

Generating Electricity from Renewable Resources in Indian Country:

Recommendations to Tribal Leaders from the Western Regional Air Partnership

Prepared for

**Western Regional Air Partnership
Air Pollution Prevention Forum**

Prepared by



Northern Arizona University

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PREFACE

The primary purpose of this report is to assist tribes in developing renewable energy technologies in order to meet air quality and visibility goals established by the United States Environmental Protection Agency. The report, however, also will help tribal leaders identify opportunities to use these technologies to achieve economic development and energy related goals.

This report was written under the direction of the Sustainable Energy Solutions Group at Northern Arizona University under contract with the Western Governor's Association, for the Western Regional Air Partnership (WRAP) and is a companion to another WRAP report, "Recommendations of the Air Pollution Prevention Forum to Increase the Generation of Electricity from Renewable Resources" (the "State Report") (<http://www.wrapair.org/tribal/index.htm>). The State Report was written to assist states in the development of renewable energy strategies to meet air quality and visibility goals, and this report examines those issues from a tribal perspective.

The contributing authors to this report were:

Thomas L. Acker, Associate Professor, Mechanical Engineering
William M. Auberle, Professor, Civil and Environmental Engineering
Earl P.N. Duque, Associate Professor, Mechanical Engineering
William D. Jeffery, Adjunct Professor, Civil and Environmental Engineering
David R. LaRoche, Program Director, Center for Sustainable Environments
Virgil Masayesva, Director, Institute for Tribal Environmental Professionals
Dean H. Smith, Associate Professor, Economics and Applied Indigenous Studies

Northern Arizona University
P.O. Box 15600
Flagstaff, Arizona USA 86011-5600

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GENERATING ELECTRICITY FROM RENEWABLE ENERGY RESOURCES IN INDIAN COUNTRY: RECOMMENDATIONS TO TRIBAL LEADERS FROM THE WESTERN REGIONAL AIR PARTNERSHIP

EXECUTIVE SUMMARY

This report is the product of the Western Regional Air Partnership's Air Pollution Prevention Forum. The report is part of a decade-long effort to characterize the sources of visibility impairment in the national parks and wilderness areas of the West and to develop pollution control and prevention strategies to improve visibility throughout the region.

Why has this report been commissioned by the WRAP?

The Clean Air Act, as augmented by the 1990 amendments, established a national goal for improving visibility in national parks and wilderness areas. The Act authorized the creation of a commission (the Grand Canyon Visibility Transport Commission (GCVTC)) to examine the problem of visibility in the Grand Canyon (later expanded to include assessments of 15 additional national parks and wilderness areas in the West) and to recommend actions to protect and improve visibility in those areas. The Commission completed its work in 1996 with the publication of a report entitled: "Recommendations for Improving Western Vistas, 1996."

One of the key recommendations of the GCVTC report was to assess the potential impact of increasing the use of renewable energy resources for the generation of electricity as a way to reduce pollution from fossil-fueled power plants in the West. The Western

Regional Air Partnership (WRAP), as the successor organization to the GCVTC, has commissioned studies to assess the potential for the generation of electricity from renewable energy resources. An earlier study by the WRAP looked at renewable energy electric generation in the context of state implementation. This report focuses on renewable energy resources in Indian country and recommends policies and strategies for tribal leaders to consider in using renewable energy resources not only to reduce pollution but also as a means to assert tribal sovereignty and autonomy and to spur economic development on tribal lands.



Solar energy at Picuris Pueblo



Wind-Solar Hybrid Installation at Manzanita

How can tribal leaders use this report?

The intent of this report is to provide a resource for tribal leaders, tribal environmental professionals, tribal energy professionals, and tribal economic development specialists concerning renewable energy.

Recommendations are provided to tribal leaders regarding actions that may be taken to encourage tribal use and development of renewable energy. In support of these recommendations, baseline information describing renewable energy is presented, followed by a summary of tribal renewable energy projects, an assessment of tribal energy issues and perspectives, and an analysis of tribal renewable energy development. A broad array of potential actions a tribe might take to increase generation of electricity from renewable energy is provided, from which the recommendations to tribal leaders are drawn. Appendices included provide detailed information about renewable energy technologies and the costs and benefits of each, detailed tables and maps showing the extent to which renewable resources may be available on tribal lands in the WRAP region, and a list of relevant information sources.

What recommendations does this report make?

The results of some of the analytical and assessment work completed in this study indicate that, although many tribes have begun to develop strategies and programs to address environmental protection and air quality management, few tribes have begun to develop an energy-specific infrastructure. The recommendations provide suggestions about how tribes might implement new energy policies or expand their governmental infrastructures to take advantage of the renewable energy resources on their lands, both to reduce visibility-impairing pollution and to expand economic development in a way that most appropriately responds to the tribe's social, economic, and cultural values. From a whole array of potential actions a tribe may take, the recommendations in this report fall under four broad categories:

Tribal Sovereignty and Energy Independence

- Establish an energy authority that would have overall responsibility to develop and implement an energy strategy for the tribe.
- Initiate energy training and education programs to include consumer options and their impact on the environment.
- Develop renewable energy resources to supply tribal electricity needs, and to foster energy independence.
- Develop a tribal energy policy that incorporates specific provisions for renewable electric energy use or development.



Navajo-Hopi Solar Photovoltaic

Tribal Policy and Leadership

- Develop a Tribal Implementation Plan under the provisions of the Regional Haze Rule and the Tribal Authority Rule that commits the tribe to expanding its use of renewable energy in the generation and use of electricity.
- Expedite the permitting process for renewable energy projects on the reservation.
- Purchase electricity generated by renewable sources.

Tribal Economic Development

- Establish an independent Tribal Economic Development Corporation to foster the development of the tribe's renewable energy resources.
- Develop renewable energy resources to increase the availability of electrification for members and others on tribal lands, to improve reliability, and to increase employment opportunities for tribal members.

Multi-party Actions

- Tribes that do not possess sufficient resources to form their

own energy authority or economic development corporation might consider doing so in collaboration with other tribes.

- Consider creating partnerships with other tribes or independent power producers to develop renewable energy resources.
- Encourage actions by the federal government such as creating a national renewable portfolio standard, expanding procurement of green energy, including renewable energy in the "Buy Indian" policy, and increasing funding to programs such as the Energy Policy Act of 1992.

Based on these recommendations, what next steps can be taken?

Tribal leaders can pursue a number of actions to determine if the tribe ought to pursue any of these recommendations. These steps include:

- Assemble a team of tribal staff representing the environmental management, economic development, and the energy interests of the tribe.
- Assess the current energy situation on the reservation, including demand, sources, and consumption.
- Review the information provided in this report to determine the tribe's potential for developing its renewable energy resources.
- Develop a strategy and action plan to implement the most appropriate recommendations.

HOW TO USE THIS REPORT

A great deal of information has been assembled and presented in this report. As such, it could be a lengthy task to sit down and read it from cover-to-cover. Because it is expected that the readers of this report will have backgrounds varying from tribal leadership and management, to air quality management, to energy or utility expertise, to interested individual, each reader may want to pick and choose among the sections of the report. While there is continuity among the section of this report, it has been written in a manner that each section of the report can be read independent of the other sections. For example, a tribal leader may wish to read the Executive Summary and then skip to the Section IV of the report “Recommendations of the Western Regional Air Partnership’s Air Pollution Prevention Forum.” Alternatively, a project manager for the tribe may wish to learn more about the renewable energy technology and renewable energy resources, and focus on reading Appendices B and C: “Renewable Energy Systems and Resources” and “Renewable Energy Resource Maps.” To assist in the process of selecting the relevant portions of the report to read, a brief description of each major section of the report is listed below:

- ***Introduction***
 - Describes the background of the Western Regional Air Partnership, and its motivation in creating this report.
 - Presents the most relevant statutory and regulatory provisions that apply to controlling visibility impairing sources of air pollution, and highlights the role of tribal governments in implementing those statutory and regulatory provisions.
 - Summarizes previous steps states, tribes, and others have taken to identify and control these sources of air pollution.
- ***I. Baseline Information***
 - Provides a definition describing what energy resources and systems are considered to be “renewable energy.”
 - Provide some details concerning the type of electricity and renewable energy information that is required in a Tribal Implementation Plan.
- ***II. Tribal Energy Issues and Perspectives***
 - Provides information and references that describe renewable energy projects completed and ongoing on Native American lands.
 - Identifies current tribal energy perspectives.
 - Analyzes the issues relevant to tribal development of renewable energy.
- ***III. Potential Actions to Increase the Generation of Electricity from Renewable Resources –***
 - Identifies potential actions tribes may take themselves to increase the

generation of electricity from renewable resources.

- Identifies potential actions tribes may take in collaboration with others to increase the generation of electricity from renewable resources.
- ***IV. Recommendations of the Western Regional Air Partnership’s Air Pollution Prevention Forum***
 - Of the potential actions identified in the previous section, this section presents selected actions that are recommended to tribes. Note, it is not necessary to read the previous section prior to reading this section.
- ***Appendix A: Fact Sheet: Final Regional Haze Regulations for Protection of Visibility in National Parks and Wilderness Areas*** – Provides an overview of the important aspects of the Regional Haze Rule
- ***Appendix B: Renewable Energy Systems and Resources***
 - Describes the pertinent renewable energy conversion techniques (solar, wind, geothermal, biomass, and low-impact hydro).
 - Provides a tribe-by-tribe summary of the renewable energy resources available on Indian lands.
- ***Appendix C: Renewable Energy Resource Maps*** – Provides maps displaying the renewable resources available to tribes within the WRAP region (solar, wind, biomass and geothermal).
- ***Appendix D: Information Sources*** – Provides references and contact information for those seeking more information on the following topics:
 - Renewable Energy Contact Information
 - Laws and Regulations
 - TIP Guidance
 - Western Regional Air Partnership
 - Economic Development Bibliography
- ***Appendix E: WRAP Tribes*** – A listing of the tribes located in the geographical region within the purview of the Western Regional Air Partnership

INTRODUCTION

Like most Americans, renewable energy advocates and businesspeople often know little about American Indian people and their communities. . . . Yet renewable energy can meet several needs in Indian Country. These needs include rural electrification, economic development, environmental protection, and expression of a broadly defined but deeply held commitment by many Indian people to balance relationships among the natural world and human beings, including future generations.

Suagee, 1998

The Western Regional Air Partnership's Air Pollution Prevention Forum has produced this report as part of a decade-long effort to characterize the sources of visibility impairment in the national parks and wilderness areas of the West, and to develop pollution control and prevention strategies to improve visibility throughout the region. This Introduction to the report:

- Describes the most relevant statutory and regulatory provisions that apply to these sources of air pollution.
- Highlights the role of tribal governments in implementing those provisions.
- Summarizes previous steps states, tribes, and others have taken to identify and control these sources of air pollution.

STATUTORY AND REGULATORY PROVISIONS

VISIBILITY

Amendments to the Clean Air Act in 1977 first identified the importance of protecting important vistas in the United States. That law contained requirements that could be used to impose limitations on sources of air pollution impairing visibility at those vistas.

The 1990 amendments to the Clean Air Act increased the focus on these visibility problems by authorizing regional commissions to develop recommendations to the United States Environmental Protection Agency (EPA) for programs to address the problem of regional haze. The amendments also specifically created a Grand Canyon Visibility Transport Commission (GCVTC) to make recommendations on how to protect visibility in the region affecting the Grand Canyon National Park.

TRIBAL GOVERNMENTS

A landmark provision of the Clean Air Act amendments of 1990 also addressed the role of tribal governments in air quality management. Although the original 1970 Clean Air Act had been very clear that States were to be important partners with EPA in implementing the

federal air pollution control requirements, it was silent on what roles, if any, tribal governments would play in implementing the federal requirements.

In 1977 Congress added a provision to the Clean Air Act that authorized tribal governments to be more protective of their air quality in certain, very limited circumstances. More importantly, in 1990 Congress added three new provisions to the Clean Air Act that:

- Authorized the EPA's administrator to treat tribes as states for the purpose of implementing the Act.
- Defined the eligibility criteria for tribes to obtain such treatment.
- Directed the administrator to promulgate regulations laying out those provisions of the act for which it is appropriate to treat tribes as states.

