

## 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

# Contingency Analysis Using Matlab

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