



Renewable Electricity Procurement in California

June 25, 2012

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National Association of Regulatory Utility Commissioners'

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About DRA

- The Division of Ratepayer Advocates (DRA) is an advocate within the California Public Utilities Commission that represents customers' interests on utility matters.
- Our statutory mission is to obtain the lowest possible rates for utility services consistent with safe and reliable service levels. In fulfilling this goal, DRA also advocates for customer and environmental protections.



1. Programs and Technologies



Renewables Portfolio Standard (RPS) background

- California has launched one of the most ambitious renewable efforts in the world — the Renewables Portfolio Standard (RPS) – with a mandate that 33% of all retail electricity sales come from renewable sources by 2020
- History of California's RPS
 - Senate Bill 1078 (2002) instituted a 20% RPS by 2020
 - Senate Bill 107 (2006) accelerated the 20% RPS to 2010 with possible extension to 2013
 - Senate Bill 1036 (2007) adopted ratepayer protections through limits on above-market costs
 - Cost limits were surpassed in less than two years
- Current RPS program
 - Senate Bill 2(1x) (2011) established a 33% RPS by 2020
 - Implements a mandatory RPS for all utilities in the state, including small and publicly-owned utilities
 - Includes the possibility of penalties for non-compliance
 - Requires reporting on total cost of program each year and that the CPUC to establish an enforceable cost limitation for each investor-owned utility
 - Currently, the CPUC is beginning to develop the cost limitation mechanism

