A Remote Region

- No roads and few electrical interties to connect communities
- 61 % more expensive than Anchorage
- High cost goods and fuel
## Fuel Prices in NANA Region, i.e., Why We’re Doing This

<table>
<thead>
<tr>
<th>Community</th>
<th>Gas</th>
<th>Stove oil</th>
<th>Utility buy/G 2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kotzebue</td>
<td>$5.27</td>
<td>$4.96</td>
<td>$2.91</td>
</tr>
<tr>
<td>Ambler</td>
<td>$9.00</td>
<td>$8.50</td>
<td>$4.65</td>
</tr>
<tr>
<td>Kobuk</td>
<td>$9.00</td>
<td>$8.00</td>
<td>$5.22</td>
</tr>
<tr>
<td>Shungnak</td>
<td>$8.25</td>
<td>$8.25</td>
<td>$5.22</td>
</tr>
<tr>
<td>Kiana</td>
<td>$6.00</td>
<td>$5.50</td>
<td>$3.43</td>
</tr>
<tr>
<td>Noorvik</td>
<td>$5.83</td>
<td>$5.42</td>
<td>$3.67</td>
</tr>
<tr>
<td>Selawik</td>
<td>$7.50</td>
<td>$7.75</td>
<td>$3.65</td>
</tr>
<tr>
<td>Buckland</td>
<td>$6.80</td>
<td>$6.80</td>
<td>$3.77</td>
</tr>
<tr>
<td>Deering</td>
<td>$5.00</td>
<td>$4.75</td>
<td>$3.25</td>
</tr>
<tr>
<td>Kivalina</td>
<td>$4.85</td>
<td>$4.40</td>
<td>$3.52</td>
</tr>
<tr>
<td>Noatak</td>
<td>$9.99</td>
<td>$9.99</td>
<td>$6.77</td>
</tr>
</tbody>
</table>
Vision: The vision is for the Northwest Arctic region to be 50 percent reliant on regionally available energy sources, both renewable and non-renewable, for heating and generation purposes by the year 2050.

- 10 percent decrease of imported diesel fuels by 2020
- 25 percent decrease of imported transportation diesel fuels by 2030
- 50 percent decrease of imported diesel fuels by 2050
Energy Plan & Project Development
Methodology & Approach
(from 2008-09 Energy Planning)

– Community Outreach, Resolutions, & Surveying
– Energy Options Analysis
– Energy Resource Data Collection and Forecasting
  – Regional Energy Plan – Solar Energy identified as an option
– Energy Summit
– Energy Steering Committee
– Project Development
  • Feasibility Studies
  • Modeling
  • Conceptual Designs
  • Secure Funding
  • Detailed Design
  • Construction
  • Commissioning & Operations
Northwest Arctic Borough - Solar

All regional water/sewer systems use solar-PV by 2016 and run solely on solar in summer.

Pioneered “solar in the round” to ease grid integration and reduce impacts to diesel generation:
- Reduce foundation costs
- Eliminate solar tracker
- Optimize summer production
- Smaller ramp rates when clouds cover sun – easier on diesel generators
## Solar PV Performance

