition of new requirements.

C57.13 Revision

It was agreed by unanimous vote that the C57.13 standard should be split into 1 standard for CT's and one for VT's, similar to IEC 60044-1 and –2. It was also agreed to divide the standards into 2 voltage ranges. This could result in 4 standards or 2 standards with 2 parts each. This will be carried out by the WG for the revision of C57.13. It will also be taken into account by the TF on C57.13.5.

There was a recommendation to remove test methods from C57.13 as they are not normally included in equipment standards This will also be addressed by the WG for the revision of C57.13.

Partial Discharge Test Guide

The possibility of setting up a task force to produce a PD Test guide was discussed. A draft was produced many years ago, which may provide a starting point. Tony Jonatti will provide copies to the SC members for consideration.

Working Group Productivity

Concerns were raised about the rate of standards development, particularly considering the 5-year life limit. It was agreed that more communication between WG members is needed between Transformers Committee Meetings. This could take the form of circulating information via Email and/or scheduling meetings outside of Transformers Committee Meetings.

Tony Jonatti has resigned as IEC TC38 representative and Vladimir Khalin has taken his place and will report at the next meeting.

9.2.3 Working Group Reports:

9.2.3.1 WG C57.13.5 - Working Group on Test Requirements for High Voltage Instrument Transformers 115 kV Nominal System Voltage and above – Joe Ma

The meeting was co-chaired by Pierre Riffon.

(1) Total 16 attendees (6 members and 10 guests).

(2) The minutes of spring 2001 meeting held at Amsterdam were approved with no change.

(3) The draft 14.2 was surveyed within the SC. Since we got a majority approval, after resolving the two negative votes, the revised Draft (D14.03) will be submitted to the Editorial Section for review. Subsequently, we will submit the Draft to the Committee for ballot.

The WG PC57.13.5 will form a new task force under the chairmanship of Ross McTaggart and Pierre Riffon to do the groundwork for future WG on the document developed.

(4) The remaining time of the sessions was devoted to the resolution of the two negative votes. The outstanding change is the retraction of the entire section on Transport Test and the related annex as the majority of the attendees considered the test is controversial.

(5) The remaining comments were essentially editorial. Proposed revisions were reviewed and accepted.

(6) The Draft will be revised in reference to the discussion in the session. It will be tentatively ready for Editorial Department review by the end of November 2001.

(7) Possible subjects for inclusion in the first revision were discussed, including:

- Transient Performance Requirements
- Balance CT's for Capacitor Bank Protection
- Station Service VT's
- Definition of realistic burdens

The need to coordinate with the Relay Committee activities and Standards was also expressed

9.2.3.2 WG C57.13.6 – Working Group on Instrument Transformers for use with Electronic Meters and Relays – Chris Ten Haagen

This WG did not meet

9.2.3.3 Working Group on C57.13 Revision – Tom Nelson

This WG did not meet but the subject was discussed in some detail in the SC meeting (see above)

9.3 Insulating Fluids Subcommittee - F. J. Gryszkiewicz, Chair (presented by Susan McNelly)

The Insulating Fluids Subcommittee and its Working Groups met in Orlando, Florida on Monday, Tuesday and Wednesday, October 15, 16 and 17, 2001.

9.3.1 Current Subcommittee Projects

9.3.1.1 C57.130 - Trial Use Guide for the Use of Dissolved Gas Analysis During Factory Thermal Tests for the Evaluation of Oil Immersed Transformers and Reactors - Frank Heinrichs, Chair

Draft 13 of this Trial Use Guide will be sent for a Standards Association Recirculation Ballot before the next meetings in Vancouver.

9.3.1.2 P1258 - Trial Use Guide for the Interpretation of Gases Generated in Silicone-Immersed Transformers - Jim Goudie, Chair

Although this Trial Use Guide has successfully completed a Recirculation Ballot, the PAR expired before it could be sent to the Standards Board for approval. A new PAR will be issued and the document will be sent to the Standards Board for approval.

9.3.1.3 C57.111 – IEEE Guide for Acceptance of Silicone Insulating Fluid and Its Maintenance in Transformers

This Guide will be sent out for a Standards Association Reaffirmation Ballot before the next meetings in Vancouver.

9.3.1.4 C57.104-1991 - IEEE Guide for the Interpretation of Gases Generated in Oil-Immersed Transformers - Frank Heinrichs, Chair

This Guide has been sent out for a Standards Association Ballot.

9.3.1.5 C57.106-1991 - IEEE Guide for Acceptance and Maintenance of Insulating Oil in Equipment - Joe Kelly, Chair

This document just completed a Standards Association Ballot. The results of the ballot were discussed at the meetings in Orlando. The comments received will be incorporated into Draft 7 which will be sent out for a Standards Association Recirculation Ballot.

9.3.1.6 C57.139 - Dissolved Gas Analysis in Load Tap Changers - Rick Youngblood, Chair

There has been no activity in this Working Group since the last meeting in Amsterdam. Rick Youngblood has resigned as the Working Group Chair due to a change in job responsibilities.

Rick Ladroga was appointed as the new Working Group Chair at the meeting in Orlando. The Working Group will have a new Draft of this Guide ready for discussion at the next meetings in Vancouver.

9.3.1.7 IEEE Standard 637 - IEEE Guide for the Reclamation of Insulating Oil And Criteria for its Use

This document is approaching the end of its five year life cycle. This means that it must be either reaffirmed or revised. Revision of this document is not feasible now since it contains test values that are included in tables in C57.106, which is currently under revision. Until C57.106 is revised, the test values in Std. 637 cannot be revised.

In view of the foregoing, a Standards Association Ballot for reaffirmation will be conducted on the condition that revision of Standard 637 will begin after C57.106 is approved.

9.3.2.2 Next Meeting

The Insulating Fluids Subcommittee and its Working Groups will next meet in Vancouver, BC, Canada, April 8-11, 2002.

Respectfully submitted,

Frank J. Gryszkiewicz, Chair

Insulating Fluids Subcommittee

9.4 Insulation Life Subcommittee - D.W. Platts

The Insulation Life Subcommittee met at 8:00 AM Wednesday, October 17, 2001 in Orlando.. Attendance was 37 members and 72 guests. The minutes of the April 11, 2001 meeting in Amsterdam, The Netherlands were approved.

9.4.1 Chair's Announcements

9.4.1.1 ADCOM meeting on Sunday.

All future ballots will be done as electronic ballots. Please make sure that the Standards Association has a viable email address for you.

We discussed future meetings, the budgets for them and a request from IEEE that we coordinate our meetings with the annual PES meeting. Details will be discussed at the main committee meeting. Our next subcommittee meeting will be in Vancouver, BC, Canada on April 17, 2002.

The Chair responded to a request for interpretation regarding Note 'a' of Table 8 of C57.91. The requestor had identified an error that is being corrected in the corrigenda to be balloted soon. No further action is required.

9.4.1.2 Review of Subcommittee Survey for new activities

Between meetings the chair conducted a survey of the subcommittee to determine the level of interest in the four proposals for new projects presented at the Amsterdam meeting. The question asked was - should we pursue these topics?

There were only 24 responses. A summary of them follows:

1. Change rated average winding rise to 70C for ODAF transformers

   Yes- 14 No 7

2. Average the winding temperature rises for split LV windings located one above the other.

   Yes- 14 No 8

3. Standardize calculations for the temperature rise tests.

   Yes- 19 No 3

4. Summarize the experience using c57.119, the overload heat run guide.

   Yes- 20 No 0

Dennis Marlow has begun work on the first two topics. The others will be addressed in new business.

9.4.2 Status Reports for active projects:

Subhash Tuli reported PC57.119; "Recommended Practice for Performing Temperature Rise Tests on Oil-Immersed Transformers at Loads beyond Nameplate Rating" has been approved.

9.4.3 Working Group reports were as follows:

9.4.3.1 Working Group on Loading of Liquid Immersed Transformer - Linden Pierce, Chair.

The Working Group met from 9:30 am to 12:00 Monday, Oct. 15, 2001 with 26 members and 51 guests in attendance. The minutes of the Oct. 16, 2000 meeting in Niagara Falls, Canada were approved.

Draft 1 of a revision of C57.91, "Guide for Loading of Liquid Immersed Transformers and Voltage Regulators" was sent to the Working Group and the Insulation Life SC members by E-mail in early September. The results of the Working Group Survey were as follows:

Approve or Approve with comments	15
Negative	1
Comments only	1
No response	21
Wrong E mail	3
Chair, no vote	1
Total	42

Conversations with the "no responses" indicated that the 4 week time period was not sufficient to review the document which was in excess of 140 pages.

The technical comments from George Henry, Jin Sim, Glenn Swift, Jerry Corkran, and Don Platts were reviewed. A summary of the major issues is as follows:

Scope

The scope will be revised as follows to better accommodate transformers with different temperature rise ratings:

"This guide provides recommendations for loading liquid-immersed transformers and voltage regulators with insulation systems rated for a 110 °C winding hottest spot temperature at rated load. This guide applies to transformers manufactured in accordance with IEEE C57.12.00 and tested in accordance with IEEE C57.12.90, and voltage regulators manufactured and tested in accordance with C57.15.

Because a substantial population of transformers and voltage regulators with insulation systems rated for 95 °C winding hottest spot temperature at rated load are still in service, recommendations that are specific to this equipment are also included."

Computer Code

When the present BASIC language code was developed in 1992, all PC's could run BASIC language programs under DOS. Present personal computers do not have this capability. The possibility of using a modern structural language such as Microsoft Visual Basic was discussed. IEEE has been contacted for examples of how other standards handle computer program documentation. The preliminary response that it is best to use a generic product and not refer to Microsoft. This issue is open. Alternatives will be reviewed after review of other IEEE standards.

Exponents

A statement will be included that if exponents are known from testing they may be used in the program. IEEE C57.119 will be referenced.

The exponents which appear in C57.12.90 are not affected since the Loading Guide is not referenced. The draft of P1524, Thermal Duplicate should be revised to give the exponents in the document and not refer to the loading guide. No Loading guide exponents are given in C57.100.

An amendment to IEEE C57.119 should be issued to show the calculation procedure for the x, y, and z exponents. The test method is satisfactory and the data taken is adequate.

Effect of LTC Taps on winding hottest spot.

Glen Swift reported that a device made by his company indicated a 20 C difference in hot spot at the same current through different LTC tap connections. Present draft states in Clause 9.5 states, "Calculating the effect of load tap changer operation into the loading predictions is an extremely complicated and controversial subject and the effect may vary with the manufacturer". Since no alternative guidance can be provided, the present wording in this clause will be retained.

Complexity of Loading Equations

Less complex loading equations are desired by Jerry Corkran for distribution transformers. Don Platts wishes to include the 1995 Guide Clause 7 equations since many utility computer programs use them.

However, simple equations will not cover complex load cycles in Specifications by some utilities. The clause 7 equations also do not consider the winding duct oil rise during high short time overloads.

The next draft will probably include simplified equations which may be used for simple loading situations, that is a two step overload in a constant ambient. It is the intent that the simple equations will be for a hand calculator use. It is not the intent that simple equations be computerized for complex loading situations. If equations are computerized, then the most accurate form should be used.

References for cold start up and low ambient temperature operation

Eastgate in 1967 and Aubin and Langhame in 1989 investigated start up under low ambients and overloading under low ambients. Results were for mineral oil. Both discovered that the winding duct oil is a factor in causing the winding hot spot to be higher than the 1995 Guide Clause 7 equations predict. The phenomena for start up or for overloading is the same. The references will be retained. References to other investigations by Northrup and Thompson and Lampe will be reviewed to determine if they are really useful.

Cold load pick up

The statement, "If prior loading cannot be controlled by demand or rate of increase, the windings may experience localized hot spots and accelerated aging of conductor insulation during cold weather ambients", will be changed to, "Loading should be controlled by demand or rate of increase to limit the winding hottest spot temperature to acceptable values". A reference to use the temperature equations for transient temperature predictions and Table 4 for constant load, constant ambient will be added.

Use bottom tank wall temperature instead of bottom oil for distribution transformers

A future revision of the test code C57.12.90 will cover a test method which will allow measurement of the tank wall temperature with a correction to give the bottom oil temperature. No modification of draft 1 is required.

Ambient Temperature

Clause 8 about ambient temperature will be rewritten to reflect modern practice. Margins will be removed. Margins should be applied to the final answer, not to the individual components.

Over and under excitation and frequency effects.

Clause 5.2.1 will be expanded to cover rating information in C57.12.00. Presently "load" is not defined. It can be either KVA or Current per C57.12.80. It is current that causes winding heating and maximum currents are given on the nameplate. To stay within the manufacturers ratings, both KVA or maximum current must not be exceeded. The next draft will replace "load" with "load current" or similar wording.

Thermal evolution of gas from transformer insulation

Clause 7 will be expanded to provide information on how to obtain the information to use the equation given.

Loading increase due to lower tested average winding rise

Margin will be removed. It will be assumed that the data provided by the manufacturer is correct. Any margin should be applied to the final answer.

Information needed for Bushing Loading Calculations

A statement will be added to contact the transformer or bushing manufacturer to obtain the bushing constants needed for the bushing loading calculations. It was reported that it is difficult to obtain the information.

Operation of directed flow transformers without pumps in operation

Clause H4.2 in C57.91-1995 was not retained in the present draft. The major reason is that operation of directed flow FOA units without the pumps is a very risky situation. The calculation procedure omitted contains many approximations which may not be valid for all transformers. Without the pumps in operation, the transformer operates in a natural convection cooling mode. Restrictions within the forced oil heat exchanger, and by the pump impeller may prevent natural convection flow. The winding duct oil temperature may reach a very high value in this situation.

It is the conclusion that only the transformer manufacturer has the detailed information required to perform any calculation for this condition. The manufacturer should be contacted for this information.

Additional caution and explanations will be provided in the next draft.

Submitted by,

Linden W. Pierce, Chair

9.4.3.2 Working Group on Definition of Thermal Duplicate - Barry Beaster, Chair.

The Working Group met on Monday, October 15, 2001 at 1:45 p.m. There were 8 members and 18 guests in attendance. One request for membership was received by Scott Digby of Waukesha Electric Systems. The minutes of the spring 2001 meeting were read and approved.

Agenda items from discussion generated at the spring 2001 meeting were included in Old Business for this meeting. The first of these topics was the improvement of definitions of terms and exponents used in the guide. The second discussion topic was the standardization of SI units throughout the guide. The third item on the agenda was the underlying assumptions about making comparisons between a new 'thermal duplicate' and a tested unit. The last Old Business topic was conditions when non-identical types, as presently defined in the guide, could be used as thermal duplicates.

With respect to definitions in the guide, it was agreed to include the complete definition of exponent's-m, n, and Z as shown in C57.91 rather than as a reference to this guide. The

definition of 'cooling flow path' in section 4.1.3 was proposed in a format closer to the IEC cooling designations. After discussion it was agreed to either make these definitions identical to the IEC wording or to better remove the terms and reference the IEC terms and add descriptive text to supplement special cases such as natural thermosiphon flow with guided oil flow within the windings.

Discussion on the use of SI units within the guide concluded with a majority of the attendees feeling the generic term 'watts per unit area' was better that selecting specific units that would only be used for comparison purposes.

The next topic discussed was the choice of the comparison of the thermal characteristics between a new unit and the tested results of the original unit, versus the comparison between the calculated designs of the new and tested units. It was apparent that those manufacturers of high volume, smaller size transformers and those doing repair of transformers from other manufacturers typically do not have the resources or information to perform a detailed analysis that is normally necessary for larger transformers. It was also noted that improvements in eddy loss analysis with field analysis programs would almost necessitate recalculation of the old design for proper one-to-one comparison. It was agreed that with some additional editorial information, the comparison would continue with the comparison of the new transformer with the tested results of the first unit.

The last agenda item was the comparison of the transformers that are thermally the same with some construction differences. In summary, it is proposed that if a new design has an on-load tap-changer, the thermal duplicate must also have an on-load tap-changer. Both of these units would have to be rated as either reduced or full capacity. Another case is if the new unit has no regulation winding, the thermal duplicate may or may not have a regulating winding. The unit with the regulating winding would have to have a reduced capacity rating.

These changes will be incorporated and a survey of both the Working Group and the Subcommittee will be completed prior the end of the year.

Respectfully Submitted,

Barry Beaster Chairman

9.4.3.3 Task Force on Winding Temperature Indicators - Phil McClure, Chair

The meeting convened at 1:55 PM on October 16, 2001. Five members and 18 guests were present. Mike Barnes, former Chair of the task force, had asked to be relieved of his duties citing additional responsibilities at his company, and Phil McClure introduced himself as the new Chair.

