Scotts Valley Band of Pomo Indians Strategic Energy Plan
December 2008

Prepared for the DOE First Steps Progam
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1.0 Introduction

The Scotts Valley Band of Pomo Indians is located in Lake County in Northern California. Similar to the other five federally recognized Indian Tribes in Lake County participating in this project, Scotts Valley Band of Pomo Indians members are challenged by generally increasing energy costs and undeveloped local energy resources. Currently, Tribal decision makers lack sufficient information to make informed decisions about potential renewable energy resources. To meet this challenge efficiently, the Tribes have committed to the Lake County Tribal Energy Program, a multi Tribal program to be based at the Robinson Rancheria and including The Elem Indian Colony, Big Valley Rancheria, Middletown Rancheria, Habematolel Pomo of Upper Lake and the Scotts Valley Pomo Tribe. The mission of this program is to promote Tribal energy efficiency and create employment opportunities and economic opportunities on Tribal Lands through energy resource and energy efficiency development. This program will establish a comprehensive energy strategic plan for the Tribes based on Tribal specific plans that capture economic and environmental benefits while continuing to respect Tribal cultural practices and traditions. The goal is to understand current and future energy consumption and develop both regional and Tribe specific strategic energy plans, including action plans, to clearly identify the energy options for each Tribe.

The DOE first steps program represents the initiation of an energy program for the Scotts Valley Band of Pomo Indians. As a product of the DOE first steps program, this Strategic Energy Plan is designed to:

- Summarize current conditions
- Initiate a realistic plan to meet energy goals
- Formulate goals for Large Power Generation

As part of the development process, a number of energy options were presented to the Tribe (meeting notes in Appendix 1). These options included:

- Biodiesel production
- Energy conservation
- Solar energy
- Wind energy
- Geothermal energy (direct)
- Geothermal energy (geo-exchange)
- Biomass use

Relative priorities were developed for these potential actions:

1. Energy conservation
2. Solar energy
3. Wind power
4. Geothermal/Geoexchange
6. Biodiesel

7. Biomass

Each of the options above is discussed below in Sections 3 through 9.

2.0 Vision Statement

Increase the use of alternative energy to reduce energy expenses for the Tribe and its members and incorporate energy planning/use of alternative energy in construction and economic development.

3.0 Conservation for Existing Homes

3.1. Immediate Measures

As with most residential buildings, modernization or even just improve maintenance can have the fastest return on energy savings. Often, Tribal housing is found to be built to minimal standards with maintenance that does not address energy efficiency. In many cases, heating, cooling, and lighting are provided for minimal installation and equipment cost and not minimal operational cost.

Using the Pacific Gas & Electric calculator for a typical home on the Reservation, estimates were made on changes that could be made by homeowners. As indicated in Table 1 below, the changes would reduce electric costs approximately 14% or a little less than $20 per month.

A first phase project to meet the requirements for Table 1 for the 5 homes managed by the Tribe would cost a total of $160 per home for equipment. The program should also include support for elders, approximately 2 hours per home that may be provided by volunteers or Tribal Staff. In general, the cost for equipment could be realized by participating households in energy savings within 9 months. It should also be noted that many of the improvements are applicable even to newer housing that may be built to better standards but may not be used to meet the energy saving potential.

3.2. Weatherization

Other weatherization projects for include caulking windows, seal leaks in ducts and other air leakage issues that can vary from home to home. Some homes may also require additional insulation and may benefit from programmable thermostats. The additional actions could increase the savings shown for first phase measures in Table 1 by a factor of 2.5.

Table 1. Recommended first phase conservation measures for Scotts Valley Band of Pomo Indians housing

Action	Costs	Provider	Savings per year
Install more efficient lighting			
Replace all lighting with compact fluorescents	$35	Home owner installs new bulbs (some assistance to elders)	$102-124
Replace halogen torchieres*	$70	Home owner	$27-33
Improve water use			
Replace shower with low-flow	$35 (1.6gpm unit)	Home owner installs new bulbs (some assistance to elders), about 30 minutes	$49-81
Insulate water heater	$20	Home owner installs new bulbs (some assistance to elders)	$11-19
Total	**$160**		**189-257**

*Assuming two per home with a replacement cost of $35/unit

For these measures to be assessed, home inspections are required. These inspections would require one to three weeks and should identify:

- Homes that require programmable thermostats
- Homes that require additional insulation and recommended amounts and measures
- Homes with ducts and appropriate measures for weatherization
- Recommendations for windows and doors
- One or two attic fan designs and homes that can benefit from their installation

This should cost approximately $4,000 and provide a plan and budget for the final phase of weatherization for the Rancheria homes including routine maintenance schedules. Do to the small number of homes, it is recommended that the Tribe consider working with a second Tribe to combine the project (bill separately, schedule together). Similarity in Tribal housing should allow similar reporting topics but include an increase in efficiency for the vendor. This could reduce cost

3.3. Update Housing Standards

The Tribe has the opportunity to develop building standards and design recommendations for housing that meet or exceed local standards. The lack of more advanced standards creates a need for weatherization for nearly all Tribal homes. It would benefit the Tribe to expand the study in Section 0 to include recommendations for standards and identify building methods and home designs that could insure that new homes meet the needs of Tribal members and utilize all technology practical to meet energy use conservation goals.

4.0 Solar

Solar (photovoltaic) energy can be used at the Scotts Valley Band of Pomo Indians in two configurations; utility scale and home/commercial installations. The Scotts Valley Band of Pomo Indians includes undeveloped and some flat area that may be suitable for solar energy development. Of particular interest, a planned gaming operation is expected to use electricity on a utility scale (greater than 1 MW) and includes sufficient space on undeveloped property, roofs and/or parking to accommodate the required solar panels.

Due to the availability of land as well as potential for covered parking that uses solar panels and south facing roof surfaces, the development of solar energy on a commercial scale is a high priority. Adding to this, the large amount of electricity required for a new gaming facility will have a high value as locally generated power.

The cost of residential photovoltaic systems can be significantly higher than the cost of utility or commercial scale systems. Its performance is also variable due to maintenance and location issues. Despite these facts, it often provides some of the most direct benefits by directly reducing Tribal member's expenses. In addition, it does increase the value of the homes and often challenges homeowners to become more energy conscious further increasing the systems value. Electricity generated by solar panels on homes can also be sold back to the grid under some incentive programs to the benefit of the occupant. An optimal situation is net metering providing a direct trade-off for the power produced by solar panels and electricity utilized in non-operating (nighttime) conditions.

A Few Important Terms

PV Module-A "solar panel" that makes electricity when exposed to direct sunlight. PV is shorthand for photovoltaic. We call these panels PV modules to differentiate them from solar hot-water panels or collectors, which are completely different technology and are often what folks think of when we say "solar panel". PV modules do not make hot water.

AC (alternating current)-This refers to the standard utility supplied power, which alternates it direction of flow 60 times per second, and for normal household use has a voltage of approximately 120 or 240 (in the USA). AC is easy to transmit over long distances, but it is impossible to store. Most household appliances require this kind of electricity.

DC (direct current)-This is electricity that flows in one direction only. PV modules, small wind turbines, and small hydroelectric turbines produce DC power, and batteries of all kinds store it. Appliances that operate on DC very rarely will operate directly on AC, and vice versa. Conversion devices are necessary.

Inverter-An electronic device that converts (transforms) the low-voltage DC power we can store in batteries to conventional 12-=volt AC power as needed by lights and appliances. This makes it possible to utilize the lower-cost (and often higher-quality) mass-produced appliances made for the conventional grid-supplied market. Inverters are available in a wide range of wattage capabilities. We commonly deal with inverters that have a capacity of anywhere between 150-6,000 watts.

One of the most cost-effective solar energy systems that is often overlooked is solar hot water heating. The systems provide a lower per unit cost for energy. The principal drawbacks for domestic applications are their targeted use, hot water and in some cases heating, and some maintenance issues. The principal maintenance issue is freezing; the least expensive systems directly heat water. For the Scotts Valley Band of Pomo Indians, freezing is not common but occasional enough to be an issue.

Rebates for installation of systems can vary as different programs come and go; it will be important to time installations to meet deadlines and changing programs. However, improvements in technology have been incremental over the last couple of decades and should not be considered a reason for delay. The same is true for incentives; plans should only be considered on a scale of months and not be delayed for future unknown incentive programs that may take years. This is not to meet a deadline of green energy, but to meet the challenge of increasing cost of energy. In other words, during the wait for changes in technology or incentives, the additional costs of energy used without savings from the systems likely will exceed the value of waiting.

Measuring Electricity

A Watt (W) is a standard metric measurement of electrical power. It is a rate of doing work.

A Watt-hour (Wh) is a unit of energy measuring the total amount of work done during a period of time. (This is the measurement that utility companies make to charge us for the electricity we consume).

An Amp (A) is a unit measuring the amount of electrical current passing a point on a circuit. It is the rate of flow of electrons through a conductor such as copper wire: 1 Amp = 6.29 billion billion electrons moving past a point in one second. (Amps are analogous to the water-flow rate in a water pipe.)

A Volt (V) is a unit measuring the potential difference in electrical force, or pressure, between two points on a circuit. This force on the electrons in a wire causes the current to flow. (Volts are analogous to water pressure in a pipe).

In summary, a Watt measures power, or the rate of doing work , and a Watt-hour measures energy, or the amount of work done. Watts can be calculated if you know the voltage and the amperage: Watts = Volts x Amps. More pressure or more flow means more power.

5.0 Wind Power

The Tribe is interested in evaluating wind resources within the residential areas. These areas are easily accessible and may provide for residential scale systems.

Within Lake County, only a small area to the east has been identified as having a marginal or greater wind source (DOE 2008). However, assessments are incomplete for the area and could be significant within certain regions. For example, Middletown historically has utilized small scale wind resources and is not identified in the DOE reference

An initial assessment may or may not be feasible for small residential systems; it is more cost effective to install a small scale pilot unit. The cost of small systems, $5,000 -

Figure 1. Mariah Energy Windspire wind turbine. The units are actually less expensive than anometer placement with the benefit of providing 1.2 kv. The unit is 30 feet tall with a 2 foot diameter cylinder turbine.

Figure 2. Southwest Wind Power Skystream 3.7 is 6,200 which with stand and additional equipment, installation can cost around $15,000.

$15,000 (Figure 1and Figure 2) approaches the cost of installing the tower, anemometer and monitoring equipment (approximately $6,000) require to measure the resource. A 3 kW turbine, including 60-80 foot tower, utility-tie inverter, hardware and installation components, can cost less than $15,000. A homeowner paying $60 - $100 per month for electricity could expect to save 30-60% off their electric bill using a 3 kW turbine. (Savings depend on average annual wind speed, tower height, electrical cost and average electric bill.) The feasibility of additional systems could then be determined by reviewing electric bills – the year before the unit is installed and one year after installation. A homeowner should have an adequate lot, approximately 1 acre, and tolerant of the noise associated with the units to participate in the program.

If the Tribe finds themselves with the property and the interest in a larger scale program, a program is available through DOE to provide "loaner" equipment. The Tribe will have to pay for installation and data logging plus interpretation, but this will provide the data needed before utility sized projects can be considered. Information on the DOE program is included in Appendix 4.

6.0 Geothermal (GeoExchange)

The use of geothermal energy goes well beyond the conversion of heated water or steam from underground sources into electricity. It is possible to take advantage of the nearly constant temperature found in large bodies of water or just a few feet underground to subsidize energy needs. Substantial increases in efficiency for heating and cooling can be obtained by developing a heat exchange system through underground or underwater

conduits. Common names for the systems include geothermal heat pumps or GHPs, ground source heat pumps or GeoExchange.

Analysis conducted by the U.S. EPA has indicated that GeoExchange systems are substantially more efficient than conventional HVAC. For example, the systems were found to be 48% more efficient than gas furnaces, 75% more efficient than oil furnaces and 40% more efficient than air source heat pumps. However, in each case GeoExchange systems are more expensive to install.

Most Casino Resort facilities use refrigerant type air-conditioning systems utilizing outdoor condenser units. All of these units have a variable performance under different outdoor temperatures and humidities. Under extreme conditions, such as 100° F plus temperatures or unusually cold temperatures, a sharp decrease in efficiency can result in increasing cooling costs. In addition, unit capacity can be reduced under these conditions. A principle benefit of the GeoExhange systems is the ability to provide constant operating conditions. Although extreme weather conditions will increase the load, the ability of the system to function does not change.

Further analysis of installation cost and efficiency of current equipment will need to be developed to determine the best application of this technology. However, it should be considered for any new facility and as HVAC equipment depreciates. These systems have residential applications, but due to the often required economy of scale, may not be practical for Tribal housing.

7.0 Biodiesel production

The Tribe has some potential to use diesel for its administrative transportation needs and Tribal vehicles. These fuel needs could be subsidized with onsite development of biodiesel. The nearest provider of biodiesel is in Upper Lake, a 20 minute drive for most residents. In addition, the Tribal members could produce some biodiesel feedstock but the Tribe has no commercial fuel facility for a retail outlet.

With a relatively low cost to incorporate small scale biodiesel production into current infrastructure coupled to high fuel costs, a partnership resulting in converting used cooking oil into biodiesel may be relatively simple. This most likely would be effective as a small scale venture using raw material from the Tribal members and providing fuel for Tribal vehicles or directly to Tribal members. This system would need to be coupled to the existing recycling program and address the potential for regional collection of raw materials although this could be competitive with existing efforts. In conclusion, the most practical approach would be to partner with another interested organization such as a Tribal or private biodiesel producer to provide feedstock in exchange for a lesser amount of diesel for the Tribe to use.

8.0 Biomass

Tribal homes in the Lake County area utilize a variety of heating methods. Many newer homes constructed by federal agencies including BIA and EPA for Tribes include electric heating which is proving to be cost prohibitive for most low income households. Adding to this dilemma, Lake County is attempting to phase out older style wood burning stoves and fireplaces to preserve the areas historically and highly valued good air quality. In the case of the Lake County program, wood pellet stoves are recommended as replacements with a less concern for air quality than other biomass heat sources.

The Robison Rancheria has utilized their DOE First Steps Program to identify home heating is a priority energy issue for all six Lake County, California Tribes participating in the program. To meet this problem, pellet stoves have been identified as a method to provide energy price security, improved confirmable quality and still be protective of public health and safety. As a method to further benefit from this, a program to utilize local sources of biomass, many currently existing as waste streams, is being examined. The goal is to utilize indigenous energy resources to the benefit of local and regional economies.

At this time, there is no local production of wood pellets despite the availability of biomass in the region. During the winter of 2006 - 2007 this resulted in unstable prices and supply problems for current users. The Scotts Valley Band of Pomo Indians will have an option to participate with the Robinson Rancheria as they examine the use of available biomass to locally produce or participate in the production of wood pellets to meet this problem. This should reduce the cost of the pilots themselves, provide for local economic development and divert solid waste to energy production.

To meet this goal the following issues must be addressed:

1. Identification/development and evaluation of home heating systems utilizing wood pellets consistent with existing Tribal housing. Since Tribal housing is often consistent with area low to middle income housing, this would have benefits well beyond the local Tribes.
2. Evaluation of local biomass for wood pellet production. Despite the suggestion of current research, the production of wood pellets often utilizes a relatively high grade of wood. The proof of concept research for this new, innovative energy idea is to determine if it is technologically and economically feasible to use the larger variety of biomass available locally. This material includes woody materials cleared for road management, fire fuel reduction and other land management practices. In summary, this will require evaluation of locally available biomass including a variety of agricultural waste byproducts and unutilized wood available from land management. Evaluation will include production at a bench and potentially pilot scale.

In summary, this system will reduce electrical power use by the Tribal members by providing a potentially environmental and economically sound alternative. In addition,

the production of the fuel locally provides economic development from material currently considered a waste product.

9.0 Green Economic Development

Green economic development can be divided into three categories;

- Supply or service of alternative energy supplies
- Providing other goods and services with a reduced environmental impact
- Recycling

Programs can address one or a combination of these categories to build a successful green business. Alternative energy is identified as a growth industry by most measures and providing supplies or servicing this industry will benefit from both regional and national growth. Providing goods and services not directly related to alternative energy; reworking other businesses to reduce their environmental impact, has a broader application but may or may not address an increasing demand. Among all three categories, recycling has the most established business models. Underutilized biomass waste streams associated with agricultural waste may provide regionally unique recycling opportunities.

Lake County in general has seen growth in both alternative energy, recycling and the use of green products due to local interest. This interest is moderated by the relatively small and less than prosperous local economy but does provide an advantage for some products and services such as the production of wood pellets or industries requiring less expensive but unskilled labor.

Locally, alternative energy related businesses that could be considered include:

- Solar (photovoltaic and water heating) installation
- Wind turbine installation (limited to specific areas)
- Installation of small scale hydroelectric systems

Production of solar panels and solar water heating systems along with wind turbines is not impossible for the area, but the raw materials are not locally available, and transportation and availability of capital may be limited.

Other non-energy related green businesses that could be considered can be divided into two general categories: services and products for a consumer market, and those that address the needs of local industry. In the case of a consumer market, green products must be cost competitive with non-green products. These products have a competitive edge by being perceived as better for the environment and/or healthier to utilize. Bringing green products directly to local industry has much the same goals, but usually supports producers bringing their green products to market.

Recycling is not a new industry to Lake County and local Tribes including the Robinson Rancheria, Big Valley Rancheria and to a lesser extent, Middletown Rancheria have successful recycling programs receiving a variety of products. The relatively small size of the local economy exerts limits on recycling programs. Note that there are no recycling programs that effectively target agriculture, the largest local industry.

Development of a green business plan is beyond the scope of this program. However, the evaluation has uncovered some areas that have a high potential for profit associated with addressing energy needs, such as wood pellet from wood waste programs discussed above in Section 8.0. For Tribes interested in this type of business, it may be most profitable to attempt to combine multiple green approaches to achieve a profitable business that address local needs while using business advantages unique to Lake County.

10.0 Review of Institutional Arrangements

Meeting the energy needs of Tribes requires tailored and unique solutions. The sections above include the tools that are used to develop that solution; the Tribe's energy future will be a combination of those opportunities. The next step in the process is to evaluate the institutional arrangements that are required at Scotts Valley Band of Pomo Indians. Table 2 and Table 3 list those arrangements:

Table 2. Institutional arrangements for solar, wind and biomass.

