



Microgrids – A Regulatory Perspective



Overview of the Regulatory Implications of Microgrid Implementation in California

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Microgrid Assessment and Recommended Future RD&D Investments

For the State of California

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What is a Microgrid?

A small, integrated energy system of interconnected loads and distributed energy resources (producing electric [or], both electric and thermal energy), which can operate in parallel with the grid or in an intentional island mode.

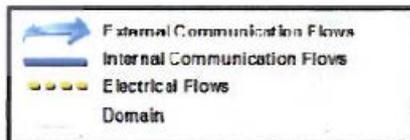
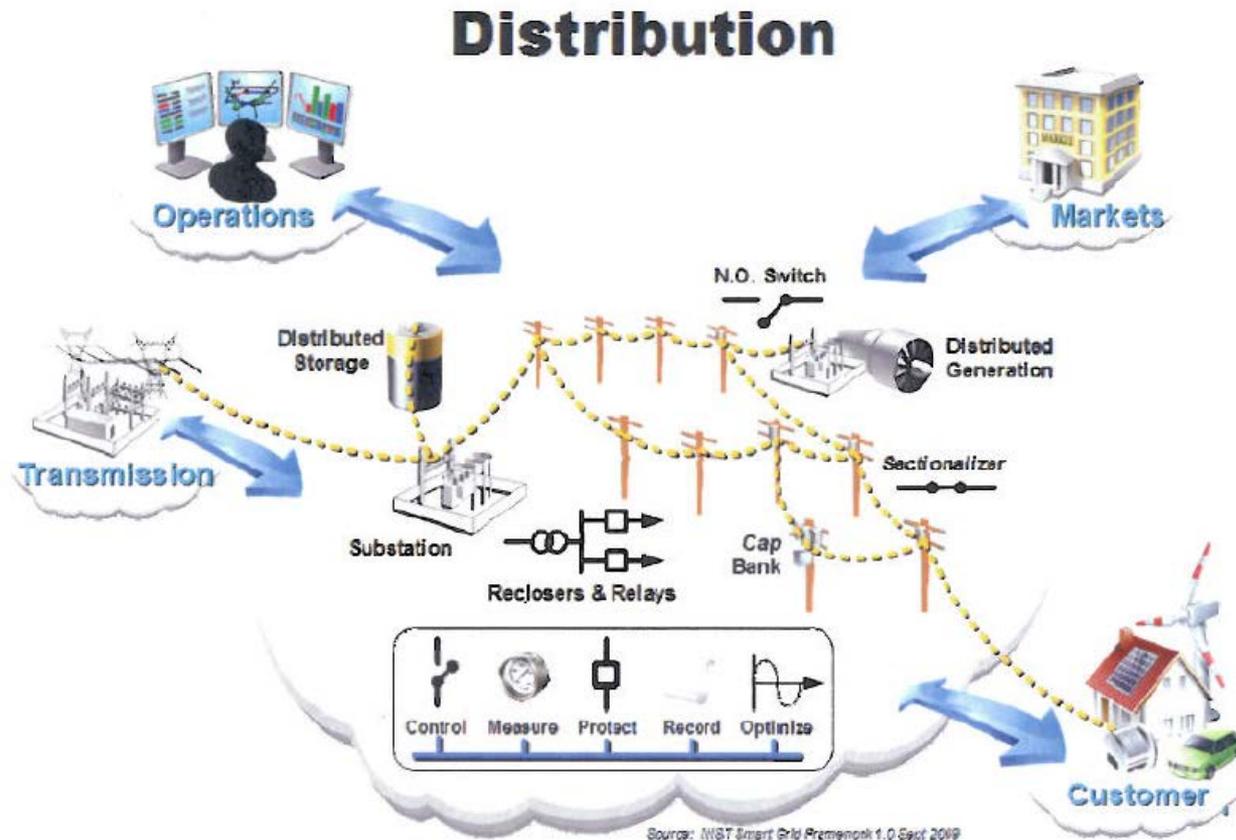
-NYSERDA microgrid whitepaper (Sept. 2010)

And appearing to the grid as a multi-function resource.





