

# Final Technical Report



## Energy Strategic Planning & Self- Sufficiency Project



Prepared For  
Smith River Rancheria

March 30, 2005



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## Smith River Rancheria

### Energy Strategic Planning & Self-Sufficiency Project

March 30, 2005

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Organization

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# Abstract

## Self-Sufficiency Report form STI (DOE F 241.3)

(Page 1, Part 1, Paragraph J)

This report provides information regarding options available, their advantages and disadvantages, and the costs for pursuing activities to advance Smith River Rancheria toward an energy program that reduces their energy costs, allows greater self-sufficiency and stimulates economic development and employment opportunities within and around the reservation. The primary subjects addressed in this report are as follow:

1. Baseline Assessment of Current Energy Costs

An evaluation of the historical energy costs for Smith River was conducted to identify the costs for each component of their energy supply to better assess changes that can be considered for energy cost reductions.

2. Research Viable Energy Options

This includes a general description of many power generation technologies and identification of their relative costs, advantages and disadvantages. Through this research the generation technology options that are most suited for this application were identified.

3. Project Development Considerations

The basic steps and associated challenges of developing a generation project utilizing the selected technologies are identified and discussed. This included items like selling to third parties, wheeling, electrical interconnections, fuel supply, permitting, standby power, and transmission studies.

4. Energy Conservation

The myriad of federal, state and utility programs offered for low-income weatherization and utility bill payment assistance are identified, their qualification requirements discussed, and the subsequent benefits outlined.

5. Establishing an Energy Organization

The report includes a high level discussion of formation of a utility to serve the Tribal membership. The value or advantages of such action is discussed along with some of the challenges.

6. Training

Training opportunities available to the Tribal membership are identified.

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# 1 Executive Summary

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This Report offers background information on Smith River Rancheria's ("SRR") energy situation as a result of investigations and assessments recently completed. The guiding principles and overall objectives of SRR that initiated this energy review are outlined in the Energy Vision Statement provided in Section 3 of this Report. This Report discusses SRR's current energy use and costs, self-generation options, self-generation development steps, weatherization subsidies, the benefits and challenges of establishing a SRR energy organization, training opportunities and recommendations. The following sections also outline SRR's energy options, the reasoning used, the evaluation results, observations, and the recommendations for implementation of the plan. This Report includes recommended actions concerning many aspects of SRR's energy situation but a more concise description of the specific steps recommended is provided by the Action Plan in Section 11.

A baseline review of SRR's current energy bills was conducted and determined that the cost of the commodity (the electricity alone, not including the distribution, transmission and other costs) is very competitive and has a range of \$0.036 – 0.042/kWh as shown in Figure 2. If SRR were able to install self-generation on SRR's side of the electric meter, it would eliminate the distribution charges and transmission charges as well as the generation charges mentioned above. The costs for these elements as shown in the Pacific Power bill (Figure 1) currently range from \$0.053 – 0.094/kWh with the lower values being enjoyed by the Casino, the largest user of power.

The first of three options for SRR to attaining the largest savings in their energy costs is by forming its own utility so it can purchase power directly from the Bonneville Power Administration ("BPA") at *wholesale rates*. BPA's regulations require that any utility choosing to purchase power from them must have a load of at least one (1) megawatt. Currently, SRR's load is around 0.5 megawatts (peak not average). They may be able to reach one (1) megawatt load as economic development continues but this will likely take several years. A BPA representative provided email confirmation that SRR is *not* within BPA's territory and therefore is not eligible to purchase power from BPA. Others knowledgeable on this subject believe that SRR may be able to obtain an exception from BPA with diligent pursuit of this matter.

Establishing a SRR utility simply to serve its members, will not likely reduce SRR's energy bill and will add the extra financial burden of recovering the capital cost needed to purchase or lease the distribution infrastructure from Pacific Power. If forming a utility is joined with purchasing power from a low cost third party or if power can be obtained from a self-generation facility, the savings would be notable. Since BPA has recently indicated that SRR is not within their service territory, the primary source of low cost power from which a SRR utility might purchase power, has been eliminated. Diligence in declaring that SRR is within BPA's service territory is encouraged and is critical to SRR maintaining their ability now or in the future to purchase power from BPA.

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The second option is to form a utility to allow the purchase of power from a third party. This would require wheeling over Pacific Power's transmission lines and depending on the location of the seller, may require wheeling over other utility's systems. Utilizing this approach would require SRR's purchasing or leasing Pacific Power's distribution system within the reservation and developing a plan to operate and maintain this newly acquired infrastructure. This option appears to offer a far less favorable financial benefit because the portion of the existing Pacific Power bill attributed to the actual commodity is between \$0.036 – 0.042/kWh as shown in Figure 2 below. This is a very competitive cost that would be difficult to improve by purchasing from third parties (unless purchasing from BPA as a wholesale customer), after paying wheeling charges, operation and maintenance costs of the distribution system, and recovering the capital cost of the distribution system. Because of the relatively small load required by SRR to serve their needs, SRR would not receive any benefits from economy of scale like that enjoyed by other projects with larger demand.

The third option to realize significant savings of SRR's energy costs is to install a self-generation facility. When self-generation is installed, there are two direct benefits that would be desirable to achieve.

- A.** If SRR could form a utility so there would be one meter to which this self-generated power could be sent, SRR would realize the greatest value of all, because this would offset or reduce the power purchased from Pacific Power thereby eliminating *all* of the energy charge of the current electric power bill. These savings are considerably higher than the generation costs that would be saved if the commodity was purchased from a third party as discussed in the preceding paragraph. In this case the cost reduction from Pacific Power would be the costs shown in Figure 1 as the Energy Charge which are from \$0.053 – 0.094/kWh. Of all the SRR facilities, the Casino receives the best energy pricing from Pacific Power. The savings range of the remaining facilities with this approach is \$0.072 – 0.094/kWh. This option appears to offer significant benefits to SRR but the *generation must be located behind the newly formed utility*. In other words, the generation facility would have to be close enough to the SRR community that a power line could be installed from the generation facility to the community so as to offset the incoming power from Pacific Power. This significantly restricts the possible locations for the generation facility.
  - B.** The other primary benefit from establishing a self-generation facility is the ability to generate power that can be sold on the open market. The challenge is to find a technology and fuel source that will allow the installation of a generation facility that can be profitable by selling to third parties at today's market pricing. This opportunity and associated costs and revenues are discussed further in Sections 5 and 6. In view of the multiple challenges of forming a utility and to gain its benefits, a generation facility whose output is not utilized by SRR but sold to third parties, may offer the best chance of success. This offers the ability to develop a larger facility to gain some economy of scale and the benefits of a potential partner.
-

If a biomass facility were developed in Oregon adjacent to the existing sawmill, there would be great synergy where the sawmill operation provides the source of fuel and becomes the recipient of the low-grade steam after it has been used by SRR to generate electricity. This is discussed further in Sections 5 and 6.

There are numerous federal, state and utility programs that offer benefits to help pay for weatherization costs for the homes of those who qualify and assistance with payment of utility bills. While these programs appear to offer significant benefits, the organizations administering these programs are sometimes overtaxed resulting in long delays in receipt of these benefits. SRR members are encouraged to pursue the programs containing funds specifically for Native Americans to avoid these delays. These programs are described more fully in Section 7.

There are several training opportunities for SRR members outlined in Section 9. These include training members to become weatherization auditors and/or contractors, to carry out the work identified by the community action agency who manages the low-income weatherization funds. Establishing trained personnel who can in turn provide training to SRR members on how to reduce their utility costs would enhance the community's quality of life and provide one or more employment opportunities. Forming a community action agency is a bit more complicated but may provide even greater benefits to the community. This agency would manager and administer the funds received for low-income weatherization and utility bill payment assistance. Establishing an economic environment at SRR where a partner with a tax burden could benefit from the New Markets Tax Credit, would take some creativity but may offer significant economic development opportunities for SRR.

## **2 Project Overview & Objectives**

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SRR desires to become energy self-sufficient, reduce their energy costs, and stimulate economic development in the community. An Energy Vision Statement and Guiding Principles, which are provided below in Section 3, have been developed to meet these objectives. This report provides the research completed, information concerning SRR's current energy costs, and a strategy that includes the necessary specific steps to achieve SRR's objectives. The elements presented in this plan include evaluation of self-generation technologies, assessment of forming a SRR utility, a training and conservation strategy.

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## **3** Develop an Energy Vision

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### **A. Vision Statement**

The Smith River Rancheria, recognizing the energy needs of the Tribe and Tribal members, visualizes that within five (5) years there will be total energy self-sufficiency for the Tribe and Tribal members with the full intention of utilizing its own natural resources to realize its goal of self-sufficiency.

### **B. Guiding Principles**

1. The Tribe shall commit to a strategic plan with the progressive development of a comprehensive energy policy, which incorporates the best interests of the Tribe and the Tribal members.
  2. The Tribe shall utilize its own natural resources as well as the technical assistance of experts in the field of renewable and alternative energy to accomplish its goal of developing a comprehensive energy policy and plan, which incorporates energy self-sufficiency as one of the goals and objectives.
  3. The Tribe shall utilize programs and training already available to implement low-income weatherization and conservation programs within the Reservation to reduce energy consumption. If necessary or prudent, the Tribe shall obtain training for some members who will become instructors to offer training to conduct weatherization inventories and/or contractor training for weatherization installation services.
  4. The Tribe shall seek out additional funding sources in order to assure full and complete accomplishment of the developed energy policy and plan.
  5. The Tribe shall compile a comprehensive database originating from direct communications with Tribal members to support the development of a comprehensive energy policy and plan.
  6. The Tribe shall strive to provide a continuous education/ orientation process to the Tribal members on the development of the energy policy and plan.
  7. The Tribe shall work and coordinate with any and all governmental and business entities who can further the goals and objectives of providing energy self-sufficiency for the Tribe and Tribal members.
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## 4 Baseline Assessment

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### A. Electric Utility Bill<sup>1</sup>

The information provided in Figure 1 below has been extracted from Pacific Power (or PacifiCorp, the holding company for Pacific Power and Utah Power) electrical bills received by SRR. For the majority of the meters, billing information provided below is the average for January 2004 through September or October of 2004. A few meters only had two or three months of invoice information.

It can be seen from this information that there is a demand charge only for those meters serving the larger loads, consistent with Pacific Power's tariffs and common in the industry. By reviewing the last column and the second to the last column it can be seen that the casino has by far, the lowest cost energy. This is likely a result of the significant load generated by the casino compared to the other meters. The column labeled "Use" reveals that the casino consumes five times more energy than Lucky 7 Fuel, the next largest consumer of electricity.

The values in the last three columns of Figure 1 below were generated as follows:

#### **"All Costs"**

Grand total of the invoice in dollars divided by the grand total of kWh's used over the period covered by the invoices.

#### **"Market Price of Commodity:"**

Taken from the Pacific Power bill. Pacific Power reports this is the average market price for power sold at the California Oregon Border (COB) and is to be used for determining the competitiveness of alternative energy supplies. However, this price is likely the day ahead price and only represents the spot market, which can often have lower pricing than long term contract pricing.

#### **"Calculated from Invoice"**

Cost in dollars shown on the invoice for Energy Charge divided by the kWh's used.

The weighted average costs of electricity for each of the cost columns can be found in the bottom two lines of the Figure 1 below.

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<sup>1</sup> Invoices for all months for all meters were not available.

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**Figure 1 – SRR Electrical Invoice History**

Line No.	Location	Meter Ending With	Use	Demand	Electrical Cost					
					Energy Avg/ Month	Other Avg/ Month	Total Avg/ Month	Per kWh		
								All Costs	Market Price of Commodity	Energy Charge <sup>2</sup> Calculated from Invoice
			kWh	kW	\$	\$	\$	\$/kWh	\$/kWh	\$/kWh
1	Office Module & Security Lights	001 4	2,556		241	13	254	0.100	0.050	0.094
2	Lucky 7 Fuel	002 2	20,456	42	1,474	156	1,630	0.080	0.052	0.072
3	Howonquet Water	001 9	928		90	6	99	0.114	0.049	0.097
4	140 Rowdy Creek Rd on Hill	008 9	700		50	18	86	0.127	0.060	0.072
5	12672 Oceanview Dr	004 8	193		14	6	20	0.116	0.050	0.073
6	12650 US Highway 101 N	001 7	1,111		105	11	116	0.107	0.054	0.094
7	12840 Mouth Smith River Rd	007 1	227		17	5	23	0.111	0.050	0.074
8	1600 Weeot Way - Health Clinic	002 4	5,491	24	427	55	482	0.092	0.051	0.078
9	350 N Indian Rd - Casino	003 7	154,167	293	8,193	1,894	10,297	0.067	0.051	0.053
<b>11</b>	<b>Total</b>		<b>185,828</b>	<b>358</b>						
<b>12</b>	<b>Weighted Avg Cost w/ Casino</b>							<b>0.070</b>	<b>0.051</b>	<b>0.057</b>
<b>13</b>	<b>Weighted Avg Cost w/o Casino</b>							<b>0.087</b>	<b>0.052</b>	<b>0.076</b>

The account manager for Pacific Power and Light is Al Alexander located in Salt Lake City (801.955.2414). However, Greg Noyes (801.955.2432) in Customer Service provided most information regarding the SRR utility bills. Appendix C provides two sample invoices from Pacific Power for reference.

It can be seen from the information gathered in Figure 1 that the Demand (this is the peak or maximum instantaneous electricity used, usually measured over 15 minute intervals) for those locations with demand charges total 358 kW or 0.358 MW. A load profile model and study would have to be performed for the remaining meters that do not have demand measuring equipment, to estimate the peak demand for those locations.

Of the 600 people living on reservations, approximately 200 of these are Tribal members. These individuals represent approximately 480 households, of which 60-70 are Tribal member households. Generally, slightly less than 1 kW is needed for each household to assure adequate power is available for those periods (morning and evening) when most

<sup>2</sup> The Energy Charge includes charges for generation, distribution and transmission and therefore does not represent the commodity cost. The commodity cost is not shown on the Pacific Power bills and must be calculated using the market price less the Competition Transition Charge. However, this is the same as the tariff prices discussed below.

residents are home using the heat, lights and appliances. When combined with the known demand shown above, the demand for the Tribal facilities with demand meters plus the residential load, would total approximately 428 kW (358 kW of known demand plus 70 kW of estimated residential demand). The missing portion of the grand total load is the power required for the six locations listed in Figure 1 that do not have demand meters and a few other SRR facilities not listed at all. But it is reasonable to estimate that the total Tribal load (residential and Tribal owned facilities) in Smith River Rancheria is likely below 1 MW (1,000 kW).

## B. Pacific Power Electric Tariffs

The SRR facilities are charged by Pacific Power under three tariffs that include Schedule – 25, Schedule – 32, Schedule – 36, and Schedule D. These different schedules are in intended to service small, medium and larger electrical loads, respectively. These schedules are enclosed as Appendix D and can be located on Pacific Power’s web page at:

<http://www.pacificpower.net/Navigation/Navigation4428.html>. There is a listing of useful web sites applicable to several sections of this report included as Appendix A. There is a full list of individuals contacted and a few not contacted but of individuals of interest included as Appendix B.

These tariffs outline multiple components of the total charge for power sold to SRR. The primary charges deserving our attention are shown in Figure 2 below:

**Figure 2 – Pacific Power Tariff Review**

Line No.	Charge	Schedule A-25 Less than 20 kW	Schedule A-32 More than 20 kW	Schedule A-36 More than 100 kW
1	<b>Energy Charge Cents/kWh</b>			
2	Distribution	4.451	3.773	1.656
3	Generation	4.218	3.381	3.597
4	Other	0.869	0.146	0.155
5	<b>Total Energy Cents/kWh</b>	<b>9.538</b>	<b>7.300</b>	<b>5.408</b>
6	<b>Distribution Demand Charge \$/kW</b>		<b>1.60</b>	<b>2.00</b>
7	<b>Generation &amp; Transmission Demand \$/kW</b>			
8	Generation		-1.00	1.00
9	Other		2.10	2.30
10	<b>Total Generation &amp; Trans Demand \$/kW</b>		<b>1.10</b>	<b>3.30</b>

From this summary of the tariffs applicable to SRR we can see that there are essentially three primary components to the charges from Pacific Power:

- Energy Charge cents/kWh,

- Distribution Demand Charge \$/kW
- Generation & Transmission Demand Charge \$/kW

A demand charge is calculated by averaging the two highest kilowatt demands during the past 12 months, multiplied by the demand price in \$/kW. From Figure 1 on the prior page, it can be seen that the Casio’s average demand for the utility bills provided is 293 kW (line 9). From Figure 2 above we see that the demand charge for Schedule A-36 (this tariff applies to the Casino) shows a Distribution Demand Charge of \$2.00/kW (line 6) and a Generation & Transmission Demand Charge of \$3.30/kW (line 10) for a total \$5.30/kW. This rate taken times the demand of 293 kW equals an average annual Demand Charge for Distribution, Generation and Transmission, of \$1,552.90 per month (\$5.30/kW x 293 kW). Note that the health clinic and Lucky 7 Fuel are the only other two facilities that report a demand because they are the only other facilities with a high enough demand to require the tariff that includes such a charge.

Figure 3 below indicates which tariff applies to each of the SRR facilities for which bills were received.

**Figure 3 – Applicable Tariff for Various Facilities**

Facility	Tariff
Office Module & Security Lights	A – 25
Lucky 7 Fuel	A – 32
Howonquet Water	A – 25
140 Rowdy Creek Rd on Hill	A – 25
12672 Oceanview Dr	A – 25
12650 US Highway 101 N	A – 25
12840 Mouth Smith River Rd	A – 25
1600 Weeot Way - Health Clinic	A – 32
350 N Indian Rd - Casino	A – 36

If SRR were to purchase power from a third party without forming a utility, SRR would still rely on all of Pacific Power’s transmission and distribution services. The only service that would no longer be provided by Pacific Power would be the generation component of the Generation Charge or in this case, 4.22, 3.38, and 3.60 cents per kWh respectively for the three tariffs (see line 3 in Figure 2 above). If SRR were to install a generation facility away from the reservation, SRR would still rely on Pacific Power for their transmission and distribution poles and wires to move the power to the SRR reservation, assuming SRR wants to utilize this power within the reservation by their own facilities. Preliminary review indicates that even in this scenario, Pacific Power would reduce SRR’s electric bills only by the generation component of the Energy Charge

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because SRR would still require the use of Pacific Power's poles and wires to move the power to the reservation. These are very low generation costs, and it is very unlikely that SRR could install a generation facility that could compete with these commodity charges.

However, if SRR were to install a generation facility within the SRR facility which is said to be on SRR's side of the utility meter, then SRR would no longer require Pacific Power's poles and wires to utilize this power. Therefore, preliminary review indicates that Pacific Power would no longer bill SRR for any of the components of the Energy Charge or, 9.54, 7.30 and 5.41 cents per kWh for each of the three tariffs (see line 5 in Figure 2 above). It is far more feasible that SRR would be able to install a generation facility that can compete with these costs for power than if SRR were to only receive benefit of the generation component of the Energy Charge described earlier.

There are additional consideration to be uncovered before this is fully sorted out. If SRR installed a generation facility (a single wind turbine or reciprocating engine, for example) within the reservation on SRR's side of the meter, SRR could use this power within the facility fed by the behind which the generation facility is installed. SRR would not be able to move this power to its other facilities without either, 1) using Pacific Power's poles and wires, and thereby incurring the distribution charges from Pacific Power or 2) building another distribution system to the SRR facilities with the largest power demand.

It is for these reasons that the location of the generation facility, and more specifically, the precise location of the electrical interconnect, is of utmost importance to evaluate the generation facility's financial merit. The same facility connected at different locations would have substantially different financial merit of viability because the associated charges from Pacific Power will vary significantly.

The precise requirements for interconnecting a power generation facility to allow SRR to obtain the Energy Charge benefits mentioned above will not likely be completely understood soon and is still being pursued and investigated with Pacific Power. This will be among the high priority steps required during the next phase of work regarding SRR's desire to develop a power generation facility to attain significant progress toward their goal of achieving energy self-sufficiency.

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# 5 Research Viable Energy Options

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## A. Generation Technology Options

### 1. General Description<sup>3</sup>

#### a. Photovoltaics (PV)

Photovoltaic systems are commonly known as solar panels. Photovoltaic (PV) solar panels are made up of discrete cells connected together that convert light radiation into electricity. The PV cells produce direct-current (DC) electricity, which must then be inverted for use in an AC system. Current units have efficiencies of 24% in the lab and 10% in actual use, below the 30% maximum theoretical efficiency that can be attained by a PV cell.

Insolation is a term used to describe available solar energy that can be converted to electricity. The factors that affect insolation are the intensity of the light and the operating temperature of the PV cells. Light intensity is dependent on the local latitude and climate and generally increases as the site gets closer to the equator. Photovoltaic systems produce no emissions, are reliable, and require minimal maintenance to operate. They are currently available from a number of manufacturers for both residential and commercial applications, and manufacturers continue to reduce installed costs and increase efficiency. Applications for remote power are quite common.

Residential and commercial/institutional systems range from 1 or 2 kW up to about 150 kW. The Kettle Foods (makers of potato chips, etc.) installation in Salem is currently the largest PV system in Oregon at 114 kW. In Eugene, the largest system is the 44 kW, installed at the University of Oregon's Lillis Business School. They are relatively expensive on a capital investment basis but have reduced operating costs consisting mostly of maintenance costs.

The photovoltaic equipment has not evolved to sufficient sizes or adequately low costs to become a viable alternative for application to SRR's needs. The relatively low levels of sunshine in the Northwest compared to other locations of the US, does not lend itself to application of this technology.

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**b. Reciprocating Engines**

Reciprocating engines are similar to simple internal combustion engines used in large trucks only somewhat larger. They can be fueled by diesel, natural gas or propane. The process begins with fuel and air being mixed. In turbocharged applications, the air is compressed before mixing with fuel. For diesel units, the air and fuel are introduced separately with fuel being injected after the air is compressed. Reciprocating engines are currently available from many manufacturers in a full range of sizes. This technology is used for both backup emergency power and for baseload continuous operation. Cogeneration configurations, typically called combined heat and power when referring to reciprocating engines, are available with heat recovery from the gaseous exhaust and the water jacket cooling, which enhances the overall efficiency significantly. Relative to some other generation technologies, reciprocating engines have somewhat higher maintenance costs. The fuel costs vary significantly depending on the fuel type utilized.

There are applications where this proven technology is an excellent choice, especially where the demand is smaller like the less than one megawatt demand of SRR. There are other low cost alternatives for base loaded power generation facilities that are configured to provide larger amounts of power that far exceed the needs of SRR that would result in lower overall operating costs. If these other technologies are employed it will require the sale of power to third parties.

**c. Microturbines**

Microturbines are an emerging class of small-scale distributed power generation in the 30-400 kW size range. The basic technology used in microturbines is derived from aircraft auxiliary power systems, diesel engine turbochargers, and automotive designs. A number of companies are currently field-testing demonstration units, and several commercial units are available for purchase.

Microturbines consist of a compressor, combustor, turbine, and generator. The compressors and turbines are typically radial-flow designs, and resemble automotive engine turbochargers. Most designs are single-shaft and use a high-speed permanent magnet generator producing variable voltage, variable frequency alternating current (AC) power. Most microturbine units are designed for continuous-duty operation, but have not achieved the efficiencies or reliability levels originally hoped for. The operating cost for microturbines is too high and the sizes available are too small for the SRR application.

**d. Combustion Gas Turbines**

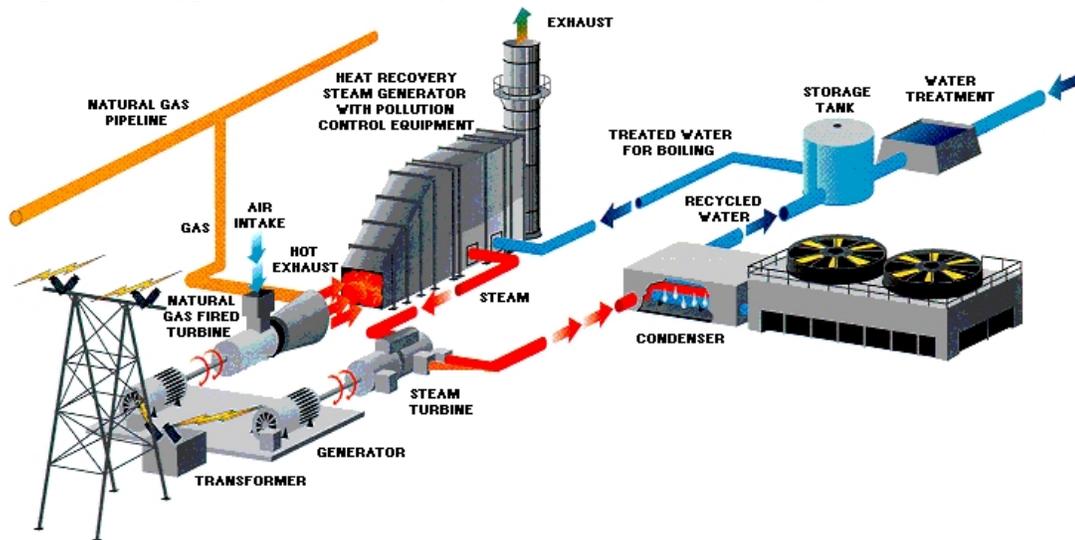
Combustion turbines range in size from simple cycle units starting at about 1 MW to several hundred MW when configured as a combined cycle power plant. Units from 1-15 MW are generally referred to as industrial turbines (or sometimes as miniturbines), which differentiates them both from larger utility grade turbines and smaller microturbines discussed above. Historically, they were developed as

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aeroderivative engines, spawned from engines used for jet propulsion. Some, however, are designed specifically for stationary power generation or compression applications in the oil and gas industries. Multiple stages are typical and along with axial blading differentiate these turbines from the smaller microturbines described above.

Combustion turbines have relatively low installation costs, low emissions, and infrequent maintenance requirements. Their electric efficiency has been dramatically increased over the years and offer a relatively high efficiency. When combined with a heat recovery steam generator for a combined cycle configuration, even greater efficiencies are achievable. Combined cycle installations are particularly advantageous when a continuous supply of steam or hot water is desired. The smaller units that would be suitable for this application do not achieve the same economy of scale as the larger utility-grade combustion turbine units. This will likely cause this technology for this application to be less competitive than other options. The diagram below provides a simplified picture of a combined cycle facility utilizing a somewhat less common air-cooled configuration.

**Figure 4 – Typical Combined Cycle Combustion Turbine Cycle**



#### e. Fuel Cells

Although the first fuel cell was developed in 1839 by Sir William Grove, it was not put to practical use until the 1960's when NASA installed this technology to generate electricity on Gemini and Apollo spacecraft. There are many types of fuel cells currently under development in the 5-1000+ kW size range, including phosphoric acid, proton exchange membrane, molten carbonate, solid oxide, alkaline, and direct methanol. One company, International Fuel Cells/ONSI, currently manufactures a 200 kW phosphoric acid fuel cell for use in commercial and industrial applications.

Although the numerous types of fuel cells differ in their electrolytic material, they all use the same basic principle. Hydrogen fuel is fed into the anode of the fuel cell. Oxygen (or air) enters the fuel cell through the cathode. With the aid of a catalyst, the hydrogen atom splits into a proton (H<sup>+</sup>) and an electron. The proton passes through the electrolyte to the cathode and the electrons travel in an external circuit. As the electrons flow through an external circuit connected to a load they create a DC current. At the cathode, protons combine with hydrogen and oxygen, producing water and heat. Fuel cells have very low levels of NO<sub>x</sub> and CO emissions because the power conversion is an electrochemical process.

Fuel cells require hydrogen for operation. However, it is generally impractical to use hydrogen directly as a fuel source; instead, it must be extracted from hydrogen-rich sources such as gasoline, propane, or natural gas. Cost effective, efficient fuel reformers that can convert various fuels to hydrogen are necessary to allow fuel cells increased flexibility and wide commercial feasibility. The capital cost for fuel cell technology is still very high relative to other sources of power and has deterred wide use of this technology except for remote or somewhat special applications and very load requirement purposes.

**f. Solar – Hot Water Heating**

Hot water was not within the scope of the energy plan defined, but hot water heated by solar energy could be an option for relieving some utility bill stress. No research was completed on this subject but there are indications that some benefits could be received through this technology. Since Oregon has many cloudy and partly cloudy days, it may not appear that logical but it may be worthy of additional investigation.

**g. Geothermal**

Geothermal power plants tap into the heat of the Earth to generate electricity. There are two generic types of geothermal power plants. The first and most common are referred to as a “dry” or “flash steam” plant and are pictured below in the schematic. Hot water or geologic steam is piped to the surface through a well drilled into a geothermal reservoir. This high pressure/temperature fluid is then allowed to “flash” (turn from liquid to gaseous state) expand at atmospheric pressure and drive a turbine generator. The fluid cools in the process, having given up some of its energy, and is reinjected back to another part of the reservoir so as not to deplete the geothermal fluid level.

