Pueblo of Zia Solar Initiative

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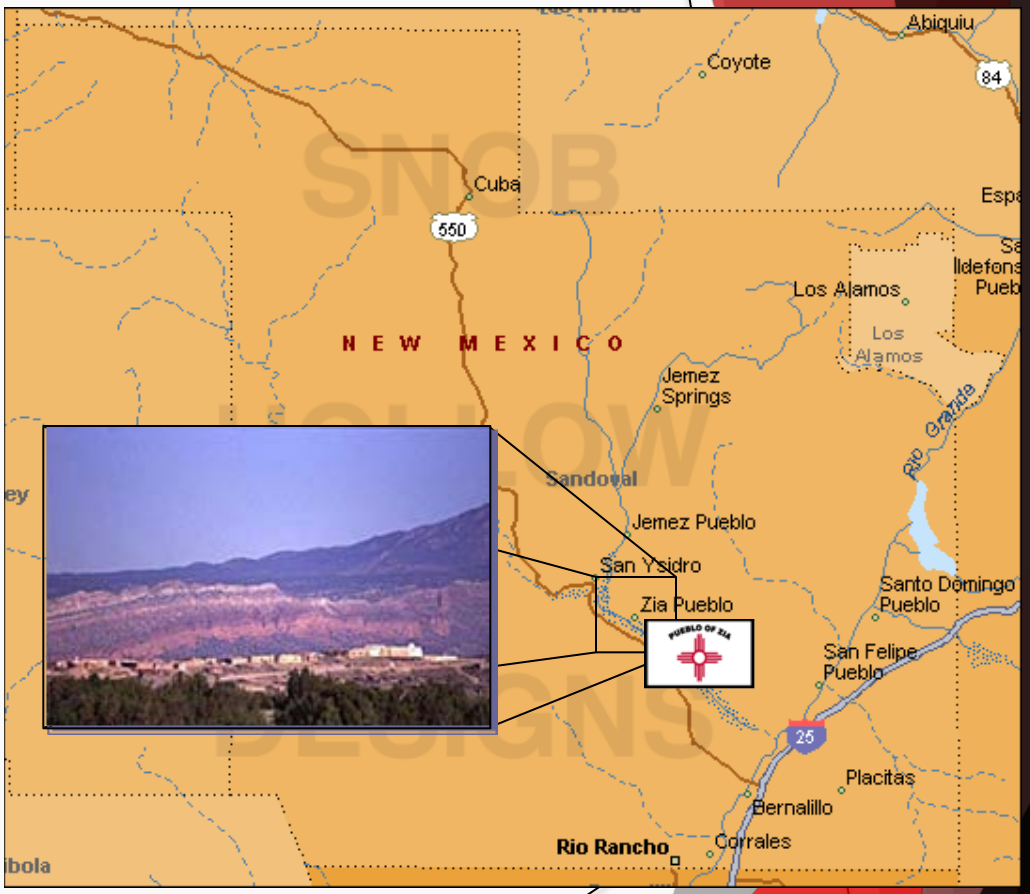
Summary

1) Pueblo of Zia Background
2) Pueblo of Zia Renewable Energy Development Feasibility Study - December 2013
3) Current Pueblo of Zia Projects
    - Solar Water Pumping Stations
    - Parking lot panels
4) Projects on the Horizon for the Pueblo of Zia
    - Rural Solar water pumps for livestock and agriculture
    - DOE/ Zia 2 day Solar Workshop
    - 3 Solar Grant Applications
5) Future Projects at the Pueblo of Zia
    - Pueblo of Zia Solar Utility

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

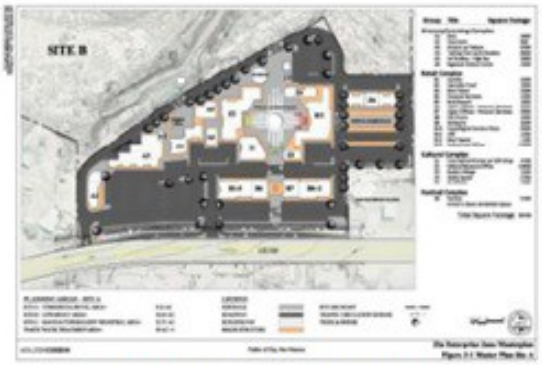


Zia Sun Symbol

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

- 924 Tribal Members (2015), living in 220 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

