

IEEE PES Task Force IBR SSO: Meeting Minutes

When: July 18, 2023, 3 pm- 4 pm, US Eastern Time

Where: Bayhill 19, IEEE PESGM 2023, Orlando FL

Attendees

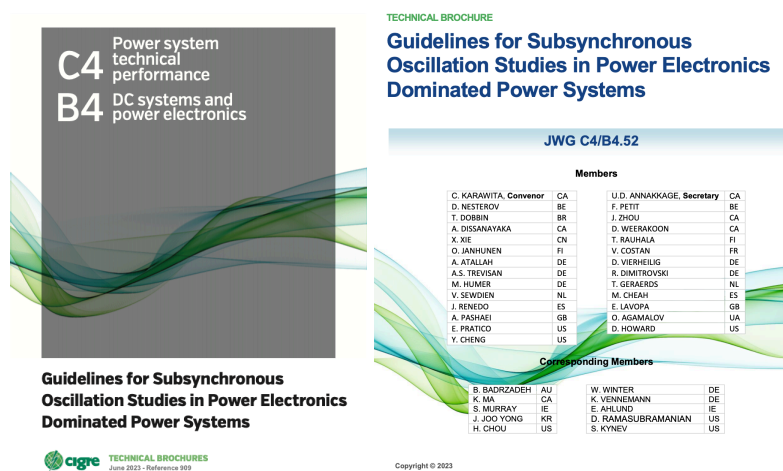
Name	Company
Ignacio Vieto	General Electric
Di Wu	North Dakota State University
Sungyun Choi	Korea University
Tong Huang	San Diego State University
Bikram Guha	Hitachi Energy
Lin Zhu	EPRI
Jigisha Desai	Power Engineers
Daniel Leon	Power Systems Consulting
Nilesh Modi	AEMO
Shahil Shah	NREL
Jean Belanger	OPEL-RT
Shuan Dong	NREL
Xiaonan Lu	Purdue University
Jin Tan	NREL
Stephen Miller	IEEE
Gaurav Malviya	Grid India
Hung-Ming Chou	Dominion Energy
Yashpdhan	NREL
Sijia Geng	John Hopkins University
Ian Hiskens	University of Michigan
Hung Nguyen	Nanyang Technological University
Rey Ramos	Southern Company
Sudipta Dutta	EPRI
Mengxian Sun	Shanghai University of Electric Power
Saibal Ghosh	Grid India
Xiaoyao Zhou	National Grid
Ratik Mittal	USF
Rahul H. Ramakrishna	USF
Huazhao Ding	USF
Zhengyu Wang	RWE
Rabi Kar	USF
Yunzhi Cheng	ERCOT
Lingling Fan	USF

1. Introduction

The attendees introduced their names and affiliations.

2. Update on the TF activities by Lingling Fan

- Panel session on Thursday 10am – 12 pm, Celebration 3
Title: Inverter-based Resource Oscillations: Real-World Events and Root Cause Analysis
Panelists: Sudipta Dutta (EPRI), Li Bao (Eversource), 최승연 [Sungyun Choi] (Korea University), Jin Tan (NREL), Yunzhi Cheng (ERCOT), Lingling Fan (USF)
- The following related activities on SSO were described.
 - [CIGRE technical brochure](#) 909: Guidelines for Subsynchronous Oscillation Studies in Power Electronics Dominated Power Systems. This TB was released in 2023 by JWG C4/B4.52. total page number: 183. It covers not only IBR but also HVDC SSO events. Many IBR SSO TF members are also the CIGRE working group members.



- EPRI's SSO workshop (April 2023)- Sudipta Dutta organized this workshop in April. The presentations and recording can be found from this link.
<https://www.epri.com/events/539B60D7-57DA-4252-9968-FB1754EE3B66>
--attachments



Event Details

Sub-Synchronous Oscillations (SSO) Workshop - Spring 2023

April 20, 2023

Charlotte Office Bld 3

West W.T. Harris Blvd
Room 741 E/F
Charlotte, North Carolina 28262
USA

[View Map](#)

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About The Event

With growing penetration of inverter-based resources in the power systems, reports of events and concerns of adverse interactions in sub-synchronous frequency range have also been growing. Since these interactions can have different drivers, studying them is a challenging and complex process. This workshop will bring together utilities, system operators, OEMs, software vendors, industry working groups, national labs, and representatives from academia to share their experiences in the area of sub-synchronous oscillations. The workshop will be offered in a hybrid format.

Presenters include Baj Agrawal from Arizona Public Service, Bruno Leonardi from EPRI, Chandana Karawita of Transgrid (convenor of the CIGRE TB), LinZhu of EPRI, Sudipta Dutta, Wes Baker of Southern Company, Rob O’Keefe of AEP, Saw Linn of LADWP, Sridhar Sahukari of Orsted, Yunzhi Cheng, and Lingling Fan.

- o AEMO 15-20 Hz SSO activities - <https://aemo.com.au/en/energy-systems/electricity/national-electricity-market-nem/system-operations/power-system-oscillations>
- o ESIG’s oscillation manual organized by Nick Miller – this manual is yet to be published by ESIG.

3. Presentations & Discussion

- Mengxian Sun, a Ph.D. student from Shanghai University of Electric Power presented the research work “Dynamic Short Circuit Ratio for Stability Assessment of Grid Connected VSC-HVDC Systems Involving Broad Frequency Oscillatory Behavior”. This work is based on a paper published in IEEE trans. Power Systems: <https://ieeexplore.ieee.org/document/10044223>
- Abstract: As more renewable resources are integrated into the receiving-end AC grid through VSC-HVDC, the grid connected VSC-HVDC system is facing a critical dynamic stability issue involving multiple-frequency oscillatory behaviors, which mainly stems from the low-system-strength and the time-varying phase shift. This paper proposes a general stability analysis method to measure the dynamic stability of grid connected VSC-HVDC system from the point of view of input to state stability (ISS). A nonlinear time-varying discrete-time state space model (NTDS 2 M) of the grid connected VSC-HVDC system is built considering the impact of the time-varying phase shift. Then, the NTDS 2 M is decomposed into several interconnected subsystems. The general asymptotic gain matrix (GAGM), whose elements are derived from the proposed dissipative-form sum-type inequalities (DSIs), is constructed to quantify the interactions between multiple subsystems. Finally, a general dynamic stability analysis index, called dynamic short circuit ratio (DSCR), is proposed to effectively explain the critical dynamic

instability point of the grid connected VSC-HVDC system, based on the spectral radius property of the GAGM. Moreover, the real-time simulations and multiple comparative studies are implemented in this paper to verify the effectiveness of the proposed NTDS 2 M and stability analysis method by using RT-LAB platform.

4. To-do lists

We continue to collect info on real-world events and studies and start to plan for the next panel session in PESGM 2024. We will schedule a virtual meeting in December 2023 to reconnect with the group and share info.

- Dr. Xiaoyao Zhou of National Grid ESO of UK mentioned that it may be beneficial to examine how to use PMU data to narrow down the suspected sources of oscillations.
- Indian Grid has observed many oscillations associated with solar PV farms and the info and knowledge disseminated from the IBR SSO TF help diagnosis and replication.

5. Adjourn -- The meeting lasted for 1 hour.

On Thursday 10 am-12 pm, the panel session was attended by a packed-room audience. Below is a snapshot of the IBR SSO panel.



See you in Seattle!