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**VOLTAGE STABILITY ASSESSMENT:
CONCEPTS, PRACTICES AND TOOLS**

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VOLTAGE STABILITY ASSESSMENT: CONCEPTS, PRACTICES AND TOOLS

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Chapter 1

INTRODUCTION

The current special publication is the result of several years of work by many experts from all around the globe, and was written to explain in great detail a variety of topics associated with voltage stability analysis of power systems, from both theoretical and practical points of view. It follows and expands on the two previous IEEE special publications on the subject [1], [2]; in [1], a basic explanation of the phenomenon of voltage stability in power systems is presented, whereas in [2] various basic voltage stability analysis techniques are discussed in detail. It also builds on and adds to the material presented in the IEEE special publication [3], where various methodologies for determining voltage stability margins are discussed. Thus, based on the level of maturity that the subject has reached since the previous documents were published, the present publication explains in detail basic theoretical and now well-established concepts behind voltage stability analysis in power systems, as well as presenting and discussing various standard procedures and techniques presently used for off-line and on-line voltage stability assessment of power systems, with a minimum use of complex equations to facilitate the understanding of the diverse topics discussed. A large number of theoretical and practical examples are used to illustrate the concepts and methodologies presented in this document.

Chapter 2 of this document covers various fundamental concepts regarding stability analysis of nonlinear power systems, concentrating in particular on voltage stability issues. The authors have tried to explain most of the material through words and illustrations, as well as with the help of some simple examples, staying away, on purpose, from lengthy and complex mathematical descriptions.

Chapter 3 concentrates on describing the techniques and tools, as well as the related modeling and data requirements used for off-line studies of voltage stability problems in power systems. Several practical examples are used throughout this chapter to illustrate the material presented in the chapter.

In Chapter 4, several voltage stability indices used to measure proximity to voltage collapse in off-line as well as on-line applications are described with great detail. A test system is used throughout the whole chapter to depict and compare the various indices. The chapter concludes with a comprehensive comparison of the different indices, and a brief explanation of several other indices that could not be directly applied to the test system.

Chapter 5 describes a set of guidelines for voltage stability assessment as well as all the functional requirements for an on-line Voltage Stability Assessment (VSA) module of an Energy Management System (EMS). A variety of software tools specifically developed to analyze voltage stability problems in practical models of power systems are also described in this chapter.

A rather comprehensive set of references that cover a wide range of issues related to voltage stability analysis of power systems, and that expand on what is presented in [4], can be found in the different chapters that make this document.

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