Item	Personnel/Staffing	Cost	Start	Complete
Solar				
Residential Solar	Quarter time staff for program development	Section 11.3	1st Qtr 2009	1st Qtr 2011
Wind Power	Quarter time staff	$5,000	1st Qtr 2009	1st Qtr 2010
Assessment	Quarter time staff for one year and maintenance support for installation of tower	$5,000	1st Qtr 2009	1st Qtr 2010
Installation	Quarter time staff	TBD	1st Qtr 2010	3rd Qtr 2010
Biodiesel and Biomass	Quarter time staff	$5,000	1st Qtr 2009	1st Qtr 2010
Assessment	Quarter time staff for one year and maintenance support for program development	$5,000	1st Qtr 2009	1st Qtr 2010
Green Business Development				
	Half time for staff to continue development of the business plan	TBD	1st Qtr 2009	2rd Qtr 2009
	Half time for staff to seek capital	TBD	3rd Qtr 2009	2nd Qtr 2010

Table 3. Institutional arrangements for energy conservation plans.

Energy Conservation				
Phase 1 Weatherization	8-16 hours of support for elders and others requiring assistance	$3,520	3rd Qtr 2008	4th Qtr 2008
Phase 2 Weatherization Planning	40 – 60 hours construction consultant	$8,000	3rd Qtr 2008	4th Qtr 2008
Phase 3 Update Standards	80 – 100 hours architect and consulting engineer	$20,000	4th Qtr 2008	1st Qtr 2009

11.0 Energy Needs and Forecast

11.1. Current Energy Providers

There are three different options available for power in the Lake County area. They include PG&E (electric), propane and heating oil including both red diesel (untaxed diesel used for heating and not transportation) and kerosene. Lake County does not have natural gas as an option for heating.

The PG&E electricity rates vary from $0.1143 to $0.3707 per kilowatt depending on usage. As of January 1, 2008, PG&E charged the average customer using 560kWh $74.50 (0.133/kWh) and a customer using 850kWh $147.49 (0.1735/kWh). An additional increase occurred in November of 2008 and is reflected in the provided estimates; 0.175/kWh. An additional increase has been approved for February of 2009.

There are nine different suppliers in the area for propane with the price varying from $2.96 to $3.86 per gallon. Some suppliers offer services to the Native American businesses at a reduced rate. Another supplier offers a rate of $2.96 per gallon for Tribal residential customers and then have step rates from $3.07 to $3.86 per gallon, depending on the usage. For current estimates, we may use $3.30 per gallon.

There are four suppliers of heating oil including kerosene and red diesel. The cost for the red diesel is approximately $3.10 per gallon and the cost for kerosene is $3.99 per gallon. Similar to propane, we may use an estimate of $3.30 per gallon.

Some Tribal members do utilize wood for heating. The source of firewood is predominately from a variety of non-commercial sources. The use of pellets stoves appears to be growing with pellets available at several local retailers.

11.2. Distribution system profile

The only distributed power within Lake County is electricity. Propane is trucked in for residential storage (no natural gas lines). There is no power generation local to the Scotts Valley Band of Pomo Indians but on the nearby Lake/Mendocino county boundary is the Geysers. The Geysers, principally owned by Calpine, is the largest complex of geothermal facilities in the world and spread across a 30 square mile area. The Geysers produce 725 megawatts of electricity to meet the typical power needs of Sonoma, Lake, and Mendocino counties, as well a portion of the power needs of Marin and Napa counties, approximately 60 percent of the power for the North Coast region of California.

Although the geysers facility is outside of the Clear Lake Basin, water to operate the facilities is provided by the Clear Lake communities via a treated wastewater pipeline.

Lake County has approved power purchase agreements with Sun Power Corporation. Environmental, as this report was being developed, installation was in progress. For SEGEP, an Operations agreement was approved by the BOS in November 2007 allowing

NCPA to install an additional 13 acres of solar arrays to support the large recycled water pump station located at the Lake County South East Treatment Plant Facility.

Two hydroelectric facilities are located east of the Scotts Valley Band of Pomo Indians. (Figure 3, Figure 4). These small dams are both owned by Yolo Water and Power Company. The Yolo Water and Power Company finished construction of Cache Creek Dam in 1914. It is situated five miles downstream of Clear Lake and was built to store winter water in Clear Lake that would normally run off into the Sacramento River. Cache Creek is the outlet from Clear Lake, but a rock ledge known as the Grigsby Riffle limits rate at which water can flow past. The District planned and constructed the hydroelectric project below Clear Lake in 1986. This project has a rated capacity of 1750 kW. The operation of the power plant is incidental to the District's operation of its facilities for water supply. In 1998, the District lowered the tailrace from the project and installed an inflatable spillway gate on the dam to facilitate removing debris. This resulted in an increase in energy production.

The Indian Valley Dam Hydroelectric Project was retrofitted to the outlet works of Indian Valley Dam in 1983, and has a rated capacity of 3100 kW. The operation of the power plant is incidental to the District's operation of its facilities for water supply and flood control.

11.3. Energy Use/PV Design

The availability of energy use information was limited for this project. Both administrative and housing energy use was found to be predominately electrical but the exact amounts were only presented occasionally and often convoluted by ill defined metering. However, enough data was found to determine that Tribal housing generally followed area norms for electricity use: the power bills presented and known size of the homes followed those presented as average for the area.

Tribal housing that would be considered for installation of PV systems was found to generally between 1,200 and 1,400 square feet with an electrical use of 500 to 600 kwh per month (Table 4). Overall, housing size was found to be consistent on the Rancheria for single family, stick build homes providing an opportunity for development of nearly uniform PV installations. Tribal housing typically follows this trend, multiple houses build of very similar design in groups to reflect funding availability. Sizing a PV system for this type of home results in a 20 panel system based on 200 watt panels. The would produce a total of 553 kwh per month and at the current rate of $0.175 per kwh, the value of the electricity would be a minimum of $96 not including known rate increases, taxes or higher use rates.

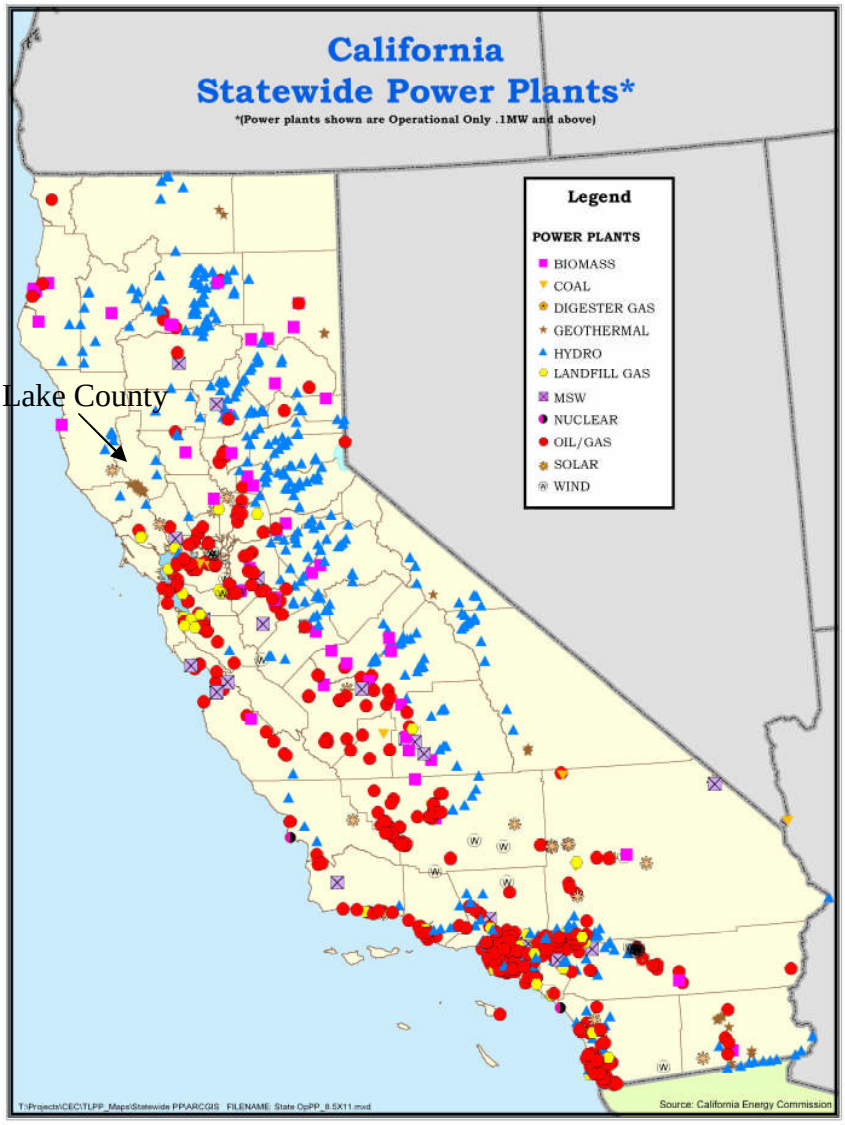

Figure 3. Power plants in California. Note the two hydroelectric and multiple geothermal facilities. This map does not include the newly re-opened Bottle Rock Geothermal facility located just north of the existing Geysers facility and south of Robison Rancheria. Map from the California Energy Commission and updated May 2008

Figure 4. One of the larger Calpine facilities at the Geysers. Photo from www.geysers.com.

For an individual to purchase this system, the total cost before rebates and incentives would be $27,750. This total can be subsidized through a state and utility program at $1.90 - $2.65 per watt and a federal tax subsidy of 30%. Starting in 2009, the tax subsidy will be unlimited and transferable. This means that a homeowner will have the $1.90 - $2.65 ($9,540 maximum) subsidy available to meet installation costs but will have to "front" the money in the tax credit ($6,000) until that years taxes are completed and the savings are realized through a lower tax bill or larger rebate.

Table 4. Data summary for Scotts Valley Band of Pomo Indians power use and PV design

Total Size of System	4 kw (20 units of 200 watt panels (rated))
Production	553 kwh per month
Useable output	3,600 watt
Solar Insolation	5.2
System Cost	$27,750 total, $9,885 actual
Federal Tax Credit (no limit starting 2009)	30% ($8,325)
State/Utility Credit	$2.65 per watt ($9,540)
FINAL COST PER HOME	$9,885
Savings per month	553 kwh, at $0.175 per kwh, $96.70/month
Payoff at $0.175	8.38 years

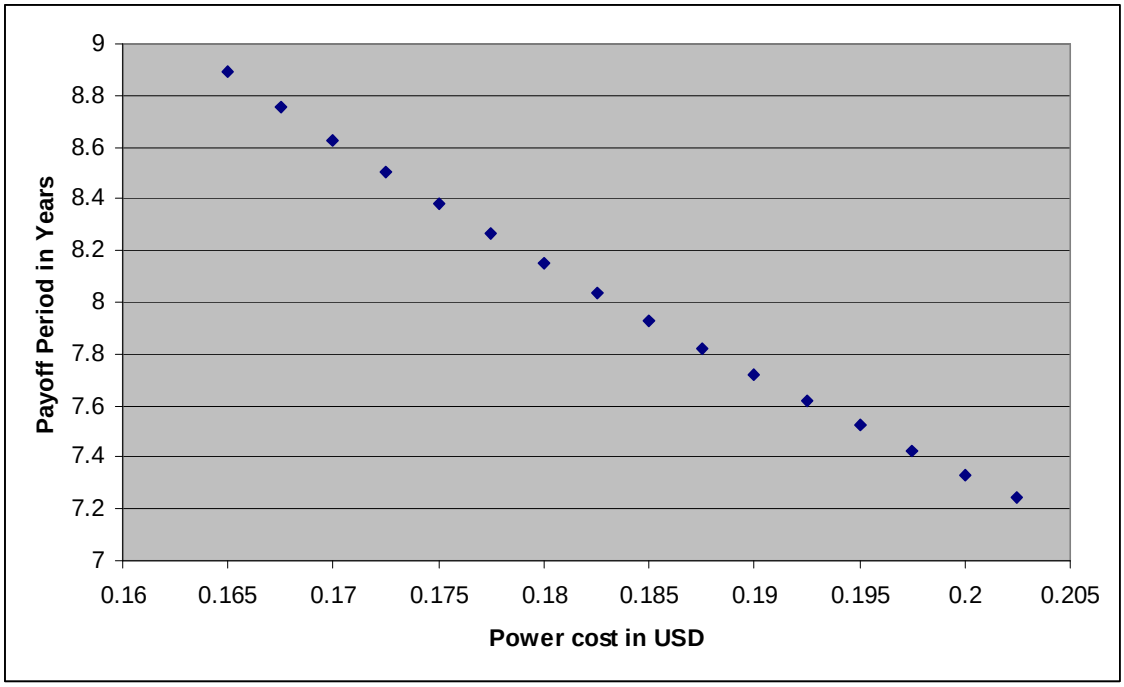

Figure 5. Payoff period for a typical Tribal home using a 4kw PV system with both a $2.65/kw (actual) and 30% tax rebate (after 1.1.09) payoff with variable energy cost. Currently, with power at $0.175 per kwh average, the payoff period is 8.38 years.

The tax rebates may not be practical for lower income Tribal members. To recover the required credit, household income must exceed a taxable household income of approximately $60,000 a year. However, the tax benefit may be transferable allowing for an external market to subsidize lower income homes or it can be used over more than one year.

Some of the issues with the rebate may be solved with combined design. The close proximity of housing allows for placement of the panels in a common area. This would reduce installation cost by 10-25% and may allow a combined approach to financing. This could include sale of the tax benefit and increase potential for grant or subsidized interest financing.

11.4. Commercial Applications (Casino)

Energy use by the casinos can be difficult to estimate. Data is often considered proprietary and even floorspace can be difficult to determine due to the combination of hotels, bars, restaurants, meeting rooms, offices and multi-use gaming spaces as well as constant addition and renovation. Review of Lake County casino energy information however does indicate that a megawatt scale system could be practical for all of the Lake County Casinos and still provide for net metering arrangement with PG&E. Even smaller casinos in the area require more than 1,500,000 kwh per year, often buying large amounts of electricity in peak use periods; summer afternoons (Table 5). This makes casinos excellent candidates for use of PV systems, the cost to the facility is higher than residential per kwh and a significant economy of scale can be achieved.

Installation of a photovolataic system includes sizing to meet energy needs and meeting potential financial support that may be available through rebates, grants or subsidized lending. In addition, larger projects can benefit from an economy of scale. For casino installation, 1 megawatt or larger, the economy of scale has been reached which allows for phased installation to meet potential financial limits. In other words, the first phase of the system, 1 megawatt, will not meet all the energy required by the facility but no cost savings are lost by delaying further installation.

A one megawatt system also benefits from increased certainty of incentives. Larger systems require additional negotiation with the utility companies to find the optimal rebates et cetera; 1 megawatt is the maximum facility to qualify for the California Solar Initiative. This rebate is provided over a sixty month period at a rate of $0.32/kwh each month for a total of $3,264.000 (Table 6).

Table 5. Power use by a Lake County Casino, a small tent-type facility.

Service ID#	Date	Kwh Billed	Days Billed	Kwh per Day
Auxillary Facility	Service Dates			
1455213918	02/15/2008-03/15/2008	3293	30	110
	01/16/2008-02/14/2008	3385	30	113
	12/15/2007-01/15/2008	3485	32	109
	11/16/2007-12/14/2007	3069	29	106
	10/18/2007-11/15/2007	3297	29	114
	09/18/2007-10/17/2007	3586	30	120
	08/17/2007-09/17/2007	5142	32	161
	07/19/2007-08/16/2007	4575	29	158
	06/19/2007-07/18/2007	5341	30	178
	05/18/2007-06/18/2007	3271	32	102
	04/17/2007-05/17/2007	3491	31	113
	03/20/2007-04/16/2007	3030	28	108
	TOTAL	***44965***	***362***	***124***
Outdoor lighting				
7892640005	02/15/2008-03/15/2008	215	30	7
	01/16/2008-02/14/2008	158	30	5
	12/15/2007-01/15/2008	33	32	1
	11/15/2007-12/14/2007	30	30	1
	10/17/2007-11/14/2007	56	29	2
	09/18/2007-10/16/2007	94	29	3
	08/17/2007-09/17/2007	91	32	3
	07/19/2007-08/16/2007	74	29	3
	06/19/2007-07/18/2007	65	30	2
	05/18/2007-06/18/2007	76	32	2
	04/17/2007-05/17/2007	83	31	3
	03/20/2007-04/16/2007	83	28	3
	TOTAL	***1058***	***362***	***35***
Main Facility				
4230928001	02/15/2008-03/15/2008	121200	30	4040
	01/16/2008-02/14/2008	122760	30	4092
	12/15/2007-01/15/2008	126240	32	3945
	11/15/2007-12/14/2007	122160	30	4072
	10/17/2007-11/14/2007	120000	29	4138
	09/18/2007-10/16/2007	119760	29	4130
	08/17/2007-09/17/2007	153240	32	4789
	07/19/2007-08/16/2007	140520	29	4846
	06/20/2007-07/18/2007	131160	29	4523
	05/18/2007-06/19/2007	143880	33	4360
	04/19/2007-05/17/2007	115680	29	3989
	03/20/2007-04/18/2007	112680	30	3756
	TOTAL	***1529280***	***362***	***4223***
		Annual		**1575303**
		Average per day		**4382.7**

Table 6. Cost estimate for a Casino PV system.

System Size		1 megawatt
Module Count		5,700
Module Label wattage		200
CEC Module rating		177.5
Monthly KWH production from system		170,000
Footprint		App. 6 acres
System Cost		$7,600,000.00
Less:		
	CSI Rebate/month	*$54,400.00*
	CSI Rebate 60 mos	$3,264,000.00
	Fed IRS Credit	$2,280,000.00
	Avoided PGE/mo	*$22,210.00*
	60 months PGE	$1,332,600.00
Cost after incentives	(at 60 months)	$723,400.00
Simple Payoff Period (Cost/production) Years after incentive period (5 years)		2.71

There are grant programs that can also be potentially accessed by the Tribe. These include the Rural Energy for America Program (REAP) that will pay for 25% of qualifying projects.

The system will provide $22,210 of electicity per month at current rates not inlcuding taxes, peak rates and other expenses. Considering the historic trend for electicity costs, increasing at 8% per year, this value could increase to over $30,000 of electricity per month at the end of 5 years.

To summarize, the system can be subsidized with the following programs:

- The federal tax credit of 30% can be applied to both commercial and residential systems. The tax incentive for this program is dependent on the ability to recognize the tax credit. The federal tax credit is transferable (26 USC & 48 from HR 1424: Div B, the energy improvement and extension act of 2008, IRS form is 3468) and a market is developing since caps on the credit have been removed. The credit can also be used over several years. The Tribe should expect the total benefit of this program to be less if the credits have to be sold to account for fees and incentives for buyers.

