Meeting Minutes of the IEEE Materials Subcommittee of the Electric Machinery Committee of the Power and Energy Society

Date: Thursday, October 20, 2016
Location: Chelsea Hotel
Toronto, Ontario, Canada

1. Meeting call to order, Agenda distributed, Introductions and Attendance sheet.

The Chair called the meeting to order and introduced the agenda. The officers are:

MSC Chair – Paul Gaberson
Vice Chair – Tyler Gaerke
Secretary – Stand in Aleksandra Jeremic for Keith Grzegorczyk

The attendance sheet was circulated at the start of the working group meetings. Total attendance was 25. Not all were present for the closing Subcommittee meeting. See Appendix 1.

2. Approval of minutes from the last meeting

Motion – Jeffrey Sheaffer
Second – Douglas Conley
All in favor – Yes, minutes approved.

3. Chair’s Comments:

Many thanks to Dr. Stone, General Chair of the 2016 CEIDP for hosting our Materials Subcommittee meeting and for providing refreshments.

Further information regarding the IEEE Collabratec™ for document management will be provided.

Chair reminded all the Working Group Chairs of the following:
Once a standard is issued, the appropriate forms must be signed and sent to Mr. Kamwa our IEEE Standards Coordinator.

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. The chair or the chair's delegate of an IEEE standards-developing working group or the chair of an IEEE standards Sponsor shall be responsible for informing the members of the working group/participants at a meeting that if any individual believes that Patent Claims might be Essential Patent Claims, that fact should be made known to the entire working group and duly recorded in the minutes of the working group meeting. This request shall occur at every standards developing meeting once the PAR is approved by the IEEE-SA Standards Board.

The Working Group Chair or the Chair's delegate shall ask any patent holder or patent applicant of a Patent Claim that might be or become an Essential Patent Claim to complete and submit a Letter of Assurance in accordance with Clause 6 of the IEEE-SA Standards Board Bylaws. Information about the draft standard will be made available upon request.

Working group Chairs please remember this requirement! Application has been inconsistent and we must fulfill this requirement.

It is strongly recommended by the Subcommittee Chair that all subcommittee members join the IEEE Standard Association so that the Members of Working Groups can vote on their standard.
The websites for the Power & Energy Society and the Electric Machinery Committee show all of the policies and procedures governing operation of the various subcommittees. All members should familiarize themselves with these documents.

4. Standards Coordinator Report and Discussion

Innocent Kamwa is the Standards Coordinator for the Electric Machinery Committee. **ACTION:** The Chair will forward meeting minutes to him after this meeting.

5. Working Group Reports and Discussion

43-2000 (revised 2014) IEEE Recommended Practice for Testing Insulation Resistance of Rotating Machinery, **Chair: Ian Culbert / Eric David**

No activity at this meeting. Open for discussion in 2020.

56-1977 (reaff 1991) IEEE Guide for Insulation Maintenance of Electric Machines Rated 35 kVA and Higher, **Chair: Doug Conley, Vice Chair: Dave McKinnon, Secretary: Jim Lau**

No activity at this meeting. Document went to Rev Com on Sept. 16, 2016 for approval, and editorial received prior to this meeting. Document was published on November 11, 2016.

95-2002 (reaff 2012) IEEE Recommended Practice for Insulation Testing of Large AC Rotating Machinery with Direct Voltage, **Chair: Dave McKinnon**

No activity at this meeting. Open for discussion in 2018.

117-2015 IEEE Standard Test Procedure for Evaluation of Systems of Insulating Materials for Random-Wound AC Electric Machinery, **Chair: Nancy Frost, Vice Chair: Shawn Filliben**

No activity at this meeting. The standard was completed and published in May 2016.

286-2000 (reaff 2012) IEEE Recommended Practice for Measurement of Power Factor and Power Factor Tip-up of Rotating Machinery Stator Coil Insulation, **Chair: Gary Heuston**

No activity at this meeting. Open for discussion in 2017.

304-1977 (reaff 1991) IEEE Standard Test Procedure for Evaluation and Classification of Insulation Systems for Direct-Current Machines, **Currently administratively withdrawn.**

No activity at this meeting. Document will remain withdrawn.

