# IEEE / PES

# Transformers

# Committee

**Meeting Minutes**
**October 28, 2004**

# *IEEE/PES Transformers Committee Meeting*

*October 28, 2004*

*Las Vegas, NV, USA*

*Unapproved*

*Minutes and Information Available on the Committee Website:*

*www.transformerscommittee.org*

**IEEE/PES TRANSFORMERS COMMITTEE MEETING**
**Las Vegas, NV, USA**
**October 28, 2004**

## ATTENDANCE SUM MARY

### MEMBERS ATTENDING, AND PRESENT FOR MAIN MEETING (10/28)

Allan, Dennis
Anderson, Greg
Antosz, Stephen
Ares, Ignacio
Arnold, Jr., Jim
Arteaga, Javier
Barker, Ron
Bartley, Bill
Beaster, Barry
Binder, Jr., Wally
Blackburn III, Gene
Boettger, Bill
Callsen, Thomas
Cash, Don
Chiu, Bill
Cooper, Tommy
Corkran, Jerry
Crouse, John
Darwin, Alan
Daubert, Ron
Dudley, Richard
Fallon, Don
Foldi, Joe
Gardner, James
Ghafourian, Ali
Girgis, Ramsis
Gruber, Myron
Gryszkiewicz, Frank
Haggerty, N. Kent
Hammers, Jack
Hanique, Ernst
Hanus, Ken
Harlow, Jim
Hartgrove, Bob
Heinzig, Peter
Hochanh, Thang
Hopkinson, Phil
James, Rowland
Johnson, Jr., Chuck
Juhlin, Lars-Erik
Kennedy, Sheldon
Khalin, Vladimir
Lackey, John
Lau, Mike
Lewis, Tim
Lundquist, Tom
MacMillan, Donald
Marek, Rick
Marlow, Dennis
Matthews, John
McNelly, Susan
Mehta, Sam
Miller, Kent
Millward, Paul
Molden, Arthur
Moore, Harold
Morehart, Gene
Mulkey, Daniel
Murphy, Jerry
Nguyen, Van Nhi
Niemann, Carl
Olson, Tim
Patton, Jesse
Perkins, Mark
Platts, Don
Poulin, Bertrand
Prevost, Tom
Raymond, Tim
Riffon, Pierre
Rossetti, John
Russwurm, Dirk
Sankar, V.S.N.
Schappell, Steven
Schweiger, Ewald
Shertukde, Hemchandra
Shteyh, Ibrahim
Shull, Stephen
Sim, Jin
Singh, Prit
Smith, Ed
Smith, Jim
Snyder, Steven
Stahara, Ron
Stiegemeier, Craig
Sullivan, John
Thompson, James
Thompson, Robert
Tuli, Subhash
Veitch, Bob
Wagenaar, Loren
Wallach, David
Watson, Joe
Wilks, Alan
Woodcock, David
Zhao, Peter

### MEMBERS ATTENDING, BUT NOT PRESENT FOR MAIN MEETING (10/28)

Aho, David
Balma, Peter
Barnard, Dave
Colopy, Craig
D'Amico, Frank
Degeneff, Bob
Dix, Larry
Elliott, Fred
Ellis, Keith
Ferreira, Marcos
Franchek, Mike
Griesacker, Bill
Grunert, Robert
Hager, Jr., Red
Harley, Jack
Henning, Bill
Jonnatti, Tony
Lindgren, Stan
McClure, Phil
McShane, Patrick
McTaggart, Ross
Orehek, Paul
Paiva, Gerry
Patel, Bipin
Preininger, Gustav
Reitter, George
Romano, Ken
Sampat, Mahesh
Sharma, Devki
Ward, Barry
Ziomek, Waldemar

**MEMBERS ABSENT (10/28)**

Allustiarti, Raymond
Altman, Mike
Atout, Khaled
Aubin, Jacques
Ayers, Don
Bancroft, Roy
Barnes, Mike
Bertolini, Edward
Bonucchi, Joe
Borst, John
Brown, Charles
Cambre, Jr., Max
Chu, Don
Colquitt, Jr., Roy
Compton, Olin
Dahinden, Vincenz
Darovny, Bill
Davis, Eric
Dohnal, Dieter
Duckett, Don
Ebert, John
Feghali, Pierre
Fleeman, Jeff
Frank, P.E., Jerry
Fyvie, Jim
Galloway, Dudley
Gaytan, Carlos
Gillies, Jim
Graham, Richard
Grubb, Bob
Haas, Michael
Hall, Geoff
Hansen, Wayne
Hayes, Roger
Heinrichs, Frank
Highton, Keith R.
Hoefler, Pete
Huddleston III, Jim
Iman, Mike
Jhonsa, VJ
Johnson, David
Kappeler, Cal
Kelly, Joe
Kennedy, Bill
Kim, Dong
Kline, Don
Koenig, E.
Ladroga, Rick
Lazar, John
Lewis, Frank
Long, Leonard
Lowdermilk, Larry
Lowe, Don
Lowe, Richard
Ma, Joe
Maguire, William
Massouda, Tito
McGill, Jack
McQuin, Nigel
Mitelman, Mike
Musil, R.J.
Mutschler, Jr., Bill
Nicholas, Ray
Norton, Ed
Papp, Klaus
Patterson, Jr., Wes
Payne, Paulette
Pearce, Henry
Pekarek, Tom
Perco, Dan
Pierce, Lin
Plaster, Leon
Progar, John
Puri, Jeewan
Purohit, Dilip
Raymond, Charlie
Reed, Scott
Risse, Peter
Robbins, Chris
Robinson, Butch
Ruevekamp, Henk
Savio, Leo
Shenoy, Vic
Smith, Jerry
Smith, Ray
Stensland, Len
Stewart, Peter
Stoner, Ron
Templeton, Jim
Thomas, Ray
Traub, Tom
Trummer, Edgar
Vaillancourt, Georges
Weffer, Felipe
Whearty, Bob
Wimmer, Bill

**GUESTS ATTENDING, AND PRESENT FOR MAIN MEETING (10/28)**

Ahmad, Naeem
Allen, Jerry
Amos, Richard
Arpino, Carlo
Bassett, Tom
Bates, Danny
Beckman, Stephen
Blew, David
Boman, Paul
Britton, Jeffrey
Bush, Carl
Carlos, Arnaldo
Castellanos, Juan
Claiborne, Clair
Cromer, Edward
Fairris, Bruce
Fausch, Reto
Fedele, Antonio
Forsyth, Bruce
Foster, Derek
Galbraith, Shawn
Gamitschni, Andreas
Garcia, Eduardo
Garcia, Ramon
Garza, Joseph
Ghosh, Saurabh
Gomez-Hennig, Eduardo
Haufler, John
Hoffman, Gary
Horning, Mike
Johnson, Wayne
Keithly, Dave
Klaponski, Brian
Kulasek, Krzysztof
Kyle, Randall
Lee, Dennis
Machado, Jr., Tamyres
Makinson, David
Morrissette, Guy
Mushill, Paul
Navarro, Martin
Olen, Robert
Oommen, T.V.
Oriti, Samuel
Peterson, Alan
Pillitteri, Paul
Ploetner, Christoph
Rave, Martin
Rosselli, Girolamo
Schaefer, Michael
Simpson, Jr., Bill
Taylor, Robyn
Teetsel, Mark
Ten Haagen, Chris
Tillman, Robert
Tolbert, George
Traut, Al
Verdolin, Roger
Wicks, Roger
Wiegand, David
Williams, Michael

**MEMBERS ATTENDING, BUT NOT PRESENT FOR MAIN MEETING (10/28)**

Ahuja, Rajendra
Alves, Marcos
Andersson, Sten
Antoran, Javier
Antweiler, Jim
Aromin, Venzon
Ashby, Derek
Baehr, Horst
Ballard, Jay
Baranowski, Derek
Barnett, Darren
Barrientos, Israel
Bartek, Allan
Basu, Bikash
Beghini, Paulo Cesar
Bello, Oscar
Benach, Jeffrey
Berler, Zalya
Betancourt, Enrique
Bittner, Carlos
Blackmon, James
Blake, Dennis
Bolliger, Alain
Breytenbach, Richard
Brush, Edwin
Carr, Christine
Carulli, Joseph
Caruso, Charles
Chatrefou, Denis
Chen, Yunxiang
Cheng, Robert
Cherry, Donald
Chisholm, John
Chmiel, Frank
Cho, Juyoun
Choinski, Scott
Coffeen, Larry
Comely, Tracy
Corsi, Dom
Costa, Florian
Cross, James
Darby, John
Davydov, Valery
de la Cruz, Dan
Dunlap, David
Ekran, Yavuz
Faulkenberry, Michael
Fridman, Harry
Ganser, Robert
Garnitschnig, Andreas
Gerhardt, Greg
Gerth, Juergen
Gianakouros, Harry
Gill, Jesse
Gillespie, Ron
Glass, Bryan
Goodwin, Dave
Grijuela, Jose Enrique
Guardado, Jeremy
Guerra, Jorge
Haas, Mark
Hajeh, Jan
Hardin, Michael
Hayman, Brent
Herron, John
Herz, Josh
Hofstee, Bert
Holifield, Thomas
Hollingsworth, Rich
Hopfner, Caron
Huff, Tim
Irusta Zarandona, Olatz
Jakob, Karl
Jakob, Fredi
Jaroszewski, Marion
Jauch, Erwin
Jeong, Benny
Johannson, Larry
Kabrich, Troy
Kalra, C.J.
King, Gary
Kirshner, Dave
Knoll, Ernst
Kopp, Alvin
Kostyal, Stanley
Kraemer, Axel
Krump, Reiner
Kurth, Bernhard
Lee, Saulie
Lemke, Eberhard
Lux, Andre
Mamtora, Jitendra
Marlowe, Dan
Martin, Mike
Martin, W. Michael
Martin, Terance
Marx, Robert
Matthews, Lee
McIver, Jim
Melanson, Joseph
Mohesky, Norvin
Monoski, Chris
Moreno, Victor
Morgan, Dan
Morris, Tom
Mucha, Richard
Neal, Jason
Nelson, Tom
Nguyen, Vuong
Nims, Joe
Nordman, Hasse
Northrup, Steve
Paik, Henry
Park, Sang Bong
Patel, Sanjay
Pink, Tony
Piovan, Ugo
Prieto, Aberto
Rahmatian, Farnoosh
Rajadhyaksha, Mangesh
Ray, Jeffrey
Recksiedler, Leslie
Rega, Chris
Rensi, Randy
Rezai, Hossein
Rivers, Mark
Roizman, Oleg
Roussell, Marnie
Russell, Donald
Sandhu, Surinder
Sarkar, Subhas
Schneider, Jeff
Seitlinger, Walter
Sestito, John
Sewell, Jeremy
Sewell, Russ
Shah, Dilip
Shekelton, Jim
Shekelton, Jay
Silvestre, Manuel
Slovik, Thomas
Smith, Charlie
Sommer, Mark
Sousa, João Paulo
Speegle, Andy
Spitzer, Tommy
Stankowski, Krzysztof
Steineman, Andy
Stenestam, Bengt-Olof
Sundkvist, Kjell
Sweetser, Charles
Swift, Glenn
Swinderman, Craig
TeNyenhuis, Ed
Termini, Giuseppe
Theirry, Juan
Trivitt, Donnie
Verner, Jane Ann
Walters, Shelby
Williams, Randy
Wiseman, James
Yule, Kipp
Yute, Douglas

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**IEEE PES TRANSFORMERS COMMITTEE MEETING**
**Thursday, October 28, 2004**
**Chair: K. S. Hanus Vice Chair: D. J. Fallon**
**Secretary: T.A. Prevost**

## 1.0 Chair's Report, Remarks & Announcements – K.S. Hanus

Chairman Ken Hanus called the meeting to order at 8:00 A.M. As there were no changes requested, the Agenda as published was generally followed.
All Meeting participants are encouraged to work towards full membership in the Main Committee. Application forms and membership requirements can be found in the Committee Operations & Procedures (O&P) Manual, accessible on the Committee website (http://www.transformerscommittee.org/). Applications can be forwarded to the Secretary at any time, for action at the next Administrative SC Meeting.
Mr. Hanus opened the meeting by covering a few announcements, including several items covered in more detail in the Administrative SC Minutes in Section 3.

- **New Transformer Committee Members**

Chairmen Hanus introduced the following new members of the Transformer Committee:

- Peter Heinzig – Siemens- Producer
- Jack Hammers – Oklahoma Gas & Electric – User
- Jerry Murphy – Reedy Creek Energy Services – User
- Van Nhi Nguyen – Hydro-Quebec – User
- Davis Wallach – Duke Power Company – User
- Steven Schappell – Waukesha Electric Systems – Producer

| | | |
|---|---|---|
| Members - | | 222 |
| Classifications: | Producers - | 99 |
| | Users - | 59 |
| | General - interest - | 40 |
| Life Members | | 2 |
| Corresponding Members - | | 1 |
| Emeritus Members - | | 21 |

The full content of Ken Hanus's Chair's report follows:

## 1.1 Future PES Meetings

### 2005 PES General Meeting

The IEEE Power Engineering Society 2005 General Meeting will be held 12 – 16 June 2005 at the Hilton San Francisco Hotel in San Francisco, CA. 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 ***Leading the Way in Uncertain Times***.

The preferential topics for the meeting are as follows.

**Track 1: Understanding and Responding to System–Wide Events**, covering such topics as:

- The Northeast Blackout of August 2003
- Physical and cyber security concerns
- Line loading, interconnect issues, IPPs
- Operating strategies under reduced generation availability (extreme contingencies)
- Releasing excess capacity through VAR control

**Track 2: Securing New Sources of Energy**, covering such topics as:

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

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

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

**Track 4: Using Innovative Measurement and Control Techniques to Improve Customer Service**, covering such topics as:

- Advanced protection algorithms, system modeling, economic dispatch
- Fault locating, down conductor detection
- Optical sensing, non-standard instrument transformers

**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

Full papers must be submitted to the on-line submission and review site; a link to the site will be available from the PES home page on or about 18 October 2004. All papers must be submitted by 13 December 2004.

Additional information about the meeting will be posted as it becomes available at http://www.ieee.org/power

**CIGRE/IEEE PES Symposium CFP**
5-7 October 2005, New Orleans, LA, USA

CIGRE and IEEE PES, in cooperation with the US National Committee of CIGRE and Study Committees C5 'Electricity Markets and Regulation', C1 'System Development and Economics', C2 'System Operation and Control', and D2 'Information Systems and Telecommunications' are organizing an International Symposium on Congestion Management in a Market Environment.

**PARTICIPANTS**
The Symposium is directed towards utilities, manufacturers, system operators, traders, transmission owners and regulators as well as towards universities. Other organizations in the Electricity Industry should also be interested.

**BACKGROUND AND SCOPE**
With the opening of electricity markets and changes in the power flows, the issue of available transmission capacity is of more and more importance. Market orientated answers and real-time solutions are implemented or under consideration; diligent management of existing assets and timely investment decisions to increase capacity and to improve the management systems are fundamental. The general purpose of the symposium is to provide a forum for discussing the congestion management issue for internal and cross border exchanges: operation aspects, market oriented answers, system development approaches and IT tools, and to consider potential future solutions and research needed.

**THE MAIN TOPICS INCLUDE:**

**Operation**
- Assessment of available transmission capacity.
- Interaction between market mechanisms and system operation.
- Communication needs with market players.
- Real-time method to solve congestion and security requirements.

**Market**
- Market solutions: theoretical and practical approaches (nodal pricing with FTRS, auctions, market splitting...
- Relations ISO - Market operator, integration or separation.
- Revenues from market mechanism, profit, non-profit approaches.
- Organization of markets: secondary markets, financial security.

**System adequacy**

- Transmission investment: balance between capital costs and market costs.
- Transmission capacity: managing open access and reliability.
- Asset management: maximizing transmission availability.
- Long-term development strategies: role in market environment.

**IT**

- Development strategies for IT systems.
- Risks associated with use of Internet/intranet: how to improve security.
- Moving to integrated utilities: blurring the borderline real-time/commercial.
- Intelligent electronic device: a tool to improve the control of power systems.

## 1.2 Power & Energy Magazine

Mel Olken encourages submissions by all Technical Committees for articles in the P&E magazine and the content is at the discretion of our committee. They suggest articles detailing the work of the technical committees. Our input was due June 2004.

## 1.3 2004 General Meeting, Denver, CO

### 1.3.1 General Membership Meeting

PES President Hans B. Püttgen addressed the membership and discussed the issues challenging PES.

Current issues include:

- Loosing members in region 1-7
- Gaining members in region 8-10
- Need to do a better job of retaining students as society members after graduation
- Need to attract members from emerging and non-traditional sectors
- Need to collaborate with other societies worldwide

Mr. Püttgen discussed changes the industry is going through. The electric energy and information distribution market merge is upon us. Utilities are seeking to become one-stop energy shopping sources. Asset management, reliability and system hardness are the top issues. Distributed generation and energy storage are becoming more important.

Regarding information dissemination, publications and meetings we have to continue to move towards electronic publication versus paper. PES is looking at various models to disseminate information and one for example has publications available at no charge to members and has authors paying to put papers on websites. On thing PES is doing right and that is doing a good job of performing technical reviews of papers.

IEEE Xplore is continuing to rapidly grow. To make sure papers and panel sessions get into Xplore requires these documents are Xplore compliant. PES is looking at electronic libraries with sister societies such as IAS or Power Electronics.

Meetings can no longer depend on volunteers only as utilities are downsizing and volunteer resources are shrinking. We will have to rely more on in-house staff, 3rd party support and more corporate support. More permanent corporate support is needed.

President Püttgen laid out goals for 2004:

#1 – Stabilize general meeting layout - Also implement PSC&E (Power Systems Conference & Exposition)

#2 – Build employer's support – Ways to do this include use of "What's in it for me" brochure, offer power system courses for non-engineers, invite industry leaders to speak at conferences even if they are attorneys or accounts.

#3 - Membership Development – Mr Püttgen suggested recruiting members from emerging technology industry segments, students, authors of technical papers and non-engineering persons attending the meetings.

#4 – Broadly publicize the T&D vision and seek broad support. This is to be implemented by the technical council.

#5 – Support smaller targeted meetings such meeting in Washington DC on hydrogen economy or at Notre Dame on ethics, etc.

#6 – Achieve launching of IEEE PES digital library

#7 – Better publicize various options available to PES members
.
#8 – Get technical committees to meet together during the general meeting and T&D exposition.

### 1.3.2 Emerging Technologies Coordinating Committee

The main topic of the ETCC meeting was about wind power. It was expressed IEEE needs to put more time towards wind power. Renewal of the tax credit will make wind power grow. ETCC provides a good forum for wind power issues.

In New York at the PSC&E there will be a joint meeting of various PES technical committees to discuss where wind power will ultimately be placed within PES. For the New York meeting five wind power related papers have been accepted at this point

### 1.3.3 Technical Council

Power and Engineering magazine articles from technical committees need to get information to Mel Olken with Keith Gray coordinating the schedule. They are looking for articles on what committees are doing. Responsibility for getting this done will move towards the technical committee chairs.

IEEE 488.2 (PSIM) is the first dual logo (IEEE/IEC) document to be approved. A maintenance procedure for dual logo documents is now in place

Terry deCourcelle made a presentation to Technical council on the results of a focus group. It was found the average age of PES members was in the upper 40's. Ideas were collected on how to develop new members and they include providing mentoring, getting students involved in technical committees and corporate funding for students to go to meetings. Ideas on getting students involved in technical committees include setting up a young engineer coordinator, student coordinator and creating positions on technical committees.

John Newbury (Power System Communications) talked about the work being done in the area of Broadband Power Line Carrier. The FCC is pushing BPL as a means to bring the internet to the rural areas. Up until now BPL development has been a broken group of various users and equipment producers. No standards exist to cover the electrical requirements or installation standards for this equipment. The Power Systems Communications committee is currently developing a standard to attempt to address some of these issues. Technical council designated a task force including myself, John Newbury and someone from T&D to address what standards are needed to address this new industry segment.

### 1.4 Status of IEC/IEEE Dual Logo Document C57.135

The final draft International Standard ballot in TC14 will open Friday, 24 September and will close on Friday, 26 November. This is the final ballot for approval of this document as an IEC/IEEE dual logo document.

Respectfully submitted,
Ken Hanus
Chair, IEEE PES Transformers Committee

## 2.0 Approval of Minutes of Spring 2004 - K.S. Hanus

Chair asked that a motion be made to approve the minutes of the Spring 2004 meeting. A motion was made and seconded to approve the minutes. This was unanimously approved.

## 3.0 Administrative Subcommittee – Ken Hanus

Chairman Ken Hanus covered the key points of the Administrative Subcommittee Meeting held on October 24, 2004. Full details of the Minutes of the Administrative Subcommittee Meeting Minutes follow.

### 3.1 Introduction of members and guests

Chairman Hanus called the meeting to order at 2:00 p.m., Sunday, October 24, 2004, in the Estancia Room at the Green Valley Resort in Las Vegas, Nevada, USA. The meeting started with introductions of members and guests.

The following members of the Subcommittee were present:

| | | |
|---|---|---|
| Gregory Anderson | Bill Chiu | Richard Dudley |
| Donald Fallon | Ramsis Girgis | Frank Gryszkiewicz |
| Everett Hager | Ken Hanus | Charles Johnson |
| Thomas Lundquist | Carl Niemann | Don Platts |
| Thomas Prevost | H. Jin Sim | Edward Smith (Ed) |
| James Smith (Jim) | Loren Wagenaar | Dan Mulkey |

The following members were absent:

| | |
|---|---|
| F.E. Elliott | J. Puri |

The following guests were present:

| | |
|---|---|
| Donald Cash | Peter Balma |
| Stephen Shull | Naeem Ahmad |

### 3.2 Approval of the San Diego meeting minutes

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

### 3.3 Additions to and/or approval of the agenda

The Agenda provided by the Chair prior to the meeting was amended to add a discussion on interpretations under item 3.11, “Patent Issue Requirements”.

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

#### 3.4.1 AM System

Since 1999 we have been contracting the registration of our meetings to IEEE. However there has never been a link of the contact information to the committee working groups.
We have now contracted a group called 123Signup. This will handle registration as well as providing a relational database so that all people in our committee are looking at the same contact information. If someone edits their information in one area it updates it for all other WG and subcommittees that person is a member of.
All transformer committee attendees are encouraged to enroll into this sytem. Working Group and SubCommittee chairs need to enroll their members in their groups as well.

#### 3.4.2 Meetings

Don Cash welcomed everyone to Las Vegas.
The next meeting will be on March 13-17 in Jackson, Mississippi. This meeting will be hosted by Andy Speegle and Kuhlman.

The Fall 2005 meeting will be in Memphis, Tennessee. This meeting will be hosted by Randy Williams and ABB.

### 3.4.3 Finances

Our account balance was around $11,000 before San Diego and is now at $18,062.74 prior to the Las Vegas meeting.

### 3.4.4 Other

An additional working group for educational development was approved for the Meetings Planning Subcommittee. This will be chaired by Kent Hagerty.
We cannot cancel a working group meeting after the meeting agenda has been finalized and the schedule distributed. Please do everything you can to review the preliminary schedule. If you don't need a timeslot for a working group meeting, please let Greg know as soon as possible so that it can be filled with something else. The schedule is getting very tight!

## 3.5 IEEE Staff – Naeem Ahmad

- Naeem reviewed the IEEE-SA policy regarding support for editing a draft standard. The editorial staff only provides recommendations for changes to the document, they will not change the document themselves.
- NEMA documents will be scannd and converted into Word documents by IEEE. They will not be proof read.
- MYBallot will b rolled out in the second quarter of 2005. Any projects started under the current balloting system will continue to be balloted that way until the process is complete.

## 3.6 Committee Service Awards – H.J. Sim

Jin indicated that he has four awards to be given at this meeting. He encouraged all members to identify retired working group chairs for awards. He also encouraged that members identify committee members deserving awards.

## 3.7 Chair's report – K.S. Hanus

Ken presented his report which is included in the main committee minutes. Ken also noted that the dual logo document which is a guide for Phase Shifting Transformers is out for ballot in IEC and will close on Friday October 26th.

## 3.8 Vice Chair's report – D.J. Fallon

Don's report was distributed prior to this meeting and is included in the main committee minutes. Task for an article submission for Power and Energy Magazine is still pending.

### 3.9 Secretary's Report – T.A. Prevost

The Secretary's Report was submitted prior to the meeting, and is included in the main committee minutes.

- There was considerable discussion regarding membership. We need to continue to encourage membership in our committee, particularly from the user community. It was encouraged that "What's in it for me?", an article written by John Estey for PES members to give to their employers be made available.

#### 3.9.1 Membership review. Six membership applications were submitted, reviewed and approved. These are:

- Peter Heinzig – Siemens- Producer
- Jack Hammers – Oklahoma Gas & Electric – User
- Jerry Murphy – Reedy Creek Energy Services – User
- Van Nhi Nguyen – Hydro-Quebec – User
- Davis Wallach – Duke Power Company – User
- Steven Schappell – Waukesha Electric Systems – Producer

### 3.10 Patent Issue Requirements – K. Hanus

Ken Hanus covered the patent policy with the administrative subcommittee. Information in this regard is included in the meeting registration packet. The minutes of all working group meetings need to include :

1) Discuss patent policy
2) Ask for any disclosure
3) Record any responses

Don Fallon and Bill Chiu will develop a template for WG chairs to be presented at each WG meeting.

#### 3.10.1 Interpretations or Explanations of Standards – K. Hanus

Some rules have changed so that there are two classes of interpretation.; explanation or interpretation. Each has a different time to respond.

### 3.11 Standards Subcommittee – B. Chiu

#### 3.11.1 Standards and coordination activities

Bill Chiu reviewed his report, which is included in the Committee meeting minutes. In addition, items of note during this section of the meeting include:

- There was considerable discussion in regards to C57.12.00 and C57.12.90. These standards are in the revision process. The word file is not available for the next recirculation ballot. This has caused the WG chair additional efforts. This discussion led to a decision that all standard word files should be kept on our server so that they can be used as a basis for future revisions.

### 3.11.2 Documents submitted to the Standards Board

See the standards status report in Attachment 1, presently posted on the website and planned for inclusion at the end of the assembled Committee Minutes.

## 3.12 Round-Table: Subcommittee Activities - Subcommittee Chairs

### 3.12.1 Distribution Transformers – Ed Smith

- Lee Mathews and Guissepi Termini were appointed co-chairs of C57.12.35 bar coding for distribution transformers.
- Don Duckett and Tom Pekarek will no longer be attending these meetings. They were both chairs of the Loss Evaluation Guide. It will be suggested that the PAR for the Loss Evaluation Guide be let to expire.

### 3.12.2 Bushings - F. E. Elliott

No report.

### 3.12.3 HVDC Converter Transformers & Smoothing Reactors - Richard Dudley

Nothing to report.

### 3.12.4 Dry-Type Transformers – Chuck Johnson

Nothing to report.

### 3.12.5 Instrument Transformers - J. E. Smith

Nothing to report.

### 3.12.6 Performance Characteristics – R. S. Girgis

Ramsis suggested that Sound and Vibration requirements in C57.12.00 fall under the performance characteristics subcommittee. He will review this with Jewaan before the next meeting..

### 3.12.7 Meetings & Planning - Greg Anderson

Wireless internet access will be available in the meeting.

### 3.12.8 Dielectric Tests - L. B. Wagenaar

Nothing to report.

### 3.12.9 Audible Sound and Vibration – Jeewan Puri

No report.

### 3.12.10 Underground Transformers and Network Protectors – C. Niemann

Nothing to report.

### 3.12.11 Insulating Fluids – F. J. Gryszkiewicz

Nothing to report.

### 3.12.12 Insulation Life – D. W. Platts

Nothing to report.

### 3.12.13 Power Transformers - E.G. Hager

Nothing to report.

## 3.13 Old Business

### 3.13.1 Review and disposition of meeting format change – Ken Hanus

We concluded that we will keep the meting as it is. We will try to keep the Thursday meeting short, with brief reports. We will also try to add an interesting topic for the Thursday meeting. The chair thanked everyone for their good suggestions.

### 3.13.2 Examples or suggestions for a certificate to recognize new members–Peter Balma

Peter distributed an example of a paper certificate that will be given to new members at the main committee meeting. This will be done for future meetings.

## 3.14 New Business

### 3.14.1 Approval of Minutes

All minutes need to be marked as “unapproved” until they are approved at the begoinning of the next meeting.

## 3.15 Adjournment

Chairman Hanus adjourned the meeting at 5:21 p.m.
Respectfully submitted,
T.A.Prevost, Secretary

## 4.0 Vice Chair’s Report – D. J. Fallon

## 4.1 PES Technical Council Committees

The following items report on activities of Power Engineering Society (PES) Committees on which the Vice Chair serves as Committee representative. These meetings were held at the 2004 PES General Meeting in Denver, CO, on June 6-10. Committee Vice Chair Don Fallon was unable to attend. Ken Hanus, Tom Prevost, and Jin Sim represented the Committee at these meetings.

### 4.1.1 Technical Sessions Committee

Plans for the 2004 Power Systems Conference & Exposition (PSCE), October 10-13, 2004, in New York City, were reviewed. Since this review, PSCE has now taken place. The initial plenary session was on the subject "Balancing the Needs of Competitive Markets with Confidentiality and System Security" and covered the lessons learned in the year following the August 14, 2003 North American blackout. Technical sessions, panel sessions, and tutorials focusing on the following tracks:

- Track 1: Planning and Operation
- Track 2: Markets, Policies, and Economics
- Track 3: Dynamic Performance of Power Systems
- Track 4: Real-Time Applications
- Educational Track: Understanding Power Systems

A review was made of plans for the 2005 PES General Meeting in San Francisco, CA, scheduled for June 12-16. The Theme and Tracks for this meeting are included in the Chair's Report.

Planning for the CIGRE/IEEE 2005 Joint Meeting in New Orleans, LA, on October 5-7 was also reviewed. The Scope and Main Topics for this meeting are also included in the Chair's Report.

Additional items of interest on the Technical Sessions Committee Agenda included a discussion on the definition of commercialism in Technical Sessions, and a review of the new "less formal" Panel Presentation Format. As the Committee Vice Chair was unable to attend this meeting, this Report will be updated when Minutes from the Technical Sessions Committee Meeting are available.

### 4.1.2 Organization and Procedures Committee

Modifications and updates have been made in many areas of the Technical Council O&P Manual for clarification of procedures and to bring it more in line with current practice. The revised manual was distributed to the O&P Committee prior to the meeting. The updates included changes in the following areas:

- References to ballots now indicate the electronic balloting process
- Reflection of the change form two PES General Meetings per year to the present schedule of one
- Definition of quorum for electronic review of Technical Council issues
- Updates to include IEEE-SA open ballot process and indication that IEEE Standards meetings are open to all, regardless of membership status

The revised Technical Council O&P Manual was approved at this meeting with minor changes. It will be available shortly on the IEEE/PES Technical Activities web page. Individual Technical Committee O&P Manuals are to be generally formatted similarly to the Technical Council O&P Manual.

## 4.2 Technical Paper Sessions

### 4.2.1 Technical Paper Sessions at the 2004 PES General Meeting

The Transformers Committee sponsored two technical sessions on June 9 at the IEEE/PES 2004 General Meeting in Denver. The sessions were scheduled as follows:

*Transformers I - Loss Performance and Thermal Evaluation*
(Aligned to Track 1 - Active Load Participation and Its Impact on Markets {subtrack Energy Efficient T&D Systems})

- "The Measurement and Evaluation of Distribution Transformer Losses Under Non-Linear Loading" by Damnjanovic and Ferguson
- "Improved Insert Geometry for Reducing Tank Wall Losses in Pad-Mounted Transformers" by Olivares, Escarela-Perez, Kulkarni, de Leon, Melgoza and Hernandez
- "Dynamic Thermal Modeling of Power Transformers" by Susa, Lehtonen and Nordman
- "Power Transformer Temperature Evaluation for Overloading Conditions" by Jardini, Brittes, Magrini, Bini and Yasuoka

**Transformers II - Modeling, System Interaction, and Diagnostics**
(Aligned to Track 2 - Environmental Dimensions {subtrack Innovative generation and transmission controls and analysis techniques for improved power system dynamic performance and efficiency})

- "Frequency Dependent Modeling of Power Transformers with Ungrounded Windings" by Gustavsen
- "Wide Band Modeling of Power Transformers" by Gustavsen
- "Development of a DC Current-Blocking Device for Transformer Neutrals" by Bolduc, Granger, Pare, Saintonge and Brophy
- "An Attempt to Correlate Time and Frequency Domain Polarisation Measurements for the Insulation Diagnosis of Power Transformers" by Saha, Purkait and Muller

The Vice Chair appreciates Chair Ken Hanus' stepping in to chair these sessions.

### 4.2.2 Technical Papers at the 2004 PSCE

The Transformers Committee reviewed and approved two technical papers for the Power Systems Conference & Exposition in New York City. The papers were presented at a Poster Session on October 12 the PSCE meeting:

- "Experimental Investigation of Internal Short Circuit Faults Leading to Advanced Incipient Behavior and Failure of a Distribution Transformer" by Mirrasoul Mousavi, Karen Butler-Purry, Texas A&M University; Mustafa Bagriyanik, Istanbul Technical University; Peter Palmer-Buckle, Black & Veatch
- "Transformer Tap Changing by Data Classification Using Artificial Neural Network" by M. Fakhrul Islam, Joarder Kamruzzaman, Guojun Lu, Monash University

### 4.2.3 Technical Paper Session(s) at the 2005 General Meeting

Planning is underway for the technical program for the 2005 General Meeting in San Francisco (June 12-16, 2005). See the Chair's Report for the Theme and Tracks. The PES web site

(http://www.ieee.org/portal/site/pes/) provides access to the "Call for Papers". Authors are encouraged to submit papers by December 1, 2004.

### 4.2.4 Call for Technical Papers - 2005 IEEE/PES T&D Conference & Exposition

This T&D Conference & Exposition will take place in October 2005 in New Orleans, LA. The theme is "Go With the Flow and Join the Parade of Technology". Papers that address any topic pertinent to transmission and distribution will be considered. Information on the Call for Papers can be found at http://www.ieeet-d.org/call.html

## 4.3 Committee Organization and Procedures Manual

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

## 4.4 Power & Energy Magazine Submission

The Transformers Committee is overdue in the schedule to contribute an article to Power & Energy magazine. The format and content is at the discretion of the Committee. The Vice Chair will be looking for volunteer authors and coordinating a submittal to the P&E magazine prior to our next meeting.