The members and guests introduced themselves and the minutes of the spring meeting in Amsterdam were approved.

A brief history was related to the group, followed by a discussion of the evolution of the task force's objectives. Progress has been slow to date, and reaffirmation of the group's interest in the objective established in April 1999 was sought. The objective was to write a technical paper

describing the problems involved with making accurate winding temperature measurements from the manufacturer's and user's perspectives, and to present current and future technologies which may offer solutions. A vote was held and it was agreed that the objective should not be changed.

A rough outline of the proposed paper was made available to the group. The outline comprises the blueprint presented by Barry Ward in April 1999 with all text written since that time merged into one document.

Concern was expressed that the lack of participation was seen as a lack of interest and that the future of the task force would depend upon the sharing of experiences and knowledge of the members.

Discussion was had regarding the collection of heat run data for presentation with the paper. The data is intended to be incorporated as a graphical representation of the effect which step changes have on time constants of winding temperature indicators. Data taken using fiber sensing elements versus simulating or calculating winding temperature indicators was desired. It was suggested that a survey should be sent to transformer manufacturers requesting any available data. It was also suggested that proprietary issues would be mitigated by removing brand name information prior to submission of the data.

A call for volunteers to help write the paper was made, but no new members responded during the open session. After the meeting adjourned several persons did volunteer to provide some thermal data and help with editing.

In discussions immediately after adjournment it was expressed that interest in the subject may have waned due to the fact that some solutions have caught up with the problem as originally stated.

The meeting adjourned at 3:10 PM.

Respectfully,

Phil McClure

Chair

9.4.3.4 Task Force on Temperature Rise Clause 5 C57.12.00- Dennis Marlow, Chair

The Task Force met on Tuesday, October 16 at 11:00 AM. All the 27 participants to this inaugural meeting are welcomed into the Working Group as members.

There were no previous minutes as this is a new Task Force.

The task force was formed to make recommendations to the Insulation Life SC concerning the 2 proposals for temperature rise changes to C57.12.00 clause 5, submitted by Dennis Marlow at the Amsterdam meeting in April 2001. The SC was polled after that meeting and responses indicated that we should proceed with further discussions on those two proposals.

The following items were discussed:

1) **Proposal 1** dealt with changes to the average temperature rise for ODAF cooling from 65°C to 70°C. 15 members of the SC survey were in favor of pursuing this proposal while 4 did not favor further investigation

2) **Proposal 2 dealt with changes to the average temperature rise of two windings that were located one above the each other.** 16 members of the SC survey were in favor of pursuing this proposal while 4 did not favor further investigation.

3) Copies of the technical supporting and background data that was sent to all SC members as part of the survey was distributed to all attendees. Copies are attached to these minutes.

4) **Proposal 1 Discussion**.

- The Chair explained that the 4 negative survey responses were returned from final users who may not have fully understood the potential cost benefits of this proposal. They seem to be concerned about the loss of potential overload capabilities.
- Several responses and comments were received concerning the calculation and verification of the actual hotspot limit of 80°C if the average temperature rise was allowed to increase to 70°C for ODAF cooling.
- Most of the SC members surveyed had no or limited experience with ODAF transformers operating at 70°C average temperature rise
- Various attendees indicated that there is a potential cooling cost reduction of 15% to 25% if the average temperature rise is increased to 70°C. The 80°C limit for the hot spot temperature rise does not change
- In order to determine if 70°C average temperature rise is indeed a normal practice, it was agreed that the SC Chair, **Don Platts will survey other users and other suppliers of ODAF transformers to verify the normal practice of others outside the poll of the SC.**

5) Proposal 2 Discussion

- VSN Sankar noted that the core, tie plate and conductor heating needs to be verified for the condition where there is load only on the upper LV winding.
- It is also noted that the short circuit force calculations need special considerations for this type of dual LV winding arrangement.
- Further discussion will be circulated within the TF membership by e-mail prior to the next meeting in Vancouver April 2002

There was no new business. The meeting adjourned at 12:00 noon

Respectfully submitted,

J. Dennis Marlow Task Force Chair,

9.4.4 Old Business

The loading guide C57.91 has reached the end of its 5 year life. Linden Pierce will be sending the document for reaffirmation. He has also prepared a corrigenda covering several errors that have been found in the printed document. It will also be balloted by the end of the year.

IEEE Guide for the Application of High Temperature Insulation Materials in Liquid-Immersed Power Transformers, IEEE 1276, will also reach its 5 year life in 2002. Mike Franchek has agreed to review the document and either recommend revision, or begin the reaffirmation process.

9.4.5 New Business

The chair continued discussion of the survey of the subcommittee to determine the interest in starting new projects. The remining two items were regarding temperature rise tests, to summarize the industry experience with the overload heat run guide, and to provide a standardized method for evaluating the results of the heat run test. Both were recommended by a clear majority of the responses.

The suggestion to summarize the experience with the overload heat run test will be pursued, but we will not start it until some of the other projects are completed.

The suggestion to standardize the procedures for calculations of the heat run data was discussed. Some of that work was attempted during work by the Working Group to revise the Temperature test code, but was abandoned.

The chair read the heat run test procedures from C57.12.90 and asked if anyone could agree that the wording was specific enough to define the test performed to demonstrate compliance with the 65°C average winding temperature rise guarantee. (It says that the tester should use a curve fitting program or draw a smooth curve through the data points). During discussion it was mentioned that Microsoft Excel spreadsheets contain several different curve fitting techniques that could be used to find the resistance at time zero and each produces a different result. Other curve fitting programs would be expected to produce additional different answers.

After the discussion, the chair agreed to survey the manufacturers in the subcommittee asking them to evaluate cooling curve data, and report the resistance at time zero that would result from using their standard techniques. The results of that survey will help to identify the extent of the variations between various factory procedures. George Henry has agreed to resume work on the test code to incorporate additional changes as needed.

The meeting adjourned at 9:20 AM.

Respectfully submitted by:

Donald W. Platts, Chair Insulation Life Subcommittee

Copy of response letter to Request for Interpretation

September 12, 2001

Mr. Jon G. Calkins

Nuclear Management Company, LLC

Prairie Island Nuclear Generating Plant

1717 Wakonada Dr.

East Welch MN 55089

Dear Mr. Calkins:

I have reviewed your request for interpretation of C57.91-1995, IEEE Guide for Loading Mineral-Oil-Immersed Transformers.

As you have pointed out, there is an error in Note a of Table 8.

IEEE has recently sent out an Invitation to Ballot for a corrigenda to C57.12.91. It includes corrections to several portions of the document. When the corrigenda is approved, Note a of Table 8 will be corrected to say 110°C, rather than the 100°C.

To address your specific question which was - "Now, is the allowed continuous temperature 110°C or is it 100°C?" Clause 9.3.1 explains that the requirements for loading are in C57.12.00. It also states that the continuous operation limit for the hottest-spot temperature is 110°C.

Donald W. Platts

Chair, Insulation Life Subcommittee

9.5 Performance Characteristics - D. J. Fallon

9.5.1 Introduction/Attendance

The Performance Characteristics Subcommittee (PCS) met at 11:00 a.m. on Wednesday, October 17, with 63 members and 39 guests in attendance. 14 of those guests requested membership in PCS. All members and guests were requested to provide E-mail addresses, as E-mail will be the primary means of communication of PCS minutes and other documentation.

The meeting was initiated with a moment of silence in memory of those lost during the tragic events of September 11, 2001.

9.5.2 Approval of Meeting Minutes

The minutes of the April 11, 2001, PCS Meeting in Amsterdam, the Netherlands, were approved as written.

9.5.3 Chairman's Remarks

9.5.3.1 Administrative Subcommittee Notes

The subcommittee notes are not produced here as the information is covered in other parts of these minutes.

9.5.3.2 Membership

14 new/return members were added to the PCS Roster:

Sam Aguirre, FAA
Jeffrey Britton, Phenix Tech.
Alvaro Cancino, Industrias IEM
Larry Coffeen, Georgia Tech./Neetrac
Don Duckett, Florida Power
Joe Foldi, ABB
Dave Kendrick, Black & Veatch
Joe Melanson, J. Melanson, Inc.
Harold Moore, H. Moore & Associates
Manuel Silvestri, Efacec Energia
Craig Swinderman, Mitsubishi Electric
Loren Wagenaar, AEP
Albert Walls, Federal Pacific
Jim Zhang, Mitsubishi Electric

The Membership roster will be reviewed shortly. Members who have not attended any of the last 4 meetings will be contacted regarding their removal from the PCS roster – thanking them for past participation, and indicating that with renewal of participation they will be welcome to rejoin the group.

9.5.4 Agenda Changes

None

9.5.5 Working Group Reports

9.5.5.1 PCS Revisions to C57.12.90 – Bruce Forsyth, Chair; submitted by Bob Ganser

The Working Group met on Monday at 11:00 a.m. Bob Ganser and Don Fallon co-chaired the meeting on behalf of the Chairman, Bruce Forsyth who was not able to attend due to travel restrictions. There were 44 persons in attendance.

The minutes of the Amsterdam meeting were read for approval. The minutes were approved with exception. Subash Tuli cited additional items that in his opinion were discussed at Amsterdam and should have been included. These items will be relayed to Bruce and he is asked to revise the minutes as necessary.

The results of a survey on 10 items related to specific revision of C57.12.90 conducted during the summer were reviewed. Three of the ten items were referred to other committee groups for final resolution. These items were:

- Item 1: regarding RIV vs. PD references was referred to the Dielectric Test Subcommittee;
- Item 4: regarding use of "average liquid temperature" was referred to the Insulation Life Subcommittee;
- Item 10: regarding wording for low frequency dielectric test for control equipment was referred to the Dielectric Test Subcommittee.

Two items were approved as submitted. These were:

- Item 2: updating cooling designations;
- Item 5: retain the use of T_K=234.5.

The remaining 5 items were opened for discussion with the bulk of the discussion time devoted to Item 3, rewording of the note under clause 4.3. As noted in the Amsterdam minutes, the level of concern for removal of the note was expressed again in the WG. Several members were opposed to the elimination of the note which would result in the elimination of Clause 4.3 entirely and thus eliminate any "Sequence of Test" requirement or recommendation.

Items 6 and 7 were accepted by the WG. Item 8 was discussed with floor acceptance by a negative vote. However, the negative voter acknowledged that he had not been contacted for resolution of objections as a follow up to the survey. The Chairmen will deal with item 9 in a follow up email because of the many negative responses.

It was decided to send these Items, 3,8 and 9 back to the Chairmen for reconciliation of the negative opinions.

On new business, Subash Tuli requested that the WG revise the Zero Sequence Section of C57.12.90. The acting Chair asked Subash to put his request and justification in writing to the Chairman of the WG.

There being no further business, the meeting was adjourned at 12:15 p.m.

Post Script: The Dielectric Test Subcommittee met after the WG and also had surveyed the question of removal of the note under clause 4.3. The result of their WG discussion was strongly in favor of retaining the note. Based on this and the discussion in the C57.12.90 WG, it appears that the note will be retained.

9.5.5.2 PCS Revisions to C57.12.00 - Steve Snyder, Chair; Dennis Marlow, Secretary

The Working Group met on Monday, October 15 at 1:45 PM. There were 18 members and 45 guests in attendance. The following 12 guests requested membership, and are welcomed into the Working Group:

Alan Darwin	Alstom T & D Transformers
Ray Nicholas	ABB Power T & D
Hemchandra Shertukde	University of Hartford
Robert Thompson	Duke Engineering
Jim McIver	Nevada Power
Manual Silvestra	EFACEC Energia, S.A.
Eduardo Garcia	VA Tech - Ferranti Packard De Mexico
Roger Hayes	VA Tech - Ferranti Packard
Robert Hartgrove	Carolina Power and Light
Tommy McGee	Howard Industries
Tommy Spitzer	Texas Utilities
Jeewan Puri	Consultant

The minutes from the April 10 Amsterdam meeting were approved as submitted.

An electronic survey of the *Performance Characteristics Subcommittee* and this Working Group was conducted in February 2001 addressing various comments received during the balloting of C57.12.00. Several issues were resolved at the Amsterdam meeting and various emails and personal discussions resolved others. C57.12.00 is expected to go out for ballot this year, with the 2001 year designation, and it will incorporate these resolved issues. The purpose of this meeting was to address the outstanding comments, resolving as many issues as possible, and then to introduce new items for discussion.

The following items were resolved:

6) **WG item 22, Table 10, note 11 (c)**, regarding nameplate information for tank, pressure and liquid data. After a lengthy discussion, the WG agreed that this note is not applicable to conservator type transformers, and that there would be **no changes to the existing wording**. There still is some interest in developing information about liquid level changes versus temperature for conservator type transformers.

7) **WG item 25, Table 10, Note 8**, concerning nameplate information for transformer weights. The Working Group agreed to add the following note:

   f) Original shipping weight, if different than total weight.

8) **WG item 32, Table 10, Note 8**, concerning nameplate information for transformer weights. A request was made that tolerances be specified for the weights shown on the nameplate and other drawings. After much discussion that the proposed tolerances were too small, it was determined that tolerance information should **not** be specified, and **no changes made to the existing document**.

   4) **WG item 38**. Subhash Tuli has requested that a section be added to C57.12.00 to address instruction manuals. The Working Group agreed this would be a useful addition. Dennis Marlow volunteered to provide a copy of similar information from the Canadian standard CSA C88-M90 to Subhash and Steve Snyder, to initiate the writing of this section.

NEW BUSINESS

1) Dave Kendrick commented that a note may need to be added requiring autotransformer nameplates to indicate their suitability for both step up and step down operation.

2) A number of other items have been received by this WG that properly belong in other subcommittees, that are being forwarded on.

The meeting adjourned at 3:02 PM

9.5.5.3 DETC Specification and Test – Phil Hopkinson, Chair; John Gauthier, Secretary

The Working Group met on Monday, October 15, with 19 members and 13 guests registering (estimated > 60 total attendance). The minutes of the meeting held 14 April 2001, in Amsterdam, The Netherlands were approved as submitted.

The chairman noted that the mission of the WG is to develop an off-circuit tap changer standard. He briefly reviewed the task and work needed to be accomplished and the kinds of information needed to provide users on how tap changers should operate in service. For most applications, the de-energized tap-changer is placed in a position and never moved again for the thirty years of expected transformer life. Contact stability is extremely important to achieving long and trouble-free life. In order to assure that good and reliable tap-changers are produced, the Standard needs to clearly delineate the expectations, duty-cycles, and proof tests that will assure a good success. The purpose of the functional life test seeks to answer the latter requirement. This test provides accelerated aging and uses changes in resistance or lack thereof to detect unstable versus stable

contacts. This discussion needs to be pursued and that is one of the purposes of the work of the WG.

OLD BUSINESS

The chairman reviewed the documents that have an impact or an influence on the work of the WG:

a. Existing C57.131 Requirements for De-energized Tap changers

The chairman noted that this standard is currently under review and would be the likely document to include the functional life test that the WG had been tasked to develop. He briefly reviewed the basis for the pursuit of the standard and the considerations promoting its consideration. He demonstrated the very stable test results of silver-plated pairs of contacts. He also showed how thermal runaway can quickly occur with unstable contacts such as tin-plated copper mated on plain copper. Included among those matters were discussions of duty cycles that allow for regular overloads as well as the necessity to verify dielectric capability. He also addressed the needs of determining suitability for synthetic insulating liquid (different behavior than mineral oil and the need the manufacturer to establish ratings), routine and type test requirements and functional life tests. An extended discussion ensued on the results of life tests conducted on tap changers with various metallic contacts.

b. Draft IEC 60214

The chairman noted that the IEC document did not have a functional life test and that the members of the IEC committee responsible for the document, TC14, have resisted inclusion of the test. The failure to include such a test will result in a continued negative vote from the US. It was noted that IEC TC 14 circulated a CDV for IEC 60214 revision; that ballot closed in early August but the USNC failed to cast a vote on the document. This was a missed opportunity for the US influence the contents of this document.

Bengt Stenestam, a member of IEC TC14, reported on the questions raised during IEC TC14's consideration of the US proposal to add the functional life test to its document. He indicated that generally the IEC working group members could find no compelling reason for including the test in the document.

Mr. Stenestam presented a brief discussion of a comparison of the contents of IEC and IEEE standards on load- and off-circuit (no load) tap changers. He pointed out that the current IEC standard on load tap changers contains a thermal design test are similar to that in the new IEEE document. He noted that no IEC standard exists for off-circuit tap changers because few problems have been encountered; however, a new standard is under development that would incorporate a thermal design test based on values from the manufacturer. He noted that the US proposed standard would be more comprehensive. He noted that the IEC views the US proposal for functional life tests as interesting, but lacking an identified need – there has been no substantive professional studies published to date on the matter and what too few tests have been conducted to validate a need for a standard. He noted that discussions in IEC technical meetings concluded that the extra

cost and effort to conduct routine tests on contacts was not matched by the need. In IEC discussions about including the dielectric test as a routine test concluded that very few transformer failures would be avoided with a dielectric test but that they could be included as special tests performed by agreement between the manufacturer and user.