It was not until February of 1998, however, that the EPA administrator promulgated regulations that established the basic framework under which eligible tribes are authorized to implement Clean Air Act programs. These regulations, commonly known as the Tribal Authority Rule (TAR), address a number of issues related to tribal program implementation. (63 Fed.Reg. 7254-7274, codified at 40 CFR Part 49)

- Eligible tribes may implement Clean Air Act programs to protect air resources “within the exterior boundaries of the reservation or other areas within the tribe’s jurisdiction” (Section 301(d)(2)(B)). This means that eligible tribes have authority to regulate all sources of air pollution within the exterior boundaries of the reservation, including those on non-Indian-owned fee land within the reservation.
- Tribes generally are exempt from statutory deadlines and the sanctions imposed for failure to meet those deadlines. Development of tribal plans to implement provisions of the Clean Air Act, therefore, will occur over an extended period without a specific deadline or deadlines.
- Finally, the TAR provides a great deal of flexibility to tribes in developing their air quality management programs. The Clean Air Act, in fact, does not require any action on the part of tribes to implement any provision of that law. To encourage tribes to consider developing air quality management programs, however, the TAR adopts a modular approach to tribal program implementation that recognizes that tribes can build their technical and management capacity incrementally at the same time they begin to address concerns unique to their situations. Through this modular approach:
 - Tribes can pick and choose among Clean Air Act provisions to craft a program that addresses the tribe’s specific air quality concerns.
 - The EPA can approve these modular programs provided that they do not depend on any other program element for enforceability.
 - To encourage tribes to develop such programs or program elements, grants are available from the EPA pursuant to Sections 103 and 105 of the Clean Air Act.

GRAND CANYON VISIBILITY TRANSPORT COMMISSION

The GCVTC created by the 1990 Clean Air Act Amendments quickly agreed to address regional haze at 15 National Parks, Monuments, and Wilderness Areas on the Colorado Plateau in addition to Grand Canyon National Park. By 1994 EPA had expanded the membership in the GCVTC to include the governors of eight western states, leaders of four tribal governments, and representatives of four federal land management agencies, plus a representative of EPA and the chair of the Columbia River Intertribal Fish Commission as ex officio members.

The GCVTC undertook an extensive analysis of the causes of regional haze affecting the targeted national parks and wilderness areas, evaluated potential strategies for mitigating these effects, and developed recommendations to the EPA Administrator in its report, "Recommendations for Improving Western Vistas, 1996" (GCVTC Report). Nine broad recommendations, plus many specific ones, are set forth in the GCVTC report. Two of these recommendations are directly relevant to this report.

- One recommendation called for the creation of "an entity like the Commission to oversee, promote, and support many of the recommendations."
- A second recommendation advocated "policies based on energy conservation, increased energy efficiency and promotion of the use of renewable resources for energy production."

WESTERN REGIONAL AIR PARTNERSHIP

In 1997, an "entity like the Commission" was created in response to the specific GCVTC recommendation to do so. This entity is the Western Regional Air Partnership (WRAP). Its charge is to implement recommendations of the GCVTC as well as to address broader air quality issues that affect the West. The composition of the WRAP, and its role in Western air quality planning, has expanded beyond that of the original GCVTC. Current WRAP membership consists of representatives of 13 Western states, a corresponding number of tribal government representatives from throughout the West, the U.S. Departments of Agriculture and the Interior, and ex officio participation by the U.S. Environmental Protection Agency.

AIR POLLUTION PREVENTION FORUM

The WRAP created numerous stakeholder-based committees and forums to carry out its responsibilities. One such forum is the Air Pollution Prevention (AP2) Forum, created by the WRAP "to examine barriers to use of renewable energy and energy efficient technologies, identify actions to overcome such barriers, and recommend potential renewable energy and energy efficiency programs and policies that could result in a reduction of air emissions from energy production and energy end-use sectors in the Grand Canyon Visibility Transport Region."

One specific charge to the AP2 Forum was to develop recommendations for achieving the GCVTC's "10/20 goal." That goal calls for states in the GCVTC region to increase the

use of renewable resources to meet the region's electricity needs produced so that the portion of electricity coming from renewable resources would increase to 10 percent by 2005 and to 20 percent by 2015. Although the GCVTC made this recommendation because it would reduce air pollution, tribal participants also noted that "Western reservations are prominent within prime solar and wind energy resource areas" and "clearly ... renewable energy development will have great added value to tribal governments."

MARKET TRADING FORUM

Another important WRAP forum is the Market Trading Forum (MTF), charged with implementing the GCVTC's stationary source recommendations. These require the establishment of regional sulfur dioxide (SO₂) milestones that would be met through:

- Adoption of voluntary measures
- Retirement of older sources over time
- Implementation of other Clean Air Act requirements.

The milestones proposed by the MTF establish the goal of significantly reducing SO₂ emissions from large industrial sources over the next two decades.

If regional emissions exceed the milestones, then a backstop emission trading program would be implemented to ensure that the environmental goals were met. As proposed by the MTF, the backstop emission trading program would have provisions for allocation of SO₂ emission credits specifically set aside for use by tribes, and for allocation of SO₂ emission credits for eligible renewable energy sources.

A detailed discussion of the MTF's proposal is beyond the scope of this report, but more information can be found at the WRAP Web site (<http://www.wrapair.org/>). Briefly, though, the MTF's proposed backstop emission trading program for SO₂ emissions is known as a "cap-and-trade" program.

- The "cap" is the total allowable SO₂ emissions from stationary sources in the region.
- The regional cap would decline over time.
- The total allowable emissions are allocated among existing and new stationary sources within the region according to an allocation methodology discussed in detail at the WRAP Web site.
- The total amount of SO₂ from any source cannot exceed the number of emission credits that source possesses.
- If insufficient credits are possessed, the source must either reduce its emissions or purchase ("trade") additional credits to make up the difference from other sources that have extra credits they do not need for their own emissions.

The proposed cap-and-trade program would, in effect, put a monetary value on emissions, which would narrow the cost differential between renewable technologies that do not emit SO₂ and fossil fuel-fired technologies that do emit SO₂. A program that also allocates additional emission credits to renewable resources, as proposed by the MTF, would

further reduce this cost differential (Western Regional Air Partnership 2000).

The MTF has recommended that the cap-and-trade program also include a special allocation of SO₂ emission credits that is set aside solely for use by tribes, to be used however they choose. Tribes could choose to make some of this allocation available to renewable energy projects on tribal lands, which would reduce the cost differential even more and could potentially create an economic incentive to encourage a renewable energy project to locate on tribal lands rather than state lands.

REGIONAL HAZE RULE

In 1999, EPA issued the national regional haze rule (RHR). (64 Fed.Reg. 35714-35774, codified at 40 CFR 51.300-309). Although the RHR has provisions that apply to all states and tribes in the United States, one provision of the RHR embraces the recommendations of the GCVTC and offers states in that region the option of complying with the RHR requirements by developing implementation plans to achieve the goals set forth by the GCVTC and later by the EPA. States can choose to comply with the general requirements of the RHR or, as an alternative, to comply with the specific requirements for the GCVTC region.

The RHR sets forth timetables for states to submit these plans. The EPA also has issued a useful fact sheet explaining its “Final Regional Haze Regulations for Protection of Visibility in National Parks and Wilderness Areas” (see Appendix A).

The requirements of the RHR are among the air quality programs that can be implemented by tribal governments, including those in the GCVTC Region, after they have received authorization from the EPA. Tribal governments in the GCVTC Region refers to tribes located in Arizona, California, Colorado, Idaho, Nevada, New Mexico, Oregon, Utah, and Wyoming.

These tribes may seek approval from the EPA to implement the regional haze program through tribal implementation plans (TIPs) developed under the provisions of the TAR discussed previously. The deadlines imposed on states by the RHR do not apply to tribes, but tribes may choose to implement programs consistent with the spirit of the Western Regional Air Partnership. Where tribes choose not to take on this responsibility, the EPA must assure air quality protection on tribal lands by taking appropriate actions to implement the regional haze program requirements, including possible development of a federal implementation plan (FIP).

The EPA has encouraged tribes to submit TIPs by the specified deadlines so the plans can be integrated and coordinated with the regional planning efforts. In the interim the EPA is committed to working with the states and tribes to ensure that achievement of reasonable progress toward visibility protection is not delayed.

ELECTRICITY GENERATION AND REGIONAL HAZE

The Technical Committee of the GCVTC has prepared the most comprehensive estimations of the causes of regional haze in the West.

- These analyses estimated in part that “utilities” in the West, in 1990, contributed approximately 17 percent of the “human-caused extinction on an annual average at Hopi Point” in Grand Canyon National Park.
- The remaining 83 percent comes from a variety of sources including road dust, mobile sources, and sources in Mexico.

On any given day this relative contribution from the various sources may be more or less. Similarly, this projection is for only one location at Grand Canyon National Park and may be more or less at other locations. To improve and expand on the GCVTC work, the WRAP created a Technical Oversight Committee and several topical forums. This committee and its forums continue to refine and update the GCVTC analyses regarding the visibility impacts of selected source sectors, including utilities.

The contributions to regional haze from the generation of electricity are attributed principally to three forms of pollutants in the atmosphere:

- Sulfates
- Nitrates
- Organic compounds

These atmospheric pollutants can be traced to waste byproducts that are emitted into the atmosphere whenever fossil fuels such as coal, oil, and natural gas are burned.

Among these three forms of air pollutants, the most significant to visibility impairment is sulfates. Sulfates are formed in the atmosphere from sulfur oxides so large sources of sulfur oxides, such as coal-burning electric generating stations, merited special attention by the GCVTC. Consequently, the Market Trading Forum and the Air Pollution Prevention Forum were charged with developing strategies to reduce emissions from these sources. This report is one element of that effort.

I. BASELINE INFORMATION

The Introduction described why this report has been written and how it is related to implementation of the Regional Haze Rule (RHR). Tribes may be interested in creating tribal implementation plans (TIPs) to improve air quality and visibility on Indian lands, as well as to pursue other tribal goals such as improved economic conditions or strengthened tribal sovereignty. Some of these tribes also may choose to encourage renewable energy as one part of a comprehensive strategy to pursue those goals.

The purposes of this Baseline Information section are as follows:

- To provide a definition describing what energy resources and systems are considered to be “renewable energy.”
- To provide more details concerning the type of electricity and renewable energy information that is required in a TIP.

Beyond this baseline information, tribes may also have numerous questions about the types of renewable energy systems that are available, the approximate cost-of-energy from each type of system, and whether or not the tribal lands possess the renewable resources necessary to practically implement these systems. Information addressing these questions has been supplied in Appendices B and C.

DEFINITION OF RENEWABLE ENERGY

Varying definitions for renewable energy have been adopted in legislation by several Western states. The Regional Haze Rule provides for a regional approach to reducing air pollution by increasing the use of renewable technologies to produce energy. Such a regional approach requires that the work of the WRAP AP2 Forum be conducted utilizing a uniform definition of what constitutes “renewable energy.” The Forum examined definitions developed by several Western states, and included a summary of these in Appendix B of the State Report (Western Regional Air Partnership 2000). The AP2 Forum used the following definition of renewable energy.

“Renewable energy” means electricity generated by non-nuclear and non-fossil low or no air emission technologies using resources that are virtually inexhaustible, reduce haze, and are environmentally beneficial. The term includes electricity generated by wind energy technologies; solar photovoltaic and solar thermal technologies; geothermal technologies; technologies based on landfill gas and biomass sources, and new low-impact hydropower that meet the Low-Impact Hydropower Institute criteria. Biomass includes agricultural, food and wood wastes. The term does not include pumped storage or biomass from municipal solid

waste, black liquor or treated wood.

There are a few important points to note about this definition:

- The focus is on the use of renewable resources for the production of electricity.
- The biomass sources that are excluded are generally not clean burning and will not help reduce haze.
- Pumped storage refers to power plants that use non-renewable resources (e.g., fossil fuels) to pump water to a storage facility. The stored water is then released later (such as when electricity demand is the greatest) through a hydroelectric turbine that converts the stored potential energy in the water to electricity.

TRIBAL IMPLEMENTATION PLANS

As discussed in the Introduction, the RHR presents two possible approaches for tribes and states to follow in addressing the problem of regional haze. One approach described in RHR Section 51.308 applies to all states and tribes both within and outside of the GCVTC region, and involves use of “best available retrofit technology” (BART). The other approach, which is presented in RHR Section 51.309, offers states and tribes in the GCVTC region an alternative method of reducing haze that includes employment of renewable energy and energy efficiency (US EPA 1999).

Under this alternative approach, tribes have the option of creating a TIP that contains information indicating the methods and programs by which tribes will address visibility problems and regional haze using the recommendations of the GCVTC and the WRAP. Similarly, state governments choosing this approach will be creating state implementation plans (SIPs) using those recommendations to address regional haze.

One component of a SIP developed under Section 51.309 must address pollution prevention programs, and in particular the renewable energy and energy efficiency programs to be implemented. The type of information concerning renewable energy and energy efficiency that states are required to include in a SIP is defined in Section 51.309(d)(8) of the RHR. Section 51.309(d)(12) makes clear that tribes in the GCVTC region can choose to comply with the requirements of Section 51.309 in the same manner as states regardless of whether a tribe participated as a member of the GCVTC.

