California's Path to 12,000 Megawatts of Local Renewables

Governor's Local Renewable Power Working Conference

Renewables on Public Buildings

SUMMARY

This policy paper attempts to tackle specific barriers associated with the siting and construction of renewable electricity projects located on public (city, county, state, federal, and military) buildings and properties. It is in no way inclusive of all the barriers for these types of projects, but highlights some key issues that warrant further discussion.

California has the potential to develop renewable electricity systems on publically owned buildings, properties, and right-of-ways to help meet the state's renewable energy goals, create green jobs, and reduce greenhouse gas emissions and other harmful air pollutants. Making public properties available to renewable developers could reduce existing energy costs in buildings, create new revenue streams by leasing vacant or unused lands and rights-of-way, and realize cost savings by eliminating the obligation to maintain lands leased to developers.

However, the installation of distributed generation on public buildings and lands faces many of the same adoption hurdles as on commercial buildings: high upfront costs, including audit and design; a steep learning curve for a non-core business functions; and technology and performance risk. Public entities also face additional hurdles including the volatility of annual government budgeting process, debt constraints, and a complex procurement process.

The expert panelists who developed this paper represent a cross-section of those entities and communities involved in the development of localized electricity generation on public buildings and property. This paper is a compilation of input from panel members and moderators and represents both individual and organizational viewpoints and perspectives. This panel has representatives from - a publicly owned utility, specifically the Sacramento Municipal Utilities District; the public finance community, specifically the State Treasurer's Office; the United States Military, specifically the U.S. Navy; a leading engineering firm that has worked on installing solar PV technologies at public schools (Psomas); and the State of California, specifically the California Department of Corrections, the California Energy Commission and the Office of the Governor.

BACKGROUND

Depending on the type of renewable energy project and its application, it could face significantly different challenges. The panel has identified four major categories that represent a majority of the type of public projects. The renewable system applications are as follows: buildings in load centers, property with potential for wholesale generation and onsite consumption, remote buildings with potential for energy independence, and land leases for wholesale generation. The applications were broken up by amount of electricity load on site, type of interconnection, the location, amount of space available, the size of the system, and the type of energy product. This table is not inclusive of all the applications, but is a starting block to categorize projects and identify specific barriers to each application.

Table 1: Types of Public Property Renewable Energy Projects

	Buildings in Load Centers	***Property With Potential for Wholesale Generation and Onsite Consumption***	***Remote Buildings With Potential for Energy Independence***	***Land Lease for Wholesale Generation***
Electricity Load	> 0.5 GWh annually	> 1 GWh annually	< 0.5 GWh annually	Without load or a DWR pumping station
Interconnection	Rule 21	Rule 21 and/or WDAT	Rule 21	WDAT or California ISO GIP
Location	One of seven load centers	Statewide	Not in a load center	Not in a load center
Amount of Land	Only rooftop and parking lots	Rooftop, parking lots, and surplus land	Rooftop, parking lots	All surplus land
Size of System	< 1 MW	> 1 MW	< 1 MW	>1 MW
Energy Product	Partially offset onsite load	Partially offset onsite load; potential for larger system for wholesale market	Fully offset; 100 percent departing load and energy independence	Wholesale distributed generation or utility scale generation

While we do not currently have a full inventory of public property in California, there is one for state property. As will be discussed in the "Potential Solutions" section the more information that can be gathered and consolidated into one place, the easier it will be to, have a sense of the potential, establish goals, and actually get the projects built. The

California Energy Commission went through this exercise with state property and found that there is huge potential to develop renewables on state property.

A renewable energy target of 2,500 megawatts installed on state properties by 2020 reflects a 33 percent renewable energy target for state buildings by 2020, Governor Brown's goal of 20,000 megawatts of new renewable capacity by 2020, and builds on staff's inventory of the potential for renewable development on state buildings and properties. Table 1 shows the goal allocated across the property types identified in staff's inventory of opportunities on state property. As shown in Table 2, 14 to 26 megawatts could be installed on state buildings in load centers, 54.5 to 195 megawatts on properties with potential for wholesale generation, and 14,460 to 26,030 megawatts on land leased for wholesale generation.

Table 2: State Inventory of Renewable Energy Projects

State Property Category	**Potential Renewable Generation Capacity (megawatts)***
State Buildings in Load Centers	14 – 26
State Property With Potential for Wholesale Generation	54.5 – 195
Land Lease for Wholesale Generation	14,460 – 26,030
Total State Properties Renewables Target	**2,500**

* The megawatt ranges reflect staff's assumption that 1 megawatt of photovoltaics can be developed on 5 to 9 acres.

Implementation of the target should be consistent with the Loading Order, California's energy policy that identifies energy efficiency as the top priority for meeting the state's energy needs and renewables as the highest ranking supply side resource. Consequently, when developing renewables on state buildings, priority should be given to buildings that have already undergone energy efficiency upgrades.