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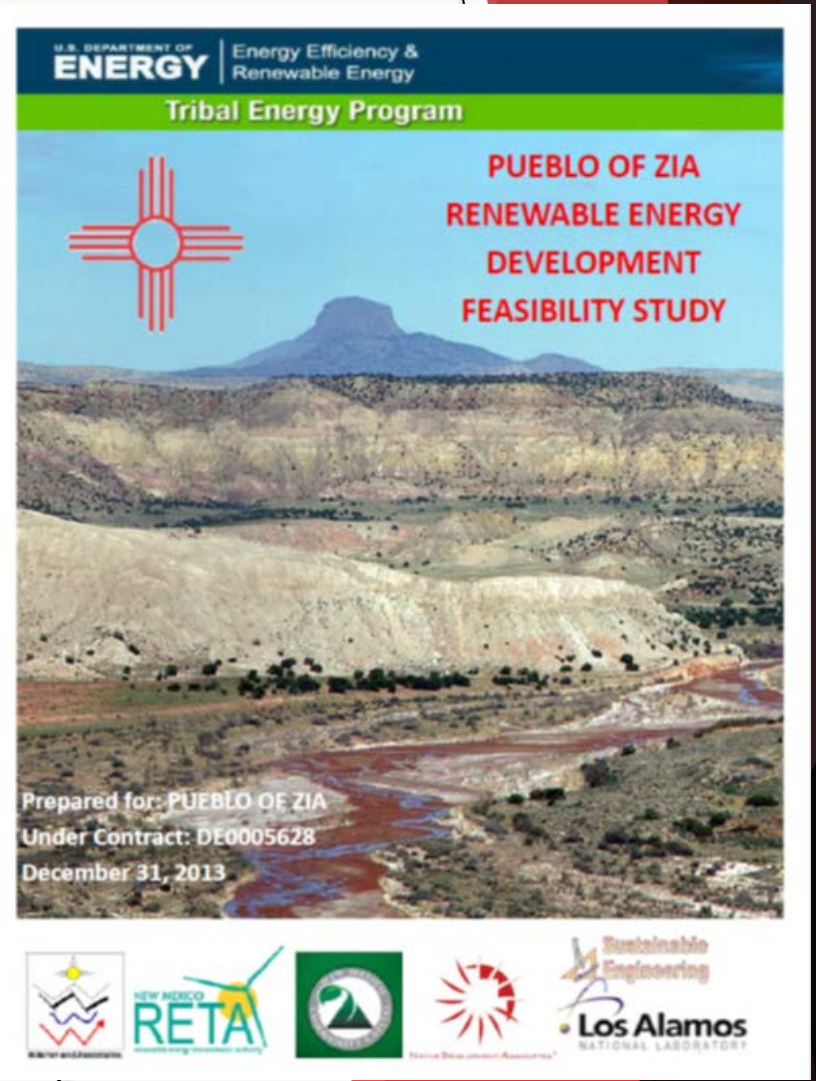
Pueblo of Zia Renewable Energy Development Feasibility Study, by the U.S. Department of Energy

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

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



Project Milestones & Accomplishments

Milestone	Completion
Project Commencement/Team Retreat	August 2012
Site Down-Select Process	December 2012
Geothermal Evaluation Complete	June 2013
Solar/Wind Evaluation Complete	August 2013
Power Firming Evaluation Complete	November 2013
Integrated Project Report Final Draft	December 31, 2014
DE 5628 Project Final Study Report	March 2014
Developer Interactions	***Ongoing***

