

IEEE Power Engineering Society

EMC - 2019 Annual Report

Entity: ELECTRIC MACHINERY COMMITTEE

Chair: Kay Chen
Vice-Chair: John YAGIELSKI
Secretary: Jim Lau

1. Significant Accomplishments

The activity and accomplishments of the Electric Machinery Committee continued in 2019 at a high level with contributions in terms of industrial standards, various activities in PES such as emerging technology white paper, hosting panel sessions and tutorial, paper submissions, liaisons, and engagement in new initiatives addressing renewable generation. The significant items are listed below, and the plans for 2020 are given in section 5. EMC's position in leading conventional industry technology while embracing the ongoing energy transition topics attracts and helps next generation volunteers in PES to develop and contribute.

1.1. Standards

2019 had been a productive year. We had 14 Working Groups are working on revising standards on a broad range of topics. Standard IEEE 115 and IEEE 1110 completed their ballots in May and August. And 5 other PARs reached their milestone date at the end of the year. In addition to these achievements, we had been cosponsoring with EDPG on two standards in the renewable generation area:

IEEE P2800: Recommended Practice for Interconnection and Interoperability of Inverter-Based Resources Interconnecting with Associated Transmission Electric Power Systems
IEEE P2800.1: Guidelines for Test and Verification Procedures for Inverter-Based Resources Interconnecting with Associated Transmission Electric Power Systems (entity standard) We have from EMC Wes Baker acting as the P2800 secretary, and we have several other people from the committee closely involved in the standard development. Particularly on the IEEE P2800.1, it is the EMC's first experience in entity standard development. So far, the experience had been really positive which gave the committee confidence and experience in supporting entity standard development. In 2019 We also successfully completed an update to our WG P&P with the support from IEEE SA staff.

1.2. Task Forces

Due to the continued high level of discussion on the topic of evolving grid codes, their impact on large machine design and performance, and the alignment of the associated IEEE standards, a task force was launched in 2015 to review the topic and make recommendations for further activity.

- *IEEE Task Force on the Impact of Grid Codes on Generator Design and Standards*

This task force is making extremely good progress with regular online meetings, and effective

use of the IEEE *Collabratec* platform for document sharing and collaborative work. In 2019 the task force had successfully reached its goal of publishing its report. The report documents the group's important work and discoveries. They also hosted a successful webinar to reach out to the industry. The group is ready to transition into a WG and work further towards bigger goals in the coming years.

1.3. Panel Sessions and Tutorial

At the 2019 General Meeting in Atlanta, the EMC subcommittees held several successful and well-attended panel sessions and tutorial on a variety of topics addressing the hottest topics in the current power industry:

EMC held six panel sessions this year in both conventional and renewable frontiers. And our committees and subcommittees all were present and well received at the poster session promoting our committees. EMC also hosted tutorials this year. See details below

Tutorials:

1. Tutorial on pump storage hydro
2. Tutorial on Electric machine design

Panel sessions:

1. Hydro and Ocean energy – Marine Hydrokinetic
2. Synchronous Condenser Application and Renewables
3. Grid Forming Technologies and applications in Hybrid Systems of Synchronous Machines and –Inverter Based Resources
4. Advanced Topics on Machines and Drives in the Memorial of Professor M. Azizur Rahman
5. Condition Monitoring and Application of Big Data and IoT for Electrical Machines and Motor Drives
6. Super Conducting Machines

2. Benefits to Industry and PES Members from the Committee Work:

The IEEE PES Electric Machinery Committee constitutes a forum of experienced, well-qualified electrical engineers active in all walks of industry where electrical machines constitute an integral element in their successful operation and development. The committee safeguards and maintains existing IEEE standards that set requirements for consistent design, quality and performance of electrical machines ranging from industrial motors to utility synchronous generator supporting a wide variety of industry in manufacturing, transportation, and power generation etc. This committee also actively take part in making new standards to address the grid transformation. In 2019, it cosponsored two important standards P2800/P2800.1 to address integrating renewable generation. At the current critical point of energy transition, this committee currently serves a new important role. Its renewable subcommittee had been very active on topics with renewable generation and interconnection. The motor subcommittee is very engaged in the topic of electrification revolutions in transportation. The members of this committee had been actively contributing to technology roadmap activities. These commitment and involvement were evident by the busy WG activities and panel sessions in 2019.

