

# Minutes of the June 12, 2008 Meeting of the Materials Subcommittee of the IEEE PES Electric Machinery Committee

1. Meeting called to order (1:02pm), Agenda, Introductions and Attendance sheet (~24 attendees)
2. Approval of the Minutes of the Last Meeting: moved Greg Stone, seconded Stefano Bomben, Motion carried.
3. Chair's Comments
  - Discussion of the new IEEE-SA-patent-slideset (Sent to all Material Subcommittee members via email prior to this meeting.)
  - IEEE Standards Association requires that a request be made at each WG meeting for disclosure (identification) of any patents or copyrights that may be related to this work. Consider that done. (Reviewed with Material Subcommittee in meeting.)
  - IEEE Dictionary - Chuck Wilson has a paper copy of the dictionary. If you have questions as to whether an item is in it already, please contact Chuck..
  - Chair moved Greg Stone forward – he has to catch a plane. Anyone else? Glenn Mottershead
4. Standards Coordinator Report and Discussion
  - **Innocent Kamwa is the Standards Coordinator for the Electric Machinery Committee (Nancy/ Chuck to forward meeting minutes to him after this meeting)**
  - 95-2002 (reaff 2007) *IEEE Recommended Practice for Insulation Testing of Large AC Rotating Machinery with Direct Voltage, (no work needed at this time)*
  - 286-2000 (reaff 2006) *IEEE Recommended Practice for Measurement of Power Factor and Power Factor Tip-up of Rotating Machinery Stator Coil Insulation (no work needed at this time)*
  - 304-1977 (reaff 1991) *IEEE Standard Test Procedure for Evaluation and Classification of Insulation Systems for Direct-Current Machines* This document has been administratively withdrawn.
  - 522-2004 *IEEE Guide for Testing Turn-to-Turn Insulation on Form-Wound Stator Coils for Alternating-Current Rotating Electric Machines (corrected from 2003 to 2004, typo) (no work needed at this time)*
  - 1043-1996 (reaff 2003) *IEEE Recommended Test Procedure for Performing Voltage-Endurance Testing of Form-Wound Coils and Bars (we need to consider working on this standard) Greg Stone suggested it should be reaffirmed – group agrees. ACTION: Chuck Wilson will move forward with paperwork.)*
  - 1107-1996 *IEEE Recommended Practice for Thermal Evaluation of Sealed Insulation Systems for AC Electric Machinery Employing Random-Wound Stator Coils – Administratively withdrawn (Information to be included as annex to 117 ACTION: Nancy Frost)*
  - 1434-2000 (reaff 2005) *IEEE Guide to the Measurement of Partial Discharges in Rotating Machinery (no work needed at this time)*

- 1553-2002 *IEEE Test and Acceptance Criteria for Voltage-Endurance Testing of Form-Wound Coils and Bars used in Hydroelectric Generators and Large Pumped Storage Motors* (Reaffirmation was done, ACTION: Alexandra will confirm that no issues exist.)
- 433-1974(1991) *IEEE Recommended Practice for Insulation Testing of Large AC Rotating Machinery with High Voltage at Very Low Frequency* (ACTION: Stefano is working on this as a recirculation to deal with the points that were under possible contention.)
- 434-2006 *IEEE Guide for Functional Evaluation of Insulation Systems for AC Electric Machines Rated 2300 Volts and Higher* (completed) (no work needed at this time)

