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The Grid and the Microgrid:
Love among the Regulations

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The Grid

- The most **complex machine** ever devised
  - The source of tremendous **economic development**
  - Run on coal – a **threat to the planet**
  - Operational risk – **cascading failure**
- An electric power system with **common automatic controls** that:
  - **Balances** power from generation and imports with load
  - Maintains scheduled **interchange** with other control areas
  - Maintains the **frequency** of the electric power system
  - Maintains **operating reserves**
- **Control areas** now are:
  - **Integrated utilities**
  - **Regional Transmission Organizations (RTOs)**

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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 Coalition

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Why is a Microgrid Desirable?

- Provides resiliency
  - Acts as a control area when isolated from the grid
  - More reliable than backup generation
- Saves money and the environment
  - Integrated management of electric and thermal loads
  - Integration of renewable energy

Customer value from Microgrids is driving rapid adoption of new technologies

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Microgrid Performance

- Cogeneration efficiency beats the grid 80 to 35%
- Microgrids integrate Variable Energy Resources with hybrid generation
- Smart management of thermal loads uses buildings as thermal storage
- Customers arbitrage fuels and time of day

These capabilities allow Microgrids to provide multiple services to the grid at favorable prices

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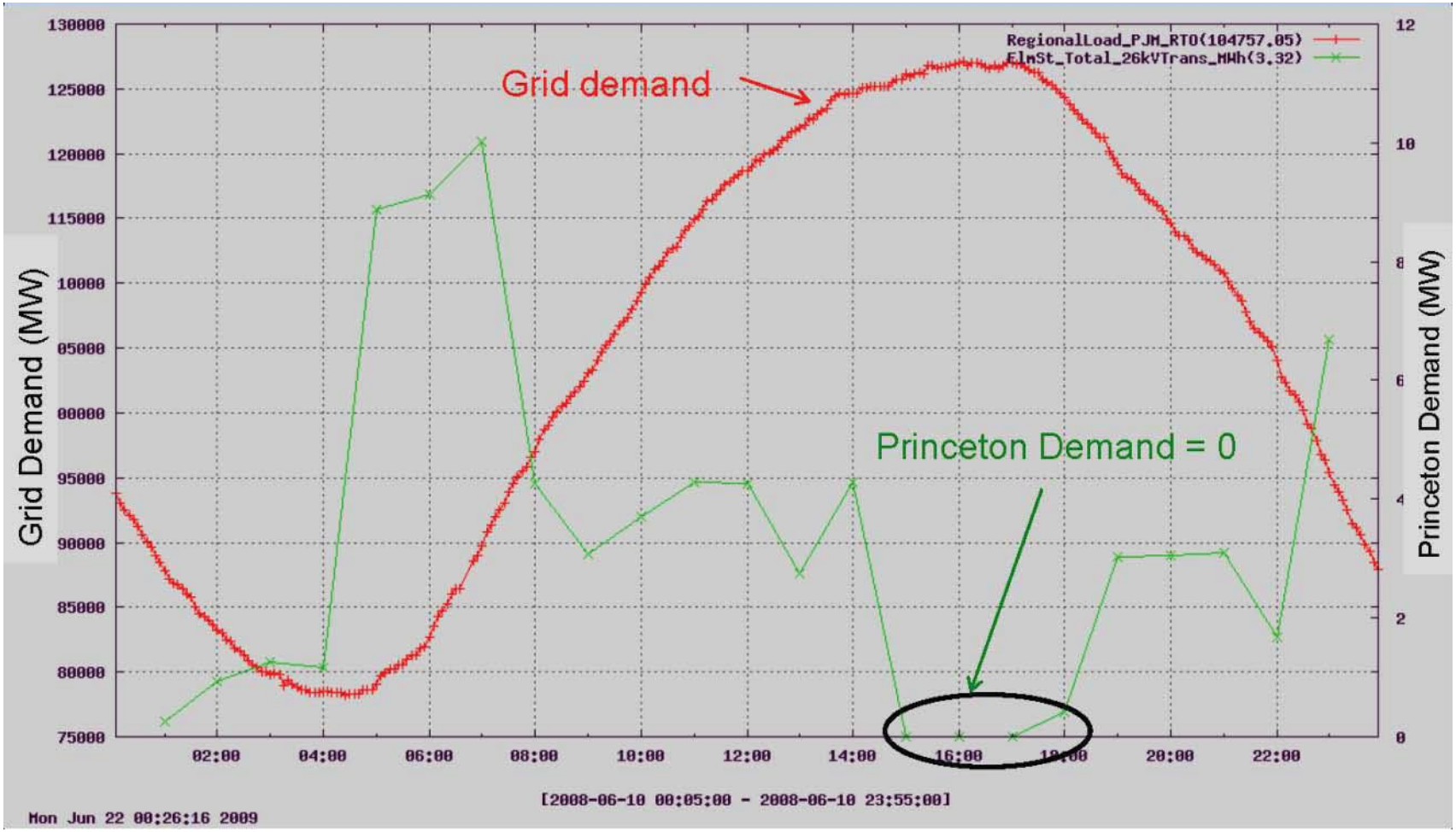
Princeton Load Shape



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The Grid of the Future

- A **self-healing grid** in emergencies
  - The grid can separate into self-supporting **islands**
  - Each island is its own **semiautonomous** control area
  - Each supplied by **Distributed Energy Resources** (DER)
  - The islands can support one another
- DERs (microgrids are the best) provide **grid support services** when not in emergency mode
- DER are mostly **clean energy resources**
- The grid operators **conduct the concert**

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So What's Wrong with this Relationship?

- You need a legal interconnection
  - FERC Order 888 - Open Access Transmission Tariff
  - Small generator interconnection procedure – up to 20 MW
  - RTO supervision of studies
- Antiquated state regulations
- Wholesale market rules
- Jealous Utilities

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State Regulatory Barriers

- Is a Microgrid a utility? Does it need a franchise?
- 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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RTO Wholesale Markets

- Federal Energy Regulatory Commission allows wholesale services from behind the meter in RTOs
  - 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
- Hughes v. Talen Energy Marketing
  - States have broad power; can't interfere with wholesale market

RTO reality lags behind the promise

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Utilities see DERs as a Threat

- To grid operation
  - Too many variable energy resources (VERs) requires additional reserves
  - VERs don't provide frequency response (FERC Docket)
  - Demand Response is unreliable
- To utility business models
  - DERs aren't paying costs of system – need large standby charges
  - Net metering is an unfair subsidy
  - DERs are destroying load and revenues

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Utility 2.0

- Several State PUCs are undertaking reviews of utility regulation
  - Looking at **new utility business models**
  - Considering the effect of widespread adoption of DERs
- New York Public Service Commission **Renewing the Energy Vision (REV)** proceeding
  - Utilities serve as **distributed service platforms (DSPs)** for integrating widespread DERs
  - DSPs will run markets for services from DERs analogous to RTOs
- California PUC DER Planning Process
  - Map the locations on the **Distribution System** where DER can contribute
  - Conduct **Requests for Proposals** for DER solutions

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New Utility Incentives

- **Decoupling**
  - Utility does not automatically earn all customer charges
- **Incentive Ratemaking**
  - Utility earns extra return for meeting specific goals:
    - **Reducing load**
    - **Interconnecting DER**
- **Rate base treatment for contracts**
  - Utilities issue RFPs for DER services
  - Contract is a **"regulatory asset"** that earns a rate of return

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Questions?

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