



Economic & Technical Aspects of California's Distributed Generation Development

November 16 -18, 2016 • Budapest, Hungary

**Ms. Jamie Ormond
Advisor of Commissioner Catherine Sandoval
California Public Utilities Commission
Jamie.Ormond@cpuc.ca.gov**



Distributed Generation: **Economic vs/& Technical.** ***Can't have one without understanding the other.***

New market model with distributed generator

- Potential benefits of system with distributed generation
- Complexity of managing and controlling huge number of small generation sources connected to distribution system
- Impact of distributed generation model on traditional utility business models
- Disincentive of DSOs connecting DG

Technical aspects of distributed generation connecting to the system

- Specialities of different DG technologies
- Network/system connection aspects of different DG technologies
- Potential regulatory measure reducing disincentives of DSOs



My background

- Lawyer
- Distribution Grid Interconnection – power engineers & protection
- Smart Inverter Working Group separated technical and money issues
- No Water Advisor - drought impact, water energy footprint, water-energy nexus
- Legal Advisor



DG is a people problem that will be solved by people:

Silos! Every Utility, Every Service. Everything is interconnected!

AB 327 defines Distributed Generation in California:

Energy Efficiency

structural/ behavioral

Demand Response

auto DR, Internet of Things, High/Lo Tech

Distributed Generators (solar, wind)

Grid Services?

Storage

Grid Services?

Electric Vehicles

Vehicle2Grid?



Microgrid

Distribution Study
Process Data

STORAGE/ EV/
Services/ Data

*Exporting
Generators
“Rule 21”
basic data

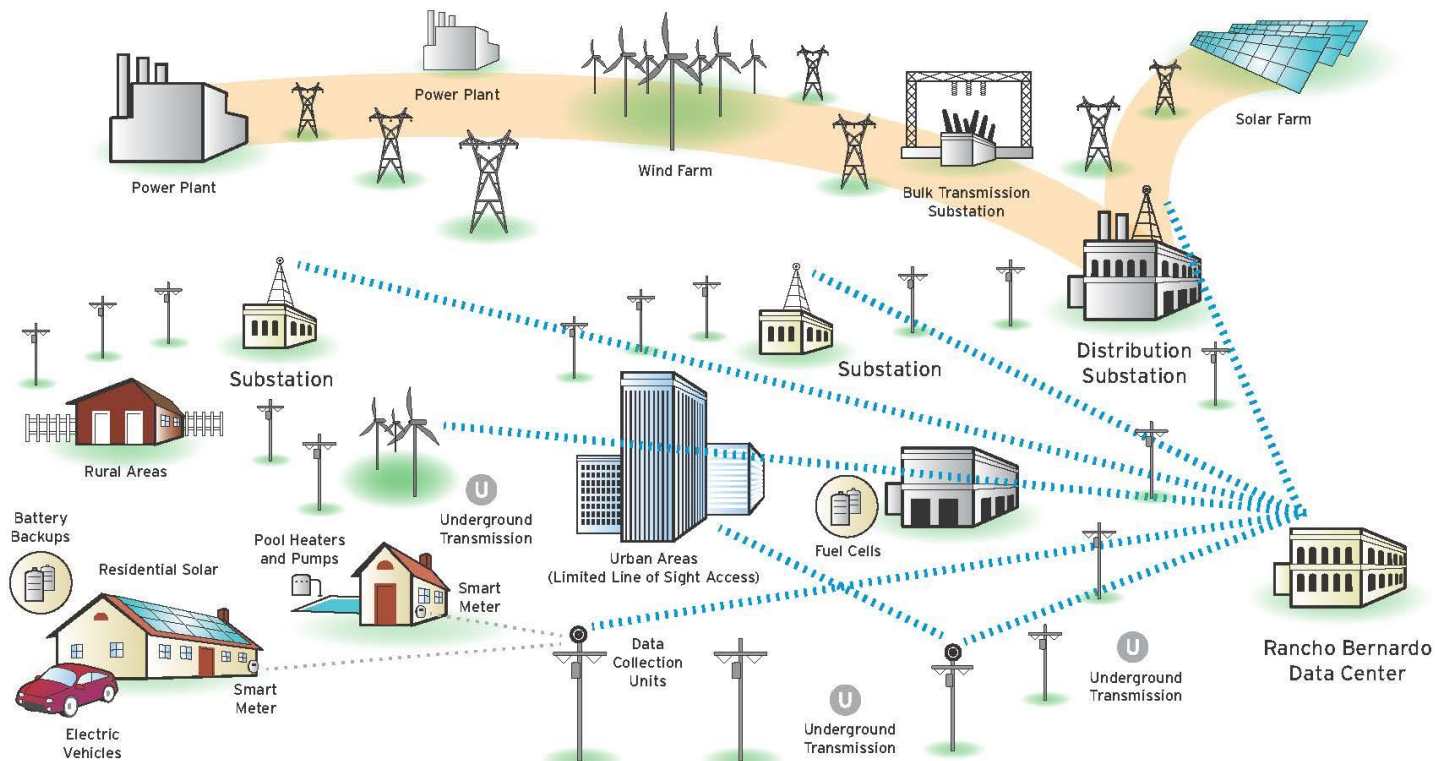
“Additional
Functionalities”



