DOE/ER/75931--T1A.1

CERT Tribal Internship Program

FINAL INTERN REPORTS

U.S. Department of Energy Grant # FG03-93ER75931

Table of Contents

DISCLAIMER

DISCLAIMER

Portions of this document may be illegible electronic image products. Images are produced from the best available original document.

COUNCIL OF ENERGY RESOURCE TRIBES

AND

THE DEPARTMENT OF ENERGY
DENVER SUPPORT OFFICE

1995 SUMMER INTERNSHIP REPORT

Prepared by

MANUEL STEELE, Intern

* Intern Profile
* Intern Resume
* Intern Personal/
  Professional Development
* Host Organization Profile
* Mentor Profile
* Mentor Resume
* Intern Activity Outline
* Intern Activity Summary
* Technical Report

INTERN PROFILE

My name is Manuel Steele and [redacted], [redacted] In this section, I will discuss my family background and academic experience. From academia, the relevant factors of my internship pertaining to my education will become imminent in the technical report. However, it is important here to describe the Apache heritage of my family. During my early childhood, I was raised with a traditional background. The primary language of use in my youth was Apache. I spoke no English until I began school. My grandfather owned a corral by his house with two horses. My uncle taught me to ride horses at an early age. Hunting, which is prevalent on the reservation, is also a traditional aspect of the Apache culture. I belong to a large extended clan of Apaches known as *Istin ai yeeh*. There had been a direct English translation for this word, but it is derived from an Apache dialect of the nineteenth century that is no longer prevalent.

I have always resented the stereotypical images of the Apaches portrayed by Hollywood films. These films often portray Apaches as savages and "red-devils." Such caricatures have inflicted enormous misunderstandings of the Apaches in mainstream society. In reality, the Apaches had a religion which emphasized the preservation of their people. The conflicts of the Apaches with the military forces of the European settlers were primarily fought in self-defense. This can be demonstrated by the fact that Apache forces rarely exceeded two-hundred warriors in strength. As a paradox, combined forces of Apache scouts, U.S. soldiers, Texas Rangers and Mexican forces often outnumbered the Apaches in repeated conflicts by hundreds or even thousands of troops.

The Apache veterans of my family do not aggressively instill a desire for war as a family tradition. Despite their treatment as second-class citizens, my grandfather, Reynold, and his brothers, Ryan and Walter, served honorably in World War II. My grandfather served in the U.S. Navy and witnessed the bloody aftermath of amphibious assaults in the islands of the Pacific. His brother, Walter, was a U.S. Marine who served at Guadalcanal during the Japanese invasion directed by Yamamoto. After the victory at Guadalcanal by the U.S. Armed Forces, Walter was assigned with the first group of Marines who landed on Iwo Jima. He was nearly killed by sniper fire during the ground battle, but he survived. In the midst of military operations, Walter and Reynold lost their brother, Ryan, to sniper fire in Frankfurt, Germany.

Ryan had survived the D-Day invasion of Normandy, but he was killed during the Allied assault on Germany in the closing days of World War II. In the aftermath of the tragedies, the Apache veterans of my family strongly condemned the violence of war.

Despite my English-speaking deficiencies, I attended a Catholic parochial school where the nuns taught me how to read in kindergarten. (Currently, I do not have adverse problems with verbal or written communication in English.) Eventually, I developed an interest in math and science. In junior high school, I began creating science fair projects. I participated in science fairs throughout high school. My high school had a diverse student population. I was often the only minority in my class, but I was among the highest academic achievers. In calculus, I normally received the highest score on my exams. I received advanced placement credit for college calculus from my AP exam score - a 4. My success in calculus invoked my desire to major in physics. The University of Notre Dame accepted my application for admission in the Spring of 1987. I was very proud of achieving my childhood goal of attending Notre Dame. My academic outlook at the age of 18 was typical of successful Native American students who aspired to achieve high academic goals in college. At the time, I did not realize the extreme level of difficulty of a physics curriculum at a school such as Notre Dame.

In my first calculus exam at Notre Dame, I received an 87/100. There were approximately 11 students in the class who received a higher score than I did. I found this to be extremely frustrating since a year earlier I had often received the highest score. I had similar difficulties in my other courses. My overall undergraduate grades were at the level of a C. As a high school senior, I had never conceptualized that I would experience such academic obstacles. Other students from the reservations encountered similar problems. The overall dropout rate for reservation students was about 80%.

I observed a repetitive pattern where students from the reservation would often arrive at Notre Dame with extremely high grade point averages in high school. However, by the end of their freshman year, many of the students often faced academic probation or a g.p.a. below a 3.00. This often caused them to lose their scholarships. By the time the students were juniors, they were often in unaffordable debt from school loans. The reservation students normally dropped out by their junior year. The parents and other family members were often simultaneously perplexed and bitterly disappointed. However, there is a socioeconomic factor which must be analyzed. I feel compelled to address this problem since it may likely benefit current reservation high school students who are motivated to pursue a rigorous college curriculum.

The difficult aspects of an engineering or science curriculum at a prestigious university is due to the fact that reservation students at these schools are unprepared. Normally, elite students at such universities attended private preparatory high schools which offered extensive advanced placement courses. For example, at Notre Dame many students attended private Catholic high schools which offered advanced placement subjects. At Brophy Preparatory School in Phoenix, Arizona, students are introduced to concepts of organic chemistry as juniors in high school. This is in stark contrast with reservation school systems which often do not offer advanced placement courses. Students from the reservation can realistically find themselves at an academic level two years below those of students from these preparatory schools. This fact is most likely very hard for reservation students to accept. The reservation students are not intellectually inferior, but they are simply forced to attend reservation schools which often do not adequately prepare them for a rigorous college curriculum.