433-2009 IEEE Recommended Practice for Insulation Testing of Large AC Rotating Machinery with High Voltage at Very Low Frequency **Chair: Ashfak Shaikh, Secretary: Aleksandra Jeremic**

- Scope was changed, only one sentence was added.
- New PAR has been submitted to IEEE and was approved prior to this meeting.
- The existing standard was circulated to the group so the feedback can be provided and any potential issues raised.
- No substantive changes due to the user needs are expected.
- During Montreal and Toronto meetings, the core group consisting of the following fellow volunteers was created: B. McDermid, S. Bomben, H. Penrose, B. Gupta, Dave McKinnon and D. Conley.
- Based on the pool of the present members, it seems that mainly utilities and test companies are using IEEE 433 for rotating machines when requested by end users. OPG prefers VLF.
Manitoba Hydro is using it sometimes for maintenance/diagnostic purposes and primarily for breakdown, since it is simpler and “cheaper” (much easier to use) setting up than ac hipot test. 
- It is recommended to consider adding section as a reference regarding VLF vs dc vs ac tests. Kinetics sponsored by EPRI has done some work regarding statistics. There is a survey 1990 vs 2000 on who is using VLF (Dr. Stone), which shows that it is mostly used for cable testing. DC is used mostly in USA, instead of DC, even though dc does not test for everything (Jim Timperly). Chair to provide these documents and present review at the following meeting.
- During Montreal meeting Dr. Lamarre raised a question as to whether distortion of the wave form was included or allowed for in the standard – this needs to be confirmed and if not possibly addressed. Per Dr. Gupta, it was not separated; whatever the wave form it is it should not be worried about, and it refers only to sin wave and not the cos rectangular wave. In addition it is hard to specify it when there are only a few users.
- Chair to follow up regarding “Megger”.

**ACTION:** Chair to circulate the new PAR and reviewed document to the whole group prior to the Spring meeting. Document to go for a ballot in August, 2017.


No activity at this meeting. Open for discussion in 2018.

522-2004 (reaff 2009) **IEEE Guide for Testing Turn-to-Turn Insulation on Form-Wound Stator Coils for Alternating-Current Rotating Electric Machines,** Chair: Paul Gaberson, Secretary: Kevin Alewine

- PAR was finalized and has been submitted. Standards Board will vote on approval in December, 2016.
- The existing Annex A will be reviewed and new Annex will be added (G. Stone and K. Alewine volunteered).
- IEEE Collaboratec™ will be used for update/development of this document.

**ACTION:** Waiting for PAR approval in December, 2016. Work may not start until then.

1043-1996 (reaff 2009) **IEEE Recommended Test Procedure for Performing Voltage-Endurance Testing of Form-Wound Coils and Bars,** Chair: Ramtin Omranipour, Secretary: Joe Williams

No activity at this meeting. This document is actually “owned” by DEIS. Will consider co-sponsorship between DEIS and P&E Societies.


No report on activity with respect to this specification.

1310-2012 **IEEE Recommended Practice for Thermal Cycle Testing of Form-Wound Stator Bars and Coils for Large Generators,** Chair: Greg Stone

No activity at this meeting. Open for discussion in 2017.

**1434-2014 IEEE Guide to the Measurement of Partial Discharges in Rotating Machinery,** Chair: Bill McDermid

- Bill provided an update on the current work and proposed development of the document by the new Working Group studying PD on individual coils and bars.
- The proposal was seconded by Douglas Conley and all present voted in favor of submitting the new PAR.
- Those interested in obtaining copies of the work done so far should contact Bill directly.
**ACTION:** Chair will circulate by email PAR with scope and purpose, to be resolved by the next meeting.

