Strategic Planning
&
The Tribal Energy Guide

Regional Workshops

Teach the Teachers Workshop

Importance of Strategic Energy Planning

Defining where you want to go, and developing a roadmap to get there.

Jumping into action, without a plan, can lead to mistakes, oversights, false starts, and additional costs.

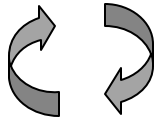
Strategic Energy Planning
Basic Steps

Vision & Champion
Energy Fundamentals
Culture & Environment

Integrated Resource Planning

Demand-Side Options

Efficiency: Weatherization & Appliances
Fuel Switching
Controls



Supply-Side Options

Conventional Options
Renewable Resource &
Renewable Technology Options

On-Site – Grid Connection **– Bulk Power**

Organizational Options
Economics & Financing
Implementation

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A Guide to
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The Rosebud Sioux Indian Reservation located in south-central South Dakota, is now home to a 750-kilowatt wind turbine. Erected near the Rosebud Casino and Convention Center, the new wind turbine is helping to power that facility while earning money by selling excess power to the Basin Electric Power Cooperative.

"Generating our own energy will help our tribe develop a sustainable homeland economy on the reservation in the short term and strengthen our tribal sovereignty in the long term," says Ronald L. Neiss, an enrolled member of the tribe and president of the Rosebud Sioux Tribe Utility Commission. "A tribe is only as sovereign as its economy and finances permit. One of our tribal goals is energy self-sufficiency, and developing our renewable energy resources will help us achieve that goal."

Tribal energy development can serve many goals: economic development, electrification, self-sufficiency, clean air...the list is as long as you wish to make it. With support from the U.S. Department of Energy's Tribal Energy Program, this Web site is intended to give you the information you need to achieve your energy goals. Learn more about this site, and how to use it.

What's New

This is a preliminary version of the Tribal Energy Development Web site and is intended for review purposes only. We continue to add content to this site, and we welcome your feedback and suggestions. Please send any comments or suggestions via email by clicking on the Webmaster link, which is located at the bottom of each page, or by sending an email to: tribal_energy_dev@nrel.gov

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Strategic Planning

Where do you want to end up, and how can you get there?

The first step in understanding your energy journey is to envision your destination. Where is it you want to go? What does that place look like? At the same time, take stock of where you are now, to better understand the resources you will need to get to your destination. The difference between these two points, where you are, and where you want to be, defines the work that needs to be done. Energy strategic planning can be a relatively straightforward process, as demonstrated below. However, the work needed to complete a plan may be considerable.

To continue, select a step in the strategic planning process:

- Vision Statement: Where do you want to end up?
- Champion: Who's going to lead the charge?
- Energy Needs and Forecasts: Defining the problem
- Resource Options: Energy supplies available from on and off the reservation
- Preliminary Options: Choosing your tribe's best options
- Bounding the Problem: Identifying your tribe's priorities
- Strategic Plan: Putting it all together

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Evaluating Options

Possible roads to the future

Based on your recently completed Strategic Plan, you have identified a number of priority needs and energy supply options. Your next step on the path is to evaluate your tribe's energy options—deciding more narrowly what makes the most sense, how much it will cost, who needs to be involved, and how it will be implemented. At this stage, the analysis becomes more rigorous, the numbers more real, and the challenges better defined. In other words, the road ahead can be seen more clearly. Take your time with this step—the more thoroughly you analyze your tribe's options, the smoother the implementation stages will be.

To continue, select a step in the process for evaluating your tribe's energy options:

- Energy Fundamentals: What is energy, anyway?
- Load Assessment: Evaluating your tribe's thermal and electrical needs
- Energy Efficiency Options: Plugging the leaks
- Current Energy Supplies and Suppliers: Drawing on existing energy supplies
- Renewable Energy Resource Assessment: Indigenous resources
- Technology Options: Evaluating costs and benefits
- Organizational Options: Ensuring the project's long-term viability
- Environmental Assessment: Minimizing the impacts on nature
- The Power Grid as a Market: Exporting electricity
- Economics: The business of energy
- Risk Assessment: Look before you leap!
- Options Integration: Narrowing the field of possibilities
- The Plan: Setting milestones and creating a timeline

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Organizational Development

The vehicles of change

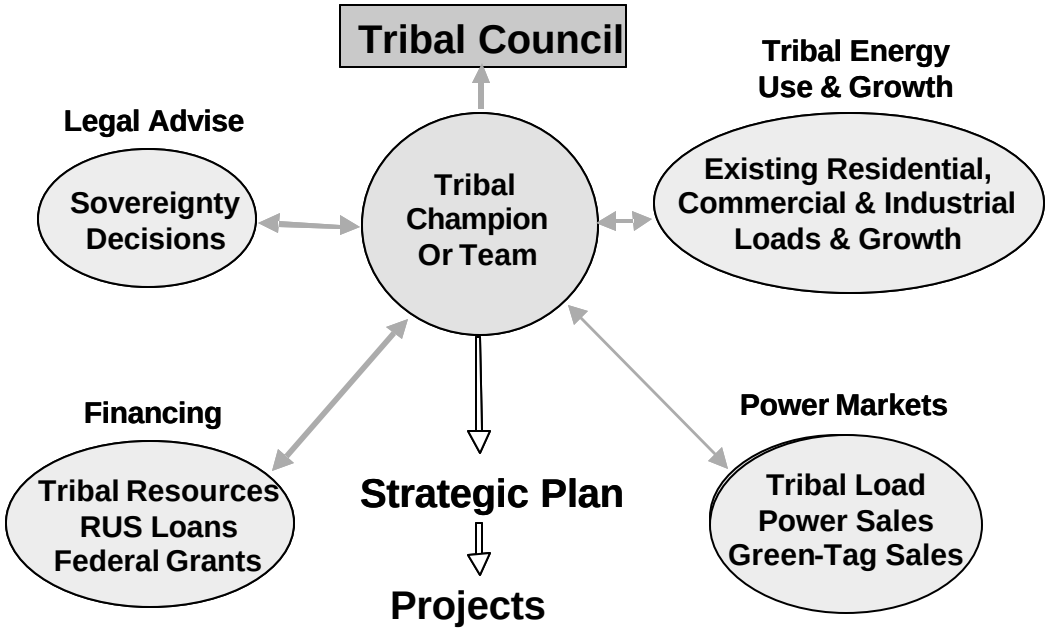
It may be necessary to develop new organizations or institutions to effectively implement your tribal energy plans and projects. In some cases, it may be possible to expand the responsibilities of an existing tribal entity to take on the responsibility of energy implementation, but sometimes a whole new entity, such as a tribal utility, is needed. Sometimes, joint ventures with outside partners may make the most sense, although true tribal economic development cannot be achieved by simply contracting out the opportunity.

To begin evaluating possible organizational and institutional structures, select a topic below:

- Human Capacity Development: Building capabilities within your tribe
- Organizational Options: Choosing the best approach
  - Tribal Utility Authority
  - Cooperatives
  - Small Business
  - Energy Service Companies

Organizational Options

How do you want to make it happen?



Characteristics of a Solution

- **Rapid**
- **Technically & Institutionally Sustainable**
- **Maximize Coordination**
- **Politically Feasible**
- **Attracts Financing & Capital**
- **Reinforces tribal enterprises**

Some Institutional Options

- **Retailers, Individual Entrepreneurs**
- **Traditional Electric Cooperatives**
- **Multi-Tribal Cooperative**
- **Tribally Owned Business Enterprise**
- **Joint Ventures**

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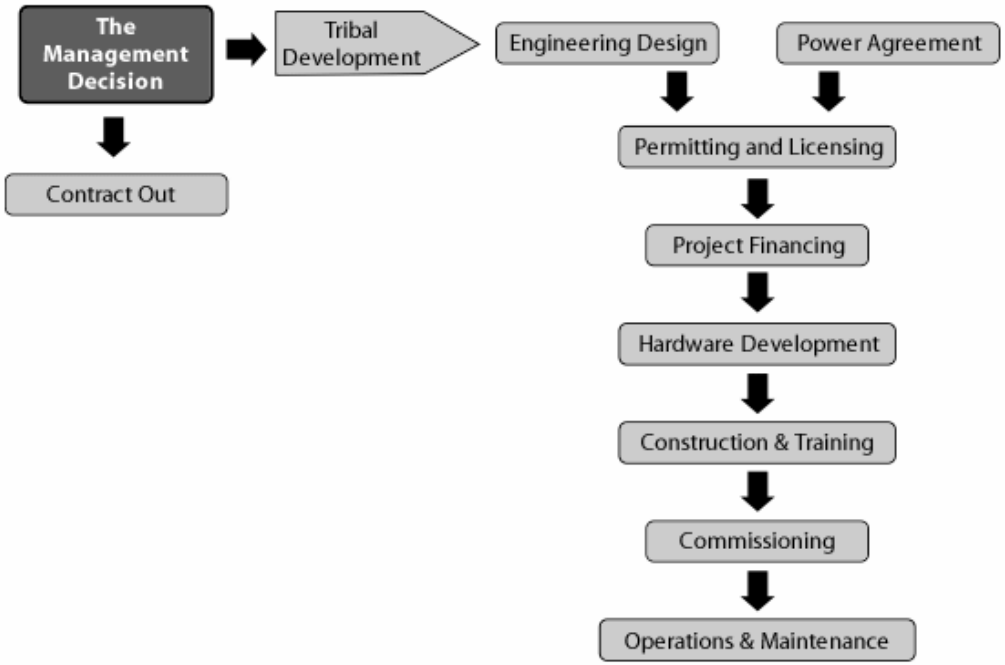
Project Development

Where the rubber meets the road

With a Strategic Plan in hand, knowing your tribe's viable energy options, and having chosen your preferred institutional arrangements, it is then possible to formulate an action plan, raise funding, and move forward with specific projects that contribute to your tribal energy sufficiency goals.