## 5. Working Group Reports and Discussion

- 1310-1996 (2004 reaffirmed) *IEEE Recommended Practice for Thermal Cycle Testing of Form-Wound Stator Bars and Coils for Large Generators*, **Chair: Greg Stone** Attended by 25-30 people, PAR worked out, pass through document completed. Working on finishing for final review and straw ballot. ACTION: Greg Stone
- 43-2000 *IEEE Recommended Practice for Testing Insulation Resistance of Rotating Machinery*, **Chair: Ian Culbert** Working group looked at section 5.1 with modified circuit, looking at 6.3 with temperature variation, applicability of 100Mohms for machines with large number of coils – new section to be added, also windings with long extensions – new section. ACTION: Nancy. Frost to look into whether reaffirmed in 2006 or not – Andy Brown and Greg Stone were involved at that time.
- 56-1977 (reaff 1991) *IEEE Guide for Insulation Maintenance of Electric Machines Rated 35 kVA and Higher*, **Chair: Doug Conley** This document has been administratively withdrawn. The working group has gone through whole document at least once, put into IEEE format, few changes added regarding dc motors, references and annex format need to be corrected. Should go to straw ballot, and submit to IEEE for format review prior to sending out for ballot. ACTION: Doug Conley
- 117-1974 (reaff 1991) *IEEE Standard Test Procedure for Evaluation of Systems of Insulating Materials for Random-Wound AC Electric Machinery*, **Chair: Nancy Frost** This document has been administratively withdrawn. Review of document complete, group accepted as is. Need to accelerate this standard, since it is for UL 1446, as expressed by Tom Mayerhofer, top expert of UL 1446 in UL. ACTION: Nancy. Frost
- EMC-SMC P1665 *IEEE Guide for the Rewind of Synchronous Generators, 50 and 60 Hz, rated 1 MVA and above*, **Chair: William Bartley** (draft 12, second session in Pittsburgh next month)
- P1719 *IEEE Guide for Evaluating Stator Cores of AC Electric Machines Rated 1 MVA and Higher*, **Chair: Glenn Mottershead** Well attended meeting 28-30 people. Moving through document once from where they stopped, making changes to first draft. ACTION: Glenn Mottershead
- P1776 *IEEE Recommended Practice for Thermal Evaluation of Sealed or Unsealed Insulation Systems for AC Electric Machinery Employing Form-Wound Pre-Insulated Stator Coils for Machines Rated 15000 Volts and Below*, **Chair: Chuck Wilson** A combination of the 275-1992 (reaff 1998) and 429-1994 documents, which have been administratively withdrawn. (about 8 attendees, voted to accept draft 11 with technical change as a result of negative vote and ballot, IEEE said it needs to go out for a recirculation ballot for 10 days, hoping to be issued this year. ACTION: Chuck Wilson
- *New activity:*
  - IEC 60034, Rotating Electrical Machines – Part 18-41: Qualification and Type Tests for Type I Electrical Insulation Systems Used in Rotating Electrical Machines Fed by Voltage Converters. **Chair: Meredith Stranges** This document has just been published. It is suggested that via the IEC-IEEE dual logo agreement, we also adopt this document. Meredith to send the document to the Working Group to review for a vote. Two options – adopt as is or form a working group, although this second option is not highly desired. ACTION: Meredith Stranges

- Trial-Use Guide for UV and Blackout Test Inspection: **Remi Tremblay** of Hydro Quebec conducted a meeting to form a Working Group for the purpose of writing a guide document for performing ultraviolet and blackout test inspections on rotating electrical machines. Remi has offered to chair this working group. Remi had his kick off meeting, well attended, input to come from working group regarding Scope, Purpose and title. Decision on PAR timing to be made in Fall meeting. **ACTION:** Remi Tremblay
- **Hugh Zhu** – (Awards and Recognition) Coordinated with EMC for awards to recognize service and technical achievement. They would like to see more involvement of Materials Subcommittee – prize paper at a PES conference or from IEEE Transactions on Energy Conversions or standards working group – this body – by this December for next year. Would like to see nominations for IEEE Fellows as well. **ACTION:** Hugh Zhu

## 6. Liaison Reports

- IEC (Greg Stone reported, to submit written report for minutes. – See Annex A)
- CIGRE (Howard Sedding gave report to Chuck Wilson, to be attached to the meeting minutes. – See Annex B) In the future, Remi Tremblay will forward notes to Howard for Hydro section.
- Electric Machines Committee (Aleksandra Jeremic to continue to serve in this role. No report at this time.)
- Generator SC (Bill Bartley reporting, to submit written report for minutes. – See Annex C)

## 7. Old Business (none)

8. **New Business:** What can we do to continue the increased attendance and interest in IEEE WG – keep up the good work. Also remember EIC 2009 in Montreal – will be our location for MSC in the fall of next year.