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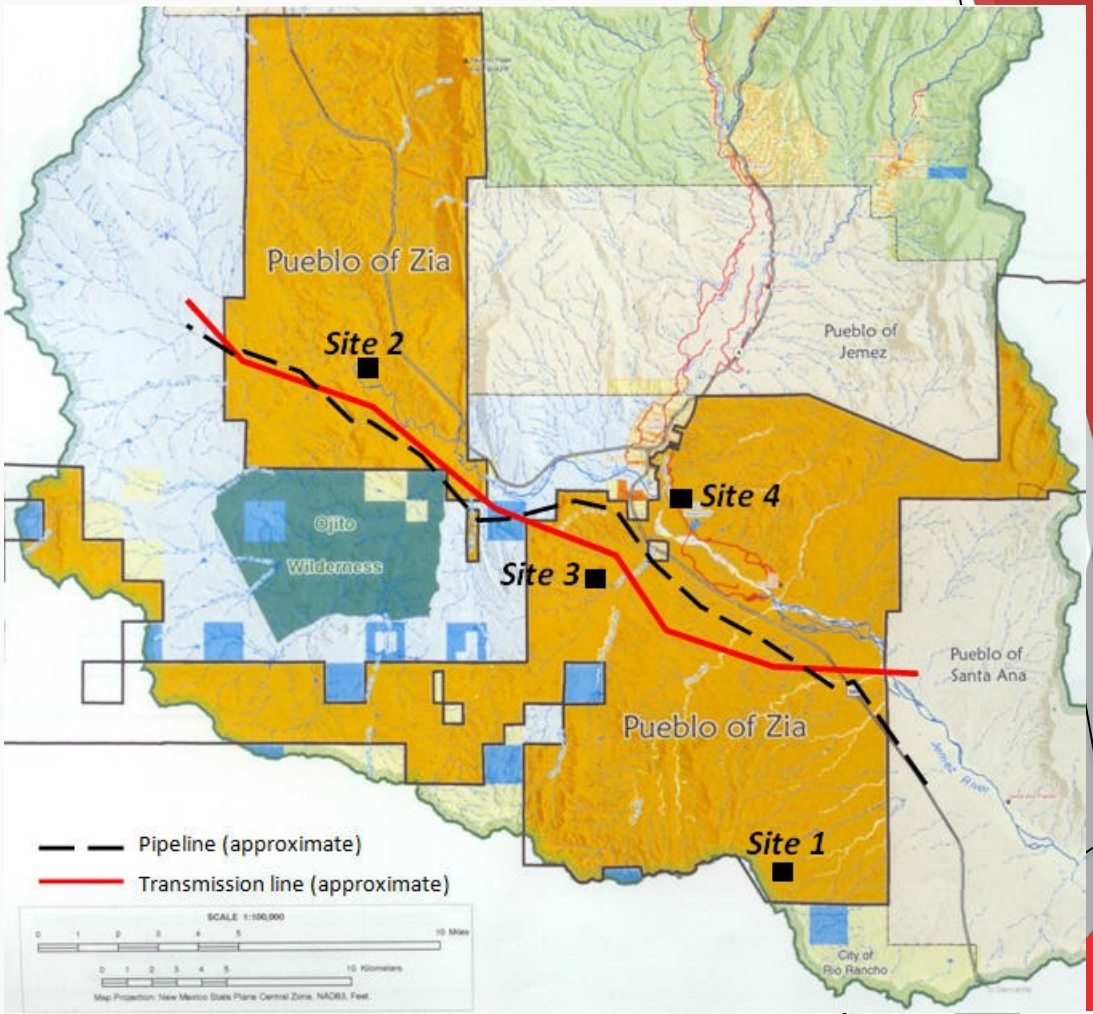
Pueblo Of Zia Development Sites

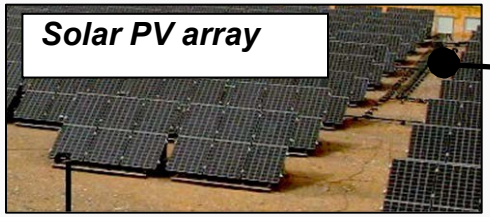
- Wind Sites: ***1,3***
- Solar Sites: ***1,2,3,4***
- Geothermal Sites: ***1,2,3,4***
- Major utility asset: San Ysidro 115 kilovolt Substation



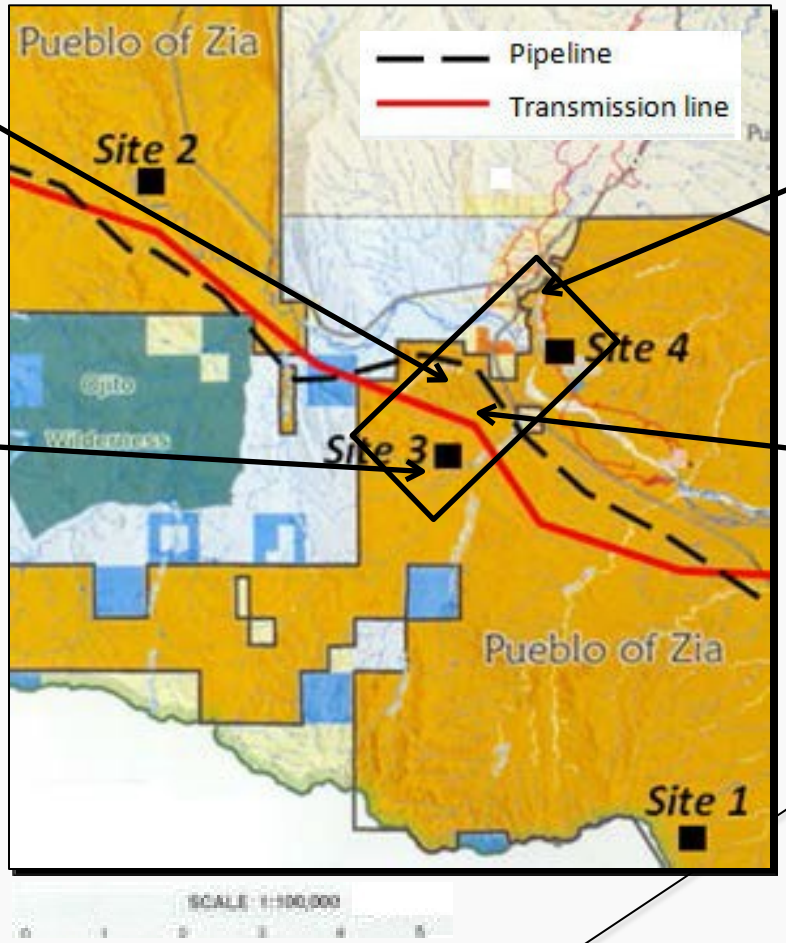
Pueblo Of Zia Development "Cluster" 5,430 kW Capacity

