Chaninik Wind Group Villages
- Kipnuk pop. 639
- Kongiganak pop. 439
- Kwigillingok pop. 321
- Tuntutuliak pop. 408

Formed organization to work together to build local capacity and innovate ways to reduce energy costs.
CWG started in 2005 with a simple idea...

- Install wind turbines to
  - Lower the cost of energy (heat and electricity)
- Small communities should work together
  - Reduce dependency on diesel fuel
  - Create local jobs
  - Certify and train employees
  - Become sustainable communities
CWG Strategies for Success

✧ Build capacity as a foundation for lasting economic development

✧ Good information to make good decisions, lower costs, and give a pathway to sustainability

✧ Adopt innovation to meet needs and support values

✧ Lead efforts to plan for community energy use creating value and fostering new opportunities

✧ Think outside the box
Wind Heat Smart Grid Design

Wind Turbines

Village Power Plant

Supervisory Controller

Smart Gateway
(sends measurement data to the EnergySmart Server)

Remote Servers:
* MAS Server
* Smart Grid Controller
* EnergySmart Server

Internet

Smart Meter Collector & ZigBee Master
* Connects to MAS server via Internet.
* Connects with up to ~1500 Meter Nodes via wireless communication.
* Controls local ZigBee slave devices (wireless) on command from Smart Grid Controller

Ethernet (other options available)

Internet

Smart Meter Node & ZigBee Master

User Display

Solar

Electric Vehicle
ZigBee slave

Thermal Stove
ZigBee slave

Battery for Local Energy Storage
ZigBee slave
Wind Heat System Components

Systems in Kongiganak, Kwigillingok and Tuntutuliak

• 95 kW Windmatic wind turbines

• Electric Thermal Storage (ETS) devices

• Community-wide Smart Metering and Smart Grid control
• ETS heat output at high is equivalent to a Toyostove Laser 56
• $.10 per kwh is equivalent to buying diesel at $2.90 per gallon
• Current diesel price in Kongiganak: $6.95 per gallon
KONGIGANAK POWER PLANT

System Status
ETS OPERATING

VILLAGE LOAD

Set Time | Description
---------|------------

Wind Speed (mph)
15.9
16.2

SCADA Scan Time
500

CHANINIK WIND GROUP
iES INTELLIGENT ENERGY SYSTEMS
Kongiganak Energy Summary 2013

### KONGIGANAK POWER PLANT
#### Energy Summary (kWh)

<table>
<thead>
<tr>
<th></th>
<th>2013</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Jan</td>
<td>Feb</td>
<td>Mar</td>
<td>Apr</td>
<td>May</td>
<td>Jun</td>
<td>Jul</td>
<td>Aug</td>
<td>Sep</td>
<td>Oct</td>
<td>Nov</td>
<td>Dec</td>
</tr>
<tr>
<td>Diesel 1</td>
<td>42,370</td>
<td>320</td>
<td>1,100</td>
<td>22,020</td>
<td>17,640</td>
<td>380</td>
<td>29,830</td>
<td>62,540</td>
<td>2,730</td>
<td>23,180</td>
<td>89,790</td>
<td>91,340</td>
</tr>
<tr>
<td>Diesel 2</td>
<td>25,260</td>
<td>71,690</td>
<td>73,620</td>
<td>47,320</td>
<td>53,320</td>
<td>63,860</td>
<td>38,850</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Diesel 3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>780</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>20,810</td>
<td>75,720</td>
<td>59,830</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Diesel 4</td>
<td>200</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>120</td>
<td>240</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>280</td>
<td>1,580</td>
<td>2,420</td>
</tr>
</tbody>
</table>

**Total Diesel Generation**

|          | 67,830 | 72,010  | 74,720   | 70,120   | 70,960   | 64,240   | 68,800   | 83,590   | 78,450   | 83,010   | 90,070   | 92,920   | 916,720  |

**Wind Turbine 1**

|          | 15,618 | 15,234  | 15,575   | 21,588   | 11,740   | 7,867    | 8,301    | 7,078    | 10,988   | 10,560   | 4,067    | 10,895   | 139,512  |

**Wind Turbine 2**

|          | 11,764 | 4,789   | 8,160    | -10      | -        | 1,396    | 736      | 2,919    | 10,670   | 13,439   | 14,341   | 11,381   | 79,588   |

