



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

SAND2009-2154P

DOE Tribal Energy / Sandia Interns – Green Collar Natives:

Immersion of future leaders into renewable energy

2002 - 2008

Sandra Begay-Campbell
Sandia National Laboratories
Spring 2009



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.





DOE's Tribal Energy Program offers student internships at Sandia National Laboratories.

Eligibility: Current college upper-classmen and graduate students, who are familiar with Native American culture and tribal issues, support the Tribal Energy Program efforts with technical project tasks

Required: As authorized by the TEP, the student applicant must

- be a US Citizen
- be a Native American as defined as
 - a member of a recognized Federally-recognized Tribe, Alaska Village or Alaska Corporation
 - not state-recognized, not bands or groups, or first peoples of Guam or Hawaii
- Be specifically interested in renewable energy

17 undergraduate & graduate interns have participated.

2 summer graduate interns will be hired for 2009



Immersion into renewable energy



**2008 Interns' field visit to Campo Band of Kumeyaay
Wind Farm (CA-Campo)**

- Wind farm (CA-Campo)
- Off-grid PV/Small Wind hybrid system
(UT-Navajo, AZ-Hopi, CA-Cahuilla)
- Tourism facility using RE (AZ-Hualapai)
- Ecotourism Development Off-grid (CA-Cahuilla)



**2008 Interns' participation in PV installation &
training workshop (AZ-Hopi)**

- Tribal Business - Passive Solar (AZ - Hopi)
- Earth ship - Green Buildings (AZ-Hualapai)
- On-grid PV installations (NM-Sandia Labs)
- Solar Power Tower & Distributed Energy Lab
(NM-Sandia Labs)

**2008 interns participated in tribal off-grid PV installation workshop
with DOE Assistant Secretary / Office of Indian Energy visit.**



Deborah Tewa (Hopi), BS - Indigenous Studies, Northern Arizona University. Her research focused on tribal off-grid PV systems and tribal RE systems.

Pictured at Sandia's PV Laboratory, NM:
Deborah Tewa (certified electrician & solar installer)

“While I had worked with photovoltaic systems for several years, including my experience at NativeSUN, the internship complemented by prior work ‘in the trenches,’ and has been a gratifying experience. “



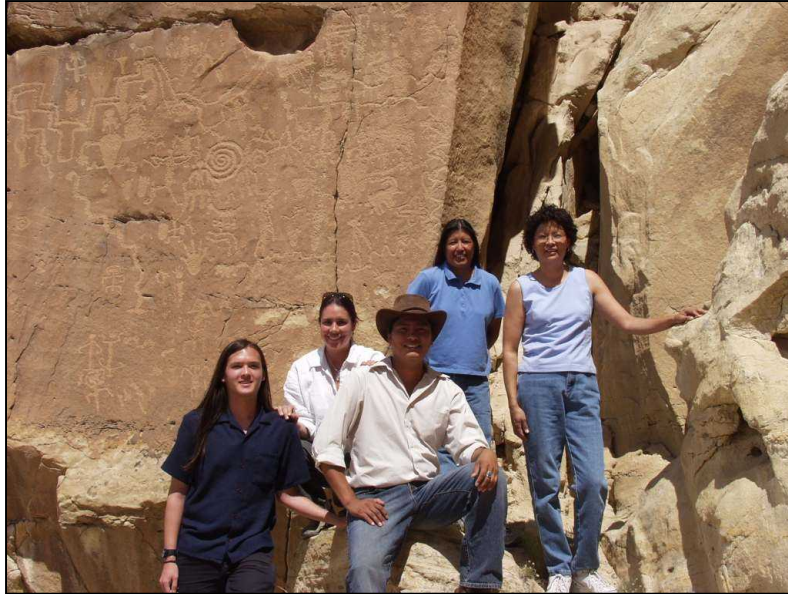
Pictured at Navajo - Monument Valley, UT:
Keith Candelaria, Velissa Sandoval & Shawn Tsabetsaye.

Keith Candelaria (San Felipe/Jemez), BS - Environmental/Earth Science, Dartmouth College
His paper entitled, *"Native American Renewable Energy Approaches: Navajo Tribal Utility Authority and NativeSun."*

Velissa Sandoval (Navajo/Zuni), BS - Electrical Engineering
Her paper entitled, *"Women Champions in Solar Energy."*

Shaun Tsabetsaye (Zuni) is a graduate student in electrical engineering, University of New Mexico, BS – Electrical Engineering. His paper entitled, *"Navajo Tribal Utility Authority: Electrification Demonstration Program - Developing a Sustainable Tribal and Rural Co-operative Solar Program"*.

