Microgrids – A Regulatory Perspective

Overview of the Regulatory Implications of Microgrid Implementation in California

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International District Energy Conference – Microgrid and Electric Distribution Workshop
February 19, 2013
Headquartered in San Francisco.

Regulates privately owned telecommunications, electric, natural gas, water, railroad, rail transit and passenger transportation companies such as moving companies, limousines and charter buses.

Responsible for ensuring that customers have **safe, reliable utility service at reasonable rates**, protecting against fraud, and promoting the health of California’s investor-owner utilities (IOUs).

Five Commissioners are appointed by the Governor and confirmed by the California Senate.

Governor selects one of the five Commissioners to serve as the CPUC president.

Commissioners make all CPUC policy decisions, meeting usually twice a month to discuss and vote on issues.
## Summary of California Energy Policy

### Environmental
- Reduce greenhouse gas emissions to 1990 levels by 2020 (AB 32)
- Implement carbon market associating a cost with carbon emissions from the electric sector

### Renewable and Distributed Generation
- 33 percent renewable sources by 2020
- 12,000 MW distributed generation
- 3,000 MW Solar PV

### Demand Side
- Demand Response peak reduction
- Zero Net Energy buildings
- Aggressive efficiency improvement targets

### Other
- Electric Vehicles
- Realtime (dynamic) pricing goals
Grid Modernization in CA, aka Smart Grid

- CA IOUs, under the direction of the CPUC, are required by SB 17 (Padilla, 2009), to undertake grid modernization. It is a key element of state energy policy.
- Smart Meter deployment began in 2006, but activities accelerated after receiving ARRA funding in 2009.
- Utilities are implementing:
  - Advanced Metering Infrastructure (Smart Meters or AMI)
  - Distribution system automation and wide area awareness
  - Time of use pricing, moving toward real time (dynamic) pricing
  - Storage and distributed generation
  - Demand Response for both residential and commercial customers
  - Microgrid pilots
Microgrid Topics We’re Covering Today

What is a microgrid?

The Field

The Action

The Players

Next Steps
A Vision: EPRI Distribution Grid of the Future
Microgrids are a New Service and Market

CAISO

bulk power system

Balanced Local Area

variable connectivity

frequency & voltage regulation

power quality & reliability

Newport adapted from ciee California Institute for Energy and Environment
Microgrid Architectures Covered Under Existing Regulations

- “Off grid” microgrid – Not connected to utility-owned transmission or distribution at all – permanently islanded – usually a remote area without other access to power such as an actual island.

- Single Direct Access Non-utility Customer microgrid, either islandable or not – Large Commercial or Institutional Customer such as a college campus; can have wholesale connected generation onsite.

- Single Net Metered Utility Customer microgrid, either islandable or not – same as above except all generation connected “behind-the-meter”

- The CPUC doesn’t distinguish a microgrid from any other customer in these cases (an islandable microgrid may be liable for standby charges)
Microgrid Architecture

- Islandable, multiple customer, multiple meter, with multiple resource types interconnected on both sides of the meter, using the existing Utility-owned distribution infrastructure; interacting with markets as a resource
- Same as above except with new “private wire” distribution infrastructure (such as a new underground DC line)
- This is the case that is the most interesting from a state policy standpoint, as it could:
  - Change the cost equation for distributed generation, storage
  - Ease integration challenge for intermittent renewables and high penetrations of distributed generation
  - Enable greater participation by customers in energy markets
The Players, The Field and The Action

Utility

Operator/Owner

Interconnect/Interoperate

Customer

Markets
The Players
Parties in the Electricity Transaction

• **The Electricity Consumer** (Ratepayer, Customer)
  – The New Model: The Pro-Sumer, both consumes and produces electricity and/or ancillary services
  – May own and operate own generation

• **The Public Utility** (can also be the supplier) aka “The Electric Corporation”
  – Usually owns and operates the distribution network
  – Regulated by the CPUC
  – Responsible for safety and reliability of distribution system

• **The Service Provider** (can be the supplier, aggregator, power purchase agreement provider, microgrid operator)
  – May also own generation
  – May interact with markets
If You Are Public Utility, You Are Regulated By CPUC

