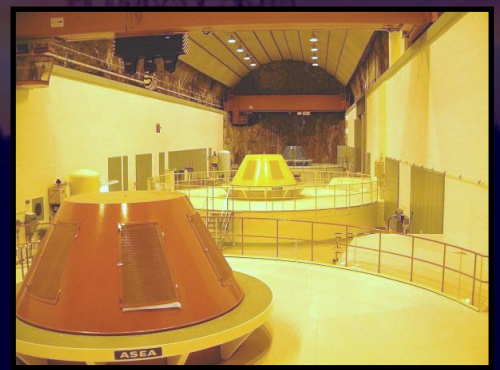


Solvina presents a 4 day Professional Seminar on

# POWER SYSTEM STABILITY AND CONTROL

By Dr. Prabha S. Kundur

International Electrical engineer with over 35 years of experience in the electric power industry



10-13 November 2009 in Gothenburg, Sweden

This seminar aims to provide a good understanding of the design, control and operation of electrical systems to maintain a good system stability of energy generation and transmission.

Cost: 21 900 SEK excl. VAT (students discount 50 % in order of vacancy)  
Last date of application: 25 September 2009, limited number of participants  
Course administrator: Stefan Kovacs, stefan.kovacs@solvina.se, +46 (0) 31-709 63 39

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## INTRODUCTION

This course will provide a unique opportunity for engineers in the power industry to undertake a comprehensive and rigorous study of a critical area, delivered by the world's foremost expert on the subject. The course will provide a comprehensive overview of power system stability and control issues and problems. The broad subject is concerned with the operation of the power system including generating plants under normal and abnormal conditions.



## SPEAKER'S PROFILE

Dr. Prabha S. Kundur  
President, Kundur Power Systems  
Solutions Inc., Toronto, Ontario,  
Canada

Prabha Kundur holds a Ph.D. in Electrical Engineering from the University of Toronto and has over 35 years of experience in the electric power industry. He is currently the President of Kundur Power system Solutions Inc., Toronto, Ontario. He served as the President and CEO of Powertech Labs Inc., the research and technology subsidiary of BC Hydro, from 1994 to 2006. Prior to joining Powertech, he worked at Ontario Hydro for nearly 25 years and held senior positions involving power system planning and design.

## WHO SHOULD ATTEND?

For network and system planners and operators, the course will be an opportunity to enhance understanding the theory and practice of system stability and control and mitigation of system oscillations after contingencies.

The course will provide young graduates with a good understanding of the fundamental of the topic, while Dr. Kundur also is able to provide experienced practitioners with insights and discussion on higher level issues. It is anticipated that senior industry experts will attend and participate.



Feskekörka



Avenyn

## PROGRAM OUTLINE

Morning and afternoon breaks will include tea and coffee. The included lunch will be served at the conference center. The course starts with registration at 08.30-09.00 Tuesday morning. On Tuesday evening there will be a welcoming dinner.



Haga

## Tuesday, November 10, 2009

### 1. Introduction to Power System Stability

- Definition and classification of power system stability
- Brief description of each category of system stability
- Conceptual relationship between power system stability, security and reliability
- Traditional approach power system security assessment

### 2. Review of Equipment Characteristics and Modeling

- Synchronous machines
- Excitation systems
- Prime movers and governing systems
- Generating unit testing and model validation
- AC Transmission Power system loads

## Wednesday, November 11, 2009

### 3. Control of Active Power and Frequency

- Fundamentals of frequency control
- Composite regulating characteristics of power systems
- Automatic generation control
- Under-frequency load shedding

### 4. Control of Reactive Power and Voltage

- Control objectives
- Production and absorption of reactive power
- Methods of voltage control
- Principles of reactive compensation in transmission systems
- Static and dynamic compensators

### 5. Transient (angle) Stability

- An elementary view of the transient stability problem
- Simulation of power system dynamic response
- Numerical integration methods
- Performance of protective relaying
- Transient stability enhancement
- Case studies
- Examples of major system blackouts due to transient instability

## Thursday, November 12, 2009

### 6. Small-Signal (angle) Stability

- Nature and description of small-signal stability (SSS) problems
- Methods of analysis; modal analysis approach
- Characteristics of local-plant mode and inter-area mode oscillations
- Case studies
- SSS enhancement
- Examples of major system disturbances due to small-signal instability