“Native Americans believe that the sun, wind, and geothermal waters are all gifts from the Creator. As people use these resources today, they should always remember to give thanks for all that is provided.”



Pictured at Hopi Tribe Petroglyph:
Benjamin Mar, Jennifer Coots, Colin Ben,
Deborah Tewa, & Sandra Begay-Campbell.

Benjamin Mar (Cherokee), BS – Electrical Engineering, Worcester Polytechnic Institute
His paper entitled *"Navajo Tribal Utility Authority: Photovoltaic Hybrid Operation and Maintenance Process for a Sustainable Program"*

Jennifer Coots (Navajo), MBA – Finance, University of New Mexico, BA Finance
Her paper entitled *"A Decade Of Changes To An Alternative Power Source For A Rural Utility."*

Colin Ben (Navajo), MA – American Indian Studies, University of Arizona. His paper entitled *"Researching Renewable Energy Systems Available to Indian Country"*

Deborah Tewa (Hopi), BS - Indigenous Studies, Northern Arizona University.
Her research focused on DOE's Solar Reliability Database for Off-grid PV systems.

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



Pictured at Hopi Old Oraibi Village: Tanya Martinez, Deborah Tewa, Sandra Begay-Campbell, and Jennifer Coots.

Tanya Martinez (Mi'Kmaq) Power Engineering graduate student, University of Massachusetts – Lowell, BS - Electrical Engineering.
Her paper entitled *"Remote Monitoring System Design - Sustainable Systems For The Navajo Tribal Utility Authority"*.

Deborah Tewa (Hopi) BS - Indigenous Studies, Northern Arizona University.
Her paper entitled *"NativeSUN: A Model for Sustainable Solar Electric Systems on Indian Lands"*.

Jennifer Coots (Navajo) MBA - Finance, University of New Mexico.
Her research focused on the tribal housing mortgage finance for renewable energy systems.

"Tribal Nations do have unique cultures that must be considered for any government project and it increases the success of the project when that awareness is there."



Pictured at Navajo Nation - Monument Valley, UT:
Thom Sacco, Terry Battiest, Jonathan Biron,
Sandra Begay-Campbell, Lani Tsinnajinnie & Debby Tewa

Terry Battiest (Choctaw)

MS – Telecommunications, University of Colorado – Boulder, BS - Industrial Engineering
His research focused on the Navajo Nation's Internet-to-the-Hogan Project.

Jonathan Biron (Sault Ste. Marie Tribe of Chippewa)

BS – Biosystems Engineering, Michigan State University
His paper entitled, "*Tribal Renewable Energy Integration: An Analysis of Current Tribal Infrastructure*"

Lani Tsinnajinnie (Navajo/Filipino)

BS – Environmental Science & Native American Studies, University of New Mexico
Her paper entitled "*Benefits of Renewable Energy for Native Nations from the Environmental and Native Perspectives*"

"...it has given me insight to what I want to do professionally..."



Pictured at Navajo Nation's Canyon De Chelly, AZ:
Debby Tewa, Thom Sacco
Cherylin Wilson, Nick Johnson & Terry Battiest

Terry Battiest (Choctaw)

MS – Telecommunications, University of Colorado – Boulder
BS Industrial Engineering
His paper, *"Navajo Tribal Utility Authority Solar Program System Data and O&M Initiative"*

Nick Johnson (Three Affiliated)

BS – Mechanical Engineering
University of Colorado – Denver
His paper, *"Sustainability of Small Wind Turbines on Native American Tribal Lands"*

Cherylin Wilson (Navajo)

BS – Biology, AS – Environmental Science
Oklahoma Panhandle University.
Her paper, *"The Ecological Effects of Native Wind Energy Projects"*

"Since day one, I have felt like a valuable member of the team, which is important because not only am I learning a great deal, I also feel like I am contributing to the group."