Tribes may create a TIP in the same manner as states, including all of the same type of information that is required in a SIP. However, the programs that tribes choose to implement may be entirely different than those chosen by the state or states in which the tribe is located because of the Tribal Authority Rule. Furthermore, tribes may act entirely independently, or in collaboration with other tribes or states. To clarify what tribes may want to include in a TIP, a summary of the guidelines presented in RHR Section 51.309(d)(8) is presented below.

The WRAP State Report (Western Regional Air Partnership 2000) describes in detail what information pertaining to renewable energy is required in a SIP and may be included by tribes in a TIP (see Section I, Baseline Information, of the State Report). These items can be condensed as summarized in the list below:

1. Establish the baseline electrical energy profile for your tribe, including electricity

generation capacity and production, and the amount of electricity derived from renewable resources. Also, summarize all pollution prevention programs currently in place.

2. Devise a plan for the tribe to contribute toward the GCVTC's goal that renewables comprise 10 percent of regional power needs by 2005 and 20 percent by 2015.
3. Demonstrate progress toward achieving the renewable energy goal set forth in the tribal implementation plan.

A more in-depth description of the first two of these items is provided below. It should be noted, however, that these three items are merely the components of a TIP related to renewable energy, and that creation of a TIP will be a complex process requiring much more information (as described in the RHR) and significant effort on the part of the tribe. For more information about how to create a TIP, refer to the "TIP Guidance" section of Appendix D.

BASELINE ELECTRICAL ENERGY PROFILE

Concerning the renewable energy portion of a TIP, it is necessary to define the baseline electrical energy profile for the tribe. This profile should include the following information:

- Inventory of *total current and expected electricity generation capacity and production* on tribal land through 2002, expressed in megawatts (MW) and megawatt-hours (MWh), respectively, from all resources.
- Inventory of *renewable energy electricity generation capacity and production* on tribal land through 2002 (expressed in megawatts and megawatt-hours).
- The percentage of total electricity generation capacity and production due to renewable energy.

Electrical generation capacity refers to the total power output of all electricity generation facilities if running at their rated capacity. For instance, the capacity of a power plant capable of producing a maximum of 250 MW has a generating capacity of 250 MW. Electricity production is the amount of electrical energy output by a power plant in a given year. For example, if a 250 MW power plant runs at 100 percent of its rated capacity for one full year, its electrical energy production would be $(250 \text{ MW})(365 \text{ days/year})(24 \text{ hours/day}) = 2,190,000 \text{ MWh}$. If the power plant were to run at 50 percent of its rated capacity for the entire year then the production would be $(0.5)(2,190,000 \text{ MWh}) = 1,095,000 \text{ MWh}$.

Electrical generating capacity and production information should be obtained for all electricity generating facilities (renewable and non-renewable resources). The percentages of generation capacity and production derived from renewable resources (the third item in the list above) are then computed simply by dividing the electricity generation capacity and production derived by renewable resources by the total electricity generation capacity and production, respectively. For the purposes of a TIP, the official definition of what counts as a renewable energy resource was provided earlier in this section of the report.

When counting electrical generation capacity and production for the baseline energy profile, there are three scenarios that tribes may consider:

- *No electrical generating facilities on tribal lands.* In this case, defining the baseline energy profile will simply require stating that there is no electrical generating capacity or production on tribal lands and answer zero to the three items in the list above.
- *Tribally owned electrical generation facilities located on tribal lands.* All of these facilities should be included in accounting the capacity and production of electricity.
- *Non-tribally owned electrical generation facilities are located on tribal lands.* The RHR is not clear about whether or not a tribe will be responsible for including these facilities in its accounting process (and TIP). The EPA should be consulted on a case-by-case basis concerning this problem.

PLANS FOR ELECTRICITY GENERATION

In the future, it is likely that tribes may add electrical generation capacity, especially as they move toward energy independence and as they consider sale of electricity on the deregulated electrical power market. For tribes wishing to sell electricity, it is especially important that those generation plans be devised in a manner consistent with air quality goals.

Creation of a TIP is the most direct way to coordinate electricity generation and air quality planning. The process of developing a TIP will require joint planning between tribal personnel responsible for environmental programs (air quality) and personnel responsible for tribal energy programs.

It is entirely possible that a tribe may not have personnel responsible for either of these positions, in which case they it would be important to designate a person(s) as responsible, or hire a professional(s). Funding to support the development of tribal air programs, including development of a TIP, is available through the EPA. Tribes considering development of a TIP under the RHR and not currently receiving funding from the EPA should consider contacting the EPA regional office for further guidance.

There are two basic scenarios for tribes interested in, or actively involved in, electricity generation:

- 1) Electricity generation for tribal use.
- 2) Electricity generation for sale on the competitive electric market.

Tribes seeking to add electricity generation for tribal use or to achieve energy independence (with or without existing generating capacity) will likely want to assess their electrical energy consumption. There are a number of sources for this type of information.

- If a tribe has an energy office or tribal utility authority, this information may be readily accessible within the tribal government.
- For tribes without a central office or agency in charge of energy (electricity) issues, the tribe may contact the current electric service provider(s) for electricity consumption information. Information of this type may also be available from a tribal housing authority. Another source worth consulting is a publication by the Energy Information Administration (2000). That report provides some information

concerning consumption of energy on Indian lands, based on 1990 census data, but may not be as accurate as data from the current service provider. Tribes may also be able to obtain consumption data directly from 2000 census data when such becomes available.

- With current consumption information in hand, the tribe may want to project anticipated growth in electricity consumption, perhaps in conjunction with tribal planning entities, housing authorities, or economic development offices. Together, the actual and anticipated electricity usage provides a basis for the tribe to plan future electricity generation capacity.

For tribes seeking to sell electricity on the open market, internal consumption data is not as important as information about the electricity market and how to participate in the generation and sale of electricity. This will require economic and resource planning, and possibly interaction with agencies such as the Federal Energy Regulatory Committee (FERC), the U.S. Department of Energy (DOE), the Council of Energy Resource Tribes (CERT), and State Corporation (or Utility) Commissions. Contact information for these agencies as well as some others are listed in Appendix D, Information Sources.

Within these scenarios for tribal development of electricity generation capacity, there will be a wide range of potential applications.

- For some tribes, adding generation may mean adding a large generation plant (in excess of 100 MW).
- Some tribes may set up a small village-scale mini-grid electricity system.
- Others tribes may add small, stand-alone energy systems to individual buildings.

However, regardless of the motivation for adding electrical generation capacity, information about the projected generating capacity and production by the tribe will be needed in the TIP. This information will establish a baseline stating where the tribe stands with respect to electricity generation, where it seeks to go, and how renewable resources fit into the implementation plan.

Adding generating capacity will require an assessment of the energy resources available to the tribe. Tribes considering the use of renewable energy will likely want to know:

- The type and magnitude of renewable resources available for development.
- The economic feasibility of developing these resources.
- Whether the resource will meet tribal electrical needs.
- How use of the resources will contribute to enhancing visibility and keeping the air clean.

To assist in answering these questions, a description of the various types of renewable energy systems (for electricity generation) is presented in Appendix B, including information indicating how a tribe can assess its available renewable energy resources. Although the focus of this report is on electricity generation from renewable resources, it is worth noting that renewable energy systems can also be used for non-electrical applications such as space heating or cooling and water heating.

II. TRIBAL ENERGY ISSUES AND PERSPECTIVES

RENEWABLE ENERGY PROJECTS ON NATIVE AMERICAN LANDS

Thus far in this report, information has been presented describing what might be in a TIP related to renewable energy. Details of the various renewable energy resources, energy conversion techniques, and a summary of renewable energy resources available on Indian lands are provided in Appendix B, and maps displaying the renewable resources available to tribes within the WRAP region in Appendix C. The purpose of this section is:

- To provide information and references that describe renewable energy projects completed and ongoing on Native American lands.
- To identify current tribal energy perspectives.
- To analyze issues relevant to tribal development of renewable energy.

Native Americans have been using renewable energy from at least as long ago as when inhabitants of the cliff dwellings at Mesa Verde (in Colorado) used passive solar to heat their dwellings in the winter months, but were shaded from the summer heat by overhanging cliffs during the summer months. Today Native American tribes continue to use renewable energy for many applications beyond simply heating their homes, and many of these applications involve the generation of electricity.

The accumulated experiences of Native American tribes in developing renewable energy can be a valuable resource for future projects, enhancing the opportunity for success. There is inherent value in learning how previous projects were financed, whether they were successful, and what the associated cultural and economic impacts were.

Native American renewable energy projects have been funded from many different sources, starting with private funds or tribal funds, and extending to private investors or funds from the U.S. federal government. Table 1 lists some of the many organizations that may provide either funding or technical assistance for renewable energy projects.

One notable source of funding for tribal renewable energy projects has been the Department of Energy through Title 26 of the 1992 Energy Policy Act, titled “Indian Energy Resources.” Funding from this source has been made available to Native American tribes for more than 50 renewable energy and energy efficiency projects through 1999.

Two recent papers describing some of these projects are “Using Renewable Energy on Native American Lands,” by Council et al. (2000), and “American Indian Reservations: A Showplace for Renewable Energy,” by Sargent and Chabot (1996). A list of all projects funded through Title 26 is provided in Appendix A of the Energy Information Agency’s report “Energy Consumption and Renewable Energy Development Potential on Indian

Table 1 – Some organizations that may fund or provide technical assistance for renewable energy projects.

Administration for Native Americans (ANA)
Bureau of Indian Affairs (BIA)
Council of Energy Resource Tribes (CERT)
Economic Development Administration (EDA)
Indian Health Services (IHS)
National Renewable Energy Laboratory (NREL)
Office of Indian Programs, U.S. HUD
Sandia National Laboratories
U.S. Department of Energy (DOE)

Lands” (2000). Funding for Title 26 programs is ongoing; information can be found by contacting the U.S. Department of Energy Golden Field Office (Golden, Colorado; <http://www.golden.doe.gov/index.html>). Another valuable source of information about tribal renewable energy projects is the Sandia National Laboratories publication “The Solar Way” (2001).

One requirement of publicly funded projects such as the Title 26 projects is that details describing the renewable energy project are made publicly available. The papers cited above are good examples. An excellent source for information about Native American renewable energy projects, energy efficiency projects, and renewable energy technologies is the “Indian Sustainable Energy News” available at the Native American Renewable Energy Education Project (NAREEP; <http://eande.llbl.gov/CBS/nareep/>).

For a summary of many different Native American renewable energy projects conducted in California, see the California Energy Extensions Service (CEES) publication “Renewable Energy: Native to California” (1991). This publication not only describes the projects, but also provides some discussion of the barriers encountered by the tribes. In addition to the project descriptions, the CEES report also contains valuable information about renewable energy project development. Another valuable resource that discusses project development and financing is “Native Power” published by NAREEP (1998). An excellent summary of solar project on Native American lands is provided in “The Solar Way” (Sandia 2001).

To demonstrate the breadth of renewable energy projects undertaken by Native American tribes, a few recent projects are listed below:

- Wind – The Rosebud Sioux Tribe in South Dakota plans to install a 750 kW (utility-grade) wind turbine to help supply the electrical needs of the Rosebud Casino and Convention Center (Council *et. al.* 2000).
- Solar – The Hualapai Tribe in Arizona, the Ute Mountain Ute Tribe in Colorado and

New Mexico, and many other tribes have long used solar photovoltaics for water pumping applications (Sandia 2001). The Salish and Kootenai Tribe implemented an innovative application of solar PV in 1993 when they provided power to a TV translator station located in a remote region of Montana not near power lines (Sandia 2001).

- Biomass – The White Mountain Apache Tribe in Arizona undertook a feasibility study of a biomass co-generation system. Logging waste from the tribe's Fort Apache Timber Company would be used as the biomass fuel source (Sargent and Chabot 1996).
- Hydropower – The Jicarilla Apache Tribe in New Mexico was awarded Title 26 funding to perform a technical and economic feasibility study for a hydroelectric generating plant on tribal land (Sargent and Chabot 1996).
- Hybrid Power System – The Manzanita Band of Mission Indians in California will install a hybrid photovoltaic–wind power system on one of their community buildings (Council *et. al.* 2000).
- Information about many non-native renewable energy projects can be found at the Renewable Electric Plant Information System Web site (<http://www.eren.doe.gov/repis>).

CURRENT TRIBAL ENERGY PERSPECTIVES

In order to formulate a set of recommended actions for tribes to consider in developing their renewable resources, information about tribal energy perspectives was sought, specifically regarding tribal views on their current electricity situation, their current interest in renewable energy, and the barriers and opportunities to development of renewable energy. Data from two sources were consulted:

- The first source is an assessment performed by the Institute for Tribal Environmental Professionals (ITEP) at NAU of 12 tribes within the WRAP region.
- The second source is a survey by Native American Renewable Energy Education Project (NAREEP) of 39 tribes from throughout the United States that were engaged in renewable energy projects

While these data are not definitive and may not be representative of all tribes within the WRAP region, they do suggest some valuable insights.

