INCENTIVE DESERTS:

The Opportunities and Barriers to Solar PV Financing at UCLA

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Los Angeles presents itself as an ideal location for solar power. It offers abundant sunlight, solar-friendly local utility policies, and leadership committed to the advancement of alternative energy sources. Yet there is limited solar photovoltaic (PV) generation in Los Angeles, specifically at the University of California, Los Angeles (UCLA), because of funding limitations. Nonprofits (including private universities) and government institutions (including public universities such as UCLA) are unable to take advantage of the investment tax credit (ITC) when installing solar PV. The ITC allows for-profit institutions and individuals to get a single tax credit equal to 30 percent of the initial solar installation costs (U.S. Dept. of Energy, 2012). Because UCLA does not pay taxes, it cannot take advantage of this incentive. Thus, on-site solar PV is significantly more costly for UCLA than for private for-profit institutions. For solar power to become a more dominant force in the energy market in higher education, universities need to explore various alternative-financing scenarios to allow installations to be revenue neutral—to pay for themselves over a set time period.

Aside from its funding limitations, UCLA is in a unique position when it comes to on-campus renewable energy. The university is able to fulfill the University of California (UC)-mandated on-site renewable energy generation requirement with its cogeneration plant, an on-site power plant that uses natural gas and the resulting steam waste to generate electricity, and now is in the process of determining what, if any, other renewable energy installations should be pursued. This paper provides background on current solar policy in Los Angeles and energy management at UCLA, and provides recommendations for UCLA to go forward with revenue-neutral solar PV installations.

SOLAR PV *in the* CONTEXT *of* UCLA

Established in 1919 in the Westwood neighborhood of Los Angeles, UCLA spans a geographic region of 419 acres and provides energy infrastructure and services to approximately 60,000 students, staff, faculty, and community members every day. UCLA uses power for heating and cooling needs, and to provide electricity to residential buildings and non-residential buildings including medical buildings and large sports complexes (UCLA Facilities Management, 2013). To meet growing and changing energy demands, UCLA utilizes a variety of generation methods from on- and off-site sources. Currently, UCLA meets the majority of its energy demands through an on-site cogeneration plant and power from the Los Angeles Department of Water and Power (LADWP).

As part of the UC system, UCLA has a commitment to provide students, faculty, and staff with reliable energy at the lowest price possible. The university must use its resources as efficiently as possible, while also promoting sustainable resource use (UC Sustainability, 2012). The UC Sustainability Practices Policy mandates that each campus, including UCLA, must reduce its overall greenhouse gas emissions to 1990 levels through energy efficiency and renewable generation efforts (UC Sustainability, 2012). Additionally, each campus must generate at least 10 MW of on-site renewable energy by 2014. UCLA fulfills this requirement by using biogas from a local landfill to produce 5 percent of the power generated in its on-site cogeneration plant (UC Sustainability, 2012).

Cogeneration Power Plant

UCLA owns and runs a 43 MW cogeneration plant to provide 75 percent of the campus's nonresidential heating, cooling, and electricity demands (Masunaga, 2009). The plant, built in 1994, burns gas to power a turbine, and the steam exhaust is then used to run a second turbine. This technique of cogeneration produces more power than a traditional plant; an average gas power plant runs at approximately 42 percent efficiency while UCLA's cogeneration plant runs at 80 percent efficiency

(Masunaga, 2009). Natural gas, a nonrenewable energy source, powers 95 percent of the plant. Biogas, a renewable energy source from the local Mountaingate landfill, supplies the remaining 5 percent (UC Sustainability, 2012).

Solar PV on Ackerman Student Union

In 2012, UCLA Facilities Management installed 132 solar PV panels on the roof of the student-owned Ackerman Union. The panels have a generation capacity of 38 kW and supply 2.5 percent of the building's energy (Hewitt, 2012). Students led the project and paid for it with funds from The Green Initiative Fund (TGIF), a grant program started in 2006 and supported by student fees to promote new sustainability projects on campus (Hewitt, 2012). The Ackerman solar installation uses the LADWP's Net Metering program to receive financial compensation for the energy it generates. The solar panels are predicted to save $12,000 annually on energy costs (Hewitt, 2012).

