



# **IEEE PES Task Force on Forced Oscillations**

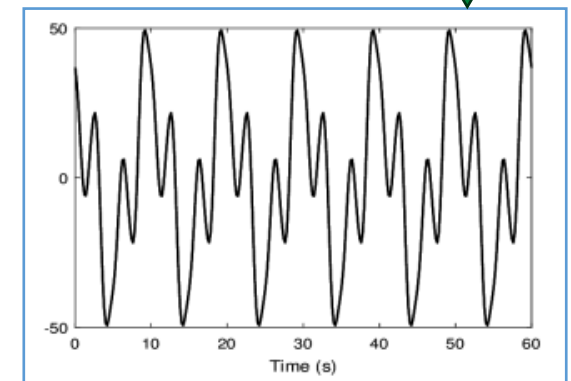
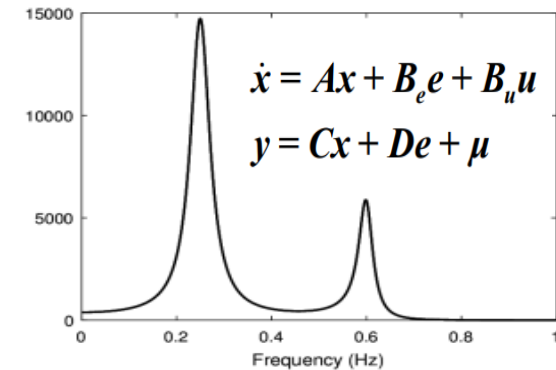
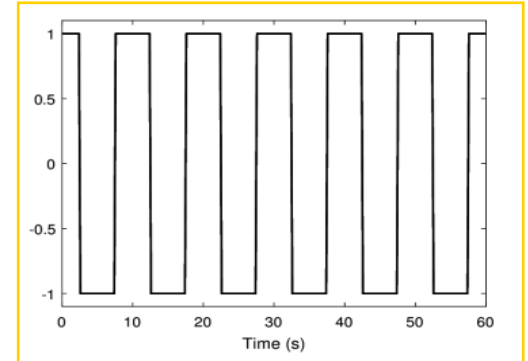
**Sponsored by IEEE PES PSDP Committee and PSSC Subcommittee**

Chairs: Kai Sun (UTK) and Jim Follum (PNNL)  
Secretary: Bin Wang (ISO New England)  
Outreach Liaison: Farrokh Aminifar

April, 2025

# Background

- Grid operators are facing various power system oscillations with the upgrades in generation and transmission and the increasing penetration of IBRs and data centers.
- Forced oscillations are different from natural oscillations in mechanisms and mitigation measures
- Caused by an external source, which is unmodeled
  - a malfunctioning or improperly tuned controller
  - an unknown outside driving force
- Unpredictable frequencies depending on the source
  - Perhaps overlapping inter-area oscillations and SSOs
- Need to locate the source in order to take a control action.
  - May be outside your system.





# Scope

- Extensive R&D activities have been focused on locating the source of a forced oscillation from measurements by
  - Energy,
  - Modal analysis or
  - Machine learning based methods.
- Some of the methods have been successfully implemented by the industry for post-event analyses or real-time applications
- This new Task Force (TF) will consolidate state-of-the-art methods, success stories, real examples, and industrial practices on locating and mitigating forced oscillations.
- Work scope:
  - Summarize and categorize the approaches for locating FO sources
  - Document industrial practices in monitoring, locating and mitigating real-life FO events.
  - Enrich the test cases library with both simulated and real FO data.
  - Finish a survey paper in Year 3.

# Task Force Portal

- Portal
  - <https://web.eecs.utk.edu/~kaisun/FOTF/index.html>

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## IEEE PES Task Force on Forced Oscillations

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### Background

Grid operators are facing various power system oscillations with the upgrades in generation and transmission and the increasing penetration of inverter-interfaced resources (IBRs). Among all types of oscillations, sustained forced oscillations have posed unique threats to reliable grid operations because, first, they have unpredictable frequencies of a wide spectrum overlapping electromechanical oscillations up to sub-synchronous oscillations, second, they are caused by an unmodeled external source such as a malfunctioning or improperly tuned controller inside the system or an unknown driving force outside of the system, and third, the sources have to be located accurately in order to take an effective mitigation action. The academia and industry have reached a consensus on the differences between forced oscillations and conventional natural oscillations in terms of their mechanisms and mitigation measures.

