



IEEE Oscillation Location Task Force (TF)

Meeting Minutes

Version 1.0

by Ning Zhou
07/23/2020

Location: Online WebEx meeting provided by IEEE
Time: 11:00am – 12:00pm (EDT), 07/22/2020 (Wed)

Attendees:

- Qiang (Frankie) Zhang, Co-Chair, ISO-NE
- Udaya Annakkage Co-Chair, University of Manitoba
- Ning Zhou, Secretary, Binghamton University
- Kai Sun, Webmaster, University of Tennessee, Knoxville
- Ruichao Xie
- Mahendra Patel
- Jimmy Zhang
- Jim Follum
- Frank Tuffner
- Yishen Wang
- Di Shi
- Lei Chen
- Shuang Feng
- Zhe Yu
- Siqi Bu
- Xiaozhe Wang
- Yilu Liu
- Tony Weekes
- And others joined later...

1. Action Items:

- Udaya will send Frankie an updated version of the TF report.
- Frankie will set up a timeline for the TF report.
- TF and NASPI will form a joint committee to oversee the OSL contest.
- Xiaozhe Wang will send info about distinguishing forced vs. natural oscillations.

2. Discussion:

- a) Round table introduction
- b) Frankie reviewed scope of meeting agenda
 - Co-hosting a contest on the oscillation source location with NASPI.
 - Member updates.

- Report by the TF on forced oscillation.
- Future plans.

c) **Open contest** on oscillation source location

- Frankie: Had a discussion with Jeff and Jim in NASPI to discuss the possibility of jointly hosting an open contest.
- Jim, Yilu: Good idea to host a contest with NASPI
- Yilu: How do we generate some special and competitive cases? For example, the cases that higher oscillation amplitudes occur at a location far away from the sources.
- Jim:
 - Simulated source also tends to have the perfect sinusoidal curve, making it easy to guess.
 - ISO-NE may have some realistic cases.
 - For a contest, the cases should not have been seen by anyone before.
- Shuang: eigenvalue analysis could be applied to identify the cases.
- Kai: A near-resonance condition among natural modes may manifest growing or sustained oscillation but there is no specific source except for the participating generators. Such a phenomenon will become more often than ever due to nonlinearities brought by increasing power electronics in the grid, and it is challenging to be distinguished from conventional natural or forced oscillations. Our GM paper will be presented soon on this topic.
- Ning: Conflict of interest should be avoided when setting up cases for participants.
 - Di: RTE had related experience. Case providers can participate but cannot compete for the award.
- Udaya: We will need to set up a committee to coordinate the contest and set up rules to take care of potential conflict of interest.

d) **Member updates:**

- Yilu: There was an oscillation events at around 0.5 Hz observed by NYISO.
 - Frankie:
 - Emily at NYISO is filled a NERC report using the draft template.
 - Slava's analysis indicated the source inside IESO, but no further info inside IESO due to lack of PMU data.
 - Tony, Udaya: Manitoba Hydro is AC connected to IESO
 - Udaya: Tony has retired, Brian Archer from Manitoba is the contact.
 - Yilu: Initial study based on FDR measurement suggested that Canada could be the source. But FDR is not available locally. It would be helpful to have someone install an FDR there.
- Frankie: Any new oscillation source location methods?
 - Yilu: developed a new method based on phase leading.

- Shuang: created an image using PMU data, used deep learning methods. Tested on 179 bus system and it was 90% accurate. Active power (line flows) were used.
- Zhe Yu: worked on similar methods, 3 layer figure created, used CNN to extract features. The method was tested using IEEE 39-bus system and WECC 179 bus system with 93-95% accuracy. A related paper will be presented in GM this year. In real world application, the model will not be needed if there are sufficient number of training cases.
- Siqi: studied energy dissipation for natural oscillations & those induced by power electronic devices. Frequency range is only limited by the accuracy of PMU.
- Jim: ESAMS update, used Eastern Interconnection data. Phase angle difference data is used. Dissipating energy approach is used. Real measurements challenging due to data quality issues. Looking at flows across the boundaries of three regions: NE, NY, PJM.
- Xiaozhe Wang studied the mechanism of oscillation to distinguish forced/natural oscillations.
- Kai: Slava has added more cases to the library.

e) TF Reports

- Original scope changed – NERC has published several reports covering tasks under our original scope. We decided to focus on theoretical aspects.
- Frankie went through the draft report.
- Xiaozhe may be able to contribute on distinguishing forced/natural oscillations.
- Udaya suggested that the shown report may not be the latest version and will send Frankie an updated version, with all the formula symbols unified.
- Frankie will send out the draft report to seek inputs from the TF members.
- Udaya suggested we set up a timeline to finish the report.

f) Life cycle of the TF

- Frankie: The two efforts (Contest and Report) are the last two activities for the TF. TF will naturally be closed afterwards.
- Lei: We shall ask whether the oscillation problem has been well solved to determine the life cycle of the TF. Sub-synchronous oscillation (SSO) is a hot topic in China.
 - Udaya: CIGRE has a working group on SSO.
- Siqi: The scope of TF could be extended to include oscillations incurred by power electronics.

3. Meeting adjourned around 12:20 EDT.