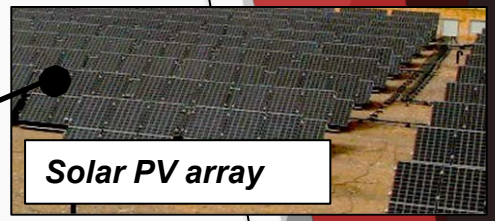
- Preferred development cluster for Geothermal, Wind and Solar technologies is located at Sites 3,4

White Mesa
1,370 kW

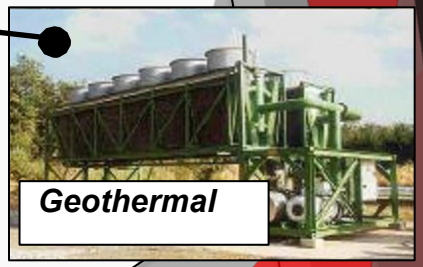


Substation
2,130 kW





ZEZ
330 kW



ZEZ
1,300 kW

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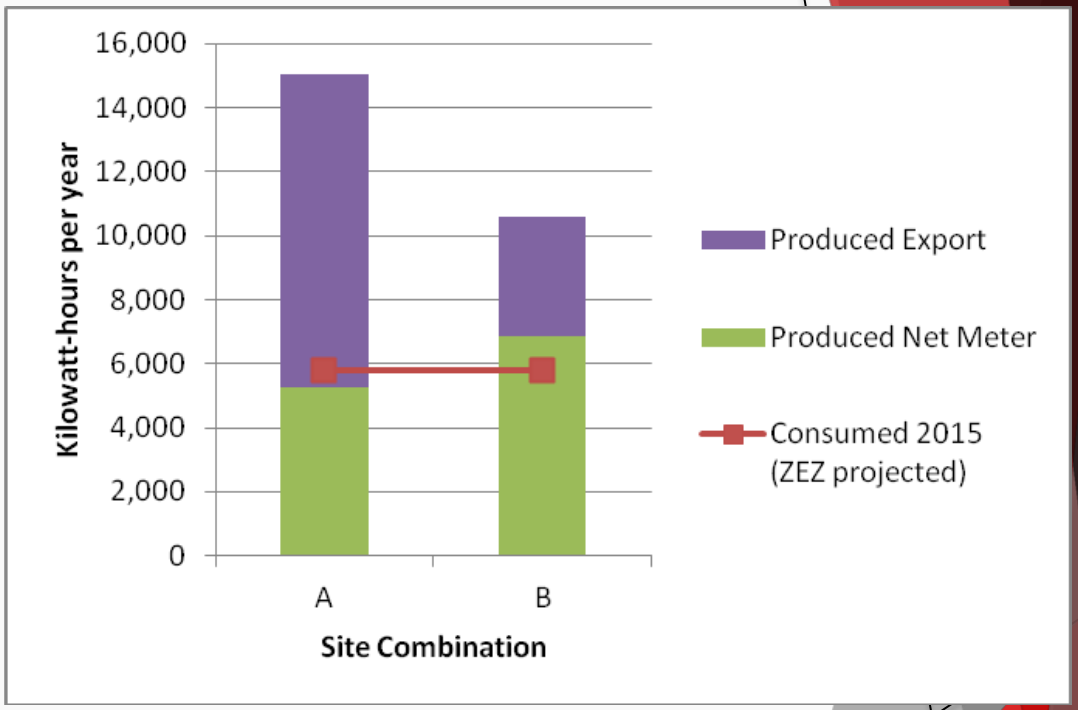
Cluster Energy Production: Net Metering versus Export