Members engaged in an extended discussion concerning the need for the functional life test. The chairman reviewed key provisions and elements indicating a need for such a test. **In fact, at a meeting of the Association Of Electric Illuminating Companies in New Orleans that the chairman attended in 1996, coked contacts of de-energized tap-changers were cited as the biggest problem with liquid-filled transformers!!** By a vote of 24 to 9, members agreed that the development of a proposed test should be pursued and offered for inclusion in C57.131. In further discussion, it was noted that the WG's recommendation and draft should be presented to the appropriate IEEE subcommittee for a determination of how the proposed test should be disposed.

c. Future Work

The chairman noted that the task remains for the WG to develop a proposal for consideration by the IEEE subcommittee distribution transformers.

There was no new business. The meeting was adjourned at 4:40 pm.

9.5.5.4 Switching Transients Induced by Transformer/Breaker Interaction - Bob Degeneff, Chair; Peter Balma, Secretary

The Working Group on Switching Transients Induced by Transformer/Breaker Interaction was called to order at 8:02 AM on Tuesday October 16, 2001. There were 28 Members and 22 Guests present. After introductions, the agenda for the meeting was reviewed, followed by approval of the Minutes from the April 11, 2001, meeting in Amsterdam, Netherlands. Draft 1.3 of the guide, minutes, letters from R. K. Smith and Nigel McQuin, and copies of the overheads presented were distributed.

1) The current draft of the guide (1.3) was revised to be more general in nature, and to clarify terminology utilized. For example, the use of terms such as transient recovery voltage versus transient terminal voltage were reviewed.

2) A discussion of the Supply Characteristics Clause of the guide suggested that rather than rewriting existing published data, the guide should only reference the material. A concern that the references be readily available was made and acknowledged. Finally, Bill Griesacker volunteered from the working group and offered to prepare a draft for the clause and will consider both approaches.

3) Currently the Circuit Breaker Clause has not been drafted, however, input from letters by R. K. Smith and Nigel McQuin were reviewed and discussed. It is clear that there is need for a model from the switchgear/breaker community to assist in understanding the interaction problem. The group concluded there is a need to increase the liaison activities between the IEEE Switchgear and Transformer Committees, and suggested that a joint tutorial on this subject should be presented at the Vancouver meeting.

4) Examples of documented transformer and breaker interaction situations or failures were requested from the group. It is the intent that the guide contain at least three examples and to date only one example is available. This request will also be made to the Performance Characteristics Sub-committee.

5) Jeewan Puri provided an update of activities at CIGRE in this area. The CIGRE Joint working group consists of members from Study Committees 12, 13 and 23.21. A workshop is planned and will be followed by a summary document, and tutorial in this area. The joint group is also working to assemble a list of risk factors to be considered. Additional information is available on the CIGRE website.

6) The guide will be revised prior to the Vancouver meeting, and will be discussed in detail at that time in preparation for review by the Subcommittee in the fall of 2002.

The meeting adjourned at 9:04 AM.

9.5.5.6 Loss Tolerance and Measurement - Ramsis Girgis, Chair; Ed teNyenhuis, Secretary

Ramsis Girgis was unable to attend the meeting due an urgent family matter, so Ed teNyenhuis, the WG secretary, chaired the meeting in his place.

12 members and 19 guests attended, with 4 guest requesting membership.

Minutes from the Amsterdam meeting, held April 10, 2001, were read and approved.

TF meeting on "Guide of Low P.F. Power Measurements"

- Bill Henning reported on the meeting, in place of Eddy So, who was unable to chair the meeting.
- 7 members were in attendance.
- The guide is complete and has been released.
- Comments on the guide were discussed.

  C57.123 Loss Measurement Guide

- The balloting for Draft 7 closed on April 11, 2001. 118 returns were received out of 146 total ballots. Out of the 118, 112 were affirmative, 1 was negative and 5 were abstention. This was a 99% affirmation.
- Draft 8 has been prepared that includes resolution of the negative ballot. As well, all of the comments, mostly editorial, given in the affirmative ballots were also included. A re-circulation letter has been prepared and members will be voting on the changes within a few weeks.
- Resolution of the negative ballot was reported upon.

- Comments from Eddy So to clarify the section on high impedance source measurements were presented and the pertaining changes to the guide were indicated.

  Presentation of Paper "Proposed Standards for Frequency Conversion Factors of Transformer Performance Parameters"

- This is a paper prepared for the IEEE 2001 Atlanta T&D conference. The paper summarizes the investigations done and measurements performed to develop frequency conversion factors.

- The paper was presented which showed analytical work and supporting measurements for conversion factors for no load loss, exciting current, load loss and noise.

- Ernst Hanique noted that it was not clear to him that data provided by WG members would be used in a paper. This will be discussed in a phone call with Ramsis Girgis after the meeting.

- It will be discussed further at the next meeting in Vancouver as to the need for such conversion factors and the next steps in developing this into a possible guide.

The meeting was adjourned at 11.55 a.m

9.5.6 Project Reports

9.5.6.1 C57.133 Guide for Short Circuit Testing - Nigel McQuin

The WG did not meet in Orlando. It had been expected the balloting would be complete and this document would be moving towards publication by the time of this meeting, but difficulties continue. There were editorial problems with figures, and work is continuing to resolve one negative ballot. The PCS Chair will work with the WG Chair to move this document towards publication.

9.5.6.2 Status of C57.21, 1990 (R1995) Standard Requirements, Terminology, and Test Code for Shunt Reactors Rated Over 500Kva

The reaffirmation ballot was out, and was then cancelled due to the discovery that the scanning process during IEEE editorial preparation of the ballot had resulted in significant errors in the document. The IEEE editorial staff plans to continue review after the meeting with the intent to re-issue the ballot shortly. IEEE will set up a review process to avoid such problems with future reaffirmations.

The Dry-Type Reactor WG has already completed Drafts of Annex sections to C57.21 covering reactor switching, and the specification and testing of thyrister controlled shunt reactors for static VAR Compensators.

9.5.6.3 Inrush Current Tutorial

Ed teNyenhuis from ABB (co-author Ramsis Girgis was unable to attend), Glenn Swift from APT Power Technologies, Gary Kobet from TVA, and Phil Hopkinson from Square D conducted a Tutorial on Inrush Current on Monday afternoon, October 15. Interest was generated by the

initial Tutorial in Nashville, and this second Tutorial presented a wider range of perspectives and went into considerably more depth of material. The following topics were treated:

- Fundamentals of Inrush
- Variables that affect Inrush
- The effect of kVA size, phases and phase angles, and source impedance
- Harmonics, especially the 2nd harmonic
- Impact of harmonics on metering

The authors presented good dynamic models that are capable of predicting inrush currents for use in preventing annoyance tripping. Discussion will continue on the possibility of additional inrush topics for future tutorial sessions.

PCS appreciates the work of the authors in preparation and presentation of this excellent Tutorial.

9.5.7 Old Business

9.5.7.1 Status of IEEE 32, 1972 (R1997) Standard Requirements, Terminology, and Test Procedure for Neutral Grounding Devices

This document expires in 2002. The Surge Protective Devices Committee has an active project to revise/supersede this document (PC62.91). PCS will not form a WG at present, as had been initially discussed, but contribution by PCS members is appropriate. Steve Schappell will assist in the PCS review. Additional volunteers may be needed; if you have experience or interest, please contact Steve at (Steven.Schappell@WaukeshaElectric.spx.com).

9.5.7.2 Topics for Future Technical Presentations / Panel Discussions / Tutorials

1) Review of the work of Bob Degeneff's WG on Switching Transients Induced by Transformer/Breaker Interaction.

2) Discussion on Loss Measurement, sponsored by Ramsis Girgis' WG on Loss Tolerance and Measurement.

3) Discussion on the variability (tolerances) of performance parameters for similar transformers, including parameters such as noise, thermal performance, core loss, excitation, inrush, etc.).

4) Energy Efficiency, and background for NEMA TP1 loading studies for distribution transformers.

These potential topics will be forwarded on to the Committee Chair. Volunteers who would be interested in developing these ideas further can contact me (donald.fallon@ieee.org).

9.5.7.3 Scope of C57.12.00 as Related to 25Hz Transformers

At an earlier meeting, a review was requested of the scope of C57.12.00 regarding applicability

to 25Hz transformers, and an understanding of the terminology "special transformers". No action has yet been taken since the last meeting. Ongoing work in the WG on Loss tolerance and Measurement on conversion of losses, noise, and excitation current from 60Hz to 50 Hz will provide a basis of discussion of the 25Hz topic.

9.5.8 New Business

9.5.8.1 Frequency Response Analysis (FRA) Testing

Per Jin Sim's concerns noted in the Chairman's Remarks section of these Minutes, the issue of FRA testing was raised to assess interest for a WG to consider development of related standard or guide material. Considerable interest in the topic was expressed by PCS members. Discussers included:

- Alan Wilson – summarizing his experience over many years with the National Grid (U.K.) and more recently with Doble; noting that there is a large volume of data but that considerable expertise is still required in interpretation.
- Larry Coffeen – reviewed Neetrac's experience and interest.
- Mark Perkins – indicating increasing number of instances of FRA requirements in user specifications.

The consensus of the group discussion was that there was a need additional data collection. The group also affirmed the need to move towards inclusion in IEEE Standards and Guides. In addition to those named above, volunteers expressing interest in participating in future work on this topic included Bipin Patel, Loren Wagenaar, Bob Degeneff, Jin Sim, Gustav Preininger, Jeff Britton, Rowland James, Thang Hochanh, and Tom Spitzer.

Meeting time will be requested in Vancouver for an informal Task Force Meeting to discuss this topic and provide recommendations to PCS for action.

9.5.8.2 Transient Recovery Voltage for Transformer Limited Faults

A letter on this subject dated May 8, 2001, from Mel Smith, Chairman of a WG in the IEEE Switchgear Committee, was forwarded to the PCS Chair. A WG was forming during the summer of 2001 to review the subject in relation to requirements for breaker equipment. The WG is interested in collecting data during the testing of new transformers. This work appears to be aligned with the work of the PCS WG on Switching Transients Induced by Transformer/Breaker Interaction. Mr. Smith's letter will be forwarded to Bob Degeneff, Chair of the PCS WG, and to the Dielectric Test SC, and the main Committee officers. In the meantime, those interested in participating with Mr. Smith in this effort, either at future meetings or through correspondence, can contact him at mel.smith@ptd.siemens.com

9.5.9 Next Meeting

The next PCS meeting is expected to be scheduled for Wednesday, April 17, 2002, in Vancouver, British Columbia, Canada.

The meeting adjourned at 12:18 p.m.

Respectfully submitted,

Donald J. Fallon

PCS Chair

9.6 Power Transformers Subcommittee: Everett Hager – Chairman (presented by Joe Watson)

The Power Transformers Subcommittee met at 9:30 AM on Wednesday, October 17th with 45 members and 71 guests present. Five guests requested and were granted membership in the Subcommittee.

The following Working Group reports were presented:

Working Group for the Revision of C57.12.10. Javier Arteaga, Chairman

The Working Group for the revision to C57.12.10 met on Monday, October 15, 2001 at 9:30 AM. There were 34 people in attendance. The official Working Group membership will be established based on the requests for membership received from all of the prior meetings.

Minutes from the meeting held in Amsterdam were reviewed with specific interest in who has already accepted assignments to write specific sections. The initial assignments are as follows:

- Ratings: John Rossetti, Rich von Gemminger
- Construction: Dennis Marlow, Rowland James, Bob Hartgrove
- LTC: Jim Harlow

The request is to complete drafts for each of these sections by the end of November. Prior suggestions for change, along with these draft sections will be compiled and issued to the Working Group by the end of December. Any of the Working Group members with suggestions may contact those assigned to work on the specific sections or either the Working Group Chair or Secretary.

There was a strong desire from the Working Group to have an electronic copy of the current version of the standard. The electronic copy issued by Jin Sim in 1997 will be sent to all Working Group members by October 30th.

There was a suggestion to add provisions for electronic gauges and meters. It was noted that Phil McClure has already submitted some work for the development of C57.12.36 (Distribution Substation Transformers) that can be used as a starting point. Dennis Marlow will contact Phil to discuss the details.

The following information regarding copyrights was requested to be added to the minutes as follows:

1. IEEE and NEMA have reached an agreement regarding the NEMA-copyrighted C57 standards, including C57.12.10.
2. IEEE "shall have the sole responsibility for the maintenance and future re-affirmations or revisions to the jointly-owned C57 standards." This means that the Transformers Committee can issue PAR's for the revision of these standards as needed.
3. The documents will continue to also be balloted by the C57 Committee and submitted to ANSI for recognition.
4. The jointly-owned C57 standards shall be designated ANSI/IEEE/NEMA C57.X.X

The PAR's for both C57.12.10 and C57.12.36 will be submitted by th October 26th deadline. The reason these PAR's are being submitted at the same time is to try and define a clear distinction between the two documents. The titles will be as follows:

C57.12.10 – Standard Requirements for Liquid Immersed Power Transformers

C57.12.36 – Standard Requirements for Liquid Immersed Distribution Substation Transformers

The scope of each document will clearly define the ratings and there won't be any overlap.

With no further business, the meeting adjourned at 10:20 AM.

Working Group on LTC Performance – William Henning, Chairman

The Working Group on Load Tap Changer Performance met on Monday, October 15th at 1:45 PM with 12 members and 12 guests attending. The first subject discussed was the reaffirmation of C57.131, "Standard Requirements for Load Tap Changers." A request has been submitted to conduct and electronic ballot of the reaffirmation. No action was required of the Working Group at this meeting in Orlando. At the next meeting, it is anticipated that the Working Group may be assigned the task to address possible negative comments resulting from the reaffirmation ballot. We will return to this subject later in the minutes.

The second subject of discussion was tap changer contact life determination. Jim Harlow presented background information for this discussion, The issues are (1) is there a need for a formal definition of contact life and (2) is there a need for a standard method for its determination? The C57.131 standard states that the results of the Service Duty Test may be used by the manufacturer to extrapolate an ultimate contact life based on observation of the contacts after 50,000 operations. But the standard does not provide a method for this determination. An intention to survey the Working Group on this subject was expressed at the meeting, but subsequent discussions led to a decision to defer this subject until a later date.

The decision to defer this action results from consideration of the mission and purpose of this Working Group and the timing of the work. The past and future activity of this Working Group was also discussed at this meeting, and informally afterward. The name of this Working Group is Load Tap Changer Performance. It had that name when it was first established under the chairmanship of Tom Traub and it produced the standard C57.131, which now is up for five-year reaffirmation. In 1997 the Working Group was re-established with the same name. A PAR for

the project to write a Load Tap Changer Application Guide was approved by the IEEE Standards Board. At that time, coordination with IEC and copyright issues were a concern of the Standards Board members. The IEEE Standard C57.131 was largely based on IEC 214. In fact, the wording of these two documents are nearly identical. Because C57.131 was based on IEC Standard 214, it made sense that the new proposed guide, with designation C57.141, would likely be based on the IEC 547 Guide.

At about this time, the IEC Working Group 26 started to revise the IEC Standard 214 (60214-1). Work is also being done by IEC to revise its Tap Changer Guide, formerly IEC 547, but now designated as 60214-2. Unfortunately, the timing of the task of our IEEE Working Group has been "out of phase" with the work being done in IEC. It seemed to make sense for IEEE to wait for IEC to complete its work. At one point it was proposed that our Working Group be disbanded until the IEC finished its work.

With the passage of time, the revised IEC 214, now 60214-1 is in the Committee Draft stage. IEEE C57.131 is due for reaffirmation. It would appear that the immediate task for this Working Group should be to consider a revision of C57.131. This could be a subject for discussion at the next Working Group meeting. The PAR for C57.141, the Application Guide, will probably expire with no Guide being produced at this time.

The immediate focus of the Working Group will be reaffirmation of C57.131. After that, work on an Application Guide could begin.

Working Group on Phase Shifting Transformers – Tom Lundquist, Co-Chairman

No Working Group meeting was held in Orlando. The Guide has been approved and submitted to IEEE. The IEEE editor advised that the PST Guide C57.135 will probably be published in May or June 2002.

