



DISTRIBUTED GENERATION IN CALIFORNIA: 14 CASE STUDIES

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Purpose

- Governor Brown's Clean Energy Jobs Plan calls for 12,000 MW of distributed generation
- Much more familiar with large-scale power plants – wanted to learn more about small scale
- Learn what hurdles the projects faced

Methodology

- Interviewed project developers, local officials, utilities' staff; reviewed public documents and reports
- Key information we looked for:
 - Procurement – Power Purchase Agreement (PPA) with utility or Independent Power Producer, Feed-in Tariff (FiT), Self-generation
 - Siting/Permitting – California Environmental Quality Act (CEQA), building permits, air quality permits
 - Interconnection process
 - Financing

Types of Projects

- Renewable Portfolio Standard eligible projects 20 MW or less
- Wholesale and behind the meter
- Solar photovoltaic (PV), biogas, solid-fuel biomass, wind, and fuel cell
 - Solar PV: fixed ground-mounted, single axis, double axis, roof-top
- Diverse procurement mechanisms (FiT, PPA, standard offer contract, net energy metering)
- Public and private lands

Recurrent Energy – Kammerer PV Facility

- 15 MW on 115 acres in Sacramento
- 20-year PPA for wholesale generation with Sacramento Municipal Utilities District (SMUD)
 - Average of \$0.111/kWh (signed July 2010)
- SMUD Feed-in tariff program
- 69 kV interconnection line
- Mitigated Negative Declaration
- Google and private equity firm KKR & Co. took majority ownership from RE
 - \$94 million from Google and KKR for all four RE projects in Sacramento County (70 MW)
- 220 construction jobs at four sites
- Full completion March 31, 2012



Gov. Brown, U.S. Secretary of the Interior Ken Salazar, and RE CEO Arno Harris signing MOU at RE Bruceville in Jan. 2012

GreenVolts Utility-Scale Solar Field

- 3 MW in Byron (Alameda County)
- Dual-axis tracking system; modules can be rotated to face down at night
- 20-year contract with Pacific Gas & Electric (PG&E) through their RPS solicitation
- 110-161 kV interconnection line
- Mitigated Negative Declaration (MND)
- Only 320 kW of 3 MW have been installed; project is on hold
- In Dec. 2011, oily soil material found onsite from a decommissioned Shell Oil pipeline
 - County approved remediation plan that Shell will implement



McHenry Solar Farm (Modesto, CA)

- 25 MW solar PV to be developed on 154 acres by SunPower
 - Would deliver power to Modesto Irrigation District's (MID) sub-transmission and distribution system
 - Scheduled to be operational late 2012
- 25-year PPA with MID signed May 2010
- 69 kV transmission line
- CEQA: Environmental Impact Report prepared - Environmentally Superior Alternative
- \$18.7M will go to local economy
- Expected to create 144 construction jobs; operating staff of 2-4



Aerojet PV Installation on Superfund Site

- 6 MW solar PV on 40 acres of Aerojet site in Rancho Cordova
- Self-generation to power portion of groundwater remediation operations
- Located on Aerojet Superfund site
 - Highly polluted location; clean-up monitored by EPA
- 10-year Solar PPA with Solar Power Inc. via SMUD custom three-tier incentive program (began May 2009)
 - SMUD is financing \$13M of the project's \$20M cost over 10 years
- Worked with U.S. EPA for review and consultation
- Created 200 construction jobs and 100 construction support jobs



Governor Schwarzenegger signs Executive Order S-14-08 at Aerojet solar farm, Sept. 2009

SCE Prologis Rooftop PV Project

- 8.6 MW, 1.2 million square-foot installation atop a Prologis-owned industrial distribution center in Rialto (San Bernardino county)
- Online September 2011
- Southern California Edison (SCE) Solar Photovoltaic Program
- Interconnection agreement with SCE via Wholesale Distribution Access Tariff (WDAT) process
- \$29M project financed by SCE, other private financiers, and federal tax incentives
- Master Services Agreement signed with International Brotherhood of Electrical Workers



Sonoma Mountain Village PV Facility

- SMV: 200-acre solar-powered development in Rohnert Park
- 2.3 MW on ~4 acres of roof-top
 - 1.14 MW in 2007
 - 1.16 MW upgrade in 2011
- PG&E Time-of-Use tariffs
- Interconnection agreement with PG&E under Rule 21
- SMV's developer financed 1.16 MW upgrade with a \$1.6M loan from the Sonoma County Property Assessed Clean Energy (PACE) program
 - PACE funding secured through Sonoma County Energy Independence Program
 - Federal grant in lieu of tax credit reimbursed 30% of total project cost



