IEEE PES Task Force on IBR SSO – Events, Studies, Detection, and Solutions: Meeting Minutes

When: July 24th, 2024, 10 am – 12 pm, US Pacific Time

Where: Room 432, Seattle Convention Center – Summit, WA, IEEE PESGM 24

1. Introduction of Attendees

	Name	Affiliation
1	Zhaongda Chu	Imperial College London
2	Hossein Mohsenzadeh	UCR
3	Farrokh Aminifar	Quanta Tech
4	Adedasola Ademola	Dominion Energy
5	Jaime De LaRee	Dominion Energy
6	Ani Gole	Univ. of Minatoba
7	Xi Lin	Powertech Labs
8	Ali Yazdanpanah	ERCOT
9	Xu Bingyin	Shandong University Of Technology
10	Yanfeng Gong	SEL
11	Sarika Solanki	Went Varginia University
12	Mukesh Das	Electranix Corp.
13	Phani Marthi	Oak Ridge National Lab
14	Chan Khu Shin	Inha Univ.
15	Miao Fan	Fire Dimensions Energy
16	Mj Yang	Hitachi Energy
17	Ramij Raha Hossain	PNNL
18	Yan Xn	NTU
19	David Sanchez	Unicamp
20	Jimmy Zhang	AESO
21	Evan Neel	Lancinm
22	Erangelos Farantatos	EPRI
23	Kaustav Chartterjee	PNNL
24	Zhangyu Wang	RWE
25	Rabi Kar	Univ. of South Florida
26	Ibrahim Alsaleh	Unicv. Of Hail
27	Sudip Manandhar	Southern Company
28	Yasser Mohammed	Univ. Of Alberta
29	Ben Marshall	National HVDC center
30	Siqi Bu	Hongkong Polytechnic Univ.
31	Jihun Kim	Dong-Seoul Univ.
32	James Marshall	Black and Veatch
33	Chetan Mishra	Dominion Energy
34	Anuradha Dissanoyah	Electranix Corp.
35	Garth Irwin	Electranix Corp.
36	Mark Mangaliag	Electranix Corp.
37	Shuan Dong	NREL
38	Srayashi Konar	GE
39	Kaustav Deep	Univ. of Minatoba

40	Sayak Mukharjee	PNNL
41	Amro Quedan	ERCOT
42	Yonggang Zhang	Univ Kassel
43	Jim Follum	PNNL
44	Ke Chen	Siemens Energy
45	Dave Beaudoin	Hydro-Quebec
46	Julia Hariharan	ERCOT
47	Jihun Kook	Yonsei Univ.
48	Panagiotis Papadopoulos	Univ . Manchester
49	Sijia Geng	John Hopkins Univ.
50	Qiuhua Huang	Colorado school of mines
51	Nitish Sharma	Baywa R. E.
52	Ahda Pavani	Fed. Univ. of ABC, Brazil
53	David Raschka	ABB
54	Jenny Zhou	PSC consulting
55	Jiutao Wang	Imperial College London
56	Luke Doseik	Union College
57	Arunprasanth Sakthi	RTDS Tech.
58	Yohan Jang	Hanyang Univ.
59	Flavio Fernandez	Digsilent GmBH
60	Joe Chow	RPI
61	Lin Zhu	EPRI
62	Tapan Manna	Burns & McDonnell
63	Kamal Garg	SEL
64	Hamzeh Devarikia	ERCOT
65	Sungyun Choi	Korea Univ.
66	Shruti Rao	GE Vernova Cunsulting
67	Niraj Dahal	MISO
68	Zhixin Miao	Univ. of South Florida
69	Janusz Bialek	Imperial College London
70	Marco Chiaramello	RTE Franco
71	Patrick Panciatici	RTE Franco
72	EMANUEL BERNABEU	PJM Interconnection
73	Di Wu	North Dakota State Univ.
74	Yue Zhu	Imperial College London
75	Anuradha Kariyawasam	Electranix Corp.
76	Xavier Guillaud	LZEP
77	Yunzhi Cheng	ERCOT
78	Xiongfei Wang	KTH Royal Institute of Technology
79	Sudipta Dutta	EPRI

2. **Task Force Meeting**

   a. **Agenda**

   The face-to-face Task Force meeting was moderated by Dr. Yunzhi Cheng, the chair. Starting with reviewing the major activities accomplished in the past year since IEEE PESGM 2023, including the 2024 Spring Technical Workshop at ESIG and published paper entitled "Real-World Sub-synchronous Oscillation Events in Power Grids With High Penetrations of Inverter-Based Resources" authored by several of Task Force members won the Technical Committee Prize Paper Award 2024 from IEEE PES Analytic Methods for Power Systems (AMPS) and Outstanding Paper Award from IEEE Transactions on Power Systems (TPWRS). Followed by introduction of the invited speakers to the Task Force meeting. There are 5 presentations planned in this year's meeting to focus on the IBR SSO events, studies, detection and solutions from different aspects. At the end, Dr. Cheng concluded the meeting with future plans of activities and upcoming meetings.

   b. **Presentation**

      i. Dr. Yunzhi Cheng, ERCOT, "Recent SSO events in ERCOT"
      SSO events observed by ERCOT recently are presented by Dr. Cheng with details. The presentation includes several types of IBR related sub-synchronous oscillations, including a newly investigated transformer saturation related oscillation. During Q&A, it was mentioned that ERCOT is evaluating if transformer saturation should be included in the planning stage to prevent such oscillation issue.

      ii. Prof. Xiongfei Wang, KTH Royal Institute of Technology, "Low-frequency resonances with GFM converters"
      Prof. Wang gave a presentation on their recent research on low-frequency resonances with grid-forming converters from power electronics perspectives, including demonstrating the implemented testbed structures, observed IBR SSO events, and proposed. Different oscillation phenomena and root causes were compared and discussed. A question received from PJM professional is about the adoption of adaptive control, which may bypass the tuning of converter control parameter. However, it was discussed and agreed that the best approach is to tune IBR based on the real-world operating conditions with regular technical updates.

      iii. Dr. Sudipta Dutta, EPRI, "Sub-synchronous interactions - tools and new considerations"
      A presentation on the detections and solutions of sub-synchronous interactions among inverter-based FACT devices, resources and loads is made by Dr. Dutta from EPRI. The toolset presented was an impedance-scan-based tool in positive sequence and EMT environment with a short circuit analysis tool.

      iv. Prof. Yue Zhu, Imperial College London, "Impedance-based method for SSO root cause tracing and early warning"

An open-source SSO analysis tool implemented in MATLAB environment was developed and introduced by Prof. Zhu in the Task Force meeting. It was developed in frequency-domain and validated with EMT simulation test benches to assist system operators with SSO analysis, where IBRs are usually black-box.

v. Prof. Di Wu, NDSU, "Oscillation analysis for power systems dominated by grid-forming converters"
In the last presentation, Prof. Wu demonstrated the research work accomplished based on Kauai Island SSO event reported in 2023. The event is different and new because of the stiff grid condition with GFM converters. It was introduced in three major parts: (1) system implementation and EMT simulation results that show oscillations against each other; (2) mode shape analysis that identified the root cause; (3) participation factor analysis.

c. **Future Plan**
At the end of Task Force meeting, Dr. Cheng concluded the meeting and indicated further collaborations for more IBR SSO related investigation and discussions, especially related to GFM IBRs. The Task Force meeting will continue in the coming year PESGM with additional activities to be scheduled.

3. **Adjourn – The meeting adjourned at 5 pm.**
4. **Meeting pictures**
   a. **During Prof. Wang's presentation.**

b. During Dr. Dutta's presentation.