Renewable Energy Based Tribal Utility Formation
Introductions

Lisa Haws
Viejas Tribal Government
XXXX
619 659 2341

Terry Meyer
Black & Veatch
Project Engineer,
Renewable Energy Specialist
913 458 7175
Agenda

- Study Overview
- Renewable Technology Alternatives
- Environmental
- Economic Analysis
- Tribal Benefits
- Conclusions
The Feasibility Study focused on Renewable Energy Alternatives and Utility Formation Feasibility.

Study Overview

1. Project Kickoff Meeting
2. Renewable Energy Resources and Technology Assessment
3. Detailed Reservation Load Profile
4. Assessment of Energy Storage and Load Management Opportunities
5. Electrical Interconnection Analyses
6. Distribution System Audit
7. Legal Analysis
8. Generation Mix Optimization Study
9. Environmental Assessment
10. Tribal Benefit Assessment
11. Economic Assessment
12. Business Plan Development
13. Participate in Tribal Energy Program Review Meeting

Wind Solar Biogas Biodiesel
Study Overview

Study performed by:

- Black & Veatch Corporation
- Viejas Tribal Government Public Works Staff
- Fredericks, Pelcyger & Hester, LLC
  - Legal Analysis
Strategic Options

- Net Metering on Individual Accounts
- Tribal Utility Interactive with the Grid
- Tribal Utility Independent of the Grid
Renewable Energy Alternatives

- Wind
- Solar
- Bio-Fuels
- Cogeneration
- Energy Storage
- Load Management
Wind Data Analysis

- Wind Strongest in Early Afternoon
- Wind From NE and SW
- Estimated Capacity Factor for Wind Turbine between 8% and 13%
Single Wind Turbine

- Connects Directly to Casino Loads
- Offsets Retail Electricity (Net Metering)
- Marginal Wind Resource
- Self Generation Incentive Program (SGIP)
- Good Visibility
- SGIP Currently Overbooked
Small Wind Farm

- Better Wind
- Economy of Scale
- Requires Off-Reservation Land
- Could Sell Power

Wind Resource Gradient
Photovoltaic (PV) Installation

- Net Metering
- High Reliability
- Good Visibility
- High Cost (per kWh)
- SGIP Applies
- Little Maintenance
- Can be Integrated Into Building Roofs or Parking Shade
Bio-Fuels

- Biodiesel, Biogas, and Straight Vegetable Oil Investigated
- Works in Diesel Engine or Combustion Turbine
- Biodiesel is Expensive
- No Known Local Biogas Resource
- Straight Vegetable Oil is Not Proven
Cogeneration

- Can be small or large size
  - 30 kW Micro-Turbine
  - Diesel Generator
  - 3000 kW Combustion Turbine

- Can Use Bio-Fuels

- If Heat is Used Can be Cost-effective
  - Absorption Chillers
  - Hot water

- Follows Electrical or Heat Load
Energy Storage

- Critical for a Renewable-based Independent Utility
- Pumped Hydro May Work for Viejas
- Batteries, Hydrogen, and other options are not currently economic
- Pumped Hydro Requires Development Outside of Reservation Boundries.
Load Management

- Energy Efficiency
- Dispatchable Loads
  - Waste Water Treatment Plant
- Well Pumps
- Central Chiller Plant
  - With Cold Storage
Economic Analysis Process

- Levelized Cost Screening
- POWROPT Scenario Analysis
- Economic Assessment
  - Net Metering
  - Interconnected Utility
  - Stand Alone Utility
Levelized Cost Screening Results

- Battery
- Micro Turbine CoGen
- Conventional Gas SC
- Fuel Cell
- Dish Stirling
- Commercial PV
- Commercial PV (SGIP)
- Residential PV
- Biodiesel Generator
- SVO Generator
- Net Metered Wind
- Net Metered Wind (SGIP)
- Small Wind Farm*
- Pumped Hydro*

Considered in Optimization Model: [Green Bar]
Not Evaluated in Optimization Model: [Red Bar]
Considered for Stand Alone Utility Scenario Only: [Blue Bar]
The results of the screening analysis and PowerOpt model were used to focus on the most economic alternatives:

- Net Metering
  - 1 to 3 MW of wind turbines
- Interconnected Utility
- No Generation
- Wind turbines added
## Cash Flow Results

10 Year Cash Flow Analysis yielded the following results:

<table>
<thead>
<tr>
<th>Option</th>
<th>10 Year NPV</th>
<th>Capital Cost (after SGIP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net Metering – 1 WT</td>
<td>$223,000</td>
<td>$700,000</td>
</tr>
<tr>
<td>Net Metering – 3 WT</td>
<td>$651,000</td>
<td>$2,100,000</td>
</tr>
<tr>
<td>Utility Base Case – No Generation</td>
<td>-$1,929,000</td>
<td>$8,210,000</td>
</tr>
</tbody>
</table>
Tornado Diagram – Renewable Utility Formation
Tribal Benefits

- Employment
- Self-determination
- Environmental Stewardship
- Energy Cost??
Conclusions

Viable Net Metering Options Include:
- Wind Turbine
- PV Parking Shade
- Boiler Co-Gen

Utility Formation may be More Expensive Depending On:
- Transmission Improvements
- Cost of Energy

Stand Alone Utility Possible Using:
- Wind Farm
- Pumped Hydro Storage
- Large Co-Gen