Relationship to Smart Grid External Actors





Behind-the-Meter 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)





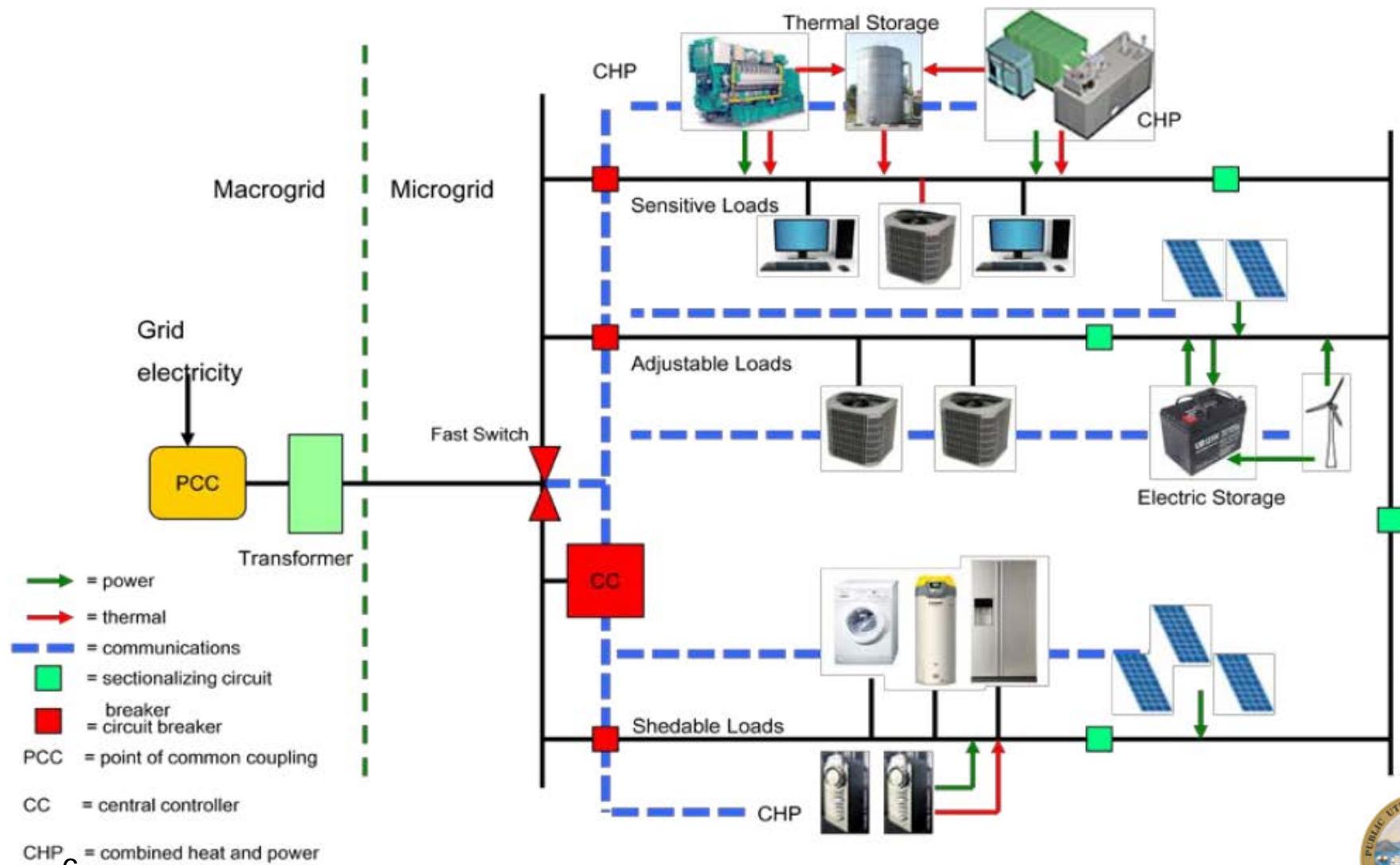
Advanced Microgrid Definition

- 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.
Islandable
- Control System coordinating all resources
- 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 Advanced Microgrid – Why can't we do this today?