- The PGE incentive is payed over 5 years (60 months) and is paid based on system production. Subsequently, finacing will need to be in place to cover up front expenses equal to this amount in additional to remaining expenses.

- Grant funding may be available for this project including the REAP program. This program can provide up to 25% of the funding for project of this type. It is recommeded to seek application to the program as soon as it becomes available in early 2009. The project is feasibile without this program but it can signficantly reduce the financing needs.

- A carbon offset market may be accesible to this project. It is recommeded to make the attempt to sale carbon offset from the project, but the market is volatile and can be expensive to access.

12.0 Energy Options Analysis and Resource Planning

12.1. Solar

The Tribe can address residential solar application in the short term and utility scale projects in the long term or associated with currently planned construction of gaming facilities. Short term efforts to provide residential solar installations to Tribal Members can include:

- Identification of appropriate properties
- Negotiation with PG&E to optimize incentives
- Determining the best use of federal tax incentives
- Finding financial support to meet the approximately 40% of the cost remaining after rebates and subsidizes

Longer term efforts can be associated with the economic development program for the Tribe starting with the planned gaming facility. This can include:

- Developing a preliminary design of a PV system for the new gaming facility
- Determining if it can be added to current construction plans or implemented in a future phase
- Estimated cost of the additional facility

12.2. Wind

Like solar, wind energy has both residential and utility scale (commercial) potential. The cost of residential units has dropped to the point that installation of a small grid-tie unit is potentially less than installing a tower and anemometer. However, if the interest is for utility scale units, then larger towers are required than standard residential units and more accurate wind determinations.

Both a traditional and, less expensive, non traditional unit are described in Section 5.0 for use in residential installations. These units range in price from a few thousand to $15,000.

It is recommended that the Tribal Environmental Office contact the National Renewable Energy Laboratory's (NREL's) Native American Anemometer Loan Program (www.windpoweringamerica.gov/na_ anemometer_loan.asp) for a no-cost loan of a tower and anemometer for utility scale wind estimates. Funding will need to be found for installation, but this may be solved by partnering with U.S. EPA which needs the tower for meteorological data for planning site assessment and remediation.

The forms for the program are included in Appendix 4.

12.3. Biomass

Many newer homes constructed by federal agencies including BIA and EPA for Tribes include electric heating which is proving to be cost prohibitive for most low income households. Adding to this dilemma, Lake County is attempting to phase out older style wood burning stoves and fireplaces to preserve the areas historically and highly valued good air quality. In the case of the Lake County program, wood pellet stoves are recommended as replacements with a less concern for air quality than other biomass heat sources.

The Robison Rancheria has utilized their DOE First Steps Program to identify home heating is a priority energy issue for all six Lake County, California Tribes participating in the program. To meet this problem, pellet stoves have been identified as a method to provide energy price security, improved confirmable quality and still be protective of public health and safety. As a method to further benefit from this, a program to utilize local sources of biomass, many currently existing as waste streams, is being examined. The goal is to utilize indigenous energy resources to the benefit of local and regional economies.

At this time, there is no local production of wood pellets despite the availability of biomass in the region. During the winter of 2006 - 2007 this resulted in unstable prices and supply problems for current users. The Robinson Rancheria is examining the use of available biomass to locally produce wood pellets to meet this problem and may provide a partnering opportunity for the Tribe.

In summary, this system will reduce electrical power, petrochemical and more air pollution intense biomass product use by the Tribal members. In addition, the production of the fuel locally provides economic development from material currently considered a waste product.

12.4. Green Economic Development

Green economic development will start with an evaluation of local business opportunities compared to the abilities and interests of the Tribe and its members. Both the positive local attitude toward green business and green products is an advantage. However, the local economy and transportation potential can limit the types of business that are practical.

The Scotts Valley Band of Pomo Indians has developed a business plan for a solar installation business (Appendix 5) under a previous program. This program provides a starting point for Green Economic Development for the Tribe. In addition, this program provides services expandable outside the area but less sensitive to local limitations.

Appendix 1. Notes from the First Energy Meeting

Vision Statement

Increase the use of alternative energy to reduce energy expenses for the Tribe and its members and incorporate energy planning/use of alternative energy in construction and economic development.

1. Rank your current energy issues and interest

1. Energy conservation
2. Solar energy
3. Wind power
4. Geothermal
5. Geoexchange
6. Biodiesel
7. Biomass

2. Number of residents: 20

3. Number of Homes: 5, 1 pending

4. Different home types with size (sq. feet) and age

All modular, 3 completed in 2006, 2 build in 1998. All are 3 bedroom and 2 bath between 1,000 and 1,200 sq. ft.

5. Heating method: 3 all electric and 2 are propane

6. Cooling method: swamp cooler

7. Acres of open development: (no trust property, fee land development currently in limbo)

8. Availability of groundwater for non-potable use: yes, both groundwater and seasonal surface water. (check gradient/altitude loss on ditch at the red hills property)

9. Is your Tribe interested in the edition of alternative energy to existing administration and commercial buildings, both prospect and physical potential? If yes, please list which buildings.

Pump house solar or wind. Ozone system may be energy intensive.

10 Maintenance capabilities: very limited (no maintenance crew)

Install insulation, caulk windows and other simple home maintenance:
Install attic fans or more involved improvements:
Include an electrician or interest in installing solar energy equipment:
Training opportunities:

11. List other energy issues the Tribe has an interest in addressing.

12. Is the Tribe interested in alternative energy technologies for economic development?

Biodiesel may be a component of a planned fuel station/quick stop type economic development.

Tribal members have been trained to install solar and are interested in working with the Environmental Staff to develop a group to retrofit Tribal homes for solar.

Appendix 2. Commercial and Utility Scale Solar Power Implementation for California Tribes

Commercial and Utility Scale Solar Power Implementation for California Tribes

This report is written for Tribes that have already determined that solar energy is a desired component of an energy and economic development program. The report will discuss the California Solar Initiative application process, projected costs, system design criteria and application fees required for connecting to the grid. Although Tribes may or may not directly benefit from some of these state programs, they serve as an entry into the local energy market. These regulations will also be an important part of the decision making process by representing the interface between the potential Tribal energy project and markets beyond the Rancheria boundary.

The California Solar Initiative is a component of the Go Solar California effort and includes the principle California utility companies; Pacific Gas & Electric (PG&E), Southern California Edison (SCE), and San Diego Gas & Electric (SDG&E.) and is overseen by the California Public Utilities Commission (CPUC). Starting in 1998, rebates for small solar energy systems were managed as part of the Emerging Renewables Program (ERP) at the California Energy Commission. A second program that covered rebates for larger systems, over 30 kW, was assigned to the California Public Utilities Commission (CPUC) was developed as the Self-Generation Incentive Program (SGIP) in 2001 and managed by the CPUC. This was followed in 2004 by the Million Solar Roofs Program.

To provide more centralized management of these programs, CPUC collaborated with the Energy Commission to develop the framework of the California Solar Initiative Program in 2006 as a ten year program.

California launched two new solar incentive programs and modified requirements for the older programs as part of the 2007 Go Solar California. Since then, the New Solar Homes Partnership (new construction) is managed by the Energy Commission with other facilities seeking solar energy rebates and operating in investor-owned utility territories coordinated through the CPUC administered program, the California Solar Initiative.

Changes in system evaluation for government support have also changed from simple stated efficiency to performance factors. These factors include angle, tilt and location with the intent to use rebate funds to optimize solar power generation. These same programs also provide incentives to wind and fuel cell programs.

California Solar Initiative Application Process

The following steps are required to initiate the process:

1. Complete an Energy Audit

   The application process for taking part in the California Solar Initiative (CSI) program begins with an energy audit, which is required to take part in the program and to be submitted with the application. There are three ways to complete an energy audit:

   • Phone Audit: Call the Solar Customer Service Center 1-877-743-4112
   • Use the PG&E business energy analyzer.
   • Direct: Contact your local PG&E division account representative.

   An exemption to the audit can be made by:

   • Provide a copy of an energy audit completed in your facility in the past 36 months
   • Provide a copy of your building's ENERGY STAR or LEED certification
   • Submit a copy showing your business complies (ENV-1-C, MECH-1-C, LTG-1-C, and OTLG-1C prepared by a Certified Energy Plans Examiner) with the 2001 or 2005 CA Title 24 Energy Code

2. Select an Installer for a Solar Site Survey

   A solar installer will site survey your facility and or property to determine the most efficient site for the system. The property should have clear, unobstructed access to the sun for most of the day, through the year. Trees may have to be removed if it will obstruct any of the sunlight.

   A bid process should be utilized in the selection of an installer with factors such as company reputation, warranty service, price and energy output.

3. Complete and Submit Application for California Solar Initiative

   The application process includes a Rebate Application as well as an Interconnection Application. Financial incentives are offered through the California Solar Initiative program for PG&E customers that install solar systems 1 kilowatt to 1 megawatt for onsite generation.

   The Net Energy Metering (NEM) application is required for all photovoltaic systems that are installed to operate in parallel with the utility grid. The Tribe will need to enter into an interconnection agreement with PG&E by submitting the appropriate application forms. There are two different NEM applications, the first being for all

solar systems that are less than 10 kw and the second for all solar systems greater than 10 kw.

Permits are typically required for building and electrical installation. The building permit may not be required if the structure is constructed on Tribal trust property. The electrical permit may also not be required but it would be recommended that what permits would be required for Tribal solar projects be reviewed to insure construction quality.

A final inspection will be required for all building and electrical permits. It is crucial that the utility final inspection include an onsite utility inspection as well as meter installation inspection.

4. Claim Incentive and Tax Credits:

The completion of the CSI application process will allow the Tribe to claim any incentives as well as possible tax credit for the system.

Costs

Utilization of an online calculator estimates that approximately 6.4 acres will be required for a 1 MW solar system. Discussions with vendors indicate that a system will require 8 to 10 acres to include access and allowances for terrain. Solar photovoltaic systems have high initial capital costs but have low maintenance cost during the service life of the system. Other costs that may be accrued during the implementation include the application fees for taking part in the CSI program as well as equipment including substation, safety equipment, meters and instruments.

There are three different types of photovoltaic systems, thin-film, crystalline silicone and concentrator. Crystalline silicone photovoltaic systems cost approximately $3.10 per watt. Thin-film systems and concentrator systems costs approximately $1.75 to $2.10 per watt for initial construction. A 1 MW solar system could include equipment cost approximately $3.1 million for a crystalline silicone PV system and between $1.75 million to $2.1 million for a thin-film and concentrator system respectively. However, further evaluation would be required to determine actual costs including installation and connection costs. It should also be noted that costs for photovoltaic equipment is not static.

Connection to the Grid:

When new large power facilities are connected to the grid, the grid facilities must be adjusted to handle it. Grid connection usually takes place at a substation, either an existing substation with room for growth, or at a new substation built for the project. Further review and negotiation with PG&E will be necessary to determine if an existing substation is available or if a new substation must be built. The owner of each substation allows new customers on the system on a first-come-first-served basis. To determine if

there is available capacity between that substation and the new generator's customers, studies must be made and shared with the regional body of the North American Electric Reliability Council (NERC) to determine the impact of the new addition to the system. These studies can be quite expensive, depending on the location on the grid and the size of the project. However, completing these studies and applications would allow the Tribe to compete effectively with other applications.

All newcomers to the grid must meet numerous standards. The studies described above provide for the safety of the interconnection and document effect the interconnection will have on the grid, and hopefully prove that power can travel to the customers of the generator. In addition to these studies, interconnection standards must be considered. Standards are policy level, such as non-discriminatory access; physical, such as the types of equipment that are necessary; and process, such as the safety steps for actually hooking up new facilities.

If a system is interconnecting with a federal or state regulated public utility, the state and/or federal rules should be researched. If the interconnection is at the wholesale level (at higher voltages for larger facilities) federal standards will apply. Regulated utilities will have federally approved tariffs governing larger interconnections. The Federal Energy Regulatory Commission (FERC) is in the process of establishing new federal rules that govern interconnections and attempt to standardize the procedures and standards for all new wholesale interconnections. The new rules are drafted to remove impediments to the interconnection of renewable energy systems and to encourage fair and non-discriminatory access to the grid. Once the new federal rules are in final form, they will require that all jurisdictional utilities conform to the new federal rules. If any party feels they are unfairly restricted from access to a grid interconnection under the federal rules, a filing of a protest or other appropriate filing may be made before FERC.

When interconnecting with a non-regulated utility, a Tribe should contact the utility to determine their rules. Copies of all published rules should be obtained, along with the charter and bylaws of the utility, so an understanding of how rules are made can be researched.

All interconnections are subject to interconnection agreements. The agreement forms are often standardized and describe the procedures, practices, tariffs, and other terms of an interconnection. When forming these agreements, the advice of legal experts is usually needed to assure that all parties have fully negotiated all the important matters.

Application Fees:

In addition to the Reservation Request Form and Required Attachments, Applicants will also be required to submit an application fee. Applicants with projects that are residential, or less than 10 kW, need not pay an application fee.

The application fee is 1 percent of the unadjusted requested CSI Program incentive amount. Application fees will be rounded to the nearest dollar amount. The formula for the EPBB or PBI fee is as follows:

Application Fee = (System Size Rating x current applicable/equivalent EPBB incentive rate) x 1%

- Applicants may submit the application fee with the Reservation Request Application with original signatures. If the application fee is not received with the Reservation Request Application, the Program Administrators will invoice the Host Customer (utility customer of record) after review of the Reservation Request Application package.

- The Host Customer will have 30 days to submit payment for the application fee in order to activate the Reservation Request. The payment must reference the project (by invoice number, facility address, and/or application number).

- Program Administrators will accept payments from either the Applicant or a third party on behalf of the Host Customer for a particular project; however, a returned application fee shall only be paid to the Host Customer.

- Program Administrators will only accept application fees in the form of a check. Cash, credit cards, money orders, promissory notes, etc. will not be accepted.

- Application fees will be linked to reservation numbers, not to the project sites; therefore, the project must be completed under the same reservation number as the one linked to the application fee.

- Upon verification of the installed CSI project and initial incentive payment, the application fee will be returned in full to the Host Customer.

- No interest shall be paid on application fees.

Recommendation

A net metering arrangement can be completed in a relatively short amount of time. This would allow a less than utility sized system to be quickly installed to meet the needs of the casino and nearby power users without issues with connection to substations or more intense grid components. In addition, excess power may be sold at a wholesale rate for the less than utility sized facilities. This primary system to meet the energy needs of Tribal economic development along with other nearby facilities might provide an efficient first step. If properly designed, this system could be expanded and re-licensed as the current obtuse regulatory market issues resolve or economic factors dictate.

Appendix 3. Home Solar Installation 101/Sizing of PV Systems for Residential Homes

The sizing of the photovoltaic system depends on various factors; the amount of electricity consumed on average annually, the orientation and tilt of the system as well as the available space.

Standard "stick built" and manufactured homes can be retrofitted for solar power with minimal roof penetration. Mobile homes do not have the structural strength to support any additional roof loading from the panels but the alternative would be to create a carport or covered patio that would still allow solar power to be utilized for the residence and also create a shade area. Sole use structures are sometimes an option but lack the economy of dual use, security and protection from shading a taller, multi-use structure provide.

The size of the system depends on what percentage of electricity is desired to be replaced by solar power. A typical dimension for a photovoltaic panes is 3' x 5'. The panels weigh approximately 50 lbs per panel or 3.3 lbs per square foot. A standard 1200 square foot home would require approximately 12 to 20 panels per house to obtain 2.5 to 4 kilowatts of electricity. 12 to 14 panels would be the estimated minimum to obtain a power offset of 50%.

The following is a general conditions example for generating 3Kw of energy to a 1,200 square foot home.

Number of Panels for Desired Energy Offset to supply 3Kw for 1,200 square foot home (General conditions – additional information required to determine exact values)

% Energy Offset	Number of 3'x5' PV Panels
50%	12 to 14
75%	15 to 16
100%	17 to 20

The number of panels would slightly increase for a 1,500 sq foot home with an emphasis that exact numbers can only be obtained after an analysis of electric bills for the last twelve months.

In order for the solar PV system to become as efficient as possible, each residence must take steps to minimize existing electricity consumption including proper weatherization and reducing energy usage.

Costs:

Typical costs for installation of a PV system range from $4.50 to $5.10 per watt including rebates. To install a 3Kwatt system for a 1,200 square foot home, the approximate costs would vary from $13,500 to $15,300.

The PV system should be sized to equal or be less than the existing annual consumption. A general rule of thumb is to take the annual consumption (in kWh) and divide that by 1300 kWh/yr. (1kW of photovoltaics will generate about 1300 kWh per year).

Installer Requirements and Training:

The California Solar Initiative requires that the system must be installed by a "appropriately licensed California solar contractors". Also it is recommended that the installer be certified by the North American Board of Certified Energy Practitioners (NABCEP) and that all installers must be pre-approved.

PV system installation contractors must have an active A, B, C-10, or a C46 license for photovoltaic (PV) systems.

Attached are excerpts from the California Solar Initiative Program Handbook detailing installer requirements, warranty requirements and circumstances requiring additional documentation for owner-installed systems. Also included is the homepage for the

Additional Resources & Links:

Go Solar California State website
http://www.gosolarcalifornia.ca.gov/

California Solar Initiative
http://www.pge.com/csi

PG&E: Self Generation Program
http://www.pge.com/selfgen/

U.S. Department of Energy – Tribal Energy Program
http://www.eere.energy.gov/Tribalenergy/

California Solar Energy Industries Association
http://www.calseai.org/

National Renewable Energy Laboratory (NREL)
http://www.nrel.gov

Appendix 4. National Renewable Energy Laboratory's (NREL's) Native American Anemometer Loan Program Forms (www.windpoweringamerica.gov/na_ anemometer_loan.asp)

National Renewable Energy Laboratory Native American 20-Meter Tower Anemometer Loan Program Description

Borrower Eligibility Requirements

The borrower must be a Native American Tribe. Generally, only one anemometer will be lent to a given tribe; however, more than one anemometer may be borrowed given sufficient justification.

