Pueblo of Laguna Reservation

Pueblo of Laguna lands in West Central New Mexico cover more than 533,000 acres
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.
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
Focus of 2007 effort was to engage the community and narrow the list of potential renewable projects for more in-depth evaluation.

Laguna Renewable Projects Evaluated in 2007

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

- Met Tower
  - 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 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.
Possible Laguna Community Solar/Gas Project Locations

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

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

Source: Red Mountain 8/06 analysis

4 MW Single Axis Tracking System

+ 2 570 kW Caterpillar Gas Generators
Proposed Wild Horse Site

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

WILD HORSE SITE
AREA= APPROX. 11.5 SQUARE MILES
Limited water availability suggests single axis PV would be appropriate technology for a large-scale Laguna solar project.
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)
Laguna Solar Project Economic Considerations

- Laguna Community Scale Solar/Gas Energy Project
  - Laguna owned/operated with 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
## Laguna Solar Project Comparison

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

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

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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.
# PV vs. Concentrating Solar Capital Cost Comparison

<table>
<thead>
<tr>
<th>Installation</th>
<th>Cost ($/Watt)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Axis Tracking PV</td>
<td>8.50</td>
</tr>
<tr>
<td>HCPV (Amonix)</td>
<td>5.00 – 7.00</td>
</tr>
<tr>
<td>HCPV - Future</td>
<td>3.00</td>
</tr>
<tr>
<td>Parabolic Trough (for comparison only)</td>
<td>4.00</td>
</tr>
</tbody>
</table>

Source: Arizona Public Service
Laguna Solar Project Partnership Considerations

- 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

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

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

Renewable Energy Input

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

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

“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.”
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.
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

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 Energy Assistance

Applicants were overwhelmingly under the established poverty level.

Applicant fuel sources reflect the use of multiple fuel types.

Applicant locations were consistent with village populations.
Contact Information

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