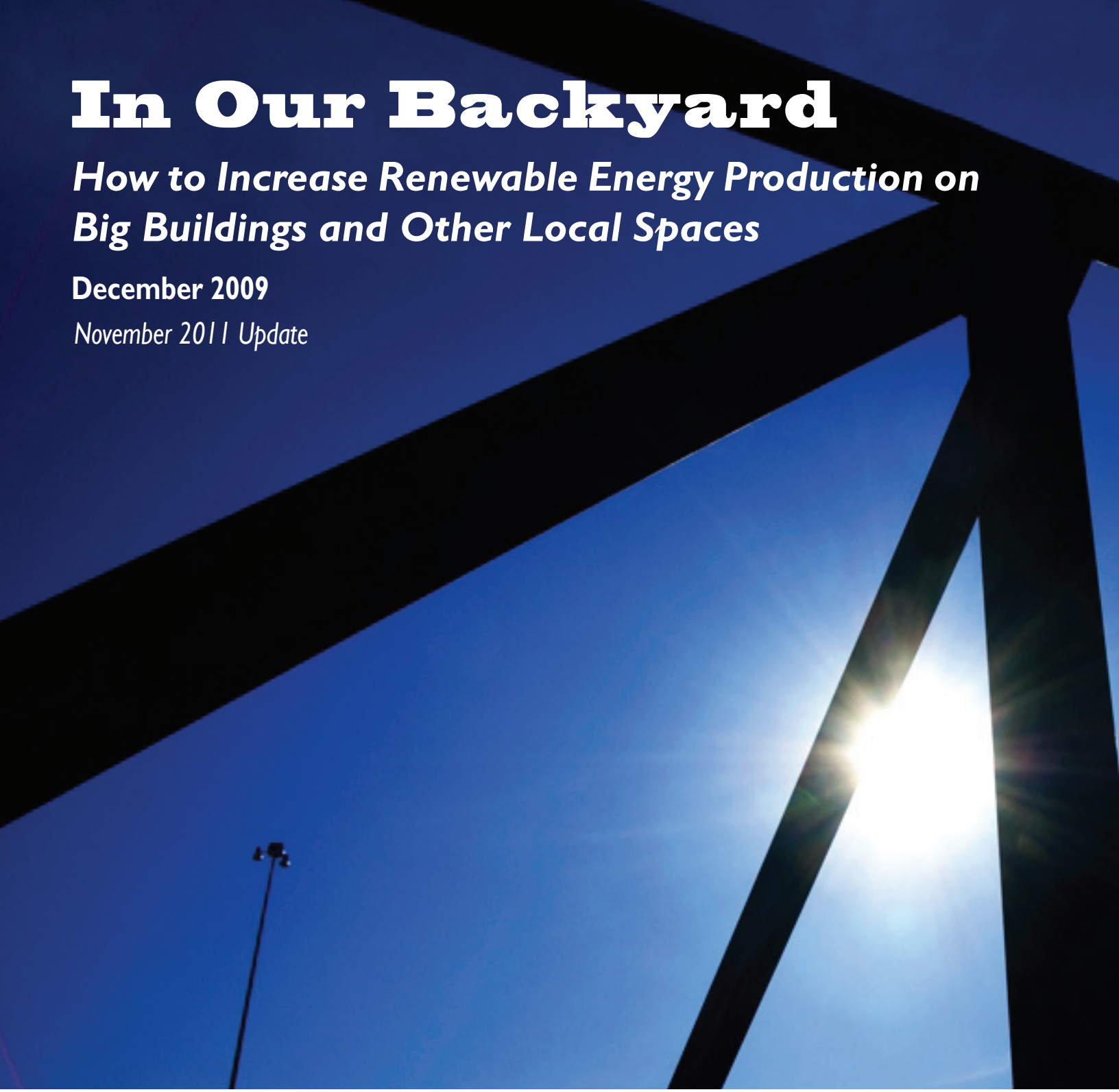

In Our Backyard

How to Increase Renewable Energy Production on Big Buildings and Other Local Spaces

December 2009

November 2011 Update

Bank of America

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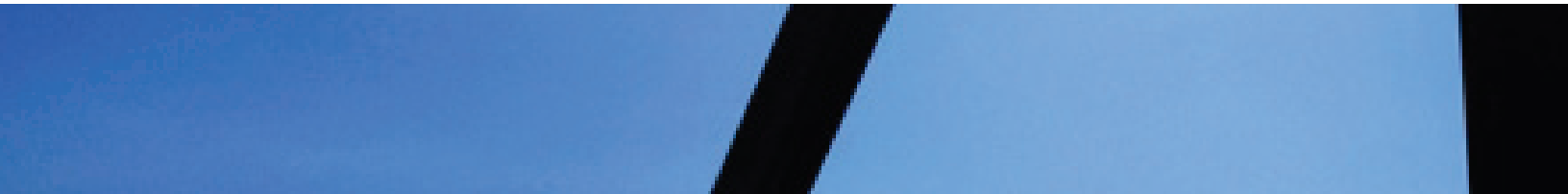

About this Report

This policy paper is the second in a series of reports on how climate change will create opportunities for specific sectors of the business community and how policy makers can facilitate those opportunities. Each policy paper results from one-day workshop discussions that include representatives from key business, academic, and policy sectors of the affected industries. The workshops and resulting policy papers are sponsored by Bank of America and produced by a partnership of the UC Berkeley School of Law's Center for Law, Energy & the Environment, UCLA School of Law's Environmental Law Center & Emmett Center on Climate Change and the Environment, and the California Attorney General's Office.

Authorship

The primary author of this policy paper is Ethan N. Elkind, Bank of America Climate Change Research Fellow for UC Berkeley School of Law's Center for Law, Energy & the Environment (CLEE) and UCLA School of Law's Environmental Law Center & Emmett Center on Climate Change and the Environment.

Additional contributions to the report were made by Richard Frank and Steven Weissman of the UC Berkeley School of Law and Sean Hecht and Cara Horowitz of the UCLA School of Law.

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For more information, contact Ethan Elkind at Eelkind@law.berkeley.edu or Elkind@law.ucla.edu

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Preface

Since *In Our Backyard* was released in December 2009, distributed renewable energy generation has received significant attention from policy makers, with new legislation and regulatory developments, and the business community. Distributed renewable energy generation has also become a priority of California Governor Jerry Brown.

Governor Brown signed the California Renewable Energy Resources Act (Senate Bill 2X, Simitian) in April 2011, which requires California's electric utilities to procure 33 percent of their electricity from renewable sources by 2020. As part of his campaign for governor in 2010, Brown's platform included securing 12,000 megawatts of the 20,000 megawatts needed for the 33 percent standard from distributed renewable resources (with the other 8,000 coming from large-scale renewable facilities). In addition, as *In Our Backyard* recommended on page 15, the governor has worked with executive agencies to explore distributed generation options on public land, such as along highway rights-of-way and on the rooftops of large government buildings. Based on a recent inventory of state property, California Energy Commission staff recommended a target of 2,500 megawatts of new renewable generating capacity on state property by 2020.

The California Legislature has also acted to advance distributed generation. Legislators passed AB 510 (Skinner, Chapter 6, Statutes of 2010) to raise the utility cap on net metering (an issue highlighted on pages 9 and 14 in this report) to five percent of each electric utility's aggregate customer peak demand. Former Governor Schwarzenegger signed the bill into law on February 26, 2010. In addition, Governor Brown signed SB 226 (Simitian, Chapter 469, Statutes of 2011) on October 4, 2011 to provide an exemption for rooftop solar panels from environmental review under the California Environmental Quality Act (CEQA). The exemption may help increase investment in distributed resources and decrease costs for planned installations.

On the regulatory front, the California Public Utilities Commission (CPUC) issued decisions that increase distributed generation opportunities for renewable energy. As *In Our Backyard* recommended on pages 17 and 18, on July 14, 2011, the CPUC expanded its virtual net metering program, which allows customers in multi-unit residences to receive partial credit on their individual meters from a single solar energy system on the property. Previously, the CPUC's Multifamily Affordable Solar Housing (MASH) Program authorized net metering only for affordable housing units. The July decision expanded the program to any multi-tenant property. The CPUC also issued regulations to implement the renewable auction mechanism (RAM), described here on page 10. The first auction will close on November 15, 2011. This program has the promise of deploying 1000 megawatts of system-side distributed renewable energy generation (under 20 megawatt systems). Finally, the CPUC is in the process of strengthening the state's feed-in tariff program through development of new regulations that would, among other changes, establish a more detailed pricing structure.

At the federal level, the Federal Energy Regulatory Commission (FERC) issued a ruling that could allow states to introduce new, and expand existing, feed-in tariffs. Under federal law, electric utilities could only offer contracts for wholesale energy at rates no greater than "avoided costs" – an issue discussed here on pages 13 and 14. Prior to October 2010, avoided costs referred to relatively cheap fossil fuel-based electricity, which typically out-competes smaller, localized renewable energy systems. FERC's decision redefined the term, however, to mean the avoided cost of similarly situated types of energy production, as well as avoided environmental costs (FERC, October 21, 2010 Order). As a result, states may have more leeway to set feed-in tariff rates that are equivalent to the comparable costs of producing small- and mid-scale renewable energy else-

(continued...)

