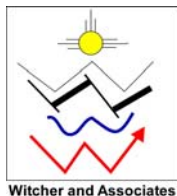


U.S. DEPARTMENT OF  
**ENERGY**

Energy Efficiency &  
Renewable Energy

**Tribal Energy Program**



## **2012 PROGRAM REVIEW**

**Pueblo of Zia Renewable Energy Development Feasibility Study**

**U.S. Department of Energy – Award No: DE-EE0005628**

**November 15, 2012**



# Pueblo of Zia Renewable Energy Development Feasibility Study, U.S. Department of Energy

## Award No: DE-EE0005628

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## Project Location: Zia Pueblo, NM

- Located in Sandoval County  
- approx. 35 miles NW of Albuquerque, NM and 17 miles NW of Bernalillo, NM
- Lands of Zia Reservation :  
155,000 acres/242 sq. miles
- Elevation range: 5,200 ft. to over 9,000 ft.: includes pine forest, red bluffs, white mesas, extensive cattle grazing lands & clear-unimpeded views in all directions



## Historical Background

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- Zia Pueblo central village is situated alongside the Jemez River atop a mesa that provides spectacular views of surrounding Zia Pueblo lands & outlying neighboring areas
- Zia Tribe - continuous inhabitation of current homelands since before 1250 A.D
- Part of Keres Indian Nation: ancestral roots to upper San Juan River basin & Mesa Verde
- Traditional language of Zia Pueblo is Keresan
- Longstanding practices of agriculture and traditional arts & crafts

## Zia Sun Symbol

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Birthplace of the renowned historic “Zia Sun symbol,” which displays sixteen stylized rays radiating in each of the traditional four directions from a central sun. In the 1920’s, the symbol was adopted by the State of New Mexico for use as its official NM State flag emblem.



# Contemporary Pueblo Life & Economic Development

- 875 Tribal Members (2012), living in 178 housing units
- Sustainable Tribal Economic Development (i.e., non-gaming), includes:



ZIA ENTERPRISE ZONE (ZEZ)



ZIA BERNALILLO PLAZA (ZBP)



SUSTAINABLE AGRICULTURE & FARMERS MARKETS



RENEWABLE ENERGY & NATURAL RESOURCES

# Project Overview

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Goal: Conduct a *comprehensive feasibility study* for best-use applications for developing renewable energy resources on Zia Tribal lands including :

- A. Provide a balanced local renewable power supply for Zia Pueblo, its members, tribal offices, schools, buildings, and businesses on tribal lands
- B. Provide a firm power supply for export and commercial market distribution
- C. Provide economic development for the tribe and its tribal members, including job training and creation