The project development process is mapped out below. Each step will provide you with much, if not all, of the information and documentation needed to move your individual projects forward. To continue, select a step in the process.



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Cultural Issues

As the population on tribal lands grows and the pressing need for economic development and an improved quality of life on the reservation continues, tribes are increasingly faced with the challenge of meeting their energy needs. For tribes, part of that challenge is to meet their energy needs while maintaining their cultural identity and values.

Energy development on tribal lands is a balancing act. Energy development can provide local jobs, tribal income, and the satisfaction of energy self-sufficiency, while also providing important contributions to the broader energy-hungry U.S. economy. At the same time, energy development can damage the earth, streams, air, and even tribal culture if not carried out in an environmentally and culturally respectful manner. Thus is the challenge.

Some key questions for tribes include:

- How to change with the times in a way that works for the entire community?
- How can this be accomplished in a manner that respects tribal needs and values?
- What are the tradeoffs in between quality of life, economic development, and the environment?

To paraphrase the challenge: "*Western development looks at things as resources. We look at them as relatives.*"

When considering energy alternatives, consider renewable energy. There is an inherent compatibility between renewable energy and traditional values that respect the earth, air, and water. Renewable power plants provide power without exhausting the resource and without polluting the environment. They are sustainable—the resource will be there for generations to come. They fit well within the web of nature.

This handbook is intended to provide useful information to help make the best energy decisions for your tribe. The following are some aspects of the balancing act between energy development and tribal cultural values that you may wish to consider:

The Impacts of an Energy Project
Sovereignty and Energy Decisions
Working with Outside Organizations and Companies

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Assessing Energy Resources

What Are Your Tribe's Energy Options?

All tribal lands have some usable energy resources, although the extent and variety of available energy sources varies widely, as do the economics of using those energy resources. For instance, even the smallest tribal lands have solar energy available to them, and solar electricity is feasible for some uses even in cloudy or far northern climates.

Most *fossil-fuel* resources on tribal lands are tapped in cooperation with industrial partners and provide a royalty stream back to the tribe for its benefit and use. In most cases, these projects contribute little or nothing to the tribe's energy self-sufficiency. But if natural gas is available — either on tribal lands or from outside tribal lands via a pipeline — it can serve as an energy source in ways similar to electricity. Natural gas can be used as both a heating source and a means of generating power on both small and large scales. For more information on your fossil-fuel options, choose from the following items:

- Oil
- Coal and Coal-bed methane
- Natural Gas

In contrast to fossil-fuel resources, *renewable energy resources* are usually either used at their location or are converted into electricity, which can be used onsite or fed into the power grid. The sole exception to that rule is biomass, which in some forms (such as wood) can be shipped short distances. Although tribes may choose royalty-stream arrangements for some large-scale renewable energy projects, tribes would likely accrue benefits more rapidly by owning the projects themselves and using their energy production as they see fit. For more information, choose from the renewable energy sources listed below:

- Wind
- Hydropower
- Geothermal
- Solar
- Biomass
- Renewable Resource Maps

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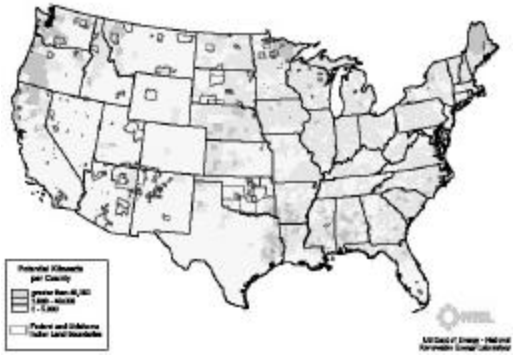
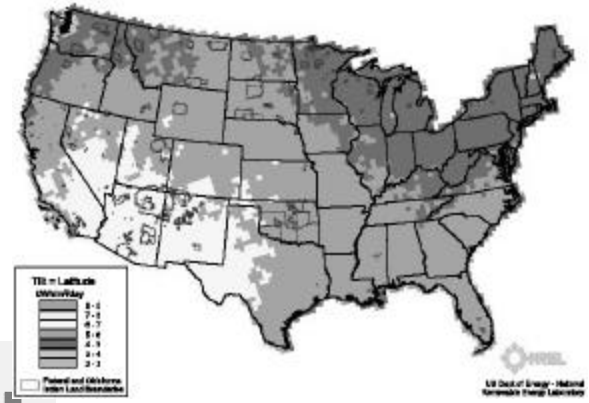
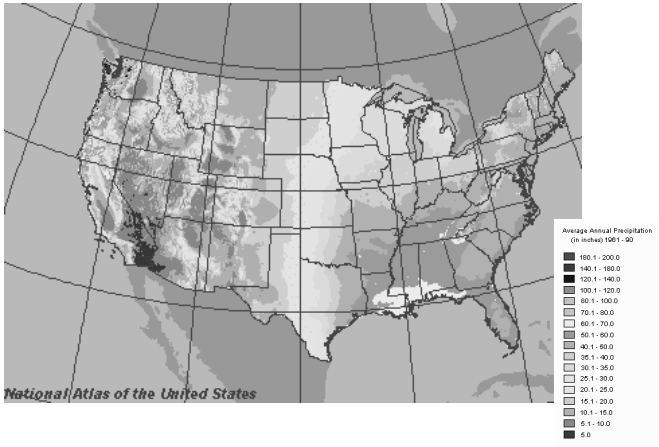
Renewable Resource Options







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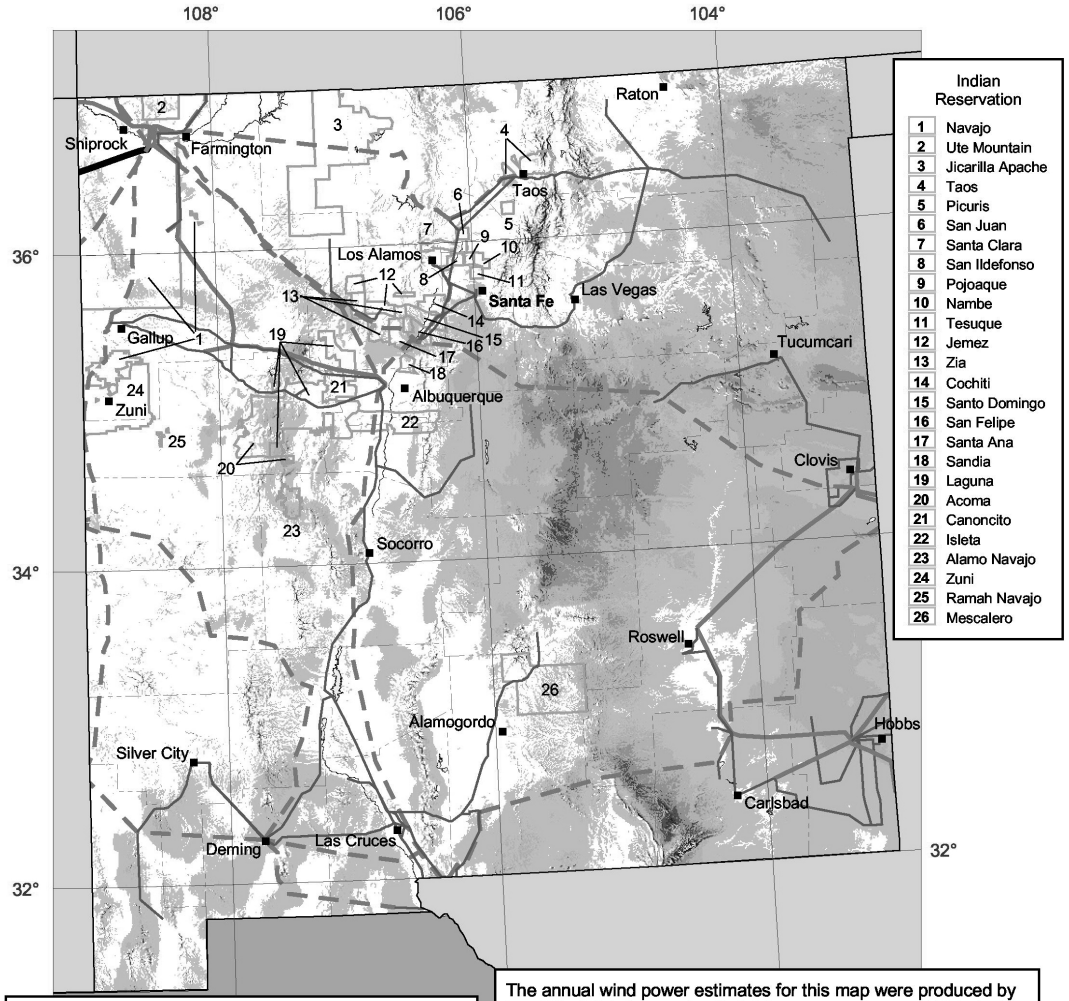
New Mexico - Wind Resource at 50 m



The annual wind power estimates for this map were produced by TrueWind Solutions using their Mesomap system and historical weather data. It has been validated with available surface data by NREL and wind energy meteorological consultants.

