



U.S. Department of Energy
Energy Efficiency and Renewable Energy

Sandia National Laboratories' Technical Assistance to the Tribal Energy Program

Project Review
October 18, 2004

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Sandia National Laboratories



Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy under contract DE-AC04-94AL85000.





Sandia **VISION**



**Helping our nation
secure a peaceful
and free world
through technology.**



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Where is Sandia National Labs?



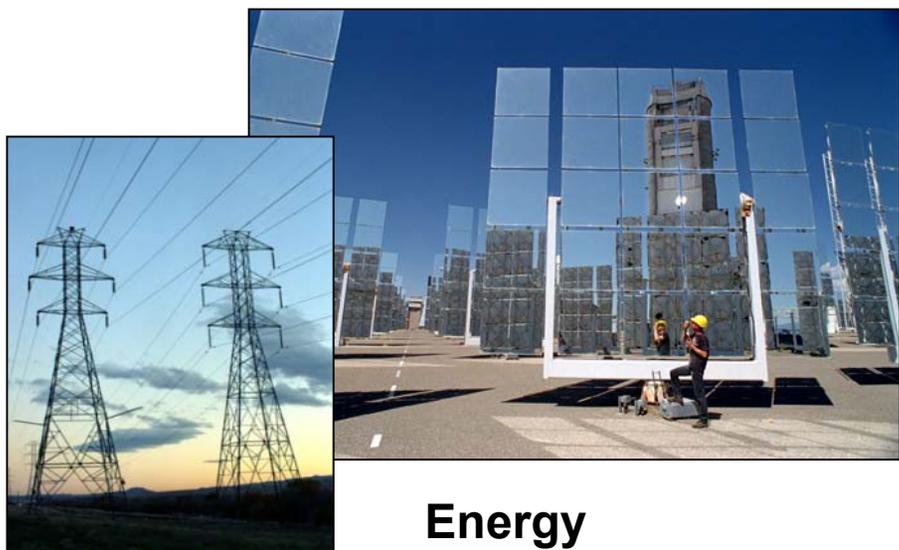
- New Mexico
- California

- Nevada
- Hawaii
- Texas

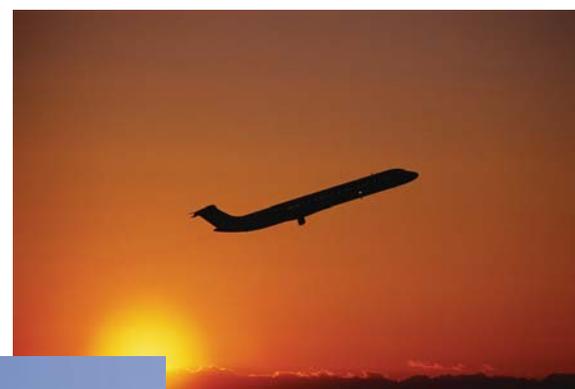




Sandia addresses the surety (safety, security & reliability) of critical infrastructures



Energy



Transportation



Architecture



Communications



Sandia's current technical assistance to tribes



Propane generator will be used as a back-up energy source for the Ramona Band's micro-grid hybrid system.

Sandia provides technical assistance for the DOE Tribal Lands Program awardees.

FY05 will include continued support of an ecotourism development (CA-Ramona Band of Cahuilla).

Albuquerque's Southwestern Indian Polytechnic Institute (SIPI) designed & installed photovoltaic, wind and solar hot water systems to educate and train Native American students in renewable energy technology.

With the students' assistance, SIPI operates and maintains the systems.

Tribal Energy Website

www.eere.energy.gov/tribalenergy



DOE/Sandia's technical assistance to the Navajo Nation through NTUA's Solar Program

- Support NTUA as a Leader in Rural Solar Electrification
- Assist NTUA Solar Program Coordinator to create a sustainable program
- Convey NTUA's success in solar to others, including the Department of Energy



DOE, Sandia and Navajo Nation signed an MOU for collaboration and technology transfer for the Navajo Nation, which emphasizes energy, environment, education, economic development, communication



NTUA's Four Generations of PV

	Financing	Customer Price / month	Array Output	Total Kilowatt-hours per day	# of Units	Manufacturer (Integrator)	NTUA Champion
1993	DOE - WAPA	\$40	240 Watt 260 Watt	1.3 Kw hr/day	40	Solar Mart	Jimmie Daniels
1999-2001	USDA - RUS	\$95	640 Watt	1.6 Kw hr/day	200	Photo Com. / Kyocera	Paul Denetclaw / Pam Myron
2002-2003	DOE - NEDP	\$75	880 Watt hybrid small wind (Phase I)	2.0 Kw hr/day	40	SunWize (NADAC)	Larry Ahasteen
		\$145	880 Watt hybrid LP gas generator (Phase I)	2.0 Kw hr/day	4		
2003-2004	DOE- NEDP	\$75	880 Watt hybrid small wind (Phase II)	2.0 Kw hr/day	63	SunWize (Ducommon Tech.)	Larry Ahasteen



NTUA's Financial Changes

	Financing	Customer Price / month	Array Output
1993	DOE - WAPA	\$40	240 Watt 260 Watt
1999-2001	USDA - RUS	\$95	640 Watt
2002-2003	DOE - NEDP	\$75	880 Watt hybrid small wind (Phase I)
		\$145	880 Watt hybrid LP gas generator (Phase I)
2003-2004	DOE - NEDP	\$75	880 Watt hybrid small wind (Phase II)

Price based on projected O&M as determined in Sandia report

Price based on amortized capital costs of PV system equipment

1 year study by NTUA to determine O&M costs of 660 Watt system

Price based on O&M costs for each hybrid system

Price taken from last PV procurement



NTUA's Technical Changes

..1993.....1999-2001.....2002-2003.....2003-2004.....