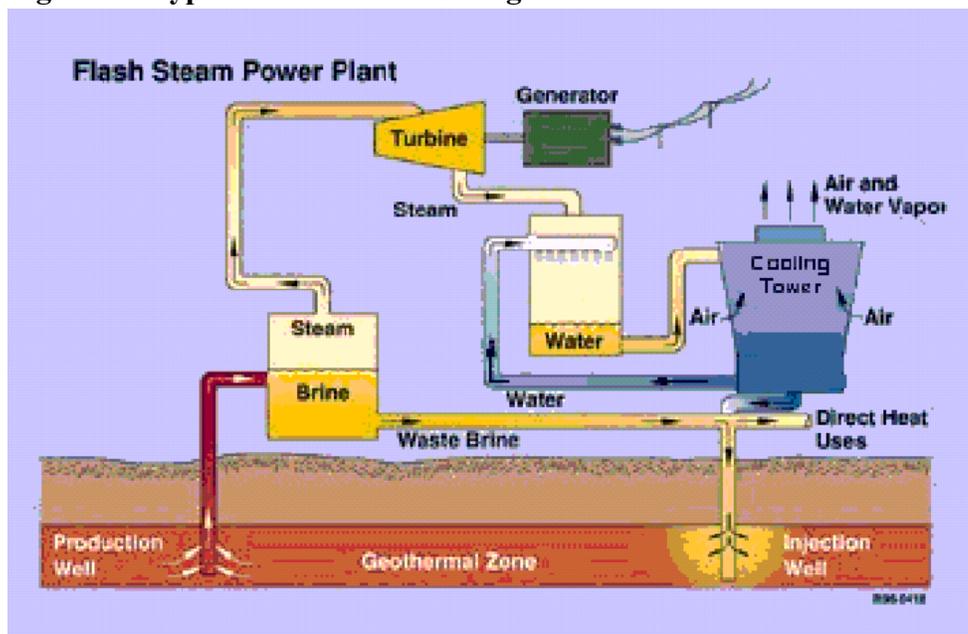
These steam type plants produce very few emissions because there is no open combustion or burning of hydrocarbons. There is sometimes leakage of sulfur compounds because of the geologic origin of the fluid but it is considered fairly well controlled in newer plants. The plume you might see as you pass a plant is from stacks used to cool the exhaust fluids so they can be re-injected.

Binary cycle geothermal power generation plants differ from dry steam or flash steam systems in that the water or steam from the geothermal reservoir never comes in contact with the turbine/generator units. In the binary system, the water from the geothermal reservoir is used to heat another "working fluid" which is vaporized and used to turn the turbine/generator units. The geothermal water and the "working fluid" are each confined in separate circulating systems or "closed loops" and never come in contact with each other. The advantage of the binary cycle plant is that they can operate with lower temperature waters (225° F - 360° F), by using working fluids that have an even lower boiling point than water. They also produce few air emissions but do have the added challenge of avoiding emitting small amounts of the working fluid through leaking seals etc.

Geothermal plants take longer to site and build than natural gas fired generating facilities. Not only does the developer have to build the plant's surface generating facilities it must explore for the resource and drill the extraction and injection well fields in addition to constructing all the interconnecting pipelines. Another issue that may prolong the siting process is that getting the permits necessary for construction can be challenging since many geothermal resource areas are located in recreation, scenic, or wildlife sensitive areas. Proper protection of those other societal "resources" must be negotiated and incorporated into site/operational permit requirements.

Geothermal plants have a relatively high capital investment cost and relatively low operating costs since there is little or no "fuel" cost. The maintenance costs varies significantly depending on the type of geothermal facility. Geothermal plants are predominately base load plants. The simplified diagram below shows the configuration of a flash or steam geothermal power generation facility.

**Figure 5 - Typical Geothermal Configuration**



Most of the world's geothermal resources have been identified and located. There are no known geothermal resources near SRR removing this technology from the list of possible technology choices for further investigation.

#### **h. Biomass**

Biomass energy, one of the oldest energy sources known to man, uses the energy embodied in organic matter. Biomass-based energy systems utilize wood, agricultural and wood waste, municipal wood (although today most only consider municipal wood waste as a biomass fuel), and landfill gas as fuels. Biomass in all its energy uses currently supplies more than 3% of total U.S. energy needs and provides almost 10,000 MW of electric generating capacity. Wood fuels provide the bulk of this generation (66%), followed by municipal waste (24%), agricultural waste (5%), and landfill gas (5%).

Biomass plants for electricity generation is an old and straightforward technology that is still effective today. Agricultural, forest, or other organic waste products are combusted in a boiler to generate steam, which is used to drive a steam turbine, which in turn drives an electric generator. Such plants have been around the Northwest for many years. Such systems are dependent on a continuous supply of fuel. Transportation costs can be significant unless the facility is located near the fuel source.

Wood is the leading biomass energy resource used for power generation, primarily because of its use as a boiler fuel in the lumber and pulp and paper industries. The lumber industry satisfies close to 75% of its energy needs through direct wood combustion, while the pulp and paper industry has achieved a 55% aggregate fuel contribution from wood. Many of these companies use cogeneration systems for power generation. The Edison Electric Institute estimates that more than 6,000 MW of non-utility, wood-fired generating capacity was in place at the end of 1991.

Combusting wood as a fuel has environmental advantages in terms of emissions of carbon dioxide (CO<sub>2</sub>). The CO<sub>2</sub> emissions are generally considered to be greenhouse neutral since the source is terrestrial biomass that at some point in its life would oxidize and re-enter the carbon cycle – unlike fossil hydrocarbons that have been sequestered from the atmosphere for millions of years. Another fact worth recognizing is that the burning of a tree releases carbon dioxide, but an equal amount of carbon dioxide is removed from the atmosphere while the tree is growing. Thus, so long as the trees that are burned are replaced by new, growing trees, the net emission of carbon dioxide is zero.

Besides CO<sub>2</sub> these systems do generate air emissions including particulates and volatile organics. Emissions levels can be managed but the control equipment adds to the capital cost of a facility.

When this technology is combined with an industrial use in a cogeneration configuration, the facility's efficiency is dramatically increased. This occurs when

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the steam already used to generate electricity is sent to the industrial facility for utilization in its process. As this steam condenses into liquid, tremendous heat is released for use by the industrial process like a lumber kiln for drying lumber. Without the cogeneration configuration, all this heat released when the steam condenses (latent heat of vaporization) is lost to the atmosphere through the cooling tower.

A cogeneration configuration with a power generation facility and a sawmill that includes a kiln is a natural pairing. This combination provides a highly efficient power generation cycle. Additional synergies are realized when the power plant utilizes the waste wood products generated by the sawmill operations. A plan of this nature can especially benefit both the power plant and the sawmill when the sawmill's existing boilers are in need of repair or updating. The sawmill can avoid the needed capital expense by purchasing steam from a newly built, modern power plant that incorporates current emission control technology.

Biomass technology may be a viable alternative and should not be ruled out at this juncture. The section below titled "Potential Biomass Fuel Supply & Information" (paragraph B) discusses in more detail the feasibility of utilizing this technology to meet the electrical needs of SRR.

#### **i. Wind Turbines**

Windmills have been used for many years to harness wind energy for mechanical work like pumping water. Before the Rural Electrification Act in the 1920's provided funds to extend electric power to outlying areas where farms were using windmills to produce electricity. In the U.S. alone, eight million mechanical windmills have been installed.

Wind energy became a significant topic in the 1970's during the energy crisis in the U.S. and the resulting search for potential renewable energy sources. Wind turbines, basically windmills dedicated to producing electricity, were considered the most economically viable choice within the renewable energy portfolio. Today, attention has remained focused on this technology as an environmentally sound and convenient alternative. Wind turbines produce electricity without requiring additional investments in infrastructure such as new transmission lines, and are thus commonly employed for remote power applications if the wind resource is present nearby. They are currently available from many manufacturers who continue to advance their designs to reduce their installed cost and increase their efficiency.

Wind turbines are packaged systems that include the rotor, generator, turbine blades, and drive or coupling device. As wind blows through the blades, the air exerts aerodynamic forces that cause the blades to turn the rotor. As the rotor turns, its speed is altered to match the operating speed of the generator. Most systems have a gearbox and generator in a single unit behind the turbine blades. As with photovoltaic systems, the output of the generator is processed by an inverter that changes the electricity from DC to AC so that the electricity can be used.

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A modern, land based, wind turbine is an example of some of the largest rotating machinery on Earth. With a swept diameter of 250 feet and a hub height of up to 325 feet, a single 1.5 MW turbine can be an imposing structure. The blades intercept the wind and transform its kinetic energy into rotational mechanical energy that drives an electric generator contained in the body of the unit at the top of the tower.

The most economical application of wind electric turbines is in groups of large machines (660 kW and up), called "wind power plants" or "wind farms." For example, the 300 MW Stateline Wind Project, built on the Oregon/Washington border, consists of turbines sited on farm and range land along windy ridges above and to the east of the Columbia river. The wind farm generates electricity while agricultural use continues relatively undisturbed. There are 6,300 MW of wind generation installed in the US today.

Contrary to energy produced by biomass or reciprocating engines, wind energy projects are considered an "intermittent" energy resource. They generate energy only when the wind blows. This also means that they are neither a base load nor a peaking plant. While winds can be forecasted to some extent, they are probabilistic in nature. The integration of this intermittent energy output requires coordination with the regional transmission system and other controllable generation.

Today, a 50-MW wind farm can be constructed in 18 months to two years. Prior to construction, wind resource availability, wildlife, and other studies can take up to two years to complete, but can usually be completed in less time.

While much more is known about the availability of wind than in the past, it is still important not only to establish the dependability of wind at a site but also to understand the prevailing directions so that turbine layouts can be most effective. Since the power contained in the wind varies with the cube of the wind speed, a site with twice the average wind speed of another site will have eight (8) times the potential power available.

The extended time for wildlife studies hinges on the fact that birds and mammals in a prospective area can have significant seasonal variation in their presence, behavior, and other facets that may influence the level to which they are affected. This variation needs to be included when potential impacts of a proposed development are estimated. For example, careful siting of strings of turbines in more recent wind projects has significantly decreased the rate of bird deaths associated with wind projects compared to early projects.

Wind projects in the Northwest have tended to be sited east of the Cascades in rural areas. A good wind project site would have good winds, low potential for bird and bat mortalities, nearby access to transmission lines, and positive local support for the development on the part of nearby communities.

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Capital costs for wind energy projects are in the medium range and generally have very low operation and maintenance costs. They have no fuel costs but because of their low capacity factors (hours of operation divided by total hours during period) it is much more difficult to recapture the capital cost of installation since they generate less kWh's per dollar expended to purchase and install the equipment. They generate little or no air or water emissions at the site though water, materials, and fuels were clearly used during their manufacture and construction. Noise does not appear to be as big an issue as it once was because the newer turbines turn more slowly and are designed to produce lower noise levels. Oregon is currently in the process of setting noise standards for wind facilities, which would actually aid developers by establishing objective standards that they can meet while protecting the interests of neighboring landowners.

Power generation by wind has been a strong consideration of SRR for some time. Its economics are within the range of other considered technologies and should not be ruled out at this early stage. The cost of power generation by wind is very reliant on the site specifics and equipment utilized.

In 1987 BPA completed a comprehensive study of wind generation for Cape Blanco, Oregon just north of Port Orford. The Final Report is available for review but is too large to include in the Appendix. At the time of this report it was concluded that such a project was not economically viable. However, the report recognized that the cost of wind power would become lower as the technology and industry matured. Such a drop in cost has been experienced in recent years as this form of power generation gains popularity.

## **2. Relative Costs of Generation Technology Options**

Figure 6 below provides approximate cost and size ranges for the various technologies considered and discussed. This is not intended to provide an exhaustive review but to provide a general comparison of the technologies.

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**Figure 6 – Relative Costs of Various Technologies**

Technology	Wind	Biomass	Recip Engine: Nat Gas	Recip Engine: Nat Gas - Combined Heat & Power	Recip Engine: Diesel	Microturbine	Combustion Gas Turbine	Fuel Cell	Geothermal
Size	0.5 MW to 3 MW Each	5MW to 40 MW	30kW to 6+ MW	30kW to 6+ MW	30kW to 6+MW	30kW to 400kW	1.5 MW to 30+MW	100kW to 3,000kW	1 MW to 300 MW
Electrical Generation Cost, including Debt Retirement \$/kWh	.065 - .090	.050 - .065	.070 - .010	.065 - .085	0.190		.045-.070	Very High	.050-.080
Installed Cost (\$/kW) <sup>4</sup>	1,200-2,000	2,000-2,500	800-1,200	2,000-2,400	600-1,000	1,200-1,700	400-900	4,000-5,000	4,000

The higher costs for a given technology usually align with a smaller facility and the lower cost with a larger facility. The installed cost will vary with the financing arrangements and the term utilized to pay down the capital costs.

In October, the subsidy for wind and biomass were renewed until the end of 2005. While this benefit will expire before SRR can complete a project, it is a strong indication that Congress will continue to provide this benefit to these technologies. Currently it provides approximately \$0.018 per kWh (depending on the escalated rate at the time the facility achieves commercial operation) for 10 years for wind projects. A similar subsidy is available for a biomass project but it will pay one-half the rate for only five years.

Appendix E provides an additional resource in a somewhat dated paper prepared by the US Department of Energy that provides information on the various technologies.

## **B. Potential Biomass Fuel Supply & Information**

### **1. South Coast Lumber (Pacific Wood Laminates)**

#### **a. Background**

South Coast Lumber (SCL) is a privately owned business formed in the 1950's that had gross income of \$104 million in 2003 and approximately \$45 million in 2002. It manufactures a complete line of engineered wood products, including plywood and veneer that can improve performance and reduce costs in a wide range of

<sup>4</sup> Cost varies significantly based on siting and interconnection requirements, as well as unit size and configuration.

applications, in its Brookings, Oregon mill. Between its Oregon facilities and its facilities in McCall, Idaho, they employed approximately 150 people in 2002.

**b. Cogeneration Facility**

SCL's sawmill near Brookings, Oregon utilizes wood waste generated from its own sawmill to generate adequate steam for its drying process. South Coast Lumber is in the process of expanding their current operation by 25%. Once the current construction activities are completed, around February of 2005, there will be a greater demand for steam as a result of the newly expanded facility. South Coast will require expansion of their steam plant to meet this demand and are contemplating the installation of a modestly sized steam turbine generator as part of this expansion. The steam generated by the future enlarged steam plant would be utilized by the steam turbine-generator to produce approximately 8-9 megawatts of electricity. The steam exhausted by the steam turbine-generator would be sent to the dry kilns to cure the final wood products.

Finding a use for steam that exits the turbine-generator (the steam that would be used by the kiln) is the simplest method of eliminating the *single largest loss* in any power plant. This loss is the latent heat of vaporization given up to the atmosphere through the cooling tower required to condense the used steam back to liquid so it can be reused by the boiler cycle. This loss occurs in all plants that do not receive the benefits of cogeneration by integrating with an industrial process so the used steam can be utilized in kilns or for some other purpose.

South Coast agreed that finding adequate capital for such an expansion is always a challenge and/or expense. SCL indicated they would not be opposed to discussing with SRR the potential for some form of joint venture for construction and ownership of the cogeneration project. South Coast anticipates commencing construction on a cogeneration facility or the expansion of their steam plant, near March of 2006.

**2. Fuel Quantities, Cost, & Location**

**a. Quantity**

SCL's mill has the capability of handling logs as large as 60" in diameter and typically does not take trees with smaller tops than around 6". They log approximately 120,000,000 board feet of logs per year. The limbs and tops of these logs are currently left in the forest. If this biomass was collected during the logging process, the limbs and tops may generate approximately 120,000 tons per year of biomass. The saw mill operation would likely generate approximately another 12,000 tons per year. These two fuel sources alone are capable of generating approximately 10 megawatts of power.

There are other off-species trees (like alder) that currently have little market as chips that are cut down as part of the logging process and left in the forest. This is done to

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assure that the new seedlings planted receive good access to sunlight to assure rapid growth. If these off-specie trees were gathered for fueling a new power generation facility, it would further enlarge the potential fuel supply available for power generation and steam for SCL's kilns.

The logging operations of SCL typically, do not reach beyond a 40-mile radius. This is important because a major part of the cost of biomass is the transportation. South Coast Lumber currently owns approximately 50% of the lumber required for their annual operation. The remaining needs are apparently purchased from various nearby sources.

**b. Biomass Fuel Supply Cost**

Understanding the cost of biomass fuel is beyond the scope of development of this plan. However, most of the commodity is currently left in the forest. The cost to capture this biomass is the cost to gather, chip and transport it to the biomass power generation facility. These costs can be quantified if SRR decides to further investigate this technology. The cost of this fuel source is less than many other locations in the country where there is high demand for the commodity and/or much farther distances between its source and point of use.

## **C. Potential Development of Wind Generation Project**

### **1. Wind Data**

**a. Nearby Site Data**

Cape Blanco is located along the southern Oregon coast, approximately five miles north of Port Orford. Wind data have been collected at the site since October 1976 from a sensor installed at the 50-foot level of a BPA microwave tower. The Cape Blanco area sits on a coastal bench roughly 200 ft. above sea level and consists of rolling pasturelands bordered by trees. The mean monthly wind speeds for the entire period of record at Cape Blanco are presented in Figure 7 below. Cape Blanco data from mid August 2001 through July 2002 was determined to be from a sensor with bad bearings and was deleted.

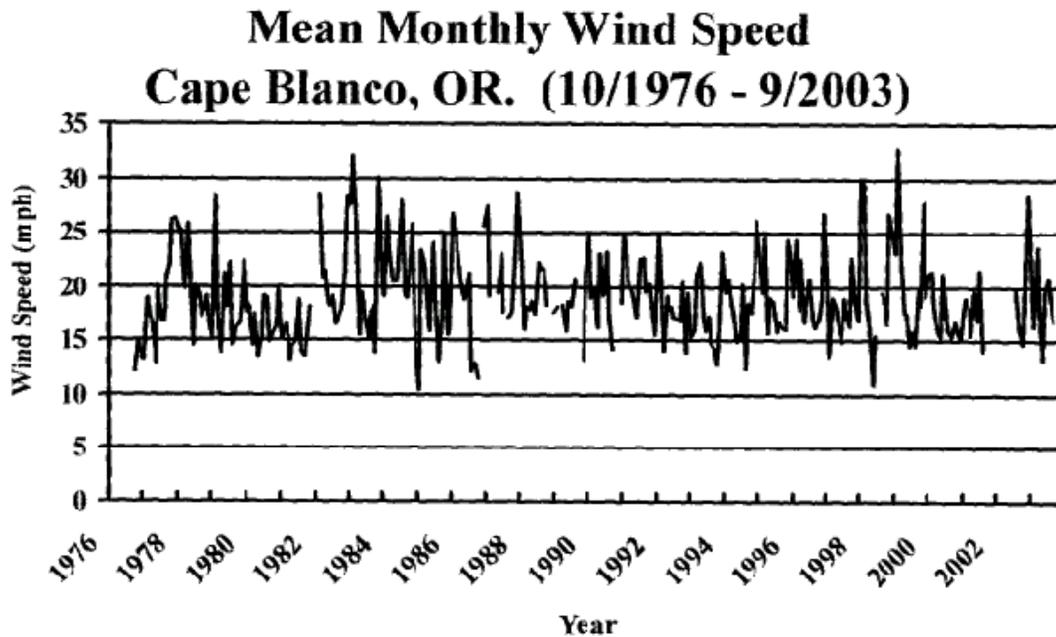
All the wind data collected for this site can be obtained from Oregon State University from Stel Walker (541.737.2027), for the cost incurred to prepare the data. This cost is typically between \$100-\$200.

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**Figure 7 - Cape Blanco Wind Speed (mph) for a 28 Year Period**

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg
21.3	22.3	19.8	18.0	17.4	17.8	19.7	17.1	17.0	17.6	19.7	20.6	19.0

**Figure 8 – Mean Monthly Wind Speed Recorded at Cape Blanco**



The Cape Blanco site is several miles from the proposed wind farm project. The more detailed version of the above data can be compared to the wind velocities measured on the proposed site. This comparison will allow a statistical analysis to be completed, which will bring greater value to the more limited data that will be collected at the proposed site. Since the anemometer equipment was removed in August of 2003 from Cape Blanco, it may be necessary to reinstall the equipment at Cape Blanco in order to allow a proper statistical analysis to be performed for the proposed wind site wind data compared to that at Cape Blanco. The wind measured at this site was found to be approximately 15% higher than actual because of the wind acceleration experienced over the bluff where the anemometer was located.

John Pease of BPA’s Wind Project Manager (503.230.2399) stated that in his experience lending institutions will typically require at least one year’s worth of wind data collected from the site. He mentioned that it is not uncommon to require three year’s of data. Utilizing the Cape Blanco wind data should help reduce the amount of wind data that will be required from the proposed site.

**b. Other Nearby Wind Projects**

According to the Northwest Independent Power Producers Coalition there are no other generation projects planned for southwest Oregon. This should reduce any competition for available transmission line capability in the area or purchasing entities. The Cape Blanco project was withdrawn before BPA performed a transmission or interconnection study. This 25 megawatt project required a two to three mile transmission line and a costly (potentially \$4-5 million) 230 kV interconnection. These interconnection costs along with the public objections may have been the driving factors behind the decision to shelf the project. There has been some local press in Grants Pass about a 100-megawatt project at Langlois, Oregon, eight miles north of Cape Blanco, but as of September 1, 2004 this project had not sought any official action by BPA.

**c. BPA Wind Feasibility Study**

In 1987 BPA completed a wind development feasibility study for Cape Blanco. This report was not obtained for development of this Report since that was beyond the scope of this work. The final report is available for review but is too large to include in the Appendix. The report can also be reviewed at the BPA Library. Contact BPA librarian Kelly Laslie (503.230.4174) for more information.

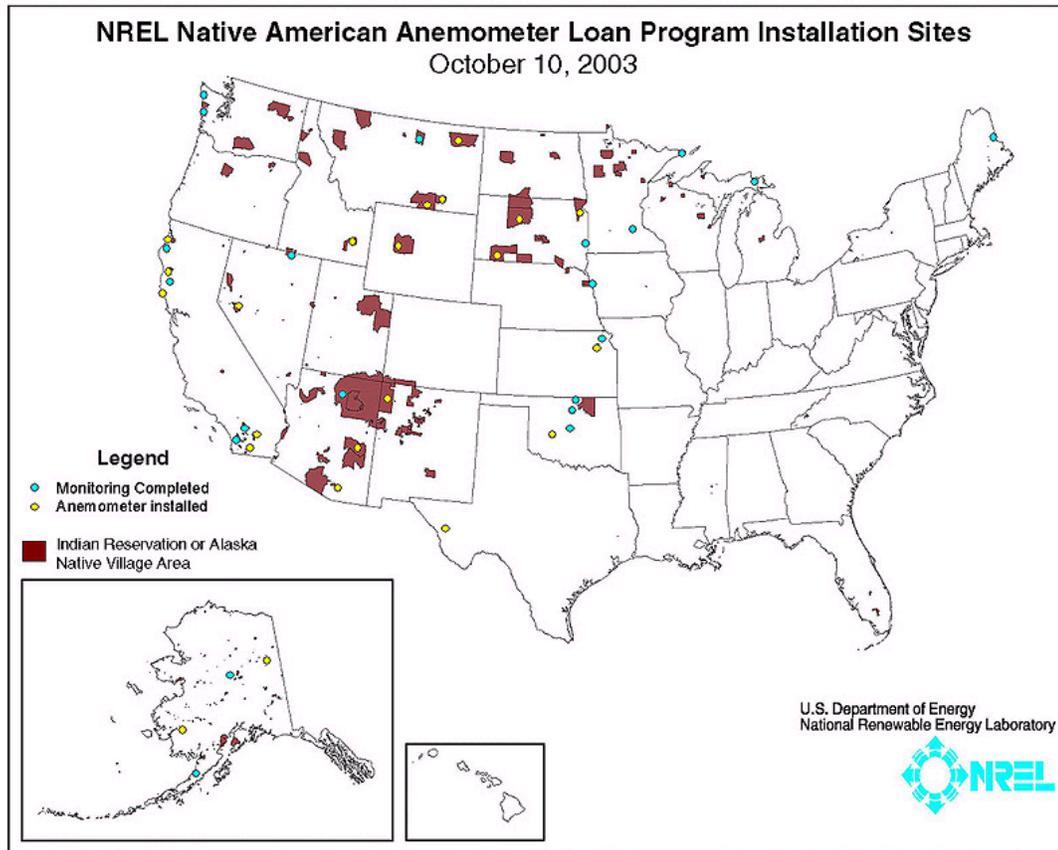
**d. Anemometer Loan Programs**

Office of Energy Efficiency and Renewable Energy (EERE) which is affiliated with the National Renewable Energy Laboratory and a part of the US Department of Energy, has an anemometer loan program for Native Americans. There is no cost to borrow the equipment but it must be loaned to a Native American for installation on Native American property. The loan program application and details can be found at the following web site:

[http://www.eere.energy.gov/windpoweringamerica/na\\_anemometer\\_application.htm](http://www.eere.energy.gov/windpoweringamerica/na_anemometer_application.html)  
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An application for this equipment and contact information is included in Appendix F.

Figure 9 below provides a map of all the anemometer installations on Native American property in the United States.

**Figure 9 – NREL Native American Loaned Anemometer Installation Sites**

## 2. Wind Study

A full wind feasibility study is beyond the scope of the authorized work for this Report. Should SRR decide to proceed with this activity as part of future plans, information regarding the likely size and economic viability of a wind project would be obtained.

Very rudimentary wind maps have been gathered to allow an indicative assessment of the wind resource at the proposed wind site in Oregon. Figure 10 below is a wind map obtained from NREL (National Renewable Energy Laboratory) showing the wind potential in portions of California and Oregon. It is difficult to see from this map where the higher wind areas fall compared to the proposed wind generation site. Refer to the legend to determine which colors represent the windiest areas.

This NREL wind map has been expanded (Figure 11 on the right) to the same scale of a map of the region (Figure 11 on the left), which identifies the proposed wind generation property. The two maps have been aligned so that Cape Blanco shown in each map align as well as Brookings. The original wind generation site has been

identified on the NREL map using the regional map as a guide. This allows a very rudimentary assessment of the wind potential at this site. From this it can be seen that the original wind development site appears to include areas identified as “poor” and “marginal” wind potential (white and brown respectively). There is one small area in the far west central portion of the marked wind site, identified as “fair” (dark orange) wind potential.

A wind resource located close to SRR would simplify the movement of this power to the SRR facilities and members and would eliminate coordinating with two states and three utilities. If this power is simply sold to third parties, then its location is less critical but the transmission route for such sales would need to be understood prior to committing to a given site.

Figure 12 contains a map of the SRR region and the corresponding portion of the NREL wind map greatly enlarged. The predominant dark line winding through the lower figure is Highway 101 and mirrors Highway 101 in the upper map of the region. It is evident that this very basic wind assessment shows there are significant areas of “fair” wind resources just south of SRR in the Tillas Slough area. Perhaps this location is too environmentally or socially sensitive for serious consideration as a wind generation facility site. Investigation during the next phase of work would allow this determination to be completed. Other nearby sites could be evaluated during the second phase of site assessment and determination of wind generation viability for SRR.

Figure 13 below is a second enlargement of the wind resources south and east of SRR obtained from Energy Atlas and USDOE’s Energy Efficiency and Renewable Energy. Both of these wind resources agree reasonably well with the NREL resource. These sources show that there are four (4) “good” (pink) and two (2) “fair” (orange) wind resources within just a few miles of SRR. These sites are adequately close to SRR such that running a transmission line from the site to SRR may be feasible. It can be seen that many of these sites are already accessible by existing roads. Most of these sites (except for the Tillas Slough) are hilly, partially forested, rural areas that could be well suited for wind turbine installations.

These sites may be better suited for wind turbine installations than the Oregon site because of their close proximity to SRR facilitating the connection of this power generation resources on the SRR side of the utility meter, and because of the higher wind indications for these sites.

