

IEEE Power and Energy Society Entity Annual Report

2015

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) is adapting to the changes proposed by the Power and Energy Society. We have spent significant effort integrating our committee into the new structure. These changes include the addition of a portion of the Transmission and Distribution Committee, specifically the “Integration of Renewable Energy into the Transmission and Distribution Grids Subcommittee,” which resulted in a new subcommittee being formed in ED&PGC with the title of “Integration of Renewables Subcommittee”. There was also a move of the Energy Storage portion of the Distributed Generation and Energy Storage Subcommittee to a new Committee titled “Energy Storage and Stationary Battery”. The remainder of that subcommittee was renamed the “Distributed Energy Resources Subcommittee”. The topic of Biogas has been added to the Renewable Technologies Subcommittee. The request to eliminate the Climate Change Technologies Subcommittee was modified to a proposed name change for that subcommittee to “Technologies for GHG Mitigation & Adaptation”. Finally, the proposal to fold in the Wind and Solar Power Coordinating Committee appears to have been rejected and is not included here. The proposed subcommittee structure is as follows:

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

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

The Distributed Energy Resources Subcommittee has developed a new working group entitled “Global Laboratory Infrastructure for DER (Distributed Energy Resources) – Application and Testing”. The new working group will give a clearer picture on the

different existing laboratories setups for testing the capabilities of DER and on the requirements on testing equipment.

This is in addition to the existing working groups that cover the topics of “Microgrid Applications and Implementation” and “Management of Large Scale Battery Storage Systems”.

The Excitation Systems and Controls Subcommittee is in the process of publishing a revision of IEEE Std 421.3 on High Potential Testing of Excitation Systems.

They are also in the process of balloting IEEE Std 421.5 on Recommended Practice for Excitation System Models for Power System Stability Studies. This standard 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. The updated document was submitted for balloting on 19th October 2015. A PAR extension has been approved to enable completion of the ballot process.

Finally, a new draft standard IEEE Std 421.6 on Recommended Practice for the Specification and Design of Field Discharge Equipment for Synchronous Machines has been created and taken to ballot. Ballot comments were reviewed at PES GM 2015 and the comments will be incorporated on next submission by the end of 2015.

The Hydroelectric Power Subcommittee has published IEEE Std 810 – 2015, Standard for Hydraulic Turbine and Generator Shaft Couplings and Shaft Runout Tolerances and are in the process of finalizing IEEE P1827, Guide For Electrical & Control Design of Hydroelectric Water Conveyance Facilities.

This standard is expected to be approved by working group January 2016 and seek a sponsor ballot in February 2016. This guide fills an industry void for electrical and control design of water conveyance facilities associated with hydroelectric projects.

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).

They organized 14 out of 20 panel sessions sponsored by the ED&PGC at the 2015 PES General Meeting with attendance of approximately 600 IEEE PES members total. The panel session topics included:

1. HVDC Grids - The European Perspective
2. Impact of Green Generation on Power Systems – Experiences, Investigation Methods and Future Evolutions towards successful Integration
3. Transmission System Security and Blackout Prevention
4. Ice-Breaking Projects in Electric Power System Engineering
5. Stochastic operation and planning considering renewable integration
6. International Practices for Smart Grid Deployment and Operation
7. International Practices for Clean Energy Generation and Management Worldwide
8. International Practices and Standard for Global Energy Internet
9. Experience on Smart Grid Applications in Asia & Australasia
10. Impact of Water/Energy Regulations on Smart Grid
11. Integrated Resource Planning Considering Gas and Water Constraints
12. Demand response in fast growing countries: Challenges and opportunities
13. Emerging optimization models and concepts to design transmission networks in modern power systems
14. Leveraging the Power Africa Initiative-Perspectives

The Station Design, Operation, and Control Subcommittee have 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. The subcommittee is in the process of forming working groups or developing PARs for these standards.

The Technologies for GHG Mitigation & Adaptation Subcommittee (formerly Climate Change Technologies) hosted a tutorial titled “GHG Emissions Standards for the Power & Energy Sector - Design and Application” at 2015 PES General Meeting along with two panel sessions:

1. Integrated Resource Planning Considering Gas and Water Constraints, chaired by Shuai Lu and Maike Luiken
2. Stochastic operation and planning considering renewable integration, Chaired by Ning Lu and Pengwei Du

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

The Distributed Energy Resources (DER) Subcommittee provides benefit to the industry and PES members through information presented at panel sessions on new developments in the field of DER.

The Hydroelectric Power Subcommittee (HPS) presented two panel sessions during the 2015 PES General Meeting titled, “IEEE Standards and Guides Developed by the Hydroelectric Power Subcommittee” and “Hydroelectric Power Plant Unit Control Modernization Schemes.”

