



Oscillation Monitoring of the RTE Power System Using Synchrophasors

Final Project Report

S-81G

Power Systems Engineering Research Center
*Empowering Minds to Engineer
the Future Electric Energy System*



Oscillation Monitoring of the RTE Power System Using Synchrophasors

Final Project Report

Project Team

Mani V. Venkatasubramanian, Project Leader
Washington State University

Graduate Students

Mohammadreza Maddipour Farrokhifard
Yuan Zhi
Washington State University

PSERC Publication 19-04

September 2019

For information about this project, contact

Vaithianathan “Mani” Venkatasubramanian
School of Electrical Engineering and Computer Science
Washington State University
Pullman, WA 99164-2752
Tel: 509-335-6452
Fax: 509-335-3818
Email: mani@wsu.edu

Power Systems Engineering Research Center

The Power Systems Engineering Research Center (PSERC) is a multi-university Center conducting research on challenges facing the electric power industry and educating the next generation of power engineers. More information about PSERC can be found at the Center’s website: <http://www.pserc.org>.

For additional information, contact:

Power Systems Engineering Research Center
Arizona State University
527 Engineering Research Center
Tempe, Arizona 85287-5706
Phone: 480-965-1643
Fax: 480-727-2052

Notice Concerning Copyright Material

PSERC members are given permission to copy without fee all or part of this publication for internal use if appropriate attribution is given to this document as the source material. This report is available for downloading from the PSERC website.

© 2019 Washington State University. All rights reserved.

Acknowledgements

The investigators acknowledge the gracious support and collaboration of engineers at RTE-France (including Gilles Torresan, Patrick Panciatici, Florent Xavier, and Thibault Prevost), who not only sponsored the project research but also have been involved in every step of the project's technical development.

Executive Summary

Recent advances in design of fast oscillation monitoring algorithms have paved the way for real-time detection and analysis of electromechanical oscillations from wide-area synchrophasor measurements in large power interconnections. The oscillations if left unmitigated can lead to unwanted tripping of transmission lines and generators that could cascade into devastating blackouts. Oscillation monitoring algorithms developed at Washington State University have previously been implemented and tested in North American power grid and in India. In this project, we have studied oscillation phenomena in the RTE portion of the European power grid by using available synchrophasor data. Suitability of ambient versus ringdown analysis algorithms for analyzing recent oscillation events in RTE have been investigated. The effectiveness of the oscillation algorithms have been tested and improved by using simulated PMU data from dynamic models of the RTE system wherein the expected answers are known from small-signal analysis of the dynamic models.

Project Publications:

- [1] Mohammadreza Maddipour Farrokhifard, Mohammadreza Hatami, Vaithianathan “Mani” Venkatasubramanian, Gilles Torresan, Patrick Panciatici, and Florent Xavier, “Clustering of Power System Oscillatory Modes Using DBSCAN Technique,” Proc. NAPS 2019 Conference, Wichita, USA, Oct. 2019, to appear.
- [2] Mohammadreza Maddipour Farrokhifard, Vaithianathan “Mani” Venkatasubramanian, Gilles Torresan, Patrick Panciatici, and Florent Xavier, “PMU-based Modal Analysis of Two Major Events in RTE Power System”, submitted for review, PSCC 2020 Conference, Wichita, Porto, Portugal, June. 2020.

Student Theses: None completed (Mohammadreza Maddipour Farrokhifard and Yuan Zhi are pursuing research toward their PhDs)