CHALLENGES

There are a number of challenges to significantly increasing the localized electricity generation (LEG) capacity on public property; many of which are challenges for all LEG projects. LEG systems can potentially provide opportunities for increasing electricity system reliability, but can also complicate a utility's ability to provide reliable and high quality power. The best place to locate generation and voltage support depends on the

location-specific load and the design of the distribution system. It is the utilities that must plan the manner in which load, generation, and distribution facilities interact. The variety of LEG technologies, the different ways in which they interact with customer load and the intermittent nature of some of the renewable LEG sources (e.g., wind and solar) make it difficult to integrate these resources while maintaining high system reliability and power quality. While most biomass LEG systems (e.g., dairy digesters, LFG systems) are baseload systems and do not create variable generation grid issues, they can be constrained in interconnection to the distribution system by other LEG systems (e.g., solar PV) that produce significantly less energy (MWh) but require access to a significant amount of capacity (MW) on the distribution system.

Interconnecting renewables located within networked grids proves difficult, because network protection devices can be damaged by electricity back-feeding from the LEG system. Further, because the infrastructure of the distribution grid and many public buildings is aging, there may be a need for costly upgrades of the grid, new roofs and upgrading wiring and conduit, which could significantly impact the economics of a project. Voltage regulation is another technical barrier that can become a significant concern when high LEG generation output and minimum local load coincide. Voltage regulation is of particular concern on bus regulated substation transformer banks (one regulating device for multiple distribution feeders). It is becoming apparent that local voltage issues are likely to precede protection, load, fault, harmonic, and stability issues as penetration increases.

There are also, financing and cost challenges associated with LEG projects. Net Energy Metering rules can be prohibitive for projects with large loads, because full retail net energy metering is limited to projects that are 1 MW or smaller. Additional cost barriers that place a substantial burden on LEG projects are departing load charges and standby fees.

The point of this paper and panel is to dive into the challenges that are solely unique to projects on public property. This paper identifies four challenges unique to public property projects.

1. **Project Funding:** The lack of access to capital, coupled with no appetite for tax credits, forces public agencies to utilize alternative financing. Building energy infrastructure rather than relying solely on the utility to provide electricity comes with large upfront costs. Financing from non-public sources can require public institutions to deviate from standard practice in the ways they manage their real estate (e.g., relocating a system if the contracting public agency relocates). Some possible alternatives are private-public partnerships through a power purchase agreement (PPA) or tax-exempt bond financing, both of which come with their own challenges. These are discussed further, below.

2. **Lack of Long-term Consistency:** Government leadership changes every few years and, many times, the turn over comes with a change in policy. For projects, that are still considered to have a high degree of risk, it is important to send the right signal of stability. Exacerbating this issue is the annual budgeting process. Funds to pay utility bills are routinely approved through a public entity's annual budget process. It is simply much easier and less risky for a government agency to seek budget approval for a utility bill than to seek approval for the development of a new energy source with unknown technology and performance risks as well as increased maintenance costs.

3. **Long and Complicated Permitting, Contracting, and Approval Process:**

   Permitting: Permitting of renewable energy can be a burden in general, however public schools have a unique issue raised by the Field Act of 1933, which sets high standards for new school design. The Division of the State Architect (DSA) is the jurisdictional authority within the State of California that provides enforcement of the Field Act in order to provide safe schools. DSA has not given clear and consistent messages through their approval process. See the solar Case study in the appendix for more information.

   Contracting: While contracting in general can be complicated, government entities have their own onerous and often outdated rules that make it especially difficult to enter into new types of contracts. Further, typical commercial terms in a PPA conflict with federal acquisition regulations for military applications and will force financiers to conform to government regulations. Other public agencies have similar issues making it difficult for private developers, because the standard language required by public agencies does not allow the flexibility that private companies need. The length of time to complete an agreement can be burdensome, as even immaterial changes of the contract trigger lengthy review and processing by state entities. Since most government agencies do not have energy as their core objective, it adds new levels of complexity if assets are locked up under long-term contracts. Public agencies tend to be risk averse for this reason. For example, Caltrans is concerned about placing solar PV panels on their rights-of-way, for fear that the land may be needed for transportation improvement in the future, or because of traffic safety concerns Transportation agency needs assessments only look forward ten years, and most renewable projects need longer term agreements, often in a 20 year time frame.

   Approval: The approval process is not consistent among public agencies. The military needs sign off from the Secretary of Defense's office, while the California Department of Corrections and Rehabilitation (CDCR) only needs sign-off from a deputy director. It can save a lot of time if project approval can stay more localized.

