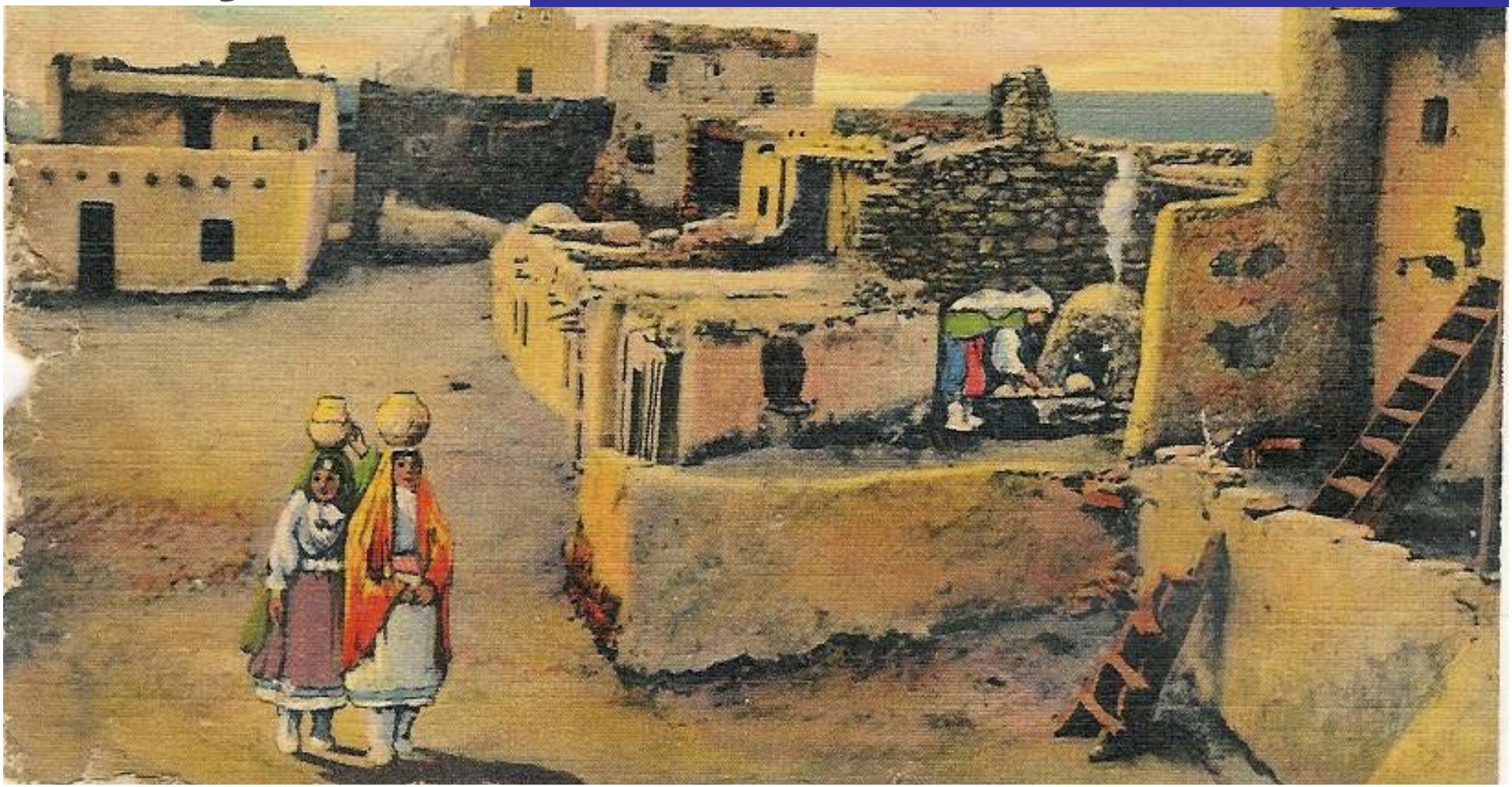
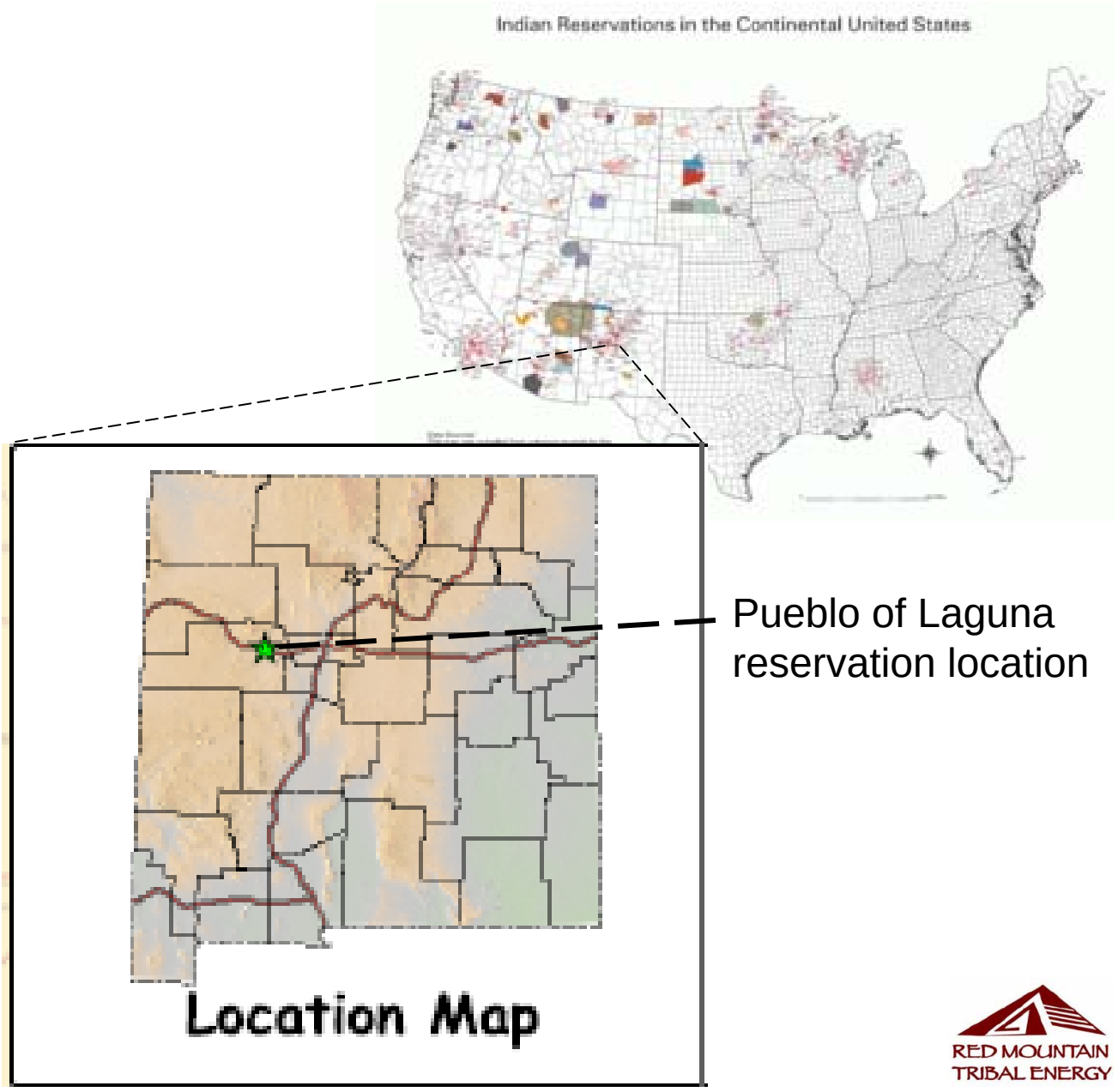
Pueblo of Laguna Utility Authority Renewable Energy Feasibility Study