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Figure 11 – Enlarged NREL Wind Map of Original Proposed Wind Site

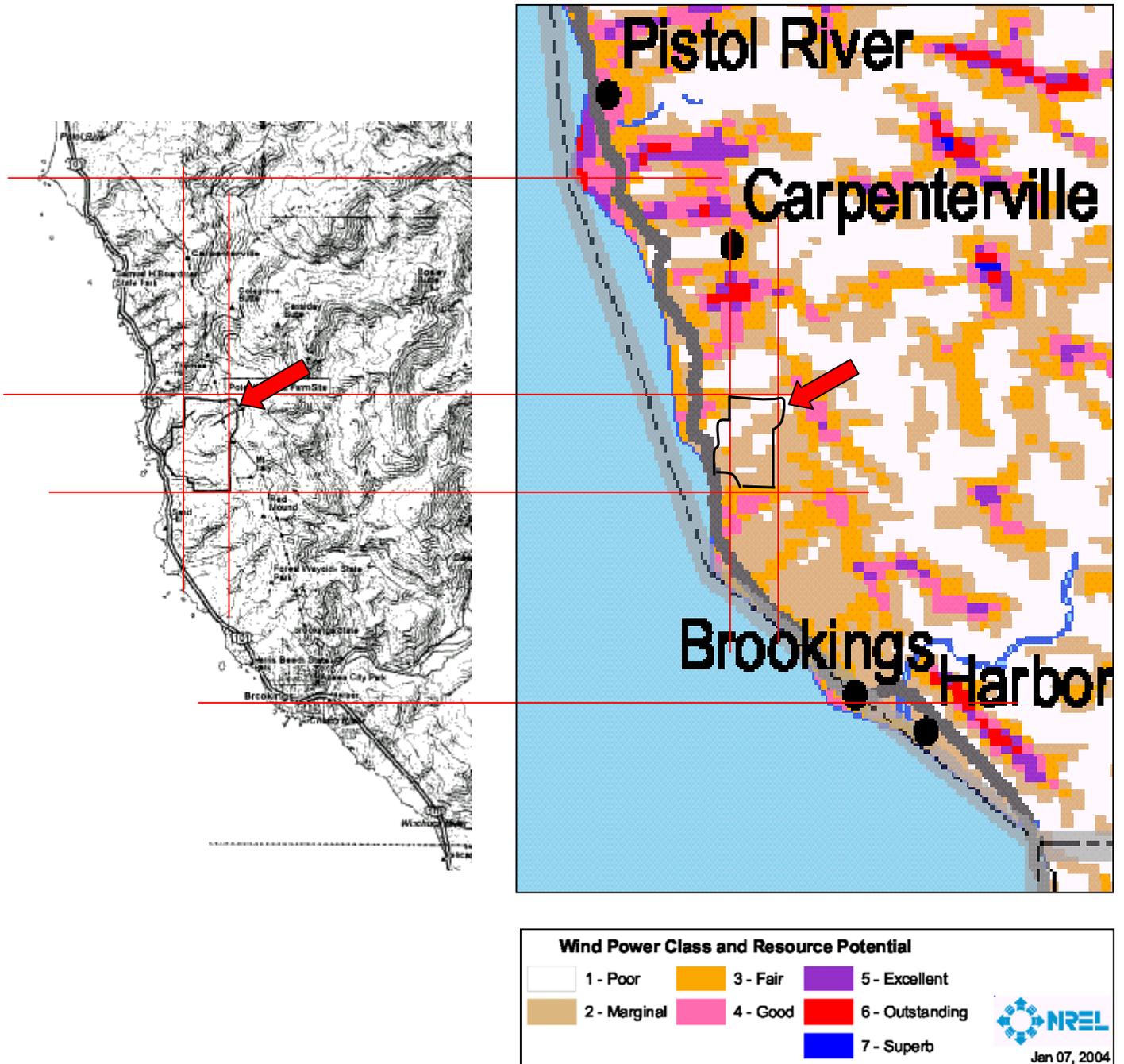


Figure 12 – Enlarged NREL Wind Map of Alternate Wind Generation Site

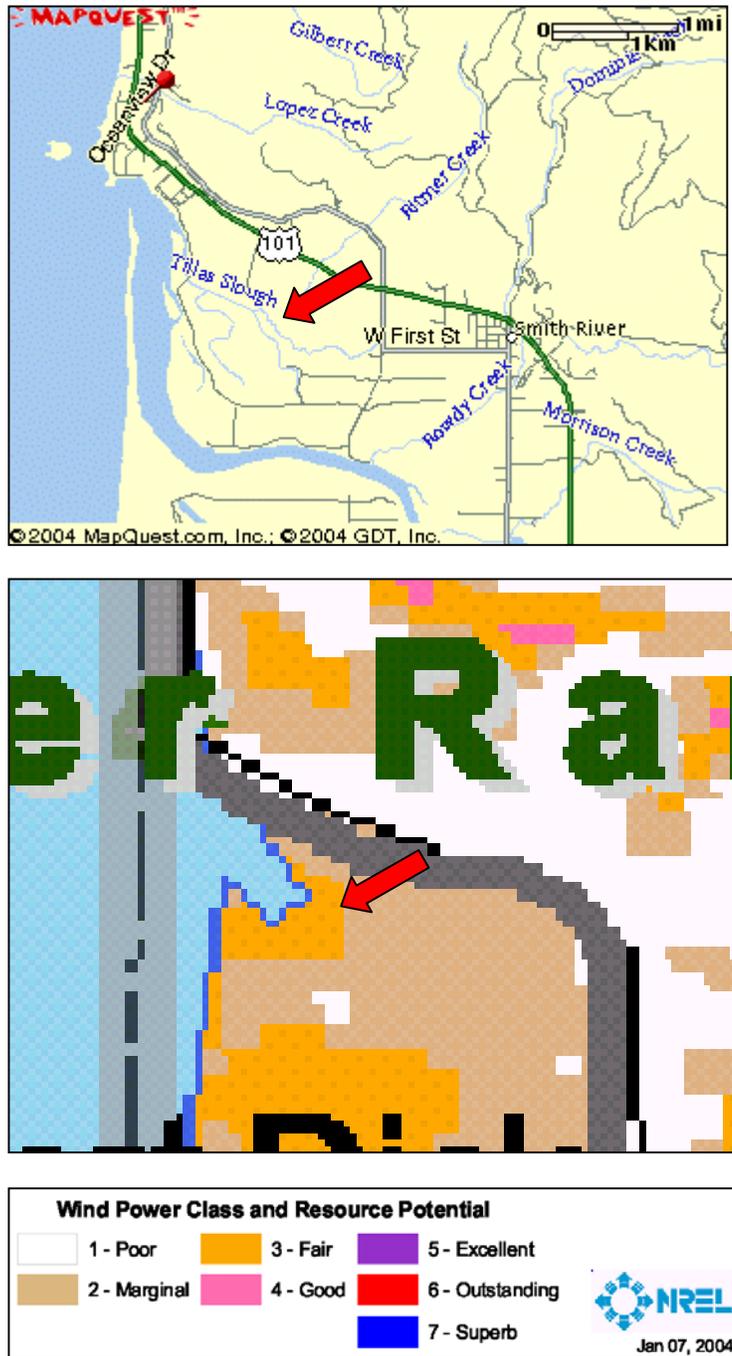
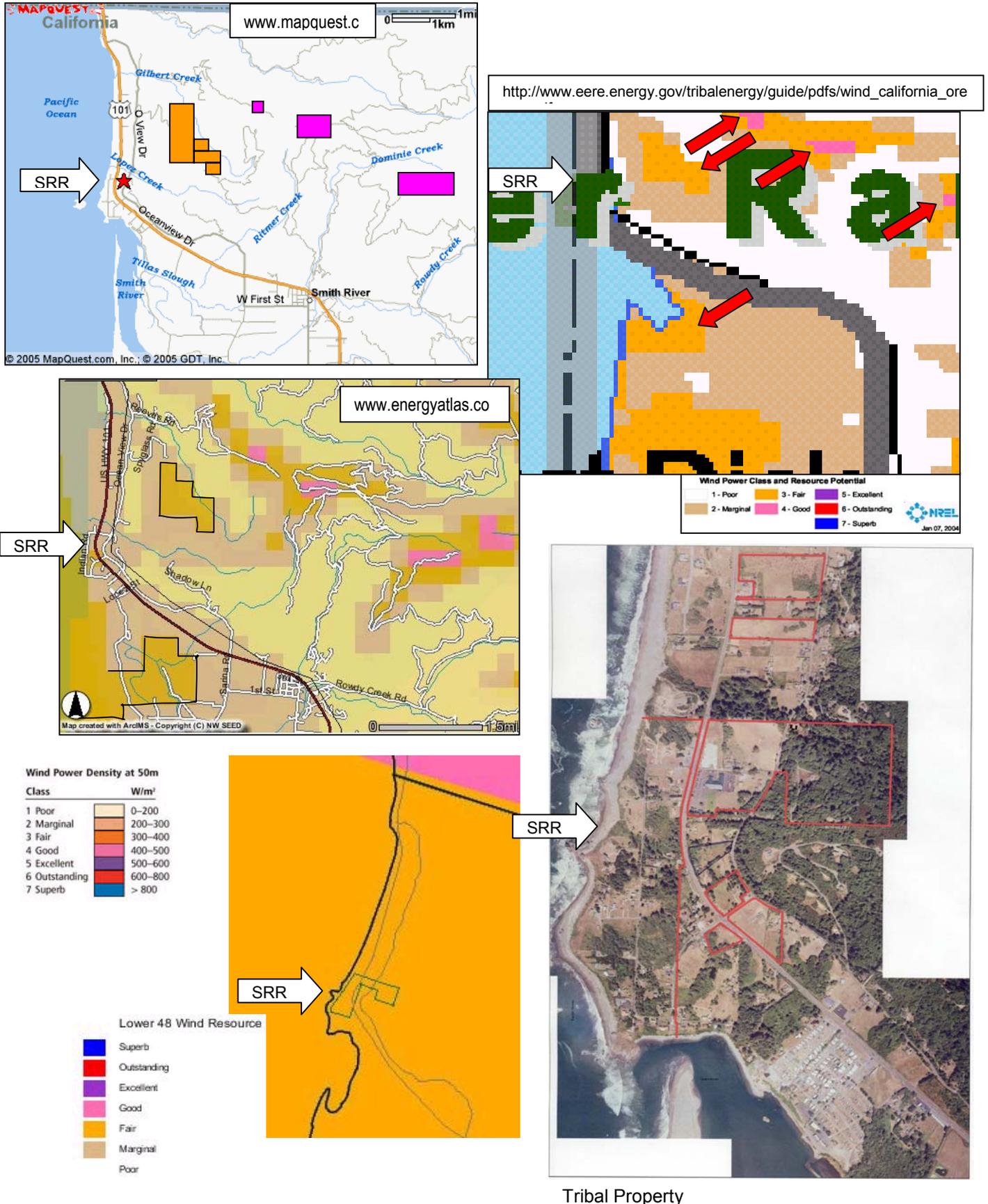


Figure 13 – Enlarged Energy Atlas and EERE Wind Maps of Alternate Wind Sites



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## **D. Summary & Technology Recommended for Further Investigation**

### **1. Discussion**

#### **a. Wind**

Wind, biomass and reciprocating engines are the technologies most suited for an application that would support SRR's membership and warrant further evaluation as a part of SRR's desire to achieve energy self-sufficiency. The other technologies are less suited because of the size of generation needed, the capital cost, the operating cost, or completeness of commercial development of the other technologies.

Further evaluation of wind should be completed because there is evidence that a wind resource is present in the SRR area, the operating costs are low, and the capital costs are reasonable. Wind does have the significant drawback of low capacity factors (hours of operation divided by the number of hours in the period). Capacity factors of around 35% are quite common and make it more difficult to repay the capital cost since there are fewer kWh's being generated per dollar of capital cost. Also, the power generation seldom occurs concurrently with the demand for power, creating a mismatch between the resource and the use. The power generated from a wind resource will have green credit value.

#### **b. Biomass**

The close proximity of South Coast Lumber's sawmill and their Pacific Wood Laminates facility in Brookings, makes biomass another choice deserving further review. These facilities and South Coast's forest holdings in the area could provide a significant source of fuel for a biomass facility. South Coast is currently expanding their sawmill facility by 25% and intends to expand their steam generating capability in the next 18 months. A partnership or cogeneration relationship could significantly enhance the economics of a biomass power generation project. Once the fuel source is certified, power generated by a biomass facility will contain green credit value.

#### **c. Reciprocating Engines**

The last technology that appears attractive for this application is the installation of small reciprocating engines. This is a very old and proven technology that is extremely reliable. Natural gas fired units are preferred but since this fuel is not available at SRR, evaluation of utilizing propane and perhaps diesel should be completed. The largest advantages of this technology for this application is threefold:

- 1) Reciprocating engines are attractive because the facility could be located directly in the SRR reservation near the power demand. This eliminates the
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multiple wheeling charges that will most likely be associated with biomass or wind, unless they can be located in California near SRR. This also simplifies the local infrastructure necessary to deliver the power to SRR facilities and its members.

- 2) Reciprocating engines facilities with smaller generation capability can be more economically installed than biomass and perhaps even wind which both require a certain level of scale to enhance their economic viability.
- 3) Additional power generation units can be added in the future as SRR's needs increase, whereas with biomass and lesser so with wind, there is more reason to develop the entire facility initially.
- 4) Multiple units would offer significant redundancy to provide added reliability

Power generated by reciprocating engines would not have green credit value and would not align as well with the renewable objectives stated in the Guiding Principles in Section 3. This option also has the greatest fuel cost.

## 2. Technology Comparison

Biomass has the disadvantage that to be economic, it should be at least 5 MW in size. To fully utilize the steam it will generate, it needs to be located near the sawmill or Pacific Wood Laminates, which requires an Oregon location. Biomass in a cogeneration configuration offers a very high efficiency facility that can operate with a very high capacity factor. To transfer power from this facility to SRR would require wheeling through Coos-Curry, BPA and Pacific Power which is costly and complicated. With this scenario, it will also require complying with regulations in both Oregon and California. This is far more complicated than a relatively small reciprocating engine or wind turbine installed within the SRR reservation in such a way that little or none of Pacific Power's infrastructure is utilized. A facility with SRR could be sized just adequately to meet SRR's power demand and avoid the complications of third party sales of excess energy. This advantage is complicated by the fact that natural gas is not currently available within the SRR reservation. However, propane utilized in reciprocating engines is an option that should be further evaluated because of this option's simplicity regarding wheeling and avoiding the regulation two states.

A small wind turbine located in SRR would have the same advantages as small reciprocating engines, but the wind resource may not be adequate at this location. Further evaluation is needed to quantify the various costs to weigh the various advantages and disadvantages. Figure 14 below provides a snap shot of which technology holds advantages and disadvantages in each of the various elements of development of the project.

**Figure 14 – Comparison of Technologies**

	<b>Wind</b>	<b>Biomass</b>	<b>Reciprocating Engines</b>	<b>Reciprocating Engines Combined Heat &amp; Power</b>
Capital Cost	Medium	Higher	Low	Higher
Operating Cost	Low	Medium	High	High
Wheeling	Yes Multiple	Yes Multiple	No	No
Most Economic Size	Larger	Larger	Small	Small
Sell Excess Energy	Yes	Yes	No	No
Most Logical Location	Ore/Cal	Ore	Cal	Cal
Net Metering Likely Avail	Unlikely	Unlikely	Perhaps	Perhaps
Multiple State Regulations	Likely	Likely	No	No
Permitting Complexity	Highest	Medium	Low	Low
US Subsidy Currently Avail	Yes	Yes	No	No
Provides Green Tags	Yes	Yes	No	No

## **6 Project Development Considerations & Explanations**

### **A. Transmission System Description**

One site considered for development of a wind farm and a location considered for a biomass facility, is in Oregon near Brookings. This area is served by Coos-Curry Electric Cooperative who has an average load of 40 megawatts and is a member of the PNGC Power. PNGC is a wholesale electric power cooperative, owned by 15 members that are retail electric distribution cooperatives with service territories in six western states. PNGC manages more than \$200 million in wholesale power transactions annually while providing a full range of additional services to their members. This coop has an average load of 450 megawatts, the majority of which is purchased power from the Bonneville Power Administration (BPA) with the remaining power provided by generation owned by PNGC. The 40-megawatt demand from Coos-Curry's system is provided exclusively by PNGC.

PNGC manages the power purchased on an hourly basis to keep it aligned with the load demand of its members. This is a service provided by PNGC to their members and is a task more easily accomplished when larger quantities of power are being purchased and sold.

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The Coos-Curry transmission system is approximately a 150-mile long, 115 kV system generally following the Oregon coastline and ending at Brookings. Coos-Curry accepts their power at the northern most portion of their transmission system. This power is obtained from BPA's Fairview substation located in Fairview, Oregon. This substation is inland approximately 10 miles between Coos Bay and Bandon.

Coos-Curry reports their transmission line may have some capacity constraints in the future if significant development occurs in the Smith River and Brookings area, unless upgrades are completed. However, Coos-Curry is in the process of reconductoring the line from Gold Beach to Brookings to provide the necessary capacity for future demands. This upgrade may not provide the long term solution desired and may be only adequate for several years into the future. The reconductoring work was about 75% complete as of August of 2004. Coos-Curry reports the BPA's transmission line that provides power from the north to the Coos-Curry system is in much greater need of upgrade to avoid a constraint in the nearer future.

If a wind or biomass project were built in Oregon, it will require connection to the Coos-Curry system since building a new transmission line from the project site to BPA's transmission line is not cost effective or logical. The Coos-Curry transmission system will allow this power to be moved to BPA's system for delivery to the market. This depends of course on the results of the BPA transmission and interconnection studies that will be performed and that are discussed elsewhere in this Report.

## **B. Sales or Use of Power Generated by SRR**

It may not be possible for some or all of the power generated by a proposed generation project to be utilized by the SRR members and/or the Tribal facilities. Since the wind is not always present and is unpredictable, alternate sources of power must be established to allow the Tribe to utilize wind power. This alternate source of power will be utilized to meet the Tribe's power demands when the wind is not present and when the wind turbines or biomass generation facility are in either a forced outage maintenance mode or during planned outage periods. Purchasing standby power from Pacific Power during periods when self generated power is not available, is the most logical and straight forward solution. However, this can be costly and it does not achieve complete self-sufficiency sought by the Tribe. The exact economics will depend on Pacific Power's tariffs and willingness to work with SRR. This will be a key consideration to unravel fully as the work to implement the self-sufficiency plan continues in the next phase of work.

If wind generation were developed on the original proposed wind site in Oregon, or a biomass facility was built in Oregon, Coos-Curry Electric Cooperative would be one logical purchaser of any excess power. The wind power will have limited value to Coos-Curry since it is not dispatchable or predictable, even though when operating, the wind power would reduce their transmission line loading, which Coos-Curry anticipates to be an ever-increasing challenge. Coos-Curry doubts their board will be interested in offering green power (like wind or biomass power from SRR) to its customers but it

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would like the opportunity to check with its board when and if SRR has green power available.

If the wind generation site is in California, as stated earlier it would simplify use of this power by SRR and the excess would, in this case, be first offered to Pacific Power since Pacific Power currently serves SRR. If Pacific Power cooperates locating the wind generation facility in California could create an excellent symbiotic relationship with Pacific Power and would be a significantly more straight forward transaction with less entities involved. Pacific Power has a strong record of interest and involvement in green power.

### **1. Third Party Purchasers Who Value Green Credits/Power**

Locating a third party who has a high desire for green/renewable power or places a fair value on green power or green credits, should be a high priority of the implementation plan. Power marketers and third party green credit marketers should be explored in addition to traditional publicly owned and investor owned utilities. A few utilities that may have interest in power or green credits from a wind project include the following:

- Eugene Water & Electric Board (EWEB) <http://www.eweb.org/>
- Salem Electric <http://www.saleme.com/>
- Emerald Electric <http://www.epud.org/>
- PacifiCorp <http://www.pacificcorp.com/>  
<http://www.pacificpower.net/>
- PNGC Power <http://www.pngc.com/>

Salem Electric has been quite active in renewable energy as exhibited by the presentation on their Green Power Purchase Program included as Appendix G.

A listing of the members of the Western Electricity Coordinating Council (WECC) is attached as Appendix H and provides contacts of other utilities that may have interest in purchasing SRR generated wind power. Pages 10 through 14 should prove most helpful.

There are a number of third party green credit marketers that should also be approached regarding the marketability of green credits from the SRR's proposed wind project to receive the full value for these green credits. This may be one of the most important marketing challenges for a successful wind power project developed by the Tribe.

There are several entities that could be pursued. A local firm that might be considered is Bonneville Environmental Foundation located in Portland, Oregon. Angus Duncan is their president.

## **2. Expression of Interest**

A marketing plan for the power produced from the proposed wind project should be firmly established early in the implementation stage. Buyers for either green power or traditional power in conjunction with sales of the green credits must be identified early in the implementation stage. Once these potential buyers are identified, it will allow the interconnection and transmission studies discussed elsewhere in this report, to commence. This is a crucial step because the route for the transfer of electricity cannot be evaluated without knowing the location of the buyer or the buyer's service territory. Obtaining an Expression of Interest or Letter of Intent from these entities is advisable.

## **C. Exporting Power from Generation Facility**

### **1. Interconnection Study**

Coos-Curry Electric Cooperative will contract for an interconnection study to be completed to establish whether an existing substation is capable of receiving the power generated and whether additional infrastructure will be required.

BPA will also perform an interconnection study. This study will include the Coos-Curry system if Coos-Curry does not perform a study. This is required to determine what equipment changes or additions will be necessary to allow a new generator to connect to the transmission system. This study usually costs between \$15,000 and \$25,000. Preliminary results are typically available in approximately three months, but the final results may not arrive for up to a year.

A similar process will be necessary if a generation project is built in California from which SRR wishes to sell power to third parties. However, in this case, the power can more readily be utilized by SRR directly and Pacific Power is a more viable purchaser of the excess power than Coos Curry Electric Coop, since they are larger and have generation assets of their own, unlike Coos Curry Electric Coop that have none.

### **2. System Impact Study (Transmission Study)**

Since the Coos-Curry transmission system interconnects with BPA, any power exported through Coos-Curry's system from the local area will utilize BPA's transmission system. To export this power, a System Impact Study or transmission study must be performed by BPA to determine if there is adequate transmission capability on their lines to transport the power generated by the proposed generation project. It is important that SRR establish a plan for exporting this power, by identifying likely power purchasers prior to performing this study so that the proper assumptions are made regarding the direction in which this power will be exported. This will allow those conducting the study to understand which lines will be utilized to export this power and will facilitate the completion of the study.

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This study typically takes six months to complete and costs around \$10,000. There is a transmission line reservation fee equal to \$1.03 per kilowatt of installed capacity. The final disposition of this reservation fee was not determined with certainty. It is believed that the fee will be applied toward the first month's wheeling bill once the facility is in operation.

BPA indicated that since this generation is near the load and near the end of Coos-Curry's transmission line, it appears that there would not be any transmission constraints. It is also noted that there are transmission constraints for moving power from the Willamette Valley to the coast, but since SRR generated power would most likely be moving in the opposite direction, it would actually help to reduce the constrictions. Intuitively it appears that transmission of power generated by a proposed generation project should not be problematic but BPA officials are quick to point out that this cannot be confirmed until a study is completed. Transmission lines from Oregon to California have been completely full for several years. It will likely be difficult to export power to California. This same transmission line would be required to wheel power from an Oregon generation facility to SRR, which could be very significant stumbling block for such a configuration.

### **3. Wheeling**

When a power generation project utilizes a utility's transmission line to export the power generated to another part of the state or country without selling power to that utility, this is referred to as "wheeling". Since it requires that utility to maintain their transmission line and associated infrastructure to accommodate this power and because it uses up capacity on the transmission line, the utility must be compensated. If power from a proposed generation project were to be wheeled over Coos-Curry's transmission lines and then BPA's transmission line to allow SRR to sell this power to a third party, there would be a wheeling charge from both Coos-Curry and BPA. According to the information received from BPA, if SRR utilizes their storage and shaping services discussed above, there could be a double wheeling charge from BPA.

## **D. Ancillary Services**

### **1. Backup Power**

Another element to be considered when evaluating the financial viability of SRR developing and building a power generation facility, is the need for backup or standby power. This is power typically purchased from the local utility while the SRR owned power generation facility is shut down for routine or emergency maintenance. This requires the utility to be prepared to provide this power very soon after notification of an outage of the SRR owned facility. As a result, the cost of this readiness to the consumer can be significant. The cost of this backup or standby power must be included in any evaluation of the economic viability of SRR

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owning and operating their power generation facility. As an alternative, SRR could consider not contracting for any backup power if SRR utilized a technology like multiple reciprocating engines and if an adequate number of units were included in the design to provide the needed redundancy and reliability. This does, however, risk placing the Tribal members in a situation where there could be extended periods of time without power under certain failure situations.

Since wind generation has a very low capacity factor and cannot be well predicted, backup power would definitely be necessary. However, with other technologies such as biomass or reciprocating engines that can have capacity factors around 85% - 95%, it would be more reasonable to consider operating without backup power available. It is seldom financially feasible to provide 100% backup but sometimes partial backup is prudent if multiple generation units comprise the generation facility.

## 2. Storage & Shaping

Power generated from wind is not easily utilized directly from the wind turbines because the amount of power generated is so varied and unpredictable creating a generation profile that is very dissimilar to the load requirements. For this power to have a market value equal to that of other technologies, it must be “shaped” to better fit the load demand. The greatest load demand typically occurs in the morning and early evening hours. This is not necessarily the time when the wind is the most intense. Shaping refers to acceptance of this power by a larger energy provider who can return an equal amount of power in a uniform stream to better match the load demand levels and hours.

BPA offers a program where they accept power generated by wind which is usually generated with a 20%-30% capacity factor and return it to the generator at a uniform 50% capacity factor a week later. The cost for this shaping service is \$6 per megawatt-hour, escalated annually at the GDP Implicit Price Deflator. Page 2 of Appendix I describes this service in greater detail.

If this energy is delivered *to* and *from* the BPA system (which will depend on where the energy is utilized or to whom it is sold) two transmission wheels are required to receive the service.

## E. Permitting Power Generation Projects

Permitting aspects of a power generation project is beyond the scope of this Report. However, information was obtained regarding some of the more time consuming permitting steps required which are discussed below.

### 1. NEPA (National Environmental Policy Act)

Any major federal action such as a construction or project site, transmission or pipeline right-of-way on federal land triggers a NEPA review. This includes using

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BPA's transmission lines to export the power. NEPA typically requires an Environmental Impact Statement (EIS) or an Environmental Assessment (EA). Preparation of an EIS or EA can be very time consuming and must be started early in the project cycle.

## **2. Avian Study (Wind Project Only)**

A portion of the EIS/EA work for a wind power generation project will include completing an avian study to monitor the species of avian life in the area and their movement habits. This is required since many birds are killed each year from collisions with wind turbines. BPA contracted for an avian study that was completed in 2002 that may be very helpful to SRR's permitting efforts should an EIS or EA become required for completion of the proposed wind power generation project.

A report titled "Synthesis and comparison of Baseline Avian and Bat Use, Raptor Nesting and Mortality Information from Proposed and Existing Wind Developments" was prepared by West, Inc. in December of 2002 for the BPA. This report states that its contents "provide an evaluation of the ability to predict direct impacts on avian resources (primarily raptors and waterfowl/waterbirds) using less than an entire year of baseline avian use data." This evaluation may be very useful because pre-construction wildlife surveys can be one of the most time-consuming aspects of permitting wind power projects. The full content of this report can be found on BPA's web site at:

<http://www.bpa.gov/power/pgc/wind/avian%5Fand%5Fbat%5Fstudy%5F12%2D2002.pdf>

If an EIS is required for the proposed power generation project, the Bureau of Land Management site <http://windeis.anl.gov/index.cfm> may prove helpful as it describes an EIS and discusses many of the elements of an EIS. The details on this web page are for an EIS prepared to obtain approval for a project on BLM land, which does not apply to the proposed wind project, but the explanations may still prove helpful. The schedule provided may not apply to an EIS prepared for a project on trust land or other federal lands.

# **7 Energy Efficiency and Conservation Review**

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## **A. Utility Cost Reductions for Tribal Membership & Facilities**

A summary of the utility invoices for electrical consumption by SRR was presented in Section 4 above. This provides information concerning the type of charges from Pacific

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Power in accordance with their tariffs and provides information concerning the relative magnitude of the invoices.

### **1. Smith River Rancheria Program**

It is recommended that SRR pursue a vigorous campaign to gain better understanding of their energy costs, and to find methods to reduce these costs. This will likely include a combination of equipment improvements or modifications, more attention to the heating and cooling cycles at various times of the year, and perhaps in some cases, creative modifications to the use of the facility.

Obtaining expert technical assistance along with increasing energy awareness by those using the facility, are important to a successful energy use reduction program. The largest energy consumers have the greatest savings potential and should be given priority over other facilities. From the data gathered in Section 4 above it can be seen that the Casino, Lucky 7 Fuel and the UIHS Health Clinic are the three largest consumers of power, with the Casino showing more than seven times the energy use of its nearest rival. Typical improvements identified often include, changing to more efficient style light bulbs, making changes to the thermostat timing, changes or improvements to the heating/cooling equipment to increase efficiency, and identifying areas of hot or cool air intrusion. Once this work is completed, consideration should be given to pursuing similar programs for the facilities using the next greatest amount of energy.

#### **a. Pacific Power Program**

Pacific Power offers a program designed to provide guidance and assistance with the customer's energy conservation efforts. Utilities offer these programs because reducing the energy use of their customers by providing this assistance will effectively reduce the customer's load thereby making this power available to help meet Pacific Power's growing energy demand. The cost to Pacific Power to recapture this power is lower than the cost for Pacific Power to build a new generation facility or purchase additional power on the open market. This energy use reduction program is called the California Energy FinAnswer. Additional information about the program and its details can be found on Pacific Power's web site at <http://www.pacificpower.net/Navigation/Navigation1855.html> or by calling Becky Berg at Pacific Power (503-813-5103).

The requirements to qualify for this program are outlined in Pacific Power Schedules 120 and 122, that are included as Appendix J.

Pacific Power also offers financing to help fund any equipment improvements or modifications that are recommended. Typically the monthly energy savings are utilized to pay back the loan provided by Pacific Power for the improvements.

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## **B. Low Income Weatherization, Conservation & Utility Bill Assistance**

One major objective and guiding principal is to reduce the cost of energy to the SRR members and the SRR facilities. Another objective of SRR is to assist those Tribal members who have significant trouble paying their utility bills. There are a number of programs designed to provide funds for weatherization, which covers a wide range of home enhancements and may include new windows, new refrigerator, and additional insulation, as well as assistance paying heating utility bills. The various programs available that support these basic objectives are described below.

### **1. Federal DOE, State & Utility Funds**

#### **a. Low-income Weatherization, US DOE & BPA Funds - Oregon**

Federal and BPA funds available for low-income weatherization programs in Oregon are managed by the State of Oregon as part of the Oregon Housing and Community Services Department. These funds come from the US Department of Energy and the federal program called LIHEAP (Low Income Heating & Energy Assistance Program). These monies are applied to the needs through Community Action Agencies. The Oregon agency that serves Southwest Oregon is the Southwest Oregon Community Action Committee, Inc. (SWOCAC) located in Coos Bay, Oregon, managed by John Huntsman (541.267.7117).

This agency has two primary programs as follows:

#### **(1) Low Income Weatherization Program – Federal & BPA Funds - Oregon**

This program has the following requirements for applicants to be accepted:

- Must reside in Oregon (Coos or Curry Counties for this particular Community Action Agencies to serve the member)
- House must not be for sale
- Must have income equal to or less than the following:

**Figure 15 – Income Limits**

<b>Size of Household</b>	<b>Gross Family Income/Month</b>
1	\$1,527
2	\$1,997
3	\$2,467
4	\$2,937
5	\$3,407
6	\$3,877

Applicants who meet the above criteria can make application for assistance. SWOCAC staff will be perform a weatherization house audit and make recommendations. Licensed, third party contractors with expertise in this area will perform the work required, at no cost to the household.

Work typically performed may include any or all of the following:

- Additional insulation in the attic
- Additional insulation in the floors
- Additional insulation in the walls
- Work to reduce infusion of outside air

Windows are not usually changed because the cost/benefit ratio is so high causing valuable funds to be taken away from other homes requiring additional insulation. Homes built after 1992 usually don't qualify because they are usually built to more restrict standards.

## **(2) Utility Bill Assistance - Oregon**

SWOCAC, discussed above, has a satellite office in Coos Bay, Oregon to provide utility bill payment assistance. The requirements to qualify for this assistance are the same as those for the low-income weatherization program discussed above. If the applicant qualifies they will typically receive payment of one heating bill, on a first come first serve basis, as long as funds are available. The funding for this program is provided by state, federal and utility funds. This assistance is provided regardless of the source of their heat (electric, propane or even wood, etc.). Assistance will be provided only once per program year (October 1 through September 30) unless there is a household hardship or emergency, which may justify additional assistance.

