

Contingency Ranking and Analysis using Power System Analysis Toolbox (PSAT)

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Abstract

In this paper according to the increasing utilization in power system, the transmission lines and power plants often operate in stability boundary and system probably lose its stable condition by over loading or occurring disturbance. According to the reasons that are mentioned, the prediction and recognition of voltage instability in power system has particular importance and it makes the network security stronger. This paper, by considering of power system contingencies based on the maximum loading parameter point is focused in order to analyze the static voltage stability using continuation power flow method. The study has been carried out on IEEE 14-Bus Test System using Power System problem has been solved by using PSAT with Matlab and results are presented.

Keywords: Contingency ranking, Continuation Power Flow, Post Voltage Stability

1 Introduction

Voltage stability assessment [1,2] is becoming an essential task for power system planning and operation. Power system security analysis [3] forms an integral part of modern energy management system. Security is a term used to reflect a power system's ability to meet its load without unduly stressing its apparatus or allowing variables to stray from prescribed range under the apparatus or allowing variables to stray from prescribed range under certain pre-specified credible contingencies. The contingencies [4,5] are in the form of network outage such as line or transformer outage or in the form of equipment outage e.g. a generator outage. The outages, which are important from limit violation viewpoint, are branch flow for line security or MW security and bus voltage magnitude for voltage security. Voltage stability has become a very important limit in assessing voltage security. The importance of voltage stability in determining system security and performance will continue to increase due to the increased loadings and interconnections brought about by economic and environmental pressures which have led to increasingly complex power systems that must operate closer to their stability limits. The conventional methods for voltage security assessment are based on load flow solution where full ac load flow is made to run for all contingencies. The results obtained were accurate but these methods were found to be slow, as for all contingencies the load flow had to be run. But in the present day, due to large interconnection and stressed operation power utilities are facing severe problems of maintaining the required security. Today more emphasis is made on the greater utility of generation and transmission capacity, which has made the system to operate much closer to their limits. So it has become, indispensable to do voltage security assessment accurately and instantaneously, to avoid the system from voltage collapse. The concept of security in system operation may be divided into three components, monitoring, assessment and control. Security monitoring starts with measurement of real time system data to provide up to date information of the current condition of power system. Security assessment is the process whereby any violation of operating limits is detected. It has two functions. The first is the detection of violation of the actual system operating states. The second, much more demanding function of security assessment is contingency analysis. This paper is also to consider in the past and run the program of continuation power flow and to result for selection and ranking of contingency.

2. Power System Analysis Toolbox (PSAT)

The Power System Analysis Toolbox (PSAT), an open source Matlab and GNU/Octavebased software package for analysis and design of small to medium size electric power systems. PSAT includes power flow, continuation power flow, optimal power flow, small signal stability analysis and time domain simulation as well as several static and dynamic models, including non-conventional loads, synchronous and asynchronous machines, regulators and FACTS. PSAT is also provided with a complete set of user-friendly graphical interfaces and a Simulink-based editor of one-line network diagrams. Basic features, algorithms and a variety of case studies are

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Computer Aided State Estimation of Electric Power Network Subramanian Srikrishna, Ganesan Sivarajan, Hariprasath Manoharan, 2020-08-01 Computer Aided State Estimation of Electric Power Networks is a fundamental introduction to the topic of state estimation at an advanced textbook level for teaching a course at either the graduate or undergraduate level as well as for Post Graduate students and Research Scholars who want to review of the latest techniques and best mathematical approaches for estimating the state of a general system Theory as well as practice of Distribution System State Estimation DSSE is covered with imperative rigidity The authors present the theory of state estimation clearly providing the right amount of essential information and linked reports in order to enable the researchers and graduate students to apply state estimation techniques across a variety of fields in power systems engineering A prerequisite knowledge of basic power system operation control data acquisition and measurement in addition to basic statistics is helpful in understanding the book Key Features include Advanced Topics based on Cloud Computing and Standards used for Preparation of Smart Grid Provides Entire Coding Information for Estimating the State Estimation Topology Performance Enables both the Researchers and Graduate Students for Pursuing their Research Projects Covers the Important Topics on Data Attacks and Solution Strategy Provides an Introduction to Distribution System State Estimation This book includes new contents like Distribution System State Estimation Data Attacks Defense strategies with an introduction to large scale systems based on cloud computing and an MATLAB training package for graduate students Smart Technologies for Power and Green Energy

Rudra Narayan Dash, Akshay Kumar Rathore, Vinod Khadkikar, Ranjeeta Patel, Manoj Debnath, 2022-09-21 The book is a collection of best selected research papers presented at International Conference on Smart Technology for Power and Green Energy STPGE 2022 organized by School of Electrical Engineering KIIT Deemed to be University Bhubaneswar India during February 12 13 2022 The book discusses recent developments and contemporary research in power electronics and energy