# Task Force Meetings

- In-person TF meetings with IEEE PESGMs
- Monthly TF Zoom meetings
  - 3rd or 4th Friday of each months at 1:00 pm EDT, whichever is closer to the 20<sup>th</sup>
  - Link:  
<https://tennessee.zoom.us/j/84436068609>
  - <https://web.eecs.utk.edu/~kaisun/FO/TF/meetings.html>

## Meeting Slides and Minutes

2/21/2025:

- Using Interharmonic Power for Power System Oscillation Source Location (by Wilsun Xu, University of Alberta): [Slides](#), [Recording](#)

1/17/2025:

- Setting Thresholds for the RMS-Energy Oscillation Detector (by Jim Follum, PNNL): [Recording](#)

12/20/2024:

- Locating the Source of Oscillation with Two-Tier Dynamic Mode Decomposition Integrating Early-Stage Energy (by Min-Seung Ko, The University of Texas at Austin): [Slides](#), [Recording](#)

11/22/2024:

- Disturbance Source Location Research and Practice in Power Quality Monitoring (by Wilsun Xu, University of Alberta): [Slides](#), [Demo](#), [Recording](#)

10/18/2024:

- Locating Forced Oscillations Sources (by Denis Osipov, NYPA): [Slides](#)
- A Case Study on Hydro Plant Oscillation Event (by Melanie Bennett, University of Tennessee, Knoxville): [Slides](#)
- [Minute](#)

09/20/2024:

- TF introduction (by Kai Sun, University of Tennessee, Knoxville): [Slides](#)
- Forced Oscillations Causes, Issues, and Mitigation (by Dan Trudnowski, Montana Tech): [Slides](#)
- [Minute](#)

# Task Force YouTube Channel

@IEEEPESForcedOscillationsTF

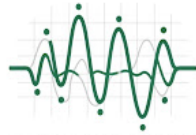
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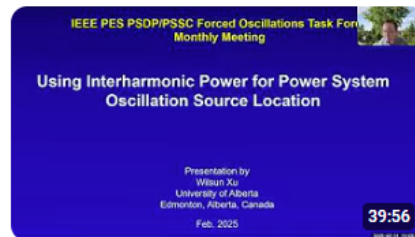
Founded in 2024, the IEEE PES Task Force on Forced Oscillations is sponsored by the IEEE PES.

[web.eecs.utk.edu/~kaisun/FOTF/index.html](http://web.eecs.utk.edu/~kaisun/FOTF/index.html)

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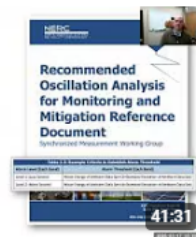
Using Interharmonic Power for Power System Oscillation Source Location (Prof....

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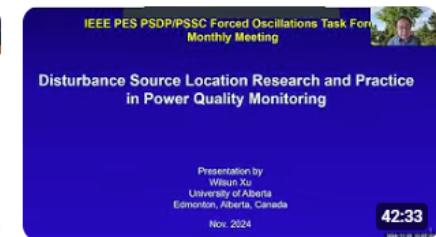
Setting Thresholds for the RMS-Energy Oscillation Detector (Dr. James D Follum)

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Locating the Source of Oscillation with Two-Tier DMD Integrating Early-Stage Energy (D...

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Disturbance Source Location Research and Practice in Power Quality Monitoring (Prof....

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# Resources

- Task force website
  - <https://web.eecs.utk.edu/~kaisun/FOTF/>
- Technical report in 2023 from “Oscillation Source Location” Task Force (chaired by Frankie Zhang and Udaya Annakkage)
- Test Cases Library of Forced/Natural Oscillations
  - <http://web.eecs.utk.edu/~kaisun/Oscillation/>
- Test Cases from 2021 IEEE-NASPI Oscillation Source Location Contest
  - <https://web.eecs.utk.edu/~kaisun/Oscillation/2021Contest/>