ITEP ASSESSMENT

ITEP has compiled a current list of federally recognized tribes and their respective reservations from the official listing according to the Bureau of Indian Affairs Web site (<http://www.doi.gov/bia/tribes/entry.html>), which cites the Federal Register (Federal Register 65, no. 49, 13 March 2000). ITEP further refined this list through phone calls to the tribes, research on the Internet, and discussions with internal and external professionals, and produced a database documenting that there are 237 tribes in the 13-state WRAP region (see Appendix E for a list of the 237 tribes in the WRAP region, alphabetized by state). This list

includes tribes within the WRAP region that are landless as well as those with land.

Although contacting all of the tribes in the WRAP region to learn about their energy situation would have been ideal, it was also outside the scope and resources of this project. As a compromise, a subset of the 237 tribes was identified and contacted by ITEP to assess the status of tribes with respect to energy issues, and to serve as a guide in assessing the potential actions to increase the generation of electricity from renewable resources on Indian lands. The tribes contacted were selected to represent a variety of tribal perspectives, based on the following characteristics:

- Geographic distribution – tribes within the GCVTC region were selected from the northern states, California, the intermountain West, and the Southwest
- Population – tribes selected range from small to large
- Land size – tribes selected range small to large
- Urban vs. rural setting – tribes selected from each
- Experience with renewable energy – tribes selected with and without such experience
- Existing energy infrastructure –
 - Organizational infrastructure –tribes selected with and without a tribal organization or entity to deal with energy issues (a utility authority)
 - Physical infrastructure – tribes selected whose members have electrical service as well as tribes whose members lack electrical service

ITEP conducted this assessment during January and February of 2001. Of the 14 tribes selected for the assessment (see Table 2), 12 responded. Tribal officials responsible for (or knowledgeable about) energy issues were contacted and interviewed by phone. Several questions were asked of each respondent about energy, electricity, and renewable energy.

Table 2 – A list of the 14 tribes selected to participate in the WRAP/NAU renewable energy assessment.

Assiniboine and Sioux Tribes of the Fort Peck Indian Reservation	MT
Hoopa Valley Tribe	CA
Kaibab Band of Paiute Indians	AZ
Morongo Band of Cahuilla Mission Indians	CA
Navajo Nation	AZ
Nez Perce Tribe	ID
Pueblo of Isleta	NM
Puyallup Tribe	WA
Pyramid Lake Paiute Tribe	NV
Shoshone Tribe of the Wind River Reservation	WY
Southern Ute Indian Tribe	CO
Standing Rock Sioux Tribe	SD
Tohono O'odham Tribe	AZ
Ute Indian Tribe of the Uintah and Ouray Reservation	UT

NAREEP SURVEY

In 1996 and 1997, NAREEP conducted a survey of 39 tribes from throughout the United States that were engaged in renewable energy projects. Of these tribes, 27 completed a comprehensive questionnaire about tribal energy use (19 of these tribes are located in the 13-state WRAP region). A list of these 27 tribes is shown in Table 3.

Table 3 – A list of the 27 Tribes that participated in the NAREEP tribal energy survey.

<i>Tribe</i>	
Blackfeet Tribe	Navajo Nation
Cabazon Band of Indians	Nez Perce Tribe
Chemehuevi Tribe	Oneida Indian Nation
Conf. Salish and Kootenai Tribes	Oneida Tribe of Indians
Conf. Tribes of the Warm Springs	Osage Tribe
Crow Tribe	Prairie Band of Potawatomi
Fort Peck Tribes	Pueblo of Jemez
Haida Nation	Pueblo of Picuris
Hualapai Tribe	Skull Valley Band of Goshutes
Keweenaw Bay Indian Community	Spirit Lake Tribe
La Jolla Band of Indians	St. Regis Band of Mohawk Indians
Lower Brule Sioux Tribe	Standing Rock Sioux Tribe
Lummi Tribe	Table Bluff Reservation
Mohegan Tribe of Indians	

DISCUSSION OF CURRENT TRIBAL ENERGY PERSPECTIVES

Data from both the ITEP assessment and the NAREEP survey were studied to gain an understanding of tribal views on a variety of energy issues, with the caveat that not all opinions held by the various tribes will have been accounted for, nor will the relatively small sampling of tribes have statistical significance. However, the information received was consistent with other informal discussions with tribes concerning energy issues, as well as with the views expressed by the Council of Energy Resource Tribes (CERT) and its 47 member tribes, as well as other tribes through the Inter-Tribal Energy Network (Council of Energy Resource Tribes 1999, 2001; Task Force 1997). Another a limitation of the NAREEP survey is that all of the tribes that were contacted were involved in some sort of energy-related or energy-efficiency project. Thus the opinions of tribes not involved in these types of energy projects are not accounted for in that survey.

Despite the limitations, a wealth of information was extracted from these tribal energy assessments, sufficient to provide direction for the discussion and analysis presented in the remainder of this section. Below is a list summarizing some of the general conclusions that can be drawn from ITEP's assessment:

- No central office or agency is in charge of tribal energy issues, such as a utility authority (75% of reporting tribes).
- No access to data about tribal electrical energy consumption is available (75%), although most (67%) do know how to acquire this information.
- There is no awareness of laws or regulations that influence energy supplies delivered to the tribe, or government programs to promote the use of renewable energy (75%).
- Tribes are interested in using renewable energy systems (75%), especially if the cost of energy is competitive with current energy supplies. It is interesting to note, however, that tribal interest in renewable energy derives primarily from a desire for better or more reliable service, rural electrification, and economic development (but not necessarily from a desire for improving air quality). Also, some tribes in urban settings with access to reliable utility electricity expressed no interest in renewable energy development.
- There is an interest in selling electricity on the deregulated electric market (83%).
- Tribes are interested in various types of assistance in planning and implementing renewable energy projects (58%).

Through the comments associated with the ITEP assessment, it was apparent that the particular opportunities available and the barriers facing each tribe's development of renewable energy were as individual and unique as the tribes themselves. Many of the tribes were concerned about cultural issues (such as sacred sites), environmental issues (not damming a river), political issues (both inter-tribal politics and external relations with states), and economics (the cost of energy). Tribes were interested in the potential opportunities for economic development offered by developing renewable energy resources, as well as the ability to gain energy independence.

The following conclusions can be drawn from the NAREEP tribal energy survey:

- Ninety-two percent of respondents to the survey reported that there was some problem related to energy use on their reservation.
 - Forty percent of the tribes thought that the problem was among the most important faced by the tribe, whereas 52 percent thought that it was moderately important but less important than other problems, such as unemployment.
 - Though the specific problems were unique to each tribe, about 70 percent of the tribes indicated that the high cost of energy, and buildings that are not energy efficient were problems. The energy-related problems tended to impact the elderly and poor members of the tribe most severely.
 - Tribes also indicated that energy issues impacted economic development (70%), employment (63%), environmental protection (59%), tribal sovereignty (59%), cultural preservation (56%), and health (59%).
 - Respondents indicated that development of the renewable resources could impact economic development through job creation, by keeping money on the reservation versus paying outside energy providers, and through income

generated from the sale of energy.

- Concerning development of energy resources, 78 percent of the tribes were interested in developing renewable energy resource, whereas only 26 percent indicated an interest in developing fossil fuel resources.
 - Of those interested in renewable energy, development of the resource for use on the reservation was of prime importance (63%) followed by development for sale outside the reservation (33%).
 - Energy conservation programs also rated highly.
- When asked about the type of renewable resources that tribes were engaged in developing, all of the electricity-generating technologies discussed in Appendix B (solar, wind, biomass, and hydroelectric) received about equal consideration except for geothermal (it is the most scarce of the renewable resources). However, concerning electricity generation and consumption, tribes indicated that they were most interested in energy efficiency or conservation programs (93%), wind energy (63%), or solar energy (63%). The top five reasons offered by tribes that were interested in developing renewable energy are listed below (the number in parentheses indicates the percentage of respondents who thought it was an important reason):
 - Compatible with natural environment (82%)
 - Potential to generate income for the tribe (70%)
 - Potential for employment (67%)
 - Compatible with culture of tribe (63%)
 - Reduced dependence of tribe on outside providers (60%)
- Most tribes indicated that some kinds of assistance would be useful in carrying out renewable energy or energy efficiency projects. Some of the types of assistance desired involve the following (the percentage indicates the number of respondents indicating either very useful or somewhat useful):
 - Obtaining project financing (93%)
 - Technical assistance in designing or building projects (89%)
 - Training to manage or evaluate projects (89%)
 - Training to operate or maintain projects (89%)
 - Assistance in conducting feasibility studies (93%)
 - Assistance in marketing energy resources (93%)
 - Assessing the renewable resources (85%)
 - Obtaining basic information about renewable energy systems (85%)
 - Legal advice in developing projects (89%)
 - Assistance in completing application forms for federal assistance (78%)

- The tribes surveyed also indicated that training through workshops or scholarships to degree-seeking programs would be favorable, as would basic information provided via handbooks, CD-ROM, or the World Wide Web. The most acceptable sources for this information were the U.S. Department of Energy (70%), a major university (70%), a tribal college or trained tribal member (63%), or the Council of Energy Resource Tribes (63%).
- Of the tribes surveyed, 93 percent indicated that they were served by at least one electric utility, with no tribe indicating an absence of utility service (however, this does not imply that all members of the tribe had access to electric service). In contrast, 48 percent of the tribes indicated that they were not served by a natural gas utility.
- Concerning tribal utilities, 67 percent of the respondents have considered forming a tribal utility. The main reasons for forming a tribal utility were to reduce utility rates (67%), to have greater tribal control (63%), to provide a source of revenue (67%), or to serve people without utility service (52%). Those who did not entertain forming a utility cited other more important priorities, such as a lack of finances or a lack of managerial or technical capacity.
- Fifty-six percent of the tribes surveyed had an electric power generating facility larger than 10 kW within their reservation boundaries. These tribes, in particular, may be interested in creating tribal implementation plans and other elements of a tribal air quality program.

The results of the survey as summarized above are consistent with information previously published by NAREEP (Howarth et al. 1997). Many of the comments recorded along with the survey questions provided further insight into the tribes' perspectives on energy. In general, the high cost of energy relative to income, combined with energy uses that are inefficient (such as poorly insulated homes) creates financial hardship and reduces the quality of life, especially for the elderly and poor members of the tribe. These factors also reduce opportunity for economic development and strain cultural preservation efforts. Many tribes are interested in developing renewable energy to improve economic conditions and gain more energy independence.

Of the tribes interested in developing renewable energy, most were interested in more information about the specific renewable energy resources available to them, what technologies are available for use, and if the renewable resources are worth developing. The information provided in Appendices B and C of this report takes the first steps in answering these questions. However, this information alone is not enough to plan a renewable energy project: there is a tremendous need for conducting site-specific resource assessments, pre-feasibility studies, and then full feasibility studies if warranted. For conducting pre-feasibility studies, RETScreen International is a very useful, freely available software tool. This software package was developed by the CANMET Energy Diversification Resource Laboratory and is available from Natural Resources Canada (<http://retscreen.gc.ca/>). Another good resource is the Renewable Energy Analytical Studies Network available from NREL that has a wealth of reports, tools, and data related to financial and policy analysis of renewable energy technologies (<http://www.nrel.gov/reasn/>).

The information acquired from the tribal energy assessments and from CERT (1999, 2001) helped build a foundational understanding of tribal perspectives on energy, renewable energy, and energy management. Conclusions from this work provided direction for analyzing the potential actions to increase the generation of electricity from renewable resources, and the applicability of the State Report recommendations to tribes. Due to the strong linkage in the tribal perspective among renewable energy, tribal energy independence, cultural preservation, and economic development, the potential actions for tribes are somewhat different than that presented in the State Report (Western Regional Air Partnership 2000).

ANALYSIS OF TRIBAL RENEWABLE ENERGY DEVELOPMENT

Efforts to encourage the development of renewable energy raise many issues. In the state context, these issues tend to involve the relative cost of electricity from conventional resources compared to the cost of electricity from renewable resources, as well as other marketplace constraints that create impediments to the development of renewable resources, such as:

- Absence of competitive market choices for electricity from renewable sources.
- Absence of market information about the source.
- Transmission and distribution system policies that impede the use of renewable energy (Western Regional Air Partnership 2000).

A combination of economic incentives and market changes is, therefore, most likely to increase the portion of electricity that is produced in a state from renewable resources.

The relative cost of power and marketplace constraints are certainly also relevant to tribes, but they may not be the determining or even the most important factors. For most tribes the development of renewable energy is inextricably intertwined with the challenges of economic development (as well as energy efficiency, which will be addressed in a later AP2 Forum report).