Potential benefits of system with distributed generation

SDG&E Grid Communication System

Smart Grid Challenges - Infrastructure





Network/system connection aspects of different DG technologies

- Market requirements @ transmission vs distribution levels
- Based on market participation, size, materiality of resource



DG vs UEG

	Tariff	Resource Size	Jurisdiction
Transmission Grid	CAISO Tariff	10 MW +	FERC – federal
Distribution Grid	WDAT : <i>Wholesale Distribution Access Tariff</i>	1-20 MW	FERC - federal
Distribution Grid	Electric Tariff Rule 21	Small – 20 MW	CPUC – state
Behind-the-Meter	Rule 21 & Net Energy Metering	1MW and smaller	CPUC - state



DG vs UEG

- Net Energy Metering (NEM) Tariff
 - *Like UEG, must meet needs of the customer*
 - For distributed energy resources (DER)
 - Interconnected behind a customer meter or on the distribution grid and affiliated with a customer meter
 - Exchange of excess energy production for energy credits, can not earn money, can only create zero \$ electricity bill
 - Not a “market,” just a tariff for bill credits



To Create a Market: Communications

Interconnection Location	Resource Size	Communications Requirements	Market Available?
Transmission Grid	10 MW+	Direct Telemetry every 4 seconds depending on market	Yes - CAISO
Distribution Grid	1MW – 9.9 MW 9.9MW- 20MW	telemetry every 4 seconds: 3 data points: real power, reactive power, voltage 3 status updates: plant on, off, panel	Not at distribution level For CAISO market participation, utilize WDAT & CAISO direct telemetry
Distribution Grid	>1MW	No telemetry required	No