DOE Tribal Energy Program Review
October 2007



Pueblo of Laguna Reservation

Pueblo of Laguna lands in West Central New Mexico cover more than 533,000 acres



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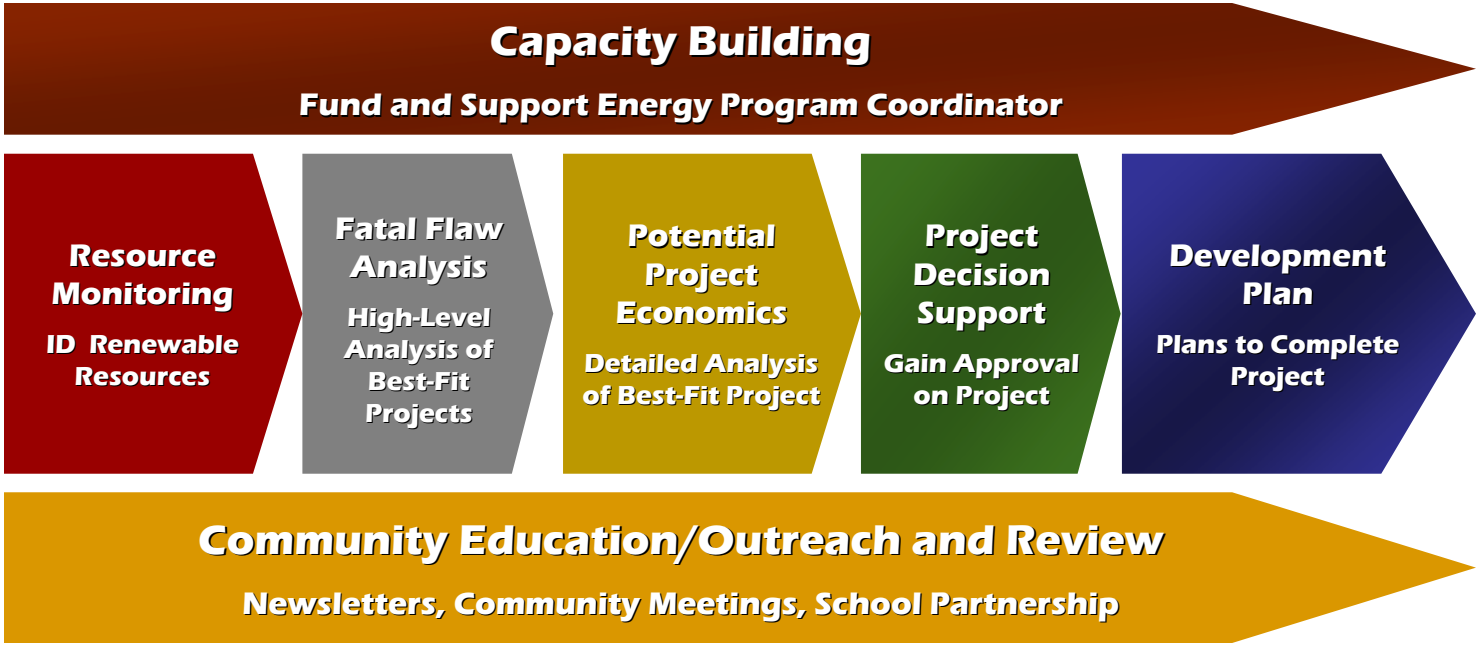
Six villages in Laguna with varying interests and needs have significant impact on Laguna decisions