Wind Power Classification

Wind Power Class	Resource Potential	Wind Power Density at 50 m W/m^2	Wind Speed[a] at 50 m m/s	Wind Speed[a] at 50 m mph
1	Poor	0 - 200	0.0 - 5.6	0.0 - 12.5
2	Marginal	200 - 300	5.6 - 6.4	12.5 - 14.3
3	Fair	300 - 400	6.4 - 7.0	14.3 - 15.7
4	Good	400 - 500	7.0 - 7.5	15.7 - 16.8
5	Excellent	500 - 600	7.5 - 8.0	16.8 - 17.9
6	Outstanding	600 - 800	8.0 - 8.8	17.9 - 19.7
7	Superb	> 800	> 8.8	> 19.7

[a] Wind speeds are based on a Weibull k value of 2.0

Transmission Line*

Voltage (kV)

- 115 - 138
- 230
- 345
- 500

* Source: POWERmap,©2002 Platts, a Division of the McGraw-Hill Companies

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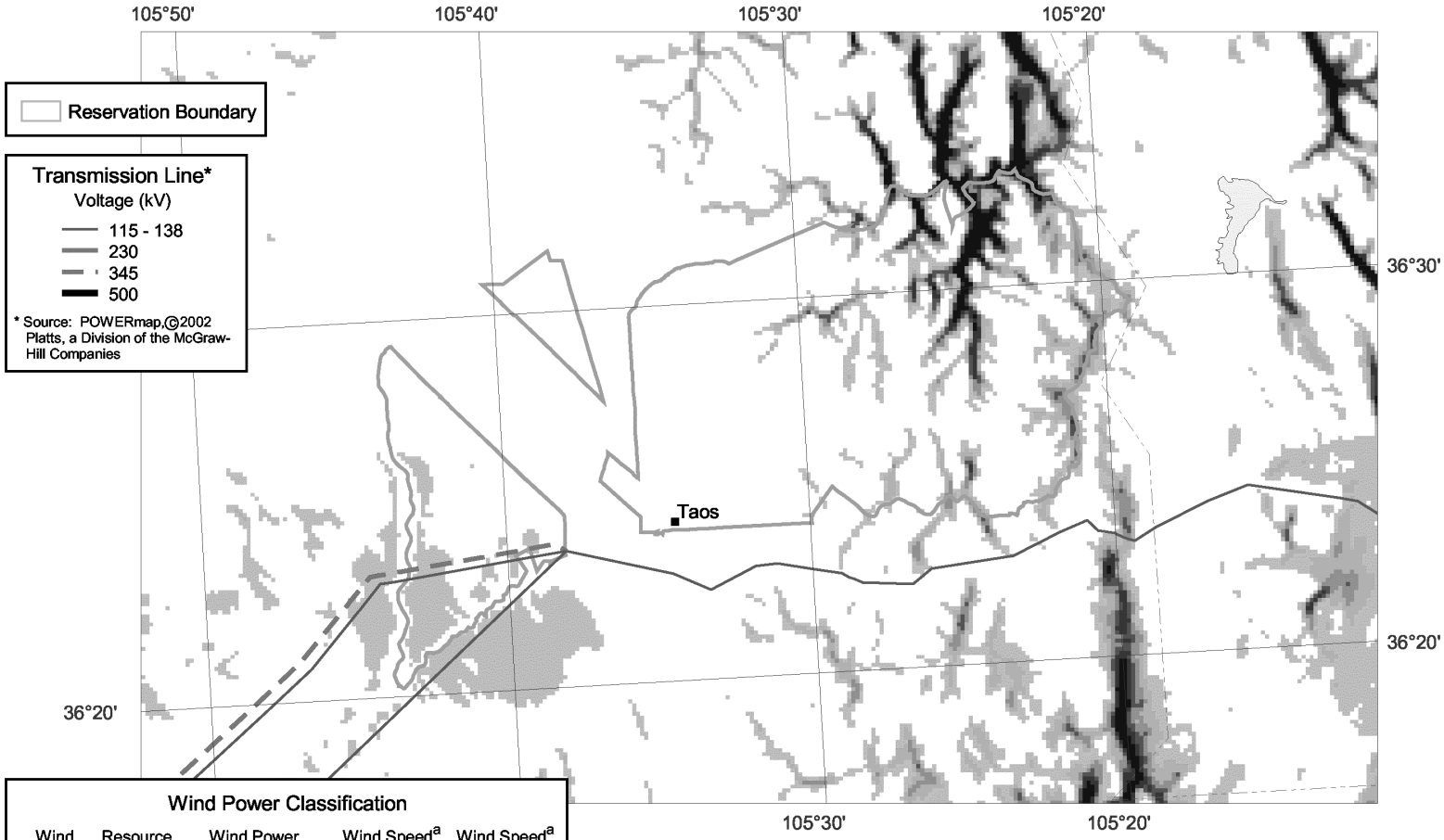
Taos Reservation - Wind Resource at 50 m



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[a] Wind speeds are based on a Weibull k value of 2.0

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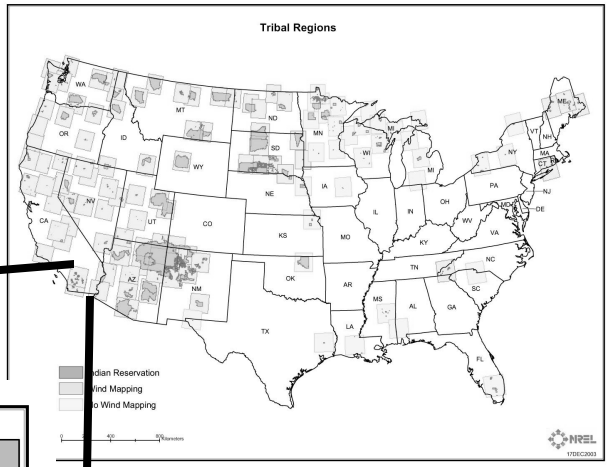
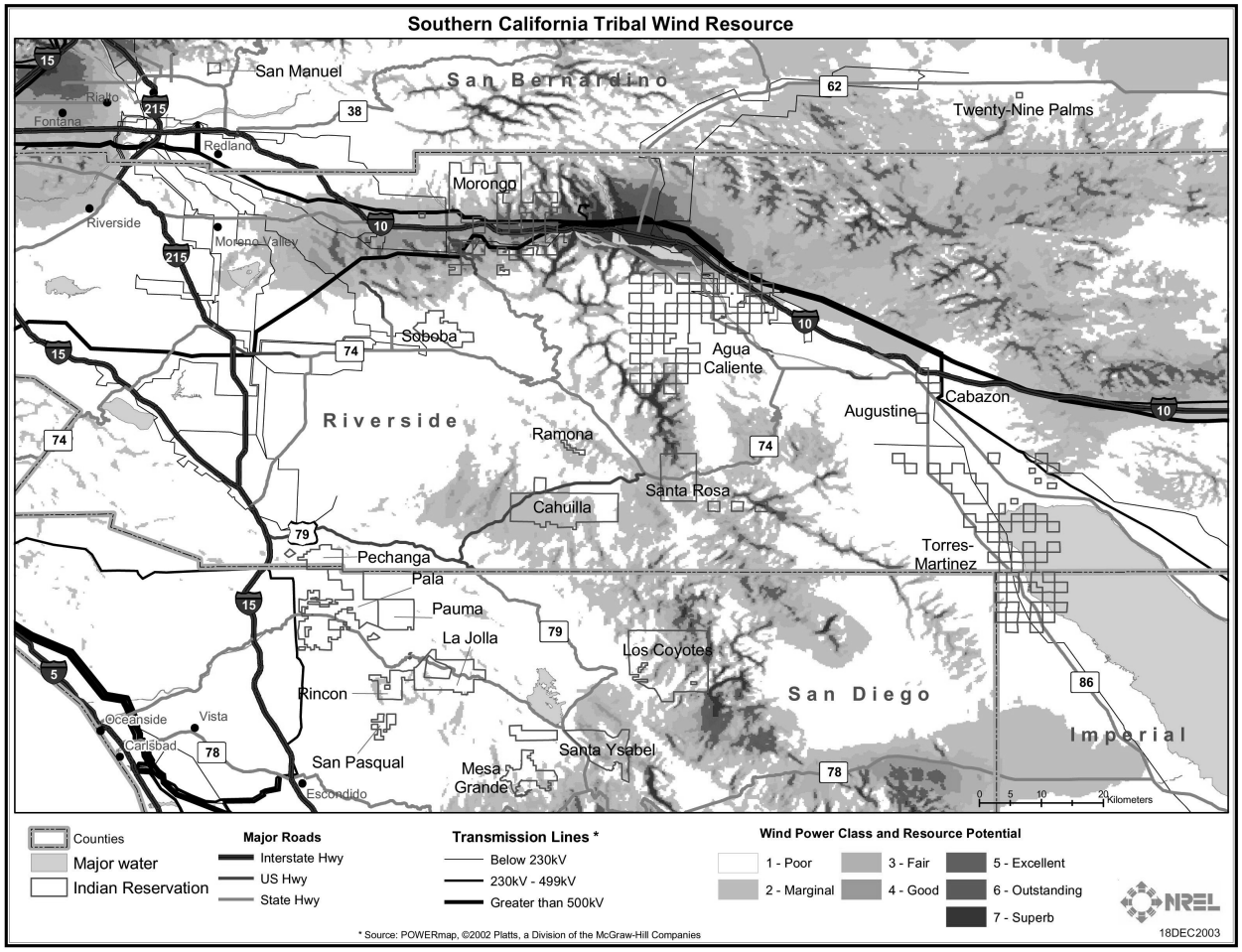
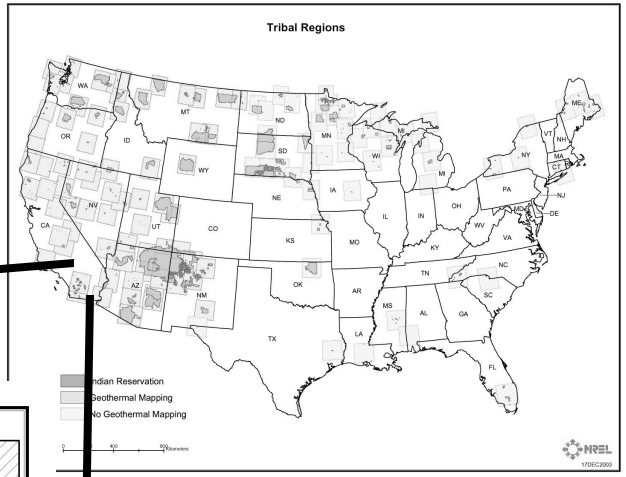
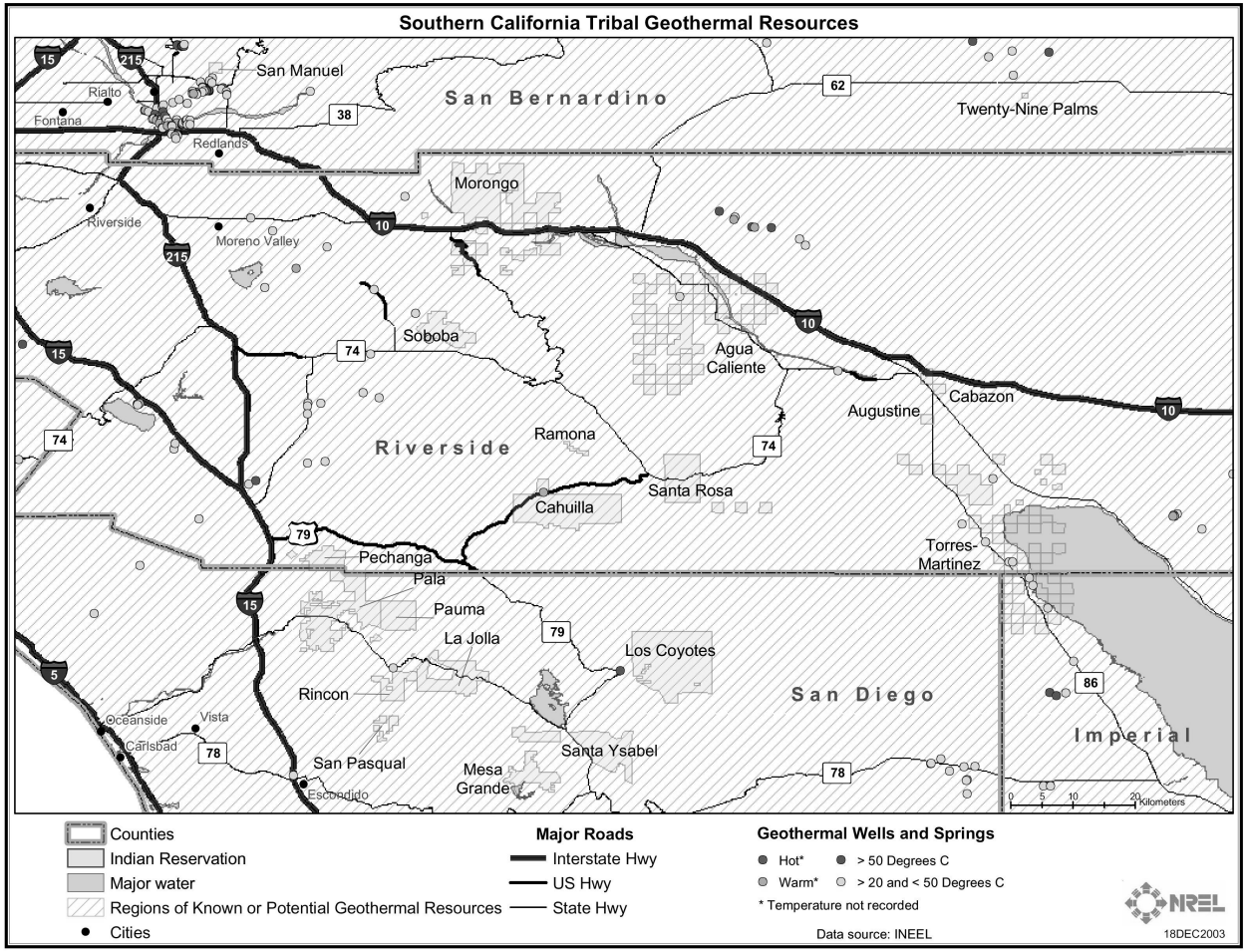
Regional Wind Maps