- For some tribes renewable energy is not just an opportunity to substitute electricity produced from one resource (renewable energy) for electricity produced from another resource (conventional resources), as it is in the state context. Rather, for these tribes it may present an opportunity to electrify portions of a reservation not presently served by electricity from any source. For the first time people in those areas could have available things that most people in the United States take for granted, such as electric lights, appliances, and other amenities for reservation homes.
- For other tribes it may present an opportunity to terminate reliance on an undependable or expensive electricity supply and shift to a more reliable and cost-competitive supply that would provide electricity to power tribal offices or businesses in new locations, electricity to power the tools necessary for a local entrepreneur to start a new business, or electricity to attract a business from outside the reservation to relocate to a new, reservation location.
- Even tribes currently served by reliable and cost-competitive electricity supplies may

want to consider renewable energy for reasons such as air quality, cultural compatibility, or independence from off-reservation electricity suppliers.

It has been observed that American Indian societies are remarkably resilient. In the face of economic, political, and cultural change, hundreds of distinct Indian nations, built upon dozens of cultural lineages, still persevere and grow, bound together by ties of family, language, history, and culture. Although resilient, these nations face many challenges and among the most difficult challenges facing native peoples today are those related to economic conditions.

On most reservations, sustained economic development, while much discussed, has yet to make a significant dent in a long history of poverty and powerlessness. Despite the many federal programs and the large sums of federal and philanthropic money that have been used over the years, many Indian reservations continue to experience extremely high unemployment rates; high dependency on welfare, government jobs, and other transfer payments; discouraging social problems; and an almost complete absence of sustainable, productive economic activity. (Cornell and Kalt 1992, p. 3)

It would be a mistake, however, to assume that all tribes share the same economic development goals. It would also be a mistake to assume that tribes necessarily share non-Indian definitions of successful economic development. Nevertheless, it is generally true that most tribes desire to improve the economic welfare of their members. At the same time they also want to gain or maintain control over the quality and nature of reservation life. They also want to do this in ways that are generally consistent with, or not destructive of, their cultural heritage.

The difficult economic conditions on most reservations, and the daunting challenges that flow from those conditions, make development of renewable energy on tribal lands particularly difficult. At the same time, development of renewable energy may offer individual tribes an opportunity to make progress toward their economic development goals in a manner that preserves or enhances tribal sovereignty and cultural values.

Much has been written on the topic of obstacles faced by Indian nations attempting to pursue development goals (see the Economic Development Bibliography in Appendix D). The Harvard Project on American Indian Economic Development studied economic development on Indian reservations in an effort to explain why tribes differ in their economic development strategies and in the outcomes of those strategies, and to discover what it takes for sustainable, self-determined economic development (Cornell and Kalt 1992).

Tribes interested in developing sources and use of renewable energy could benefit from considering the findings from these studies. Cornell and Kalt concluded that many of the common explanations for lack of successful economic development on Indian reservations, while not necessarily wrong, are of unequal importance or are insignificant, misleading, or mistaken. As an alternative, they offered what they believe to be a more useful analytical framework that identifies the key ingredients of successful economic development, determines which are most important, and identifies which ones tribes actually can do something about. The key ingredients of development identified by Cornell and Kalt are the following:

- *External factors*: Political sovereignty, market opportunity, access to financial capital, and distance from markets
- *Internal assets*: Natural resources, human capital, institutions of governance, culture
- *Development strategy*: Overall economic system, choice of development activities

EXTERNAL FACTORS

Some of the ingredients necessary for successful economic development relate to factors that are largely external to a reservation, although conditions on a reservation may influence these factors. These ingredients include political sovereignty and the related concept of federal trust responsibilities, market opportunities, access to financial capital, and distance from markets.

Political Sovereignty

Many of America's tribal lands enjoy abundant renewable energy resources, but bringing renewable energy to Indian country will require an exploration of the opportunities and constraints offered by tribes' sovereign power (Suagee 1998). Early in the nineteenth century, Chief Justice Marshall established the legal foundation for the concept of tribal sovereignty when he wrote that Indian nations are "a distinct people, divided into separate nations, independent of each other and of the rest of the world, have institutions of their own, and governing themselves by their own laws" (*Worcester v. Georgia*, 31 U.S. (6 Pet.) 515, 8 L. Ed. 483 1832).

Thus federal law recognizes the inherent tribal sovereign authority over their members and their tribal lands; tribes have the power to exercise *self-determination* to make and enforce laws and policies to protect the health and welfare of its members. This inherent authority comes from within the tribe itself and existed before the founding of the United States. This concept is important in understanding tribal-state-federal relations because it separates tribes from states and other ethnic groups and establishes the "unique status" of Indian tribes.

The legal status of Indian sovereignty may change over time with federal court decisions and legislation, often to the detriment of legal sovereignty. Individual tribes typically have limited ability to control or influence such decisions.

An assertive and capable tribe, however, can take primary control of many economic decisions and governmental services away from outside entities, such as the Bureau of Indian Affairs (BIA), which might otherwise supplant tribal decision-making. This genuine decision-making control over the running of tribal affairs and the use of tribal resources is sometimes referred to as "de facto" sovereignty and is not dependent on federal court decisions and legislation for its strength (Cornell and Kalt 1992). For example, Matthew Krepps (1992) studied more than 70 tribes whose members have gained some degree of control over the forestry operations on their reservations. He observed that as tribal control increases relative to BIA control, worker productivity rises, costs decline, and income improves.

Although tribal control over decisions does not guarantee successful development for any individual tribe, it increases the likelihood of success measured according to goals and criteria determined by the tribe because it strengthens the connection between decision-making and its consequences. Also, if someone outside of the tribe has control of decision making, the result will likely reflect the goals and agenda of that outsider rather than the tribe (Cornell and Kalt 1992).

These observations about sovereignty and economic development decisions are directly applicable to decisions about renewable energy. To maximize the likelihood that such decisions will reflect tribal goals and agendas, tribes may want to take aggressive and concrete steps to gain control of the decision-making process.

Federal Trust Responsibilities

In addition to sovereignty, another aspect of the unique relationship between tribes and the federal government is the notion of the federal government's trust responsibility for tribes. The Constitution of the United States, as well as applicable treaties, statutes, Executive orders, and court decisions, recognize Indian tribes as domestic dependent nations under the protection of the United States.

Chief Justice John Marshall, in Supreme Court decisions at the beginning of the nineteenth century, first articulated the trust relationship for the Court (the Marshall trilogy; *Johnson v. McIntosh*, 21 U.S. 8 Wheat 543 1823; *Cherokee Nation v. Georgia*, 30 U.S. (5 Pet.) 1, 5 L. Ed. 681 1831; *Worcester v. Georgia*, 31 U.S. (6 Pet.) 515, 8 L. Ed. 483 1832). In a suit brought by the Cherokee Nation against the state of Georgia (where the Cherokee Nation claimed the status of foreign nation), Marshall characterized tribes not as foreign nations but as "domestic dependent nations. . . . Their relationship to the United States resembles that of a ward to his guardian" (*Cherokee Nation v. Georgia*, 30 U.S. (5 Pet.) 1, 8 L. Ed. 25 1831).

This concept became the foundation for our basic understanding of trust responsibility. It applies to all agencies and departments of the federal government. Federal agencies in their interaction with tribal governments cannot and should not treat tribes as the general public, nor as interest groups or stakeholders in their consultation process. Executive Order 13084 (14 May 1998) observes that "As domestic dependent nations, Indian Tribes exercise inherent sovereign powers over their members and territory. The United States continues to work with Indian Tribes on a government-to-government basis to address issues concerning Indian tribal self-government, trust resources, and Indian tribal treaty and other rights" (see also *United States v. Mazurie*, 419 U.S. 544, 557, 1975).

The federal trust responsibility means that the government must consider the interests of tribes when taking any action that might affect them. However, it is a responsibility that is governed neither by statute nor by regulation. A number of Presidential Executive Orders have been issued that direct federal agencies to ensure that tribal interests are considered when federal action is contemplated; these directives speak to consultation on a government-to-government basis. Although consultation can be considered an element of trust responsibility, no one can read Chief Justice Marshall's words without understanding that this fiduciary responsibility goes beyond prescribed actions. It connotes a moral dimension

that cannot be satisfied by simply following a set of rules.

This moral dimension has its roots in treaties under which tribes ceded vast amounts of land to the United States government in exchange for protection and the rights of Indian tribes to exist as self-governing nations. The tribes gave up their aboriginal lands for this solemn promise, which the government offered and which the tribes accepted. This same doctrine led to the concept of “trust lands” or Indian reservations. This means that the federal government owns legal title to Indian trust lands (reservations), and the law prohibits the transfer of Indian lands without the expressed approval and consent of the U.S. Congress.

The trust responsibility in the context of the Clean Air Act and the Regional Haze Rule poses some interesting issues. As noted elsewhere in this report, the tribes, under the provisions of the Tribal Authority Rule, are not required to take any action to implement the RHR. However, as the RHR is implemented, the EPA, under its federal trust responsibility, must consider the interests of tribes as it promulgates its decisions. As the states, tribes, and federal government move forward in the implementation of this program, situations will arise where the EPA may have to act under its fiduciary responsibility to protect the interests of tribes, whether they be environmental, economic, or political. The EPA’s role will be especially important for tribes that opt not to participate directly in the RHR implementation process.

It can be argued that this trust responsibility also creates unique duties for the federal government in assisting tribes to develop renewable energy. Actions that may not have broad political support in the state context for private renewable energy projects on state lands (such as direct subsidies) may arguably be required in the tribal context because of the federal government’s trust responsibility to tribes.

Market Opportunity

As discussed in Appendix B, many opportunities exist on Indian lands for the production and installation of renewable energy systems. Several chapters in Smith (2001) discussed the details of these opportunities. Biomass, solar, and wind production and distribution of electricity exist on many reservations in the WRAP region. These facilities could be used as substitutes for the existing electricity supply on many reservations, which in many instances is purchased from off-reservation providers. Alternatively, these facilities could export electricity to off-reservation purchasers.

For many tribes there is substantial need to provide power to tribal residents who currently do not have access to electricity. For many of these residents, the least expensive source of electricity may be from small, village-based production or individual solar panels or wind turbines. This need creates a large potential for economic development in the installation and maintenance of renewable energy units.

The production, installation, and maintenance of these renewable energy units will be most beneficial to the tribe if based on the reservations and operated by tribal residents. Joint ventures might be possible with outside investors, but they tend to draw money away from the reservation.

Other tribes may pursue renewable energy as a source of electricity that could be sold

for a profit to off-reservation users. A tribe's ability to make a profit from such sales will depend on factors such as market demand, production costs, and transmission costs.

In summary, given the RHR requirements and the potential demand for electrification on Indian lands and the potential for sale of electricity to off-reservation users, renewable energy presents a large potential for economic development opportunities. As tribes begin or continue to implement de facto sovereignty and look for development opportunities, the production, installation, and maintenance of renewable energy units could be viewed as welcome opportunities.

Access to Financial Capital

As with all economic development opportunities on Indian lands, a major barrier to renewable energy development is access to financial capital needed for production and transmission facilities. Furthermore, if the goal is to increase the electrification of individual tribal homes, the residential customer also may have little access to money necessary to pay for the cost of electrification.

There are many ways to finance the purchase of the new energy solutions: government subsidies, including tax exemptions, loans, grants, incentives, and rebates, subsidies for tribal governments, and industry subsidies. Some of the organizations that may fund renewable energy projects were previously presented in Table 1. However, in the ever-changing markets and political arena, no exhaustive list is possible.

Distance from Markets

The history of federal Indian policy has resulted in many reservations having remote land bases. Many tribal communities also have very low population densities with scattered housing. Added to this is the fact that the Indian population is the poorest in the United States. As a result of this combination, Indian communities face two problems with electricity unique to Indian lands in addition to the RHR issues:

- Poor and unreliable delivery
- Many places with no electricity at all.

This is true in spite of the fact that many of today's conventional energy resources are extracted from Indian lands and many of the nation's electrical transmission lines pass right over individuals' non-electrified homes.

Renewable energy can be used to remedy these problems, because as the delivery and availability of electricity is improved, secondary improvements can begin to occur in Indian communities. Village-based production can allow communities to have Laundromats and even small convenience stores and other services. This will further improve regional air quality because of fewer trips to border towns—many times 100 or more miles—for provisions and services. New employment opportunities will become available in this secondary development. Thus, although stimulated by the RHR, the substitution and electrification aspects of renewable energy hold the potential for additional benefits for

Indian communities.