## 5.0 Presentation/Tutorial on New "Association Management" System–G.W. Anderson

Greg Anderson gave an interactive presentation of the new "Association Management" system.

## 6.0 Transformer Standards – B. Chiu

## 6.1 Meeting Attendance

a. The Standards Subcommittee met on Wednesday, October 27, 2004 at 4:30 PM. There were approximately 15 members and 10 guests present. (Due to oversight by the subcommittee Chair, a roster was not circulated. This number is an estimate based on memory recollection of those present during the meeting)

## 6.2 Approval of previous meeting minutes

a. The meeting minutes from the Spring, 2004 meeting in San Diego was approved as written.

## 6.3 Working Group Report

a. Continuous Revision of C57.12.00 & C57.12.90 – Subhash Tuli, WG Chair

i. Draft 3 of the documents are being developed to addressed the many comments and negatives on metrification received from the D2 ballot in 2002.

ii. There are considerable editorial challenges in working with the D2 document provided by the IEEE. The word documents we have are converted from the FrameMaker document used by IEEE for the D2 Ballot.

iii. Subhash made a commitment to complete the required work on both PC57.12.00 and PC57.12.90 for recirculation ballot submittal prior to the end of 2004.

b. PC 57.144 - Guide for Metrification of Transformer Standards – Tim Olson, WG Chair

i. The document was approved by RevCom in June of 2004.

c. C57.12.80 – Terminology for Power & Distribution Transformers – WG Chair - Tim Raymond

i. Work is currently underway to pursue the revision of the C57.12.80-2002. Definitions such as *thermally-upgraded paper* are bring considered.

ii. The working group is still actively seeking representative participation from each of the subcommittees.

d. IEEE 62 – IEEE Guide for Diagnostic Field Testing of Power Apparatus – Part 1: Oil Filled Power Transformers, Regulators, and Reactor. – Wally Binder, WG Chair

i. The document has gone through reaffirmation ballot (in 2003) with negatives. Subsequently, there was a recirculation with 99% approval. Currently working on packaging the necessary documentation for RevCom approval. Anticipate submission before year end.

**6.4 Old Business**

a. IEEE/IEC Dual Logo

i. IEEE C57.135 / IEC 62032 Guide for Application, Testing, Installation and Operation of Phase Shifting Transformers – Currently under balloting process of IEC TC 14.

b. NEMA Standards – Status update on obtaining electronic copies of the NEMA documents

i. Initial contact has been made with the NEMA staff member regarding the availability of the relevant NEMA document in word format. No further progress to report at this point.

c. Cross Reference of IEEE/IEC Standards - IEC TC10, TC14, TC36 and TC98 and the IEEE C57 series

i. The current available references are:

1. Excel Spreadsheet from IEEE

2. PDF file from Jin Sim – comparison of requirements

ii These documents are not up-to-date. After a brief discussion it was decided the work of updating these reference documents be best handled by a newly formed task force under the Standards Subcommittee.

iii Stephen Beckman has volunteered to take on the responsibility of chairing the new TF on IEC/IEEE Cross Reference. The primary scope of this new TF is to provide an easy cross reference of the current IEC and IEEE transformer standards. The details of the TF scope and the deliverables will be developed prior to the start of the first TF meeting.

1. Task Force Chair contact info:
   Stephen Beckman
   beckmansa@ieee.org

d. C57.12.00 Section reference - Assignment of responsible subcommittee

i. Don Platts has volunteered to review of the current C57.12.00-2000 version and submit for further discussion at our next meeting.

**6.5 New Business**

a. Future IEC/IEEE Dual Logo candidates.

b. A selected list of IEEE Standards was review briefly during the meeting to solicit comments.

c. David Aho voiced concerns that C57.15 is currently not being consider as good candidate for dual logo. David provide clarification that currently there is no C57.15 counter part in the IEC standards. In fact countries that rely on the IEC standards use IEEE C57.15 when specifying voltage regulators. Based on this discussion , C57.15 was added back in to the list. The current list of the candidates are listed below. This list will be reviewed by the committee officers and IEEE staff for prioritization of dual logo consideration.

i. IEEE Std 32-1972 - IEEE Standard Requirements, Terminology, and Test Procedures for Neutral Grounding Devices.
(This standard is being revised under PC57.32)

ii. IEEE Std 62-1995 - IEEE Guide for Diagnostic Field Testing of Electric Power Apparatus - Part 1: Oil Filled Power Transformers, Regulators, and Reactors (currently under reaffirmation)

iii. PC57.12.60 - IEEE Standard Test Procedure for Thermal Evaluation of Insulation Systems for Ventilated Dry-Type Power and Distribution Transformers
(This is a revision of IEEE Std C57.12.56-1986 and IEEE Std C57.12.60-1998. Coordination is taking place with TC98)

iv. PC57.13 - IEEE Standard Requirements for Instrument Transformers

v. PC57.15 - IEEE Standard Requirements, Terminology, and Test Code for Step-Voltage Regulators

vi. IEEE Std C57.93-1995 - IEEE Guide for Installation of Liquid-Immersed Power Transformers (currently undergoing revision)

vii. IEEE Std C57.94-1982 - IEEE Recommended Practice for Installation, Application, Operation, and Maintenance of Dry-Type General Purpose Distribution and Power Transformers

viii. IEEE Std C57.110-1998 - IEEE Recommended Practice for Establishing Transformer Capability When Supplying Nonsinusoidal Load Currents

ix. IEEE Std C57.116-1989 - IEEE Guide for Transformers Directly Connected to Generators

x. IEEE Std C57.119-2001 - IEEE Recommended Practice for Performing Temperature Rise Tests on Oil Immersed Power Transformers at Loads Beyond Nameplate Ratings

xi. IEEE Std C57.123-2002 - IEEE Guide for Transformer Loss Measurement

xii. IEEE Std C57.136-2000 - IEEE Guide for Sound Level Abatement and Determination for Liquid-Immersed Power Transformers and Shunt Reactors Rated Over 500 kVA

xiii. PC57.140 - Guide for Evaluation and Reconditioning of Liquid Immersed Power Transformers

xiv. PC57.142 - A Guide To Describe The Occurrence And Mitigation Of Switching Transients Induced By Transformer-Breaker Interaction

xv. PC57.143 - Guide for Application for Monitoring Equipment to Liquid-Immersed Transformers and Components

xvi. PC57.147 - Natural Based Esther Fluids

**6.6 Adjournment**

The meeting adjourned around 5:30PM.

**6.7 Standards Activities since the March 11, 2004 meeting**

**DATE: October 18, 2004**

**TO: Members of IEEE Transformers Committee, Las Vegas, NV Meeting**

**FROM: Bill Chiu, Standards Subcommittee Chair**

**IEEE /PES Transformers Committee**

**SUBJECT: Standards Activities Since the March 2004 Meeting**

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## TRANSFORMERS STANDARDS STATUS

The transformers standards status is given with one attachment entitled IEEE/PES Transformers Committee Status
Report of Standards, Dated 10/18/2004.
The report is a list of all the transformer related standards under the sponsorship of IEEE Power Engineering Society Transformers Committee (IEEE PES/TR). The standards are grouped by Subcommittees and sorted by document numbers. The report also contains the active PARs under the responsible Subcommittee. The standards that are not yet assigned to a subcommittee are temporarily listed under the Standards Subcommittee.
DOCUMENTS SUBMITTED TO THE IEEE STANDARDS BOARD
NEW STANDARDS COMMITTEE (NesCom)
**EXISTING PARS – EXTENSTION & MODIFICATION**

**PC57.12.44** (PE/TR) Standard Requirements for Secondary Network Protectors
***Recommendation:*** Approve modified PAR until December 2006. (6/23/2004)

**PC57.13.6** (PE/TR) Standard for High Accuracy Instrument Transformers
***Recommendation:*** Approve modified PAR until December 2007. (5/5/2004)

**PC57.142** (PE/TR) A Guide To Describe The Occurrence And Mitigation Of Switching Transients Induced By
Transformer-Breaker Interaction
***Recommendation:*** Approve target extension request until December 2006. (6/23/2004)

**PC57.104** (PE/TR) Guide for the Interpretation of Gases Generated in Oil-Immersed Transformers
***Recommendation:*** Approve target extension request until December 2005. (9/24/2004)
**NEW PARS - REVISIONS OF EXISTING STANDARDS**

**PC57.110** (PE/TR) Recommended Practice for Establishing Transformer Capability When Supplying Nonsinusoidal Load Currents
***Recommendation:*** Defer PAR for the revision of a standard. Request that the title be revised to be more descriptive of the type of transformers included in the standard. (9/24/2004)
***Sponsor Action:*** Requested NesCom for reconsideration of accepting existing title through the continuous processing. (10/8/2004)

**PC57.129** (PE/TR) Standard for General Requirements and Test Code for Oil-Immersed HVDC Converter
Transformers
***Recommendation:*** Approve PAR for the revision of a standard until December 2008. (6/23/2004)
**NEW PARS - NEW STANDARDS**

**PC57.149** (PE/TR) Guide for the Application and Interpretation of Frequency Response Analysis

for Oil Immersed Transformers
***Recommendation:*** Approve new PAR until December 2008. (6/23/2004)
STANDARDS REVIEW COMMITTEE (RevCom)
**NEW & REVISED STANDARDS**

**PC57.12.34/D11** (PE/TR) Standard Requirements for Pad-Mounted, Compartmental-Type, Self-Cooled, Three-
Phase Distribution Transformers, 2500 kVA and Smaller: High-Voltage, 34 500 GrdY/19 920 Volts and Below;
Low Voltage, 480 Volts and Below
***Recommendation:*** APPROVE (9/22/2004)

**PC57.144**/D5 (PE/TR) Guide for Metric Conversion of Transformer Standards
***Recommendation:*** APPROVE (6/23/2004)
**REAFFIRMATION**

**C57.12.35-1996** (PE/TR) IEEE Standard for Bar Coding for Distribution Transformers
***Recommendation:*** APPROVE (6/23/2004)

**C57.21-1990 (R1995)** (PE/TR) IEEE Standard Requirements, Terminology, and Test Code for Shunt Reactors
Rated Over 500 kVA
***Recommendation:*** APPROVE (6/23/2004)

**C57.91-1995** (PE/TR) IEEE Guide for Loading Mineral-Oil-Immersed Transformers
***Recommendation:*** APPROVE (6/23/2004)

**C57.110-1998** (PE/TR) IEEE Recommended Practice for Establishing Transformer Capability When Supplying Nonsinusoidal Load Currents
***Recommendation:*** APPROVE (3/24/2004)

**IEEE 259-1999** (PE/TR) IEEE Standard Test Procedure for Evaluation of Systems of Insulation for Dry-Type Specialty and General-Purpose Transformers
***Recommendation***: APPROVE [Vote: Yes=12; No=0; Abstain=1 (Engmann)] (9/22/2004)

**C57.96-1999** (PE/TR) IEEE Guide for Loading Dry-Type Distribution and Power Transformers
Recommendation: APPROVE [Vote: Yes=12; No=0; Abstain=1 (Engmann)] (9/22/2004)
PARS DUE TO EXPIRE AT THE END OF 2004
**(from IEEE SA/J. Haas)**

**PC57.12.25** Standard for Pad-Mounted, Compartmental-Type, Self-Cooled, Single-Phase Distribution Transformers with Separable Insulated High-Voltage Connectors; High Voltage, 34500 GrdY/19920 Volts and Below, Low Voltage, 240/120 Volts; 167 kVA and Smaller – Requirements

**PC57.12.33** Guide for Distribution Transformer Loss Evaluation

**PC57.15** Standard Requirements, Terminology, and Test Code for Step-Voltage Regulators

**PC57.19.00** Standard General Requirements and Test Procedure for Power Apparatus Bushings

**PC57.145** Guide for the Definition of Thermal Duplicate Liquid-Immersed Distribution, Power, and Regulating Transformers

If the projects will not be submitted to RevCom in time for the December 2004 meeting, you have the following options:

1) Request an extension for the projects. The Target Extension Request Form can be found at http://standards.ieee.org/guides/par/extension.rtf. Please note that this extension request can now be from one to four years.
2) Request withdrawal of the projects.
If there is no response by **19 October 2004**, the projects will be recommended for administrative withdrawal at the 8 December 2004 IEEE-SA Standards Board meeting.

INVITAION TO BALLOT STATUS -- 2004, SORTED BY INVITATION NUMBER (As of 10/10/2004)
Invitation Number
Sponsor (Soc/Com)
Working Group Chair
Invitation Open Date
Invitaiton Close Date
Invitations Sent Out
Type of Invitation

PC57.12.20 PE/TR Alan Wilks(awilks@ermco-eci.com) 2004-02-03 2004-03-04 673 Electronic

PC57.146 PE/TR William H Bartley(william_bartley@hsb.com) 2004-02-19 2004-03-20 675 Electronic

PC57.104 REV PE/TR Frank W Heinrichs(frankus1@earthlink.net) 2004-04-27 2004-05-27 729 Electronic

PC57.12.29 REV PE/TR Robert C Olen(rolen@cooperpower.com) 2004-05-18 2004-06-17 729 Electronic

PC57.12.28 REV PE/TR Robert C Olen(rolen@cooperpower.com) 2004-05-18 2004-06-17 729 Electronic

PC57.12.44 REV PE/TR Daniel H Mulkey(dhm3@pge.com) 2004-07-08 2004-08-07 737 Electronic

BALLOT STATUS -- 2004, SORTED BY BALLOT NUMBER (As of 10/10/2004)
Balloting Results
Ballot Number
Sponsor (Soc/Com)
Type of Ballot
Ballot Opened
Sched. Close Date
# Ballots Affirm Neg Abstain

Type of Ballot
Std. 259-1999 PE/TR Reaff 12-Dec-03 11-Jan-04 56 100% 0% 2% Electronic
Std. C57.96-1999 PE/TR Reaff 5-Jan-04 4-Feb-04 70 100% 0% 1% Electronic
Std. C57.121-1998 PE/TR Reaff 21-Jan-04 20-Feb-04 73 100% 0% 1% Electronic
PC57.12.34/D10 PE/TR New 3-Feb-04 15-Mar-04 90 95% 5% 4% Electronic
PC57.13.2/D3 PE/TR Rev 23-Mar-04 22-Apr-04 70 96% 4% 3% Electronic
PC57.130/D14 PE/TR New 23-Mar-04 22-Apr-04 128 90% 10% 3% Electronic
PC57.12.37/D11a PE/TR New 26-Mar-04 25-Apr-04 78 96% 4% 3% Electronic
PC57.146/D3 PE/TR New 5-Apr-04 5-May-04 72 96% 4% 4% Electronic
PC57.144/D5 PE/TR Recirc 8-Apr-04 8-May-04 120 100% 0% 2% Electronic
PC57.12.20/D10b PE/TR Rev 13-Apr-04 13-May-04 81 95% 5% 3% Electronic
PC57.12.34/D11 PE/TR Recirc 18-Jun-04 28-Jun-04 90 97% 3% 4% Electronic
PC57.12.44/D1.9 PE/TR Rev 09-Sep-04 08-Oct-04 50 94% 2% 4% Electronic
PC57.104/D11d PE/TR Rev 6-Jul-04 5-Aug-04 138 85% 5% 3% Electronic
PC57.13.6/D2 PE/TR Recirc 15-Jul-04 14-Aug-04 82 97% 3% 5% Electronic
PC57.12.28/D1.9 PE/TR Rev 15-Jul-04 14-Aug-04 79 98% 2% 1% Electronic
PC57.12.29/D1.4 PE/TR Rev 15-Jul-04 14-Aug-04 70 100% 0% 1% Electronic
PC57.19.00/D6.1 PE/TR Recirc 12-Aug-04 11-Sep-04 89 Electronic

**2005 STANDARDS BOARD MEETINGS SCHEDULE AND SUBMITTAL DEADLINES**

| **Meeting Dates** | **Deadline for Submittal of PAR** (1) **or Draft Standard (2)** |
|---|---|
| March 19, 2005 | February 4, 2005 |
| June 8, 2005 | April 29, 2005 |
| September 21, 2005 | August 12, 2005 |
| December 6, 2005 | October 17, 2005 |

1) A PAR must be sent to the Standards Subcommittee Chair before the stated deadline.
2) Standards must be submitted directly to the IEEE Standards Department by the Working Group Chair before the stated deadline to be considered at the next Standards board Meeting.
For current PAR form: http://standards.ieee.org/guides/par/index.html.
Target Extension Request form: http://standards.ieee.org/guides/par/extension.html.

CURRENT LIST OF ALL OPEN STANDARDS PROJECT (FROM IEEE Website 10/10/2004)
**http://standards.ieee.org/board/nes/C2-C136.html**
Only PARs submitted electronically and approved since the December 1998 Standards Board meeting are listed

**PC57.12.00** (PE/TR) Standard General Requirements for Liquid-Immersed Distribution, Power, and Regulating
Transformers

**PC57.12.01** (PE/TR) Standard General Requirements for Dry-Type Distribution and Power Transformers Including those with Solid Cast and/or Resin Encapsulated Windings

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

**PC57.12.20** (PE/TR) Standard for Overhead Type Distribution Transformers, 500 kVA and Smaller: High Voltage, 34500 Volts and Below; Low Voltage, 7970/13800Y Volts and Below

**PC57.12.25** (PE/TR) Standard for Pad-Mounted, Compartmental-Type, Self-Cooled, Single-Phase Distribution Transformers with Separable Insulated High-Voltage Connectors; High Voltage, 34500 GrdY/19920 Volts and Below, Low Voltage, 240/120 Volts; 167 kVA and Smaller - Requirements

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

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

**PC57.12.33** (PE/TR) Guide for Distribution Transformer Loss Evaluation

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

**PC57.12.37** (PE/TR) Standard for the Electronic Reporting of Distribution Transformer Test Data

**PC57.12.40** (PE/TR) Requirements for Secondary Network Transformers, Subway and Vault Types (Liquid-Immersed)

**PC57.12.44** (PE/TR) Standard Requirements for Secondary Network Protectors

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

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

**PC57.12.90** (PE/TR) Standard Test Code for Liquid-Immersed Distribution, Power, and Regulating Transformers

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

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

**PC57.13.2** (PE/TR) Conformance Test Procedure for Instrument Transformers

**PC57.13.3** (PE/PSR) Guide for Grounding of Instrument Transformer Secondary Circuits and Cases

**PC57.13.6** (PE/TR) Standard for High Accuracy Instrument Transformers

**PC57.15** (PE/TR) Standard Requirements, Terminology, and Test Code for Step-Voltage Regulators

**PC57.19.00** (PE/TR) General Requirements and Test Procedures for Power Apparatus Bushings

**PC57.19.03-1996/Cor 1-20xx** (PE/TR) Standard Requirements, Terminology, and Test Code for Bushings for DC Applications - Corrigendum 1

**PC57.21** (PE/TR) Standard Requirements, Terminology, and Test Code for Shunt Reactors Rated Over 500 kVA

**PC57.32** (PE/TR) Standard Requirements, Terminology and Test Procedures for Neutral Grounding Devices

**PC57.93** (PE/TR) Guide for Installation of Liquid-Immersed Power Transformers

**PC57.98** (PE/TR) Guide for Transformer Impulse Tests

**PC57.104** (PE/TR) Guide for the Interpretation of Gases Generated in Oil-Immersed Transformers

**PC57.106** (PE/TR) Guide for Acceptance and Maintenance of Insulating Oil in Equipment

**PC57.119** (PE/TR) Recommended Practice for Performing Temperature Rise Tests on Oil Immersed Power Transformers at Loads Beyond Nameplate Rating

**PC57.127** (PE/TR) Guide for the Detection and Location of Acoustic Emissions from Partial Discharges in Oil-Immersed Power Transformers and Reactors

**PC57.129** (PE/TR) Standard for General Requirements and Test Code for Oil-Immersed HVDC Converter Transformers

**PC57.130** (PE/TR) IEEE Trial-Use Guide for the Use of Dissolved Gas Analysis During Factory Temperature Rise Tests for the Evaluation of Oil-Immersed Transformers and Reactors

**PC57.131** (PE/TR) Standard Requirements for Tap Changers

**PC57.139** (PE/TR) Guide for Dissolved Gas Analysis in Transformer Load Tap Changers

**PC57.140** (PE/TR) Evaluation and Reconditioning of Liquid Immersed Power Transformers

**PC57.142** (PE/TR) A Guide To Describe The Occurrence And Mitigation Of Switching Transients Induced By Transformer-Breaker Interaction

**PC57.143** (PE/TR) Guide for Application of Monitoring to Liquid-Immersed Transformers and Components

**PC57.145** (PE/TR) Guide for the Definition of Thermal Duplicate Liquid-Immersed Distribution, Power, and Regulating Transformers

**PC57.146** (PE/TR) Guide for Interpretation of Gasses Generated in Silicone-Immersed Transformers

**PC57.147** (PE/TR) Guide for Acceptance and Maintenance of Natural Ester Fluids in Transformers

**PC57.148** (PE/TR) Standard for Control Cabinets for Power Transformers

**PC57.149** (PE/TR) Guide for the Application and Interpretation of Frequency Response Analysis

for Oil Immersed Transformers

## NEMA/ANSI DOCUMENTS TRANSFERRED TO IEEE

The following standards were transferred to IEEE as of December 2, 2002. The date of transfer (December 2, 2002) will be considered as the start of the standard's life. The Transformers Committee will have 5 years from the date of transfer to revise these standards. Given that these are special circumstances, it is likely we could obtain some extension from RevCom.

C57.12.10-1997
C57.12.20-1997
C57.12.21-2002
C57.12.22-1993
C57.12.24-2000
C57.12.25-1990
C57.12.26-1992
C57.12.28-1999
C57.12.29-1991
C57.12.31-2002
C57.12.32-2002
C57.12.40-2000
C57.12.50-1981
C57.12.51-1998
C57.12.52-1981
C57.12.55-1987
C57.12.57-1987

At this point IEEE SA indicated they can only provide PDF document for our revision work. Efforts are being made to contact ANSI/NEMA staff Mr. Scott Choinski to obtain the electronic word documents for these standards. The standards with yellow highlight indicate no activities at current time.

## 7.0 Recognition and Awards – Chair. H. Jin Sim

### 7.1 Certificates of Appreciation

Certificates of Appreciation have been obtained for the following persons:

| Name | Service Rendered |
|---|---|
| Don Cash | Host, Fall 2004 Meeting, Las Vegas, NV |
| Mark Christini | Certificate of Appreciation, Editor, IEEE Transactions on Power Delivery |
| Prit Singh | Certification of Appreciation, Distinguished Service Award |
| Tom Prevost | Certification of Appreciation, Chair of Standards Subcommittee & Standards Coordinator |

### 7.2 Nominations for IEEE, PES, and Technical Council Awards

None at this time.

### 7.3 Awards – General

The following is a listing of various awards available. Detailed current information and nomination forms are available from the PES website.

| AWARD | NOMINATION DEADLINE | NOMINATION SENT TO |
|---|---|---|
| PES Prize Paper Award | *** | Mohammad Shahidehpour |
| PES Working Group Award (Technical Report) | *** | Mohammad Shahidehpour |
| PES Working Group Award (Standard or Guide) | *** | Mohammad Shahidehpour |
| “High Interest” Paper | *** | Noel Schulz |
| Alfred Nobel Intersociety Award | *** | Noel Schulz |
| Charles Concordia Power System Engineering Award | January 1 | Richard G. Farmer |
| Cyril G. Veinott Electromechanical Energy Conversion Award | February 2 | Steve Pekarek |

| | | |
|---|---|---|
| Electrotechnology Transfer Award | *** | Sandra Kim |
| IEEE Herman Halperin Electric Transmission and Distribution Award | *** | IEEE Awards Activities |
| IEEE Richard H. Kaufmann Award | *** | IEEE Awards Activities |
| IEEE Charles Proteus Steinmetz Award | *** | IEEE Awards Activities |
| IEEE Nikola Tesla Award | *** | IEEE Awards Activities |
| Uno Lamm HVDC Award | *** | Prof. Willis Long |
| Walter Fee Outstanding Young Engineer Award | February 15 | Prof. Thomas J. Overbye |
| Technical Committee Prize Paper Award | *** | Noel Schulz |
| Technical Committee Distinguished Service Award | *** | Noel Schulz |
| Tech. Com. Working Group Recognition Award | *** | Noel Schulz |
| IEEE Prize Paper Award (W.R.G. Baker) | April 1 | Mohammad Shahidehpour |
| IEEE Prize Paper Award (Donald G. Fink) | April 1 | Mohammad Shahidehpour |
| IEEE Prize Paper Award (Browder J. Thompson) | April 1 | Mohammad Shahidehpour |

*** Will be decided later. Most of these are annual awards and we can submit the nominations throughout the year.

## 8.0 Report of Technical Subcommittees

## 8.1 Underground Transformers and Network Protectors - Carl G. Niemann

### 8.1.1 Introduction/Attendance

The Underground Transformers and Network Protectors Subcommittee met on Wednesday, October 27, 2004, in the Estansia BC room of the Green Valley Ranch Resort & Spa at 9:30 AM with eight members and four guests present.

### 8.1.2 Approval of Minutes

The minutes of the March 10, 2004 meeting in San Diego, California were approved as submitted.

### 8.1.3 Membership

Membership stands at 20 members. One guest Isran Bamentos requested membership at meeting.

### 8.1.4 Chairman's Remarks

**Administrative Subcommittee Notes Reported to SC**

- The Chair reitteratedthat it was necessary to discuss patents at all future meetings

### 8.1.5 Working Group Reports

#### 8.1.5.1 Underground Single Phase Transformers (C57.12.23) A. Traut – Chairman

1. The WG met on Monday, October 25, 2004, with 16 members present.
2. Minutes of the Spring meeting in San Diego were approved as submitted.
3. Patent/Disclosure was announced. No patent issues were raised.
4. After discussion it was voted on and approved to change the title of the standard to "**Submersible Single-Phase, Transformers; 167 kVA and Smaller; High Voltage 2500V and Below; Low Voltage 600V and Below.**
5. Sec. 1.1: Change "underground" to :submersible" in first sentence.
6. Sec. 4.2: Add "certain" before accessories and change may require to "will require"
7. Sec 7.4: Move last sentence "An oil-level ……." To Sec. 7.3.
8. Sec 7.3: Move the paragraph beginning with "The lifting provisions shall be……." to the Tank Section. It was agreed this is not part of accessories.
9. Combine 7.5 "Enclosure Integrity" and 7.4 "Liquid Preservation". Change upper limit of temperature range to $120^0$C.

#### 8.1.5.2 Three-Phase Underground-Type Transformers (C57.12.24) Giuseppe Termini Chairman

1. Met on Monday, October 25, 2004, at 8:00 AM in the Estancia A room with nine members and fourteen guests present.
2. Minutes of the Spring meeting in San Diego were approved.
3. The patent/disclosure issue was discussed. No issues raised.
4. Discussions under old business:
    a. The chairman stated he will work with Bill Chiu to initiate a PAR so that working group can begin work on revision to this standard.
    b. It was voted to change the title to **"Submersible Three-Phase Transformers; 3750kVA and Smaller"** (an increase from 2500kVA). The Purpose and Scope were also changed to agree with .23.
    c. Dan Mulkey stated that Sec. 1.2 should be under the Scope and Sec. 1.1 should be under the Purpose. It was voted on and approved to make this change

5. Discussions under New Business:
    a) SC Chairman stated all future meetings will have meeting rooms wired with wireless interconnects.
    b) SC Chairman also stated that the AM System was fully functional and that all members shold log into the system and make sure all their edata was correct ot register if they haven't done so.
6. The meeting was adjourned at 9:15 AM.

### 8.1.5.2 Liquid Filled Secondary Network Transformers (C57.12.40) B. Klaponski -Chairman

1. Met on Monday, October 25, 2004 at 9:30 AM with 14 members and one guest present.
2. Minutes of the March 8, 2004 meeting in San Diego were approved as submitted.
3. The Chairman reported that the standard was now in the start of the blloting process. This ballot is to correct errors in the last revision by NEMA.

4. There was discussion on throat height dimensions for network protectors, primary grounding switch requirements, and NEMA defined transformer terminals. These changes will be made in the next revision.
5. Patents were discussed. Their were no issues.
6. The meeting was adjourned at 10:45 AM.

### 8.1.5.3 Secondary Network Protectors (C57.12.44) D.H. Mulkey - Chairman

1. Met on Monday, October 25,2004 at 1:45 PM with five members and one guest present.
2. Minutes of the March 8, 2004 meeting in San Diego, California were approved as written.
3. Discussion centered on:
    A. Chairman reported ballot was successful
        - 94% return
        - 97% affirmative
        - One negative ballot
    B. Reviewed the 28 submitted comments and agreed to make many small changes.
    C. Chair will discuss results of his discussion with the negative balloter
    D. Patents were discussed. No issues.
4. Meeting adjourned at 2:44 PM

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

No report, Chairman not in attendance. Working Group discussed moving this to new category

### 8.1.6 New Business

A. There was discussion on renaming the SubCommittee. It was voted on to change the name to **"Submersible and Network Equipment".** This will be reported at the next AdCom meeting for approval.

B. We then discussed some serious problems we are having with how the PAR creation/editing/balloting process works. Discussion centered on how apparent it is becoming that the process is a burden to WG chairs. We must remind ourselves that we are a customer of the IEEE and as such the IEEE should be supplying administrative services to allow us to concentrate our efforts on the technical standards and not worry about the ever changing administrative process. Our decision was that we would strongly recommend that this entire process be thoroughly reviewed with an objective to make the process "lean" or user friendly. To us the current process appears to be an improvement from an IEEE administrative perspective, however, it has created significant additional work for WG chairs

   If others feel as we do, please let us know. As a united front we were able to Resolve the MOU and metrification issues. Hopefully we can also resolve this issue and make loife simpler for all the important volunteer work we are doing.

### 8.1.7 Future Meetings

The location and dates for future meetings are as follows:

| | |
|---|---|
| March 13-18, 2005 | Jackson, Mississippi |

### 8.1.8 The Subcommittee adjourned at 10:45 AM.

## 8.2 Audible Sound and Vibration

No minutes submitted.

## 8.3 Bushings – F.E. Elliott, Chair

### 8.3.1 Introduction/Attendance

Pritpal Singh, acting Chair, opened the meeting at 3:00 PM and welcomed the members and guests. There were 42 attendees with 19 members and 23 guests present. Two guests requested membership to the Bushing Subcommittee.

Prit stated that due to his retirement, he decided to resign as the Secretary of the Bushing SC and Peter D. Zhao will take the position.

IEEE patent policy was discussed and no patent conflicts were reported at the meeting.

### 8.3.2 Approval of Minutes of Last Meeting

The minutes were approved as written.

### 8.3.3 Chairman's Remarks

On behalf of Fred Elliott, Loren Wagenaar made the following remarks after attending the Administrative Subcommittee.

- The Spring 2005 Transformer Committee meeting will be held in Jackson, Mississippi, March 13-17, hosted by Andy Speegle and Kuhlman Electric.
- The Fall 2005 Transformer Committee meeting will be in Memphis, Tennessee, October 23-27, hosted by Randy Williams and ABB Inc.
- AM system will be used for future administration/registration process. Members are encouraged to use the system.
- When contacting IEEE SA on any working documents related issues, a copy at the same time needs to be sent to Bill Chiu Chair – Standard SC.
- Wireless technology is available now, owned by the committee. Members can connect to the Internet during the meetings.
- Transformer committee meeting format will stay at 3.5 days. Thursday meeting will be more efficient. All the reports should be short and to the point.
- Minutes should be marked as **Unapproved**. Their status will change when they are approved at the next meeting. Don Fallon is looking into the process.

In addition, Loren expressed his sincere thanks to Pritpal Singh, for his long time contributions to the committee, and wished him well in his retirement.

### 8.3.4 Working Group (WG) and Task Force (TF) Reports

#### 8.3.4.1 WG - Revision of C57.19.00 - Keith Ellis, Chair

Keith reported that ;

- Final document has been submitted to REVCOM for further process.
- At the same time, a request has been submitted to extend the PAR.

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

The TF Chair opened the meeting at 11:00 AM and welcomed members and guests. There were 50 attendees with 24 members and 26 guests.

Present patent information was discussed.

Minutes of the last meeting were approved as written.

Held discussions on draw lead by Prit Singh on Keith Ellis's comment and made corrections including comments on duration of overloads. Other related standards will be referenced.

Bushing storage was discussed. For new bushings, reference will be made to manufacturer instructions. Other general information will be added and the proposal will be re-worded before the next meeting.

Proposals on on-line monitoring were discussed. It was decided to write a proposal to cover only general information and concerns without going into specific details about the circuits.

Draw lead extensions – the present guide does not mention draw lead extensions, and some wording will be added to address the use of extensions.

The meeting was adjured at 12:15.

### 8.3.4.3 TF – Bulk Bushings – Bob Hartgrove, Chair

The TF Chair reported that the meeting on Bulk Bushings was held on October 26, 2004 at 3:15 to 4:00 PM. There were 22 attendees with 7 members and 15 guests. 5 guests requested for membership.

An update was given by WARCO and HJ Enterprises upon the status of accumulating dimensional and electrical characteristics of distribution transformer bulk type bushings. Because of the vast number of ratings and dimensions, the task has not been completed by either company as requested by the committee in the Spring meeting.

Definition of bulk bushing was discussed; Prit Singh recommended that we use the definition from the 1991 IEEE Standard. Bob's recommendation was to include the definition in this standard.

There was a major discussion on who specifies bulk type bushings within Distribution Transformers, End User or Transformer Design Engineer, or Transformer OEM Procurement.

Since only two Utilities, or End Users, were present out of the 22 attendees, it was proposed that this committee make all the necessary provisions to ensure that the END Users have good representation. Therefore, Mark Rivers from Doble along with Prit Singh representing ABB proposed to create a survey to be disseminated via Doble Conference Attendees or Doble Clients to survey Bulk Type Bushing standardization and concerns.

Discussions were primarily about Distribution type bushings and not Power. After realizing that there are hundreds of thousands of distribution type bulk bushings being manufactured each year and having many different variations of styles and variations within each kV class, the group unanimously decided to discontinue this effort and propose a task force on GSU type bulk bushings for Power Transformers. Upon this decision the bulk bushing survey was not required by

Mark Rivers and Prit Singh. This subject will be discussed at the next Bushing Subcommittee meeting.

#### 8.3.4.4 C57.19.03 – DC bushing Standard

TF Chair Fred Elliott sent the following information;

An initial draft of the corrigendum has been circulated to the members of the TF for comments. A revised draft is being prepared for submission to IEEE for balloting.