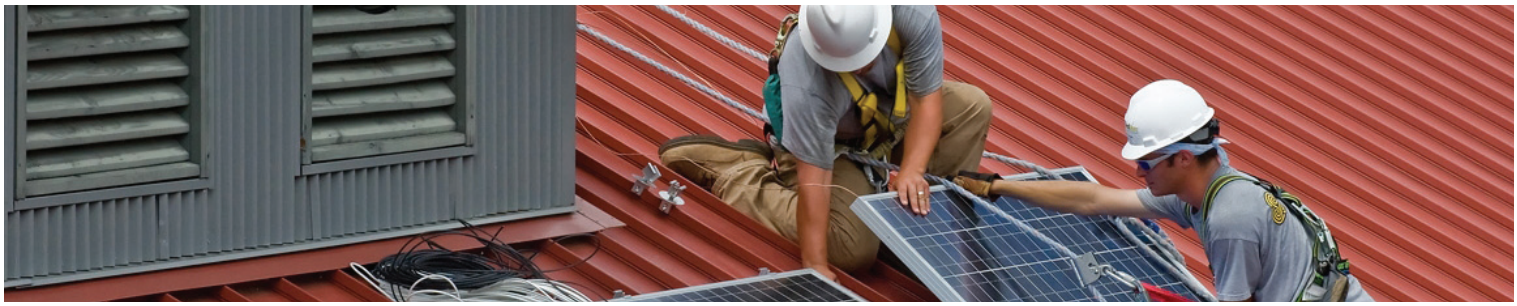
where. However, the ruling applies only to sources that are eligible as "qualifying facilities" under the Public Utility Regulatory Policy Act, which entails compliance with federal law and numerous regulatory requirements.

On the business side, California's electric utilities have continued to show progress toward meeting the state's renewable portfolio standard. Although the utilities fell short of the 2010 goal of 20 percent renewables, they served 17 percent of their retail electricity sales from renewable sources in that year and appear to be on track to achieve the 20 percent goal by 2013. While *In Our Backyard* discussed the need for additional transmission investments to meet the 2020 RPS (see page 7), recent statements from electricity entities indicate that there may be sufficient transmission infrastructure to meet the 2020 standards at this time. For example, the president and chief executive officer of the California Independent System Operator, the entity that manages the state's transmission system, indicated in December 2010 that seven transmission projects it had already approved and identified would be sufficient to meet the 33 percent requirement without the need for other new transmission lines. Meanwhile, based on the number of permitted projects in the pipeline, the governor's office expects that California's utilities may be able to provide up to 40 percent of their electricity from renewable sources by 2020.

On the economic front, the proliferation of renewable incentive programs around the world, coupled with increased global manufacturing output at lower cost, has led to significant price decreases in the cost of solar panels. This price decrease has helped to spur growth in the industry and further deployment of these distributed renewable resources. In addition, the proliferation of solar technologies holds the promise of creating new jobs. Solar investments create more jobs per megawatt than any other energy resource, and over 100,000 Americans are currently working in the United States solar industry.

Distributed renewable energy generation is likely to expand further due to business interest, falling prices, and favorable policies at the federal, state, and local levels. However, much work remains to be done at these various levels of government to continue to remove the barriers and make this resource a substantial component of the state's renewable energy mix.

UC Berkeley / UCLA Schools of Law
November 2011



Executive Summary: Clean Energy from Big Buildings and Other Local Spaces

In California's effort to combat climate change, few other sectors present as many opportunities as renewable energy. Transitioning from fossil-fuel based energy to renewable sources will result in significant greenhouse gas reductions and more jobs and economic growth.[1] And with its abundant wind, solar, and geothermal resources, California is well-situated to capitalize on this effort. While the state has developed programs to promote small-scale renewable energy options, such as solar photovoltaic panels on individual homes and small businesses, much of the political and legislative effort for increasing renewables has focused on large-scale, centralized wind and solar developments, usually located far from the majority of energy consumers. Many of these proposed developments require new, expensive transmission lines and face significant land-use and related hurdles. Siting and construction will take years.

But climate change and the state's aggressive renewable energy requirements (mandating that renewable energy sources constitute 20 percent of electrical power for the state by 2010 and 33 percent by 2020) require immediate action. As a result, there is considerable interest in installing renewable energy technology on the rooftops of large commercial and government buildings, and in other spaces such as wastewater treatment plants, the aqueduct, and highway rights-of-way. Many of these systems could be considerably larger than the small-scale solar panels on individual homes while still allowing the power to be generated close to the customers using it. This type of decentralized electricity production is a critical alternative and complement to large-scale renewable developments. It represents the single most immediate and feasible means to produce renewable energy on a broad scale without reliance on long-distance transmission lines, some of which have yet to be built.

Decentralized renewable energy generation represents the single most immediate and feasible means to produce renewable energy at a broad scale without reliance on long-distance transmission lines, some of which have yet to be built.

Unfortunately, decentralized energy generation also faces financing and regulatory barriers. State incentive programs need improvement, such as net metering, which allows renewable energy generators to offset their electricity bills with credits from the energy they provide to the grid; and the feed-in tariff, which provides cash payments for renewable energy.

To address these barriers and formulate solutions, a group of leading renewable energy suppliers, policy advocates, public agency leaders, and large private company representatives met at the UC Berkeley School of Law in June 2009. The group identified and prioritized the most critical barriers to promoting widespread decentralized generation on large buildings and other local spaces that are sometimes in our own backyard. Based on that discussion, this paper identifies the immediate and longer-term actions that government leaders, private industry, and public agencies must take to address the barriers. *The key finding is that policy makers must expand and improve the net metering and feed-in tariff incentive programs.*

Top Four Barriers to Decentralized Renewable Energy Production on Big Buildings and Other Local Spaces

1) Lack of Predictable and Adequate Financing

Current state and federal policies provide inadequate financing for the high upfront costs of installing large renewable arrays like solar panels and wind turbines.

2) Uncertain Government Permitting and Regulatory Programs

Uncertainty about existing and potential energy and climate change programs, as well as an unpredictable and complicated permitting process, discourages building owners and operators from investing in renewable energy.

3) Lack of Education and Outreach

Many businesses and public agencies are unaware of the opportunities to place renewable energy systems on their buildings and are sometimes reluctant to invest under the assumption that prices will continue to decline.

4) Landlord/Tenant Split Incentives

Commercial and multifamily residential property owners have little incentive to install renewable energy arrays that will lower energy costs for their tenants but not for them, while tenants lack incentive to invest in renewable energy technology for a rental property that they may vacate before they see a return on the investment.

Short and Long-Term Solutions

Federal Government

Ensure that renewable energy tax incentives can be applied efficiently to public properties, such as schools and government buildings.

Consider creating a "Green Bank" that would extend federal loan guarantees to renewable energy projects.

Strengthen state net metering programs, which allow property owners to offset their electricity bill with renewable energy generated on-site, by requiring states to allow utilities to meet a greater percentage of their peak load through the energy generated under the program and to increase the size limits of eligible renewable energy sources.

Amend the federal Public Utility Regulatory Policies Act (PURPA) to require states to enact policies that will result in expanded decentralized energy generation.

Amend PURPA to clarify that states are not preempted by federal law from establishing feed-in tariffs, which provide payments to owners of renewable energy generators for the electricity they feed into the grid.

Require the Federal Energy Regulatory Commission (FERC) to consider decentralized renewable energy generation as an alternative or as a complement to siting new transmission lines for renewable energy projects.

Require federal agencies to utilize, when possible, public buildings, including structures along rights-of-way, large offices, and other sizeable facilities with roof space and/or wind energy potential, for renewable energy generation.

Modify applicable procurement rules to encourage federal agencies to invest in renewable energy.

The federal government should require the Federal Energy Regulatory Commission (FERC) to consider decentralized generation as an alternative or as a complement to siting new transmission lines for renewable energy projects.

State Government

Strengthen and improve California's existing feed-in tariff program by expanding it to cover larger sources at a rate that will increase production without over-stimulating the market.

Allow owners of renewable energy systems to sell surplus electricity to more than two adjacent properties without facing regulation by the California Public Utilities Commission (CPUC) as a utility.

Modify the California Solar Initiative (CSI), a rebate program for purchasers of solar panels, to provide rebates for customers who sell excess energy to the utility.

Expand California's Renewable Energy Transmission Initiative (RETI) process to include decentralized renewable energy generation as a preferred alternative to new and large transmission-dependent renewable energy projects.

Improve the net metering program by raising the cap on the percentage of a utility's load that can be met through the renewable energy generated under the program and by increasing the size limit on eligible renewable energy sources.

Instruct state agencies to utilize, when possible, public spaces and buildings, including schools, structures along rights-of-way, highways, aqueducts, and other large facilities, for renewable energy generation.

Modify procurement processes and rules to encourage state agencies to invest in renewable energy.

Require utilities that lease commercial rooftop space for renewable energy installations to offer the property owners an option to share some of the costs and benefits.

Expand "virtual net metering" to allow multiple tenants in any type of building to receive proportional credit on their electricity bills for the renewable energy generated on-site.

Local Governments & Municipal Utilities

Develop a robust municipal utility feed-in tariff program that includes a payment plan that will increase production without over-stimulating the market.

State government should strengthen and improve California's existing feed-in tariff program by expanding it to cover larger sources at a rate that will increase production without over-stimulating the market.

Allow businesses and local public agencies to have access to municipal bond money to finance renewable energy investment.

Ensure that the permitting processes for renewable energy technology, including wind and solar, are simple and predictable and share best practices for permitting with other local governments.

Direct planners to consider renewable energy potential when they devise local land use codes, which could include encouraging greater sun exposure for the rooftops of new buildings in order to increase their ability to generate solar electricity.

Designate areas suitable for renewable energy development as part of the general plan update process.

Install decentralized renewable energy technology on public facilities that are owned and managed by local government.

Industry Leaders

Educate company salespeople, large building owners, and policy makers about the potential for siting large renewable energy generators on public and private roofs and other local spaces near energy consumers.

Educate businesses about the time-limited nature of existing federal and state tax credits to encourage immediate investment in renewable technology.

Simplify the process for financing and installing renewable energy technology for clients and educate them about the benefits of not waiting for future price reductions.

