

การกำหนดความสามารถถ่ายโอนกำลังไฟฟ้าที่มีได้ในเวลาจริงในระบบไฟฟ้ากำลังที่เปิดเสรี

นาย พรประนต ดิษยบุตร

วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาวิศวกรรมศาสตรดุษฎีบัณฑิต

สาขาวิชาวิศวกรรมไฟฟ้า ภาควิชาวิศวกรรมไฟฟ้า

คณะวิศวกรรมศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย

ปีการศึกษา 2543

ISBN 974-13-0038-7

DETERMINATION OF REAL-TIME AVAILABLE TRANSFER CAPABILITY  
IN DEREGULATED POWER SYSTEMS

Mr. Pornpranod Didsayabutra



A Dissertation Submitted in Partial Fulfillment of the Requirements  
for the Degree of Doctor of Philosophy in Electrical Engineering

Department of Electrical Engineering

Faculty of Engineering

Chulalongkorn University

Academic year 2000

ISBN 974-13-0038-7

I 2C473643

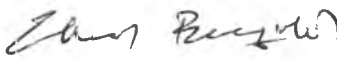
Thesis Title                      Determination of Real-time Available Transfer Capability in Deregulated  
Power Systems  
By                                      Pornpranod Didsayabutra  
Program in                         Electrical Engineering  
Thesis Advisor                    Associate Professor Dr. Bundhit Eua-Arporn  
Thesis Co-advisor                Professor Dr. Wei-Jen Lee

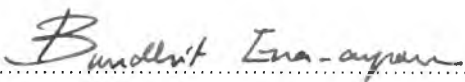
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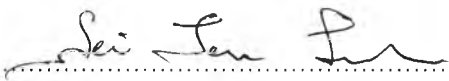
Accepted by the Faculty of Engineering, Chulalongkorn University in Partial  
Fulfillment of the Requirements for the Doctoral Degree

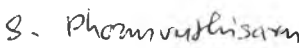
  
..... Dean of Faculty of Engineering  
(Professor Somsak Panyakeow, D. Eng)


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(Professor Charuay Boonyubol, Ph.D.)

  
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..... Member  
(Associate Professor Sukumvit Phoomvuthisarn, Ph.D.)

  
..... Member  
(Mr. Gumpanart Bumroonggit, Ph.D.)

พรประนต ดิชยบุตร:การกำหนดค่าความสามารถถ่ายโอนกำลังไฟฟ้าที่มีได้ในเวลาจริง  
ในระบบไฟฟ้ากำลังที่เป็ดเสรี (Determination of Real-time Available Transfer  
Capability in Deregulated Power Systems) อ. ที่ปริกษา รศ. ดร. บัณตติ เอื้ออกรณ  
อ. ที่ปริกรษา ร่วม Prof. Dr. Wei-Jen Lee 270 หน้า ISBN 974-13-0038-7

โดยทั่วไปในอดีต อุตสาหกรรมไฟฟ้าในประเทศต่างๆทั่วโลกเป็นอุตสาหกรรมที่มักจะถูก  
ผูกขาดโดยรัฐบาลหรือรัฐวิสาหกิจทั้งในระบบผลิต ระบบสายส่ง และระบบจำหน่ายภายใต้โครง  
สร้างดังกล่าว โครงสร้างการควบคุมระบบไฟฟ้ามักประกอบไปด้วยหลายหน่วยงานหรือศูนย์ควบคุม  
ซึ่งมีหน้าที่ครอบคลุมทั้งในส่วนการวางแผน เช่น การวิเคราะห์การไหลของกำลังไฟฟ้า การทำ  
นายความต้องการการใช้ไฟฟ้ารวมถึงการควบคุมการทำงานของระบบซึ่งในบางครั้งอาจเกิดการชำ  
ซ้อนของหน้าที่ความรับผิดชอบและอาจก่อให้เกิดปัญหาในการประสานงาน ดังนั้นเมื่อระบบไฟฟ้า  
ถูกแปรรูปไปสู่โครงสร้างใหม่ การจัดการระบบดังกล่าวจึงถูกเปลี่ยนแปลงไปอย่างมากโดยเห็นได้  
จากการยุบหรือลดจำนวนศูนย์ควบคุมเมื่อมีการจัดตั้งตลาดกลางซื้อขายไฟฟ้า (Power Pool) ขึ้น  
ในหลายๆประเทศ

เป็นที่ทราบกันโดยทั่วไปว่าระบบไฟฟ้าหลังการแปรรูปมักจะมีคามซับซ้อนกว่าระบบผูก  
ขาดเนื่องมาจากการเพิ่มขึ้นของปริมาณการซื้อขายไฟฟ้าซึ่งมักก่อให้เกิดปัญหาการคับคั่งในระบบ  
สายส่ง (Transmission Congestion) ดังนั้นเพื่อป้องกันปัญหาดังกล่าวในระยะยาว จึงได้มีการกำหนด  
ค่าความสามารถถ่ายโอนกำลังไฟฟ้า (Available Transfer Capability) ขึ้นโดยค่าดังกล่าวถูก  
ใช้เป็นค่าอ้างอิงสำหรับการซื้อขายไฟฟ้าในระบบที่บ่งบอกถึงความสามารถของสายส่งที่จะรองรับ  
การซื้อขายไฟฟ้า ทั้งนี้ ค่าความสามารถถ่ายโอนกำลังไฟฟ้าของการซื้อขายไฟฟ้าระหว่างผู้ซื้อกับผู้  
ขาย คู่หนึ่ง มักจะถูกคำนวณไว้หลายค่าที่ เวลาแตกต่างกันขึ้นอยู่กับจุดประสงค์ของการใช้งาน