The attrition rate of reservation students at a school such as Notre Dame is not immedicable. In order to deal with this reality, the students can seek a curriculum which gradually introduces them to more difficult courses. Instead of registering for 18 credits in the first semester, the students can register for 12-14 credits. Courses such as calculus and physics should be postponed until all necessary prerequisites are taken. Physics is a course which realistically requires a year of calculus as a prerequisite. Chemistry courses often require laboratory work as co-requisites, which is extremely time consuming. Notre Dame often requires freshman engineering and science students to enroll in physics, calculus, chemistry, English and an elective during the first semester. Reservation students who have attempted to enroll in such courses have often been placed on academic probation due to low grades. Others often received a g.p.a. below a 3.00 which was inadequate for retention of scholarships.

I am advising my younger relatives from the reservation to attend state universities for undergraduate studies for various reasons. State universities are close to home and in a more secure environment. Travel and living expenses are easier to accommodate. Culture shock from leaving the secure family and school environment of the reservation can be minimized at a school in a familiar setting. State universities also offer relatively inexpensive costs of tuition and fees which can allow the reservation students to attend summer school or an extra year of college. For an engineering and science curriculum, five years of undergraduate study may become realistically necessary for adequate completion of subjects required for graduation. The above fact is most likely difficult for successful high school seniors from the reservation to conceptualize. However, a stochastic analysis of graduation rates of reservation students will show that this is often the case. Five years of undergraduate study would not be realistic at an elite, private university for most reservation students due to the expenses. However, once a reservation student has completed undergraduate studies at a state university, I believe that they will have developed the skills necessary for graduate or professional studies at an elite, private university.

An analogy of preparation for college can be found in the following manner. Let us assume that we have an eighteen-year-old student who is not in good physical condition who wishes to complete a marathon race. For such a student, it would not be realistic to attempt to finish a marathon race on the first attempt. But rather, the student should gradually increase the duration and intensity of races after having completed habitual periods of training before each race. For example, the student may practice running for two months then complete a two mile race. After a few months of additional conditioning, the student may then attempt to complete a 10 kilometer race. As the student completes more athletic training, the student may eventually find the strength necessary to complete a marathon. This is similar to the concept of preparation for a rigorous college curriculum. A reservation student who wishes to attend college at a school such as Stanford could first gain the skills necessary for graduate school at the University of Arizona. Once the student has graduated from the University of Arizona, they will most likely be more prepared as older and more mature students for Stanford's rigorous curriculum. Unfortunately, at such elite schools, many reservation students often find themselves unprepared immediately after completion of high school.

In my own experience, I finally "caught up" to the other students as a graduate student. Despite my low undergraduate grades, I felt complete ecstasy when I graduated from Notre Dame because the school had been extremely difficult for me. Moreover, because of the rigorous undergraduate curriculum at Notre Dame, my math score on the Graduate Record Exam was above average for the College of Engineering and Applied Sciences at Arizona State University. This invoked my admission into the M.Sc. Program in Bioengineering in 1992. I finally found academic success as a graduate student. In the spring semester of 1994 I had a 4.00 in my graduate level engineering and science courses. My overall g.p.a. is a 3.11 in graduate school. I have completed my courseswork for an M.Sc. in Bioengineering. For graduation in December of 1995, I will have to orally defend my thesis in the fall.

My graduate research involved the digital processing of medical images created by Positron Emission Tomography. The latter is an imaging modality used to assess metabolic features of regions of interest in patients for diagnostic purposes. I completed my research at St. Joseph's Hospital in Phoenix, Arizona. My advisor, Dr. Alden Bice, is a medical physicist from the University of California at Berkeley. He has taught at Johns Hopkins University, and his wife is a pediatric radiologist. Dr. Bice advised me to earn a medical degree if I choose to establish a career in clinical radiology. However, I will need more time to reflect on the sacrifices necessary for such an academic endeavor. Meanwhile, I have been accepted into the M.Sc. Program in Nuclear and Energy Engineering at the University of Arizona. My research will involve a project in nuclear medicine under the advisement of Dr. Harrison Barrett. Dr. Barrett is a well-respected Harvard physicist in the field of nuclear medicine, and he has given me a research assistantship for my graduate studies. I will most likely make a decision on my future academic training after extensive collaboration with the relevant advisors at Arizona State University and the University of Arizona.

Despite my ongoing interest in medical image processing, I have also had a perpetual desire to help Tribal communities with my academic background. I have established a basic knowledge of the engineering sciences. I am also familiar with the technical format necessary for engineering reports. I gained this knowledge as an intern for CERT in 1992. I completed research on renewable energy resources and their possible applications to Native American communities. This was completed at the National Renewable Energy Laboratory in Golden, Colorado. I worked rigorously with the NREL librarians to incorporate the DOE technical format into my report. I have used this format throughout graduate school, and I have never received a score below 90/100 on my major term papers. At times, the instructors have used my report format as an example for other students to follow.

This summer, my mentor, Dr. Stephen Sargent, hired me to assist him with the technical evaluation of Tribal proposals for funding of projects in renewable energy. Dr. Sargent is the project manager of the Indian Energy Resources Program for the Department of Energy. His task is to disperse government funds to Tribal energy projects through a competitive process of evaluation. As an intern, I assisted him in his daily tasks of evaluating proposals and monitoring existing awardees. My most memorable event was using my technical writing skills to determine technical, environmental and cost factors which would be addressed during future negotiations with potential awardees. The internship has provided me the opportunity to apply my research skills in determining the scope of work proposed by each Tribe interested in project funding. I am gratified to know that I am directly assisting with the technology transfer of projects in renewable energy to Native American communities. I have learned that engineering projects often must incorporate cost factors. As an engineer, I have been taught to examine the scientific aspects of project development. However, this internship has given me practical experience in analyzing the development of energy projects. I have learned that economic factors are as important as engineering specifications for technology transfer. Moreover, environmental impacts are emphatically addressed in projects involving energy development. For those individuals who are not familiar with this internship, I would state that technology transfer involves graduate-level training in the engineering sciences with utility applications. The skills necessary for participating in technical reviews of proposals for renewable energy projects involves the ability to communicate with other engineers in verbal and written fluency.

