Pueblo of Zia Renewable Energy Development Feasibility Study

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

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<thead>
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</thead>
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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: 167,000 acres/261 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

- 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
- Continuous inhabitation of current homelands since < 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

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 (2013), 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

**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.

- 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
## Project Milestones & Accomplishments

<table>
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<tr>
<th>Milestone</th>
<th>Completion</th>
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<tbody>
<tr>
<td>Project Commencement/Team Retreat</td>
<td>August 2012</td>
</tr>
<tr>
<td>Site Down-Select Process</td>
<td>December 2012</td>
</tr>
<tr>
<td>Geothermal Evaluation Complete</td>
<td>June 2013</td>
</tr>
<tr>
<td>Solar/Wind Evaluation Complete</td>
<td>August 2013</td>
</tr>
<tr>
<td>Power Firming Evaluation Complete</td>
<td>November 2013</td>
</tr>
<tr>
<td>DE 5628 Project Final Study Report</td>
<td>March 2014</td>
</tr>
<tr>
<td>Developer Interactions</td>
<td>Ongoing</td>
</tr>
</tbody>
</table>
POZ Development Sites

- Wind Sites: 1, 3
- Solar Sites: 1, 2, 3, 4
- Geothermal Sites: 1, 2, 3, 4
- Major utility asset: San Ysidro 115 kilovolt Substation
Site Down Selection

- Four development sites plus three technologies offer *many siting combinations of value to POZ*
- POZ team facilitated exercise in Dec. 2012 to reduce number of site combinations
- 14 technical and non-technical factors were used to score POZ’s development sites

*Above:* Site scoring; Sites 3 and 4 received significantly higher scores than Sites 1 and 2
POZ Business Development Issues

Siting combinations affect POZ’s tribal income, ability to create jobs and cost of electricity....

- Changes in key cost factors: e.g., solar cell module pricing falls more quickly than assumed
- Future purchase power RFPs: such as a Green Power procurement at market-based PPA rates

Increases in JMEC's regulated retail electricity rates

- Growth at ZEZ creates a need for power: that is more competitive than JMEC's retail rate
- Changes in natural gas prices and availability: that affect regional energy supply

Net Metering of electricity offers POZ’s best short-term business strategy....
POZ Development “Cluster” 5,430 kW Capacity

- Preferred development cluster for Geothermal, Wind and Solar technologies is located at Sites 3,4

- White Mesa 1,370 kW
- Substation 2,130 kW
- ZEZ 330 kW
- ZEZ 1,300 kW
Cluster Energy Production: Net Metering versus Export

- **Combination A:**
  Geothermal, solar, and wind capacity is installed; 55% capacity factor; installed cost: $15.1 Million

- **Combination B:**
  Geothermal and solar capacity is installed; 40% capacity factor; installed cost: $13.6 Million

**Above:** Net meter location is at ZEZ; “Consumed 2015” is based on projected ZEZ development plus existing consumption of tenants and Zia Village
Example: Solar PV Array Site 3

20-Year cumulative for 2,130 kW capacity, 7.5% IRR:

- Total cost: $6.3 Million
- Operating expenses: $4.4 Million
- Energy revenue: $12.1 Million
- POZ payment: Up to $940,000

Above: Phase 1: up to 3,000 racks of solar PV panels; plant occupies approximately 20 acres
Example: Project Risk Scoring

<table>
<thead>
<tr>
<th>Siting Options</th>
<th>Financial</th>
<th>Technology</th>
<th>Regulatory</th>
<th>Resource Availability</th>
<th>Water use</th>
<th>Emissions, waste, disposal</th>
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<tbody>
<tr>
<td>Site 3 Geothermal</td>
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<td>3</td>
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**Above:** “1” is not preferred, unacceptable or too much risk; “2” is acceptable, possibly favorable, some risk; “3” is very favorable, little or no risk, preferred.
Observations and Lessons Learned

- **Multiple sites & Diversity of technologies** requires significant lead-time, research & structured selection process w-active ongoing tribal participation.

- Tribal interface with commercial vendors & potential developers requires *realistic advance & lead time*

- Tribal considerations & cultural preferences combined w/scientific & technical feasibility are KEYS to strategic planning.

- History of challenges for PPA’s w/tribes: No existing PPA’s

- High value of forming key strategic project partnerships, technical expertise and collaboration
Next: Proving Commercial Feasibility

- Export Market Analysis
  - Community Power / Export Power
  - Customer Pool
  - PPAs

- Partnership Development
  - Financial Backing

- Financial Analysis
  - Model All Economic Parameters

- Operational Integration
  - Bring All the Study Results and Plans Together in a Market-Driven Solution
The expertise and assistance provided to the Pueblo of Zia by DOE TEP has been invaluable to our success thus far…