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# Military Microgrids: Finance Follows Function

Energy Planning for Resilient  
Military Installations  
December 5, 2017  
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# Resiliency

The ability to preserve critical infrastructure for communities and customers, adapt the grid rapidly to disruptions, and promptly restore service that is lost.

## Microgrid Resources Coalition

(This definition is abstracted from Enhancing the Resilience of the Nation's Electricity Grid, a report of the National Academy of Science, Engineering and Medicine)

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# The Microgrid

A microgrid is a local electric system (**a local control area**) or combined electric and thermal system:

- that includes retail load and the ability to provide energy and energy management services needed to meet a significant proportion of the included load on a non-emergency basis
- that is capable of operating either in parallel or in isolation from the electrical grid
- that, when operating in parallel, is capable of providing energy, capacity or related services to the grid

# Microgrid Resources

## Resources

- Energy efficiency and demand response
- Renewables – solar, wind, biomass, biogas
- Co-generation – meets thermal and electric load
- Storage – thermal and electric (including buildings)
- Electric vehicle fueling stations – act as storage
- Black start

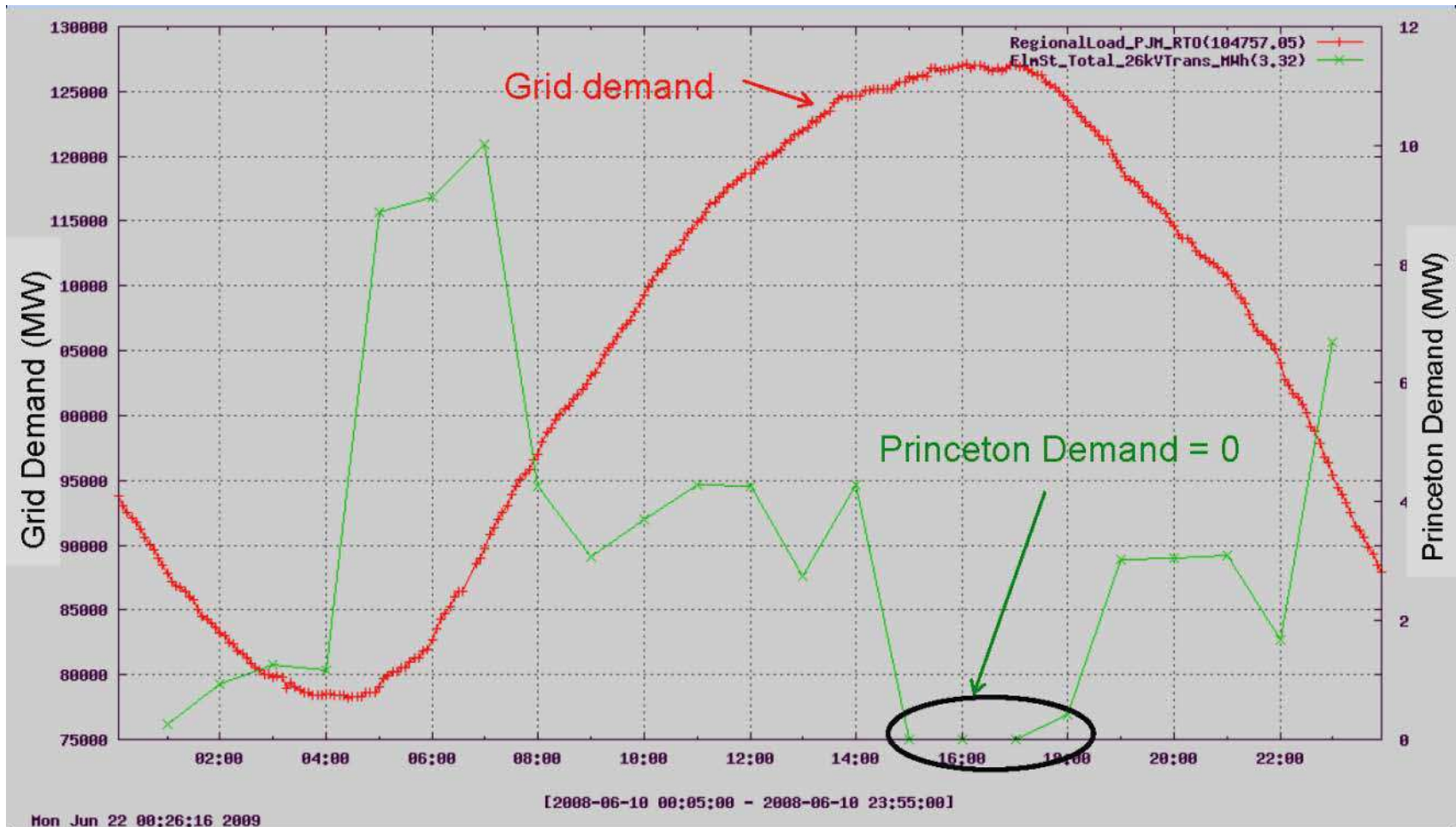
## Integrated management

- Comprehensive system controls
  - Grid interface management
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# Microgrid Capabilities

- Provides resiliency
    - Acts as a control area when isolated from the grid
    - Multiple regularly used resources (backups fail)
    - Intelligent load shedding
    - Can provide resiliency to the local community
  - Provides savings and revenues
    - Cogeneration efficiency beats the grid 80 to 35%
    - Ability to optimize fuel use, time of use and manage load shape against import costs and tariff design
      - Avoid transmission and distribution charges
    - Can provide sophisticated services to the grid
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# Princeton Load Shape



# Credit Engineering

- Capacity and compliance
    - Must be permitted under federal law and comply with state energy regulation