Manuel Steele
P.O. Box 103
San Carlos, AZ 85550
(602) 475-2898

Objective: Engineering Specialist

Work Experience:

June 1995 to August 1995 — **Denver Regional Support Office/DOE, Golden, CO**
SUMMER INTERN

- Participated in evaluation of proposals for government funding allocated to the Indian Energy Resources Program.
- Analyzed technical proposals written with engineering and cost specifications to determine Tribes to be funded.

May 1992 to August 1992 — **CERT, Denver, CO**
SUMMER INTERN

- Assessed feasibility of development of renewable energy resources for Native Americans of the Southwestern United States.
- Applied knowledge of physics and engineering fundamentals to technical survey of literary sources pertaining to technology transfer of advanced energy projects onto Native American Lands.

June 1989 to August 1989 — **Lawrence Livermore National Laboratory, Livermore, CA**
TECHNICAL TRAINEE

- Assisted engineers and physicists in completing basic aspects of a government research project funded by the U.S. Department of Energy. The subject under study was the Electron Beam Ion Trap.

Research/Accomplishments

Completed research on medical image processing in M.S. program.

Utilized extensive computer algorithms in C and MacToolBox Routines.

Received commendations on technical format of written research projects in graduate school.

Established basic foundation of knowledge of Engineering Sciences.

Education

Present	**University of Arizona, Tucson, AZ** Accepted into M.Sc. program in Nuclear and Energy Engineering (Fall/95). Academic Awards and Scholarships: Research Assistantship from Dr. Harrison Barrett, a Harvard Physicist in the Radiological Sciences (1995), Departmental Academic Scholarship (Nuclear and Energy Engineering, 1995).
June 1995	**CERT, Denver, CO** Facilitation Workshop. Learned to coordinate group projects with a sequential method of communication.
1992-1995	**Arizona State University, Tempe, AZ** M.S. in Bioengineering (Anticipate in December of 1995). Academic Awards and Scholarships: Patricia Roberts Harris Fellowship (1992-1995), American Indian Graduate Center Scholarships (1992-1994), BIA Scholarships (1994-1995).
1987 - 1991	**University of Notre Dame, Notre Dame, IN** B.Sc. in Physics (1991). Academic Awards and Scholarships: AISES Scholarships (1987-1988), American Physical Society Scholarships (1987-1988), BIA Scholarships (1987-1991).

INTERN PERSONAL/PROFESSIONAL DEVELOPMENT

The internship with the Department of Energy provided me with new insight into the development of projects in renewable energy. I learned that extensive engineering specifications are necessary for technical communication of proposed objectives between relevant agencies of interest. For the Indian Energy Resources Program under Title 26, this involves agencies such as the Department of Energy, Tribal governments, utility companies and consulting firms. Such engineering specifications are relevant features of technical writing assignments given to graduate engineering students at Arizona State University. However, such reports often do not include cost specifications to assess economic factors for development. This is a necessary aspect of competitive proposals for energy funding that was introduced to me during my internship.

As an engineering student in graduate school, I was inundated with design projects which included programming features, electrical instruments, calculus derivations, the basic forces of nature and communication skills. As a biomedical engineering student, I learned that physics and mathematics are required for engineering projects. Biomedical Engineering is a discipline which correlates medicine with the different aspects of engineering such as electrical, mechanical and chemical engineering. My mathematics background derived from physics has often provided me with an advantage in group engineering projects. Testing methods developed for engineering products have also been incorporated into my engineering curriculum. However, I was not exposed to the specific cost ramifications of engineering designs. A specific itemization of cost features of equipment and the work performed is necessary to successfully complete an engineering project. Specific knowledge of such factors enable engineers to assess the economic feasibility of proposed projects. My summer internship allowed me to gain this additional skill necessary for success as an engineer. Unfortunately, such economic factors were not included in my curriculum throughout graduate school.

The Denver Regional Support Office for the Department of Energy assists with the facilitation of technology transfer of advancements in renewable energy. The administrative decisions to be made by the office groups often require the assistance of engineers with technical backgrounds. As an intern, I was able to utilize the research which I completed in renewable energy to assist in evaluating the proposals for funding by the Tribes. My research at the National Renewable Energy Laboratory in 1992 involved an assessment of the possible applications of renewable energy to reservation communities. This experience involved the development of an understanding of renewable energy from a scientific perspective. Renewable energy resources discussed in my report included solar, wind, geothermal and biomass energy. Once the conceptual efficiency of renewable energy had been demonstrated by my report, the direct application of such technologies for Tribal benefits became imminent. My technical writing skills and knowledge of physics allowed me to assist my mentor in evaluating proposals and monitoring existing awardees.

Dr. Sargent demonstrated the reality of the skills needed for itemizing costs in technical projects. A knowledge of specific costs for equipment, design, feasibility studies, data analysis and other engineering tasks is necessary for practical project development. Such skills must be actively developed by experience in developing engineering designs and projects in technology transfer. Utility projects often involve collaboration between government agencies, utility companies, and consulting firms. Specific services and equipment provided by each project participant must be itemized to facilitate efficient organization.

As a graduate student, I plan to specialize in engineering. I am in the process of completing my M.S. in Biomedical Engineering from Arizona State University. My undergraduate physics curriculum and my graduate-level course in electricity and magnetism provided me with skills in solving partial differential equations in different coordinate systems. This curriculum also emphasized vector calculus and applications of surface and volume integrals to boundary value problems involving electromagnetic fields. This knowledge of analytical calculus required for physicists is significantly more advanced than the mathematical skills required for an engineer. However, despite my enhanced skills in solving calculus problems, I have become aware of practical skills necessary for engineering projects. A career as an engineering specialist requires an awareness of economic factors in project development. In the future, I will try to develop an understanding of itemized costs of each engineering project in which I am an active participant.