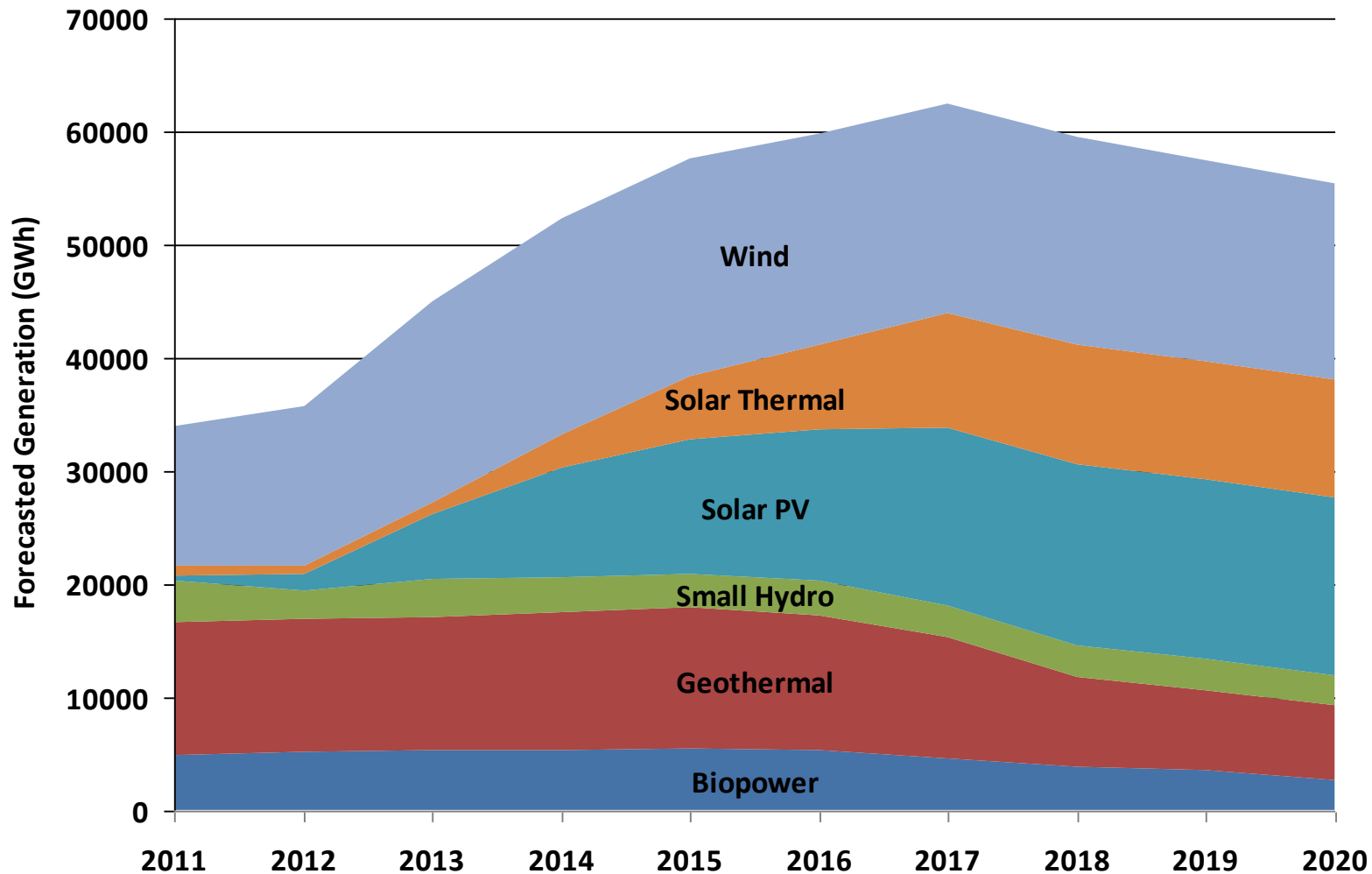


Eligible technologies

Resource	Description
Solar	1) Photovoltaic (PV) cells which are grouped into panels 2) Solar thermal power plants which heat fluid to produce steam to power a generator
Wind	Wind turns the blades, which are connected to a drive shaft that turns an electric generator to produce electricity
Geothermal	Geothermal power plants harness heat from the Earth's core by drilling wells and piping steam or hot water to the surface to generate electricity
Hydropower	Convert water's kinetic energy into electricity. Only small run-of-the-river dams up to 30 MW qualify for the RPS
Biomass	Biomass is burned which produces steam for electricity generation and other energy uses