Tribes interested in wholesale production will need a means to get the electricity produced from renewable resources to an external market. In reality this means that the production facility must be near electricity transmission lines. For a discussion of some of the technology and regulatory impediments to connection with these transmission lines, see the WRAP State Report (Western Regional Air Partnership 2000) and NREL's case studies (National Renewable Energy Laboratory 2000). NAREEP has also published a detailed discussion of tribal issues and opportunities presented by the electric industry's restructuring (Howarth et al. 1997).

INTERNAL ASSETS

Internal assets are the resources and constraints within the reservation itself. For purposes of this discussion, the most important are natural resources, human capital, institutions of governance, and culture. Though not described in detail below, tribes with successful gaming ventures or other business ventures may have significant sources of revenue to fund development of renewable energy resources. These also are considered important internal asset.

Natural Resources

One of the key internal assets that must be available for the development of renewable energy is the natural resource itself.

- What types of renewable resources are available?
- Is the resource sufficient to supply tribal requirements?
- Is it readily accessible?
- Can it be accessed economically?

These questions have been addressed at some length in the information provided in Appendices B and C of this report. Those portions of this report provide information describing the renewable technologies, the approximate cost of energy generated from each technology, the magnitude of renewable resource typically required for economic application of each technology, and a general indication of the types of renewable resources available on tribal lands (see also Energy Information Administration 2000; Native American Renewable Energy Education Project 1998).

The purpose of this information is to provide tribes with some idea of what renewable resources may be worth developing (note that resource maps provided by the National Renewable Energy Laboratory (NREL) provide a guideline, but local knowledge of the available renewable resources will probably be more accurate). Tribes can use this information to identify a renewable resource and renewable technology for development. The next step is to conduct a more detailed resource assessment and pre-feasibility analysis prior to committing to the more extensive and expensive analysis that would be required to evaluate the feasibility of available options and to select, plan, and implement a particular

project.

Human Capital

Much has been written about the challenges inherent in tribal governments taking on more “governmental” roles. As more tribes move into the mainstream of governance, more and more demands are being placed on these governments to assume broader roles in managing their communities. Each new demand, however, places additional strain on a tribe’s infrastructure.

A good recent example of this challenge is the tribes’ entrance into the sphere of environmental management under federal statutes. Over the last 30 years, the federal government has recognized the appropriate role of tribal governments in protecting reservation environments. Many federal statutes, including the Clean Air Act, have been amended to provide explicit authority for tribes to develop and implement federally enforceable environmental programs. However, the tribal resources to address these many new programs have not kept pace with the demand. Tribal governments, with rare exceptions, have limited staffs, even though such staffs typically are gifted at multi-tasking. For example, often the person who manages the natural resources department (or the health and safety office) is also in charge of the environmental programs. The environmental program may be staffed by one or two individuals who have responsibility for all aspects of the program (e.g., monitoring air and water quality, developing codes, closing a landfill).

The same holds true for the energy sector. Energy management and the development of tribal utility authorities are often not high priorities for most tribes. Indeed, only a handful of tribes have specific organizations within the tribal governmental structure to manage utilities or energy (Suagee, 1998), thus making any energy development opportunity more challenging.

The current state of tribal governmental capacity should not be considered predictive of the future. Over the last 10 years, in response to these new programs and initiatives, tribal governments have made progress in building their capacity to meet these new challenges. With the help of the federal government and organizations like the National Tribal Environmental Council and the Institute for Tribal Environmental Professionals, a new cadre of tribal environmental professionals has been building skills to develop and manage tribal programs. Although much remains to be done, models have been developed and institutions are in place to begin addressing the increasing demand for energy coming from Indian country.

One such model that may be adapted to the renewable energy context has been developed at Northern Arizona University’s Institute for Tribal Environmental Professionals (ITEP). ITEP’s American Indian Air Quality Training Program was established in 1993 under a Memorandum of Understanding with the EPA. ITEP’s primary goal is to assist tribes in environmental capacity building, through training and education, but their environmental training and education model could be explored with regard to renewable energy and energy efficiency. Basically, the ITEP model includes these essential elements:

- *Training.* To date, 25 courses in air quality have been developed and presented,

starting from basic introductory courses to more complex, technical courses in ambient monitoring. The training courses are the foundation for capacity building in tribal air quality management.

- *Technical support.* To support the training courses, on-site technical support is provided one-on-one by a cadre of tribal, ITEP, EPA, and other professionals. This service augments the training courses offered by ITEP.
- *Environmental education.* An outreach program to K-12 schools on the reservations to work with students and teachers in the promotion of environmental science and technology education, curriculum development, teacher training, and community education.
- *Information clearinghouse.* A repository of environmental education materials and information for tribal environmental professionals.
- *Internship programs.* One program for students and another for tribal environmental professionals have been created to place interns within federal, state, and tribal agencies for the enhancement of learning and training experiences.

The success of this integrated approach to environmental training and education has led to another successful partnership among the tribes, the EPA, and NAU. In September of 2000, the partnership inaugurated the Tribal Ambient Monitoring Support (TAMS) center, which now serves as the technical support center for tribes in ambient monitoring.

The demonstrated success of the ITEP model can be replicated in the area of renewable energy and energy efficiency initiatives. The same type of partnership between tribes, federal agencies, educational institutions, and others is plausible, but will require a commitment of resources and support from the federal government, as part of its fiduciary trust responsibility.

Institutions of Governance

Cornell and Kalt (1992) have written extensively concerning the importance of institutional reform and stability as a path toward economic development and self-sufficiency for Native American communities. Gomez Dierks (1999) also observes that where private money from outside a Reservation is required for a tribal project, lenders or investors are unlikely to make money available unless the tribal government is willing to make certain commitments and the lenders or investors are confident that those commitments will be satisfied.

In other words, for any development process to succeed, including the development of renewable energy, stability within the tribal government and between the tribe and outside businesses—whether they are partners, lenders, or clients—must be present. Tribal stability is vital during any planning and negotiation period. If the makeup and orientation of the tribal government changes during the planning process or during negotiations to implement the project, it becomes difficult to finalize any project. Similarly, when negotiations have been completed and the enterprise is underway, instability within the government can lead to disturbances if the new government interferes with the ongoing project. This also will make

it increasingly difficult to plan and implement future projects.

Regardless of the effectiveness of past treaties and negotiations, tribes entering into agreements for funding, land, or supply must honor the agreements if they want to maximize stability. This does not mean clauses cannot be written into contracts allowing renegotiation at some future time; rather, once a contract has been entered into, all future governments must honor that contract.

This, of course, is a partial definition of self-determination: the tribe is accountable for its own actions. With stable government and detailed analysis, the tribe will be able to develop a detailed plan for specific renewable energy projects. Rather than accepting BIA negotiated contracts, such as the Peabody Coal contract on Hopi and Navajo land which subsequently led to conflict and turmoil, the tribe itself should determine its best interest and negotiate from a position of stability and knowledge. When the negotiations are completed, it is in the best interest of the tribe that its future governments should honor those contracts.

One means that some tribes have used to try to increase stability is the creation of an Economic Development Corporation (EDC). An EDC can be particularly useful where there is separation between the EDC management and the political whims of government. Clearly, the elected officials and their constituents need to be involved in the long-term strategic planning for projects such as renewable energy development, but employment and management needs to be based on the productivity and profitability of the enterprise, and not the changing political desires of the tribal council.

Culture

The United States is a heterogeneous mixture of diverse cultures and regions. Differences in cultural norms, languages, traditions, and religions are often viewed as a positive energy that drives the country to the forefront of the global economy. In spite of this view, many of the distinct values and traditional practices of the Native American tribes within the United States are threatened by a large variety of forces that are beyond the scope of this report to discuss in any detail. One-thing tribes can do to protect their own cultures, however, is to make sure that tribal resources are developed within an appropriate cultural context. Only an individual tribe can decide what is or is not appropriate within its own cultural context.

A few general observations, however, can be made.

- First, tribes with a culture that discourages reliance on outside sources for necessities of life can support and strengthen that culture by developing and implementing a plan for energy independence.
- Second, the many tribes concerned with stewardship of Mother Earth may find an investment in renewable energy technologies to be culturally acceptable.
- Third, economic development actually can be a means of sustaining tribal character if development plans are developed with an understanding of how they impact the overall societal makeup. In these cases, developing the economy actually increases the potential for strengthening and developing the tribal culture (Smith 2000). Only when the individual tribe has control of its resources and sustains its identity as a

distinct civilization does economic development make sense; otherwise, it is true that a tribe may have to choose between cultural integrity and economic development.

- Finally, some people have argued that the concept of entrepreneurship does not pervade Native American societies for cultural, as well as other reasons (Brown 1990, Cecil 1988).
 - For tribes where that is true, it is unlikely that much of the initial economic development, whether it involves renewable energy projects or other types of projects, will come in the form of private ownership. Even if there is cultural support for private ownership, individuals may lack the funds for opening their own business. In these situations, the initial steps toward the development of renewable energy may need to be done as tribal enterprises.
 - Many tribes have been successful with tribal enterprises, however, and these tribes have begun to emphasize the importance of private ownership and entrepreneurship. Tribes interested in planning for development of renewable energy initiatives may want to begin with tribal enterprises and later encourage private enterprise as capital, knowledge, and interest becomes more widely available among tribal members. Trospen (1992) has discussed this relationship between culture and business structure in more detail. In some instances, the cultural norms may point to tribal enterprises and in other instances, sole proprietorships may be more appropriate.

In conclusion, for many tribes expanding the production and installation of renewable energy fits well into the general goals of sustaining cultural integrity.

- Substitution of renewable energy for existing electricity supply meets multiple goals, including air emission reduction.
- The use of renewable energy to electrify previously non-electric homes, combined with the production of new energy-efficient homes, will improve the lifestyles of tribal residents.
- Energy efficiency improvements will also reduce the relative need for electricity production, resulting in reduced expenditures for energy supplies and reduced air emissions where energy is supplied by non-renewable sources.
- Production of renewable energy capacity provides employment opportunities for tribal residents.
- In addition to reduced emissions and employment opportunities, local production also reduces import expenditures made to off-reservation suppliers.

Each tribe, however, will decide whether and in what way such activities are appropriate within that tribe's cultural context.

DEVELOPMENT STRATEGY

The development strategy is the way a tribe goes about planning for and implementing a development program, in this case a renewable energy program. It consists generally of a

tribe's overall economic development system and in particular of the choice of particular development activities.

Overall Economic System

The overall economic system is the organization of the reservation economy itself. Cornell and Kalt (1992) identify four major models that are emerging in Indian Country:

1. Federal control
2. Tribal enterprise
3. Private enterprise with tribal member ownership
4. Private enterprise with nontribal member control

These four models are not mutually exclusive and may be found in various combinations throughout Indian Country. Tribes are currently finding, and have found, the economic systems and accompanying institutions of self-government that match their culture as well as the resource and opportunity situations they face. Where there is a match between the economic system adopted by the tribe and the social organization and culture, the odds of successful development increase.

Choice of Development Activity

Tribes often are presented with ideas for development activities such as development of renewable energy resources. The challenge for tribal decision-makers and for individual tribal members is to separate the good ideas from the bad ideas and then to develop a strategic plan to implement the selected ideas.

Anderson and Smith (1999) developed a process by which tribes can begin strategic planning for development projects such as renewable energy projects. The process begins with interviews and workshops leading to development of a written statement about shared goals or visions for the future. The next step is to develop a strategic plan for how the tribe is going to achieve that vision.

In the case of renewable energy, the strategic plan to achieve an energy vision may be best if imbedded in an overall, comprehensive energy plan for the tribe. This plan could analyze current and future energy needs in light of the goals set by the energy vision, how those needs currently are or are not being met, and alternative ways of meeting those needs in the future. The benefits, potential problems, conflicts, and interactions among alternatives also could be discussed. Finally, the plan could select the best combination of alternatives to meet the tribe's energy goals and identify specific steps to implement each alternative. If the plan is developed with the maximum possible participation of tribal leaders and tribal members, it has the best opportunity for success.

III. POTENTIAL ACTIONS TO INCREASE THE GENERATION OF ELECTRICITY FROM RENEWABLE RESOURCES

As noted in the Introduction to this report, the Grand Canyon Visibility Transport Commission (GCVTC) recommended a goal for states in its transport region of increasing the use of renewable resources for meeting the region's electricity needs to 10 percent by 2005 and to 20 percent by 2015 (GCVTC 1996). The EPA has identified the use of renewable energy as one method of improving air quality. The WRAP subsequently charged its Air Pollution Prevention (AP2) Forum with responsibility for developing recommendations to achieve this "10/20 goal." The purposes of this Section are:

- To identify potential actions tribes may take themselves to increase the generation of electricity from renewable resources.
- To identify potential actions tribes may take in collaboration with others to increase the generation of electricity from renewable resources.

Section IV of this report evaluates the potential actions listed here and recommends a portfolio of actions for tribes to consider.