Conclusion

Heightened support for renewable energy at all levels of government indicates that the renewable power industry faces new opportunities and a potentially paradigm-shifting moment. But rather than wait for large renewable energy plants to become available, policy makers should strengthen existing laws and provide financing for decentralized renewable energy generation. Ultimately, this type of generation represents the best immediate hope to produce renewable energy at a broad scale, particularly given the likely delays facing the construction of new long-distance transmission lines. But it will take a combined effort of all levels of government and industry for decentralized renewable energy generation to reach its potential.

GLOSSARY OF TERMS

California Energy Commission (CEC): The state's primary energy policy and planning agency.

California Public Utilities Commission (CPUC): State agency that regulates investor-owned electric companies.

California Solar Initiative (CSI): The "Million Solar Roofs" rebate program that set a goal of securing 3,000 megawatts (MW) of solar-produced electricity by 2017.

Distributed Generation (DG): Electricity production that is on-site or close to the load center and is interconnected to the utility distribution system (also described as "decentralized generation").

Federal Energy Regulatory Commission (FERC): Agency with regulatory authority over transmission siting.

Feed-in Tariff (FiT) Requires the utility to pay a set amount for electricity generated from sources such as a rooftop solar system.

Investor-Owned Utilities (IOU): A privately-owned electric company that is regulated by the CPUC.

Municipal Utility: A political entity, such as city or county governments, that provides utility-related services such as electricity, water, and sewage.

Net Metering: State program allowing customers who have installed renewable energy technologies to use the energy generated to reduce their electricity bills, averaging the usage over the year.

Power Purchase Agreements (PPA): A third party owner/service provider receives tax benefits from installing a renewable technology array on a host's property and then passes those benefits on to the end-user/host in the form of lower energy costs over a contractually-arranged term.

Public Utility Regulatory Policies Act (PURPA): Federal legislation from 1978 designed to increase energy efficiency and alternative forms of energy production.

Qualifying Facilities: Small-scale or incidental producers of commercial energy who generate energy for their own needs but also produce a surplus of saleable electric energy pursuant to PURPA. Utilities have been required to purchase energy from these facilities at highly-favorable rates for the producer in order to encourage energy production from these facilities and to reduce dependence on other sources of energy.

Renewable Energy Transmission Initiative (RETI): Statewide interagency process to identify renewable energy zones that can be developed cost effectively and with the least environmental impacts. RETI also develops conceptual transmission plans for identified energy zones and the permitting processes for projects identified in RETI transmission plans.

Renewable Energy Credit (REC): A certificate of proof, issued through a state accounting system, that one unit of electricity was generated and delivered by an eligible renewable energy resource. A REC can be sold either "bundled" with the underlying energy or "unbundled" into a separate REC trading market, and utilities in California can use RECs to meet their RPS obligations.

Renewable Portfolio Standards (RPS): Legal requirements that a specific percentage of retail electrical power for the state come from renewable energy sources.

Why Decentralized Renewable Energy Matters

The impacts of climate change threaten California's economy, natural resources and quality of life.[2] As a result, the state, through legislation, regulation and executive orders, has acted to reduce the greenhouse gas emissions (GHG) that cause climate change. For example, the California Global Warming Solutions Act of 2006 (AB 32) mandates that the state roll back its GHG emissions to 1990 levels by the year 2020, equivalent to a 30 percent cutback from the business-as-usual scenario projected for 2020.[3] And California Governor Arnold Schwarzenegger's Executive Order S-3-05 calls for an 80 percent reduction from 1990 levels by 2050.[4]

The electricity and commercial/residential energy sector is collectively the second largest source of GHG emissions in California, contributing over 30 percent of the statewide GHGs (See Figure 1).[5] California's efforts to reduce aggregate GHG emissions will therefore require the state to reform this sector. Emissions reductions from energy use can result from two actions: first, reducing demand for energy through energy efficiency and/or conservation measures and second, switching from fossil fuel-based energy to renewable sources that do not contribute to GHGs emissions. This paper focuses on the second action and specifically on the opportunities for decentralized renewable energy generation on large buildings and other local spaces.

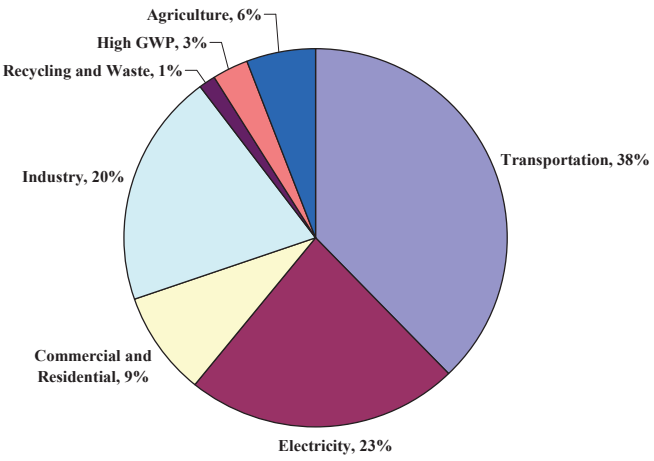


Figure 1. California's Greenhouse Gas Emissions
Source: California Air Resources Board

California has taken two major steps to encourage renewable energy generation. First, the state developed "renewable portfolio standards" (RPS) that require retail electricity sellers, with the exception of municipal utilities, to procure 20 percent of their electricity from eligible renewable energy resources by 2010.[6] The Governor issued Executive Order S-14-08 in November 2008 to increase the percentage to 33 percent by 2020 for all utilities.[7] In support of this goal, California Air Resources Board (CARB), charged with implementing AB 32, stated in its AB 32 scoping plan that achieving a statewide renewable energy mix of 33 percent by 2020 "is a key part of CARB's strategy for meeting the AB 32 targets."[8] The Governor also issued Executive Order S-21-09 on September 15, 2009, directing CARB to issue regulations to achieve the new standard.[9]

The second major step California has taken is the California Solar Initiative (CSI). In 2006, California enacted SB 1, called the "Million Solar Roofs" program, with the goal of securing 3,000 megawatts (MW) of solar-produced electricity by 2017. The legislation offers $3.35 billion in solar power incentives for existing residential homes and new commercial, industrial, and agricultural properties.[10]

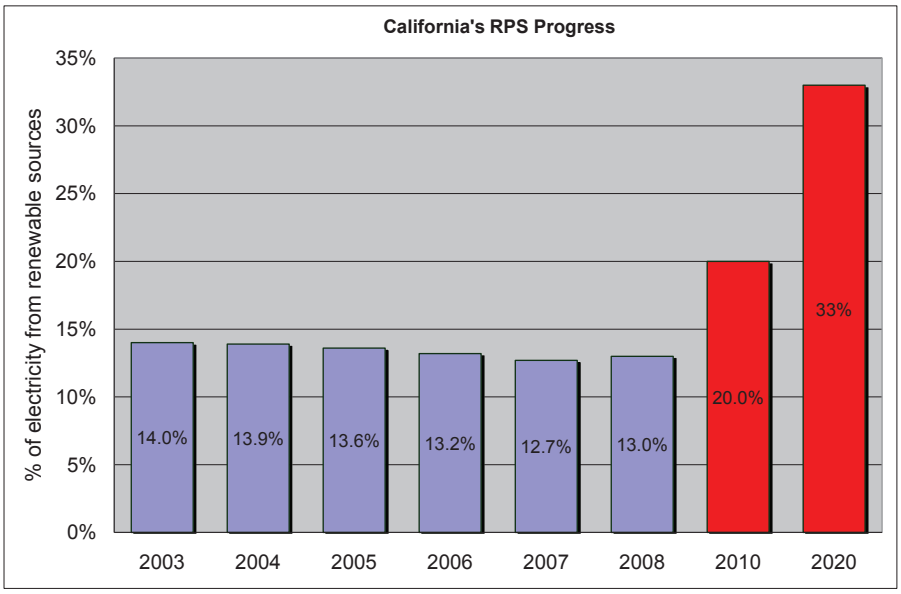


Figure 2. California's RPS Progress: Percentage of renewable energy from California's three largest investor-owned utilities (2010 and 2020 targets in red).

Electric utility customers pay for this program through their electricity rates. Its objective is to achieve a self-sustaining solar market by 2016. On average, CSI incentives are projected to decline at a rate of seven percent each year following its implementation in 2007.[11] The legislation therefore contains an incremental phase-out in the incentive payments over the duration of the CSI program.

California Utilities Will Likely Fail to Meet the RPS Goals on Time through Reliance on Large and Remote Central-Station Renewable Energy Sources

California's investor-owned utilities (IOUs) are not on pace to meet the RPS goals on time. From 2003 to 2008, the percentage of electricity sold by these utilities that came from eligible renewable sources actually declined from 14 percent to 13 percent (See Figure 2).[12] Even with new sources of renewable energy added to the system, increased growth in demand has outstripped this progress.[13]

IOUs have focused much of their efforts to meet the RPS goals on contracts with large, central-station renewable energy generators, such as massive concentrating solar plants in the Mojave Desert. Providing some of this power to the grid, however, requires building new, expensive transmission lines that face significant, multi-year permitting and siting challenges, considerable public opposition, and losses associated with transmitting electricity.[14] New transmission lines can take many years to build from conception to operation due to the regulatory and public review processes (See Figure 3).[15] The California Public Utilities Commission (CPUC) predicts that "to meet the current 20 percent RPS by 2010 target, four major new transmission lines are needed at a cost of four billion dollars," while meeting the 33 percent by 2020 RPS goals would require "seven additional lines at a cost of $12 billion."[16]

"SMUD [Sacramento Municipal Utility District] has been trying to get new transmission lines approved, but people are coming out in droves against it. We'll get two to three hundred people coming out from towns of that population size."