Ocean Wave, Thermal, and Tidal	Various energy conversion technologies harness the energy in tides, waves, and thermal gradients in the oceans
Fuel Cell (using renewable fuels)	Generate an electrical current by converting the chemical energy of a fuel directly into electrical energy. Fuel cells differ from conventional electrical cells in that the active materials such as fuel and oxygen are not contained within the cell but are supplied from outside
Landfill Gas	The methane in landfill gas may be vented, flared, or combusted to generate electricity or useful thermal energy onsite, or injected into a pipeline for combustion off-site
Municipal Solid Waste	Residential solid waste and some nonhazardous commercial, institutional, and industrial wastes

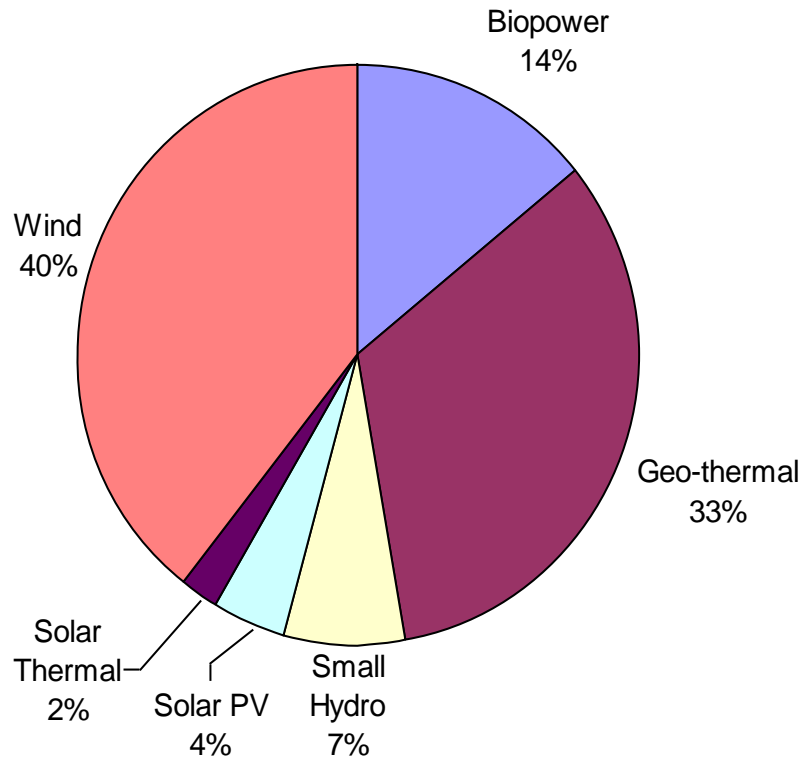


Renewable energy generation by technology (2011-2020)