4. **Government Agencies Lack Knowledge in Energy Arena: Most g**overnment agencies do not have specific positions dedicated to working through contracts, financing and engineering of renewable energy projects. Each agency that takes on the challenge of including renewables in its portfolio usually does so without experience. The resulting steep learning curve and concerns about unknown challenges create many inefficiencies. This must change if public agencies want to take a leadership role in this area.

POTENTIAL SOLUTIONS

In order to make real progress to increasing government's role of installing renewable energy capacity on its property, it will take motivated energy pioneers within each agency at the staff level all the way to the Executive Office. Further, it would be extremely useful if there was a dedicated office or department offering advice to agencies and leading the charge. What follows is a brief discussion of some ways to overcome a number of the challenges set forth above. Additional solutions will be fleshed out during the panel discussion at the conference.

Power Purchase Agreements Discussion

PPA agreements may create an opportunity for the public government to save money. However, they may not create sufficient incentive for a specific public agency to pursue renewable electricity development on its property. Further, penalties such as early termination fees may also raise concerns about future and unknowable risks to staff responsible for managing public budgets. A well-constructed PPA can help solve government's lack of energy knowledge and risk adverse tendencies.

If an agency or building incurs savings via third-party owned projects (purchasing renewable electricity below retail rates) its utility budget in future years would be reduced because it will need less funds for utility payments. These savings may go back to the general fund and not to the agency that is housing the renewable system, significantly reducing incentives for managers to invest time and staff resources in such efforts.

Similarly, this issue may also occur with land leased arrangements that do not filter the money generated from leasing property back into the programs from which it is being generated. Funds get filtered back to operations or into the general fund and subsequently spent on other projects, or allocated for items unrelated to either the host agency or renewables.

Public Private Partnership Discussion

Public agencies may not be appropriately staffed or funded to maintain equipment on

their own. The current state of public budgets limit new hiring in most agencies, including those, dedicated to maintenance and construction. Partially because of the inability to hire new kinds of experts or simply to add workers to plan, procure and maintain new energy resources, public private partnerships will remain an important factor in state renewables development.

Further, the cost of a project should decrease if it is done by a private company capable of benefitting from federal tax credits and accelerated depreciation that are not provided to governments or charitable entities under federal tax laws. If local institutions (e.g., schools) can enjoy a new revenue stream by serving as hosts for rooftop systems, such public-private partnerships can also become instruments for furthering public policies such as encouraging local economic development, promoting workforce training, creating sustainable local jobs, and utilizing land that would otherwise have little value. For example, one can envision community-scale projects that would allow private industry to build and perhaps own the systems; the utility to allocate its output to multiple customers through virtual net metering; many community institutions to serve as hosts, or even co-owners, of the systems; local banks to finance them; and local workers to build them.

The following is an example of how the Public Private Partnership is working in the Solar Highway Project located in the Sacramento area:

- CalTrans – steward & lessee of public transportation land that would be used for solar PV, site selection, public safety, etc.;
- SMUD – purchaser of electricity, provision of incentives (e.g., SB 1, Solar Shares), grants proposer/administrator, permitting lead, conduct of competitive solicitation, etc.
- Private Developer/PV Industry Team – project financing, design & construction, own/operate/maintain PV facility, etc.
- Local Governments & Community – input to design, permitting support, etc.

Bond Financing Discussion

While tax exempt bond financing probably offers the lowest interest rate, it brings with it its own set of obstacles and transaction costs. First, if a public entity were to incur debt for this purpose, it would likely trigger a vote of the public pursuant to the state constitution. (Section 18 of Article XVI.) Lease revenue bonds are exempt from this provision, but most local energy projects are probably too small to make a leasing approach feasible. The state could issue a bond to create a fund out of which it could make no or low interest loans for the construction of LEGs on public buildings, both

local and state. If this were a general obligation bond, it would have to be put on the ballot, and would add to the state's already sizable debt. It would also have to compete with other infrastructure needs, such as roads and levies, and the cost of this capital could be fairly high due to the state's lackluster credit ratings.

The state could also consider a larger lease revenue bond to pool and fund several projects. However, the transaction costs on this would be extremely high as each lease would have to be established and tracked, and payment streams would have to be combined. In addition, many public buildings already have lease financing attached to the building, making additional lease financing extremely complex if not impossible.

Finally, even if the state were to create some kind of fund out of which it made loans to local and state governments to finance LEG, these loans may themselves run into the constitutional vote requirements requiring certain thresholds of legislative and electoral approval. The Energy Commission, however, has run a program known as the Energy Conservation Assistance Act under which the Energy Commission made loans to local governments to assist with energy conservation projects. This program could be expanded to issue a bond to put money into the program for renewable energy projects; however there would be competition with other state infrastructure needs. The California Attorney General's office issued an opinion in 1984 that found these loans (debts) did not run afoul of the constitutional vote requirements because the statute specifically required (and the Energy Commission determines) the loans will be repaid from energy savings. It is not clear if this rationale would apply to LEG.