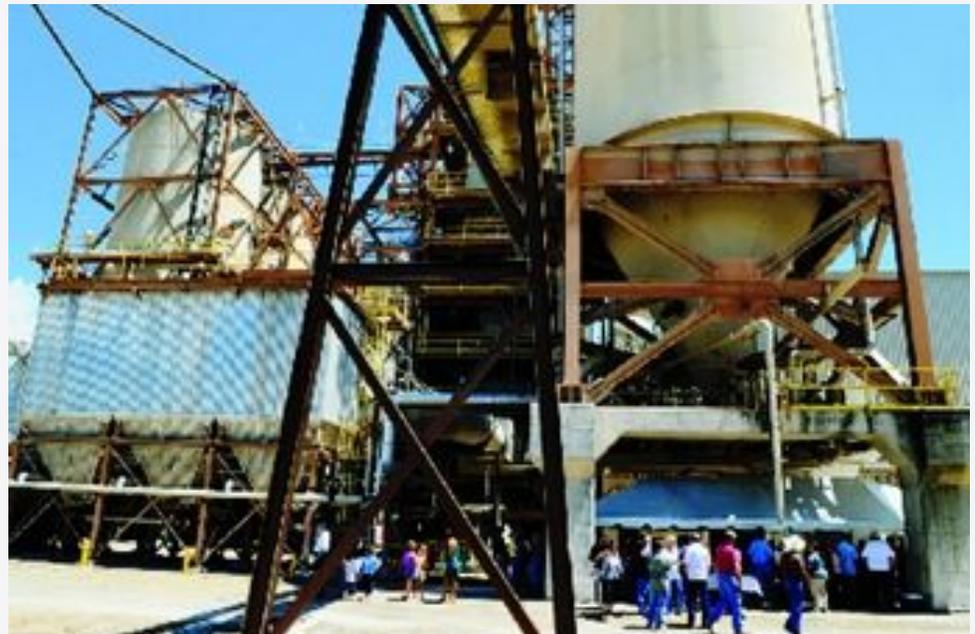
China Lake Naval Station PV Facility

- ~14 MW, 118 acres at China Lake Naval Air Weapons Station
- High-density 1.5 MW power blocks with tracking mechanism
- 20-year PPA with SunPower Corporation (signed 09/2011)
- Navy will pay \$80M-100M for electricity generated; expects to save \$13M over 20 years
- Plant is expected to provide 30% of base's 20-year energy needs
- Not yet approved for interconnection with SCE (applied 09/2011)



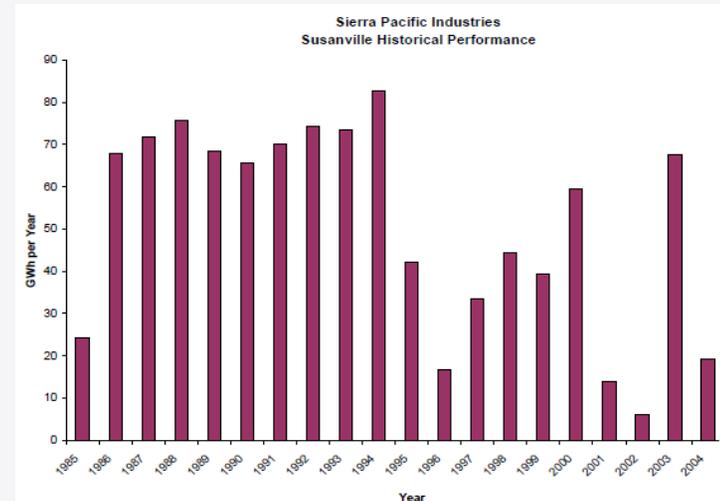
Buena Vista Biomass Power Facility

- 18 MW woody biomass-fired generation facility on 50 acres
 - Developed by BVBP in Ione, CA
- 20-year PPA with SMUD signed July 2010; online 2012
 - Wholesale generation
 - Expected average annual payment from SMUD of \$15M
- Interconnection agreement with PG&E
- Required air quality, water supply, wastewater discharge, hazardous materials management, and land use permits
- CEQA Environmental Impact Report
- Received Wildland Fire Management Grant from U.S. Department of Agriculture for \$2,452,450
- Created 50 construction jobs; 90 commercial service jobs



SPI Susanville Cogeneration Facility

- 13 MW, biomass solid fuel plant; most fuel for steam turbine acquired from sawmill operations
- PG&E Interim Standard Offer PPA for 30 years (self-generation)
 - Weighted annual average of \$0.056 in 1985, \$0.131 in 1997
- Air quality permitting violations and lawsuits
- Operated by Sierra Pacific Industries from 1985-2004; has been offline since
- Renegy purchased plant for \$1.3M in 2007; planned to spend \$5M-6M on improvements
 - Facility acquired from Renegy and SPI by Laidlaw Energy Group in November 2011



Teichert Aggregates Wind Turbine

- 1.5 MW on 0.25 acres at the facility in Vernalis (San Joaquin county)
 - 391-foot tall GE turbine is a collaboration between Foundation Windpower and Teichert Aggregates to lower operation costs at the facility
 - Online July 2010
- Rule 21 interconnection agreement with PG&E
- Mitigated Negative Declaration
- Use permits
- CPUC Self-Generation Incentive Program provided approx. half of \$4.5M cost