Project Steps and Objectives

Feasibility project focused heavily on Capacity Building and Community Outreach to ensure Laguna has ability to implement its plans



Study Objectives:

- Increase energy knowledge and capacity
- Improve quality and reliability of electric service
- Contribute to development of environmentally clean energy
- Provide data/analysis to support Laguna involvement in renewable energy projects as an owner or participant

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Project is being led by Laguna UA personnel, with technical support provided by Red Mountain Tribal Energy

Project Participants

- **Tribal and Staff Participants:**
  - Pueblo of Laguna Utility Authority and Board of Directors
  - Pueblo of Laguna Tribal Council and Staff Officers
  - Pueblo of Laguna Villages
  - Pueblo of Laguna Entities/Facility Managers
- **Project Consultant:**
  - Red Mountain Tribal Energy

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Laguna Renewable Projects Evaluated in 2007

Focus of 2007 effort was to engage the community and narrow the list of potential renewable projects for more in-depth evaluation

- Commercial-scale wind (Foresight Energy)
- Solar project focus
  - Community-scale hybrid solar/natural gas
  - Small and large-scale single axis tracking PV and HCPV
  - Community Solar program

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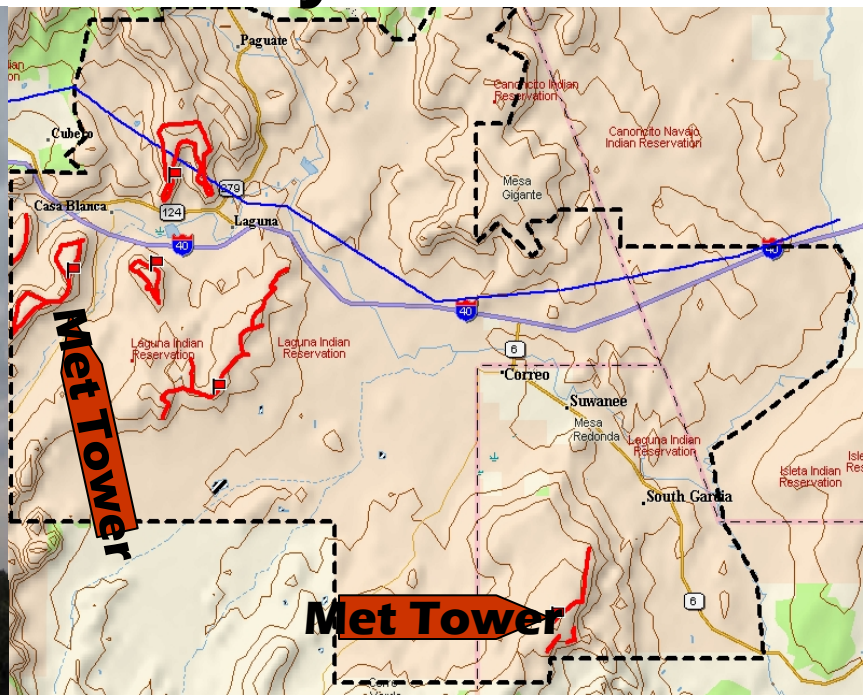
Wind Resource Monitoring and Feasibility

Wind resources monitored at two locations; one year of data did not confirm the potential for a commercial scale project



- Data suggests sites have wind resources of 2+ to 3 PNL wind class
  - Seama Mesa
    - Close proximity to transmission lines & I-40
    - No known cultural/historical concerns
    - 60 MW project req. $3.25 million in access & tie-in costs
  - Lucero Mesa
    - Large area able to accommodate larger project
    - + Remote location, no view shed concerns, but far from transmission lines & access
    - 90 MW project would req. $6.3 million in access & tie-in costs