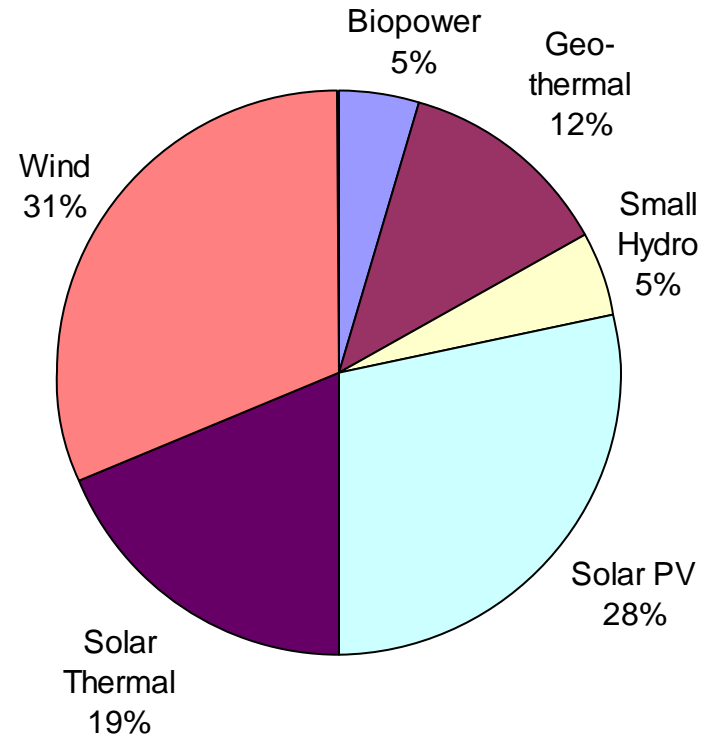


California's renewable resource mix

Renewable Resource Mix by MWh
(2012)



Renewable Resource Mix by MWh
(2020)



Variety of renewable programs

Multiple methods of renewable procurement have been created

- **Utility Requests for Offers (RFOs):** solicitation conducted annually for large renewable facilities
- **Bilaterally Negotiated RPS Contracts:** contracts with large facilities executed outside of solicitations
- **Tradable Renewable Energy Credits** (now referred to as unbundled RECs): purchases of RECs without their underlying electricity
- **Utility Owned Generation (UOG):** renewable facilities developed and owned by the utility
- **Feed-In-Tariff (FiT):** standard contract for small renewable facilities (0.5 MW to 3 MW)
- **California Solar Initiative (CSI):** incentive program for residential roof-top solar
- **Qualifying Facilities (QFs):** generators under 20 MW with must-take agreements
- **Renewable Auction Mechanism (RAM):** twice-yearly reverse auction for facilities under 20 MW
- **Self Generation Incentive Program (SGIP):** incentive program for non-solar facilities up to 3 MW
- **Emerging Renewables Program (ERP):** incentive program for wind and fuel cells installed by customers
- **Net Energy Metering (NEM):** tariff for receiving credit for onsite renewable generation under 1 MW
- **New Solar Homes Partnership (NSHP):** incentive program for solar on new residential buildings