-- Obadiah Bartholomy
Sacramento Municipal Utility District

To help address transmission siting and permitting issues for renewable resources, the California Energy Commission (CEC), CPUC, California Independent System Operators (ISO), and municipal and investor-owned utilities have created the California Renewable Energy Transmission Initiative (RETI). Through this statewide interagency process, the agencies identify the areas with renewable energy potential that can be developed cost-effectively and with the least environmental impacts. RETI develops the conceptual transmission plans for identified energy zones and the permitting processes for projects identified in RETI transmission plans.[17] RETI also coordinates with the federal government, including large federal landowners such as the Bureau of Land Management, United States Forest Service, and the Department of Defense, as well as entities such as the Federal Energy Regulatory Commission (FERC), which has limited federal regulatory authority with respect to transmission siting. Because these projects carry big price tags and often engender fierce opposition, they are likely to face significant delays.

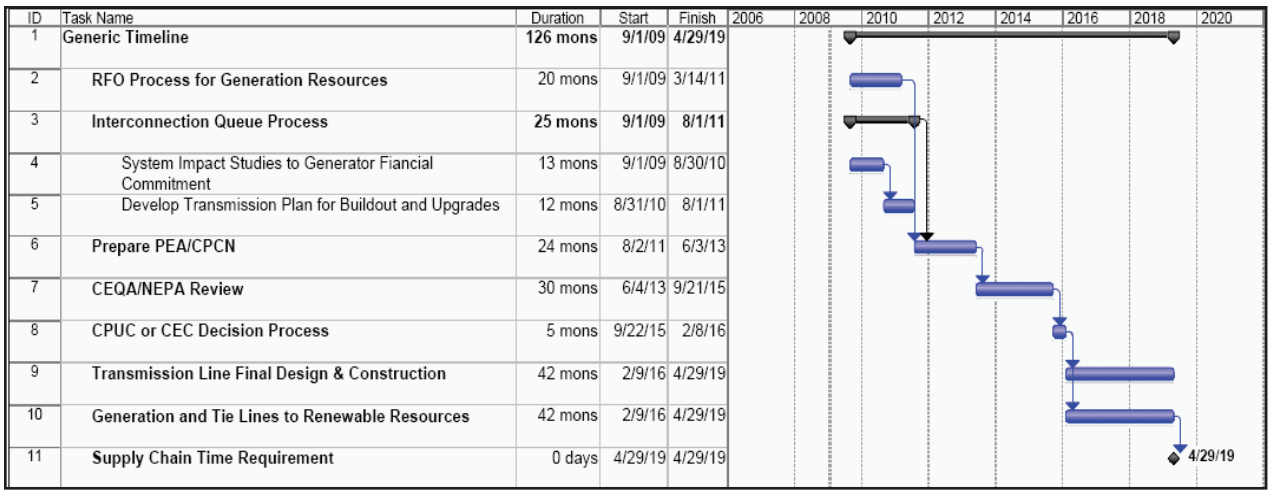


Figure 3. Source: Energy and Environmental Economics, Inc. report to the CPUC, January 15, 2009

Decentralized Generation Represents the Fastest and Most Reliable Option for Increasing Renewable Energy Supplies

Decentralized renewable energy generation, often called "distributed generation," represents a promising alternative and supplement to reliance on large central-station solar and wind plants and the attendant transmission challenges. The CEC defines distributed generation as "electricity production that is on-site or close to the load center and is interconnected to the utility distribution system."[18] Distributed generation is not limited to one type of technology or size category. Ironically, distributed generation was Thomas Edison's original vision for electricity production in the United States. But technical advancements made this system obsolete by enabling a substantial amount of power to be generated at large off-site plants and transmitted at high voltage to homes, where transformers reduced the voltage for consumer use.[19]

California utilities could likely exceed the amount of renewable power they need to meet the RPS requirements through expanded use of distributed generation. In a Public Interest Energy Research Program report to the California Energy Commission, the report's authors estimate that rooftop solar could provide 60,929 MW of electricity, equivalent to 128 to 213 percent of the amount of energy California will need from off-site renewable sources to meet the RPS requirements.[20] And the opportunities for locating distributed generation on rooftops are likely to expand in the future. In another study, Navigant found that the total roof space available for solar power in 2025 will be an estimated 84.5 billion square feet nationwide, compared to 62.4 billion square feet in 2003. The residential share is 53%.[21] These statistics do not include additional opportunities, such as along highways, aqueducts, and other large public and private buildings near electricity consumers, as well as commercial parking lots and ground-mounted solar systems.

Decentralized Renewable Energy Generation is Becoming More Cost-Effective as Technology Prices Decline

Critics note that decentralized renewable energy generation may involve relatively high costs compared to central-station solar. The CPUC, for example, estimates that by 2020, if the state relied heavily on decentralized generation for renewable power to meet the RPS targets (the "high distributed generation" case), the cost would be $58 billion, compared to $54.2 billion for exclusively large central-station solar. This differential represents a seven percent cost

premium for decentralized generation over central-station solar (although the agency acknowledges that large central station solar may entail unforeseeable costs from public opposition and legal challenges, risks from relying on the new technologies involved in central-station solar, and financing difficulties).[22]

The CPUC cost projections for solar photovoltaic (PV) distributed generation panels, however, appear to be outdated and unduly pessimistic. In its study, the CPUC based its cost data on polycrystalline silicon solar PV technology and not thin-film solar panels, a distinct and less-expensive technology. Published data on the cost of thin-film panels by manufacturer First Solar indicates that the current production cost is $3.50 per watt,[23] exactly half of the CPUC's installed cost estimate of seven dollars per watt.[24] And based on a 2008 renewable energy deal between PG&E and Sempra Generation for 10 MW of thin-film PV,[25] distributed PV generation at this scale may already be cost-competitive with, or possibly cheaper than, large central-station solar. Even for polycrystalline silicon, the CPUC's seven dollar per watt figure (based on a 2007 price) is significantly higher than the CEC's identified 2009 installed cost of polycrystalline silicon PV as $4.55 per watt for installations up to 25 MW in size.[26] Moreover, the CPUC assumes that two-thirds of the distributed PV will be remotely located and will require new transmission at a cost equivalent to a remote central-station wind or solar project.[27] This assumption contradicts the generally-understood definition of distributed PV and adds an extra one billion dollars per year in transmission costs to the "high distributed generation" case.

California's attempts to capitalize on decentralized generation opportunities have shown promise but are limited by institutional barriers. The two primary programs promoted by the state have had limited success to date: net metering and feed-in tariffs.

California Must Improve its Decentralized Renewable Energy Generation Policies

California's attempts to capitalize on decentralized generation opportunities have shown promise but are limited by institutional barriers. The two primary programs promoted by the state have had limited success to date: net metering and feed-in tariffs. Net metering allows participating customers with renewable energy systems on their properties to receive a credit on their electricity bill for the electricity that they generate and feed back to the utility. The billing cycle covers a calendar year, so a customer can bank the benefit of excess power generated during periods of low usage and apply it later in the year when the customer generates less than he or she consumes. In this system, the utility does not pay the customer for any electricity produced beyond the customer's own needs (AB 920 [Huffman], signed into law on October 11, 2009, will require utilities to purchase a limited amount of surplus electricity under net metering in order to encourage on-site energy efficiency). Electric service providers must make net metering available to customers until the amount of electricity generated in the provider's area under the program meets the "net metering cap," which is a percentage of each utility's peak demand.[28] SB 1, the legislation creating the California Solar Initiative in 2006, raised the net metering cap to 2.5 percent.[29]

Net metering suffers from some critical legal limitations. First, most renewable energy advocates agree that the cap is too low (some investor-owned utilities may reach the cap in 2010).[30] Of the 44 states that offer net metering, 18 have entirely eliminated the cap on total net energy metered capacity. AB 560 (Skinner), debated in 2009 in Sacramento and now tabled until 2010, proposed to raise this limit to five percent. Second, the program currently limits the size of eligible renewable generation systems to one MW, which prevents some large-scale customers from participating in the program.[31]

Net metering also faces inherent limitations on its ability to promote widespread decentralized generation. Because customers only see financial benefits

under the program from reductions in their on-site electricity bill, the on-site usage becomes a de facto cap on how much a customer is willing to invest in renewable energy technology. For example, the owner of a large building with ample roof space but low on-site energy consumption is unlikely to invest in significant rooftop renewables. The owner's electricity bill in these situations is simply not high enough to generate savings to offset the upfront cost. The same limitation is true for any owner of an energy efficient building (although AB 920, referenced above, may ameliorate this problem). And the renewable energy generated under net metering does not count toward meeting each utility's RPS obligation.[32] Therefore, any increase in renewable energy generated under net metering will not help the state meet its RPS goals.

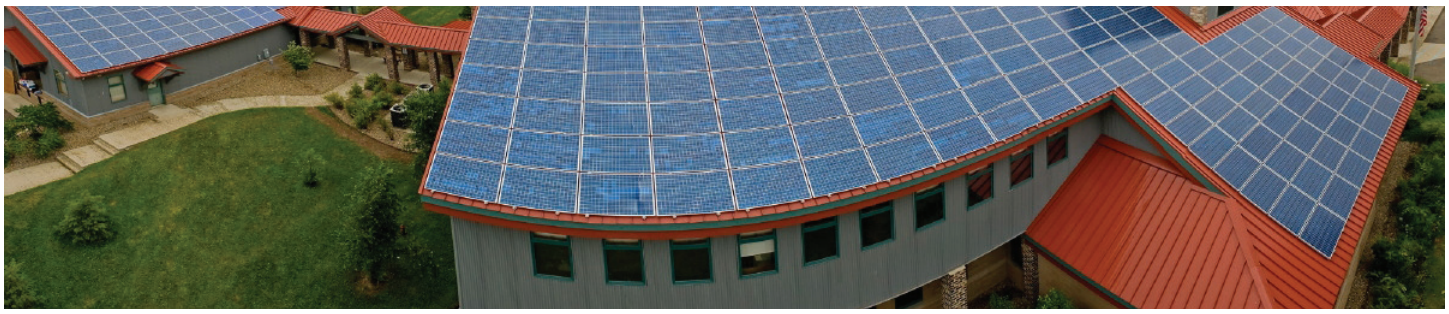
California's feed-in tariff represents the state's second effort to stimulate decentralized renewable energy generation. At its simplest, a feed-in tariff requires the utility to pay a set amount for electricity generated, such as from rooftop solar systems. Feed-in tariffs can provide eligible generators with a predictable revenue stream over a specific term. In Germany, the feed-in tariff payment rate declines over time to provide an initial market stimulation that then decreases as the cost of solar panels declines. The interconnecting utility usually offers the feed-in tariff and sets the price. The tariffs may vary depending on the type of renewable technology, resource quality, or project size, and they may decline on a set schedule over time.[33] Unlike net metering, the feed-in tariff provides "wholesale distributed generation," in which the electricity generated feeds directly into the grid, as opposed to "retail distributed generation," in which the electricity generated stays "behind the meter" and offsets a consumer's retail electricity bill.