- ***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

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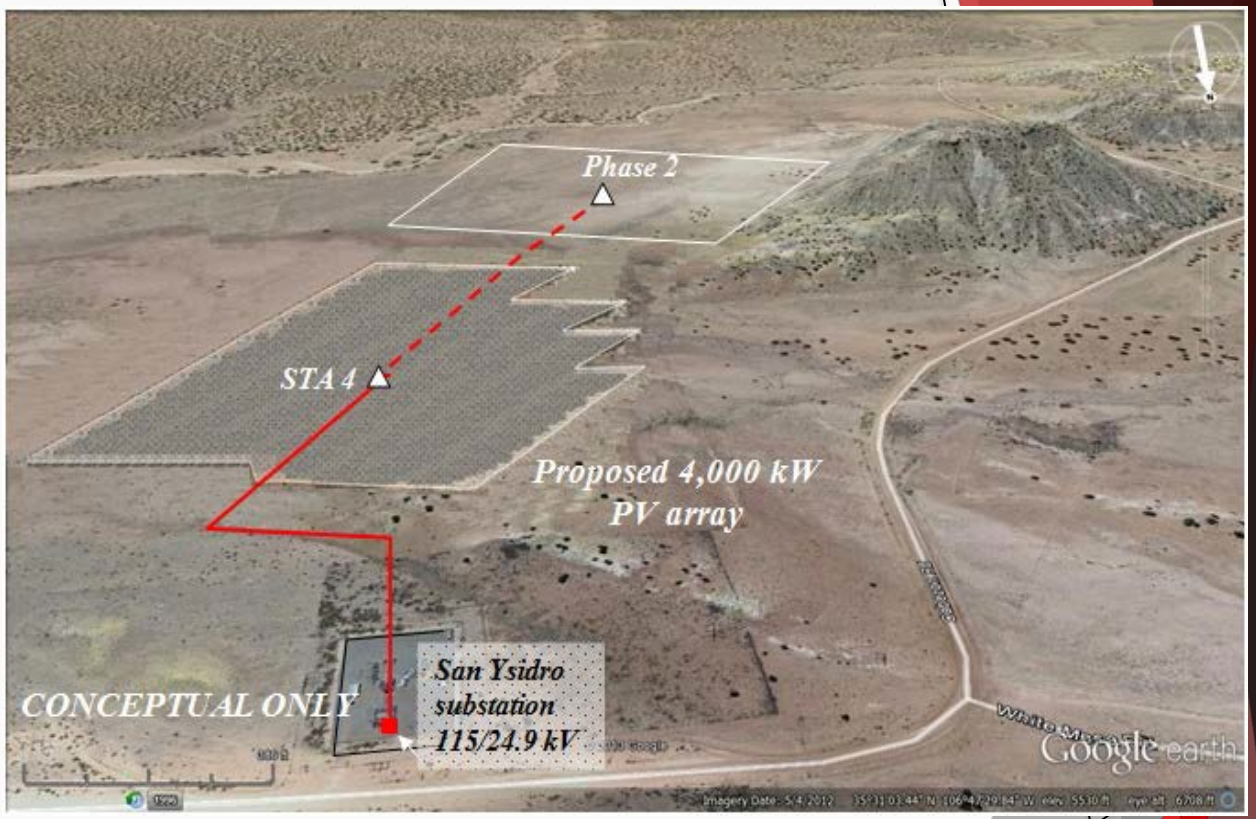
Example: Solar PV Array Site 3

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

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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

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Current and Future Zia Electric Demand

- Zia's peak electric demand equals or exceeds 0.4 Megawatts (MW)
  - Requiring over 2.5 million kilowatt-hours (kWh) of energy to be delivered annually to the Pueblo village and commercial operations located on Tribal lands.
- Potential increases in electric demand due to growth at the Zia Enterprise Zone (ZEZ)
  - Expected to occur between 2015-2018.
  - The initial build out could add approximately 0.7 MW of electric demand.
  - Requiring delivery of an additional 3.3 million kWh of energy annually.