Impact of distributed generation model on traditional utility business models

1) Who gets the data

- Grid visibility
- Resource telemetry

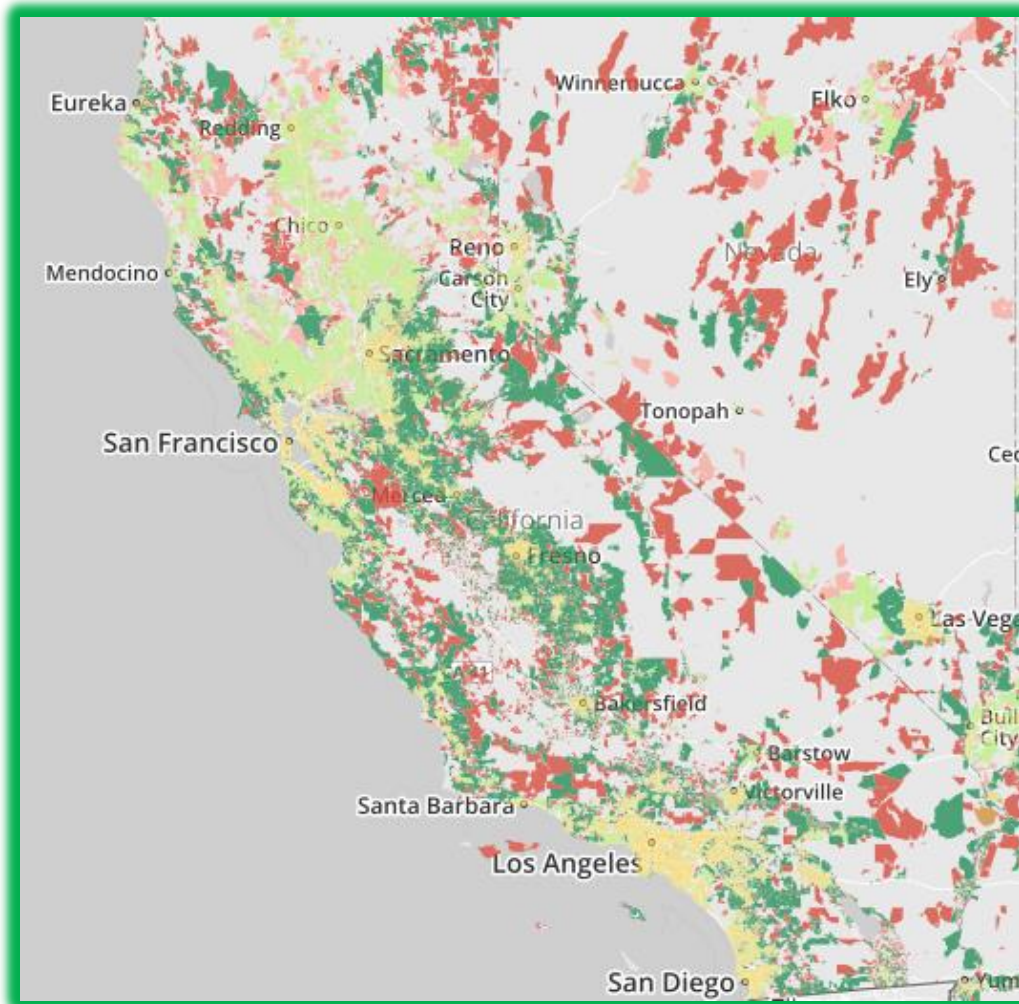
2) How to call for services







3) How to pay for services

→ investigation: data transportation & the electric grid



Complexity of managing and controlling huge number of small generation sources connected to distribution system



Model Landscape		
Cost per location	Served ¹	Unserved ¹
Above Price cap: \geq \$207.81		
Between Price cap: $>$ \$52.50 and $<$ \$207.81		
Below Price cap: \leq \$52.50		

¹ This map only shows Price-Cap areas.

<https://www.fcc.gov/reports-research/maps/connect-america-phase-ii-initial-eligible-areas-map>

Who sees/ controls what?
 At what cost?
 Easy to do?
 What are the pathways?
 What are the rules?



Moving towards markets: DSOs connecting DG

New York **REV** vs California **DRP**

(Renewing the Energy Vision) (Distribution Resources Planning)

NY = picked DSO, top down, communications

CA = ?! “brains,” bottom up, standards based
pathways, communications requirements



Specialities of different DG technologies

- Urban vs rural – feeder size, loading
- Knowledge of utility engineers/ protection engineers
- Costs associated with upgrade distribution grid to accommodate generation/ grid services
- Cost of communications services for telemetry



Potential regulatory measure looking towards some type of DSO

- (NY REV)
- CA Distribution Resource Planning Process: DRP – [R. 12-08-013](#)
- CA Integrated Distributed Energy Resources: IDER – [R. 14-10-003](#)
- CA Water Energy Nexus – [R. 13-12-011](#)
- CA Interconnection Proceeding – [R. 11-09-011](#)