The Experiences in Europe, Asia and the Americas in Initiating Regional Power Market

D. Dobbeni
Abu Dhabi - September 28 – 29, 2014
Power Systems all over the world

Dispatchable

Load Following Generation + Base Load Generation +/- Bulk Energy Storage = Customer Demand - Interruptible Load

Forecastable
Power Systems all over the world

Renewable and Local Generation,
Near-Zero Fossil Generation, Nuclear Power
Power Systems all over the world

Consumer Engagement, Energy Efficiency, Demand Response, Energy Storage
A Power System that is **Flexible, Resilient and Connected** and is the Optimizer of Energy Resources
Tomorrow: flexibility = trade

- Local Generation
- New Customer Demands
- Electric Vehicle Battery Storage
- Wind and Solar

More Variable
Less Forecastable
Less Dispatchable

Demand Response

Flexibility

Dispatchable
- Base Load Generation
- Load Following Generation

Forecastable
- Bulk Energy Storage
- Customer Demand
- Interruptible Load

GCCI 3rd Regional Power Trade Forum
EPRI 2013
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Power Systems = Uncertainties

- Forecast errors
  - Weather uncertainties
  - Consumer load and its spatial distribution
  - Generation availability
- Variation in network topology
  - Disparity in project implementation
  - Mid-course changes in project execution
  - Prolonged outages
  - Non-firm maintenance programs
- Practical constraints
  - Reconfiguration of switching arrangement ▼ Radial operation
  - Opening of bus couplers
  - Opening of 220 kV loops etc.
- Other uncertainties
  - Changes in long term allocations in Inter State Generating Stations

Indian Power System Operation Corporation Ltd.
Reliability = Energy and Capacity

**Energy**
- Generation of electric power over a period of time
- Energy revenues paid to resource based on participation in Day-Ahead or Real-Time energy market
- Daily/hourly commitment
- Hourly or real-time product

**Capacity**
- A commitment to provide energy during emergency.
- Capacity revenues paid to committed resource whether or not energy is delivered to the grid.
- Long-term commitment
- Daily product

*Capacity, energy & ancillary services revenues are expected, in the long term, to meet the fixed and variable costs of generation resources to ensure that adequate generation is maintained for reliability at a reasonable cost.*
Power Markets around the world

+ Evolution towards regional markets
  e.g. Market coupling (Europe), Market Splitting (India), Nodal
Power markets = Grid Operators
Electricity Market in India: Key Success Factors

- Control area demarcation & boundary metering
- Seams Management
- Robust transmission system
- Assessment of Transfer Capability by the System Operator
- Balancing mechanism
- Clear Methodology for
  - Transmission charge sharing
  - Treatment of transmission losses
- Streamlined scheduling and settlement mechanism
- Transparency and non-discriminatory implementation
- Dispute redressal mechanism
- Congestion management
- Automation
Lessons learned all over the world

Regional Power Trade = a must to face the fast evolution of the power sector

Prerequisites: committed parties + transmission capacity + regional operator + model
“We will see more changes in the next 10 years than we have in the last 100 years”

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