## 9. Next Meeting

### Possible Fall 2008 dates and sites for meetings:

26-29 Oct. 2008	CEIDP 2008– Hotel Delta, Quebec City, Canada
3 - 5 Nov. 2008	EME Electrical Manufacturing Expo 2008, Gaylord Palms, Orlando, Florida

Move to select CEIDP by Eric David, seconded by Doug Conley – unanimously agreed (Dates desired are Wednesday October 29 to Thursday October 30<sup>th</sup> at CEIDP – depends on how long the conference lasts)

10. **Adjournment** (Moved by Ian, seconded by Remi , adjourned at 2:12pm)



**Dr. Nancy Frost, Secretary – 2008 06 12**



**Chuck Wilson – Chairman**

## **IEC Liaison Report**

IEC 60034-18-41 has been published. This document describes the qualification tests required for low voltage random wound stator windings intended for inverter duty application. Meredith Stranges has initiated an IEEE WG to adopt this as an IEEE standard.

IEC 60034-18-42 is a similar document, but intended to qualify the insulation and stress relief coatings of form wound stator windings intended for inverter duty applications. This document has now been voted upon and accepted, with minor changes. It should be issued in 2009.

A new IEC working group called IEC TC2 WG 27 will be creating a guide for on-line PD testing of motor and generators. Just an outline has been prepared so far. Like IEEE 1434, it looks like it will permit most of the commercially available PD measurement methods. A document is many years into the future

IEC 60034-15 for surge testing of coils has been revised and undergone a first vote. It seems likely that the surge risetime will be closer to the risetime specified in IEEE 522 (100-300 ns). There will continue to be small difference from IEEE 522 in surge magnitude, however. 60034-15 specifically says the test is not intended for complete windings. There was one negative vote on a procedural issue, and thus it will need to go through the voting procedure again. We shall see if the tighter risetime spec survives.

The entire array of qualification tests for machine insulation systems is slowly being revised. These are documents IEC 60034-18, parts 1, 21,22,31,32,33, and 34. This covers the thermal classification standards, as well as voltage endurance and thermal cycling documents for both random wound and form wound windings. In general, progress is rapid in revising the IEC documents, and many test procedure variations are being deleted that are not being used. We are trying to keep the IEEE and IEC documents as harmonized as possible. However, the current version of IEC 60034-18-34 does allow thermal cycling testing using liquid cooling and heating. IEEE 1310 only allows heating by circulating current.

Greg Stone  
June 12, 2008

## ANNEX B

### CIGRE LIAISON REPORT 2008

The two CIGRE Study Committees (SCs) of most interest/relevance to the Materials Subcommittee are,

SC A1 (Rotating Machines)                      Chair: Gert Coetzee (South Africa)  
SC D1 (Materials & Emerging Technology)      Chair: Ernst Gockenbach (Germany)

Both SCs met jointly in Gyeongju, Korea in October 2007. Key points of interest are,

#### SC A1

AG A1.01 (Turbine Generators)                      Convenor: Bob Fenton (US)  
Current active projects are,

- Generator stator water chemistry management
- State-of-the-art survey of on-line condition monitoring methods for turbogenerators
- Stator winding grounding methods
- Economic basis for replace/refurbishment decisions for turbogenerators
- Guide for overfluxing
- Generator/power system interaction

AG A1.02 (Hydraulic Generators)                      Convenor: Remi Tremblay (Canada)  
Current active projects are,

- Guide on fire protection - (50 answers) report in August, final next yer
- Guide on intermittent operation - prelim is written – final in August
- Guide on generator failures - Finished
- Guide on the use of Teflon bearings - working on it for the last year
- Guide on stator winding stress grading problems – prelim report next year

New WG on Class H insulation has been formed.  
Tried to start a working group on Generator Cleaning in Work.

AG A1.05 (Novel Machines)                      Convenor: Sam Salem (US)

Currently this advisory group (AG) is somewhat dormant but is being refocused on wind energy issues. Historically much of the work of this AG was in the area of superconducting machines.