Laguna UA

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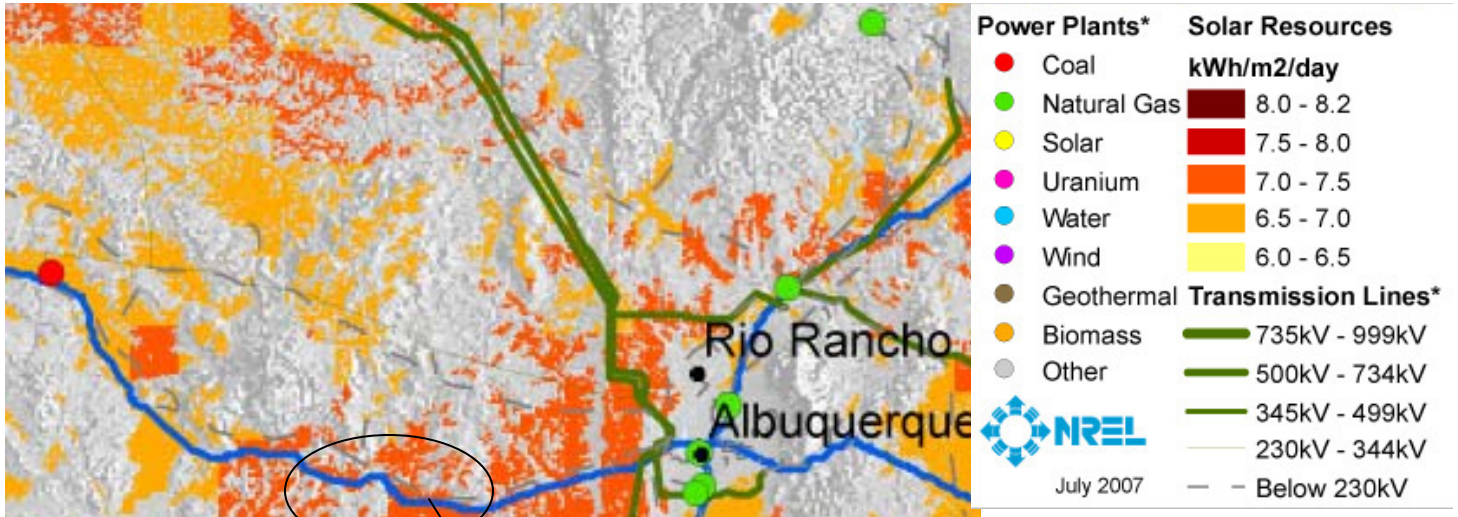
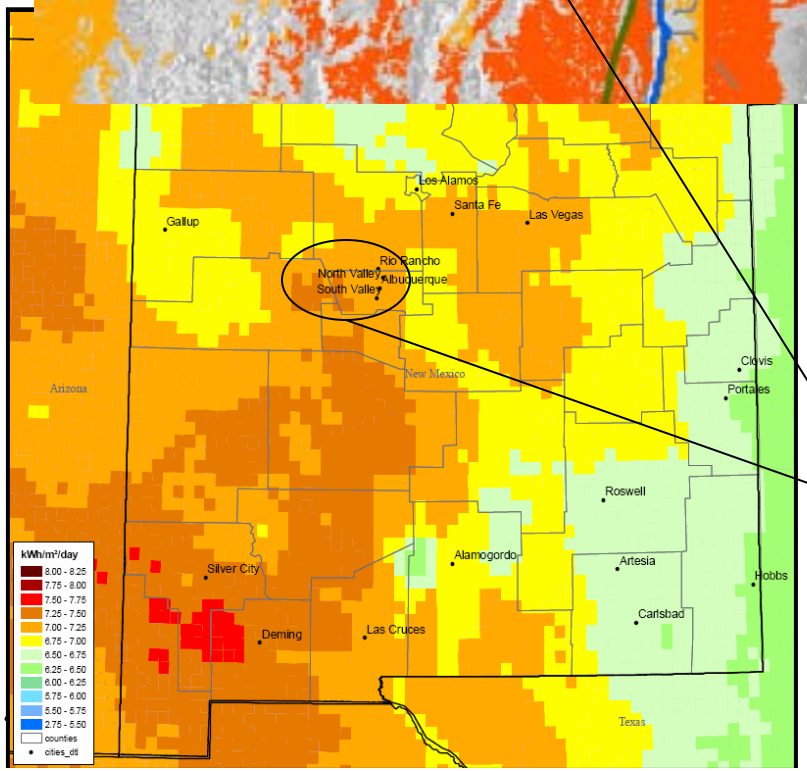
Laguna solar resources appear excellent for both PV and CSP projects



Average annual insolation at the site falls in the range of 7.25 – 7.5 kWh/m2/day – suitable for CSP applications.