Regional Geothermal Maps





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Energy Technologies

How Can Your Tribe Use its Energy Resources?

Once you know what energy resources are available to your tribe, you can begin to think about how best to use those resources. A wide variety of technologies provides a great deal of choice in this matter, whether drawing on fossil fuels or renewable energy sources. But don't neglect energy efficiency technologies, which are usually the least-cost approach to meeting a tribe's energy needs. In fact, tribes should consider reducing their energy needs as much as possible through energy efficiency before trying to meet those needs with energy production. Choose from the following for more information on:

Energy Efficiency Technologies
Renewable Energy Technologies
Fossil-Fuel Technologies

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Energy Efficiency Technologies

Energy efficiency technologies provide ways to reduce your tribe's energy needs, making the goal of energy self-sufficiency that much easier. Energy efficiency technologies are often the most cost-effective "source" of energy available. Unless a tribe has heavy industry on its lands, likely options for saving energy are in homes and other buildings. For a consumer guide on how to implement energy savings in homes, try *Energy Savers: Tips on Saving Energy & Money at Home*. To save energy in all types of buildings, the following approaches may be used:

- Energy Audits
- Energy-Efficient Appliances
- Smart Building Controls (Energy Management Systems)
- Efficient Heating and Cooling
- High-Efficiency Lighting
- Efficient Office Equipment
- Walls and Roofs (Insulation, Weatherization, and other technologies)
- Whole Building Design - Building Energy Systems
- Windows


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Weatherization & Intergovernmental Program
Weatherization Assistance Program
About the Weatherization Assistance Program
DOE Guidelines
Weatherization Technologies
State Activities
State Contacts
Weatherization Information Resources
Training Centers
How do I apply for Weatherization?
The Weatherization Assistance Program enables low-income families to permanently reduce their energy bills by making their homes more energy efficient. It is this country's longest running, and perhaps most successful energy efficiency program. During the last 27 years, the U.S. Department of Energy 's (DOE) Weatherization Assistance Program has provided weatherization services to more than 5.2 million low-income families. In 2003, the goal is to weatherize 93,750 homes, which is a program metric.
By reducing the energy bills of low-income families instead of offering aid, weatherization reduces dependency and liberates these funds for spending on more pressing family issues. On average, weatherization reduces heating bills by 31% and overall energy bills by $200 to $250 per year. This spending, in turn, spurs low-income communities toward job growth and economic development.
Weatherization has helped spawn an energy efficiency industry for residential housing. This industry today employs 8,000 people who work in low-income weatherization alone, and many times that number work in companies that help homeowners increase their energy efficiency through low-cost measures. Many of the techniques that are today standard procedure in this industry were first developed and tested by the Weatherization Program. And through weatherization, DOE continues to develop and test in the field new advances in home energy science.
Weatherization Works! It is more than a slogan; it's a fact!
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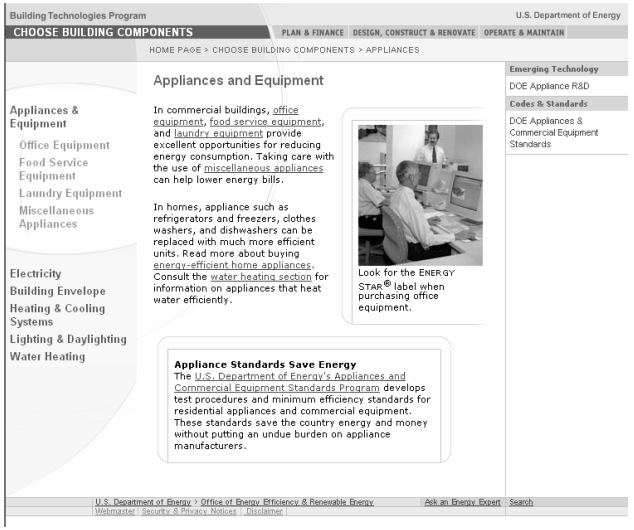
Ask an Energy Expert
NEWS
DOE Releases Funding to the States
July 1, 2003
More News
FEATURE
Non-Energy Benefits of Weatherization
UT-BATTELLE
Oak Ridge National Laboratory gives technical support and evaluations.
The Weatherization Assistance Program Technical Assistance Center gives program operations and partnerships with stakeholders.