AG A1.06 (Large Motors)                      Convenor: Enzo Tortello (Italy)  
Current active projects are,

- Experience with nuclear motors
- Application of ASD motors

#### SC D1

The working groups (WGs) of relevance to the materials subcommittee are,

WG D1.07 (Solid Insulation for Rotating Machines)      Convenor: Howard Sedding (Canada)

This WG is due, under CIGRE rules, to be disbanded in 2008. However, the work will be continued under a new task force (TF) within D1.

WG D1.19 (Solid Insulation Endurance Under Repetitive Transient Voltages)  
Convenor: Joachim Holboll (Denmark)

This relatively new WG, just converted from a TF, is looking at materials issues across all equipment areas, relevant to the stresses imposed by repetitive transients.

WG D1.24 (Potential of Nanocomposite Polymers as Electrical Insulation)

Convenor: T. Tanaka (Japan)

This is a new WG formed after the disbandment of WG D1.16 that was concerned with interfaces and high field effects. The objective is to gather information on practical applications of nanocomposites in electrical insulation.

The next meeting of SC A1 and D1 as well as the associated AGs, TFs and WGs will take place August 24 – 29, 2008 during the CIGRE General Session in Paris.

H. Sedding      June 2008

## ANNEX C

### Report on EMC /Generator Subcommittee Activities

For the EMC Material Subcommittee Meeting                      June 12, 2008  
By William H. Bartley P.E. Generator Subcommittee Chair

The Generator Subcommittee has quite a number of standards /issues that we are working on.

First, I must recognize the Working Groups that are diligently working on the Revision of existing Standards  
WG#7 IEEE Std 115, Standard Test for Synchronous Machines, Haran Karmaker, chair  
WG #5, IEEE Std 492, Operation & Maintenance Guide for HydroGenerators, Robert Brummond, chair

In addition, we have four working groups which are tackling some important and timely issues:

WG 3 -Generator Rewind Guide - with an aging infrastructure across this country, we have hundreds of powerplant generators which are near the end of life. There is no existing IEEE document that guides the owner through the Rewind process. This Guide will provide the owner with important advice. Chaired by W.Bartley

WG 4 Grid-Induced Torsional Vibrations in Generators - There have been numerous studies performed and papers written regarding the damage of power plant generators by transmission system transients. It is the purpose of this new working group to develop a paper presenting a clearer picture regarding the characteristics of transients that lead to severe responses of turbine generators. This group is chaired by Tom Wait.

WG 6 Application Guide for Superconducting Machines – this group is working on a guide for the application of superconducting materials in Electric Machines. Chaired by Swarn Karsi

WG 8 Harmonizing IEC/ IEEE standards on Generators - after several years of work, the IEEE C 50 series for generators was consolidated into just two: C50.12 & C50.13. These were approved in 2005 and published in 2006. But, we are mandated to continuously harmonize with the IEC. (Of course the generator manufacturing industry is also lobbying for ONE global standard.) This new Working Group will study the similarities and differences of our IEEE std and the corresponding IEC standards, to create a matrix for future changes. This group is chaired by Kay Chen.

WG 9 Renewable Energy Machines - You cannot pick up a newspaper today without seeing something about Renewable Energy. This new Working Group will study the issues concerning Renewable Energy and how this affects Electric Machinery. One of the first topics they will address is Short Circuit contributions from Wind Turbine Generators. This group is chaired by Prof. Mohammed El-Sharkawi.

#### **Short Circuit Currents from Wind Generators**

At the PES Annual General Meeting in Pittsburgh, the EMC Generator SubCommittee will host a meeting on Wednesday, July 23, titled "Organizational Meeting to Address Short Circuit Currents from Wind Generators".

The meeting will bring together people from EMC, Power Systems Relay Committee, T&D Committee (Wind Plant Collector Design WG), and Wind Power Coordinating Council to discuss what is needed and to formulate plans for a new working group or task force to be formed under one (or more) of the PES technical committees. During the meeting, the scope of the new group will be discussed and candidates for chair, vice-chair, and/or secretary will be identified.

This first "organizational" meeting would be moderated by someone from the Wind Power Coordinating Committee. As soon as the scope is agreed and candidates for chair and vice-chair are identified, the leadership would be turned over to the technical committee(s) that will sponsor the new working group or task force.

WHB