Purpose of Evaluation

This evaluation has two objectives:

- to document the successes and challenges of the Oneida Solar Energy Project &
- to document decisions regarding direction of the project.

Project Background

The aim of the Oneida Solar Energy Project is to increase the use of renewable energy on the Oneida Nation Reservation through the installation of solar hot water and photovoltaic systems. Homeowners receive financial assistance for the installation of photovoltaic and solar hot water systems, and also receive free consulting from the Oneida Solar Energy Project.

Furthermore, the Oneida Solar Energy Project provides education about renewable energy at events throughout the State of Wisconsin. The focus of this education is the solar energy trailer, which contains solar hot water and solar electric systems.

Most importantly, the Oneida Solar Energy Project represents collaborations between the Oneida Environmental Resource Board, Environmental Health and Safety Department, U.S. Department of Energy, the Wisconsin Department of Administration, the Wisconsin Public Service Corporation, the Midwest Renewable Energy Association, and multiple consultants and tribal contractors.

Project Goals and Implementation

The project evolved from the desire of the Environmental, Health & Safety Area to explore the use of more sustainable energy technologies. Bruno Zagar was hired as the Environmental Specialist in 1998 and had previous experience as the project manager of the Oneida Sustainable Home Project. In 1995, the Oneida Nation received a DOE (Title 26 of the Energy Policy Act of 1992) grant for the project which was a joint venture between the Oneida Nation, U.S. Department of Energy, the U.S. Department of Housing and Urban Development and the Wisconsin Public Service Corporation. The fiscal year 1999 Environmental Quality Strategic plan included activities to research and investigate renewable energy technologies.

Once the DOE grant was secured in 1999, the activities to promote renewable energy use and energy efficiency became a priority department goal. The initial DOE

grant objective was to install 54 solar hot water and 18 photovoltaic systems over three years. The desired outcome was to increase the use of renewable energy on the Oneida Nation Reservation. The use of renewable energy systems provides a method for the Oneida Tribe to move toward self-sufficiency while meeting the needs of contemporary life. The Oneida Nation strives to sustain an ecologically healthy environment for future generations.

The Oneida Solar Energy Project was established to increase the use of renewable energy on the Oneida Nation Reservation through the installation of solar hot water and photovoltaic systems. Tribal member homeowners received financial assistance for the installation of photovoltaic and solar hot water systems and no-cost energy audits of their homes.

The Oneida Solar Energy Project provided education about renewable energy to the Tribe and throughout the State of Wisconsin. Education was hands-on and interactive through the use of the solar energy demonstration trailer, installed with operational solar hot water and solar electric systems.

Most importantly, the Oneida Solar Energy Project represents collaborations between the Oneida Nation Environmental Resource Board (ONERB), Oneida Nation Environmental, Health and Safety Area, U.S. Department of Energy (DOE), the Wisconsin Department of Administration (WDOA), the Wisconsin Public Service Corporation (WPS), the Midwest Renewable Energy Association (MREA), and multiple consultants and Tribal contractors. The project was funded by the Oneida Nation, U.S. Department of Energy, the Wisconsin Public Service Corporation, the WDOA Wisconsin Focus on Energy Program and WisconSUN.

Once the project began, it became apparent that most Tribal members were hesitant to invest $3,000 - $6,000 in solar energy systems. There were project implementation delays due to misunderstanding of the commitment from Oneida Plumbing to install solar hot water systems while installers were being trained. Furthermore, out of the four electric companies trained, only one actually participated in the project. After a second training session, two solar electric contractors were secured.

Due to these factors, the project focus was officially revised in the third year to target Tribally owned buildings for larger solar systems. In addition, efforts were focused to promote and to increase energy efficiency in Tribal buildings and some Tribal member homes through energy audits. By targeting Tribal buildings, the program hoped to lower operation and maintenance costs and lower life cycle building costs. Also, the benefits of these improvements would ultimately be lower fuel costs for Tribal buildings and Tribal members. Improving the energy efficiency of Tribal buildings and homes would result in more comfortable working and living space and better indoor air

quality.

