Special Report

Ronan Jamieson – C2: Power System Operation and Control

Study Committee C2 – Power System Operation and Control

C2 covers the technical, human resource and institutional aspects and conditions for a secure and economic system operation of power systems in a way that is in compliance with requirements for network security, against system disintegration, equipment damages and human injuries, and security of electricity supply.

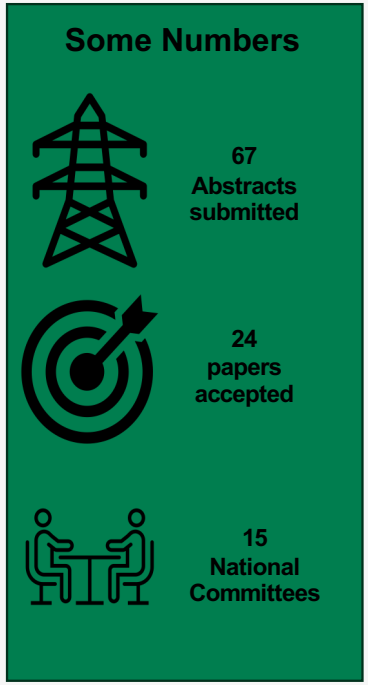
The summary of the 2024 Paris Session Papers- I
Special Reporter – Vivek Pandey

Preferential Subject 1 - **Create operational resilience to extreme/unpredictable events**

- Natural phenomena forecasting applied to operation planning studies & real time decision support.
- Threats and hazards from other systems that affect supply/demand of electricity.
- Lessons learned & best practices to deal with high impact/low probability events on system operation.

Best paper nomination : Advancing Forecast Technique for Photovoltaic Power Generation in Kansai Area under Snow Conditions - Shiho NAKATA, Takayuki YOSHIDA, Shota MIYAKE

UK paper : Holistic Approach to Solving the Current Zero Missing Phenomenon in Cable Compensated Networks - Fabian KOEHLER (SSE)

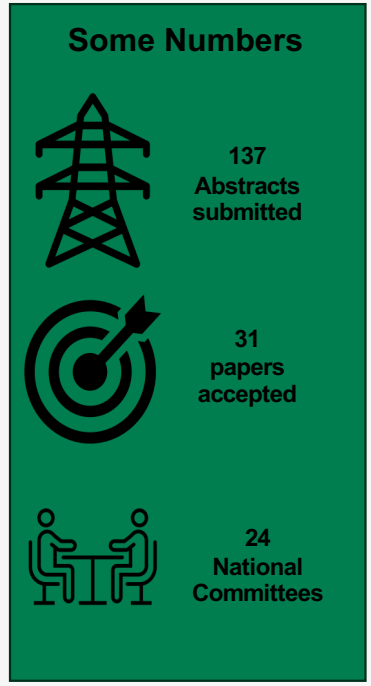


The summary of the 2024 Paris Session Papers- II Special Reporter – Ronan Jamieson

Preferential Subject 2 - **Changes on system operation and control considering the energy transition**

- Disturbances and system restoration in power systems with a high share of inverter-based resources.
- Flexibility and ancillary services for high RES share environments.
- Power system operation strategies & operation planning studies considering a high share of RES.

Best paper Nomination: GridOptions Tool: Real-World Day-Ahead Congestion Management using Topological Remedial Actions - Jan VIEBAHN, Sjoerd KOP, Joost van DIJK, Hariadi BUDAYA, Marja STREEFLAND, Davide BARBIERI, Paul CHAMPION, Mario JOTHY, Vincent RENAULT, Simon TINDEMANS



Highlights of some papers from PS1

Advancing Forecast Technique for Photovoltaic Power Generation in Kansai Area under Snow Conditions (10872) - **Shiho NAKATA, et al (Japan)**

Summary: An improved solar PV power prediction method that considers the effect of snow cover, temporal change in snow and movement vector of clouds besides solar radiation on Solar PV panels.

Conclusion: Two different techniques were verified; a solar radiation forecasting technique using snow depth and the satellite images, followed by a synthesis technique which combines the two. We verified the effectiveness of the synthesis method using actual data from a day with heavy snowfall. The results showed that the RMSE of PV power outputs was reduced by about half.

Highlights of some papers from PS2

GridOptions Tool: Real-World Day-Ahead Congestion Management using Topological Remedial Actions (10528) - **Jan VIEBAHN, et al (Netherlands)**

Summary: Congestion is one of the major system risks for transmission system operators. At the same time, topological remedial actions still represent a largely unexploited form of non-costly flexibility due to the combinatorial explosion in the number of possible actions. Also, the tool offers a simple user interface which is developed in interaction with operators to satisfy their cognitive needs.

Conclusion: The tool successfully recommended to operators topological remedial actions to mitigate congestion in the day-ahead/intraday timeframe, that were a significant improvement compared to both the situation in which no topological remedial actions are applied and the known operator strategies.

Highlights of some papers – PS2

Mitigating Continental Europe North-South Oscillations Using An Adaptive Wide-area Damping Controller: Field Implementation and Testing (10448) - **Lin ZHU, et al (USA/Italy)**

Summary: The field implementation and testing of the measurement-based adaptive Wide Area Damping Control (WADC). This is providing system operators with a novel automated wide-area monitoring protection and control (WAMPAC) tool that mitigates natural oscillations and enhances secure operation of power grids.

Conclusion: The field implementation and testing of the measurement-based adaptive WADC at the Italian Transmission System Operator - Terna, demonstrated that the WADC can improve the damping ratio of the targeted oscillation mode.

Highlights of some papers – PS2

Outage Planning Automation and Optimization on Swiss Electricity Transmission System with High Shares of Hydropower Generation (10748) - **Davood RAOOFSHEIBANI, et al (Switzerland)**

Summary: The first step towards automation and optimization of outage scheduling. The technical and non-technical constraints for the scheduler optimizer are derived from real outage planning business cases and programmed using multi-objective Mixed Integer Linear Programming (MILP). The structure of the outage scheduler platform is followed by the validation of the scheduler for the already planned outage requests of 2023 in a year-ahead outage planning process.

Conclusion: The results of the scheduled outages from the developed algorithm outperforms the ones which were performed manually based on operator's experience. Consequently, more network capacity is acquired which leaves room for additional unpredictable outages.

Potential relevance to the UK CIGRE Members

From the 55 papers presented at the Paris session, the following themes can be considered as areas of relevance

- Enhanced usage of wide area monitoring systems to assist in identifying system disturbances and solutions as early as possible
- Improved power system studies to better simulate potential issues early in the planning process thereby enabling early identification of solutions
- Improved understanding and shared learning on how to optimise frequency control using wind, solar in combination with battery storage
- The growing use of advanced computation techniques (machine learning, genetic algorithms) to speed up the process of finding an optimise solution

Summary and feedback from the GDM

(PS1) **Create operational resilience to extreme/unpredictable events** – During the general discussions there were concerns

- Regarding emerging challenges for human performance at the control center and the application of new technologies for decision support.
- Members opined that reliability of automated decision making and human performance is critical for reliable operations.
- Collaboration for improving operator training,
- The growing need for improving modelling tools
- Reinforce the offline support to real-time control centre operations

(PS2) **Changes on system operation and control considering the energy transition** – During the general discussions there were concerns

- Around the complexities of modelling demand,
- Should ancillary services really be considered ancillary now or should they be considered as essential (especially if they are considered for system reliability).
- In reality of the amount of demand that could be really be considered as “flexible”
- How to reach the end consumers to increase participation.