THE SOLAR PV MARKET *and* REGULATIONS *in* LOS ANGELES

California is the largest solar market in the nation, representing more than 60 percent of all national solar PV installed since 2006 (American Council on Renewable Energy, 2012). Los Angeles has been an active player in the expansion of solar PV in California. The urban environment of Los Angeles offers model areas for solar PV installations. Rooftops and parking lots are cost-effective hosting areas, and the ample sunlight they receive allows the majority of solar PV installations to pay for themselves faster than in other parts of the country (Callahan, DeShazo, and Chomitz, 2013). State and local policy and incentives, UC regulations, and campus-specific conditions also affect current and potential solar PV installations at UCLA.

While there are several state policies and financial incentives promoting the growth of solar PV, the actions of the LADWP heavily influence installations in the City of Los Angeles, and at UCLA. A critical part of the LADWP's governance is that it does not allow third-party power purchase agreements (PPA). Under a PPA, a third party buys a certain percentage of the power generated from a solar PV system. The third-party buyer receives the benefits associated with renewable energy—obtaining Renewable Energy Certificates[1] and meet-

[1] Renewable Energy Certificates (REC) represent the environmental attributes of the power produced from renewable energy projects and are sold separately from commodity electricity. One REC is issued for every 1 MWh produced from a renewable source. (EPA, 2013).

ing policy mandates[2]—without having the installation on site. Any and all renewable energy generated in the LADWP's territory must be interconnected with its utility distribution system or go directly to the consumer (LADWP, 2012). Power purchase agreements are often utilized to subsidize the cost of installing a solar PV system (Second Nature, 2012). However, for utility customers in the City of Los Angeles, a PPA is not a funding option.

The State and Federal legislation and the LADWP programs do allow other capital financing and funding options and utility pricing programs for solar PV deployments within the LADWP service area. Financing and funding mechanisms are related but distinct needs for investment in solar power. Financing refers to a way in which UCLA can raise money for the initial capital investment, and it is often a one-time source of capital. Funding refers to an ongoing source of money to pay back the initial capital investment and to cover continuing costs. For a solar PV system to be revenue neutral, the university must utilize both financing and funding mechanisms for the project.

FINANCING OPTIONS

Capital Financing with a Municipal Bond

State and local governments issue municipal bonds to finance capital expenses. Municipal bonds are a very low-cost means of raising capital because the interest investors earn on the bonds is tax exempt, so investors are willing to accept lower interest rates than they would from private-sector bonds.

There are different types of bonding mechanisms, including revolving loan funds and bundled loans backed by statewide public financing institutions. For a tax-exempt institution like UCLA, the borrowing rate ranges from 2.5 to 3.5%. A new or bundled bond can usually be issued within six to twelve months, as it must go through public financing channels (UCLA Capital Programs, 2013).

Currently, UCLA is unable to use bonds to finance a solar PV installation. Bonds, however, are included in the analysis in this paper to further explore alternative financing mechanisms.

Capital Financing with a Tax-Exempt Lease

UCLA has the ability to utilize a Tax-Exempt Lease (TELP) as an alternative financing mechanism. TELPs are available

[2] A renewable portfolio standard (RPS) is a regulation mandating that a certain percentage of total energy produced in state be generated from renewable sources such as solar, wind, biomass, and geothermal. Under Senate Bill 1078, California has set its RPS for 33 percent of its total energy production to come from renewable sources by 2020 (California Energy Commission, 2012).

to government and nonprofit institutions and provide a low-interest financing option for obtaining equipment. At the end of a TELP, ownership of the equipment is transferred from the lessor to the lessee. At the moment, a twenty-year TELP is available with interest payments ranging from 3.75 to 4%. Interest payments may increase in the future. The LADWP allows a TELP within its territory because the power generated from the system still goes to the utility even though the system equipment is owned by a third party. The twenty-year financing period of a TELP is ideal because it is the same time period as the LADWP FiT policy, a utility pricing program.

