



Comments on California Renewable Portfolio Standards, Feed-in Tariffs, and Net Metering

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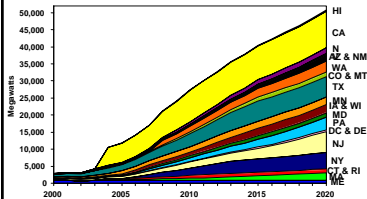
Outline of Presentation

- Progress toward 20% RPS
- Transmission process and progress
 - Grid issues related to as-available renewables
- Key policy choices for 33% renewables
- Feed-in Tariffs
- Net Metering

What is Possible for Renewable Electricity



Renewable Energy From State Standards



Total Estimated Solar Capacity Driven by State RPS Set-Asides

2010: 400 MW to 500 MW
 2015: 1,200 MW to 1,400 MW
 2020: 2,800 MW to 3,200 MW
 2030: 3,700 MW to 4,300 MW

Western Governor's Association 2015 Goal

- Clean Energy – 30,000 MW
- Solar – 8,000 MW
 - Wind – 5,000 to 9,000 MW
 - Geothermal – 5,600 MW
 - Energy Efficiency – 40,000 MW



California's RPS Policy Required All Retail Energy Sellers to Procure 20% Renewable Energy by 2010

- Original legislation (SB 1078, 2002) was 20% by 2017. Accelerated target to 2010, effective January, 2007 (SB 107, 2006). **Began at around 14% in 2003.**
- All RPS-obligated retail sellers must procure an incremental 1% of retail sales per year until 2010
- 20% obligation continues post-2010, growing with California's energy use
- RPS procurement compliance is measured in terms of electricity deliveries (GWh), **not signed contracts**



Current Contracting Status: The Good News

- California Public Utility Commission (CPUC) has approved 112 contracts for almost 7,000 MW of new and existing RPS capacity
- Of these, 73 are projects with new capacity, totaling 5,245 MW
 - Were all this capacity to come online by 2010, we would more than achieve our RPS target
- Recent RPS solicitations have been robust:
 - Increased participation from larger and more experienced developers
 - Utilities shortlisting 10x their incremental procurement targets
 - California renewable market is maturing
- Procurement process is working
 - Due to complexity of program, took time to coordinate across agencies and implement; process now hitting its stride



Renewable Power Delivery Status: Not So Good News

- 21 contracts for over 800 MW of new capacity have come online
- RPS generation has not kept pace with overall load growth
- Utilities likely to hit 20% by ~2013

		2003	2004	2005	2006	2007	2008 (estimate)
PG&E	RPS Eligible GWh	8,828	8,575	8,543	9,114	9,047	10,275
	RPS GWh as % of bundled sales	12.4%	11.6%	11.7%	11.9%	11.4%	12.9%
SCE	RPS Eligible GWh	12,613	13,248	12,930	12,706	12,465	12,754
	RPS GWh as % of bundled sales	17.9%	18.2%	17.2%	16.1%	15.7%	16.0%
SDG&E	RPS Eligible GWh	550	678	825	900	881	1,071
	RPS GWh as % of bundled sales	3.7%	4.3%	5.2%	5.3%	5.2%	6.3%
TOTAL	RPS Eligible GWh	21,991	22,500	22,298	22,719	22,393	24,100
	RPS GWh as % of bundled sales	14.0%	13.9% ↓	13.6% ↓	13.2% ↓	12.7% ↓	13.7% ↑

Numbers in red represent year-on-year decreases in GWh or % terms



California's IOUs Served 12.7% of 2007 Retail Electricity Sales with Renewable Power

- Pacific Gas and Electric (PG&E) - 11.4%
- Southern California Edison (SCE) - 15.7%
- San Diego Gas & Electric (SDG&E) - 5.2%
- ESPs served 4.7% and small and multi-jurisdictional utilities served 6%.
- 2007 renewable energy by resource type:
 - Geothermal - 47.93%
 - Wind - 19.04%
 - Biomass - 14.32%
 - Small Hydro - 11.12%
 - Biogas - 4.73%
 - Solar - 2.86%

