BERKELEY UNIFIED SCHOOL DISTRICT (BUSD)

Solar Master Plan

Made possible by a U.S. Department of Energy *Solar America Showcase* Award to the Sequoia Foundation and KyotoUSA/HELiOS (2009)

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Acknowledgments

Transforming a successful local solar project into something that has statewide application and benefits can be challenging. In the years ahead, we hope the effort by the contributors to this Solar Master Plan (SMP) helps make renewable energy generation a possibility for schools throughout the state. One thing is certain – everyone who participated in the SMP project genuinely believes that our schools will become important local sources of clean energy. We hope that this document will help to spread their enthusiasm for local electricity generation far and wide.

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— Tom Kelly

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An example of a complete Solar Master Plan is available to download at: www.heliosproject.org

Executive Summary

In June 2006, KyotoUSA and Berkeley Unified School District (BUSD) management met to discuss the possibility of installing renewable energy systems on BUSD schools. That meeting – and those that followed – traversed a path similar to the one other school districts in the state have followed or are likely to follow when asked to consider generating electricity from school rooftops and parking lots. BUSD's attitude toward installing renewable energy systems went from skepticism and doubt in 2006 to an openness that enabled the District to add $7 million dollars for solar projects to a general obligation bond request in 2010, which passed with the overwhelming support of Berkeley voters.

The path to energy conservation, energy reduction, and energy generation is a difficult one for most school districts – fraught with concerns about diminishing operating budgets, up-front costs of new equipment, the time and effort busy district staff must expend to oversee a project, as well as doubts about whether a solar project will "pencil out." However, many school districts are recognizing that energy savings and electricity generation can result in significant benefits to a district's financial health.

In working on our first successful solar project with BUSD (Washington Elementary 2006 –2008), we learned a number of important lessons. The most important lesson was that trying to get solar installed on a single school is going to be challenging. We often meet students or parents who are helping a school to "go green" and would like to see renewable energy be part of that plan. They demonstrate a high level of enthusiasm, organization, and energy – characteristics that are remarkably valuable to the education of our children, the health of their schools, and the future of our society. However, school districts generally develop Facilities Master Plans (FMPs) that describe the construction that will take place in the district over a 5- to 10-year period and therefore are not well equipped to respond positively to a community's request for a major construction project like solar at an individual school. The funding for projects described in a FMP is likely to have been approved by local voters in the form of a General Obligation bond that is limited to the projects described in the FMP. The commitments made in the FMP may not provide enough flexibility to take on a newly introduced idea like a large solar array that benefits a single school. We realized we had to find a way to integrate solar projects into a district's overall long-term construction plans if we were going to see solar installed on schools throughout a district.

KyotoUSA and our fiscal sponsor, the Sequoia Foundation, approached the U.S. Department of Energy (DOE) in early 2009 to find out if we could qualify for a technical assistance grant through DOE's Solar America Showcase program. We wanted to develop a Solar Master Plan (SMP) that could be integrated into any school district's Facilities Master Plan. DOE encouraged us to apply, and in April 2009, we learned that our application had been successful. We immediately began work with the National Renewable Energy Laboratory (NREL) in Golden CO. During the next two years, NREL, KyotoUSA, and our school district partners (Berkeley, Oakland, and West Contra Costa Unified School Districts) worked together to develop a Solar Master Plan for each of the districts.

A requirement of the Solar America Showcase award was that the grantee had to commit to installing at least 250 kilowatts (kW) within the districts. We made a "good faith" commitment to do so. **As of November 2011, more than 400 kW has already been installed; BUSD has local bonds for PV that could result in the installation of an additional 800 kW in the next few years; WCCUSD will install another 350 kW in 2012; and OUSD will install a PV system at its Downtown Education Complex in 2012. OUSD also has enough federal bond authorization to install PV systems at another 17 of its schools.**

Our school district partners – all facilities directors and staff – provided us with important guidance on the information we would need to integrate plans for photovoltaic (PV) systems into an FMP. We received an incredible amount of donated technical assistance and support in the development of the SMPs from organizations, companies, and individuals listed in the Acknowledgments section. As a result, we have assembled a document that covers every aspect of what a district should consider as it begins to move away from relying on increasingly expensive utility-provided electricity toward its own self-generated, clean, renewable solar energy.