Borrowing Process

The borrowing process consists of the following steps:

- Application and approval
- Loan agreement and shipment of the anemometer
- Anemometer installation
- Return of the installation kit
- Data collection and analysis
- Return of the anemometer and tower
- Meeting to review results

Application and Approval

Native American Tribes may request an anemometer by sending an application to the NREL contact listed below. The purpose of the application is to verify that:

- The borrower has the capability to properly install, maintain, and dismantle the anemometer and anemometer tower;
- The borrower will replace the data plugs monthly;
- The borrower has identified potential sites that have a favorable combination of good wind resource, road access, transmission proximity, and land ownership. NREL will review and confer on site selection.
- The borrower has envisioned a viable project concept if the wind resource is sufficient

Once the loan request is approved, NREL will notify WAPA to process the loan agreement. (You can download an example loan agreement form from the Wind Powering America Web site, http://www.windpoweringamerica.gov/)

Loan Agreement and Shipment of the Anemometer

Upon receiving approval to borrow an anemometer, tribal representatives should contact WAPA to execute a loan agreement and arrange for the anemometer to be shipped. The loan period will be for up to 14 months. This should allow enough time for shipping, installation, collecting one year of data, disassembly, and return shipping.

The Equipment
Each anemometer set consists of an NRG Wind Explorer anemometer, wind direction vane, data logger, 20-meter tower, and an installation kit. The data logger collects and saves wind speed and direction data.

Anemometer Installation
NREL will provide technical assistance with the installation of the tower and programming of the data logger.

The anemometer includes an installation kit consisting of a gin pole, winch, and miscellaneous equipment needed to raise and lower the tower. The number of installation kits is limited. Therefore, please install the tower and anemometer promptly when it arrives (within 30 days) and return the installation kit to WAPA.

Return of the Installation Kit
Prompt return of the installation kit will prevent delays in shipping anemometers to other users. Please let WAPA know if you already have tower raising equipment and do not need an installation kit.

If for any reason, the tower must be lowered, the borrower may contact WAPA and an installation kit will be sent. Although we understand that this is a cumbersome and time-consuming process, budgetary constraints prevent us from purchasing an installation kit for every tower. However, because this equipment has a good reputation for reliability, we expect that most users will not need to lower their anemometer tower prior to the end of the data collection period.

Data Collection and Analysis
The anemometer's data logger collects continuous wind speed and direction data. This data is stored as 10-minute average data in a data plug. Each anemometer will include two (2) data plugs. Each plug will hold roughly seven months of ten-minute data. However, as part of the loan agreement, the user must replace the plugs monthly. Each time a plug is replaced, the user must mail the plug containing data to Robi Robichaud at the address below. Please be sure to include a return address so that the data plug can be returned after the data has been downloaded and processed. A copy of the data results will be sent to the borrower and NREL will publish a full report upon completion of the monitoring period. **Please be advised that all wind speed data will be public domain**. (You can download an example data results from the Wind Powering America Web site, http://www.windpoweringamerica.gov/)

Return of the Anemometer and Tower

Upon completion of data collection, WAPA will send the borrower an installation/disassembly kit so that the tower may be taken down. Prompt action on the part of the user (30 days) is requested so that the installation kit may be quickly returned and made available to another user.

Meeting to Review Results
NREL will meet with Tribal representatives to discuss the output.

Agency Roles and Responsibilities
NREL selects qualified borrowers and offers technical support on siting, installation, and operation of the anemometers as well as analysis of the collected wind speed data. WAPA manages the lending of the anemometers.

NREL Contact
Robi Robichaud
National Renewable Energy Laboratory
1617 Cole Blvd., MS3811
Golden, CO 80401
Phone: 303-384-6969
Fax: 303-384-7097
E-mail: robi_robichaud@nrel.gov

WAPA Contact
Richard Burnkrant
Western Area Power Administration
12155 West Alameda Parkway
Lakewood, CO 80228
Phone: 720-962-7420
Fax: 720-962-7427
E-mail: Burnkran@WAPA.gov

National Renewable Energy Laboratory Native American 20-Meter Tower Anemometer Loan Program Application Instructions

Introduction
The National Renewable Energy Laboratory's (NREL) Native American Anemometer Loan Program is administered jointly by NREL and the Western Area Power Administration (WAPA). To participate in the program, follow the instructions below for completion and submission of an application letter. This letter must be completed before the request can be processed. (Completion of the application does not guarantee the loan of an anemometer.)

Instructions
Read the loan program information that describes the program and details the borrower's responsibilities. Please contact Robi Robichaud (contact information below) if you have any questions or need assistance preparing the application.

Prepare an application letter containing the following information:

1. **Intentions/Potential Projects**: Please describe the potential projects that the tribe/reservation could feasibly undertake given a proper wind resource (A-C). The information needed depends upon the type of project envisioned.

    A. For each potential off-grid project, please provide:
        1. Load description. Describe the load both qualitatively (e.g., residences, water pumps, etc.) and if possible, quantitatively (e.g., number of kilowatt (kW) hours per day or per month or average kW)
        2. Topographic map showing the location of the load(s) and potential wind turbine locations.

    B. For each potential on-grid project please provide:
        1. Load description. Describe the load both qualitatively (e.g., residences, casinos, water treatment plant, etc.) and if possible, quantitatively (e.g., number of kilowatt (kW) hours per day or per month or average kW)
        2. Topographic map showing the location of the load(s) and potential wind turbine locations.

    C. For each potential wind farm project please provide:
        1. Topographic map showing the location and, if possible, the capacity of existing electrical lines and substations and potential wind turbine locations.

Note: Maps should delineate Tribal land and indicate areas that, for whatever reason, cultural, legal, etc., are excluded from consideration.

Note: Review a brief primer on wind project siting. (You can download this document from the Wind Powering America Web site, http://www.windpoweringamerica.gov/)

2. **Installation and maintenance**: While the towers and anemometers are designed for simple installation, this is not a trivial task. In addition, the installed anemometer will require monitoring and monthly changing of the data plugs. Who will be responsible for installing the tower and anemometer? (NREL will provide technical assistance if needed.) Who will be responsible for monitoring the equipment and replacing the data plugs?

3. **Contact**: Who will be the point of contact (POC) for the request?

4. **Address**: Shipping address for the anemometer.

5. **Authorized signature**: The request must be signed by a tribal authority.

Send the application to:
Robi Robichaud
National Renewable Energy Laboratory
1617 Cole Boulevard, MS 3811
Golden, CO 80401
Phone: 303-384-6969
Fax: 303-384-7097
Email: robi_robichaud@nrel.gov

Appendix 5. Preliminary Business Plan for a Tribal business to install solar energy systems and manufacture PV system accessories

NATIVE SOLAR

A Preliminary Business Plan

for a Tribal business to install solar energy systems and manufacture PV system accessories

Scotts Valley Band of Pomo Indians

March 2008

Prepared with Technical Support by:

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NATIVE SOLAR
A Preliminary Business Plan for a Tribal business to install solar energy systems and manufacture PV system accessories
Scotts Valley Band of Pomo Indians

March 2008

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Summary

The proposed business will include installation of residential and business solar power systems and manufacturing of photovoltaic (PV) panel accessories including mounting equipment. The business start-up will target installation of PV systems for Tribal housing. Planned growth includes expanding the manufacturing of roof mounting equipment and other PV panel installation equipment, providing services to larger commercial customers and developing utility sized projects. The business represents a unique model which markets solar power systems adapted to a more uniform and lower cost housing type.

As solar technology continues to expand into more diverse residential markets, the need for less customized, lower cost uniform applications will increase. This creates a situation where meeting the demand in Indian Country; lower cost and more uniform application on prefabricated and track-type housing, is a precursor to a an emerging market. In other words, to meet the needs of the Tribes, the company will develop a number of relatively uniform installations for the relatively uniform Tribal housing. Since Tribal housing is not unique and often reflects the vast majority of non-Tribal housing, this will prepare the company to meet the emerging and potentially much larger future residential solar market.

The initial business will be housed in a mixed light industrial/commercial area requiring approximately 500 ft.^{2} of office and customer meeting space, 1000 ft.^{2} of light industrial space and 500 ft.^{2} of warehouse space. A possible site, 7130 Red Hills Road, Kelseyville, is a fee-simple (non-trust) single piece of property located at the southeast intersection of Red Hill road, a county arterial, and State Highway 29 in unincorporated, rural Lake County. Of the approximately 35 acres of this single piece of property, about 20 acres along the Highway frontage are currently zoned Commercial Resort. Use of this site is contingent on current County of Lake General Plan policies and Zoning Ordinances and the possible revisions in the property lines from the eventual widening of Hwy 29 by Cal Trans. In the event this parcel is not available to the business at the future start date, it is proposed to find another location for the business somewhere in Northwest Lake County.

The service area for this business will include Northern California with an emphasis on Lake County and adjacent local areas. Current market research indicates that there is a lack of installers and other solar energy support companies in the area that actively address the Tribal market. However, as a Tribal owned business it can be assumed that a larger Tribal market may be available if the company can assist with grant writing. If the company can assist other Tribes in obtaining funding in the form of grants, loans and subsidies then this potentially larger market can be reached. A less grant driven market also exists within Indian Country if the benefit of solar energy to gaming facilities can be demonstrated.

Employment opportunities will include a manager that will also provide on-site supervision of installations and grant writing support. One administrative/marketing position will be required to manage the office and client paperwork for tax and other incentives along with light bookkeeping. Two to four labor positions for installers and a shop staff are also required. Initial job growth will include an assistant administrator and additional labor positions.

1.0 Introduction

Scotts Valley Band of Pomo Indians is a landless Tribe, Federally restored in 1992.

Scotts Valley Band of Pomo Indians purchased a single parcel (APN 009-021-07) of approximately 35 acres under fee simple (non-trust) status in Lake County in 1996. This property (referred to as 7130 Red Hills Road, shown in Figure 1.1) is located at the southeast intersection of Red Hills Road, a County arterial, and State Highway 29, 6 ½ miles east of Kelseyville, in rural, unincorporated Lake County. Of the 35 acres, about twenty acres along the frontage of both roads are currently zoned Commercial Resort (CR) and the remaining acreage is zoned Rural Residential (RR).

Highway 29 was a two lane arterial roadway but recently was widened to four lanes at this intersection. Cal Trans is proposing to build a major interchange at this intersection which could requisition 6 to 10 acres of the Commercial Resort portion of this parcel. Cal Trans has informally agreed to replace Scotts Valley's parcel with a like property if that 10 acres is requisitioned.

The current zoning designation of Commercial Resort as described in the Draft 2006 Lake County General Plan …"provides for a mix of commercial uses oriented toward tourists and other visitors to the community." "This designation is located both inside and outside of Community Growth Boundaries." A more appropriate designation for the business "Native Solar" would be Service Commercial. "The purpose of this zoning/land use category (Service Commercial) is to provide areas suitable for heavier commercial uses within developed areas. Typical uses that would be permitted include …building maintenance services, construction sales and services and warehousing. This designation is located both inside and outside of Community Growth Boundaries." (This is quoted from the Lake County General Plan Draft – November 2006.)

Juggling the possibility of Cal Trans appropriating the front portion of this Red Hills Property and waiting for the General Plan Revision in order to request the change of zoning designations from the County of Lake; has caused delays. During this period of delays in finishing the economic and market analysis, several options have been considered for the business development of 7130 Red Hills Road. These options have included: the development of a commercial resort on this property; a possible retail store featuring Lake County agricultural and art/craft products including a winery tasting room; or the development of a Sports Complex.

Finally, the development of a solar panel framing and installation business, "Native Solar", was chosen to provide solar energy (initially) for the Tribal housing in Lake County and adjacent counties. This project will provide jobs for Tribal Members; several have already had some training in solar installation, and will assist in alleviating the soaring utility costs experienced by Tribal households. There is great enthusiasm for this project among the Members of Scotts Valley Band of Pomo Indians and the other Tribes of Lake County.

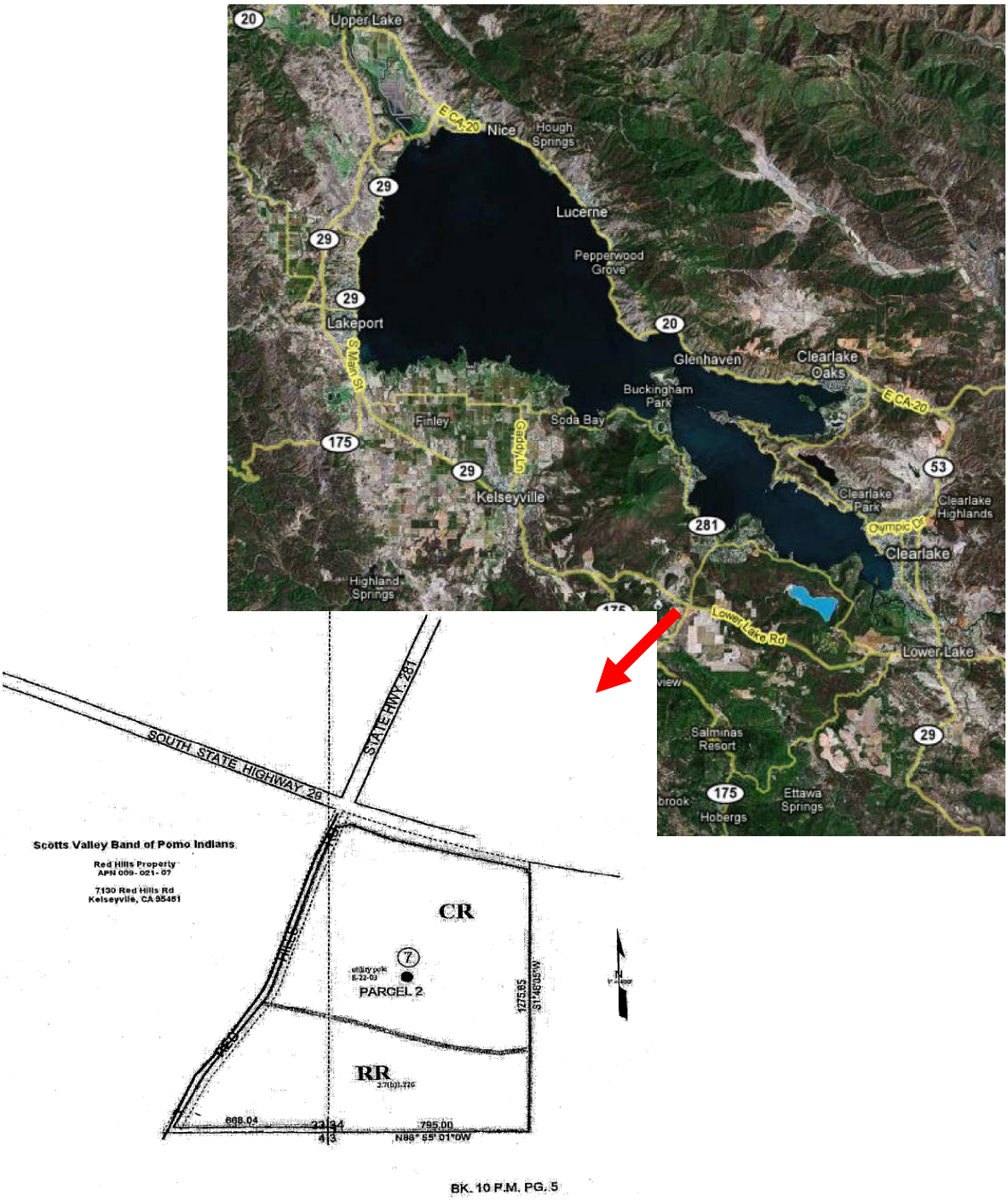

Figure 1.1. Scotts Valley Band of Pomo Indians 7130 Red Hills Road parcel (APN 009-021-07) of approximately 35 acres under fee simple (non-trust) status located at the southeast intersection of Red Hills Road, a County arterial, and State Highway 29, 6 ½ miles east of Kelseyville, in rural, unincorporated Lake County. Of the 35 acres, about twenty acres along the frontage of both roads are currently zoned Commercial Resort (CR) and the remaining acreage is zoned Rural Residential (RR).

The use of the Red Hills Road property is contingent upon the outcome of the CalTrans project to widen Highway 29. Although the road expansion is expected to be 30 feet north or south of the current roadway, an interchange has been designated for Red Hills Road that will require use of the Tribal property. Both will reduce the amount of land available for the project, but the "spread diamond" (Figure 1.2) will not result in a suitable parcel for the project. This situation may be remedied by a replacement parcel provided by CalTrans for the Tribe. The other option "partial cloverleaf" (Figure 1.3) will not only leave an adequate parcel, but also provide improved access to the site.

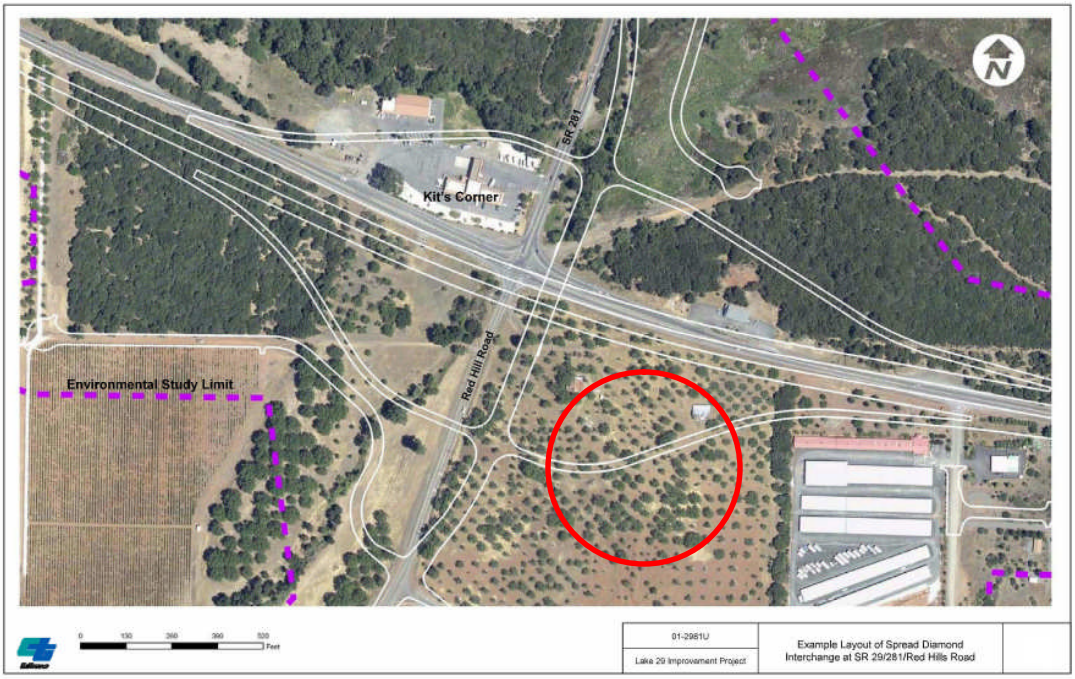

Figure 1.2. The spread diamond interchange layout. The red circle denotes the potential location for Native Solar that is on the CR zoned property and an appropriate distance from the existing Tribal housing to the south. Figure from CalTrans 2007.

