Course 701

**Generator Dynamics Modeling and Reliability Requirements**

<table>
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<tr>
<th>Course Objectives</th>
<th>This course is to provide fundamentals of generators and associated control systems.</th>
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| Material covered  | - Basic concepts of generator, excitation system, turbine-governor and power system stabilizer and their roles in power system stability;  
|                   | - Modeling of generator and its associated control systems and their association with NERC reliability standards;  
|                   | - Coordination of generator protection, limiter and capability; |
| Who should attend | - Plant engineers/technicians  
|                   | - Transmission planners  
|                   | - Power system study engineers |
| Background required | - Basic knowledge of power system  
|                   | - Basic knowledge of generation components |
| Duration          | 3 days (Wednesday-Friday, June 12-14, 2019) |

**Day 1 (Wednesday June 12, 2019)**

**Part 1: Generator dynamics modeling background and overview**

- Basics of power system operation  
- Concepts of power system stability  
- NERC reliability standards and guidelines  
- Testing and model validation methodology

**Part 2: Synchronous Generator Modeling and Parameter Testing**

- Synchronous generator modeling  
- Generator terminal characteristics  
- Generator reactive capability  
- Generator parameters testing methods  
- Field testing for generator model parameter validation  
- Typical models and parameter ranges  
- Dynamic simulation consideration

**Day 2 (Thursday June 13, 2019)**

**Part 3: Excitation system Modeling and Parameter Testing**

- Functions and performance requirement  
- Common elements and types of excitation system
- Control and protection functions
- Modeling of excitation systems
- Reactive current compensation
- Dynamic performance measures
- Dynamic simulation consideration
- MOD-025 and MOD-026 field testing and studies

**Part 4: Power System Stabilizer Parameter and Performance Testing**

- Small signal stability
- Principles of PSS design
- Types of commonly used PSS
- Excitation system suitability
- PSS parameter tuning
- PSS performance tests
- Dynamic simulation consideration

*Day 3 (Friday June 14, 2019)*

**Part 5: Turbine and Governor Modeling and Testing**

- Turbine and governor overview
- Hydraulic turbine and governor models
- Steam turbine and governor models
- Gas turbine and combined-cycle power plant
- Permanent droop and dead-bands
- MOD-027 field testing and studies
- Turbine governor model validation based on system frequency event
- Dynamic simulation consideration

**Part 6: Excitation Limiter and Relay coordination**

- PRC-019 limiter, relay and capability coordination
- PRC-024 voltage and frequency relay setting verification
- PRC-025 load responsive relay setting verification