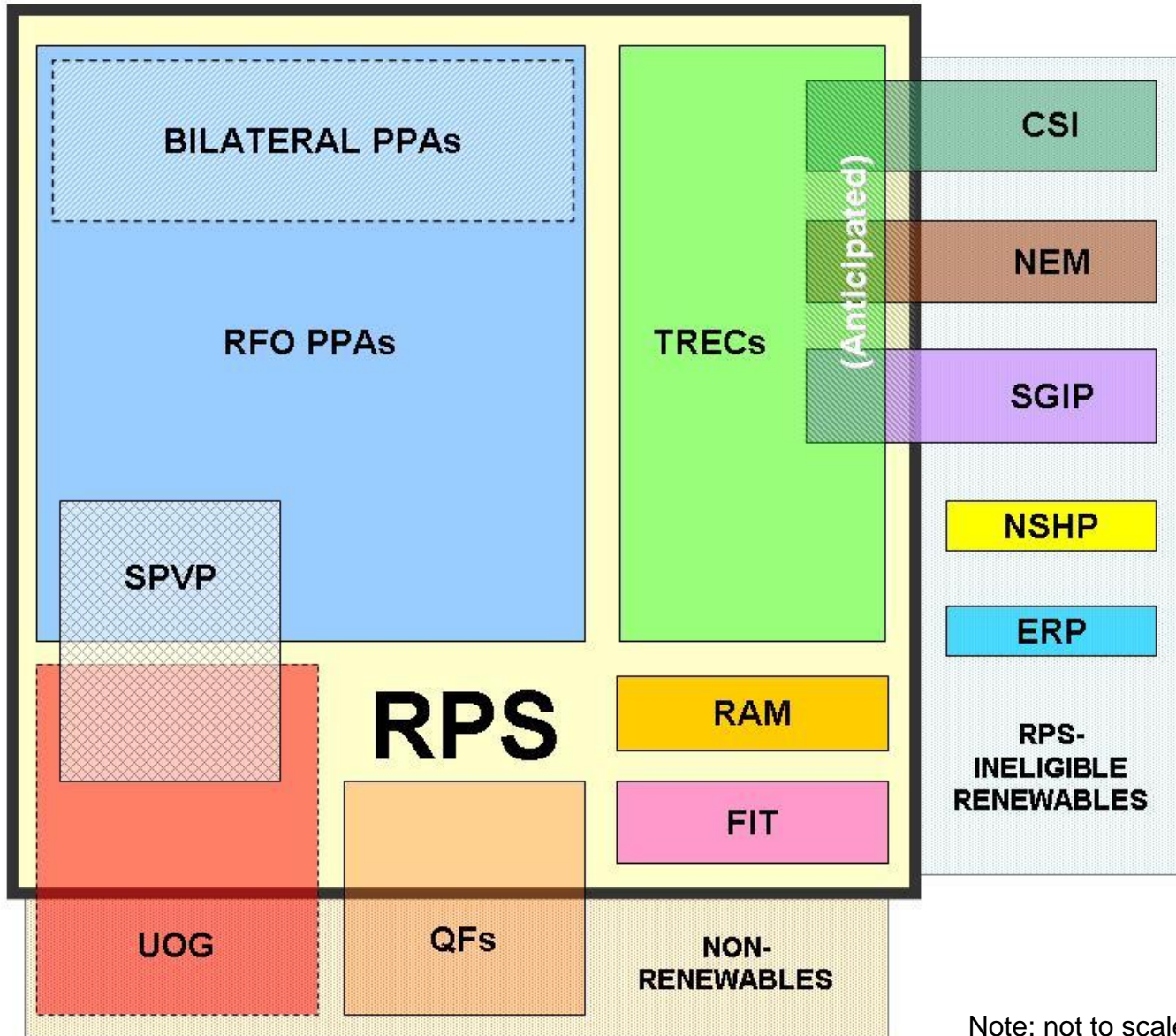


Renewable programs by size and technology

Size	Solar PV	Wind	Other
Less than 1 MW	<ul style="list-style-type: none"> - California Solar Initiative - New Solar Homes Partnership - Emerging Renewables Program - Net Energy Metering 	<ul style="list-style-type: none"> - Emerging Renewables Program - Small Generator Incentive Program - Net Energy Metering 	<ul style="list-style-type: none"> - Net Energy Metering
1-3 MW	<ul style="list-style-type: none"> - Feed-in Tariff - Renewables Auction Mechanism - Solar Photovoltaic Program - Request for Offers Power Purchase Agreement - Bilateral Power Purchase Agreement 	<ul style="list-style-type: none"> - Feed-in Tariff - Renewables Auction Mechanism - Small Generator Incentive Program - Request for Offers Power Purchase Agreement - Bilateral Power Purchase Agreement 	<ul style="list-style-type: none"> - Feed-in Tariff - Renewables Auction Mechanism - Request for Offers Power Purchase Agreement - Bilateral Power Purchase Agreement
1-20 MW	<ul style="list-style-type: none"> - Solar Photovoltaic Program - Request for Offers Power Purchase Agreement - Renewables Auction Mechanism - Bilateral Power Purchase Agreement 	<ul style="list-style-type: none"> - Request for Offers Power Purchase Agreement - Renewables Auction Mechanism - Bilateral Power Purchase Agreement 	<ul style="list-style-type: none"> - Request for Offers Power Purchase Agreement - Renewables Auction Mechanism - Bilateral Power Purchase Agreement
Greater than 20 MW	<ul style="list-style-type: none"> - Request for Offers Power Purchase Agreement - Utility Owned Generation - Solar Photovoltaic Program - Bilateral Power Purchase Agreement 	<ul style="list-style-type: none"> - Request for Offers Power Purchase Agreement - Utility Owned Generation - Bilateral Power Purchase Agreement 	<ul style="list-style-type: none"> - Request for Offers Power Purchase Agreement - Bilateral Power Purchase Agreement - Utility Owned Generation



Overlap in renewable programs



CSI = California Solar Initiative

ERP = Emerging Renewables Program

FIT = Feed-in Tariff

NEM = Net Energy Metering

NSHP = New Solar Homes Partnership

PPA = Power Purchase Agreement

QFs = Qualifying Facilities

RAM = Renewables Auction Mechanism

RFO = Request for Offers

RPS = Renewables Portfolio Standard

SGIP = Small Generator Incentive Program

SPVP = Solar Photovoltaic Program

TRECs = Tradable Renewable Energy Credits

UOG = Utility Owned Generation

Note: not to scale

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Limitations on REC-only purchases

- Utilities may use a limited amount of Renewable Energy Credit (REC)–only purchases, called unbundled RECs, to comply with the RPS
- They may also use a limited amount of Firm and Shaped contracts. Firm and Shaped contracts are purchases of RECs coupled with purchases of energy from a different facility

Compliance Period	Bundled	Unbundled	
		REC-only	Firm and Shaped
2011-2013	At least 50%	Up to 25%	Remainder
2014-2016	At least 65%	Up to 15%	Remainder
2017-2020	At least 75%	Up to 10%	Remainder