Overall, it appears bond financing would be problematic, does not mitigate any of the known risks, and would likely only create additional transactional costs and hurdles. The best of these options would be to create a statewide fund through issuance of GO bond, but that proposal may not be timely considering the state's other obligations.

IMPORTANT QUESTIONS TO PURSUE

- **How do we best compile information about government buildings and properties that have the greatest potential for renewables development?**

  There are significant gaps in our collective understanding of the potential for renewables development on public properties. The goal is to gather needed data without causing undue delay. The California Energy Commission has already attempted to create an inventory for state facilities and identify the most promising sites, however the more information is gathered the more one discovers what further information they need to move ahead. For example, in the process of creating an inventory of state buildings it became quickly apparent that more data

on utility interconnections was needed as well as more specific information on the quality and useful life of state rooftops.

- **What type of institutional structure is needed to ensure consistency and information sharing across and between various levels of government?**

  Does this take the form of individual champions within agencies and departments? Do we need a high-level political appointee to bring people together? Should we explore developing a clearinghouse similar to what the Department of Defense has done?

CASE STUDIES

In order to better illustrate some of the challenges related to placing renewables on public buildings and property, the panel has put together a few case studies for various localized renewable technologies. The below discussions focus on challenges unique to solar on K-14 schools, wind and biomass.

WIND

Case Study Provided by the U.S. Navy

At the U.S. Navy's San Clemente Island, the southernmost of California's Channel Islands, diesel generators provide 88 percent of the electricity needs of the island, at a cost of nearly $300,000 per month. The other 12 percent is provided by three wind turbines, which total 675 kW. Installation of the wind turbines, purchased and owned by the Navy, decreased the costs for fuel, but also presented challenges. Wind turbines can significantly impact military missions if not sited correctly, and the intermittency of the wind resource caused problems with stability of the small island electric grid.

Compatibility with military operations was ensured through rigorous analysis of the proposed turbine site as the final location featured a good wind resource and no adverse mission impacts. Issues with grid stability and intermittency have been largely mitigated through installation of a synchronous condenser.

The Navy is applying lessons learned at San Clemente Island in the development of wind turbines at San Nicolas Island, located west of Catalina Island. Up to 900

kW of wind turbines are planned for the island, and have been sited to ensure they do not interfere with critical military operations. The island and wind turbines will also be used as a site for a large-scale energy storage demonstration.

BIOMASS

Case Study Provided by the Sacramento Municipal Utilities District

Distributed biomass projects - especially dairy digesters and other facilities that process solid materials or have disposable wastes - must comply with a number of environmental requirements. These requirements include complex permitting process for air quality, water discharge, and waste discharge permits that is time consuming and costly. The current regulatory environment in California, with the backdrop of AB 32, creates some uncertainty for distributed biomass developers who have green house gas (GHG) reducing technologies which may not be defined as "low emissions" for local air quality by the California Air Resources Board and local air quality management district's (AQMDs). Managing these permitting requirements in a cost effective manner is a challenge for distributed generation (DG) projects which are small by nature.

To illustrate the complexity and barriers around building a distributed biomass facility, below is listing of challenges a typical project may face. Some of these are drawn directly from the experiences of the Sacramento Municipal Utilities District (SMUD).

- State environmental policies and programs are fragmented and sometimes conflicting (e.g., AB 32 policies to reduce GHG emissions such as methane from livestock operations vis-a-vis local AQMD emission regulations).
- Statutory barriers impeding some conversion technologies for energy production and resulting in non-optimal technology choices, limiting the opportunities to develop energy from post-recycled trash.
- Stringent restrictions and penalties on the injection of landfill gas into the natural gas pipeline in California, imposed by Assembly Bill 4037 *(Hayden, Chapter 932, Statutes of 1988).* Pipeline injection of biomethane from landfills for an off-site DG facility is currently prohibited in California even if the gas is treated to meet health and safety standards. This statute effectively precludes landfill gas from being introduced into the pipeline from in-state sources.
- Economic barriers including the costs of systems can be high in comparison with traditional forms of electricity generation. Meeting or exceeding air

quality and water quality standards for DG projects is costly. Specifically for dairies, the low cost of milk makes it difficult for farmers to invest and install new digesters.

- Technical barriers include lack of biogas "cleanup" technologies, lack of environmental performance data, and the need for sustainable feedstock sourcing. Voltage regulation is also another technical barrier that is pervasive for many localized renewable energy resources.
- Limited public awareness of the benefits and costs of DG. In case of solid biomass–fueled DG, proposed U.S. EPA Maximum Available Control Technology requirements may inhibit development.
- Limited funding for research and development to help resolve the challenges related to next generation of lower-cost, lower-emission.