1553-2002 (reaff 2007) IEEE Test and Acceptance Criteria for Voltage-Endurance Testing of Form-Wound Coils and Bars used in Hydroelectric Generators and Large Pumped Storage Motors,
**Chair: Hugh Zhu, Secretary: Aleksandra Jeremic**
- After Montreal meeting some comments were received and more discussion is required for 50 versus 60 Hz. Life span is shorter at 60 Hz? or for 50 Hz increase time by how much?
- It was proposed to test at 50 Hz if “selling” at 50 Hz, and if testing at 60 Hz and “sell” at 50 Hz reduce time but dependency is not linear. l/f dependency at VE is published in the papers, to be reviewed.
- A. Khazanov will provide the paper that shows there is no relation to 400 versus 480 hours and whether the coil is going to last 40 or 20 years. It was noted that 400 hrs or so came about from OPG experience in 1950’s.
- Discussion regarding Table expansion to address higher levels continued. Chinese have it in their standards, Alstom performed it at 23 kV, G. Mottershead at 20 kV with cooling allowed on the stress grading. Further discussion required to reach consensus.
- Discussion regarding temperature level continued. H. Zhu proposed 100 – 120 degC, or leave to be agreed upon the user and OEM. D. Conley proposed to state explicitly room temperature or RTD temperature (expectable temp that shall be in the operation check C50.13/12), given that these terms are clearly defined in the document. It was decided to add a new sentence to the document that will define temperature as: i) agreed between, ii) observable RTD, iii) or room temperature. Room temperature is easier to do and is slightly more severe.
- In addition state clearly that it is a method of evaluating insulation only. It is used more in North America than in Europe.
**ACTION:** Chair to provide the literature review summary, and reviewed document with proposed updates by the next WG meeting.

1719 IEEE Guide for Evaluating Stator Cores of AC Electric Machines Rated 1 MVA and Higher,
**Chair: Glenn Mottershead, Secretary: Stefano Bomben**
- Suggestion was reiterated at this meeting to make criteria for vibration a velocity rather than displacement to avoid frequency dependence. It was also suggested that different criteria would be applicable to different designs i.e. hydro vs. turbo, solid vs. spring mount core suspension.
- OEMs discussed some values. Chair to survey different OEMS for particular values for stiff and flexible ones.
- Certain definitions regarding vibrations are to be added to the document.
**ACTION:** Please send comments to Stefano Bomben before the next meeting. Updated version will be distributed before next meeting.

1776 - 2009 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: William Chen, Secretary: Nancy Frost**
- The title will stay the same in the new PAR.
- It was decided to reverse the decision from last meeting (of limiting this standard to 50 MVA only). Instead, we will keep the same title & scope (as per the 2009 standard) for the new PAR.
- When this standard was approved back in 2008, only figures & typos were updated, but not the technical contents. In order to speed up the approval process, we will need to review all technical contents during this revision.
- The WG chair will contact previous chair (Chuck Wilson) for inputs/comments.
- The WG chair will welcome & review future comments submitted.
- Core group to review this current document consists of the following fellow volunteers: P. Gaberson, K. Alewine, and T. Gaerke.
- The WG chair will contact others (such as Eltek, UL, Von Roll, etc.) to see whether they may be interested in joining the core group.
- The WG chair will check whether it is feasible to put related documents through IEEE Collaborate, for easier access by WG members.

**ACTION:** Continue review of the document. Send comments to the Chair or Secretary. Submit the PAR, sponsored by both DEIS and PES.

_P1799-2012 IEEE Recommended Practice for Quality Control Testing of External Discharges on Form-Wound Coils, Vacuum Pressure Impregnated Stator Insulation and Fully Assembled Stator Windings, Chair: Claude Hudon_

No activity at this meeting. Open for discussion in 2017.

_Endurance Test for Turn Insulation in Rotating Machine Coils, Chair: Joe Williams III_

No activity at this meeting. Based on discussion during Montreal, 2016 meeting it was decided that work on the guide will be suspended until more research and testing results become available, despite a need for some type of guide for the evaluation of turn insulation in multi-turn form wound coils.

_NEW – IEEE Dissection Guide, Chair: Dr. Frost, Vice-Chair: Charles Millet, Secretary: Andy Brown_

No activity at this meeting.

**ACTION:** WG Chair to try for a PAR before next working group meeting, so document development can start.

_New – IEEE Guide for Diagnostic Test Methods for AC Electric Machinery using Direct Voltage, Chair: Laurent Lamarre, Vice Chair: Doug Conley, Secretary: Tyler Gaerke_

- Scope and Purpose were reviewed.
- PAR was submitted, and it is now IEEE 95.1, not 97.