### Solar PV for NAB Waterplants

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambler</td>
<td>3/1/2013</td>
<td>8.4</td>
<td>21.69</td>
<td>0.67</td>
<td>$14,532.30</td>
<td>18.39694656</td>
</tr>
<tr>
<td>Kobuk</td>
<td>5/1/2013</td>
<td>7.38</td>
<td>16.32</td>
<td>0.73</td>
<td>$11,913.60</td>
<td>14.59749553</td>
</tr>
<tr>
<td>Shungnak</td>
<td>10/1/2014</td>
<td>7.5</td>
<td>9.97</td>
<td>0.73</td>
<td>$7,278.10</td>
<td>16.61666667</td>
</tr>
<tr>
<td>Noorvik</td>
<td>10/1/2013</td>
<td>12</td>
<td>23.29</td>
<td>0.55</td>
<td>$12,809.50</td>
<td>24.13471503</td>
</tr>
<tr>
<td>Noatak</td>
<td>11/1/2013</td>
<td>11.27</td>
<td>23.44</td>
<td>0.78</td>
<td>$18,283.20</td>
<td>25.09635974</td>
</tr>
<tr>
<td>Deering</td>
<td>11/1/2013</td>
<td>11.13</td>
<td>27.56</td>
<td>0.71</td>
<td>$19,567.60</td>
<td>29.50749465</td>
</tr>
<tr>
<td>Kotzebue-1</td>
<td>10/15/2015</td>
<td>10.53</td>
<td>8.69</td>
<td>0.45</td>
<td>$3,910.50</td>
<td>39.32126697</td>
</tr>
<tr>
<td>Kotzebue-2</td>
<td>11/10/2015</td>
<td>10.53</td>
<td>8.28</td>
<td>0.45</td>
<td>$3,726.00</td>
<td>42.46153846</td>
</tr>
<tr>
<td>Selawik</td>
<td>11/20/2014</td>
<td>9.72</td>
<td>17.45</td>
<td>0.51</td>
<td>$8,899.50</td>
<td>31.72727273</td>
</tr>
<tr>
<td>Kiana</td>
<td>8/13/2015</td>
<td>10.53</td>
<td>11.22</td>
<td>0.56</td>
<td>$6,283.20</td>
<td>39.50704225</td>
</tr>
<tr>
<td>Buckland</td>
<td>4/1/2016</td>
<td>10.53</td>
<td>6.22</td>
<td>0.47</td>
<td>$2,923.40</td>
<td>119.6153846</td>
</tr>
<tr>
<td>Kivalina</td>
<td>2/15/2016</td>
<td>10.53</td>
<td>6.5</td>
<td>0.55</td>
<td>$3,575.00</td>
<td>66.32653061</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td>120.05</td>
<td>180.63</td>
<td>$113,701.90</td>
<td>467.3087138</td>
</tr>
</tbody>
</table>
NANA Region Energy Projects

Anchorage Solar Conference

NANA co-sponsored solar energy conferences in Anchorage to educate and develop solar energy concepts.

Participants included DOE, NREL, solar developers, investors, villages, and other stakeholders.
NANA Solar with DOE IE Support

- NANA partnered with KEA and tribes to apply for DOE funding; to install solar energy into Deering, Buckland, and Kotzebue

- Will be largest solar PV project in Alaska

- Public-Private Partnership – Evaluated, loans, grants, and investment tax credits

- Community & Business Development
  Total Project Cost: $2.2M

- Local/Village commitment of VEDC funds in Buckland & Deering
The Primary goals of the solar energy project are to:

1. Lower energy costs for the communities of Kotzebue, Buckland, and Deering
2. Reduce diesel fuel use and increase renewable energy deployment in these communities
3. Develop clean energy job skills and expertise among residents in the three communities
4. Demonstrate the success of high penetration solar-wind-storage-diesel hybrid systems in remote high latitude locations for broad replication (aiming for “diesel-off” for some period of time)
Funding, Financing, & Partnerships

• Project Partners:
  – Kotzebue Electric Association; Deering & Buckland Tribal Councils, Cities, Utilities; KIC

• Funding: DOE-IE ~$1 million

• Financing/Cost Share:
  – Deering & Buckland - ~$200K from VEDC (NANA)
  – KEA - $1 million (CFC Bank) - May Require Joint Venture between NANA & KEA
Renewable energy projects need smaller generators and battery packs – battery funding has been secured for all 3 communities

Need operator training/follow up and run measures for power generation

Power Cost Equalization could be reformed to not penalize integrating renewable energy (reward diesel savings)
Opportunities

- Develop solar project for Deering, Buckland, and Kotzebue; promote public/private partnership and local capacity for funding & replication elsewhere
- Diesel – off operation in the summer time
- Change the culture: Grants vs. loans