Outcomes Achieved

The use of solar radiation as a source of renewable energy reduces the pollution produced through conventional non-renewable sources of energy. For the Oneida Nation, it means decreasing dependency on coal as an energy source, which contributes to:

- global warming through the release of carbon dioxide,
- air pollution through the emission of nitrous oxides and sulfur oxides, and
- mercury pollution through precipitation

It is estimated that the solar installations on the Oneida Nation Reservation have prevented the burning of 16 tons of coal, which is a reduction of **75,200 lbs. per year of carbon dioxide released to the atmosphere**.

The energy audits, energy assistance and energy planning on new and existing Tribal members homes, Community Center and Community Health Center have helped Tribal members and the Tribe to lower their fuel bills and thus reduce coal burning by 100 tons and **reduced carbon dioxide emissions by at least 470,000 lbs. per year.**

Work Completed

Technical Advisory Committees

A key component to the success of the program was the formation of technical advisory committees for both the solar hot water and solar electric systems. The technical advisory groups selected the most appropriate manufacturers and design of the solar systems for application on the Oneida Nation Reservation. They also analyzed full life-cycle costs of the systems, developed maintenance plans for the systems, and developed operation manuals.

The committee for solar hot water systems consisted of Bruno Zagar; Bill Hurrle, Community Builders; and Richard Lane, Public Energy Systems. The committee for solar electric systems consisted of Debra Tewa, Hopi NativeSUN and Chris Laforge, Midwest Renewable Energy Association. Installation is design built for each house as determined by the contractor and project supervisor. Contractors are responsible for maintenance and installation as well as providing warranty service on system installation.

Solar Electric Installation Training

The solar electric installation training was held October 18th-22nd, 1999. Project Consultants Chris Laforge and Debra Tewa trained four electricians from three separate electric contracting firms. Electricians attending the week-long training learned from classroom education and by installing the first system for the Oneida Solar Energy Project. One of the contractors trained completed photovoltaic sign repair and installed the 2 kilowatt system on the Oneida Nation Community Center.

Solar Hot Water Installation Training

The solar hot water installation training was held June 20-23rd, 2000. Consultants Bill Hurrle and Richard Lane trained eight Tribal contractors in a classroom environment and in the field on installing solar hot water systems. Two systems were installed on a duplex through the training. In addition, two half hour videos of solar hot water system installation and education were created and 20 copies were distributed through the Oneida Nation, the State of Wisconsin, and the Department of Energy. Four contractors have continued to do work installing and repairing solar hot water systems.

Ten individuals have been trained and certified in Solar Hot Water installation contracting. Three Oneida Tribal Vendor Contractors are now registered with the Oneida Nation Compliance Division.

Completed Solar Hot Water System Installations (12)

Solar hot water systems are flat plate solar collector installed on the roof, and are supported by angle brackets, which adjust to the maximum extent the solar access window. An electric pump which is powered by a small photovoltaic panel to circulate the glycol solution. Systems consist of either one or two 4 x 8 ft. panels, storage tank, heat exchanger, and associated piping and valves.

Larry Cornelius	W781 Pearl St.	Oneida, WI 54155
Laura Manthe	484 Shady Drive	Oneida, WI 54155
Debbie Powless	W1850 Poplar Road	Seymour, WI 54165
Patricia Friedrich	1401 Brocoin Way	Green Bay, WI 54304
Mark and Shirley Powless*	2754 Cormier Road	Green Bay, WI 54313
Chris Powless	2752 Cormier Road	Green Bay, WI 54313
Nadine Escamea	W1428 Ray Road	De Pere, WI 54115
Ted Skenandore	W810 CTY Road VV	De Pere, WI 54115
Tim Webster	837 E. South St.	Appleton, WI 54199
Girl's Group Home*		Oneida, WI 54155
Oneida Solar Trailer	3759 West Mason St.	Oneida, WI 54155
Tsyunhehkwa	139 Riverdale	Oneida, WI 54155