- **Public Utility** is defined in Public Utilities Code Sec. 216; Includes “Electric Corporations”

- **The Electric Corporation** (PU Code Sec. 218)
  - Includes every corporation or person owning, controlling, operating, or managing any electric plant for compensation within this state

- You may be an “electric micro-utility” if you serve fewer than 2,000 customers. You may be subject to special consideration in this case in regulatory proceedings (PU Code Sec. 2780)
NOTES ON OTHER ENTITIES MENTIONED IN THE PUBLIC UTILITIES CODE
The Field
Interconnection Takes Many Forms

- Distribution Connected
  - Wholesale Distribution Tariff
  - DER
  - Fast Track <= 2 MW
  - Rule 21 Generation
    - 500 kW <Fast Track <= 2 MW
  - Net Metering (NEM)
  - DER <= 1MW

- Point of Common Connection (PCC)
  - 60 kV

- Transmission Substation
  - >100 kV
  - DER
  - No MW Limit
  - Fast Track up to 5 MW

- Customer Load
  - DER
  - Meter
  - 12 kV
  - Fast Track <= 2 MW

Next Steps
What is a microgrid?
The Field
The Players
The Action
What is a microgrid?

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The Field

Next Steps

DG (Retail) Interconnection: Rule 21

Interconnection Technical Framework Overview

Complete/Valid Interconnection Request

Does the Applicant choose to go directly to Detailed Studies?

Non Export/Net Energy Metering (NEM) or Export?

Go to Electrical Independence Tests and Detailed Studies

Fast Track Eligibility MV Limit

Generating Facility Greater than Fast Track Eligibility MV Limit

Supplemental Review did not determine requirements without further study.

Applicant chooses to go directly to Transmission Study Process

The Action

Electrical Independence Tests

Electrical Independence Test for Transmission System

Electrical Independence Test for Distribution System

Independent Study Process

Distribution Group Study Process

Transmission Cluster Study Process

Proceed with interconnection subject to requirements determined by Detailed Studies

Initial Screen A - M

Pass All Screens

Fail Any Screen

Does quick review of failed screens determine requirements to address the screens?

Will power be exported across the POC?

Generating Facility ≤ 1 kVA?

Is Generating Facility a NEM project whose nameplate capacity is ≤ 500 kW?

T. Dependency / Stability Test

Aggregate generation ≤ 15% of line section peak load?

Proceed with interconnection subject to requirements determined by Initial Review or SR, if any

Go to Electrical Independence Tests and Detailed Studies
The Action
Markets: Who’s the Buyer?

- IOU Customers in CA pay a “bundled” rate
  - Has two primary components: 1) the generation charge; 2) the transmission and distribution charge
  - Utility procurement on a wholesale basis determines the generation charge paid by customers, as set by the ratesetting process

- Direct Access customers pay an “unbundled” rate where the generation charge is set by a contract with their supplier. This is the way retail deregulation works in states such as Ohio, Texas, Illinois and others

- Community Choice Aggregators pay IOU Transmission and Distribution system charges, procure own power, similar to DA
Markets: Who’s the Seller

- Wholesale: Merchant generators sell power to utilities based on price competition using a power purchase agreement, or sell power on the wholesale market, run by CAISO, regulated by FERC (includes storage)
- Wholesale: WDT generators
- Wholesale: Rule 21 generators who export power
- Wholesale: Demand Response aggregators can bid into the CAISO electricity market
- Ancillary Services Providers (special market)
- Retail: Net Energy Metering customers sell excess power back to the utility at retail rate
Open Issues and Next Steps

**Policy & Procurement**
- Fitting in to utility procurement model for capacity
- Addressing third party participation
- Moving toward other state goals for DR, CHP, storage, renewables

**Customer Acquisition**
- Marketing to multiple customers and providing choice
- Marketing to Community Choice Aggregations and MUDs

**Economics**
- Standby Charges
- Cost of distribution grid studies
- Cost of distribution grid upgrades
- Avoided cost calculation based on transmission needs
Thank You!

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