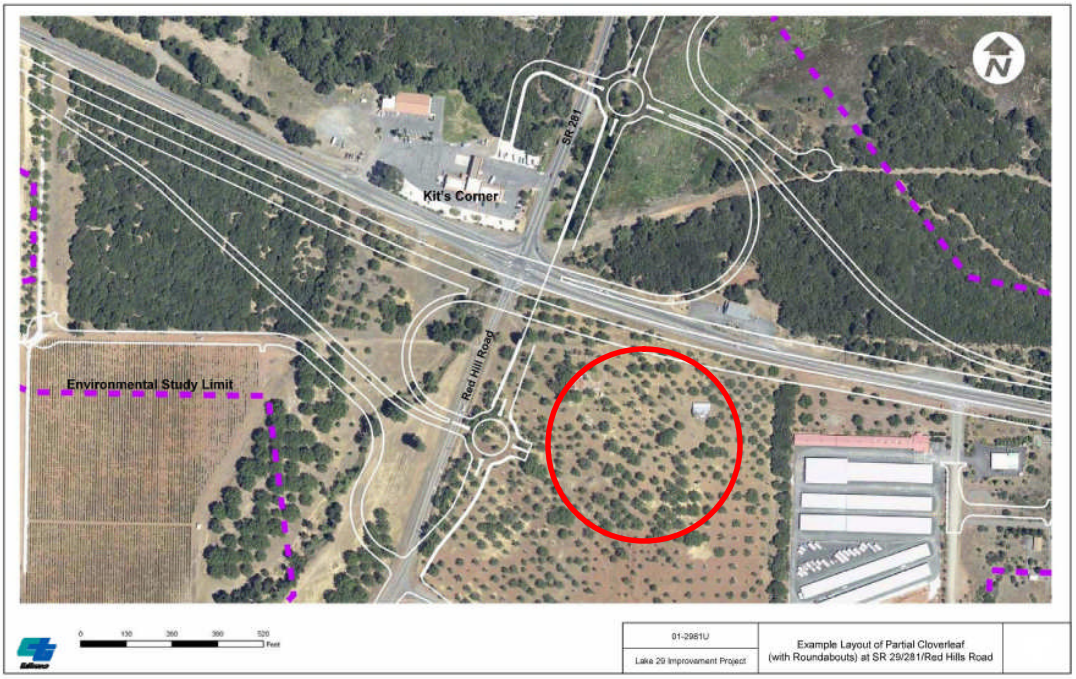

Figure 1.3. The partial cloverleaf interchange layout. The red circle denotes the potential location for Native Solar that is on the CR zoned property and an appropriate distance from the existing Tribal housing to the south. Figure from CalTrans 2007.

To accommodate this uncertainty, a review of area rents is included in the cost information in Section 5. However, the Tribe recognizes the benefit of locating the business on Tribal property as well as the convenience of nearby Tribal housing.

2.0 Market Size and Growth

2.1 General Market Description

Of the four mainstream alternative energy industries; biomass, geothermal, wind and solar, solar is the fastest growing in terms of global market value and total power produced. This growth margin is due to the widespread application of the industry (solar panels are viable across the broadest range of climates) and the relative maturity of the industry.

A significant benefit to entering this business at present is the diversity of solar panel use compared to other emerging energy technologies. Wind energy application is limited by location (windy areas are less common than sunny areas) and the principal market growth is in larger utility scale units. The end result involves larger projects with fewer vendors. Nearly every home in the proposed market area as well as in the United States may benefit from the addition of solar panels. This creates a general market that is amenable to small vendors serving a range of consumer needs. In this case, the ability to start small decreases start up cost; growth can be organic, utilizing cash flow from an increasing market or market share. In addition, due to the widespread application of solar technology, unique "niche" markets will emerge that can be more profitably addressed than general market trends.

Similar to other alternative energy technologies, solar energy derives some of its value from government and utility company incentives. Both types of incentives are driven by legislation which provides the variable fundamentals for business development. The absolute effect of this varies by technology with the general rule that larger development and installation costs are affected more than smaller, more widespread applications. For alternative energy, wind energy is the most effected due to its high

A Few Important Terms

PV Module-A "solar panel" that makes electricity when exposed to direct sunlight. PV is shorthand for photovoltaic. We call these panels PV modules to differentiate them from solar hot-water panels or collectors, which are completely different technology and are often what folks think of when we say "solar panel". PV modules do not make hot water.

AC (alternating current)-This refers to the standard utility supplied power, which alternates it direction of flow 60 times per second, and for normal household use has a voltage of approximately 120 or 240 (in the USA). AC is easy to transmit over long distances, but it is impossible to store. Most household appliances require this kind of electricity.

DC (direct current)-This is electricity that flows in one direction only. PV modules, small wind turbines, and small hydroelectric turbines produce DC power, and batteries of all kinds store it. Appliances that operate on DC very rarely will operate directly on AC, and vice versa. Conversion devices are necessary.

Inverter-An electronic device that converts (transforms) the low-voltage DC power we can store in batteries to conventional 12-=volt AC power as needed by lights and appliances. This makes it possible to utilize the lower-cost (and often higher-quality) mass-produced appliances made for the conventional grid-supplied market. Inverters are available in a wide range of wattage capabilities. We commonly deal with inverters that have a capacity of anywhere between 150-6,000 watts.

start-up costs and continued technology development. Both wind and solar technologies are still experiencing improvements but those improvements are more notable with wind energy than solar which indicates more industry maturity. Other technologies including biomass and biodiesel technologies have seen development in the same period of time, but represent a far smaller segment of the total alternative energy market. The end result is a steady, baseline market for home and commercial installation of solar panels that peaks with periodic utility and government programs. This baseline market has provided relatively consistent growth as energy costs increase and solar equipment costs decrease and become more efficient.

The incentives provided to homeowners and businesses throughout the United States from the federal government and the individual states may or may not cross into Indian Country. However, despite the lack of a unified approach by the federal government to increase alternative energy in Indian Country, there has been a steady and significant increase in funding availability for the use of alternative energy including solar energy in Tribal homes, administrative buildings and other facilities. For businesses that address the niche market of Tribal alternative energy, this adds another layer to the requirement to meet the demands of paperwork of incentives and tax programs. This is also an opportunity since Grant programs may cover a larger percentage of project cost and as such, are easily marketed.

Measuring Electricity

A Watt (W) is a standard metric measurement of electrical power. It is a rate of doing work.

A Watt-hour (Wh) is a unit of energy measuring the total amount of work done during a period of time. (This is the measurement that utility companies make to charge us for the electricity we consume).

An Amp (A) is a unit measuring the amount of electrical current passing a point on a circuit. It is the rate of flow of electrons through a conductor such as copper wire: 1 Amp = 6.29 billion billion electrons moving past a point in one second. (Amps are analogous to the water-flow rate in a water pipe.)

A Volt (V) is a unit measuring the potential difference in electrical force, or pressure, between two points on a circuit. This force on the electrons in a wire causes the current to flow. (Volts are analogous to water pressure in a pipe).

In summary, a Watt measures power, or the rate of doing work , and a Watt-hour measures energy, or the amount of work done. Watts can be calculated if you know the voltage and the amperage: Watts = Volts x Amps. More pressure or more flow means more power.

2.2 Solar Use Trends and Statistics

Statistics on the use of alternative energy in Indian Country are not readily available. Recent surveys by the Robinson Rancheria DOE First Steps Program indicate that no alternative energy use is occurring among the six federally recognized Tribes of Lake County, however, they do indicate significant interest. Although some Tribes, particularly in the plains, have developed wind and solar programs, they are the exception. Other exceptions include areas farther north in California, near Oregon, where solar and small-scale hydroelectricity have been used to substitute connections to the grid. In either case, these systems are not relevant to the market considered for this business. This business will target projects similar to the largest emerging solar market in the United States which

involves the installation of solar panels for home and business owners to supplement electric use.

Two variables in measuring the size of the solar market are the sale of equipment and the total energy market. The total energy market statistics can be complicated since home solar users, the largest part of the market, do not quantify energy used beyond net metering. The sale of equipment can be a better indicator, although solar panels have a long lifetime, warrantees are often 20 to 25 years, and there is an active used market.

Growth in the solar industry has dramatically increased in response to recent increases in oil cost and the subsequent increased energy need in developing economies. In addition, government solar initiatives in Germany have had a significant impact on the market. The end result is growth averaging 31% per year for the last decade, 20-25% for the last 20 years and over 40% per year for the past three years (Figure 2.1 and 2.2).

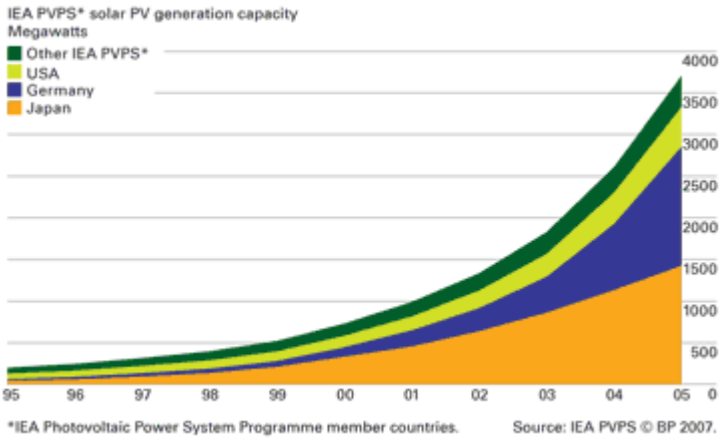

Figure 2.1. Global solar energy use for 2005 to 2006 (from BP 2008). IEA PVPS is the International Energy Agency Photovoltaic Power System Program.

An elevation of energy security and climate change issues has been noted in the public discourse in preparation for the 2008 US presidential election. Common themes of energy source diversification and conservation are soon followed by support for pro-solar policies. However, a rapid increase in the use of photovoltaic cells is noted even prior with applications in the United States growing by 30% to 145 MW in 2006. This does not include the 14 MW used in off grid consumer applications such as remote residences, boats, motor and small-scale agriculture. For the commercial and industrial sector an additional 23 MW were installed in 2006. This diverse application of solar technology can complicate statistics that measure its use. Although statistics for commercial installation of utility sized solar electric generation facilities are well documented, the availability of rugged, reliable and efficient solar panels has led to new applications for

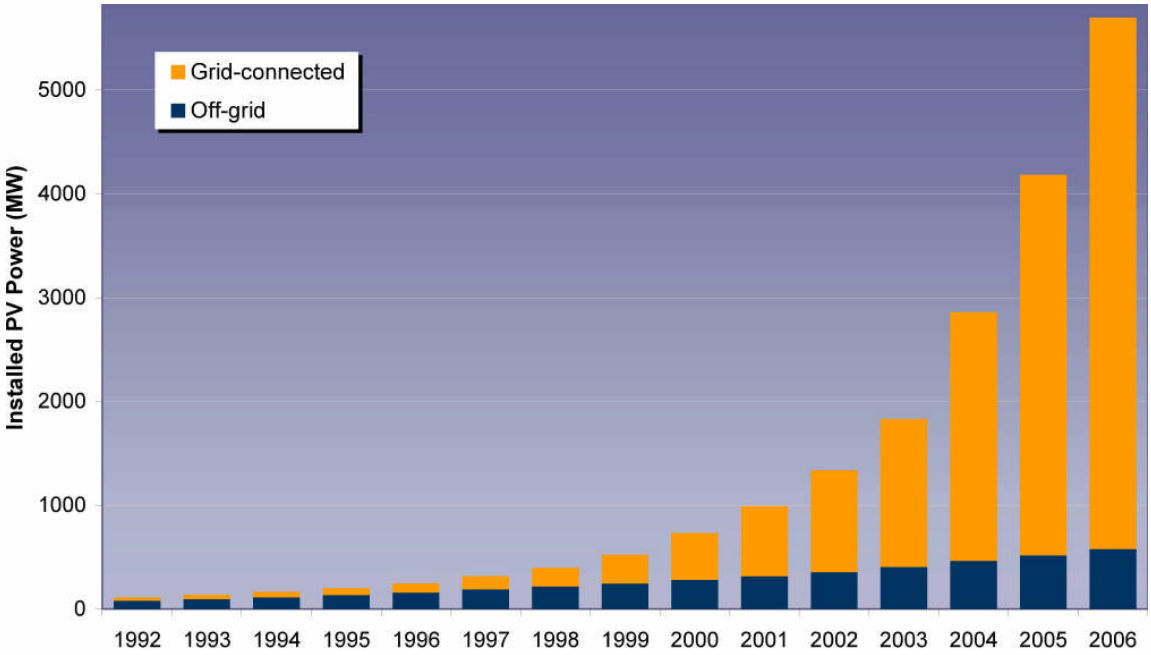

Figure 2.2. From IEA 2006. Trends in use of solar panels showing the largest increase in grid connected units.

both consumers and commercial users. Many remote sensing applications as well as the prospect for available electricity at remote locations have only become practical with new solar technology.

For the U.S. market as a whole, 1,460 Megawatts of PV installed in 2005 increased to 1,744 Megawatts in 2006. (2006 www.solarbuzz.com). A study released by the Energy Foundation in March suggests that the U.S. could produce 2,900 new megawatts of solar power by 2010, which is enough to power 500,000 homes. If a price breakthrough occurs, reducing watt prices from $4 to $5 to $2 to $2.50, the reports assumed price structure would represent a $6.6 billion annual market opportunity. (Carlstrom 2005).

The grid connected distribution sector grew 54% between 2005 and 2006 to over 100

Going off the Grid

Although off grid capacity is captured in production statistics, its effect is hard to decipher due to the size of the market and the range of panel efficiency. However, comparisons of total production compared to grid connected solar use indicate that it is a small part of the current market growth (Figure 2.2). Subsidizing electrical use with solar is often cost effective but there is no economic benefit to being totally off a readily available grid-based market for electricity. The cost of storage (batteries) far exceeds the negligible cost of electricity purchased beyond site production and net metering. Based on this, true solar installations without grid connections are expected to be a very small market. Not providing these relatively expensive services initially is the most efficient approach. A larger entity or targeting this business later after growth and maturity have occurred, can serve this niche market and expect reasonable profits.

MW. Over half of these are located in California with 65 MW installed in 2006. California is currently operating a 10 year, 3000 MW expansion of solar power as part of the California Solar Initiative (CSI) managed by the California Energy Commission (CEC). The target is to increase the use of solar panels and create a larger market. This larger market can increase economy of scale reducing PV costs. The California initiatives are assuming that the decreased costs of solar panels will reduce the need for subsidies. In general, these programs are budgeted to end subsidies by 2016 with the goal that unsubsidized installations will be economical by that time. The additional 3000 MW of electricity could substantially increase the share of electricity in California produced by solar above its current 0.2% level (Figure 2.3, CEC 2007). However, this 0.2% estimate may not include use by households beyond net metering.

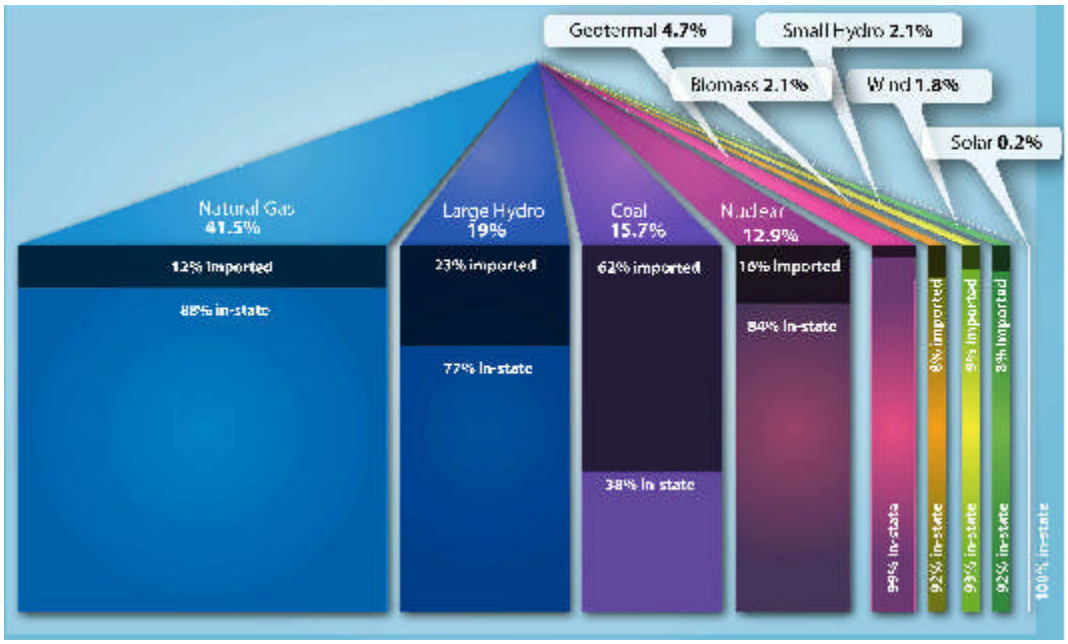

Figure 2.3, from CEC 2007. Diversification of energy sources for California energy markets.

President Bush announced the Advanced Energy Initiative in his State of the Union Address in January 2006. The president promised more aggressive renewable energy policy including research efforts by the Federal government to diversify U.S. energy supplies and address climate change among other issues. Following this, the Solar America Initiative (SAI) was created by the U.S. Department of Energy to address manufacturing, cost, and commercialization of solar energy technologies. Federal tax credits for PV also went into effect in 2006 and include a 30 % investment tax credit for commercial grid-connected systems and a 30 % tax credit for residential grid-connected PV systems with an annual cap of $2,000 for a single system.

Since US electricity generation is a states rights issue, all utility policy and regulation is determined state by state. State policy issues related to PV include factors such as restructuring, net metering, on-site generation (residential and commercial),

interconnection standards, insurance, taxes, and some subsidies. Fourteen states have established clean-energy funds that are typically funded by a small surcharge on retail electricity rates. Most of these subsidies are renewable power set asides and direct tax credits totaling more than $300 million in 2006. Details on these different codes, laws, and incentives can be found at www.dsireusa.org. Another important government-related program is the "PV for Schools" program to install PV systems on educational buildings and increase students' and consumers' awareness about solar energy.

Since many of these incentive programs are state derived or based on tax rebates, their effect on Tribal construction may be minimal or not applicable. In addition, the programs are new enough that Tribes may have yet to take advantage or them or mix them with other Tribal specific programs. For this program, incentives will be mixed with grant programs on a program by program basis.