Pictured at Navajo Nation, AZ:
Gepetta Billie, Amanda Benavidez,
Carson Pete & Suzanne Singer

Gepetta Billie (Navajo)

MS – Regional & Community Planning; BA – Environmental Planning & Design, University of New Mexico, AS – Civil Engineering Technology, SIPI
Her paper entitled, *"Renewable Energy: Planning for Sustainability & Self-Determination for the Navajo Nation"*

Amanda Benavidez (Taos/San Juan/Isleta)

MS – Regional & Community Planning, University of New Mexico; BA – Business Administration
Her paper entitled, *"Renewable Energy and Energy Efficiency Initiatives on the Laguna Pueblo Reservation"*

Carson Pete (Navajo)

MS – Mechanical Engineering; BS – Mechanical Engineering, Northern Arizona University
His paper entitled, *"North Leupp Family Farms Project – Sustainable Agriculture Systems Using Photovoltaic Cells and Small Wind"*

Suzanne Singer (Navajo)

PhD – Mechanical Engineering; MS – Mechanical Engineering, UC-Berkeley; BS – Mechanical Engineering

"This internship has allowed me to learn and see first hand what it means to plan and build sustainably on Native lands. "



“My presentation [at the DOE TEP Review] and the aftermath was definitely a learning experience.... I was presenting to Native, or mostly Native, people who have been in the renewable energy field longer than I have...To say I was surprised at the reception I received at the end of my presentation would be an understatement. People like former Navajo Nation president Dr. Peterson Zah and other influential individuals came up to me and congratulated me for my efforts and my presentation. That made me feel really good about what I was doing and what the possibilities for my future were. At that moment, I realized the value of my work and all that I have done to get where I am.”

Gepetta Billie, 2008

“This internship has been one of the most motivating and unsurpassed experiences of my life. The summer opportunities were diverse and ranged from working, conversing, and experiencing what the top engineers and leaders in the country have planned and are developing for local and nationwide energy problems, to developing a better understanding of current renewable energy projects on tribal lands and the difficulties they have encountered, to examining the need for more tribal groups to become champions in leading their nations to the renewable energy world and setting examples other nations can follow, and finally, to helping address the need for young, educated Native Americans to become proactive in using their higher education to the best of their abilities and providing a better world for all of us to live in.”

Carson Pete, 2008



“At the beginning of my internship I understood the concept of renewable energy, but I didn’t understand it in-depth. At every site visit, conference, or meeting that I participated in, I learned a great deal. It’s such a great feeling to learn something new, to be able to understand it, and to explain to other people. I’ve learned so much while participating in this internship... This has truly been one of the greatest summers for me. I was able to work with some great people and form lasting friendships. I think that it is great to be working with people have the same interests and are willing to share their knowledge and passion for helping native communities.”

Amanda Benavidez, 2008

“Since I started the internship I have been introduced to many new things. The first week of my internship, we were in San Diego visiting tribes with TEP projects on their lands. It was nice to hit the ground running and see some projects that have been done and were in development stages. I thought it was a good, albeit different, way to get acclimated to the working environment. Since day one, I have felt like a valuable member of the team, which is important because not only am I learning a great deal, I also feel like I am contributing to the group...It has been a change of pace for me that has enriched my perspective on tribal and renewable energy technologies. I think this will serve me well as an engineer because I will have seen how these technologies can affect a person first hand.

Nick Johnson, 2007



"I am currently a graduate student pursuing a degree in Energy Engineering with a solar option...This particular project has given me the opportunity to become more familiar with communications infrastructures and how they can be tied to remote PV applications. It provided an interesting research topic because of its cutting edge nature. I had the opportunity to visit numerous PV sites within the Navajo, Hualapai, Hopi, and Cahuilla Nation...Not only did I increase my technical capacity for PV, but I have witnessed some facets of Tribal and federal government relations from the government side. It is important to continue to build and maintain good relationships between the federal government and Tribal Nations while remaining aware of cultural values. Tribal Nations do have unique cultures that must be considered for any government project and it increases the success of the project when that awareness is there."

Tanya Martinez, 2005

"The collaboration among the DOE Tribal Energy Program, Sandia, and the Navajo Tribal Utility Authority support renewable energy development. The interns learned a wealth of information about numerous clean and efficient renewable energy technologies that are available for Native American tribes according to their natural environmental resources. The installation field visits throughout Indian Country provided an opportunity for the team to research and interact with 'real installation projects, real people, and witnessing real energy produced.'"

Colin Ben, 2004



“This internship has been a great experience that has allowed me to share my perspective as well as learn from other perspectives. My work with other Native People in the engineering field has been an invaluable experience for me since I have not had this opportunity before the internship. This experience has helped me to see that a problem has many facets that cannot be answered entirely with technical answers, but must be complemented by societal, financial, and other considerations as well. By visiting current Native American renewable energy installations, I was able to see the implementation of an electrical engineering design with real world applications - a piece which can be overlooked by engineers when developing the latest technology.”

