Microgrids: A Developer's Perspective

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Our Definition of a Microgrid

- Three General Microgrid Architectures
  - Individual load facility
  - Campus
  - An islandable portion of a larger distribution system

- Design Goals
  - Provide targeted reliability and power quality for critical areas of the grid and critical loads
  - Should be integrated with the Grid and wholesale markets
  - Should facilitate the integration of variable energy resources to the greatest extent possible

Our Microgrid Development Focus

- Generation resource that combine multiple technologies (including gas, renewable, and storage) to provide unsurpassed efficiency and flexibility

- Generation <u>interconnected</u> on utility side of the meter
  - Avoids undermining utility rate base, which can result in cross-subsidization

- Leverage existing utility infrastructure as much as possible

- Strategic location of generation
  - Support high penetration levels of VERs
  - Support the Grid
  - Provide targeted local enhanced reliability and power quality

Central Generation

- Drivers for central generation design and location:
  - Wholesale market price signals (energy, capacity, ancillary services)
  - Optimal interconnection infrastructure (gas and electric)
  - Other siting considerations (zoning, proximity to water, etc)

- Factors <u>not</u> included:
  - Local reliability and reliability for critical loads
  - Support of distribution system

Problems with Baseload Plants

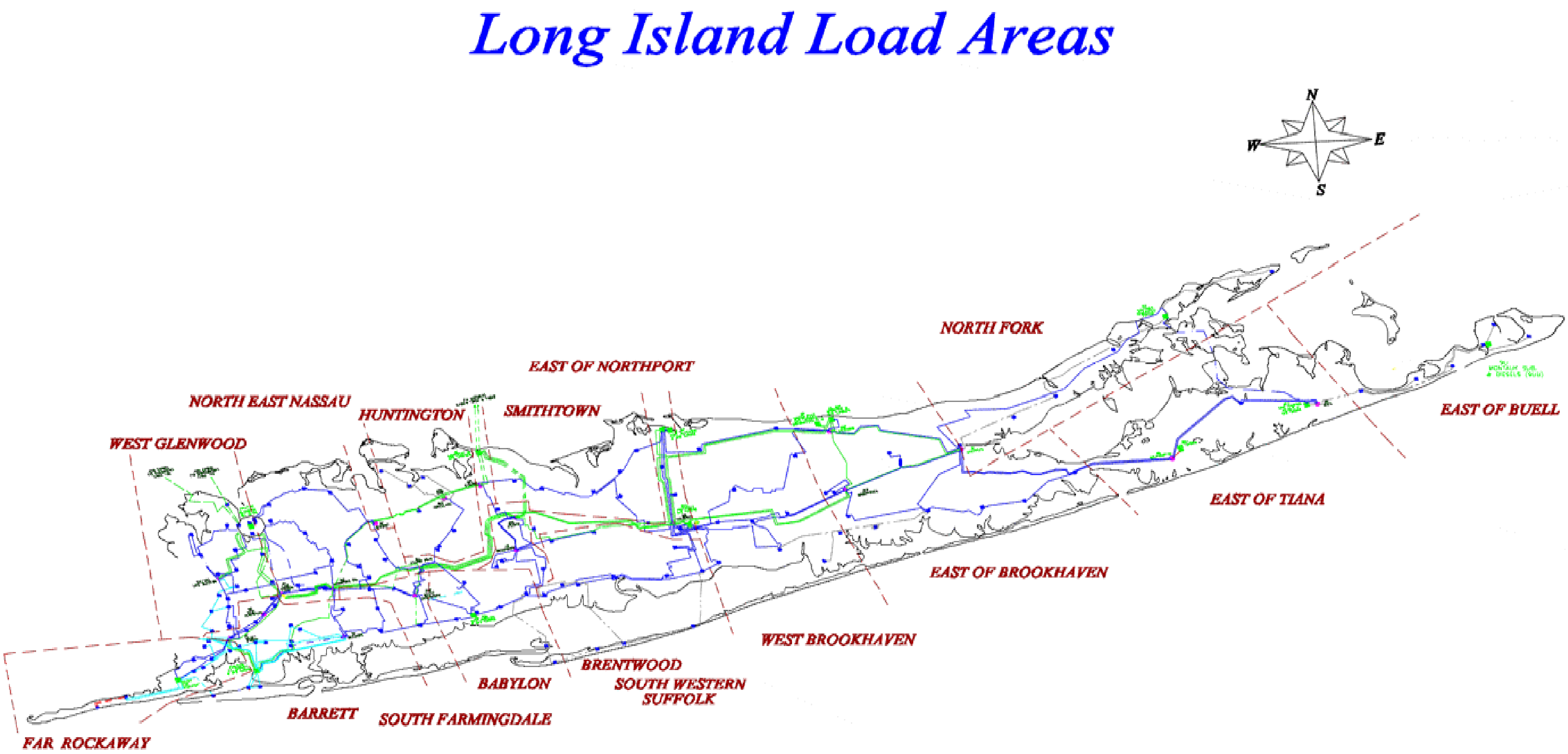
- Large (200-1,000 MW)
- Slow to respond
- Cannot operate at partial loads
- Efficiency drops if not operating at full output
- Impacted by merit order effect of VERs – stranded cost risk

Variable Energy Resource (VER) Integration

- A lot of attention at federal (FERC Order 764)and state level on VER integration
- Integration issues
  - Short term grid stability (seconds to minutes)
  - Long-term resource needs (10-30 years)
- The need for more flexible generation is already being called for in ISO-NE, CA, TX, CO, Pacific Northwest, and Northern Europe

Fact: In Germany, solar meets 50% of its supply during certain hours of the day.

A Case Study - LIPA Load Areas



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LIPA Load Area

- 15 load (or control) areas
- Load and generation in each area ranges from 100-750 MW (~5,500 MW for all LIPA)

- Example 1: Huntington Load Area: 106 MW load, 0 MW gen
- Example 2: East Brookhaven Load Area: 224 MW load, 724 MW gen

**** Goal: Congruent load and generation topologies ****

Solution

- Smaller (<100 MW) fast response dispatchable resources
- Located close to critical loads and in areas with high anticipated VER penetration levels
- Integrated into a microgrid architecture to be optimized with other DG and DR resources
- Enabled to provide back-up power to a load area, or subsection of it, during Grid outages

Policy Recommendations

- Better resource planning at the state and local level
- Incentives for design and financing of privately owned microgrids
- Price signals for generation developers that provide enhanced local reliability and/or VER integration services
- Regulatory support for cost recovery for T&D owners to deploy necessary monitoring and control technologies
- Paradigm shift in long-term supply planning. Planning should be built on VER, DG, and DR optimization

Questions?

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