The Department of Energy has a finite level of funding available for disbursement to Tribes through the Indian Energy Resources Program. The level of funding allocated must adequately serve Tribal interests. This funding must be of an appropriate amount such that a significant number of grants can be awarded. In order to negotiate with the Tribes on cost factors, the proposals must be evaluated thoroughly for cost reasonableness. The cost estimates may be inaccurate or vague in some cases. Such inconsistencies must be identified by the Department of Energy to ensure that the proposed costs are consistent with the project work. Minimizing costs in such a manner allows more funding to be available to other Tribes. This is important in helping Tribal governments obtain the necessary funding. By negotiating with Native American leaders to eliminate excessive costs of proposed projects, money can be allocated to more Tribes. This fair and impartial review is of great benefit to Native Americans who applied for funding through the Indian Energy Resources Program.

HOST ORGANIZATION PROFILE
DENVER REGIONAL SUPPORT OFFICE
U.S. DEPARTMENT OF ENERGY

The Denver Regional Support Office (DRSO) of the Department of Energy is an agency of the federal government. The DRSO, located in Golden, Colorado, performs a variety of functions related to technology transfer and deployment of energy efficiency. The DRSO manages the award and administration of grants for funding of technical projects to state governments and other projects of interest. The advancements in designs of energy- efficient projects are discovered at other agencies such as the National Renewable Energy Laboratory. However, overall project funding is not confined to renewable energy resources. For example, grants are also managed and provided for technology transfer advancements in new building technologies.

Currently, the Denver Regional Support Office also provides funding for Tribal governments for projects related to energy efficiency and renewable energy resources. Renewable energy can be derived from geothermal, wind, solar, hydroelectric and biomass energy. Projects in coal and natural gas were also funded in 1994. The funding is made possible by Sections 2603 and 2606 of Title 26 (Indian Energy Resources) of the Energy Policy Act of 1992. These grants are awarded on a competitive basis to Tribal governments.

The goal of the Denver Regional Support Office is to publicly demonstrate the usefulness of energy efficiency designs in broad areas of resources. Such improvements can help the Department of Energy to accomplish its mission of assuring an adequate supply of clean energy to the nation.

MENTOR PROFILE
STEPHEN L. SARGENT

Dr. Stephen Sargent is a member of the technical staff of the Department of Energy Regional Support Office (DRSO). His title is Program Manager for Indian Energy Resource Development. He is responsible for advancing the transfer of renewable energy technologies to Indian lands by means of managing projects authorized under Title 26 of the Energy Policy Act of 1992. Funding is provided on a competitive basis to Tribes who submit proposals to the DRSO for evaluation.

Dr. Sargent provides the technical input for proposal solicitations, coordinates the review of proposals and manages the projects that are selected from submitted proposals. Dr. Sargent has more than 30 years of experience in the renewable energy field and uses this experience daily in his job. He designed his own home that incorporates passive solar and energy efficiency features, which save energy and money over conventional designs.

Stephen L. Sargent
Program Manager, Indian Energy Resource Development
U.S. Department of Energy, Denver Regional Support Office
Golden, Colorado

Work Experience

February 1995 - present — **Program Manager, Indian Energy Resource Development, Denver Regional Support Office**

Manages the Indian Energy Resource Development Program, authorized under Title 26 of the 1992 Energy Policy Act. Pursuing opportunities for joint projects with other agencies, and alternate funding sources to expand program scope.

June 1991 - February 1995 — **Renewable Energy Engineer, Western Area Power Administration, Golden, Colorado**

Coordinated renewable energy activities for WAPA Headquarters offices, including technology transfer, production of renewable energy promotional materials, conduct of workshops, and presentations on renewable energy. Managed projects for the Western Regional Biomass Energy Program, managed by WAPA for the Department of Energy. Served as Program Chairman for Bioenergy '94, the annual biomass energy conference sponsored by the Regional Biomass Energy Program.

September 1979 - February 1991 — **Solar Energy Technology Specialist, DOE Golden Field Office (formerly SERI Area Office), Golden, Colorado**

Served as the senior technical staff member at the DOE office located at the Solar Energy Research Institute. Performed field management for several DOE Renewable Energy Programs, including the Cooperative Field Test Program for WindEnergy and the Passive Solar Manufactured Products Program. Monitored technical progress of SERI programs.

Education

Ph.D., Mechanical Engineering, University of Wisconsin, 1971.

M.Sc., Mechanical Engineering, University of Wisconsin, 1967.

B.Sc., Mechanical Engineering, Arizona State University, 1964.

Professional Associations and Activities

American Solar Energy Society
American Society of Mechanical Engineers
American Wind Energy Association
Tau Beta Pi

INTERN ACTIVITY OUTLINE

I. Project Purpose

- Facilitate transfer of advancements in renewable energy to Native American lands for economic and educational benefits.
- Assist in evaluation of proposals submitted for government funding under Title 26 Indian Energy Resources Program.

II. Project Objectives

- Examine specific cost factors stated by each Tribe for economic assessment of each proposal.
- Assess environmental impacts of proposed scope of work presented by each Tribe.
- Monitor existing grants for disbursal of requested funds.
- Provide Tribal governments with a fair and impartial review of grant proposals for funding by the Department of Energy.

III. Project Approach

- Utilization and analysis of six criteria for evaluation of proposals.
- Thorough scrutiny of economic factors stated by each Tribe through reading skills established from knowledge of technical writing formats.
- Communication of engineering fundamentals with reviewers at the Department of Energy Regional Support Office.
- Verbal communication with Tribal leaders on progress reports.