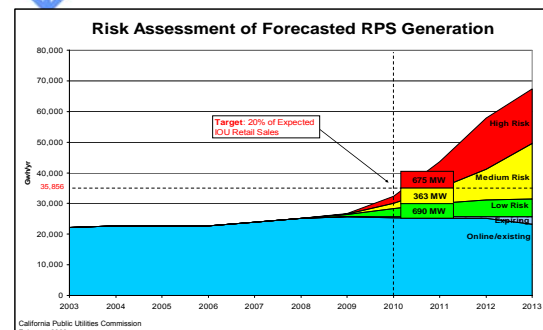
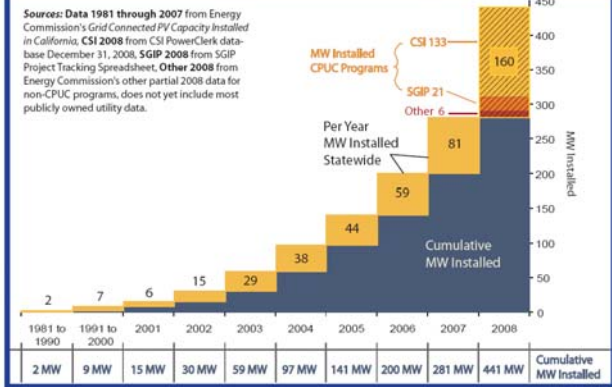
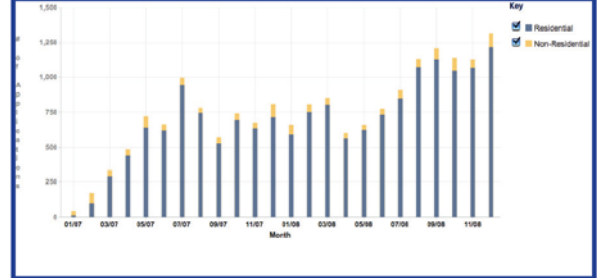


Figure 1. Grid Installed PV Capacity in California, 1981 through 2008



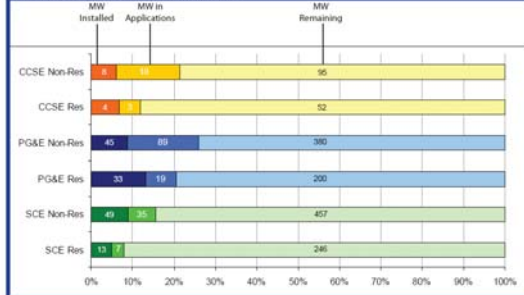
PV Applications Over the Past Two Years

Figure 2. Total number of applications per month by customer sector, January 2007 - December 2008



California Solar Initiative

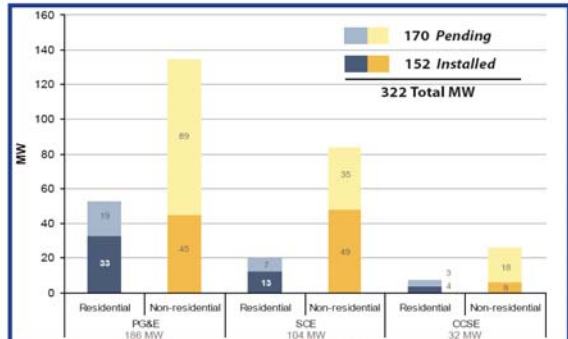
Figure 3. CSI progress towards 1,750 MW goal



Source: CSI data from www.CaliforniaSolarStatistics.ca.gov through December 31, 2008, CSI-SGIP Transitional Projects data from SGIP spreadsheet December 2009.

Clean Solar Initiative Progress

Figure 6. Total Capacity of CSI Applications by Program Administrator, in MW



Source: www.CaliforniaSolarStatistics.ca.gov, data through December 31, 2008, CSI-SGIP data from SGIP Project Database January 2009.