#### 8.3.4.5 IEC Bushing Standards Activity - John Graham of Trench Ltd., UK

John Graham submitted his report as follows;

**IEC BUSHING STANDARDIZATION WORK**

Within IEC, standardization of bushings is covered by Technical Committee TC36: Insulators, Subcommittee SC36A: Insulated Bushings.

Subcommittee officers are:

Chairman: Lars Johnsson, ABB, Sweden.
Secretary: Danilo Perin, CESI, Italy.

The last meeting of SC36A was held at the IEC General Meeting in Beijing, China in October 2002. The next meeting will be NEMA Headquarter, Rosslyn, Virginia, on December 9th 2004.

There are two active working groups:

**SC36A WG4: IEC 62199: Bushings for DC Application**
Project Leader: Gilles Desilet, TransEnegrgie, Canada.

This document was published in July 2004 and is very similar to the equivalent IEEE standard C57.19.03. DC test voltages are determined in a similar manner, however, definitions and terms follow the IEC styles based on IEC 61378-2: Transformers for HVDC Application. This document has been adopted as a European Standard (EN). It may be possible in future to align the IEC and IEEE standards more closely.

**SC36A MT5: IEC 60137: Insulated Bushings for Alternative Voltage above 1 kV.**
Project Leader: John Graham, Trench-UK.

Although IEC 60137 Edition 5 was just published in August 2003 due to adverse comments received from the IEC transformer committee TC14 work was immediately restarted. TC14 comments were based on the difference between the tests on bushing and the latest test requirement of IEC 60076-3. In March 2004 a new Committee Draft (CD) was distributed for comment by National Committees.

Comments have been received and will be discussed at the next meeting of SC36A that takes place in Washington later this year.

As reported in San Diego, some compromises have been agreed to increase the range of routine lightning impulse tests for 245kV rating. For transformer bushings in the range 100kV to 170kV, full wave and chopped wave lightning will be included as a type test (based on the testing of three bushings to increase statistical security). A new type test has been added for AC long duration on transformer bushings equal to and above 170kV rating and an EMC test for all bushings above 123kV rating.

The altitude correction factor has been revised following the procedures given in IEC60694 Common Clauses for switchgear (and IEC60071-1) and other equipment standards. The factor k is based on altitude correction above 1000m with different correction for BIL/power frequency and SIL. The change gives higher figure than the present 1%/100m above 1000m e.g. at 3000m the correction factor becomes 1.28 instead of 1.2.

The Maintenance Team met in Geneva, Switzerland in September 2004 and agreed responses to the comments raised on the CD. It is expected that after the Washington meeting the document will go directly to a vote.

**Other Work**

**SC36A MT7: IEC 61463: Seismic qualification of bushings.**
This new maintenance team will be set up to review the document published in 1997. This offers a more simplified approach to qualification than IEEE 693, allowing static calculation. No work yet.

**CENELEC TC36A WG4 EN____: Capacitance graded outdoor bushings 52 up to 420kV for oil filled transformers**

CENELEC is the European parallel committee for IEC and produces standards or harmonization document for use in the European Community. As standards, they have a legal status and override similar standards in member states.
This document will give dimensional standardization for transformer bushings, however at present, work is making no progress and is out of time. CENELEC Management Committee will now decide whether to proceed.

### 8.3.5 Old Business

Information on CIRGE bushing activity was not reported, however Sam Mehta indicated that there is some activity on bushing reliability in CIGRE Working Group A2.25. A questionnaire has been prepared to collect information on bushing failures.

### 8.3.6 New Business

No topic was suggested for new business

### 8.3.7 Technical Papers

No activity was reported for this year, however Prit Singh reported that there were a few papers at the 2003 Doble Conference.

### 8.3.8 Adjournment

The meeting was adjourned at 3:40 PM.

## 8.4 Dry Type Transformers – C.W. Johnson

### 8.4.1 Introductions and Approval of Minutes

The Dry Type Transformer Subcommittee met in Henderson, NV on October 27, 2004 with 15 members and 8 guests present; 1 guest requested membership. Introductions were made and the attendance roster was circulated. Minutes from the October 8, 2003 meeting were reviewed and approved.

Prior to any other activities, IEEE patent policy was discussed. Attendees were asked if they know of any patents that were essential to the implementation of any of the standards related topics under current control of the subcommittee. None were noted.

### 8.4.2 Working Group Reports

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

#### 8.4.2.1 WG Dry Type General Requirements C57.12.01 - Chairman John Sullivan

The working group met in the Estancia E meeting room of the Green Valley Ranch Resort & Spa in Las Vegas, Nevada.

Chairman John Sullivan called the meeting to order at 1:45 PM on Monday October 25, 2004.

The meeting was convened with ten (10) members and eight (8) guests present. (Four) 4 guests requested membership.

Introductions were made.

The first order of business was to ask the members if they knew of any patents or pending patents that apply to the contents of the C57.12.01 standard. No one knew of any patents that pertained to C57.12.01.

The minutes of the San Diego meeting were approved.

Members were encouraged to sign up to the Transformers Committee AMS system. Without a valid working e-mail address entered into this system, members will not receive meeting notices or committee correspondence.

The current status of the C57.12.01 standard was discussed:

- The working Group PAR expires 31 December, 2005.
- The revised standard will be submitted for ballot prior to the spring 2005 meeting.
- Comments and any negatives will be resolved prior to or during the spring meeting.
- Final ballot is planned immediately after the spring meeting to meet the December 31 deadline.

Comments received since the last meeting was discussed.

1. Figure 2 and figure 2 (continued) are not of good quality. This will be corrected when the standard is published.

2. Section 4.2 – Annex A is data that may belong in the body of the standard or in the loading guide C57.96. The consensus of the working group was to leave the material in Annex A in its present location for this revision and address the issue during the next revision.
3. A task force of Carl Bush, Charles Johnson, Anthony Jonnatti, Phil Hopkinson and John Sullivan was appointed to review and clarify the contents of Section 5.10.5 and Table 5. Their resolution will be included in the final draft of the standard.
4. Language to clarify section 5.10.2 will be resolved by Carl Bush, Anthony Jonnatti and John Sullivan. The new language will be included in the final draft of the standard.
5. Paragraph 5.1 and section 5.7 will be addressed in the next revision of the standard.
6. The remaining comments were editorial and will be corrected as necessary.

There being no old business or new business presented, the meeting adjourned at 3:00 pm.

### 8.4.2.2 Dry Type Reactor TF - Chairman Richard Dudley

**The Dry Type Reactors T.F. met in the Estancia E Meeting Room of the Green Valley Resort Hotel in Las Vegas, Nevada on Oct. 25, 2004 at 8:00 a.m. There were 8 members and 4 guests present. The following are the highlights of the meeting.**

1. The minutes of the Dry Type Reactors T.F. meeting in San Diego were approved.

NOTE: The minutes of the Las Vegas meeting of the T.F. will not be approved until the meeting in Jackson, Mississippi.

2. IEEE patent policy was discussed; details in registration package. Attendees were asked if they know of any patents that were essential to the implementation of any of the standards related topics under current consideration by the T.F. None were noted.
3. The first draft of an informative annex, prepared by the Chairman, on circuit breaker TRV issues associated with the application of series reactors was discussed. The draft annex covers a description of the TRV phenomenon, reactor application issues and mitigation. The following are the highlights of discussions.

   (i) Pierre Riffon reviewed work now in progress in the switchgear committees of both IEC and IEEE on circuit breaker TRV issues. The proposed annex for inclusion in a revision of IEEE C57.16 should be consistent with this standards development work.

   - IEEE will adopt IEC's method of defining TRV waveforms for CBs 100 kV and above. IEC will follow IEEE terminology for CBs rated 100 kV and below.
   - An amendment to IEC 62271-100 Alternating Current Circuit Breakers is at the CDV stage; voltage stage. The focus of the amendment is on CBs 100 kV and below. Four classes of CBs are defined; 2 for cable systems (lower TRV capability) and 2 for line application.
   - The IEEE Switchgear Committee is in the process of revising IEEE C37.06. The revision will be consistent with the IEC CB standard.
   - Pierre Riffon will provide T.F. members a copy of the amendment to IEC 62271-100 and background information on the revision process for IEEE C37.06.

   (ii) In applying series reactors it is critical to evaluate the type of CB to be utilized and its TRV capability vs the system requirements.

(iii) $SF_6$ CBs are especially vulnerable to TRV. Capacitors, applied across a series reactor or to ground, provide the best mitigation. Capacitors applied across a series reactor are usually low cost compared to the cost of using a higher class CB.

(iv) Pierre Riffon will prepare Draft #2 of the annex "Application of Series Reactors and Circuit Breaker RTV Consideration" taking the proceeding into consideration.

4. A draft proposal, prepared by the Chairman, covering the measurement of inductance of tapped filter reactors was discussed; Annex A clause A.5.4.2. The following are the highlights.

   (i) The inductance of all tap positions MUST be measured on the first unit of an order.

   (ii) It was noted that practice at site during commissioning of filters is to measure the capacitance value of individual capacitor cans, calculate the total capacitance, select the closest tap to meet design tuning and verify the appropriate tap by measuring the high frequency impedance response of the filter. Inductance of the filter reactor (at the selected tap position) is not measured. Therefore the exact inductance value at the tap positions does not appear to be critical; tapping range and sufficient steps is important.

   (iii) For multi-tuned filters, the inductance of the filter reactor (taps) should be measured at either the lowest or highest tuning frequency; to be specified.

   (iv) Inductance should be measured at a minimum of 3 points; typically maximum, minimum and nominal.

   (v) For continuously tunable filter reactors the inductance should be measured at nominal and extremes of regulation.

   (vi) Should Note 2 be in the main part of C57.16; Clause 7.2.5? The Chairman will review the standard and recommend appropriate location(s).

5. Should Table 5 in C57.16 be harmonized with the current revision of C57.21 and the transformer standard; standardized BILs? What is the impact on filter reactors? A NOTE should be added to Table 5 stating that in the application of series reactors different BILs are specified across the coil and to ground. The BIL across the reactor is usually lower; strongly influenced by the inductance of the reactor and arrester protection practice. What is the impact of the different BILs in Table 5? T.F. members were asked to provide their thoughts and input on this complex issue.

The meeting adjourned at 9:15 a.m.

### 8.4.2.3 WG Dry Type Thermal Evaluation C57.12.56/60 Chairman Richard Provost

The working group met in Las Vegas, NV at the Green Valley Ranch Resort at 9:30 AM on Tuesday, October 26, 2004 with nine members and two guests present. Attendees introduced themselves and signed a roster.

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

The Title of the document will be: "IEEE Standard Test Procedure for Thermal Evaluation of Insulation Systems for Dry Type Power and Distribution Transformers, Including Ventilated, Solid-Cast and Resin Encapsulated Transformers". This needs to be modified in the draft document.

There was a discussion related to the scope in the draft document, however, this needs to be reworded to be consistent with the Scope of the PAR, as well as the title. This should resolve many of the issues discussed in the meeting. The Scope of the PAR is worded as follows: This Test Procedure is for the thermal evaluation of insulation systems of dry type power and distribution transformers, including both ventilated technology and solid-cast / encapsulated technology, to be used for determining the temperature classification of the insulation systems.

There was a discussion related to the voltage ratings covered in both the introduction and the scope of the draft document, as well as how they relate to other documents, such as IEEE 259. Bill Simpson agreed to propose rewording as appropriate.

Martin Navarro provided draft definitions which were the basis of substantial discussion, especially around the use of gas insulated windings and whether they are covered by this document. It was agreed that this would not be included, and that we would look at C57.12.52 (gas insulated product standard) to consider future revisions (outside of current scope) of this document. The working group agreed to review these definitions and provide feedback to the chair, who will then forward them to Martin.

Martin Navarro also provided a presentation with the various technologies used to produce coils which may be applicable to this standard. The group agreed to review these “typical” technologies, and then this information would be included as an informative annex in the next revision.

Bill Simpson agreed to look at relevant IEC documents for definitions, etc., as a part of this review.

For the next meeting we agreed that we would be reviewing all of the revised definitions, as well as to further discuss the test procedures for models and coils consistent with the draft document. The working group agreed to look at these procedures prior to the next working group meeting.

#### 8.4.2.4 WG Dry Type Test Code C57.12.91 - Chairman Derek Foster

1 The working group met at 1:45 pm with 9 members and 4 guests present. Two guests requested membership: Don MacMillan of Hunterdon Transformer and Yunxiang Chen, company not listed.

2 After introductions the minutes from the March 9, 2004 meeting in San Diego were approved as written.

3 The Chairman reviewed the IEEE information on patents and asked if anyone present had any reason to believe the work we were assigned would have any patent implications. No one replied.

4 Old Business

The Chairman led a discussion of the various clauses of the standard objected to by Nigel McQuin during the last ballot. Nigel McQuin was not present for the meeting. The meeting consisted of discussing these comments by clause numbers.

Prior to the meeting the Chairman sent to the members via email, a document containing each clause in question with the comment by Mr. McQuin and had asked for their opinion as to whether theses clauses should be revised or remain as written. A matrix voting form was included with the email whereby members could vote on each clause, stating their opinion as to whether the change should be accepted.

Only 3 members submitted a complted matrix. Therefore, the members were requested to review the document and to send in the completed matrix as soon as possible. Also included on the voting form is a question to be answered as to whether the member desires to have a PAR initiated for complete review of the standard.

Just prior to the meeting, Nigel McQuin returned the voting form, in which he agreed to withdraw some of his objections and to accept a compromise on some others.

Jeewan Puri submitted a copy of the re-write of Clause 13 of C57.12.90. The Chairman sent this to the members for review and comment, with a view to include this in the next revision of the standard.

There being no new business, the meeting was adjourned at 3:05 pm..

### 8.4.3 Report On Status Of IEEE STD. 259 - William Simpson Jr.

The reaffirmation of IEEE Std 259-1999: Standard Test Procedure for Evaluation of Systems of Insulation for Dry-Type Specialty and General-Purpose Transformers was approved by the IEEE-SA Standards Board on 23 September 2004. There were no negative ballots, however one comment received was technical in nature and would have required a revision of the standard. It was agreed to circulate the recommended modification to members of the SC for review. If deemed appropriate, it will be submitted as a proposed revision during the next updating of the standard.

It is recommended that this standard be forwarded through the USNC TAG to TC14 to IEC/TC98, the Technical Committee on Electrical Insulation Systems (EIS), to be included as a Part in the IEC 61857 series of standards on the thermal evaluation of EIS.

### 8.4.4 New Business

1 The chair gave a report on the activities of the Administrative Subcommittee meeting.

2 Sites for upcoming meetings were announced.

3 The Association Management System (AMS) was discussed and the chair asked that all attendees register their email address so that SC members could be added to the system.

4 The subcommittee was once again reminded that the working group members are required to participate and not just attend the meetings. A suggestion was again made for working group chairs to consider removing inactive members from the group. Several WG chairmen stated they had removed inactive members from their rosters.

5 The subcommittee discussed the four (4) ANSI documents (C57.12.50, C57.12.51, C57.12.52, and C57.12.55) transferred from NEMA. The status of the documents remains in flux as we have no information on how to have the documents approved as IEEE standards. The SC chairman will request support from Bill Chiu on how we should proceed.

6 The SC chairman talked about the Cenelec standards used in Europe to validate dry transformer performance. These standards the dry transformer capability to withstand flammability, climatic, and environmental conditions under normal operation. The members were asked if they thought these issues were applicable to our transformers and if we should consider referencing the Cenelec strandards in our documents. The consensus was that the documents were not needed.

7 The SC chairman discussed the difference in polarity of the impulse waveform for IEEE and IEC standards for dry transformers. IEEE C57.12.91 requires dry transformer impulse testing with a positive crest waveform and the corresponding IEC standards state that a

negative waveform be used. The chairman asked if the membership if an effort should be made to harmonize the waveform polarity. After some discussion, there was no consensus opinion.

8 There being no further business, the subcommittee meeting adjourned at 2:45 PM.

## 8.5 Distribution Transformers – J.E. Smith (edsmith@h-jenterprises.com)

Meeting Time: Wednesday October 27, 2004 at 3:00pm
Attendance: 49 Total
32 Members
12 Guests
5 Guest Requesting Memberships

### 8.5.1 Chair's Remarks & Announcements:

Review of Administrative Committee meeting highlights

- Future Meetings
- New Members
- Transformer Standards Activity
- C57.12.33, Loss Evaluation Guide has been dissolved at the recommendation of the Working Group Chairs, Don Duckett and Tom Pakarek. No further actions will taken on this proposed Standard.

### 8.5.2 Working Group Reports

### 8.5.2.1 C57.12.20 Overhead Distribution Transformers

(Alan Wilks & Tommy Cooper Co Chairs
(awilks@ermco-eci.com & Tommy.cooper@faypwc.com)
PAR Status: Current
PAR Expiration Date: 12/31/ 2005
Current Standard Date: 1997
Current Draft Being Worked On: 10c
Meeting Time: 09:30am, Monday, October 25, 2004
Attendance: 37 Total
19 Members
18 Guests
0 Request for membership

***Issues, Remarks & Announcements:***

Alan informed the working group of the new IEEE rules governing patents and asked if anyone had any patents to declare, no one did and this information was duly recorded. Alan then announced that John Crotty was replacing Ron Kirker representing San Diego Gas and Electric. Alan also reminded everyone that they had to register on the new AM System.

Minutes – The minutes of the previous meeting in San Diego were reviewed and approved.

Old Business – Alan covered comments from the most recent ballot. He divided them into four categories; those to be considered in the future, those that he had already made the corrections, those that were not to be considered, and those that he was undecided about. Alan will make the following changes to draft 10c: 1. Page 13, paragraph 9.3 – add "T" to "wo", 2. Page 14, paragraph 9.5.2 – add "T" to "he", 3. Page 28, Figure 3 – change the parenthesis on "6.4 )0.25)" to "6.4 (0.25)". At this time the meeting was adjourned until Tuesday at 1:45 pm.

Alan called the meeting to order on Tuesday, at 1:50, there were no introductions and Alan continued with the Old Business. Another change that should be made to draft 10c was: Item 4. - Page A-1, Auxiliary Mounting Devices, first line – Change " covered by IEEE C57.12.20-2004 are not …" to " …covered by this standard are not …". After these changes, the draft will be sent for a re-circulation ballot. For this revision, the ballooning issue in the Figures has been taken care of with notes.

New Business – Alan's survey of PRD manufacturers produced only one that could meet the +140C to –40C. He proposed to send the same survey to one other manufacturer, IFD, to see if they could meet that requirement. Ignacio Ares volunteered to come up with wording on PRDs that would meet C57.12.91. Alan then informed the WG about one request to expand C57.12.20 to cover up to 69KV high voltage. There was no motion to support the proposal. The meeting was then adjourned.

**8.5.2.2 C57.12.XX Single-Phase Padmounted Distribution Transformers**
**Combined C57.12.25 & C57.12.21**
Ali Ghafourian & Ignacio Ares Co Chairs
(aghafourian@ermco-eci.com & Ignacio_ares@fpl.com)

PAR Status: Approved 12/08/1998 (For combining Standards C57.12.25 & C57.12.21)
PAR expiration Date: End of 2004
Current Standard Date: 1990
Current Draft Being Worked on: #05, Dated: 10/2004
Meeting Time: 11:00am, Monday, October 25, 2004
Attendance: 37 Total
14 Members
23 Guests
0 Request for membership

***Issues, Remarks & Announcements:***
The WG met and discuss and approved the minutes of the San Diego meeting with three Corrections:

1) C57 was misspelled as C75.
2) C57.12.25 was misspelled as C57.1.25
3) The meeting adjourned at 12:15 P.M. not A.M.

Four Handouts were given:

1) Meeting Agenda
2) Minutes of San Diego meeting
3) Drafts dated October, 2004 to be renamed 05.1

4) Two proposals from Tommy Holifield for table 1

The WG then discussed various proposals for D5.1
These will be incorporated into the next draft including changes to figures 2.3 and 5.

The WG chains also discussed the recent request by IEEE for identification of any patents related to WG work.
None were identified by the group.
The meeting adjourned at 12:15 P.M.

**C57.12.28, C57.12.29, C57.12.31 & C57.12.32 Represent Cabinet integrity Standards and are handled under one basic working group.**

**8.5.2.3 C57.12.28 Pad-Mounted Equipment Enclosure Integrity**
Bob Olen & Dan Mulkey Co Chairs
(bolen@cooperpower.com & dhm3@pge.com)

PAR Status: Approved
PAR expiration Date: May 09, 2007
Current Standard Date: ANSI/NEMA 1999
Current Draft Being Worked on: D 1.9 Dated: April 17, 2004
Meeting Time: October 26, 2004 Time: 8:00 AM
Attendance: 47 Total
24 Members
18 Guests
5 Guest Requesting Memberships

***Issues, Remarks & Announcements:***

1) Initial Balloting of the standard was completed on Aug. 14, 2004. 70 people in ballot group, 62 affirmative, 1 negative with comments, 1 abstention for 81 % returns.
2) Discussed all comments from affirmative and negative ballots.
3) The negative is being withdrawn if comments are addressed during next revision of standard.
4) Section 4.1.1 based on affirmative and negative ballots , the last sentence is Being deleted.
5) Figure # 3 the diameter of the pull hook is being corrected from 31.5" – 32" to 1.02" to 1.48".
6) Based on the changes which are being made – A recirculation balloting of the Standard will be conducted.

**8.5.2.4 C57.12.29 Pad-Mounted Equipment Enclosure Integrity for Coastal Environments**
Bob Olen & Dan Mulkey Co Chairs
(bolen@cooperpower.com & dhm3@pge.com)

PAR Status: Approved by NES Com May 23, 2002
PAR expiration Date: May 09, 2007

Current Standard Date: ANSI/NEMA 1999
Current Draft Being Worked on: 1.4 Dated: April 17, 2004
Meeting Time: October 26, 2004 Time: 8:00 AM
Attendance: 47 Total
24 Members
18 Guests
5 Guest Requesting Memberships

***Issues, Remarks & Announcements:***

1) Initial balloting of the standard was completed on Aug. 14, 2004.
70 people in ballot group, 55 affirmative, 1 abstention and 80 % returned.

2) Discussed all affirmative comments.

3) Section 4.1.1 based on comments made and a vote by the working group
The last sentence will be deleted.

4) Figure # 3 the diameter of the pull hook is being corrected from 31.5" – 32.0" to 1.02" to 1.48".

5) Based on the changes which are being made. A recirculation balloting of the Standard will be conducted.

**8.5.2.5 C57.12.31 Pole Mounted Equipment Enclosure Integrity**
Bob Olen & Dan Mulkey Co Chairs
(bolen@cooperpower.com & dhm3@pge.com)

PAR Status: Approved by NESCOM N/A
PAR expiration Date: N/A
Current Standard Date: 2002 Published March 7, 2003
Current Draft Being Worked on: Dated :
Meeting Times: ***DID NOT MEET***

**8.5.2.6 C57.12.32 Submersible Equipment Enclosure Integrity**
Bob Olen & Dan Mulkey Co Chairs
(bolen@cooperpower.com & dhm3@pge.com)

PAR Status: Approved by NESCOM N/A
PAR expiration Date: N/A
Current Standard Date: 2002 Published March 7, 2003
Current Draft Being Worked on: Dated :
Meeting Times: ***DID NOT MEET***

**8.5.2.7 C57.12.33 Guide For Distribution Transformer Loss Evaluation**
Don Duckett & Tom Pekarek Co Chairs
(don.duckett@fpc.com & tjpekarek@firstenergycorp.com)

PAR Status: PAR extension renewed for two years
PAR expiration Date: December 2004

Current Standard Date: October 2001
Current Draft Being Worked On: #9 Dated April 2003
Meeting Date: ***THIS STANDARD HAS BEEN DISOLVED***

**8.5.2.8 C57.12.34 Three-Phase Padmounted Distribution Transformers**
Ron Stahara & Steve Shull Co Chairs
(rjstahara@msn.com & sshull@empiredistrict.com)

PAR Status: Approved 9/21/1995 (For Standard Development)
PAR expiration Date: December 2004
Current Standard Date: September 24, 2004
This NEW Standard is a combination of the following two Standards
C57.12.22 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)
Current Draft Being Worked On: 1N/A See Below
Meeting Time: October 24, 2004 Time: 1:45 PM
Attendance: 46 Total
29 Members
15 Guests
2 Guest Requesting Memberships

***Issues, Remarks & Announcements***

**This standard has been approved by REVCOM as of September 24, 2004 and should be published in the next 6 to 9 months. The WG will formulate a new expanded PAR by the next meeting and submit it for approval.**

Ron Stahara called the meeting to order, introductions were made, and an attendance roster was circulated. Ron announced that Don Duckett had been released from Progress Energy due to downsizing. He then showed his new contact information. Ron reviewed the IEEE Patent Policy and asked the group if there were any patents that needed to be disclosed. None were announced to the group. The minutes have been published and Ron requested the group to review these online. If there were no comments received within the next three weeks, they will stand approved as published. The group was asked to send these comments to Steve Shull or himself. Ron asked for any other old business. Gerri Piava said that he had received a call from a user asking why C57.12.26 had been withdrawn. Gerri explained the switch to this standard which seemed to be acceptable to the caller.

Ron then asked the working group to look to the next revision of C57.12.34 and thus a new PAR. He said that during the last meeting we had discussed various size limits and a consensus at that time was that 5 MVA would be the new limit. There was some discussion to move the limit to 10 MVA but the group felt that unit sizes above 5 MVA although built were at the present time the exception rather than the rule. Therefore a motion was made by Gerri Paiva and seconded by Gael Kennedy to set the top limit at 5 MVA. A vote was taken and this passed with only 2 members opposed. The high voltage level of 34.5 kV (200 kV BIL level) was suggested. After some discussion on the merits of moving to 200 BIL levels as opposed to 150 kV BIL levels, a motion was made by Gerri Paiva and seconded by Tom Callsen to establish a high voltage level of 34.5 kV (200 kV BIL). A vote was taken and this passed with only 2 members opposed. The low voltage level was suggested as 13.8 kV. After some discussion which included a suggestion

that we go to 25 kV, a motion was made by Bob Grunert and seconded by Gerri Paiva to make the low voltage upper limit at 15 kV (95 kV BIL). A vote was taken and this passed with none opposed. The currently approved purpose was reviewed by the group. A motion was made by Gael Kennedy and seconded by Bob Grunert to accept this as it is currently written because it would not be affected by our limits changes. A vote was taken and this passed with none opposed. The current scope was reviewed and was changed to reflect the changes in the size, high and low voltage limits. A motion was made by Don Trivitt and seconded by Bob Grunert to accept this as it is was corrected. A vote was taken and this passed with none opposed. Ron made a comment that we would formulate this PAR and resubmit it to the working group for approval before it would be submit to IEEE.

Steve Shull passed out a packet that discussed the following items.

**A)** Change the minimum impedance on 300 & 500 kVA 208/120 ratings to limit fault current – Requested by Gerald Paiva

**B)** Change the Table 2 values

(1) Based on new calculation philosophy – Requested by David Gilmer

(2) It isn't clear why the 13800 and 16340 are not 2 ½ above and below. Are these specific values required and does a user requiring 2 - 2 ½ taps above and below need to specify an exception to the standard? – Requested by Tom Lundquist

**C)** Add a new pad-mount front plate for a three, phase miniature design – Requested by Steve Shull

**D)** Removal of Barriers
I do not believe a barrier is "required" between the HV and LV Compartments on a "deadfront" design below 600V... Having this as a requirement in the ANSI standard should be addressed in future revisions to allow some degree of flexibility... I agree this should be "provided" unless a utility has reviewed their operating practices and have specifically addressed this issue in their operating rules before taking exception to this feature. – Requested by Don Duckett

**E)** The voltage levels used in the standard need to be adjusted to relate to the new proposed secondary voltage ranges. This might include 600 V or 347/600 V systems which are used in some places in the USA.

After the group discussed this sheet, it was decided that Jerry Murphy would create a questionnaire for Items A and D to be distributed among the users. This information would be shared at the next meeting. Items B, C, and D would be reviewed by each member. All of these items would be discussed at the next meeting as it would pertain to the next version of this standard.

**8.5.2.9 C57.12.35 Bar Coding For Distribution Transformers**
Lee Matthews & Giuseppe Termine Co Chairs
(lmatthews@howard-ind.com & Giuesseppe.termine@peco-energy.com)

PAR Status: Active for Reaffirmation

PAR expiration Date: The PAR expires December 2002(*see below)
Current Standard Date: 1996 (R2004)
Current Draft Being Worked On: NEW
Meeting Time: October 25, 2004 Time: 3:15 PM
Attendance: 18 Total
11 Members
5 Guests
2 Guest Requesting Memberships

***Issues, Remarks & Announcements:***

The meeting was called to order on October 25, 2004 at 3:15 p.m. in the Estancia B room of the Green Valley Ranch Hotel in Las Vegas, Nevada.

The meeting began with introductions of those in attendance.

The chairman announced the IEEE patent requirements and asked if anyone was aware of any patents that might affect the development of this standard. No patent claims were made.

The minutes to the previous meeting were approved.

The chairman announced that the reaffirmation of current standard had been approved by the IEEE on June 24, 2004.

At the previous meeting, it was proposed to bring step-voltage regulators into the standard. Per discussions during the PAR submittal process it was determined that the Title and Scope of the document will need to be revised for the PAR submittal. A revised Title and Scope were proposed and approved. The PAR request will now submitted.

Negative comments from the re-affirmation ballot were reviewed and discussed. Items from the ballots were:

a. Usage of the word shall (Annex A).
b. Metric conversion.
c. Update to latest standards in references.
d. Differing print quality retention requirements in 4.1.6.3 and 4.2.5.1.
e. Include fluid type on barcode label.

The results of the working group review on each item was as follows:

a. The consensus was that the word "shall" should not be used in the informative appendix.
b. The standard should be revised to the current IEEE Transformers committee metrification policy.
c. The standard should be update to most recent standards for references.
d. Bob Olen volunteered to look into clarifying the requirements of section 4.2.5.1.
e. The consensus was not to include the fluid type in the standard barcode label.

The chairman showed a slide that contained a summary of special customer bar code requirements, which was suggested for review in the previous meeting. The consensus was that the standard label should continue to require basic information and that unique requirements should remain in customer specifications.

The chairman asked if anyone had any expertise in the revisions of the referenced bar code standards. Ed Smith suggested contacting one of the previous WG chairman for references used in the development standards. Ed will provide contact information from the original WG.

The meeting was adjourned at 4:15 P.M.

**8.5.2.10 C57.12.36 Distribution Substation Transformers**
John Rossetti & David Aho - Co Chairs
(jrossetti@mlgw.org & daho@cooperpower.com)

PAR Status: PAR Approved June 2002
PAR expiration Date: October 2005
Current Standard Date: NEW Standard Under Development
Current Draft Being Worked On: #7 Dated October 21, 2004
Meeting Date: October 26, 2004 Time: 11:00AM
Attendance: 41 Total
22 Members
16 Guests
3 Guest Requesting Membership

***Issues, Remarks & Announcements:***

**Main Meeting Summary:**
All comments and suggestions from the past meeting have been incorporated into the draft document. Specific areas that were cleaned up included the rating tables, BIL levels, and a variety of items in the construction section. A few sections were identified as good candidates for future enhancements based on the expected feedback once this standard is published. Some of the sections included pressure relief requirements, arrester mounting inside of cabinets, and equipment coordination. At the moment there doesn't appear to be any outstanding issues that need to be resolved prior to taking this draft to ballot.

**Distribution SC Summary:**
Patent disclosures issues were discussed at the beginning of the meeting and everyone was notified of additional information in their registration packets. No patent issues were noted.

The WG meeting minutes from San Diego were reviewed and approved as submitted.

A copy of the draft 07 will be posted on the transformer committee website immediately following these meetings. All WG members and guests were asked to review the draft carefully as it was a bit difficult to address all issues during the meeting due to technical difficulties with the projector.

**Some of the specifics covered during the meeting were as follows:**

Due to concerns over the various rating tables from prior meetings, it was decided to remove those tables causing the most heartache and clarify the remaining ones for the voltage applications.

The height of the gauges in the past meeting was an issue, which also was addressed in the last WG meeting for revision to C57.12.10. The maximum allowable gauge height, when there are operating controls, was increased from 1600mm to 2000mm.

Section 5.1.7, Pressure Relief, was reviewed to determine how much detail is necessary for this product standard. The amount of detail currently in this draft, which coincides with C57.12.34, appears to be excessive. It was agreed that this detail should likely reside elsewhere such that other product standards may also reference it without having to repeat this same information. For now it was agreed to keep the performance requirement detail in this document.

Section 5.2, Bushings, was tweaked in order to cover both HV and LV neutral bushing requirements for three-phase grounded wye applications. A decision was made not to address single-phase bushing issues with respect to allowing a derated neutral bushing when using single-phase design in a grounded wye connection.

Another area of clean up was to remove figure 5.5 for angular displacement. Based on a suggestion made at a prior meeting, the document will reference C57.105, Connections In Three-Phase Distribution Systems.
One specific area everyone was asked to review is section 5.13, Bushing-Type Current Transformers, as the changes to this section were not reviewed in this meeting.

During the meeting it was noted that surge arrester mounting, inside of cabinets, has created a variety of field connection problems. A general statement already covers this issue and the WG felt it was best to hold off on any more changes at this point in time.

The last item of discussion was in regards to annex A, Substation Equipment Coordination for Secondary Unit Substations. A suggestion was made to try and establish some transition section standards in an attempt get the switchgear manufactures to adopt. Due to the variety of embedded switchgear transition and connection requirements, which vary significantly by manufacturer, it's believed that trying to force a standard will be a lost cause. At this point some recommendations are identified in the annex and this will be an area to try and improve upon in the future.

After staring at a blue screen and listening to me read sections of the draft for approximately an hour, unanimously the WG agreed to adjourn the meeting at 12:00pm.