IV. Project Results

- Specific itemization of cost factors included with proposal.
- Coordination of administrative tasks necessary for disbursal of funds.

V. Project Assessment

- The tasks were performed to provide maximum benefit to Tribes within the allotted time schedule.
- The Native American leaders who wrote successful proposals were effective in stating the specific scope of work with itemized cost factors.

INTERN ACTIVITY SUMMARY

I. Project Purpose

Facilitate transfer of advancements in renewable energy to Native American Lands for economic and educational benefits. Steve Sargent at the DOE Denver Regional Support Office is the program manager for the Indian Energy Resources Program. The Energy Policy Act of 1992 authorized money for this program through Title 26 - Sections 2603 and 2606. In 1994, funding was appropriated by Congress for Sections 2603 and 2606. Eighteen Tribes have been awarded funds for projects relating to renewable energy, energy efficiency, natural gas and coal. In 1995, Congress designated funding for Section 2606 but not Section 2603. These funds will be awarded on a competitive basis to facilitate the development of renewable energy resources and energy efficient projects.

Assist in evaluation of proposals submitted for government funding under the Title 26 Indian Energy Resources Program. Numerous proposals have been submitted by Native American leaders for funding under Section 2606. The finite amount of funding available necessitates a competitive process for awarding funds to Tribes. This involves a thorough evaluation of each proposal with analysis of specific factors.

II. Project Objectives

Examine specific cost factors stated by each Tribe for economic assessment of each proposal. An important aspect of engineering projects involving utilities is the itemization of costs for equipment and tasks. Successful projects have an economic basis for development. Tribal governments must submit proposals which specifically outline equipment needed for feasibility studies or demonstration projects. Incorporation of advanced features into tribal utility projects also involves specific services by personnel who may be provided by the Tribe or by contractors. The cost estimates of these services must also be included for corroboration of the funds allocated to the Indian Energy Resources Program.

Assess environmental impacts of proposed scope of work presented by each Tribe. Government regulations for funding requires that compliance with environmental standards is present in each project of interest. Respect for the earth and its environment is a belief expressed in many Native American cultures. Tribal lands are often located in remote areas where there has been little environmental damage which is often present in large industrial regions. Effective monitoring of environmental impacts of Tribal projects in renewable energy are necessary to minimize the possibility of the same kind of damage which has occurred in these large areas.

Monitor existing grants for disbersal of requested funds. In order to disburse funds for each phase of energy development, progress on existing projects must be determined. The Department of Energy has a responsibility to insure that awarded grants will provide legitimate benefits to Native American communities.

Provide Tribal governments with a fair and impartial review of grant proposals for funding by the Department of Energy. [As a tribal member, I have often observed favoritism among past Tribal leaders of the San Carlos Apaches.] Political favoritism is inefficient and unprofessional. As an Apache engineer, I feel that it is my duty to provide each Tribal proposal with a stringent evaluation based strictly on engineering factors involving, costs, environmental impacts and technical features.

III. Project Approach

Utilization and analysis of six criteria for evaluation of proposals. There are six criteria which are used to evaluate proposals for funding under Title 26. The criteria are weighted and summed to give a maximum total of 100. The proposals are ranked to determine the competitive projects envisioned by Native American leaders in each category of designs involving renewable energy and energy efficiency. These factors are discussed in the technical report.

Thorough scrutiny of economic factors stated by each tribe through reading skills established from knowledge of technical writing formats. In order to determine specific costs of competitive proposals, the scope of work and relevant costs must be determined. These engineering documents require technical communication skills at the graduate level for determination of factors which must be addressed for negotiation with potential awardees.

Communication of engineering fundamentals with reviewers at the Department of Energy Regional Support Office. The review of competitive proposals involves extensive collaboration with Dr. Sargent and Margaret Learmouth, Contracting Officer at the DRSO. The evaluation process is an example of group coordination for completion of necessary tasks. Communication skills gained in graduate school must be applied in a consistent manner to facilitate an analysis of the scope of work, cost factors, and environmental impacts of competitive proposals.

Verbal communication with Tribal leaders on progress reports. The project managers of existing grants which have been awarded were contacted. A questionnaire was prepared for phone discussion to gain information on project progress. This is necessary for Dr. Sargent to disperse funds for the various phases of the awarded projects.

IV. Project Results

Specific itemization of cost factors included with proposal. The costs of specific equipment and services necessary for competitive proposals are often thoroughly addressed. These tribal proposals are more likely to be funded. Other proposals are inundated with vague information relevant for determination of economic factors. In other words, the DOE must be aware of the equipment and services to be funded. With my analysis, I have been able to provide Dr. Sargent with the information necessary for future negotiation with Tribes that will be awarded.

Coordination of administrative tasks necessary for disbursal of funds. I have spoken with project managers from the Hoopa Valley Tribe, the Turtle Mountain Chippewa, and the Blackfeet Tribe for information on project progress. The information gained from these phone interviews provided Steve Sargent with the report necessary for disbursement of funds.

V. Project Assessment

The tasks were performed to provide maximum benefit to Tribes within the allotted timeframe. The internship has allowed me to contribute to the process of technology transfer of advancements in renewable energy and energy efficiency designs to Native American communities. However, the short two month timeframe was insufficient for completion of other tasks. For example, various Native American leaders were informed that representatives of the Department of Energy would be available for site visits. Dr. Sargent had allocated funding for me to complete several of these tasks, but the time limitations did not allow me to complete them.

The Tribal governments who wrote successful proposals were effective in stating the specific scope of work with itemized cost factors and minimization of environmental impacts. The Department of Energy has the responsibility of ensuring safe and economic development of energy resources for United States citizens. Therefore, successful proposals often specifically stated the scope of work to be funded. Schedules of tasks to be completed and relevant costs for equipment and services were stated in separate sections. Environmental effects were also specifically addressed by successful proposals. Unsuccessful proposals often documented cost factors, environmental impacts, and the scope of work in a highly unorganized format.