CPUC Developing Multi-Agency Solutions to Facilitate 20% RPS

- **Transmission planning and permitting**
 - See forthcoming slides
- **Site control and permitting**
 - Working with relevant federal (BLM), state agencies (CEC), and local agencies
- **Project Viability**
 - Attempting to evaluate non-performing contracts
- **Generation permitting**
 - California Energy Commission (thermal facilities)
 - County agencies (wind, thermal <50 MW)



Transmission for 20% RPS Can Be an Issue in Certain Regions

- CPUC ordered Edison to build Tehachapi; segments 1-3 are under construction, segments 4-11 are under review
- CPUC implemented Public Utilities Code Section 399.25, which allows for backstop rate recovery for transmission built for renewable purposes
- CPUC approved Sunrise Powerlink for SDG&E in December 2008
- **With these actions, available transmission will be sufficient to reach 20% renewables**



Effective Transmission Planning Is Critical in Reaching 33% Goal

- Initiated Renewable Energy Transmission Initiative
 - with California Independent System Operator (ISO) and Energy Commission, plus investor-owned and publicly-owned utilities
- Purpose is to identify and rank competitive renewable energy zones (CREZs) for transmission development
 - To solve “chicken and egg” problem of which comes first: transmission or generation (similar issue in Hawaii linking load on one island with renewable resource on another island)



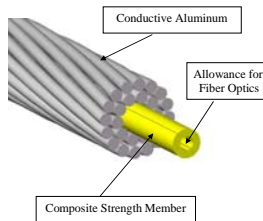
Transmission Permitting

- Transmission pathway identified for CPUC-jurisdictional entities:
- Utility submits to ISO for approval – IPP must also do study for ISO
- CPUC and ISO working to collaborate on determination of “need” to streamline timing
- Utility simultaneously conducts initial environmental assessment
- Utility files application, with proposed route, alternatives, and environmental assessment, at CPUC
- CPUC conducts California Environmental Quality Act (CEQA) review or CPUC is a co-lead with a federal agency on CEQA/National Environmental Policy Act review – includes extensive public input and outreach
- CPUC issues certificate of public convenience and necessity (CPCN) or permit to construct (PTC): aka “permit”

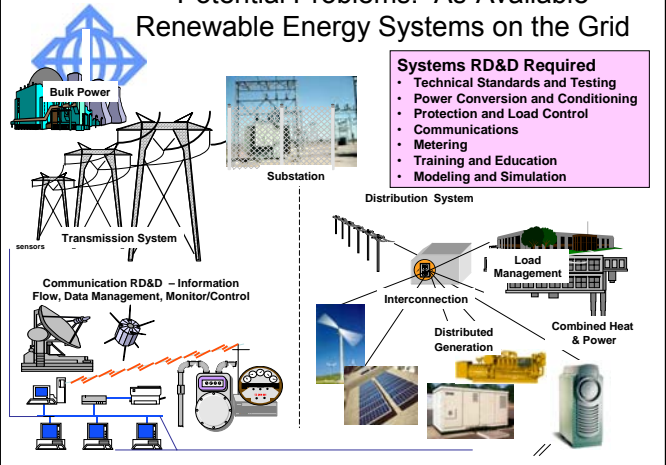


Improved Transmission Performance with Composite Reinforced Aluminum Conductors

- **transmission lines Performance Improvements:**
 - Ampacity increases by 200%
 - Operating temperature increase by 146%
 - Tension is reduced by 35%
- **Contractor's plan is to gain a 5-10% market share of new ACSR equivalent sales within 5 years.**
 - \$800 million – yearly sales for overhead conductor cable in California
 - \$2 million – cost per mile to build new transmission line
 - 31,321 –total circuit miles of California overhead
- **Conductor (for double layer stranded sizes) can be ready for large-scale production in 6-8 months.**



Potential Problems: As-Available Renewable Energy Systems on the Grid



Power Quality and Reliability: A Necessity in a Digital Society

Outage Costs for U.S. Industry estimated at \$79 Billion Annually in a recent study by Joe Eto, LBL

Total U.S. Cost of Electricity \$250 Billion Annually

Momentary Interruptions (<5min) are More Costly than Sustained Interruptions



From Imre Gyuk, DOE, 2007



Transmission and As-Available Renewables: Examining "What-if" Scenarios

What if 1MW of wind power were added to an island grid?