**8.5.2.11 C57.15-200XStep-Voltage Regulators**
(Craig Colopy & Gael Kennedy Co Chairs
(ccolopy@cooperpower.com & grkennedy@nppd.com)

PAR Status: Active
PAR Expiration Date: April 2004
Current Standard Date: C57.15 – 1999 – Published April 2000
Current Draft Being Worked On: Draft 4 Dated: September 2004
Meeting Date: October 26, 2004 Time: 15:15
Attendance: 25 Total
19 Members
6 Guests
1 Guest Requesting Membership

**Issues, Remarks & Announcements:**

Introductions and opening remarks –
Approval of the Minutes of the Last meeting -
Notation of IEEE Patent Policy and request for responses, No disclosures of any conflicts at this time

PAR Extension requested and acknowledgement received from IEEE headquarters, action to be taken Dec 8th 2004

Comments on revisions to Draft 4.0
Requesting comments by the end of November 2004.
Draft sent to editors with a long response – abstract and key words, wording must be the same on scope, etc., these comments are to be included in review along with the committee comments.
Five editorial comments from Martin Navarro were reviewed and entered as corrections. Use Mass instead of weight in equation 29. Table 19 has dual 'V' labels need to correct.

**New Business**:

Craig was at the C57.91 meeting the loading guide and the request was for volunteers to comment on LTC(overload), regulator loading, 55/65 degree rise considerations, etc.

C57.95 was withdrawn; this was the old regulator loading guide.

**Questions/Clarifications:** Paragraph 7.2 should there be a current limitation as well as a kVA? Craig gave the background for the limitations in this section. Limitations for single phase distribution type regulators of 288 kVA or 328 Amps? Craig will review.

Martin Navarro with reference to Table 2 ,Temperature rise is dependent upon on the insulation – suggest deletion of the words in the parenthesis under item 1 on table. Agreed upon by the entire group.

RON Stahara moved for adjournment – seconded and passed.

**8.5.2.12 C57.12.37 Electronic Reporting of Test Data (formerly P1388)**
Richard Hollingsworth & Thomas Callsen Co Chairs
(rhollin@howard-ind.com & Thomas.Callsen@ExelonCorp.com)

PAR Status: Submitted for editorial review and balloting
PAR Expiration Date: December 2005
Current Standard Date: Published under IEEE Std. 1388-2000
Current Draft Being Worked On: D11 Dated: August 2003
Meeting Date: Time:
Meeting Times: ***DID NOT MEET***

**8.5.2.13 C57.144 Guide to Metric Conversion of Transformer Standards**
Tim Olson Chair
(tolson@hydro.mb.ca)

PAR Status: Active
PAR Expiration Date: April 2006

Current Standard Date: New Document
Current Draft Being Worked On: D5 Dated: March 10, 2004
Meeting Date: Time:
Meeting Times: ***DID NOT MEET***

### 8.5.3 Subcommittee Old Business:

*None reported*

### 8.5.4 Subcommittee New Business:

*None reported*

## 8.6 Dielectric Test Subcommittee – Loren B. Wagenaar, Chairman; Stephen Antosz, Secretary

The Dielectric Test Subcommittee (DTSC) met on Wednesday, October 27, 2004, in Las Vegas, NV with 69 members and 39 guests present. 8 of the guests requested membership in the Subcommittee. See the last page of these minutes for attendance list.

### 8.6.1 Chairman's Remarks

The Chair reviewed highlights of the Administrative Subcommittee meeting held on Sunday.

1) Everyone was encouraged to sign up and keep their profile information updated on the Association Management System, AMS. It will be the main method of communication.

2) Next meeting date and location is March 13-17, 2005 in Jackson, MS; followed by Oct 23-27, 2005 in Memphis, TN.

3) The minutes of the Spring 2004 meeting in San Diego, CA were approved as written, and are available on the IEEE Transformers Committee Web Site.

4) The IEEE Patent Policy was discussed. There were no patent issues for this SC meeting.

5) There is a wireless router in operation in the meeting rooms for free Internet access to attendees. Instructions are available at the registration table. The equipment is owned by the Transformers Committee and will be moved to future meetings as well.

### 8.6.2 Working Group Reports

#### 8.6.2.1 Working Group on Acoustic Partial Discharge Tests in Transformers - J.W. Harley, Chair

Attendance: 23 members and 17 guests attended the meeting. Attendees introduced themselves. The minutes from the March 8, 2004 San Diego meeting were approved.

IEEE Patent disclosure requirements were discussed and a request was made for attendees to identify or disclose any patents that may be related to the work of the WG.

- Hem Shertukde stated the equipment of his company was covered by patent #6,178,386 and the software was protected by copyrights. We think the PC57.127 Draft Guide descriptions of

workstation and on-line systems are general enough that there are no conflicts with the patent. Contact will be made with the patent holder to confirm this: University of Hartford attorney Charles Condon 860-768-4275. Hem confirmed to the Chair in separate conversation that there is no conflict with the software copyright, which he holds.

- There was discussion about whether to include a patented locator algorithm in the Guide. This works in conjunction with the Three Sensor System patent #6,340,890 in order to make location measurements in low AE signal situations. The Three Sensor System was added as Section 5.7 to the Guide in the last draft and referenced in the bibliography. Both are patented by ABB. The Chair has had discussions with ABB patent attorney Jan Anger about the locator algorithm. The conclusion was that ABB would allow use of the algorithm for a reasonable fee. Mark Perkins was requested to follow with him to confirm this also applies to the Three Sensor System. Mark will also suggest the best way for this material to be included in the Guide. Don Fallon will follow up with the next step as appropriate.

In other discussion:

1. Several names were suggested for assistance in writing a HVDC converter transformer and smoothing reactor section and a reactor section. Anyone with experience with acoustic testing of these devices and that wants to contribute to the document should contact Jack Harley at jack@harleyinc.com.
2. Luis Chiem will send information about a new transducer developed in Australia.
3. Allan Darwin led the group discussion of changes to Sections 2, 4, 9.7, 10, 11 and Annex A, the bibliography. New figures and a number of wording changes were made in the Definitions, Signal Transmission Characteristics and Bibliography sections of the last draft.
4. Barry Ward's group focused on Sections 5, 6 and 7 that cover equipment specifications and field and factory tests.
5. Mark Perkins led the discussion on Section 9, Characterization of AE signals. DSP transportable work station and On-line (continuous) monitoring units were defined in better detail in the last draft.
6. Dirk Russwurm's group reviewed Annexes D & E. These Annexes are old and tend to cover methods necessary for calibration of transducers and equipment that are no longer in use. There will be further discussion about the use of these sections. They may be deleted from the Guide.

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

The working group met Monday, October 25, 2004 at 11 am. There were 22 members and 21 guests present.

After the introduction of members and guests, the IEEE patent policy was discussed as requested by the committee leadership. The chair then made a request for a volunteer for a secretary of the working group. Ron Daubert later volunteered for this.

The report on the meeting of the task force on revision to C57.113 partial discharge guide was given by Dr. Eberhard Lemke. The first draft of the revised guide, which had been distributed to the task force, contains significant changes over the current guide in an effort to harmonize with IEC 60270. The task force discussed the essential parts of the draft document and agreed to several items:

1. The new document will remain as a guide rather than a recommended practice.

2. Harmonization with IEC 60270 will remain as a goal, but consideration will be given to existing PD measurement systems which may not meet the IEC requirements.

3. A survey will be conducted of subcommittee members to determine the present PD measurement systems in use to support the development of the guide. The proposed survey will first be circulated to the task force members for comments prior to distribution.

4. Survey results and comments from task force members will be used to prepare a second draft for the next meeting.

The next item of business in the working group was the recommended changes to the temperature correction of the insulation power factor test. The working group proposal to remove the requirement in C57.12.90 to correct the power factor readings to 20°C was surveyed at the subcommittee level, and the response was nearly unanimous in favor with only one negative vote. The group reviewed the comments from the survey, which were minor in nature, and agreed on revised wording for inclusion into C57.12.90. A motion will be made at the subcommittee to accept these changes for inclusion in the next ballot of the standard. (note that the revised wording to be forwarded to Subhash Tuli is attached to the minutes).

With a hand vote at the SC meeting, there was unanimous approval to remove the PF temperature correction curve from C57.12.90. Mark will submit wording to Subhash.

The working group then discussed a proposal by Subhash Tuli for low frequency dielectric testing of buried tertiary windings. The majority of members were not in favor of the proposal, and Subhash agreed to draft a new proposal that more clearly states that such testing is not required.

The final item of business was a request by Alan Wilkes that the special test procedures being used on single-phase distribution transformers with a permanently grounded high-voltage winding terminal be incorporated into C57.12.00. It was unclear how this should be done, and Ron Daubert volunteered to provide a clarified recommendation for the next meeting.

The following has been approved by the Working Group for the next Ballot of C57.12.90:

1. Revise Section 10.10.1 item d) The average temperature of the windings and insulating liquid should be between 10°C and 40°C, but preferably as near to 20°C as practicable and the top liquid temperature shall be measured and recorded.

2. In Section 10.10.4 add the following sentences: The power factor shall be reported along with the top oil temperature measured and the bottom oil temperature if available. No temperature correction shall be applied. Temperature correction of the power factor results for trending basis may be applied by the user.

3. Section 10.10.5 would be eliminated.

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

The WG met on October 26, 2004, from 3:15 pm to 4:30 pm. Fifteen members and ten guests attended the meeting. None of the guests requested membership. The IEEE patent requirement

policy was added on the agenda. The minutes of the San Diego meeting were approved as written.

The IEEE patent disclosure requirement policy was discussed. Reference to the package received by the meeting attendees at registration was made. None of the members and guests present during the meeting were aware of any patents related to the work of the WG.

The first technical subject on the agenda was to discuss the impulse test procedure on protected or partially protected windings by non-linear devices. Before discussing the normative proposal, Peter Heinzig, vice-chair of the WG, did make a presentation on design and testing aspects of transformers using non-liner devices across windings or within winding sections. After his presentation, a new revised proposal for modification to clause 10.3.2.5 of C57.12.90 was presented and discussed. This new proposal takes into account the comments received on previous proposal. The main changes from the previous proposal are:

- The intermediate reduced impulse is not anymore required at prescribed test levels. Instead, a test level ranging from 75% to 90 % of the full wave test level has been proposed. The exact test level is let to the manufacturer choice but it shall show the effect of the operation of the non-linear devices on voltage and current waveshapes. After discussion, it has been agreed upon to modify this range from 75% to 100% since some transformer designs may show non-linear device operation in between 90% and 100% of the full wave test level.

- The two full-wave impulses are split apart the chopped-wave impulses. The first one has to be applied before the chopped-wave impulses and the second after the chopped wave tests.

- Notes will also be added to cover cases where the non-linear devices do not operate at the 100% full-wave test level and for cases where they will operate only during the chopped-wave impulses.

- An additional clause forbidding the operation of the non-linear devices under standard switching impulse tests has been agreed upon.

The WG members felt this proposal is quite mature and agreed that this proposal has to be surveyed within the Dielectric Test Subcommittee. This will be done prior to the next meeting.

The second technical subject on the agenda was the review of the negative comments received on the survey made in February 2004 concerning the lightning impulse test procedure for cases where the tail time of the impulse waveshape cannot be obtained. Because the WG meeting was running out of time, the review of the negative comments was not done. Instead, a draft of a new proposal has been presented. This draft is a reworded version of the previous proposal taking into account the negative comments received. The main changes from the previous proposal are:

- The only mandatory requirement is to use the optimum impulse generator connection e.g. maximum available capacitance.

- If by using the optimum impulse generator arrangement, the required minimum tail time of 40 µs is not achieved, loading resistors have to be used in the following preferred order:
    - on non-impulse windings;
    - and if the tail time is still not met, on the grounded end of the impulse winding.

- After discussion, it has been agreed upon that for special cases, loading resistor values exceeding the surge impedance of the connected systems may need to be used. A note covering this case will be added.

- The concept of using a minimum capacitance value or available impulse generator energy has been kept only as a non-mandatory recommended practice. A note has been also added explaining how the available impulse generator energy has to be determined and clearly explains that the available impulse generator energy may be lower than the maximum energy capability of the impulse generator.

- If it is forecasted that the tail time can not be achieved for a particular transformer design and/or because of test equipment limitations, the manufacturer has to notify this deviation at the bidding stage and states the strategy that they will use to obtain the best possible waveshape.

All members and guests present consider this draft proposal as a good compromise and could be acceptable to those individuals having cast negative ballots on the survey. Because this draft proposal has not been yet circulated to the WG membership prior to the meeting, an informal survey on this revised proposal within the WG will be done prior to the next meeting.

At the SC meeting, Subhash asked for a discussion about the required polarity during switching surge testing. Pierre responded that he will try to add this as an agenda item for next meeting.

#### 8.6.2.4 Working Group for Revision of the Impulse Test Guides C57.98 and C57.138 – Art Molden, Chair; Joe Melanson, Secretary

The meeting started at 3:15PM on Monday October 25th, with 47 attendees present of which 15 were members and 5 were guests requesting membership. The Minutes of the last meeting in San Diego were approved.

An extensively revised version of the present Guide had been made available to the members and some comments were forthcoming regarding those revisions:

- With regard to impulse testing of units that include non linear devices Joe Melanson raised a question about the sequence of the applied impulse voltage applications referenced in the guide; the sequence and numbers of reduced voltage applications is also a topic being discussed by Pierre Riffon's group in the Revision of Impulse Tests. Art Molden indicated that the sequence included in our guide would be reviewed so as to agree with the sequence proposed by Pierre and his group members.

- Alvin Kopp questioned the practicality of using "Method 1" of clause 2.4 of the guide, this clause references alternate methods of impulse testing low impedance windings, Method 1 allows all terminals of a winding that are of the same BIL rating be tied together for the impulse test. Several other members also questioned the efficacy of this method and agreed with a suggestion that this Method be removed from the list of alternate tests. Pierre Riffon noted that for some larger distribution class transformers with low voltage foil type windings Method 1 was sometimes the only method that could be used to obtain an impulse wave tail of the required duration. It was therefore decided to retain Method 1 in the list but to include wording to suggest its use be as a last resort, only to be used when other methods failed to extend the tail time.

- The group had discussions about the polarity to be used for switching impulse tests. The subject was brought up by Subhash Tuli in reference to the option included in our guide for tests to be of either positive or negative polarity. The question was whether or not the reference to the "positive" polarity test on transformers should be eliminated in keeping with the similar IEC documented test practices. Pierre Riffon indicated that in his experience positive SI was sometimes used to provide a test of the clearance between the transformer bushings. Bertrand Poulin and Ernst Hanique pointed out that the use of positive polarity SI required much greater clearances be used between transformer bushings, and that this was more a test of the bushing electrode geometry than of the transformer. Negative polarity will be the preferred polarity recommended in the guide.

- A question was raised about experiences with the application of switching impulse tests by inducing the SI from the LV windings. Bertrand Poulin pointed out that one disadvantage of using this method was that, should there be a failure of the transformer major insulation during this test, the HV SIL voltage would be applied to the LV windings and to the test equipment connected to the LV terminals. This could result in dangerous over voltages being applied to the impulse test and measurement equipment.

- Steve Beckman asked if any manufacturers really did go looking for "smoke and bubbles" in their transformers as a means of failure detection during an impulse test, as suggested in clause 2.5 of the guide. The manufacturers replied that they almost never let the smoke out of their products and that, as a general rule, they also recommended that the users did not let the smoke out. However, on those rare occasions when they did let some smoke out, they knew that they had and didn't need to go looking for it. One or two consultants in the group that had themselves been involved with manufacturing operations in their past, proffered that, smoke and bubbles were pretty reliable indications of failure, and that they provided an invaluable correlation between discrepancies on the impulse records and "thunks" emanating from a transformer tank. The group concluded that smoke detectors were not yet a reliable means of impulse failure detection but that smoke location would continue to be used for the correlation of failure locations.

- An item of new business was proposed by Thang Hochanh of Hydro Quebec. As a means of comparing the relative sensitivity of transfer function software programs currently being used in North America Thang would like to obtain impulse records from those members that utilize such software. Anyone interested in this project please contact Thang or the Chair.

### 8.6.2.5 Task Force on Liquid-Filled Transformers Dielectric Test Table – Phil Hopkinson, Chair; Scott Choinski, Secretary

The Task Force on Dielectric Test Tables, Liquid-Filled was called to order at 1:45 PM. There were 44 attendees, 28 members, 1 requesting membership and 16 guests. Reviewed the agenda for the meeting, and the IEEE patent policy. The Minutes from the March 9, 2004, meeting in San Diego, California were approved.

Reviewed Rev. 8 of ANSI C57.12.00 Dielectric Test Tables in kV Liquid Filled Transformers Y-Connected and for Delta-Connected

- Motion: Modify table to remove all bold BILs and replace with minimums and alternates.

Passed 40-3.

- Motion: Restrict to 2 BIL columns. 1st is for minimum advisable, 2nd is for alternate. Failed for lack of second.

- Membership polled:
  Separate tables for Wye and Delta – received 10 votes
  Single table for Wye and Delta with footnotes denoting differences – received 16 votes.

- Members agreed unanimously that Induced levels for Wye and Delta should be the same.

### 8.6.3 Liaison Reports

#### 8.6.3.1 Surge Protection Devices – Bob Degeneff

No activity. Nothing to report.

#### 8.6.3.2 High Voltage Test Techniques (HVTT), IEEE Standard 4 - Arthur Molden

The last meeting was held at the facility of Florida Power and Light, West Palm Beach, FL on April 14th and 15th, 2004. Editorial work on the revised document continues. There is to be another meeting later this year, possibly at the premises oh Hubble/Hipotronics in Brewster NY.

### 8.6.4 Old Business

#### 8.6.4.1 Phase to Ground Clearances – Loren Wagenaar

Nothing to report. Will continue this activity next time.

#### 8.6.4.2 Continuation of Discussion of Class 1 and Class 2 Testing

Should C57.12.00 be changed so that Impulse Testing is a ROUTINE test on Class 1 transformers? It is already ROUTINE for Class 2 and for Distribution Transformers. After some discussion there were 2 hand votes of the people present:

1. Should Class 1 transformers receive Impulse Testing as a ROUTINE? 36-Yes; 23-No
2. If Yes, should a Task Force be formed? 42-Yes; 2-No

This is not such a simple issue to be decided too quickly; it would be a significant change. Loren will investigate and report back at the next meeting. A survey of the entire Diel Test SC membership may be conducted.

### 8.6.5 New Business

#### 8.6.5.1 Steep Front Test Levels

Subhash Tuli suggested consideration to add back to C57.12.00 the test levels for steep front impulse test levels. Some discussion ensued; this topic seems to come up again and again every few years. The collective memory was that this was voted on before and the levels have been

removed and are left out on purpose. If they are put in C57.12.00, it may imply (or promote) this test and that is not what the industry wants to do.

The test is listed as an OTHER test in Table 19. Maybe this should even be removed too. No final decision was made on this last point.

**Members Present**

1. Aho, David
2. Ahuja, Raj
3. Antosz, Stephen
4. Arpino, Carlo
5. Artiega, Javier
6. Barker, Ron
7. Barnard, David
8. Beckman, Stephen
9. Bello, Oscar
10. Boettger, Bill
11. Bolliger, Alain
12. Britton, Jeffrey
13. Bush, Carl
14. Caruso, Charles
15. Chiu, Bill
16. Choinski, Scott
17. Colopy, Craig
18. Corkran, Jerry
19. Crouse, John
20. Darwin, Alan
21. Daubert, Ron
22. Degeneff, Bob
23. Dudley, Richard
24. Fallon, Donald
25. Fausch, Reto
26. Foldi, Joe
27. Franchel,Michael
28. Garcia, Eduardo
29. Garnitschnig, Andreas
30. Ghafourian, Ali
31. Gianakouros, Harry
32. Goodwin, David
33. Griesacker, Bill
34. Gruber, Myron
35. Hanique, Ernst
36. Hartgrove, Bob
37. Heinzig, Peter
38. Henning, Bill
39. Herron, John
40. Hochanh, Thang
41. Hopkinson, Philip

**Guests Present**

1. Dilip Shah
2. Jesse Patton
3. Juan Luis Thierry
4. Edwin Jauch
5. Charlie Smith
6. Bo Blackmon
7. Bob Grunert
8. Randy Rensi
9. Clair Claiborne
10. Ibrahim Shteyh *
11. Juan Castellanos
12. Andy Steineman *
13. Martin Navarro
14. Sam Mehta
15. Steve Northrup *
16. Sten Andersson
17. Jan Hajek
18. Ramon Garcia *
19. Josh Herz
20. George Tolbert
21. Vallamkonda Sankar
22. Prit Singh
23. Saurabh Ghosh *
24. Guy Morrissette

42. Kennedy, Sheldon
43. Khalin, Vladimir
44. Lackey, John
45. Lemke, Eberhard
46. Marlow, Dennis
47. Matthews, John
48. Melanson, Joe
49. Miller, Kent
50. Molden, Arthur
51. Perkins, Mark
52. Platts, Don
53. Poulin, Bertrand
54. Preininger, Gustav
55. Raymond, Tim
56. Riffon, Pierre
57. Rossetti, John
58. Russwurm, Dirk
59. Schappell, Steven
60. Shertukde, Hemchandra
61. Snyder, Steve
62. Speegle, Andy
63. Spitzer, Tommy
64. Tuli, Subhash
65. Veitch, Robert
66. Wagenaar, Loren
67. Williams, Michael
68. Zhao, Peter
69. Ziomek, Waldemar

25. Girolamo Rosselli
26. Mahesh Sampat *
27. John Haufler
28. Hossein Rezas
29. Alan Wilks
30. David Dunlap
31. Tamyres Machado *
32. Eduardo Gomez-Hennig *
33. Valery Davydov
34. Van Nhi Nguyen
35. Samuel Oriti
36. Sau-Lie Lee
37. Sangbong Park
38. Jose Grijuela
39. Alvin Kopp

* Requested Membership.

## 8.7 HVDC Converter Transformers & Reactors

### 8.7.1 MINUTES OF THE MEETING OF THE HVDC CONVERTER TRANSFORMERS & SMOOTHING REACTORS S.C. IN LAS VEGAS, NEVADA, OCT. 25, 2004

The S.C. met in the Estancia D Meeting Room of the Green Valley Resort Hotel in Las Vegas, Nevada on Oct. 25, 2004 from 1:45 p.m. to 3:00 p.m. There were 15 members and 11 guests present. Since the San Diego meeting 2 new members have been added; Jan Hajek of ABB and Ugo Piovan of EHV Weidmann. The following are the highlights of the meeting.

1. Members were encouraged to attend the tutorial session on the modeling of polarity reversal dielectric stresses in converter transformers; Ugo Piovan of EHV Weidmann prime presenter. The results of Ugo's work will be taken into consideration in the revision of IEEE C57.129; polarity reversal.

2. The corrected minutes of the S.C. meeting in San Diego were approved. The minutes from the Las Vegas meeting will not be approved until the S.C. meeting in Jackson, Mississippi.

3. IEEE patent policy was reviewed; details in registration package. No patents affecting the implementation of IEEE C57.129 were noted.

4. The PAR for the revision of IEEE C57.129 was approved at the June 24, 2004 meeting of the IEEE Standards Board. The life of the PAR is to Dec. 2008.

5. Peter Heinzig and Ugo Piovan are members of the CIGRE Joint T.F. that is reviewing converter transformers service experience and has the task of making recommendations that will improve reliability. A report should be available in 2006. Peter and Ugo will keep the S.C. informed of developments.

6. D #3 of the revision of IEEE C57.129, prepared by the Chairman based on inputs from Les Reckseidler, Pierre Riffon, Peter Heinzig and Tony Weekes, was reviewed. The following are key points of discussions/agreed actions.

   (i) Input from Sten Andersson (Sept. 29 and Oct. 30), Lars-Erik Juhlin and Gene Wolf will be included in D #4.

   (ii) The Chairman reminded SC/WG members that the standard should be test code focused and not design orientated. A lot of comments have been received related to design issues. It was agreed that such comments should be included in NOTES or in an annex. Comments should also be kept general; not design specific. Peter Heinzig's e-mail of Oct. 21, 2004 will be used as a basis on how to treat design issues. The best approach may be to cover all design related comments/issues in an appropriate annex. IEC 61378-3 is an HVDC application guide that is being prepared. It should be referenced. It is at the CVD stage and could be published at the end of 2006. Ugo Piovan, who is a member of the W.G., will provide a copy of the CVD draft. The Chairman will attempt to collect all design related comments etc. in an annex for D #4.

   (iii) The polarity reversal test was discussed. Pierre Riffon recommended it be left as is. Model studies such as those carried out by Ugo Piovan can be used to refine the design and possibly provide insight into possible test code changes. It was also noted that DC systems operate differently today vs the past; more polarity reversals due to changes in power flow. Polarity reversals also occur due to fault conditions. It was noted that there have been no converter transformer failures directly related to polarity reversal; CIGRE publication. All converter transformer manufacturers will provide input re their model studies of polarity reversal dielectric stresses and any possible input/concerns re the current test code.

   (iv) Measurement of FURANS during the 48 hour test described in Annex B is considered to be of no value.

   (v) Detailed specs re replacement bushings should not be included but general guidance etc. may be appropriate.

   (vi) Peter Heinzig presented information on gassing; type and rate. He will distribute his presentation for comments. No evolution of acetylene should be allowed due to testing; < 1 ppm. Peter will modify Annex D.

(vii) Jan Hajek made an excellent presentation on the impact of oil quality on converter transformer service life; level of refining/processing and source of the crude (sulfur content). This presentation will be included with the minutes; to S.C. members only. Should any of the information in Jan's presentation be included in the revision of IEEE C57.129? At the very least his paper should be included in a bibliography.

The meeting adjourned at 3:00 p.m.

### 8.8 C57.13 Instrument Transformers – J. E. Smith

The Subcommittee met on October 27.
5 members and 7 guests attended

#### 8.8.1 Chair's Remarks & Announcements:

The Chair asked the attendees if they were aware of any patent issues as required by the new IEEE policy. There were none.

**The previous meeting minutes were approved as written**

#### 8.8.2 Working Group Reports:

#### 8.8.2.1 WG C57.13.5 - Working Group on Test Requirements for High Voltage Instrument Transformers 115 kV Nominal System Voltage and above

The WG met on October 26, 2004. Five members and seven guests attended the meeting. One guest requested membership. The meeting was co-chaired by Mr. P. Riffon and Mr. R. McTaggart.

The agenda was approved with the addition of the IEEE patent policy.

Minutes of the San Diego meeting were approved during the Subcommittee meeting.

The IEEE patent disclosure requirement policy was discussed. Reference to the package received by the meeting attendees at registration was made. None of the members and guests present during the meeting were aware of any patents related to the work of the WG.

The Trial-Use Standard C57.13.5 has been published by IEEE in August 2003. WG members did finally receive a complimentary copy. The lifetime of this document is 5 years and will expire in 2008.

No feedbacks have been received yet on the use of C57.13.5. It appears that this document is still too young to get feedbacks. None of the manufacturer representatives present during the meeting have used this document yet on actual orders.

An update of previous proposal regarding a new normative Annex (Annex H) related to unbalance current transformers for use as unbalance current protection of capacitor banks has been done. None of the members or guests present during the meeting raised new comments on this annex. This Annex is now quite mature and need to be surveyed within the WG and Subcommittee. A parallel survey within the WG and Subcommittee is recommended.

An update of previous proposal regarding the allowable temperature rise of power terminals of instrument transformers during temperature rise test. None of the members or guests present during the meeting raised new comments on this new clause. This clause is also quite mature and need to be surveyed within the WG and Subcommittee. A parallel survey is also recommended.

The main topics of IEC 60044-6 dealing with Instrument transformers having transient performance requirements have been presented. The discussion was mainly focused on TPY cores because they cover most of the CTs having rated transient requirement performances. Special routine and type tests applicable to these CTs were presented and discussed. It has been proposed to add an informative Annex to C57.13.5 for covering this special application and rating. This Annex will only make a simple reference to IEC 60044-6. It is not needed to repeat all the wording of IEC 60044-6 since the WG does not need to add anything more to the existing IEC standard. A first draft of this informative Annex will be circulated to the WG membership prior to the next meeting.

A PAR needs to be approved prior to the next meeting and will be requested to IEEE in the next few weeks. The PAR will ask to re-issue C57.13.5 as a Trial-Use Standard. It has been an agreement that it is still too early to change its status to a Full-Use standard because of a lack of feedbacks regarding its application. If needed, its status may be changed later on as a Full-Use standard. If this is the case, a revised PAR needs to be obtained and the scope of C57.13 needs to be changed accordingly.

### 8.8.2.2 WG C57.13.6 – Working Group on Instrument Transformers for use with Electronic Meters and Relays – Chris TenHaagen

**Chair's remarks & Announcements:**
The subcommittee met on October 26, 2004 in Las Vegas, NV, with four members and five guests present.

**Old business**

-Minutes from San Diego were accepted.
-Results of C57.13.6 D2 Recirculation:
Pool closed August 14, 2004
Ballot met 75% retuned requirement (90% returned)
82 Eligible people in-group
68 affirmative
2 negative with comments
4 abstention votes
The 75% affirmation requirement was met (97% affirmative)

**New business**

1 Review and discuss **negative** ballots, reject or accept and vote to recirculate

1) Jeffrey Nelson, TVA
    a. Section 4- Add language similar to what appears in C57.13 section, 6.10, which requires certain type test and performance data be made available.
        i. Chair comment:
            1. Informed balloter that the scope and introduction specifically state that this standard C57.13.6 is subordinate to C57.13, in order to eliminate many areas of needless duplication. In addition, it is the expectation that these standards will merge in the future.
            2. Balloter Rejected. Suggested the following sentence be added after 4.3: "*Characteristic data suitable for portraying or calculating the performance listed above shall be made available upon request"*
            3. Chair will review with WG for consensus.
        ii. *Working group rejected, and concurred that the requirement to provide characteristic data, along with many, many other requirements omitted from this draft standard, are covered by the clearly stated relationship of this document to C57.13. In addition, the lack of redundancy between the two documents improves clarity and potential for future errors in the revision process*

    b. Section 7.1- Suggests first paragraph can't say, "shall …at test points shown in Table 3, …" then turn around and say you only have to test at two points in last paragraph of this section. Suggests Deletion of last paragraph, thereby requiring four test points.
        i. Chair comment
            1. Informed balloter the issue of an option for two test points was thoroughly discussed and approved by WG.
            2. Accepted balloter concern for the wording. Re wrote first paragraph as follows (Balloter accepted by Email):

Accuracy tests for current transformers with 0.15 or 0.15S metering accuracy ratings shall be made on each transformer when energized at rated frequency**.** Two or four test points defined in Table 3 may be required**.**

        ii. *Working group accepted this wording*.

2) Randy Mullikin, Kuhlman
    a. Section 7.1: (technical comment only) Concerned that users assume that the order of test points in Table 3 dictates correct sequence for testing. He proposed different order.
        i. Chair comment:
            1. Accepted concern, but not specific sequence. Placed asterisk (*) in table next to "Test Point" column heading, and beneath table wrote: * No significance to test sequence.
        ii. *Working group accepted this wording*

3) James Frysinger, Vice Chair SCC14
    a. Misc Editorial suggestions. See attached.
        i. Chair: need input from WG, see attached for discussion.
        ii. Working group rejected, format used is the same as C57.13

**Summary**

. Chair will recirculate Standard for two changes to section 7.1 only.
Chair comment: Working group anxiously awaits publication of this standard.

### 8.8.2.3 Working Group on C57.13 Revision – Tom Nelson

Five members and eight guests attended the meeting that was chaired by Jim Smith in Tom Nelson's absence.

The minutes of the San Diego meeting were approved.

The new IEEE disclosure requirements regarding patent issues related to the WG work was presented. The group was asked if anyone is aware of patents relating to the content of C57.13 revision. There were no responses. It was noted that no patent or IP was disclosed or identified as relevant to C57.13 revision.

The status of the balloting process was reviewed. The graphics still needed to be completed so that the draft could be submitted to IEEE for ballot. Mr. Charlie Smith of ABB volunteered to help with the graphics.

Mr. Chris TenHaagen of GE – Energy presented a presentation on different connections for the testing of Instrument transformers for Partial Discharge. Mr. Ten Haagen will forward a copy of his presentation to the Subcommittee Chair to be emailed to the WG members for comments before the next meeting in Jackson, Mississippi.

### 8.8.2.4 Study Group IEEE Std C57.13.2 – Vladimir Khalin

The Working Group met on Tuesday, October 26 at 3:15 PM with 11 members and guests present.
The minutes from the San Diego, CA meeting were approved.
IEEE Patent Disclosure Policy was reviewed by the WG and an opportunity was provided for WG members and guests to identify or disclose patents that the WG member believes may be essential for the use of that standard. No responses were given.

The Chair reported the Ballot results as follows:

- Ballot met 75% returned requirement (89% returned)
- 97% - affirmative
- 3% - negative with comments
- 3% - abstention votes
- The 75% affirmation requirement was met (97% affirmative)

The WG reviewed the negative ballots and developed recommendations.
The Standard will be re-circulated.

### 8.8.2.5 Joint PSIM/Transformer Working Group - PAR P1601 Optical Current and Voltage Sensing Systems

Session co-chaired by: Harley Gilleland and Farnoosh Rahmatian (TC/ITSC)
Attendees: V. Khalin (M), V. Nguyen (G), L. Davis (M), C. Ten Haagen (M), R. McTaggart (M), P. Canova (G), L. Recksiedler (G), V. Moreno (G), Paul Millward (M), J. Smith (M), A. Jonnatti (M)

Minutes:

- Jim Smith presented the new IEEE disclosure requirements regarding patent issues related to the WG work
    - Farnoosh Rahmatian asked if anyone is aware of patents relating to the content of PAR 1601 work. There were no responses. It was noted that no patent or IP was disclosed or identified as relevant to P1601 work.
- Minutes of previous meeting, June 8, 2004, Denver, were reviewed.
- PAR status and timetable were reviewed
    - Scheduled completion date: December 2005
    - Extending the completion date the PAR P1601: need to make decision in August 2005 if needed.
    - Scheduled P1601 Meetings:
        - October 25, 2005, TC, Las Vegas
        - March 13-17, 2005, TC, Jackson, Miss.
        - June 12-16, 2005, San Francisco, IEEE/PES General Mtg. *
        - October 2005, TC, Memphis, TN
    - Target the June 2005 meeting as the meeting to
        - start final balloting
        - make decision on extension of the completion date
- Update on other standards activities were given by F. Rahmatian and H. Gilleland:
    - UCA Guide for using IEC 61850-9-2 (digital interface to instrument transformers)
    - PSRC ITF4 for Optical Sensor System Guide for Relaying. Moving to establishing Working Group.
    - CSA series (Canadian Standards)
    - CIGRE WG A3.15
- Some technical material presented previously was represented (dynamic range designation, …), and it was suggested to include some info (or reference) on accuracy testing.
- Next Scheduled Working Group Meetings
    - IEEE/PES Transformer Committee Meeting, Mar 13-17, 2005, Jackson Mississippi.