2. Interconnection and Integration

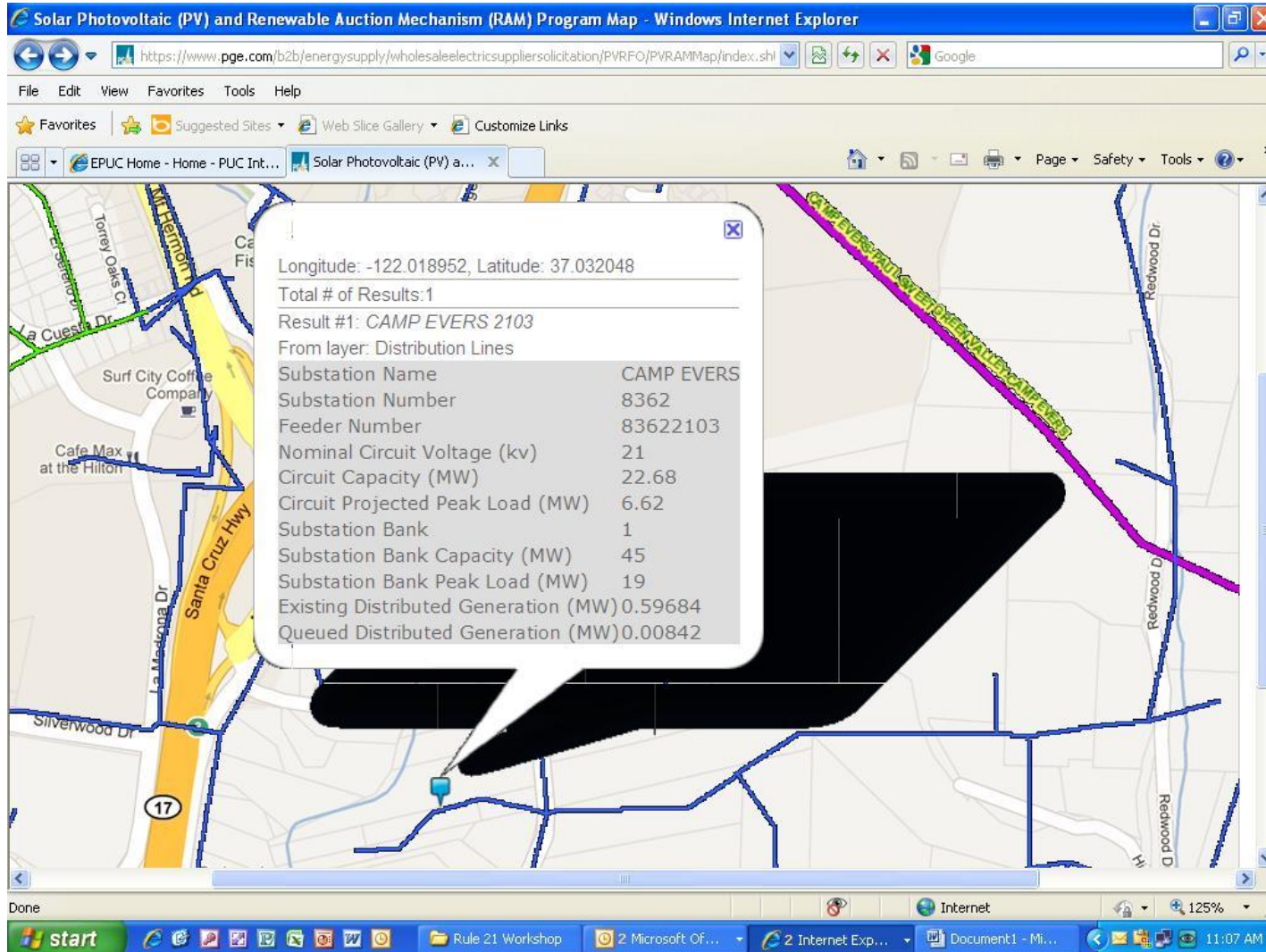


Interconnection of distributed generation (DG)