LADWP FUNDING PROGRAMS

The LADWP FiT Pricing Program

In January 2013, the Board of Water and Power Commissioners implemented the Feed-in-Tariff (FiT) Set Pricing Program for 150 megawatts (MW) of solar PV. A FiT establishes a long-term contract between the energy producer and the LADWP that sets a price paid per kilowatt-hour (kWh). The FiT price paid per kWh is often higher than the market price per kWh in an effort to incentivize solar energy generation. The program was created to encourage renewable energy development within the Los Angeles Basin and to help meet California's 33 percent Renewable Portfolio Standard (RPS) mandate by 2020.

The FiT program will pay for projects ranging from 30 kW to 3 MW in capacity. The price for energy generated is grouped into five tiers and ranges from \$0.17/kWh to \$0.13/kWh. The first 20 MW of capacity receives the highest price, \$0.17, and each additional 20 MW receives a reduced price. This competitive pricing structure encourages solar PV projects to apply early for the FiT to receive the highest price per kWh. One downfall of the FiT program is that the energy producer loses the Renewable Energy Certificates (RECs) associated with the power it produces. When the producer sells its power to the utility, the LADWP assumes ownership of the RECs, and the energy producer cannot claim the carbon neutrality of the solar energy.

The LADWP Net Metering Policy

Net Metering is another utility pricing program that "enables customers to use their own generation from on-site renewable energy systems to offset their electricity consumption over a billing period by allowing their electric meters to turn backwards when they generate electricity in excess of their demand" (LADWP, 2012). While in many instances Net Metering can be a viable source of revenue for energy generated on site, it is not a cost-effective option for UCLA. The LADWP has set a rate structure with high fixed costs for UCLA, in part because the university produces the majority of its own power at an on-site cogeneration power plant. These high fixed costs result in an approximate loss of $0.04 per kWh produced. The Luskin Center for Innovation estimates that under the LADWP's Net Metering program, the university would earn an average of $0.10 per kWh, less than any of the five tier prices paid under the FiT program (Callahan, DeShazo, and Chomitz, 2013). The primary benefits of Net Metering are that it is not a competitive pricing program and it would allow UCLA to own the RECs associated with its solar installation. These benefits may not be outweighed by the lower price paid per kWh.

Funding Through State Legislation: Proposition 39

State legislation also offers UCLA a potential funding option through Proposition 39—the Multi-State Business Tax and Clean Energy Initiative—which California voters passed in November 2012. The new legislation requires all California businesses operating in California and other states or countries to calculate their tax liability using a single sales factor method rather than the cheaper, more commonly used three-factor method (California Secretary of State, 2012). Half of the increase in tax revenue, or a maximum of $550 million per year, will be used to create the Clean Energy Job Creation Fund. For the next five years, the fund will go toward projects to support energy efficiency and expand the use of alternative energy in California, including "alternative energy projects in public schools, colleges, universities, and other public facilities" (California Secretary of State, 2012). UCLA has the opportunity to apply for funding from the Clean Energy Job Creation Fund. At the time of this report, there was limited information on the amount of potential funding UCLA could receive from Proposition 39.

THE FUTURE *of* SOLAR PV *at* UCLA

Given the policy and regulations governing solar PV at UCLA and the financing limitations placed on the university, UCLA needs to start with a smaller deployment and work to ensure that the system costs are kept as low as possible. The university must also secure a high price paid per kWh generated to increase revenue to develop a revenue-neutral installation. The university needs to look at both the current market conditions for solar PV and plan for future changes to cost and available funding. In addition, UCLA must include solar PV in long-range planning and construction efforts to create a more established protocol for on-campus generation.