### 8.8.3 New Business

- A presentation entitled “A Proposed Saturation Curve for BCT’s” was made by Charlie Ballentine. It is available on the Instrument Transformer Subcommittee web page.

## 8.9 Insulating Fluids Subcommittee – F. J. Gryszkiewicz, Chair; R.K. Ladroga, Vice-Chair

### 8.9.1 Introduction/Attendance

The Insulating Fluids Subcommittee met in Las Vegas, Nevada on Wednesday, October 27, 2004 with 18 members and 28 guests present. Four guests requested membership on the Subcommittee.

### 8.9.2 Approval of Meeting Minutes

The Minutes of the San Diego meeting were approved as written.

The Transformers Committee had received a letter of concern related to the attachment letter included with the Insulating Fluids Subcommittee Meeting in Pittsburgh, Pennsylvania. At the San Diego meeting, the Committee Officers stated that they would review this concern with IEEE as a follow-up to its initial review with IEEE when this letter was presented for inclusion in the Minutes. Upon completion of that review, a decision will be made as to any changes and notifications needed related to the Minutes.

In view of the foregoing, the Minutes of the Pittsburgh meeting were approved with Exception noted to inclusion of the subject letter included with the Insulating Fluids Subcommittee Minutes, subject to review with IEEE, and final determination of the status of this item in the Minutes.

The Subcommittee Chair reported that this matter has been resolved. In view of the foregoing, the Insulating Fluids Subcommittee Minutes of the Pittsburgh Meeting stand approved as originally written.

### 8.9.3 Subcommittee Membership

There were no changes to report in the Subcommittee Roster.

### 8.9.4 Current Subcommittee Business

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

Jim Thompson and T.V. Oommen are the Co-Chairs of this Working Group. The Working Group met on Tuesday, October 26, with 10 members and 38 guests in attendance.

As required in the IEEE Standards Board By-law, Section 6.3.2, the IEEE patent disclosure requirements were discussed and a request was made for disclosure of any patents that may be related to the work of the Working Group. There were no responses to the request for disclosure.

The WG Chair again emphasized that the scope of the Guide applies to “mineral insulating oil” and not to moisture in paper issues. The Working group reviewed Draft 3.V2 of the suggested revision of Section 4.5. No comments were received from the group on this section.

There was a considerable amount of discussion on the water content values to be included in Table 7 of the Guide. T.V. Oommen volunteered to address this issue in Table 7. The Working Group will review T.V.’s recommendation at their next meeting in Jackson.

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

This Working Group is Chaired by Frank Heinrichs. A Standards Association Ballot was recently conducted on Draft 11D. Sixteen negative ballots were received. The Working Group, previously, had agreed to participate with IEEE Headquarters in an experimental procedure where negative ballots will be resolved or rebutted via a website based and teleconferencing procedure. A ballot resolution team has been set up to begin work on the resolution process.

#### 8.9.4.3 C57.130 – Trial Use Guide for the Use of Dissolved Gas Analysis During Factory Temperature Rise Tests for the Evaluation of Oil- Immersed Transformers and Reactors

This Working Group is Co-Chaired by Frank Heinrichs and Frank Gryszkiewicz. A Standards Association Ballot was recently conducted on Draft 14 of this document. Ten negative ballots were received. An attempt has been made to resolve the negative ballots and Draft 15 of the document has been sent to IEEE for a Recirculation Ballot.

#### 8.9.4.4 C57.139 – IEEE Guide for Dissolved Gas Analysis of Load Tap Changers

The Working Group, which is chaired by Fredi Jakob, met on Tuesday, October 26, with 22 members and 24 guests in attendance. The following seven guests requested membership on the Working Group:

| | |
|---|---|
| Danny Bates | Van Nhi Nguyen |
| Craig Colopy | Paul Pillitteri |
| Donald Fallon | Bengt-Olof Stenestam |
| Bernhard Kurth | |

As required in the IEEE Standards Board By-law, Section 6.3.2, the IEEE patent disclosure requirements were discussed and a request was made for disclosure of any patents that may be related to the work of the Working Group. There were no responses to the request for disclosure.

In the past, the Working Group had a difficult time agreeing on dissolved gas analysis (DGA) limits for the different design load tap changers. In view of the foregoing, it was decided to use “generic limits” of the combustible gases of interest for the various design types of load tap changers. A Task Force has been assigned to develop a generic description of each LTC.

Absolute values and ratios of the various combustible gases would be used in determining whether the DGA data is indicative of a tap changer problem. The ratios discussed were Ethylene/Acetylene, (Methane + Ethane + Ethylene)/Acetylene, Ethane/Methane, and Ethylene/Ethane. The WG Chair asked those present at the meeting to send their DGA data to him so that enough data could be accumulated for a statistical analysis to be performed.

- The Working Group will prepare a new draft, which will be discussed at the next meeting in Jackson, Mississippi.

#### 8.9.4.5 C57.146 – IEEE Guide for the Interpretation of Gases Generated in Silicone Immersed Transformers

This document previously carried the IEEE designation P1258. This has been changed to the IEEE designation C57.146 to be consistent with the other standards in the C57 collection.

Jim Goudie and Bill Bartley are the Working Group Co-Chairs of this project. A Standards Association Ballot was recently conducted. One negative ballot was received. The negative ballot was resolved and the Subcommittee voted to send the document to the Standards Board for approval.

#### 8.9.4.6 C57.147 – IEEE Guide for the Acceptance and Maintenance of Natural Ester Based Fluids

Patrick McShane is the Working Group Chair. The Working Group met on Tuesday, October 26, with 15 members and 50 guests in attendance. Six guests requested membership on the Working Group. Clair Claiborne of ABB was nominated and approved for the new position of Working Group Vice Chair.

The Working Group meeting was then called to order by the WG Chair, Patrick McShane. As required in the IEEE Standards Board By-law, Section 6.3.2, the IEEE patent disclosure requirements were discussed and a request was made for disclosure of any patents that may be related to the work of the Working Group. ABB indicated that they were working on preparing a response to the patent disclosure.

The Working Group reviewed Draft 5, through Clause 5.3.1, of the Guide. The comments received will be incorporated into Draft 6 which the WG Chair expects to send to WG members in two-three months.

### 8.9.5 Adjournment

The Subcommittee adjourned at 12:00 noon.

### 8.9.6 Next Meeting

The Insulating Fluids Subcommittee and its Working Groups will next meet in Jackson, Mississippi during the period of March 13-17, 2005.

## 8.10 Insulation Life

The Insulation Life Subcommittee met in Las Vegas NV. on October 25, 2004, at 8:00 AM. There were 29 members and 72 guests present, with 2 guests requesting membership in the subcommittee.

The minutes of our meeting in San Diego, CA on March 10,2004 were approved as submitted.

### 8.10.1 Chair's Report

The chair reported on the patent issues that have been reviewed at each meeting during the week. This process will be continued at future meetings to ensure that any effected patents are disclosed. The meeting minutes shall note that a request was made for disclosure of any patents that may be related to our work, and the response to that request.

The chair reminded participants that we need to continue to promote membership in the committee. He reviewed the balance of users, producers and general interest, and the requirements to qualify for membership. The requirements are active participation for a year, and that a prospective member needs the sponsorship of 3 working group or subcommittee chairs.

The 2005 meetings will be held in Jackson, MS in spring and Memphis, TN in fall.

A request was made for disclosure of any patents related to the work of the subcommittee. None were reported.

### 8.10.2 Project Status Reports

1.2.1 Reaffirmation Ballot 1276-1997 IEEE Guide for the Application of High-Temperature Insulation Materials in Liquid-Immersed Power Transformers Mike Franchek
Mike reported that he has resolved the negatives, and that he should be able to proceed with the reaffirmation. He has suggested that based on comments received and additional data that has been collected since the guide was published, that a new task force should be formed to update the document.
Since the PAR will expire at the end of the year, we need to move forward with this document. We will consider a revision after some other projects are completed.

### 8.10.3 Working Group and Task Force Reports

#### 8.10.3.1 Revision to C57.91 Loading Guide - Tim Raymond

Meeting started at 1:45 PM, Tuesday, October 26, 2004.

There were 22 members present and 38 guests with 7 guests requesting membership to the WG.

The chair raised the following question: Do we feel that combining distribution and power transformers into single document still good idea?

There was discussion about the different risk profiles between distribution and power transformers. The problem with not having them combined is that with two documents, areas that should be the same ended up being out of sync.

One comment from Glenn was that these were at one time two documents and then combined. He indicated that we should be very careful when thinking about splitting the document back up again. It will take time and effort to do this.

*Loss of life equations:* Should we include some qualification of the effects of moisture and oxygen? Presented a formula from Lundgaard, Emsley, CIGRE. Problems: Moisture content within winding insulation is difficult, if not impossible to quantify. Can we create two or three categories to pigeon-hole a specific transformer (dry, aged, wet)?

*Comment*: Loading Guide should consider the condition of the transformer. A clear statement of expected tolerances and to use the guide with some caution.

*Comment*: If you indicate categories of dry, moderately dry, wet, how do you identify what is dry etc? The problem is that you don't always know this condition.

*Comment*: Another option would be to leave equations as is, add note that moisture content and oxygen affect the loss of life and provide some examples to provide a feel for how much they affect the aging of the transformer. This would let the user recognize that if they have a wetter transformer, that they would need to be more conservative.

*Bubble Evolution:*

- 1995 guide partially included detailed model by McNutt, Rouse, et al.
- Early drafts of revision replaced old material with an equation by TV Oommen.
- Bubble evolution relies heavily on moisture content of paper. This is difficult, if not impossible, to determine with sufficient accuracy for predicting bubble evolution.
- Propose removing mathematical models and give guidance on hot spot limit to avoid bubble evolution. Why it is important, what happens when you have pockets of bubble formation. Put in a limit of 140C. If you want to load above that, you are taking a chance that you will have bubble evolution.

  *Comment*: Has anyone documented a failure of a transformer during overload? There was a response that this had occurred on a transformer loaded up to 170%.

  *Comment*: Overload is not the only problem. The rate of temperature rise is also a problem and can cause generation of bubbles.

  *Comment:* Equation is complicated, perhaps it could be converted into a graph for illustrative purposes only.

  *Comment:* Add wording that you can go above 140C, but have discussion of the potential risks in doing so.

*Thermal Model:* After much discussion and study, we have come to the following:

- Move Annex G (Pierce) model to main body of guide.
- Move Clause 7 to Annex to provide continuity and alternative for older and distribution transformers. May add resistance and viscosity corrections.

Comment: Bottom oil gives a stable reference point. By moving the Annex G model to the main body, it gets away from the impression that it is experimental. The other method would still be available.

*Comment:* Design data is required to use the model from Annex G and will be difficult for users to implement use of this model.

*Response*: The old model is still planned to be there, newer transformers are required to have this information and it may be available for older transformers. We want to give the impression that both models are available and can be used.

*Without* serious objections, we plan to move ahead with this proposal. None were brought forth.

*Volunteers:*

5.0 Effect of loading beyond nameplate rating – *Bob Tillman and James Cross volunteered to help with this clause.*
- 5.1 General
- 5.2 Voltage, core excitation, and frequency considerations
- 5.3 Non-sinusoidal load currents *(keep? No, will mention reference to other guide that deals with this issue)*
- 5.4 Supplemental cooling of existing self-cooled transformers (?)

6.0 Transformer Insulation Life – *TV Oommen volunteered to help with this clause.*
- 6.1 General
- 6.2 Aging equations
- 6.3 Life expectancy
- 6.4 Percent loss of life

*7.0* Thermal Evolution of Gas from Transformer Insulation – *TV Oommen volunteered to help with this clause.*

8.0 Ambient temperature and its influence on loading – *Don Platts and Jim? Thompson volunteered to help with this clause.*
- 8.1 General
- 8.2 Approximating ambient temperatures for air-cooled transformers
- 8.3 Approximating ambient temperatures for water-cooled transformers
- 8.4 Influence of ambient on loading for normal life expectancy.

9.0 Information for loading calculations– *Tim Raymond, Glenn Swift and Gary Hoffman volunteered to help with this clause.*

10. Loading of distribution transformers and voltage regulators - *Craig Colopy*
11. Loading of power transformers – *Sue McNelly will provide Xcel Energy's loading guide for informational purposes, David Wallach.*
12. Effect of loading Transformers above nameplate rating on bushings, tap-changers, and other auxiliary components - *Tim Huff*
13. Operation with part or all of the cooling out of service – *no volunteers*
14. Operation at altitudes above 1000m – *Sue McNelly may be able to provide information from its Denver area on this.*

*Schedule:*

Need comments back by Jan 31st, 2005.

Produce working, complete draft by Feb 28, 2005.

Will arrange e-mail list and web facilities to enable work to proceed between this meeting and next.

Send draft to all members for comment prior to Spring 05 meeting.

Discuss comments at Spring 05 meeting

Send document out for ballot Fall 05.

Meeting adjourned at 3:00 PM.

Tim Raymond, Chair
Glenn Swift, Vice-Chair

**Attachment A**
**(PPT Presentation can be found at www.transformerscommittee.org)**

### 8.10.3.2 WORKING GROUP ON THERMAL EVALUATION OF POWER AND DISTRIBUTION TRANSFORMERS (C57.100) – Roger Wicks

1.0 Introduction and Rosters

The working group met on Monday, October 25, 2004 at 9:30 AM with 17 members and 21 guests attending. Two requested membership bringing the total number of members to 46.

Prior to the introduction of members and guests Chairman Wicks requested that all working group members should sign up for the Transformer Committee AM. The information can be found on the transformer committee web site. Don Platts reviewed the patent documents for our meeting, and no patent related issues were noted for the work of this working group.

2.0 Approval of minutes from March 8, 2004 meeting

The minutes of the March 8, 2004 meeting in San Diego were approved as written.

3.0 Review of scope

The chair reviewed the scope of the working group. This has been incorporated into the PAR which has been submitted to the Standards Board. The scope is:

Scope - This standard provides test procedures to evaluate the thermal aging characteristics of insulation systems used in liquid-immersed distribution or power transformers. The dielectric liquid is part of the insulation system. The test procedure shall simulate practical service conditions of the insulation system, with the main emphasis on the thermal aging of materials in the candidate insulation system as compared to a conventional insulation system.

4.0 Discussion of “conventional insulation system” (for both power and distribution transformers)

The curves that we have today are based on testing of thermally upgraded paper in mineral oil. It was recommended that we need to extend the definition beyond conductor wrap. For example, some manufacturers are using netted CTC conductor which has no cellulose paper. In this case we need to consider the stress on the spacer material.

It was noted that transformers have been built for more than one hundred years and that this insulation system should be considered as the basis for conventional insulation system.

There was considerable discussion regarding the sealed tube aging test. In recent work done by Cigre WG 15.01.10 there were several papers presented which compared the aging of non thermally upgraded and thermally upgraded paper with respect to moisture content of the mineral oil. The sealed tube test does not represent free breathing transformers. More study needs to be done in this regard. The chair requested that any member should have access to any papers relating to aging studies that they forward them to the chair for circulation. The chair will see if he can get a place in the transformer committee web page to post these papers.

Jerry Corkran has volunteered to present a definition for a conventional insulation system for liquid-filled distribution transformers. He will have a draft of a definition for the next WG meeting.

Gustav Preininger and Steven Schappell will develop a similar definition for power transformers for the next meeting as well.

5.0 Distribution Transformer Aging

Jerry Corkran will send the chair sealed tube aging data that Cooper has as well as testing on complete distribution transformers (Lockie Test). He asked that this be circulated with the meeting minutes.

6.0 Power Transformer Aging

Tom Prevost indicated that he wrote a paper for Doble last year which gives a single point aging test to verify that material meets the criteria in the present C57.100. This will be circulated as well.

In regards to Power Transformer model aging the chair asked the membership to submit current and past literature dealing with this subject. These will be circulated to the working group for review. It was noted that Cigre WG 15.01.10 has information on this subject. Members of the WG who have access to Cigre should try to get this information to share with the WG.

IEEE 99 "IEEE Recommended Practice for the Preparation of Test Procedures for the Thermal Evaluation of Insulation Systems for Electric Equipment" should be reviewed to determine if there is anything included in that document which can be used to define the power transformer aging model. Tom Prevost will send the Chair a copy of IEEE 99 for circulation to the WG.

7.0 Sealed Tube Aging

There was discussion about whether the Sealed Tube Aging test should be in an Annex (as it is in the current document) or in the main body of the document. The consensus was that it should be in the main body. However Patrick McShane indicated that doing so would require a revision of the scope because the sealed tube test does not qualify as simulating practical service conditions of the insulation system.

Peter Heinzig from Siemens volunteered to give a short presentation on some aging tests which his company has performed. The chair asked for additional information regarding aging tests that could be shared with the WG.

8.0 Adjournment

The meeting adjourned at 10:34 AM.

### 8.10.3.3 WG on Definition of Thermal Duplicate – PC57.145 - Barry Beaster

The working group met on Tuesday, October 26, 2004 with ten members and 23 guests in attendance. An agenda, a copy of the Spring 2004 meeting minutes, an example of possible

variations in hot spot reporting, and draft eight of the guide were electronically distributed to the working group prior to the meeting. Additional paper copies were available for guests. Prior to working group discussions, Don Platts, the Insulation Life Subcommittee Chairman, asked for patent disclosure concerns regarding the working groups' activities. This was an IEEE mandatory meeting requirement. No concerns were raised.

After introductions, the Spring 2004 meeting minutes were approved. A correction to the membership roster was noted during review of the Spring 2004 meeting attendance roster. A request for new membership was noted. The membership roster now includes Ron Daubert of Finley Engineering and Saurabh Ghosh of Pauwels.

The PAR for this working group expires at the end of 2004. The question addressed to the working group is whether work should continue on this guide, or has the state of our standards moved to make the guide unnecessary?

An example of a set of thermal computations, with hot spot, was presented to illustrate that it is possible to perform detailed analysis beyond the methods presently in the guide. It was also shown that it is important to properly adjust these results with the proper loss calculation techniques. Cautions were mentioned in how the final analysis might be made in arriving at the final hot spot temperature. There were no additional comments on this example. In an effort to recognize that the methods in the guide might not be suitable for every installation across the scope of the guide, additional statements were added into the purpose clause. A proposed 'limitations and caveats' clause was also proposed. The proposed wording referenced a large population of transformers not requiring detailed analysis. Mark Perkins suggested being specific and restate the large population be clarified as distribution transformers, which was the original intent of the statement.

Discussion was heard on the aforementioned topics and the following comments and concerns were raised.
When does the guide apply? Tom Holifield, Mark Perkins, and Don Platts commented on this question. As written in the present draft, the guide only applies when a specification statement clearly requests, "Perform a thermal test in accordance with C57.12.90 unless the manufacturer has thermal test data from a thermal duplicate transformer".
Carlo Arpino requested the guide require thermal data from the tested transformer be provided in addition to the calculated results from the method in the guide.
Sanjay Patel questioned the validity of using the thermal results of a duplicate design being manufactured in two different facilities.
Juergen Gerth stated his concern that manufacturers should work to establish a base to use and not set individual limits.
Barry Beaster stated the present method requires a recalculation of the test data into thermal variables and used those to determine the proposed values for the new transformer. The question was raised if the improved methods and models allow pure computation without specific reference to a single test. This method uses its historical adjustment of all thermal tests.
Sanjay Patel expressed concern that thermal duplicate analysis may not offer any quality control.

Discussion was halted to determine what recommendations should be made to the Insulation Life Subcommittee regarding our original question on continuing work per the original PAR, or propose a new PAR be written. Mark Perkins proposed adding an alternative method to the document allowing those manufacturers, who have detailed thermal models and historical test data, to apply a statistical margin to compute results. A hand ballot indicated three persons approved, two persons disapproved this proposal. Marion Jaroszewski proposed to keep the

tolerances in Table 2 of the guide, but drop the method to permit the manufacture to apply other methods. This might be to adjust parameters in a program to match the tested results and apply those adjustments to the computations of the new unit. A hand ballot showed four persons approved, three persons opposed this proposal.

Time had expired and the meeting had to be adjourned. The conclusion perhaps from these results is that consensus from the working group is still a long way off.

### 8.10.3.4 Discussion During the Subcommittee Meeting:

Barry reiterated the problem that the PAR is due to expire at the end of 2004, and the working group still has a lot of work to do before we can hope to reach a consensus on this draft document. He noted that some have questioned the need for the document considering the changes in the standard during the extended life of this project. Now that detailed thermal models are required by C57.12.00 is there still a need for this? The subcommittee chair has supported the idea that the document is no longer needed, and posed a question to the attendees. Does anyone deal with the question of having a "thermal duplicate" for a new transformer in his day to day work? No one responded that it is an issue that they must deal with.
A proposal was made to archive the existing work on this project, discontinue the project, and allow the Par to expire. A show of hands vote gave overwhelming support to this proposal. Barry was asked to determine the best method of preserving the work either in a formal paper or as a document to be preserved on our website, etc. then to oversee that task.

### 8.10.4 Task Force on Winding Temperature Indicators - Phil McClure

Monday, October 26, 2004 Las Vegas, NV.

The meeting convened at 8:00 am with eleven of the fourteen members and forty one guests attending. The members and guests introduced themselves. There were six more persons requesting membership in the task force.

The group was instructed that existing and pending patents may not be used in standards, or other work the group may produce, without the written permission of the patent holder or patent applicant. The group was asked if anyone present knew of any patents that may be affected by the work being performed, and there were no affirmative responses.

The minutes of the Spring meeting in San Diego were read, then approved as written.

<u>Old Business</u>

The group was asked if there were any new comments regarding the stepped load heat run test plan that was emailed to several interested parties. The test is intended to establish the response time of various types of WTI, to winding temperature changes, which are the result of abrupt load increases. No comments were voiced.

The group was directed to refer to newly added figure 2 in the technical paper. This figure is a graph of data that was taken during a heat run, which was conducted according to the load profile contained in the test plan. It was disclosed that figure 2 was presented in this draft revision as an

example of the results which are sought, but due to data irregularities, it would not appear in the final paper. The chair felt that several anomalies that occurred during the test may have been partially the result of a lack of scrupulous plan detail, and resolved to rewrite the proposed plan, with help from the other WTI manufacturers in the group and comments from transformer owners and manufacturers.

A second test plan also needs to be written to describe a survey test which is proposed to be conducted on installed transformers, under normal loading patterns.

New Business

Draft seven of the technical paper was made available to the group, and eight added, edited and / or expanded sections were briefly discussed.

During the discussion of the response of WTI to step load increase, Sankar Vallamkanda explained his concern, which was largely responsible for formation of the group. His concern regarded the response of a simulating WTI to a sudden, unplanned load shift from two load sharing transformers to only one of them, in the event of a failure in the other. The transformers were ODAN types, and the specific concern was that at a time when the shifted load would result in a rapid increase in winding temperature, the inactive pumps would restrict oil circulation, and the slow response of the simulating WTI would not call on the pumps in time to forestall thermal runaway. The chair responded that the group would like to include a transformer with OD cooling in its testing, but if one was not available, the testing would otherwise proceed without an OD subject.

During discussion of possible improvements to the paper's structure, two suggestions were made which would make the paper more readable; the addition of a glossary of terms and illustrations of typical connections of the various WTI types. Both of these suggestions were well received and will be implemented in draft eight.

A brief discussion of terminology was had, regarding the concept of loading transformers at higher or lower magnitudes, depending upon the temperature of the ambient air mass available for cooling, and possibly the health of the cooling auxiliaries themselves. This has been referred to variously as load forecasting, predictive loading, dynamic rating and dynamic loading. It was decided to use the term dynamic loading in the paper. It was also decided to discuss the difference between dynamic loading and seasonal setback in the paper, because of their seemingly similar, but completely different reasons for existence.

Section 1.5 "Support of National Standards" was split out from section 3.6 to provide a venue for de-mystifying the degree of compliance of calculating and virtual WTI to IEEE and IEC loading guides. It was decided that the WTI manufacturers should meet separately to discuss this issue.

It is anticipated that the main body of the paper, minus the transformer heat run and survey tests and conclusions sections, will be completed by the next meeting.

A motion to adjourn was made and seconded, and the meeting adjourned at 9:20 am.

Respectfully Submitted

Phil McClure,
Chair

### 8.10.5 Task Force for Temperature Rise Test Procedures Section 11 of C57.12.90 - Paulette Payne

The meeting of the Working Group was held October 25, 2004 at 11:00 AM in room Estancia E at the Green Valley Resort Hotel in Las Vegas, Nevada. Don Platts lead the meeting for Paulette, who could not attend. Allen Mitchell has resigned as the secretary; Steve Snyder filled in for this meeting.

There were 51 attendees; 17 members and 34 guests of which 7 requested membership.

The IEEE patent issues were reviewed with no concerns noted.

The Minutes of the San Diego Meeting were approved as written.

1) Don Platts reviewed the previous work by a Task force chaired by George Henry in the 1990's. That working group completely rewrote clause 11. It was submitted to the Standards Subcommittee after the fall 1999 meeting. Although it was part of the draft balloted in 2002, this previous work has not yet been published. As a result of this discovery, we found that the new working group has been working based on the latest approved revision of the standard, but not from the latest approved work of our subcommittee. He will provide the wording in that draft to the group for review, and to serve as the basis of all future work.

2) We discussed the correction of No Load Losses to a standard reference temperature to be used in the Total Losses for the temperature rise test. The working group agreed to accept the wording in the latest draft ballot of C57.12.90/D2-2002. We will not make further changes.

3) Thang Hochanh raised the question about the necessity of performing the temperature rise test on the tap with the highest losses, even if it is only slightly different from the tap that produces the highest winding rise. The working group discussed and agreed that the present wording in the standard is acceptable. Thang was offered the opportunity to prepare a proposed wording that would address his concerns, and submit it to the working group for future consideration.

4) Time for Resistance Measurements After Shutdown
We discussed the change proposed in previous meetings, and surveyed prior to this meeting. It would have changed the maximum time allowed from 4 minutes to 2 minutes. The conclusion was that although it would be very practical for tests of some transformers, it is not possible for the larger units. We concluded not to change the standard.

5) Discussion on Standardizing Cooling Curve Methodology
Don Platts reviewed the history of the request and our plan to develop a standardized methodology to become a part of the standard. He suggested that each of the manufacturers and other interested parties submit their methodology to Paulette for consideration at future meetings.

The meeting was adjourned at 12:05 PM

Steve Snyder Oct. 25, 2004
Don Platts; For Paulette Payne

**8.10.6 Task Force Definition of Thermally Upgraded Insulation. – Don Platts**

The Task Force met on Tuesday, October 26, 2004 at 8:00. The meeting began with introductions and circulation of the rosters. Attendance was 5 members and 37 guests.

The IEEE patent issues were reviewed with no concerns noted.

The minutes of the previous meeting in San Diego were approved as submitted.

Don Platts, the chair, reviewed the status of our work. We have established a definition of thermally upgraded insulation. To resolve issues with the definition, and the content of C57.100, we have proposed that the minimum life expectancy for a transformer insulation system must be a requirement in C57.12.00, not merely listed in the loading guide, C57.91, and in the Standard Test Procedures for Thermal Evaluation of Liquid immersed transformers, C57.100.

Draft #3 is the latest work to develop the basis of temperature limits and thermal aging performance requirements. The attendees were given time to read the background information and the draft.

We spent a considerable amount of time reviewing the wording in the draft, particularly related to the use of the phrase “high thermal stress”, and the idea that some insulation components in a transformer do not need to be thermally upgraded. The phrase “high thermal stress” was used in draft 3 to distinguish insulation that needed to be thermally upgraded from other insulation components. The draft also said that insulation for structural components did not need to be upgraded. Joe Foldi suggested -- leaving out the reference to structural components as they may also get hot. The statement implies that structural parts do not get hot. This should state insulation components that are not exposed to high thermal stress are exempt from upgraded insulation. We don’t need to single out the structural insulation from others.--

Roger Wicks pointed out that we should define “high thermal stress”. Does “high thermal stress’ have a different value for other insulation materials?

Joe Foldi noted that CSA allows a 100ºC rise for other insulation (not windings)

C57.12.00 clause 5.11.1.3 discusses rises of metallic parts other than windings shall not attain excessive temp rises

Joe Foldi questioned the ‘other insulation’ Failures have been observed in leads, not just windings. Lead temp rise must meet the winding rise requirements, should this be added?

Someone proposed using the words “Match material used in other places to its loading condition and temperature.” This was not supported.

Don Platts offered a proposal to shorten the paragraph and simplify it by saying:
“Transformers that meet the Temperature and Loading Conditions in this standard shall be built using Thermally Upgraded Paper or an alternative insulation system that has been proven to

possess minimum aging characteristics that either match or exceed those of Thermally Upgraded Paper. This requirement applies to winding, insulation, layer to layer insulation, lead insulation, and other insulation components that determine the minimum life expectancy."

This was accepted. The new Draft #4 will be sent to the Insulation Life Subcommittee for a survey before the next meeting.

The meeting adjourned at 9:20.

Donald W. Platts
Chair Task Force - Definition of Thermally Upgraded Insulation

Barry Beaster
As Secretary

**8.10.7 Task Force for Revision to Temp Ratings in C57.12.00 – Dennis Marlow**

This group did not meet. Their work has been completed and submitted to the subcommittee for a survey. Due to problems with our mailing list, and since the secretary was not available to work on this, the survey has not been done. It will be sent out shortly, in time for Dennis to review the results before the next meeting.

**8.10.8 Old Business**

Dennis Marlow reminded the subcommittee that he is serving as our representative on the working group that is updating C57.12.80, Standard Terminology For Power And Distribution Transformers. He requested that any new definitions from our working groups be forwarded to him promptly to ensure that the are included in the next draft.

The chair reminded the group that our subcommittee is facing a leadership crisis. We have had at least 1 working group or task force chair miss each of the recent meetings. We have also had some resignations. Our subcommittee secretary has missed the past 2 meetings and has not contributed since the last meeting. Most of our groups do not have a vice-chair or secretary to assist the chair, and to fill in if he/she cannot attend a meeting. He urged everyone to become more actively involved in supporting the process, and has asked for each WG and TF as well as the subcommittee to fill all 3 leadership positions.

**8.10.9 New Business**

Our Guide For Determination Of Maximum Winding Temperature Rise In Liquid Filled Transformers, IEEE 1538, will reach the end of its 5-year life in 2005, and must be revised or re-affirmed. Don Platts requested that attendees provide any suggested changes or updates to the document. None were offered and he will survey the subcommittee to determine if a reaffirmation of the existing document is adequate for this update.

The meeting adjourned at 9:05 AM

Don Platts
Chair, Insulation Life Subcommittee

## 8.11 Performance Characteristics Subcommittee

### 8.11.1 Introduction/Attendance

The Performance Characteristics Subcommittee (PCS) met on Wednesday, October 27, 2004 with 67 members and 46 guests in attendance. 14 of those guests requested membership in PCS. See last page of these minutes for attendance summary.

### 8.11.2 Approval of Meeting Minutes

The minutes of the last meeting in San Diego were approved as written.

### 8.11.3 Chairman's Remarks

### 8.11.3.1 Administrative Subcommittee Notes

- Next Standards meeting dates and locations are as follows:
  Spring 2005: March 13 – 17, Jackson, MS
  Fall 2005: October 23 –27, Memphis, TN
- IEEE PES meeting future dates and locations are as follows:
  San Francisco, California: June 12 – 16, 2005.

### 8.11.4 Agenda Changes

None

### 8.11.5 Working Group and Task Force Reports

### 8.11.5.1 PCS WG for Continuous Revision to C57.12.90 – Bruce Forsyth, Chairman; Rowland James, Secretary

The PCS Working Group for Revisions to test code C57.12.90 met in Henderson, NV on October 25, 2004 at 9:30 A.M. There were 48 persons in attendance, 27 members and 21 guests. 11 guests requested membership in the working group. After introductions, the minutes from the last meeting were reviewed and approved.

Announcements
Bruce Forsyth urged working group members who haven't registered for the Association Management System to do so. This system will enhance our abilities to communicate with the Working Group.

Subhash Tuli announced that C57.12.90 will be re-balloted in December.

Bruce then reviewed with the Working Group IEEE's Patent Requirements for Standards Under Development. Two slides provided by the Transformers Committee related to the IEEE's Patent Policy were presented and an opportunity was provided

for WG members to identify or disclose patents that may be essential for the use of this standard. No responses were received.

**Old Business**

1.0 There was a discussion of the proposed draft #5 of the WG Item #11 "Proposal for Single Phase Excitation Tests." The remaining outstanding issue was the number of exciting current test required to demonstrate proper performance of a transformer during factory tests.

1.1. It was agreed that performing the single-phase excitation test in four positions (maximum, rated, 1-step below rated, and minimum) is sufficient to demonstrate acceptable performance unless there are other tap positions that change the magnetic excitation circuit. Notes 2 and 3 were reviewed and it was agreed they provide sufficient information to address such cases.

1.2. A comment from the floor recommended adding the word "voltage" in Note 1. Note 1 now reads as follows:

**"**The de-energized tap-changer (DETC) shall be set to the maximum voltage tap position for these tests."

1.3. The title of table 1 was changed from "Measurements Required for Exciting Current and Loss Test" to "Measurements Required for Single-Phase Excitation Test."

1.4. A motion was made by Bob Hartgrove and seconded by Joe Melanson to accept these changes. The motion passed unanimously.

2.0 The next item discussed was draft #2 of WG Item #9 "Proposal for Operational Tests for Load Tap Changers."

2.1. The test requirements in draft 1 of this procedure included 4 basic tests: Motor Drive Mechanism Test, LTC Control Equipment Test, Load Current Test, and a Step Voltage Test. A comment submitted prior to this meeting noted that a separate test for the motor drive mechanism is not necessary since the subsequent tests require the motor to be operated, which should be sufficient to demonstrate acceptable operation. The Chair agreed and struck out that motor drive mechanism test in draft 2. During a discussion of this issue, Joe Foldi recommended testing the motor for minimum voltage operation. Bruce Forsyth noted that another WG member, Boyd Leuenberger, had submitted a similar comment prior to this meeting. This item was not resolved and remains open.

2.2. A discussion took place regarding the use of the term "cycle" in this document. After some discussion it was agreed the following statement would be included to define the term "cycle" as it related to LTC operating in this document:

"The LTC mechanism shall be considered to have operated one full cycle when it has operated through all LTC tap positions in both the raise and lower directions."

2.3. John Melanson stated that the LTC motor should be energized from a specific position in such a way that the control circuit is used to operate the motor as installed. Subhash Tuli stated that manufacturers

should not be allowed to make any temporary connections in the control cabinet. After some discussion it was agreed that the current wording is sufficient to address these issues.