## Recent Project Milestones

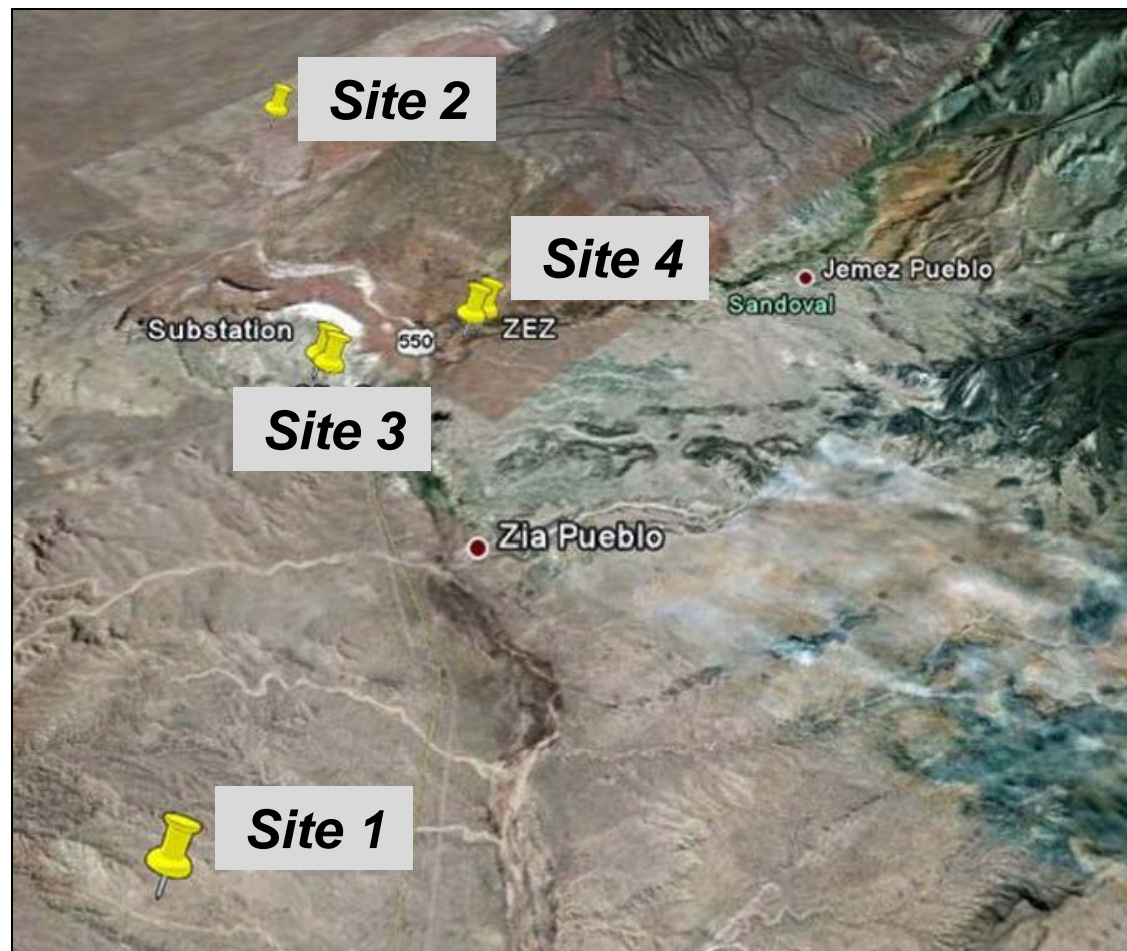
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Milestone	Completion
Project Kickoff/Down select development sites	August 2012
Evaluate wind/solar metering options, Collect and evaluate Geothermal Data	September 2012
Install 10 meter wind/solar metering	October 2012
Install 80 meter wind/solar metering	November 2012
Detailed Site Assessments	<b>Ongoing</b>



# Zia Pueblo Development Sites

- Solar/Wind Sites: 1-4
- Geothermal Sites: 1,2
- Major utility asset:  
San Ysidro  
115 kilovolt  
substation