	GWh	Fuel Use		Emissions (tons)		
		MMBtu	NOx	SOx	CO ₂	
Combined Cycle	-2.1	-15545	0	-2	-1352	
Combustion Turbine	-1.3	-13905	-1	-2	-1245	
Diesel	0.0	-341	0	0	-29	
Puna Geothermal	0.0	0	0	0	0	
Small Hydro	0.0	0	0	0	0	
Steam Oil	-0.6	-7582	-1	-1	-726	
Wind	4.1	0	0	0	0	
Solar	0.0	0	0	0	0	
Grand Total	0.1	-37374	-2	-6	-3352	

HELCO Cost

HELCO IPPs

+++ CT +++ CC

↓ Diesel

++ Steam Oil

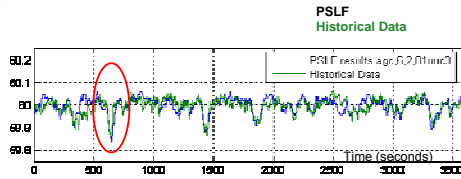
Wind ++ ...?

- With no other changes to the system, an increase in wind power offsets fossil fuel generation and reduces emissions
- From a cost of energy perspective, the price paid to wind producers matters - currently avoided cost of oil
- Additionally, HELCO must maintain their system frequency at 60Hz and sudden changes in wind power will affect the frequency - need for spinning reserve and/or new technology

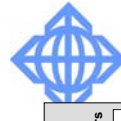
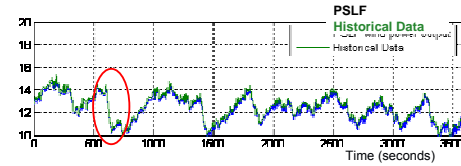


Significant Wind Fluctuations Can Have Significant Impacts on Voltage and Frequency

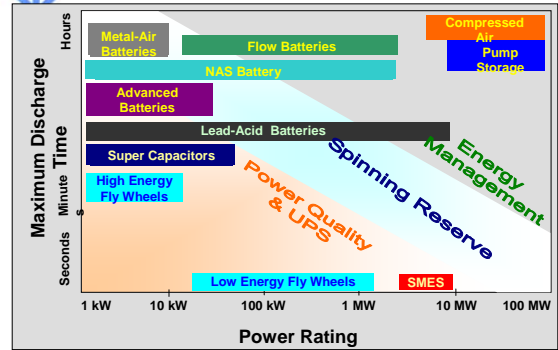
Frequency (Hz)



Apollo Windfarm (MW)



Storage Technologies Used to Address As-Available Impacts



California's Future Storage Technology Portfolio Must Address Certain Issues

Industrial

- Need for increased reliability
- Need for improved power quality due to increased use of digital controls in industry

System Support

- Manage transmission and distribution instability caused by congestion
- Overcome transmission bottlenecks caused by limited transmission capacity

Distributed Generation

- Improve dispatchability and reliability of intermittent renewables
- Create load-following capability for fuel cells



Getting Stakeholders Together: Level of Consensus

What we expected: What we got:





Lessons Learned from 20% Goal Drive Policy Options for Meeting 33% Goal by 2020

- 20% RPS legislation was detailed and prescriptive - 33% statute should be as **simple and flexible** as possible, to allow responsiveness to market conditions
- 20% RPS legislation focused on the procurement process (now working) – 33% should focus on **statewide coordination** needed to facilitate more efficient and timely project development
- Consider recognizing **different characteristics and starting points**
- Current **cost containment mechanism** (market price referent – MPR or benchmark) should be phased out in favor of a more dynamic approach to **utility portfolio planning and procurement**



Cost Containment

- MPR (or any replacement benchmark) problematic
 - May actually increase costs to MPR level
 - Does not contain costs or help assess contracts
- Reasonableness should be assessed by CPUC just like any procurement costs, as part of utility portfolio
- In 2015-16 timeframe, possible to compare against other GHG-emissions mitigation strategies under AB 32 and related laws



Feed-in Tariffs Based on AB 1969 (for Renewables) and AB 1613 (for CHP)

What is a Feed-in-Tariff (FIT)?

