

2016

**Entity: Energy Development and Power Generation Committee**

**Chair: Michael J. Basler**

**Vice-Chair: Ward T. Jewell**

**Secretary: John B. Yale**

**1. Significant Accomplishments:**

The Energy Development and Power Generation Committee (ED&PGC) was selected for the IEEE PES Technical Council Outstanding Technical Committee of the Year Award in 2016, a much appreciated accomplishment.

The Committee has expanded to incorporate a new subcommittee, the Integration of Renewables Subcommittee. They are working with the newly named Renewable Technologies Subcommittee to define each subcommittee's role and address technical areas of interest.

The Committee is made up of the following subcommittees:

- Distributed Energy Resources
- Excitation Systems and Controls
- Hydroelectric Power
- Integration of Renewables
- International Practices
- Renewable Technologies
- Station Design, Operation and Control
- Technologies for GHG Mitigation & Adaptation

Significant accomplishments in the past year are broken down by subcommittee as follows:

The Distributed Energy Resources Subcommittee Working Group “Global Laboratory Infrastructure for Distributed Energy Resources – Application and Testing” has started its work on surveying installations. It is planned to distinguish among power-hardware-in-the-loop, controller-hardware-in-the-loop, and multi-energy-domain facilities.

The Excitation Systems and Controls Subcommittee updated IEEE Std. 421.3 - IEEE Standard for High-Potential Test Requirements for Excitation Systems for Synchronous Machines. The updated standard was published on 23<sup>rd</sup> June 2016. The subcommittee also completed updates to and publication of IEEE Std. 421.5 - IEEE Recommended Practice for Excitation System Models for Power System Stability Studies. This standard was approved 15<sup>th</sup> May 2016 and has been extensively updated to include many new models and to add limiter inputs to existing models. Other sections including saturation and per unit definitions have also been updated. Finally, the subcommittee sponsored a panel session at the GM 2016 on the subject of “Use of the new revisions of IEEE Standards 421.2 and 421.5 to satisfy international grid code requirements.”

The Hydroelectric Power Subcommittee has received approval from REVCOM in December 2016 for the publishing of IEEE P1827, Guide for Electrical & Control Design of Hydroelectric Water Conveyance Facilities.



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The document's assigned IEEE program manager anticipates publishing by the end of March 2017. This guide fills an industry void for electrical and control design of water conveyance facilities associated with hydroelectric projects.

The Renewable Technologies Subcommittee (RTSC) has two working groups: Photovoltaics and Electric Vehicles. They both met during the 2016 GM in Boston. The highlight of the activities in Boston was the highly successful Panel Session entitled "Smart Integrated Renewable Energy Systems (SIREs), organized and chaired by Dr. Ramakumar. It attracted as many as 50 attendees. In addition, A Panel Session entitled "Current R&D in Photovoltaics: Technology and Grid Integration" was organized by the Photovoltaics Working Group of RTSC. It was well participated.

The International Practices Subcommittee has five Working Groups that cover Europe, Latin America, Asia/Australia, China, and Africa. Their primary scope is to provide depth and breadth updates and insights on global best practices in the areas of: energy policy; energy regulation; standardization and interoperability; Research, Development, Demonstration and Deployment (RDD&D); design & engineering; maintenance and operations; new business model; new technology/solutions and integration trend; etc. across the entire value chain (from generation to end customer). This reflects regional and country level diversity, differences and approaches in addressing how energy innovation effectively addresses technical, business, societal and environmental challenges through financial measures, industry collaboration and ecosystem of stakeholders (government, businesses, academia and customers).

The Station Design, Operation, and Control Subcommittee has three working groups, all related to standards. The standards are IEEE Std 665-1995 IEEE Guide for Generating Station Grounding, IEEE Std 666-2007 IEEE Design Guide for Electric Power Service Systems for Generating Stations and IEEE Std 1050-1989 IEEE Guide for Instrumentation and Control Equipment Grounding in Generating Stations.

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

The various subcommittees within the Energy Development and Power Generation Committee inform members and other interested individuals through standards and paper / panel sessions as mentioned above on new developments in their areas of expertise.

## **3. Benefits to Volunteer Participants from the Committee Work:**

By actively working on the committee, members are able to contribute their knowledge to the industry while at the same time earning Professional Development Hours that count toward their various PE continuing education requirements.

Volunteers get opportunities to propose panel sessions, discuss cutting edge power system operation and planning problems with leaders and experts in specific fields, and invite right individuals to attend panel sessions. Volunteers also benefit from technical paper reviews and presentations.

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

Jay A. Anders is being recognized by the IEEE PES Technical Committee and Hydroelectric Power Subcommittee for his exemplary leadership, service, and commitment to the Hydroelectric Power Subcommittee as Chair from 2014 to 2016.