Potential project site

Average annual insolation at the site falls in the range of 7.25 – 7.5 kWh/m2/day – suitable for PV

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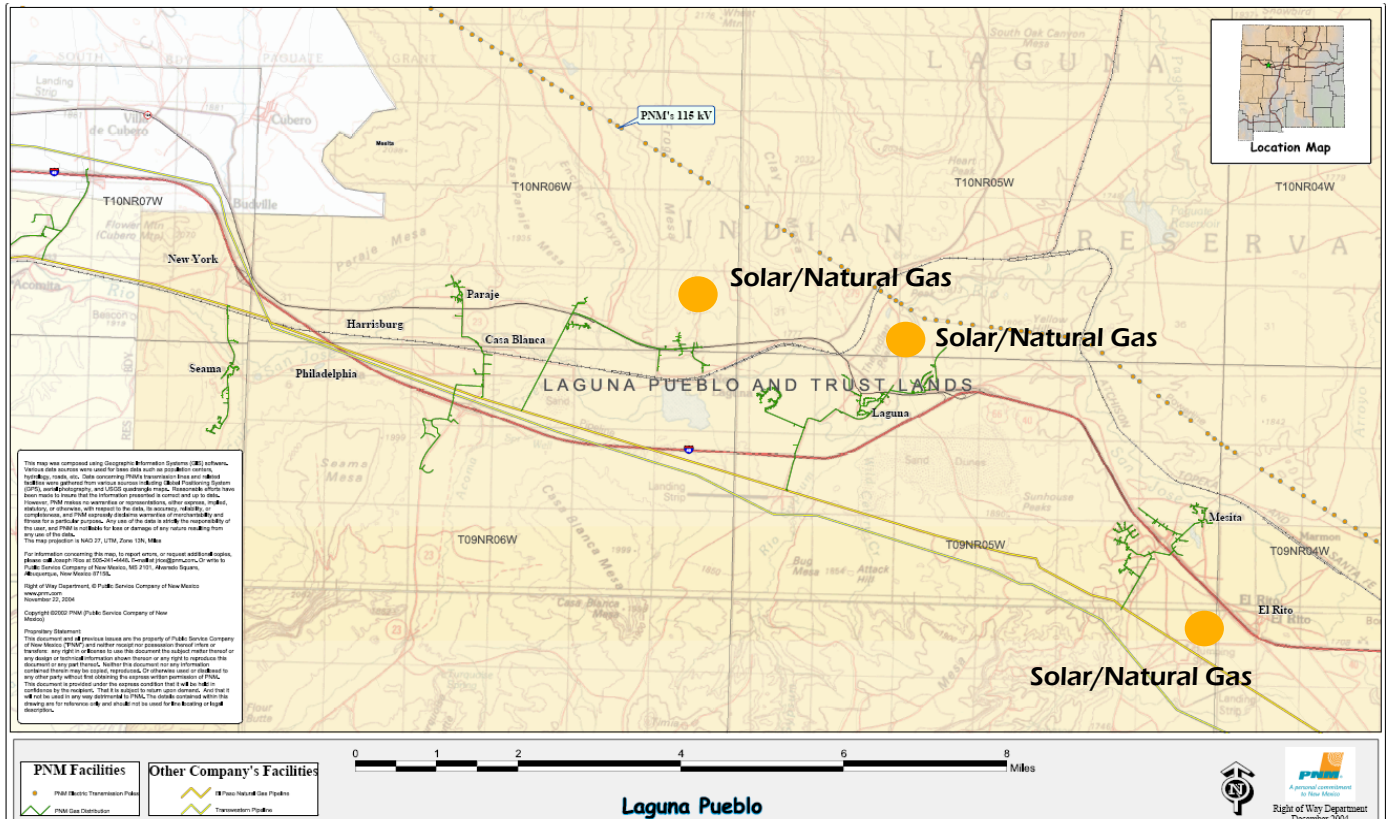
Multiple community projects appear feasible; economics are dependent on technology costs and availability of grant funding

Possible Laguna Community Solar/Gas Project Locations



A hybrid solar/natural gas project could produce enough power to meet Laguna reservation needs, but without grant funding, would result in too high a power cost

Laguna Community-Scale Solar/Gas Project Economics

Project Size	Solar Component	Cost per KW	Natural Gas Component	Cost per kW	Total Capital Cost	Optimized LCOE estimate
5.1 MW	4 MW Single Axis Tracking System	$6,800	Caterpillar 570kW G3512 90 TA engine (2 units)	$1,263	$42.2 million	16.7 cents per kWh (36% solar; 25% gas; 39% grid)