Building Technologies Program
U.S. Department of Energy
CHOOSE BUILDING COMPONENTS
PLAN & FINANCE
DESIGN, CONSTRUCT & RENOVATE
OPERATE & MAINTAIN
HOME PAGE > CHOOSE BUILDING COMPONENTS > APPLIANCES
Appliances & Equipment
Office Equipment
Food Service Equipment
Laundry Equipment
Miscellaneous Appliances
Electricity
Building Envelope
Heating & Cooling Systems
Lighting & Daylighting
Water Heating
Appliances and Equipment
In commercial buildings, office equipment, food service equipment, and laundry equipment provide excellent opportunities for reducing energy consumption. Taking care with the use of miscellaneous appliances can help lower energy bills.
In homes, appliance such as refrigerators and freezers, clothes washers, and dishwashers can be replaced with much more efficient units. Read more about buying energy-efficient home appliances. Consult the water heating section for information on appliances that heat water efficiently.
Look for the ENERGY STAR® label when purchasing office equipment.
Appliance Standards Save Energy
The U.S. Department of Energy's Appliances and Commercial Equipment Standards Program develops test procedures and minimum efficiency standards for residential appliances and commercial equipment. These standards save the country energy and money without putting an undue burden on appliance manufacturers.
Emerging Technology
DOE Appliance R&D
Codes & Standards
DOE Appliances & Commercial Equipment Standards
U.S. Department of Energy > Office of Energy Efficiency & Renewable Energy
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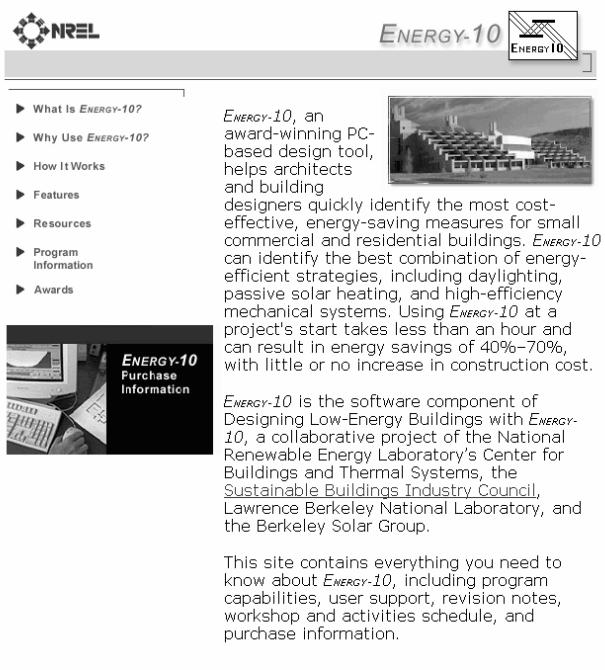
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ENERGY-10
What Is ENERGY-10?
Why Use ENERGY-10?
How It Works
Features
Resources
Program Information
Awards
ENERGY-10 Purchase Information
ENERGY-10, an award-winning PC-based design tool, helps architects and building designers quickly identify the most cost-effective, energy-saving measures for small commercial and residential buildings. ENERGY-10 can identify the best combination of energy-efficient strategies, including daylighting, passive solar heating, and high-efficiency mechanical systems. Using ENERGY-10 at a project's start takes less than an hour and can result in energy savings of 40%–70%, with little or no increase in construction cost.
ENERGY-10 is the software component of Designing Low-Energy Buildings with ENERGY-10, a collaborative project of the National Renewable Energy Laboratory's Center for Buildings and Thermal Systems, the Sustainable Buildings Industry Council, Lawrence Berkeley National Laboratory, and the Berkeley Solar Group.
This site contains everything you need to know about ENERGY-10, including program capabilities, user support, revision notes, workshop and activities schedule, and purchase information.


State
Walls and Roofs
Walls and Roofs
Technology Overview
Walls and Roofs in Use
Walls and Roofs-at-a-Glance
Frequently Asked Questions
Other Information
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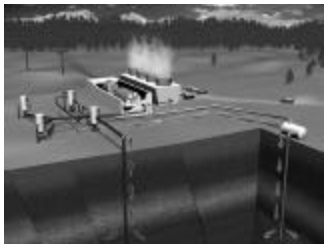
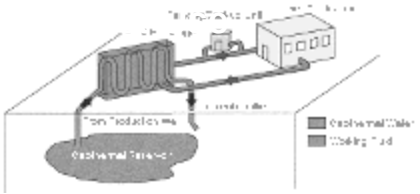
Renewable Energy Technologies

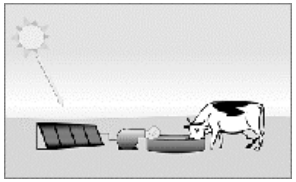
A wide range of renewable energy technologies have been developed, allowing each renewable energy resource to serve at least two applications, and often more. The primary renewable energy technologies that are commercially available today include:

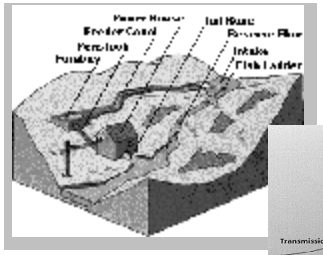
- Wind Turbines
- Hydroelectric Turbines
- Geothermal Power Plants
- Direct Use of Geothermal Heat
- Photovoltaic Solar Power Systems
- Concentrating Solar Power Systems
- Biomass Combustion
- Biomass Digestion
- Landfill Gas Systems

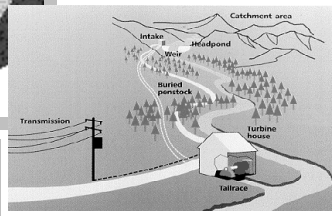
Renewable Technology Options

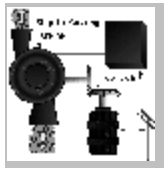












Web-based HTML Information

DC PV Systems with Battery Storage
Many applications can use DC power, but require a steady power supply. Lighting applications are a good example — these systems are often used for flashing warning lights. The systems require a controller to govern the flow of electricity to and from the batteries while maintaining a steady flow of power to the application. Note that using energy-efficient lighting will greatly reduce the cost of the PV system.


DC System with Battery Storage

A good example of a DC PV system with battery storage is found outside the Prince Jonah Kuhio Kalanianiole (PJKK) federal building in Hawaii. DC PV systems are installed on top of the parking lot light poles, using two 48-watt solar panels per lamp and a 90 amp-hour battery to provide 12 hours of power per night to two 30-watt fluorescent lamps that produce 2,500 lumens each.


Solar lighting in the PJKK federal building parking lot

Small individual DC systems have many applications, such as providing power for home systems, public area lighting, schools, health clinics, pumping water and water purification, as well as rural telephony and micro-enterprise development.

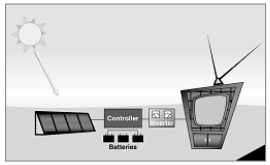

Solar home lighting in Brazil


A solar-powered water pumping station for irrigation

Off-Grid AC PV Systems
Many electrical appliances require AC power. To power a typical off-grid household, most people prefer to use a standard AC wiring system and AC appliances, which means that the power system must produce AC power. For PV systems, that means that an inverter must be used to convert the DC power into AC. A typical off-grid AC PV system includes the PV modules, a bank of batteries, a controller, and an inverter.


A Typical Inverter

Grid-Connected PV System
In most buildings that have access to the electrical grid, the preferred configuration is to connect the PV system directly into the building wiring on the customer's side of the meter. In this configuration, the PV system can be used to supplement the grid during the day while the grid meets the building's power needs at night. And if the PV system produces more power during the day than is needed, the excess power can be fed back into the power grid, turning the meter backwards! In many states, the building owner can earn credit on the power bill for any power fed back into the grid — a concept known as net metering.

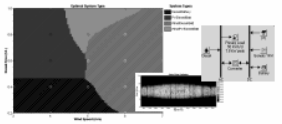


An off-gird AC solar power system

NREL

Log On / Register

HOMER
THE OPTIMIZATION MODEL FOR DISTRIBUTED POWER



About HOMER
Overview
User Interface
Version History
User Testimonials
Ask Tom (FAQs)

Downloads
Software
Sample Files
Getting Started Guide
(PDF File, 404 kB)

Contact Us
Names and Addresses
Send us Email
Renew License

3350 people have downloaded HOMER from 148 countries...

Security & Privacy

HOMER 2.0 Now Available!

If you are currently using version 1.5 and you want to upgrade to version 2.0, please click **Software** in the Downloads section on the left. If you want to continue using version 1.5 and you need to renew your license, please click **Renew License**.

About HOMER
HOMER is a computer model that simplifies the task of evaluating design options for both off-grid and grid-connected power systems for remote, stand-alone, and distributed generation (DG) applications. HOMER's optimization and sensitivity analysis algorithms allow you to evaluate the economic and technical feasibility of a large number of technology options and to account for variation in technology costs and energy resource availability. HOMER models both conventional and renewable energy technologies:

Power sources:
- solar photovoltaic (PV)
- wind turbine
- run-of-river hydro power
- generator: diesel, gasoline, biogas, alternative and custom fuels, cofired
- electric utility grid
- microturbine
- fuel cell