Microelectronics, Circuits and Systems Abhijit Biswas, Aminul Islam, Rishu Chaujar, Olga Jaksic, 2023-06-26 This book covers the proceedings of the 8th International Conference on Microelectronics Circuits and Systems Micro2021 having design and developments of devices micro and nanotechnologies and electronic appliances This book includes the latest developments and emerging research topics in material sciences devices microelectronics circuits nanotechnology system design and testing simulation sensors photovoltaics optoelectronics and its different applications This book is of great attraction to researchers and professionals working in electronics microelectronics electrical and computer engineering

Induction Motors Rui Esteves Araújo, 2012-11-14 Motivated by the need of energy efficiency improvements process optimization soft start capability and numerous other environmental benefits it may be desirable to operate induction motors for many applications at continuously adjustable speeds The induction motor drives can provide high productivity with energy efficiency in different industrial applications and are the basis for modern automation This book provides an account

of this developing subject through such topics as modelling noise control techniques used for high performance applications and diagnostics Compiled from contributions by international researchers this is not a textbook but the result is an interesting exploration of this technology that provides a combination of theory implementation issues and practical examples

Securing Cyber-Physical Systems Al-Sakib Khan Pathan,2015-10-06 Think about someone taking control of your car while you re driving Or someone hacking into a drone and taking control Both of these things have been done and both are attacks against cyber physical systems CPS Securing Cyber Physical Systems explores the cybersecurity needed for CPS with a focus on results of research and real world deploy

Innovations in Electrical and Electronic Engineering Saad Mekhilef,Margarita Favorskaya,R. K. Pandey,Rabindra Nath Shaw,2021-05-24 This book presents selected papers from the 2021 International Conference on Electrical and Electronics Engineering ICEEE 2020 held on January 2 3 2021 The book focuses on the current developments in various fields of electrical and electronics engineering such as power generation transmission and distribution renewable energy sources and technologies power electronics and applications robotics artificial intelligence and IoT control automation and instrumentation electronics devices circuits and systems wireless and optical communication RF and microwaves VLSI and signal processing The book is a valuable resource for academics and industry professionals alike

Power System Modeling, Computation, and Control Joe H. Chow,Juan J. Sanchez-Gasca,2019-12-23 Provides students with an understanding of the modeling and practice in power system stability analysis and control design as well as the computational tools used by commercial vendors Bringing together wind FACTS HVDC and several other modern elements this book gives readers everything they need to know about power systems It makes learning complex power system concepts models and dynamics simpler and more efficient while providing modern viewpoints of power system analysis Power System Modeling Computation and Control provides students with a new and detailed analysis of voltage stability a simple example illustrating the BCU method of transient stability analysis and one of only a few derivations of the transient synchronous machine model It offers a discussion on reactive power consumption of induction motors during start up to illustrate the low voltage phenomenon observed in urban load centers Damping controller designs using power system stabilizer HVDC systems static var compensator and thyristor controlled series compensation are also examined In addition there are chapters covering flexible AC transmission Systems FACTS including both thyristor and voltage sourced converter technology and wind turbine generation and modeling Simplifies the learning of complex power system concepts models and dynamics Provides chapters on power flow solution voltage stability simulation methods transient stability small signal stability synchronous machine models steady state and dynamic models excitation systems and power system stabilizer design Includes advanced analysis of voltage stability voltage recovery during motor starts FACTS and their operation damping control design using various control equipment wind turbine models and control Contains numerous examples tables figures of block diagrams MATLAB plots and problems involving real systems Written by

experienced educators whose previous books and papers are used extensively by the international scientific community

Power System Modeling Computation and Control is an ideal textbook for graduate students of the subject as well as for power system engineers and control design professionals

Power Systems Analysis T K Nagsarkar, M S Sukhija, 2007-03

Power Systems Analysis provides a thorough understanding of the principles and techniques of power system analysis and their application to real world problems Beginning with basic concepts the book gives an exhaustive coverage of transmission line parameters symmetrical and unsymmetrical fault analysis and power flow studies The book includes separate chapters on state estimation stability analysis and contingency analysis and also provides an introduction to HVDC and FACTS Relevant topics such as power quality and power management are also dealt with The book extensively illustrates the use of MATLAB in the analysis of power systems With its lucid style of presentation the book should be useful to both students and practising engineers

Advances in Numerical Analysis of Nonlinear Dynamical Systems and the Application to Transfer Capability of Power Systems Alexander Joel Flueck, 1996

Simulation and Analysis of Modern Power Systems Ranjana Sodhi, 2021-02-19

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