This program is managed by:

Phil Handsaker (541.888.1527) manages the Coos County and Curry County offices and the Utility Bill Assistance Program described above.

The individual office managers are as follows:

Cindy Davis – Curry County – (541.469.3155)

Al Spence – Coos County – (541.269.9974)

## **b. Low-income Weatherization, US DOE & PacifiCorp Funds – California**

Federal and PacifiCorp funds available for low-income weatherization programs in California are distributed similar to those in the state of Oregon. These funds come from the US Department of Energy and the federal program called LIHEAP (Low Income Heating & Energy Assistance Program). These monies are applied to the needs through Community Action Agencies. The federal Department of Energy Weatherization Assistance Program (DOEWAP) in California is managed by Leslie Campanela in Sacramento (916.341.4376), as a part of the Department of Community Services and Development for the State of California.

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These monies are applied to the needs through Community Action Agencies. The California agency that serves Del Norte county in northern California is the Norte Senior Center in Crescent City, California. This agency is managed by Ms. Ilene Silvey (707.464.9013). Additional funds for this program are received by the Norte Senior Center from Pacific Power.

The Norte Senior Center administers four programs for the area, which are outlined below.

**(1) Low Income Weatherization Program – Federal Funds**

This program is similar to the Oregon program. It provides funds to allow a variety of home improvements to reduce the energy consumption. The federally funded program has the following requirements:

- Must reside in California (Del Norte County for this particular Community Action Agencies to serve the member)
- House must not be for sale
- Must have had an electric bill for at least 22 days
- Must have income equal to or less than the values shown below, which have been rounded for brevity.

**Figure 16 – Income Limits**

Size of Household	Gross Family Income/Month
1	\$1,658
2	\$2,168
3	\$2,478
4	\$3,188
5	\$3,698
6	\$4,208
7	\$4,304
8	\$4,400
9	\$4,495
10	\$4,591
11	\$4,686
12	\$4,782
13	\$4,878
14	\$4,973
15	\$5,069

Applicants who meet the above criteria can make application for assistance. A weatherization house audit will be performed by the Norte staff to determine what weatherizations services are needed. The Norte staff will also make these recommended changes to the home to reduce the energy bill, at no cost to the household. There are no requirements regarding the fuel used for heating to qualify for this program. This program also applies to individuals who rent the home in which they live, subject to approval by the owner.

Work typically performed may include any or all of the following:

- Additional insulation in the attic
- Additional insulation in the floors
- Additional insulation in the walls
- Work to reduce infusion of outside air

Additional information regarding this and the other programs administered by the Norte Senior Center are attached as Appendix K.

**(2) Utility Bill Reduction – PacifiCorp Funds**

PacifiCorp also offers their CARE program to reduce the cost of applicant’s heating bill. This program has slightly different income requirements than the program discussed above to qualify and *the home must be heated by electricity to qualify*. This program also applies to individuals who rent the home in which they live. The income level requirements for this program are as follows:

**Figure 17 – Income Limits**

Size of Household	Gross Family Income/Month
1	\$1,950
2	\$1,950
3	\$2,292
4	\$2,758
5	\$3,225
6	\$3,692
For household with over 6 members, increase income by \$467 for each additional family member.	

Additional information regarding this and the other programs administered by the Norte Senior Center are attached as Appendix K.

**(3) Energy Assistance Payments**

Applicants who qualify for the federal weatherization program described above can also qualify for assistance paying their utility bill for heating. This

*program applies to costs for heating the home regardless of the fuel used for heating their home.* Applicants are limited to one payment per contract, which is typically one payment per year. There are graduated benefits that increase for applicants with decreasing levels of income and for applicants with more individuals in the home. The one time benefit provided will typically fall between \$182 and \$315.

Additional information regarding this and the other programs administered by the Norte Senior Center are attached as Appendix K.

#### **(4) Heater Replacement Program**

A portion of the weatherization funds are used to replace residential heaters that are in poor repair. The requirements to qualify for this program are similar to those for the weatherization program.

#### **c. LIHEAP Funds in Short Supply<sup>5</sup>**

The following is an excerpt from a recent article regarding the availability of federal funds for LIHEAP.

The funds available to fund public efforts are far short of the overall requirement. Low income energy assistance doesn't get enough money to support all of those in need because of budget constraints and other pressing needs. But the solution is multi-faceted. Beyond government backing, community action groups, consumers and utilities all have a role to play.

Government and energy experts all “predict that prices will be higher for years to come, and we must do more to support weatherization and other energy-efficiency measures,” says Missouri Public Service Commission Chairman Steve Gaw. He is asking federal lawmakers to increase the level of support for the Low Income Housing Energy Assistance Program (LIHEAP), mentioned above, from its current \$2 billion to \$3.4 billion a year to “forward fund” that effort until 2006.

According to a report issued recently by the American Gas Association, millions of households that qualified for LIHEAP in the aftermath of rising energy prices in 2001 did not receive assistance. Such funding was the same in 2001 as it had been 20 years earlier, but there were 10 million more eligible households in 2001, AGA says.

AGA's study, *The Critical Need for LIHEAP and Its Impact on Utility Customers*, says that roughly 5 million households received assistance through LIHEAP and related programs in 2001. But, another 25 million eligible households did not

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<sup>5</sup> Excerpt from article written by Ken Silverstein of UtilitiPoint International, Inc., dated September 20, 2004, titled “*Heating Costs to Make Disadvantaged Shudder*”.

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receive such assistance, leaving more than 80 percent of those eligible without LIHEAP benefits.

The report points to several factors increasing the gap between need and funding: more households are living closer to the poverty line, energy costs have been significantly higher and more volatile since 2000 and Congress has not increased funding in step with energy costs and other economic realities. According to the AGA report, low-income households have reduced their home heating consumption by 25 percent since 1981. But, because of rising energy prices, these households are still paying 28 percent more for heating than they did in 1981.

“Recent congressional proposals to increase annual LIHEAP funding to \$3.4 billion would help an additional 3 million needy homes,” says David Parker, chairman of the AGA. “A cold winter, combined with the higher home heating costs predicted by the Department of Energy, could force those who are most vulnerable to choose between heating their homes and eating this winter.”

He notes that natural gas and electric utilities provided low-income families with \$700 million of assistance in 2001. That's more than one-third the amount of federal funding that was provided by LIHEAP.

**d. Funds Allocated Exclusively for Native Americans – Oregon & California**

The DOE and BPA funds discussed above (managed by the states) are in great demand, resulting in longer waits between making application and receiving funds for weatherization. There is another program where additional funds from BPA are set aside for exclusive use by Native American households. Once the applicant demonstrates they qualify, the home improvements will be implemented far more promptly than when performed through the programs discussed above. Applicants qualifying for these funds will be given priority by simply identifying themselves as a Native American. This program is administered by the same community action agencies as those discussed above. This program has the following additional qualification requirements.

- Must be able to demonstrate their membership in the Tribe.
- Must be served by an electric utility that is a BPA customer (like Coos-Curry Electric Coop)
- Must heat with electricity

The State of Oregon is currently negotiating with BPA to provide some base program for those homes that meet all the criteria *except* for the “must heat with electricity” requirement. Once SRR begins implementing this Report, SRR should determine if agreement between the State of Oregon and BPA has been reached regarding the requirement that the applicant heat with electricity in order to qualify for any assistance.

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For additional information on BPA's Low-Income Tribal Weatherization program, refer to Appendix L.

**e. BPA Funding of Tribal Weatherization Program**

BPA has funds available to fund a Tribal weatherization program rather than relying on the community action agencies to manage these funds by serving the Tribal members. The paragraph titled "Tribal Program" in Appendix L discusses this further.

**f. Funding Directly from US Federal Government – Oregon & California**

Some tribes have been successful in receiving federal funds directly from the government, bypassing the state organizations and the community action agencies. Demonstrating how or why the local community action agency is not adequately meeting the Tribe's needs is one method of establishing reason to justify direct funding. The federal funding received by the Warm Springs and Grand Ronde tribes came from the Low Income Heating & Energy Assistance Program (LIHEAP).

**2. Other Programs or Related Programs**

**a. Oregon HEAT (utility bill assistance) - Oregon**

Oregon HEAT is an independent nonprofit organization founded in 1989 to help low income Oregonians become more energy self-reliant. Oregon HEAT's primary program objective is to prevent disconnection of utility service during inclement weather by providing bill payment assistance to low income households in emergency situations.

Oregon HEAT works in partnership with Southwest Oregon Community Action Committee, Inc. (SWOCAC) discussed above who screen the applicants and advise Oregon HEAT which applicants qualify. Oregon HEAT then makes, usually a one time payment directly to the applicable utility. The maximum income levels allowed to qualify are as follows:

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**Figure 18 – Income Limits**

Size of Household	Annual Income	Monthly Income
1	11,836	986
2	15,916	1,326
3	19,996	1,666
4	24,076	2,006
5	28,156	2,346
6	32,236	2,686
7	36,316	2,026
8	39,196	3,266

Oregon HEAT is funded by donations from Oregon utility customers and large cash donations from Pacific Power and Portland General Electric. They receive no federal, state or United Way funds. Donations received by Oregon HEAT are used to assist households in the areas from which they were received.

Portland General Electric or Pacific Power must service applicants where electric heat is used to heat the home, or a heating oil provider if oil is used to heat the home. The maximum benefit is \$125 for electrically heated homes and \$200 for homes heated by fuel oil. Applicants can receive assistance for two consecutive years without conditions and for up to five years with conditions including reduced benefit limits.

This program is managed by Executive Director, Jay Formick (503.612.3770) who is located in Portland, Oregon. A more complete description (slightly out of date) of the program can be found in Appendix M.

**b. Oregon HEAT (Pilot Program) - Oregon**

Oregon HEAT has received a grant from the Meyer Memorial that is utilized to assist low-income households with a variety of financial needs including car repairs and providing coats in colder climates. This pilot program will also provide funding for a household assessment of the needs and barriers to success for self-reliance. This assessment will be utilized to determine the level of assistance provided.

**c. Oregon Energy Trust - Oregon**

Charlotte Rollier of the Energy Trust of Oregon was contacted (503.493.8888 x219) regarding their weatherization program. They offer a weatherization program for residents who live in Oregon and are served by Portland General Electric, Pacific Power or Northwest Natural. This is *not* a low-income program and provides a reimbursement payment for a portion of the weatherization planned by the resident.

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## 8 Research Establishment of Energy Organization

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### A. General Advantages

Forming a tribal utility can offer great benefits but gaining such a status can be an arduous and complex process to determine how the current serving utility will respond and how they will embrace such a plan. However, the benefits can be worth the effort and may include all or some of the following:

- Reduced energy costs for members
- Develop cost-based rather than tariff power costs
- May allow promotion of renewable resources
- Provides greater Tribal control
- May attract commercial customers
- Additional voice in regional, state and federal energy discussions.
- Expanded economic development opportunities
- Ability to provide extra assistance to some especially needy customers

### B. Wholesale Power Purchase

#### 1. Energy Source

The primary financial advantage of forming a tribal utility is create the ability to purchase power on the wholesale market and specifically from low priced BPA. This provides very cost effective energy pricing because the Tribe would essentially bypass the local serving utility and in some cases purchase power from the same source as their energy provider.

If SRR can establish that they are located within BPA's service territory and were to form a tribal utility, *and* could demonstrate that their load exceeds one megawatt, they would be eligible to purchase power from BPA. However, as of this writing, a preliminary decision was reached by BPA that SRR is *not* within BPA's service territory. Refer to Appendix N for a copy of the notification of BPA's findings to date. If this decision stands, it may preclude SRR's to-be-formed tribal utility from purchasing wholesale power from BPA and thereby realize the greatest potential for energy savings.

However, even if BPA were to make an exception and reverse the preliminary ruling about whether SRR is within their service territory, SRR currently cannot demonstrate that they have a load demand exceeding one megawatt. SRR's current

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load is probably under one-half a megawatt peak load and their average load would be considerably lower. However, obtaining an exception from BPA may preserve SRR's right to purchase wholesale power from BPA in the future.

SRR should continue to pursue their claim that they are within BPA's service territory by nature of their location, that there are members served in Oregon by a BPA subscriber and because of their status as a sovereign nation with historical water use rights. SRR would be attempting to persuade BPA to grant an exception by stating that SRR is within their service territory, thereby preserving SRR right to future purchases of wholesale power from BPA.

Although SRR apparently has never taken advantage of power offered by Western Area Power Administration (WAPA), establishing a relationship with WAPA may prove beneficial in the future. WAPA may have blocks of power that could be purchased by SRR from time to time but there are no long-term power contracts available. Not having received an allocation of power from WAPA may work in SRR's favor when appealing to BPA for an exception. However, since an offer of such an allocation was provided in 1999 but apparently not acted on by SRR, this may work to SRR's detriment in their efforts to persuade BPA.

## **C. Alternative Metering**

### **1. Master Metering**

A less desirable alternative to forming a tribal utility is the establishment of a master metering arrangement with SRR's existing energy provider. The classic use of this arrangement is in a mobile home park where the serving utility reads one master meter that services all the homes and the park owner reads the individual home meters and provides a bill to each resident. This aggregation of users can sometimes qualify the organization for a more favorable tariff than that offered to each individual member, to provide reduced energy pricing. It provides the master meter reader some discretion (with the understanding and approval of all participants) to provide additional assistance to the particularly needy members. Master metering theoretically reduces the costs for the energy provider because it only has to read and bill one meter rather than dozens or hundreds, depending on the number of members in the organization or community.

This concept is complicated at the SRR reservation because not all meters in the community are SRR members. It is not practical to have some member and some non-members within the same community and expect to only include the members in the master metering concept because special power lines bypassing the master meter would have to be erected to those not participating in the master meter program. However, if all residents in the community (SRR members and non-members) were willing to participate in the program, this hurdle would be eliminated.

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In some states the public utility commission has not allowed master metering arrangements unless the membership forms its own utility. This ruling has been made in some states because such an arrangement, by definition, places the entity that is reading the members' meters and preparing bills, into the role of a utility. The public utility commission has the role and responsibility of regulating utilities for the benefit and protection of the consumers. They do not want an entity "acting" as a utility without actually forming a utility because they would be operating outside the commission's control.

As of this writing, Pacific Power representatives are checking to determine the position of the California Public Utility Commission regarding this issue. This will determine whether a master metering arrangement can be established without forming a utility. If it is found that California does allow master metering without forming a utility, it still does not solve the problem of having both participants and non-participants within the same community. Forming a utility may be the only way SRR can receive the benefits of a master metering concept.

## **2. Automatic Meter Reading**

Technology is available to allow automatic reading of the meters to eliminate the expense of manual reading of the hundreds of meters within a community. Pacific Power representatives have indicated that while such technology is available, it is not cost effective. It would take too long to pay back the cost of the high technology equipment to justify the expense.

## **D. Utility Formation Enhances Self-Generation**

### **1. Self-Generation Apart from the Reservation**

Establishing a utility would allow SRR to receive self-generated power to offset SRR's current energy bills, thereby realizing the *retail* value of this power because there would now be a single point to which this power could be delivered for SRR's use. If a utility were not formed by SRR, then the self-generated power would likely be sold to third parties at *wholesale* values.

Establishing a utility may not significantly benefit SRR directly, but it enhances the benefit of any future self-generation that SRR chooses to develop. If the power were generated away from the reservation property, there would be a single point to which the power could be delivered for use by SRR. This power would be delivered by Pacific Power's transmission lines after being wheeled by other utility's transmission systems as necessary, to move the power from the generation site to SRR. Without such a utility formation, there would be multiple electrical power users with multiple meters desiring the use of this power. This power cannot be

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delivered to multiple points. Establishing a utility would provide this single point of delivery.

## **2. Self-Generation Near the Reservation**

If SRR developed a power generation facility near the SRR reservation such that a power line could be economically built to connect to the SRR community on the SRR side of Pacific Power's meter, then this Pacific Power meter would read less power because most of the power needs could be provided by the self-generation facility. As with the example above, forming a utility solely with the expectation that SRR will be able to perform the duties of operating and maintaining the distribution system at a lower cost than Pacific Power and thereby save its members expense, is not realistic. But it does offer a single meter or delivery point that can be offset by the power received by SRR from their own self-generation facility connected on SRR's side of the meter or wheeled to this point by Pacific Power.

# **9 Training Opportunities**

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## **A. Weatherization & Conservation Training**

### **1. Weatherization Services**

Gene Ferguson of BPA (503.230.3608) provides training to individuals who wish to become certified to perform residential audits to support the weatherization programs discussed above. This training can only be provided to Oregon residents and is available on a first-come, first-serve basis. As of September 1, 2004 there were still five training slots open at the next training session planned for late September, so apparently these sessions do not always fill up completely. For a listing of past training locations and the associated listing of topics covered please refer to Appendix O.

### **2. Utility Bill Reduction - Oregon**

Oregon HEAT (Jay Formick 503.612.3770) discussed above under Weatherization, offers training on how to reduce all utility bills (gas, water, electric) on a first come first serve basis. Training of this nature may be obtained by one or more Tribal members who will in turn educate other Tribal members. This will allow a greater number of the members to receive this training and the resulting reduction in utility bill costs.

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### 3. Forming a Community Action Agency

Forming a Tribal community action agency may be a challenge because of the regulations that must be followed and the various funding sources involved. However, if this were undertaken, it would place control of the administration of the program in the control of SRR, assure high quality service to SRR's members rather than relying on the community action agency for SRR's area, and it would generate modest employment opportunities.

Appendix L discusses that BPA will fund a Tribal community action agency directly, bypassing the local community action agency already in place to serve SRR.

### 4. New Markets Tax Credit

Congress has enacted a new investment tax credit called the New Markets Tax Credit ("NMTC"). This credit is designed to stimulate investment in low-income communities by providing a 39% tax credit to taxpayers that make equity investments in community development entities ("CDEs"). The CDEs in turn make investments in or loans to qualified businesses in low-income communities. The CDE must be a taxpayer to receive the credit which is received over seven years. This may be an entrepreneurial opportunity for SRR if they can partner with an entity that has a tax bill. Or SRR could locate an entity who would qualify for the CDE program and who would be willing to invest in the SRR community to take advantage of the program.

#### a. Qualifying as a CDE

Any domestic corporation or partnership may qualify as a CDE provided that:

- its primary mission is serving, or providing investment capital for low-income communities or persons;
- it maintains accountability to residents of low-income communities through representation on its board or an advisory board; and
- it applies for and is certified as a CDE.

Once an organization is certified as a CDE it must apply for an allocation of the tax credit.

#### b. Investments that qualify for the credit

In order to qualify for the credit, the investment in the CDE must be an equity investment solely in exchange for cash and the CDE must use at least 85% of the cash received to make qualified low-income community investments. Such investments may be equity investments or loans to a qualified low-income community business, or provision of financial counseling or certain other services to a low-income community business or investment in, or loan to, other CDEs. A

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qualified low-income community business is a corporation or partnership (including a nonprofit corporation) provided that:

- at least 50% of its income is from an active business within a low-income community;
- a substantial portion of its tangible property is used and its employees' services are performed within the low-income community; and
- less than 5% of its assets consist of financial investments such as stocks, bonds, or debts with maturity of greater than 18 months.

**c. Organizations that will benefit from the NMTC**

Financing community benefit organizations such as nonprofit charter schools and health centers are viable options. The NMTC may also benefit a wide variety of other organizations and industries. For instance, large retailers may obtain an NMTC credit for establishing a new location in a low-income community. For charitable or nonprofit organizations whose mission is to revitalize economically distressed areas, the NMTC is an opportunity to leverage private investment.

**B. Operation or Construction Training**

If development of a power generation facility is pursued, various training opportunities will become available as follows.

- The original equipment manufacturers (OEM's) typically offer training concerning the equipment they provide,
- The contractors engaged to construct the facility may offer training and/or employment opportunities to provide manpower to support the construction and employment for the Tribal members, and
- The third party operator hired to operate and maintain the facility will have training available for local residents that are willing and capable of being trained as operators or maintenance personnel for the facility.

# 10

## Prepare Briefs & Reports

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- A.** Quarterly reports have been drafted and uploaded as required by the DOE schedule.
- B.** A draft version and final version of the Report has been prepared and distributed.
- C.** Progress has been communicated verbally. Written progress reports have not been requested by SRR or prepared to further track the progress of the Report development.
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# 11 Action Plan (Conclusions & Recommendations)

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This Report provides background information, advantages, disadvantages and other considerations on several possible avenues for SRR to reduce their energy costs and meet the other guiding principles stated early in this Report. What follows is a listing of specific steps that are recommended for SRR to implement the various elements listed in this Report to move closer to full realization of energy self-sufficiency, reduced energy costs and greater employment for the SRR community.

## A. Evaluate Merits of Self Generation

### 1. Technical Feasibility

The preliminary assessment of the technologies that offer the greatest potential for self-generation directs SRR to consider wind, biomass and reciprocating engines. These three options offer considerably varying arrangements regarding location, size, the amount of energy available for third party sale, if any, and ease of transfer to the SRR community for use. It is recommended that a full evaluation be completed for technical feasibility and financial viability of these three technology options. Listed below are a few of the items that should be considered as a part of the evaluation:

- Capital Cost
- Operating Cost
- Fuel source, quantity and cost
- Facility location which affects whether wheeling is necessary, how many utilities will be included, and whether one or two states are involve
- Transmission capability and availability of infrastructure for the facility
- Standby power needs and cost
- Facility size because this affects whether there will be excess sales to third parties
- Permitting challenges likely to be encountered and their cost
- Subsidies, tax benefits
- Green credit availability, pricing, and marketability

### 2. Financial Viability

Once the technical feasibility review is complete and all pertinent factors are gathered and understood, a financial analysis of the three options should be completed to assess their financial viability and relative profitability. This will

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include the financing terms, the equity arrangements, partner shares where applicable, taxes and depreciation, as well as capital cost, operating costs and fuel cost. This financial assessment that will demonstrate whether the project is economically viable for SRR and provide the return on investment values, should a third party entity become a partner with SRR for completion of the project.

## **B. Energy Efficiency and Conservation**

### **1. Electric Costs**

#### **a. Smith River Rancheria Program**

Obtain expert technical assistance to determine methods for reducing the electrical costs at the SRR's largest energy consumers, which include the Casio, Lucky 7 Fuel and the UIHS Health Clinic. If this is successful, then the same program should be applied to the next largest energy consumers.

#### **b. Pacific Power Program**

The program offered by Pacific Power regarding assistance to their customers who wish to reduce their energy consumption, should be fully utilized. The financing offered by Pacific Power in this program is a benefit that should be used to make the necessary changes to facilities using the greatest amount of energy.

### **2. Establish Community Action Agency**

Establishing a SRR Community Action Agency may be prudent especially if

- a.** the Norte Senior Center Community Action Agency does not adequately service the Tribal members resulting in long delays, poor communication, or inadequate home weatherization evaluations,
- b.** a strong desire of the SRR membership exists to avoid non-Natives from entering the members homes for the weatherization assessments,
- c.** such a move will allow greater control by SRR and self-sufficiency,
- d.** this is necessary to obtain funding from one of the direct funding programs of the US Government or BPA as outlined above in Paragraphs 7 B 1 e) & f).

### **3. Weatherization & Utility Bill Assistance**

Establish and implement a program to communicate with the Tribal membership the details of the multiple weatherization and utility bill assistance programs outlined in the Report. It may best serve the members to train one or more individuals about the numerous state, federal and utility programs to act as a resource to the membership. This resource will provide details of the programs to the members,

help them understand if they qualify, and offer guidance about which programs are best suited for specific members.

### **C. Establishing a SRR Utility**

Establishing a utility for SRR membership would be beneficial to 1) enable SRR to purchase power at wholesale prices, 2) establish a single point to which power generated by SRR from outside the reservation could be delivered to offset SRR's use from Pacific Power, or 3) establish a meter through which all of SRR current use would flow allowing this meter to be offset by self-generation that SRR might develop within the SRR reservation (on SRR's side of the meter). There is likely little benefit to forming a utility if none of these three options is accomplished.

SRR should continue to assert their position that SRR is within BPA's service territory for purposes of being able to purchase power directly from BPA, should SRR form their own utility. It is recommended that SRR utilize tribal account executives within BPA and perhaps seek other experts to pursue this position until exhausting all approaches. This would preserve SRR rights to purchase power from BPA should their load ever exceed one megawatt in the future. BPA has indicated that the ability for new entities to establish themselves as new wholesale customers of BPA will likely no longer be available after the second quarter of 2005.

### **D. Implement Training**

#### **1. Weatherization & Utility Bill Reduction**

Consider forming a weatherization and conservation department within SRR to provide a resource to Tribal members. Either this new entity, if formed, or SRR staff should pursue the steps outlined below.

- a. Contact BPA as outlined in Paragraph 9 A 1 above regarding training of individuals to become certified to perform residential audits to support the weatherization programs.
  - b. Contact the state of Oregon HEAT as outlined in Paragraph 9 A 2 to obtain details on how to obtain training to reduce Tribal members' utility bill costs.
  - c. Whether or not a weatherization and conservation department is established within the SRR organization, SRR should consider the merits of establishing a community action agency to administer the funds made available by the various agencies and programs described in Paragraph 7 B. Note that the programs described in Paragraph 7 B 1 e) and f) may require following certain procedures for proper administration of the funds. Forming a community action agency would likely meet those requirements.
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**2. Community Development Entity**

Brainstorm and develop ways that the new investment tax credit could be used to SRR's advantage by utilizing a financial partner with a significant tax burden. This may include identifying programs that could be financed by this partnership and outline how this would benefit the financial partner in order to attract candidates.

**3. Operation or Construction Training**

Determine who within SRR would act as the training coordinator for training that will be provided by the original equipment manufacturer and the third party operator. Once this phase is reached by the project, this coordinator will recruit from within the members and act as a liaison with those providing the training.

# 12

## Action Plan Approval

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The final draft Report was reviewed by SRR's Council the week prior to their regular council meeting on December 14, 2004. The Tribal Council approved the submitted report during their December council meeting. A copy of the resolution approving the report is included as Appendix P.

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# Appendix

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- Appendix A Web Pages of Interest
  - Appendix B Contact List
  - Appendix C Sample Pacific Power Invoices
  - Appendix D Pacific Power Schedules 25, 32, 36 and D
  - Appendix E Profiles in Renewable Energy: Case Studies of Successful Utility-Sector Projects, October 1993, US Department of Energy: Office of Power Technologies
  - Appendix F NREL Application for Anemometer Loan Program
  - Appendix G Salem Electric Green Power Purchase Program Presentation
  - Appendix H Western Electricity Coordinating Council Information Summary
  - Appendix I BPA Wind Integration Services
  - Appendix J Pacific Power Schedules 120 and 122
  - Appendix K Norte Senior Center Program Materials for Weatherization & Energy Assistance Payments Assistance
  - Appendix L BPA's Low-Income Tribal Weatherization Program
  - Appendix M Oregon HEAT Energy Assistance Criteria & Restrictions
  - Appendix N Email from Iris Crisman of BPA, dated November 16, 2004 advising her findings regarding whether SRR is within BPA's service territory.
  - Appendix O Oregon Weatherization Training Workshop Past Locations & Training Topics
  - Appendix P Smith River Rancheria Tribal Resolution Number 04-68, dated December 14, 2004 approving the Energy Strategic Planning & Self-Sufficiency Project Report.
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## Appendix A - Pertinent Web Site Resources

Web Site	Description
<a href="http://www.nippc.org">www.nippc.org</a>	Northwest Independent Power Producers Coalition
<a href="http://www.nrel.gov">www.nrel.gov</a>	National Wind Technology Center – Anemometer Loan Program – Many Links & Publications
<a href="http://www.energyatlas.org">www.energyatlas.org</a> <a href="#">click on interactive tool</a>	Has wind, biomass, geothermal resource information
<a href="http://www.eere.energy.gov/windpoweringamerica/">www.eere.energy.gov/windpoweringamerica/</a>	US DOE's Office of Energy Efficiency and Renewable Energy. Very Good Resource
<a href="http://www.eere.energy.gov/tribalenergy/guide">www.eere.energy.gov/tribalenergy/guide</a>	Go to "Resource" then "Renewable" then "Wind" etc
<a href="http://windeis.anl.gov">http://windeis.anl.gov</a>	Wind Energy Environmental Impact Statement. BLM's web page with useful wind resources and links
<a href="http://windeis.anl.gov/index.cfm">http://windeis.anl.gov/index.cfm</a>	BLM web site to assist with wind development. Contains helpful discussion on environmental impact statement (EIS)
<a href="http://www.oregonheat.org">www.oregonheat.org</a>	Assistance program using donated funds utilizing community action agencies
<a href="http://www.windpoweringamerica.gov/docs/primer_siting_wind.doc">http://www.windpoweringamerica.gov/docs/primer_siting_wind.doc</a>	A brief primer on wind project siting
<a href="http://me.oregonstate.edu/ERRL/pnwdat.html">http://me.oregonstate.edu/ERRL/pnwdat.html</a>	wind data from OSU and BPA and OSU anemometer loan program information.
<a href="http://www.eerl.org">http://www.eerl.org</a>	Electronic Environmental Resource Library
<a href="http://www.clean-power.com/nrelwind/default.asp">http://www.clean-power.com/nrelwind/default.asp</a>	National Wind Technology Center
<a href="http://windeis.anl.gov">http://windeis.anl.gov</a>	Environmental Impact Statement preparation assistance
<a href="http://www.rmp.org">http://www.rmp.org</a>	Renewable Energy Resource for the Northwest.