- Standard offer contract for the sale of electricity from a qualifying Distributed Generation facility to the utility grid
- California experience with Qualifying Facilities (QFs)
- Public Utilities Regulatory Policy Act (PURPA) of 1978 established QFs and outlined their payment according to the avoided cost of power
 - PURPA is no longer relevant in developing Power Purchase Agreements (based on avoided costs)
- QF is currently defined as non-utility generator with less than 80 MW capacity that utilizes cogeneration and/or renewable fuels (for bioenergy, ≥ 50% biomass)



Feed-in Tariffs

- In February 2008, the CPUC made new Feed-in Tariffs available for the purchase of up to 480 MW of renewable generating capacity from small facilities throughout California.
- New Feed-in Tariffs are a simple means for small renewable generators to sell power to utilities at predefined terms and conditions, without contract negotiations.
- Power sold to the utilities under the feed-in tariffs will contribute to the utilities ability to meet their Renewables Portfolio Standard goals.
- AB 1969 authorized Feed-In Tariffs for small renewable generators (<1.5 MW) owned by public water and wastewater facilities and facilitates a streamlined interconnection process
- Statewide cumulative capacity is now up to 228 MW for total of 478 MW
- Rate is determined by Market Price Referent with Time of Delivery adjustments



Feed-in Tariffs

- Feed-In tariff approach complements RPS and other programs to promote procurement of renewable energy, while avoiding overlap
- Allows for generation above on-site demand
- Streamlined approach
 - Standard Terms and Conditions
 - Renewable Energy Certificates transfer to utilities with sale of electricity
 - Helps utilities meet RPS requirements
 - 10, 15, or 20 year fixed base price contracts



Net Metering Is Another Program Designed to Increase the Penetration of Renewable Resources

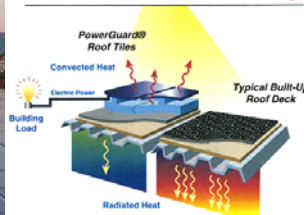
- Net metering laws, as amended, allow for up to 1 MW systems
 - Up to 10 MW for biogas digesters
- Eligible technologies are photovoltaic systems, wind, fuel cells, and biogas
 - PV “in” and “out” prices are the same
 - Biogas digesters only allowed to recoup generation costs
- Limited to 2.5% of Investor Owned Utilities (IOUs) peak demand
- Net excess generation is carried forward for one year with any remaining given to the utility



PowerLight’s PowerGuard



PowerGuard® - Power Generation & HVAC Savings



PowerLight’s insulated 30 year roof system reduces building air conditioning loads while it’s PV surface generates electricity during hot and expensive peak summer hours

While California is known for its hot dry summers, that same solar resource provides a clean, safe and reliable way to generate electricity



The Yolo County Success

Accomplishments

- Is opening the way for landfill gas electricity systems to be more widely used in California
 - Accelerates gas production from over 30 years to less than 10 years, making landfill electricity more competitive
 - Reduces volume of landfill which can extend landfill life by 20 percent
 - Significantly reduces the chance for groundwater pollution from leachate release
- Has become the leading bioreactor project within EPA’s XL Program and will strongly influence landfill regulations across the country



Control cell without bioreactor



Enhanced bioreactor cell



33% Renewables Target Has Multiple Benefits

- Greenhouse gas emissions reduction
 - AB 32 California Air Resources Board Scoping Plan as key driver, along with other related laws
- In-State economic and environmental benefits
 - Job creation
 - Fuel diversity
 - In-state air quality
- **Orderly progress toward a higher percentage renewable portfolio at reasonable costs**
 - Different starting points implies potential for different end points
 - Acknowledgement of customer-owned rooftop photovoltaics helping to meet statewide goals (similar issue in Hawaii)?