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

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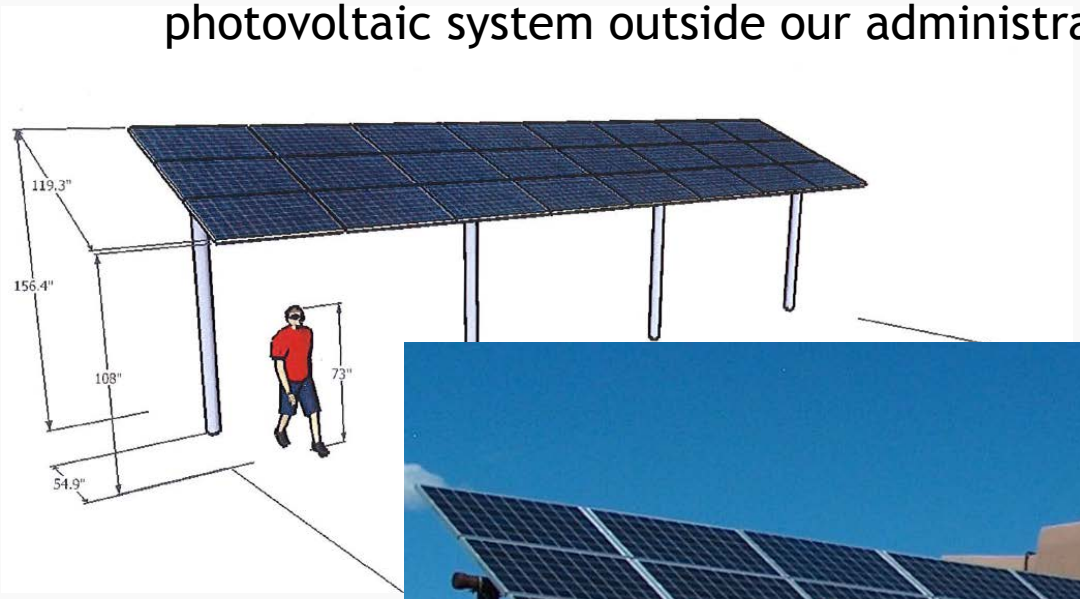
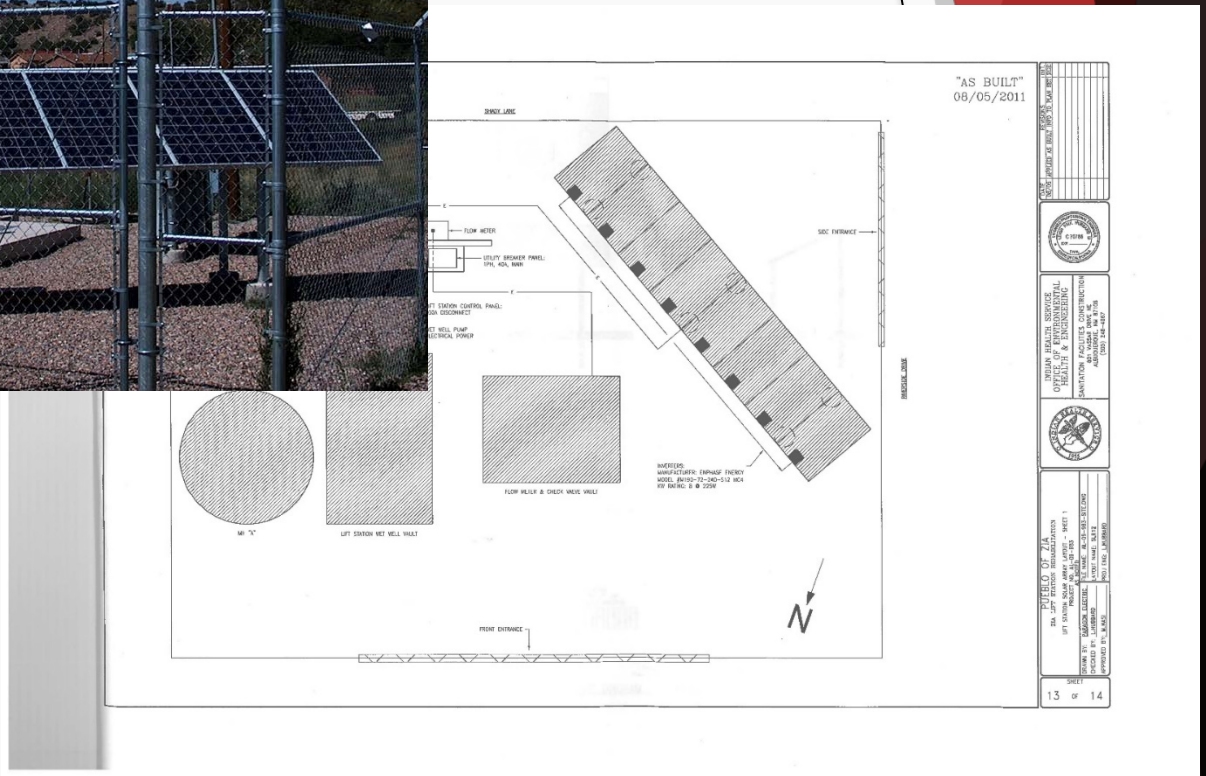
Pueblo of Zia's Current Solar PV System