## Appendix B - Contact List

Contact	Company	Title or Responsibilities	Email Address Or Web Page	Phone	State Served
Werner Buehler	Coos-Curry Electric Cooperative-Port Orford	CEO		(541) 332-3931	Oregon
Duffel Gray	Coos-Curry Electric Cooperative -Brookings	Planning Engineer		(541) 469-2103	Oregon
David Smith (now retired)	Coos-Curry Electric Cooperative (Consultant)	Planning Engineer		(541) 332-3931/41	Oregon
Ken Johnston	BPA	Tribal Account Exec - TBL		(360) 418-8640 (360) 608.9825 Cell	Oregon
Steve Enyeart *	BPA	Customer Service Rep - TBL Technical resource regarding transmission & interconnection studies		(360) 619-6059	Oregon
Tony Rodriguez *	BPA (Past Coos-Curry)	Customer Service Rep - TBL		(360) 619-6014 (503) 720-6155 cell	
Iris Crisman	BPA	Tribal Account Exec – PBL	ifcrisman@bpa.gov	(503) 230-4736	Oregon
Debra Malin	BPA	Acct Exec. Renewable Energy	djmalin@bpa.gov	(503) 230-5701	Oregon
Gene Ferguson*	BPA	Low Income Weatherization Training - PBL	egferguson@bpa.gov	(503) 230-3608	Oregon
John Pease*	BPA	Project Manager, Wind & Renewable Studies		(503) 230-5000	Oregon
Clair Hobson	BPA	Assistant Account Executive for PNGC who provides Coos-Curry with their power		(503) 230-5544	Oregon
Shannon Greene	BPA	Assist Tribal Acct Exec – PBL		(206) 220-6775	Oregon
Kelly Laslie	BPA Library	Wind Study by BPA for Cape Blanco		(503) 230-4174	
Sam	PacifiCorp	Marketing for Program Support		(800) 842-8458	California
Barb	PacifiCorp	Customer Contact Center		(888) 221-7070	California
Becky Eberle	PacifiCorp	Residential Weatherization		(503) 813-5154	
Robin Cross	PacifiCorp Customer Service	Customer Service	robin@pacificorp.com	(800) 532-1626 Leave Message (541) 776 5429 Medford Fax	
Joy Brotherton	PacifiCorp Customer Service	Customer Service		(800) 532-1626 Leave Message	
Greg Noyes	PacifiCorp Customer Service	Customer Service, Answered Invoice	Gregory.Noyes@pacificorp.c	(801) 955-2432	

		Questions	om		
Becky Berg	PacifiCorp	FinAnswer – Program to Assist Customers Reduce Their Electrical Bills		(503) 813-5103	
John Lowe	PacifiCorp	Contact for Power Purchase agreements:		(503) 813-5957	
Leonard Gold	L. S. Gold & Associates	Experience Forming Utilities		(480) 731-9506	
Stel Walker	Oregon State University	Energy Resources Research Laboratory		(541) 737-2027	
Phil Barbour	Oregon State University	Anemometer Loan Program Energy Resources Research Laboratory	barboup@ENGR.ORST.EDU	(541) 737-7022	
Jack Hruska	State of Oregon, Housing & Community Services	Manages Federal Funds for Weatherization	jack.hruska@hcs.state.or.us	(503) 963-2283	Oregon
John Huntsman	SW Oregon Community Action Agency	Distributes Federal Funds for Weatherization		(541) 267-7117	Oregon
Cindy Davis	SW Oregon Community Action Agency – Curry County	State, Federal & Utility Funds for Utility Bill Assistance		(541) 469-3155	Oregon
Al Spence	SW Oregon Community Action Agency – Coos County	State, Federal & Utility Funds for Utility Bill Assistance		(541) 269-9974	Oregon
Phil Handsaker	SW Oregon Community Action Agency – Coos & Curry Counties	State, Federal & Utility Funds for Utility Bill Assistance		(541) 888-1527	Oregon
Jay Formick Cindy Olmstead	State of Oregon?	Oregon Heat Executive Director		(503) 612-3770 (503) 810-4799	Oregon
Rick Saunders	Pacific Wood Laminates	Information on Biomass Quantities and Costs	www.socomi.com	(541) 469-2127	
Mike Begely	South Coast Lumber Sawmill	Information on Biomass Quantities and Costs			
Ilene Silvey (sp)	Norte Senior Center, Crescent City, CA	Low Income Weatherization		(707) 464-9013	California
Leslie Campanela	State of California, Department of Service & Development	Manages Federal Funds for Weatherization		(916) 341-4376	California
Duane Reichlin	Snoozie Shavings Arcadia Particleboard Plant Crescent City Particleboard Plant	Knowledge of Biomass Market		(707) 464-6131	
Charlotte Rollier	Energy Trust of Oregon	Weatherization	char@energytrust.org	(503) 493-8888 x219	Oregon
Joe Nadal	PNGC Power	Coop to which Coos-Curry belongs		(503) 288-1234	

		and from which all their power is provided			
Marty Wilde	WINDynamics, Inc.	Past Project Consultant		(406) 892-1313	
Chris Walker	Electronic Environmental Resources Library	Manager		(563) 441-4095	
Roger Taylor	National Energy Renewable Lab	Wind Resource	roger_taylor@nrel.gov	(303) 384-7389	
Tony Jimenez	National Energy Renewable Lab	Wind Resource	tony_jimenez@nrel.gov	(303) 384-7027	
Al Alexander	Pacific Power & Light	Account Representative	www.ppl.net for rate schedules	(801) 955-2414	
Margaret Schaff	Margaret M. Schaff PC	Experience forming utilities	Mschaff@att.net	(303) 443-0182	
Ron Doan (Iris Crisman BPA)	Umpqua Indian Utility Cooperative (UIUC)	General Manager - formed a utility under PacifiCorp		(541) 677-5569	
Foley Cleveland (Iris Crisman)	Tulalip Tribe			(360) 651-3325	
Tom (Mac) McKensie	Tulalip Tribe, Tulalip, WA	In the process of utility formation. Discuss process Special Projects	8802 27 <sup>th</sup> Ave NE Marysville, WA 98271 Tmac@tgi.net	(360) 651-4399	
Jeff Weiss	Kalusa Tribe – Tribal Contact	Installed reciprocating engine for tribal energy		(913) 338-3734 x201	
David Christy	Western Area Power Administration (WAPA)	Similar organization to BPA servicing SW US		(916) 353-4436	California
<b>Other Individuals of Interest</b>					
W/C Tom Foley					
Jeannette Nelson	State of California, Department of Service & Development	Manages Federal Funds for Weatherization-Humbolt County location		(530) 625-4808	
Ray Weismann (Iris Crisman)	Yakima Power or Yakima Nation	General Manager		(509) 865-5121 ? Economic Dev (509) 865-7233, 4406 ?	
Carl DeWinkel	Oregon State Energy Office	Oregon wind working group, referred by Curtis Frammel of DOE Seattle			
Clare Hobson	BPA	Assistant Account Executive for PNGC Energy		X5544	
Mike Pommarane (John Lowe)	PacifiCorp	Location and size of substations		(541) 679-3650	
Larry Loderqist	PacifiCorp Portland	Transmission questions		(503) 813-6102	

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(John Lowe)					
Jim Haberman (John Lowe)	PacifiCorp Portland	Net Metering Up to 1 MW in CA, 25 kW in Oregon Must be renewable biomass excluded. Net metering applies only if excess power otherwise just displaced power.		(503) 813-5224	
Les Balls	PacifiCorp Klamath Falls	Director of Field Services, Points of Interconnection		(541) 883-7899	

PBL – Power Business Line  
 TBL – Transmission Power Line

# Appendix C

## PACIFIC POWER

PAGE 1 OF 4

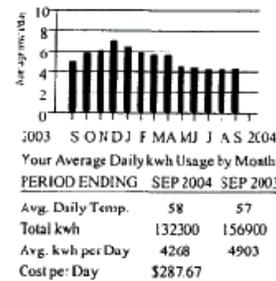
SMITH RIVER LUCKY 7 CASINO  
350 N INDIAN RD  
SMITH RIVER CA 95567-9474

Questions about your bill: 1-888-221-7070  
24 hours a day, 7 days a week  
www.pacificpower.net

BILLING DATE: Sep 27, 2004  
ACCOUNT NUMBER: 2431041-003 7  
DATE DUE: Oct 18, 2004  
AMOUNT DUE: \$9,084.80

Your Balance With Us		Payments Received	
DATE	DESCRIPTION	DATE	AMOUNT
Previous Account Balance	9,138.18	Sep 14, 2004	Payment Received - Thank you 9,138.18
Payments/Credits	-9,138.18		
New Charges	+9,084.30		
Current Account Balance	\$ 9,084.30	Total Payments	\$ 9,138.18

Historical Data - ITEM 8



Detailed Account Activity

ITEM 8 - ELECTRIC SERVICE 350 N Indian Rd Smith River CA  
Main Service To Casino Schedule A36

METER NUMBER	SERVICE PERIOD From To	ELAPSED DAYS	METER READINGS Previous Current	METER MULTIPLIER	AMOUNT USED THIS MONTH
2492761	Aug 24, 2004 Sep 24, 2004	31	27169 27610	300.0	132,300 kwh
2492761	Demand Sep 24, 2004			0.784	300.0 235 kw
2492761	Reactive Sep 24, 2004			0.305	300.0 92 kvar

NEW CHARGES - 0904	UNITS	COST PER UNIT	CHARGE
Basic Charge - JP			160.00
Distribution Demand Charge	394 kw	2.0000000	788.00
Generation & Transm Demand	235 kw	3.3000000	775.50
Energy Charge	132,300 kwh	0.0531400	7,036.42
Low Income Assistance Charge	132,300 kwh	0.0008200	108.49
CPUC Surcharge	132,300 kwh	0.0001200	15.88
State Energy Resource Tax	132,300 kwh	0.0003300	39.69
Total New Charges			8,917.98

*Handwritten notes: AUG OF 2 HIGHEST MONTHS, 105408*

BREAKDOWN OF CHARGES BY SERVICE CATEGORY	TOTALS
CATEGORY	TOTALS

SCHEDULE A-36

Write account number on check & mail to: Pacific Power, 1033 NE 6th Ave, Portland, OR 97256-0001

See reverse

Late Payment Charge for California  
A late payment charge of 1.5% may be  
charged on the total unpaid balance, if  
greater than \$20.

RETAIN THIS PORTION FOR YOUR RECORDS.  
RETURN THIS PORTION WITH YOUR PAYMENT.

## PACIFIC POWER

PO BOX 25308  
SALT LAKE CITY UT 84125

Change of Mailing Address or Phone?  
Click here & provide information on back.

Account Number: 62431041-003 7

WRITE ACCOUNT NUMBER  
ON CHECK & MAIL TO:

Date Due: Oct 18, 2004

\* AUTOGR \*\* R-001

25899 01 AC 0 275 173-0  
\*555679474500\*  
SMITH RIVER LUCKY 7 CASINO  
350 N INDIAN RD  
SMITH RIVER CA 95567-9474

PACIFIC POWER  
1033 NE 6TH AVE  
PORTLAND OR  
97256-0001

AMOUNT DUE: \$9,084.80

Please enter the amount enclosed.

Questions about your bill:  
1-888-221-7070

H 62431041 003 748 000908480



**PACIFIC POWER**

Questions about your bill: 1-888-221-7070 www.pacificpower.net

BILLING DATE: Sep 27, 2004 ACCOUNT NUMBER: 62431041-003 DATE DUE: Oct 18, 2004 AMOUNT DUE: \$9,084.80

**BREAKDOWN OF CHARGES BY SERVICE CATEGORY - - CONTINUED**

CATEGORY	TOTALS	
Distribution	3,138.89	** This Service is subject to competition. You may purchase electricity from another supplier. The Market Energy Price portion of this bill is provided for comparison with prices offered by other Energy Service Providers. Pacific Power's charge is based on the weighted average cost of the energy at the California Oregon Border (COB) Index for this billing period.
Interstate (FERC) Transmission	340.75	
State Transmission	199.75	
Generation		
Competition Transition Charge	-1,123.41	
**Market Price @ 1.0462300	6,117.24	
Public Purpose	205.07	
State Energy Resource Tax	39.69	
<b>Total Breakdown by Service Category</b>	<b>58,917.98</b>	

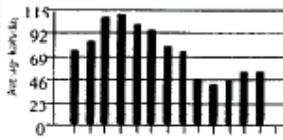
**ITEM 9 - ELECTRIC SERVICE**

13170 Us Highway 101 N Smith River CA  
Office Annex - Office Annex - Schedule 23

METER NUMBER	SERVICE PERIOD From To	ELAPSED DAYS	METER READINGS		METER MULTIPLIER	AMOUNT USED THIS MONTH
			Previous	Current		
34883057	Aug 24, 2004 Sep 24, 2004	31	23616	25255	1.0	1,639 kwh

NEW CHARGES - 09/04	UNITS	COST PER UNIT	CHARGE
Basic Charge - 1P			10.00
Energy Charge	1,639 kwh	0.0944400	154.79
CPUC Surcharge	1,639 kwh	0.0001200	0.20
Low Income Assistance Charge	1,639 kwh	0.0008200	1.34
State Energy Resource Tax	1,639 kwh	0.0003000	0.49
<b>Total New Charges</b>			<b>166.82</b>

**Historical Data - ITEM 9**



PERIOD ENDING	SEP 2004	SEP 2003
Avg. Daily Temp.	58	57
Total kwh	1539	2447
Avg. kwh per Day	53	76
Cost per Day	\$5.38	

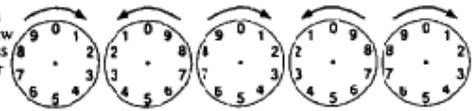
**BREAKDOWN OF CHARGES BY SERVICE CATEGORY**

CATEGORY	TOTALS	
Distribution	82.95	** This Service is subject to competition. You may purchase electricity from another supplier. The Market Energy Price portion of this bill is provided for comparison with prices offered by other Energy Service Providers. Pacific Power's charge is based on the weighted average cost of the energy at the California Oregon Border (COB) Index for this billing period.
Interstate (FERC) Transmission	7.49	
State Transmission	4.20	
Generation		
Competition Transition Charge	-6.65	
**Market Price @ 0.0462300	75.78	
Public Purpose	2.56	

**New Mailing Address or Phone?**

Please print your new information below and check the box on the reverse side of this Payment Stub. Thank you.

If you fee your meter has been read incorrectly, draw lines representing hands as they appear on your meter now, then call toll free 1-888-221-7070



ACCOUNT NUMBER 62431041-003 7

LAST FIRST MI

NEW STREET ADDRESS

CITY

ST ZIP TELEPHONE NUMBER



\*9R076B1200000\*



**PACIFIC POWER**

Questions about your bill: 1-888-221-7070 [www.pacificpower.net](http://www.pacificpower.net)

BILLING DATE: Sep 27, 2004 ACCOUNT NUMBER: 62131041-403 DATE DUE: Oct 18, 2004 AMOUNT DUE: \$9,084.80

BREAKDOWN OF CHARGES BY SERVICE CATEGORY -- CONTINUED

CATEGORY	TOTAL \$
State Energy Resource Tax	0.49
Total Breakdown by Service Category	\$ 186.82



Questions about your bill: 1-855-221-7000 [www.pacificpower.net](http://www.pacificpower.net)

PAGE 4 OF 4

BILLING DATE: Sep 27, 2009 ACCOUNT NUMBER: 62431141-003 DATE DUE: Oct 18, 2009 AMOUNT DUE: \$9,084.80

\*980918220000\*

# PACIFIC POWER

PAGE 1 OF 4

UNITED INDIAN HEALTH CLINIC  
SERVICES INC  
1600 WEEOT WAY  
ARCATA CA 95521-4734

Questions about your bill: 1-888-221-7070  
24 hours a day, 7 days a week  
www.pacificpower.net

BILLING DATE: Sep 30, 2004  
ACCOUNT NUMBER: 62431111-002 4  
DATE DUE: Oct 21, 2004  
AMOUNT DUE: \$1,002.55

Your Balance With Us

Previous Account Balance	837.71
Payments/Credits	-837.71
New Charges	+1,002.55
Current Account Balance	\$ 1,002.55

Payments Received

DATE	DESCRIPTION	AMOUNT
Sep 8, 2004	Payment Received - Thank you	837.71
Total Payments		\$ 837.71

Summary of Account Activity

ITEM 1 ELECTRIC SERVICE	501 N Indian Rd Bldg A Smith River CA Main Sr Clinic California General Service Schedule A32 METER # 1792091	718.73
ITEM 2 ELECTRIC SERVICE	241 Salmon Ave Klamath CA Health Clinic Schedule 25 METER # 70505713	251.71
ITEM 7 ELECTRIC SERVICE	501 N Indian Rd Bldg A Smith River CA Service To Lights-parking Lot Schedule 25 METER # 25497973	32.11

Write account number on check & mail to: Pacific Power, 1033 NE 6th Ave, Portland, OR 97256-0001

See reverse 

Late Payment Charge for California  
A late payment charge of 1.5% may be  
charged on the total unpaid balance, if  
greater than \$20.

RETAIN THIS PORTION FOR YOUR RECORDS.  
RETURN THIS PORTION WITH YOUR PAYMENT.

Change of Mailing Address or Phone?  
Click here & provide information on back.

# PACIFIC POWER

PO BOX 25308  
SALT LAKE CITY UT 84125

Account Number: 62431111-002 4

WRITE ACCOUNT NUMBER  
ON CHECK & MAIL TO:

Date Due: Oct 21, 2004

33377 01 MB 0.309 172-0  
\*955214734000\*  
UNITED INDIAN HEALTH CLINIC  
SERVICES INC  
1600 WEEOT WAY  
ARCATA CA 95521-4734

PACIFIC POWER  
1033 NE 6TH AVE  
PORTLAND OR  
97256-0001

AMOUNT DUE: \$1,002.55

Please enter the amount enclosed.

Questions about your bill:  
1-888-221-7070

H 62431111 002 449 000100255





Questions about your bill: 1-888-221-7070 www.pacificpower.net

BILLING DATE: Sep 30, 2004 ACCOUNT NUMBER: 62431111-002 DATE DUE: Oct 21, 2004 AMOUNT DUE: \$1,002.55

ITEM 1 - ELECTRIC SERVICE 241 Salmon Ave Klamath CA  
Health Clinic Schedule 25

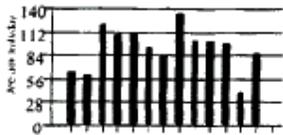
METER NUMBER	SERVICE PERIOD		ELAPSED DAYS	METER READINGS		METER MULTIPLIER	AMOUNT USED THIS MONTH
	From	To		Previous	Current		
70505713	Jul 29, 2004	Aug 27, 2004	29	48117	50604	1.0	2,487 kwh

NEW CHARGES - 09/04	UNITS	COST PER UNIT	CHARGE
Basic Charge - 3P			13.75
Energy Charge	2,487 kwh	0.0944400	234.87
CPUC Surcharge	2,487 kwh	0.0001200	0.30
Low Income Assistance Charge	2,487 kwh	0.0003200	2.04
State Energy Resource Tax	2,487 kwh	0.0003000	0.75
<b>Total New Charges</b>			<b>251.71</b>

BREAKDOWN OF CHARGES BY SERVICE CATEGORY

CATEGORY	TOTALS	
Distribution	124.45	** This Service is subject to competition. You may purchase electricity from another supplier. The Market Energy Price portion of this bill is provided for comparison with prices offered by other Energy Service Providers. Pacific Power's charge is based on the weighted average cost of the energy at the California Oregon Border (COB) Index for this billing period.
Interstate (FERC) Transmission	11.37	
State Transmission	6.37	
Generation		
Competition Transition Charge	-42.30	
**Market Price @ 0.0591800	147.20	
Public Purpose	3.88	
State Energy Resource Tax	0.75	
<b>Total Breakdown by Service Category</b>	<b>\$ 251.72</b>	

Historical Data - ITEM 2



2003 S O N D J F M A M J J A S 2004  
Your Average Daily kWh Usage by Month

PERIOD ENDING	SEP 2004	SEP 2003
Avg. Daily Temp.	59	58
Total kwh	2487	1820
Avg. kwh per Day	86	65
Cost per Day	\$8.67	

ITEM 7 - ELECTRIC SERVICE 501 N Indian Rd Bldg A Smith River CA  
Service To Lights-parking Lot Schedule 25

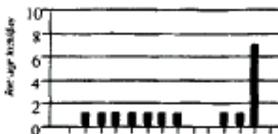
METER NUMBER	SERVICE PERIOD		ELAPSED DAYS	METER READINGS		METER MULTIPLIER	AMOUNT USED THIS MONTH
	From	To		Previous	Current		
25497973	Aug 24, 2004	Sep 25, 2004	32	52	283	1.0	231 kwh

NEW CHARGES - 09/04	UNITS	COST PER UNIT	CHARGE
Basic Charge - 1P			10.00
Energy Charge	231 kwh	0.0944400	21.82
CPUC Surcharge	231 kwh	0.0001200	0.03
Low Income Assistance Charge	231 kwh	0.0008200	0.19
State Energy Resource Tax	231 kwh	0.0003000	0.07
<b>Total New Charges</b>			<b>32.11</b>

BREAKDOWN OF CHARGES BY SERVICE CATEGORY

CATEGORY	TOTALS	
Distribution	20.28	** This Service is subject to competition. You may purchase electricity from another supplier. The Market Energy Price portion of this bill is provided for comparison with prices offered by other Energy Service Providers. Pacific Power's charge is based on the weighted average cost of the energy at the California Oregon Border (COB) Index for this billing period.
Interstate (FERC) Transmission	1.06	
State Transmission	0.59	
Generation		
Competition Transition Charge	-0.96	
**Market Price @ 0.0463200	10.70	
Public Purpose	0.36	
State Energy Resource Tax	0.07	
<b>Total Breakdown by Service Category</b>	<b>\$ 32.10</b>	

Historical Data - ITEM 7



2003 S O N D J F M A M J J A S 2004  
Your Average Daily kWh Usage by Month

PERIOD ENDING	SEP 2004	SEP 2003
Avg. Daily Temp.	58	57
Total kwh	231	15
Avg. kwh per Day	7	0
Cost per Day	\$1.00	



Questions about your bill: 1-888-221-7070 www.pacificpower.net

PAGE 4 OF 4

BILLING DATE: Sep 30, 2004 ACCOUNT NUMBER: 62431111-002 DATE DUE: Oct 21, 2004 AMOUNT DUE: \$1,002.55

\*9U101122G1000\*

## Appendix E

### Profiles in Renewable Energy: Case Studies of Successful Utility-Sector Projects

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- [The Shape of Renewable Energy Technologies Today](#)
- [Biomass](#)
  - [Wood-Burning Plant Reduces Air Pollution](#)  
Kettle Falls Wood-Fired Plant  
*Washington Power Company*
  - [Regulatory Changes Spur Wood-Fired Plant](#)  
Grayling Generating Station  
*Decker Energy International, Inc.*
  - [Community Partnership Leads to Waste-Burning Plant](#)  
Bristol Waste-to-Energy Plant  
*Ogden Martin Systems*
- [Geothermal](#)
  - [Geothermal Loan Encourages New Power Industry](#)  
Ormesa Geothermal Complex  
*OESI Power Corporation (Orman Group)*
  - [Project Consolidation Rescues Geothermal Development](#)  
Dixie Valley Project  
*Oxbow Geothermal (Oxbow Corporation)*
- [Hydropower](#)
  - [Run-of-River Plant Minimizes Environmental Impacts](#)  
Sidney A. Murray Hydroelectric Station  
*Catalyst Energy Corporation*
- [Photovoltaics](#)
  - [Stand-Alone PV Systems Meet Many Utility Needs](#)  
Helms Pumped Storage Plant and Other PV Applications  
*Pacific Gas and Electric Company*
  - [Utility Demonstrates Feasibility of Rooftop PV Systems](#)  
Gardner PV Project  
*New England Electric System*
- [Solar Thermal](#)
  - [Solar Thermal Plants Meet Utility Peaking Needs](#)  
Luz Solar Electric Generating Systems  
*Luz International, Ltd.*
- [Wind](#)

- [Performance Improvements Make Wind Power Economical](#)  
Altamont Pass Windplants  
*U.S. Windpower, Inc.*
- [For More Information](#)

### **The Shape of Renewable Energy Technologies Today**

As considerations of fuel diversity, environmental concerns, and market uncertainties are increasingly factored into electric utility resource planning, renewable energy technologies are beginning to find their place in the utility resource portfolio. This document profiles 10 renewable energy projects, utilizing six different renewable resources, that were built in the United States throughout the 1980s. For each project, the factors that were key to its success and the development issues that it faced are discussed, as are the project's cost, performance, and environmental impacts and benefits.

Renewable energy technologies have important advantages to utilities: they use a fuel source that is either free (such as sun or wind) or relatively inexpensive (such as wood waste or municipal solid waste); their project construction lead times can be significantly shorter than those of traditional power plants, thus reducing utility risks; their capacity can be increased incrementally to better match load growth; and they are environmentally cleaner than fossil fuels. Because of these advantages, many utilities and regulatory bodies are increasingly interested in acquiring hands-on experience with renewable energy technologies in order to plan effectively for the future. Furthermore, many financial incentives now encourage the manufacture and development of renewable energy technologies, including federal incentives contained in the Energy Policy Act of 1992.

A great deal of renewable energy development occurred in the 1980s, and the prime stimulus for it was the passage in 1978 of the Public Utility Regulatory Policies Act (PURPA), which created a class of non-utility power generators known as "qualifying facilities" or QFs. QFs were defined to include cogeneration systems and small power generators utilizing waste fuels and renewable energy sources. For the first time, PURPA required electric utilities to interconnect with QFs and establish contracts to purchase QFs' power output at "avoided cost," or the cost that the utility would have incurred by supplying the power itself. PURPA also exempted QFs from certain federal and state utility regulations.

Utility power purchase contracts, which many projects received under the requirements of PURPA, were the most important contributors to the success of the non-utility projects profiled in this document. By providing a predictable revenue stream, power purchase contracts significantly reduced the financial community's perceived risk of non-utility projects.

Other factors for success were transmission access and availability; federal and state tax incentives; special financing opportunities, such as federal loans; and the ability to satisfy other societal needs, such as the disposal of wood waste or municipal solid waste. In many cases, a cooperative effort among all affected parties was a dominant factor in project success.

In contrast to QFs, electric utilities played a relatively small role in the development of non-hydro renewables during the 1980s, in part because the government policies that drove much of the QF development during this period largely excluded utility developers. Utilities developed projects only where economics were highly favorable or as a component of their research and development (R&D) programs. For these utility developers, the regulatory treatment of project

costs was an important concern. Although some utilities undertook renewable energy R&D projects without seeking cost recovery, cost recovery issues must be addressed if utilities are to invest more broadly in renewables in the future.

Overall, many regulatory, environmental, and economic factors spurred the projects profiled in this document, but a number of factors hindered the projects. These hindrances included negotiation of right-of-way for new transmission lines; mitigation of wildlife and protected lands issues; an overly long project-approval process; and technological issues, particularly for first-of-a-kind project endeavors.

Utility decision makers and regulators need to be aware that there are a number of successful renewable energy projects now in operation. By drawing on the experience of the projects profiled in this document, decision makers should be better equipped to evaluate the conditions under which specific renewable energy projects and proposals can be successfully implemented in the future.

### **Biomass**

Biomass energy, one of the oldest energy sources known to man, uses the energy embodied in organic matter (mainly plants). Biomass-based energy systems utilize wood, agricultural and wood waste, municipal waste, and landfill gas as fuels. Biomass, in all its energy uses, currently supplies more than 3% of total U.S. energy needs and provides almost 10,000 MW of electric generating capacity. Wood fuels provide the bulk of this generation (66%), followed by municipal waste (24%), agricultural waste (5%), and landfill gas (5%). While biomass resources, in one form or another, are present in all 50 states, the development of short-rotation woody crops may significantly expand the future supply of biomass resources.

Wood is the leading biomass energy resource used for power generation, primarily because of its use as a boiler fuel in the lumber and pulp and paper industries. The lumber industry satisfies close to 75% of its energy needs through direct wood combustion, while the pulp and paper industry has achieved a 55% aggregate fuel contribution from wood. Many of these companies use cogeneration systems for power generation. The Edison Electric Institute estimates that more than 6000 MW of non-utility, wood-fired generating capacity was in place at the end of 1991.

Wood has environmental advantages in terms of emissions of carbon dioxide, a greenhouse gas. Although the burning of a tree releases carbon dioxide, an equal amount of carbon dioxide is removed from the atmosphere when the tree grows. Thus, so long as the trees that are burned are replaced by growing new trees, the net emission of carbon dioxide is zero.

Municipal waste is the second largest source of biomass power, generating more than 2000 MW of electricity and providing steam for industrial uses. More than 526,060 metric tons (580,000 tons) of municipal waste are generated in the United States each day, with three-quarters or more of this total going to landfills. With landfills nearing capacity, charging higher costs, and adopting stricter regulations, many localities have turned to waste-to-energy (WTE) systems as a disposal alternative-- an estimated 15%-20% of municipal waste is burned for energy. Several industry sources have predicted that from one-third to one-half of the nation's municipal waste could be burned for energy by 2000.

Agricultural waste plants are the third largest biomass generators, producing another 575 MW nationwide. These plants use such diverse feedstocks as bagasse (sugarcane residue), rice hulls, rice straw, nut shells, crop residues, and prunings from orchards and vineyards.

Finally, more than 100 power plants in 31 states burn landfill-generated methane. The high natural gas prices of the 1970s prompted the exploitation of methane, and its development was further spurred by the enactment of PURPA and federal tax incentives for the production of non-conventional fuels. Environmental concerns have also had a positive impact on the landfill methane industry. More than 10% of the nation's 6000 existing landfills are expected to require methane collection systems to comply with federal regulations on hazardous emissions from landfills. Methane is also a potent greenhouse gas, and this may provide greater impetus for landfill methane projects in the future.

## **Wood-Burning Plant Reduces Air Pollution**

### ***Kettle Falls Wood-Fired Plant***

#### ***Washington Water Power Company***

*The Kettle Falls wood-burning plant overcame high initial costs to generate cost-effective power using local labor and fuel, while producing environmental benefits for the surrounding community.*

During the late 1970s, the Washington Water Power Company (WWP), an investor-owned utility serving customers in eastern Washington and northern Idaho, began investigating alternative generation sources to expand its electricity supply base. The abundance of wood waste from the lumber industry contributed to the decision to build a power plant fueled entirely by that renewable fuel.