COUNCIL OF ENERGY RESOURCE TRIBES

AND

THE DEPARTMENT OF ENERGY
DENVER SUPPORT OFFICE

1995 SUMMER INTERNSHIP

TECHNICAL REPORT

Prepared by

MANUEL STEELE, Intern

AUGUST 1995

Council of Energy Resource Tribes
1999 Broadway, Suite 2600
Denver, CO 80202-5726
Phone: (303) 297-2378
Telefax: (303) 296-5690

TABLE OF CONTENTS

TECHNICAL REPORT

INTRODUCTION

According to David Lester, the member Tribes of the Council of Energy Resource Tribes (CERT) have a goal in which they will "... enter the 21st century on their own terms." David Lester is the Executive Director of CERT. For hundreds of years, Native Americans have been portrayed as primitive savages with the inability to govern themselves and as having a lack of technology in their society. However, cultural progress has been delayed for centuries due to war, disease and disintegration of Native people. Native American leaders generally contend that this process can now be reversed with education and development of Tribal resources. With the utilization of technical resources on Native American lands, the "Indians" are now capable of supplying their communities with energy and economic benefits.

The Indian Energy Resources Program at the DOE Denver Regional Support Office is designed to facilitate the technology transfer of advancements in renewable energy and energy efficiency designs to Tribal lands. This report addresses the chronological process of research in renewable energy and acquisition of engineering communication skills for participation in resource development. Many Native Americans throughout the United States are aware of the potential for development of their Native resources. (David 1995; Steele 1992; U.S. DOE (March and May) 1995).

ASSESSMENT OF RENEWABLE ENERGY ON NATIVE AMERICAN LANDS IN 1992

In 1992, the CERT Intern Program hired me to complete research at the National Renewable Energy Laboratory (NREL). The specific duty was to assess the possible applications of renewable energy resources on reservations throughout the southwestern United States. Extensive research on renewable energy resources was completed at the NREL library. The four types of resources analyzed were solar, wind, geothermal and biomass energy. NREL has staff experts on each type of resource for information on possible applications. Therefore, the reading material and verbal communication necessary for research in renewable energy were readily accessible at NREL. Renewable energy resources are often economical and generally environmentally safe. These resources exist throughout many reservations in the southwestern United States. (Steele 1992).

Applications of solar energy include photovoltaic modules, passive solar homes and solar thermal electricity. All of which harness energy from the sun. The sun is an ongoing natural generator of energy through a fusion process known as the proton-proton reaction. Solar energy is radiated by the sun as photons. The sunlight travels through space at a speed of approximately 300,000,000 meters per second. The photons are units of energy which are quantized. They behave as particles in the sense that they are confined to relatively small regions of space. Photovoltaic (PV) modules convert sunlight to electricity with semiconductors. The photons provide energy which allows electrons to flow as a current. Passive solar homes are energy efficient homes designed with spacing, windowing and insulation features which minimize the use of energy necessary to maintain cooling and heating. Solar thermal electric generators use collectors to pre-heat water before it is converted to steam. The steam is used for a turbine which generates electricity. All are examples of effective solar energy designs. (Steele 1992).

Wind energy is a natural resource specific to certain geographical areas. The concept involves the use of wind to turn electric turbines which generate electricity. The turbines are placed on towers which are strategically placed in windy regions for effective generation. Projects often involve small scale develop[illegible] with as little as one turbine to provide electricity to a home or large scale wind farms for regional use of electricity. Such large scale developments have been demonstrated to be economically competitive in certain regions of the United States. (Steele 1992).

Biomass energy involves the use of energy derived from organic compounds. These compounds are present in plants, wood, and organic waste, all of which can provide energy for electricity. The resources are used as reactants in an exothermic reaction which generates heat. The heat is useful for electric generating systems by providing rotational kinetic energy to electric turbines. Moreover, biomass can be used to create a biogas which has less pollutants than natural gas. Power plants which utilize biomass have been found to be most economical in regions inundated with these natural resources. (Steele 1992).

Geothermal energy for practical applications is derived from natural hot water sources such as springs. These warm water sources are created by heat generated by the earth's interior. The presence of this heat can be exemplified by volcanoes. Certain geographical regions have an abundant source of geothermal energy. The hot water can be used for heating and steam generation for electric turbines. Aquaculture is also a possibility. However, these resources are very site specific, and in many regions they are nonexistent. Extensive site analysis must be completed to determine the feasibility of project developments with geothermal energy. (Steele 1992).

The NREL library contains extensive documents which demonstrate that many Tribes had already completed projects in renewable energy. These were compiled into an Appendix and categorized by the different types of resources. The purpose of this Appendix was to convince Native American leaders to develop renewable energy with a goal of benefitting their respective communities. The document was written to provide a convincing argument for creating an interest in developing Tribal renewable energy resources by demonstrating that many Native American communities had already benefitted from such projects. (Steele 1992).

The internship of 1992 required an initial assessment of renewable energy resources on Tribal lands to convince Native American leaders to develop energy projects. However, the technological advancements in renewable energy are not useful unless they are effectively incorporated for direct use by Tribal utilities and homes. During that summer, I attempted to coordinate a group of experts from DOE for a cost assessment of a solar thermal electric project at San Carlos, Arizona. The San Carlos Apache Reservation has a high level of solar influx for applications to utility projects. Such a project could involve solar thermal electric generation as an application of solar energy. Development of this application would require an electric distribution system. The Apaches had been offered a unique opportunity to acquire transmission lines from the federal government in 1992. (Steele 1992).

