Power System Stability Enhancement Using Facts Controller

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ABSTRACT
It is specifically important to focus on voltage stability analysis of the power system to avoid worst case scenarios such as voltage collapse. The purpose of this dissertation is to identify methods for enhancing the steady-state voltage stability using FACTS devices and determining their impact on real and reactive power losses, improvement of bus voltage magnitude and transmission line load ability. To achieve this, FACTS devices are used in IEEE 5, IEEE 9 and IEEE 30 test bus systems. The results obtained assist in drawing conclusions on the effectiveness of FACTS devices at generator, load and swing buses in terms of matrices such as voltage magnitude profile, PV curves, and active and reactive power losses.

Keywords:- FACTS, Steady state voltage stability, reactive power compensation techniques, flexible AC transmission systems.

INTRODUCTION

Voltage Stability examination is vital as voltage instability may result in the partial or complete disturbance in the power system. For voltage stability examination, a number of steady-state examination methods such as standard power flow methods, continuation power flow methods, nodal methods and dynamic simulation methods are being used by the electrical utilities.

The reactive power plays an important role in a power system. Basically, an electric power is generated, transmitted and then distributed to the consumers. Transformers, transmission and distribution lines, cables and many common load devices such as motors swing the relationship between current and voltage due to their inherent characteristics. This swing is measured in volt-ampere reactive (VAR). High VAR levels may result in lessening in power transference capability and increase in losses. Low VAR levels may result in voltage sag. Therefore, suitable levels of reactive power are to be sustained for improving the voltage stability of the power system. The bases of reactive power such as conventional devices which are built out of resistance, inductance or capacitance together with transformer, and Flexible AC Transmission System (FACTS) strategies offer adequate reactive power to the system. FACTS devices offer reactive power compensation, and improve voltage stability, transmission ability, power flow control, and working tractability of the power system.

II. LITERATURE SURVEY

The various literature associated to 'Power System Stability Enhancement using Facts Controller' has been surveyed in various IEEE transactions, journals, Conference papers and websites and also, their relationship with present research work.

Nidul Sinha [2015]: In this paper, a Thyristor Controlled Series Compensator (TCSC) is incorporated as a FACTS controller in an IEEE-30 bus test system to maximize the Available Transfer Capability (ATC) and minimize the TCSC capital cost and voltage deviations of the load buses occurring in the system.

Entitle of Paper
Flexible AC Transmission Systems (FACTS) are being popularly used by utilities due to their capability to enhance power system static as well as dynamic performance
Approached Used

Thyristor Controlled Series Compensator

Software MATLAB 7.1

Parameter IEEE-30 bus system

Advantages Maximize available transfer capability.

Sudhansu Kumar Samal [2014]: This paper presents the effectiveness of the UPFC without and with power flow controller on power system stability improvement.

Entitle of Paper
Unified Power Flow Controller which is controlled externally by a newly designed power system controller.

Approached Used
Proportional Integral Differential controller(POD & PID)

Software Fuzzy Controller

Parameter 500KV transmission line
Advantage Interconnected multi-machine power system for stability improvement.

Tarik Zabaiou [2013]: In this paper, a novel VSC-OPF approach for the voltage stability preventive control has been presented. The proposed approach is addressed by incorporating the VCPI into the classical OPF problem. The VCPI index is first used as the voltage stability constraint, this requires only one additional voltage constraint added to the conventional OPF constraints.

Entitle of Paper
Compare the effectiveness and robustness of the proposed VSC-OPF system.

Approached Used
VSC-OPF approach

Software MATLAB

Parameter IEEE 30 Bus System

Advantages Simple concept and can be practically applicable for the online voltage security assessment.

Mohammed Amroune [2013]: In this paper, voltage stability assessment with SVC and TCSC devices is investigated and compared in the modified IEEE 30-bus test system. The fast voltage stability indicator (FVSI) is used to identify weakest bus and to assess the voltage stability of power system.

Entitle of Paper
Learning Salient Features for Speech Emotion Recognition using Convolutional Neural Networks.

Approached Used
Fast voltage stability indicator is used to identify weakest bus and to assess the voltage stability ofpower system.

Software MATLAB.

Parameter IEEE 30-Bus TestSystem.

Advantages Reactive power demand in the test system is improved It shows that how various works correlate the evolution of Power System Stability of power system.

III. BACKGROUND AND MOTIVATION FOR THIS RESEARCH

In this dissertation, proposed research work yields with a novel, robust, secure and highly efficient power system. The purpose of this research is to provide an analysis on the use of FACTS devices in improving voltage stability, minimizing power loss, and improving transmission system load ability that result from utilization of different types of shunt and series FACTS devices such as Static Voltage Compensator (SVC), Static Synchronous Compensator (STATCOM), and Thyristor Controlled Series Compensator (TCSC). To test the idea, we have introduced different FACTS devices into the IEEE 5, IEEE 9 and IEEE 30 test bus system. Voltage stability of the power system before and after introducing the different FACTS devices is observed by comparing metrics such as active and reactive power losses, voltage magnitude profile and PV curve.

IV. EXPECTED OUTCOMES OF THE RESEARCH

The expected outcomes of the proposed research are as follows:

(i) The system become novel,
(ii) The system becomes more robust,
(iii) The system is highly secure and
(iv) The system is highly efficient
(v) Voltage profile improvement at weak bus near to collapse point

V. CONCLUSION

After surveying different literatures available in IEEE transactions, journal and conference proceedings on the topic "Power system stability enhancement by using facts controller" it is found that improve voltage stability, transmission ability, power flow control, and working tractability of the power system.

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