At the time, wood waste created by the numerous lumber mills in the area was being incinerated in wigwam burners primarily as a method of waste disposal. These burners had no pollution controls and thus posed a serious air pollution problem. A dedicated wood-waste-fired generating plant, incorporating state-of-the-art emission controls, offered a solution to this growing environmental concern and at the same time provided WWP with an energy resource alternative to the hydroelectric supplies of the Northwest.

The Morrison-Knudsen Company designed and constructed the 42.5-MW steam-generating plant on a 19-hectare (46-acre) site at Kettle Falls, Washington. The site selection near the lumber mills took advantage of the plentiful fuel supply while meeting the need for wood waste disposal. A new 115-kV substation was constructed adjacent to the plant to provide transmission access. Construction took 2 1/2 years, and commercial operation began in December 1983.

#### **Cost and Performance**

The total capital cost of the plant, exclusive of financing, was about \$85.9 million (excluding the substation) or slightly more than \$2,000/kW. The estimated levelized capital charge for the plant was 3.22 cents/kWh in 1989. WWP maintains 5- to 10-year contract agreements for wood waste delivery with about 15 large lumber companies within a 161-km (100-mile) radius of the plant, but also signs short-term contracts to take advantage of competitive markets for the wood waste. Given the abundance of the wood waste resource in close proximity to the plant, fuel costs have been very low. In 1989, fuel costs were just \$0.75/gigajoule (\$0.79/million Btu), or 1.22 cents/kWh, and 85%-90% of that was due to the cost of freight. Including operation and maintenance costs (O&M), total operating costs were 1.43 cents/kWh in 1989, for a total plant generating cost of slightly more than 4.65 cents/kWh.

The Kettle Falls plant has been an operating success, continuously exceeding utility industry operating standards. The plant's availability factor has averaged about 95%. During 1989 and

1990, the station operated 247 consecutive days without an outage. The plant has also consistently operated at a power output of 47 MW, which is 4.5 MW greater than its nameplate rating.

A plant service factor of 75% was originally expected at Kettle Falls--based, in part, on the projected cost of fuel and the availability of alternative power sources (such as inexpensive hydropower). The annual service factor has been as high as 95%, but the plant is usually shut down during the spring runoff, when inexpensive hydropower is readily available.

#### Environmental Issues

A great emphasis was placed on environmental considerations during the design phase of the project. The plant's boiler produces ash in volume equal to 3% of the fuel. The ash is entrained in the flue gas and is removed in a particulate removal system, which employs an electrostatic precipitator. The recovered ash is then disposed of in a dedicated solid-waste landfill. Recently, the utility received permission to market the ash as a liming agent, to be added to soil to decrease acidity.

The entire particulate removal system was designed to limit particulates to 0.02 grains per standard cubic foot (gr/scf), which is the state standard. The actual emissions rate has been 0.003 gr/scf, well below the state threshold. For its role in cleaning up the air in the Pacific Northwest, WWP was the recipient of Power magazine's Electric Utility Energy Conservation and Environmental Protection Award in 1984.

The Kettle Falls plant uses well water as makeup to the plant's cooling water system. The plant produces only minor amounts of liquid wastes, which are treated on-site prior to discharge.

#### Success Factors and Barriers

There are several reasons why the Kettle Falls project is a success. First, the plant provided a solution to an existing environmental problem created by the wigwam combustion of forest industry wastes. This helped galvanize initial support for the project. Second, the plant uses local fuels and labor. Third, despite the high initial cost (\$2,000/kW), the plant has been cost effective because of its low-cost fuel sources and its above-average plant performance.

At the same time, the project did confront several problems. The higher front-end cost of the plant turned out to be an important issue with state utility regulators. Because the wood plant was a first-of-a-kind endeavor, the total project cost was much higher than that of a conventional power plant of comparable size using fossil fuel. The utility experienced difficulty convincing regulators that the higher cost of the Kettle Falls plant was prudent and justified. Eventually, 10% of the plant cost was disallowed from the rate base.

In addition, fuel supply has recently become an issue for the project. WWP will ship fuel from within a 161-km (100-mile) radius of the plant, but beyond that radius the fuel costs are prohibitive. Although the fuel supply has been plentiful most of the time, the logging reductions in recent years have impacted the supply, increasing fuel costs and reducing the plant service factor.

#### **Regulatory Changes Spur Wood-Fired Plant**

*Grayling Generating Station  
Decker Energy International, Inc.*

*A power purchase contract clause impeded the Grayling Generating Station's financing for several years until a new law solved the problem. Nine years after it was conceived, the plant began environmentally sound operation with high availability.*

Decker Energy International began developing and acquiring energy facilities in 1982. Initially, Decker developed small gas-fired cogeneration projects, but later sought to expand to larger projects. The company viewed wood waste as an unexploited source of fuel. About that time, a remote area of central Michigan faced two growing concerns: first, additional electric capacity was needed by the local utility; and second, the disposal of lumbering refuse was becoming a critical problem. The concept for a wood-waste-fired generating station grew out of these concerns, and Decker soon initiated plans for the 34-MW Grayling Generating Station (GGS).

GGS, located on a 7-hectare (17-acre) site, is owned by the Grayling Generating Station Limited Partnership, which includes Decker Energy, the primary developer; Primary Power, the initial developer; and CMS Generation Company. CMS, a utility subsidiary, manages the project and provides operating services for the partnership. Power is sold to Consumers Power under terms of a negotiated power purchase contract.

Originally conceived of in 1983, the plant took 7 years to develop and 2 years to construct. A consortium of construction companies led by Black & Veatch completed the construction phase of the project on time and within budget. Commercial operation began in June 1992.

#### Cost and Performance

The plant was constructed under a fixed-price turnkey contract for \$50 million, including both engineering and construction. The total project cost, including the cost of financing, was \$68 million, or \$1,878/kW (nameplate).

The power purchase contract with Consumers Power was originally signed in 1984. Because of project delays and regulatory factors, the contract was renegotiated in 1989. Under the current 35-year contract, Consumers purchases power at a rate of 6.20 cents/kWh consisting of a 4.05 cents/kWh levelized payment for capacity, 0.40 cents/kWh for operation and maintenance, and 1.75 cents/kWh for energy (based on the price of coal).

The plant burns 56 metric tons (55 tons) of wood waste per hour with an output of 36.2 MW. The wastes and by-products from lumbering and milling operations provide 95% of the fuel. An adjacent sawmill serves as the procurement source for the wood fuel. About 50% of the fuel is purchased at a fixed rate while the remaining 50% is procured on a cost-plus basis. The plant design also provides for the future use of 1 kg/s (8000 lb/hr) of steam for a drying kiln at the adjacent sawmill.

To date, the availability factor of 94% has exceeded the guaranteed availability of 88%.

#### Environmental Issues

The plant employs an electrostatic precipitator for particulate removal and a nitrogen oxide reduction system. The plant also uses a boiler system that minimizes emissions of carbon monoxide. In operation, emissions of these airborne pollutants have remained below the allowed levels.

Approximately two-thirds of the cooling-water needs are supplied by ground wells. The remainder of the water needs are supplied by tertiary wastewater from the town of Grayling. The plant also incorporates a cooling tower to reduce wastewater disposal needs.

After undergoing toxicity tests, the ash from the plant has been designated as benign and thus can be spread on local farmers' fields as fertilizer.

### Success Factors and Barriers

The development of the GGS took 9 years from conception to operation. With a power purchase contract in hand, and confident that the GGS was an economically sound project, the developers persisted through years of regulatory delays. The first delay was due to the regulatory out clause in the original power purchase contract, which allowed Consumers to lower the power purchase rate if, at any point, cost recovery was disallowed. This clause discouraged financing for the project because of revenue stream uncertainty. Subsequently, a state law passed in 1987 required utilities to purchase power at a fixed rate for the duration of the project financing.

A second cause of delay was the regulatory approval process. The project approval filing coincided with that of a highly controversial 1300-MW project proposal that dominated regulatory attention. Consequently, the project approval for GGS took 28 months. According to Mike Whiting, chief executive officer of Decker Energy, these types of delays make it very difficult for small power producers to sustain a project's viability.

### Community Partnership Leads to Waste-Burning Plant

#### ***Bristol Waste-to-Energy Plant Ogden Martin Systems***

*Faced with a waste-disposal problem, eight Connecticut communities banded together to build a waste-to-energy plant, which now offers the lowest-cost municipal waste disposal in the state.*

In the early 1980s, the Connecticut state legislature passed an act requiring municipalities to provide safe and sanitary disposal of all community-generated solid waste. This legislative act provided the impetus for a consortium of Connecticut communities to plan and develop a waste-to-energy (WTE) facility. A 7.4-hectare (18.2-acre) site in Bristol, adjacent to a sanitary landfill, was chosen for the plant location.

Ogden Martin Systems was selected to perform the design, construction, operation, and maintenance of the facility. Construction began in September 1985, and the plant was dedicated in May 1988. The plant consists of two waterwall furnaces designed to process a minimum of 200,000 metric tons (195,725 tons) of municipal solid waste (MSW) per year. The Bristol Resource Recovery Facility (BRRF) became the first project developed by Ogden Martin involving and serving multiple independent communities. The project, which initially had eight participating communities, now serves 14 communities. The power output is sold to Connecticut Light and Power Company (CL&P).

### Cost and Performance

The BRRF is owned and operated by Ogden Martin. A 25-year standard service agreement with the 14 participating communities includes a guaranteed (minimum) waste delivery of 155,750 metric tons (153,300 tons) per year. Each community is committed to delivering all of their waste that is not recycled. Under PURPA, a 25-year, levelized, fixed-rate power purchase contract was negotiated, with CL&P paying the project 8.3 cents/kWh.

The \$58.4 million construction cost (\$3,583/kW) was financed with \$73.5 million in tax exempt revenue bonds and \$17.8 million in company equity. Annual O&M costs are approximately \$5

million but are more than offset by tipping fees--the charges for accepting the trash. Portions of the tipping revenue are also used to support other waste reduction activities of the communities.

The facility's rated capacity is 16.3 MW. With an availability factor of 92%, the plant has the highest availability of any generating plant on the CL&P grid. Consequently, the relationship between Ogden Martin and the utility has been very good.

#### Environmental Issues

The Bristol plant was one of the first WTE plants to include both dry-flue-gas scrubbers and fabric-filter baghouses; air emissions are lower than ambient standards by an order of magnitude or more. The plant is also electronically linked to the state environmental compliance office for continuous emissions monitoring.

To date, the ash from the plant has passed all toxicity tests and has been disposed of at the adjacent landfill. However, a recent change in state regulations now requires that ash and MSW be landfilled separately so their possible toxicity can be monitored. This restriction has cut the life of the original ash disposal site to 4 years from 14-16 years. Now the communities must locate an alternative site for ash disposal.

#### Success Factors and Barriers

The most important factor contributing to the success of the Bristol project has been the cooperation of the original eight participating communities. Scott Mackin, president and chief operating officer of Ogden Projects (the parent company of Ogden Martin), believes that the development of an effective partnership, where decision making rests with the community participants, is key. For example, because the communities jointly determined the plant site, Ogden Martin avoided siting and zoning delays. Representatives from each community continue to meet to monitor the facility and review legislative issues.

The emphasis on air-emissions control is another factor in the project's success. WTE plants are facing increasing public and environmental scrutiny because of concerns about air emissions. This scrutiny makes it difficult to site WTE plants in many parts of the country.

The efficient design and operation of the Bristol plant also played a role in its success, because they allowed the plant operator to charge a lower tipping fee to the communities involved. The current tipping fee of \$50/ton is the lowest in the state; tipping fees at other WTE facilities and landfills range from \$55/ton to more than \$100/ton. The project's lower tipping fee has attracted a waiting list of potential waste suppliers.

Another factor in the project's success was the availability of a fixed-rate power purchase contract under PURPA. In addition, the facility is located near a utility substation, which minimized transmission and interconnection issues and costs.

Although increased recycling efforts and a depressed New England economy have decreased the waste stream in recent years, this has allowed three additional communities, which have been on a waiting list since the plant's inception, to sign waste delivery contracts with Ogden Martin.

The developers of the Bristol project encountered few permitting or regulatory difficulties, but Richard Ubaldi, vice president of marketing at Ogden Martin, notes that other projects have encountered very time-consuming state regulatory approval processes, which have contributed to higher project costs.

## Geothermal

Geothermal resources can be used for power generation or for heating and exist as either dry steam or as hot water. Dry steam, which is a rare resource, can be routed directly to a turbine to generate power. For power generation from hot water, there are two primary conversion technologies: flash plants (for resource temperatures >175 degrees C), which rely on flashing the hot water to steam, and binary plants (for resource temperatures of 100 degrees C to 175 degrees C), which use the heat of the hot water to boil a "working fluid," usually an organic compound. These technologies are currently used to generate electricity from geothermal resources in California, Hawaii, Nevada, and Utah. In 1990, 62 geothermal electric plants were in place with a total generating capacity of slightly more than 2350 MW.

Geothermal energy is also found in the form of geopressured brines. These brines are hot pressurized waters that contain dissolved methane and lie at depths of about 3 km to more than 6 km. The technology has been developed to use this resource, but because it is not currently cost-effective, no commercial power plants have been built.

Geothermal water is sometimes heavily laden with salts and dissolved minerals. In U.S. geothermal developments, the geothermal water is always injected back into the geothermal reservoir, both to replenish the reservoir and to dispose of unwanted dissolved salts. However, geothermal power plants also produce some solid materials, or sludges, that require disposal in approved sites.

Although geothermal power generation requires relatively high-temperature resources that exist primarily in the West, low-temperature resources (<130 degrees C) are more widespread across the country. These resources can be used for direct-use applications such as heat pumps, district heating, space heating and cooling, aquaculture, industrial processes, and domestic hot water. It is estimated that there are 130,000 direct-use installations with a total thermal installed capacity of 2100 MW and an annual energy use of 19.8 petajoules (18.8 trillion Btu). The fastest growing direct-use application is geothermal (ground source) heat pumps.

### Geothermal Loan Encourages New Power Industry

#### *Ormesa Geothermal Complex*

#### *Ormesa Power Corporation (Ormat Group)*

*A guaranteed loan from the U.S. Department of Energy was crucial in overcoming financial uncertainty when developing the Ormesa geothermal plants. The modular facility has since achieved a 98% on-line availability, and the loan has been refinanced privately.*

In 1986, the Ormat Group acquired geothermal leaseholds, along with preexisting utility power purchase contracts, from Republic Geothermal Company. These acquisitions established the beginning of the Ormesa Geothermal Complex, which is now operated by OESI Power Corporation.

Located on a 23.3-square-km (9-square-mile) development in the Imperial Valley near Holtville, California, the Ormesa Complex was developed over a period of 4 years, from 1986-1989. The modularity of the Ormat technology allowed power plant segments to be added as new production wells were drilled and proven, rather than requiring many wells to be drilled before building one large plant. Each of the four plants, ranging in size from 6.5 MW to 24.0 MW, and totaling 57 MW, was added incrementally as new wells were drilled. Each power plant module is

self-contained; should one module need to be serviced, the remaining units can continue to generate power.

A 150 degree C geothermal resource is tapped by a network of 18 pumped production wells and 15 injection wells to serve the four binary plants. The complex is interconnected with the Imperial Irrigation District (IID) transmission system, and the power is wheeled and sold to the Southern California Edison Company (SCE) under a power purchase contract.

#### Cost and Performance

The average capital cost of the Ormesa units was \$2,500/kW, including development of the well fields, associated support infrastructure, and the geothermal power plant modules.

Approximately 75% of this cost was for the power plant with the remainder for the field development. With resource acquisition, financing and transaction costs, and capital reserve funds, the installed project cost averaged \$3,500/kW. Operation and maintenance costs for the plant and the field are 0.9 cents/kWh.

The Ormesa Complex has had an on-line availability of 98%, which is attributed to the redundancies present in the modular technology.

#### Environmental Issues

The operation of binary system geothermal plants has limited airborne environmental impact because the geothermal water is not released to the environment. However, some gases (such as carbon dioxide) are released from the water and vented as its pressure drops. The most important environmental concerns involve siting, water use for cooling, and sludge disposal, although the latter has not been a significant factor because of the minimal amounts of sludge produced.

The disturbance of wildlife habitats was the most significant siting issue at Ormesa. During the construction of the project, it was necessary to reroute several roads and construct berms to protect lizard habitats.

#### Success Factors and Barriers

The most significant factor contributing to the success of the Ormesa geothermal complex was the availability of a loan guarantee from the U.S. Department of Energy. The guarantee, which was available to developers from 1974-1984 under the Geothermal Loan Guarantee Program, was invaluable in obtaining the original financing for the project. Because binary geothermal technology was unproven at the time, lenders were reluctant to make a financial commitment to the project. The loan guarantee provided the necessary security to overcome this initial reluctance. The modularity of the technology also helped address lender reservations over plant availability and longevity.

Approximately 1 year after the loan guarantee became effective, the first unit (Ormesa I) was refinanced with long-term debt through private sources. All subsequent units were privately financed because institutional lenders had become more comfortable with the technology. The power purchase contracts with SCE also provided a guaranteed revenue stream. Another significant factor in the project's success was the company's assumption of total responsibility for project development (including engineering, construction, project management, and start-up services), which helped avoid project delays and costly overruns.

Initially, the transmission of power to SCE presented a problem because existing transmission lines out of the development area could not accommodate the additional power generation. In

1986, the geothermal developers in the Imperial Valley formed a funding group to provide IID with a loan to construct a new transmission line to the SCE interconnection. The resulting 185-km (115-mile), 230-kV transmission line is owned by IID. Because IID is a publicly owned utility, transmission line approval was not required from state utility regulators.

OESI Power Corp. believes there are several important lessons in the Ormesa development experience: it proves the feasibility of large-scale power generation from lower-temperature hydrothermal resources; it proves the viability of incremental resource development; and it provides a successful example of federal government aid to a nascent energy industry.

## **Project Consolidation Rescues Geothermal Development**

### ***Dixie Valley Project***

#### ***Oxbow Geothermal (Oxbow Corporation)***

*Combining several small geothermal projects allowed Oxbow Geothermal to achieve the economies necessary to construct its own transmission line. Although construction approvals were difficult to obtain, existing power purchase contracts gave the company the impetus to overcome those obstacles.*

In 1985, Oxbow Geothermal, a unit of Oxbow Corp., acquired three separate geothermal leaseholds in the Dixie Valley area of Nevada from Sun Company and Trans-Pacific Geothermal. Both Sun and Trans-Pacific held power purchase contracts with the Southern California Edison Company (SCE) for power sales from proposed geothermal plants of 10-20 MW each, but could not economically justify development of these smaller projects because of transmission costs. Oxbow developed a plan to combine the smaller developments into one 55-MW geothermal power facility, making it economically feasible to construct a 354-km (220-mile), 230-kV transmission line to interconnect with SCE. The resulting line is the largest privately owned electric transmission facility in the country.

The turnkey contractor for the generation plant was Ebasco Services, which selected the Ben Holt Company as the project engineer. The project took 3 1/2 years from the acquisition of the geothermal leaseholds to plant completion. The single-unit, double-flash plant, brought on-line in July 1988, was the largest of its kind in the country.

#### **Cost and Performance**

The capital cost of the power project, including acquisition and drilling costs, was \$135 million (\$2,455/kW). The transmission line added \$35 million. The entire project was financed with \$70 million in company equity and \$100 million in non-recourse bank loans. In March 1989, the project was refinanced with a \$170 million non-recourse project finance loan from Prudential Power Funding, Inc. The plant has had an availability factor of approximately 99% and has continually met contract power output requirements.

Although the project was eligible for the federal 10% energy tax credit, this credit had a fairly modest impact on the project's economics because of alternative minimum tax considerations.

#### **Environmental Issues**

Because the geothermal field is located in an unpopulated desert area, there was no opposition to the siting of the facility. However, the siting of the transmission line did encounter some delay in addressing concerns over wildlife areas and other protected areas.

The geothermal water in the Dixie Valley resource is unusually clean; therefore, disposal of waste sludge and water has not been a significant issue. Furthermore, the operators reinject as much of the water as possible to maintain pressure in the wells. With approximately 75% of the water reinjected and 23% lost to evaporation, only a small percentage (2%) requires disposal and is discharged into a nearby salt marsh.

### Success Factors and Barriers

The most significant success factor for the Dixie Valley project was the pre-existing utility power purchase contracts. Having a power purchase agreement in hand eliminated some of the risk in financing the first-of-its-size geothermal power plant. Another success factor was the acquisition of geothermal leaseholds where extensive exploration had already been performed to confirm the resource. This helped minimize the total project development time.

Probably the most difficult hurdle that Oxbow encountered was the transmission line approval. Negotiations with the U.S. Bureau of Land Management (BLM) and other landowners for transmission right of ways were time consuming, taking almost 2 years. Although BLM and the other landowners were cooperative, the route of the line had to be changed several times to bypass wildlife and protected areas, leading to additional expense. Oxbow maintains that without the cooperation of the BLM and the various counties and private landowners along the way, power transmission, and thus the entire project development, would not have been possible. Barney Rush, executive vice president of Oxbow, stresses that the maintenance of a positive relationship with both BLM and SCE has been an important factor in the continuing success of the project.

### Hydropower

Hydropower accounts for almost one-half of the total energy contribution from renewable energy sources in the United States. Hydropower uses the energy of flowing water to turn a turbine, which rotates a generator to produce electricity. Although many hydropower facilities use large impoundment dams, hydropower can also be generated by diverting a portion of a stream or river. Such diversion projects may require a dam, but the dams are usually much smaller and less obtrusive than impoundment dams.

Hydropower technology can also be used to store energy. During low-load periods, excess electrical supplies can be routed to a pumped storage facility, which stores the energy by pumping water from a lower reservoir to another reservoir at a higher elevation. During peak-load periods, the water is allowed to return from the upper reservoir to the lower reservoir, turning a turbine and generating electricity in the process.

Hydropower plants have a rich history and played a major role in spurring industrial development in the 19th century. By the 1930s, hydropower provided 30% of the nation's generating capacity. However, the growth of other non-renewable generation sources slowly eroded the hydropower capacity share to its current 12%.

Considerable potential still exists for obtaining additional capacity from hydropower resources. The Federal Energy Regulatory Commission (FERC) estimates that the nation's existing hydropower capacity of more than 72,000 MW could be nearly doubled through a combination of new site development, development of generating capability at preexisting impoundments, and equipment upgrade at existing plants. There is also a significant potential for development of small hydropower facilities throughout the country.

Nevertheless, hydropower development has slowed in recent years because of environmental concerns and more stringent regulatory and operating requirements. As a result of the Electric Consumers Protection Act (ECPA), enacted in 1986, the time and cost of licensing hydroelectric projects has escalated. Many older hydropower projects will require relicensing during the 1990s, exposing these projects to greater scrutiny and a potential loss of capacity.

### **Run-of-River Plant Minimizes Environmental Impacts**

#### ***Sidney A. Murray Hydroelectric Station Catalyst Energy Corporation***

*A combination of innovative design and construction features helped Vidalia, Louisiana, achieve an environmentally benign solution to its power problems.*

In 1977, the town of Vidalia, Louisiana, was faced with significant electric power rate increases due to cost recovery on two nuclear power plants by the local utility, Louisiana Power & Light (LP&L). Sidney A. Murray, the mayor of Vidalia, engaged community support in the search for a less costly source of power.

The Baton Rouge engineering firm of Forte and Tablada Inc. was hired to investigate alternate sources of power that would stabilize or reduce the town's electric power rates. A potential hydropower site was identified approximately 64 km (40 miles) south of Vidalia on the Mississippi river. Initially, development of the site conflicted with the responsibilities of the U.S. Army Corps of Engineers to maintain unimpeded navigation. A second site was eventually identified upstream from the first.

The facility was designed as run-of-the-river; that is, the project was to take advantage of the existing elevation drop along the river and rely on the natural river flow, thus avoiding the need for a large impoundment dam. A "bulb" turbine engineering design was used to accommodate both the low head (low elevation drop between the inlet and the outlet) and the limitations that were required to maintain unimpeded navigation. Because of construction site constraints caused by the remoteness of the project and the lack of qualified labor, much of the 192-MW plant was prefabricated in a New Orleans shipyard and floated 451 km (280 miles) up river. The plant began full-scale operation in 1990.

#### **Cost and Performance**

A total of \$550 million was raised for project development under a limited partnership--\$410 million (\$2,135/kW) for the construction, design, engineering, land, and 64 km (40 miles) of transmission, and the balance for interest. Catalyst Vidalia Corp., a subsidiary of Catalyst Energy, served as the general partner with Dominion Capital Inc., an affiliate of Virginia Power, as a limited partner. The project received exemptions from sales and use taxes under the State Enterprise Zone Program and was granted a 10-year exemption from ad valorem taxes on buildings and equipment.

Under an approved 42-year power purchase contract with LP&L, the power purchase rate is 6.5 cents/kWh with a fixed escalation schedule. The town of Vidalia currently purchases 6% of the power at a price of 6.0 cents/kWh and has an option to eventually purchase up to 15% of the power generated.

With a capacity factor of approximately 55%, the plant operates more continuously than many run-of-the-river hydro plants. The greater output is attributed to the special engineering design

for low-head waters. Although warranty activities are continuing, the plant availability is estimated to be in excess of 99%.

### Environmental Issues

Environmental impact assessments specific to the Vidalia project were not required due to extensive studies on river flow and environmental impacts that had already been conducted by the Army Corps of Engineers. According to Sidney Murray, "the only impact environmentally is that the town of Vidalia now has a good, clean, safe, odorless power plant which supplies all its power." Designing the plant in accordance with the Corps' preexisting water management objectives minimized additional impacts on the environment.

### Success Factors and Barriers

Securing financing for the Vidalia project proved difficult until several well-capitalized institutional finance companies became involved. The existence of a power purchase contract, with its unusually long contract period of 42 years, helped reduce financial risk.

A second factor contributing to the success of the project was the relatively quick issuance of a construction license by the Federal Energy Regulatory Commission (FERC). Because much of the data collection and site analyses had already been undertaken by the Corps, many of the federal regulatory requirements had been addressed. As a result, after the design and site parameters had been identified, a construction license was issued within 10 months.

Other factors contributing to the success of the Vidalia project included a strong commitment to the development by all parties involved and the sharing of the Corps' river flow studies, which saved a great deal of preliminary effort on the part of the project developers. The off-site prefabrication of the plant allowed site work to be performed simultaneously with the construction of the facility. This last factor resulted in an estimated \$125 million savings in carrying costs.

However, the project was not without problems. Delays were experienced while several regulatory issues were resolved. First, the original license had to be amended to accommodate the limited partnership; for the owners to receive tax credits, the town could not be part of the partnership. Because of a preference to license municipalities, FERC originally denied the transfer of the license from the city of Vidalia to the limited partnership, causing a 2-year delay while partnership agreements were amended to satisfy FERC requirements.

Second, because the project exceeded the PURPA 80-MW threshold, it became subject to the Public Utility Holding Company Act (PUHCA). As a result, the power purchase contract had to be approved by FERC and the entire transaction was subject to review by the Securities and Exchange Commission (SEC). Eventually, the parties managed to obtain a project exemption from both the SEC and PUHCA, but these requirements caused additional delays. These issues have since been lessened by the PUHCA reforms contained in the Energy Policy Act of 1992.

### Photovoltaics

Photovoltaics (PV) energy technology employs a solid-state device to directly convert sunlight into electricity. PV cells, also called solar cells, represent one of the most benign forms of electricity generation available, because they can be used to make stand-alone systems with no fuel or cooling requirements and no operating emissions or noise. However, because much of the current PV cell technology uses crystalline semiconductor materials (similar to integrated circuit

chips), production costs have been high. Even so, technology improvements have reduced PV generation costs from \$1.50/kWh in 1980 to a range of \$0.30-\$0.40/kWh today.

PV cells are combined into large panels, or modules, which are used commercially in a number of remote and stand-alone applications. Worldwide sales of PV modules have doubled in the last 5 years and, in 1992, totaled about 60 MW. However, the largest and most lucrative market, utility bulk power generation, remains elusive because of the high cost of PV systems.

Several collaborative programs have been initiated recently between the federal government (through the U.S. Department of Energy) and the PV manufacturing industry to develop lower cost PV manufacturing processes. In addition, the electric utility industry has joined with these same entities to identify current, cost-effective, utility markets for PV systems, thus providing a near-term market pathway for further PV cost reductions. For example, Idaho Power Company now has a pilot program to supply selected customers with PV systems for remote applications, including remote residences and vacation homes, stock watering wells, sign lighting systems, communication relays, and cathodic protection systems. Delamarva Power and Light--serving Delaware, Maryland, and Virginia--and the Sacramento Municipal Utility District are also installing PV systems as a form of demand management.

### **Stand-Alone PV Systems Meet Many Utility Needs**

#### ***Helms Pumped Storage Plant and Other PV Applications Pacific Gas and Electric Company***

*A total of about 1100 PV systems are providing a peak capacity of 44 kW for 17 different cost-effective applications throughout the Pacific Gas and Electric Company's service area.*

In 1989, the research and development department at the Pacific Gas and Electric Company (PG&E) in San Ramon, California, began a survey of the utility's applications that used photovoltaic (PV) systems. The department found that hundreds of PV systems were already in use by the utility company. Several PG&E departments had independently determined that PV represented the most cost-effective option for meeting small-scale, remote power needs. By December 1992, about 1100 cost-effective PV systems had been installed by the company. The total peak capacity of these PV systems is 44 kW.

Although PG&E has found approximately 17 different applications, the majority of the PV systems provide power for gas flow computers, automated gas meters, and water level sensors. Two distributed PV applications that have proven to be particularly reliable are a power system for a gatehouse at a pumped storage plant and power systems for cathodic protection of natural gas lines.

One of the gatehouses at the Helms pumped storage plant near Courtright Dam used thermoelectric generators (TEGs) to charge a 500-amp-hour battery bank that powers lights, a radio transmitter, surface detection equipment, and relays to start emergency penstock gate closure. The TEGs required substantial operation and maintenance as well as propane fuel. Analysis suggested that maintaining the TEGs at the remote location was neither cost efficient nor reliable. As a result, the TEGs were replaced with a 5.8-kW PV system.