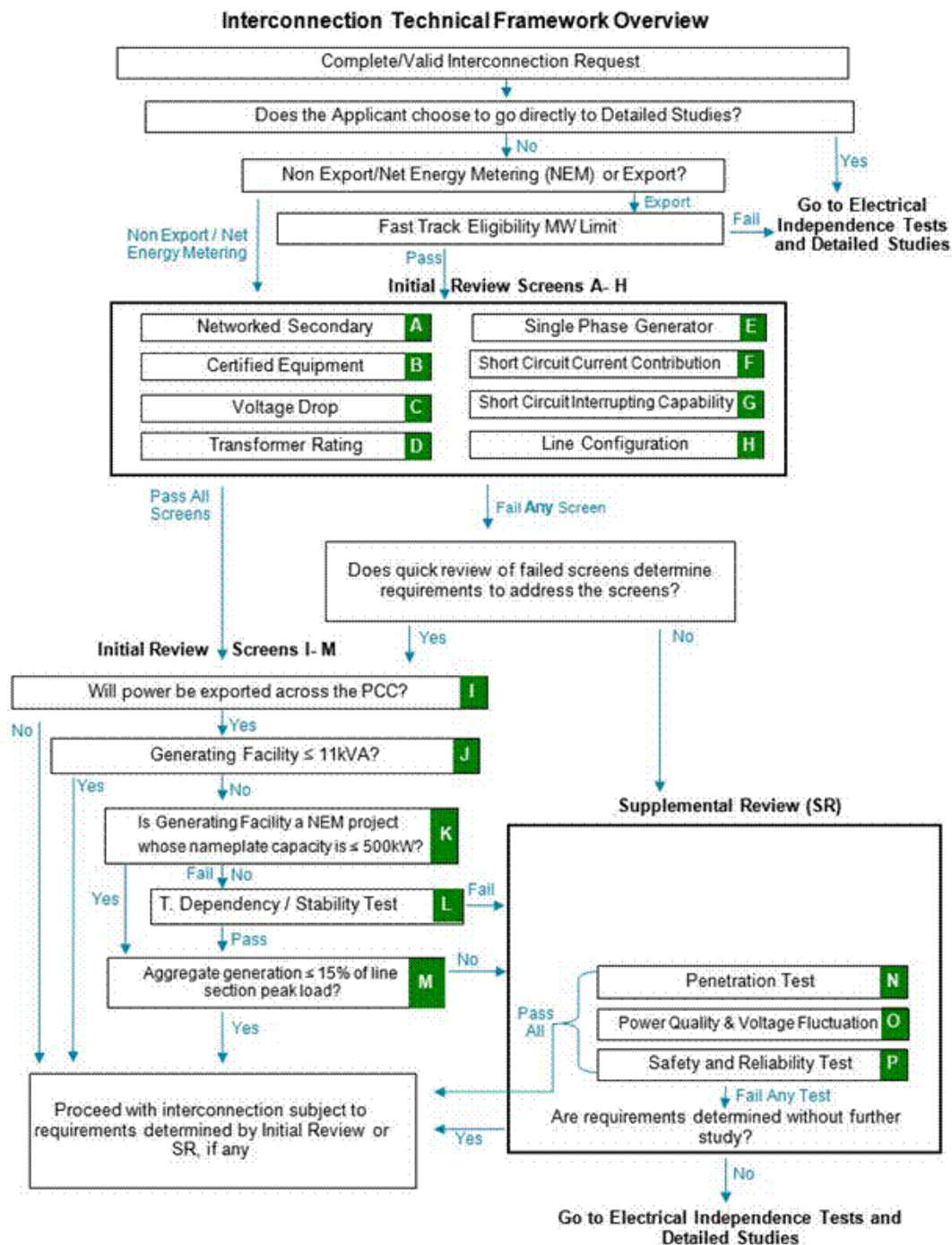
- California has ambitious DG goals with the Governor aiming to have 12,000 MW of DG renewables in the state
- Interconnection of small, distribution-level facilities poses a procedural and technical problem for renewable generators and utilities
 - Interconnection under the small DG tariff, Rule 21, can take up to a year and the generator will incur substantial costs for necessary system studies
 - A Fast Track process is being developed within Rule 21 to allow a faster and cheaper option of interconnection for DG facilities
 - The Fast Track will allow interconnection within 30 days at a much lower cost to eligible facilities
 - The utilities will provide the generators with tools to locate and size installations to serve available local load and thus not impact either the distribution system or the transmission system
 - Eligibility MW Limit Screen
 - Distribution system maps that show available local load that needs serving are made available to the generators



Sample Interconnection Map



Rule 21 Fast Track Process



Integration of renewables into the grid

- Intermittency of most renewable technologies creates additional costs and reliability concerns
- Very few of California's renewable facilities are dispatchable, majority operate on a must-take basis
- The California Independent System Operator has called for over 4,000 MW of new conventional generation to back up intermittent renewables
- CPUC does not yet have a systematic approach to renewable integration
 - CPUC is studying the amount of new conventional generation, if any, that will need to be built to integrate renewables
 - Fast-ramping facilities will likely be necessary
 - Valuation of renewable offers may include an “integration adder” to account for the cost on integrating the facility

