POWER SYSTEM STABILIZER TUNING

27 - 29 APRIL 2015 | SINGAPORE

Topics Covered

Introduction to synchronous generators

Voltage control equipment

Modeling of synchronous generators

Impact of AVR and PSS

Different AVR and PSS structures

Perspective of AVR and PSS performance requirements

Expert Course Faculty Leader

LEONARDO LIMA

In Collaboration With
About This Training Course

The three-days course is designed for electrical engineers and operational staff involved in power generation, particularly when a power system stabilizer is applied or is being considered. The content is relevant for all types of generation involving synchronous machines. The course will provide a firm understanding on the application of power system stabilizers, including modeling, testing and commissioning of these devices.

Learning Outcomes

Delegates will learn about:

- Fundamentals of the synchronous machine and their excitation system
- Aspects of modeling of synchronous generators and their controls
- Aspects of stability of synchronous generators
- The impact of the AVR and PSS in the dynamic performance of interconnected systems
- Different AVR and PSS structures and their relative pros and cons
- Principles applied for tuning and testing of voltage controls (AVR and PSS) of synchronous generators to enhance the damping of plant and interarea modes
- Aspects of generator requirements especially from perspective of AVR and PSS performance requirements
- Practical aspects related to tuning and testing of voltage controls including differences between rotating and static exciters and different AVR-structures
- Modelling and validation of the generator AVR and PSS controls
- Challenges related to modelling and validation of the generator AVR and PSS controls
- Principles of dual-input PSS tuning considering inter-area, local and plant level electromechanical oscillations
- The studies and the study techniques required for tuning of dual input stabilizers
- Case example(s) of the modelling, tuning and the testing process of voltage controls (including validation issues)

Who Should Attend

Electrical engineers involved in power generation, particularly for those plants in an interconnected system
Power plant operational staff, particularly for those units equipped with a PSS or considering the addition of a PSS
Electrical engineers involved in interconnected system operation and planning, particularly those involved in dynamic system simulation

Your Expert Course Faculty: Leonardo Lima

Leonardo Lima received his B.S.E.E. in 1986, his M.Sc. in 1991 and his D.Sc. in 1999 from Universidade Federal do Rio de Janeiro in Rio de Janeiro, Brazil. He has more than 20 years of professional experience in power system analysis and simulation, including system studies for transmission planning and operation. He worked in the development of the small-signal stability program PacDyn between 1984 and 1988. In 1992, he joined the Power System Engineering Department of the Universidade Federal Fluminense, in Niterói, Brazil, as an Assistant Professor, lecturing under-graduate and graduate courses in classical control theory, power system analysis, power system stability, power system planning, and electrical machines. He became a full Professor in 1999. He joined the PTI’s (currently Siemens PTI) consulting practice in 2002 and became a Principal Consultant in 2009, where he specialized in dynamic modelling and simulation using PSS/E. He joined Kestrel Power Engineering in 2010 as a Senior Engineer. He is a member of the IEEE Power Engineering Society and is currently the Secretary of the Power System Stability Controls Subcommittee of the Power System Dynamic Performance Committee.
3 Day Course Outline

DAY 1
Course Introduction
- Introduction to synchronous generators and their voltage control equipment
- Modeling of synchronous generators and their controls
- Review of stability of synchronous generator
- Impact of AVR and PSS on dynamic performance of power systems

DAY 2
- Overview of different AVR and PSS structures
- Principles applied for tuning and testing AVR and PSS to enhance the damping of plant and inter-area modes
- Background and review of the generator requirements especially from perspective of AVR and PSS performance requirements
- Practical aspects related to tuning and testing of voltage controls incl. differences between rotating and static exciters and different AVR-structures

DAY 3
- Modelling and validation of the generator AVR and PSS controls
- Challenges related to modelling and validation of the generator AVR and PSS controls
- Case example(s) of the modelling, tuning and the testing process of voltage controls (including validation issues)

This training course has a limited attendance for up to 20 participants only.

Sessions commence at 9am on all days, with short intervals at 10.30am and 3.30pm respectively. Refreshments will be provided in the short intervals. Lunch will be provided at 12:30pm for 1 hour. Sessions will end at 5pm on all days.
Courses Available