2.4. A short discussion was held on the need to test the control circuit at the minimum and maximum control voltage levels. This item remains open.

2.5. A question was raised on the need for a separate control circuit test since the control circuit is used for load and voltage tests.

2.6. Steve Beckman asked if LTC travel stops would be challenged? It was noted that the current wording of the LTC Control Equipment Test includes testing the mechanical limit switches.

2.7. A question from the floor was made on what are we trying to accomplish with these tests. Bruce Forsyth responded that the purpose of these test is to demonstrate that the LTC and controls are functioning properly as installed on the transformer.

2.8. In a follow up question it was asked if the LTC is controlled remotely how is this tested? Bruce responded that this procedure is not intended to cover equipment that is not directly installed on the transformer and that this test procedure would be limited to demonstrating the installed equipment performs as specified by the manufacturer.

2.9. Pierre Riffon stated that IEC requires only two steps above and below neutral. Joe Foldi stated that he would prefer to keep the ranges recommended in the proposed text. After some discussion, there was agreement that the proposed text be retained.

2.10. It was noted from the floor that the step voltage test states that no current will be flowing during this test. It was recommended and agreed that this be reworded to “load current”.

2.11. As time was running out, Bruce Forsyth announce that the current comments will be incorporated into a new draft that will be sent to WG members before the end of this week for their review.

New Business

1.0 Vallamkonda Sankar raised two issues.

1.1. Clause 9.3.3.2 – recommended a statement be added that the equations only apply to concentric windings. Bruce Forsyth noted that this request has already been addressed by the WG in previous meetings and agreed to research the issue to determine the WG’s previous resolution.

1.2. An issue regarding switching impulse polarity was raised, but it was noted that this WG only addresses issues falling under the scope of the Performance Characteristics SC and switching impulse issues should be directed to the Dielectric Test SC.

**8.11.5.2 PCS WG for Continuous Revision to C57.12.00 - Steve Snyder, Chairman; Dennis Marlow, Secretary**

The Working Group met on Monday, October 25 at 1:45 PM. There were 27 members and 39 guests in attendance, with 1 person, Pritpal Singh, consultant, requesting membership. The chairman reported that the roster has been reviewed recently,

resulting in 7 inactive members being removed. With the addition of the new member above, the Working Group membership now stands at 60 .

Following introductions, the minutes from the March 8, 2004 San Diego meeting were approved as submitted.

The chairman then reviewed the IEEE patent disclosure requirements. No guests or members present indicated knowledge of any patent activity applicable to our work at this meeting.

Subhash Tuli reported that the latest draft of standard C57.12.00 will be re-circulated in mid-December 2004.

The Working Group then began discussing the topics of old business, as follows :

**WG Item 53,** C57.12.00 Table 19, request to make the zero sequence impedance test a "Routine" test requirement for transformers with wye connected high-voltage and low-voltage grounded neutrals with a low side voltage greater than 600 volts and a rating greater than 2500 kva.

There was an exhaustive and lively discussion on this topic. Joe Foldi noted that zero sequence impedance tests are usually done at 10 to 15% of the rated current to avoid tank heating and core saturation effects, and that zero sequence impedance is not linear and may be quite different at full load and/or during a fault condition. It typically is less than the tested value due to the effects of saturation. Another comment was that sufficient measurements are needed to be able to calculate the resistive and reactive components correctly as required for the test report specified by C57.12.90. Some people voiced support for the proposal as many times users do not realize they need to request this test be performed. On the other hand, for multiple unit orders there is little value in conducting the test on identical units. Other statements were that single phase, shell form, and 5-legged core designs should be exempt from this requirement. The location of the delta winding (for tertiaries) also has an effect. Dennis Marlow noted that C57.12.90 already addresses most of these concerns, and any proposed changes to that document should be addressed by that working group. Ultimately the working group decided by a vote of 24 to 2 to make the following changes to C57.12.00 Table 19 :

1) In the column labeled "tests", the test listed as "Zero-phase sequence impedance voltage" will be changed to "Zero-phase sequence impedance voltage and load loss".
2) The columns will be marked to require this as a "Routine" test and a "Design" test, and the mark will be removed from the "Other" test column.
3) A new note 18 will be added which reads "Zero-phase sequence impedance shall be a routine test for Class 11 transformers, and a design test for Class 1 transformers, having a neutral brought out. This test is not applicable to single-phase, shell-form, or transformers with 5-legged cores."

**WG Item 54,** C57.12.00 Table 19 and Section 8.2, request to add winding DC resistance measurements as a requirement for buried tertiary windings.

The Working Group began this discussion by noting the difficulty of performing this test compared to the benefits received from it. There did not appear to be much support for this proposal, but as time was expiring, the chairman decided to continue the discussion at the next meeting.

### 8.11.5.3 Loss Tolerance and Measurement, WG - Ed teNyenhuis, Chairman; Andy Steineman, Secretary

- 12 members and 22 guests attended, with 2 guests requesting membership.
  - Minutes from the San Diego meeting, Mar 9, 2004, were read and approved.
  - IEEE Patent Policy - The policy was reviewed by the WG and an opportunity was provided for WG members to identify or disclose patents that the WG member believes may be essential for the use of that standard. No responses were given.
  - Eddie So is still recovering from his illness and thus the TF meeting for "Guide of Low Power Factor Power Measurements" was canceled. It was hoped that Eddie would be able to attend and hold the next meeting.
  - Frequency Conversion Factors of Transformer Performance Parameters
  - Revised wording in C57.12.90 Section 9.4.3 (Impedance voltage) – The WG agreed to and discussed the following:
    - The WG was presented x/r ratios for distribution transformers in the range of 5 to 20. Several members commented that in fact the x/r ratio could be as low as 1 for distribution transformers. It was agreed that the error for the frequency ratio for impedance voltage would be too high for distribution transformers (up to 5% error). Thus, for distribution transformers the emphasis for load loss measurement should be put on having the correct rated current.
    - The following revisions were agreed to in the third paragraph –first sentence the "should" should be a "shall", in the last sentence the "should" to "would".
    - The proposed wording with the above changes was approved by the WG.
  - Revised wording in C57.12.90 Section 12.4.7 - Short Circuit Test – The WG reviewed and reaffirmed the wording with no changes.
  - Revised wording in C57.12.90 Section 11.7 - Temperature Rise Test – The WG agreed to the following:
    - In the section on the fact that direct hot spot temperature measurements would not be valid, it was agreed that the following wording should be added "would need to be corrected for winding eddy losses at the rated frequency" instead of "would not be valid since the winding eddy loss will be not be correct"
    - There was discussion on the fact that the calculated heatrun current would only be valid for the initial estimate of the heatrun current. The Chairman agreed to develop revised wording for this and replace the second sentence.
  - Revised wording in C57.12.90 Section 8.6 – No Load Loss and Exciting Current. The WG reviewed and reaffirmed the wording with no changes.
  - Revised wording in C57.12.90 Section 13.3.7 – Audible Sound Emissions – The WG agreed and discussed the following:
    - The WG reviewed and agreed to a direct analytical method to convert the ONAF sound level from non rated to rated frequency. It was agreed that the manufacturer shall provide an adequate supply to operate the cooling equipment at the rated frequency.
    - Proposed wording to encompass the ONAF conversion was shown. The following changes were agreed to: remove $LP_{Amb}$ from the list of the variables, add "corrected for ambient" to $LP_{ONAN-50}$ and $LP_{ONAN-60}$.
    - With the above changes, the wording was agreed to by the WG.

- Revised wording in C57.12.00 Table 19 Note – The WG agreed to the following:
  - Add “at the tender stage” to the end of the phrase: “then upon mutual agreement with the customer”
- The text additions to C57.12.90 and C57.12.00 for the 50 to 60 Hz frequency conversions is now complete for all performance parameters and will be sent for survey to the WG and PCS survey shortly
- Other Business from a previous meeting:
  - A point was raised at a previous meeting as to the limit of how much load loss should be corrected if not exactly rated current is applied. There is presently no limit in 12.90. It was agreed by the WG that even measured losses lower than 50% of rated current were accurate. In fact it can be more accurate since the windings would not heat up as quickly. The WG agreed that no changes to the wording are required in 12.90 or the loss guide on this matter.
- New Business – The WG suggested new discussion items for future meetings:
  - Investigate the errors in the temperature rise measured values due to corrections and assumptions.
  - Overload test at different frequencies
  - Zero sequence impedance and losses
  - Investigate the total error for load loss in all corrections due to temperature and other factors. There is a paper that discusses these matters that can be used as reference.

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

The Working Group was called to order at 8:04 AM on October 26, 2004. There were 63 attendees, 33 members, 3 requesting membership, and 27 guests. The agenda for the meeting was reviewed, and the Minutes from the March 9, 2004 meeting in San Diego California were approved. Copies of both the minutes and Draft 1.7 of the guide were distributed.

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

Draft 1.6 of the guide was sent to Performance Characteristics Subcommittee as well as members of the working group to request feedback. There were 12 responses, which could be categorized into four areas:

- Typos, and spelling errors
- Rewording and clarification of grammer
- Re-drafting of figures is needed
- Technical comments

Prior to discussing the technical comments Gustav Preininger made a presentation considering the assumptions that must be made to develop a typical ladder model of the transformer to study transformer breaker interactions. Of particular concern is the determination of the parallel capacitance in the model. If it is assumed the voltage distribution is linear across the winding, and working with the energy stored in each parallel capacitor, a value can readily be calculated. However it must be understood that such a model would only be appropriate up to 150-250 kHz, probably adequate for considering a standard lightning impulse or most of the interactions this guide

describes. If higher frequencies are of interest all winding and turn-to-turn capacitances would have to be considered. It is important to recognize that the model selected has to be appropriate for study of the transient applied to the transformer terminal.

The committee then reviewed the technical comments received, and two areas were identified for discussion. First, there was a request for a simple rule of thumb that could be applied. The group has discussed this previously, and again concluded that there were too many variables to consider. However the group suggested instead that the circumstances surrounding such interactions could be listed so that a user may consider further study. It was suggested that the items to be considered by a user are:

- Lightly loaded transformers
- Breakers that are switched frequently
- That arrestors alone are not adequate to protect a transformer from interactions
- Application of snubbers can be a simple economic solution to interaction problems.

The rules of thumb identified, generated a discussion on arrestors and their impact on transformer breaker interactions. Several examples of failures were described and considered the location of the arrestors as well as the location of failures within a transformer. The salient points discussed were that arrestors may not provide protection for very fast transients or transformer breaker interactions, and that location and lead length for an arrestor are critical.

The second technical comment discussion area was the consideration to address additional topics in the guide. Suggestions were to consider phase-to-phase voltages generated by switching; a lack of phase-to-phase protection in delta or ungrounded windings; the effects of disconnects as well as breakers at transformer terminals; and part winding resonance. The consensus of the group was that these topics would be considered in future revisions of the guide.

Two figures were added to the guide to help display the statistical nature of breaker characteristics. The first illustrates breaker transient recovery voltage characteristics, and the second arcing time/breakdown time for two types of vacuum interrupters.

Next steps are to incorporate this meetings comment, to rework the figures to meet publishing requirements, a final review by IEEE editorial staff, and to send the guide out to ballot by years end.

Under old business, Ramsis Girgis, discussed another transformer interaction problem, the failure of GSU's under backfeed conditions. Approximately 42 of these failures have been reported in the last 30 years, and are generally the results of high voltage transients simulating a resonance in the transformer when little or no damping is present. It was suggested that this is an area that the working group should consider after the completion of this guide, as there is little guidance available in this area.

New business discussions indicated that CIGRE would be holding a Transformer Colloquium in June or July next year in Moscow.

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

The W.G. met in the Estancia D Meeting Room of the Green Valley Resort Hotel in Las Vegas, Nevada on Oct. 25, 2004 from 11:00 a.m. to 12:15 p.m. There were 8 members and 3 guests present. The following are highlights.

1. The minutes of the W.G. meeting in San Diego were approved.

   NOTE: The minutes of the Las Vegas W.G. meeting will not be formally approved until the W.G. meeting in Jackson Mississippi.

2. IEEE patent policy as related to standards development was reviewed; details in registration package. Attendees were asked if they knew of any patents that would impact the implementation of the revision of IEEE C57.21. None were noted.

3. The reaffirmation process for IEEE C57.21-1990 (R1995), the current version, is now complete. IEEE Standards Board approval was obtained at the June 24, 2004 meeting.

4. Draft #2 of the revision of C57.21, prepared by the Chairman was discussed. The following are the key points.

(i) Input/comments provided by Sten Andersson will be included in Draft #3. A copy of his input will be provided by e-mail to W.G. members.

(ii) Pierre Riffon lead off discussions re the audible sound test; Clause 10.6.3.3. The audible sound type test must be carried out at full operating temperature. This will reflect in-service operating conditions. If a temperature rise type test is conducted, the audible sound type test can be conducted at the end of the temperature rise type test as it will ensure the unit will be at full operating temperature. The temperature rise type test and audible sound type test must be conducted at maximum operating voltage. If no temperature rise type test is carried out (similar type test report available) but an audible sound type test is required, sound level measurements must be made with the unit at operating temperature. This can be demonstrated when the measured sound level stabilizes within $\pm$ 2 dBA. The other approach is to reach an agreement between purchaser and manufacturer as to when the unit is near operating temperature; multiple of the thermal time constant.

(iii) The test values in Table 5 for 765 kV should be reviewed. The notes to Table 5 will also be reviewed for consistency. Duration, magnitude and methodology for the low frequency test will also be reviewed; 2 columns -69 kV and below and above 69 kV. Pierre Riffon will make the revisions.

(iv) The proposal to extend the turn-to-turn test, as an alternate to the impulse test, to oil immersed shunt reactors was discussed. Sten Andersson will provide input before the next W.G. meeting re the suitability of the test methodology and equipment availability. It should be noted that in the current revision of the IEC reactor standard, the Turn-to-Turn Test is applicable to dry type shunt reactors and not oil-immersed shunt reactors. This is the practice in the current version of IEEE C57.21. Should this be maintained in the revision?

(v) Fig. 3C should be clarified. The crest voltage value "read out" is different from that obtained from the "graph" waveshape. Is the recorded value based on "smoothed" waveshape. How should the observed oscillation be handled? The Chairman agreed to investigate and make appropriate changes.

(vi) Table 4A was discussed. It was proposed to make the Vibration Test a type test and add an additional "walk around" sound test as a routine test for oil immersed shunt reactors. The "walk around" test is conducted using an integrating sound level meter. The tests are carried out with the shunt reactor "cold". However, in order to provide a calibration point a "walk around" sound test should be carried out at the beginning of the audible sound type test; unit cold.

(vii) Should the audible sound type test methodology be changed to reflect the standard use of integrating sound levels which allow a "walk around" procedure? The answer seems to be YES. The Chairman will change the test code in Draft #3.

**8.11.5.6 TF for Revision of C57.110 – IEEE Recommended Practice for Establishing Transformer Capability When Supplying Non-Sinusoidal Load Currents – Rick Marek, Chair; Kent Haggerty, Co-Chair**

The meeting opened with introductions and Kent Haggerty was introduced as the Co-Chair. The Chairman indicated that this was the first meeting and that it would be a Task Force meeting, since there was no PAR. Signup sheets were then passed around requesting volunteers for membership on the Working Group.

The IEEE Patent presentation slides #1 and #2 were shown to the Task Force and they were advised that:

- The IEEE's Patent Policy is consistent with the ANSI patent policy and is described in Clause 6 of the *IEEE SA Standards Board Bylaws*;
- Early disclosure of patents which may be essential for the use of standards under development is encouraged;
- Disclosures made of such patents may not be exhaustive of all patents that may be essential for the use of standards under development, and that neither the IEEE, the WG nor the WG Chairman ensure the accuracy or completeness of any disclosure or whether any disclosure is of a patent that in fact may be essential for the use of standards under development.

An opportunity was provided for TF members to identify or disclose patents that the TF member believes may be essential for use of that standard. No responses were given.

The Chairman gave a brief historical background on the C57.110 document and a summary of the last revision. In the last revision, $H_{FL}$ was defined and liquid-filled formulas and examples were added to the document. The definition of K-factor was also clarified in the context of the new definitions.

The Chairman noted that a PAR request had been submitted, but was rejected by NESCOM on the grounds that the word transformer in the title was not sufficiently descriptive. Since several appeals by Bill Chiu and Ken Hanus failed to convince NESCOM, it was agreed to change the title, rather than continue the debate. The new title will add the words “liquid-filled and dry-type power and distribution” before the word “transformer”.

The Chairman noted that revision of the document is necessary as a resolution to a negative ballot received during the reaffirmation process. This ballot also resulted in an errata sheet. The Chairman will correct the errata sheet items.

Phil Hopkinson noted that one change over the years since the 1998 printing was that key learnings have been gained on transformer loading patterns. He also noted that reproducing test conditions in the lab is difficult. The Chairman agreed that there was no good test that accurately duplicated the harmonics. A guest commented that there is now a solid state AC source that is programmable and can provide a wide range of harmonics. He and Chuck Johnson offered to provide information, which will then be passed on to all present. It was also suggested that this could be an interesting tutorial topic. The Chairman noted that this is one example illustrating the need to reevaluate and update the document.

All members were requested to provide the Chairman with information on papers and other technical information that should be added to the bibliography. A guest questioned whether the affects of current harmonics on core loss should be added to the document. He referred to a paper that indicated a very large increase in core loss due to current harmonics. The paper will be reviewed by several of the members to determine appropriate action.

The Chairman reviewed some of the many comments and editorial corrections that were submitted for the reaffirmation process. All were minor errors, which will be corrected by the Chairman. He also noted that he would review the whole document for consistency in the use of decimal places. Ramsis Girgis suggested limiting the numbers to just two decimal places, due to the approximate nature of the calculations.

Another comment from the reaffirmation process noted the weak coverage in the document on 3$^{rd}$ harmonics in general and specifically the need for additional treatment on excessive heating of neutral bus due to 3$^{rd}$ harmonics. Phil Hopkinson offered to provide information to the group from power quality experts. He will also review the section for improvement.

The Chairman will provide the discussed information to all present. The members will also receive a copy of the latest version of the C57.110 document. A number of volunteers were requested and assigned specific tasks that are due by mid-December.

- Ramsis Girgis volunteered to review the abstract and introduction and update if necessary.

- Sheldon Kennedy and the Chairman will compare and harmonize the symbols and key formulas in C57.110 and C57.18.10.
- John Crouse, Tim Lewis, Subhas Sarkar, Phil Hopkinson, Chuck Johnson, and Ramsis Girgis volunteered to review the whole document for upgrades.

15 requested membership in the Task Force and there were 13 guests.

### 8.11.5.7 Semi-Conductor Rectifier Transformers, C57.18.10, WG – Sheldon Kennedy, Chairman

The Task Force met on Monday, October 25, 2004 at 3:15 PM with 10 members and 4 guests present. Sheldon Kennedy chaired the meeting.

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

The minutes of the March 2004 meeting in San Diego, California were approved.

Comments received during the 2003 reaffirmation of C57.18.10 required action to resolve the negative votes received. The Task Force decided to have a corrigenda revision of C57.18.10 to correct the errors and missing or undefined terms. Technical comments will be worked on during a full revision process following the corrigenda revision. The proposed corrigenda PAR was reviewed and approved by the task force. This PAR will be submitted by the chair following the meeting.

Items from the comments for editorial corrections received during the reaffirmation were reviewed. Members were encouraged to review the standard for any editorial errors.

Technical comments received were also discussed, but these will be tabled until the full revision process. Clarifications of the routine, design and other tests were discussed. No table exists showing these concisely and it may be recommended to add this. Some of the standard language is confusing on some of the tests.

A statement was requested giving clarification of the differences between dedicated rectifier transformers covered by C57.18.10 and transformers serving distributed loads containing harmonic content covered by C57.110. The chair informed the working group that C57.110 was also beginning a revision process. The chair also pointed out that C57.18.10 states that it is for dedicated rectifier loads.

### 8.11.5.8 Neutral Grounding Devices, PC57.32, WG – Steve Schappell, Chairman

The working group met at 9:30 am on Tuesday, October 26, with 16 in attendance. There were 7 members and 9 guests. One of the guests requested membership and will be added.

Introductions were made and the group was asked if they had any knowledge of the possibility of any patents, which may be essential to the implementation of the Standard. The response was negative.

The roster was handed out, as well as copies of Draft 2 of the Standard, which had been previously emailed, and an IEC draft concerning arc suppression reactors. The new AM system was discussed, and attendees were requested to ensure that they are registered with this system in order to receive future emails concerning this Standard.

A list of major changes to Draft 2 was reviewed. These changes include: adding an introduction, table of contents, and reference standards; updating the definitions and moving them to the front of the guide; re-creating two tables that were not available electronically; formatting the equations in MathType; adding missing tables and a bibliography. Thanks were given to Devki Sharma, Peter Balma, Richard Dudley and Klaus Papp for help in these revisions.

The IEC draft on arc suppression reactors was briefly discussed. Richard Dudley volunteered to work with Klaus Papp to edit this section for inclusion in the next draft of PC57.32. It was pointed out that the symbols in the IEC draft would need to be aligned with IEEE symbols. The IEC reactor standard was discussed, and Richard mentioned that it does not contain information on resistors or neutral grounding devices. It was pointed out that we would need to add definitions to the Standard once the arc suppression reactors section is added.

The definitions were briefly discussed and it was agreed that any definitions already listed in C57.12.80 would be removed from the Standard.

Section 4 on Service Conditions was discussed. It was decided that Section 4.2 needs to point out that neutral grounding devices are often mounted on other equipment, resulting in higher effective ambient temperatures.

Section 5 on Operation at Altitudes in Excess of 3300 feet (1000m) was discussed. Table 2 was discussed and the group determined that it is an accurate table. Meters will be listed first in the next revision.

Section 6 on Basis for Rating was discussed. Table 4 lists the continuous duty rating of resistors as 0% for any rated time and the accuracy of this was questioned. It became evident in the discussions that we need input from manufacturers of neutral grounding resistors and capacitors. Peter Balma and Richard Dudley volunteered to make contact with them and solicit input. Steve Schappell volunteered to review the grounding transformer section.

It was pointed out and agreed that Table 1 “Limits of Temperature Rise for Neutral Grounding Devices at Rated Continuous Current” should be moved to Section 8 on Temperature Limitations and the definition for insulating materials deleted. Richard Dudley agreed to revise Table 1, using input from C57.16 and C57.21.

The group discussed how the test code should be handled for the Standard. The options are to have one test section, or a test section for each type of device. It was noted that Table 5 lists X/R and Table 11 lists R/X and they need to be aligned. Table 6 on Insulation Classes was briefly discussed. It was questioned whether 230kV class devices were used, and the response was affirmative.

The members and guests were asked to email further comments to the Chairman to incorporate into Draft 3 before the next meeting.

### 8.11.5.9 PC57.149 – Guide for the Application and Interpretation of Frequency Response Analysis for Oil Immersed Transformers – Chairman; Charles Sweetser

WG PC57.149 met for the development of a guide for Frequency Response Analysis (FRA) in Las Vegas, Nevada on October 26, 2004 at 3:15 P.M. There were 44 persons in attendance, 21 members and 23 guests of which 3 guests requested membership.

The FRA Working Group meeting was called to order at 3:15 PM.

The first order of business was to show the two slides regarding patents & inappropriate behavior. Larry Coffeen indicated that he has patents related to the subject of our work. Larry agreed to provide the WG Chair with the administrative details for the patents.

The minutes from the last meeting were presented and approved without comment.

It was announced that the IEEE Task Force became an official Working Group on June 24, 2004. The new title is: PC57.149 – “Guide for the Application and Interpretation of Frequency Response Analysis for Oil Immersed Transformers.”

Charles Sweetser presented a brief report on what had been done in the last six months. The latest contributions were identified and discussed. The major contributors were Paulette Payne, Bertrand Poulin, and Subhash Tuli. Each section was then discussed.

- **Section 1:Scope and Application** – Progress has been made on this section. The definition section is not yet completed and roughly 20 definitions are still needed. Roger Verdolin offered to provide the first round of needed definitions, and Mark Perkins offered to review this work. Larry Coffeen asked about how the WG plans to define the “impulse method”. It was recommend that the WG possibly redefine the “impulse method” as the “time domain method”.

- **Section 2: Test Parameters** – The topic of measurement impedance dominated this discussion. The advantages and disadvantages of using measurement impedances, such as 0 Ohms, 10 Ohms, 50 Ohms, and 1 MOhm were presented.

Other issues were also raised in Section 2, such as frequency range, specific standard for calibration, and types of co-axial cable, however these parameters will most likely be specified by the end user.

- **Section 3: Measurement Parameters (test plan)** - Charles Sweetser presented information related to various FRA test types and test connections to generate discussion. Issues such as recommended tap positions were also raised. Four test categories were also presented and defined; Open Circuit, Short Circuit, Inter-Winding, and Transfer Admittance. There was considerable discussion regarding phase convention and test order. Most of these issues do not appear to be resolved at this point. Bob Degeneff also brought to our attention that he wants any definitions in this Section and in Section 1 to be check with any existing IEEE definitions that may already exist.

- **Section 4: Test Records** – This section appears to be complete for the first draft. The WG agreed that the data format must remain open. Proprietary formats should be discouraged.

- **Section 5: Analysis and Interpretation** – The WG agreed that this section is in poor condition. In past revisions, this section has been filled with case studies that have often been misleading. The WG would like to see work done in the area of computer modeling analysis. This analysis should be applied to various transformer designs to see how the results compare to actual measurement. Mark Perkins requested that this section contain a realistic assessment of what FRA can do. Charles Sweetser, Larry Coffeen, and Richard Breytenbach will review and edit this section for the next meeting.

- **Section 6**: **Appendix I –** Bob Degeneff will continue to the lead contributor to this section. Roger Verdolin volunteered to review Section 6.

Charles Sweetser provided an update as to the status of the CIGRE FRA Working Group A2.26. The CIGRE and IEEE FRA Working Groups established a liaison relationship earlier this year. Charles stated that WG A2.26 plan to have their first draft completed by January 2005. This draft will be available to PC57.149 for our group to review. The WG A2.26 draft will consists of three primary sections; Introduction for New FRA Users, Techniques, and Interpretation.

Ramsis Girgis announced that Charles Sweetser will be the new WG Chair for WG PC57.149.

### 8.11.5.10 Core Overexcitation TF – Craig Steigemeier, Chairman

The meeting took place at 8:00am on October 26th, 2004. There were 70 total attendees, of which 44 were members and 26 guests. 22 new members requested membership and will be added to the Task Force roster. This was second meeting of the Core Over-excitation Task Force. This Task Force is charged with the identification of limits for core over-excitation and coming up with suggestions for modification of appropriate standards.

At the beginning of the meeting, the IEEE patent policy and the meeting room WiFi capabilities were reviewed. No one offered the chairman suggestions of patentable work or identified any inappropriate topics covered during the meeting.

Based on input from the spring San Diego meeting, suggested changes to C57.12.00 (IEEE Standard General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers), Section 4.1.6 (Operation above rated voltage or below rated frequency) were presented and discussed. Also, core hot spot temperature limits were reviewed.

Suggestions made during the meeting after review of the suggested changes include:

- instead of using 130$^{o}$C, use the 90$^{o}$C rise over the 40$^{o}$C ambient for clarity
- address core hot spot when overexcitation occurs in lightly loaded situations
- consider the core formula in IEC standards
- consider setting induction limits, but must consider core material and construction
- refer to C57.116 for consistency – both in terminology and details like power factor
- consider using a curve for temperature/overexcitation (attendees will send Chairman examples/suggestions)
- in addition to the GSU and system tie transformers, consider adding a third category for "other" transformers that are designed only for step-down operation
- insure consistency in the use of rises versus absolute temperatures
- address boundary conditions - such as number of fans in operation and material
- develop and include a core hot spot calculation similar to the winding hot spot calculation

In general, most attending seemed to prefer to keep the modifications as simple as possible, while coming up with something adequate to address concerns over the adequate handling of overexcitation situations.

The Chairman will modify the changes based on the comments from the meeting and review it with a volunteer group including representatives from the following 3 manufacturers and 10 utility/consultants:

Peter Balma – PSE&G
Ed teNyenhuis - ABB
Donald Chu - ConEd
Ramsis Girgis - ABB
Peter Heinzig - Siemens
Harold Moore - Consultant
Rowland James - Entergy
Miguel Oliva - ABB
Bipin Patel – Southern Company
Stephen Beckman– Fort Pierce
Gustav Preininger - Consultant
Bob Tillman – Alabama Power Co
Subhash Tuli – Waukesha Elec Sys
Loren Wagenaar – AEP
Dieter Wagner – Hydro One
Peter Zhao – Hydro One

### 8.11.6 Project Reports

#### 8.11.6.1 Status of C57.133 - Guide for Short Circuit Testing - Nigel McQuin, Chairman

IEEE removed the PAR of this Guide and therefore the document has been withdrawn. Niguel was absent from this meeting. The PCS and Standards SC are in the process of deciding whether to send the manuscript as is to a reaffirmation ballot or revise the Guide with technical updates and improved clarity graphs / pictures before sending it for ballotting. The second proposal will require forming a TF to produce the revised document.

#### 8.11.6.2 Measurment of "Zero Sequence Impedance" for transformers with interconnected windings – Ramsis Girgis

A group of six SC members met to review and confirm accuracy of the method suggested by Gerry Rosselli and to develop appropriate text to describe the test for implementation in C57.12.90. This text will be reviewed in the spring meeting of that WG. Bruce Forsyth was given the responsibility of chairing this group.

### 8.11.7 Tutorial Session on "Taps" – V. Sankar

Mr. Sankar gave this tutorial. He presented types of Taps, Tap windings, TCs, and design strategies. The main recommendations by Sankar were that Specifications should not restrict design options and that users should confirm the requirements of the specification and should work together with suppliers developing the specifications. He also suggested not requiring DETC.

### 8.11.8 Old Business

None

### 8.11.9 New Business

- A motion was made by Jerry Cockran to move the DGA Guide C57.104 from under jurisdiction of Insulating Fluids SC to PCS. A number of SC members commented on the proposal and it was agreed that Jerry will submit in writing the technical reasons for his request and that the Admin SC will study those reasons and make a decision.

- Another request was made to examine C57.12.00 clause 7.1.1 regarding the MVA reference for the temperature gradient testing of TV windings.

## 8.12 Power Transformers - Tom Lundquist, Chairman

The Power Transformers Subcommittee met at 1:30 pm, on Wednesday, October 27th with 59 members and 50 guests. 22 of the Guests requested membership.

The minutes from the San Diego meeting were approved with no changes or corrections.

Tom Lundquist reported that Everett Hager had stepped down from his Chairman position with the Subcommittee and that Tom Lundquist has been appointed as the new Chairman. Joe Watson was appointed as Vice-Chair and Bill Griesacker was appointed to Secretary.

### 8.12.1 WORKING GROUP AND TASK FORCE REPORTS

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

The Task Force on revision of C57.17, Arc Furnace Transformers, was called to order at 8:00 am on Monday, October 25, 2004. There were 20 attendees. Eight members and twelve guests comprised the assembly.

Mr. Dom Corsi opened the meeting with a reading of the "Instructions for the WG Chair" as prescribed.

- The opportunity was provided for the WG members to identify or disclose patents that the WG member believes may be essential for the use of that standard.
- There were no responses given that specifically referenced patents and patent applications that were involved in the WG activities.

Dom Corsi then presented the Agenda. The first order of business was review and approval of the minutes from the March 2004 meeting that was held in San Diego. The minutes were approved as presented.

Under old business, a proposed revision to the Ratings Section was presented for discussion. The incentive for this revision was based on prior member comments that the Ratings Section was not flexible enough with respect to large furnace transformers (San Diego) and the need for a continuous revision of this standard as needed during the activity of the Task Force. "General Requirements for Ratings" was inserted as an addition to the Ratings Section, 4.0.

Several members engaged in a discussion concerning the "cooling water temperature limits", the first item listed in the "General Requirements for Ratings" insert. The discussion centered on the limit of 30ºC presently in the Standard. Apparently, some users have requested operation at ambient temperatures higher and up to 40ºC and manufacturer members were questioning how the present standard could accommodate this request. Changes in cooling capacity or ratings were suggested. In addition, a request was made to review the IEC standard with respect to this

area for possible alignment. At present, there was no proposal to change the standard value of 30º.

Continuing in the "General Requirements for Ratings", Table 1: HV ratings for 3-phase and 1-phase Arc Furnace Transformers were reviewed. It was suggested that the wording be changed to include "Preferred". In addition, the members recommended eliminating the 115 and 138kV levels from the Table.

In Section 5.1, "HV Insulation Levels", the 115 and 138kV levels will also be removed.

In Section 5.2, "Low Voltage Terminals", members suggested revising this table to include preferred ratings at different levels to reflect the higher voltage levels used on AFT's today. Suggested levels are: 1.2, 2.4 and 5kV.

The chair distributed two proposed documents for:

1. Appendix A: Guide for the Interpretation of DGA for Furnace Transformers
2. Appendix C: Guide for the Protection of Arc Furnace Transformers.

The chair requested the group to review and provide written comment on these drafts to the chair.

Under New Business, Dom Corsi again asked for volunteers to write Sections of the Standard.

With no other new business proposed from the members, the meeting was adjourned at 9:15am.

### 8.12.2 WORKING GROUP FOR DEVELOPMENT OF PC57.143, GUIDE FOR APPLICATION OF MONITORING TO LIQUID IMMERSED TRANSFORMERS AND COMPONENTS- Donald Chu and Andre Lux, Co-Chairmen

The Working Group met Monday, October 25th at 9:30 am. There were 80 Members and Guests in attendance.

The IEEE Standards Board Bylaw on Patents and Standards was discussed. The membership was encouraged to read the IEEE patent requirements that are contained in their registration package. An opportunity was given to WG members to identify or disclose patents that the WG members believe may be essential for the use of this standard. No items were brought up.

Comments from the members on the minutes of the last meeting in San Diego were discussed. The comments regarded items to be removed from the Guide and the reduction of Section 4 concerning communication protocols.

In March, twelve members of the working group met in Boston at the Doble conference and made significant changes to draft 13. These changes were incorporated into draft 14 and were sent to members for comment.

The Comments from the members on Draft 14 were discussed. There were 4 general comments, 27 technical comments and 22 editorial comments. Each technical comment was reviewed in detail. Sections that need work were identified and the WG will be looking for members to address those sections.