Southwest Windpower Skystream 3.7

- Personal wind generator (self-generation); requires 0.5 acres and a building permit
- Mean system capacity: 2.47 kW
- Universal inverter compatible with any utility grid from 110-240 VAC
 - Battery-charging applications in off-grid locations
- 87 systems installed in CA since 2007
- Average total system cost is \$17,871.38
 - U.S. federal tax credit (30% of installed cost) set to expire end of 2012
 - CEC's Emerging Renewables Program offers an incentive of \$3.00/watt for the system
 - Average rebate of \$6,368.62



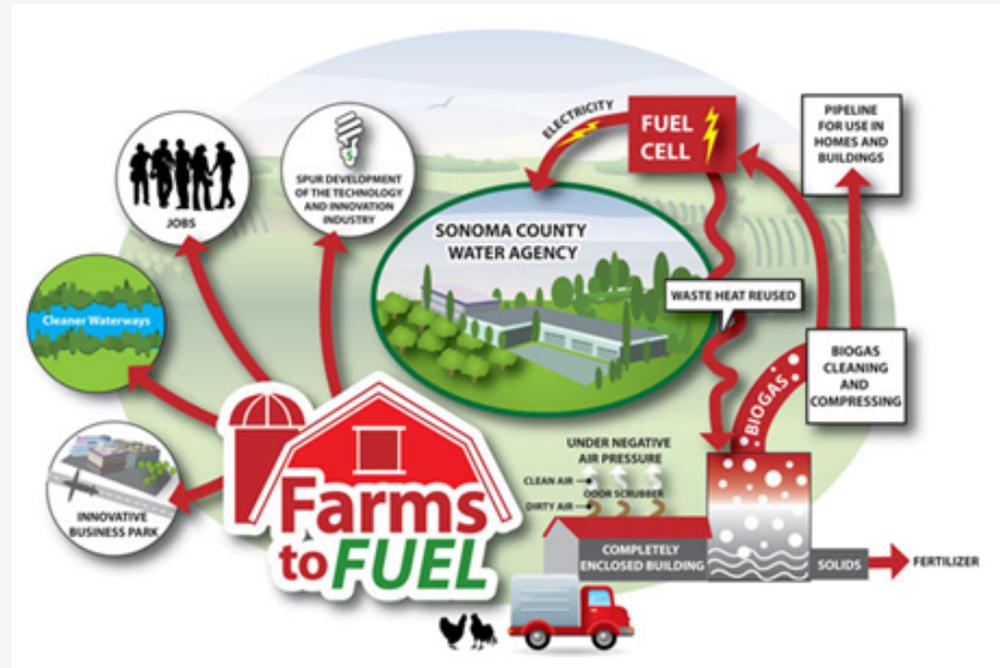
Tank 7 In-Conduit Hydroelectric Project

- 400 kW in a 1200 sq ft building for El Dorado Irrigation District (EID)
 - Proposed small in-conduit hydroelectric station at an existing drinking water storage facility
- 20-year PPA with PG&E via FiT program (expired)
 - \$0.117/kWh
- Project will cost \$1.6M-\$1.7M; EID is seeking a \$500K grant to make project financially feasible
 - EID has not secured financing



Sonoma County Farms to Fuel Project

- Sonoma County Water 1.4 MW chicken manure fuel cell on 5.4 acres
 - Currently under construction
 - Partnership between BioStar Systems and the Sonoma County water and transit agencies
- Dairy and food processor waste processed in biodigesters to produce biomethane gas
- 20-year wholesale PPA with PG&E
- Scheduled to come online 2013
- Mitigated Negative Declaration
- \$48M project, majority to be financed through bonds sold by the California Municipal Finance Authority (a JPA)
 - \$3.4M grant from CEC's Alternative and Renewable Fuel and Vehicle Transportation Program fund



Recycling Plant 1 (RP-1) Fuel Cell

- 2.8 MW fuel cell powered primarily with renewable biogas in Ontario
 - Placed in water-treatment plant operated by Inland Empire Utilities Agency
 - Generating since September 2011
- 20-year PPA with UTS BioEnergy at \$0.1262 per kWh
- Interconnected with RP-1 electrical grid; funnels all electricity to facility.
 - No formal interconnection process needed.
- Exemption from CEQA
- Received rebates through SCE Self Generation Incentive Program
- California Municipal Finance Authority applied for a private-activity bond allocation of \$25.2M on behalf of RP-1 Fuel Cell, LLC
 - Total construction cost of \$29.7M



Recommendations

- Further analysis and tracking to identify:
 - Data gaps
 - Reoccurring challenges
 - Issues that can be readily addressed by regulatory agencies

Questions?