PG&E has also installed stand-alone PV systems for cathodic protection of two 40-km (25-mile) sections of natural gas lines near the town of Topock, in the California desert. The PV systems were chosen based on economic considerations and because they provided a solution to right-of-way issues for power line extension. The first system uses a 7-kW, fixed PV array to charge a

120-V lead-acid battery bank that maintains a constant current of 6 amps. The second system uses a 1-kW single-axis passive-tracking array to charge a 24-V lead-acid battery that maintains a constant current of 2 amps.

#### Cost and Performance

The cost of the PG&E PV systems vary by project. Although cost information is not available from the utility, capital costs for a typical off-grid PV system may range from \$10,000 to \$20,000/kW installed. However, PV systems are often the most cost-effective solution because of their reliability, modularity, low maintenance, and independence from transmission and distribution systems.

Financing for the PV systems typically comes from standard operating budgets for each line organization. The overall reliability of the systems has been high and has led to widespread acceptance within the company of the capability of PV systems to serve small off-grid loads. PV systems are even used on transmission towers to accommodate small loads that would otherwise require a transformer.

#### Environmental Issues

Currently, the largest environmental concern related to PV systems is their visual impact. However, that has not been an issue in the PG&E projects, because most of the utility's PV systems are small-scale and remotely located. PG&E believes that PV installations would have to increase many fold before their visual impact became a siting issue.

#### Success Factors and Barriers

The primary factor contributing to the successful installation of PV systems in the PG&E service territory is the cost effectiveness of the systems. While PV is not currently cost competitive as a bulk power source, PV does offer the utility an economic and reliable source to serve small-scale, stand-alone power needs.

Although PG&E found many applications for PV systems within its service area, other utilities have installed relatively few PV systems. The main barrier to the greater use of PV systems is a lack of awareness within utilities as to the advantages of PV systems in certain applications.

### **Utility Demonstrates Feasibility of Rooftop PV Systems**

#### ***Gardner PV Project***

#### ***New England Electric System***

*A demonstration project in Gardner, Massachusetts, showed that rooftop PV systems could be interconnected with the utility grid without adverse effects. The systems provide load management without encountering siting issues.*

A commitment to finding alternate electric energy sources, in part, spurred New England Electric System (NEES) to begin an investigation into PV technology in the mid-1980s. NEES was also concerned that if PV costs were to become competitive with bulk power generation in the future, there would be an increase in customer-owned PV systems. NEES sought to examine the possible impact that thousands of small generating units would have on its power distribution system.

As part of a 10-year Commercial and Residential Photovoltaic Systems Research and Demonstration Project, a PV panel was installed on each of 30 houses in Gardner,

Massachusetts. Each house had a southern exposure and was located on one of two neighboring streets served by a single distribution feeder. The project was monitored by New England Power Service Company (NEPSCo), a subsidiary of NEES.

Construction of the project began in 1985 and took about 2 years to complete. The multiple objectives of the PV project were to gather data on the reliability of the system components, record the variation in system power output during the year, study the effects that a cluster of PV installations has on a single distribution line, and showcase PV system components made in Massachusetts.

#### Cost and Performance

Each PV system has a rated output of 2 kW and generates about 2200 kWh/yr. At a cost of \$20,000 per system, the generation cost is \$0.91/kWh, assuming a 10% discount rate. Although these costs are very high by conventional standards, the intended purpose of the project was to demonstrate the technology and study distribution system impacts, knowing that PV costs will fall in the future.

The costs of the Gardner project were paid through NEPSCo's research and development budget with no attempt at cost recovery. The Electric Power Research Institute (EPRI) contributed funds to the monitoring effort. Ownership of the PV systems will be transferred to each participating homeowner upon completion of the research phase of the project.

Energy production, monitored from 1988 through 1992, varied from approximately 50 kWh in winter months to 270 kWh in summer months. Much of the energy produced by the PV systems in the summer months occurred during the utility's peak hours, providing a load management benefit.

The results of the 3-year, EPRI-funded study indicated that the PV systems produced no adverse effects on the operation, protection, and control of the utility distribution system. There were no problems with the operation of the systems and the project proved that residential PV systems can be readily installed by local roofers and electricians.

#### Environmental Issues

Customers had no complaints about environmental issues such as the visual impact of the panels. Project participants appreciated both the free electricity and the lack of emissions from the energy source.

#### Success Factors and Barriers

According to Dr. John J. Bzura, principal engineer for the Gardner project, the most important factor contributing to the project's technical success was "using the highest quality equipment available and choosing the most experienced, qualified people to design and install the systems." Because of the R&D nature of the project, and the fact that NEPSCo did not seek cost recovery, there was no regulatory involvement.

Also, by locating the project in Gardner, Massachusetts, an economically depressed area at the time, and utilizing local labor and manufacturers, the local economy was boosted. Community support for the project, therefore, was high. The detailed studies that have resulted from this project have promoted the utility's reputation regarding PV systems and have increased the awareness of PV potential in New England.

Other utilities have recently undertaken similar research activities in rooftop PV installations. For example, the Southern California Edison Company (SCE), in conjunction with Texas Instruments Inc., is investigating a prototype low-cost rooftop PV module. According to Nick Patapoff, SCE project manager, the value of this research is in the potential for the utility to provide peaking power to residents without overloading transmission lines. "The home run ball (with PV) is on rooftop capabilities," says Patapoff.

### **Solar Thermal**

Solar thermal systems collect the thermal energy in solar radiation for direct use in low- to high-temperature thermal applications. High-temperature applications include the generation of electricity using conventional steam cycle technology. For electricity generation, several types of collection systems (parabolic trough, central receiver, and parabolic dish) may be used to concentrate and convert the solar resource. Higher temperatures result in greater thermodynamic energy conversion efficiencies. Solar thermal technology offers significant potential for meeting utility peaking or intermediate electric power generation needs in sunny climates.

The leading solar thermal electric technology is the parabolic trough, which focuses the sunlight on a tube that carries a heat-absorbing fluid, usually oil. The fluid is circulated through a boiler, where its heat is used to boil water to steam, and the steam is routed to a turbine to generate electricity. More than 350 MW of parabolic-trough electric generating capacity is operating in California's Mojave Desert, connected to the Southern California Edison Company (SCE) utility grid. These projects, profiled on the following pages, represent more than 95% of the world's solar electric capacity.

Central-receiver technology is about to be rejuvenated in the United States. Central-receiver plants use a field of mirrors to focus the sun's energy on a central receiver, which is mounted on a tower. An experimental 10-MW central-receiver power plant, Solar One, was built and operated in Barstow, California, during the 1980s by a government-industry team. Plans are currently under way to refurbish this plant with an improved conversion technology. The new plant will be named Solar Two, and is being developed by a consortium of several utilities, private companies, California government agencies, and the U.S. Department of Energy.

Parabolic dishes are relatively small-scale applications of solar thermal electric technology. A parabolic dish tracks the sun and focuses its heat on a Stirling engine, which converts the heat energy to mechanical energy. The mechanical energy drives a turbine to generate power. Parabolic dish systems can generate 5-25 kW of power; they are expected to find applications in remote locations, and the larger units might eventually be grid-connected to provide voltage support.

Low-temperature solar thermal applications include domestic water and space heating for residential and commercial buildings, as well as building designs and orientations that take full advantage of the sun's light and heat. Tax credits available during the late 1970s and early 1980s led to thousands of solar heating system installations across the United States. However, installations waned after the tax credits expired in the mid-1980s. Several utilities are again initiating programs to utilize solar water heating systems as a demand-side management measure.

### **Solar Thermal Plants Meet Utility Peaking Needs**

### ***Luz Solar Electric Generating Systems Luz International, Ltd.***

*Since 1984, Luz International, Ltd. had been building successively better solar electric power plants in California's Mojave desert. But the tax credit that helped the company succeed also contributed to its ultimate failure.*

In 1984, Luz International, Ltd. built its first Solar Electric Generating System (SEGS) plant and became the world leader in solar power generation. The SEGS technology consists of modular parabolic-trough solar collector systems, which use oil as a heat transfer medium. One unique aspect of the Luz technology is the use of a natural-gas-fired boiler or oil heater to supplement the thermal energy from the solar field or to operate the plant independently during evening hours. The use of natural gas is limited to 25% of total energy input under FERC rules implementing PURPA.

Nine separate SEGS plants have been constructed by Luz at three different sites in California's Mojave Desert. SEGS I is a 13.8-MW plant with 3 hours of dedicated thermal storage and a natural gas superheater. SEGS II, built in 1985, is a 30-MW plant and was the first of the SEGS plants to incorporate a natural gas-fired backup boiler.

Five additional 30-MW plants (SEGS III-VII), incorporating an advanced collector design and other improvements, were constructed from 1986 to 1988, with the 30-MW size dictated by PURPA limitations. As Luz built new plants, the company spent more than \$22 million to improve the SEGS technology. With SEGS VIII and IX, Luz incorporated a third-generation collector design with other improvements, and achieved additional economies of scale by moving to an 80-MW plant design when the PURPA size limitation was temporarily raised.

In 1991, Luz ran into financial trouble, a casualty of reduced profit margins resulting from a number of factors, including lower fossil fuel prices, which reduced utility avoided costs, and uncertainty regarding the federal tax credit. Luz eventually filed for Chapter 7 bankruptcy, and the operation of its existing plants was taken over by the investor groups.

#### **Cost and Performance**

SEGS I was installed at a total cost of \$62 million (~\$4,500/kW) and generates power at 24 cents/kWh (in 1988 real levelized dollars). The improvements incorporated into the SEGS III-VI plants (~\$3,400/kW) reduced generation costs to about 12 cents/kWh, and the third-generation technology, embodied in the 80-MW design at an installed cost of \$2,875/kW, reduced power costs still further, to 8-10 cents/kWh. All of the Luz plants operate under power purchase contracts with SCE, but the two 80-MW plants are operated under less lucrative contracts that allow payments to vary with SCE's avoided energy costs.

In addition to the direct plant costs, Luz incurred costs related to grid interconnection and power transmission. Although the first two project sites were located in close proximity to existing substations with adequate capacity, the third site required that Luz construct a 19.3-km (12-mile), 220-kV transmission line.

The Luz plants are operated to maximize the power contribution during SCE's peak-load period, because that is the time of highest utility payments. The plants operate for almost 100% of the on-peak hours, 80% of the summer mid-peak hours, and 66% of the winter mid-peak hours. On average, only 13% of the total SEGS generation occurs during off-peak hours. The SEGS III-VII

plants have met performance expectations within 10%, while SEGS VIII and SEGS IX experienced initial problems caused by a new gas-fired oil heater design.

### Environmental Issues

The SEGS plants help reduce environmental emissions. Although 25% of the SEGS generation is based on natural gas, the plants still produce only one-fourth of the emissions from a comparably-sized fossil fuel plant.

Because solar energy is a diffuse resource, the dedicated land requirement for the Luz plants is large compared to conventional plants--on the order of 2 hectares/MW (5 acres/MW). However, when the full-fuel-cycle land requirements (including mining and waste disposal) of other energy resources are taken into account, Luz plants use no more land than conventional plants.

Cooling water requirements can also be an issue in arid areas, but have not been a problem for the SEGS plants. SEGS I, II, VIII, and IX all draw sufficient cooling water from underground aquifers. SEGS III-VII buy aqueduct water from the local water district. Although the water quality deteriorated during the recent California drought, the plant capacity was never limited because of a lack of cooling water. Dry cooling is an option that would reduce water use by about 80% at a modest increase in plant cost.

Finally, the use of oil as a thermal transfer medium can create a potential hazard. In early 1990, the SEGS VIII plant experienced a series of explosions when a fire started in one of the four gas-fired oil heaters. The fire was caused by a design flaw that has since been corrected.

### Success Factors and Barriers

Over its life, Luz raised more than one billion dollars for the SEGS projects. Luz's success during the 1980s was largely because of the availability of federal and state tax credits, the enactment of PURPA, the development of California's standard-offer contracts, and the persistence of the company. However, as short-run utility avoided costs fell in the late-1980s, it became more difficult to finance new SEGS plants, and the technology cost improvements could not keep up with falling natural gas prices.

At the same time, the federal policies that had provided a favorable market environment for Luz in the early and mid-1980s contributed to its financial collapse in 1991. Beginning in 1986, the 10% energy tax credit for solar energy property was extended in a piecemeal fashion, anywhere from 9 months to 2 years at a time, creating tremendous financing uncertainty. In 1990, Luz had to build SEGS IX in just 7 months to qualify for the tax credit. This led to serious cost overruns that exceeded revenue coverage, resulting in a loss of project profitability. Furthermore, the tax credit could not be applied against the alternative minimum tax established in the 1986 Tax Reform Act. The 10% solar tax credit was permanently extended in the Energy Policy Act of 1992, but this came too late to benefit Luz.

PURPA's QF size limitation also prevented the SEGS technology from achieving the optimal size for economies of scale, which is believed to be 150-200 MW. Although the PURPA size limitation was eventually lifted, this change again came too late for Luz.

Finally, although electric utility subsidiaries contributed nearly 50% of the total project equity, utility companies were not eligible for many of the incentives available to non-utility developers. The lack of incentives for utility investments in solar power was an important barrier to greater interest and direct participation by utilities in SEGS projects.

## Wind

Wind turbines capture the wind's energy with a rotor, usually consisting of two or three blades mounted on a shaft; the spinning blade shaft rotates a generator to produce electricity. The turbines are mounted on towers to maximize the capture of wind energy, because the wind is generally slower and more turbulent close to the ground. There are two types of wind turbine designs: the vertical-axis wind turbine, which resembles an upright eggbeater, and the horizontal-axis wind turbine, which resembles a windmill. Although wind turbines can be stand-alone systems, there are operating advantages to siting wind turbines in a large array to form a windplant.

Important progress has been made in the development of wind energy technology. Currently, there are more than 1500 MW of wind-generating capacity in operation in California. Improved turbine designs and operation have contributed to a reduction in wind energy generation costs from 25 cents/kWh in 1980 to a range of 7-9 cents/kWh for today's commercially installed machines in the most favorable locations. Turbine availabilities of 95% or above are now the norm, and operation and maintenance (O&M) costs have declined sharply from 4 cents/kWh to 1-2 cents/kWh today.

Continued research and commercial demonstration of a new class of wind turbines with advanced airfoils and electronics, and some incorporating variable speed operation, are expected to further reduce the cost of wind energy to 5 cents/kWh or less in regions with more moderate winds. These technological developments have caught the interest of a number of electric utilities outside of California that are now exploring wind energy development.

### Performance Improvements Make Wind Power Economical

#### *Altamont Pass Windplants*

##### *U.S. Windpower, Inc.*

*Since 1981, U.S. Windpower, Inc. has continually improved the performance of its wind turbines, reducing the cost of electricity by almost half. The company's newest turbine is expected to produce electricity at a cost of 5 cents/kWh or less.*

Founded in 1974, U.S. Windpower, Inc. (USW), a subsidiary of the privately held Kenetech Corp., is the world's oldest and largest wind energy company. USW currently operates 23 windplants, utilizing its Model 56-100, a 100-kW horizontal-axis turbine first installed in 1983. These windplants range in size from 25 MW to 85 MW. The turbines are manufactured at the company's headquarters in Livermore, California, and then erected on the windplant site, with a field construction time of about 6 months. The performance of each turbine is monitored from a central control room. The majority of USW's windplants are located in the Altamont Pass, east of San Francisco, and the power is sold to the Pacific Gas and Electric Company.

With utility industry support, USW has developed a larger, 360-kW horizontal-axis turbine, the 33M-VS, which utilizes variable speed drive and advanced power electronics to reduce component stresses and increase energy capture. The company erected the first prototype in 1989 and began commercial production in 1993. USW President Dale Osborn has stated that "this new, large, utility-scale wind turbine is the key element of our business strategy for the future. If we can achieve the technical and financial goals for this project, we will define a completely new market for wind power--a market in which it will be commercially viable generation on the basis of fuel savings alone."

## Cost and Performance

The current capital cost for the Model 56-100 turbine is about \$1,200/kW, and power generation costs are about 7-9 cents/kWh in regions with favorable winds. In contrast, the first USW turbines, erected in 1981, generated power at a cost of more than 12 cents/kWh. Most of this cost reduction has been attributed to performance improvements, such as higher turbine availabilities and capacity factors, rather than lower turbine costs. Wind turbine availabilities are now in the 95%-99% range, with capacity factors of 20%-25% in California. Capacity factors are expected to reach as high as 40% in parts of the Midwest and Northeast, which have more moderate but also more constant winds.

The capital cost for the advanced 33M-VS turbine is estimated to be \$800/kW in large-scale production with an O&M cost of 1.2 cents/kWh. Both USW and the Electric Power Research Institute estimate that the levelized cost of electricity from the 33M-VS will be 5 cents/kWh or less.

## Environmental Issues

The three notable environmental impacts of windplants are aesthetics, noise, and avian mortality. The avian mortality issue has been most pronounced in the Altamont Pass area because of a large raptor (eagles and hawks) population. Other California wind development areas (such as Tehachapi Pass and Palm Springs) have not experienced avian-related problems. To address avian mortality, USW has established a task force of leading U.S. ornithologists and biologists to study avian behavior in the Altamont Pass and suggest mitigation measures. The company has also taken remedial measures such as painting turbine blades and installing sonar systems.

Although turbine noise can be an issue, its potential impact is reduced if turbines are sited away from populated areas. Where in close proximity to residences, USW ensures that its windplants meet local noise ordinances.

Typically, USW works closely with the community on siting and environmental issues. Aesthetic (visual) concerns are studied initially through visual analyses in which, through an electronic process, turbines are visually located on a landscape of the proposed site, providing a simulated picture of the complete project.

Finally, because wind turbines occupy less than 10% of the land area at windplant sites, the sites allow for multiple land use. At Altamont Pass, traditional land uses, such as livestock grazing, can still be accommodated. In fact, landowners often earn more from their wind leases than from the traditional land uses.

## Success Factors and Barriers

According to Eric Miller, director of business development at USW, the most important factor contributing to the success of the USW projects has been the existence of utility power purchase contracts. Miller notes that these contracts "practically invented the industry."

Several additional external factors contributed to the USW success, including the federal and state tax incentives of the early 1980s and support of the state regulatory commission with regard to the utility power purchase contracts. In addition, a need for power existed in the state, state energy policy is supportive of renewable energy development, and the power generated by the wind projects is supplied to large utilities with power systems that can easily accommodate the

intermittent wind system power output. To date, transmission has not been an issue for USW projects because these projects have been located close to existing transmission facilities.

Windplant development involves a time consuming and expensive review process, primarily at the county level. To ensure the continued success of wind power development, Miller believes there needs to be greater consideration of the relative environmental merits of power generation sources. If environmental attributes are considered, wind projects may become the least-cost option for utilities seeking to expand capacity. Says Miller, "if the total costs to society are included in the comparison of wind energy to fossil fuels, then no special treatment is needed for wind projects. They sell themselves."

#### For More Information

The U.S. Department of Energy (DOE) conducts research on all the renewable energy technologies described in this document. For further information about DOE research programs, contact:

Deputy Assistant Secretary, Office of Utility Technologies  
U.S. Department of Energy  
EE-10

Director, Office of Renewable Energy Conversion  
U.S. Department of Energy  
EE-12

Director, Office of Solar Energy Conversion  
U.S. Department of Energy  
EE-13

Director, Office of Energy Management  
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Springfield, VA 22161  
(703) 487-4650

Information pertaining to the pricing codes can be found in the current issue of the following publications which are generally available in most libraries: Government Reports Announcements and Index (GRA and I); Scientific and Technical Abstract Reports (STAR); and publication NTIS-PR-360 available from NTIS at the above address.

## Appendix F

### NREL Anemometer Loan Program Application Letter

Tony Jimenez  
National Renewable Energy Laboratory  
1617 Cole Blvd., MS3811  
Golden, CO 80401

Contact information:  
Phone: 303-384-7027  
Fax: 303-384-7097  
E-mail: [tony\\_jimenez@nrel.gov](mailto:tony_jimenez@nrel.gov)

Dear Mr. Jimenez:

I, the undersigned authorized Tribal official, have read the loan program information sheet ([http://www.windpoweringamerica.gov/anemometer\\_loan.html](http://www.windpoweringamerica.gov/anemometer_loan.html)) that describes the program and details the borrower's responsibilities. I have prepared this application letter containing the following information:

1. **Intentions/Potential Projects:** Please describe 1-3 potential projects that the tribe/reservation could feasibly undertake given a proper wind resource. The information needed depends upon the type of project envisioned.
  - A) For each potential off-grid project please provide:
    - (1) Load description. Please describe the load both qualitatively (e.g. residences, water pumps, etc.) and if possible, quantitatively (i.e. number of kilowatt 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. Please describe the load both qualitatively (e.g. residences, casinos, water treatment plant, etc.) and if possible, quantitatively (i.e. number of kilowatt 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) (1) Topographic map showing the location and, if possible, the capacity of, existing electrical lines & 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: A brief primer on wind project siting is available at**  
[http://www.windpoweringamerica.gov/docs/primer\\_siting\\_wind.doc](http://www.windpoweringamerica.gov/docs/primer_siting_wind.doc)

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.

\_\_\_\_\_  
Name

\_\_\_\_\_  
Title

\_\_\_\_\_  
Telephone Number

Appendix K

2004 HEAP PAYMENT TABLE FOR DEL NORTE COUNTY					
Household's Monthly Income & Heap Benefit Amounts					
	Poverty Group I	Poverty Group II	Poverty Group III	Poverty Group IV	
HH Size	HEAP	HEAP	HEAP	HEAP	
1	\$0 - \$636.83	\$636.84 - \$823.91	\$823.92 - \$973.58	\$973.59 - \$1687.75	\$1687.76 AND ABOVE
Payment	\$315.00	\$259.00	\$217.00	\$182.00	NOT ELIGIBLE
2	\$0 - \$859.50	\$859.51 - \$1112.00	\$1112.01 - \$1314.00	\$1314.01 - \$2167.53	\$2167.54 AND ABOVE
Payment	\$315.00	\$259.00	\$217.00	\$182.00	NOT ELIGIBLE
3	\$0 - \$1082.18	\$1082.19 - \$1400.10	\$1400.11 - \$1684.43	\$1684.44 - \$2678.00	\$2678.01 AND ABOVE
Payment	\$315.00	\$259.00	\$217.00	\$182.00	NOT ELIGIBLE
4	\$0 - \$1304.86	\$1304.87 - \$1688.19	\$1688.20 - \$1994.86	\$1994.87 - \$3188.08	\$3188.09 AND ABOVE
Payment	\$315.00	\$259.00	\$217.00	\$182.00	NOT ELIGIBLE
5	\$0 - \$1627.54	\$1627.55 - \$1976.29	\$1976.30 - \$2338.29	\$2338.30 - \$3698.16	\$3698.17 AND ABOVE
Payment	\$315.00	\$259.00	\$217.00	\$182.00	NOT ELIGIBLE
6	\$0 - \$1750.22	\$1750.23 - \$2264.38	\$2264.39 - \$2676.72	\$2676.73 - \$4208.25	\$4208.26 AND ABOVE
Payment	\$315.00	\$259.00	\$217.00	\$182.00	NOT ELIGIBLE
7	\$0 - \$1972.90	\$1972.91 - \$2552.48	\$2552.49 - \$3016.15	\$3016.16 - \$4302.83	\$4302.84 AND ABOVE
Payment	\$315.00	\$259.00	\$217.00	\$182.00	NOT ELIGIBLE
8	\$0 - \$2195.57	\$2195.58 - \$2840.57	\$2840.58 - \$3356.57	\$3356.58 - \$4399.50	\$4399.51 AND ABOVE
Payment	\$315.00	\$259.00	\$217.00	\$182.00	NOT ELIGIBLE
9	\$0 - \$2418.25	\$2418.26 - \$3128.67	\$3128.68 - \$3697.00	\$3697.01 - \$4495.16	\$4495.17 AND ABOVE
Payment	\$315.00	\$259.00	\$217.00	\$182.00	NOT ELIGIBLE
10	\$0 - \$2640.93	\$2640.94 - \$3416.78	\$3416.79 - \$4037.43	\$4037.44 - \$4890.83	\$4890.84 AND ABOVE
Payment	\$315.00	\$259.00	\$217.00	\$182.00	NOT ELIGIBLE
11	\$0 - \$2863.61	\$2863.62 - \$3704.86	\$3704.87 - \$4377.86	\$4377.87 - \$4866.41	\$4866.42 AND ABOVE
Payment	\$315.00	\$259.00	\$217.00	\$182.00	NOT ELIGIBLE
12	\$0 - \$3086.29	\$3086.30 - \$3992.95	\$3992.96 - \$4718.29	\$4718.30 - \$4782.08	\$4782.09 AND ABOVE
Payment	\$315.00	\$259.00	\$217.00	\$182.00	NOT ELIGIBLE
13	\$0 - \$3308.97	\$3308.98 - \$4281.05	\$4281.06 - \$4877.75	\$4877.76 AND ABOVE	
Payment	\$315.00	\$259.00	\$217.00	NOT ELIGIBLE	
14	\$0 - \$3531.64	\$3531.65 - \$4669.14	\$4669.15 - \$4973.33	\$4973.34 AND ABOVE	
Payment	\$315.00	\$259.00	\$217.00	NOT ELIGIBLE	
15	\$0 - \$3754.32	\$3754.33 - \$4867.24	\$4867.25 - \$6069.00	\$6069.01 AND ABOVE	
Payment	\$315.00	\$259.00	\$217.00	NOT ELIGIBLE	

**PLEASE KEEP THIS INFORMATION SHEET**

1-866-675-6626 TOLL-FREE (916) 327-6318 TDD/TTY 1-800-735-2922 CA Relay Service for the Deaf/Hearing Impaired

**PROVIDE ALL REQUESTED INFORMATION SO THERE WILL BE NO DELAYS IN PROCESSING YOUR APPLICATION****YOU MAY BE ELIGIBLE FOR THE Pacific Power (CARE), IF:**

You are a Pacific Power residential customer and pay your energy cost directly to Pacific Power

**- and -**

Your gross monthly income, before deductions for all persons living in your household, is not over the CARE Income Guidelines. (See Proof of Income and Income Guidelines.)

**EXAMPLES OF PROOF OF INCOME****All proof of income must be current and show an income amount.**

- Temporary Assistance for Needy Families (TANF): Notice of Action; or computer printout; or benefit letter; copy check;
- Supplemental Security Income: Notice of Planned Action or Form 2458; computer printout from Social Security Office; copy of bank statement showing SSI direct deposit; copy of SSI check; or
- Social Security: copy of current check(s); SSA Form 4926, or 2458; computer printout from Social Security Administration Office; Bank Statement showing direct deposit; or
- Pension and Annuities: copy of a current check; verification on letterhead or annual statement from pension plan; or
- Wages: copy of current paycheck stub(s) covering a one-month period and showing gross income; or
- Interest Income: monthly or quarterly bank statement; statement of interest income from bank or agency; or
- Disability Compensation: copy of a current check; printout or letter from agency or insurance company verifying the compensation amount; or
- Unemployment Benefits: copy of current check(s); printout from Employment Development Department; or
- Child and/or Spousal support: copy of current check; or
- Support from an Individual: copy of check and statement signed by person providing the support; or
- General Assistance: Notice of Action from County Social Services; copy of a current check; or
- Student Aid: Financial Aid statement from College or University; or
- Veteran's Benefits: letter indicating receipt of Veteran's Pension; copy of Veteran's Administration check;
- Signed Federal Tax Form 1040: ONLY FOR SELF-EMPLOYED

**PLEASE NOTE: W2's are no longer accepted. The 2003 Federal Tax Form 1040 (valid through April 15, 2005) will only be accepted for the Self-Employed. Medi-Cal stickers are not accepted as proof of income.****The Department of Community Services and Development does not discriminate in the provision of services on the basis of race, color, national origin, disability, sex, or sexual orientation. For Americans with Disabilities Act/Section 504 Rehabilitation Act issues, and other Affirmative Action issues, call (916) 263-8673.**

Pacific Power (CARE) Income Guidelines		
Size of Household	Monthly	Yearly
1	\$1,950.00	\$23,400
2	\$1,950.00	\$23,400
3	\$2,292.00	\$27,500
4	\$2,758.00	\$33,100
5	\$3,225.00	\$38,700
6	\$3,692.00	\$44,300
<b>NOTE: For households with more than 6 members, increase income by the amount below for each additional family member.</b>		
<b>Additional Family Member Amounts:</b>	\$467.00	\$5,600

**You are not eligible for the CARE if you are claimed as a dependent on another person's income tax return.**

## Weatherization Program

Because of the *Energy Conservation Measures* installed on your home, it may be necessary for your household members to make behavioral adjustments in order for the installed weatherization measures to gain you their Energy Saving potential.

Below is a brief description and explanation of the effectiveness of weatherization measures that may have been applied to your dwelling. It is possible that not all of these measures were applied to your dwelling and as such does not indicate that they were forgotten, but instead that they may not have been cost effective, practical or we were just unable to install them for one reason or another. Every effort was made to weatherize your dwelling in such a manner as to maximize Energy Saving potential, given the guidelines we must follow.

1. **Water Heater Blanket:** Helps to lower hot water heat loss thus using less energy to keep water up to temperature.

2. **Low Flow Shower Head:** Reduces water flow of shower head down to 2.0 gallons per minute decreasing water usage. This in turn saves energy by decreasing the work load on your water heater. This device is equipped with a shut off so that while showering you can turn off the shower head while soaping, instead of allowing the water to run needlessly.

3. **Caulking:** This is applied where necessary to reduce the amount of air infiltration, and results in using less energy to heat and cool your home.

4. **Weatherstripping:** Weatherstripping helps reduce the passage of air around doors and windows by creating a seal between the door or window and the weatherstripping. This in turn helps eliminate drafts and lowers heating and cooling costs. Weatherstripped doors are harder to close, so make sure they are shut tight after entering or leaving.