ปัญหาสำคัญในเชิงเทคนิคของการคำนวณความสามารถถ่ายโอนกำลังไฟฟ้าคือความซับซ้อน  
ในการคำนวณค่าดังกล่าวในระบบไฟฟ้ากำลังขนาดใหญ่ภายใต้เวลาที่จำกัด วิทยานิพนธ์ฉบับนี้ได้  
นำเสนอวิธีใหม่ในการคำนวณค่าความสามารถถ่ายโอนกำลังไฟฟ้าสำหรับระบบไฟฟ้ากำลังขนาด  
ใหญ่ที่มีความเร็วสูงภายใต้เงื่อนไขมาตรฐานทางด้านความปลอดภัยที่กำหนดโดย North America  
Electric Reliability Council (NERC)

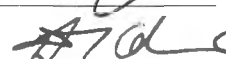
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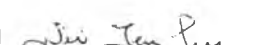
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ลายมือชื่ออาจารย์ที่ปริกษา \_\_\_\_\_



ปีการศึกษา \_\_\_\_\_ 2543 \_\_\_\_\_

ลายมือชื่ออาจารย์ที่ปริกรษา ร่วม \_\_\_\_\_



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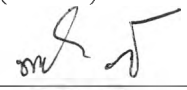
KEY WORD :POWER SYSTEM SECURITY/ DEREGULATED POWER SYSTEM/ AVAILABLE TRANSFER CAPABILITY / TOTAL TRANSFER CAPABILITY / CAPACITY BENEFIT MARGIN/ TRANSFER CAPABILITY / POWER SYSTEM STABILITY

PORNPRANOD DIDSAYABUTRA: DETERMINATION OF REAL-TIME AVAILABLE TRANSFER CAPABILITY IN DEREGULATED POWER SYSTEM. DISSERTATION ADVISOR: ASSIST. PROF. BUNDHIT EUA-ARPORN, Ph.D. 270 pp. ISBN 974-13-0038-7

In the past, power industry in many countries is monopolized by government or state enterprises. These utilities typically own generation, transmission and distribution systems for the whole country or a wide geographical area. Under this structure, each system usually has more than one control centers and divisions taking care of necessary responsibilities for power industry such as load flow analysis, load forecasting, system planning, automatic generation control, unit commitment or security analysis. Obviously, this is not an efficient structure and may cause coordination problem. In contrast, under the pool structure, all resources in the system are combined in order to increase reserve margins and increase the robustness of the system. Under the deregulated structure, single control center operates the system based on the policy provided by the board of governance.

It is accepted that size of the system under the new structure is much larger and more complicated due to the increasing number of transactions. This may lead to the congestion and voltage problems that must be carefully concerned. In addition, it is reasonable to conclude that transmission system under the new structure may carry more load than the past since utilities have more options to purchase power from other areas than produce it by themselves similarly to the customers. This outcome of the deregulation has created an issue that, under this situation, what is the maximum transmission capability to deliver power from one area to another area (Total Transfer Capability- TTC) and what is the available power can be transferred over transmission facilities relative to the current operation conditions. Obviously, Available Transfer Capability (ATC), the optimum value between security level and commercial viability, is a premier answer for this situation. Currently, ATC values between selected pairs of transactions are calculated and posted for participants in hourly, daily, weekly and annually basis. However, this dissertation will concentrate mainly on real-time ATC determination.

The technical challenge of the real time ATC calculation is how to calculate ATC values for a large-scale power system when time constraint is a limited resource. A good solution should consider all of security requirements that ensure the security of the system. This dissertation proposes an algorithm that is reliable and fast enough to handle with these problems. Thermal limits, voltage limits and stability limits are considered in this algorithm in both normal and n-1 contingency conditions according ATC framework defined by North American Reliability Council (NERC).

Department	<u>Electrical Engineer</u>	Student's signature	
Field of study	<u>Electrical Engineer</u>	Advisor's signature	<u>B. Eua-arporn</u>
Academic year	<u>2000</u>	Co-advisor's signature	<u>Sci-Tan Sue</u>



## Acknowledgement

I thank the truly support of my family with enduring love that accompanied my studies since I was young until I graduate. I appreciate the guidance, suggestion, dedication and support of my advisor and co-advisor, Dr. Bundhit Eua-Arporn and Dr. Wei-Jen Lee during my studies at Chulalongkorn University and Energy System Research Center, The University of Texas at Arlington. In addition, I am indebted to Prof. Dr. L. D. Swift for the invaluable experiences and guidance he shared for my life. His suggestion is one of the best resources enlightening my future.

Center of Excellence in Electrical Power Technology (CUCEPT), Chulalongkorn University partially sponsored me during the first six month of my research and I thank CUCEPT for generosity and support.

I am grateful to Electricity Generating Authority of Thailand (EGAT) who provided me information whatever I need. These resources are the fundamental for everything I propose in my dissertation.

I thank all of my committees who help and encourage me to fulfill this dissertation as well as my friends and co-workers at both Chulalongkorn University and University of Texas at Arlington for their help, friendships and encouragement.

Pornpranod Didsayabutra

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