At its simplest, a feed-in tariff requires the utility to pay a set amount for electricity generated, such as from rooftop solar systems. The tariffs may vary depending on the type of renewable technology, resource quality, or project size, and they may decline on a set schedule over time.

The current California feed-in tariff applies to facilities up to 1.5 MW in size (equivalent to one large wind turbine), and the state caps the overall amount of electricity that utilities can purchase under this program at 500 MW.[34] SB 32, signed into law on October 11, 2009, raises the size limit to three MW and the statewide cap to 750 MW.[35] Critics complain, however, that the program provides inadequate incentives to stimulate market activity because the prices paid to generators would not reflect the cost of generation. They also contend that the 1.5 MW maximum should be raised to 20 MW to allow more projects to qualify for the payments.[36] In August 2009, the CPUC introduced a feed-in tariff proposal that would require utilities to purchase one GW of electricity from renewable sources up to ten MW in size. The utilities would auction the rights to provide the power to bidders who could offer the lowest contract payment rates.[37]

Meanwhile, federal agencies like FERC are oriented more toward facilitating transmission for large, central-station renewable plants rather than supporting and strengthening state programs to encourage decentralized generation. As a result, both the state and federal governments presently have a significant opportunity to reorient the focus of renewable energy programs to encourage the production of decentralized generation on large public and private buildings and other spaces that are sometimes literally in our backyard.

Participants at the June 2009 workshop at UC Berkeley identified and prioritized the most significant barriers to decentralized renewable energy generation on large public and private buildings and other spaces near electricity consumers. This report presents a guide for industry leaders and policy makers at all levels of government to remove the barriers to, and facilitate, decentralized generation on these sites.



Barrier # 1:
Lack of Predictable & Adequate Financing

Solar panels and other renewable arrays require high upfront costs. But the current economic downturn has depleted many available sources of capital, and the public sector currently fails to provide enough investments in the payments, loans and tax credits necessary to establish a cost-competitive renewable energy industry. When businesses do have access to capital, they are unlikely to use it to invest in low-yield renewable technology when they may have core business needs to invest in that could yield higher returns.

SOLUTION: Improve and Expand Existing Financial Incentive Programs
Part of the solution depends on how quickly the economy can rebound to provide more capital for businesses to invest in renewable technology. But in the meantime, potential renewable energy investors, from public agencies to private businesses, need loan and tax credit programs that have certainty and applicability over the life of the project and that will make the investment reasonably certain to yield a profit. These programs should be more robust in the near term, with declining long-term incentives, in order to build the scale and innovation necessary to make renewable energy cost-competitive with fossil-fuel based energy. A comprehensive feed-in tariff would also stimulate greater demand for renewable energy, which would provide more revenue to suppliers. As one workshop participant stated, we need to get to the point with renewable energy technology where "you'd be stupid not to buy."

"Right now we're constrained to fit the technology to the financing opportunities. I prefer that we clean up the tax code to make it more efficient, so we're fitting the financing to the commercial reality."

-- Eric Lundquist
Banc of America Leasing

Federal Government

Ensure that renewable energy tax incentives can be applied efficiently to public properties. Public entities like schools cannot benefit directly from federal tax incentives for renewables because they are tax-exempt entities and are therefore disqualified under existing law. As a result, the best financing option for these public institutions is to enter into a power purchase agreement (PPA) with an investor/owner and typically a third party operator. The investor/owner receives the available tax benefits for the installed renewable technology and utilizes those federal incentives to provide the end-user (in this case, the public institution) with lower overall energy costs under the PPA. Currently, however, many large financial institutions are reluctant to invest in PPA deals due to uncertainty about the federal tax treatment of these transactions. To encourage widespread investment in PPA arrangements, the Internal Revenue Service could issue a "Revenue Procedure" that defines the acceptable structure and terms for solar financing under a PPA, similar to Revenue Procedure 2007-65, which defined a "safe harbor" structure for wind partnership transactions in 2007. The result would likely be increased investment in PPA arrangements that would boost decentralized generation across California and the nation.

Consider creating a federal "Green Bank" that would extend federal loan guarantees to renewable energy projects. Existing federal loan guarantees and tax incentives may not be sufficient to provide adequate financing given the scale of the renewable energy needs in the country.

State Government

Strengthen and improve the feed-in tariff program by expanding it to cover larger sources at a rate that will increase production without over-stimulating the market. Sources from 3.0 to 20 MW currently are not covered by the feed-in tariff program. A new feed-in tariff should allow these sources to receive payments from the utilities for their energy contributions to the grid. With an adequate price offering, the certainty of the payment structure under a feed-in tariff, coupled with the fact that a feed-in tariff provides actual cash payments as opposed to electric bill credits, would encourage more property owners to invest in renewable technology. California should ensure, however, that an expanded feed-in tariff does not replicate the problems suffered by Spain. That country devised a very generous feed-in tariff regime that over-stimulated production well beyond the target established by the Spanish government. In response, the government had to drastically decrease the tariff rate and target, resulting in a significant drop-off in solar panel purchases. By contrast, the German feed-in tariff program has been more successful, in part due to payment options that more closely track market conditions.[38] A California feed-in tariff program should therefore set strict capacity minimums and limits to avoid creating a PV installation "boom and bust" cycle that would destabilize the market.

Allow owners of renewable energy systems to sell surplus electricity to more than two adjacent properties without facing regulation by the CPUC as a utility. Currently, the CPUC regulates as a utility any owner of a renewable energy system who sells that energy to more than two users on adjacent properties. The owner can sell the energy to a maximum of two neighbors who are located "over the fence" from the owner's property but not across the street or separated by another property.[39] The legislature should increase this number to increase the profit potential for renewable investors and therefore stimulate more private financing for decentralized generation.

Local Government & Municipal Utilities

Allow businesses and local public agencies to have access to municipal bond money to finance renewable energy investments. This local bond money would provide yet another source of financing for renewable energy projects.

Develop a municipal utility feed-in tariff program that covers large sources at a rate that will increase production without over-stimulating the market. Municipal utilities, such as the Los Angeles Department of Water and Power, have the authority to develop their own feed-in tariff programs in the absence of state and federal legislation to the contrary. These local government entities should implement an effective feed-in tariff program to stimulate more renewable energy production locally.

Barrier # 2:
Uncertain Government Permitting & Regulatory Programs

Businesses and large agencies crave certainty in both costs and processing time. But they face uncertainty over the permitting process and how state renewable portfolio standards will be affected by the potential state or federal cap-and-trade program and AB 32 regulations. They also are unsure how they can benefit from proposed state and federal renewable energy programs. For example, under the proposed state and federal cap-and-trade programs, businesses that fall under the government "cap" on GHG emissions may be able to purchase credits for GHG reductions that occur elsewhere. These "offsets" might take the form of investment in renewable energy installations on large buildings owned by other companies. Therefore, potential private owners of decentralized generation technologies may want to delay investment with the hope that they might become eligible for funding (essentially free money) from a business looking to purchase offset credits. Meanwhile, complicated and burdensome permitting procedures have discouraged building-owners and operators from installing renewable energy arrays.

"A farmer who is looking at renewables should be able to go to the county and get a straightforward path to the permitting requirements. It needs to be time-predictable, transparent, fair, and with straightforward costs."

-- Case van Dam
U.C. Davis & California Wind Energy Collaborative

SOLUTION: Improve Existing Incentives for Decentralized Generation

In order to stimulate businesses to invest in renewable energy despite the uncertainties and regulatory burdens, the state and federal government must act to stimulate decentralized generation by strengthening and expanding existing incentive programs. The federal government can encourage and improve state programs, such as the feed-in tariff and net metering. In California, state incentive programs should more effectively promote large-scale decentralized generation. Local governments, meanwhile, should streamline the permitting process.

"One of the reasons the private sector hasn't jumped in with both feet is the uncertainty about how a solar project is going to be value-certified under AB 32 implementation."

-- Fran Inman
Majestic Realty Co.

Federal Government

Amend the federal Public Utility Regulatory Policies Act (PURPA) to require states to enact policies that will expand the use of decentralized renewable generation. Such policies include improvements to state net metering programs and introduction of feed-in tariffs. Enacted in 1978, PURPA encourages increased energy efficiency and alternative forms of energy production; states are responsible for implementation.

Strengthen net metering programs in the states by requiring utilities to meet a greater percentage of their peak load from renewable distributed generation. Some net metering programs, like California, contain caps on the total amount of renewable energy generation that the program will cover and on the size of the sources providing the renewable energy. The federal government should require states to remove these limits in order to expand decentralized generation opportunities.