## Site Down Selection

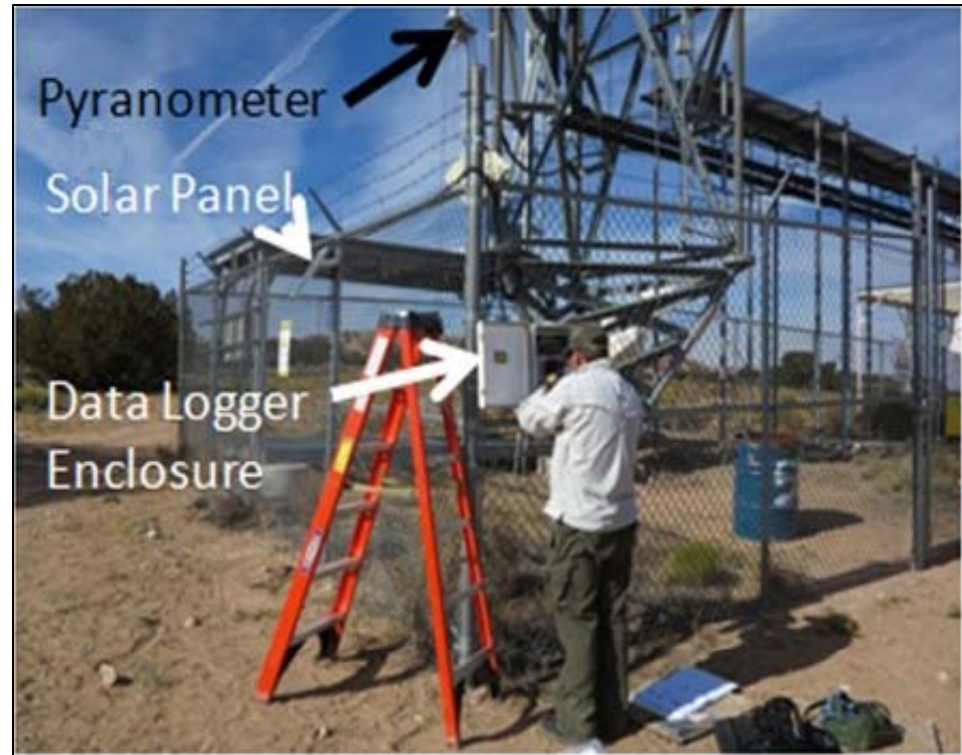
- Potential electric capacity is estimated to exceed *13,000 kilowatts (kW)* (maximum capacity up to 26,800 kW)

Combined Siting Options	Geothermal 2000 kW	Solar PV 1000 kW	Solar PV 8800 kW	Wind 4200 kW	Installed kW	Annual kWh (x1000)
1	Site 2	Site 1	N/A	Site 2	7,200	27,000
2	Sites 1, 2	Site 1	N/A	Site 2	9,200	42,600
3	Sites 1, 2	N/A	Site 2 or 4	N/A	12,800	45,200
4	Sites 1, 2	N/A	Site 2 or 3	N/A	12,800	45,200
5	Sites 1, 2	Site 1	Site 2 or 4	N/A	13,800	47,000
6	Sites 1, 2	Site 1	Site 2 or 3	N/A	13,800	47,000

- The annual fossil fuel reduction may exceed *27,000 short tons of coal*

# Wind/Solar Metering Equipment

- Campbell Scientific Model CR10x data recorders used as data loggers
- CMP3 Kipp and Zonen pyranometer
- Met One 14A anemometer and wind direction sensors
- 10-meter tower at Tribal Office, 80-meter tower at Site 1 (*existing commercial tower*)



# Wind/Solar Metering Sites



# Geothermal Evaluation

- Geothermal Play- deep basin- high conductive heat flow regime
- Intermediate-temperature (250-300 F), binary power generation potential
- Estimate temperatures from heat flow and deep well bottom-hole temperatures
- Compile geophysical logs, well construction and history



**Red: Convective zone**

**Blue/Blue: Deep Conductive zone**

# Observations and Lessons Learned

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- *Multiple sites- Diversity of technologies* requires structured selection process with tribal review
- To be “*bankable,*” wind metering must be collected at turbine hub height
- Tribal interface with commercial vendors requires *realistic lead time* (6 months estimated versus 2 weeks actual)
- Key pre-funding role possible from state programs, example: New Mexico Small Business Assistance Program (NMSBA); New Mexico Renewable Energy Transmission Authority (RETA)
- Recognize value of project partnerships & team collaboration

## Next: Proving Commercial Feasibility

- Export Market Analysis
  - Community Power / Export Power
  - Customer Pool
  - PPAs
- Partnership Development
  - Financial Backing
- Regulatory
  - Understand Issues and Requirements
- Financial Analysis
  - Model All Economic Parameters
- Operational Integration
  - Bring All the Study Results and Plans Together in a Market-Driven Solution



*Geothermal*



*Substation*



*Solar PV*



*Wind*

# Pueblo of Zia Renewable Energy Development- Q&A



*"The expertise and assistance provided to the Pueblo of Zia by DOE TEP is a key component of our success thus far."*

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