4 Pillars of Transformer Condition
Advanced Project Finance for Power
Advanced Technical Report Writing & Presentation Skills
Advanced Turnaround Shutdown & Outage Management
Ancillary Services in Competitive Electricity
Asset Management for the Power Industry
Best Practice Renewable Energy Capital & Project Management
Biomass Power Generation
CFB Combustion for Boiler Operations
Clean Development Mechanism and Carbon Markets
Coal Contracts
Combined Cycle Power Plants Operation
Combined Heat & Power (CHP) and Co-Generation Plant Operations
Competency Management System for the Power Industry
Design & Operations of Circulating Fluidized Bed Boiler
Developing & Structuring Public-Private Partnership (PPP) for Infrastructure
Effective Tender Process Management for Power & Utilities
Electrical Hazop (eHazop) Studies for the Power Industry
Electricity Demand-Side Management
Electricity Industry Design
Electricity Network Planning
 Electricity Retail Contracts
 Electricity Theft
Electricity Trading Essentials
Energy Efficiency
EPC Contract Management for Power & Utilities
Essentials of Coal Markets and Trading
Essentials of Power Trading
Excitation Systems
Feed-In Tariffs for PV Systems
Finance for Non-Finance Professionals in Power & Utilities
Financial Modelling for Project Finance in Power & Utilities
Fitness-For-Service AP1 579 & High Energy Piping Life Management
Fundamentals of Geothermal Energy
Fundamentals of Power Generation
Gas & LNG Contract Negotiation
Gas Turbine Generator Selection, Operation & Maintenance
Gas Turbine Hot Gas Paths, Rotors & Failure Analysis
Gas Turbine Major Inspection & Overhaul
GE Gas Turbine Operations Simulation Based
HRSG Design, Operations & Understanding, Controlling of HRSG Damage
Mechanisms
HV Substation Design & Construction
IEC for Utilities
Integration of Distributed Generation
Introduction to Carbon Capture & Storage
Introduction to Clean Coal Technology
Introduction to Power Systems
Keeping Electrical Switchgear Safe
Leadership & Team Dynamics for Power & Utilities
LNG Fundamentals
LNG Markets & SPOT Trading
Maintenance Planning & Scheduling
Making IPP & Renewable Energy Projects Contract
Frameworks Bankable
Managing Complex Projects for Power and Utilities Professionals
Medium Voltage & High Voltage Switchgear
Metallurgy for Engineers
Mechanical Engineering for Non-Mechanical Engineers
Mini Hydro Project Analysis
MKV Speedtronic Control System
MK VI Speedtronic Control System
Nuclear Energy Project Planning & Economics
Nuclear Power
Offshore Platforms Electrical Systems Design & Illustrations
Operations of Coal Fired Power Plants
Power Generation Commissioning, Operations & Maintenance
Power Generation Operation, Protection & Excitation Control
Power Plant Chemistry for Chemist & Chemical Engineers
Power Purchase Agreements
Process Control Methods
Programmatic CDM
Relay Protection in Power Systems
Reliability Centered Maintenance Masterclass
Reliability Engineering
Renewable Energy Development & Investment
Renewable Energy Integration
Risk Based Inspection
Risk Management in Power Markets
Root Cause Analysis
Rotating Equipment Maintenance & Reliability Excellence
SCADA & Power Systems
Smart Grid
Solar Energy & Photovoltaic Power
Spare Parts Optimisation
Supercritical and Ultra-Supercritical Coal-Fired Power Plant
Technical Report Writing & Presentation Skills for Power & Utilities Professionals
Ultra Low NOx Gas Turbine Combustion
Uninterruptible Power Supply
Vibration Analysis & Condition Monitoring
Waste to Energy Plant Operations
Water Treatment and Corrosion Control for Steam Generation and Power Production
Writing Effective Standard Operating Procedures (SOP) for Power & Utilities Professionals & Engineers