The first eight chapters of this Solar Master Plan address a range of topics that a district must consider in planning for solar energy. Chapter Nine is a Case Study on a student-initiated project installed at San Ramon Valley Unified School District in October 2011.

Any California public school district can use this SMP as a template. It can also provide helpful guidance to districts in other parts of the country. Data and studies specific to the individual district are covered in Chapters One, Three, and Four. The remaining chapters are applicable to all districts. Therefore, the SMPs for the three districts that participated in this DOE project are identical except for the site-specific information in those three chapters.

Chapter One discusses "benchmarking" of the district's energy use through the U.S. Environmental Protection Agency's ENERGY STAR Portfolio Manager software tool. Every district – regardless of its current or future plans for renewable energy – should be aware of its energy consumption and energy costs so that it can make energy-efficiency improvements and encourage better conservation behavior at its schools. The energy data is also essential to making Chapter Four a more robust report.

Chapter Two discusses what makes a school building a good candidate for PV installation and offers information on tools that can help in evaluating a building's potential for hosting a solar array.

Chapter Three presents a structural analysis of the roofs of several schools in the district. To prepare this analysis, NREL hired a local structural engineer to determine whether, based on the architectural drawings, the buildings could handle the added loads of a PV system. California public schools have very strict building codes, administered by the Division of the State Architect (DSA), which can make any construction project a challenge. The reports in this chapter provide an overview of issues that DSA will consider when looking at plans for roof-mounted PV systems.

Chapter Four provides detailed information on the district's electricity consumption and energy costs, the total amount of PV that each district facility is capable of hosting, and the amount of PV that each facility needs to reduce its electricity costs to the minimum charge. Also included are the estimated costs, savings, and electricity generation of each PV system, as well as the greenhouse gas (GHG) emissions avoided and renewable energy credits (RECs) earned. All of these criteria are calculated for the district as a whole and for each facility individually. Aerial imagery identifies the buildings and parking areas appropriate for PV installation and is the basis for estimating the amount of space available for the renewable energy systems.

Chapter Five provides an overview of today's solar technology, how it works, net metering rules, monitoring systems, and ways to ensure that a PV system provides maximum efficiency and output throughout the 20 to 40 years during which the system can be expected to generate electricity.

Chapter Six provides a thorough, well-researched Design-Build contract template that covers all aspects of procuring a commercial-scale PV system. This chapter explains that school districts will achieve the best pricing and best overall value when using a well-constructed Request for Proposals and seeking public bids rather than sole-sourcing a PV project.

Chapter Seven discusses financing options for acquiring PV systems. Financing can be the single biggest challenge in acquiring PV; however, costs – for PV systems and for financing – continue to come down and are increasingly within reach for school districts. The chapter describes in detail the two primary methods of acquiring PV systems – district ownership and third-party ownership (Power Purchase Agreement).

Chapter Eight covers rate/tariff structures that are associated with the delivery of electricity from the utility to each school. Understanding how tariffs work and how they are applied will assist a district in determining which tariffs are most favorable for a specific school even if a PV system is not yet contemplated.

Chapter Nine describes how a Monte Vista High School junior, Julia Mason, inspired San Ramon Valley Unified School District to install 3.3 megawatts of PV throughout the district. Julia began her advocacy effort with an attempt to get district officials to install solar at her high school. Demonstrating commitment, patience, and a lot of heart, Julia and her classmates were able to overcome the district's initial hesitance and eventually persuaded the school board to move forward. The board's journey took them from concerns about whether the district could "afford to install solar" to the point where all board members eventually agreed that the district could "not afford to not install solar."

Chapter Nine does not provide a step-by-step formula for achieving success in a district, but it demonstrates the types of concerns that arise and how they were overcome. It is our hope that Julia's story will inspire school districts to start on a path toward reducing their energy consumption and producing all the electricity needed to operate their schools.