Working with Utilities in a Complex Regulatory Environment

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C. Baird Brown
The Grid

• The most complex machine ever devised
  • The source of tremendous economic development
  • Runs 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)
The Grid of the Future

• A **self-healing grid** provides **resiliency**
  • The grid can separate into self-supporting **islands**
  • Each island is its own **semiautonomous** control area supplied by DER
  • The islands can support one another through distributed energy resource management systems (DERMS)

• Microgrids provide **grid support services** when not in island mode

• Smaller, local, diverse resources reduce grid risk

• Utilities **invest in the platform**
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
Microgrid Performance

• Cogeneration efficiency beats the grid 80 to 35%
• Microgrids integrate Variable Energy Resources with hybrid generation
• Smart, integrated management of thermal loads
  • Uses thermal storage including building mass
• Customers arbitrage fuels and time of day

Microgrids invest to meet own needs, can provide multiple services to the grid at favorable prices
The Utility

- **Retail distribution**
  - Plans and manages the Distribution System
  - Bills for energy and wires

- **In an RTO**
  - Maintains its transmission for RTO
  - Revenue requirement is wrapped by RTO tariff

- **Outside an RTO**
  - Typically vertically integrated
  - Acts as control area operator
  - Provides open access to transmission
Utility DER Concerns

• Risks to grid operation
  • Too many variable energy resources (VERs) requires additional ramping resources and reserves
  • DER are invisible and unresponsive

• Risks 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 (even if the utility doesn’t own generation)
Utility Constraints

• Must serve all customers fairly
  • Assets in rate base must be used to optimize grid for all customers.

• Can’t generally own assets behind the meter
  • Can’t optimize customer energy use

• State policies on generation ownership should be respected

• Utility - Private Partnership
  • Take advantage of strengths of each party
Microgrid Constraints

• Is a Microgrid a utility?
  • Can it sell at retail?
  • Can it own wires?

• 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

• Other regulatory options
  • Retail electric supplier, Community Choice Aggregation
  • Utility/Private Partnership
Princeton Microgrid

• **Includes:**
  – 15 MW cogeneration
  – 4.5 MW solar
  – 400 MWh Thermal Energy Storage
  – Advanced building controls
  – Advanced grid interface

• **Survived Hurricane Sandy as an island**
• **Sells demand response and frequency regulation**
• **Arbitrages thermal storage and fuel diversity**
• **Supports critical research power quality needs**
• **Few regulatory hurdles**
Princeton Load Shape

Grid demand

Princeton Demand = 0
The Parks at Walter Reed

- Multiuse development on former Army site
- DC defines utility by wires ownership
  - Exception for self supply
- Owners association (OA) owns the wires
  - Collective self supply
- Concession agreement with microgrid operator
  - OA leases wires to operator
  - Developer leases generating sites to operator
  - OA enforces the concession agreement
The Parks at Walter Reed – Microgrid Structure

TPWR Developer
Transfers properties to component developers who sell or lease developed parcels to Owners

Microgrid Concession Agreement
Defines planning process for microgrid buildout
Defines customer tariff framework, and Quality of Service Standards
Gives concessionaire exclusive right to serve

WGL
Generator
Owns generating facilities

Electric Supplier
Licensed Retailer

TPWR Developer
Transfers properties to component developers who sell or lease developed parcels to Owners

Declaration of Covenants
Establishes Owners’ Association
Binds Owners to concession

Infrastrucure Lease

Owners’ Association
Commercial Owners
Residential Owners
Vertical Developers/Building Owners

WGL
Generator
Owns generating facilities

Electric Supplier
Licensed Retailer

PJM
Interconnection Agreements

PEPCO
Energy Delivery Arrangement

District of Columbia
Infrastructure Transfer

Land Transfer

Generators Own generating facilities

Electric Supplier Licensed Retailer

Infrastructure Lease

Energy Services Agreements
Electric and Thermal

Landlord Tenants
Residential Tenants
Commercial Tenants

Interconnection Agreements

Energy Delivery Arrangement

Interconnection Agreements

Energy Delivery Arrangement
Benefit Corporation will run a market for excess power generated by rooftop solar in a Brooklyn neighborhood.

Block-chain technology implemented through smart meters will set “peer to peer” price for solar.

Brooklyn Microgrid is a retail electric supplier.

Solar owners are “qualified facilities” under PURPA.

Utility bills customers based on Brooklyn Microgrid’s settlement.

Future submarket microgrids will use cogeneration:
- Need to own wires or partner with utility to permit island operation.

Retail electric supply regulations form initial basis for partnership without additional negotiation.
Duke University

- Duke Power proposes to install a new cogeneration facility on the Duke University campus.
- The electric generation is owned by Duke Power, it is financed in rate base and is operated to optimize the utility distribution system.
- The utility is permitted to own generation and there are no RTO power markets, only the utility.
- Generation is paid for by ratepayers and operates for ratepayer benefit.
- Duke University gets low cost thermal energy, and its payments reduce the cost for utility ratepayers.
- Duke University can’t use generation to optimize its system.
Borrego Springs

- San Diego Gas and Electric serves an isolated community at the end of a long feeder
- The community experienced repeated outages
- The utility installed islanding switchgear on the feeder and batteries in the community
- Other generation was added with third party ownership
- No “special services” are provided – the project allows the utility to provide reliable service
- Utility improvements are included in rate base
PEPCO Maryland Proposal

- PEPCO agrees in merger to do public purpose microgrids
- Prince Georges County proposal would include County building, medical center, pharmacy, gas station and grocery store
- PEPCO will install islanding switchgear and controls
- PEPCO will issue RFP for included generation to be built and operated by third parties – will pay for some services
- Customers continue to have retail choice when the microgrid is not in island mode
- Proposed microgrid includes solar, batteries and gas generation
- No cogeneration proposed
  - Can RFP respondent’s propose cogeneration and offer thermal services?
Services to the Grid

• Wholesale markets
  • Energy, capacity, ancillary services
  • EPSA v. FERC has given FERC clear authority
  • Aggregators are the real market participants
  • Market sets the price
  • Resources must be visible and responsive
  • Bids not baselines

• Distribution support services
  • Avoid upgrading wires or substations, local peak support

• California PUC DER Planning Process
  • Map the locations on the Distribution System where DER can contribute
Contracts and Pricing

• Conduct **Requests for Proposals** for DER solutions
  • Virginia unsolicited proposal model for transportation projects
• Distribution company enters long-term performance-based contract that serves as (partial) basis for financing
  • Penalties for failure to deliver
• Alternative is a fixed tariff or resilient resource credit rewarding resilient resources
• Hughes v. Talen Energy Marketing
  • States have broad power; can’t interfere with wholesale market
  • Zero Emissions Credits upheld in courts
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 DER contracts**
  - Contract is a "regulatory asset" that earns a rate of return
  - Making the Utility indifferent

- **Integration with wholesale markets**
Questions?

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