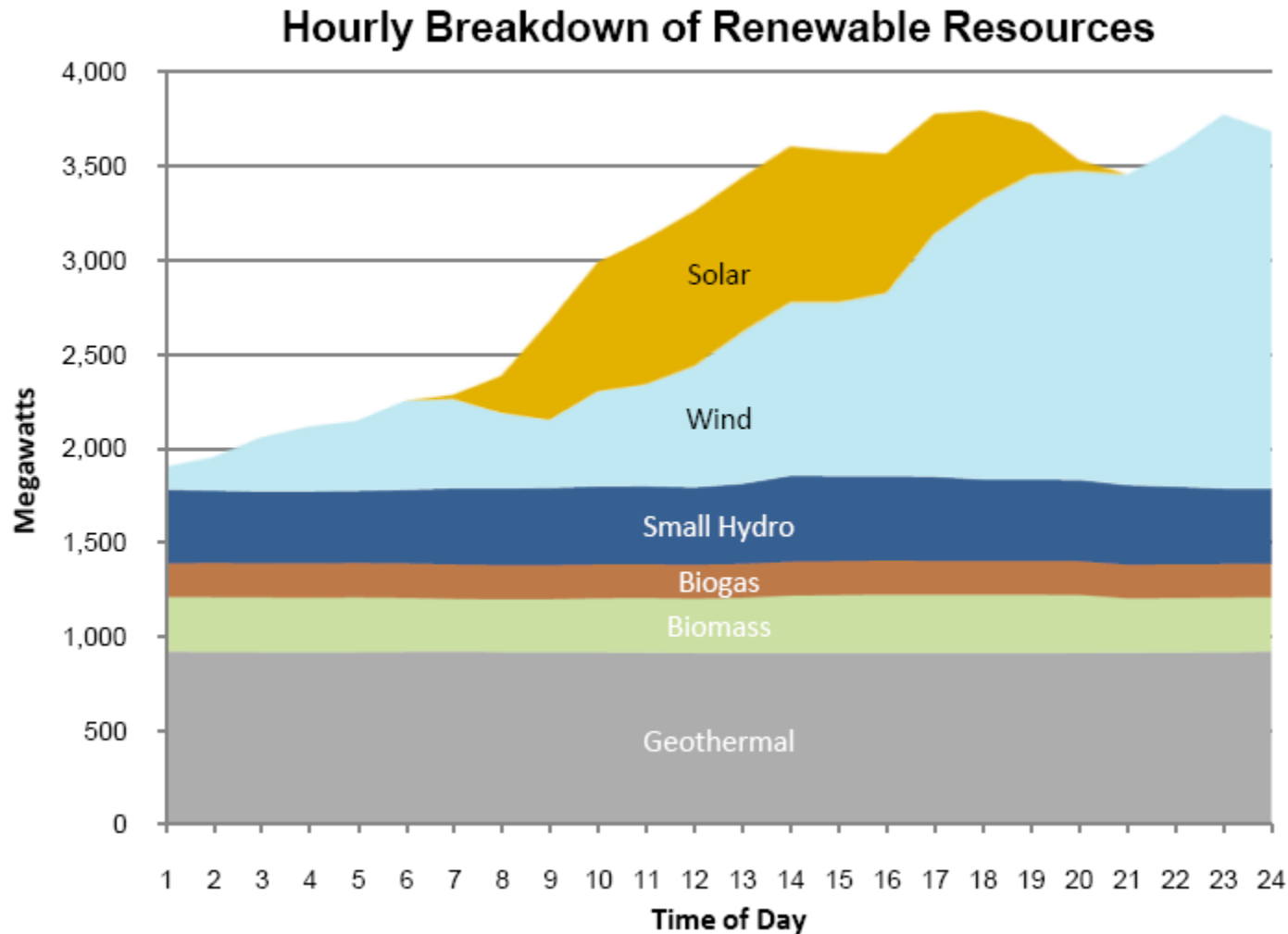


Other mechanisms to address intermittency

- **Energy storage:** the CPUC is studying the possibility of using energy storage to collect off-peak renewable generation, especially nighttime wind production, and use during peak hours. Currently, most energy storage options are not cost-competitive
- **Plug-in electric vehicles:** a tariff is being designed to enable customers to charge electric vehicles and incentivize charging during off-peak hours
- **Demand response:** utilities are starting to use demand response programs to ramp load up and down in response to intermittent supply. Demand response programs can be based on price signals, remotely-controlled technology or stages of emergency



Renewable production example – June 17, 2012



Data from the California Independent System Operator



Resources

- DRA's Renewable Jungle report:
http://www.dra.ca.gov/uploadedFiles/Content/Energy/Renewable_JungleRevisedJan31FINAL.pdf
- DRA's renewables web page: <http://www.dra.ca.gov/general.aspx?id=174>
- CPUC's renewable web page: <http://www.cpuc.ca.gov/PUC/energy/Renewables/>
- Handbook for Rule 21 interconnection (from 2003, currently being updated):
http://www.energy.ca.gov/reports/2003-11-13_500-03-083F.PDF
- **California Independent System Operator renewable web page:**
<http://www.caiso.com/market/Pages/ReportsBulletins/DailyRenewablesWatch.aspx>

