UNIVERSITI TEKNOLOGI MARA

NOVEL TECHNIQUES FOR VOLTAGE STABILITY ASSESSMENT AND IMPROVEMENT IN POWER SYSTEM

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Thesis submitted in fulfilment of the requirements
for the degree of
Doctor of Philosophy

Faculty of Electrical Engineering

December 2004

ACKNOWLEDGEMENTS

In the name of Allah, The Most Merciful and The Most Compassionate. Syukur to Allah SWT. Alhamdulillah.

I would like to take this opportunity to express my sincere gratitude and appreciation to my supervisor, Assoc. Prof. Dr. Titik Khawa Abdul Rahman for her continuous guidance and assistance towards the accomplishment of this research work and in the preparation of the thesis. I am also indebted to The Faculty of Electrical Engineering, Universiti Teknologi MARA, Malaysia for allowing me to fully utilise the necessary facilities during my studies. I would also like to thank The Department of Human Resource Management (formerly known as The Training and Staff Development Section) of UiTM for the scholarship. Great appreciation and gratitude should also be given to The Institute of Research, Development and Commercialisation (IRDC) (formerly known as Bureau of Research and Consultancy (BRC)) of UiTM for partly funding the research work. I would also like to record my gratitude to my colleagues Muhammad Murtadha, Mohd. Fadhil, Mohd. Khayat, Mohd. Asari, Farid, Meor Azreen, Khairil Iskandar, Fuad and Badrul Hisham for their support, motivation and for being good friends.

Special appreciation, love and gratitude to my mother Maznah Junid, my beloved wife Puziah Ngabiah, my children Nur Auni Syafiqah, Muhammad Nizar Fareeth, Nur Rahatul Ain, Nur Fatma El-Zahra and my new born son, Muhammad Fauzan Nazeef for their prayer, patience and support and being my source of inspiration.

ISMAIL MUSIRIN
December 2004

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VOLTAGE STABILITY ANALYSIS TECHNIQUE

ABSTRACT

his thesis presents novel techniques for voltage stability assessment and improvement in ower system. A novel line-based voltage stability index termed as Fast Voltage Stability ıdex (*FVSI*) was developed and used to evaluate the voltage stability condition on a line. The alue of FVSI was used in order to determine the most sensitive line and corresponding weak us in the system. The results obtained from the voltage stability analysis using *FVSI* were tilized to predict system violation, identify most sensitive line corresponds to a load bus and stimate the maximum loadability and operating margin in the system. A new Evolutionary rogramming (EP) based acceleration search algorithm was developed to accelerate the rocess in estimating maximum loadability in a power system. The maximum loadability stimated from the proposed acceleration search technique was found in a good agreement ith those obtained from the conventional voltage stability analysis technique. The application f *FVSI* was extended for the evaluation of the overall system stability and determination of oaded buses in a radial distribution system. The effect of reactive power load variation on otal losses in the system was also investigated. The proposed *FVSI* was consequently used as ıe line outage severity indicator in the implementation of contingency analysis and ranking. lew automatic contingency analysis and ranking algorithms due to line and generator outages ere separately developed. These algorithms have profoundly reduced the computation urden experienced in the conventional technique. Finally, a novel Reactive Power Planning RPP) algorithm using the state-of-the-art of EP for voltage stability improvement was eveloped. The *FVSI* was used as the objective function for the developed optimisation chnique. A performance comparison in terms of loss minimization and voltage stability nprovement was made when loss minimization was taken to be the objective function. It was ound that the proposed algorithm with *FVSI* as the objective function has been able to roduce a better result as compared to the techniques developed in the literature.