Working Group on Diagnostic Field Testing & Monitoring of Liquid-Filled Transformers – Andre Lux & Donald Chu, Co-Chairmen

The Working Group met Sunday afternoon and Tuesday morning. 24 members and guests were in attendance for the Sunday meeting.

Draft 10 and comments from a recently-conducted survey on the Guide were discussed in both meetings. All relevant comments that were obtained in the survey are being incorporated into Draft 11.

After all the comments are incorporated, the Guide will be re-organized and volunteers will be needed to take a section of the Guide and edit, re-write sections, etc. The re-organized Guide will be sent to the Working Group membership well in advance of the spring meeting. The Working Group will meet during the Doble conference in April to review Draft 11 in detail.

Working Group for the Guide for the Evaluation and Reconditioning of Liquid Immersed Power Transformers, C57.140, Rowland James, Chairman

The Working Group met at 8:00 AM on Tuesday, October 16, with 66 in attendance. There were 32 members and 34 guests -- 19 requested membership.

After introductions a brief discussion of the latest draft's status was held. Volunteers were accepted for a number of sections.

Attached is a summary of the status of the Guide

The chairman appointed several task forces to assume the responsibility of completing the individual sections and will make assignments to complete the articles. Revisions and additions to draft 6 are due by the end of February 2002. Draft 7 will be mailed out electronically shortly thereafter.

The meeting was adjourned at 9:15 AM.

Article	**Author**	**Status**
1. Overview / Scope	Rowland James	completed - needs review does it match PAR?
1.2. Purpose	Rowland James	completed - needs review
2. References –	Malcolm Thaden	awaiting input
3. Definitions		volunteers needed add after guide is written??
4. Condition Assessment	Brian Sparling, Phil Mc Clure, Jeewan Puri,John Crouse	
4.1External		
4.1.1Dissolved Gas Analysis	Brian Sparling	completed - needs review
4.1.2 Oil Quality Assessment	Brian Sparling	completed - needs review
4.1.3 Furan Analysis	Brian Sparling	completed - needs review
4.1.4 Power Factor	Alan Wilson and Tommy Spitzer	awaiting input
4.1.5 Frequency Response Analysis –	Alan Wilson	awaiting input
4.1.6 Radiator/Fans/ Pumps/Cooler	Michael Havener	awaiting input

Condition	& Robert Thompson	
4.1.7 Bushings –	Alan Wilson	awaiting input
4.1.8 Surge Arresters –	Robert Thompson	awaiting input
4.1.9 Load Tap Changer –	Don Platts	awaiting input
4.1.10 Rapid Rise Relay	Mike Barnes	awaiting input, volunteers needed
4.1.11 Pressure Relief Devices	Mike Barnes	awaiting input, volunteers needed
4.1.12 Constant Oil Pressure system	Robert Thompson	volunteers needed
4.1.13 Gas Blanketed System	Rowland James	volunteers needed
4.1.14 Tank Condition	Rowland James	volunteers needed
4.1.15 Vibration/Noise –		volunteers needed
4.1.16 Partial Discharge Detection	Hem Shertukde	awaiting input
4.1.17 Controls, Alarms, Annunciators	Phil McClure	completed –review needed
4.1.18 Infrared Inspection	Tom Prevost & Robert Thompson	awaiting input
4.1.19 Gas Detector Relay	Mike Barnes	awaiting input, volunteers needed
4.1.20 Liquid and Winding Temperature Gauges	Mike Barnes	awaiting input, volunteers needed
4.1.21 Liquid Level Indicator	Mike Barnes	awaiting input, volunteers needed
4.2. Internal	Rowland James, Mike Franchek	
4.2.1 Core & Coil Inspection	Rowland James & Robert Thompson	awaiting input, volunteers needed
4.2.2 Bus and Leads	??	completed - needs review
4.2.3 De-energized Tap Changer	Jeewan Puri	completed– review needed
4.2.4 Pumps	Michael Havener	awaiting input
4.2.5 Gaskets	Joe Watson	volunteers and input

		needed
4.2.6 Bushing Current Transformers	Brian Sparling	volunteers and input needed
4.2.7 Bushings –	Alan Wilson	awaiting input
5. Risk Assessment	[Joe Watson, Paulette Payne, Bill Bartley]	
5.1 Need For Particular Transformer		volunteers and input needed
5.2 Value to User		volunteers and input needed
5.3 Vintage		volunteers and input needed
5.4 Not Full Vacuum		volunteers and input needed
5.5 Low or High Density Paper		volunteers and input needed
5.6 Spare Parts Availability		volunteers and input needed
5.7 Operational History (loading & through faults		volunteers and input needed
5.8 Type of Construction		volunteers and input needed
5.9 Animal Caused Outages		volunteers and input needed
5.10 Shielding		volunteers and input needed
5.11Grounding		volunteers and input needed
5.12 Operating Environment	–	volunteers and input needed
6. Reconditioning	[Rowland James, Javier	

	Arteaga, Mike Lau, Van Nhi Nguyen, John Progar, Juan Thierry, Mike Barnes]	
6.1 External		
6.1.1 Surge Arrester Replacement	??	completed - review needed
6.1.2 Fan/Pump Replacement	?? and Michael Havener	awaiting input /review needed
6.1.3 Pressure Relief Device Maintenance/ Replacement	–	completed - needs review
6.1.4 Oil Dry Out/Reclamation	Mike Lau	completed - needs review
6.1.5 Load Tap Changer Maintenance/ Upgrade (contacts)	Mike Lau & Saurabh Ghosh	completed - needs review
6.1.6 Bushing Replacement	Mike Lau	completed - needs review
6.1.7 Oil and Winding Temperature Gauges	Mike Lau & Saurabh Ghosh	completed - needs review
6.1.8 Liquid Level Gauge(s)	Mike Lau & Saurabh Ghosh	completed - needs review
6.1.9 Fault-Pressure Relay	Mike Lau	completed - needs review
6.1.10 Gas Detector Relay	Mike Lau	completed - needs review
6.1.11 Tank	Mike Lau	completed - needs review
6.1.12 Free-breathing Transformers	Mike Lau	completed - needs review
6.2 Internal	Rowland James, Mike Lau	
6.2.1 Core & Coil Reclamping	Mike Lau & Robert Thompson	completed - needs review
6.2.1a Coil Reclamping shell forms	Juan Thierry and John Progar	awaiting input
6.2.2 Paper Sampling for Degree of Polymerization Tests	Tom Prevost and Tom Lundquist	awaiting input
6.2.3 De-energized Tap Changer Maintenance/Upgrade	??	completed - needs review

6.2.4 Maintenance of Leads	Rowland James	awaiting input
7. Bibliography	Andre Lux	review and/or volunteers needed

West Coast Working Group, Michael Lau, Chairman

The West Coast Working Group did not meet in Orlando, but a session is planned for the next meeting in Vancouver.

Working Group for the Installation of Liquid-Filled Transformers, C57.93, Michael Lau, Chairman

The Working Group on The Installation of Liquid-filled Transformers was called to order at 3:20 PM on Tuesday October 16, 2001. There were 35 attendees, 14 members, 9 requesting membership, and 12 guests. The agenda for the meeting was reviewed, followed by approval of the Minutes from the April 10, 2001, meeting in Amsterdam, Netherlands. The agenda, minutes and copies of the overheads presented were distributed.

1) A new PAR has been prepared. The PAR will be submitted after this meeting pending any scope changes that may result from this session.

2) Results from the survey of the Power Transformer Subcommittee on the installation guide were presented. Approximately 15 responses were received, with 10 providing detailed input, representing manufacturers, users and consultants. The results initiated comments in many areas including: old vs. new units, concern for absolute limits, utilization of public domain data to facilitate educated decisions, and the testing for oxygen and combustible gases prior and during internal inspections. The working group expressed a general philosophy of working to provide guidance versus absolute limits. Furthermore, manufacturers instruction books would be consulted, as they will provide a valuable source of information.
3) Volunteers were requested to re-write several sections of the guide. There was an excellent response from the group and volunteers were as follows:

• Clause 3.8.3 –	Energization under cold conditions	H. Moore, S. Mcnally & M. Lau
• Clause 4.3 –	Inspection & Receipt	A. Peterson
• Clause 4.6.1 –	Oil filling	D. Baranowski
• Clause 4.8.4 –	Vacuum filling	J. McIver & T. Prevost
• Clause 4.9.2 –	Method 2 – Short Circuit Method	A. Peterson
• Clause 4.10 –	Recirculation	P. Pilitteri
• New item –	Internal inspection airflow	M. Lau

4) Under old business a discussion of the installation of oil filled transformers for indoor application was raised, particularly since this guide covers transformers as small as 501 kVA. The specific concern was for cooling and safety issues related to units installed indoors. After discussion the working group voted to not include these concerns in the guide, but to refer the reader/user to other industry standards that address this issue.

   A second item under old business was the measurement of dew point at temperatures as low as −20° C. The revised guide will consider this area, and it was suggested that ASTM D2029 could provide valuable input.

5) Under new business Clause 4.9.4 Method 4 – Hot air drying was raised for consideration. It was decided this was no longer a preferable method of drying, but that it should be moved to an annex for historical reference. In addition, it was indicated that Doble was embarking on a similar effort to produce installation guidelines. The group suggested a liaison between IEEE and Doble and Paulette Payne volunteered to provide this support.

The meeting adjourned at 4:35 PM.

Working Group for the Control Cabinet Guide, Joe Watson, Chairman

The Working Group started out as a Task Force, meeting at 9:30 AM on Tuesday, October 16th, 2001 with 49 members and guests present.

Discussions were held on the task of developing a Guide for control cabinets. It was agreed that the scope of the Guide will begin as a Guide for the Layout, Functionality and Construction of Control Cabinets for Class II Power Transformers. No PAR will be established until the Working Group assembles various users' requirements and makes substantial progress toward a number of standard designs that are substantially in compliance with those users' requirements.

Steven Schappell was volunteered by Jin Sim as a Co-Chairman. Shawn Cross later volunteered to serve as a Working Group officer and will be appointed Secretary.

After a lengthy discussion on the eventual content of this Guide, it was agreed that more work was needed toward incorporating various users' designs into a small number of standard modular designs with optional features. Representatives from 5 different North American transformer manufacturers volunteered to help develop a collection of various users' requirements, as well as their own standard cabinet designs and work toward common designs. This work will begin following the meeting and continue throughout the next few months.

OLD BUSINESS:

E. Hager stated Rulon Frank, Chairman of the W.G. for Guide for Substation Design to meet Seismic Withstand was looking for a 500kv transformer tank to test bushings. The tank would be one ready for salvaging.

New Business:

1. Joe Watson presented information on a repair process utilized by FPL for corroded aluminum coolers. The process involves careful sandblasting and coating with a slow-setting epoxy. The presentation will be posted on the Transformers Committee website under the Power Transformers Subcomittee page.

2. Joe Watson also presented information on experiments by FPL of on-line bushing power factor testing. The initial results are promising and this work is continuing. This presentation will also be posted on the Transformers Committee website under the Power Transformers Subcomittee page.

3. Bipin Patel led a discussion, raising the question of the impact of merchant power plants on power systems and the effects of the repeated transients produced from frequent switching of peaking units on GSU's at base loaded stations.

4. Brian Sparling discussed a request from IEC for information that had been produced by a former Transformer Committee Task Force. The discussion led to a consensus to survey the Subcommittee on these questions in order to provide current information.

5. It was announced that D. Corsi would head up a task force for C57.17, ARC Furnace Transformers.

The meeting adjourned at 10:45 AM

9.7 Underground Transformers and Network Protectors - C.G. Niemann

Meeting Minutes – Orlando, Florida

9.7.1 Introduction/Attendance

The Underground Transformers and Network Protectors Subcommittee met on Wednesday, October 17, 2001, in Salon 5/6 of the Rosen Centre Hotel at 1:30 PM with eight members and five guests present.

9.7.2 Approval of Minutes

The minutes of the April 11, 2001 meeting in Amsterdam, The Netherlands were approved as submitted.

9.7.3 Membership

The five guests attending the meeting requested membership. Membership now stands at 21 members.

9.7.4 Chairman's Remarks

Administrative Subcommittee Notes Reported to SC

- Attendance at meeting less than anticipated

- Cost of hosting meetings is increasing, looking for ways to reduce costs.
- Balloting on standards requires you are an SA member. All WG chairs must be SA members or PARS they submit will not be approved.
- Discussion on Web Page development.

9.7.5 Working Group Reports

9.7.5.1 Three-Phase Underground-Type Transformers (C57.12.24) J. Sullivan – Chairman

1. Met on Monday, October 15, 2001 at 9:30 AM with six members and three guests present.
2. Minutes of the April 9, 2001 meeting in Amsterdam, The Netherlands were approved as submitted.
3. Discussed the Metrification Guide.
4. With the resolution of agreement between IEEE and NEMA, chairman will submit a PAR for the next revision.
5. Meeting adjourned at 10:45 AM.

9.7.5.2 Liquid Filled Secondary Network Transformers (C57.12.40) L. Plaster – Chairman

1. Met on Monday, October 15, 2001 at 11:00 AM with 11 members and three guests present.
2. Minutes of the October 16, 2000 meeting in Niagara Falls, Canada were approved as submitted.
3. Steve Schroeder (ABB) and Giuseppe Termine (PECO Energy) requested membership into the WG. Approved by members.
4. Discussion on the PAR took place. NEMA printed the 2000 addition with errors in Fig.'s 1,3 & 4. Decision was reached to pursue a PAR to correct these mistakes before a PAR would be taken out for the next revision of the standard. Tom Prevost advised that with the new agreement with NEMA, this would be handled by IEEE.
5. Additional items discussed:
   - LV bushing clearance between transformer and protector
   - LV bushing adapter flexibility
   - Mag-break electrical interlock
   - Short circuit rating
6. Working group was informed that Brian Kaplonski will be the new chairman.
7. Meeting adjourned at 12:15 PM.

9.7.5.3 Secondary Network Protectors (C57.12.44) D.H. Mulkey – Chairman

1. Met on Monday, October 15, 2001 at 3:15 PM with seven members and three guests present.
2. There was no meeting in Amsterdam so the minutes of the October 16, 2000 meeting in Niagara Falls, Canada were approved as written.
3. Membership informed that new PAR had been submitted on August 19, 2001
4. Jock Moffat provided additions to cover the new composite frame breaker.
5. Joe Cultera, Jock Moffat, and Dan Mulkey will rewrite paragraphs 7.3, 10.5.13-14, and 11.4.1 in response to comments from last ballot and recent clearance issues.
6. Meeting adjourned at 4:30 PM.

9.7.5.4 Ventilated Dry-Type Network Transformers (C57.12.57) A.L. Robinson – Chairman

1. Met on Monday, October 15, 2001, at 1:55 PM with eight members and one guest present.
2. No meeting in Amsterdam so the minutes of the October 16, 2000 meeting in Niagara Fall, Canada were approved as written.
3. Membership was informed that the revised standard had been successfully balloted by NEMA but had not been printed.
4. Chairman informed the WG that he would work on submitting a PAR to IEEE for work on the next revision.
5. Meeting adjourned at 2:30 PM..

9.7.6 New Business

None

9.7.7 Future Meetings

The location and dates for future meetings are as follows:

April 14-18, 2002	Vancouver, British Columbia, Canada
October 20-24, 2002	Oklahoma City, Oklahoma

The Subcommittee adjourned at 2:45 PM.

9.8 Audible Sound and Vibration - J. Puri, Chair

9.8.1 Meeting Minutes

The Subcommittee met in Orlando on Wednesday, October 17 at 8:00 a..m. with fourteen members and thirteen guests present. Seven new members were welcomed to our subcommittee.

The minutes of the last meeting at Amsterdam, The Netherlands, were approved.

The following items were discussed:

1. **WG Report**: The WG on "Sound Intensity and Sound Pressure measurement procedures" met for the first time on Tuesday, October 16 at 3:13 p.m. with 6 members and 19 guests present. Eleven new members were welcomed to this working group. The total membership of this WG now includes 30 participants.

   Mr. Jan Declercq withdrew form the chairmanship of this WG due to other assignments so, Jeewan Puri took over as the acting chairman. We will mess Jan's expertise and contributions in this WG.

   The WG discussed and resolved all the comments on the first draft of Section 13 of C57.12.90 and C57.12.91. This section will cover sound level measurement procedures using Sound Intensity and Sound Pressure measurement methods.

   The second draft of this document will be circulated to all the participant of the WG for their comments. These comments will be discussed in the next WG meeting.

   Mr. Jim Nielsen from Pauwels, Canada has accepted the chairmanship of this WG. His participation in this effort is greatly appreciated.