3.0 Local Market Conditions

3.1 Competitors

Complete market testing was not possible in the timeframe for preliminary business plan development. However, surveys within Lake County indicate that competitors are present but currently not addressing the Tribal market. At least one Tribe, Robinson Rancheria, has been approached by vendors selling novel solar products. These products were not well adapted to existing Tribal housing and no attempt was made to capture available funding beyond direct purchase by the Tribe.

Limits may well exist on the total market size within Lake County due to other economic factors; the area is not particularly wealthy. However, some economic growth has been experienced and would benefit businesses such as the one proposed here. For the short term, targeting a market within Indian Country and providing grant writing support is recommended. This approach may also be effective with neighboring Tribal markets as well as with government agencies including subsidized housing and schools.

The following businesses (Table 3.1) are listed by the Public Utilities Commission's California Solar Initiative and the Energy Commission's New Solar Homes Partnership Program and are located with 50 miles of Lakeport, CA. As of March 2008, the installers are capable of installing systems consistent with California's rebate programs.

Table 3.1. Solar system installers within 50 miles of Lakeport (from Go Solar CA 2008).

Gaiam Energy Tech dba Real Goods PO Box 593 13771 S. Hwy 101 Hopland, CA 95449	**Phone:** (800) 919-2400 **Fax:** (303) 222-8702 **Email:** steve.rogers@realgoods.com **Web:** www.realgoods.com
Aragon Electric 27 Meadowbrook Dr., Apt B Ukiah, CA 95482	**Phone:** (707) 467-0220 **Fax:** 707-467-0220 **Email:** ajaragon@sbcglobal.net
Clover Electric Inc. 50 Industrial Drive Cloverdale, CA 95425	**Phone:** (707) 894-3531 **Fax:** (707) 894-2113 **Email:** cloveralarm@comcast.net
Advance Solar, Hydro, Wind Power Company 6331 N. State St. Redwood Valley, CA 95470	**Phone:** (707) 485-0588 **Fax:** 707-485-0831 **Email:** advance@advancepower.net **Web:** www.zapsucker.com

Pure Power Solutions 1083 Vine Street #279 Healdsburg, CA 95448	**Phone:** (707) 433-6556 **Fax:** (707) 431-7880 **Email:** mkumec@purepowersolutions.com **Web:** www.purepowersolutions.com
Robert Nuese, General Contractor 414 Grant St. Healdsburg, CA 95448	**Phone:** (707) 431-1129 **Fax:** 707-431-1129 **Email:** r.nuese@comcast.net
Gaia Productions, Inc. 107 North Main St Willits, CA 95490	**Phone:** (707) 456-0881 **Fax:** 707-456-0861 **Email:** kate@gaiaproductions.com **Web:** http://www.gaiaenergysystems.com/
Haddon Engineering 6751 Third Gate Rd Willits, CA 95490	**Phone:** (707) 477-2250 **Fax:** (707) 456-1146 **Email:** hirsh@sonic.net
Jay T Fraser General Build Contractor 16101 Ridgeeview Rd. Willits, CA 95490	**Phone:** (707) 459-1967 **Fax:** (707) 459-1967 **Email:** jtfbuilder@saber.net
Redwood Electrical Sevices 27566 Bear Ln Willits, CA 95490	**Phone:** (707) 354-3910 **Fax:** (707) 459-0925 **Email:** RES101@yahoo.com
Affinity Energy PO Box 1794 Windsor, CA 95492	**Phone:** (707) 836-9195 **Fax:** 707-838-4842 **Email:** jerry_shafer@comcast.net **Web:** www.affinityenergy.com
Black Dog Electric 399 Business Park Ct #202 Windsor, CA 95492	**Phone:** (707) 696-3647 **Fax:** (707) 837-9733 **Email:** youdogyou@comcast.net
M D Electric 38191 Old Stage Rd. Gualala, CA 95445	**Phone:** (707) 884-1862 **Fax:** (707) 884-1862 **Email:** mdelectric@sbcglobal.net
Greg Pahlow Electric	**Phone:** (707) 849-2961

6900 Ellen Ln. Forestville, CA 95436	**Fax:** (707) 887-0526

Clark & Associates / Clark Construction 5000 Flight Line Drive Santa Rosa, CA 95403-1036	**Phone:** (707) 523-0140 **Fax:** (707) 523-0144 **Email:** robcec@clarkandassoc.net **Web:** www.clarkandassoc.net

Solar Solutions by Combs Electric 1415 Fulton Road Santa Rosa, Ca, Ca 95403	**Phone:** (707) 578-1814 **Fax:** (707) 546-7957 **Email:** combs_electric@comcast.net

Pete & Sun 2667 Eureka Hill Rd. Point Arena, CA 95468	**Phone:** (707) 882-3118 **Fax:** (707) 882-3118 **Email:** desimone@mcn.org

Co-Van Alarm Company 365 Sky Oaks Drive Angwin, CA 94508	**Phone:** (707) 333-6542 **Fax:** (707) 965-3732 **Email:** coontlc@aol.com **Web:** www.covansystems.com

THOMAS G FIORI CONSTRUCTION 3662 RUTHERFORD WAY SANTA ROSA, CA 95404	**Phone:** (707) 322-3216

Sebastopol Heat and Cool PO Box 2406 Sebastopol, CA 95473	**Phone:** (707) 823-8042 **Fax:** 707-823-5046 **Email:** djsmit@sonic.net **Web:** www.coolerheat.com

Renewable Energy Resources, Inc 17225 Taylor Lane Occidental, CA 95465	**Phone:** (707) 874-1216 **Fax:** (707) 540-6081 **Email:** info@greatenergy.biz **Web:** www.greatenergy.biz

Energy Equity dba North Coast Solar Resources 1468 Funston Dr. Santa Rosa, CA 95407	**Phone:** (707) 575-3999 **Fax:** 707-575-3525 **Email:** brian@ncsr.com **Web:** http://www.ncsr.com/

Goodman Construction 121 Horn Ave Santa Rosa, CA 95407	**Phone:** (707) 586-3771 **Email:** rick@webuild.net

Joe Fortuna Electric Co. Inc. P.O. Box 7420 Santa Rosa, CA 95407	**Phone:** (707) 526-6599 **Fax:** (707) 523-2090 **Email:** Joefortunaelectric@yahoo.com

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Everything Electric 826 Gravenstein Hwy S. Sebastopol, CA 95472	**Phone:** (707) 291-8567 **Fax:** (866) 357-0394 **Email:** hevanger@gmail.com **Web:** everthing-electric.com

JP & Sun, Inc. (DBA Solar Works) 130 Petaluma Avenue, Suite A Sebastopol, CA 95472	**Phone:** (707) 829-8282 **Fax:** (707) 829-8283 **Email:** info@solarworksca.com **Web:** http://www.solarworksca.com

Solaris Solar, Lighting & Electric, Inc. 321 South Main Street #37 Sebastopol, CA 95472	**Phone:** (707) 829-0342 **Fax:** 707-829-0344 **Email:** sales@solarissolar.com **Web:** www.solarissolar.com

Contacts with at least two local suppliers indicate a brisk business not considered saturated despite the long list of installers. It should be noted that not all will serve Lake County and some are contractors only interested in providing solar systems in homes they build and would not be part of this target market.

Of all of the installers and suppliers contacted for this study, we found that installations are apparently still customized to the specific home size and power use. This is a product of the market history; the addition of solar panels was most often associated with more upscale, custom homes. This market is driven further by the fact that low income, prefabricated and even typical tract type housing is still not associated with this technology.

As solar technology continues to expand into more diverse residential markets, the need for less customized, lower cost and uniform applications will increase. This creates a situation where meeting the demand in Indian Country, and more uniform application on prefabricated and track-type housing is a precursor to more widespread demand. In other words, to meet the needs of the Tribes, this business will develop a number of relatively uniform installations for the relatively uniform Tribal housing. Since Tribal housing is not unique and often reflects the majority of low to middle income non-Tribal housing,

this will prepare the company to meet the emerging and much larger residential solar market.

3.2 Suppliers

Sharp, Kyocera, BP Solar and Shell Solar are the four major manufacturers of solar modules, representing over 50% of global production. (Solarbuzz 2006). World solar photovoltaic market installations reach a record high in 2007 according to the annual PV market report issued by Solarbuzz. Global solar cell production reached a consolidated figure of 3,436 MW in 2007, up from 2,204 MW in 2006.

Currently, many suppliers are regional. Solar panels are supplied to a typical installer with weatherproof frames ready to be connected to a relatively uniform support. The two types of solar panel supports that dominate the market are a freestanding unit not attached to any structure but anchored directly to the ground and a roof mount that attaches through the roof covering and onto the roof decking or rafters. Recently, national distributors have emerged that offer solar panels and a variety of states of completion. Bulk suppliers include Affordable-Solar and SouthwestPV.

In general, the equipment suppliers should be determined closer to the time of purchase. Due to a fast production growth rate in the industry following increased demand, prices are not stable. However, it is advisable to compare national and international suppliers to local suppliers listed in Table 3.2.

Table 3.2. Solar system suppliers advertising within 50 miles of Lakeport (from Go Solar CA 2008).

Fresh Energy Systems LLC 10512 Rosa Trail Kelseyville, CA 95451	**Phone:** (707) 928-5865 **Fax:** (707) 928-5835 **Email:** dan@freshenergysystems.com **Web:** www.fresh-energy-systems.com
Amp City Electric 483 Oak Knoll Rd. Ukiah, CA 95482	**Phone:** (707) 228-8512 **Email:** ampcity95482@gmail.com
Fresh Training Concepts P.O. Box 755 Cobb, CA 95426	**Phone:** (707) 928-5865 **Fax:** (707) 928-5835 **Email:** dan@freshtc.com **Web:** www.freshtc.com
REGENERATIVE SOLUTIONS 11755 MID MOUNTAIN RD Potter Valley, CA 95469	**Phone:** (707) 743-1816 **Fax:** (415) 593-6670 **Email:** joldham@hughes.net **Web:** www.regenerativesolutions.net

MIDDLETOWN 21048 JERUSALEM GRADE MIDDLETOWN, CA 95461	**Phone:** (707) 987-9432 **Email:** gene@debsolar.com **Web:** www.debsolar.com
DC Power Systems, Inc. 30 C Mill street Healdsburg, CA 95448	**Phone:** (707) 433-5824 **Fax:** 707-433-5698 **Web:** www.dcpower-systems.com
Stellar Energy Solutions, Inc 525 Grove St. Healdsburg, CA 95448	**Phone:** (707) 473-4320 **Fax:** (707) 473-0727 **Email:** info@stellarenergy.com **Web:** www.stellarenergy.com
Offgrid Outfitter 6751 Third Gate Rd Willits, CA 95490	**Phone:** (707) 477-2250 **Fax:** (707) 456-1146 **Email:** hirsch@sonic.net
Two Seas Metal Work 291 Shell Ln. Willits, CA 95490	**Phone:** (207) 985-0088 **Fax:** 207-985-5577 **Email:** naoto@bluelinksolar.net **Web:** www.bluelinksolar.net
Major Development PO Box 991 Point Arena, CA 95468	**Phone:** (707) 882-1652 **Fax:** (707) 882-1652 **Email:** major@mcn.org
NPC Solar 2228 Magowan Dr. Santa Rosa, CA 95405	**Phone:** (707) 573-9361 **Fax:** (707) 573-9361 **Email:** nick@npcsolar.com **Web:** www.npcsolar.com

4.0 Regulatory Issues for Business Development and Operation

4.1 General Business Permits and other Business Start Requirements.

Tribal businesses, especially if located on trust property, minimize the number of permits and license requirements expected from other, non-Tribal entities. A Tribal business would be expected to meet federal requirements but in many cases are exempt from local and many state requirements. Since the exact structure and location of this business has not been defined, the most stringent requirements are listed below; local and state requirements are listed. It should also be noted that some solar incentives require contractors to have state and local permits or licenses independent of office location.

The listing is developed using a state of California resource, CalGold (http://www.calgold.ca.gov/). This database is developed by the California Environmental Protection Agency. The database is limited to a number of business descriptors; this listing utilized "electrical contractor".

The following is required by the city; in this case The City of Lakeport was used as a possible location. Locating in unincorporated areas which includes most of Lake County, as well as Tribal property would prevent the need for these permits:

Business License: Required for businesses in the City Limits
Contact: Lakeport Community Development
Business License Department
225 Park Street
Lakeport, CA 95453
707-263-5613

Fire Prevention Information/Inspection: Businesses may be subject to a yearly inspection of facility - annual fee may be charged.
Contact: Lakeport Fire Department
445 N. Main Street
Lakeport, CA 95453
707-263-4396

Land Use Permit/Zoning Clearance: Example: zone change, variance, conditional use permit. Required if business located within incorporated city limits.
Contact: Lakeport Community Development
Planning/Building Department
225 Park Street
Lakeport, CA 95453
707-263-5613

Police Regulation/Public Safety Issues: Some city police departments may issue a permit i.e. burglar alarm, massage/adult business, peddlers, places of

entertainment, second-hand dealers, solicitors, pawnbrokers, taxi-cabs, etc.- requirements vary from city to city.
Contact: Lakeport Police Department
916 N. Forbes St.
Lakeport, CA 95453
707-263-5491

Lake County only requires a Fictitious Business Name Filing for new businesses:

Contact: Lake County Clerk
255 N. Forbes Street
Lakeport, CA 95453
707-263-2311

As the business develops, land use permits, zone permits and building permits for Lake County are often required in the unincorporated areas. Information for these can be found at www.co.lake.ca.us/Business/Permits_And_Licenses.htm.

The state requirements are task specific. Some of these requirements are specific to the industry and will be required to participate in rebate programs as well. A contractor's license (a detailed discussion of contractor requirements is found in Section 4.2) and OSHA requirements will have to be addressed before business start. However, other items such as air tank permits and asbestos certification may be delayed until those tasks become part of the services. Air tanks are required for welding. Asbestos can be an issue as work is done on older buildings that may contain asbestos. Workers may not need to work with asbestos but it may be important to be able to identify it and avoid contact/recommend removal.

Air Tanks Permit: Required of all businesses using (1) pressurized tanks with a volume greater than 1.5 cubic feet and containing greater than 150 PSI (pounds per square inch) of air; (2) Steam boilers over 15 PSI; or (3) retail stationary propane tanks.
Contact: Department of Industrial Relations
Pressure Vessel Unit-North
1515 Clay Street
Suite 901
Oakland, Ca 94612
510-622-3066

Asbestos Certification: No contractor shall engage asbestos-related work which involves 100 square feet or more of surface area of asbestos containing materials unless the qualifier for the license passes an asbestos certification examination.
Contact: Department of Consumer Affairs
Contractors State License Board
P.O. Box 26000
Sacramento, CA 95826

1-800-321-2752
916-255-3900

Asbestos Registration: Contractors and other employers who perform asbestos-related work that involves 100 sq.ft. or more of asbestos-containing construction materials that have an asbestos content of more than 0.1% must register. Contractors may bid on a project involving asbestos-related work as long as a contractor with the proper CSLB certification and Cal/OSHA registration performs the work.
Contact: Department of Industrial Relations
Division of Occupational Safety & Health
Asbestos Contractor Registration Unit
455 Goldengate Avenue, 10th Floor
San Francisco, CA 94102
415-703-5191

Construction Related Permits: Any contractor who is trenching, building or demolishing buildings or erecting scaffold may require a permit
Contact: Department of Industrial Relations
Division of Occupational Safety & Health

Contractor's License: In general, all persons or businesses constructing or altering, moving, wrecking, or demolishing any building, highway, road, parking facility, railroad, excavation or other structure, project, development or improvement must be licensed as a contractor if the total cost of labor and materials for a project is $500 or more. A license is also needed to do any work as a subcontractor or specialty contractor, and persons engaged in the business of home improvement.
Contact: Department of Consumer Affairs
Contractors State License Board
P.O. Box 26000
Sacramento, CA 95826
1-800-321-2752
916-255-3900

Corporation, Company or Partnership Filings: If you are considering becoming a corporation, (either stock or nonprofit), a limited liability company or a partnership (limited, or limited liability), you must file with the Secretary of State's Office.
Contact: Secretary of State
Business Programs Division
1500 11th Street
Sacramento, CA 95814
916-657-5448

Employers must post the Harassment or Discrimination in Employment notice (DFEH 162) and provide their employees with a copy of the DFEH's information

sheet on sexual harassment (DFEH 185) or a statement that contains equivalent information. Employers must also provide notice of an employee's right to request pregnancy disability leave or transfer, as well as notice to request a family and medical care leave (CFRA). Employers with 5 or more employees must maintain all personnel records for a minimum of 2 years.
Discrimination Law: Harassment or discrimination in employment is prohibited if it is based on a person's race, ancestry, national origin, color, sex (including pregnancy), sexual orientation, religion, physical disability (including AIDS), mental disability, marital status, medical condition (cured cancer), and refusal of family care leave. Discrimination in housing, public services and accommodations is also prohibited.
Contact: Department of Fair Employment and Housing
30 Van Ness Avenue, Suite 3000
San Francisco, CA 94102-6073
1-800-884-1684

Occupational Safety and Health Information: Businesses with employees must prepare an Injury and Illness Prevention Plan. The state provides a no-fee consultation service to assist employers with preventing unsafe working conditions and workplace hazards.
Contact: Department of Industrial Relations
Cal/OSHA Consultation Services
2424 Arden Way, Suite 410
Sacramento, CA 95825
916-263-2855
Certain permits/licenses/certifications may be required for compliance with Health & Safety Standards, General Industry Safety Order, Carcinogen regulations and Construction Safety orders, I.e. excavation/trenching, asbestos related work, crane/derrick operation, air/liquid petroleum gas tanks, etc.