The HPS Standards and Guides 2015 PES General Meeting Panel Session introduced all HPS responsible standards and guides and focused on IEEE 1147, Guide for the

Rehabilitation of Hydroelectric Power Plants, IEEE 1249/ IEC 62270, Guide for Computer-Based Control for Hydroelectric Power Plant Automation, IEEE 1248, Guide for the Commissioning of Electrical Systems in Hydroelectric Power Plants, and IEEE P1827, Draft Guide for Electrical and Control Design of Hydroelectric Water Conveyance Facilities.

The HPS Unit Control Modernization 2015 PES General Meeting Panel consisted of a presentation by utilities, consultants, and manufacturers on the unit control modernization schemes they have utilized in recent years. These schemes range from hardwired logic (relay controls) to PLC/computer controls. The advantages and disadvantages of the different schemes were explored.

The Technologies for GHG Mitigation & Adaptation Subcommittee sponsored a tutorial and two panel sessions. The main benefit of the tutorial was helping industry and academe to understand environmental regulations on GHG emissions. The panel sessions provided a good platform for technical and knowledge exchange among industry, research institute, and universities on power system operation and planning topics.

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 earn PDH's to count toward their various PE continuing education requirements.

Volunteers got 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:

Dr. Maren Kuschke and Professor Kai Strunz, both with Berlin University of Technology, received the IEEE PES Prize Paper Award 2015 for the article "Transient Cable Overvoltage Calculation and Filter Design: Application to Onshore Converter Station for Hydrokinetic Energy Harvesting".

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

The Committee's Hydroelectric Power Subcommittee maintains a Category D Liaison with IEC/TC 4, Hydraulic Turbines, Randall Groves.

The Committee's Hydroelectric Power Subcommittee is targeting input to National Electric Code (NFPA 70) 2020 version small hydro section through Liaison, James Volk.

The Committee's Hydroelectric Power Subcommittee is considering the State Grid Corporation China (SGCC) Smart Hydropower Plant Integrated Solution PAR. Sponsorship determination expected in 2016.

Members of the ED&PGC Excitation Systems and Controls Subcommittee are working with Power System Relaying Committee (PSRC) WG J13 and Power Systems Dynamic Performance Committee (PSDPC) on a report entitled "Modeling of Generator Controls for Coordinating Generator Relays".

Members of the ED&PGC Excitation Systems and Controls Subcommittee are working with the Electric Machinery Committee (EMC) Generator Subcommittee Task Force 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".

The Distributed Energy Resources Subcommittee plans to coordinate with the newly proposed IEEE PES Committee "Energy Storage and Stationary Battery". A good starting point of co-operation would be an affiliation of the working group "Management of Large Scale Battery Storage Systems, which was inaugurated by the DER Subcommittee.

6. New Technologies of Interest to the Committee:

With the change of name from DGES (Distributed Generation & Energy Storage) to DER (Distributed Energy Resources), the Subcommittee plans to refocus its scope on distributed energy resources and their applications in power and energy systems. Energy storage as such is no longer singled out. Of course, when energy storage is considered as a distributed energy resource, for example when appearing in the context of a microgrid, then this application is part of the committee's scope.

The Technologies for GHG Mitigation & Adaptation subcommittee plan to investigate integrated resource planning considering gas and water constraints along with stochastic methods used for mitigating the impact of extreme weather events

7. Significant Plans for the Next Period:

The Hydroelectric Power Subcommittee is considering conducting a panel session at the 2016 HydroVision meeting to showcase the efforts of the group and the standards we are working on.

The Excitation Systems and Controls Subcommittee has proposed a panel session for PES 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 Distributed Energy Resources Subcommittee has submitted proposals for two panels for the IEEE PES General Meeting 2016: "Measuring and Enabling Resiliency using

Microgrid” and “Flexible Energy Systems”. Furthermore, it is planned to start activities related to the WG “Global Laboratory Infrastructure for DER – Application and Testing.”

The Technologies for GHG Mitigation & Adaptation Subcommittee plans a Tutorial and Panel Sessions at 2016 PES General Meeting.

Tutorial

GHG Accounting for the Power Sector, including the Definition, Integration and Quantification of Green Energy hosted by Jim McConnach and Pengwei Du

Panel Sessions

1. Enhancing the resiliency into the grid infrastructure chaired by Jim McConnach
2. Operation and Planning Considerations for mitigating GHG chaired by Chunlian Jin and Pengwei Du

They also are planning a panel session at 2016 T&D meeting

1. Joint Sessions: Cost benefit studies of GHG Mitigation & Adaptation Technologies chaired by Pengwei Du and Ning Lu

Submitted by: Michael J. Basler

Date: 1/5/16