The Pueblo of Zia has authorization to Interconnect to the Jemez Mountain Electrical Cooperative with our 5.28kW photovoltaic system outside our administrative offices



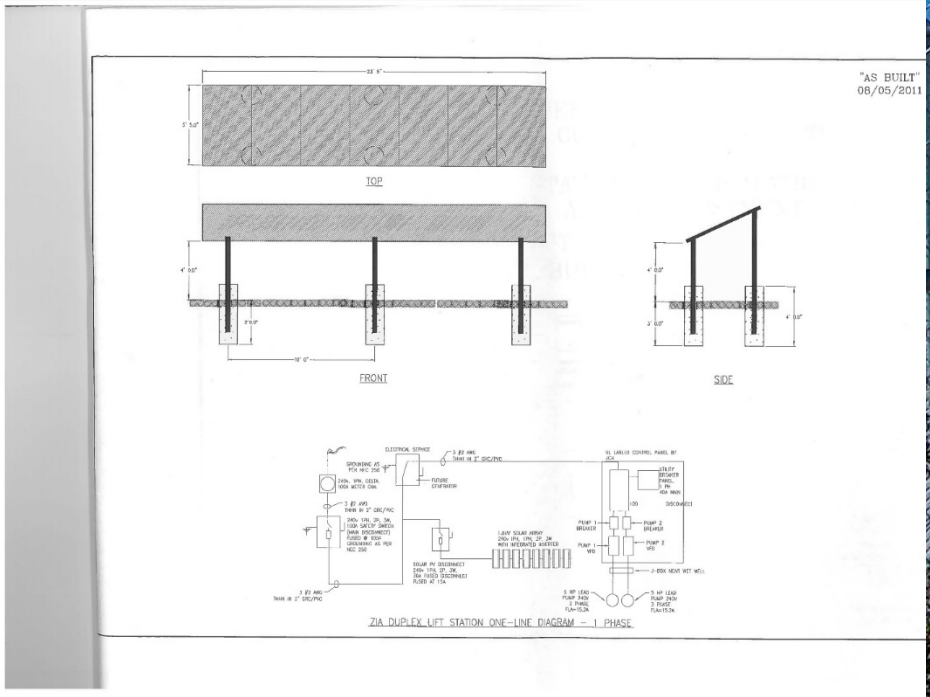
Current Solar PV Lift Station

The Pueblo of Zia currently uses some of their Solar Potential in a Waste Water Pump Station



Current Solar PV Pumping Station

Solar Power is also used on the Zia land to pump drinking water



Projects Starting in the near future the Pueblo of Zia

- Rural Solar water pumps to replace nonfunctioning windmills
  - For livestock and agriculture
  - IAD funding
- DOE/Pueblo of Zia 2 day Solar Workshop
- 3 Baker/ Tilley Solar Grant Applications

Solar Water Pump Project

- Remove nonfunctioning windmill and install solar water pumps
  - Rural round water wells
  - Feeding of livestock
  - Energy and Economic Independence
- Solar powered water pumps
  - IAD TIF award - Planning
  - Identify non-functioning windmill groundwater well sites
  - Purchase and install 5-10 solar test pumps
  - Study and identify best fit for community
- Increase community support and training on solar technology.

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DOE Pueblo of Zia Community Solar Workshop

- DOE Tribal Energy Program Technical Assistance
  - Open door workshop for administration and community members. Increase community understanding for solar technology
- Day 1. Goal: Preliminary Development of Strategic Energy Plan based on Pueblo's vision , Energy Resources, and Needs
- Day 2. Goal: Develop an Action Plan for Strategic Energy Plan and installation of PV Solar Array.

