



Analysis Tool for Fast Power System Steady-State Angular Stability Assessment

Final Project Report

S-85G

Power Systems Engineering Research Center

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the Future Electric Energy System*



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PSERC Publication 20-02

April 2020

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Acknowledgements

The investigators acknowledge the financial and technical support from engineers at ISO New England, Dr. Slava Maslennikov, Dr. Xiaochuan Luo, Mr. Qiang Zhang and Dr. Mingguo Hong. Special thanks are extended to other engineers at ISO New England, including Dr. Tongxin Zheng, and Dr. Eugene Litvinov, for the insightful and fruitful discussions.

Executive Summary

Determining reliable actionable limits for phase angles measured by Phasor Measurement Units can help trigger remedial control actions in a timely fashion to avoid system blackouts. Traditional ways for calculating the steady-state stability limits always require manually selected interfaces and a pre-defined methodology for system stressing. However, there is no systematic way or NERC Standards for neither one. This project proposes and validates a novel analytical tool for fast assessment of power system steady-state angular stability limit, which provides a new perspective to understand and determine the steady-state angular stability leveraging the nonlinear information within the underlying power system dynamic model. This new tool can determine the angle limits for all lines, i.e. naturally covering all interfaces, without calculating the nonlinear power flow equations. This study would provide guideline for phase angle based system stability monitoring and control. Next steps to move the research toward applications include developing dedicated algorithms without symbolic derivations to further reduce the computation, conducting N-1 contingency analysis and design of remedial control actions.

Project Publications:

- [1] Bin Wang, Le Xie, Slava Maslennikov, Xiaochuan Luo, Qiang Zhang, Mingguo Hong, “A model-space method for online power system steady-state stability monitoring,” IEEE Trans. Power Systems, in preparation.