* two panel system

Photo: Tsyunhehkwa system with installers & Jill Martus-Ninham, Agricultural Supervisor

Refurbished and Repaired Solar Hot Water Systems on Residential Homes (5)

Dale Powless
Michelle Powless
Tina House
Robert Grenguist
Laura Cornelius

Completed Solar Electric System Installations (6)

Photovoltaic systems will be positioned on a pole or tracking system if roof access in not available, with solar panel arrays being a combination of fixed panel mounts or stationed on a passive solar tracker. The passive solar tracking system will be a design feature as it increases energy production by up to 40%. Systems will include

the standard package of an inverter; charge control, batteries sufficient to meet system voltage, and a battery capacity meter. Systems will be sized to meet 100% of summer demand or yearly average loads, and will not be sized to meet winter short falls, the grid system will be accessed to satisfy this demand. Anticipated size is a six-panel array for the standard system.

Laura Manthe (300 watt) 484 Shady Drive Oneida, WI 54155

Tim Webster (300 watt) 837 E. South St. Appleton, WI 54199

Oneida Longhouse (240 watt) Oneida, WI 54155

Oneida Solar Trailer 3759 W. Mason St. Oneida, WI 54155
Three - 90 watt solar electric panels with Trace inverter, One 4'x8' solar hot water panel

Oneida Community Center (2 Kilowatt) Cty. H & Ranch Rd. Oneida, WI 54155
2.05 kiloWatt system composed of 16 - 128 Watt panels. Standing photovolteic modules adhered onto galvalume® standing seam roofing panels from UniSolar.

Tower Foods Cooperative (10 Kilowatt) Water Circle Place Oneida, WI 54155
The design has 36 photovolteic panels and uses a Trace technologies 10K inverter combined with the appropriate balance of system gear. The estimated average daily output is 34.5 kilowatt-hours.

Photo: Tower Foods (community coop)


Photo: Oneida Community Center

Repair of Non-Functional Remote Solar Electric Sign Lighting Systems (5)
Division of Land Management (120 watt)
Oneida Nation Commission on Aging (120 watt)
Airport Road Daycare (120 watt)
Oneida Nation Elementary School (120 watt)
Oneida Business Park (120 watt)

Completed Energy Audits & Energy Star Certifications:

Energy Star - New Homes:

Nadine Escamea	W1428 Ray Road	DePere, WI 54115
Kathy & Kevin Skenandore	816 Silver Creek Road	Oneida, WI 54155
Ted Skenandore	W810 CTY Road VV	Seymour, WI 54165
Oneida Land Management	N7160 Path of the Bear	Oneida, WI 54155
Oneida Land Management	N7177 Path of the Bear	Oneida,WI 54155
Oneida Land Management	N7169 Path of the Wolf	Oneida, WI 54155
Alfred & Gail Danforth	N6326 Van Boxtel Road	Oneida, WI 54155
Richard Summers	324 Country Club Drive	Green Bay, WI 54313
Hartman Summers	326 Country Club Drive	Green Bay, WI 54313

Energy Audits - Existing Homes:

Eugene Cornelius	8048 CTY Road Y	Seymour, WI 54165
Shad Webster	2876 Commissioner	Oneida, WI 54155
Patti Archiquette	302 Eagle Street	Seymour, WI 54165
Debra Skenandore	1404 Onu-u-sla Way	Green Bay, WI 54313
Rita Lara	W1106 Old Seymour	Oneida, WI 54155
Servilla Van Dyke	2781 Chief Hill Lane	Green Bay, WI 54313
Todd Vandehei	2769 Chief Hill Drive	Green Bay, WI 54313
Don Charnon	N6337 Van Boxtel Rd.	Oneida, WI 54155
Dennis Danforth	956 Cyrus Road	De Pere, WI 54115
Wayne Skenandore	8048 CTY Road Y	Oneida, WI 54155
Carol Elm	510 Adams Street	De Pere, WI 54115
Larry Cornelius	W781 Pearl St.	Oneida, WI 54155
Laura Manthe	484 Shady Drive	Oneida, WI 54155
Debbie Powless	W1850 Poplar Road	Seymour, WI 54165
Patricia Friedrich	1401 Brocoin Way	Green Bay, WI 54304
Mark and Shirley Powless	2754 Cormier Road	Green Bay, WI 54313
Chris Powless	2752 Cormier Road	Green Bay, WI 54313
Sherry Jubert	2150 Shamrock Lane	Green Bay, WI 54304
Jody Cornelius	1076 Riverdale Drive	Oneida, WI 54155
Chaz & Raeann Wheelock	W1020 Pearl Street	Oneida, WI 54155
Land Management	431 Hillcrest	Green Bay, WI 54155
Land Management	Girl's Group Home	Oneida, WI 54155
Land Management	1871 Cty Road EE	Oneida, WI 54155
Land Management	130 Riverdale Drive	Oneida,WI 54155