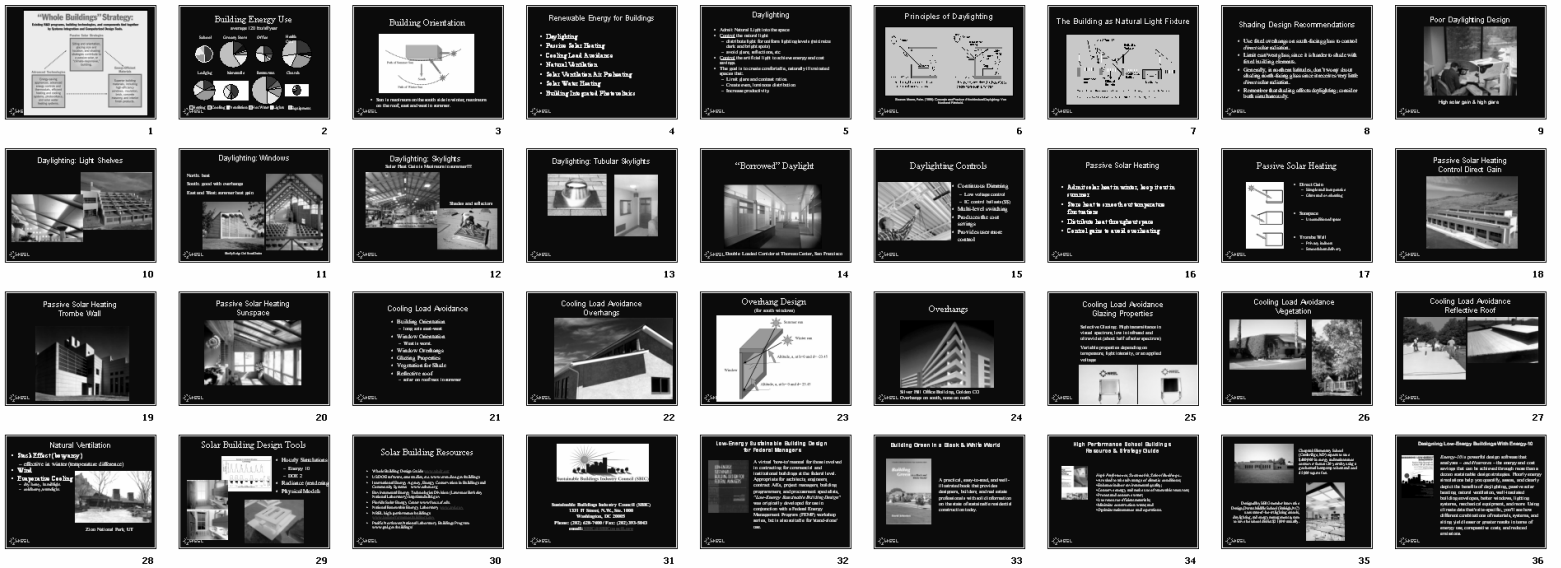
Storage:
- battery bank
- hydrogen

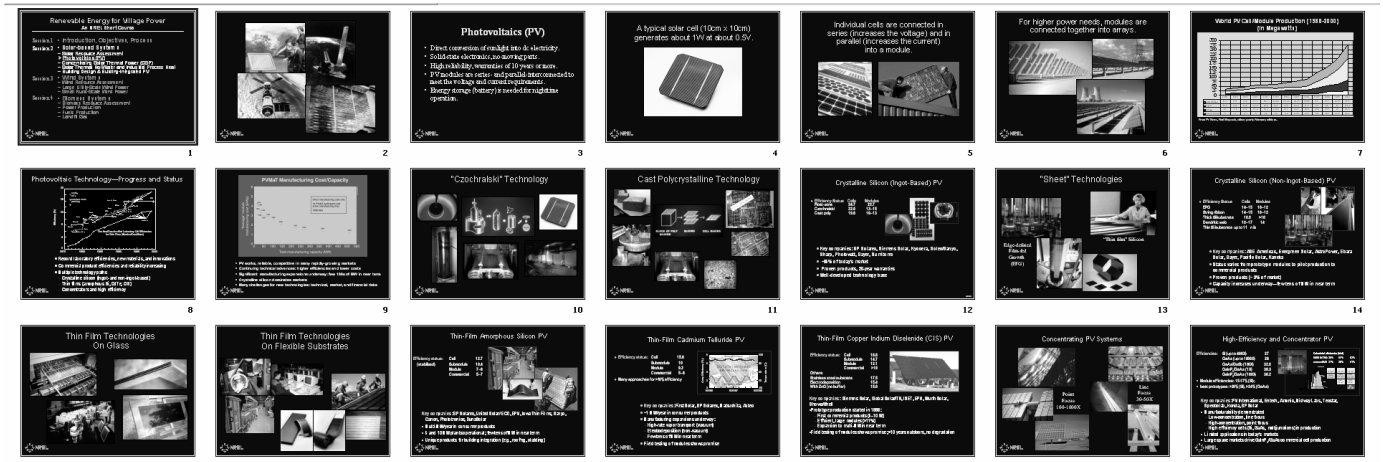
Loads:
- daily profiles with seasonal variation
- deferrable (water pumping, refrigeration)
- thermal (space heating, crop drying)
- efficiency measures

You can download and use HOMER for free. You must be a registered user to download the software. When you install HOMER, you automatically receive a free six-month license, which you can renew for free an unlimited number of times. To register, click **Log On / Register** and complete the registration form.

NREL

PDF-based – RE 101 Technology Tutorials






Peter Lilienthal
Micro-Power Systems
Design Models

Fossil-Fuel Technologies

Fossil-fuel technologies run the gamut from 19th-century boiler and turbine technologies to recent innovations like microturbines and fuel cells. They also range in size from small units fit for a home to power plants capable of energizing entire cities. To learn more, choose among the following items:

- Conventional Boiler and Turbine Technologies
- Cogeneration
- Gas Turbines
- Diesel Engines and Reciprocating Engines
- Microturbines
- Fuel Cells

The Electrical Grid

The U.S. electrical grid can be considered a source of electricity or a means of selling electricity to power markets. This section includes background information on the types of electric utilities in the United States, how power is transmitted within and between utilities, how the U.S. electrical power system is regulated, and the intricacies of connecting a power source to the grid. Choose from the following for more information on:

- Types of Electric Utilities in the United States
- The U.S. Power Transmission System (i.e., WAPA, BPA)
- The U.S. Electrical Regulatory System (FERC, PURPA, etc.)
- Grid Interconnection

Regulatory Agencies

There are several agencies that have developed standards and regulations to address environmental protection issues. The lead agency is the Environmental Protection Agency (EPA), which develops environmental policies to protect the air, land, and water. The EPA uses a process of requiring and reviewing permits to ensure that new or substantially changed generation plants do not cause unacceptable amounts of environmental damage or pollution. The following Web sites were developed by the EPA to help tribes understand the issues and to find out how to interact with the EPA:

- EPA American Indian Environmental Office
- EPA American Indian Environmental Office - Resource Guide
- Tribal Environmental and Natural Resource Assistance Handbook
- EPA Waste Management in Indian Country
- The Plain English Guide to the Clean Air Act

The Department of the Interior (DOI) Web site can lead you to explanations of how its different agencies deal with a variety of issues. The Bureau of Indian Affairs deals with the use and protection of Indian lands. Unfortunately, the Bureau of Indian Affairs Web site is not currently available, and may not be available for some time. The U.S. Fish and Wildlife Service (FWS) handles protection of animals and their habitats. Two key issues are the relationship between the FWS and tribal lands, and permits for projects that could affect threatened or endangered species. Depending on your location and what you are trying to do, other DOI Agencies, such as the Bureau of Land Management or the Minerals Management Service may have information of interest.

While the Fish and Wildlife Service is tasked with protecting species and their habitats on land and in the rivers, the National Marine Fisheries Service (NMFS) manages protection and permitting related to marine species. Projects that could affect threatened or endangered marine life need a permit from the NMFS. Note that NMFS permits are required for projects affecting threatened or endangered anadromous fish, such as salmon, which migrate between rivers and the ocean.

The National Environmental Policy Act (NEPA) requires Environmental Impact Statements (EIS) for any undertaking that might significantly impact the environment. U.S. government agencies are required to comply with this act in all their dealings. Your tribe or a company or agency you are working with may be required to produce an EIS and have it approved. A good explanation of NEPA and EIS requirements is available on the National Preservation Institute Web site.

A generic term for smaller or mid-sized electricity producing systems is "distributed energy resources" (DER). The Federal Energy Management Program (FEMP) provides an online resource called "Environmental Siting of Distributed Energy Resources" that explains the processes that one must go through to site a DER system. For additional information about connecting to the grid, see the Grid Interconnection section.

Since tribes have a wide variety of experiences in dealing with regulatory bodies, it is often a good idea for tribes to develop their own codes and standards. The Green Development Codes/Ordinances section of DOE's Smart Communities Network provides models that you can use if you are considering this.

Finally, the following tribal organizations can offer their experience in dealing with environmental issues:

- National Tribal Environmental Council
- National Tribal Environmental Research Institute
- Institute for Tribal Environmental Professionals

Environmental Benefits and Impacts

We use energy for fuel, electricity, heating, cooling, and mechanical power. The human production and use of energy has always had an impact on the environment. This impact is growing dramatically as the population increases and the demand for energy increases.

The choices we make regarding where our energy comes from and how it is used impact the environment. In order to fully understand this, we need to look at the entire life cycle of energy production and use. The processes involved include:

- manufacture of the energy conversion technologies
- extracting, harvesting, or otherwise obtaining the energy feedstock (e.g. coal, natural gas, oil, nuclear fuel, wood or other biomass, flowing water, geothermally heated liquids, sunlight, or wind), as well as transporting and managing it.
- converting the feedstock to electricity, heat, mechanical power, or fuel
- storing the electricity, heat or fuel
- transporting the electricity or fuel from where it is produced to where it is needed
- efficient use of the energy
- managing any waste products—including contamination of air, soil, and water.

When looking at the environmental impacts and benefits of an energy solution, it is important to look at all parts of the energy life cycle, as well as long-term management and conservation of natural resources. All approaches have environmental impacts, but we can minimize them by understanding the impacts and making wise choices.

The following are brief discussions of the environmental benefits and impacts of some key technologies. It is important to note that they represent current technology. The challenges and problems of each are being worked on through research and development. See the following for information about:

Fossil fuels
Nuclear energy
Renewable energy technologies
- Biomass
- Geothermal
- Hydrogen
- Hydropower
- Solar
- Wind

The Costs

Economic Analysis of Your Tribe's Energy Options

The main factors affecting the economics of energy installations are the initial capital cost and the annual operating costs ofver the life of the installation. Life-cycle cost analysis compares these costs to the energy output of the system. This section includes information on:

- Cost of Technology Options
- Life-Cycle Cost Analysis and Technology Comparisons

Risk Factors

When developing renewable energy projects, tribes must often call upon outside developers and financiers in order to succeed. These business relationships create risks for the tribes and for the developers. These can be significantly reduced with prior planning and infrastructure development. Though not all-inclusive, the following are some of the risk factors that arise in these projects.