Benjamin Mar, 2004

“On our field visit to the Navajo land, [Larry Ahasteen, Navajo Tribal Utility Authority] mentioned that people refer to renewable energy as *free* energy. However, Native Americans believe that the sun, wind, and geothermal waters are all gifts from the Creator. As people use these resources today, they should always remember to give thanks for all that is provided. Nothing is essentially free from this land.”

Keith Candelaria, 2003



2007 & 2008 Intern Group Photos



**2007 Pictured at Navajo Nation - Monument Valley, UT:
Debby Tewa, Vircyntia Charley, Cherylin Wilson, Larry
Ahasteen, Nick Johnson, Melissa Parrish & Thom Sacco**



**2008 Pictured at AISES Conference, Anaheim, CA:
Gepetta Billie, Carson Pete, Terry Battiest, Sandra Begay-
Campbell & Suzanne Singer**

“My ‘ah ha’ moment here [at the AISES National Conference] was not in the sense that I learned something new, but that I understood the concept of the national conference for its full value. I think when I attended as a [undergraduate] student I did not fully appreciate the value of the conference even though I heard it was a networking opportunity... This time, I attended as a different person. I knew who I was and where I was headed on my career path. I was confident. I realized that this conference is about possibility. The possibilities are endless and they can only be realized by what we do. I think Native American students need to see that for themselves and not be so willing to limit themselves.”

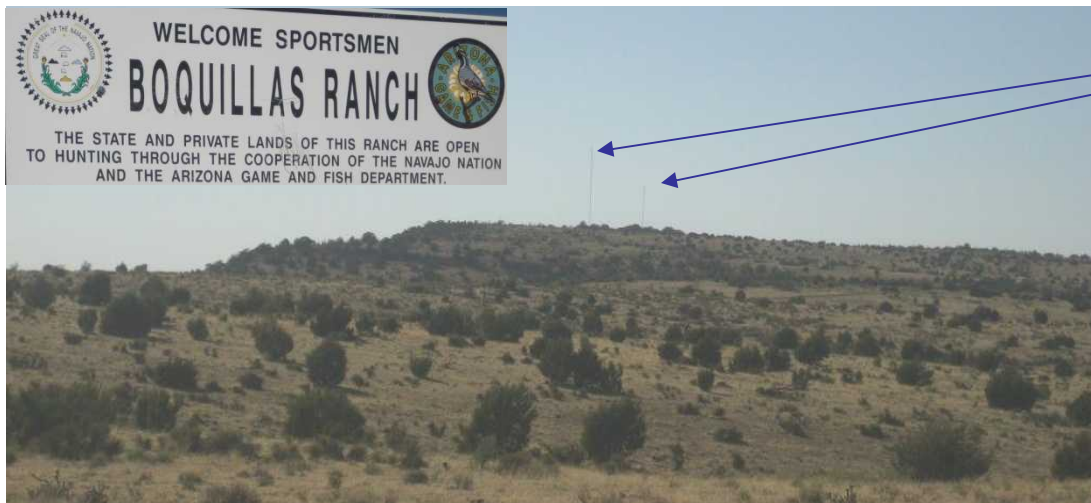


NTUA Solar/Wind hybrid – Monument Valley, UT





Navajo Wind Potential – Aubrey Cliffs, AZ



Anemometers study
wind characteristics

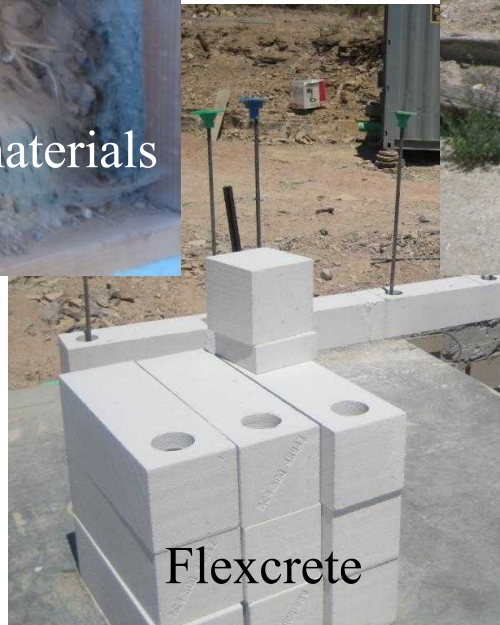




Sustainable Building Materials - Peach Springs, AZ



Recyclable materials



Flexcrete





Hualapai Tourism - Grand Canyon West, AZ



Renewable energy powers
tourism





Cahuilla Ecotourism - Ramona, CA

Developing off-grid
reservation





Photovoltaic Installation, Hotevilla, AZ