Registration Form for Employers: Required to file a registration form within 15 days after paying more than $100.00 in wages to one or more employees. No distinction is made between full-time and part-time or permanent and temporary employees in meeting this requirement.
Contact: Employment Development Department
Employment Tax Customer Service Office

Sales & Use Permit (Seller's Permit): All businesses selling or leasing tangible property must obtain a Seller's Permit.
Contact: State Board of Equalization
Sales/ Use Tax Division
For Additional information about RESALE CERTIFICATE go to this website:
www.boe.ca.gov/sutax/faqresale.htm

State EPA Identification Number: Required of businesses that generate, surrender to be transported, transport, treat, or dispose of hazardous waste. This can include

small scale waste such as lubricants and shop waste that can be generated by this business.
Contact: Department of Toxic Substances Control
Generator Information Services
8810 Cal Center Drive, Suite 100
Sacramento, CA 95826
916-255-1136
800-618-6942
DTSC issues State Generator EPA ID Numbers. You may be referred to Federal EPA if you generate over 100 kg per month of RCRA waste (1-415-495-8895) or 800.618.6942

State Income Tax Information: Businesses should obtain the appropriate State income tax forms from the Franchise Tax Board.
Contact: Franchise Tax Board
50 Fremont Street
San Fransico, CA
800-852-5711

State Income Tax Information: Businesses should obtain the appropriate State income tax forms from the Franchise Tax Board.
Contact: Franchise Tax Board
Business Entities Division
P.O. Box 942857
Sacramento, CA 94257
1-800-852-5711
916-845-4543

All businesses have to meet federal requirements. However, many federal requirements including environmental standards are often managed by the state. In the event that the business finds itself excluded from state requirements, it will be important to determine if the situation has not created additional, Tribal specific, federal requirements. For example, construction on trust property does not require a state storm water permit. However, US EPA Region IX does have storm water management requirements for construction that Tribes do have to meet.

Employer Identification Number (EIN or SSN): Employers with employees, business partnerships, and corporations, must obtain an Employer Identification Number from the I.R.S. Businesses can obtain appropriate Federal income tax forms from this location.
Contact: US Department of Treasury
Internal Revenue Service
4330 Watt Avenue
Sacramento, CA 95814
800-829-3676

Proof of Residency Requirement: Employees hired after November 6, 1986 must provide proof of eligibility to work in the United States.
Contact: US Immigration and Naturalization Service

4.2 Contractor Requirements Specific to Solar Installations

Although some Tribal installations may not require state incentive programs, the standards may still be useful in insuring a utility compliant system. According to the California Energy Commission and California Public Utilities Commission the following requirements must be met to become a solar power certified installer.

1. Systems must be installed in conformance with the manufacturer's specifications and with all applicable electrical and building codes and standards.
2. If installed under a contract, an appropriately licensed contractor, in accordance with rules and regulations adopted by the California Contractors State License Board, must install systems. Installation contractors must have an active A, B, C-10 or, C-46 license. Contractors with roofing specific licenses may place PV panels in accordance with limitations of their specific licenses: however, an above-mentioned contractor must make electrical connections. Owner-builders are allowed under the NHSP (New Solar Home Partnership) to install their own systems.

All solar power systems must be verified for proper installation by a third-party to ensure that installations are consistent with the information used to determine the estimated performance, reservations, and the final incentive amount.

If applicable, field verification will check the consistency for either residential buildings that have relied on the "California Flexible Installation" criteria and the minimal shading criteria, or for residential buildings that have uniquely specified orientation, tilt and shading characteristics. When the field verification determines that the installation will not meet the expected performance, the deficiencies must be corrected or the estimated performance must be recalculated based upon the actual installation and the application must be re-submitted for approval at the incentive level in effect at the time of the original reservation. The reservation is the period of time of 18 months for base incentive and 36 months for other qualifying developments and affordable housing projects. No extensions are allowed.

When field verification determines that the installation will achieve an estimated performance greater than that used for the reservation , the estimated performance may be re-calculated at the builder's option to reflect the higher performance, and the application may be resubmitted for the incremental performance at the incentive level in effect at the time of the original reservation.

All systems must have a minimum ten-year warranty provided in combination by the manufacturer and installer to protect against defective workmanship, system or component break-down or degradation in electrical output of more than 15 percent from the originally rated electrical output during the ten-year period. The warranty must cover the solar generating system only, including PV models (panels), inverters, and meters and provide for no-cost repair or replacement of the system or system components, including any associated labor during the warranty period. The Tribe may want to consider developing a partnership with a manufacturer. The possible benefits of such a partnership would be that the manufacturer may provide training for installation. Also manufacturers may be more willing to assist Tribes in their solar power installation business development because of the importance of properly installed solar systems. The manufacturer should also realize the vast array of opportunities that will become available on Tribal lands. Manufacturers may also have far greater resources that would be available to the Tribe to further develop the Tribal solar power installation business.

The California Solar Initiative requires that installers be registered with PG&E in order to take part in the CSI program. Upon verification by PG&E of the installers contractors licensing with the California Contractors State License Board, the application process begins.

The classification descriptions for the California Contractors State License Board Class A, B, C-10 and C are as follows:

12.5.

12.6. A Classification - General Engineering Contractor

7056. A general engineering contractor is a contractor whose principal contracting business is in connection with fixed works requiring specialized engineering knowledge and skill, including the following divisions or subjects: irrigation, drainage, water power, water supply, flood control, inland waterways, harbors, docks and wharves, shipyards and ports, dams and hydroelectric projects, levees, river control and reclamation works, railroads, highways, streets and roads, tunnels, airports and airways, sewers and sewage disposal plants and systems, waste reduction plants, bridges, overpasses, underpasses and other similar works, pipelines and other systems for the transmission of petroleum and other liquid or gaseous substances, parks, playgrounds and other recreational works, refineries, chemical plants and similar industrial plants requiring specialized engineering knowledge and skill, powerhouses, power plants and other utility plants and installations, mines and metallurgical plants, land leveling and earthmoving projects, excavating, grading, trenching, paving and surfacing work and cement and concrete works in connection with the above mentioned fixed works

12.7. B Classification - General Building Contractor

7057. (a) Except as provided in this section, a general building contractor is a contractor whose principal contracting business is in connection with any structure built, being built, or to be built, for the support, shelter, and enclosure of persons, animals, chattels, or movable property of any kind, requiring in its construction the use of at least two unrelated building trades or crafts, or to do or superintend the whole or any part thereof.

This does not include anyone who merely furnishes materials or supplies under Section 7045 without fabricating them into, or consuming them in the performance of the work of the general building contractor.

(b) A general building contractor may take a prime contract or a subcontract for a framing or carpentry project. However, a general building contractor shall not take a prime contract for any project involving trades other than framing or carpentry unless the prime contract requires at least two unrelated building trades or crafts other than framing or carpentry, or unless the general building contractor holds the appropriate license classification or subcontracts with an appropriately licensed specialty contractor to perform the work. A general building contractor shall not take a subcontract involving trades other than framing or carpentry, unless the subcontract requires at least two unrelated trades or crafts other than framing or carpentry, or unless the general building contractor holds the appropriate license classification. The general building contractor may not count framing or carpentry in calculating the two unrelated trades necessary in order for the general building contractor to be able to take a prime contract or subcontract for a project involving other trades.

(c) No general building contractor shall contract for any project that includes the "C-16" Fire Protection classification as provided for in Section 7026.12 or the "C-57" Well Drilling classification as provided for in Section 13750.5 of the Water Code, unless the general building contractor holds the specialty license, or subcontracts with the appropriately licensed specialty contractor.

12.8. C-10 Classification - Electrical Contractor

An electrical contractor places, installs, erects or connects any electrical wires, fixtures, appliances, apparatus, raceways, conduits, solar photovoltaic cells or any part thereof, which generate, transmit, transform or utilize electrical energy in any form or for any purpose.

12.9. C-46 Classification - Solar Contractor

A solar contractor installs, modifies, maintains, and repairs active solar energy systems. An active solar energy system consists of components, which are thermally isolated from the living space for collection of solar energy and transfer of thermal energy to provide electricity and/or heating and cooling of air or water. Active solar energy systems include, but are not limited to, forced air systems, forced circulation water systems, thermo siphon systems, integral collector/storage systems, radiant systems, evaporative cooling systems with collectors, regenerative rockbed cooling systems, photovoltaic cells, and solar assisted absorption cooling systems.

A licensee classified in this section shall not undertake or perform building or construction trades, crafts or skills, except when required to install an active solar energy system. The C-46 classification will be issued after development of an examination. (See Appendix for Examination C-46 examination information.)

The California Energy Commission strongly recommends that installation contractors also become certified by the North American Board of Certified Energy Practitioners (NABCEP).

The following are the application requirements for becoming certified by NABCEP for solar power – PV installation:

PV Requirements/Education

Basic Requirements

To be eligible for NABCEP solar PV installer certification, candidates must first meet these basic requirements:

1. Be at least 18 years of age
2. Meet prerequisites of related experience and/or education
3. Complete an application form documenting requirements
4. Sign a code of ethics
5. Pay applicable fees
6. Pass a written exam

Prerequisites or Education Requirements

The NABCEP Board and PV Technical Committee identified seven different entry tracks for solar PV installer certification.

The first entry path is based upon four years of installing PV systems as the responsible person. As is indicated below, various levels of training and education can be substituted for some years of experience; however, there is a prerequisite for at least one year of actual installation experience in all seven categories. This is based on the core principal that all NABCEP certified installers should have actual experience on the job performing an installation. Candidates will need to show that they meet the prerequisites for any ONE of these combinations:

a) Four (4) years of experience installing PV; **OR**
b) Two (2) years of experience installing PV systems in addition to completion of a board-recognized training program; **OR**
c) Be an existing licensed contractor in good standing in solar or electrical-construction related areas with one (1) year of experience installing PV systems; **OR**
d) Four (4) years of electrical-construction related experience working for a licensed contractor, including one (1) year of experience installing PV systems; **OR** e) Three (3) years experience in a U.S. Dept. of Labor approved electrical-construction trade apprentice program, including one (1) year of experience installing PV systems; **OR**
f) Two-year electrical-construction related, or electrical engineering technology, or renewable energy technology/technician degree from an educational institution plus one (1) year of experience installing PV systems; **OR**

g) Four-year construction related or engineering degree from an educational institution, including one (1) year experience installing PV systems. For definitions of experience and acceptable training, please refer to the Candidate Information Handbook for NABCEP Solar PV Installer Certification.

How to Apply

NOTE: NABCEP encourages candidates for the Solar PV Installer Certification Exam to complete the application electronically. Click here to start the Electronic Application Form process or go to http://forms.nabcep.org.

1. First, read the Candidate Information Handbook for NABCEP PV Solar Installer Certification., available online by download.

2. Review the entry options. Choose the entry option that best fits your personal background, experience, and training. Be sure you understand the Entry Requirements, the Code of Ethics, the fees, and how to prepare to take the written exam, which is offered around the U.S. twice a year.

3. Review the Application Form (available inside the PV Candidate Information Handbook) and prepare the documentation you will need to complete the application.

4. Fill out the Application Form completely, attaching required copies of permits, inspection certificates, and training transcripts, as well as optional documentation such as letters from customers and employers, photos of systems you've installed, etc.

5. Be sure to **sign the application** and enclose the $50 application fee.

6. You will hear back from NABCEP after review of your application, informing you that you were or were not approved to sit for the exam.

7. If you are approved, you will be sent, and need to immediately return the PV Exam Scheduling Form, along with the $200 first-time exam fee.

8. About three weeks before the scheduled exam date, you will receive your Admission Slip confirming that you are approved to sit for the Exam at your selected test site.

Additional application information is provided in Appendix 1.

5.0 Business Description

The proposed business will include installation of residential and business PV systems and manufacturing of accessories such as mounting systems. The business start up will target installation of PV systems for Tribal housing to offset electrical use. Planned growth includes increases in manufacturing of roof mounting equipment and other installation equipment and expanding installation markets to commercial and potentially, larger utility scale projects. Similar to other successful businesses in this market, the business will include assisting customers interested in the various rebate incentive programs associated with their installation. Unique to the market, this business will assist Tribal governments and preparing grants and other incentives for Tribal housing and businesses.

The target market, middle market homes including tract and manufactured housing typical of those found in Indian Country, provides opportunities for more uniform installations. By moving away from custom design, the industry standard, it is assumed costs can be reduced providing systems appropriately priced for the lower market application. At the same time, rising energy costs are improving the economies of even custom installations for many homes. Addressing Tribal housing will provide an opportunity for the company to develop lower costs, more uniform applications of PV that can address the emerging market targeting tract and larger manufactured homes.

5.1 Schedule

Business development will follow several phases. These include:

1. Grant writing to fund the education of Tribal members expected to work with in the business, including training and testing for contractors licenses.
2. Grant writing to fund installations in Lake County Tribal housing.
3. Development of a permanent facility to locate the business (steps one and two will utilize borrowed space and existing Tribal administrative offices).
4. Equipping the facility including office and shop supplies.
5. Contracting with an electrician to complete and inspect solar installations.
6. Start the first installations for Tribal housing.
7. Develop a manufacturing facility (the first installations will utilize “off the shelf” accessories as needed).
8. Expanded to commercial installations targeting local Tribal casinos.
9. Begin marketing to non-Tribal residential and commercial customers.
10. Expand target Tribal market to outside of Lake County.

A schedule is proposed in Table 5.1

5.2 Facilities

The grant writing required to train perspective employees among Tribal members and to start the business will continue to be done at the Scotts Valley Band of Pomo Indians administrative offices. As the project progresses, it is proposed to expand to a mixed light industrial/commercial area requiring approximately 500 ft.^{2} of office and customer meeting space, 1000 ft.^{2} of light industrial space and 500 ft.^{2} of warehouse space

A possible site, 7130 Red Hills Road, Kelseyville, is a fee-simple (non-trust) single piece of property located at the southeast intersection of Red Hill Road, a county arterial, and State Highway 29 in unincorporated, rural Lake County. Of the approximately 35 acres of this single piece of property, about 20 acres along the Highway frontage are currently zoned Commercial Resort. Use of this site is contingent on current County of Lake General Plan policies and Zoning Ordinances and the possible revisions in the property lines from the eventual widening of Hwy 29 by Cal Trans. Therefore, it is proposed to locate the business somewhere in Northwest Lake County associated with Kelseyville, Lakeport, Upper Lake or Lucerne.

5.3 Job Descriptions

Full job descriptions are found in Appendix 2 and salary ranges are found in Table 5.2. Employment opportunities will include a manager that will also provide on-site supervision of installations and grant writing support. One administrative/marketing position will be required to manage the office and include client paperwork for tax and other incentives along with light bookkeeping. Two to four labor positions for installers and a shop staff are also required. Initial job growth will include an assistant administrator and additional labor positions.

5.3.1 Manager

The Manager will supervise the business and provide on-site supervision of installations. The Project manager will also oversee the grant writing program.

The Manager will be a licensed contractor and meet the requirements set by the incentive rebate programs. Grant writing and business management experience will be an important expectation of the person filling this position.

5.3.2 Administrative/Marketing

Support the Manager for grant writing and provide customer support. Initially, this position will include managing the office including some bookkeeping. As the business grows, this position will include an assistant to provide day-to-day office management and bookkeeping.

Table 5.1. The schedule is tentative based on complete the rest of the business planning process within the next 60 days. However, even without a precise start date, the schedule can be used to prioritize activities and create a logic order for business development. The schedule is also critical to communicating the scope and functions of the company to funding agencies.

ID	Task Name	Start	Finish	Duration
1	Select Project Manager	6/2/2008	6/13/2008	2w
2	Develop Training Program/license contractor	6/2/2008	12/2/2008	26.4w
3	Grant writing for Lake County Tribe installations	9/2/2008	3/2/2009	26w
4	Move into permanent location and file business permits et cetera	12/2/2008	12/30/2008	4.2w
5	Hire employees	12/15/2008	1/15/2009	4.8w
6	Select Electrician subcontractor	1/5/2009	2/4/2009	4.6w
7	Start first Lake County Project	3/5/2009	3/30/2009	3.6w
8	Expand workshop for specialty mounting equipment manufacturing	4/2/2009	8/24/2009	20.6w
9	Target and design first casino/ commercial installation	6/2/2009	7/31/2009	8.8w
10	Develop marketing materials for non-Tribal customers	8/4/2009	12/4/2009	17.8w
11	Marketing and Grant writing for non-Lake County Tribes	9/2/2009	12/31/2009	17.4w

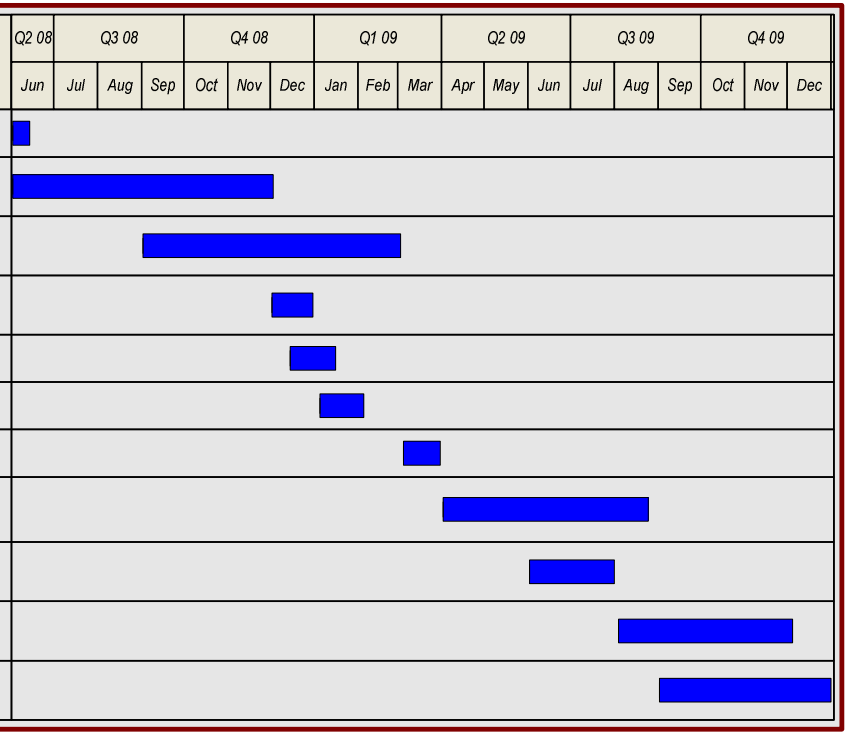

Table 5.2. Salary estimates based on state and local averages. The provided descriptions are general, industry specific data is currently not yet available.

Occupational Title	Mean Hourly Wage	Mean Annual Wage	Mean Relative Standard Error	25th Percentile Hourly Wage	50th Percentile (Median) Hourly Wage	75th Percentile Hourly Wage	Annual Wage Range (25th-75th)
Managers, All Other	$54.30	$112,947	2.1	$40.27	$52.30	$66.39	81,761-138,091
Office and Administrative Support Workers, All Other	$18.49	$38,467	6.4	$10.88	$16.05	$26.29	22,630-54,683
Installation, Maintenance, and Repair Workers, All Other	$24.33	$50,615	10.3	$15.85	$21.72	$33.64	32,968-69,971

The Administrative/Marketing position should be filled by someone with business experience including office management. Previous marketing experience in construction or real estate would be a plus.

5.3.3 Installers

These positions will be supervised by the Manager and duties will include installation of photovoltaic panels, wiring and other equipment. The installers will also work in the shop to prepare equipment for installation and fabricate parts.