Additional comments are expected from members. All the comments will be sent to the WG members for review.

With that, the meeting adjourned at 10:45 am.

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

The task force met at 11:00 am on Monday, October 25, 2004, with 36 in attendance. There were 27 members and 17 guests. Four of the guests requested membership and will be added to the membership list.

The roster was handed out, as well as copies of Draft 2 of the Standard, which had been previously emailed.

The group was asked if they had any knowledge of the possibility of any patents that may be essential to the implementation of the Standard. The response was negative.

The new AM system was discussed, and attendees were requested to ensure that they are registered with this system in order to receive future emails concerning this Standard. The difficulty in sending the Draft attachment was discussed. It was over the 500Kb file size limit.

The controls drawings at the end of the Standard were discussed. Discussions centered on whether these drawings should be shrunk down to 8 ½ by 11, or placed on the Web using links. Later discussion mentioned the possibility of putting these drawings in PDF files, where the larger size (such as D or E) could be maintained.

A suggestion was made to show the color-coding of the wires for the various devices.

Discussion then moved on to the mounting of the control cabinet to the tank wall. It had been previously decided to make vibration-dampening mounting standard, but several members had said that this should be an option. It was decided to make non-vibration-dampening standard unless devices are present which require vibration-dampening mounting.

The group then discussed how close the cabinet should be to the tank. Several members felt that air circulation was necessary, and perhaps enough room should be left to get a paint roller between the cabinet and tank. Seven centimeters was proposed. It was proposed that the distance should not necessarily be the same for Class I and Class II transformers. Another

member proposed zero distance. This suggestion was voted and approved as a minimum spacing.

The minimum thickness of the cabinet was discussed. Three millimeters is the requirement listed in Draft 2. Fourteen gauge (1.9mm) was proposed and agreed upon.

The requirement for three separate sections in the cabinet was discussed, as well as the mounting of circuit breakers (swing panel versus rear panel). Paint coatings were discussed, and polyurethane will be added as an acceptable paint. C57.12.28 will be reviewed for information concerning paint standards, as well as options for coastal environments, etc. Panel thickness was discussed (1.9mm minimum), as well as the spacing of the rear panel from the cabinet (12mm).

The cabinet ground bus was discussed, with the agreement that the Standard would require on ground bus without specifying the location. Standoffs were mentioned as an option.

The meeting adjourned at 12:15 pm.

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

The Working Group on LTC Performance met on Monday, October 25th with 17 members and 42 guests attending.

The IEEE patent slide was discussed. The Chairman asked if anyone was aware of any patents that would affect PC57.131, “Requirements for Tap Changers,” or that would affect the LTC Application Guide. No one in the room was aware of such patents.

The two documents being prepared by this Working Group have direct counterparts in the IEC Standards. They have the same scope and the same general content. A discussion was devoted to the merits and feasibility of IEEE simply adopting these two IEC Standards as dual logo IEEE/IEC Standards. It was agreed that to avoid duplication of efforts and for other similar reasons it is a highly desirable goal to combine these Standards into one. However, there appear to be three roadblocks to adopting the two IEC Standards.

- The first is administrative. Although IEC has adopted IEEE Standards for dual logo, IEEE has not adopted IEC Standards.
- Secondly, there are many small differences between PC57.131 and IEC60214-1 that would have to be resolved.
- Thirdly, C57.131 cites a long list of ANSI/IEEE Standards, while IEC60214-1 cites a long list of IEC Standards. Before adopting IEC60214-1, all of these other IEC Standards would have to be reviewed and approved.

Because of these three roadblocks, it was agreed that the Working Group would use the wording and content of these two IEC Standards as much as possible, but that we would have to write a separate document. That is the case today. Today we have IEEE PC57.131 and IEC60214-1 as separate standards.

Of the two Working Group documents, priority was given to the major revision of PC57.131. It is planned that a link to an electronic survey will be placed on this Working Group's Transformers Committee web page. Members and guests will be able to review the differences between IEEE PC57.131 and IEC60214-1 and by clicking on option buttons, give their opinions on which items to adopt and which not to adopt. Similarly, the proposed revisions from the PC57.131 reaffirmation ballot will be presented.

It was proposed, as a separate matter, to establish a Task Force to work on the LTC Application Guide.

The meeting adjourned at 2:45 pm.

### 8.12.5 WORKING GROUP FOR DEVELOPMENT OF PC57.140, GUIDE FOR THE EVALUATION AND RECONDITIONING OF LIQUID IMMERSED POWER TRANSFORMERS - Rowland James, Chairman.

The Working Group met at 3:15 PM on Monday, October 25, 2004 in Henderson, NV. There were 99 in attendance, 53 members and 45 guests.

After introductions of members and guests the chairman reviewed the Standards Association's slides pertaining to IEEE's Patent Requirements for Standards Under Development. Two slides provided by the Transformers Committee related to the IEEE's Patent Policy were presented and an opportunity was provided for WG members to identify or disclose patents that may be essential for the use of this standard. No responses were received.

1. The Association Management System (AM system) was announced. The chair encouraged all to register for it if they haven't already done so.
2. The chair announced that Draft 12 of the guide is complete and has been sent to the Editorial Staff for review. Draft 13 will be issued within one month for comments and a straw poll.
3. Several editorial comments were made including one on the fault tree table (that it is too hard to read).
4. A discussion followed on furan analysis. It was noted that there are some conflicts in furan levels and their corresponding degree of polymerization. This will be addressed and resolved in Draft 13.
5. Percent moisture in cellulose was then discussed. A possible method to determine this value is described in an EPRI paper.
6. The chair then announced that the roster will be reduced to include only those members that have contributed to the development of the guide. He also commented that anyone that submits further contribution, editorial comments or corrections will remain on the roster.

7. Since there was no other business, the meeting was adjourned

The meeting adjourned at 4:15.

### 8.12.6 WEST COAST WORKING GROUP - Michael Lau, Chairman

The Working Group met at 8:00 am on October 26, 2004 with 8 members and 9 guests present.

Wallace Binder provided an update on the reaffirmation processes of three Standards, IEEE62, C57.117 and C57.125.

IEEE 62 – Guide to Diagnostic Field Testing on Power Transformers will be a Standard that belongs to the Standards Subcommittee. Reaffirmation requires resolution of some negative ballots concerning moisture equilibrium and calculation issues which are being worked on by the C57.106 Working Group.

C57.117 – Guide for Reporting Failure Data and C57.125 – Guide for Failure Investigation will reside in the Power Transformers Subcommittee. Reaffirmation of both Guides are essentially completed. Some final paperwork will need to be submitted.

The Chairman advised the Group that a new Working Group has been formed to deal with transformer transportation issues.

Discussion among the Group indicated that there is a need for a Guide on step-up transformers for wind farms. Joe Watson agreed to request and set up a study session during the next Committee meeting.

The Working Group adjourned at 9:00 am.

### 8.12.7 WORKING GROUP FOR DEVELOPMENT OF PC57.150, GUIDE FOR THE TRANSPORTATION OF TRANSFORMERS AND REACTORS RATED 10,000 KVA OR LARGER – Tom Lundquist, Chairman

This was the first meeting of the Working Group for Transportation Issues Guide. The meeting started at 9:45 am, Wednesday, October 27, 2004.

There were 55 present with 31 requesting membership in the WG.

Tom Lundquist made the patent issue announcement and requested that anyone having any patent issues to please indicate so. None were brought forth.

Tom then discussed the title, scope and purpose of the guide. The main purpose is to give advise to users and vendors that will reduce the risk of damage to the power transformer or reactor in transport.

Questions and answers regarding the PAR were received and returned to NESCOM. Ken Hanus will try and help get the PAR through NESCOM.

The Chair, Tom Lundquist commented that he would remain Chair until the PAR is approved to avoid confusing the issue with NESCOM. He then requested volunteers for Secretary and Vice Chair. The Vice Chair position would assume the Chair position after the PAR is approved and the new chair would select the new vice chair. Sue McNelly volunteered as WG Secretary and Greg Anderson volunteered as WG Vice Chair.

There was a brief discussion as to where this WG should reside. Should it reside under the West Coast WG or under the Power Transformer SC? Tom will discuss this with the Admin Committee and get this resolved.

Task Force Assignments:

Ewald Schweiger volunteered to be TF chair on General Issues that will apply to the equipment through out the complete shipment. Peter Balma, Joao Sousa and Les Recksiedler volunteered to work with Ewald as TF members

Examples of some issues are:

- Impact recorders, where and when should they be required?
- What is attached to the outside of the unit when shipped?
- Checklist to ensure that the vendor is doing things correctly, such as has the vendor sent special verbiage to the shipper?

Task force for specific issues related to Barge and Ship Transport: Philip Sherman and Kipp Yule volunteered as TF co Chairs and Ingo Schmidt (subject to agreement ). They will work on special concerns for barge and ship transportation that can be used by vendors and users to specify risk to equipment reductions.

Task force for Rail Shipment: Mike Lau volunteered as TF Chair. Tom Lundgren, Phil Sherman, Ingo Schmidt (subject to his agreement), and Robyn Taylor will work with Mike.

Task force for Truck Rigging & Crane: Craig Swinderman volunteered as TF Chair. Tom Bassett, Shawn Galbraith, Ingo Schmidt (subject to agreement), and Jerry Murphy will work with Craig.

Phil Sherman volunteered as a liaison to this WG with RICA (Railroad Industrial Clearance Association) & SCNRA (Specialized Carriers & Rigging Association) and he will report to the WG and useful feedback from this liaison position.

At a minimum we would like to have an outline of subjects or topics from the TF chairs 2 months prior to the Jackson meeting to have documents to be posted on the web to the secretary of the WG (Sue McNelly) so WG members can review the items for discussion prior to the Jackson meeting.

A comment was made that we should include instructions on what to do when there is an impact to a unit being shipped.

Also a question was raised as to whether we should get into how a control cabinet, radiators etc should be packaged for shipment should be included.

Meeting was adjourned at 10:45 am.

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

The Working Group met at 3:20 pm on October 26. There were 34 attendees comprised of 13 members, 19 guests and 2 guests requesting membership. The agenda for the meeting was reviewed and the minutes, figures, presentation and Draft 5b of the Guide were distributed.

The agenda for the meeting was reviewed, and the following items were completed at this session:

- Agenda review
- Patent review
- Progress update
- Figures and Tables update
- Adjournment

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

The PAR was approved on June 13, 2002. A revised PAR is required to include maintenance in the title. Draft 5b has been assembled and is available on the Transformers Committee website. A clause on cold weather Dewpoint testing is needed. In addition, a clause on internal grading shielding will be added,

The update resulted in a discussion of cold weather dewpoint that considered many aspects of receiving and installing a new transformer in low temperature conditions. Salient points of the discussion considered the following:

- A dewpoint test performed in sub-zero temperatures has a questionable accuracy
- Little or no water vapor will come out of insulation below freezing
- An alternative is to measure power factor of the winding after filling
- The unit can be blanketed and heated, or hot oil circulation can be utilized to get the unit above freezing temperatures for a dewpoint measurement

- Some users may rely on the unit being received with positive shipping pressure and proceed with processing without performing a dewpoint test

While a conclusion was not reached, the group agreed, in general, that some guidance is needed in this area and that a clause on the topic is needed.

A discussion was held on the series of figures in the Appendix and their inclusion and location in the Guide. A key point considered was the source and currency of the information they provide. Consensus was that the charts and figures ass value and should be maintained, but that examples and/or explanations as to their use should also be included.

Two new tables were presented for inclusion in the Guide. The first presented suggested vacuum hold times versus voltage class, and the second hold time before energization versus voltage class. The general consensus was that the values were conservative, but in the absence of manufacturers' information they would provide guidance. Some concern was expressed for those cases where the manufacturers' values may be less than those proposed for the Guide.

Minutes from the March 8, 2004 meeting in San Diego, California, were reviewed and approved.

The group was asked for volunteers to read the complete document and submit comments. Twelve people volunteered, and they were asked to try to return their comments within a month to be incorporated into Draft 6 of the Guide.

The meeting adjourned at 4:35 pm.

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

The Task Force met at 9:30 am on October 26th. The group is preparing a technical paper on several tests currently being performed with different types of materials and oils.

The group was polled on the patent issues and the group was not aware of any patented items included in their work.

The meeting adjourned at 10:45 am.

### 8.12.10 WORKING GROUP FOR REVISION OF C57.135, GUIDE FOR THE APPLICATION, SPECIFICATION AND TESTING OF PHASE-SHIFTING TRANSFORMERS – Tom Lundquist, Chairman

The Working Group met at 11:00 am on Tuesday, October 26th with 9 members and 21 guests present. Six of these guests requested membership.

The question of applicable patents was asked and all in attendance indicated that they had no knowledge of any patents covering materials in this Guide.

The AM system was also discussed to ensure that all members and guests understand the need to be registered to be included on WG mailings and rosters.

Tom Lundquist informed the WG that he intended to step down as WG Chair to avoid conflicts with his new position as Power Transformers Subcommittee Chair. After a request for Chairman and Secretary volunteers, Jim McIver was appointed Co-Chairman and he will assume the position of Chairman at the next meeting in Jackson, Mississippi. Joe Watson was appointed Secretary.

Two Task Forces were assembled to address comments from the original approval ballot and the recent re-affirmation ballot. The figures in the existing Guide will need to be recreated to comply with IEEE format requirements and some figures may be revised to resolve ballot comments.

The first group will address comments on Section 4 and will be led by Walter Seitlinger with support from Gustaf Preininger, Bipin Patel and Tim Raymond. The second group will address comments on Sections 3, 5 and 7 and will be led by Jim McIver with support from Bipin Patel and Robert Veitch. Tom Lundquist will distribute a Draft 1 of the Guide.

Joe Watson will post a copy of the existing Guide and subsequent Drafts on the website for review by the WG members.

The meeting adjourned at 12:15 pm.

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

The WG met on October 26, 2004 from 1:45 PM to 3:00 PM. In attendance were 12 members and 15 guests. Five guests requested membership and were welcome.

After the introductions were made, the WG chair advised the group members to identify or disclose patents that may be essential for the use of this standard, and no patent was brought to group's attention.

The meeting was dedicated to discuss the different Liquid Preservation Systems. Four systems will be included in the standard, being their use at the option of user and manufacturer:

- Sealed-Tank System

- Inert-Gas Pressure System
- Conservator-Tank System without Diaphragm
- Conservator-Tank System with Diaphragm

Gas-liquid seal system present in current standard was eliminated due to its lack of use.
The top oil temperature range of operation for these systems in current standard is 100°C. It was pointed out that current C57.12.00 specifies the minimum operating ambient temperature of -20°C and the maximum top oil temperature of 65+40=105°C, making the range of top oil temperature of 125°C. A preservation system for a range of 100°C may result on liquid levels that may leak out of the tank or, as minimum, would make more frequent the operation of the bleeder valve, resulting in more maintenance of the transformer. It was proposed to increase the range to 125°C. It was acknowledge that this will result on larger gas spaces. One manufacturer indicated that they do this already. It was noted that conditions present during overload conditions are addressed in C57.91, but the larger temperature range will increase the overload capability of the transformer. It was requested to manufacturers to comment on the impact of this requested change on the design of the transformer, noting that is the average liquid temperature, not the top liquid temperature, the one used to determine the size of the gas space.
Regarding the specific preservation systems, the following other items were discussed:

Sealed-Tank System

A note will be added to this system indicating that the use of this system may result in the introduction of oxygen and moisture into the transformer due to the operation of the bleeder valve. Standard accessories for this system will be a pressure-vacuum gage and a pressure-vacuum bleeder valve.

Inert-Gas Pressure System

No changes from current standard

Conservator-Tank System without Diaphragm

It was agreed to use this system without any limitation on the capacity of the transformer. It was noted that this practice is already in use in Canada. Standard C57.12.80 will be reviewed for the definition of conservator tank.

A combination of valves shall be provided in the conservator tank and the main tank to close the flow of liquid between both tanks. The size of the valves will be at the manufacturer's option.

A drain valve will be located on the conservator tank side as near the bottom as possible.

A dehydrating breather with desiccant to absorb at least 20% of its own weight in moisture will be provided.

Liquid level indicator will be provided.

Upon request, a pressure vacuum bleeder and a gas accumulation relay can be provided.

Conservator-Tank System with Diaphragm

The same accessories required for systems without diaphragm will be required for this system, plus the following accessories:

- A diaphragm which characteristics, including its permeability, will be included in Rubber Air Cell (use the terminology Diaphragm instead)
- A vent valve at the top of the conservator tank release any air trapped in the liquid side of the tank will be required.
- A vacuum-equalizing valve will be required when the conservator tank is designed for full vacuum filling.

With no more time for discussions the meeting adjourned.

### 8.12.12 OLD BUSINESS

None

### 8.12.13 NEW BUSINESS

New officers of the Power Transformer Subcommittee have been appointed as reported at the initiation of the meeting with Tom Lundquist as Chairman, Joe Watson as Vice Chairman and Bill Griesacker as Secretary.

The chair reported that a decision is made that the PC57.150 Transportation Issues WG will report directly to the Power Transformer Subcommittee rather than as a TF under the West Coast Working Group.

The AM system was discussed and it was stressed to the Committee membership that it is important to keep personal information updated in the AM system.

Tom Lundquist reminded everyone of the process for developing or revising IEEE Standards and Guides. No drafts of new or revised Standards or Guides should be developed or circulated before a PAR is obtained. Members are not indemnified by IEEE for work on any draft documents created without first obtaining a PAR.

Tom Lundquist also notified the Working Group chairs that each Working Group needs a co-chair.

The meeting adjourned at 2:45 pm.

## 9.0 Editor's Report

Editor's Report – Fall 2004 Las Vegas Meeting

Between January 1, 2004 and October 21, 2004, a total of 53 papers in the transformer area were submitted to IEEE Transactions on Power Delivery for possible publication. During this time 37 reviews were completed and 16 reviews are still in-progress. For completed reviews, the recommendations were: Accept without changes – 6; Revise and Resubmit – 24; and Reject - 7. A complete summary of these papers is listed below.

For the submitted papers, 81% were accepted while 19% were rejected.

I would like to thank all of the reviewers who volunteered for this effort and donated their time, and would like to encourage everyone associated with IEEE Transformers Committee activities to consider becoming a Reviewer. There seems to be many more papers submitted this year, and I sometimes may need to call on you. Please be kind and lend your expertise.

General categories of most popular topics covered in the recent papers:

- 6 papers related to Distribution, Dry-Type, Instrument Transformers
- 6 papers related to Life/Condition Assessment including oil testing, DGA, Furan Analysis
- 7 papers related to FRA Testing and Modeling
- 8 papers related to Loading Analysis, Temperature Prediction, Thermal Modeling
- 11 papers related to FEA, transients, faults, EMTP

Respectfully Submitted,
Stephen Antosz
Editor, IEEE Transactions on Power Delivery

| | Number | Title | Key Words | Author | Decision |
|---|---|---|---|---|---|
| 1 | TPWRD-00645-2003 | Dual-tap Chopping Stabilizer with Mixed Semi-natural Switching. Analysis and Synthesis | tap changer | Dr. Juan Campo | Revise & Resubmit |
| 2 | TPWRD-00658-2003 | Advanced Design Methodology for Single and Dual Voltage Power Transformers Based on a Particular Finite Element Model | FEA, finite element | Prof. Antonios Kladas | Revise & Resubmit |
| 3 | TPWRD-00672-2003 | Estimation of Capacitive Voltage Transformer Parameters from the Secondary Input Impedance Frequency Response | FRA, voltage transformer | Mr. Johannes Strauss | Revise & Resubmit |
| 4 | TPWRD-00015-2004 | Hybrid Transformer Model for Transient Simulation | model, transient, EMTP | Dr. Bruce Mork | Revise & Resubmit |
| 5 | TPWRD-00034-2004 | A Semiconductor On-load Tap Changer for Power Transformer | tap changer | Dr. Nasrullah Khan | Reject |
| 6 | TPWRD-00071-2004 | transient recovery voltage of power transformers - a model-based determination procedure | FRA, transient, TRV | Mr. Wolfgang Hribernik | Revise & Resubmit |
| 7 | TPWRD-00112-2004 | Some Limitations of a Linear Transformer Dynamic Thermal Model | thermal model, temperature | Mr. Xiaolin Mao | Reject |
| 8 | TPWRD-00169-2004 | Calculation of Stress Dependent Life Cycle Costs of a substation component -Demonstrated for Controlled Energisation of Unloaded Power Transformers | economics, | Dr. Diego Politano | Revise & Resubmit |
| 9 | TPWRD-00171-2004 | Dynamic Thermal Modelling of Distribution Transformers. | thermal, modelling, distribution transformer, temperature | Mr. Dejan Susa | Revise & Resubmit |
| 10 | TPWRD-00175-2004 | Improved Detection of Power Transformer Winding Movement by Extending the FRA High Frequency Range | FRA, | Dr. May Wang | Revise & Resubmit |
| 11 | TPWRD-00182-2004 | Ferroresonant Oscillations in a Transformer Terminated Line Due to an Energized Parallel Line on the Same Right-of-Way | ferroresonant | Mr. Kassim Al-Anbarri | Reject |
| 12 | TPWRD-00187-2004 | Measurement of Three-Phase Transformer Derating and Reactive Power Demand under Nonlinear Loading Conditions | losses, harmonics | Prof. Ewald Fuchs | Revise & Resubmit |
| 13 | TPWRD-00188-2004 | Real-Time Monitoring of Iron-Core and Copper Losses of Transformers under (Non)Sinusoidal Operation. | core loss, copper loss, harmonics, non-sinusoidal | Prof. Ewald Fuchs | Revise & Resubmit |
| 14 | TPWRD-00210-2004 | Application of Extension Theory to PD Pattern Recognition in High Voltage Current Transformers | partial discharge, instrument transformers | Dr. Mang-Hui Wang | Revise & Resubmit |

| | | | | | |
|---|---|---|---|---|---|
| 15 | TPWRD-00215-2004 | A Genetic-Algorithm-based Neural Network (GANN) Model for Prediction of Temperature in Power Transformers | neural network, thermal, loading | Mr. Manoj Pradhan | Revise & Resubmit |
| 16 | TPWRD-00228-2004 | Analytical approach to internal fault simulation in power transformers based on fault-related incremental currents | fault, EMTP | Dr. Guzmán Díaz | Revise & Resubmit |
| 17 | TPWRD-00658-2003; Rev 1 | Advanced Design Methodology for Single and Dual Voltage Power Transformers Based on a Particular Finite Element Model | FEA, finite element | Prof. Antonios Kladas | Reject |
| 18 | TPWRD-00672-2003; Rev 1 | Estimation of Capacitive Voltage Transformer Parameters from the Secondary Input Impedance Frequency Response | FRA, voltage transformer | Mr. Johannes Strauss | Deferred |
| 19 | TPWRD-00215-2004; Rev 1 | A Genetic-Algorithm-based Neural Network (GANN) Model for Prediction of Temperature in Power Transformers | neural network, thermal, loading | Mr. Manoj Pradhan | Reject |
| 20 | TPWRD-00228-2004; Rev 1 | Analytical approach to internal fault simulation in power transformers based on fault-related incremental currents | fault, EMTP | Dr. Guzmán Díaz | Revise & Resubmit |
| 21 | TPWRD-00234-2004 | Magnetizing Inrush Model of Transformers Based on Structure Parameters | magnetizing, inrush current | Prof. Jiann-Fun Chen | Revise & Resubmit |
| 22 | TPWRD-00265-2004 | A Pattern-Based Fault Classification Algorithm for Power Transformers | transfer function, FRA | Dr. Seung Jeong | Revise & Resubmit |
| 23 | TPWRD-00275-2004 | Numerical Calculations of Three-Phase Transformer's Transients | inrush current, transient analysis, ferroresonance | Mr. Amir Tokic | Revise & Resubmit |
| 24 | TPWRD-00290-2004 | New Diagnosis Approach to Epoxy Resin Transformer Partial Discharge | ultrasonic, dry-type, partial discharge | Mr. L. J. Chen | Revise & Resubmit |
| 25 | TPWRD-00293-2004 | On the Estimation of Elapsed Life of Oil-Immersed Power Transformers | life, insulating fluids, furans, DP, oil testing, ageing | Mr. Manoj Pradhan | Revise & Resubmit |
| 26 | TPWRD-00296-2004 | Improving the IEC Table for Transformer Failure Diagnosis with Knowledge Extraction from Neural Networks | neural network, fuzzy logic, mapping, fault, failure, dga | Prof. Vladimiro Miranda | Revise & Resubmit |
| 27 | TPWRD-00307-2004 | Analysis of Transformers on the Concept of Elementary Winding | windings, impedance, circuit | Mr. Mingxing Tian | Reject |
| 28 | TPWRD-00325-2005 | Performances Of Distribution Transformers Installed in Metallic Enclosures - An Australian Experience | distribution transformer, | Mr. Selver Corhodzic | Revise & Resubmit |
| 29 | TPWRD-00210-2004; Rev 1 | Application of Extension Theory to PD Pattern Recognition in High Voltage Current Transformers | partial discharge, instrument transformers | Dr. Mang-Hui Wang | Accept |

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|---|---|---|---|---|---|
| 30 | TPWRD-00672-2003; Rev 1 | Estimation of Capacitive Voltage Transformer Parameters from the Secondary Input Impedance Frequency Response | FRA, voltage transformer | Mr. Johannes Strauss | Reject |
| 31 | TPWRD-00171-2004; Rev 1 | Dynamic Thermal Modelling of Distribution Transformers. | thermal, modelling, distribution transformer, temperature | Mr. Dejan Susa | Revise & Resubmit |
| 32 | TPWRD-00175-2004; Rev 1 | Improved Detection of Power Transformer Winding Movement by Extending the FRA High Frequency Range | FRA, | Dr. May Wang | Revise & Resubmit |
| 33 | TPWRD-00228-2004; Rev 2 | Analytical approach to internal fault simulation in power transformers based on fault-related incremental currents | fault, EMTP | Dr. Guzmán Díaz | Accept |
| 34 | TPWRD-00645-2003; Rev 1 | Dual-tap Chopping Stabilizer with Mixed Semi-natural Switching. Analysis and Synthesis | tap changer | Dr. Juan Campo | Accept |
| 35 | TPWRD-00365-2004 | Time-Frequency Representation of Resistance for Modeling of Transformer Winding under Impulse Test | model, transient, EMTP | PRITHWIRAJ PURKAIT | |
| 36 | TPWRD-00370-2004 | Transformer Insulation Life Assessment | life, insulating fluids, furans, DP, oil testing, ageing | Kshira T Muthanna | |
| 37 | TPWRD-00390-2004 | An Hybrid Tool for Detection of Incipient Faults in Transformers Based on the Dissolved Gas Analysis of Insulating Oil | dga, neural networks, fuzzy | Jacqueline G. Rolim | |
| 38 | TPWRD-00411-2004 | Novel Analytical Solution to Fundamental Ferroresonance¡ªPart I: Power Frequency Excitation Characteristic | emtp, ferroresonance | Wei Shi | |
| 39 | TPWRD-00412-2004 | Novel Analytical Solution to Fundamental Ferroresonance¨CPart II: Criterion and Elimination | emtp, ferroresonance | Wei Shi | |
| 40 | TPWRD-00290-2004; Rev 1 | New Diagnosis Approach to Epoxy Resin Transformer Partial Discharge | ultrasonic, dry-type, partial discharge | Mr. L. J. Chen | |
| 41 | TPWRD-00296-2004; Rev 1 | Improving the IEC Table for Transformer Failure Diagnosis with Knowledge Extraction from Neural Networks | neural network, fuzzy logic, mapping, fault, failure, dga | Prof. Vladimiro Miranda | |
| 42 | TPWRD-00234-2004; Rev 1 | Magnetizing Inrush Model of Transformers Based on Structure Parameters | magnetizing, inrush current | Prof. Jiann-Fun Chen | Accept |
| 43 | TPWRD-00171-2004; Rev 2 | Dynamic Thermal Modelling of Distribution Transformers. | thermal, modelling, distribution transformer, temperature | Mr. Dejan Susa | Accept |
| 44 | TPWRD-00432-2004 | Simulation, Measurements and Analysis of Voltage Transients in Windmills | dry-type, Wind, transient | Rune E Jensen | |

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|---|---|---|---|---|---|
| 45 | TPWRD-00467-2004 | Characterization of winding faults using a multi-condition based approach | faults | Guzmán Díaz | |
| 46 | TPWRD-00473-2004 | Synthesis of Fast On-load Multi-tap-changing Clamped-hard-switching AC Stabilizers | | Juan C. Campo | |
| 47 | TPWRD-00474-2004 | Analysis of Fast On-load Multi-tap-changing Clamped-hard-switching AC Stabilizers | | Juan C. Campo | |
| 48 | TPWRD-00476-2004 | Monitoring of the power transformer aging through the dynamic loading corrected by furfural analysis | life, insulating fluids, furans, DP, oil testing, ageing | Teresa C B N Assuncao | |
| 49 | PESL-00076-2004 | Partial Discharge Investigation of a Power Transformer using Wireless Wideband Radio Frequency Measurements. | PD, test, wideband | P J Moore | |
| 50 | TPWRD-00482-2004 | Transformer tank vibration modelling as a method of detecting winding deformations. Part 1: Theoretical foundation | frequency, vibration | Prof. Belén García | |
| 51 | TPWRD-00483-2004 | Transformer tank vibration modelling as a method of detecting winding deformations. Part 2: Experimental verification | frequency, vibration | Prof. Belén García | |
| 52 | TPWRD-00494-2004 | Comprehensive Diagnostic Methodology for Power Transformers Insulation Based on Polarisation Methods and Some Chemical Tests | insulation | Dr. Tapan Saha | |
| 53 | TPWRD-00175-2004; Rev 2 | Improved Detection of Power Transformer Winding Movement by Extending the FRA High Frequency Range | FRA, | Dr. May Wang | Accept |

All members of the IEEE Transformer Committee are invited to review technical papers. To review IEEE Transaction Papers on transformers, please sign up at: http://tpwrd-ieee.manuscriptcentral.com/

INSTRUCTIONS FOR SIGNING UP TO REVIEW IEEE TRANSACTIONS PAPERS

1. Before you create a new account, please check for an existing account by clicking on: "Check for Existing Account"
2. Assuming that you do not get an existing account notification email, click on "Create New Account" and enter in your information.
3. Please specify any “Specialty / Area of Expertise” according to the 5 numerical codes below:

    13a: Power and Instrument Transformers
    13b: Insulating fluids category
    13c: Dielectric Testing
    13d: Audible Noise and Vibration

13e: Transformer Modeling Techniques

4. Please specify any “Key Words” such as: distribution transformers, core losses, oil DGA, or thermal, for example.
5. Submit your information.
6. Click on "Request Reviewer Status" to be enabled as a reviewer.

## 10.0 Meetings Planning Subcommittee - G. W. Anderson, SC Chair

The Meetings Planning Subcommittee (Mtgs SC) holds an open meeting at each Committee meeting to plan future meetings and to assist future hosts by education, mixing of ideas, and lessons-learned. The meeting is attended by 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 SC meeting began at 3:00 p.m., Wednesday, October 27, 2004 at the Green Valley Ranch Resort, in Las Vegas (Henderson), Nevada, USA. Twenty-three (23) people were in attendance. Greg Anderson, SC Chair facilitated. The meeting began with introductions by the attendees.

### 10.1 Committee Finances

Committee funds are presently $18,062.74 (as of July 15, 2004). Greg thanked the Meeting Hosts for working hard to control expenses and help with stewardship of the Committee's funds.

### 10.2 Past & Present Meetings

#### 10.2.1 Past Meeting - San Diego, California, USA (March 7-11, 2004)

Earl Harris and the San Diego Gas & Electric (SDG&E) team at the San Diego Meeting did a great job of planning and implementing the meeting. Special thanks to Earl, who had never attended a Committee Meeting. The Catamaran Hotel was an excellent location. We hope to return there in the near future.

#### 10.2.2 Present Meeting - Las Vegas, California, USA (October 24-28, 2004)

Special thanks to Don and Wilma Cash for being the gracious host and hostess of the Las Vegas Meeting. It was noted that Don and Wilma hosted a meeting in Detroit in 1983. We hope they will accept the call to host another meeting 20 years from now! Attendance was exceptional with 352 attendees and 92 companions (FYI, the Fall 2000 Meeting in Niagara Falls was 361 attendees and 94 companions).

The speaker for our Tuesday Luncheon (184 attendees) was Mr. John Futrell, President of Futrell Financial Management, and a local motivational speaker. Mr. Futrell gave us a challenging presentation titled "Engineers Have a Life Too!" and shared some tips on how to develop personal and professional relationships and how to follow our passions. On Monday, 96 people

participated in a working luncheon where Bill Chiu, our new Standards Coordinator reviewed the procedures in developing standards. This event continues to be very well accepted.

On Wednesday evening, 240 people took a 45-minute bus ride out to Bonnie Springs, Old Nevada. Although it rained most of the time, we enjoyed some great "chow" and a taste of the Old West, a humorous gunfight in the street, and the long-awaited hanging of our past chairman, Jin Sim. On Monday, 52 companions/spouses enjoyed a bus tour of The Vegas Strip, including brief stops at a few locations that define Vegas. On Tuesday, 52 companions/spouses enjoyed the popular backstage tour of Bally's Jubilee and shopping at the Fashion Show Mall.

On Thursday afternoon, 103 attendees and companions/spouses visited the Hoover Dam Facility. Of those attendees, 53 were earlier obtained security clearance and journeyed deep within the dam for a VIP hard-hat tour. Mr. Robert Knill, a long-time mechanical engineer at the facility gave us a personal one-hour stroll through areas the general public is not allowed. We will long remember this event!

Special thanks to Hyundai Heavy Industries, GE Prolec, Kelman, and ABB Inc. for sponsoring coffee breaks at this meeting and helping us defray the cost.

### 10.3 Future Meetings

#### 10.3.1 Summary

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

- March 13-17, 2005 -- Jackson, Mississippi at the Hilton Jackson. Hosted by Andy Speegle and Kuhlman Electric.
- October 23-27, 2005 -- Memphis Tennessee at the Peabody Hotel. Hosted by Randy Williams and ABB Inc.

Possible locations for future meetings include: Miami, Montreal, Minneapolis, Denver, Phoenix, New York or New Jersey (near IEEE HQ) to name a few. Discussions continue of a possible meeting in an overseas location such as Portugal, Italy, or perhaps Japan or Korea.

