Agenda

- Introduction
- Grid Management code
- Planning code
- Connection code
- Operating code
- Metering code
- Scheduling Dispatch code
- Settlement code
- Data requirement code
- Glossary
Introduction

• Grid Codes was originally developed for conventional power plants with synchronous generators
• Unlike the conventional power plants, power generation of variable power generation plants changes rapidly and is relatively less predictable.
• Connection and parallel operation of variable power generation plants, if not properly designed and planned, may adversely affect the stability, reliability and power quality of the Transmission System
• Grid Code should be updated to include interconnection guidelines for VRE
• Typically interconnection guidelines are segmented by size of project:
  ○ Large size projects connected to transmission system
  ○ Medium or small size projects, connected to distribution system
Grid Management Code

- The grid management committee should include persons to represent VRE
Planning Code

- Technical specifications and procedures for planning of the new component or upgrade to an existing component.
- For VRE it contains provisions and procedure for planning the integration of new generation to the transmission grid. It may include studies that should be performed, data that should be used for the study, who should conduct the study and what should be timeline and cost. Typical studies are:
  - Connection Feasibility Study
  - Connection Facilities Study
Connection Code

- The Connection Code specifies the minimum technical and operational requirements for any User connected to or seeking connection with the Grid
- All users of the grid have to ensure that the connected VRE facilities have performance characteristics that meet the grid code
- It includes nominal frequency and voltage, acceptable range for frequency and voltage, total harmonic distortion allowed, flicker allowed, etc.
Operating Code

- Describes the rules and procedures to ensure acceptable level of reliability and operation efficiency
- Basic responsibilities of all the Users of the Grid to contribute to the secure and reliable Grid operations
- Responsibility of VRE plants for grid security are to be available for active and reactive power control
Metering Code

- Specifies the minimum technical and operational requirements for the revenue and check metering equipment to be installed
Scheduling and Dispatch Code

- Specifies the rules and procedures for scheduling of transactions and dispatch of resources, including:
  - Long Term Operational Scheduling
  - Monthly Scheduling
  - Weekly Scheduling
  - Daily Dispatch
  - Real time on Re-Dispatch request

- Requirement for forecasting of VRE output and use of this information for scheduling is specified
Settlement Code

- Describes the rules and procedures for billing and paying for energy sales and energy services
Data Management Code

- Summarizes the detailed technical data required by the operator from all Grid Users, including Generators, Distribution Units and Large Customers.
- Operator requires these detailed data to evaluate compliance with the various technical and operating standards set forth in the Grid Code in order to assure Grid security, reliability and operational efficiency.
- Generation plant information, one time and update as required.
- Operational information is sent daily of more frequently. Data includes weather and energy forecast, actual energy generation, and available capacity forecast and actual.
Thank You

Contact Person:
Pramod Jain, Ph.D., Consultant to USAID
Power the Future
President, Innovative Wind Energy, Inc.,
pramod@i-windenergy.com,
+1-904-923-6489