Energy Audits - Commercial Buildings

Oneida Community Center	N6457 CTY Road H	De Pere, WI 54115
Oneida Community Health	Overland Road	Oneida, WI 54155

Education and Promotion

Solar Trailer

The demonstration solar trailer was instrumental in generating interest in the program. The trailer is the only known system in the Midwest featuring both a complete solar hot water system and a complete solar electric system for educational purposes. The active solar hot water system can provide up to 35 gallons of tempered hot water at events. The solar electric system has the storage capacity of 21 amps for 100 hours. The trailer can be used at remote event locations to provide needed hot water and electricity.

Events Attended with the Solar Demonstration Trailer			
Event	Date	Location	Estimated attendees
Oneida Earth Day	May 2000 & 2001	Oneida, WI	150
Oneida Youth Fishing Opener	May 2000, 2001, 2002	Oneida, WI	275
Midwest Renewable Energy Fair & American Solar Energy Conference,	June 2000, 2001	Amherst, WI	30,000
Family Carnival	June 2000	Oneida, WI	500
Oneida Pow-wow	July 2000	Oneida, WI	10,000
Oneida Nation Elementary School		Oneida, WI	

Events Attended with the Solar Demonstration Trailer			
Pavilion Nights Concerts	August 2000	Oneida Casino Green Bay, WI	6,000
Oneida Nation High School	Fall 2000	Oneida, WI	31
Menominee Pow-wow	August 2000	Keshena, WI	10,000
Indian Summer Festival	September 2000	Milwaukee, WI	62,000

Brochures

A brochure was specifically developed for Oneida Nation Tribal members for the Oneida Solar Energy Project and distributed to Tribal members living on the Reservation. This brochure focused primarily on solar hot water systems and about how Tribal members could purchase a system. About 1,000 brochures were directly mailed during 2000, and another 1,000 during the Spring of 2001. See Appendix A. In addition, a brochure was created in the Fall of 2000, specifically about solar electric systems. See Appendix B. This brochure has been distributed through education events. Oneida Tribal members were also informed about the Oneida Solar Energy Project through a variety of other information sources. Several articles have been published in the Tribal newspaper, Kalihwisaks. The circulation of the Kalihwiseks is 7,500 tribal members and non-tribal subscribers. See Appendix C &D. Articles were also published in Environmental Quality"s quarterly newsletter, Oneida Earth News. The circulation of the newsletter is to the Tribal households of Brown and Outagamie Counties which reaches 5,617 tribal members. See Appendix E. In addition, several educational meetings were held on the Oneida Reservation.

High School Outreach

Oneida Nation High School students, under the guidance of science teacher Becky Nutt, utilize a renewable energy curriculum package obtained by the Oneida Solar Energy Project from WPS. Becky Nutt's science class and two Oneida student interns were involved with the construction of the Oneida Nation Solar Energy Trailer during the summer of 2000. Thirty Oneida Nation High School students from two separate science classes toured the trailer as part of a class project on renewable energy.