Advanced Microgrid Regulatory Barriers and Some Solutions

- Interconnection
- Costs and Rates
- CPUC regulation of electric corporations
- Existing Franchise agreements
- Community Choice Aggregation
- Siting and Section 769 Distribution Resources Plans





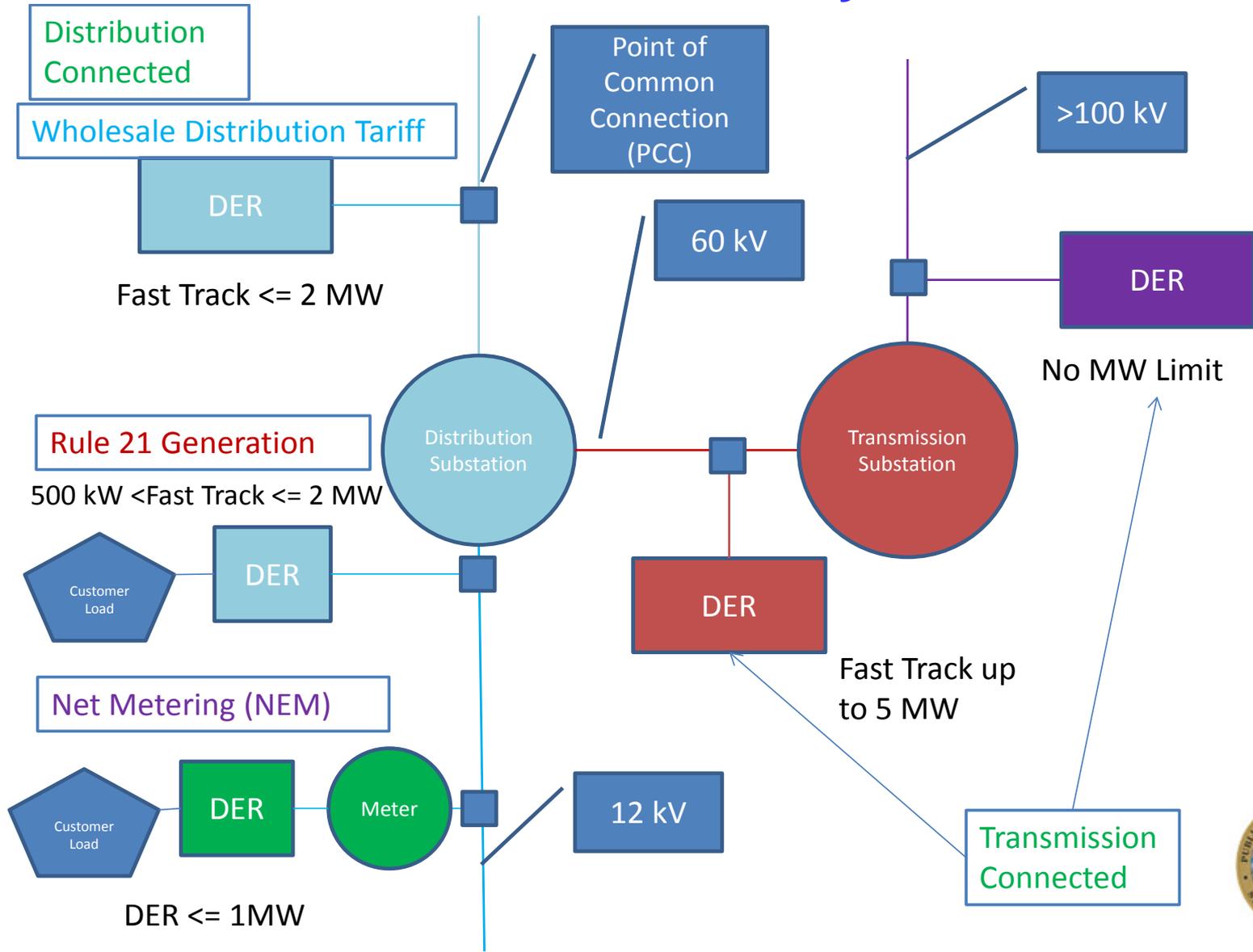
Interconnection

Which side of the meter?





