Energy Paths for the Yurok People
Yurok Country

- Yurok Tribe organized as a government in 1991
- The reservation is roughly 56,000 acres
- Largest Tribe in California with 6,232 members
- Employees roughly 500 people
Roughly 50% of homes on and adjacent to the Upper Yurok Reservation do not have access to grid electricity.
(The Present)
Start of the Energy Paths for the Yurok People Project

• Objective: To create a Strategic Energy Action Plan, complete with an implementation Strategy and a prioritized list of energy projects.
  • Increase energy efficiency/ decrease energy costs
  • Develop renewable energy
  • Meet the energy needs of the Yurok People
The Future
(Fulfilling Our Vision)

To make sure all Tribal members on the Reservation have access to reliable, affordable, modern, cost-effective energy services. In addition, the Tribe seeks an energy program that promotes energy self-sufficiency, environmental sustainability, use of local renewable resources, and job creation and economic opportunity for Tribal members.
• Review past Yurok energy studies and projects
• Load analysis
• Demand reduction assessment
• Resource assessment

• Infrastructure analysis
• Community engagement process
• Energy options analysis
• Yurok Strategic Energy Action Plan
Review past Yurok energy studies and projects

Partial List of Studies Reviewed

• Numerous small hydroelectric studies (Pecwan, Achelth, Ke’pel, Miners, & Pine Creeks; 1997-2011)
• Sandia/WAPA Energy Options Assessment (2000)
• Biomass utilization preliminary feasibility study (2003)
• Tribal utility feasibility (included inventory of renewable energy resources; 2007)
• Human capacity building (2007)
• Wind & hydro feasibility (2011)
**Load Analysis**

**Approach:**
- Primary focus on Tribal facility energy use
- Compile data & ID biggest users
- ID usage by geographic region

**Results:**
- 9 facilities account for majority of costs (71%)
- These facilities are key focus in demand reduction assessment
- Determined electrical load by geographic area, using to match resource availability to load
- >85% of Tribal facility electrical load & cost is in Klamath

Including the residential sector:
- 70% of total cost & 80% of total load is in Klamath
- Residential sector accounts for >70% of total load & cost
# Demand Reduction Assessment

**Approach:**
- Examine big users
- Calculate Energy Use Intensities (EUIs) and compare with national median for building type
- Engage with local utilities and assess programmatic opportunities

**Results:**
- Most EUIs are higher than national median
- Expected to be lower due to mild climate and in some cases built to CA energy code
- Many utility program opportunities identified

<table>
<thead>
<tr>
<th>Facility</th>
<th>Location</th>
<th>Year Built</th>
<th>Fuels</th>
<th>Site EUI (GJ/m²)</th>
<th>National Median EUI (GJ/m²)</th>
<th>Difference (%)</th>
<th>Area (ft²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Casino</td>
<td>Klamath</td>
<td>2014</td>
<td>electricity</td>
<td>0.56</td>
<td>0.45</td>
<td>24%</td>
<td>35,750</td>
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<tr>
<td>Hotel</td>
<td>Klamath</td>
<td>2014</td>
<td>electricity</td>
<td>0.98</td>
<td>0.87</td>
<td>13%</td>
<td>11,770</td>
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<tr>
<td>Klamath Office</td>
<td>Klamath</td>
<td>2002</td>
<td>electricity &amp; propane</td>
<td>0.89</td>
<td>0.66</td>
<td>35%</td>
<td>28,983</td>
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<tr>
<td>Pem-mey Gas Station/Convenience Store</td>
<td>Klamath</td>
<td>2002</td>
<td>electricity</td>
<td>3.32</td>
<td>2.4</td>
<td>38%</td>
<td>3,496</td>
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<tr>
<td>Convenienc Store/Pec-tah Gas Station</td>
<td>Klamath</td>
<td>2005</td>
<td>electricity</td>
<td>1.58</td>
<td>2.4</td>
<td>-34%</td>
<td>4,562</td>
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<tr>
<td>Weitchpec Tribal Office</td>
<td>Weitchpec</td>
<td>1999</td>
<td>electricity &amp; propane</td>
<td>1.22</td>
<td>0.6</td>
<td>103%</td>
<td>5,519</td>
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</tbody>
</table>
# Energy & Cost Savings Opportunities