The San Carlos Irrigation Project Divestiture Act of 1991 was approved as Public Law 102-231 by Congress on December 12, 1991. This law allowed the appropriation of transmission lines on the Gila River and San Carlos Indian Reservations to the respective Tribal governments. This was due to the fact that the transmission lines were in good operating condition. However, they had been installed to distribute electricity along the Gila River from a hydroelectric dam on the river portion which passes through the San Carlos Apache Reservation. This dam became defunct in 1983. It had been installed for an uncharacteristic excessive flow rate of water greater than the average yearly flow. The divestiture was a conditional arrangement with Native American leaders from the San Carlos Apache Reservation and Gila River Indian Reservation. The respective Tribes had to demonstrate the technical capacity to maintain the transmission lines. (Steele 1992).

Richard David of the Department of Energy had resided in San Carlos during the 1970s. As a program manager at the DRSO, Mr. David suggested that the Apaches could demonstrate technical capability by submitting proposals for projects in solar energy. These could be incorporated into the electric distribution system at San Carlos. This involved a feasibility study of potential projects. One such example included solar thermal electric generation. This potential project needed a cost assessment of the generation system by experts at NREL. The assessment required data from the Bureau of Indian Affairs on the engineering specifications of the power distribution system at San Carlos. This information was never obtained from the BIA. Due to the short timeframe for the internship, the cost assessment was never completed. This would have been the first step for technology transfer of solar energy onto the San Carlos Apache Reservation. (Steele 1992).

However, the author submitted the technical report to Apache leaders to assist them with developing conceptual designs of potential applications involving the electric distribution system. Such potential projects were necessary to provide a convincing argument to Congress for Tribal ownership of the transmission lines. Essentially, the respective Tribes had to effectively demonstrate to Congress that they had the capacity to operate and maintain the electric distribution systems. The relevant hearing was scheduled in December of 1992. According to William Byler, a lobbyist for the Apaches, the ownership was not approved due to failure of the Gila River Tribe to actively participate in the divestiture. The Gila River Tribe was complacent about this rare opportunity. Throughout the United States, it is rare to find Tribal governments that own their own extensive power distribution system. (Byler 1995; Steele 1992).

However, despite the disapproval of the divestiture act of 1992, technology transfer is still possible for many tribal governments throughout the United States. The initial task of completing a general assessment of renewable energy resources on Indian reservations was completed in 1992. The subsequent process of practical technology transfer directly to tribal communities was never accomplished during the first internship by me. However, the facilitation of technological development is now the current goal for my second internship of 1995. Such Tribal projects often require funding from the Title 26 Indian Energy Resources Program. The funding is appropriated for feasibility studies, demonstration projects and energy efficiency designs for development of Native American resources. The process involves coordination of project development with the Department of Energy. The necessary tasks for initial phases of development of Tribal resources requires a knowledge of the basic engineering sciences and communication skills. (Steele 1992).

DOE/DRSO 1995 INTERNSHIP FOR INDIAN ENERGY RESOURCES

This internship requires participation in technology transfer for energy development with a diverse group of staff members at the Department of Energy. At the DRSO, the participants include engineering experts and administrative personnel who need to coordinate their relevant skills for successful completion of the technology transfer to communities of interest. Dr. Sargent is the Program Manager who coordinates the relevant activities. The DRSO utilized me to provide them with an additional technical perspective on the evaluation of proposals for funding by the Title 26 Program. This program has been created to provide Native Americans with economic growth and development. (David 1995; U.S. DOE (March and May) 1995).

TITLE 26 - SECTIONS 2603 AND 2606

Title 26 of the Energy Policy Act of 1992 authorizes funds for development of energy resources on Tribal lands. There are six sections; two are relevant to this report. Section 2603 allocates funding for energy development, but the types of energy resources include renewable energy <u>and</u> the development of oil, natural gas and coal resources. Section 2606 allocates funding specifically for renewable energy resources and energy efficiency designs. The congressional appropriations are often adjusted on a yearly basis. In 1994, three projects were funded under Section 2603. The Tribes involved were the Crow, Colville and Seneca. For Section 2606, 15 projects were funded of which two are still pending negotiation for determination of awards. The information pertaining to these two Tribes is proprietary. The Native American governing bodies which were initially awarded funds from the DOE for this section include the Agdaagux, Blackfeet, Cape Fox, Chignik Lagoon, Fort Peck, Haida Corp., Hoopa Valley, Koniag Corp., Lower Brule Sioux, Onedia, Laguna Pueblo, Zuni Pueblo, Turtle Mountain Chippewa and White Mountain Apaches. In 1995, Congress appropriated funding to be awarded under Section 2606 but not Section 2603. Currently, the DRSO is evaluating proposals submitted by Tribes for funding under Section 2606. This is a competitive process in which Native American leaders must address factors for technical review by the DRSO and its technical experts. (David 1995; U.S. DOE (March and May) 1995).

ENGINEERING SKILLS FOR ENERGY DEVELOPMENT

Cooperative learning involves group methods for completing engineering projects and reports in an efficient manner. This is an engineering skill which emphasizes the individual contribution of each student to effectively complete relevant assignments. For example, an engineering group designing a photovoltaic project for water pumps may include four students with diverse backgrounds. Possibly, the first student is an electrical engineer, the second student is a physicist, the third student is an environmental engineer and the fourth an accountant, respectively. Each student could contribute unique skills for final completion of the photovoltaic project. It is important to note that in the above example the engineering project may not be completed effectively by one individual's work. Each student's strength must be combined to insure efficient completion. (Kipke 1993).

The individual contributions from each student may be completed by assigning specific tasks to different members of the group. For example, the electrical engineer can be assigned with the installation of the electrical distribution system, and the physicist can describe the process of fusion in the sun which generates solar energy in quantized units. (Steele 1992). The environmental engineer can assess factors necessary to comply with government environmental regulations. The accountant can contribute economical factors relevant for completion and projection of future benefits. In order to consolidate the individual contributions, the group members must be able to demonstrate the effective capacity to communicate with each other. (Kipke 1993).