2. SC Chairman's Report. Jeewan Puri, the Subcommittee Chairman reported on the following subjects:

- Jeewan had proposed revised sound level tables for NEMA Standards TR1 and ST 20 for liquid filled and dry type transformers. These tables were extended based on a "Validity Check Equation" to include sound levels for additional transformer kVA ratings.

  This proposal was reviewed by NEMA membership. Mr. Phil Hopkinson informed us that NEMA members have no objection to the use of the proposed methodology for extending these tables to include additional kVA ratings. The present figures however, should not be changed.

  Jeewan Puri will revise these tables and submit them for approval by NEMA membership.

- The first draft of sound level measurement procedures is now close to its final draft stage. It was agreed that the SC should now start writing a guide for sound level measurement with sound intensity and sound pressure measurement procedures.

3. New Business:

- Jeewan Puri proposed that in order to harmonize the IEEE Standards with IEC, the US transformer manufacturers should be expected to guarantee sound levels only when so specified by the customers. Otherwise, no sound level guarantees should apply.

  This proposal was rejected by 18 to 0 votes in the Subcommittee.

- Jeewan Puri proposed that all transformers should meet sound levels listed in NEMA

standards TR 1 and ST 20. These requirements should be specified in C57.12.00 and C57.12.01 standards.

This proposal was accepted by 15 to 1 votes in the Subcommittee.

Jeewan Puri will draft statements for the final approval of the Subcommittee before submitting them for inclusion in Standards C57.12.00 and C57.12.01.

There being no other business, the meeting adjourned at 9:15 a.m.

Jeewan Puri

SC Chairman

9.9 Bushings - F. E. Elliott, Chair

9.9.1 Introduction and Membership

Acting Chairman, Keith Ellis opened the meeting at 3:00 PM and welcomed the members and guests. Eight members and 21 guests attended the meeting. Four requests for membership were received. See attachment for membership list.

9.9.2 Chairman's Remarks

The acting chair reviewed the highlights of the Administrative Subcommittee meeting held October 14th at 2:00 PM. The main items included the schedule for the next meeting to be held in Vancouver, BC 2002 April 14-18th.

Additionally, it was discussed that in order to ballot the bushing standards you had to be a member of the Standard Association and if you are a member it is advisable to verify that you current email address is in the SA data base. You can do this by going to: http://standards.ieee.org/db/ballotform.html.

Other items covered in the Administrative Subcommittee meeting will be detailed in the Transformers Committee meeting minutes.

9.9.3 Approval of Minutes of April 11th, 2001 Meeting

The minutes were approved as written.

9.9.4 Working Group / Task Force Reports

9.9.4.1 WG on General Requirements and Test Procedure For Power Apparatus Bushings (C57.19.00)

Keith Ellis reported that his WG met on October 16, 2001 at 1:45 PM with 11 members and 16 guests present. One request for membership was received. He reported the following:

1. Approval of Last Meeting Minutes

   The minutes were approved as written.

2. Discussion on Comments Received on PC57.19.00 Draft 5 from the survey of the Bushing Subcommittee was under taken. There were 10 pages of comments generated and all 10 pages were discussed during the meeting. There were a few unresolved items but it was agreed that these would be resolved by correspondence by the end of November 2001. If these items are successfully resolved the document would be sent to the IEEE Project Editor for editing and then to the SA for final ballot. If the open items cannot be resolved they will be held over until the April 2002 meeting

3. New Business

There was no new business

4. Adjournment

The meeting was adjourned at 4: 30 PM after two sessions.

9.9.4.2 Task Force on Draw-Lead Bushings

Russ Nordman reported that his Task Force meeting was held at 11:00 AM on October 16, 2001 with 5 members and 8 guests present. No requests for membership were received. He reported the following:

1. Approval of Last Meeting Minutes

The minutes were approved as written.

2. The attendance list for the TF has been updated, copies made available upon request.

3. Members were asked to report on their review of Draft 1 proposal. One report was received. The draft is intended to be included in the Bushing Application Guide as a method for manufacturers to conduct thermal testing on drawleads. Initial conditions and temperatures limits will be defined. They were asked to submit suggested data by the end of the year.

4. Completion of this Task Force was discussed. Anticipate 2002 for draft proposal to Bushing Subcommittee.

5. Adjournment

The meeting was adjourned at 11:45 AM

9.9.5 Report from Technical Advisor to IEC 36 A

Russ Nordman reported the following:

1. IEC 62199: "Bushing for DC application". Draft has been circulated for discussion in the October 19 IEC meeting.

2. IEC 60137: "Bushings for AC voltage above 1 kV". Work will be extended to include composite insulator, routine BIL and AC duration tests.

3. IEC 61639: "Direct connection – Transformer to GIS". Guide for dimension on gas side of bushing. Postponed for now.

9.9.6 Old Business

1. Keith Ellis brought up a possible issue from the WG on PC57.19.00. The WG agreed that bushing nameplates are to include the bushing weight but did not discuss what weight to use, English or Metric. For safety reason it as proposed that English pounds would be required. A vote of the members and guest present was taken and the by majority vote was accepted.
2. Keith Ellis reported that in another Dialectic Subcommittee in was agreed that altitude correction factors would begin to be applied starting at 1000 meters. This would make the table in C57.19.00 correct.

9.9.7 Reaffirmation/Revision of C57.19.100

Keith Ellis reported that on the recirculation ballot one additional negative ballot was received. This will also be address by the Bushing Subcommittee.

9.9.8 C2 Measurement Study Group

No new information has been received.

9.9.9 New Business

Russ Nordman attended the new WG on Webpage development and reported that each Subcommittee should have a permanent Webpage. This would allow Bushing Subcommittee work to be placed on the Transformers Committee Webpage on a regular basis.

9.9.10 Future Meeting Topics

The following proposals were discussed.

1. Standards for "Bulk Type Bushings"
2. Line terminals for dead tank SF_6 circuit breakers.
3. Transformer to GIS bushings

9.9.11 Adjournment

The meeting was adjourned at 4:00 PM

Minutes Submitted By,

Pritpal Singh, Secretary Bushing Subcommittee

9.10 Dry-Type Transformers - W. F. Patterson, Chair

Secretary: Charles W. Johnson Jr.

9.10.1 Introductions and Signing of Attendance Forms - W. Patterson

- The meeting began at 9:30 am with 12 members and 8 guests were present

9.10.2 Approval of Minutes - W. Patterson

- Approved as written (Motion/Seconded:P.Payne/S.Kennedy)

9.10.3 Reports of the Working Groups

9.10.3.1 WG Dry Type Thermal Evaluation C57.12.56 / C57.12.60 - R. Provost

- Meeting was cancelled (WG Chair R. Provost could not attend meeting.)

9.10.3.2 WG Dry Type General Requirements C57.12.01 - J. Sullivan

- The meeting of C57.12.01 was held at 9:30 AM on October 16, 2001 in the Salon 2 room of the Rosen Centre Hotel in Orlando, Florida.
- After introductions of members and guests present, the minutes of the Amsterdam, The Netherlands meeting were approved.
- Twelve members and thirteen guests were present. Five guests requested membership.
- The first order of business was presented. The chairman, Mr. Sullivan reported that the revised standard had been submitted to IEEE Headquarters for balloting. The ballot will be processed electronically and begin in early 2002. The balloting pool is being formed now. All members who are interested in balloting must insure their correct e-mail address is current in the IEEE balloting database. Each member must be an SA member to ballot. Members should access the IEEE web site at:
- http://www.standards.ieee.org/ed/balloting/ballotform.html
- An update on the Metric Annex to be added to the standard was discussed. It was decided that since so few conversions were necessary the annex was not needed.
- A short discussion was held on possible additions to a future C57.12.01 standard to include epoxy materials. It was suggested that requirements on this subject may be placed in other standards.

- A discussion was held on possible addition of a table listing voltage class and corresponding arresters. It was determined this was not needed in future standards.
- No interest was generated in the working group on the subject of fire prevention for cast resin transformers.
- It was determined that a - 50°C level for epoxy to be added to the standard was not needed at this time.
- The chairman asked for any old business. None was presented.
- With no new business brought before the working group, the meeting was adjourned at 10:15 AM.

9.10.3.3 WG Dry Type Reactors - R. Dudley

- The Dry Type Reactor W.G. met Monday, October 15, 2001 in Salon 2 of the Rosen Centre Hotel in Orlando Florida. Four members and three guests attended.
- The attendance list was circulated.
- The minutes of the last meeting, April 10, 2001 in Amsterdam were approved.
- Reaffirmation status of C57.16 and C57.21 was reviewed.
- Accredited Standards Committee C57 (ANSI) ballot of C57.16 failed June 12, 2001 due to lack of ballot response. ANSI requires at least 51% of eligible voter response. C57.16 ballot return was only 40%. All returned votes were affirmative.
- As the IEEE reaffirmation ballot (which closed on April 6, 2001) was successful the standard is considered reaffirmed and will be published early next year. The ANSI ballot failure and resolution is scheduled to be discussed at the ASC C57 Main Committee meeting Thursday, Oct. 18, 2001.
- Reaffirmation of C57.21 was delayed due to errors introduced into the document by the scanning optical character recognition program used by IEEE. The editing process is now underway and the reaffirmation ballot should be ready in approximately two weeks.
- The second draft of an annex for C57.21 concerning Thyristor Controlled Reactors was reviewed. The following modifications were recommended and will be incorporated in Draft #3 of this annex. It was agreed that Draft #3 would be issued to all W.G. members in a "Final Draft" with the meeting minutes.
- (i) A.2.3: Include definition of "RSS" as root sum squared where "RSS" is first stated, or in definition section.

- (ii) A.3.2: Include statement that although di/dt can be limited by just one single reactor of a reactor pair this is not quite as effective as a two coil approach due to ground capacitance effects.
- A.3.4: Confirmation to be obtained regarding acceptability of reference to an IEC standard in an IEEE standard.
- A.4.6: Change "should" to "shall".
- A.4.7: Remove 75°C as option for reference temperature. Use 20°C plus the average temperature rise of the reactor.
- A.5.1(d): Copies of a typical turn to turn test oscillogram were distributed. The rise time of the first peak was on the order of 0.1 microsec for dry type reactors. Therefore the "note" will be removed.
- A.5.4.3: Change the second to last paragraph to read, "The measurement of the losses shall be performed after dielectric testing and if so specified, also be performed prior to the dielectric test."
- A.5.4.4: Change the first sentence of the note to read, "The lightning impulse test is generally not required on thyristor controlled shunt reactors unless specifically requested by the end user, since they operate at distribution voltage class levels.
- A.5.5.1: Add comment to describe "structure elements".
- Also add the following sentence to the second last paragraph, "if such connector and incoming bus are not supplied, the terminal temperature rise cannot be assessed.
- A.5.6.1.1: Add statement that sound levels measured in the laboratory may be different from those measured at site due to actual simultaneous application of harmonics in service at site.
- A.5.6.1.2 to A5.6.1.8: All information that has been already stated in the main section of the standard will be deleted.
- A.6.2: The statement regarding losses that appears in C57.16 will be used. Two loss figures may be stated one for upper and one for lower unit of stacked reactors, where applicable.
- A.7.1: Altitude will be made optional information on the nameplate. System voltage will be made recommended information on the nameplate.
- A.7.2: System voltage removed. Harmonic current spectrum included.
- The first draft of Annex B for C57.21 concerning shunt reactor switching was reviewed. The following modifications were recommended and will be incorporated in Draft #2 of this annex to be issued to all W.G. members with the meeting minutes:

- B.1: First paragraph - "SWIL" will be corrected to read "SIWL". The last sentence will be deleted. A sentence will be added stating that a chopped wave test could be considered to simulate a switching device reignition phenomenon. Second paragraph - the last sentence will be deleted.

- All: "Shunt reactor switching device" will be used instead of "circuit breaker".

- B.3.1: Second paragraph to be changed to read, "chopping number (2) is circuit breaker dependent. Severity of chopping is described by a chopping current which is a function of chopping number and the total capacitance seen by the circuit breaker; stray capacitance of the shunt reactor plus the parallel capacitance across the circuit breaker contacts. Typical chopping numbers are:

    - Air blast circuit breakers: 15-25 x 10^4 A.F. $^{-0.5}$
    - SF_6 circuit breakers: 4-17 x 10^4 A.F.$^{-0.5}$
    - Minimum oil circuit breakers: 7-10 x 10^4 A.F.$^{-0.5}$

    o $I_{Chopped} = > \sqrt{C_T}$

    - Second last paragraph: start first sentence with, "For extra high voltage (>362 kV) ……
    - Last paragraph: (<362 kV) to be changed to (≤ 362 kV).

- B.3.2: In second last sentence of the first paragraph, parenthesis to be closed.

    - Last paragraph on Page 5 of 8 to be deleted as it is repeated directly above.

- B.3.2: Page 6 of 8, table title to be change to "Typical Worst Case Dielectric Stresses on Shunt Reactors During Re-Ignitions".

    - Another method other than colour coding to be used to identify cases where dv/dt is a concern.

- B.5.0: First sentence to be deleted and replaced with, "Surge arresters shall be used to protect shunt reactors".

    - The following sentence is to be added to the second paragraph, "The switching device should be qualified for switching reactors and its characteristics should be known in order to evaluate reactor overvoltage stresses caused by switching.

- B.6.0: Heading to be changed to read "maximum switching transient overvoltage."

    - Delete the first sentence of the first paragraph and replace with, "The following are maximum overvoltage levels that shall not be exceeded unless agreed upon by the user and manufacturer."
    - Replace the last three words of the last sentence of the first paragraph with, "has been considered."

(viii) B.3.1: The following statement to be added below the chopping numbers, "Vacuum circuit breakers are commonly used to switch shunt reactors connected at distribution voltage class levels." Chopping numbers for these breakers are not available.

- Two other requests for change that were not adopted were as follows.
- B.3.1: Air blast and min. oil breakers are not being used for new installations and hence chopping numbers for these are no longer relevant.
  - The values were retained in the text since some utilities use older in stock breakers for new installations.
- B.6.0.1: SIWL for solid insulation, bushings for example is only approximately 70% of rated BIL., not 83% of BIL as proposed.
  - Consensus at the meeting was to retain the 83% figure for simplicity and since other factors for "aging" and "margin" were also included.
- No further discussion or new business was raised. The meeting adjourned at approximately 11:50 a.m.

9.10 3.4 WG Dry Type Test Code C57.12.91 D. Barnard

- The chairman was unable to attend and Tim Lewis conducted the meeting
- Tim advised the members that IEEE will send them copies of the recently approved Standard.
- Active business items were not able to be addressed due to lack of attendance by the key assignees
- No new business was discussed.

9.10.4 Chairman's Remarks and Announcements - W. Patterson

- **Paulette Payne** reported on the status of the PC57.12.59/D4.0
  - This standard was withdrawn and could not be balloted for reaffirmation. It is being balloted as though it is a new standard.
  - The ballot had 94% affirmative with 3 negatives and was sent to REVCOM for approval
- W. Patterson reiterated the need for all members wishing to participate in the balloting process to ensure their email address at IEEE

- See http://standards.ieee.org/db/balloting
- After the meeting a requested help as he has no access to email but still would like to participate in the balloting process. A possible was made as follows:
  - Go to a local library with free internet access
  - Setup a free email account
    (ex: Microsoft Hotmail www.hotmail.com)
  - Go to www.ieee.org and setup an email alias account to shield against maintenance required when the email account changes

- W. Patterson reiterated the need for anyone wishing to participate in a ballot to
  - Be a member of the Standards Association
  - Have an email address

9.10.5 New Business - W. Patterson

- Mike Mitelman requested that IEEE prominently indicate on a ballot if it is being balloted for the Working Group or to become a Standard in order to assist in prioritizing the review process. The Subcommittee generally felt this would be an improvement

9.10.6 Adjournment - W. Patterson

- The meeting was adjourned at 10:15 am

9.11 Distribution Transformers – Ed Smith

Meeting Time:3:00pm, Wednesday, October 17, 2001

Attendance: 50 Total

38 Members

12 Guests

4 Guest Requesting Membership

9.11.1 Chair's Remarks & Announcements:

The chair's remarks and announcements are not produced in entirety here as some of the information is covered in other parts of these minutes.

New Standards Added to Distribution Transformer Subcommittee:

Due to the Joint Copyright issue and agreement between IEEE and NEMA the following Standards have been included under the Distribution Transformer Subcommittee umbrella.

ANSI C57.12.28 – Pad-Mounted Equipment Enclosure Integrity.

ANSI C57.12.29 – Pad-Mounted Equipment Enclosure Integrity for Coastal Environments.

ANSI C57.12.31 – Pole-Mounted Equipment Enclosure Integrity.