## Residential

**Direct install programs:**
- Energy Savings Assistance Program (ESA) & Weatherization services
- Moderate Income Direct Install (MIDI) Program
- Plan community level deployment

**Reduced rates:**
- California Alternate Rates for Energy Program (CARE)
- Medical baseline
- LIHEAP assistance

## Business

- No-cost, interest free loans via on-bill financing
- Direct install program, full service starting with free energy assessment
- Special focus on lighting and refrigeration
- Energy management and custom analysis services → target high EUI facilities for retrocommissioning activities
- Contractor deployment for multiple facilities at once
Approach:
- Compile available data (statewide maps, utility data, Yurok Tribe line extension data)
- Assess capacity of distribution circuits & capability to support distributed generation resources

Note: As of August 2018 the line extension has been completed all the way to the village of Wauteč. Many of the Wauteč homes shown as structures without power on this map now have power.
Infrastructure Analysis

- PG&E provides guidance on the potential capacity of distributed energy resources (DER) that can be connected to the distribution grid.
- Available data only cover Weitchpec to Tulley Creek. No data are available for the rest of PG&E territory or Pacific Power territory.

Next Steps:
- For potential deployment of distributed generation, apply for interconnection with local distribution utility.
- This will provide accurate information regarding how much generation capacity can be interconnected and what the associated upgrade costs might be (if any).
## Resource Assessment

### Approach:
- Considering broad array of resources (wind, hydro, biomass, solar)
- Examine resource potential
- Match resource to load (offsetting retail load is best value)
- Consider distribution system constraints
- Consider opportunities for energy storage and microgrids

### Results:
- Initial assessment focused on solar electricity (PV)
- Favorable resource, space available, numerous opportunities exist
- Planning for aggregate net metering arrangement

<table>
<thead>
<tr>
<th>Location</th>
<th>Klamath</th>
<th>Tulley Creek</th>
<th>Wautec</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Area available</strong></td>
<td>2.8 acres</td>
<td>525 m²</td>
<td>0.28 acres</td>
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<tr>
<td><strong>PV array parameters</strong></td>
<td>800 kW&lt;sub&gt;DC&lt;/sub&gt;, ground mount, south @ 30° tilt</td>
<td>103 kW&lt;sub&gt;DC&lt;/sub&gt;, roof mount, 135° azimuth @ 15° tilt</td>
<td>93 kW&lt;sub&gt;DC&lt;/sub&gt;, roof &amp; ground mount, south facing @ 15° tilt (roof) &amp; 30° tilt (ground)</td>
</tr>
<tr>
<td><strong>Rough cost estimate</strong></td>
<td>$2.4M</td>
<td>$309k</td>
<td>$279k</td>
</tr>
<tr>
<td><strong>Estimated array output</strong></td>
<td>1,130 MWh/yr, 58% of load for 33 Tribal facilities</td>
<td>135 MWh/yr, 96% of load for 3 Tribal facilities &amp; 10 residences</td>
<td>129 MWh/yr, 99% of load for 2 Tribal facilities &amp; 13 residences</td>
</tr>
</tbody>
</table>
Possible Tulley Creek Aggregate Net Metering (NEMA) System

- 100 kW<sub>DC</sub> PV system at Tulley Creek
- Convert 3 separate Tribal facility electric accounts into 1 primary voltage account with 1 point of common coupling.
- Add behind-the-meter battery energy storage and microgrid controls.
- Provide resilience for critical cluster of Tribal facilities in the Upriver section of the Reservation.
- PV system will be oversized for serving primary voltage account. Aggregate w/ 10 residential load accounts under PG&E NEMA tariff.
- Meet nearly 100% of the NEMA aggregate load.
Activities to be completed

• Community engagement process
• Energy options analysis
• Yurok Strategic Energy Action Plan
Future Plans

- Develop NEMA Projects
- Extend electrical lines to nearby residences.
- Provide renewable energy systems to residences far from the grid.
- Further explore hydro and biomass resources for sale to the grid.
Special thanks to

U.S. DEPARTMENT OF ENERGY

Office of Indian Energy