**ACTION:** Complete IEC references, list of Definitions, and the test methods and body prior to the next meeting.

6. Other MSC activities

   a) Awards and Recognition – Dr. Hugh Zhu

   **ACTION:** Members are invited to submit award nominations to Dr. Zhu.

7. Liaison Reports

   **APPENDIX II** - CIGRE SC A1 Liaison Report submitted by Charles Millet
   **APPENDIX III** - EMC Liaison Report submitted by James Lau
8. Old Business

There is interest in officially starting a working group to write a standard on surge testing of random wound machines. IEEE Std. 522 specifically excludes random wound machines from its scope. Volunteers will need to be identified.

9. New Business

- There will be new specification to be looked at in the future, such as IEEE 286, 1310, 1043, 1799. Four (4) new specifications will be added, and it will be MSC Chair’s and WG Chairs’ challenge on how to organize the meeting schedule due to potential overload.
- IEEE 62.2 – Gary Heuston will not be able to serve as the Secretary any more. James Lau will submit the PAR under this Group and Web will be used as the communication tool. Next meeting will take place in Baltimore.

10. Next Meeting

SPRING MEETING:
The next meeting will take place on Wednesday and Thursday, June 14 and 15, 2017 in Baltimore, MD at the conclusion of the 35th EIC sponsored by the DEIS.

FALL MEETING OPTIONS:
It was indicated that the later date is preferred so EIC Abstract Review can coincide with the meetings.
   i) October 25 and 26, 2017 in Fort Worth, TX at the conclusion of CEIDP
   ii) Week of October 30 OR week of November 6, 2017. Tyler Gaerke of Siemens Norwood and Glenn Mottershead of HDR Seattle will look into possibility of hosting these meetings with their respective companies.

11. Adjournment

Motion – Douglas Conley
Second – Dr. Hugh Zhu
## APPENDIX 1

### Attendance Sheet

<table>
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<tr>
<th>First Name</th>
<th>Surname</th>
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APPENDIX II  
CIGRE SC A1 Liaison Report submitted by Charles Millet

Organization of the SC-A1 - Study Committee on Rotating Electrical Machines
- Chair: Nico Smit (ZA)
- Secretary: Peter Wiehe (AU)

Juergen R. Weidner is succeeding Robert E. Fenton as Convener of the A1.01 Turbine Generators Advisory Group and Remi Tremblay is succeeding Howard Sedding as Canadian Representative of the A1 Study Committee.

AG-A1.01 (Turbine Generators) Convener: Juergen R. Weidner (DE)
Completed projects in the last 12 months are:
  Convener: William Moore (US)
  This was published as TB – 641
- A1-41 Inventory of Main Maintenance Interventions on Turbo Generators
  Convener: Vincent Fernagut (FR)
  This has not yet been published.

Current active projects are:
  Convener: Luis Rouco (ES)
- A1-33 Guide for the Proper Storage and Cleanliness of Turbogenerators and their Components
  Convener: Kevin Mayor (CH)
- A1-37 Turbogenerator Stator Winding Support System Experience
  Convener: Alberto Villarrubia (ES)
- A1-39 Application of Dielectric Dissipation Factor Measurements on New Stator Coils and Bars
  Convener: Monique Krieg-Wezelenburg (NL)
- A1-44 Guideline on Testing of Turbo and Hydrogenerators
  Convener: David Tarrant (ZA)
- A1-48 Guidance on the Requirements for High Speed Balancing / Over speed Testing of Turbine Generator Rotors Following Maintenance or Repair
  Convener: Ben Adams (UK)
- A1-50 Factory Quality Assurance Testing Requirements for Turbogenerator Components
  Convener: Sergio Rodriguez (ES)
- A1-57 The Visual Inspection of Stator Windings and Cores of Large Turbogenerators
  Convener: Fred Claassens (ZA)

New projects to come are:
- Guide on Slot Radial Wedge evaluation methods
  Convener: Alberto Villarrubia (ES)
• Generator bushings  
  Convener: Juergen R. Weidner (DE)