**Wind Turbine 3**

|          | 26,130 | 18,936  | 22,211   | 20,113   | 15,733   | 12,018   | 9,678    | 8,921    | 5,854    | 15,038   | 14,444   | 11,510   | 180,584  |

**Wind Turbine 4**

|          | 23,363 | 5,139   | -61      | 13,437   | 14,968   | 3,886    | 2,603    | 5,316    | 8,485    | 7,168    | 3,455    | 4,813    | 92,571   |

**Wind Turbine 5**

|          | -      | -       | -        | -        | -        | 1,672    | 10,926   | 2,333    | -62      | -53      | 14,816   | -        | |

**Total Wind Generation**

|          | 76,876 | 44,099  | 45,885   | 55,128   | 42,441   | 25,167   | 21,318   | 25,905   | 46,923   | 48,539   | 36,245   | 38,546   | 507,071  |

**Total Generation**

|          | 144,706 | 116,109 | 120,605  | 125,248  | 113,401  | 89,407   | 90,118   | 109,495  | 125,373  | 131,549  | 126,315  | 131,466  | 1,423,791|

### Summary of Consumption

<table>
<thead>
<tr>
<th></th>
<th>Station Service</th>
<th>Wind to Village</th>
<th>Wind to Load Regulator</th>
<th>Wind to ETS</th>
<th>Total Village</th>
<th>Total Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>2,742</td>
<td>40,487</td>
<td>14,556</td>
<td>18,833</td>
<td>108,317</td>
<td>144,706</td>
</tr>
<tr>
<td></td>
<td>2,387</td>
<td>28,254</td>
<td>7,032</td>
<td>8,813</td>
<td>100,264</td>
<td>116,109</td>
</tr>
<tr>
<td></td>
<td>2,757</td>
<td>31,072</td>
<td>8,527</td>
<td>6,285</td>
<td>105,792</td>
<td>120,605</td>
</tr>
<tr>
<td></td>
<td>2,455</td>
<td>33,362</td>
<td>11,898</td>
<td>9,868</td>
<td>103,482</td>
<td>125,248</td>
</tr>
<tr>
<td></td>
<td>2,627</td>
<td>23,518</td>
<td>11,335</td>
<td>7,588</td>
<td>94,478</td>
<td>113,401</td>
</tr>
<tr>
<td></td>
<td>2,974</td>
<td>14,383</td>
<td>8,442</td>
<td>2,342</td>
<td>78,623</td>
<td>89,407</td>
</tr>
<tr>
<td></td>
<td>2,819</td>
<td>14,593</td>
<td>5,723</td>
<td>1,002</td>
<td>83,993</td>
<td>90,118</td>
</tr>
<tr>
<td></td>
<td>2,549</td>
<td>16,640</td>
<td>7,489</td>
<td>1,776</td>
<td>107,805</td>
<td>109,495</td>
</tr>
<tr>
<td></td>
<td>2,897</td>
<td>29,355</td>
<td>12,892</td>
<td>4,676</td>
<td>116,385</td>
<td>125,373</td>
</tr>
<tr>
<td></td>
<td>2,881</td>
<td>33,375</td>
<td>8,859</td>
<td>6,305</td>
<td>113,450</td>
<td>131,549</td>
</tr>
<tr>
<td></td>
<td>2,338</td>
<td>23,380</td>
<td>8,364</td>
<td>6,481</td>
<td>118,400</td>
<td>126,315</td>
</tr>
<tr>
<td></td>
<td>2,524</td>
<td>25,480</td>
<td>7,832</td>
<td>5,233</td>
<td>1,230,619</td>
<td>131,466</td>
</tr>
</tbody>
</table>

**% Diesel kWh Displaced by Wind**

|          | 37.4% | 28.2% | 29.4% | 32.2% | 24.9% | 18.3% | 17.5% | 16.6% | 27.2% | 28.7% | 20.6% | 21.5% | 25.5% |

[Logo of CHANINIK WIND GROUP and IES INTELLIGENT ENERGY SYSTEMS]
Example – Kongiganak ETS Fuel Displacement 2013

[Graph showing fuel displacement from January to December 2013, with bars representing gallons equivalent and a line representing kwh.]
Lessons Learned

- Energy issues must be addressed on all levels
- More resources are needed to build capacity
- New opportunities reveal themselves everyday
- Risks are possible…expect the unexpected
- Stay positive and focus on the project goal
Quyana cakneq!

Thank you very much!

Special Thanks To

This work is possible because of your support.