#### 10.3.2 Upcoming Fall 2004 Meeting (October 24-28) -- Las Vega, Nevada, USA

Andy Speegle and Kuhlman Electric will be the host of this meeting. Jackson, Mississippi was chosen due to its central location of 3-4 transformer-related manufacturing facilities including Kuhlman Electric, Howard Industries, and Siemens. The room rate at the Jackson Hilton will be $119/night (single/double). The Wednesday Evening Dinner Social will be held at The Old Capitol Inn. Companion tours will include a day-trip to Vicksburg, MS and time at Mynelle Gardens.

#### 10.3.3 Upcoming Spring 2005 Meeting (March 13-17) -- Jackson, Mississippi, USA

Randy Williams and ABB Inc. will be the host of this meeting. A tour of ABB's Alamo Facility is planned. We will have exclusive use of Graceland for the Wednesday Evening Dinner Social.

### 10.4 Working Group Report

### 10.4.1 WG on Web-Site Development - Submitted by Susan McNelly

This working group did not meet in Vegas.

## 10.5 New Business

### 10.5.1 Association Management System

We are now using a new system which is revolutionize how we communicate within the Committee, and administrate our membership and meeting attendance records. This new system has replaced our old Reflector/Listserv email system and is now the Committee's primary mode of communication.

The Committee has contracted with a company called 123Signup which provides membership administration and event registration solutions. We have modified their core system into a system we call the "Association Management System" (or AM System or simply AMS). This innovative web-based system allows our 90+ subcommittees, working groups, task forces, and liaison associations to communicate more effectively via email messages. Fewer bounced emails will result because individual contact information is "self-maintained" and is stored in a single relational database used by all functions of the system. Activity leaders can print meeting rosters and maintain meeting attendance records. The new AM System will also provide us a more efficient and cost-effective on-line meeting registration system in the future (starting with our Spring 2005 Meeting).

There are essentially three levels of membership in the system:

- Committee Member (a "full voting member" of the Committees, including Emeritus Member, IEEE Life Member, and Corresponding Member)
- Active Participant (not a Committee Member, but an active contributor and meeting attendee)
- Interested Individual (a "remote observer" and supporter of the Committee's scope)

Anyone can enroll in the AM System -- even those who desire to passively monitor our work from a distance. Initially, a person is automatically enrolled as an Interested Individual. Once Committee membership or regular participation is validated, enrollment is upgraded to Committee Member or Active Participant.

More information can be found on the AM System page within our website. There will also be a brief tutorial in the Thursday morning Committee Meeting in Vegas.

### 10.5.2 Tutorials/Presentations

The technical tutorials/presentations continue to "exceed all expectations". Material from each of the presentations is available on the Committee's web-site. Contact Kent Haggerty (n.kent.haggerty@ieee.org) if you are interested in presenting in the future or have an idea of a future presentation.

There were two presentations at the Vegas Meeting:

- "HVDC Converter Transformers Polarity Reversal Impact on Dielectric Design", by Ugo Piovan and others
- "Taps", by V. Sankar

Future candidate presentations include: Net Meetings (On-line Meetings and Remote Conferencing), Web-based Review of PES Technical Papers, IEEE Virtual Communities, Loss Tolerance & Measurement (by Ramsis Girgis), Noise and Sound Measurements, Paralleling Transformers, and National Energy Policy (by Phil Hopkinson).

We discontinued providing CEUs at the presentations. It was determined that most people do not need accredited CEUs for maintaining professional licenses, but rather unaccredited professional development hours (PDHs) is sufficient. Again at this meeting, we provided a means for attendees to download a "certificate of attendance" from the web-site and bring to the presentation for the instructor to personally sign. This process worked well in previous meetings and will continue for future meetings.

We continue to experiment with recording the presentations with a program called "Camedia". This application runs in the background of a MS-Powerpoint presentation, creating a .MOV file, while recording in real-time the voice of the presentation over the slide presentation. We will continue to experiment with this program and provide the presentations on the website after each meeting.

### 10.5.3 Coffee Break Sponsors

We continue to develop a program to allow companies to sponsor coffee breaks. Joe Watson is administrating the program. We highlight the sponsors in the Meeting Schedule and indicate their patronage on new signs located in the break area. Representative from the companies are allowed to distribute limited commercial information (flyers) during the break. We will continue to cautiously experiment with this and develop a policy to foster relationships with vendors and help maintain our low registration fees, while keeping a technical focus. We have also started posting the list of upcoming prospective break sponsors on the website. Contact Joe (joe_watson@ieee.org) if you are interested in sponsoring a future break.

### 10.5.4 Committee Historians

We continue to look for volunteers to help document and archive the history of the Committee; i.e. old meeting minutes, old photos, etc. It was proposed that a group of "historians" (or "old timers") develop a plan to gather old meeting information for permanent archiving. It was suggested that we should create an "anniversary CD" that will contain an assembly of documents and meeting minutes from the past 10-15 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 continue to look for someone to champion this effort.

### 10.6 Miscellaneous

Additional topics were discussed and reviewed:

We have purchased wireless LAN equipment that we will bring to each meeting. This will provide attendees with a secure access to the Internet. An access key to the network can be obtained at

the meeting registration desk. For more information, contact Craig Stiegemeier (craig.stiegemeier@ieee.org).

We started taking a photo of each attendee at the San Diego Meeting and created a webpage displaying the photos. This would help everyone "place a face with a name". The page would be protected from access from the general public and will be accessible only behind the secure portion of the website. We initially are only including photos of Committee members on the website. These photos will soon be incorporated into the AM System in the member profiles.

Greg again encouraged everyone to create their own "IEEE 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 three times. 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 immediately forwarded to his work 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. An alias also identifies a person as an IEEE member. A link to the IEEE e-mail alias service is provided within the Committee's website.

The 2001 9/11 event and the depressed economy have affected our meeting attendance and participation. We need to develop a contingency plan and look for opportunities to continue work during such situations. We need to learn to work more efficiently between normal scheduled Committee meetings. Greg suggested that one WG or TF plan and hold a "between meeting" Internet or telephone conference and report the results (how it went, etc) to the Committee at a future meeting. We will continue to consider a WG or TF project that would be a candidate to hold a mid-meeting on-line conference.

Again it was noted that the Committee's "Marketing Flyer" is available on the website (see the "Services" box on the homepage). It is encouraged that everyone download and print this two-page document and distribute it at local conferences, seminars, and IEEE meetings.

The meeting was adjourned.

Respectfully Submitted,

Greg Anderson, SC Chair

## 11.0 Reports of Liaison Representatives

### 11.1 SCC4 - P. A. Payne

No Standards coordinating Committee No. 4 (SCC4) activities to report at this meeting.

### 11.2 TC 14 TAG - P. J. Hopkinson

#### 11.2.1 Reviewed dielectric test table in C57.12.01. Referred to Dry Type SubCommittee

### 11.2.2 IEC Documents reviewed:

- IEC Loading Guide
- High Temperature Insulation System
-

### 11.3 CIGRE – Jean-Christophe Riboud

There was no report presented.

### 12.0 Old Business

There were no items of old business raised for discussion.

### 13.0 New Business

There were no items of new business raised.

### 14.0 Adjournment

The meeting was adjourned at 11:26AM.

Respectfully submitted,

Thomas A. Prevost
Secretary

# IEEE/PES TRANSFORMERS COMMITTEE
## Status Report of Standards

*October, 2004*
*Las Vegas, NV*

*10/12/2004*

| STANDARD / PROJECT | TITLE | WorkingGroup Chair / Phone / Email | Pub Year / Rev Due Date | PAR Issue Date / PAR Expiration | Standard Status / Remark |
|---|---|---|---|---|---|
| SubCommittee Chair | **AUDIBLE SOUND & VIBRATION** *Puri J.* | (704) 821-6638 manopuri@worldnet.att.net | | | |
| **C57.136** | IEEE Guide for Sound Level Abatement and Determination for Liquid- Immersed Power Transformers and Shunt Reactors Rated Over 500 kVA | | 2000 12/31/2005 | | Approved |
| SubCommittee Chair | **BUSHING** *Elliott F. E.* | (360) 619-6099 felliott@ieee.org | | | |
| PC57.19.03-1996 | Standard Requirements, Terminology, and Test Code for Bushings for DC Applications - Corrigendum 1 | | | 2/27/2004 12/31/2007 | New Project - Active PAR std under development |
| **C57.19.00** PC57.19.00 | IEEE Standard General Requirements and Test Procedure for Outdoor Power Apparatus Bushings | Tuli S. C. (262) 547-0123 x1428 subhash.tuli@waukeshaelectric.spx.com | 1991 12/31/2004 | 6/20/1996 12/31/2004 | Approved PAR to Revise IEEE Std C57.19.00-1991 PAR to expire in 2004 |
| **C57.19.01** | IEEE Standard Performance Characteristics and Dimensions for Outdoor Apparatus Bushings | | 2000 12/31/2005 | | Approved |
| **C57.19.03** | IEEE Standard Requirements, Terminology, and Test Code for Bushings for DC Applications | | 1996 12/31/2007 | | Approved |
| **C57.19.100** | IEEE Guide for Application of Power Apparatus Bushings | | 1995 12/31/2008 | 12/10/2003 | Approved |

| STANDARD<br>PROJECT | TITLE | WorkingGroup Chair<br>Phone<br>Email | Pub Year<br>Rev Due Date | PAR Issue Date<br>PAR Expiration | Standard Status<br>Remark | *10/12/2004* |
|---|---|---|---|---|---|---|
| SubCommittee<br>Chair | **DIELECTRIC TESTS**<br>***Wagenaar L. B.*** | (614) 552-1759<br>lbwagenaar@ieee.org | | | | |
| **C57.113** | IEEE Guide for Partial Discharge Measurement in Liquid-Filled Power Transformers and Shunt Reactors | Perkins M. D.<br>(314) 679-4836<br>mark.perkins@us.abb.com | 1991<br>12/31/2007 | | Approved | |
| **C57.127** | IEEE Guide for the Detection of Acoustic Emissions from Partial Discharges in Oil-Immersed Power Transformers | Harley J. W.<br>(330) 657-2471<br>jack@harleyinc.com | 2000<br>12/31/2005 | 2/13/2003<br>12/31/2007 | Approved<br>PAR to Revise IEEE Std C57.127-2000 | |
| **C57.138** | IEEE Recommended Practice for Routine Impulse Test for Distribution Transformers | Rossetti J. R.<br>(901) 528-4743<br>jrossetti@mlgw.org | 1998<br>12/31/2004 | | Approved | |
| **C57.98** | IEEE Guide for Transformer Impulse Tests | Molden A.<br>(845) 225-0993<br>a.molden@ieee.org | 1994<br>12/31/2006 | 9/12/2002<br>12/31/2006 | Approved - Active PAR to revise std.<br>PAR to Revise IEEE Std C57.98-1994 | |

| STANDARD<br>PROJECT | TITLE | WorkingGroup Chair<br>Phone<br>Email | Pub Year<br>Rev Due Date | PAR Issue Date<br>PAR Expiration | Standard Status<br>Remark |
|---|---|---|---|---|---|
| SubCommittee<br>Chair | **DISTRIBUTION TRANSFORMERS**<br>***Smith J. E.*** | (636) 677-3421 X32<br>edsmith@h-jenterprises.com | | | |
| C57.12.36 | Standard Requirements for Liquid-Immersed Distribution Substation Transformers | | | 6/13/2002<br>12/31/2006 | New Project - Active PAR Std under development |
| PC57.12.28 | Standard for Pad Mounted Equipment - Enclosure Integrity | Mulkey D. H.<br>(415) 973-4699<br>DHM3@PGE.COM | | 5/9/2002<br>12/31/2006 | New project - Std under development |
| PC57.12.29 | Standard for Pad Mounted Equipment - Enclosure Integrity for Coastal Environments | Mulkey D. H.<br>(415) 973-4699<br>DHM3@PGE.COM | | 5/9/2002<br>12/31/2006 | New project - Std under development |
| PC57.12.33 | Guide for Distribution Transformer Loss Evaluation | Duckett D. A.<br>(407) 942-9401<br>don.duckett@pgnmail.com | | 6/25/1999<br>12/31/2004 | New Project - Std under development<br>Modified PAR<br>PAR to expire in 2004 |
| PC57.12.37 | Standard for the Electronic Reporting of Distribution Transformer Test Data | | | 11/1/2001<br>12/31/2006 | Active PAR std under revision<br>PAR to revised IEEE Std 1388-2000 |
| **C57.12.20**<br>PC57.12.20 | Standard for Overhead Type Distribution Transformers, 500 kVA and Smaller, High-Voltage 34 500 Volts and Below; Low-Voltage, 7970/13 800 Y Volts and Below | Wilks A. L.<br>(731) 285-9121<br>awilks@ermco-eci.com | 1997<br>12/31/2005 | 12/6/2001<br>12/31/2005 | Approved - Active PAR for Revision<br>PAR to revise IEEE Std C57.12.20 - 1997 |
| **C57.12.23** | IEEE Standard for Underground Type, Self-Cooled, Single-Phase Distribution Transformers with Separable Insulated High-Voltage Connectors; High Voltage 25kV and Below; Low Voltage 600V and Below | Traut A.<br>(859) 879-2912<br>ahant@kuhlman.com | 2002<br>12/31/2007 | | Approved |
| **C57.12.25**<br>PC57.12.25 | Standard for Pad-Mounted, Compartmental-Type, Self-Cooled, Single-Phase Distribution Transformers with Separable Insulated High-Voltage Connectors; High Voltage, 34500 GrdY/19920 Volts and Below, Low Voltage, 240/120 Volts; 167 kVA and SmallerRequirements | | | 12/8/1998<br>12/31/2004 | Approved - Active PAR for revision<br>PAR to expire in 2004 - need PAR extension |
| **C57.12.31** | IEEE Standard for Pole Mounted Equipment - Enclosure Integrity | Mulkey D. H.<br>(415) 973-4699<br>DHM3@PGE.COM | 2002<br>12/31/2007 | | Approved |
| **C57.12.32** | Standard for Submersible Equipment - Enclosure Integrity | Mulkey D. H.<br>(415) 973-4699<br>DHM3@PGE.COM | 2002<br>12/31/2007 | | Approved |

| STANDARD / PROJECT | TITLE | WorkingGroup Chair<br>Phone<br>Email | Pub Year<br>Rev Due Date | PAR Issue Date<br>PAR Expiration | Standard Status<br>Remark |
|---|---|---|---|---|---|
| SubCommittee | **DISTRIBUTION TRANSFORMERS** | (636) 677-3421 X32 | | | |
| Chair | ***Smith*** ***J. E.*** | edsmith@h-jenterprises.com | | | |
| **C57.12.34** | Requirements for Pad-Mounted, Compartmental-Type, Self-Cooled, Three-Phase Distribution Transformers, 2500 kVA and Smaller: High-Voltage, 34 500GrdY/19 920 Volts and Below; Low Voltage, 480 Volts and Below | | 12/31/2000 | 9/21/1995<br>12/31/2004 | Approved - Active<br>PC57.12.34/D11 approved by RevCom 9/22/2004 for publication. |
| **C57.12.35** | IEEE Standard for Bar Coding for Distribution Transformers | Termini G.<br>(610) 941-1524<br>giuseppe.termini@peco-energy.com | 1996<br>12/31/2004 | | Approved reaffirmation<br>C57.12.35-1996 reaffirmation approved by RevCom 6/23/2004 |
| **C57.15**<br>PC57.15 | IEEE Standard Requirements, Terminology, and Test Code for Step-Voltage Regulators | Colopy C. A.<br>(262) 896-2342<br>ccolopy@cooperpower.com | 1999<br>12/31/2004 | 12/7/2000<br>12/31/2004 | Approved - Active PAR to revise std.<br>PAR to Revise IEEE Std C57.15-1999<br>PAR to expire in 2004 |
| **IEEE 1388** | IEEE Standard for the Electronic Reporting of Transformer Test Data | Hollingsworth R.<br>(601) 422-1105<br>rhollin@howard-ind.com | 2000<br>12/31/2005 | | Approved - Active |



Original table can be found at www.transformerscommittee.org

| STANDARD / PROJECT | TITLE | WorkingGroup Chair<br>Phone<br>Email | Pub Year<br>Rev Date Date | PAR Issue Date<br>PAR Expiration | Standard Status<br>Remark | 10/12/2004 |
|---|---|---|---|---|---|---|
| SubCommittee | **DRY TYPE TRANSFORMERS** | (919) 272-4051 | | | | |
| Chair | ***Patterson, Jr., W. F.*** | wes.patterson@ieee.org | | | | |
| **C57.12.01** | IEEE Standard General Requirements for Dry-Type Distribution and Power Transformers Including Those with Solid Cast and/or Resin Encapsulated Windings | Sullivan J. C.<br>(813) 884-5424<br>jcsullivan@ieee.org | 1998<br>12/31/2005 | 3/18/1999<br>12/31/2005 | Approved<br>PAR to revise IEEE Std C57.12.10 - 1998 | |
| PC57.12.01 | | | | | | |
| **C57.12.56** | IEEE Standard Test Procedure for Thermal Evaluation of Insulation Systems for Ventilated Dry-Type Power and Distribution Transformers | Wicks R.C.<br>(804) 383-3300<br>roger.c.wicks@usa.dupont.com | 1981<br>12/31/2007 | | Approved | |
| **C57.12.58** | IEEE Guide for Conducting a Transient Voltage Analysis of a Dry-Type Transformer Coil | | 1991<br>12/31/2007 | | Approved | |
| **C57.12.59** | IEEE Guide for Dry-Type Transformer Through-Fault Current Duration | | 2001<br>12/31/2006 | | Approved | |
| **C57.12.60** | IEEE Guide for Test Procedures for Thermal Evaluation of Insulation Systems for Solid Cast and Resin-Encapsulated Power and Distribution Transformers | Provost L.<br>82-2-2222-5297<br>richard.l.provost@kor.dupont.com | 1998<br>12/31/2007 | 12/10/2003<br>12/31/2007 | Approved - Active PAR for Revision of Std<br>PAR to Revise IEEE Std C57.12.56-1986 and IEEE Std C57.12.60-1998 | |
| PC57.12.60 | | | | | | |
| **C57.12.91** | IEEE Standard Test Code for Dry-Type Distribution and Power Transformers | | 2001<br>12/31/2006 | | Approved | |
| **C57.124** | IEEE Recommended Practice for the Detection of Partial Discharge and the Measurement of Apparent Charge in Dry-Type Transformers | | 1991<br>12/31/2007 | | Approved | |
| **C57.134** | IEEE Guide for Determination of Hottest Spot Temperature in Dry Type Transformers | | 2000<br>12/31/2005 | | Approved | |
| **C57.16** | IEEE Standard Requirements, Terminology, and Test Code for Dry-Type Air- Core Series-Connected Reactors | Dudley R. F.<br>(416) 298-8108<br>richardd@ca.treichgroup.com | 1996<br>12/31/2006 | 6/14/2001 | Approved | |
| **C57.94** | IEEE Recommended Practice for Installation, Application, Operation, and Maintenance of Dry-Type General Purpose Distribution and Power Transformers | | 1979<br>12/31/2005 | | Approved | |
| **C57.96** | IEEE Guide for Loading Dry Type Distribution and Power Transformers | Raymond C.T.<br>(518) 884-4080<br>C.RAYMOND@IEEE.ORG | 1999<br>12/31/2009 | | Approved Reaffirmation<br>RevCom approved reaffirmation on 9/22/2004 | |

| STANDARD / PROJECT | TITLE | WorkingGroup Chair / Phone / Email | Pub Year / Rev Due Date | PAR Issue Date / PAR Expiration | Standard Status / Remark |
|---|---|---|---|---|---|
| SubCommittee Chair | **DRY TYPE TRANSFORMERS** ***Patterson, Jr. W. F.*** | (919) 272-4051 wes.patterson@ieee.org | | | |
| **IEEE 259** | IEEE Standard Test Procedure for Evaluation of Systems of Insulation for Dry-Type Specialty and General-Purpose Transformers | | 1999 12/31/2009 | | Approved Reaffirmation 9/22/04 - RevCom approved reaffirmation |
| SubCommittee Chair | **HV CONVERTER TR & REACTORS** ***Dudley R. F.*** | (416) 298-8108 richardd@ca.trenchgroup.com | | | |
| **C57.129** PC57.129 | IEEE General Requirements and Test Code for Oil Immersed HVDC Converter Transformers | Dudley R. F. (416) 298-8108 richardd@ca.trenchgroup.com | 1999 12/31/2004 | 6/23/2004 12/31/2008 | Approved - Active PAR for Revision PAR for revision of C57.129-1999 approved on 6/23/2004 |
| **C57.21** PC57.12.21 | IEEE Standard Requirements, Terminology, and Test Code for Shunt Reactors Rated Over 500 kVA | Dudley R. F. (416) 298-8108 richardd@ca.trenchgroup.com | 1990 12/31/2007 | 9/11/2003 12/31/2007 | Approved - Active PAR to revise std PAR to Revise IEEE Std C57.21-1990 Reaffirmation approved on 6/23/2004 |
| **IEEE 1277** | IEEE General Requirements and Test Code for Dry-Type and Oil-Immersed Smoothing Reactors for DC Power Transmission | Dudley R. F. (416) 298-8108 richardd@ca.trenchgroup.com | 2000 12/31/2005 | | Approved |
| SubCommittee Chair | **INSTRUMENT TRANSFORMERS** ***Smith J. E.*** | (601) 346-9104 jes1@ieee.org | | | |
| PC57.13.6 | Standard for High Accuracy Instrument Transformers | Ten Haagen C. W. (603) 749-8433 chris.tenhaagen@indsys.ge.com | | 2/13/2003 12/31/2007 | PAR to Amend C57.13 NesCom approved PAR modification on 5/5/2004 - new expiration date 12/31/2007 |
| **C57.13** PC57.13 | IEEE Standard Requirements for Instrument Transformers | Nelson T. N (301) 975-2986 thomas.nelson@nist.gov | 1993 12/31/2008 | 12/10/2003 12/31/2007 | Approved - Active PAR to revise std. PAR to Revise IEEE Std C57.13-1993 |
| **C57.13.2** PC57.13.2 | Conformance Test Procedure for Instrument Transformers | Ma J. (706) 554-8800 jma@ritzusa.com | 1991 | 5/15/2003 12/31/2007 | PAR to Revise Std C57.13.2-1991 |
| **C57.13.5** | IEEE Trial-Use Standard of Performance and Test Requirements for Instrument Transformers of a Nominal System Voltage of 115 kV and Above | Ma J. (706) 554-8800 jma@ritzusa.com | 2003 12/31/2008 | | Approved |

| STANDARD<br>PROJECT | TITLE | WorkingGroup Chair<br>Phone<br>Email | Pub Year<br>Rev Due Date | PAR Issue Date<br>PAR Expiration | Standard Status<br>Remark |
|---|---|---|---|---|---|
| SubCommittee<br>Chair | **INSULATING FLUIDS**<br>***Gryszkiewicz F. J.*** | (617) 393-3161<br>frankjg@ieee.org | | | |
| PC57.130 | IEEE Trial-Use Guide for the Use of Dissolved Gas Analysis During Factory Temeprature Rise Tests for the Evaluation of Oil-Immersed Transformers and Reactors | Heinrichs F. W.<br>(412) 941-6924<br>frankus@usaor.net | | 1/30/2000<br>12/31/2005 | New Project - Std under development<br>New Project - Std under development |
| PC57.139 | Guide for Dissolved Gas Analysis in Transformer Load Tap Changers | Ladroga R. K.<br>(617) 393-3133<br>rladroga@doble.com | | 12/11/2002<br>12/31/2007 | New Project - Std under development |
| PC57.146 | Guide for Interpretation of Gasses Generated in Silicone-Immersed Transformers | Bartley W. H.<br>(860) 722-5483<br>william_bartley@hsb.com | | 10/31/2002<br>12/31/2006 | New Project - Active PAR Std under development |
| PC57.147 | Guide for Acceptance and Maintenance of Natural Ester Fluids in Transformers | McShane C. P.<br>(262) 524-4591<br>cpmcshane@cooperpower.com | | 12/10/2003<br>12/31/2007 | New Project - Active PAR Std under development |
| **C57.104**<br>PC57.104 | IEEE Guide for the Interpretation of Gases Generated in Oil-Immersed Transformers | Heinrichs F. W.<br>(412) 941-6924<br>frankus@usaor.net | 1991<br>12/31/2009 | 12/10/1996<br>12/31/2005 | Approved - Active PAR to revise std.<br>PAR to Revise IEEE Std C57.104-1991<br>PAR extension granted on 9/24/2004 - new expiration 12/31/2005 |
| **C57.106** | IEEE Guide for Acceptance and Maintenance of Insulating Oil in Equipment | Thompson J. A.<br>(605) 534-3571<br>writejt@trservice.com | 2002<br>12/31/2007 | | Approved |
| **C57.106**<br>PC57.106 | Guide for Acceptance and Maintenance of Insulating Oil in Equipment | | 2002 | 12/11/2002<br>12/31/2006 | PAR to Revise IEEE Std C57.106-2002 |
| **C57.111** | IEEE Guide for Acceptance of Silicone Insulating Fluid and Its Maintenance in Transformers | Bartley W. H.<br>(860) 722-5483<br>william_bartley@hsb.com | 1983<br>12/31/2008 | | Approved |
| **C57.121** | IEEE Guide for Acceptance and Maintenance of Less-Flammable Hydrocarbon Fluid in Transformers | McShane C. P.<br>(262) 524-4591<br>cpmcshane@cooperpower.com | 1998<br>12/31/2004 | | Approved |
| **IEEE 637** | IEEE Guide for the Reclamation of Insulating Oil and Criteria for Its Use | Thompson J. A.<br>(605) 534-3571<br>writejt@trservice.com | 1982<br>12/31/2007 | | Approved |

| STANDARD / PROJECT | TITLE | WorkingGroup Chair / Phone / Email | Pub Year / Rev Due Date | PAR Issue Date / PAR Expiration | Standard Status / Remark |
|---|---|---|---|---|---|
| SubCommittee Chair | **INSULATION LIFE** *Platts D. W.* | (610) 774-4686 donplatts@ieee.org | | | |
| PC57.145 | Guide for the Definition of Thermal Duplicate Liquid-Immersed Distribution, Power, and Regulating Transformers | Beaster B. L. (601) 422-1302 blbeaster@ieee.org | 0 | 6/25/1998 12/31/2004 | New Project - Active PAR Std under development PAR to expire in 2004 |
| **C57.100** | IEEE Standard Test Procedure for Thermal Evaluation of Liquid-Immersed Distribution and Power Transformers | Wicks R. C. (804) 383-3300 roger.c.wicks@usa.dupont.com | 1999 12/31/2004 | | Approved |
| **C57.119** | IEEE Recommended Practice for Performing Temperature Rise Tests on Oil Immersed Power Transformers at Loads Beyond Nameplate Ratings | Tuli S. C. (262) 547-0123 x1428 subhash.tuli@waukeshaelectric.spx.com | 2001 12/31/2006 | | Approved |
| **C57.91** | IEEE Guide for Loading Mineral-Oil-Immersed Transformers | Raymond C.T. (518) 884-4080 C.RAYMOND@IEEE.ORG | 1995 12/31/2007 | | Approved - Active Reaffirmation approved by RevCom 6/23/2004 |
| **C57.91-1995/Co** NONE | IEEE Guide for Loading Mineral-Oil-Immersed Transformers--Corrigendum 1 | Raymond C.T. (518) 884-4080 C.RAYMOND@IEEE.ORG | 2002 12/31/2007 | | Approved - Active In conjunction with C57.91 - reaffirmed in 6/2004. Currently under revision |
| **IEEE 1276** | IEEE Guide for the Application of High-Temperature Insulation Materials in Liquid-Immersed Power Transformers | | 1997 12/31/2004 | | Approved - Active Need reaffirmation |
| **IEEE 1538** | IEEE Guide for Determination of Maximum Winding Temperature Rise in Liquid Filled Transformer | | 2000 12/31/2005 | | Approved - Active Under ballot resolution from 2002 ballot |

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|---|---|---|---|---|---|
| SubCommittee Chair | **POWER TRANSFORMERS** *Hager, Jr. E.G.* | (760) 789-3022 redhager@ieee.org | | | |
| PC57.12.10 | Standard Requirements for Liquid-Immersed Power Transformers | | | 6/13/2002 12/31/2006 | New Project - Std under development |
| PC57.143 | Guide for Application for Monitoring Equipment to Liquid-Immersed Transformers and Components | | | 3/21/2002 12/31/2007 | New Project - Active PAR Std under development |
| PC57.148 | Standard for Control Cabinets for Power Transformers | | | 2/27/2004 12/31/2007 | New Project - Active PAR Std under development |
| PC57.149 | Guide for the Application and Interpretation of Frequency Response Analysis for Oil Immersed Transformers | | | 6/23/2004 12/31/2008 | New Project - Active PAR<br>PAR approved by NesCom 6/23/2004<br>Std under development |
| PC57.150 | Transportation Guide | | | | New Project - Requested PAR pending approval<br>PAR approval pending Dec. 2004 Std Bd meeting |
| **C57.116** | IEEE Guide for Transformers Directly Connected to Generators | | 1989 12/31/2003 | | Approved |
| **C57.117** | IEEE Guide for Reporting Failure Data for Power Transformers and Shunt Reactors on Electric Utility Power Systems | | 1986 12/31/2004 | | Approved<br>original approval date 6/19/1986 |
| **C57.120** | IEEE Loss Evaluation Guide for Power Transformers and Reactors | | 1991 12/31/2005 | | Approved |
| **C57.125** | IEEE Guide for Failure Investigation, Documentation, and Analysis for Power Transformers and Shunt Reactors | | 1991 12/31/2004 | | Approved |
| **C57.131** PC57.131 | IEEE Standard Requirements for Load Tap Changers | Henning W. R. (262) 547-0121 whenning@ieee.org | 1995 12/31/2007 | 5/15/2003 12/31/2007 | Approved - Active PAR to revise std<br>PAR to Revise IEEE Std C57.131-1995 |
| **C57.135** | IEEE Guide for the Application, Specification and Testing of Phase- Shifting Transformers | | 2001 12/31/2006 | | Approved |

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|---|---|---|---|---|---|
| | | | | | *10/12/2004* |
| SubCommittee | **POWER TRANSFORMERS** | (760) 789-3022 | | | |
| Chair | ***Hager, Jr. E.G.*** | redhager@ieee.org | | | |
| **C57.93** | IEEE Guide for Installation of Liquid-Immersed Power Transformers | Lau M. Y.<br>(604) 528-3201<br>mike.lau@bchydro.bc.ca | 1995<br>12/31/2006 | 6/13/2002<br>12/31/2006 | Approved - Active PAR to revise std<br>PAR to Revise IEEE Std C57.93-1995 |
| PC57.93 | | | | | |
| **PC57.140** | Evaluation and Reconditioning of Liquid Immersed Power Transformers | Arteaga J.<br>(601)422-1920<br>javier.arteaga@ieee.org | | 9/16/1999<br>12/31/2005 | New Project - Active PAR Std under development |
| PC57.140 | | | | | |
| SubCommittee | **STANDARDS** | (626) 308-6086 | | | |
| Chair | ***Chiu B. W.*** | bill.chiu@sce.com | | | |
| | Guide to Metric Conversion of Transformer Standards | Olson T.<br>(204) 474-4080<br>tolson@hydro.mb.ca | | 3/21/2002<br>12/31/2007 | New Project - Active PAR std under development |
| PC57.144 | | | | | |
| **C57.12.00** | IEEE Standard General Requirements For Liquid-Immersed Distribution, Power, and Regulating Transformers | Tuli S. C.<br>(262) 547-0123 x1428<br>subhash.tuli@waukeshaelectric.spx.com | 2000<br>12/31/2005 | 6/14/2001<br>12/31/2005 | Approved - Active<br>PAR to revise IEEE Std C57.12.00 - 2000 |
| PC57.12.00 | | | | | |
| **C57.12.70** | IEEE Standard Terminal Markings and Connections for Distribution and Power Transformers | | 2000<br>12/31/2005 | | Approved |
| **C57.12.80** | IEEE Standard Terminology for Power and Distribution Transformers | | 2002<br>12/31/2007 | | Approved |
| **C57.12.90** | IEEE Standard Test Code for Liquid-Immersed Distribution, Power, and Regulating Transformers | Tuli S. C.<br>(262) 547-0123 x1428<br>subhash.tuli@waukeshaelectric.spx.com | 1999<br>12/31/2005 | 6/14/2001<br>12/31/2005 | Approved - Active PAR to revise std.<br>PAR to Revise IEEE Std C57.12.90-1999<br>Currently under ballot resolution to resolve negatives from 2002 ballot. |
| PC57.12.90 | | | | | |
| **C57.144** | Guide for Metric Conversion of Transformer Standards | Olson T.<br>(204) 474-4080<br>tolson@hydro.mb.ca | 2004<br>12/31/2009 | | Approved<br>PC57.144/D5 approved by RevCom 6/23/2004 |
| **C57.18.10** | IEEE Standard Practices and Requirements for Semiconductor Power Rectifier Transformers | Colopy C. A.<br>(262) 896-2342<br>ccolopy@cooperpower.com | 1998<br>12/31/2008 | | Approved |
| **IEEE 62** | IEEE Guide for Diagnostic Field Testing of Power Apparatus - Part 1: Oil Filled Power Transformers, Regulators, and Reactors | | 1995<br>12/31/2004 | | Approved - Active<br>Need reaffirmation |

| STANDARD / PROJECT | TITLE | WorkingGroup Chair<br>Phone<br>Email | Pub Year<br>Rev Due Date | PAR Issue Date<br>PAR Expiration | Standard Status<br>Remark | 10/12/2004 |
|---|---|---|---|---|---|---|
| SubCommittee | UNDERGROUND TR & NW PROTECT | (847) 683-2145 | | | | |
| Chair | *Niemann C. G.* | carlpumco@sbcglobal.net | | | | |
| **C57.12.40** | Standard for Requirements for Secondary Network Transformers - Subway and Vault Types (Liquid Immersed) | | 1993<br>12/31/2005 | | Approved | |
| **C57.12.44** | IEEE Standard Requirements for Secondary Network Protectors | Mulkey D. H.<br>(415) 973-4699<br>DHM3@PGE.COM | 2000<br>12/31/2006 | 12/31/2006 | Approved - Active PAR for revision<br>Latest revision under ballot - closed 10/2004. One neg w/ comments. Will resolve negative and seek for approval from RevCom<br>NesCom approved PAR 2-year extension request on 6/23/2004 | |
| PC57.12.44 | | | | | | |