Solar Grant Applications Submitted

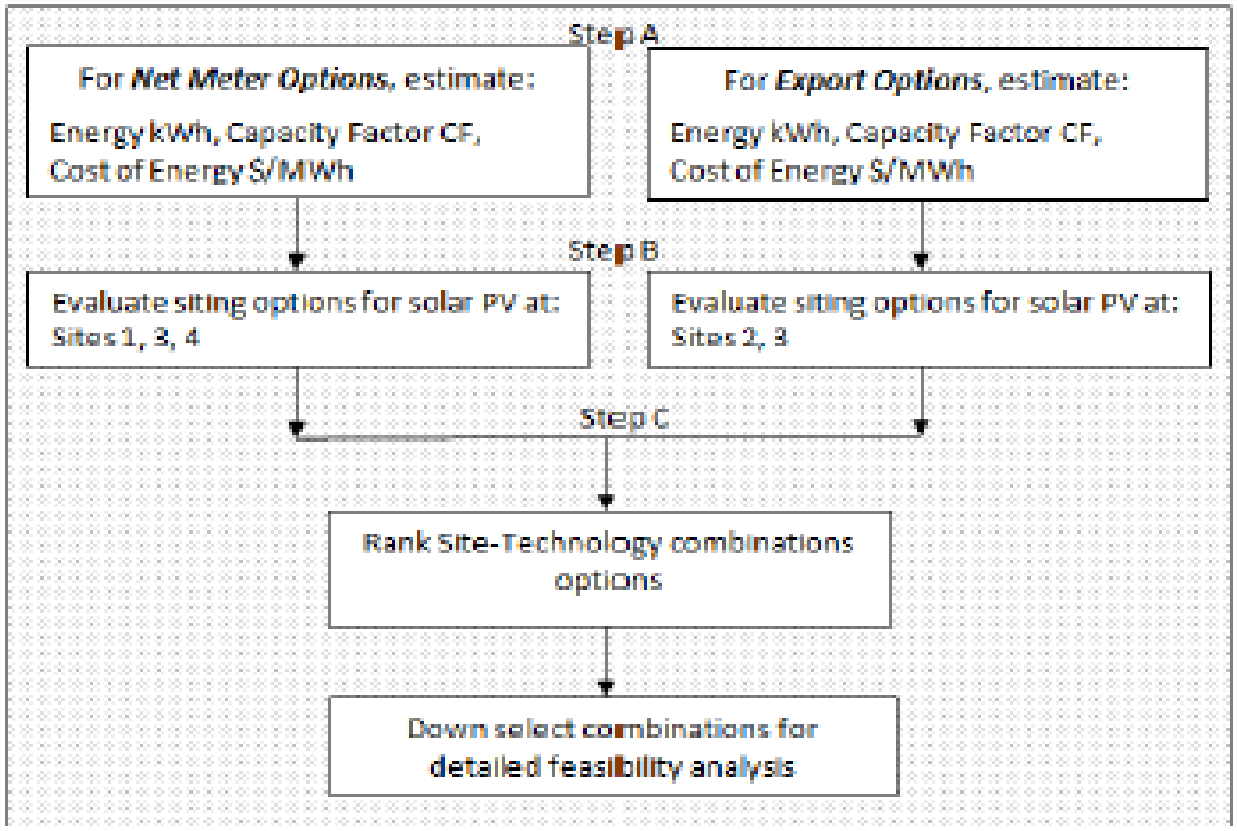
- BIA Grant Application to “Assess, Evaluate and Promote Development of Tribal Energy and Mineral Resources” (BIA-15-FA0001)
  - Distributed Generation Feasibility Study
  - Power Supply for Export and Commercial Market Distribution Feasibility Study
  - Tribally Owned and Operated Utility Feasibility Study

Future Projects at the Pueblo of Zia

- Down selection process for solar installation
- Pueblo of Zia Solar Utility
- Install commercial scale utility project

Down selection process for Solar PV Installation

Four development sites identified by DOE Renewable Energy Feasibility Study



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Net Meter

- Net Metering, the electricity produced by a renewable energy generation project would be used directly by the Zia to offset its demand for power purchased JMEC.
- The term “Net” refers to the amount of electricity purchased after deducting that which is produced by the renewable energy generation project.
- The amount of “Net” electrical use results in a significant reduction in the amount of electricity required to be purchased.
- JMEC will apply a credit for every excess kWh produced which is equal to the purchased price of a kWh.

Exporting (selling) Electricity

- For Zia to receive payments, the electricity would need to be “exported” to customers via the electrical transmission grid.
- In an export scenario, the developer (Seller) of the renewable energy project would enter into a Power Purchase Agreement (PPA) with a utility or other large-scale user (Buyer) of electricity to supply a specified amount of electricity at specified pricing.
- Through a PPA, a Buyer can ensure a reliable, long-term, cost-competitive supply of electricity.
- PPAs contain detailed incentive and penalties for the Seller and guarantees for the Buyer. They are legally binding contracts and are subject to state and federal regulation.

Set up Tribal Utility

- Identify utility operations model to increase renewable energy
- Identify local labor sources.

Construction of Commercial Scale Solar PV Array