Source: Red Mountain 8/06 analysis

4 MW Single Axis Tracking System

+

+ 2 570 kW Caterpillar Gas Generators

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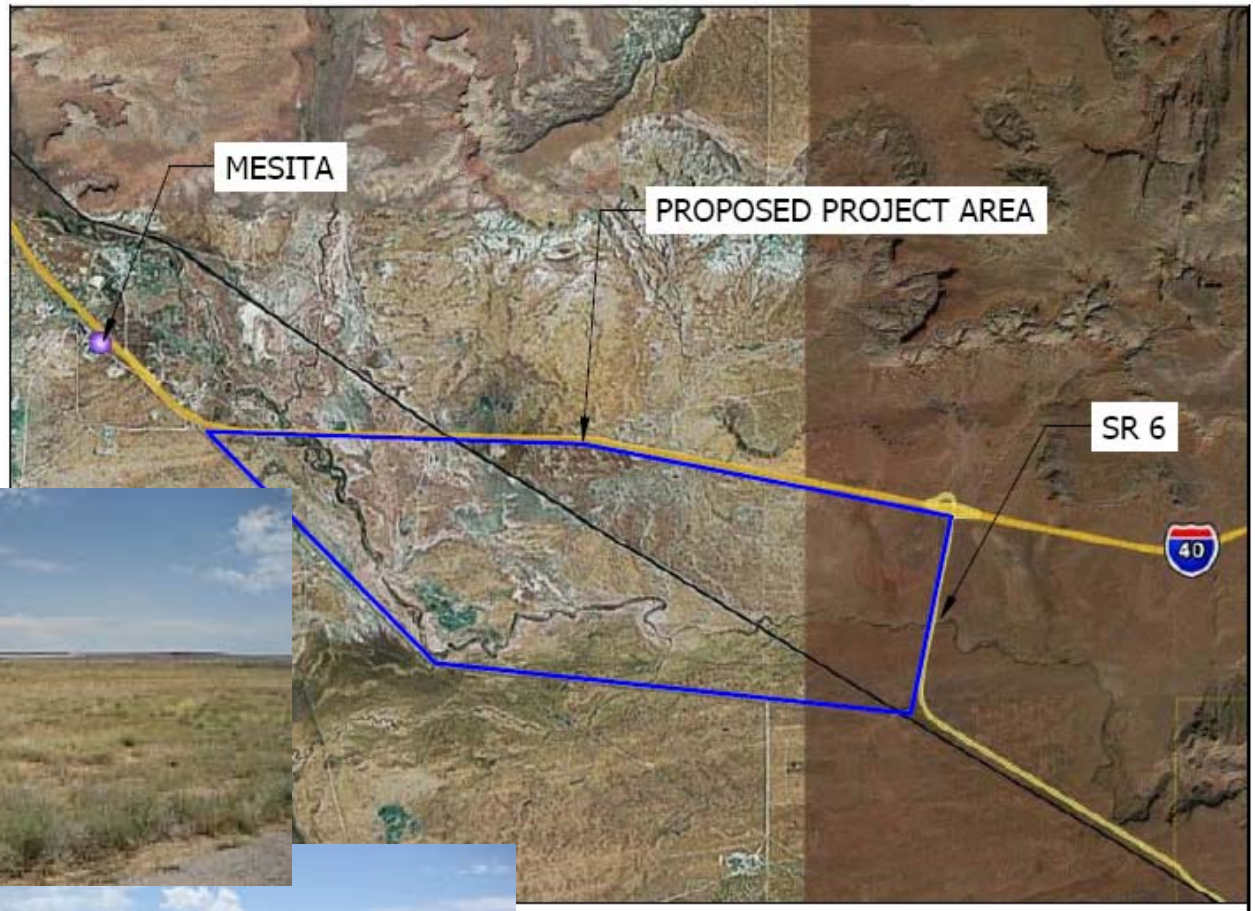
Proposed Wild Horse Site

Proposed large-scale solar project site has excellent insolation, close proximity to transmission line and large, flat available area



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3, 50, 100 MW Single Axis Tracking PV Projects Evaluated

Limited water availability suggests single axis PV would be appropriate technology for a large-scale Laguna solar project

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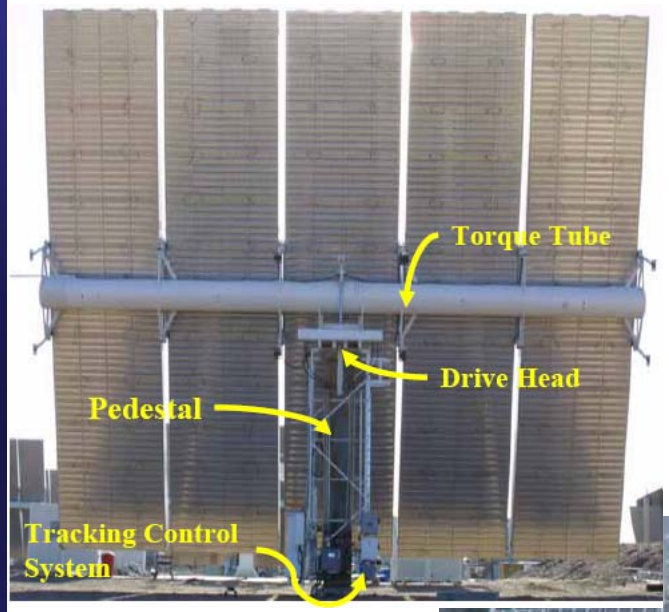
50,100 MW Large Scale HCPV Projects Evaluated

Laguna's limited water resource and excellent CSP insolation also suggests potential for High Concentration PV (HCPV)



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Laguna Solar Project Economic Considerations

Scale of Laguna project and available technology/ costs suggest different ownership approaches