- Tribal Risk Factors
- Developer's Risk Factors

Tribal Risk Factors

Tribal risk factors can be divided into the following categories:
Cultural Sensitivity
Technical Expertise
Tribal Job Development
Financial Security
Environmental Impacts
Continuity in Tribal Leadership

Cultural Sensitivity

Whenever an outside entity is brought into a tribal setting to help develop a project, there is a risk that the people involved will not be sensitive to cultural values. The level of risk will often depend on whether or not the personnel have prior tribal experience. These relationships can fail simply because the parties do not understand each other. Have these people ever dealt with a tribe? What is their level of knowledge and expertise in working in Indian country? What do they know about your tribe's culture and history? The tribe may need to plan to help educate its new business partners.

Once you have decided that the business relationship is worth pursuing, consider bringing in respected elders or tribal historians to educate your business partners. Take them on a tour of your housing areas, schools and government offices. Consider inviting them to a powwow, dance, community meal or ceremony, so they can get a sense of who you are. These experiences have a tendency to create a level of trust and understanding that is reciprocal, helping both parties.

Technical Expertise

Each type of power generation calls for its own level of technical knowledge, both at the development stage and at the operations and maintenance stage. A common challenge is acquiring and retaining appropriate levels of technical knowledge and employees who have the expertise necessary to operate and maintain the generation facilities. The level of expertise must match the technology used for the facilities. Wind power generation, for example, calls for specialized expertise that may not be met by experts knowledgeable in nuclear power generation. Careful selection of experts needed for all stages of development will help eliminate risks of failure.

Tribal Job Development

Tribes must often be willing to compromise, allowing outsiders with expertise in the industry to develop and operate the facilities until tribal members can be trained to take over operations. To understand how this will work, the tribe must know what level of expertise will be required and what level of training will be needed for the tribal workforce. Uncertainties in this area should be resolved early, so there are no surprises on either side. Financiers may be included in this discussion, as they will want assurance from the tribe and developer that the project will run smoothly and have a continuity of properly trained operators.

Developer Risk Factors

The developer's risk factors can be divided into the following categories:
Sovereign Immunity
Uncertainty in Tribal Law
Choice of Law
Mediation or Arbitration
Taxation
Permitting

Sovereign Immunity

Dispute resolution is usually one of the most contentious issues in any business relationship with tribes. Tribal sovereign immunity is often the focal point. It is important to recognize the distinction between sovereign immunity and sovereignty. Sovereignty is the power of the tribe. Sovereign immunity is an attribute of sovereignty that makes a sovereign immune from suit. To waive sovereign immunity is not the same as a waiver of sovereignty. Actually, a waiver of sovereign immunity is an exercise of sovereignty. The tribe is merely allowing a party to sue the Tribe in the event of default. The waiver can be limited in scope so that all that it put at risk is property or funds that are specifically identified in the waiver.

Uncertainty in Tribal Law

The single biggest risk perceived by developers is the uncertainties in what laws will apply in Indian country. Many of these uncertainties can be eliminated through the development of tribal laws that will either govern disputes that might arise during the project, or give the parties certainty in what remedies are available to deal with disputes. Some of the uncertainty can be eliminated by merely providing the business partners a copy of the tribe's law and order code, or taking them on a tour of tribal court so that can see that the tribe has a functional judicial system. With some education, potential business partners may come to realize that they would be better served by requiring that disputes be settled in tribal court rather than insisting they go to state or federal courts.

Choice of Law

The parties can lay out the choice of what law will apply in the event of default. Tribes are often reluctant to make any mention of state law when they deal with outside parties. However, in order to create certainty, it may prove beneficial to rely on particular bodies of state laws, such as contract laws, to govern interpretation and enforcement of documents. This does not mean that the state will be allowed to enforce its laws on the reservation; it only means that for purposes of settling disputes with business partners, state laws will be relied upon to interpret documents and settle disputes.

Legal Issues

Energy development on tribal lands involves a patchwork of jurisdictional issues. The more certainty that can be brought to a project — through the adoption of tribal laws, for instance — the easier it will be to encourage developers and financiers to do business with your tribe.

Following are some of the tribal, federal and state law issues that can arise when developing energy projects. Of course, jurisdictional issues vary with each tribe, so the following issues are not intended to address them all, but rather to identify those that often arise. Tribes should consult with their legal advisers before any project is undertaken.

- Tribal Legal Issues
- Federal Legal Issues
- State Legal Issues

Tribal Legal Issues

Utility or Enterprise?

Your tribe should first decide whether the project will serve as a profit-making enterprise or as a governmental function of the tribe. Tribes that have obtained a corporate charter from the U.S. Department of the Interior under Section 17 of the Indian Reorganization Act, 25 U.S.C. § 477, may decide to build and operate the project under the corporation. Your tribe could also form a corporation chartered under tribal law, if the tribe's constitution allows it.

Your tribe might also decide to build and operate the project as a public service under the tribal government, such as a tribal utility. This may require a tribal utility code. The tribe's governing constitution or corporate charter will determine what steps must be taken to properly authorize the project, depending on whether it is to be a business or a governmental entity.

Tribal Code

New tribal laws may be needed to govern financing arrangements and development contracts. For these business relations, the tribe may decide to adopt a lease mortgage ordinance and an arbitration code. Some tribes have adopted noninterference codes, which restrict the ability of the tribe to adopt laws that would change the contractual relationship with developers and financiers. The tribe may also want to adopt environmental protection laws, cultural resource protection laws, building codes and worker safety laws, all of which will govern construction and operation of the project facilities.

States have developed extensive bodies of law surrounding the interpretation and enforcement of contracts. The tribe may want to consider a brief code that refers to state law in situations in which the tribal court interprets and enforces contract disputes. Reliance on state contract laws could be limited so that their application does not conflict with tribal laws, customs and traditions. The contract documents can also refer to state contract laws that would be used by an arbitrator or the tribal court to settle contract disputes.

Federal Legal Issues

Environmental Protection

The Environmental Protection Agency (EPA) includes an American Indian Environmental Office that has primary jurisdiction to enforce environmental protection laws on Indian reservations. If the project involves the discharge of any pollutants into the environment, federal permitting may be required. Under the Clean Water Act and the Clean Air Act, tribes can assume responsibility to adopt their own water or air quality standards for their reservations. However, this can be a lengthy and burdensome process, and project development should not be contingent on the tribe securing that authority.

Cultural Resource Protection

The National Historic Preservation Act (NHPA), the Archeological Resource Protection Act (ARPA) and the Native American Graves Protection and Repatriation Act (NAGPRA) apply on reservation lands. Tribes can assume the federal enforcement functions under the NHPA and appoint a Tribal Historic Preservation Officer. Any project requiring a federal permit or approval must have cultural resource clearance.

Rights of Way or Leases

If the project requires any rights of way or leasing of Indian lands, federal law requires that the Bureau of Indian Affairs (BIA) must approve those arrangements. Failure to follow the strict requirements of these laws will result in a finding that the facilities are in trespass. Security arrangements for financing that encumber trust or restricted lands for seven years or more will also require BIA approval.

Taxation

Income derived from Section 17 chartered corporations is tax exempt. However, recent policy of the Internal Revenue Service (IRS) calls for closer scrutiny of corporations chartered under tribal law (in order for the income of the corporation to remain tax exempt). Tribes should never use state laws to form their business enterprise. The IRS treats income from those businesses as taxable. For a good summary of these rules, see the IRS Website for Indian Tribal Governments.

State Legal Issues

Taxation

States may not impose taxes on tribes or tribal members doing business on reservations. If the tribe's project involves the delivery of goods or services, arrangements should be made to have those goods or services delivered to the tribe on the reservation. Non-tribal or nonmember businesses are subject to state income and business taxes, even when operating on the reservation. Though tribes are generally exempt from workers compensation laws, federal laws governing contracts and grants usually require that some type of worker compensation protection be provided to employees. Tribes may self-insure or voluntarily participate in state programs. Contracts with outside parties should require some type of protection for workers. The same would apply to unemployment programs.

Building Codes

As a general rule, state regulatory laws do not apply on reservations. In some states, electric power companies will not connect service to new facilities until there has been a state inspection. Some states agree to conduct these inspections as a courtesy so that power may be connected. State building codes do not apply to construction on Indian lands. These codes are formatted under the Uniform Building Code (UBC). A tribe may consider adopting the UBC, or requiring compliance with the UBC in the construction documents. The tribe might also consider hiring a retired building inspector to monitor construction, and require that the cost be included in the bid as a construction cost.

