

## **TUTORIAL – POWER GRID BLACKOUTS: CAUSES AND MITIGATION**

### **DESCRIPTION OF TUTORIAL**

This tutorial will provide a comprehensive overview of power system stability problems leading to grid blackouts, and will describe measures that can be used to enhance secure operation of power systems in the new electric power industry environment. The topics that will be covered include: physical aspects and classification of power system stability phenomena; examples of major system blackouts caused by different categories of instability; challenges to secure operation of today's power systems, complex modes of instability, deregulated market environment; major power grid blackouts in 2003 and 2004; comprehensive approach to secure system operation, risk-based reliability criteria, improved protective relaying, robust power system controls, coordinated emergency controls as a defense against multiple contingencies, on-line security assessment, wide-area monitoring and control, widespread use of distributed generation, and regulatory framework with well defined roles and responsibilities for individual business entities.