- Laguna Community Scale Solar/Gas Energy Project
  - **Laguna owned/operated w/grant funding likely to provide best economics**
    - Grant funding could reduce capital outlay
    - Net metered power/use as self-generation
    - RECs sold separately
- Laguna Large Scale Solar Energy Project
  - **Developer/Tax Partner Joint Venture likely to provide best economics**
    - Tax partner can take advantage of tax incentives (ITC)
    - Project could sell power/RECs bundled or separately
    - Utility or developer could partner with Laguna

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Laguna renewable resources allowed for multiple projects to be evaluated; with current technology cost/ performance indications, 100 MW HCPV appears most viable

Laguna Solar Project Comparison

	Project Capital Cost (includes development, transmission/ interconnection costs)	**Acreage Required**	**Levelized Cost of Energy * (Cents per kWh)**	**Capital Cost Considerations**
3 MW Single axis tracking PV	$28.3 million	30		Assumes lower-cost CIGS modules
50 MW Single axis tracking PV	$410 million	500		Assumes lower-cost CIGS modules; 20% economies of scale
50 MW HCPV	$188 million	530		Assumes projected CPV cost reductions
100 MW Single axis tracking PV	$604 million	1000		Assumes lower-cost CIGS modules; 30% economies of scale
100 MW HCPV	$340 million	1060		Assumes projected CPV cost reductions

* Assumes Tribal/tax partner JV; 30% ITC; no REC value or grant funding for capital outlays

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PV vs. Concentrating Solar Capital Cost Comparison

Technology/ cost improvements indicate increasing competitive position of HCPV

Installation	Cost ($/Watt)
Single Axis Tracking PV	8.50
HCPV (Amonix)	5.00 – 7.00
HCPV - Future	3.00
Parabolic Trough (for comparison only)	4.00

Source: Arizona Public Service

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Laguna Solar Project Partnership Considerations

Numerous advantages of a Laguna solar project partnership suggest competitive power pricing

- Location
  - Proximity to market, transmission lines (115 kV)
- Resources
  - Excellent PV and CSP solar resource
  - Nearby natural gas lines
- Time to market
  - Permitting process could be accelerated
  - Tribal leadership support for energy development
- Manufacturing/component integration facilities
  - Business incentives
  - Workforce development
  - NM Alternative Energy Product Manufacturers Tax Credit for businesses
  - Solar Energy Gross Receipts Tax Deduction for businesses
- Incentives and financing considerations
  - Low-interest loan/loan guarantees/Clean Renewable Energy Bonds
  - NM solar set aside; RECs from tribal lands worth 2x for certain power purchasers

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Laguna Solar Project Next Steps

Laguna is working on next steps for both large-scale and community scale solar and solar/ hybrid projects

- Large Scale
  - PNM solar solicitation expected by year end 2007, early 2008
    - RPS requirements/solar set aside requires roughly 200 MW of solar by 2011
  - Laguna beginning to make project developer contacts
  - Technology providers also interested in Laguna potential
- Community Scale
  - Need to identify and pursue potential capital funding sources, pending community needs

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Laguna Community Outreach

Renewable Energy education efforts have been a consistent focus; community input indicates strong community support for Renewable Energy projects

UA Newsletter highlighted Renewable Energy education in several issues


Pueblo of Laguna
Renewable Energy Project Options

Your input is invited.

Background

Project Overview


WIND POWER in Indian Country

Laguna Utility Service News

What is Renewable Energy?

65 surveys completed reflecting very strong support for renewable energy development for member, community and large-scale projects

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Renewable Energy Input

“Our Father gave us an abundant amount of sun and wind. It is only plausible to make use of it.”

“It is good to know that our Tribe is being proactive in considering all viable options in addressing renewable energy projects”

“The electrical and gas is so high it is hard to keep up with the cost.”

“It is a good idea because it would help the tribe to be more independent...”

“I totally support renewable energy projects that are a good fit for our people, especially tribal members who don’t have access to natural gas or households who must depend on wood only.”

“It will be a good source of energy, providing all tribal members are in support…“…Council approval would even be greater. Sometimes, they don’t always work towards what the people want.”

“I have seen the use of solar energy in our area. We need to capitalize on our natural resources… Isn’t this the purpose for the POLUA?”

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Renewable Energy Input

“I think if our forefathers survived on the energy they primitively generated in their day, so can we. With the technology, we have a good opportunity on our hands”

“More than any other group, Native Americans are supposed to protect mother nature..”

“I think it’s good for the world, our kids’ future”

“I think it will help just not my family but the whole community..”

We have the resources all about us. Let’s get with it. It’s clean and efficient.

“I have a mobile home and the cost of propane is outrageous to me. If solar was available I would definitely make use of that.”

“I believe it is a wonderful idea. We need it to help our future generations”

“It would be helpful to the elderly who are on a fixed income to help curb the cost of gas/electricity during the winter months.”

“We would then have a form of energy power that would never run out like gas could.”