ANSI C57.12.32 – Submersible Equipment Enclosure Integrity

9.11.2 Working Group Reports

9.11.2.1 C57.12.20 Single Phase Pole Mounted Distribution Transformers

(Copyright: IEEE/**NEMA**)

Alan Wilks & Glenn Andersen Co Chairs

(awilks@ermco-eci.com & gwanders@duke-energy.com)

Current Standard Date: 1996

Current Draft Being Worked On: #VI Dated September 2001

Meeting Times: 9:30am, Monday, October 16, 2001

Attendance: 40 Total

20 Members

20 Guests

Issues, Remarks & Announcements:

Glenn handed out Draft VI dated September, 2001, along with a 37 point list outlining the changes made in Nashville, Niagara Falls and changes made by himself while reviewing the document. The W.G. reviewed each of the 37 points and either agreed with them or made a few minor corrections. The location of TC's & DV's switches was discussed and changed to the current unwritten standard location.

Paragraph 6.1.3.3 was discussed in detail and it was decided to strike the last sentence stating "The HV & LV neutrals shall be connected internally by a link that is accessible and capable of being reconnected". This was a safety issue since the Ho & Xo bushings are insulated and should not be connected together internally. All metrification issues were deferred until after Dudley Galloway's Tutorial. The next step will be to create a Draft VII using the IEEE template and the changes as discussed in this meeting. After a review period, Draft VII will be sent for a Transformer Committee Ballot.

A PAR for this document has been sent to IEEE for renewal. This will be reviewed at the Dec. 14 IEEE meeting.

9.11.2.2 C57.12.23 Single Phase Submersible Distribution Transformers

(Copyright: **IEEE**)

Al Traut & Roger Lee Co Chairs

(alant@keco.com & leerj@sce.com)

Current Standard Date: 1992, Reaffirmed 1999

PAR Approved 3/18/1999 (For Standard Revision)

Current Draft Being Worked On: #4

Meeting Time: DID NOT MEET

Issues, Remarks & Announcements:

The WG did not meet this week. The last meeting was in Niagara Falls, October 2000. Since that time the chairs have been finalizing the draft for IEEE ballot. The draft, D4, has successfully passed the scrutiny of the IEEE editors and the PAR has been revised to reflect the changes in title and scope. IEEE is in the process of forming the balloting pool for an electronic ballot. The next meeting will be in Vancouver to review the results of this ballot.

9.11.2.3 C57.12.25 Single Phase Padmounted Distribution Transformers

(Copyright: **IEEE/NEMA**)

Ali Ghafourian & John Lazar Co Chairs

(ali.ghafourian@us.abb.com & john.p.lazar@nspco.com)

Current Standard Date: 1990

PAR Approved 12/08/1998 (For Standard Revision)

Current Draft Being Worked On: #VIII

Meeting Times: 1:45pm, Monday, October 15, 2001

Attendance: 33 Total

21 Members

12 Guests

Issues, Remarks & Announcements:

Draft VII of the standard have been balloted in 1999 with 7 negative votes. All negative votes have been resolved except for one. The negative vote is related on having a dual BIL on 19900 Voltage. The attempt was made to resolve the negative vote without success.

A copy of Draft VIII was distributed in the WG. All 7 negative votes were reviewed in the WG. The WG decided to go ahead for the publication of Draft VIII without resolving the one negative vote.

Under the new business, it was agreed to start working on combining .21 & .25 standards. The WG voted and agreed to expand the scope of the combined standard to include 250 KVA size and increased the L.V. to 600 volts and below.

9.11.2.4 C57.12.33 Guide For Distribution Transformer Loss Evaluation

(Copyright: **IEEE**)

Don Duckett & Tom Pekarek Co Chairs

(don.duckett@fpc.com & tjpekarek@firstenergycorp.com)

Current Standard Date: NEW Standard Under Development

PAR Approved 6/25/1998 (For Standard Development)

Current Draft Being Worked On: #8 Dated N/A

Meeting Time:11:00am, Tuesday, October 16, 2001

Attendance: Total of 49 members and guests

Issues, Remarks & Announcements:

After introductions of attendees, draft 8 of the guide was distributed. This draft incorporates the changes discussed at the last working group meeting.

Draft 7 had been balloted by IEEE with 6 negative votes. Three were related to clause 6, which is an excerpt from NEMA TP 1 covering non-loss evaluation procedures.

The working group agreed to incorporate the revised tables into draft 9. The draft and copies of the negative ballots (with associated correspondence) will be sent to working group members. The same data will then be sent to IEEE for recirculation of the document for completion of the balloting process (there were sufficient ballots returned and sufficient affirmative ballots to publish the guide).

9.11.2.5 C57.12.34 Three-Phase Padmounted Distribution Transformers

(Copyright: **IEEE**)

Ron Stahara & Steve Shull Co Chairs

(rjstahara@msn.com & sshull@empiredistrict.com)

Current Standard Date: NEW Standard Under Development

This NEW Standard is a combination of the following two Standards 57.12.22 1989 (Three-Phase Padmounted Distribution Transformers with H.V. Bushings) (Copyright

ANSI) C57.12.26 1992 (Three-Phase Padmounted Distribution Transformers with Separable Connectors) (Copyright ANSI)

PAR Approved 9/21/1995 (For Standard Development) The PAR extension expires 2000

Current Draft Being Worked On: #8

Meeting Time: 3:15pm, Monday, October 15, 2001

Attendance: 33 Total

21 Members

12 Guests

Issues, Remarks & Announcements:

Ron Stahara asked Steve Shull, his co-chair, to review the status of this standard. Steve stated that this standard was the second standard that was processed as an electronic ballot. Because of this, there were a lot of challenges to overcome. IEEE reported the final balloting results to Steve. The balloting group was formed of 87 people. To have a successful ballot, there must be 75% of the total group returned. There were 29 ballots returned, 27 affirmative and 2 negative. This is 37 short of a successful ballot. A discussion ensued concerning the ballot returns. A number of the members were concerned that even though they had returned the ballot and IEEE confirmed it by Email reflection, their ballots had not been shown on the summary from IEEE.

9.11.2.6 C57.12.35 Bar Coding For Distribution Transformers

(Copyright: **IEEE**)

George Henry Chair

(gehenry@centralmoloneyinc.com)

Current Standard Date: 1996

Current Draft Being Worked On: NONE

Meeting Time: ***DID NOT MEET THIS SESSION***

Issues, Remarks & Announcements:

This standard carries a 1999 date; AND will be sent out for reaffirmation.

9.11.2.7 C57.12.36 Distribution Substation Transformers

(Copyright: **IEEE**)

John Rossetti & Leon Plaster Co Chairs

(jrossetti@mlgw.org & leon.plaster@us.abb.com)

Current Standard Date: NEW Standard Under Development

Current Draft Being Worked On: #1 Dated March 31, 2000

Meeting Time: 1:45pm, Tuesday, October 16, 2001

Attendance: 32 Total

12 Members

20 Guests

Issues, Remarks & Announcements:

The working group for Distribution Substation Transformers (C57.12.36) met on Tuesday, 10/16 at 1:45 P.M. In total there were 32 people in attendance, 12 members and 20 guests.

The PAR will be submitted by October 26th. This will also be in conjunction with the PAR for C57.12.10.

The prior PAR request was rejected with the reason being, that there wasn't a clear distinction between the scopes of C57.12.10 & C57.12.36. Both of the PAR requests have been revised to eliminate any product overlap and the titles will be as follows:

C57.12.10 – standard requirements for liquid immersed power transformers

C57.12.36 – standard requirements for liquid immersed distribution substation Transformers

One of the objectives of this standard is to create a section that addresses equipment coordination.

9.11.2.8 P1338 Electronic Reporting of Test Data

(Copyright: **IEEE**)

Rich Hollingsworth & Jerry Smith Co Chairs

(rhollin@howard-ind.com & jwsmith@southernco.com)

Current Standard Date: Published under IEEE Std. 1388-2000

Current Draft Being Worked On: N/A

Meeting Time: 11:00am, Wednesday, October 17, 2001

Attendance: 17 Total

6 Users

11 Manufacturers

Issues, Remarks & Announcements:

Status of Standard: It is published under IEEE Std. 1388-2000 PAR has been applied for and granted to move document to C57.12.37, along with modifying various data fields and possibly adding more defined fields.

Action Items:

1)Survey taken on the number of users taking advantage of the standard

2)Discussion of, and adjustment to field descriptions of both the "standard data set" and the "extended data set".

3) Further definition of the information to be used in 2 data fields will be required

Open Action Item:

Paragraph 4.3.9 – Types of insulating fluids

We will investigate the general types of fluids (i.e. sc insulating fluids, NEC & Factory Mutual) and reference the proper terminology in the spec.

9.11.2.9 C57.15 Step-Voltage Regulators

(Copyright: **IEEE**)

Open & Craig Colopy Co Chairs

(Open & ccolopy@cooperpower.com)

Current Standard Date: C57.15 – 1999 – Published April 2000

Current Draft Being Worked On: See Below

Meeting Time: : 3:15am, Tuesday, October 16, 2001

Attendance: 26 Total

9 Members

17 Guests

8 Requested Membership

Issues, Remarks & Announcements:

Tom Diamantis is retiring and is relinquishing his co-chairman position. We will be pursuing a replacement from the user side

C57.15 – 1999 – Published April 2000

PAR was established July 2000, approved December 2000

PAR will be revised to change C57.15 representative due to Tom Diamantis retirement

Items to be investigated by C57.15 working group

Dimensions to be fully metric

Update to the latest references documents and standards including C57.12.00 and C57.12.90

Raise add-amp limit from 668 amps to 875 amps

Removal of references to 55 °C rating and establish 65°C windinG, rise as Standard

Add bushing terminal connector sizes per rated current of 669-1200 amps

Update of tables of preferred ratings

Clarification of Type A and Type B designs and their resulting voltage regulation

Address application of Type A and Type B regulators in an annex

Draft I will be issued to WG before next meeting

9.11.2.10 C57.12.28, .29, .31 & .32 Standards are reviewed and revised NOW under the IEEE Transformer Committee umbrella)

Bob Olen with Cooper Power Systems is the Chair for these four Working Groups. Bob Olen, Cooper Power Systems, P. O. Box 100, Franksville, WI, 53126, Tel: 262-835-3362, rolen@cooperpower.com

9.11.2.10.1 C57.12.28 Pad-Mounted Equipment Enclosure Integrity

(Copyright: IEEE/**NEMA**)

Bob Olen Chair

Current Standard Date: 1999

Discussed alternative corrosion tests

Issue related to PENTA Bolt Drawing

PAR to be submitted to convert to IEEE Std.

9.11.2.10.2 C57.12.29 Pad-Mounted Equipment Enclosure Integrity For Coastal Applications

(Copyright: **NEMA**)

Bob Olen Chair

Current Standard Date: 1999

No discussion

PAR to be submitted to convert to IEEE Std.

9.11.2.10.3 C57.12.31 Pole Mounted Equipment Enclosure Integrity For Coastal Applications

(Copyright: **NEMA**)

Bob Olen Chair

Current Standard Date: 1996

Working Group voted to reaffirm Oct. 2000

NEMA Secretariat notified Nov. 2000

No action taken to reaffirm

PAR to be submitted to convert to IEEE Std.

9.11.2.10.4 C57.12.32 Submersible Equipment Enclosure Integrity For Coastal Applications

(Copyright: **NEMA**)

Bob Olen Chair

Current Standard Date: 1994

Revision balloted to WG & NEMA main committee

No action taken since Oct. 2000 due to NEMA C37 problem

PAR to be submitted to convert to IEEE Std.

9.11.3 Subcommittee Old Business:

NONE

9.11.4 Subcommittee New Business:

NONE

9.12 Dielectric Test Subcommittee - L.B. Wagenaar, Chair

The Dielectric Test Subcommittee (DTSC) met on Wednesday, October 17, 2001, at 1:30 p.m., in Orlando, Florida, USA at the Rosen Centre Hotel, with 43 members and 44 guests present. 11 of the guests requested membership on the Subcommittee. They include: Jeffrey Britton, Larry Coffeen, Tom Harbaugh, Roger Hayes, Thang Hochanh, Dave Kendrick, Sheldon Kennedy, Vladimir Khahlin, Mike Mitelman, Thomas Traub and Albert Walls.

9.12.1 Chair's Remarks

After introduction of the attendees, the Chair reviewed some of the highlights of the Administrative Subcommittee meeting held on October 14, 2001. (See Section 4.0 of IEEE/PES Transformer Committee meeting minutes from the Amsterdam, Netherlands meeting for additional details of the Administrative Subcommittee meeting).

The chair's remarks and announcements are not produced in entirety here as some of the information is covered in other parts of these minutes.

In the future all of the DTSC minutes, agenda and other correspondence will be sent via e-mail. It is very important that we get your correct e-mail on the DTSC membership roster.

The secretary will review the attendance at the past four meetings to see who has not been attending the meetings. Those who have not been attending will be sent a letter thanking them for their past participation but will be told that they are being removed from the membership roster unless they specifically request to stay on the list.

The minutes of the meeting held on April 17, 2001 in Amsterdam, Netherlands were approved as written.

9.12.2 Working Group Reports

9.12.2.1 Working Group on Partial Discharge Tests in Transformers - J.W. Harley, Chair

21 members and 23 guests attended the meeting.

Minutes of the previous meeting April 10, 2001 in Amsterdam, The Netherlands were approved.

Discussions continued on the Guide for the Detection and Location of Acoustic Emissions from Partial Discharges in Oil-Immersed Power Transformers and Reactors. The Working Group was split into four subgroups led by Alan Darwin, Ron Daubert, Mark Perkins and Hem Shertukde. My thanks to them and the other participants for a highly productive meeting. Sections on basis acoustic PD systems, specifications, field and shop testing and characterization of signals were reviewed.

Comment of Chair: The tutorials or seminars slots are filled for the next meeting in Vancouver, BC, but at a future meeting the working group should give a seminar on what they have done in developing the guide.

9.12.2.2 Working Group on Revision of Low Frequency Tests - Mark Perkins, Chair

The working group met Monday, October 15, 2001 at 3:15 PM with 17 members and 31 guests present. 10 people applied for membership in the working group. After the introduction of members and guests, the minutes of the last meeting in Amsterdam were approved.

The chairman then reviewed the results of the survey on changes to C57.12.90 that was conducted. The survey, which consisted of four separate items relating to low frequency dielectric tests, was e-mailed to 130 members of the dielectric test subcommittee and working group on low frequency tests. 31 responses were received. The working group reviewed the results and approved the following actions:

Item 1, on the question of removing note on Section 4.3 of C57.12.90, received 18 yes votes, 11 no votes, and 2 abstained. Based on the number of people who wanted the note to remain, it was unanimously agreed to leave the note in the standard. Possible changes in the wording will be considered in future meetings.

Item 2, on the instructions for control wiring dielectric test, 23 people voted yes, 6 voted no, and 2 abstained. It was agreed unanimously to change the duration of the test from a "maximum of 1 minute" to "1 minute". It was also unanimously agreed that the test could be performed at either 50 or 60 Hz. The group agreed that it did not matter if the test was done at 50 Hz or 60 Hz.

The working group considered Loren Wagenaar's request to lower the test voltage to 1000 v for contacts not rated for tripping; however, this was not accepted by a vote of 4 in favor, 40 opposed.

Item 3, on 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 the section in an annex rather than in the body of the standard since it is more of a guide than a standard.

Item 4, on changes in the table for power factor temperature correction, the vote was 14 yes, 10 no, and 5 abstained. Since the majority of negative votes addressed the reasons for having separate correction factors for EHV transformers and power transformers, it was proposed and agreed to eliminate the column for EHV transformers and use the correction factors of power transformers for all power transformers, including EHV.

A new survey will be prepared with the above recommended changes and sent to the working group and subcommittee for comments. Justification for the new power factor temperature correction factors will be included.

The working group adjourned at 4:40 PM.

9.12.2.3 Working Group on Revision of Impulse Tests - Subhash Tuli, Chair

The working group on Revision of Impulse Tests met on October 16th at 3:15 PM. Thirteen members and 6 guests attended this meeting. After introduction status of various standards related to Impulse tests were discussed.

Status of IEEE Std. C57.98-1993, "Guide for Transformer Impulse Tests"

This guide was reaffirmed in 1998 with minor additional changes The PAR for this standard had expired during 1995. There is an urgent need to return this document to active status and the PAR needs initiation before the next meeting. During the meeting upon request by the WG chair, Arthur Molden volunteered to chair the task force meeting to start working on this guide towards its completion.

