Reactive Power Support

Planning, Design and Operation

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This book, the second in the EPECentre series, is based on the CIGRE Joint AP-B4/C1 two-day Seminar held in Brisbane (Australia) in 8-9 May 2008. The contributors and titles of the Seminar presentations were:

Carson Taylor (ex-BPA, USA)
Voltage Stability - An old problem and new thinking
Nalin Pahalawaththa (Transpower NZ)
Behaviour and modelling of loads
Tom Pearcy (Western Power, AU)
Shunt reactive compensation
Michael Redpath (Vencorp, AU)
Series reactive compensation
Colin Parker (TransGrid, AU)
Voltage instability mechanisms and assessment
Nalin Pahalawaththa and Tim George(Transpower NZ)
Dynamic voltage instability
Jennifer Crisp (NEMMCO, AU)
Planning standards, guidelines and emergencing trends, Australian perspective
Carson Taylor (ex-BPA, USA)
Planning standards, guidelines and emergencing trends, An international Perspective
Peter Biddle (NEMMCO, AU)
Operational aspects of voltage control
Keith Frearson (SKM)
Synchronous condensers and synchronous generators
Peeter Muttik (AREVA)
Shunt capacitors
Bo Nilsson, Leif Andreasson and Anders Bostrom (ABB)
Series capacitors
Claus Matthias (SIEMENS)
SVCs
Narend Reddy (American Superconductors)
STATCOMs
Carson Taylor (ex-BPA, USA)
A critical comparison of technologies
John Mouatt (TransGrid, AU)
Operational experiences of SVC installations in TransGrid
Tuan Vu (Powerlink, AU)
Specification, design and refurbishment of SVC installations
Tim George (Transpower NZ) and Marian Piekutowski (Hydro Tasmania)
Reactive power control

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Preface

In his opening address to the Brisbane Seminar, Simon Bartlet, CIGRE ANC Director, referred to the growing demand and the use of new generation sources located remotely from load centres, coupled with the community opposition to new transmission lines. To try and reduce these problems the transmission lines needed to be operated at increasingly higher power levels, often above their surge impedance loading. This makes the long transmission systems more vulnerable to voltage instability. The problem is more critical in long and narrow countries, such as New Zealand and to large countries, such as Australia, where remote loads are supplied through weak transmission links. Mr Bartlet also indicated the increasing consumption of reactive power (especially when lines trip), the need to provide more reactive power locally and the increasing part that renewable generation can make in this respect.

The availability of turn off semiconductors of large power ratings, coupled with the development of a Flexible AC System Transmission (FACTS) technology has made a great impact in the area of power system reactive power support. To review the state of the art, the Australasian sections of CIGRE Study Committees B4 and C1 held a two day seminar in Brisbane in May 2008. The comprehensive coverage and high standard of the contributions prompted the preparation of this book, the second in the New Zealand EPECentre Power and Energy series, in order to make the information generally available.

Subject to some introductions and clarifications, the material in the book comes largely from the seminar presentations and is somewhat based on the experience of the Australia and New Zealand power systems. However, the involvement of the main international power companies in the seminar presentations, ensures that the coverage reflects the global state of the art on the subject. The editor wishes to thank the support received from all the seminar contributors, especially Carson Taylor, the main international contributor and Nalin Pahalawaththa (chairman of the PLB4 Study Committee) and also the main local contributor. It is also appreciated the backing and financial assistance of the EPECentre (NZ), and specially Joseph Lawrence its manager, for his enthusiastic support. The editor also wishes to acknowledge the help received from Greta Arrillaga in the preparation of the manuscript and of John Arrillaga and John Mouatt for their part in the cover design

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