Publications that featured the Oneida Solar Energy Project

Builder/Architect Magazine, Jan./Feb. 2000
The Solar Way - Photovoltaic on Indian Lands, Sandia National Laboratories Corporation, December 2001
Focus on Energy News, Focus on Energy, September 2002
Renewable Energy Today - Successful Demonstrations in Northeastern Wisconsin, Focus on Energy, 2002
DOE Tribal Energy Program website, http:www.eren.doe.gov/power/tech_access/tribal energy/projects/remote_oneida.html

Program Assessment

The Oneida Nation Solar Energy Project was a success. The goals of the grant were fulfilled. There is an increase of sustainable energy consumption on the Oneida Reservation. The Oneida Nation and individual Tribal members have reduced utility costs while using renewable energy technologies. There is a increased awareness of renewable energy technology and the benefits.

A brief survey was conducted of the initial participants of the project to assess their satisfaction with the system. The homeowners were asked their views on the energy audit and their opinion on the solar energy project . Seven homeowners and one facility manager responded with positive comments. Two homeowners commented that they were saving money. Four commented on the benefit to the environment. Four comments were made in support of continuing the project for others.

On July 12, 2002, Bruno Zagar, Environmental Specialist who served as the Project Manager resigned his position with the Tribe. As Project Manager, he was the person responsible for the completion of the grant. Also, he was well trained and had the expertise needed to complete and coordinate program activities. The expertise and experience does not exist within other department staff for program activities to continue. In addition, other staff are performing critical duties within other programs and are not available to be reassigned. For these reasons, it is recommended that with the end of the DOE grant, the program will be closed with some functions reassigned to other areas. The functions to be reassigned are described below:

Technical Assistance & Education

Staff within the Environmental Quality Department will be trained in operation of the solar trailer. The trailer will be displayed at educational activities of the Environmental Quality Department. Also, material will be gathered for the Environmental Quality Department staff to distribute when requested from participants of the OSEP. The Environmental Resource Board will serve as clearing house to distribute information about contractors who can install solar hot water & photovoltaic systems**.**

Oneida Community Energy Action Plan

The Oneida Community Energy Action Plan (OCEAP) is a cross-departmental effort divided into commercial and residential energy efficiency. Oneida entities directly participating in the project include the Department of Public Works (Leroy King), Land Management (Diane Wilson and Dave Danforth), Building Managers, Maintenance

Personnel, and the Environmental Resource Board (Gene Schubert).

This project is a continuation of energy efficiency and renewable energy efforts started under the Oneida Environmental Quality Program and Environmental Resources Board with funding from the U.S. Department of Energy and Wisconsin Focus on Energy program. The goal of the OCEAP is to increase awareness and implementation of energy efficiency. Awareness is developed through education of Oneida department leaders and general personnel, as well as education of the Oneida citizens. Implementation is done based on the recommendations generated after targeting priority areas for energy audits.

Photo: Trailer at staff meeting

Photo: Solar Trailer

ERB staff Laura Manthe & Gene Schubert and ERB member Nadine Escamea at Midwest Renewable Energy Fair

Solar powered lights for sign at Land Office on State Highway 172

Individual Grant Summaries

Oneida Solar Energy Project

The Oneida Solar Energy Project began when the Tribe applied and received a grant from the Department of Energy under the title "Applications of Renewable Energy Technologies on Native American Lands". The three year grant project period was 09/01/99 to 8/31/02 and the assistance agreement number was DOE # DE-FC36-99G010466. The total project budget was $233,696; $180,564 from federal funds and $53,132 from Tribal and other matching funds. Bruno Zagar, Environmental Specialist - Natural Resources and Gene Schubert, ONERB Research Specialist were the personnel assigned to the project.

Wisconsin Focus on Energy

The project secured a grant from the State of Wisconsin, Department of Administration, Division of Energy and Intergovernmental Relations, Wisconsin Focus on Energy Program. The grant project period was from 10/1/99 to 9/30/00. The grant award was $25,000. The grant required a match of $25,100 which was from the DOE grant. The grant paid for personnel costs for the Project Manager, trainers & trainees, equipment for the demonstration trailer, related supplies, materials and printing of educational information and installation manuals.