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



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The Distributed Energy Resources Subcommittee has informal exchanges with CIGRE Study Committee C6 "Distribution Systems and Dispersed Generation". Professor Nikos Hatziargyriou acted as a liaison and informed in the last meeting of the DER subcommittee in Boston on CIGRE SC C6.

The Excitation Systems and Controls Subcommittee members Thornton-Jones, Egretzbürger, Baechle and Seeger attended IEC MT12 meeting on 31<sup>st</sup> Jan 2017 where IEC Std 60034-16-3 and -2 were reviewed. Additional models were presented by IEC MT members including PSS2RU stabilizer model and relay forcing model. Testing requirements of 60034-16-3 were also reviewed. The IEC MT12 meeting agreed to work towards retiring of the IEC Std 60034-16-2 whilst working to include the PSS2RU and relay forcing models into IEEE Std. 421.5 which has been reopened for updating as explained above. Further details will be provided by Russian IEC participants and these will be reviewed by the ESCS members with the aim of merging the details into the document. IEEE WG and IEC MT members will work with respective organizations to determine appropriate actions to achieve joint logo standard using the joint logo Generator Switchgear standard as an example.

In addition, members of the Excitation Systems and Controls Subcommittee are working with the Electric Machinery Committee (EMC) Generator Subcommittee Task Force to prepare a report as an IEEE special publication on the Impacts of Grid Codes upon Generator Design and Standards towards preparation of a report entitled: "Coordination of Grid Codes and Generator Standards: Consequences of Diverse Grid Code Requirements on Synchronous Machine Design and Standards".

Finally, members of the Excitation Systems and Controls Subcommittee are working with Power System Relaying Committee (PSRC) WG J13 and Power Systems Dynamic Performance Committee (PSDPC) to review the requirements for generator short circuit clearance time frequently specified in procurement specifications and continue work on a report entitled "Modeling of Generator Controls for Coordinating Generator Relays".

The Hydroelectric Power Subcommittee maintains a Category D Liaison with IEC/TC 4, Hydraulic Turbines, Randall Groves. Additionally, they are targeting input to National Electric Code (NFPA 70) 2020 version small hydro section through Liaison, James Volk. Finally, they are considering the State Grid Corporation China (SGCC) Smart Hydropower Plant Integrated Solution PAR.

## **6. New Technologies of Interest to the Committee:**

The Distributed Energy Resources Subcommittee has promoted interest in laboratory infrastructures for DER application and testing with the working group titled "Global Laboratory Infrastructure for DER (Distributed Energy Resources) – Application and Testing.

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

The Distributed Energy Resources Subcommittee has submitted proposals for four panels for the IEEE PES General Meeting 2017 as follows. Melanie Johnson and Anurag Srivastava propose "Microgrid security"; Caisheng Wang leads "Analysis, integration and implementation of distributed energy storage in power systems"; Michael Negnevitsky co-ordinates "High renewable energy penetrations within isolated and remote area power systems"; Ben Kroposki and Mark o'Malley propose "Unlocking grid flexibility - energy systems integration.

The Excitation Systems and Controls Subcommittee submitted a new standard, IEEE Std 421.6 - Recommended Practice for the Specification and Design of Field Discharge Equipment for Synchronous Machines. This standard is in the process of a recirculation ballot and is expected to be published in 2017.



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In addition, the Excitation Systems and Controls Subcommittee members have proposed that a panel session for PES GM 2017 should include the subject of “Further recent revision of IEEE Standard 421.5 including Coordination with IEC 60034-16 Standards.”

The Hydroelectric Power Subcommittee began planning in October 2016 for two sponsored panel sessions for the upcoming 2017 PES General Meeting titled, “IEEE Standards and Guides Developed by the Hydroelectric Power Subcommittee” and “Integrating Wind and Solar with Your Hydro.” In addition, the Subcommittee has 4 documents (IEEE 1010, 1147, 1248, and 125) under revision with active PARs.

The Renewable Technologies Subcommittee is working to increase interest in the Electric Vehicle working group and to add other renewable technologies such as ocean energy (tides, waves and thermal), geothermal and possibly biomass. They are also organizing three Panel Sessions for the 2017 GM in Chicago, IL during July 16-20, 2017. They are (i) solar photovoltaic, (ii) electric vehicles and (iii) general renewable topics.

The Station Design, Operation and Control Subcommittee has three approved PARs for standards development and is planning work on these standards in 2017.

**8. Global Involvement**

PES is looking to increase involvement with members from Regions 8, 9 and 10 (Africa, Europe, Middle East, Latin America, Asia and Pacific). Please provide the following information

Total Number of committee members	Officers from regions 8,9 and 10	Subcommittee officers from regions 8, 9 and 10	Subcommittee members from regions 8,9, and 10
57 total, 6 from regions 8, 9 and 10.	2	2	>10

**Submitted by: Michael J. Basler**

**Date: 1/31/17**