  - Financial Sustainability
    - Revenues/savings must cover the debt service
  - Collateral
    - In a project financing all the assets and all the contracts that allow profitable operation are pledged
  - Financial optimization
    - Use financing techniques suited to the assets involved
    - Sophisticated strategies require sophisticated agreements
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# Sources of Authority

## Energy Savings Performance Contracts 42 USC 8287

- 25 year contracts
- Relaxed procurement rules
- Must guarantee savings greater than finance cost ([shared savings model](#))
- Private contractor must maintain and repair as a condition of guarantee

## Power Purchase Agreements 10 USC 2922a

- 30 year contracts
- For geothermal resources on military land
- “for the provision and operation of energy production facilities on real property under the Secretary’s jurisdiction or on private property and the purchase of energy from such facilities”

## Enhanced-Use Leases 10 USC 2667

- 5 years unless special findings made
- Consideration can be construction of facilities

## Easements

- Power and telecommunication lines 10 USC 2668 (Rights of way and substations)
  - Generic 40 USC 1314 (Does not include rights of way)
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# Limitations

40 USC 591 – Federal department or agency may not use appropriations to purchase electricity in a manner inconsistent with state law governing provision of electric utility service including:

- State utility commission rulings
- Electric utility franchises and service territories

Does not apply to:

- Energy facility contracts under 10 USC 2922a
- Energy savings performance contracts under 42 USC 8287
- Power and energy management for the base is permitted

Limitation effects

- Net metering
  - Third party sales
  - Ancillary services
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# State Regulatory Barriers

- Is the Microgrid a utility?
  - Self Generation is usually permitted
    - Most states allow a third party supplier on site
  - Some states exempt multiple local customers
    - New York Qualified Facility exemption
    - Not “holding oneself out to serve the public”
  - Other regulatory options
    - Retail electric supplier
    - Utility/Private Partnership
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# Public Utilities