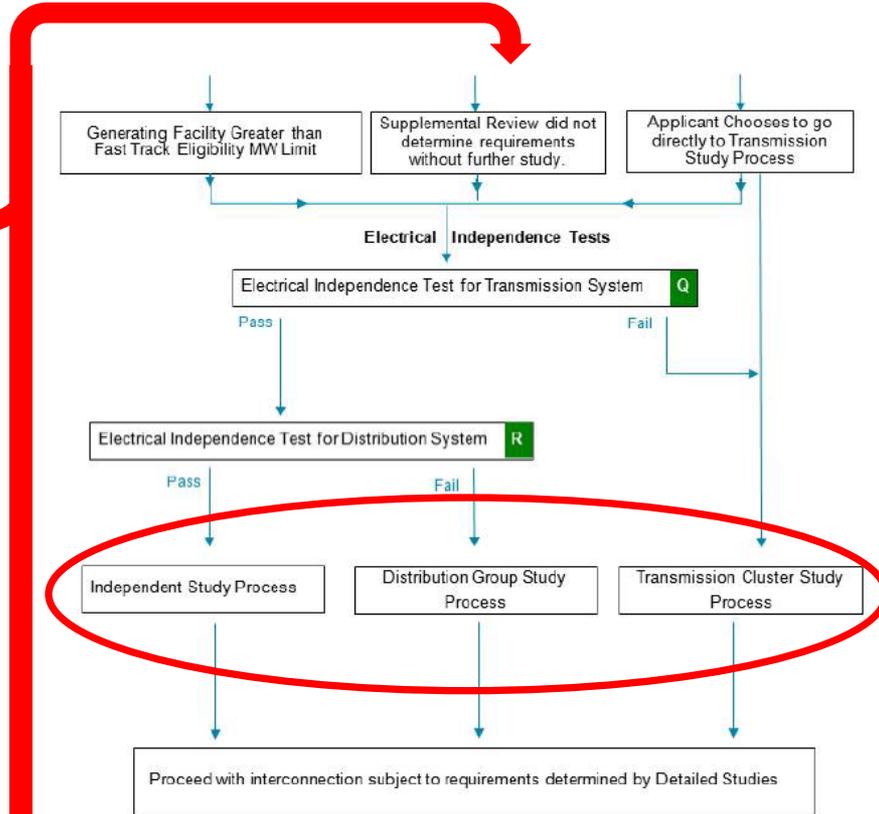
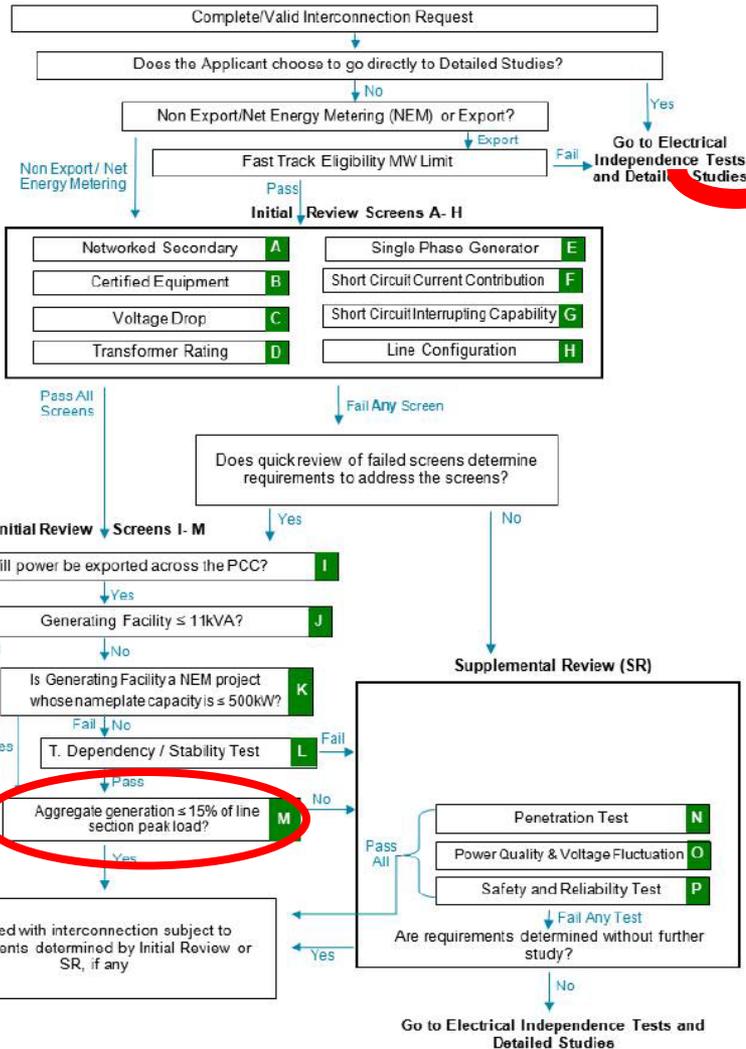
Interconnection Takes Many Forms