240-260 Watt

640 Watt

Phase I 880 Watt Hybrid

Phase II 880 Watt Hybrid



Business potential realized

Standardization achieved

Battery bank powered by hybrid design

Economic Development: Units assembled on Navajo Nation



NTUA's partnership with DOE/Sandia helped to create a sustainable solar program

- **External Technical Advice**
 - Specification creation and modifications
 - Technical evaluations of procurement proposals (RFPs)
 - Existing O&M processes documented & improved
 - Training activities for electricians and customer service representatives
 - PV panel failure analysis and report
 - System optimization testing and recommendations
 - Future development of O&M data which can be added to the DOE Reliability Database
- **Customer Education – “Power from the Sun” video**
 - The O&M process begins with customer education.
 - Customers must realize that electricity produced from the PV system is limited and they must manage their electrical loads.



NTUA hybrid unit delivered to Sandia for testing. Sandia and SWTDI technical staff with NTUA's Larry Ahasteen

Along with appropriate equipment, a sustainable solar program includes operations and maintenance processes and educated end-users



TEP Internship provides students with relevant renewable energy systems experiences



Sandia interns mounting the PV modules onto the sun tracker.

Renewable Energy systems

- On-grid photovoltaic installations (NM-Navajo, OR-Portland)
- Off-grid photovoltaic electricity system (AZ-Hopi)
- Off-grid PV/Small Wind hybrid system (AZ, UT-Navajo & CA-Ramona)
- Large scale commercial wind farm (NM-Taiban Mesa)
- Solar Power Tower (NM-Sandia Labs)
- Distributed Energy Resource Systems (NM-Sandia Labs)
 - Large PV array, micro-turbine, fuel cell, large battery bank
- Co-generation facility (NM-City of Albuquerque)

Building Systems

- Passive solar, day lighting (AZ-Hopi)
- Energy efficiently designed building with Trombe wall (NM-Sandia Labs)
- AC/DC lighted off-grid residence (AZ-Hopi)



2004 Tribal Energy Program Student Interns

- **Deborah Tewa**
 - Hopi
 - Northern Arizona University
 - BA – Applied Indigenous Studies
- **Colin Ben**
 - Navajo
 - University of Arizona
 - MA – American Indian Studies
- **Jennifer Coots**
 - Navajo
 - University of New Mexico
 - MBA – Finance
- **Benjamin Mar**
 - Cherokee
 - Worcester Polytechnic Institute
 - BS – Electrical & Computer Engr.



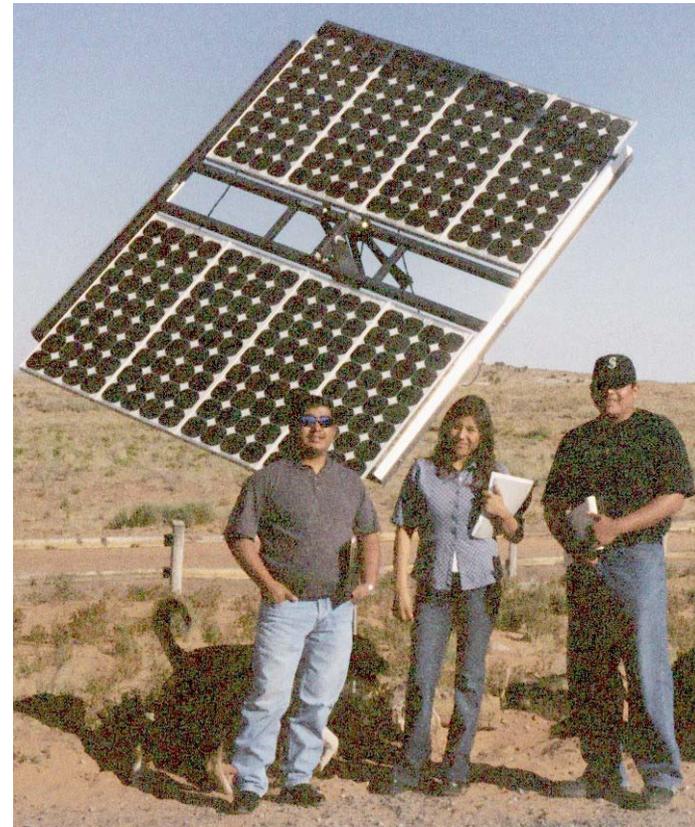
DOE summer interns at New Mexico Wind Energy Center

With our diverse backgrounds, we shared our perspectives as well as analyzed situations through different points of view whether cultural, technical or financial.



2003 Tribal Energy Program Student Interns

- **Deborah Tewa**
 - Hopi
 - Northern Arizona University
 - Indigenous Studies
- **Shaun Tsabetsaye**
 - Zuni
 - University of New Mexico
 - Electrical Engineering
- **Velissa Sandoval**
 - Navajo/Zuni
 - University of Denver
 - Electrical Engineering
- **Keith Candelaria**
 - Jemez/San Felipe
 - Dartmouth College
 - Environmental/Earth Science



DOE summer interns: Shaun Tsabetsaye, Velissa Sandoval & Keith Candelaria



Contact Information

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