www.poweredgeasia.com
<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Does PowerEdge have other programmes than those listed?</td>
<td>We have more than 200 programmes that we are capable of running. All we need is for you to contact us and request for the preferred programme and we will able to develop it.</td>
</tr>
<tr>
<td>2. Where is PowerEdge based?</td>
<td>PowerEDGE is headquartered in Singapore but we run our training programmes in different venues around Asia.</td>
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<tr>
<td>3. What does PowerEdge do?</td>
<td>We are a Power &amp; Utilities Training Specialist.</td>
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<td>4. Can this course be done in our city?</td>
<td>It absolutely can. Get in touch with us to request for a training programme to be carried out in your city.</td>
</tr>
<tr>
<td>5. Can you reduce the price of our preferred course?</td>
<td>While our price has been reduced before it is even launched, we are always happy to help you with further discounts.</td>
</tr>
<tr>
<td>6. Can you change the dates of the course?</td>
<td>If you have a special requested date, let us know and we will arrange another session for you.</td>
</tr>
<tr>
<td>7. Who are the companies that will be participating?</td>
<td>This varies from a diversity of Power Operators, Regulators, Financers, to Vendors in the Power &amp; Utilities industry.</td>
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<tr>
<td>8. Where is the venue for the course?</td>
<td>We usually engage a 4 to 5 star hotel meeting room to ensure the comfort of our participants.</td>
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<td>9. How many delegates should we expect for each course?</td>
<td>This varies from 15 to 20 participants. Class sizes are kept small to allow trainers to focus better on each participant.</td>
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<td>10. What are the different payment modes?</td>
<td>We accept Visa/MasterCard, cheques, bank transfers and cash on site.</td>
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<td>11. Is accommodation included when I sign up for a course?</td>
<td>Accommodation is not included in the course fee but we are always happy to advise on available accommodations.</td>
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<td>12. Can I get a cheaper accommodation through PowerEdge?</td>
<td>We will be pleased to help you negotiate a better rate with hotels.</td>
</tr>
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<td>13. Is lunch provided during the course?</td>
<td>We provide lunch and 2 tea breaks every day during our training programmes.</td>
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<td>14. Are the training materials included once I have signed up for a course?</td>
<td>Yes, training and course materials are included in the course fee.</td>
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<td>15. Will there be a certificate for the course?</td>
<td>Yes, there will be a certificate of participation upon completion of a course.</td>
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<tr>
<td>16. Who are PowerEdge trainers?</td>
<td>They are expert consultants and practitioners with many years of experience in the subject matter that they deliver on.</td>
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<td>17. Are PowerEdge trainers competent?</td>
<td>We have received numerous favourable feedbacks on our trainers from past participants.</td>
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<td>18. Can PowerEdge assist with Visa travel applications?</td>
<td>We can assist in advising you on the relevant procedure(s) and embassies/consulates that provide Visa for travel purposes.</td>
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<tr>
<td>19. Can we purchase training materials without attending a course?</td>
<td>Unfortunately this option is not available as training materials are specially developed for courses.</td>
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<td>20. Can course content be tweaked to cater to our needs?</td>
<td>Of course! Just let us know your request and we will get the trainer to assist in carrying it out.</td>
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REGISTRATION FORM

<table>
<thead>
<tr>
<th>3 Day Programme</th>
<th>NORMAL PRICE</th>
<th>Early Bird SAVE SGD 200 Ends 30 Jan 2015</th>
<th>GROUP OF 3 or More</th>
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<tbody>
<tr>
<td></td>
<td>SGD 4, 200</td>
<td>SGD 4, 000</td>
<td>SGD 3, 700</td>
</tr>
<tr>
<td>Per Participant</td>
<td>(*GST Inclusive)</td>
<td>(*GST Exclusive)</td>
<td>Per Participant</td>
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<td></td>
<td>SGD 4, 494</td>
<td>SGD 4, 280</td>
<td>SGD 3, 959</td>
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<td>(GST Inclusive)</td>
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ATTENDEE DETAILS

Name ............................................................................................................. Job title .............................................................................................................
Tel .............................................................................................................. Department .............................................................. Email .......................................................................................................

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COMPANY DETAILS

Organisation name ....................................................................................... Industry.................................
Address ...........................................................................................................
Postcode........................................................................................................ Country.................................
Tel .............................................................................................................. Fax.............................................................................................................

PAYMENT METHOD
By Cheque/ Bank Draft: Make payable to PowerEdge Pte Ltd.
By Telegraphic Transfer: Please quote AE1 with the remittance advise
Account Name: PowerEdge Pte. Ltd.
Bank Address: 65 Chulia Street OCBC Centre, Singapore 049513
All bank charges and payment in Singapore dollars (SGD) to be borne by payer. Please ensure that PowerEdge Pte Ltd receive the full invoiced amount.

CANCELLATIONS & PUNITIONS
Payment is due in full at the time of registration. Full payment is mandatory for event attendance. I agree to PowerEdge Pte Ltd. payment terms
* GST: Exclusive price is only applicable for overseas corporate customers subject to qualifying conditions.

You may substitute delegates at any time. POWEREDGE PTE LTD does not provide refunds for cancellations. For cancellations received in writing more than seven (7) days prior to the training course you will receive a 100% credit to be used at another POWEREDGE PTE LTD training course for up to one year from the date of issue. For cancellations received seven (7) days or less prior to an event (including day 7), no credits will be issued. In the event that POWEREDGE PTE LTD cancels an event, delegate payments at the date of cancellation will be credited to a future POWEREDGE PTE LTD event. This credit will be available for up to one year from the date of issuance. In the event that POWEREDGE PTE LTD postpones an event, delegate payments at the postponement date will be credited towards the rescheduled date. If the delegate is unable to attend the rescheduled event, the delegate will receive a 100% credit.

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4 ways to Register

Online Web Registration
info@poweredgeasia.com
(65) 6741 9927
(65) 67478737

RELATEd COURSES

☑ Coal Fired Plant Operations
☑ Introduction to Power Systems
☑ Renewable Energy Integration
☑ Fundamentals of Power Generation

On Site Training

Can’t make it for the Course? We’ll make the course come to you!!

Simply let us know your preferred time and dates and we will meet you at your schedule and venue.

With a host of highly trained experts, we will be happy to customize your programme with your needs 100% fulfilled.

Contact us today at
info@poweredgeasia.com
(65) 6741 9927