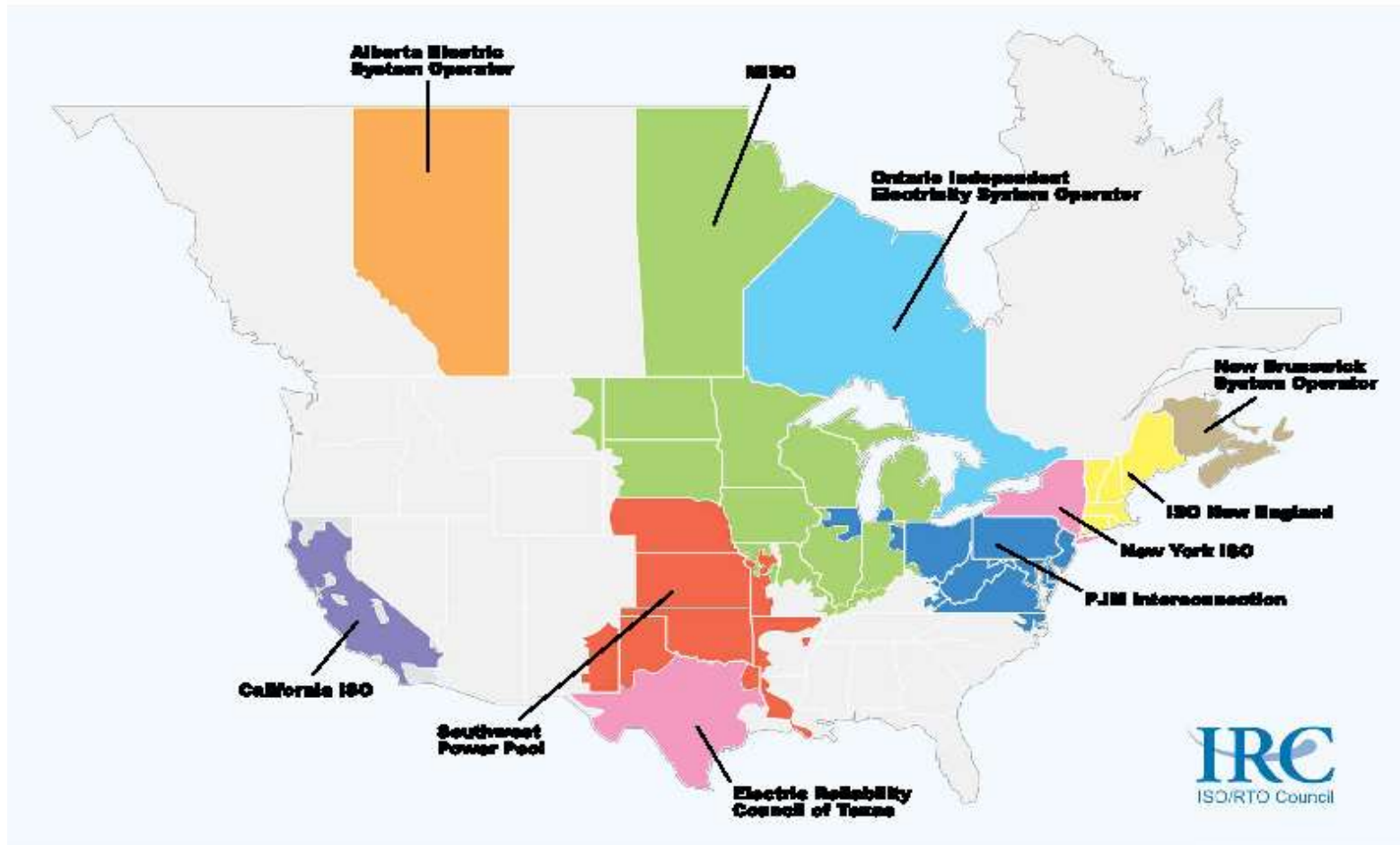
## EEI U.S. Member Company Service Territories December 2011



# RTO Wholesale Markets

- Federal Energy Regulatory Commission allows wholesale services from behind the meter in Regional Transmission Organizations
    - Order 745 - Demand response
    - Order 755 - Regulation
    - Order 784 - Storage
    - Order 819 - Frequency
  - EPSA v. FERC has given FERC clear authority
    - Wholesale market is not an intrusion on the retail price
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# RTOs



# Financing Strategies

## Public Private Partnership

- Private developer: technology, expertise, guarantees
- End user – long term demand, credit strength, partial prepayment
- Tax investors

## Project Finance

- Finance an asset on its own revenues/savings
- Makes money independent of market volatility
- Performance guarantees from builder/operator

## Tax incentives

- Renewable energy tax credits
- Energy efficiency tax deduction
- Tax-exempt bonds (Waste fuel, district heating and cooling)

## Environmental markets

- Renewable energy credits (RECs) and REC swaps
  - Carbon credits
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# Takeaways

- The flexibility, redundancy and control that gives you resiliency, also creates savings
    - Against the tariffs for energy, transmission and distribution
    - By arbitrage of fuel, technology and imports
  - That flexibility permits sales of multiple services
    - In RTO markets
    - To distribution companies
  - You have opportunities to extend resiliency to your community
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# Questions?

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