

# IEEE Power Engineering Society

## EMC - 2018 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 2018 at a high level with contributions in terms of industrial standards, hosted panel sessions, paper submissions, liaisons, and engagement in new initiatives. The significant items are listed below, and the plans for 2019 are given in section 5. Highlights for 2018 include PES EMC involvement in standard IEEE 1547 and further support in kicking off P2800 series. 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 an contribute.

#### **1.1. Standards**

2018 was a busy but transitional year. We had 14 Working Groups are working on revising standards on a broad range of topics. In addition EMC GSC also had worked through hurdles to get involved in the development of IEEE 1547, carried out discussions with IEEE 1547 WG leads to successfully reconcile differences with C50.13. Through this effort, they also raised the awareness among other technical committees to engage EMC on various new standard developments which machines are involved.

#### **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. The WG ran a well-attended Panel Session. They also presented their findings to a greater audience at the super session "driving towards less inertia". The task force had completed their report and was close in publishing it. It is discussed during the Portland GM that the task force shall transform itself into a WG in 2019.

### **1.3. Panel Sessions and Tutorial**

At the 2018 General Meeting in Portland, 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:

Tutorials:

1. Tutorial on PSS
2. Design and specification of synchronous condensers
3. Tutorial on 421.1 -421.6

Panels:

1. Grid Task Force Panel Session
2. Harmonizing IEEE Standards and NERC requirements related to synchronous generator and excitation systems for power system dynamic modelling
3. IEEE 115 Upgrading IEEE Std 115 to reflect new testing approaches and emerging sensing technologies Panel Session
4. Hydro and Ocean energy – Marine Hydrokinetic
5. Weak Grid Renewables Applications and modeling
6. Synchronous Condenser Application and Renewables
7. RECENT VIOLENT SYSTEM UPSETS AND LESSONS LEARNED
8. Advanced Topics on Machines & Drives I & II
9. Control and Condition Monitoring of Electrical 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 standards that set requirements for consistent design, quality and performance of electrical machines from a power of 10 MVA up to the largest electrical machines in the world at 2000 MVA. These machines are the most critical assets for the modern electricity industry and means significance to the reliability of the modern electricity generation. The committee currently serves a new important role in the ongoing grid transformation introduced by renewable generation. The committee is deeply involved in all the frontiers in the “grid transformation/energy transition”. The members of this committee actively contributes to technology roadmap activities as new electrical machines and drives technologies are adopted in multiple industries – including transportation, renewable energy generation, and the oil & gas sector. These commitment and involvement is evident by the busy WG activities and panel sessions in 2018.

### **3. Recognition of Outstanding Performance:**

In 2018 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.

Standards Coordinator Dr. Innocent Kamwa is awarded **PES Steinmetz Award**.

#### **EMC PRIZE PAPER AWARDS:**

<u>Year</u>	<u>Author(s)</u>	<u>Title</u>
2018	S. Gradev, J. Reuss and H.-G. Herzog	<i>Voltage-Behind-Reactance Formulation of a Multivoltage 3 Phase Hybrid-Excited Synchronous Machine</i> , Transactions Energy Conversion, Vol. 31, No. 4, December 2016
2018	Y. Zhang and A. Cramer	<i>Model Formulations for Synchronous Machine Models with saturation and Arbitrary Rotor Network Representation</i> , Transaction Energy Conversion, Vol. 31, No. 4, Dec 2016
2018	Z. Zhu, Z. Wu X. Liu	<i>A Partitioned Stator Variable Flux Reluctance Machine</i> , Transaction on Energy Conversion, Vol. 31, No. 1, March 2016

**EMC Distinguished Service Award** is awarded to Kay Chen and Robert Nelson

**EMC Past president Service Award** is awarded to Kiruba Sivasubramaniam Haran

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

In the 2018, 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.

In 2018, EMC had strengthened contacts and collaborations with CIGRE. The EMC chair and CIGRE study committee A1 exchanged current ongoing WG/task force activities and identified several areas for further collaborations. For example, there are interests from both parties to collaborate on WGs under the similar topics. The interests had been forwarded to TCPC annual meeting for further guide

#### **5. Significant Plans for the Next Period:**

In 2019 the EMC 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.

- Strengthen collaboration with CIGRE/IDMEC on several frontier topics to join forces as well as increase participation and influence.
- Sponsor the P2800 series standards to support IEEE’s activity in improving electricity grid transformation
- Continue joint conferences with the IEEE Transportation Community and AIAA on electrification of commercial transport aircraft

**Submitted by: Kay Chen**

**Date: January 31, 2019**