Clarify that states are not preempted from establishing feed-in tariffs. The Federal Power Act grants FERC exclusive jurisdiction to regulate the sale of wholesale power in interstate commerce. PURPA allows states a limited role in wholesale power markets by giving them authority to set utility "avoided cost rates" for wholesale power that utilities purchase from special FERC-approved qualifying facilities.[40] The extent of states' authority to set feed-in tariffs is not entirely clear under the

law, however, and some have claimed that feed-in tariffs, especially those not based on avoided costs, are preempted by federal law. Congress should remove the legal uncertainty by clarifying that states are free to develop a feed-in tariff without fear of preemption. The House of Representatives has passed House Resolution 2454 (the Waxman-Markey Bill), with Section 102 of the bill clarifying that states have the authority to set rates for the purchase of renewable energy pursuant to a state-approved incentive program. Congressional leaders must now ensure that this provision becomes law.

Require FERC to consider decentralized renewable energy generation as an alternative or as a complement to siting new transmission lines for renewable energy projects. FERC should make the expansion of decentralized generation a policy goal that is identified as a preferred alternative to siting new transmission lines for large central-station projects when decentralized generation is demonstrated to be the more cost-effective alternative.

State Government

Strengthen and expand the feed-in tariff program (see above).

Improve the net metering program by increasing the size limits on eligible sources and the utility load percentage that can be met through decentralized generation. As discussed, net metering in California caps the size of eligible sources of renewable energy generation and the total amount of generation allowed as a percentage of each utility's load. These limitations must be increased or eliminated. AB 560, which would have increased the cap to five percent, was tabled in September 2009. The legislature will have to address this issue again in 2010. But even a five percent cap will likely be insufficient in the near future to accommodate the rising demand for renewable energy generation technology.

Expand the Renewable Energy Transmission Initiative (RETI) process to include decentralized generation as a preferred alternative to new transmission-dependent large renewable energy projects whenever decentralized generation is more cost-effective. RETI has focused exclusively on facilitating large central-station projects. The state should ensure that decentralized generation alternatives are accorded preferred weight in the RETI process.[41]

Modify the California Solar Initiative to provide rebates for PPAs when the electricity generated is used off-site. Currently, the CSI only offers rebates to PPAs where the energy is consumed on-site.[42] Allowing rebates for PPAs with off-site consumption would provide greater incentives for these financing arrangements and therefore greater deployment of renewables.

Require utilities that lease commercial rooftop space for renewable energy installations to offer the property owners an option to share some of the costs and benefits. More commercial property owners may be willing to lease their roof space to utilities for renewable energy production if they could use some of the electricity for their on-site needs or could earn renewable energy credits (REC) from the renewable energy produced. The CPUC should consider requiring utilities to present these options to potential lessees.

Local Government

Simplify the permitting process for renewable energy technology, including wind and solar, to create a "one-stop shopping" permit. Many business and agencies have limited resources to navigate the complex permitting requirements. A simplified process with easy-to-use brochures and checklists would solve this problem. The Sierra Club Loma Prieta chapter recently issued a comprehensive survey of local government permitting practices, which highlights model procedures for other cities and counties to follow. The report noted that cities need to have a "progressive attitude" about promoting renewable energy, should streamline permit processes with flat fees, and train staff to inspect renewable energy systems.[43]

Share best practices for permitting and siting with other local governments. Local governments that have been at the forefront of siting renewable energy technology should help other local governments learn from their experiences. The Sierra Club report, referenced above, lists standout cities in the San Francisco Bay Area, including Mill Valley, Palo Alto, Novato, San Jose, Saratoga and Walnut Creek.[44]

Barrier # 3:
Lack of Education & Outreach

"We have CalTrans, water resources, and other huge assets in the state for renewables. But unless agency performance is based on delivering a product, they stay parochial in their focus."

-- R. Gregg Albright
California Business, Transportation & Housing Agency

Despite the opportunities to save money over the long term, many businesses may be too busy or lack the resources to research the process and the potential financial benefits of installing renewables. They also may believe that they would benefit by waiting to purchase the technologies in anticipation of continued price declines. Public agencies, meanwhile, often do not view capitalizing on their physical assets, such as highway land or aqueducts, as part of their organizational mission.

SOLUTION: Educate Business Owners and Policy Makers about the Benefits and Opportunities for Decentralized Renewable Energy Generation

The renewable energy industry should utilize existing advocacy groups or combine its marketing power to conduct an education and outreach campaign. Such a group should lobby the local, state, and federal governments to make renewable energy opportunities part of their agencies' mission. In addition, the group could make local governments aware of how proper planning can facilitate renewable energy production. Finally, the campaign could contact businesses to make them aware of the renewable opportunities on their facilities and to provide them with resources to expedite the transaction.

"Our company has thousands of sales people with relationships, and we need to get those people educated to press the issue. The majority of landlords don't have time to do it on their own. How can we partner with installers to get the word out and educate people faster?"

-- Mike Kimball
CB Richard Ellis

State & Federal Governments

Instruct state and federal agencies to utilize, when possible, public spaces and buildings, including structures along rights-of-way, large offices, and other sizeable facilities for renewable energy generation. Without a clear directive in their organizational mission, an agency is unlikely to capitalize on the renewable energy potential of its assets.

Modify procurement processes and rules to encourage agencies to invest in renewable energy. For example, the United States General Services Administration requirement that agencies search for the "lowest-cost" service or technology may impede renewable energy purchases that may not appear to be "lowest cost" when considering only the upfront cost alone. Agencies should be allowed and encouraged to capitalize on these technologies due to their long-term cost-effectiveness and overall utility to the environment.

Local Government

Direct planners to consider renewable energy potential when they devise local codes and ordinances. This process could include zoning and building height rules that maximize sun exposure to increase the solar potential for buildings, as well as zoning and building codes designed to harness the potential of wind energy as it travels through municipalities.

Designate preferred areas for renewable energy development as part of the general plan update process. General plans represent the blueprint for how a city or county will develop, and the zoning and other building and infrastructure requirements must conform to this document. By highlighting areas where local renewable energy generation facilities, such as rooftop or ground-mounted solar panels or wind turbines, could be effectively located, general plans can facilitate the construction of these facilities.

"We're seeing dramatic changes now with price drops of 30 percent, which is likely to continue on an accelerated basis this year relative to previous years."

-- Julie Blunden
Sunpower

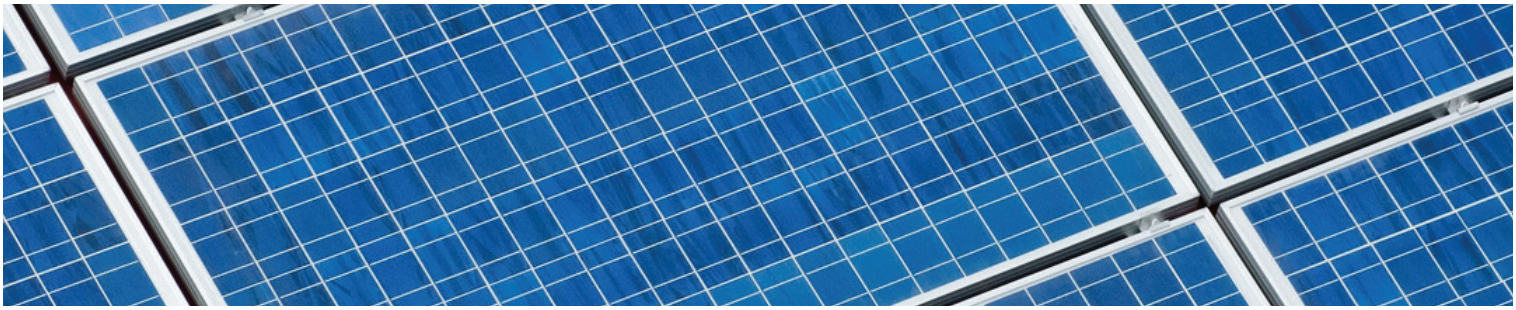
Industry Leaders

Educate company salespeople, large building owners, and policy makers about the potential for siting large renewable energy arrays on their properties. Renewable energy suppliers will need an organized marketing campaign to inform companies and agencies about their decentralized generation opportunities.

Educate businesses about the time-limited nature of existing federal and state tax credits to encourage immediate investment in renewable technology. Ironically, as the cost of renewable energy technology, particularly solar panels, has decreased, many businesses are reluctant to lock in long-term contracts when they expect the prices to continue dropping. When a business sees the price of solar technology drop 30 percent in one year, that business is unlikely to want to invest now when more cost-savings may occur in another 12 months. Industry leaders can address this problem by educating potential customers about the benefits of purchasing now. For example, the incentives under the CSI program decline by seven percent each year until an eventual phase-out, and feed-in tariff programs contain diminishing payment structures over time. Customers may want to capitalize on these incentive programs while they still exist, even with the likelihood of future price decreases. Ultimately, the sales and marketing departments at renewable energy companies will have to address the perception among customers that they will benefit financially by waiting to purchase.

"If you have a ten-year-old roof, you don't want to put a 20-year asset on top of it without revisiting the decision to re-roof. So there are physical limitations and timing issues."

-- Fran Inman
Majestic Realty Co.



Barrier # 4: Landlord/Tenant Split Incentives

Some commercial property owners are reluctant to install renewable energy arrays that will lower energy costs for their tenants but not provide the landlords with financial returns. The tenant, meanwhile, is reluctant to pay for renewable energy systems that may improve the value of the property but provide only short-term benefits for the tenant, who may move to a different building soon. Complicating matters, under the net metering program, the renewable energy produced on-site can only offset the electric bill from one meter. Therefore, renewable energy produced on a building cannot benefit the multiple tenants if they pay their electricity bills separately.

"We have existing buildings with multiple tenants and meters. It's too much work to feasibly make renewables happen. It should be much easier."

