MISSION ASSURANCE, RENEWABLES and the SMART GRID

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PJM as Part of the Eastern Interconnection

Key PJM Statistics
- Millions of people served: 51
- Peak load in megawatts: 144,644
- MWs of generating capacity: 164,634
- Miles of transmission lines: 164,260
- Generation sources: 1,271
- Square miles of territory: 164,260
- Area served: 13 states + DC

26% of generation in Eastern Interconnection
23% of load in Eastern Interconnection
19% of transmission assets in Eastern Interconnection
19% of U.S. GDP produced in PJM

Western Interconnection:
- Load = 146,326 MW
- Cap. = 159,134 MW

Texas Interconnection:
- Load = 54,493 MW
- Cap. = 61,751 MW

Eastern Interconnection:
- Load = 600,000 MW
- Cap. = 650,021 MW

Substations: 6,038
Central Question - How does the paradigm or Operational Balance change with the integration of Renewables and SMART GRID technologies?
What are Typical Operations?
Renewable Energy
Generation To Be Built in PJM?

Existing
- Coal, 68,137 MW (40%)
- Natural Gas, 48,839 MW (29%)
- Nuclear, 30,372 MW (18%)
- Wind, 2,361 MW
- Hydro, 7,940 MW (5%)
- Oil, 10,700 MW (6%)

As of 12/31/2009

Proposed Queue
- Wind, 41,877 MW (55%)
- Natural Gas, 18,833 MW (25%)
- Nuclear, 6,647 MW (9%)
- Coal, 4,345 MW (6%)
- Solar, 1,198 MW (6%)
- Diesel, 18,456 MW
- Wood, 108,456 MW
- Methane, 190 MW
- Other, 349 MW
- Hydro, 488,291 MW

As of March 31, 2010
Renewables – referred to as “Intermittent” or “Variable” Gen

Wind is coming, but not on the peak hours
  • (in the East - 13% available at the time of peak)

Energy Storage is needed to ensure renewables achieve their potential
PJM Load and Wind Resources – April 7, 2009

PJM Load and Total Wind

Load MW

Wind MW

PJM Load, MW
PJM Total Wind, MW
Interregional Studies of Higher Penetrations

20% Wind - $80B in Transmission
54 GW Potential of Off Shore Wind
PJM’s Role in the Smarter (Robust) Grid

The Smart Grid is realized by merging data to achieve a total end-to-end systems view by integrating information technology and operational technology.

Two-Way Communication and Control
Smart@Car—a connection to the grid
Information Flow for Today’s Grid

**Generation**
- Transmission substation

**RTO**
- TO
- Distribution substation

**EDC**
- EDC

**Load**
- Residential
- Industrial
- Commercial

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Smart Grid – Information Flow

- Consumer Devices
- Energy Users
- Energy Providers
- Network Operations
- Grid Community
- Transmission
A New Paradigm of Operational Balance

Reliability in Historic Grid Operations

Reliability in Future Grid Operations
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