Status of IEEE Std. C57.12.00: "Standard General Requirements for Liquid-Immersed Distribution, Power and Regulating Transformers

WG chair urged all the attendees to offer their comments concerning any areas for enhancement/improvements of the contents of this standard so that the new items of interest to all users can be added to the next revision of this standard.

Status of IEEE Std. C57.12.90, "Standard Test Code for Liquid Immersed Distribution, Power and Regulatory Transformers"

During the last revision of this standard, the requirement of up dating the state of the art impulse wave measurement WMF Digitized Technology for recording and analysis are at most required. The enhancement of this clause related to impulse wave measurement is a top priority of this WG. A need to add voltage and time tolerances for chopped and switching impulse waves were also discussed along with few details of amplitude after the impulse wave is chopped. Slope of the chopped wave upon flashover also needs to be looked into and needs to be discussed at all approval levels.

WG chair requested another volunteer as a Task Force chair to lead the revision of Impulse Test for Standard C57.12.00 and C57.12.90. Pierre Riffon volunteered to chair this task force.

Pierre Riffon already presented several tutorials in the past WG meetings which is the scope of this subject.

Several items of new Impulse Test requirements were also discussed during the meeting. There is also our urgent need to update measurement techniques and evaluation of normal and abnormal recordings during transformer impulse tests.

The chair will also initiate a new PAR for the revision on Impulse Guide C57.98-1993. This guide will cover present changes in the other standard and stay in line with the revision of C57.12.00, C57.12.90 and changes in impulse tests.

9.12.2.4 Task Force on Liquid-Filled Transformers Dielectric Test Tables - Phil Hopkinson, Chair

There were 23 members and 22 guests, 10 of which desired new memberships, for a total of 45 people in attendance.

The purpose of this working group is to revise the dielectric test tables of C57.12.00.

The chairman reviewed the following documentation:

- Minutes of Amsterdam
- Decisions from Amsterdam as reflected in the changes in the draft
- The present charts as they exist

Then WG has an extended discussion of the test levels for repaired transformers. This discussion is a carryover from Mark Perkin's work in C57.12.00 and its proposal to use the 75% value in testing re-worked transformers. The value is at odds with the views of others in WG 57.12.00 and 57.12.90. They suggest this level should be at 85% level. The WG has agreed to look more deeply into this matter and to take it up in Vancouver, BC meeting.

One of the issues discussed was proposing "preferred test levels". There is a mixed response to the proposal given, it was noted that the existing C57.12.00 document does implacably direct the reader to preferred values. WG agreed to study this requirement in great detail.

Members agreed to survey the entire WG for additional comments on the current draft tables. This survey is intended to identify any existing major issues to be added before submitting the document to a formal WG ballot.

The meeting was adjourned at 3:10 PM.

Comment of Chair: Recommended that the entire subcommittee be surveyed.

9.12.4 Liaison Reports

9.12.4.1 Insulation Coordination – John Crouse

(No report)

9.12.4.2 Surge Protection Devices – Bob Degeneff

(No Report)

9.12.4.3 IEC TC14/WG24 – Loren Wagenaar

The Chair had reported at the last meeting in Amsterdam that the WG was to meet in September 2001 but the meeting is actually scheduled for 2002. The Chair has the latest revision of the IEC Impulse Guide. Anyone interested in a copy please request it from Loren Wagenaar.

9.12.4.4 High Voltage Test Techniques (HVTT) – IEEE Standard 4

Arthur Molden - Liaison

The last meeting of the working Group was held in West Palm Beach, Florida, USA on April 9-10, 2001, with 16 members present. The main topics discussed at this meeting were the membership policies with a view to establishing a common and consistent membership policy. A request was made to the Liaisons present to provide a copy of the respective groups membership policy and membership eligibility forms. IEC activities require that all HVTT members become a TAG member, the annual cost is $250.

The latest draft of IEC Standard on Sphere Gaps (IEC – 600052) was reviewed section by section with the purpose of harmonizing the sections of Standard IEEE-4 that deal with Sphere Gaps. Two round robin tests will be completed to obtain test data from various sites. This project has been under way for several years.

Impulse round robins will also be done, the equipment requirement for these tests is complete and testing will starting at NRC in Canada. It is still possible to add test site to this test series, and those interested should contact A. Molden.

Two Liaison members were present at the meeting (Mel Smith – Switch Gear Committee and Arthur Molden – Transformer Committee). M. Smith reported that the Switch Gear Committee is referencing IEEE-4 in the IEC document.

Arthur Molden opened the discussion on altitude correction factors. This issue was not new to the members of the WG and there was a strong consensus that the present method of gradually

applying approximately 1% per 100 meters above 1000 meters is the correct way to apply the correction factor.

The other question raised was if there was any work currently being done in that area of digital measurement of partial discharges. A. Molden reported that there is a WG working on a guide for the detection and location of acoustic admission of PD. He will update the members at the next meeting on this subject.

The main work completed at this meeting of the HVTT was the review of a T&D paper that compares IEEE-4, 1978 with IEEE-4, 1995. It also compared IEEE-4 1995 to the present IEC 60-1 and 60-2. The result of this review by the group will be presented at a panel session. This paper will be the basis of a revision of IEEE-4. It was suggested that the members of the Transformer Committee review IEEE-4 and send comments on its revision to A. Molden by e-mail (a.molden@IEEE.org). A. Molden, along with two other members will be looking at the sections of IEEE-4 that concern impulse testing for the revision.

The meeting was adjourned at 2:00pm on April 10, 2001.

Comments: Subcommittee members were requested to review the old C57.98 (Impulse Test Guide) and be prepared to discuss revisions to the document at the Vancouver, BC meeting. A. Molden also requested that manufacturers and users provide oscillograms of certain types of faults that have occurred during impulse testing. These will be placed in the new guide as a reference. These new oscillograms will replace the old Polaroid photos in the old guide.

9.12.5 Old Business

9.12.5.1 Altitude Correction Factors – A. Molden

As reported above, the working group of IEEE-4 is in favor of keeping the present method of applying the altitude correction factors. This current method is to use a correction factor at 1000 meters of 1.0 and de-rate the correction factor from there. It was noted that the relative air density factors have been used for a long time without any known problems with this correction factor. The Chair made a motion that he write a letter to the Main Transformer Committee recommending that the altitude correction factors do not change, that is, the correction will start at 1000 meters with the value of 1.0 and be de-rated from there. The motion was past by the subcommittee.

9.12.5.2 Phase to Ground Clearances – Bill Chiu

Subhash Tuli and Bill Chiu have been working on phase-to-ground clearances.

Bill Chiu presented a table and chart that compared the phase-to-ground clearances from several different sources (see attached 2 pdf files). There is a fair amount of inconsistency in the different sources of data. The reason that B. Chiu and Subhash Tuli started gathering this type of data was to develop a new Table in C57.12.00 that shows phase-to-ground clearances. It was decided by the Subcommittee that this type of table was needed.

It was pointed out that that there were inconstancies between NEMA TR-1 and IEEE C57.12.00 for 230 kV class transformers. It was felt that these type of inconsistencies need to be addressed

in any new table that is developed. L. Wagenaar was a member of the original WG that developed the information for Table 13. He has some of the old documentation on the development of these tables that he will review. There are also inconsistencies between IEC 76-3 and IEEE Table 12. It was requested that B. Chiu add the NESC (National Electric Safety Code) clearances to his data. This will be reviewed at the next meeting in Vancouver, BC. It was pointed out that the NESC clearances are for personal safety and not design of equipment.

9.12.6 New Business

9.12.6.1 Frequency Response Measurements - FRA

Background

The Main Transformer Committee received a request from a transformer manufacture for the Committee to review the need to develop standards for conducting frequency response measurements (FRA). This subject was discussed at the Performance Subcommittee.

Meeting Discussion

The feeling of the Chair was that this request should be handled by the Performance Subcommittee. It was pointed out that this test is really an impedance test and belongs in the PSC, Chaired by Don Fallon. The feeling of PSC was that since it also involves dielectric testing methods that PSC would like to have input on this subject from the DTSC. It was the feeling of the PSC that the FRA test is still in the developmental stage and that more data is needed to improve the interpretation and make the data more meaningful. It has been proposed that this FRA subject be introduced at the Main Transformer Committee meeting and that if there is interest that a Discussion Group be assembled at the meeting in Vancouver, BC. The purpose of this Discussion Group will be to plot a course of action on this issue. It is that intent that the Discussion Group will be on the meeting agenda for the next meeting.

9.12.6.2 Other Business

Tutorials: There are a couple possible tutorials that could come out of Jack Harley's and Mark Perkins' Working Groups. One possible one could be Digital Recording Devices. Please let the Chair know of any good subjects that could be presented in future meetings.

There being no new business the meeting was adjourned at 2:45 pm.

Minutes submitted by Michael Franchek

10.0 Reports of liaison representatives

10.1 EPRI – B. Ward

Memorandum

October, 2001

TO: Mr. Ken Hanus

Secretary, IEEE Transformers Committee

TXU Electric & Gas

PO Box 970

Fort Worth, TX 76101

FROM: Barry Ward, Manager, Power Transformers

SUBJECT: **EPRI LIAISON REPORT**

The following report is for inclusion in your minutes for the October, 2001 meeting in Orlando:

1. Moisture Dynamics:

   Very rapid load changes can cause bubble formation under some conditions and reduce low frequency and impulse dielectric strength by 40%. This has been demonstrated in models with rapid/high overload.

   Additional work has been completed to experimentally study moisture dynamics associated with rapid overloads and cool-down cycles plus detect inception of partial discharges caused by bubble evolution. Moisture moves away from the hot conductor fast and returns very slowly after cool-down. Distribution of moisture in the solid insulation was found to be very uneven and time to dissolve free water is very long. TR-113390, *Power Transformer Behavior During Overload - Phase I: Dynamic Behavior of Moisture,* is now published. Phase II has been completed to study the correlation between moisture-in-oil with moisture-in-paper for a range of conditions and temperature cycles using winding models with moisture contents ranging from 0.5% to 7.0% in paper and pressboard. Phase III started 1/99

to broaden the experimental work and include prototype field applications of a dynamic moisture assessment method on operating conservator-type core-form transformers. TR-114075, *Transformer Moisture-In-Paper Assessment Method – Field trial,* is published. An algorithm has now been developed and is described in report number 1000724, *Green-Yellow-Red Diagnostic Method: Transformer H2O Assessment Method* It describes the Transformer Moisture Monitor, a stand-alone software application for the assessment of moisture conditions in the insulation system of a core-form conservator power transformer. Further experimental work covering nitrogen-blanketed and shell-form transformers are in process. Field trials are underway at three utilities. Two involve long-term on-line continuous assessment; the third is a dry-out experiment.

2. High Voltage Instrument Transformers & Bushings

EPRI sponsored a workshop 9/90 to provide a forum to compare and categorize failure information, failure modes and potential mitigation measures. This was an outgrowth of the Transformers Committee roundtable in Washington, DC, 4/88. Proceedings, TR 100205, were published. A Project was completed to study fast disconnect switching transient effects on HVCTs. Mathematical modeling was checked experimentally through laboratory tests and switching tests in a 500 kV substation with very high speed instrumentation. Effects of switching resistors during disconnect switching has been studied and found to reduce bus transients and stresses by up to 80%. A final report is published, TR-104961.

A project has been completed to monitor a large number of HVCTs and bushings in laboratories and in service, including on-line tan delta, partial discharge (pd) and other available monitoring methods. Units are being tested to failure to evaluate failure modes, sensitivity of monitoring and to develop "end-of-life" criteria for interpretation of field monitoring data.

A Symposium: *HVCTs & Bushings – Failure Prediction & Prevention,* was held September 22-24, 1999 in Portland, Oregon. Proceedings, TR-113649, are published. At this time, three different failure detection methods are being tried at three different utility sites. These are: an electrical pd method for detecting internal pd, on-line and without taking an outage, an acoustic pd system for measurements in the field, and an on-line tan delta system being evaluated under field conditions but with accelerated aging.

3. Power Transformer Loading Software PTLOAD

EPRI's Power Transformer Loading program (PTLOAD 5.1) calculates transformer oil and winding temperatures, thermal ratings, insulation loss-of-life, and the likelihood of gas bubble formation. The calculation methods, which incorporate user-specified load and air temperature, are based on the IEEE C57.91-1995, "Guide for Loading Mineral-Oil-Immersed Transformers" as well as the IEC Standard 354, "Loading Guide for Oil-Immersed Power Transformers." It provides a convenient way for substation engineers to plan a full, yet safe, loading of power transformers under a wide variety of operating conditions. PTLOAD Version 6.0 is under development. It will expanded functionality to include a means of generating 24-hour load and temperature files by a probabilistic derivation from actual measured data over a long period of time (e.g., a month). This will give the code a more

accurate basis on which to calculate ratings. Version 6.0 will also include a three-winding (dual secondary) transformer model. The software is currently in beta test.

4. Dynamic Thermal Circuit Ratings - DCTR

This project involves all transmission components including power transformers regarding software development and a field test involving two substations on a utility system. The field test has been completed. A final report is published, TR-105421. An IEEE paper, 94 SM 473-9 PWRD, was presented at the IEEE/PES 1994 Summer Meeting in San Francisco. A second paper, "Field Application of a Dynamic Thermal Circuit Rating Method", was presented at the IEEE/PES 1996 Winter Meeting in Baltimore. The method has been extended to include transmission lines. DTCR 2.0 is available to EPRI Substations Asset Utilization, Overhead Transmission, and Underground Transmission Target members. DTCR 2.1 is being developed to add the IEC transformer thermal model and other refinements. It uses the PTLOAD engine and future enhancements to PTLOAD will be included in DTCR.

5. On-Line Transformer Condition Assessment – Green / Yellow / Red

This project is a continuation of earlier EPRI efforts to develop an on-line low cost gas analyzer that were abandoned because of baseline drift of the sensors. A "key gas" analyzer uses metal-insulated-semiconductor (MIS) sensors to monitor individual ppm for hydrogen, acetylene, ethylene and carbon monoxide. A field demonstration program that involved 40 prototypes, starting October 1993, was completed in 1996. An EPRI/Micromonitors/Sandia National Labs collaborative project was initiated 2/99 to solve technical problems that have delayed commercial production of the MIS sensors. An alternative 8-gas analyzer for nitrogen-blanketed transformers has been developed and is now commercially available. A prototype version suitable for conservator-type transformers began a successful field trial May, 2000, and is now commercially available. Current work at Sandia National Labs will first concentrate on producing a complete model for a hydrogen only sensor with lab verification. The feasibility of an acetylene sensor will also be studied.

Experimental work is in process to identify the dynamic behavior of gases and other byproducts associated with loading and internal problems. Early results show that gases are developed in the form of tiny bubbles that *are not* quickly absorbed into the oil, including gases with high solubility such as acetylene. Knowledge developed will be used in the development of fuzzy logic expert system modules that can provide Green-Yellow-Red indication of transformer operating condition. Report number 1000726, *Dynamic Behavior of Gases and Chemicals & On-Line Monitoring of In-Service Transformer: Laboratory Transformer Simulation Experiments & Field Trials* was published December, 2000. Further field trials are underway.

6. Power Transformer Remaining Life Prediction & Extension

Furaldehydes in Transformer Oil

A project has been in place since 1994 to develop a correlation between furaldehydes in oil samples with degree of polymerization (DP) found in paper insulation samples

taken from a significant number of transformers in service. Additional laboratory experimental work has identified trace chemicals that are an early indication of insulation degradation and could be sensed through on-line monitoring. A report is being written.

Frequency Response Analysis (FRA)

A project has been in place since 1994 to develop a correlation between existing winding conditions and FRA tests before and after internal inspection and reclamping of the same transformers. The objective was to develop noninvasive field test methods and criteria that can be used to predict winding condition in the broad variety of existing power transformers without entering the transformer. Over 40 transformers have had the initial FRA and internal inspection, and over 20 have had the follow-up FRA test. Results have been applied to assess the condition of a number of core-form and shell-form transformers. Recent co-sponsored experiments on a retired 345kV auto-transformer comparing the swept-frequency method and the impulse method were presented at the EPRI Substation Equipment Diagnostics Conference VIII held in New Orleans, February 21-23, 2000 (*Proceedings: Substation Equipment Diagnostics Conference*, EPRI 1000124, June 2000). A variety of problems were introduced individually. In general the study showed that both methods, properly applied, are effective and give similar results. Current work includes the field assessment of the in-situ, on-line impulse technique and the off-line swept frequency method to determine the feasibility of comparing signatures from one technique with signatures from the other, for the assessment of winding movement. Additional field tests were performed in August, 2001 and a report will be available at the end of the year.