5. **Outlet and Switch Gaskets:** These are installed behind your electrical switches and plugs, helping to eliminate the transfer of air from outside walls to the inside of your home.

6. **Thresholds, Door Shoes, and Door Sweeps:** Applied at the bottom of doors, reduce air infiltration, increasing heating and cooling efficiency and reducing drafts.

Weatherstripping, Door Shoes, and Door Sweeps need to be checked periodically and adjusted, if necessary.

7. **Ceiling and Floor Insulation:** By installing insulation in the ceilings and floors, you reduce the amount of heat transfer thus retaining heat in your home for a longer period of time, resulting in lower heating bills.

If your home was insulated, you may find it necessary to lower your thermostat. Since your home is now more *Energy Efficient*, it won't take as much heat to maintain a comfortable environment. If you need to open doors and windows to cool down, chances are your thermostat needs to be lowered. In the case of wood stoves or fireplaces, you may find it necessary to have smaller fires and reduce operating temperatures.

## Eligibility Requirements

- \* Applicant can own or be renting their home; if renting, a Landlord Service Agreement must be completed.
- \* The dwelling must have more than 300 square feet of floor space.
- \* The dwelling must also be structurally sound and not in excessive need of repairs.
- \* At least one person per household must be receiving one of the following:

- a. Aid to Families with Dependent Children (AFDC); or
- b. Supplemental Security Income (SSI)/ State Supplementary Program (SSP); or
- c. Food Stamps; or
- d. Payments under Sections 415, 521, 541, or 542 of Title 38 or the United States Code, or under Section 306 of the Veterans and Survivor Pension Improvement Act of 1978.

## Appendix L

# Low Income Weatherization Plan through 2006

### **Background:**

Bonneville has been committed to serve the Low Income population of the Pacific North West since we began conservation programs under the regional act. We ran a successful program through our utilities augmented by the states in some instances.

In 1996, as a result of the regional review, we agreed to provide a bridge fund of \$8.5 million to last through 1999 after which time we envisioned the four Northwest States to pass legislation that would require the utilities to spend money on conservation and included in this would be a Low Income component. The states were awarded another \$6 million in 1999 as the bridge funding needed to be extended.

By early 2000 it became apparent that Bonneville would have to continue to help maintain a strong Low Income Program or risk losing the infrastructure built up during the previous several years. Bonneville pledged to maintain funding during the 2001 through 2006 rate period. We promised to provide \$15 million for the four states over the next 5 years. Shortly thereafter Bonneville met with tribal representatives to try to find ways to improve Native American participation in Low Income programs funded by BPA. We then promised to help tribes encourage and support members through the process and to set aside money that would put tribal members at the head of waiting list. Bonneville set aside \$500,000 a year to fund both the weatherization and the outreach envisioned.

Since 1997 till present Bonneville has spent \$20.2 million through the four states and \$398,579 with utility grants (the funds spent on actual weatherization is not reported separately from the weatherization program, and the \$398 thousand represents only money spent directly with the tribes for outreach and support of tribal members as they work with the local Community Action Agency Programs (CAP).

### **Current Initiatives and Plans:**

#### **Base Load Measures:**

We are currently reviewing the four states proposal to add "base load" (non-heating load) measures. The specific proposal before us is a Refrigerator Replacement proposal. Currently the DOE program allows for base load programs, and refrigerator replacement in particular.

We proposed to the states that they start with a one-year program that would be reviewed at the end of the first year to determine how many refrigerators are still found in the houses where they were initially installed. If the program is both successful (a lot of measures are installed, and a majority of the refrigerators remain, we would consider adding funds to the overall program for the refrigerator component.

The states will propose additional components to the base-load program as measures are proven cost effective and as the states see the need and capability to deliver these added measures. We will evaluate these as they are proposed.

#### **Housing Age Eligibility:**

We discussed this with the States and agreed to use a rolling ten-year life. This is consistent with the DOE requirements (they use this standard to insure that the DOE program is not used to pay for measures that should have been put in a new home but for a lack of good building practices.)

#### **Tribal Program:**

We are continuing to try to expand the tribal outreach. We added three tribes to the program this year and are funding 6 programs, five of which are outreach and one that is a full services weatherization program. We are currently in discussions with the Nez Perce to add them to our program. We have contacted others who may become part of the program in the next year.

We plan to piggy-back on the new DOE emphasis on tribal weatherization. The DOE is encouraging states and tribes to work together to build capability within the tribes to add full service weatherization. Our intent is to support this effort through contributions for training and other means of building tribal infrastructure, culminating in adding funds to the tribes programs for funding Bonneville served tribal members. When eligible tribes are ready to run weatherization programs we will begin funding them directly, rather than through the CAPs (some tribal funding may continue for Native Americans not members of the tribes who reside in the community served by the tribe, if their program does not serve these members.)

**Beyond 2006:**

Beginning in late 2005 and early 2006 we will begin work with the states to set budgets for the new rate case to extend the program.

# Bonneville Power's Tribal Low Income Weatherization Program

## Talking Points:

- ✚ Tribal Set-Aside funding began in 1999. Funds were to be used only for weatherization of tribal homes (on or off Reservations; Tribally owned, privately owned by a Tribal member).
- ✚ Program is run through existing process of the States transferring funds to local community action (CAA) agencies.
- ✚ The rules of the program are identical to the US DOE low income program with a few notable exceptions.
  - ✚ All cost effective measures may be installed, there are no dollar limits per home.
  - ✚ Only tribal members have access, therefore they are not to be put on the same waiting list as non-tribal members.
  - ✚ A Tribal member can access these funds regardless of having been served in the last ten years, under tribal or DOE programs.
- ✚ Initial program had limited success, and therefore was modified to increase participation by Tribal members.
- ✚ Tribal Housing Authorities were asked to become involved in the implementation of the program by performing services such as: outreach, coordination, marketing, qualification of eligible members, and administration. BPA provides a small grant directly to the Tribe to perform these services.
- ✚ This approach provided an opportunity for Tribes to meet with their CAA and to develop a program specific to that Tribe's needs.
- ✚ BPA's Tribal Set-Aside budget is \$350,000 for each of FY03 and FY04 and projected to be \$500,000 for each of FY05 and FY06.
- ✚ Approximately 130 Tribal homes have been weatherized since the Tribal LIWx has begun.
- ✚ An additional 35 homes are under Tribal grants to be completed within the next year and another 30 homes are currently under active discussion.
- ✚ Participating Tribes include: Tulalip Tribes, Quinault Indian Nation, Yakama Nation, Cowlitz Tribe, Nez Perce Tribe, Siletz Tribe, Confederated Tribes of the Coos, Suislaw, and Umpqua, Confederated Tribes of the Grand Ronde and Confederated Tribes of the Warm Springs
- ✚ Bonneville is training tribes to manage tribal programs to increase weatherization penetration and employment opportunities.

## Handouts

1. BPA Tribal Set-Aside LIWx Program
2. Budget Flow

## Appendix M

### Oregon HEAT Energy Assistance Criteria & Restrictions Fiscal Year 1997 - 1998

#### Preface

All Oregon HEAT energy assistance programs are predicated on the concept of neighbors helping neighbors. Oregon HEAT energy assistance programs should realize this concept to the fullest extent possible. The eligibility criteria for assistance contained in this document, and contracts between Oregon HEAT and program delivery agencies and utilities, are useful only so far as they support the neighbors helping neighbors concept. Where eligibility criteria and contracts interfere with this concept, Oregon HEAT fails in its mission to help low income people and its commitments to donors, agencies, and utilities.

Oregon HEAT delegates to caseworkers in the agencies with which it contracts the role of a neighbor helping low income neighbors in the community. Oregon HEAT trusts that when delivering the program, caseworkers will represent the compassion and best intentions of the donors who support Oregon HEAT. The board and staff of Oregon HEAT acknowledge that the final decision concerning the delivery of energy assistance resides with the caseworkers delivering the program.

#### Criteria & Restrictions For Fiscal Year 1997 - 1998

Assistance from the Oregon HEAT/PGE Energy Assistance Program is restricted to low income PGE customers with priority given to those customers whose primary source of household heating is electricity.

Assistance from the Oregon HEAT/PacifiCorp Energy Assistance Program is restricted to low income PacifiCorp customers with priority given to those whose primary source of household heating is electricity.

Assistance from the Oregon HEAT/Oregon Oil Heat Commission Energy Assistance Program is restricted to low income heating oil customers whose primary source of household heating is oil.

The maximum dollar amount households may receive from the Oregon HEAT/PGE and Oregon HEAT/PacifiCorp programs is \$125.00 during one 12 month period.

The maximum dollar amount households may receive from the Oregon HEAT/Oregon Oil Heat Commission program is \$200.00.

Customers may receive assistance for two consecutive years without conditions.

To be eligible to receive assistance for a third consecutive year, customers must provide some evidence that they have taken action to reduce their energy use. Action may include, but is not limited to, weatherization of their residence, attendance at an energy conservation workshop, and installation of low-impact weatherization devices (door sweeps, water limiters, caulking, etc.).

To be eligible for a fourth and fifth assistance in a fourth and fifth consecutive year respectively, customers must provide some evidence that they have taken action to reduce their energy use, however, **the maximum amount of assistance in a fourth or fifth consecutive year is \$75.00.**

Customers may receive assistance in a third, fourth, fifth, or sixth consecutive year without any conditions if the caseworker and Executive Director or other officer of delivering entity both warrant the customer's need and approve of the assistance.

Caseworkers should review the bill payment history of customers applying for Oregon HEAT assistance with energy providers. Oregon HEAT discourages use of funds to assist customers who have not made good faith efforts to pay their energy bills or have used large amounts of assistance from any source to pay their energy bills without making any payments on their own account.

Customers must exhaust all other resources for energy assistance including application to the Low Income Energy Assistance Program ("LIEAP").

Receipt of LIEAP assistance disqualifies applicants for Oregon HEAT energy assistance during the same heating season.

Total household income may not exceed 150 percent of the federal poverty guidelines.

Annual and Monthly Income Levels:  
150% of Federal Poverty Guidelines

Size of Household	Annual Income	Monthly Income
1	11,836	986
2	15,916	1,326
3	19,996	1,666
4	24,076	2,006
5	28,156	2,346
6	32,236	2,686
7	36,316	2,026
8	39,196	3,266

Customers must provide a disconnection notice or their most recent energy provider bill bearing their name and address.

Customers **must make some effort** to pay their energy provider bills. Amounts of even five or ten dollars applied to the bill can constitute an acceptable effort.

Assistance funds are to be used to make up the difference between what a customer can pay and the total due on one month's energy provider bill.

All assistance funds will be given directly to the energy provider to pay for household heating. No cash funds may be given to the recipient of assistance.

Assistance will never be denied on the sole basis of race, religion, color, national origin, sex, age, marital status, disability, political affiliation, sexual orientation, source of income, or Viet Nam era veterans' status.

## Appendix N

### **Greg Retzlaff**

**From:** Crisman, Iris F - PL [ifcrisman@bpa.gov]  
**Sent:** Tuesday, November 16, 2004 9:05 AM  
**To:** Greg Retzlaff  
**Subject:** RE: Is SRR in BPA Territory

Greg,

It appears that the Smith River Rancheria is not in BPA's service territory per the definition of BPA's service territory contained in the Pacific Northwest Consumer Power Preference Act of 1964 as amended by the Northwest Power Act of 1980.

That definition (as stated in the Regional Power Act) is:

"Pacific Northwest", "region", or "regional" means:

"(A) the area consisting of the States of Oregon, Washington, and Idaho, the portion of the State of Montana west of the Continental Divide, and such portions of the States of Nevada, Utah, and Wyoming as are within the Columbia River drainage basin; and

"(B) any contiguous areas, not in excess of 75 air miles from the area referred to in subparagraph (A), which are a part of a service area of a rural electric cooperative customer served by the Administrator on December 5, 1980, which has a distribution system from which it serves both within and without such region."

Also for your information here is the BPA web site on Regional Dialogue  
<http://www.bpa.gov/power/pl/regionaldialogue/>

Again, please call if you have any questions.

Iris

Iris Crisman  
Tribal Account Executive  
Power Line Business  
Bonneville Power Administration  
905 NE 11<sup>th</sup> Ave.  
Portland, Oregon 97208-3621  
Tel. 503.230.4736 Fax. 503.636.5354

-----Original Message-----

**From:** **Greg Retzlaff** [<mailto:retzlaff@sterling.net>]  
**Sent:** Monday, November 15, 2004 2:41 PM  
**To:** Crisman, Iris F - PL  
**Cc:** Don Kittson; [doperry@gte.net](mailto:doperry@gte.net)  
**Subject:** Is SRR in BPA Territory

Iris

I was able to determine that there is no REA or COOP serving Smith River. The California locations are completely served by PacifiCorp. However, I also learned that 1) there is trust land in Oregon owned by individual members of the Tribe and served by the Tribe.  
2) This may not be pertinent but the University of Oregon recognizes any SRR member as an Oregon resident because of the Oregon trust properties mentioned above.

I look forward to hearing about the results of the additional research you intend to complete to help SRR determine if BPA considers them to be within BPA's service territory.

Regards,  
Greg Retzlaff  
STRATEGIC ENERGY SOLUTIONS, INC.  
Providing Solutions & Experienced Service to  
the Energy Industry  
12345 SW Kame Terrace  
Sherwood, Oregon 97140  
(503) 582-8419 Bus  
(503) 582-0419 Fax  
[retzlaff@sterling.net](mailto:retzlaff@sterling.net)

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## Appendix O

Two Seasons Weatherization Training: “Building Tribal Energy Coordinators Capacity”:

Making Weatherization Work for the Tribes!                      Scott Hansen 866-744-9300

Training workshops monthly from May 2004 through September 2004

To allow for travel time we have scheduled the first day of the workshop to start at 10:00 am and the last day to close at 3:00 pm. The workshops range from two days for May’s and three days for June, July and September workshop. We have expanded August’s workshop to 5 days (Monday 10:00am through Friday 3:00) to allow for certification testing. Days between the first and last day of the workshop will be 8 to 5.

### May 26 & 27, 2004

409 High Street, Eugene, Oregon

May Two Day Workshop: Overview of Training and Weatherization

{May’s 2-Day Workshop is for Tribal Staff that know little about wx.}

Instructors:

Instructor Kathy Grey, EWEB’s Residential Energy Management Programs Supervisor

Speaker Betty Merrill of ODOE will discuss Oregon’s Department of Energy’s Programs

Dan Hines, Teaches IBC at Colleges and for the BIA, He has decades of education and experiences in International Building Code and has been a building safety inspector.

Bill Sullivan retired from the BIA and is becoming the informational resource for mold.

May 26<sup>th</sup>: Introduction to Weatherization Workshops and Training

10:00am Workshop Overview & Round Table Introduction

Wx Program description and terminology.

1. Insulation
2. Windows
3. Duct Sealing

Noon Lunch Provided: Guest Speaker Chuck Dalton, EWEB

1:00pm 2 hours on ODOE’s Conservation Resource Mgmt Prgm.

3:00pm Ventilation and Mold: “Finding the Fungus Among Us”

1. Mold is it a health risk?
2. Finding mold and testing for mold.
3. Removing mold and preventing mold.
4. Ventilation, how important is it?
  - a. IBC ventilation code, is it enough?

Mold Informational resources handout and online.

4:30pm Closing questions

Day 2 409 High Street, Eugene, Oregon

May 27<sup>th</sup> Building Code and Contractors Licensing by Dan Hines:

8am to 10am Dan will cover Residential Building Code and his instructional CD

1. What is Building Code?
2. Why use Building Code?
3. Looking up Building Code.
4. Using the Instructional CD

10am to noon Dan will cover Contracting Licensing and his home study course

1. What is a Contractor's License?
2. Why become a Licensed Contractor?
3. Using the home study course to pass the license test.

Noon Lunch Provided: Guest Speaker TBA

1:00pm Success Stories of Native American Wx: Working Together and Independently (Scott Hansen of NA Wx and Don Coon of Grand Ronde Housing will share their insights on cooperative wx projects!)

3:00 Closing questions; Discussion of June's Workshop

**June 8-10, 2004** (Lane Community College)

June's Three day Workshop Outline: (Lane Community College)

Lane Community College, 4000 East 30th Avenue, Eugene, Oregon: Building 15

Instructors:

Roger Ebbage, Director Energy Programs, Lane Community College

Bruce Manclark, Co-owner, Delta-T Inc.

Lunch Breaks will be scheduled each day at noon and only the first & third day having a provided Lunch with flexibility during the field trips for open lunch hour.

Guest Speaker for June 9<sup>th</sup> Luncheon:

10:00am	Day One: Ebbage	<ul style="list-style-type: none"> <li>Construction Overview</li> <li>Residential Heat Loss</li> <li>Energy Definitions               <ul style="list-style-type: none"> <li>KWh, Therms, BTU</li> <li>Conversion math</li> </ul> </li> <li>Heat Transfer Related to Residential Heat loss               <ul style="list-style-type: none"> <li>Forms of Energy                   <ul style="list-style-type: none"> <li>Potential</li> <li>Kinetic</li> </ul> </li> <li>Temperature VS Heat</li> <li>Specific Heat</li> <li>Related Math</li> </ul> </li> <li>Heat Loss Methods Introduction               <ul style="list-style-type: none"> <li>The Envelope.</li> <li>The Amount and Type of Openings.</li> <li>The House Systems</li> <li>The Use of the House</li> <li>Conduction/related math</li> <li>Convection/related math</li> <li>Radiation/related math</li> </ul> </li> </ul>
8:00am	Day Two: Ebbage	<ul style="list-style-type: none"> <li>Heat loss Calculations (Classroom) Morning</li> <li>Heat loss Calculations (Field Work) Afternoon</li> </ul>
8:00am	Day Three: Manclark	<ul style="list-style-type: none"> <li>Blower Door and Related Calculations (Classroom) Morning</li> <li>Blower Door and Related Calculations (Field Work) Afternoon, Ebbage</li> </ul>
3:00	Closing Questions	

## July 13-15, 2004

### Instructors:

Drew Edwards holds an Energy Management Degree from LCC, a certified state trainer and has worked 10 years in wx for Lane County's Housing and Community Services.

Tom West, Energy Services Specialist II with EWEB (Time donated)

Dan Elliot, Wx Trainer with OHCS Wx Certification Program (Time donated)

### Weatherization 101

#### Tuesday:

- 10:15 Greeting background and training outline
  - Instructor introduction.
  - Class introduction weatherization interest and background (3 or 4 question quiz)
- 10:30 House as a system and the people in it
  - Weatherization and why we do it and what weatherization isn't
  - History of weatherization
  - Energy auditor's mission
  - Benefits and drawbacks and weatherization
  - Handouts and glossary
- 11:00 Typical energy consumptions in a home
  - Utility bill / what is baseload and heating / cooling load
  - People and lifestyles
  - Heating
  - Refrigeration
  - Water Heating
  - Appliances
  - (Pie charts)
- 11:30 Causes of Inefficiency
  - People and awareness
  - Air Leakage
  - Water Heating
  - Cooling
  - Heat Gains
  - Distribution losses
  - Home appliances
  - Questions?
- 12:00 Lunch Provided: Guest Speaker TBA
- 1:00 Building types and construction
  - Site built
  - Mobile home
- 1:15 Heat loss and the building shell
  - Attic
  - Crawl space
  - Walls
  - Doors
- 1:30 Weatherization priorities (samples)
  - Health & safety
  - Infiltration
  - Insulation types and values
  - Windows
- Break
- 1:45 Building pressures
  - Blower door

- Infiltration
- Duct leakage
- Indoor air quality
- Baseload opportunities
- 3:15 What does an energy audit / inspection look like (eyes ears nose)
  - Typical tools of the trade
  - Typical audit procedure
  - Inspections and why
- 4:00 Questions

**Wednesday**

- 9:00 Field trip to perform basic audits on (1) site built home and (1) mobile home
- 12:00 Lunch
- 1:00 Audit calculations
  - Recommendations
  - Economics and savings to investment ratio
- 3:00 Questions and tutoring hour for math applications

**Thursday**

- 8:00 Tom West of Eugene Water & Electric Board: No Cost Energy Savings
- 10:30 Dan Elliot, Oregon Housing and Community Services: OHCS Training Program
  - Training Modules & Certification
  - Noon: Luncheon Provided: Guest Speaker TBA
- 1:00 N. A. Weatherization Stories: Successes and Challenges of the referral system
  - Finding Qualified Wx Applicants
  - Referring Qualified Applicants
  - Follow up and Problem Solving
- 2:00 Closing questions and discussion of August's Workshop

## Native American Weatherization Project

### August 2-6, 2004                      Certification Workshop

**Instructors:**

Roger Ebbage, Director Energy Programs, Lane Community College  
Bruce Manclark, Co-owner, Delta-T Inc.

**Day One:**                      Residential Heatloss (Review)

Starts at 10:00 am

Priorities of Weatherization

Health and Safety

Building Durability

Comfort and Energy Savings

How Insulation Works

Insulation Density Related Math

Insulation Coverage Related Math

Air barriers and Insulation Related Math

Ends at 5:00 pm

**Day Two:**                      Attic and Crawl Space Ventilation

8:00 am

Purpose

Placement

Driving Forces

Ventilation Related Math

Building Pressure

What is Pressure?

Related Math

Physics of Pressure

High to low Pressure

Related Math

Types of Air Pressure

Static

Velocity

Total

HVAC Fans and Air Movement

Related Math

Combustion Appliances

Multi-story buildings

Attached Garages

5:00 pm

Carbon Monoxide

Starts at 8:00 am

**Day Three:**                      Moisture Transport

Air Movement

Diffusion

Capillary

Liquid movement

Indoor Air Quality

- Biological Pollutants
- Pesticides
- Combustion Gases
- Volatile Organic Compounds (VOCs)
- Metals
- Minerals
- Radiation
- Smoking
- Strategies for Improving IAQ
  - Source control
  - Separation
  - Filtration
  - Ventilation

5:00 pm

End of Day Three:           BPA Certification Test (3 hours)

Day Four:                   Weatherization Specifications           8:00am to 5:00 pm

Day Five:                   Weatherization Specifications           8:00 am to 3:00 pm

End of Day Five:          Weatherization Installer Certification Test (Two Hours)

## September 21- 23, 2004

September three day workshop; Clean, Green and Energy Renewables

### Instructors

Jon Miller, Executive Director of OSEIA, has a BS Electrical Engineering from the University of Washington and promotes solar power through Oregon Solar Energy Industries Association.

Allen Van Zuuk, of the Energy Outlet Resource Center is a recovering general contractor and is a Limited Renewables Technician apprentice, who promotes energy renewables and efficiency.

### Day One:

10:00am Workshop Overview, roundtable introductions and hand out materials.

10:30am A 4-hour workshop would encompass the following 4 main ideas:

1. Our Energy Choices Matter
  - Presentation on current energy use and impacts
2. Renewable Energy Options are available  
(continuation of energy presentation)
  - Describing Oregon's abundant and available RE resources

Noon Break Lunch Provided; Guest Speaker Carol Gates, USDOE

3. Things each of us can do for our sustainable energy future:  
(continuation of energy presentation)
  - Conserve energy
  - Use energy more wisely (efficient appliances...)
  - Support clean energy through political action
  - Install RE systems that produce clean, local energy
4. Overview of information on RE technology
  - Passive Solar Building Design
  - Solar Hot Water
  - Solar Electric
  - Small wind turbines
  - Micro-hydroelectric systems
5. Summary
  - Where to get more information

3:00pm Introduction to "The Energy Outlet Resource Center"

1. Mission and overview of resources
  - a. Duct Sealing Certification Training
  - b. Training and Information on The Energy Outlet's website
2. Energy Efficiency
  - a. What is Efficiency?
  - b. How to implement it.
  - c. Why document the saving?

4:30pm Closing questions and brief overview of Day two's Field Trip

## Day Two

8:00am Travel to Allen Van Zuuk's home for field trip

9:00am Introduction to Zero Energy Homes

1. Architecture
  - a. Evaluating Sun, Wind and Water Resources
  - b. Using resources: Wind Energy Atlas, Solar Path Chart and Re
2. Maximize Free Energy
  - a. Passive Solar Heating and Cooling
  - b. Landscaping & the Right Building Site
  - c. Thermal Mass and Thermal Swings
  - d. Superinsulate and Build Tight but Ventilate Right
  - e. Energy Efficient Home and Indoor Air Quality

Noon Break Lunch Provided:

1:00pm Practical Examples and Illustrations of Building in Energy Efficiency

1. Contractor Considerations: Code, Cost, Design and Function

Renewable Energy: Practical Applications

1. What Renewables are available at your site?
2. Construction Challenges and Costs to renewable energy.

3:00pm Hands On Demonstrations of above topics

4:00pm Closing Questions and Brief Overview of tomorrows class

## Day Three

Instructors

Kathy Grey or TBA, EWEB Energy Conservation Programs

Diana Enright or TBA, ODOE "Renewables and Conservation"

Jan Schaffer or TBA Oregon's Energy Trust (uncommitted at this time).

8:00am Overview of EWEB Conservation Programs

1. Heat Pump Program
2. Solar Program
  - a. Solar Hot Water Heater Program
  - b. Solar Photovoltaic System Program

10:00am Overview of ODOE Renewables, Conservation and Tax Credits

1. Renewable Energy
  - a. Solar
  - b. Wind
  - c. Biomass and other
2. Conservation Program
  - a. Saving energy today and everyday
  - b. October is Energy Awareness Month
3. Tax incentives & rebates
  - a. What are the incentives?
  - b. What is the pass through credit?
  - c. Why is it important to Tribal Trust Lands?
  - d. How to apply for these and other ODOE Programs
  - e. Quick overview of ODOE Website and what's on it.

Noon Break Lunch Provided: Guest Speakers: Gene Ferguson, BPA

1:00pm Overview of Energy Trust and Programs

1. Home Programs
  - a. Home Energy Savings
  - b. Efficient New Homes and Home Products
  - c. Solar Electric and Solar Water Heating
2. Renewable Energy

- a. Solar Program and Case Studies
- b. Small Wind Anemometer Program
- c. Open Solicitations and other opportunities

3:00pm Closing Questions

October/November 2004 Training Survey Follow up:

## Appendix P



Smith River Rancheria  
250 North Indian Road  
Smith River, CA 95567-9525  
Tel.: (707) 487-9255 Fax: (707) 487-0930

Kara Brundin Miller, Chairperson  
Joel R. Bravo, Vice-Chairperson  
Terile A. Keevil, Secretary  
Denise L. Padgette, Treasurer

Loren Bommelyn, Council Member  
Marian Lopez, Council Member  
Luanna Scott, Council Member  
Roy LaFromboise, Tribal Administrator

**RESOLUTION NO. 04-68**

**DATE APPROVED: December 14, 2004**

**RESOLUTION:** To Approve the DOE Final Technical Report on the Energy Strategic Planning & Self-Sufficiency Project.  
DOE Award Number DE-FG36-03GO13115

**WHEREAS:** The Smith River Rancheria is a federally recognized Indian tribe located in the State of California and organized pursuant to the Tribal Constitution which was duly adopted by the members of the Smith River Rancheria; and

**WHEREAS:** The Smith River Rancheria Tribal Council is the duly elected governing body of the Smith River Rancheria with the Constitutional duties and responsibilities to preserve, protect and promote the best interests of the Smith River Rancheria; and

**WHEREAS:** Pursuant to Article IV, Section 1(b), (l) of the Constitution of the Howonquet Indian Council of the Smith River Rancheria, the Tribal Council of the Smith River Rancheria has the power to negotiate and make contracts with the Federal Government, and to manage, control and establish economic projects and programs for the Rancheria; and

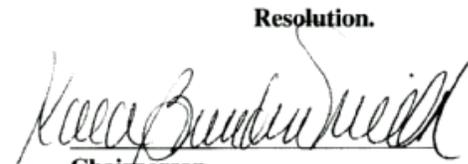
**WHEREAS:** The Tribal Council of the Smith River Rancheria has had an opportunity to review and discuss the Final Technical Report for the Energy Strategic Planning & Self-Sufficiency Project which is to be submitted to the United States Department of Energy pursuant to DOE Award Number DE-FG36-03GO13115, said report having been prepared by Strategic Energy Solutions by and through its principal, Mr. Greg Retzlaff; and

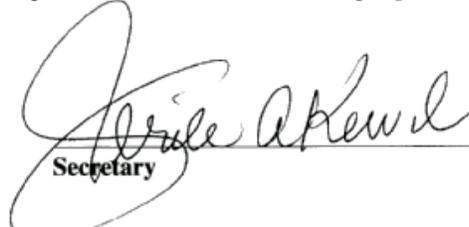
**WHEREAS:** The Tribal Council of the Smith River Rancheria is informed that the aforementioned report has been prepared and submitted as part of an ongoing

process where the Rancheria will be in a position to submit further applications to DOE for a comprehensive feasibility study, future development activities and ultimately financing of its designated energy self-sufficiency projects;

NOW, THEREFORE BE IT RESOLVED:

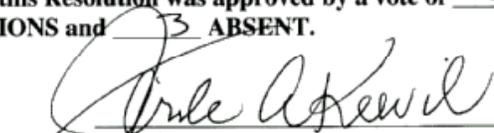
1. That the Tribal Council of the Smith River Rancheria does hereby formally approve the Final Technical Report for the Energy Strategic Planning & Self-Sufficiency Project which is being submitted to the United States Department of Energy pursuant to DOE Award Number DE-FG36-03GO13115.
2. That the Chairperson and Secretary of the Smith River Rancheria Tribal Council are hereby authorized to sign this Resolution and any and all other documents which are necessary to effectuate the intents and purposes of this Resolution.

  
Chairperson

  
Secretary

CERTIFICATION

I hereby certify that the Smith River Rancheria Tribal Council met in a duly called and noticed meeting on the 14<sup>th</sup> day of December 2004, at which 4 Tribal Council members were present to constitute a quorum and that this Resolution was approved by a vote of 3 FOR, 0 OPPOSED, 1 ABSTENTIONS and 3 ABSENT.

  
Secretary