As previously noted, the AP2 Forum of the WGA has already issued a final report recommending actions for states to take to increase the generation of electricity from renewable resources (Western Regional Air Partnership 2000). That report was focused on increasing the use of renewables in states in the transport region and the analysis of the use of renewables on tribal lands was reserved to this report.

Although the State Report did not discuss tribal issues as such, much of the information is of general interest to tribes.

- The State Report recognizes that meeting the 10/20 goals will be difficult. It found that in 1998, only 4.6 percent of the electricity consumed in the WRAP region was generated from renewable resources, and only 5.4 percent of the electricity consumed in the nine transport region states was derived from renewables.
- After examining the barriers to development of renewable energy and a lengthy list of potential actions to reduce or remove those barriers, the State Report recommends that states and the federal government adopt a combination of specific financial incentives and specific actions to improve the efficiency of the electric power marketplace.

Because the State Report did not consider the special circumstances of tribal lands, this report is necessary to examine which recommendations from the State Report are relevant or appropriate to address tribal issues and to identify other actions that may be appropriate as additional or alternative actions for tribes to consider.

POTENTIAL ACTIONS TRIBES MAY TAKE ON THEIR OWN

1. Develop a tribal energy policy or plan, including a strategic plan for renewable energy development, in coordination with economic development and other tribal initiatives.
2. Create or rewrite tribal strategic plans to formally incorporate renewable energy and possible linkages with other programs.
3. Upgrade or create building codes to incorporate energy efficiency and renewable energy. In particular, tribes may adopt the Model Energy Code and land use codes that require solar orientation of buildings. (Suagee 1998)
4. Buy renewable-energy derived power. Tribes could consider purchasing electricity generated partially or entirely from renewable resources, and legally may designate a power supplier for tribally owned businesses on trust land, and possibly for homes and public facilities. Tribes might also consider adopting a renewable portfolio standard in their electricity purchases, that effectively requires a certain amount of their electricity be generated from renewables. (Suagee 1998)
5. Sell renewable-energy derived power. Tribes may consider investigating ways to install their own renewable generating capacity, either for use on reservations or for sale to utilities and power marketers. (Suagee 1998)
6. “Use local educational facilities: Tribal colleges can investigate and disseminate information about local renewable resources, create indigenous technical capacity, and explore possible sources of and structures for renewable energy financing. Tribal colleges can also help spread popular knowledge about the links among energy, environment, and economy, and about the role that renewables can play on Indian lands. Finally, these institutions can be showcases for energy efficiency and renewable energy” (Suagee 1998).
7. “Consider exporting Indian skills: Tribal governments or private businesses with experience with renewable energy in Indian Country may be uniquely suited among Americans to pursuing such ventures in developing countries. Such international efforts might take advantage of programs offered by the U.S. Agency for International Development or the Small Business Administration. They might also prove attractive partners or consultants to private-sector or nonprofit entities seeking to promote renewable energy overseas” (Suagee 1998).
8. “Develop and disseminate knowledge of innovative financing mechanisms: While tribal sovereignty presents certain obstacles to obtaining financing for projects in Indian Country, mechanisms exist to ensure that investors can enforce agreements and secure their interests. These include limited waivers of sovereign immunity, the conduct of business through various kinds of tribal entities that do not share in the Tribe’s immunity, and the use of leasehold mortgages to create security interests in land. ... Tribes also have unique sources of financing ... such as tax-exempt revenue bonds, gaming revenues, federal grant and loan guarantee programs, and the tribe’s own freedom from liability for federal income tax” (Suagee 1998).
9. Create a tribal electric utility (Council of Energy Resource Tribes 2001; Howarth et al. 1997).

10. Aggregate tribal customers (Council of Energy Resource Tribes 1997).
11. Develop the tribe's renewable energy resources (Council of Energy Resource Tribes 1997, 2001).
12. Establish expedited permitting and approval processes for renewable energy projects.
13. Initiate energy, training, and education programs, including translating renewable energy literature into indigenous languages (where applicable).
14. Create an Economic Development Corporation. If an EDC is already in place, make sure it is staffed with individuals familiar with renewable energy issues.
15. Devise capital funding opportunities to facilitate entrepreneurial activities and private purchase of renewable energy.

POTENTIAL ACTIONS TRIBES MAY TAKE IN COLLABORATION WITH OTHERS

1. Collaborate with other tribes to develop renewable energy resources or to share information about developing such resources.
2. "Evaluate federal Indian policy comprehensively: The federal agencies responsible for providing energy conservation and renewable energy assistance to state and local governments (DOE, HUD, and other agencies such as the Rural Utilities Service in the U.S. Department of Agriculture) should review their programs from the last two decades and determine the extent to which tribal governments and reservation communities have been included. Simultaneously, appropriate members of Congress might request an investigation by the General Accounting Office. The review should consider various mandates and initiatives for conserving energy and using renewables in federal facilities, since many tribal government programs operate in buildings owned or constructed by the Bureau of Indian Affairs or Indian Health Service" (Suagee 1998).
3. Request that the federal government fund existing programs. "The federal government should demonstrate its support for tribal development of renewable energy resources through increased funding for the tribal provisions of the Energy Policy Act of 1992. This should include two measures currently receiving no funds at all: the program to be administered by the Department of the Interior to provide assistance to tribes, including help in developing codes and regulatory programs, and the Indian Energy Resource Commission (U.S. Code, vol. 25, sec. 3504 and 3505.) The mandate of the Commission should be modified, however, to expressly include renewable energy resources and energy conservation" (Suagee 1998).
4. Action by order of the Federal Energy Regulatory Commission, or alternatively by act of Congress, recognizing tribal regulatory authority over non-Indian lands within areas of tribal jurisdiction and over wholesale power transactions involving tribes (Council of Energy Resource Tribes 2001).
5. Request the creation federal project subsidies or grants comparable to, and in lieu of, tax credits available to private developers but not available to tribes (Council of Energy Resource Tribes 2001).

6. Request state and federal tax credits for electricity purchased from tribes (Council of Energy Resource Tribes 2001).
7. Request the Federal government adopt amendments to the Energy Policy Act of 1992 to provide the following:
 - a. Tribal Energy Block Grants for support of energy policy, planning, and management activities, as well as investments in energy infrastructure improvements (Council of Energy Resource Tribes 2001).
 - b. Tax credits for renewable energy projects that serve tribal communities (Council of Energy Resource Tribes 2001).
 - c. Expansion of the federal government's Buy Indian policies (currently limited to goods and services purchased by the BIA and DOD) to ensure that federal agencies will give preference to purchasing energy produced on Indian lands (Council of Energy Resource Tribes 2001).
 - d. Annual funding for these programs equivalent to DOE's spending on renewable energy, energy efficiency, and fossil energy, or approximately \$40 million (Council of Energy Resource Tribes 2001).
8. Create special tribal SO₂ allocation credits for the WRAP's backstop trading program (see discussion in the Background Information section).
9. Work with states to require green marketing programs to include information regarding whether renewable energy comes from an Indian source or from a non-Indian source (see discussion of green marketing programs in the WRAP State Report, Western Regional Air Partnership 2000).
10. Work with states to develop allocation of generator-consumer credits for State Renewable Portfolio Standards that create incentives for tribal generators or consumers or at least does not disadvantage tribal generators and consumers (see discussion of renewable portfolio standards in the WRAP State Report (Western Regional Air Partnership 2000).
11. Enter into agreements with states that recognize tribal regulatory authority over non-Indian lands within reservation boundaries and over wholesale power transactions involving tribes (Council of Energy Resource Tribes 2001).
12. Create business partnerships between tribes and non-Indian independent power producers to develop renewable energy resources (Council of Energy Resource Tribes 2001).

RECOMMENDED ACTIONS FROM THE WRAP'S STATE REPORT

The WRAP State Report recommends actions for states to take to increase the production and use of electricity from renewable resources; tribes with tribal utilities or other regulatory frameworks may want to consider similar actions. These recommendations are briefly listed here, and a reader interested in further explanation of the recommendations should consult the State Report for an in-depth description (Western Regional Air

Partnership 2000).

1. Adopt an aggressive renewable portfolio standard.
2. Adopt a system benefits charge with revenues allocated to acquisition of renewables.
3. Create a system for trading renewable energy credits among states (and tribes) that have adopted a renewable portfolio standard.
4. Adopt policies to ensure that every electricity consumer has the opportunity to choose renewable energy products through a viable green market or green pricing program, including the following:
 - a. Programs to establish consumer information disclosure rules and a power-labeling program
 - b. A regional generation tracking system
 - c. Consumer education programs on sources of electricity available for purchase
 - d. Consumer protection guidelines as proposed by the National Association of Attorneys General
5. Establish renewable energy purchasing requirements for government operations.
6. Adopt an SO₂ cap-and-trade program under Section 51.309 of the Regional Haze Rule that includes emission allowances for renewable energy generation, issued at the rate of 2.5 tons per megawatt of capacity.
7. Improve the permitting process for renewable energy generating facilities.
8. Adopt tax incentives for renewable energy projects.
9. Encourage the federal government to establish a national renewable portfolio standard that includes provisions for trading renewable energy credits among providers of electricity.
10. Encourage the federal government to develop and extend tax credits for renewables.
11. Encourage the federal government to adopt a mandatory agency renewable energy purchase requirement coupled with a tradable purchase-credit program among agencies.

For the reasons discussed above, the issues confronting tribes that desire to increase the use and production of renewable energy are not the same as the issues confronting states, although in some cases the issues do overlap. The development of renewable energy will present many challenges to tribes, but it also presents some opportunities that may not be available to states. The next Section in this report evaluates the potential actions discussed and recommends a portfolio of actions for tribes to consider when trying to encourage the development and use of renewable energy.

IV. RECOMMENDATIONS OF THE WESTERN REGIONAL AIR PARTNERSHIP'S AIR POLLUTION PREVENTION FORUM

Tribal lands in the West have great potential for the development and delivery of electricity generated from renewable resources. This project's research has revealed that many of these tribes are interested in generating, selling, and using such electricity. Consequently, tribal energy programs can be significant contributors to the GCVTC's "10/20 goal". Substantial barriers exist, however, to the full implementation of tribal opportunities for development of renewable energy resources. Of particular importance to rural residents is the fundamental need for basic electric service or reliable electric service. As tribes seek ways to provide more reliable and new electrification, electricity that is generated and distributed from renewable resources could be one of the best alternatives to consider.

The Air Pollution Prevention (AP2) Forum has recognized that the special relationship of American Indians and their lands within the federal framework has great bearing on strategies to enhance renewable energy development. That is, tribal-state-federal relations must be considered in their legal, economic, and cultural contexts when exploring the development and delivery of electric energy across political boundaries. Because these relationships are markedly varied, appropriate strategies will differ from tribe to tribe, and the concept of setting priorities among alternative strategies must be left to individual tribes. Tribes may select and pursue these options in the context of their overall goal of maintaining and strengthening their cultural, social, economic, and political integrity.

The following recommendations present a broad selection of opportunities from which the tribes in the WRAP region and their collaborators can choose according to their specific circumstances. The recommendations are presented in two broad categories:

- Those that can be implemented by individual tribes with little or no involvement by other governments or agencies.
- Those that can best be implemented in collaboration with others.

OPTIONS FOR INDIVIDUAL TRIBAL IMPLEMENTATION

The strategies listed here can be implemented by individual tribal governments and agencies, and can help to achieve the GCVTC's 10/20 goal for renewable energy. Cleaner air benefits every living thing in the region. Renewable energy also presents other opportunities such as economic development or increased tribal sovereignty that may be attractive to tribes.

Tribes may want to consider multiple elements of these recommendations when compiling an appropriate portfolio of programs. The selected recommendations in this portfolio may then be implemented either unilaterally by the tribe or in concert with others having similar interests, depending on the programs.

1. DEVELOP A TRIBAL ENERGY POLICY

Regardless of a tribe's size, location, or other demographic variables, a formal energy policy statement that incorporates specific provisions for renewable electric energy is an important beginning to a larger set of strategies. A program to stimulate renewable energy generation will be most effective as part of a more comprehensive energy policy developed by and adapted to each tribe. For example, the energy policy can articulate a renewable energy portfolio standard (RPS) to be applied to tribal electric consumers, including the tribal government, as well as federal government entities located on the tribal lands. This could be implemented alone or in collaboration with other tribes or states. An example energy policy, developed by the Navajo Nation can be viewed at <http://www.navajonationenergypolicy.com>.

2. DEVELOP A TRIBAL IMPLEMENTATION PLAN

Consider developing a Tribal Implementation Plan under the provisions of the Regional Haze Rule and the Tribal Authority Rule that commits the tribe to expanding its use of renewable energy in the generation and use of electricity. Under the Clean Air Act, as interpreted in the Tribal Authority Rule, the tribe has jurisdiction over all areas within the exterior boundaries of the reservation, notwithstanding ownership status. Thus developing a TIP can assist in implementing an effective tribal energy policy, including full development of renewable energy resources, where jurisdiction over areas within the external boundaries of the reservation is important.