For this internship, a student must understand the basic engineering science concepts for developing renewable energy. This involves a knowledge of Newton's laws of physics. Other concepts of relevance include potential and kinetic energy, thermodynamics, chemical reactions, electricity and magnetism. Mathematical distributions relevant to engineering computations are also helpful for understanding reliability and data analysis. Knowledge of quantum mechanics for solar energy and physical chemistry are also necessary to understand the process of fusion in the Sun. Such basic engineering skills must also be effectively communicated to group participants. The ability to articulate technical contributions and problems of interest also enhances effective organization. For an engineering internship this involves a knowledge of technical writing formats and the relevant areas of the engineering sciences. Therefore, a knowledge of the engineering sciences and the ability to communicate in verbal and written formats is necessary to effectively contribute to technology transfer as a DOE intern. (Kipke 1993; Steele 1992).

PROCESS OF EVALUATION

There are two steps in the evaluation process. This process is currently not completed. First, the DRSO must determine that all necessary forms have been submitted and if the Tribes are eligible for these funds. Second, the proposals must be reviewed by technical experts in each area of renewable energy. These proposals are assigned with categorical labels depending on their scope of work. These are: (1) photovoltaics, (2) wind resources, (3) hydroelectric generation, (4) biomass resources, (5) building technology, (6) geothermal and (7) miscellaneous. This year there were four groups of technical experts which reviewed the applications. The experts were comprised of DOE and BIA employees and engineering consultants. For the DOE, there were three experts from the Denver Regional Support Office and from the National

Renewable Energy Laboratory. There were two additional federal employees from the BIA who served as expert reviewers. Three reviewers are independent engineering consultants, and one is from an engineering firm. (David 1995; U.S. DOE (March and May) 1995).

Although the technical factors have been evaluated by experts, the final selection process has yet to be completed. The initial evaluation of the proposals by the experts has identified competitive projects which may be funded. However, before this is initiated, the proposals must be reevaluated thoroughly for the scope of work with itemized cost assessments. The internship requires active participation in these tasks designated to the DRSO. This involves a thorough analysis of the engineering specifications of the proposed projects with account summaries of itemized costs. The services and equipment to be provided by external consulting firms must be identified. In-kind services which are contributed by the Native Americans must also be determined to evaluate Tribal participation. The contributions of various agencies in Tribal governments are important for identifying competitive proposals. A timetable for the proposed scope of work must also be negotiated between the Tribal leaders and the DRSO. Thus, the facilitation of technology transfer involves an administrative assessment of Native American leaders who most effectively demonstrate cost-containment and benefits of the project to the DOE. (David 1995; U.S. DOE (March and May) 1995).

In addition, the environmental factors of each competitive proposal must be thoroughly evaluated under regulations of the National Environmental Policy Act (NEPA). The DRSO requires the internship participant to identify Tribal proposals which may need additional environmental studies before completion of their projects. There are thee types of categories into which each proposal can be placed. The first category, known as categorical exclusions, is reserved for projects that do not need further determination of environmental effects. These types of projects often involve feasibility studies that utilize data analysis in an office system. If there are no anticipated environmental disturbances, a project can be categorically excluded from environmental assessments. Projects that need an environmental assessment must be identified. These are developments that may disturb the environment to a degree which must be determined. The last category of proposed projects requires an enivironmental impact statement (EIS). These types of projects may significantly alter its proximal environment. The potential impacts must be assessed in an EIS. In order to make the above determinations for each proposal, the specific scope of work must be identified for use with the Code of Federal Regulations provided by the Department of Energy. It is the responsibility of the DRSO to insure that awardees will adequately address compliance with environmental standards. However, many Native Americans have a cultural tradition of respecting the earth and their environment. These cultural values can be applied to environmental standards in developing Tribal projects. (David 1995; U.S. DOE (March and May) 1995).

TRIBAL ENERGY DEVELOPMENT INTO THE 21ST CENTURY

The tasks designated for this internship are designed to effectively facilitate the development of energy resources for direct Native American benefits. The coordination of participants in the Indian Energy Program requires extensive reviews of technical details given by the Tribal leaders. The process is time-consuming and requires engineering reading skills at the graduate level. The author of this report has signed a proprietary statement to not reveal any specific details on proposals submitted by various Native American governments. Therefore, although a discussion of specific proposal strengths/weakness of each Tribe would be helpful, it is not possible due to their status as proprietary information. However, the assigned tasks have enabled the author of this report to contribute individual skills which significantly aided in the evaluation process necessary to begin the development of Native American resources. In conclusion, this internship benefited Tribal leaders by providing existing awardees with monitoring for disbursal of awarded funds. The internship also provided Native American leaders with a fair and impartial review of proposed projects. These were the primary purposes of my 1995 internship for the Indian Energy Resources Program managed by the Department of Energy. (David 1995; U.S. DOE (March and May) 1995).

REFERENCES CITED

Byler, William. "Oral Communication with Author." Golden, CO: DRSO, 1995.

David, Richard. HISTORY: TITLE 26 INDIAN ENERGY RESOURCE DEVELOPMENT. Golden, CO: Unpublished Document, 1995.

Kipke, Daryl. "Oral Communication with Author." Tempe, AZ: Arizona State University, 1993.

Steele, Manuel. Renewable Energy Resources on Southwestern Native American Reservations. Denver, CO: CERT, 1992.

U.S. DOE. TITLE XXVI INDIAN ENERGY RESOURCES: A Handbook. Golden, CO: DOE DRSO, (March) 1995.

U.S. DOE. Office of Energy Efficiency and Renewable Energy: NEPA Reference Notebook. Washington, D.C. (May) 1995.