-- Robyn Uptegraff
The Irvine Company

SOLUTION: Improve the Energy Payment and Rebate Policies for Landlords and Tenants

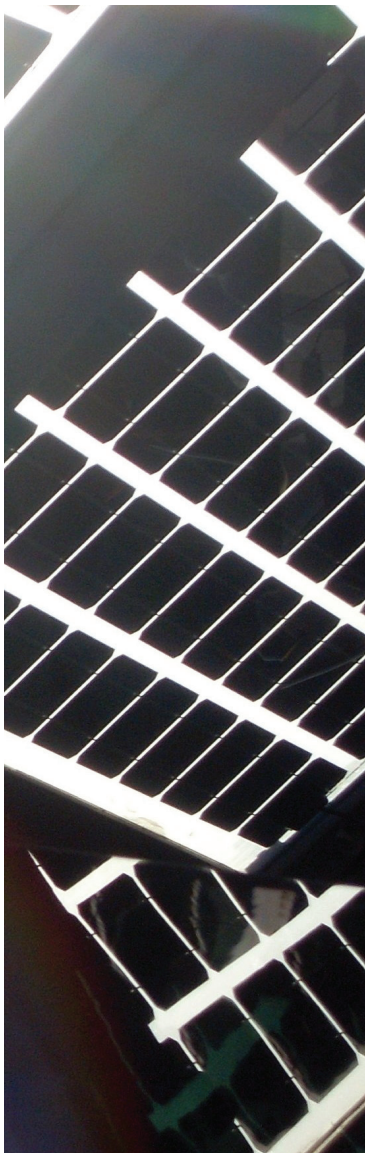
Policy makers should ensure that the party that invests in the renewable technology will receive the financial benefit. A comprehensive feed-in tariff would address this problem from the landlord's perspective. A feed-in tariff would ensure that the payments from the renewable energy generated on the building would flow directly to the owner/investor. The tenant's on-site energy use would be irrelevant in this scheme because the energy produced on the roof bypasses the meters on the building and goes directly into the grid. Another solution involves allowing multiple tenants with separate meters to receive a share of the net metering retail benefits from a single renewable array.

State Government

Devise a feed-in tariff program that will allow the renewable energy investor/property owner to receive payments directly for the energy generated on the property. Under this program, the landlord/investor receives payments directly from the utility for the electricity generated on the property and fed into the grid, rather than having that energy reduce the tenant's electricity bill (as with net metering) with no savings or financial benefits for the owner.

Expand virtual net metering to allow multiple tenants in a single building to receive proportional credit on their electricity bills for the renewable energy generated on-site. The net metering program can typically provide retail benefits for only one meter from the energy produced on-site. As a result, a landlord is likely to install a renewable array just large enough to supply power for common areas paid for by the landlord, but not large enough to benefit multiple tenants on-site. However, the PUC recently created an exception that requires IOUs to credit all the meters in certain buildings with a share from the on-site renewable generation (called "virtual net metering"). Under this program, a landlord can install a renewable system on a building and use the electricity credits to offset the energy use from the building's common areas (such as hallways

and community facilities), with the remaining credits offsetting each tenant's electricity bill according to a pre-determined proportion. However, the program, called the Multifamily Affordable Solar Housing (MASH), only applies to certain multifamily affordable housing projects. The PUC should expand MASH and virtual net metering to cover all types of buildings and customers.[44] An expanded rule would allow all building owners who finance a renewable energy installation on their property to receive savings on the common area electricity bills. In addition, the owner could negotiate fixed payments or higher rent from tenants who experience substantial savings on their electricity bills.



Municipal Utilities

Devise a feed-in tariff program to stimulate landlord investment in renewable energy generation (see above).

Conclusion: Big Opportunities

Heightened support for renewable energy at all levels of government is providing the renewable power industry with new opportunities and a potentially paradigm-shifting moment. While the current economic downturn threatens the short-term viability of many renewable projects and companies, in the long term, climate change laws and the increasing cost of fossil fuel-based energy assure greatly expanded use of renewable energy in the long term.

But rather than wait for large renewable energy plants to become available, policy makers should strengthen existing laws and provide additional financing for decentralized renewable energy generation technology. Ultimately, decentralized generation represents the most immediate means for California to expand renewable energy production in the state and to combat climate change. But it will take a combined effort at all levels of government, and a substantial exercise of political will by businesses and the public, for decentralized renewable energy generation to reach its potential.

Participant Bios

R. Gregg Albright

California Business, Transportation & Housing Agency

R. Gregg Albright has over 31 years of experience in State government service within planning, project delivery, project management, local programs, community involvement and administration. Beginning in 1976 as a Landscape Architect, Gregg worked through a variety of headquarters and district settings. In 2000, he was promoted to District 5's Deputy District Director for Planning and Local Assistance and two years later he was appointed as the District 5 Director. As District Director, Gregg continued his emphasis on stakeholder collaboration in the planning and development of transportation solutions. With his appointment as Deputy Director, Gregg has expanded opportunities to promote effective stakeholder involvement and to advance proactive and strategic behavior within the Department. This emphasis on enhancing staff skill sets and organization competency has also engaged him at the national level, particularly in the area of promoting the principles of Context-Sensitive Solutions.

Ken Baker

Wal-Mart

Ken is a native of Hot Springs, Arkansas and currently resides in Bentonville, Arkansas where he is a Sr. Manager of Sustainable Regulation for Wal-Mart Stores, Inc. Ken worked in Wal-Mart's Real Estate Department for 6 years before transferring to the Energy department in 2007. Before his tenure at Wal-Mart, Ken practiced law in Little Rock, Arkansas. Ken holds a Bachelor of Science degree from College of St. Frances, located in Joliet, Illinois and a Juris Doctor degree from the University of Arkansas at Little Rock School of Law.

Obadiah Bartholomy

Sacramento Municipal Utility District

Obadiah Bartholomy is a Project Manager in the Advanced Renewable & Distributed Generation Technologies group at SMUD. He has worked on PV performance monitoring for SMUD's fleet of 1,400+ PV systems for 6 years, and currently works on solar R&D, commercial and residential solar mapping tools, and utility scale solar assessment for meeting SMUD's Renewable Portfolio Standards. He also leads many of SMUD's climate change activities related to AB 32 implementation, strategic planning, physical impact assessment, mitigation and carbon offsets. He earned a BS in mechanical engineering from Cal Poly, San Luis Obispo and an MS in Transportation Technology & Policy from UC Davis.

Julie Blunden

SunPower

Since April of 2005, Julie has served as VP of public policy and corporate communications at SunPower, leading public relations, financial relations, public policy, and market development. Prior to SunPower, Blunden was a consultant at KEMA-XENERGY on energy markets, renewable resources and policy to industry, utilities and state and federal governments. In that role, Blunden supported the Schwarzenegger administration in developing the Million Solar Homes Initiative. In 1997, she co-founded Green Mountain Energy Company, a national retail electric supplier of renewable power. Blunden began her career doing development and acquisitions in the independent power generation business at the AES Corporation. She received her MBA from the Stanford Graduate School of Business and an AB from Dartmouth College majoring in engineering, modified with environmental studies. She serves on the board of directors at the Center for Resource Solutions and the Real Goods Solar Living Institute, as well as on the board of advisors for Vote Solar.

Dave Brennan

Solar Sonoma County

Dave Brennan was recently appointed to the position of Regional Climate Protection Coordination Plan (RCPCP) Manager with the Sonoma County Transportation Agency (SCTA). The development and implementation of a coordination plan is being supported by Sonoma County, all nine cities in Sonoma County, Sonoma County Water Agency and SCTA. Prior to Mr. Brennan's appointment, he served as the City Manager in Sebastopol for nine years working with local leaders on several energy conservation programs resulting in 215 KW of solar power installed on city facilities and housing projects. Prior to Sebastopol, Mr. Brennan served in city, county and regional government in public administration and program

management including financial management, redevelopment, capital project financing, personnel administration, solid waste management, regional housing and economic development programs.

Joe Desmond

Joseph Desmond served as Chairman of the California Energy Commission and was appointed Under Secretary for Energy Affairs in the California Resources Agency. As Chairman, Mr. Desmond represented the Governor on the Western Interstate Energy Board (WIEB). Mr. Desmond, of Pleasanton, served as Deputy Secretary for Energy at the Resources Agency in 2004. Prior to that, he was President and Chief Executive Officer of Infotility, Inc., an energy consulting and software development firm for four years. From 1997 to 2000, Mr. Desmond was President and Chief Executive Officer of Electronic Lighting, Inc., a manufacturer of controllable lighting systems, and from 1991 to 1997 he was with Parke Industries, where he served as vice president. Mr. Desmond was marketing and demand planning administrator for Taunton Municipal Lighting Plant, a publicly owned utility, from 1987 to 1991. He also served as co-chair of the Silicon Valley Manufacturing Group's Energy Committee from 2001 to 2004 and as a board member of the National Association of Energy Service Companies.

Mark Freyman

Chevron Energy Solutions

Mark Freyman has fifteen years of finance, strategy, partnership development, and operations experience. At Chevron Energy Solutions, he works on strategy and finance issues. Previously, Mr. Freyman has been a distributed generation solar project developer (VP, Finance at Verde Energy) and a utility-scale wind developer (VP, Finance and Project Development at Katabatic Power). Katabatic Power develops wind farms in British Columbia marrying a world-class wind resource with the firming capabilities of BC Hydro's hydro-electric assets. Mr. Freyman also spent five years as a strategy consultant helping high tech clients position their products and marketing messages and bringing new products to market. Mr. Freyman began his career at American Airlines negotiating joint ventures with Latin American air carriers covering sales, marketing and operations. Mr. Freyman holds an MBA from Harvard Business School and a BBA in Finance from the University of Michigan.