3. DEVELOP RENEWABLE ENERGY RESOURCES

Virtually every tribe in the WRAP region enjoys an abundance of renewable energy resources. Some tribes with an established tribal electric utility are already well positioned to expand the role of that utility to develop viable sources of renewable energy. The AP2 Forum encourages tribal utilities to consider exploring these opportunities. Other tribal governments that lack the infrastructure of an existing utility might consider establishing such an enterprise. There are several potential advantages to creating or expanding the tribal government's direct role in renewable energy development and marketing:

- Increased opportunities for new electrification services to members and others on tribal lands.
- Improved reliability of existing electric supplies.
- Acquisition of low-cost electricity that is competitive with traditional energy sources.
- Acquisition of electric supplies that reflects the tribal energy policy and supports other tribal objectives.
- Increased employment for tribal members in a skilled work force.

4. Initiate Energy Training and Education Programs

The Forum recommends that all consumers have the opportunity to select the purchase of energy supplies from renewable sources. Tribal implementation of this recommendation may include consumer education programs addressing purchasing options and their associated environmental impacts. Depending in tribal infrastructure such education programs can include:

- Direct education programs by the tribal utility to tribal members.
- Energy education in grades K-12 in local schools.
- Specialized training in renewable energy technologies and commerce at tribal colleges.
- Project-specific education and training associated with renewable energy initiatives.
- Translation of information on energy conservation and promotion of renewable energy into indigenous languages.

5. Create an Economic Development Corporation

Tribes that choose to pursue a renewable energy enterprise may consider setting up a tribal Economic Development Corporation (EDC). Tribes with an EDC or comparable entity already in place may utilize it to advance the opportunities for entrepreneurial energy development. The somewhat autonomous role of an EDC has been shown to be useful when pursuing a long-term economic development initiative such as required for most energy projects.

An important resource often employed by EDCs is development of capital funding to support individual enterprises. Renewable energy initiatives are often successful at the small-scale and best suited to small business enterprises—enterprises needing start-up or expansion capital. The Forum recommends utilization or development of tribal EDCs to facilitate prompt action toward the GCVTC 10/20 goal.

6. Establish Energy-Conserving Building Codes

In many cases tribal building codes can be improved by incorporating (1) energy efficiency requirements and (2) incentives and requirements for incorporating renewable energy technologies into building design and construction. Various models for such codes are available and can be evaluated by individual tribes with respect to specific local conditions and characteristics. Example energy codes that could be partially or wholly adopted are the ASHRAE Standards 90.1-2001 (Energy Standard for Buildings Except Low-Rise Residential Buildings) and 90.2-2001 (Energy-Efficient Design of Low-Rise Residential Buildings), the International Energy Conservation Code (IECC), or the U.S. Green Builder's LEED (Leadership in Energy and Environmental Design) Standard.

7. Purchase Electricity Generated by Renewable Sources

Tribal governments could demonstrate leadership in renewable energy advocacy through the purchase of electricity from renewable energy suppliers as part of their tribal energy policy. This direct action can be supplemented with several complementary steps:

- Purchase goods and services from vendors that use renewable energy.
- Require businesses located on tribal lands to use renewable energy sources (or purchase from a tribal utility using such sources).
- Develop an aggressive consumer education program about renewable energy options and the advantages of energy conservation.

8. Expedite the Permitting Process for Renewable Energy Projects

Tribal governments could streamline the permitting process for renewable energy projects located within their jurisdiction. Such a process will encourage rather than discourage innovative energy supply and distribution enterprises.

OPTIONS FOR COLLABORATIVE IMPLEMENTATION

Some initiatives that tribes may consider are best (or only) implemented in collaboration with others. Such strategies are presented here in two categories: actions that would benefit on-reservation development, and actions that provide tribal leadership in renewable energy markets beyond tribal lands.

1. Multi-Party Renewable Energy Actions for On-reservation Programs

- Renewable Energy Programs at Federal Facilities

The federal government is the nation's largest energy consumer, including many energy-consuming facilities on tribal lands. Tribal governments could consider requiring that such federal facilities comply with a tribal energy policy that stipulates (1) purchase of electricity from a renewable energy supplier, including the tribal utility where applicable; (2) energy conservation measures in all new and existing federal facilities; and (3) incorporation of renewable energy practices in the design and construction of all new federal facilities.

- Federal Financing of Authorized Renewable Energy Assistance

Several federal statutes authorize funding for energy conservation and renewable energy incentives on tribal lands. Most notable is the Energy Policy Act of 1992 and its amendments. Tribal leaders could formally request adequate appropriations from the U.S. Congress and appropriate agencies to implement the energy conservation and renewable energy development provisions of these laws. This should include funding of training programs for tribal energy professionals related to renewable energy and energy efficiency.

- Federal Project Grants and Subsidies

One federal mechanism to encourage private sector development and use of renewable

energy is tax credits. Because this mechanism does not apply or is of little use to tribes, equivalent financial subsidies for comparable tribal projects should be available. For example, Tribal Energy Block Grants could provide effective incentives to progressive tribal renewable energy initiatives. The Forum recommends that tribes consider seeking equitable financial support for projects comparable to those eligible for tax credits.

- Create Special Tribal SO₂ Emissions Credits

The EPA's Regional Haze Rule authorizes and encourages an innovative cap-and-trade program to reduce regional emissions of sulfur dioxide. The Forum recommends that tribes consider seeking allowances under this program to encourage renewable energy generation on tribal lands through both a tribal set-aside allocation and a renewable energy set aside allocation.

2. Tribal Leadership in Renewable Energy Activities Beyond Tribal Lands

- Develop Inter-Tribal Energy Collaborations

Some renewable energy development opportunities require resources beyond those available to small tribal populations and lands. In some instances this limitation of scale and scope can be overcome through multi-tribal collaborations. This is particularly appealing where tribal lands are adjacent or in close proximity. The Forum recommends that small tribes consider expanding existing intertribal relationships and forging new ones where renewable energy development projects exceed the capacity of an individual tribal government.

- Encourage Creating a Federal Renewable Portfolio Standard

Tribal governments could support a national renewable portfolio standard (RPS). Because tribal lands in the West have great potential for development of renewable energy projects, such a national policy can be effective as well as particularly advantageous to tribal energy and economic development.

- Expand Federal Government's Buy Indian Policy

The "Buy Indian" policy is advantageous to suppliers of selected products and services that are purchased by specific federal agencies. The Forum recommends 1) that this policy be expanded to include the purchase of electricity generated from renewable sources on tribal lands, and 2) that the participating agencies be expanded to include all relevant federal energy procurement.

- Expand the Federal Government's Program for Procurement of Green Energy

Tribes may consider requesting that the Federal government encourage Power Marketing Agencies to obtain electricity generated from renewable resources on tribal lands, combined with the Federal government programs in Executive Order 13123 for the Federal Government's procurement of green energy. A portion of the electricity generated from these renewable resources could be made available for tribal use, similar to hydropower electricity made available from the Western Area Power Administration.

- Encourage Federal Tax Credits for Renewable Generation

As discussed previously, the Forum recommends that tribes consider engaging in the preferential procurement of electricity from suppliers of renewable energy. Concurrently, private sector suppliers of renewable energy, in response to these policies, should be awarded appropriate federal tax credits. This practice will stimulate short-term competitive pricing while limiting financial penalties to both purchasers and providers.

- Create Partnerships with Independent Power Producers

Innovative and successful renewable energy projects are often developed by independent power producers (IPPs). Tribal governments seeking to develop renewable resources may find it desirable to collaborate with an IPP to expedite resource development and to limit tribal financial exposure. The Forum recognizes that such collaborations may be appropriate for some tribal interests.

- Explore State-Tribal Agreements for Renewable Energy Projects on Tribal Lands

Some tribes may want to explore with states the possibility of a state-tribal agreement for renewable energy projects on tribal lands as part of a state's strategy to meet its own 10/20 goal for renewable energy. Such agreements could provide an incentive for locating projects on tribal lands or could remove a disincentive that would arise if location of the project on tribal land meant that the state would not receive credit for the project as part of its progress toward meeting its 10/20 goal. How such an agreement should be structured, and whether such an agreement would be compatible with other tribal goals such as sovereignty, would have to be decided by each tribe through its own internal decision processes.

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GLOSSARY

Aerosol Solid particles or liquid droplets that are small enough to be suspended in the air. Aerosols cause most of the light extinction responsible for haze on the Colorado Plateau.

BART Best available retrofit technology

Cap and Trade

A cap-and-trade program would establish a “cap” on specified pollutant emissions. Under such a program, each affected emission source is allocated a fixed number of tradeable emission credits, subject to the constraint that at any given time the total number of credits in the region must not be greater than the level of the cap. To comply with its allocation, a source would be required either to reduce its emissions or to purchase credits from an over-complying source.

Class I Area The Clean Air Act defines mandatory “Class I” federal areas as certain national parks (over 6,000 acres), wilderness areas (over 5,000 acres), national memorial parks (over 5,000 acres), and international parks that were in existence as of August 1977. It also set a visibility goal for these areas to protect them from future human-caused haze, and to eliminate existing human-caused haze, and required reasonable progress toward that goal.

Colorado Plateau

A high, semi-arid tableland in southeast Utah, northern Arizona, northwest New Mexico, and western Colorado. The unique erosional forms of the Plateau are world famous.

DOE U.S. Department of Energy

EDC Economic Development Corporation

EIA U.S. Energy Information Administration

EPA U.S. Environmental Protection Agency

EPRI Electric Power Research Institute

ESP Energy Service Provider

FERC Federal Energy Regulatory Commission

GCVTC Grand Canyon Visibility Transport Commission

IOU	Investor-Owned Utility
IPP	Independent Power Producer
ITEP	Institute for Tribal Environmental Professionals
kW	Kilowatts
kWh	Kilowatt-hours

Light extinction

The "loss" of light as it travels through the air. Light can be truly lost by being absorbed by gases and aerosols in the air. Light can also be "lost" as it scatters off gases and aerosols.

Mobile source

A pollution source that moves. Mobile sources are often divided into road sources, including cars, trucks, buses, and motorcycles, and non-road sources like trains, planes, boats, lawnmowers, etc.

MTF	Market Trading Forum
MW	Megawatts
MWh	Megawatt-hours
NAAG	National Association of Attorneys General
NAU	Northern Arizona University
NREL	National Renewable Energy Laboratory

Plume blight Plume blight is a distinct band or layer of visible air pollution, often from a single pollution source.

PV Solar photovoltaic cells

Regional cap A limit on the amount of specific air pollutants that can be released in a defined geographic area, or a limit on the amount of a specific air pollutant that is allowed to be in the air in a defined geographic area.

RHR	Regional Haze Rule
RPS	Renewable Portfolio Standard
SBC	System Benefits Charge

SIP State Implementation Plan; plans devised by states to carry out their responsibilities under the Clean Air Act. SIP's must be approved by the U.S. Environmental Protection Agency and include public review.

SO₂, SO_x, sulfates

Compounds composed of oxygen and sulfur. Burning fuels, manufacturing paper, or smelting rock containing sulfur produces sulfur dioxide gas (SO₂) which is converted in the air to other sulfur oxides (SO_x) or haze-causing aerosols (sulfates).

Source Where air pollutants are released. Sources are usually classified as point, mobile, or area sources.

Species A term used to refer to types of pollutants. Nitrogen dioxide (NO₂), carbon dioxide (CO₂), carbon monoxide (CO) and sulfur dioxide (SO₂) are examples of pollutant species.

Stationary source

An air pollution source that remains in one place (generally a business or industrial facility).

TIP Tribal Implementation Plan; plans devised by tribes to meet requirements of the Clean Air Act as defined by the U.S. Environmental Protection Agency.

Trading program

In air quality management, a plan under which some limit is set on the amount of an air pollutant that can be released into the air. If a facility releases less than its limit, it may trade or sell the ability to release "unused" amount of air pollutant to another facility, so the second facility can release more than the limit.

Visibility impairment

The loss of clarity in the air that results when gases or aerosols scatter and absorb light. We usually see visibility impairment as a general haze or a distinct plume.

W Watt

WGA Western Governor's Association

WRAP Western Regional Air Partnership

**APPENDIX A: FACT SHEET: FINAL REGIONAL HAZE REGULATIONS FOR
PROTECTION OF VISIBILITY IN NATIONAL PARKS AND WILDERNESS
AREAS**

APPENDIX B: RENEWABLE ENERGY SYSTEMS AND RESOURCES

APPENDIX C: RENEWABLE ENERGY RESOURCE MAPS

APPENDIX D: INFORMATION SOURCES

APPENDIX E: WRAP TRIBE