### 7. Sub synchronous Oscillations

- Steam turbine generator torsional characteristics
- Torsional interaction with power system controls
- Sub synchronous resonance
- Impact of network-switching disturbances

### 8. Voltage Stability

- Description of the phenomenon
- Factors influencing voltage stability
- Methods of analysis
- Prevention of voltage instability
- Case studies
- Examples of major system disturbances due to voltage instability

### 9. Laboratory demonstration at Chalmers University of Technology

A power system stability and control demonstration. This will give a practical understanding of the theoretical material of the seminar.

## Friday, November 13, 2009

### 10. Frequency Stability

- Nature and description of frequency stability problems
- Examples of system disturbances caused by frequency instability
- Analysis of frequency stability problems
- Case studies
- Mitigation of frequency stability problems

### 11. Major Power Grid Blackouts in 2003

- Description of events
- Causes of blackouts
- Lessons learned

### 12. Comprehensive Approach to Power System Security

- Requirements
- Application of power system controls
- Defense plans against extreme contingencies
- Restoration plans
- On-line security assessment
- Reliability management system
- Real-time monitoring and control
- Risk-based Dynamic security Assessment

## REGISTRATION AND CONTACT

Registration to the course should be addressed to the course administrator Stefan Kovacs:

stefan.kovacs@solvina.se or

Stefan Kovacs  
Solvina AB  
Gruvgatan 37  
S-421 30 Västra Frölunda  
Sweden

Include your name, telephone number and the invoice address of your company in the registration mail. The registration is binding, see the cancellation rules.

## ADDITIONAL INFORMATION

### CONFIRMATION

Within a week from your reservation you will receive a confirmation. If the course is filled, you will be placed in a queue.

### COURSE FEE

Course documentation, lunch, coffee, fruit and a welcoming dinner (Tuesday evening) is included in the course fee. The course fee will be invoiced prior to the course. Terms of payment: 30 days net.

### CANCELLATION

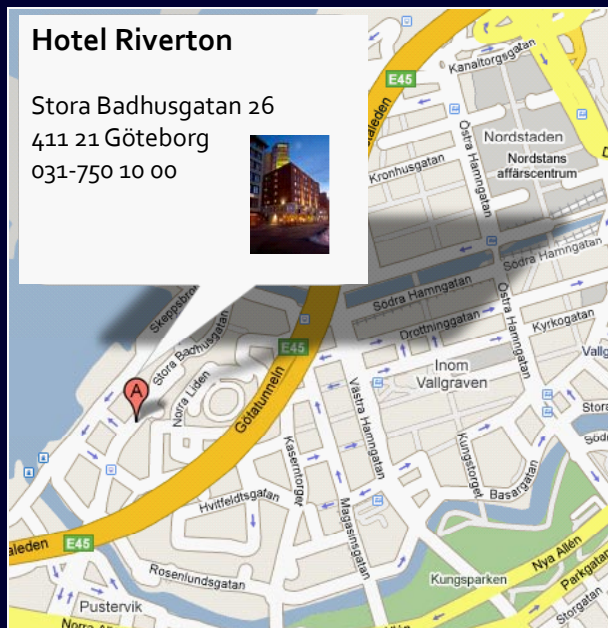
If you are not able to participate in the course, you may transfer it to another person within your company. There will be a 50 % charge of the course fee if cancellation is made 2-4 weeks prior to the course and 100 % charge 0-2 weeks.

### HOTEL RESERVATION

The accommodation is not included in the course fee. Solvina AB recommends closeby hotel, see accommodation below.

### FORCE MAJEURE

Solvina AB is not liable for damage due to Swedish or domestic law, Swedish or foreign authority, war, strike, blocking or other similar circumstance, and shall not be held responsible for damage in case the course, in parts or in full, not being completed due to disease.



## ACCOMMODATION

Solvina recommends **Hotel Riverton**, five minute walk from the seminar building.

+46 31 750 10 00

For your convenience Solvina has preliminary booked accommodation. It has to be confirmed before the 25th of September, with the booking number 518 453. This will give you the advantage to get an upgraded room.



# Solvina

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