Richard Gruber

First Solar

Richard Gruber leads First Solar's project development efforts, focused on developing utility scale solar PV power plants in the southwestern U.S. First Solar, headquartered in Tempe, AZ is the world's largest and lowest cost manufacturer of thin film photovoltaic solar modules and trades on the NASDAQ under the ticker FSLR. Prior to joining First Solar, Gruber was with The Electric Reliability Council of Texas (ERCOT), the independent system operator responsible for running the Texas electric grid. Richard led the development and operation of ERCOT's wholesale and retail Market Services supporting Texas' electric market deregulation evolution. Prior to ERCOT, Gruber was Vice President, Marketing and Sales at NUI Corporation (NYSE) a natural gas utility with operations in NJ and FL, and President of NUI Energy Solutions, an energy services company. Prior to NUI, Gruber was Co-Founder and C.O.O. of Exchange Development Corporation, an incubator company created to establish more efficient and transparent energy markets. Earlier in his career, Gruber was a consultant engaged in business development for Energy Management Associates.

Fran Inman

Majestic Realty Co.

As Senior Vice President, Corporate Development, Fran Inman directs all marketing, public relations, government relations and community affairs activities for Majestic Realty Co., the privately held development firm based in Los Angeles County. With a real estate portfolio of more than 50 million square feet, Majestic Realty has offices in Los Angeles, Atlanta, Denver and Las Vegas. In recent months, Fran's responsibilities have included coordination and administration of the company's anti-secession efforts in the City of Los Angeles. In 2002, she also was named the founding director of the Majestic Foundation, the firm's newly established corporate-giving program. From January, 1998 to June, 2001, Fran was Executive Vice President of the Silverton Hotel & Casino in Las Vegas, Nevada, a property owned by Edward P. Roski, Jr. Prior to joining Majestic, Fran owned her own consulting business in the leisure and entertainment industry, providing business planning and marketing strategies for clients worldwide. She received both a BA and an MBA in Finance from California State University, Fullerton.

Mike Kimball

CB Richard Ellis

As National Director of CBRE's Solar Group, Mike Kimball is responsible for the leadership of CB Richard Ellis' solar services across the Americas. Additionally, Mike oversees the company's global solar strategy and implementation with Charlotte Eddington. CBRE's solar services are part of the broader services offered by CBRE's Energy & Sustainability Group. CBRE's Energy & Sustainability Group interacts with all divisions of CBRE. CBRE's Solar Group focuses 100% of their time on the solar industry and provides solar services to any landlord or tenant ("client") who wants to know if installing a solar system anywhere on their property makes economic sense. CBRE educates the client on the feasibility of solar and (if solar makes sense for the client) CBRE helps the client select the right solar installation company to install the solar system through a professional managed bid process. Prior to heading up CBRE's Solar Group in 2008, Mike spent 5 years working in CBRE's Brokerage division in Los Angeles, California. Mike's brokerage experience included lease and investment sale transactions for industrial, office, retail, and entitled/unentitled land properties.

Jay Knoll

Unisolar

Jay Knoll is Senior Vice President, General Counsel and Chief Administrative Officer of Energy Conversion Devices, Inc., the leading global manufacturer of thin-film flexible solar laminate products for the building integrated and commercial rooftop markets. Before joining ECD, Mr. Knoll held leadership positions at Collins & Aikman Corporation, Lear Corporation, Covisint LLC, Visteon Corporation and Detroit Diesel Corporation. Mr. Knoll received a B.A. degree from the University of Michigan and a J.D. degree from the Wayne State University School of Law. He is active in community activities and has held leadership positions with the American Jewish Committee (Detroit Chapter) and the Karmanos Cancer Institute.

Craig Lewis

RightCycle Enterprises

Craig Lewis, Principal of RightCycle Enterprises, is a Government Relations Advisor to clean technology clients with a focus on achieving desirable outcomes via legislation, regulation, and public funding (grants, siting incentives, etc) in California, at the Federal level, and in other states. Until early-2009, Mr. Lewis was VP of Government Relations for GreenVolts, where he served for two years securing successful policy outcomes in legislation, regulation, and public funding. In 2005, he spearheaded energy policy development for Steve Westly's 2006 gubernatorial campaign in California. Mr. Lewis is a leading renewable energy strategist and advocate. Among other efforts, Mr. Lewis leads the effort to introduce a comprehensive Feed-In Tariff (FIT) in California and to unleash the tremendous potential of the Wholesale Distributed Generation (WDG) market segment, which is the 20MW-and-under, distribution-interconnected market segment that avoids transmission dependencies and the long delays that are associated with transmission build-outs. Mr. Lewis has held senior government relations, corporate development, and marketing positions at wireless and semiconductor leaders, including Qualcomm, Ericsson, LinCom Wireless, Comarco Wireless, and Altera. He was active in the strategic planning and lobbying efforts to obtain the long-sought approval for CDMA technology in China; and has led the establishment of several successful business operations in Asia. Mr. Lewis received his MBA and MSEE from the University of Southern California, and his BSEE from UC Berkeley. Mr. Lewis was also a formative member of the Clean Tech for Obama (CT4O) organization, which was highly successful in raising funds for the Obama campaign.

Eric Lundquist

Banc of America Leasing

Eric Lundquist is a Managing Director in the Pricing & Portfolio Analysis group for Banc of America of Leasing. He and his team are responsible for the financial modeling and economic analysis work on most complex transactions in both Banc of America Public Capital Corp and Banc of America Leasing. In recent years, Eric has had a senior role on all of Banc of America Public Capital Corp's high-profile green transactions, including wind and solar deals closed under various structures. In addition, he is an internal resource for developing and structuring new products, and acts as a general advisor on tax and legislative related issues. Prior to joining Banc of America Leasing (via Fleet Capital Leasing) in 2000, Eric was a technical support and product development associate in the New York office of Warren & Selbert, the industries leading provider of lease pricing software. Eric also spent two years as a financial analyst at McManus & Miles, working on project finance and energy leasing transactions. Eric is an active member of the Equipment Leasing & Finance Association's Federal Tax Committee. He holds a Bachelor of Arts degree (cum laude) from Harvard University.

Wally McOuat

HMH Resources

Wally McOuat was one of the founders of HMH. He has twenty-five years experience in the energy industry as a financial advisor and negotiator both in the United States and abroad. He has played a major role in the development of several high-profile projects and has assisted many clients in the successful implementation of cutting-edge as well as 'typical' energy projects. Wally spent the first six years of his career with Price Waterhouse, serving as a Tax Manager during the last two years. He subsequently worked in the risk management industry where he helped form Risk Sciences Group, Inc. (RSGI) - a company that is still an industry leader in the analysis and quantifying of insurable risks. Wally earned an A.B. in mathematics and an MBA from Indiana University where he was elected to several honoraries including Phi Beta Kappa. Wally has also been active in community affairs including a term as chairman of the Marin County Planning Commission.

Neal Skiver

Bank of America

Neal Skiver is a Senior Vice President, Energy & Power Finance, for Banc of America Public Capital Corp located in Santa Fe, New Mexico. He focuses on the origination and structure of energy-related financings including: equipment lease/purchase agreements, energy services agreements, renewable energy power purchase agreements, Clean Renewable Energy Bonds, limited tax and revenue obligations, tax credits and 501(c)(3) obligations. Prior to joining Banc of America Public Capital Corp in June 2006, Neal was at National City Energy Capital, which is a subsidiary of National City Bank. For the 12 years prior to joining National City, Neal was at several divisions within ABN AMRO and LaSalle National Bank, including investment banking and the leasing corporation. Neal was responsible for the origination of various municipal and energy-related financing products for its portfolio and for syndication or securitization to other funding sources. Neal has been in the municipal financing business for the past 23 years, dedicated to the energy marketplace for the past 13 years. Neal is an active member of the National Association of Energy Service Companies and the Association of Governmental Leasing and Finance. Neal attended Northwestern University and graduated from the University of Denver with a BSBA (Cum Laude) in Marketing and Finance.

Robyn Uptegraff

Irvine Co.

Robyn Uptegraff serves as Senior Vice President, Community & Environmental Affairs for the Irvine Company, a century-old, privately-held company known for the master planned, sustainable communities it has developed on The Irvine Ranch in Orange County. Ms. Uptegraff is responsible for key entitlement and environmental issues for development throughout the Ranch, including local, State and National policy related to environmental issues such as endangered species, water quality and air quality. In addition, Ms. Uptegraff leads company efforts to ensure that appropriate environmental assessment is completed as required by CEQA prior to any project consideration, for environmental permitting from resource agencies and for environmental compliance during construction and operation. Before joining the Irvine Company, Ms. Uptegraff was the Executive Director of the Planning & Building Agency in Santa Ana for eleven years. In this capacity, Ms. Uptegraff was responsible for all current and advance planning, plan check, inspection and code enforcement efforts. Prior to this, Ms. Uptegraff served in the economic development and redevelopment programs in Santa Ana. Ms. Uptegraff graduated from the University of California, Irvine with a degree in Social Ecology.

Case van Dam

California Wind Energy Collaborative

C.P. "Case" van Dam is a professor of mechanical and aeronautical engineering at the University of California at Davis and heads the California Wind Energy Collaborative; a partnership between the University of California and the California Energy Commission. He previously was employed as a National Research Council (NRC) post-doctoral researcher at the NASA Langley Research Center and as a research engineer at Vigyan Research Associates in Hampton, Virginia and joined UC Davis in 1985. Van Dam's current research includes wind energy engineering, aerodynamic drag prediction and reduction, high-lift aerodynamics, and active control of aerodynamic loads. He has extensive experience in computational aerodynamics, wind-tunnel experimentation and flight testing; teaches industry short courses on aircraft aerodynamic performance and wind energy; has consulted for aircraft, wind energy, and sailing yacht manufacturers; and has served on review committees for various government agencies and research organizations.

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