Wisconsin Public Service

The project secured funding from Wisconsin Public Service from February to July 2000. Wisconsin Public Service received a DOE grant under Assistance Agreement number DE-PS36-99GO10383 titled "Solar Thermal Pilot Program." Oneida entered into a Letter of Agreement with WPS for a joint project to design a demonstration trailer featuring a operational solar hot water and solar electric system for educational purposes. Two Oneida high school student interns were involved with the construction of the Oneida Nation Solar Energy Trailer. An operational manual was developed to instruct unfamiliar users with the operation, set-up and performance process. An educational brochure was printed that focused on solar hot water systems and distributed to Tribal members living within the Reservation.

WisconSUN

The project secured a grant from WisconSUN, which is a program funded by the Energy Center of Wisconsin, the Million Solar Roofs Program, and the Focus on Energy

Program. The grant project period was from 10/1/99 to 5/30/01. The grant award was $7,000 with $5,000 match from Environmental Protection, a Tribal business unit. The project goal was to install a photovoltaic system integrated into the construction of a community facility. A 2 kilowatt field laminated solar electric system is installed on the new Oneida Community Center located on County H. The system was inspected by the Wisconsin Public Service Corporation and is set-up as a grid-tied system with net metering. Oneida Community Center solar electric system is producing 2048 watts per hour, an average of 4.2 hours per day, 365 days a year, totaling 3,139.58 kilowatts per year. The building was constructed with energy efficient detailing and heat recovery ventilation.

Photo from top left: solar trailer, tribal member's system, sign at Airport Road Daycare, installers at Longhouse, brochure cover, tribal contractor at Tower Foods system, (center) Community Center

Acknowledgments

This report was prepared by Jennifer Hill-Kelley, Environmental Quality Director

Oneida Solar Project Team:
Bruno Zagar, Project Manager, Environmental, Health and Safety Area,
Jennifer Hill-Kelley, Environmental, Health and Safety Area,
Donna Heezen, Office Manager, Environmental, Health and Safety Area,
Gene Schubert & Laura Manthe, Environmental Resource Board
Patti VandeHei & Jean Van Dyke, Accounting Department

Grant Agencies:
U.S. Department of Energy (DOE), Lizana Pierce
Wisconsin Department of Administration, Wisconsin Focus on Energy, Alex Depillis
Wisconsin Public Service Corporation (WPS), Chip Bircher
WisconSUN, Neils Wolter

Consultants:
Bill Hurrle, Community Builders
Chris LaForge, Great Northern Solar
Richard Lane, Solar Mining Company (formerly Public Energy Systems)
Debra Tewa, Hopi Nativesun

Tribal contractors:
J. D. Construction
Danforth & Sons Enterprises
Thomas Solar Enterprises
C & C Smith Electric
All Pro Insulation King

Vendors:
Midwest Renewable Energy Association
W. W. Grainger
AAA Solar Supply
Mary Hill
Sikora Engineering
Arrow Electric
Heliodyne
Dacco Inc. of Wisconsin
Tsyunhehkwa
Trace Engineering

United Solar Systems (Uni-Solar)
Advantage Sunrooms
American Solar Energy Society
Menards
First Supply of Green Bay
Bay Insulation of WI
The Energy Center of WI
Fastenal Company
Council of Energy Resource Tribes
Brand Electronics
Jones Enterprises (Murray Jones)
Ambrosius Concrete
Monday's Concrete Pumping
Peters Concrete
Photovoltaic Systems
Van Ert Electric
WI Energy Conservation Corporation
WI Energy Star Homes

Photo: Oneida Sunset by Conrad King

The Oneida Nation Environmental Quality Department exists to work together to meet the everyday needs of the Oneida community and Tribal departments by providing technical assistance and education. We strive to protect the natural resources and achieve environmental sovereignty in a proactive manner.

A program of the
Environmental, Health & Safety Area
Governmental Services Division
Oneida Nation of Wisconsin