The installers should be experienced in the construction trades or metal shop. This is a physical activity and may include additional safety training.

5.3.4 Shop Manager

This position may be required as much as a year after the business starts; it is not a hire at business start (description not included in Table 5.1 or Appendix 2). This person will be an assistant to the Project Manager and will focus on manufacturing, capable of supervising installations when the Project Manager is unavailable.

The requirements for this position are similar to that of the Project Manager with the exception of the shop manager will not be expected to participate with the grant writing.

5.4 Expense Estimates

At this stage of business development, cost estimates are limited. Decisions regarding facility location and type, scope and products have yet to be made. In addition, considerations are still underway regarding business structure; nonprofit, for-profit *et cetera*. However, some information can be gathered to begin an order of magnitude estimate of business startup cost. These costs, combined with the salary information presented in this section and revenue estimates can be combined at a later date to more accurately determine the capital needs of the new business.

Equipment and construction represent a major capital investment in the beginning of any business. Most new businesses do not start with construction but due to the advantages of being located on Tribal property, construction may be desirable.

For comparison, rental space in the area was researched. At the time this report was developed, the price range for buildings located in Lake County, CA are very dependent upon location and appearance. For more finished office space, a range between $1.00-$1.50 per square ft. can be expected. A lower range was found for a retail building, 80-90 cents per square ft. and for more industrial, unfinished buildings the range was 50-60 cents per square ft. (Bennett 2008).

Speaking with the real estate agents in this area, it was found that the cost of utilities is not usually included in rent. They stated that the energy bill is dependent upon the type of fuel they are using for energy, where they are located and how big the building is (City

Center Realty). An average monthly cost for a building to suit the installation and light industrial work that a project like this would entail can range in cost at this time between $1500 on the lower end and $2000 on the higher end. Adding this to the rent of a 2000 sq. foot space, the monthly rent and utilities would be approximately $3,100 to $5,000 per month.

Expected construction costs are provided in Table 5.3. It is assumed that property for the operation will be provided.

Table 5.3. Expected new construction and equipment costs.

Item	**Cost**
1. New building, 2000 sq ft @ $ 125/s.f. with slab, electrical, & heating	$250,000.00
2. Interior finishing	$20,000.00
3. Offices Furnishings Desks, chairs, files, PCs, & Misc. office equipment	$30,000.00
4. A.C. Parking and Roads	$50,000.00
6. Small Loading Docks and doors	$10,000.00
7. Load/unload equipment	$2,000.00
8. Installation tools	$20,000.00
9. Machine Shop	$9,000.00
10. Work Vehicle	$40,000.00
11. Miscellaneous	$35,000.00
Subtotal	$466,000.00
Engineering Costs Survey, design and construction administration	$51,000.00
Grand Total	$517,000.00

The cost presented above does not include cash required to meet operating expenses prior to the business becoming profitable. These expenses would include labor and business operation costs. Generally, financing between $500,000 to $1 million is required.

If this level of financing is not available, then lower cost alternatives are available. Lower cost startup alternatives generally will require no new construction and may not represent real savings in long-term. Using a lower cost alternative may however be required depending on the availability of funding.

6.0 References

Bennett, Scott. 2008. Personal Communication. Konocti Realty, 707.349.2584.

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Solarbuzz. 2008. www.solarbuz/bs.

IEA 2..6. PVPS Website, http://www.iea-pvps.org. Trends in photovoltaic applications. Survey report of selected IEA countries between 1992 and 2006.

Schaeffer, John. 2008. Real Good Solar Living Source Book. 30th Edition. ISBN 978-0-91657106-1

BP. 2008. Solar Energy, Section Articles. http://www.bp.com/section genericarticle.do?categoryId=9017927&contentId=7033482.

Appendix 1

California Contractors State License Board Exam Information

California Contractors State License Board Exam Information

13.0 Study Guide for the Solar (C-46) Examination

13.1. Content of the Examination

The Solar (C-46) examination is divided into six major sections. These sections are:

1. Solar Design Engineering (18%)

- Evaluate client needs and site feasibility
- Design system
- Read and draw plans
- Estimate job cost

2. Safety (18%)

- Protect public from safety hazards
- Identify and correct unsafe working conditions
- Handle hazardous materials

3. Solar Collector Installation (18%)

- Install roof mount collectors
- Install ground mount collectors
- Weatherproof penetrations

4. Service and Maintenance (16%)

- Evaluate PV systems
- Evaluate thermal systems
- Repair and replace components

5. Solar Thermal Installation (15%)

- Install domestic hot water systems
- Install pool heating systems
- Install radiant and forced air systems

6. Photovoltaic (PV) System Installation (15%)

- Install basic PV systems
- Install battery back-up systems
- Interface with utility grid

Percentages are approximate

Test Site Policy

This is a closed-book examination. No reference materials may be used during the examination. All materials brought to the examination site must be left in an unmonitored area at your own risk.

Test Strategy

This is a multiple-choice examination with four choices per question. Some questions require mathematical computation. Examination questions are written to provide only one BEST answer and are NOT written as trick questions.

All correct answers have equal value. If you are unsure about a particular question, it is better to try to answer the question with the chance of possibly getting it correct (and earning one point) than it is to leave the question blank and definitely get it wrong (and lose one point).

Ample time is provided to answer all examination questions, so be sure to read each question and its four choices completely and carefully before selecting the BEST possible answer to the question.

13.2. Sample Questions

The following questions are typical of the types of items that are on the examination. The correct answer is **highlighted**.

1. Which of the following valves would open to relieve internal pressure in a vessel?

a. Stop valve
b. Check valve
c. **T & P valve**
d. Pressure reducing valve

2. At what current do thermal control sensors typically operate?

a. High amps
b. High voltage
c. **Milliamps**
d. Low voltage

3. What does the NEC require in a 120 v residential electrical circuit located in a garage?

a. Branch circuit
b. Lightning protection

c. Disconnect switch

d. **Circuit protection**

All questions are written and reviewed by licensed contractors who are actively working in the field

13.3. Resources

Publisher information is provided. Additional sources for purchasing materials may be available online.

A Guide to Photovoltaic (PV) System Design and Installation Consultant Report # 500-01-020.
California Energy Commission.
PHONE: (800) 555-7794.
FAX: (916) 654-4288.
INTERNET: www.energy.ca.gov

Cal/OSHA State of California Construction Safety Orders.
California Code of Regulations, Title 8,
Industrial Relations, Division 1, Chapter 4, Subchapter 4.
Thompson/Barclays Division.
PHONE: (800) 888-3600.
FAX: (415) 344-4950.
INTERNET: http:// ccr.oal.ca.gov

California Building Code.
International Code Council.
PHONE: (800) 786-4452.
FAX: (886) 891-1695.
INTERNET: www.iccsafe.org

California Electrical Code.
International Code Council.
PHONE: (800) 786-4452.
FAX: (886) 891-1695.
INTERNET: www.iccsafe.org

California Mechanical Code.
International Association of Plumbing and Mechanical Officials (IAPMO).
PHONE: (800) 854-2766.
FAX: (909) 472-4150.
INTERNET: www.iapmo.org

California Plumbing Code.
International Association of Plumbing and Mechanical Officials (IAPMO).
PHONE: (800) 854-2766.

FAX: (909) 472-4150.
INTERNET: www.iapmo.org

Operating Guidelines and Minimum Standards for Certifying Solar Water Heating Systems (OG 300).
The Solar Rating & Certification Corporation, FSEC.
PHONE: (321) 638-1537.
FAX: (321) 638-1010.
INTERNET: www.solar-rating.org

NRCA/ARMA Manual of Roof Maintenance and Repair.
Asphalt Roofing Manufacturers Association.
PHONE: (202) 207-0917.
FAX: (202) 223-9741.
INTERNET: www.asphaltroofing.org

Uniform Solar Energy Code.
International Association of Plumbing and Mechanical Officials (IAPMO).
PHONE: (800) 854-2766.
FAX: (909) 472-4150.
INTERNET: www.iapmo.org

Appendix 2
Job Descriptions

JOB DESCRIPTION

JOB TITLE: **Manager**	GRADE: FLSA: **Exempt**
REPORTS TO:	

BASIC SUMMARY:
Oversee all aspects of the business and provide on-site supervision of solar energy system installations. Responsible for oversight of the grant writing program.

ESSENTIAL DUTIES AND RESPONSIBILITIES:
- Oversee all aspects of managing the business.
- Manage the grant writing program.
- Oversee installations, modifications, maintenance, and repairs to active solar energy systems.
- Manage activities of employees to ensure effective performance of function.
- Interview and select qualified personnel. Review and approve personnel actions, including hiring, promotions and raises. Handle disciplinary issues. Prepare and/or approve appropriate personnel action paperwork.
- Identify training and development needs. Develop and oversee the implementation of training programs, including orientation; monitor training programs to ensure ongoing effectiveness.
- Monitor performance of direct reports. Provide regular coaching and counseling. Prepare and deliver salary and performance reviews; review and approve performance and salary appraisals initiated by direct reports.
- Authorize overtime as needed. Review and approve time cards. Review and approve vacation/time off requests and coordinate vacation/time off schedules.
- Assist in the development of short- and long-range operating objectives, organizational structure, and staffing requirements.
- Develop the budget and authorize expenditures in accordance with budget. Approve expenses of subordinates.
- Ensure optimum performance of group function. Determine and implement techniques to improve productivity, increase efficiencies, cut costs, take advantage of opportunities, and maintain state-of-the-art practices.
- Develop and maintain business processes. Communicate policies and procedures to employees. Ensure communication of duties and responsibilities to employees.
- Perform all other related duties as assigned.

QUALIFICATIONS:
- ***Education:*** High school diploma or General Education Degree (G.E.D.)
- ***Experience:*** # years related experience in solar energy systems. Grant writing and business management experience required.
- An equivalent combination of education and experience may be accepted as a satisfactory substitute for the specific education and experience listed above.

- ***Certification/Licensure:*** Contractor's Licence required. North American Board of Certified Energy Practitioners (NABCEP) preferred.
- ***Other:*** Must be 18 years of age.

PHYSICAL DEMANDS:

- While performing the duties of this job, the employee is frequently required to walk, climb, kneel, crouch or crawl, and use hands to handle, finger or feel objects, tools or controls.
- While performing the duties of this job, the employee is occasionally required to lift, move and/or hold up to 80 pounds (or other weight limit as determined by employer); this includes equipment, work materials and supplies.
- Specific vision abilities required by this job include close vision, distance vision, depth perception, peripheral vision and the ability to adjust focus.

WORK ENVIRONMENT:

- While performing the duties of this job, the employee is occasionally required to work in high/precarious places, tight or confined spaces, and in outside weather conditions.
- While performing the duties of this job, the employee is occasionally required to work with and/or near moving mechanical parts or tools.
- The noise level in the work environment varies.

All employees are required to satisfactorily perform the essential duties and responsibilities of their position. • The essential duties and responsibilities listed above are not intended to be construed as an exhaustive list of all responsibilities, duties and skills required. • Reasonable accommodations may be made to enable individuals with disabilities to perform the essential functions of this job.

JOB DESCRIPTION

JOB TITLE:	**Installer**	GRADE: FLSA: **Non-Exempt**
REPORTS TO:	**Manager**	

BASIC SUMMARY:
Install photovoltaic panels, wiring and other equipment.

ESSENTIAL DUTIES AND RESPONSIBILITIES:
- Install photovoltaic panels, wiring and other equipment.
- Work in the shop to prepare equipment for installation.
- Fabricate parts as needed.
- May perform maintenance or repairs on photovoltaic panels, wiring and other related equipement.
- Perform all other related duties as assigned.

QUALIFICATIONS:
- ***Education:*** High school diploma or General Education Degree (G.E.D
- ***Experience:*** # years related experience in solar panel installation.
- An equivalent combination of education and experience may be accepted as a satisfactory substitute for the specific education and experience listed above.
- ***Certification/Licensure:***
- ***Other:*** Must be 18 years of age.

PHYSICAL DEMANDS:
- While performing the duties of this job, the employee is frequently required to walk, climb, kneel, crouch or crawl, and use hands to handle, finger or feel objects, tools or controls.
- While performing the duties of this job, the employee is occasionally required to lift, move and/or hold up to 80 pounds (or other weight limit as determined by employer); this includes equipment, work materials and supplies.
- Specific vision abilities required by this job include close vision, distance vision, depth perception, peripheral vision and the ability to adjust focus.

WORK ENVIRONMENT:
- While performing the duties of this job, the employee is occasionally required to work in high/precarious places, tight or confined spaces, and in outside weather conditions.
- While performing the duties of this job, the employee is occasionally required to work with and/or near moving mechanical parts or tools.
- The noise level in the work environment varies.

All employees are required to satisfactorily perform the essential duties and responsibilities of their position. • The essential duties and responsibilities listed above

are not intended to be construed as an exhaustive list of all responsibilities, duties and skills required. • *Reasonable accommodations may be made to enable individuals with disabilities to perform the essential functions of this job.*

JOB DESCRIPTION

JOB TITLE:	**Administrative Support**	GRADE: FLSA: **Non-Exempt**
REPORTS TO:	**Manager**	

BASIC SUMMARY:
Provide basic administrative support to manager. May prepare customer invoices, post cash receipts, input payroll data, and various other duties pertinent to the general function of the office.

ESSENTIAL DUTIES AND RESPONSIBILITIES:
- Responsible for general office activities.
- Receive and distribute mail. Take phone messages and handle routine matters as they arise.
- Relay information and requests to department members and follow-up as needed.
- Collate and distribute information.
- Prepare routine documents and forms as requested.
- With guidance, handle special projects and duties as needed (for example, data collection, report creation, database maintenance, contacting personnel for routine updates, etc.).
- Establish and maintain files.
- Make meeting and travel arrangements.
- Answer questions and provide assistance relating to office operations and established policies and procedures.
- Assist with phone coverage for others as needed.
- May greet visitors, set up and maintain management calendars, prepare expense reports, handle scheduling for one or more conference rooms, order office supplies, ensure office machinery is maintained and/or handle mail and shipping activities for the department.
- May perform various book keeping duties including billing, accounts receivable and management of petty cash.
- Perform all other related duties as assigned.

QUALIFICATIONS:
- ***Education:*** High School or G.E.D. and specialized secretarial training beyond High School. Associate's degree (A.A. /A.S.) or equivalent from two year college preferred.
- ***Experience:*** 2-4 years related experience.
- An equivalent combination of education and experience may be accepted as a satisfactory substitute for the specific education and experience listed above.
- ***Certification/Licensure:*** None.
- ***Other:*** Ability to prioritize and multi-task. Good keyboarding skills, proficient in utilizing personal computer, e-mail, some book keeping and standard office software packages (word processing, spreadsheet, presentation, database and book keeping).

PHYSICAL DEMANDS:

- While performing the duties of this job, the employee is regularly required to talk, hear and type at a computer.
- Specific vision abilities required by this job include close vision and the ability to adjust focus.

WORK ENVIRONMENT:

- General office working conditions, the noise level in the work environment may be slightly elevated.

All employees are required to satisfactorily perform the essential duties and responsibilities of their position. • The essential duties and responsibilities listed above are not intended to be construed as an exhaustive list of all responsibilities, duties and skills required. • Reasonable accommodations may be made to enable individuals with disabilities to perform the essential functions of this job.

Appendix 3

13.4. Home Solar Installation 101

Home Solar Installation 101

13.5.

13.6. Sizing of PV Systems for Residential Homes

The sizing of the photovoltaic system depends on various factors; the amount of electricity consumed on average annually, the orientation and tilt of the system as well as the available space.

Standard "stick built" and manufactured homes can be retrofitted for solar power with minimal roof penetration. Mobile homes do not have the structural strength to support any additional roof loading from the panels but the alternative would be to create a carport or covered patio that would still allow solar power to be utilized for the residence and also create a shade area. Sole use structures are sometimes an option but lack the economy of dual use, security and protection from shading a taller, multi-use structure provide.

The size of the system depends on what percentage of electricity is desired to be replaced by solar power. A typical dimension for a photovoltaic panes is 3' x 5'. The panels weigh approximately 50 lbs per panel or 3.3 lbs per square foot. A standard 1200 square foot home would require approximately 12 to 20 panels per house to obtain 2.5 to 4 kilowatts of electricity. 12 to 14 panels would be the estimated minimum to obtain a power offset of 50%.

The following is a general conditions example for generating 3Kw of energy to a 1,200 square foot home.

Number of Panels for Desired Energy Offset to supply 3Kw for 1,200 square foot home (General conditions – additional information required to determine

% Energy Offset	Number of 3'x5' PV Panels
50%	12 to 14
75%	15 to 16
100%	17 to 20

The number of panels would slightly increase for a 1,500 sq foot home with an emphasis that exact numbers can only be obtained after an analysis of electric bills for the last twelve months.

In order for the solar PV system to become as efficient as possible, each residence must take steps to minimize existing electricity consumption including proper weatherization and reducing energy usage.

Costs:

Typical costs for installation of a PV system range from $4.50 to $5.10 per watt including rebates. To install a 3Kwatt system for a 1,200 square foot home, the approximate costs would vary from $13,500 to $15,300.

The PV system should be sized to equal or be less than the existing annual consumption. A general rule of thumb is to take the annual consumption (in kWh) and divide that by 1300 kWh/yr. (1kW of photovoltaics will generate about 1300 kWh per year).

Tribal, State and Federal Energy Grants and Programs:

See Attached "Solar Programs, Grants and Incentives"

Installer Requirements and Training:

The California Solar Initiative requires that the system must be installed by a "appropriately licensed California solar contractors". Also it is recommended that the installer be certified by the North American Board of Certified Energy Practitioners (NABCEP) and that all installers must be pre-approved.

PV system installation contractors must have an active A, B, C-10, or a C46 license for photovoltaic (PV) systems.

Attached are excerpts from the California Solar Initiative Program Handbook detailing installer requirements, warranty requirements and circumstances requiring additional documentation for owner-installed systems. Also included is the homepage for the NABCEP. (See "PV Solar Installer Requirements and Training")

Net Metering:

See Attached "California – Net Metering"

Additional Resources & Links:

Go Solar California State website
http://www.gosolarcalifornia.ca.gov/

California Solar Initiative

http://www.pge.com/csi

PG&E: Self Generation Program
http://www.pge.com/selfgen/

U.S. Department of Energy – Tribal Energy Program
http://www.eere.energy.gov/Tribalenergy/

California Solar Energy Industries Association
http://www.calseai.org/

National Renewable Energy Laboratory (NREL)
http://www.nrel.gov/