A Guide to
Tribal Energy Development

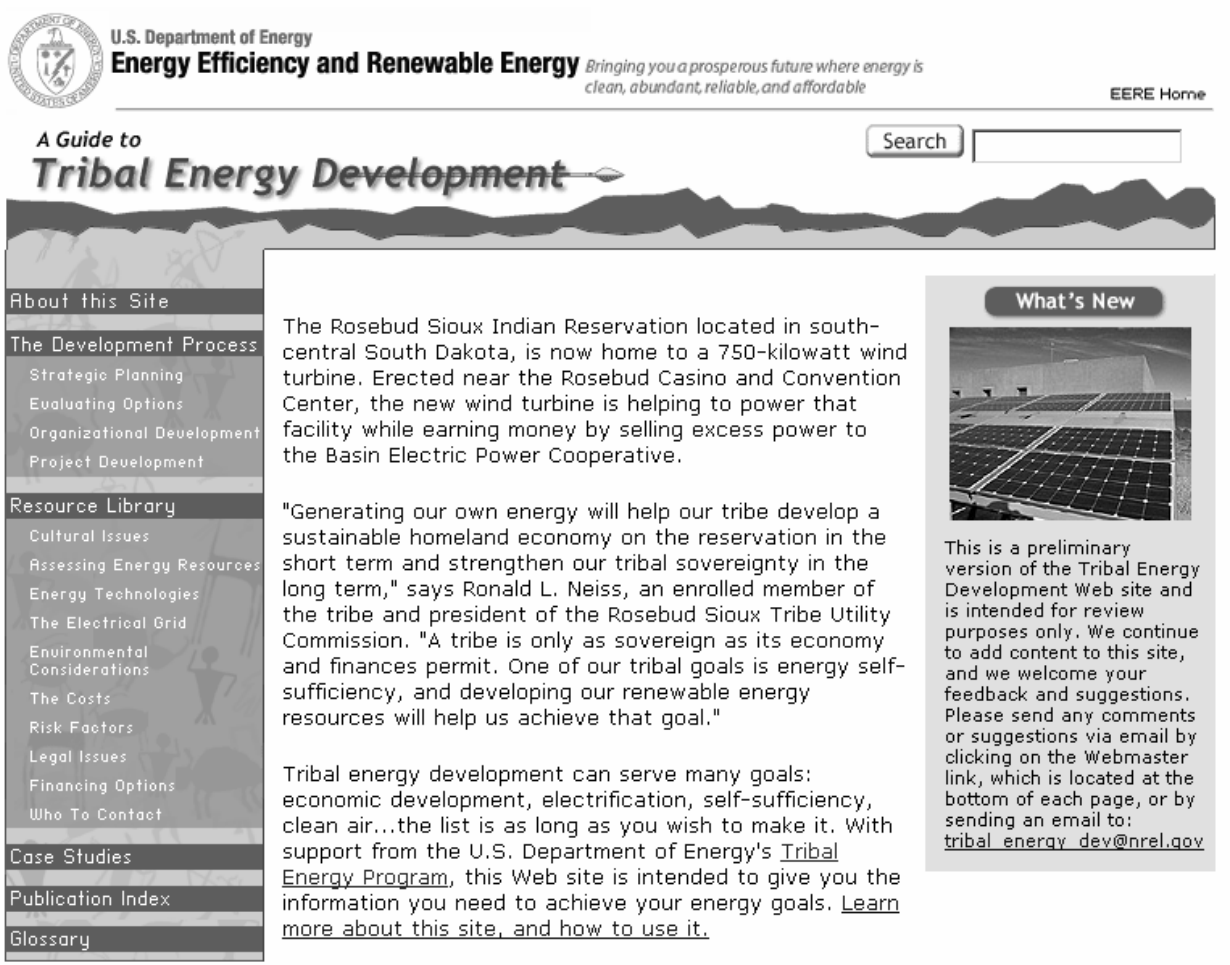
Financing Options

Who's Got The Money

Financing for a tribal energy project may come from a traditional source such as a bank or a government grant or, for renewable energy projects, could come through an innovative financing tool called "green tags." See below for more information about your tribe's financing options:

- Financial Institutions
- Government Grants
- Loans
- Green Tags

http://www.eere.energy.gov/power/tech_access/tribalenergy/guide/



Regional Workshops

In cooperation with CERT (earmark)

January 27-28	Mni Sose in Denver
March 16-18	All Indian Pueblo Council
April 6-8	Intertribal Council of Arizona
May 18-20	Oklahoma Tribes (may be 1 week later)
June 22-24	Affiliated Tribes of Northwest Indians
TBD	Mid-America
TBD	Nevada
TBD	MT-WY
TBD	Southern CA

Tribal Energy Regional Workshops
Draft Agenda

Day 1 (Tuesday)

8:45 am – 9:00 am	**Invocation** Tribal Elder
9:00 am – 9:15 am	**CERT Welcome** David Lester/Roger Fragua/Sonya Tehowski (as available)
9:15 am – 9:30 am	**Tribal Host Welcome** Host Tribe Remarks
9:30 am – 10:00 am	**State/Federal Welcome Remarks** DOE and/or State PUC Representative
10:00 am – 11:00 am	**Historical Context** Sonya Tehowski, CERT A review of the Opportunities and Barriers to Indian Energy Development
11:00 am – 12:00 pm	**Importance of Strategic Planning** Roger Taylor, Kevin Cooney Vision, Champion, Energy Fundamentals, Demand Side Options (Loads & Efficiency), Conventional & Renewable resource options, Technology options, Organizational options, Grid Connection, Economics, Environment, Cultural,
12:00 pm – 1:00 pm	**Lunch**
1:00 pm - 6:00 pm	**Opportunities and Barriers Facilitated Workshop (Professional Facilitation)**
1:00 pm – 2:30 pm	**Review of Identified Barriers to Energy Development and Tribal Input on Additional Barriers** Financing, Human capacity development, Organizational development, Tribal laws and regulations,
2:30 pm – 4:00 pm	**Review of Opportunities and Strategies to Seize Them** Tribal utility formation, Strategic industry partnerships, Tribal cooperatives, Education, Rights-of-way re-licensing, water rights,
4:00 pm – 6:00 pm	**Tribal Dialogue Session** Prioritize Needs, Training, and Technical Assistance Establish Next Steps
8:00 pm – 8:00 pm	**Reception**

Tribal Energy Regional Workshops
Draft Agenda

Day 2 – Facilitated Technical Workshops

8:00 am – 11:00 am	**Renewable Energy and Energy Efficiency** RE Resources (solar, wind, biomass, geothermal, hydro); RE Technologies (PV, wind, biomass, geothermal, hydro); EE Technologies (audits, appliances, HVAC, lighting, building envelope, windows); Weatherization program
11:00 am – 1:00 pm	**Power Generation, Transmission, Utility Formation** Conventional power options (steam turbines, gas turbines, engine/generators); Cogeneration; Transmission (access, interconnection, limitations, power purchase agreements); Utility formation (examples, pros & cons, legal requirements)
1:00 pm – 2:00 pm	**Lunch**
2:00 pm – 4:00 pm	**Regional Strategy as a Part of the National Tribal Picture (Optional/Concurrent)**
2:00 pm – 4:00 pm	**Fossil Fuels/Conventional Technologies (Optional/Concurrent)**

Tribes Only Facilitated Strategy Session, 2:00 – 4:00 (Concurrent Session)

Day 3 – Discussion and Follow-up

8:00 pm – 11:00 pm	**Where do we go from here for our region?** Recap of Day 1 Priorities: Region-specific technical and organizational discussion based on information, learning, issues, and opportunities raised during previous two days. Develop action-items and follow-up issues. Attempt to develop consensus on priority opportunities for region.
11:00 am – 1:00 pm	**Final Roundtable** All participants have an opportunity for a final statement. Comment on the workshop. What are the most important things that were not covered? What additional information is needed? What can CERT, DOE, others do to move the opportunities forward? Next Steps?

Tribal College – Teach the Teachers

Tribal College – Teach the Teachers

Workshop on Renewable Energy
National Renewable Energy Laboratory
July 12-16, 2004 – Golden, Colorado

Monday, July 12
Solar Electric
8:00 NREL Security Badging
8:30 Introductions and Overview of NREL and Renewable Energy
9:00 Solar Resource Assessment
10:00 Solar Electric Technologies (Photovoltaics)
11:00 Concentrating Solar Thermal Power
12:00 Lunch
1:30 *NREL Solar Facilities*
1:45 SERF Tour
2:30 OTF Tour
3:15 SERL Tour
4:00 Solar Electric Q&A
5:00 Return to Hotel

Tuesday, July 13
Wind Power
8:00 *Depart for NWTC*
8:45 Wind Resource Assessment
9:30 Large Utility-Scale Wind Power
10:30 Small Village-Scale and Application-Specific Wind Power
11:30 Hybrid Power Systems – Introduction
12:00 Lunch
1:30 Hybrid Power Systems – Computer-Based Options Analysis
2:30 NWTC Site Tour
- Dynamometer
- Blade Test
- Hybrid Test
- Small Systems
- Large Turbines

4:30 Return to Hotel

Wednesday, July 14
Buildings
8:30 Building Design
9:30 Energy-10 – Building Design Model
10:30 Building Integrated PV
11:15 Active Solar Heating & IPH
12:00 Lunch

Biomass
1:30 Biomass Systems – Resource Assessment
2:00 Bio-Thermal Power
3:00 Bio-Liquids
4:00 Fuel Cells and Hydrogen
5:00 Return to Hotel

Thursday, July 15
Bio Facility Tours
8:30 NREL Thermal Test Facility
9:15 NREL Alternative Fuels
10:00 Field Trip to Community Power Corporation (Small Modular Bio-Power Systems)
12:30 Lunch
2:00 **Geothermal Systems**
3:00 **Renewable Energy Policy Status**
4:00 **Strategic Planning & Project Development**
5:00 Return to Hotel

Friday, July 16
Tribal College Challenges
8:30 Tribal College Presentations
10:00 Facilitated Group Discussion
12:00 Lunch
1:30 PV Technician Accreditation and Certification
2:30 NREL Teacher Research & Sabbatical Opportunities
3:30 Depart for Airport
4:15 Arrive DIA

NREL
National Renewable Energy Laboratory

For further information contact:
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roger_taylor@nrel.gov