DG (Retail) Interconnection: Rule 21

Interconnection Technical Framework Overview





Cost and Cost Recovery

How do Rates and Tariffs work for Microgrids?





Bundled and Unbundled Rates

- 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
- LCOE of microgrids can probably not (currently) compete with the generation charge in an unbundled rate
- Microgrids, like solar PPA providers, can compete with a bundled rate
- Fixed distribution charge for the general microgrid?





Markets: Who Gets the Revenue

- Wholesale: Merchant generators sell power to utilities or LSEs 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 (QFs)
- Wholesale: Demand Response aggregators can bid into the CAISO electricity market (emerging market)
- Ancillary Services Providers (special market), including flex
- Retail: Net Energy Metering customers in effect sell excess power back to the utility at retail rate





CPUC Regulation of Electric Corporations

How much or little should microgrids and their operators be regulated?





If You Are Public Utility, You Are Regulated By CPUC

- **Public Utility (not POU)** 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)
- When does a third party microgrid operator become an electric corporation or distribution operator?





Local Electricity Franchise and Other Issues

- Grants exclusive monopoly to an electric provider
- Covers new and existing electric distribution infrastructure
- Local government must grant new or modify existing franchise to allow additional infrastructure using or crossing city property.
- Must also deal with easements and other private property issues





Microgrid Siting and the Optimized Distribution System

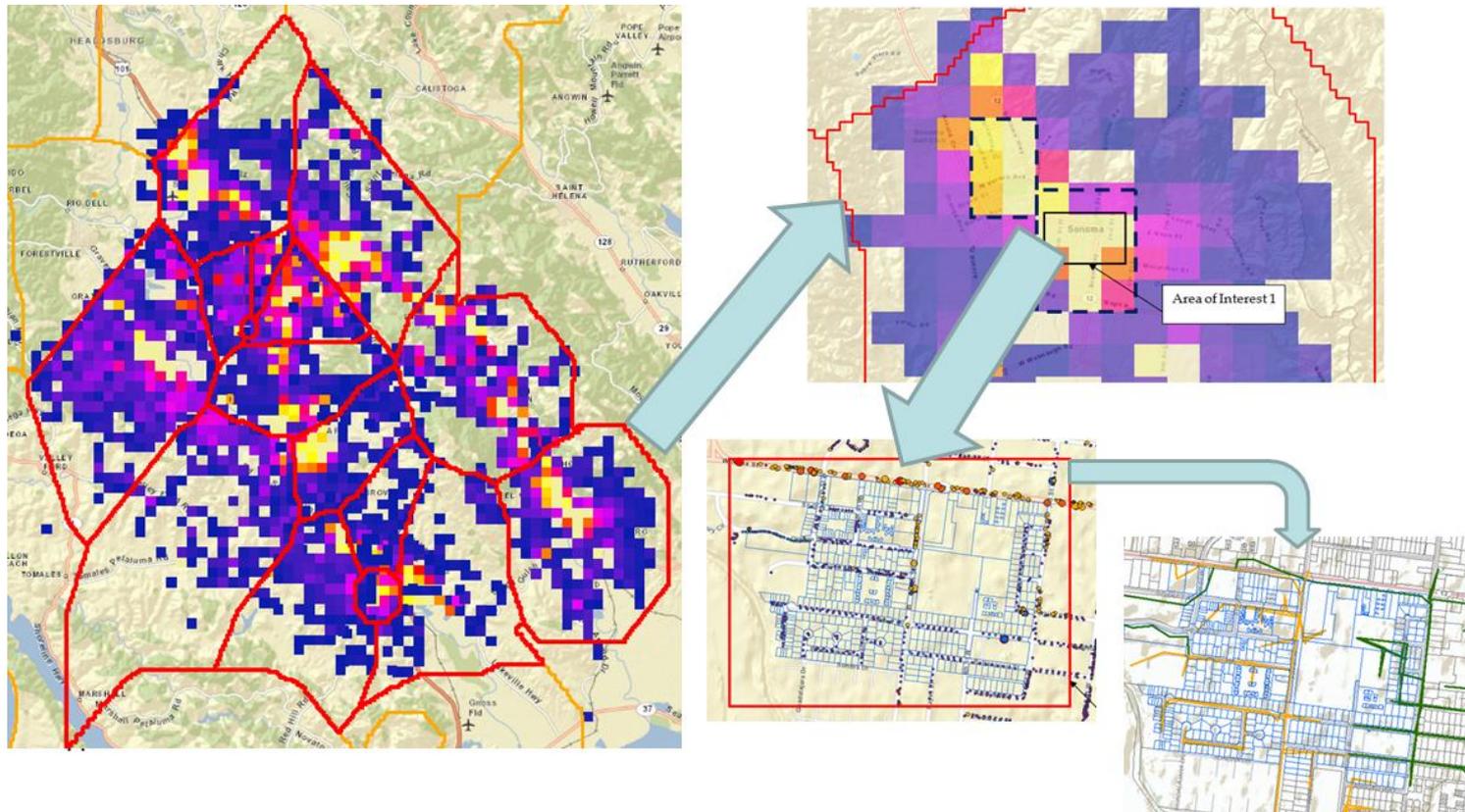
Microgrid friendliness and Distribution Resources Plans