Increase Revenue

To receive the highest price possible for solar energy generated from the PV system, UCLA needs to utilize the LADWP's FiT pricing program. If UCLA decides to pursue FiT pricing, the price it receives for solar energy generated on campus will be dependent on the timing of the application. At the time of this paper, the first round of FiT applications had closed, meaning that the Tier 1 $0.17/kWh price is no longer available. However, Tiers 2-5 are still available, and the lowest price paid under FiT ($0.13/kWh) is still more than the price paid under Net Metering ($0.10/kWh).

Leave Environmental Attributes for the Future

Given the current local utility policies for price paid per kWh, now is not the time to focus on collecting the Renewable Energy Certificates of the PV system (see footnote 1). FiT pricing policy, and the subsequent loss of the environmental attributes of the system, is currently the most effective way to offset the costs and to make the system revenue neutral. Under FiT policy, UCLA can still utilize some of the environmental benefits of the system, specifically the public relations and green branding opportunities that come with the installation. Environmental attributes may be best to pursue in the future when system costs decrease and more funding options are made available.

Keep It Small

UCLA should initiate its on-site solar generation efforts with a small PV system under 300 kW. A smaller system will reduce the amount of capital needed for installation and maintenance costs. It also has less risk attached to it overall. A successful smaller installation has the ability to set precedent for the university and act as a catalyst for future installations. Past capital financing illustrates that institutions of higher education, including UCLA, are much more inclined to pursue a project when there is already a successful project in place (AASHE, 2011).

A smaller PV system also provides the opportunity for the university to learn from the negotiation, installation, and maintenance processes that it can then apply if it decides to go forward with a larger installation. The lessons learned from a smaller system may be especially valuable if and when Proposition 39 Clean Energy Fund money becomes available to UCLA. The university is more likely to receive capital from the fund if it can demonstrate a commitment to successful on-site generation projects (Callahan, DeShazo, and Chomitz, 2013).

Reduce System Costs

The university can reduce overall system costs in two critical ways: utilizing low-interest capital and receiving a competitive rate for the cost per watt installed. The tax-exempt leases available to UCLA are an ideal way to self-finance the project at a low interest rate of about 4 percent. The interest of the TELP, however, is somewhat time sensitive as the current interest rate is historically low and will most likely increase in the near future.

Reducing the cost paid per watt installed depends on the size of the installation and UCLA's involvement in the negotiation process. UCLA has the opportunity to partner with other installations to utilize an economy of scale when negotiating with a solar contractor. For example, the Smart Grid Energy Research Center (SMERC) is in the process of acquiring funding for a solar PV installation that will provide research and development for the center. If UCLA Energy Services were to work in collaboration with SMERC, they might be able to negotiate a lower cost per watt than if they negotiate on their own. Maintenance costs are more fixed than installation costs, as the system will require regular maintenance given current PV technology.

UCLA Policy

UCLA has the power to shift its campus policies at the micro level to encourage the growth of solar PV. Ultimately, UCLA needs to integrate solar PV into its planning and construction policies and protocols if it wants to promote on-campus solar PV energy generation. Even though UCLA exists in perpetuity, it tends to plan for the short-term. University master plans rarely account for more than ten years. In any ten-year window, an investment in solar is a huge expenditure, and this short-term view does not take into account the benefit of reduced energy bills over the longer term. Expanding the time frame of the university's plan would allow solar to better fit into its plans.

The university can also implement a "build-in" policy requiring all new construction to include a rooftop solar deployment. A build-in policy makes rooftop solar the standard, not the exception. This policy could stem from the existing UC Sustainability policy mandating all new construction to meet LEED (Leadership in Energy and Environmental Design) Silver certification (UC Sustainability, 2012). For a build-in policy to become a reality, UCLA needs to secure a reliable, long-term source of funding.

CONCLUSION

The financing and funding limitations for institutions of higher education can make on-site solar PV seem unrealistic, but it's not all bad news. There are several potential opportunities to help institutions, including UCLA, drive down the cost of solar PV and expand solar power on campus. Whether or not UCLA ultimately decides to go with increased solar power, a better understanding of alternative financing mechanisms will make it easier for all colleges and universities to access solar PV in the future.

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