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Community Solar Program Evaluation

Laguna Community Solar program being studied is intended to assist economically disadvantaged /elderly lower their energy bills as well as support community renewable energy acceptance

UA-coordinated efforts could improve economics of member solar equipment installation and combine value of renewable energy credits (RECs) and tax credits to support program

Initial efforts are focused on installing equipment at six community centers and several homes to serve as a pilot for a broader Community Solar program

Laguna Community Solar Program

- Purpose to aid elderly/disadvantaged members
- UA program concept
  - Purchase solar/PV equipment locally
  - Fund purchases via bundled REC sales + tax credits available
  - Leverage any other grants/incentives available to UA
  - Make available to low-income households
    - 161 customers already approved for payment assistance
  - UA arranges net metering with utility
    - Meter runs backwards when sun is shining
    - Customer bill credit would need to be negotiated with CDEC

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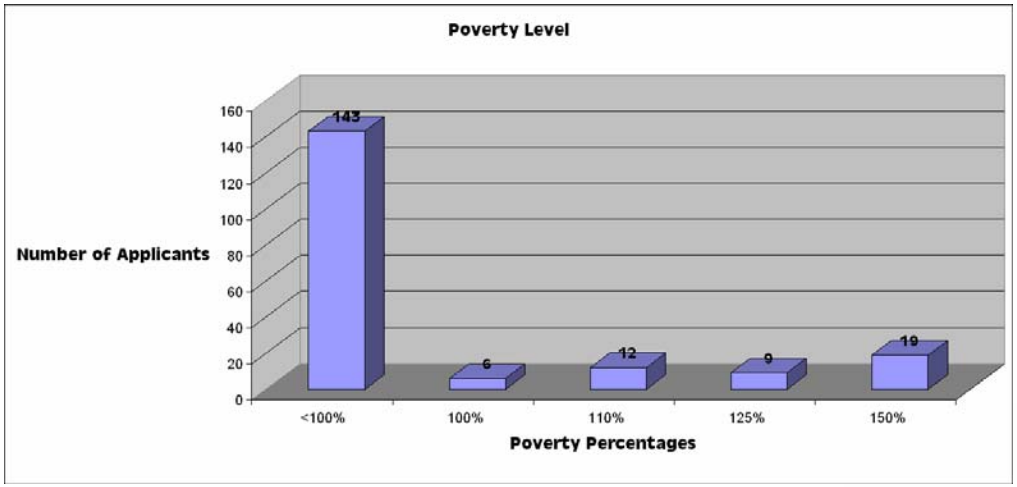
Laguna Community Energy Assistance

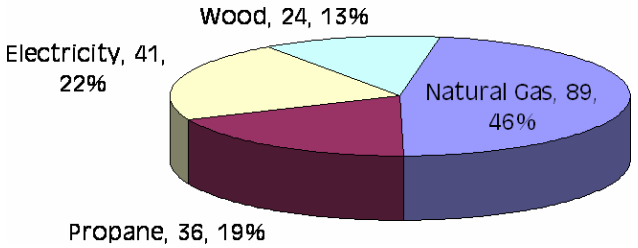
Laguna UA energy personnel also coordinate access to LIHEAP funding; twice as many members served as in prior years

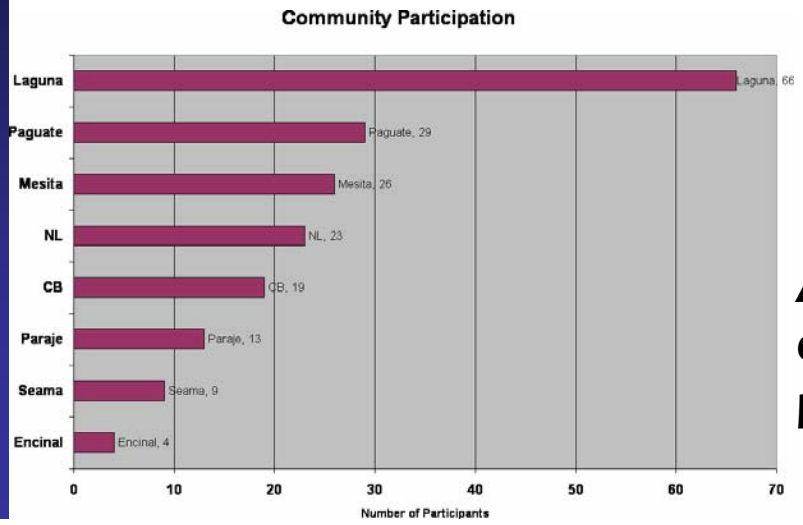


Applicants were overwhelmingly under the established poverty level

Energy Source

Applicant fuel sources reflect the use of multiple fuel types





Applicant locations were consistent with village populations

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Contact Information

Pueblo of Laguna Utility Authority:

Thelma Antonio, Energy Coordinator

505 246-4277

thelma.antonio@lagunaua.org

Ken Garcia, General Manager

505 246-4272

ken.garcia@lagunaua.org

Red Mountain Tribal Energy:

Carolyn Stewart, Partner/Principal

602 516-7540

cstewart@RedMtnTribalEnergy.com

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