3. Recognition of Outstanding Performance:

In 2019 the following awards were presented within the Electric Machinery Committee as recognition of the contributions made to both the IEEE PES and the EMC in particular.

- The EMC Distinguished Service Award for 2019 goes to Jim Lau, “for Organizing and Convening the EMC Synchronous Condenser Tutorial,” (first EMC tutorial in many years) and sustained administrative service to the EMC.
- The EMC Committee Chair recognition award for 2019 goes to Kay Chen.
- The EMC is recognizing three (3) outstanding technical papers in 2017. They are as follows:
 1. Shuan Dong and Yu Christine Chen, authors of, “Adjusting Synchronverter Dynamic Response Speed via Damping Correction Loop,” in Transactions on Energy Conversion, Vol. 32, No. 2, June 2017, pp. 608-619.
 2. Vahidreza Nasirian, Ajay Pratap Yadav, Frank Lewis and Ali Davoudi, authors of, “Distributed Assistive Control of Power Buffers in DC Microgrids,” in Transactions on Energy Conversion, Vol. 32, No. 4, December 2017, pp. 1396-1406.
 3. Xiao Ge, Z. Q. Zhu, Graham Kemp, David Moule and Connel Williams, authors of, “Optimal Step-Skew Methods for Cogging Torque Reduction Accounting for Three-Dimensional Effect of Interior Permanent Magnet Machines,” in Transactions on Energy Conversion, Vol. 32, No. 1, March 2017, pp. 222-232.

4. Coordination with Other Entities (PES Committees, CIGRE, standards, etc.):

In the 2019, The Electric Machinery Committee is maintaining liaises with the following IEEE committees and institutions which share common fields of interest:

- ***IAS: Industry Applications Society***
Related topics on the applications of electrical machines. Additionally, the IAS and PES are sponsors of The International Conference on Electrical Machines and Drives (IEMDC) in which the EMC is actively involved.
- ***PSRD: The Power System Relay Committee***
The PES has responsibility for relay protection tasks, some of which are of interest to the Electric Machinery Committee in that they provide protection and control functions for electric machines.
- ***ISO: International Organization for Standardization***
The ISO issues several technical standards which are of relevance to electric machines, e.g. regarding the measurement of noise and vibration, and recommended vibration limits.
- ***IEC: International Electrotechnical Commission***
CIGRE: International Council on Large Electrical Systems
The IEC issues standards on the design and performance of electrical machines which complement those of the IEEE. There is a strong liaison with common participants who work to align the requirements of these standards where conflicts and unnecessary deviations are evident.
CIGRE does not issue standards, but has Study Committees and Advisory Groups in the field of rotating machines that survey current industry practices and experience, and issue reports, guidelines, brochures and tutorials. Several EMC members participate in both CIGRE and IEEE working groups and conferences.

- ***IEEE Transportation Electrification Community***

The IEEE Transportation Electrification Community coordinates broad activities throughout the IEEE in the growing electrification revolution across transportation domains, including advances in electric and hybrid cars, more-electric ships and aircraft, rail systems, personal transport, and the motive, storage, power grid, electronic intelligence, and control technologies that make them possible. The outgoing EMC Chair, Kiruba Haran, represents PES in the TEC Steering Committee.

5. Significant Plans for the Next Period:

In 2020 EMC will have important change in leadership, the current vice chair John Yagielski will take over as the committee chair and the secretary Jim Lau will take over as the vice chair. In addition, the EMC subcommittee level will also have some changing roles. At the meantime, the committee will continue to work on the standards that are the mainstay of its contribution to industry and get involved more deeply with the ongoing “Energy Transition” topics in electric grid transformation, renewable generation and electrification revolutions in transportation. It will strive to bring the work carried out within the EMC and the benefits to a wider audience and broaden its appeal to younger engineers and foreign engineers.

Submitted by: Kay Chen

Date: January 5, 2020