AG A1.02 (Hydro Generators)  
Convener: Remi Tremblay (Canada)

Completed projects in the last 12 months are:
• A1-35 Hydroelectric Generators Behaviour under Abnormal Operating Conditions  
  Convener: Rudra N. Bedi (IN)
• A1-36 Vibration and Stability Problems In New, Old and Refurbished Hydro generators, Root Causes and Consequences  
  Convener: Jouni Ahtiainen (FI)

Current active projects are:
• A1-31 State of the Art of Stator Winding Supports in Slot Area and Winding Overhang of Hydro Generators  
  Convener: Franz Ramsauer (AT)
• A1-34 Testing Voltage of Doubly-fed Asynchronous Generator-motor Rotor Windings for Pumped Storage  
  Convener: Osamu Nagura (JP)
• A1-40 Survey on Hydro Generator Instrumentation and Monitoring  
  Convener: Mark Bruintjies (ZA)
• A1-42 Influence of Key Requirements to Optimize the Value of Hydro Generators  
  Convener: Eduardo Guerra (AR)
• A1-43 State of the Art of Rotor Temperature Measurement  
  Convener: Ante Elez (HR)
• A1-49 Magnetic Core Dimensioning Limits in Hydro Generators  
  Convener: Johnny Rocha (BR)
• A1-55 Survey on Split Core Stators  
  Convener: Sun Yutian (CN)
• A1-56 Survey on Lap and Wave Winding and their Consequences on Maintenance and Performance  
  Convener: Richard Perers (SE)

New projects to come are:
• Thrust Bearings for Hydropower - A Survey of Known Problems and Root Causes  
  Convener: Erik A. Kaggestad (NO)
• Guide on Economic Evaluation Refurbish/Replace Decision Including General Means and Features to Increase Reliability of Hydro Generators  
  Convener: Mark Bruintjies (ZA)
• Survey on Stator Cutting Out Coils  
  Convener: Charles Millet (CA)

AG A1.05 (New Technologies)  
Convener: Luis Rouco (ES)

Current active projects are:
• A1-51 Monitoring, Reliability and Availability of Wind Generators  
  Convener: David McMillan (UK)
• A1/C4-52 Wind Generators and Frequency-active Power Control of Power Systems
  Convener: Nick Miller (US)

AG A1.06 (Motors)  Convener: Erli F. Figueiredo (BR)

Current active projects are:
• A1-45 Guide for Determining the Health Index of Large Electric Motors
  Convener: Phumlani Khumalo (ZA)
• A1-46 Guide on Use of Premium Efficiency IE3 Motors & Determining Benefits
  of Green House Gas Emission Reduction
  Convener: D-K. Chaturvedi (IN)
• A1-47 Technological Feasibility Studies for Super (IE4) and Ultra (IE5)
  Premium Efficient Motors
  Convener: Do-Hyu Kang (KR)
• A1-53 Guide on Design Requirements of Motors for Variable Speed Drive
  Application
  Convener: A.K. Gupta (IN)
• A1-54 Impact of flexible operation on large motors
  Convener: John Doyle (IE)
• A1-58 Selection of Copper Versus Aluminum Rotor for Induction Motors
  Convener: Fredemar Rüncos (BR)

New projects to come are:
• Partial Discharge.
  Convener: Andre Carvalho
  With the intensive use of adjustable frequency drivers the problems due to partial discharges
  are aggravated due to harmonic imposed on motors and should be investigated.
APPENDIX III
EMC Liaison Report submitted by James Lau

1. PES Technical Council is looking for EMC to provide some input into the various things that EMC does within the industry. Any ideas for paragraphs on that topic would be welcomed.
2. IEMDC – The IEMDC is meeting May 21-24, 2017 in Miami. This year it is sponsored by the PES; therefore, they were looking for EMC to do things to participate. There was some talk about moving the EMC meeting there, but that was not approved. They encouraged working groups to consider meeting there.
3. We reported the various statuses of the standards we oversee.
4. The EMC gave the distinguished service award to Aleksandra Jeremic for her work on the Materials Subcommittee.