Need for Siting Methodology

How to identify distribution area candidates suitable for microgrids? What is an “optimal location”?





To Site & Develop an Advanced Microgrid Based on a Distribution Feeder, You Would Need...

- Access to information on existing deployed DER
- Detailed studies of impact of additional distributed resources are probably required both for the feeder and upstream
- Telemetry for distribution feeder components for both operator/IOU
- Possible upgrades of circuit breakers, switches, reclosers and transformers
- Communications infrastructure for microgrid operator to send/receive data from distribution grid operator and ISO
- Installation of switching equipment for islanding
- Access to AMI/HAN and SCADA networks by operator
- Cost? Socialization? Reliability?





Section 769 (R. 14-08-013) to the Rescue!

- Requires Distribution Resource Plans to be filed by IOUs July 1, 2015
- DRPs identify “optimal locations” for distributed energy resources
- DRPs are required to contain:
 - Integration Capacity Analysis: “maximum hosting capacity” of circuits without upgrade
 - Locational Benefit Analysis: evaluation of net benefit of DER on a circuits or line section
- Will consider benefit of “coordinated” portfolios of DER including:
 - DG
 - DR
 - Storage
 - EV
 - Energy Efficiency
- Will address many of the issues identified previously





Community Choice Aggregation Enables Microgrids

- CCAs can wheel distribution-connected wholesale (WDAT) resources
- CCAs can develop distributed generation “sub-rates” that apply to microgrid customers
- CCAs can socialize some of the costs associated with development such as distribution studies, thereby providing incentives to developers
- CCAs can build microgrids into their procurement strategies and can realize revenues from microgrid value streams such as ancillary services
- CCAs can work with other local agencies to form “integrated micro-utilities”
- CCAs not subject to regulation as “electric corporations”
- CCAs can integrate operations across other municipal services such as solid waste management, water, wastewater.





Open Issues

Policy & Procurement

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

Customer Engagement

- Marketing to multiple customers and providing choice
- Role of CCAs and MUDs
- Encouraging “prosumer” behavior through microgrid technology

Economics

- Standby Charges
- Cost of distribution grid studies
- Cost of distribution grid upgrades
- Avoided cost calculation based on transmission needs
- New value streams





Thank You!

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