

# DERs and the Smart Grid - Facing a New Horizon

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# Now I can say renewables

The reason behind this is a presentation unto itself. --- FTC Green Guidelines

# Challenges of Maintaining Reliability When DER is Integrated into the System

- Resource Types -What are DERs?
- Planning – Integration Process and Tools
- Reliability – Operations, Safety, Real Time Data
- Regulatory – Bid Markets vs. Vertically Integrated
  - FERC
  - State Commissions
- Value / Economics – Participants and Non-participants (Customer Impacts)
- Liabilities – Who is Responsible? (Who Pays When the Lawyers Come Calling?)

# History – In the beginning

- Distributed generation was the beginning
- No standards
- No oversight
- No protection
- High cost and low reliability
- DC vs AC (Edison vs. Westinghouse)

# Second Phase

- Merging of individual distributed systems at a local level
- Creation of larger companies – telephone, electric, gas, and rail
- Creation of Mega Companies
- State and Federal Oversight
- PUCHA – destruction of Mega Companies
- Vertically Integrated Utilities and Bid Market (ISO/ITO)

# Third Phase – the Unknown

- NY REV
- Hawaii Plan
- California Plan
- Federal Plan (DOE, DOD, etc.)

# Resource Types – What are DERs?

(Typically connected to Customers' Facilities or Distribution Systems )

- Solar
- CHP
- Micro-Turbines
- Reciprocating Engine Generators
- Hydro
- Storage
- Energy Efficiency Programs
- Demand Response Options
- Unknown Future Technologies



# Planning for Reliability– Integration Process and Tools

- DERs are a challenge to model due to their small size
- Strategic and Production based models typically need several hundred MW sized blocks to work. Below this level is typically in the noise of the model.
- Transmission based models typically have DERs embedded in their load nodes and are treated as load reductions
- Distribution models have their challenges as well, since they typically model steady-state and cannot allow the generation or load to be dynamic

# Operations/Reliability – DERs Impacts

- Non-networked distribution systems are designed for one way directional flow
- Circuit coordination and protections schemes are based on one way directional flow
- DERs can be an additional source for fault-current and harmonic distortions to the system
- DERs can re-energize the T&D system causing safety concerns and equipment damage (utility and customer equipment)
- Collection of real time DER data and integration is a major challenge

# Reliability/Operations – DERs Impacts - continued

- DERs could conflict with CVR systems causing a loss of capacity
- If distribution systems reach limits, who gets to have DERs? Who pays for upgrades? Who decides?
- DERs would likely cause increases in T&D O&M for equipment operations (regulators, cap banks, LTCs, etc.)
- Disconnection rights
- Repairs and maintenance

# DERs Regulatory Issues

- Jurisdictional Issues/Policy - FERC, State, or FERC/State
- Market Participation Issues – Regional Bid Markets versus Vertically Integrated Systems
- Non-jurisdictional Issues – Federal Agencies, Munis, Co-ops, and etc.
- Interconnection Requirements
- Cost Recovery/Payments
- Monitoring and Verification

# Value and Economics

- Whose value proposition – customer, utility, etc.
- Apples-to-apples comparison – DERs need to be equivalent to power system generation
- Example - Incremental Capacity Equivalent using EUE method
- Matrix or scenario approach
- Direct and Indirect benefits and costs to utilities
- Direct and Indirect benefits and costs to utilities- participants versus non-participants
- With or without cross-subsidization
- Accounting and Tax Practices

# Liabilities-

(Who pays when the Lawyers come calling?)

- Insurance Requirements
- Indemnification
- Civil and/or Criminal responsibility for equipment damage or personal injury
- NERC/FERC reliability requirements – fines, etc.
- Example – Fire Marshal policy for rooftop solar and fires

# Other Challenges to DERs

- NAAQS
- Water
- Land
- Hazardous Pollution Standards
- CPP (Clean Power Plan)
  - State Based/Regional Base
  - Legal Issues
  - Customer Impacts
  - Winners and Losers

# Other Challenges - continued

- Customer Wants (new technology) – replacement/obsolete equipment
- Law of Unintended Consequences
- Politics





Questions?