7. Transformer Expert System - XVISOR

Objective of this project is to capture the knowledge of transformer experts and make it usable in an off-line software tool for evaluation of transformer design questions, condition assessment, problem diagnosis, and identification of maintenance needs. XVISOR Version 1.0 is available to EPRI Substations O&M members. An LTC module for this software has been developed and has just completed beta test. The software has been submitted for EPRI software quality testing and will be available by the end of November, 2001.

8. Guidelines for Life Extension of Substations

These guidelines, now published in Final Report TR-105070 dated April 1995, include a large section on transformer inspection, condition assessment, testing, and maintenance practices. An extensive update and extension, *Guidelines for the Life Extension of Substations (CD-ROM Version)*, EPRI 1000032 is now available to O&M members.

9. Low Maintenance LTC

Work is completed to identify and categorize specific LTC problems, causes and populations involved; evaluate existing mitigation measures; and identify R&D needed to achieve substantial reduction in LTC maintenance requirements. A workshop was held November 1996 in Tampa, FL. to provide a forum for discussion of LTC problems /

maintenance / and ways to improve reliability and reduce maintenance. Proceedings were published in TR-108398 dated June 1997. Two EPRI projects to improve understanding of contact coking, oil filtration effectiveness and monitoring concepts were recently completed. Further work is on going regarding coking, filtration, contact material effectiveness, the development of oil characteristic signatures for normal and abnormal operation, and novel methods for on-line monitoring. Two reports are being written and will be available at the end of the year.

10. Continuous On-Line Oil Filtration

The objective is to develop or adopt technologies for a passive on-line filter for mounting on transformers to continuously remove moisture, oxygen, and oil degradation products to keep oil in pristine condition and thus retard the aging of the cellulose insulation. Laboratory experimental work has been completed. Full-scale simulation tests are in process, and a field demonstration is underway. A patent for a special purpose filter designed for the removal of moisture, oxygen, and certain other chemicals has been allowed and will be issued soon. The next step will be commercialization.

11. Environmentally Acceptable Transformer Oils

Objectives are to 1) review the state-of-the-art of dielectric fluids, 2) perform laboratory tests & simulations on available candidate fluids for transformer application, and 3) demonstrate promising fluids in operating transformers. Laboratory tests & simulations have been completed on 12 candidate fluids. Report number 1000438, *Environmentally Acceptable Transformer Fluids: Phase I State-of-the-Art Review; Phase II Laboratory Testing of Fluids* was published December, 2000

10.2 SCC4 - P. A. Payne

No report was provided for the minutes.

10.3 TC 14 TAG - P. J. Hopkinson

TECHNICAL ADVISORY GROUP

ON TC14 (Power Transformers)

Place of Meeting:	Rosen Centre Hotel
	Orlando, Florida
Date & Time:	Tuesday, 16 October 2001
	8:00 AM

INTRODUCTIONS

Members Present

C. Colopy	Cooper Power Systems
J. Foldi	ABB Inc, (Canada) Liaison

J. Gauthier	NEMA
B. Henning	Waukesha Electric Systems
P. Hopkinson	Square D Company
R. Nordman	Waukesha Electric Systems
W. Patterson	ABB T & D

Members Absent

C. Bush	PEMCO
J. Cockran	Cooper Power Systems
R. Del Vecchio	North American Transformer
D. Foster	Olsun Electrics Corp
R. Girgis	ABB
S. Kennedy	Niagara Transformers
G. Morehart	Acme Electric
R. Marek	Dupont Advanced Fibers Systems
P. Payne	PEPCO
J. Puri	Consultant
M. Rajadhyaksha	Ciba-Energy
H. Jin Sim	Waukesha Electric
J. Smith	Khulman Electric Corp
L. Wagenaar	Amer Electric Power Co

Others Present

B. Darvony	VA Tech Farrenti-Packard
J. Lackey	Ontario Power
D. Marlow	PORLEC-GE
B. Patel	Southern Company Services
S. Snyder	Khulman Electric
C. Steigemeier	ABB
G. Swift	APT Power Technologies

PRESIDING OFFICER: P. Hopkinson, Technical Advisor

I. APPROVAL OF PREVIOUS MINUTES

The minutes for the meeting held 10 April 2001, were approved as submitted.

APPROVAL OF THE AGENDA

The agenda was accepted as circulated.

MEMBERSHIP

The chairman reviewed the criteria for membership and the status of TAG membership.

OLD BUSINESS

The Chairman noted that activity in IEC TC14 has been noticeably lower this year (2001) than in previous recent years. While the WGs have met, the meetings have not been as frequent as in the past. He noted that there are a number of issues that remain to be addressed.

Revision of IEC 60076-5 (Ability to withstand short-circuit)

The chairman reported that there has been little additional new work on this document. It was noted that work is underway in CIGRE to address accepting short-circuit testing by calculation, noting that if a manufacturer proved a short-circuit capability by using the CIGRE calculation method, it probably will be accepted.

Revision of IEC 60076-3 (Insulation levels and dielectric tests)

The chairman reported that work continues at a slower pace on this standard, with little new information being available.

Revision of IEC 60378-2 (Converter Transformers: for HVDC applications)

The chairman noted that work continues in TC14 on converter transformers but the only US expert does not have his company's support to participate. There is little activity in the US on this subject matter.

The chairman requested member support to identify a candidate who can provide US participation in this activity. He noted that the candidate should be prepared to address the cost for USNC membership.

Revision of IEC 60214 (Tap Changers)

It was noted that the WG held its last meeting in June 2001. Two documents have been the subject of interest and circulated to national committees. Document 14/314/CDV was approved in August.

Work is underway in developing an application guide for reactive tap changers. It is still in the preliminary stages. It was noted there appears to be support for the continuation of the project and to harmonize with IEEE C57.131standards. While the document is progressing, the chairman expressed disappointment that the WG has not addressed the functional life test for de-energized tap-changers. Based on the testing work that some members have done, the European working group members are increasingly motivated to doing their own tests. The

chairman expressed optimism that a functional requirements test would be included in the IEC document, with some persistence on the US part, in the near future. He briefly reviewed why it is necessary to include such a test in the IEC standard

The chairman noted that there is a need to develop the necessary technical paper that would be the basis for supporting (validating) the need to include a test in the standard. He noted that a paper has been developed and that additional co-authors were needed to enhance its fundamental conclusions to support tests – directly or indirectly (through adoption of the US proposal and putting in place practices to exercise contacts on a regular basis and thereby achieving the same end.)

Revision of IEC 60551 (Audible sound)

It was noted that work is ongoing in the committee on this subject, but the WG has not supported US expert proposals for sound level tables for specific equipment.

The chairman briefly discussed the need for maintaining a reference base and the reasons for NEMA's revival and re-issuance of its audible sound standard TR-1. It was noted that the European position is to leave specific sound levels as a negotiating point between buyer and seller.

A brief discussion ensued on the utility and value of audible sound tables. It was proposed

Review activities of TC 106 (EMF)

The chairman noted that some in the industry have indicated that transformers neither produce nor are affected by EMF. The chairman also noted that EMF is a maximum at the transformer enclosure and that it drops off quickly with distance. He noted that the field varies according to the type of transformer and its encasement. He reported that some individuals in Europe are seeking to establish the limits for field intensities in the 5-milligauss range. The chairman briefly reviewed the environments for exposure and consequence.

He noted that TC106 is seeking to identify means for measuring magnetic fields. IEEE SCC28, SC3 (0-3kHZ) has done work on exposure levels that can be met around most electrical apparatus. It was noted that establishing an exposure level of 5 milligauss would be nearly impossible to meet and apparently unnecessary.

Discussion of new document 14/397A/NP

The chairman noted that the guide for the application of high temperature insulation materials in liquid immersed power transformers has been proposed. There appears to be support in TC14 for continuing the work. He expects the issue to be discussed at the next meeting of TC14 in 2002. In late breaking news, as of November 26, the work was approved:

14/405/WG announced the formation of **Working Group 29** to establish a document on **High Temperature Insulation Systems.** The convenor will be Rick Marek of Dupont, USA.

The chairman briefly discussed differences in the contents of IEC and IEEE standards; the latter seem less complete and less detailed than the former. He noted also that people who work on standards should understand that harmonization does not mean that standard document should be identical in language and text, but that they do not conflict.

Members briefly discussed how national and regional differences are reconciled in IEC standards. It was noted that the "in some country" clause is a vehicle for addressing this and regional acceptance (i.e., North American practices). Members urged that the Mexico National Committee be encouraged to participate in TC14 activities. The chairman agreed to identify the individual or organization to be contacted.

ACTION: P. Hopkinson provide information on individual or organization in Mexico for liaison activities.

It was noted that work on the loading guide in the IEC committee has been encumbered on the harmonization issue and has not moved as smoothly or as quickly as expected. It was noted that a draft document will be released in November for national committee review. It was noted that this matter will likely be discussed at the 2002 meeting of TC14 and it was important that the key people in the US and Canada review the document and provide comment as appropriate.

ACTION: P. Hopkinson circulate any proposal as soon as it is received.

Revision of IE 60076-11 (Dry-type power transformers)

The chairman briefly described a test requiring the immersion of the transformer in highly flammable liquid. It was noted that US had expressed interest in flame-resistance and evaluation technique. It was agreed that

New Work Item on Distribution Transformer Efficiency

The chairman presented a brief review of US activities relating to energy efficiency of distribution transformers, 2500 kVA and below. He inquired about member interest for submitting a new work proposal to the IEC. J. Foldi requested that a proposal be sent to the CNC subcommittee 14 for consideration.

Members engaged in a brief discussion. It was noted that such a document would define some of the economic parameters (TOC and payback period) for evaluating efficiency. Members agreed that the presentation of such a proposal would be useful. The chairman agreed to develop a proposal for review.

ACTION: P. Hopkinson prepare a proposal for TAG review.

NEW BUSINESS

There were no new business items identified. However, as of November 26, there were several new items of work that deserve a report:

14/399/WG announced the formation of **Working Group 28** to develop a document on **Transformers with internal protection.** The task will be to produce a standard for immersed distribution transformers with protection and current breaking device. The convenor will be Michel Sacotte of Schneider Electric, France.

14/402/MCR announced a **maintenance cycle report** on **IEC 60076-7** Power transformers-Part 7**: Loading guide for oil-immersed power transformers.** The convenor is Hasse Nordman of ABB, Norway.

14/403/CD is the revision of loading guide IEC 60354, announced in 14/402/MCR.

TIME AND PLACE OF NEXT MEETING

Members agreed to meet in conjunction with the IEEE Transformer Committee meetings in Vancouver, British Columbia in April 2002

ADJOURNMENT

There was no additional business. The meeting was adjourned at 9:25 AM

REPORTED BY

John A. Gauthier

TAG Administrator

16 October 2001

11.0 Old Business

None

12.0 New Business

None.

13.0 Adjournment

The meeting was adjourned at 11:30 AM.

Respectfully submitted,

Ken S. Hanus, Secretary

GROUPS	Little R Apr. 98	Leon, MX Nov. 98	NO, LA Apr. 99	Monterrey Nov. 99	Nash, TN Apr. 00	Niagara F. Oct 00	Amster. Apr01	Orlando Oct 01	MAX	AVG
Committee Registration: Members and Guests	267	262	262	275	302	361	265	289	361	285
Spouses	34	49		35	94	94	67	69	94	63
Luncheon	156	262	262	216	175	217	131	149	262	196
SC ADMINISTRATIVE	16	19	22	23	23	22	18	24	24	21
NEWCOMERS ORIENTATION										
SC Meeting and planning							15	17	15	15
SC AUDIBLE NOISE AND VIBRATION	32	23	28	31	21	21	17	27	32	25
WG Sound measurements WG Transformer siting guide C57.136										
SC BUSHINGS	32	25	11	27	28	28	28	29	32	26
WG Revision C57.19.00		36	22	23	25	38	25	27	38	28
TF Draw Lead Bushings	23	23	20	16	24	27	18	13	27	21
WG Revision C57.19.01	33	38	24	22	19				38	27
SC DIELECTRIC TESTS	81	80	52	68	91	96	62	87	96	77
WG Revision to Low FrequencyTests	42	20		54	48		34	48	54	41
WG Revision of Transient Dielectric Tests		20		35	43	37			43	34
TF Rev. to Impulse Tests								19	19	19
TF L.F. Transformers Dielectric Test Table			28	37		46	60	45	46	43
WG Partial Discharge Tests	51	58	41	66	47	66	65	44	66	55
SC DISTRIBUTION TRANSFORMERS	49	29	36	34	53	41		50	53	42
WG Dist. Substation Transformers C57.12.36		16	22		40	37		32	40	29
WG Overhead Type Distr. Transfs. C57.12.20	39	19	35	28	49	39		40	49	36
WG Single-Phase Submersible C57.12.23	41		16	10	20	18			41	21
WG Single-Phase Deadfront Padmount C57.12.25	41		30		47			33	47	38
WG Bar Coding	40								40	40
WG Loss Evaluation C57.12.33	48				45			49	49	47
WG Electronic Data Transmittal		12			22			17	22	17
WG Three-Phase Padmount C57.12.34			23		42			33	42	33
WG Step-Voltage and Induction Regs C57.15		16	9					26	26	17
SC DRY-TYPE TRANSFORMERS	22	26	27	25	25	31	20	20	33	25
WG Test Code C57.91	23	20	22	18	11	24	12	10	23	18
WG Dry-Type Reactors	9	6	13	9	10	11	13	7	13	10
WG Dry-Type Thermal Eval. And Flammability										
WG Dry-Type General Requirements C57.12.01	28	24	18	26	23	23	14	25	28	23
WG Dry-Type Thru Fault Current C57.12.59					15	16			16	16

GROUPS	Little R Apr. 98	Leon, MX Nov. 98	NO, LA Apr. 99	Monterre Nov. 99	Nash, TN Apr. 00	Niagara Oct. 01	Amster. Apr01	Orlando Oct. 01	MAX	AVG
SC HVDC CONVERTER TRANF. & REACTORS	6	7	8	13	7	19	15	7	19	10
IEC TC 14 TAG						37	30	14	37	27
SC INSTRUMENT TRANSFORMERS	13	7	11	10	10	17			13	11
WG C57.13.5 Test Req Instr Transf >115 kVA	20	13	12	13	10	13	13	16	20	14
WG C57.13.6 Instr Transf for Electronic Meters & Relays		9		20	11				20	16
WG Revision of C57.13	17	8	12			10	10		17	11
SC INSULATING FLUIDS	84	71	56	68	75	66		70	84	70
SC INSULATION LIFE	73	58	65	56	51	66	30	109	109	64
WG Loading Liq. Transformer				108		58		76	108	81
WG Revision of Temperature Test Code		24	24	29					29	26
WG Thermal Duplicate	34	24	34	40	27		30	26	40	31
TF Winding Temperature Indicators	32	22	16	25	27	28		23	32	25
TF On Temperature Rise Clause 5, C57.12.00								27	27	27
SC PERFORMANCE CHARACTERISTICS	77	52	45	58	69	82	81	102	102	71
WG Loss Tolerance and Measurement	27	25	26	29	33	37	29	31	37	30
WG PCS Rev. C57.12.00	36	32	75	65	49	70	37	63	75	57
WG PCS Rev. C57.12.90	33	43	28		42	65	34	44	65	41
TF Joint/PSIM low pf measurement										
WG Switching Transients	31	33	40	0	52	49	39	50	52	42
WG DETC specifications and tests				50	49	40		3	50	43
SC POWER TRANSFORMERS	26	25	42	59	66	109	80	116	116	65
WG LTC Performance	31	29	25	30	24	21	29	24	31	27
WG C57.140 Transformer Life Extension			31	46	62	48	35	66	66	48
WG Monitoring of Liquid Immersed Transformers	83	42	20	54		55	70		70	54
TF Control Cabinet Guidelines								49	49	49
WG Revision of C57.12.10					37	30	27	34	37	32
WG West Coast									13	13
WG Installation of Liquid Filled Transformers, C57.93							39		39	39
WG Phase Shifting Transformers C57.137	43	30	31	34	26	45	25		45	33
SC STANDARDS	11	4	5	23	38		32	47	47	23
Standards Development Paractice Review	8								8	
SC UNDERGRND. TRANF. & NETWK. PROTCS.	11	14	18	21	26	18	3	13	26	16
WG Three-Phase Underground Transfs. C57.12.24	14	16	10	14	27	15	4	9	27	14
WG Liquid-Filled Sec. Network Transfs. C57.12.40	16	16	17	15	16	15		14	17	16
WG Secondary Network Protectors C57.12.44	12	9		12	10	14		10	14	11
WG Dry-Type Network Transfs. C57.12.57	5	7	5	10	10	15		9	15	9

Note: Data maintained for four years only.