• The Institute of the North’s mission is to inform public policy and cultivate an engaged citizenry.

• Circumpolar Policy Tours provide the opportunity to examine energy, resource and economic development best practices while also sharing Alaska's interests and perspectives with international leaders.
Iceland Policy Tour - An Overview

• **Policy Meetings**
  – Parliament
  – President
  – Ministry of Foreign Affairs
  – Ministry of Industries and Innovation

• **Renewable Energy Industry Visits**
  – Landsvikjun Fljótsdalur power station
  – Reykjavik Geothermal
  – Municipality of Arborg/Selfoss District Heating
  – Hellisheidi Geothermal Plant
  – Mannvit Engineering
  – Verkis Consulting

• **Economic Development: Energy Intensive Industries**
  – Alcoa Fjardaál aluminum smelter
  – Verne Global data center
  – Fluda Sveppir mushroom plant

• **Research/Education Briefings**
  – University of Iceland
  – Gekon Consulting (cluster management)
## Iceland and Alaska by the Numbers

<table>
<thead>
<tr>
<th>Category</th>
<th>Iceland</th>
<th>Alaska</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population (2011)</td>
<td>320,000</td>
<td>722,000</td>
</tr>
<tr>
<td>Area (square miles)</td>
<td>39,768</td>
<td>664,988</td>
</tr>
<tr>
<td>GDP (USD, 2011)</td>
<td>$14 Billion</td>
<td>$45 Billion</td>
</tr>
<tr>
<td>GDP/Capita (2011)</td>
<td>$38,0000</td>
<td>$65,143</td>
</tr>
<tr>
<td>Power Consumption/ (Petajoules in 2010)</td>
<td>234.0</td>
<td>.676</td>
</tr>
<tr>
<td>Installed Electricity Generating Capacity in 2011 (MW)</td>
<td>2,579.0</td>
<td>2,067.0 (1,400 in Railbelt)</td>
</tr>
<tr>
<td>Democratic Government/Currency</td>
<td>Sovereign, Unicameral Parliament; 5 parties; President; Not EU/IS Kroner</td>
<td>Non-Sovereign State; Bi-Cameral; 2 parties; Governor/US Dollar</td>
</tr>
<tr>
<td>Electricity</td>
<td>Hydroelectric</td>
<td></td>
</tr>
<tr>
<td></td>
<td>73.8%</td>
<td>21%</td>
</tr>
<tr>
<td>Geothermal Electricity</td>
<td>26.2%</td>
<td>-</td>
</tr>
<tr>
<td>Natural Gas Electricity Generation</td>
<td>-</td>
<td>56%</td>
</tr>
<tr>
<td>Oil</td>
<td>-</td>
<td>14%</td>
</tr>
<tr>
<td>Coal</td>
<td>-</td>
<td>9%</td>
</tr>
<tr>
<td>Home Heating</td>
<td>Natural Gas</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>46%</td>
</tr>
<tr>
<td>Fuel Oil</td>
<td>-</td>
<td>36%</td>
</tr>
<tr>
<td>Electricity</td>
<td>10%</td>
<td>10%</td>
</tr>
<tr>
<td>Geothermal</td>
<td>90%</td>
<td>-</td>
</tr>
</tbody>
</table>
Air Crossroads of North America and Europe
Iceland and Alaska—Gateways to the Arctic
Arctic Transshipment
Iceland Energy Themes

• Identifying comparative advantages
• Strategic, long-term planning
• Investment
  – People
  – Institutions
  – Infrastructure
Iceland Energy Mix

- 80% of primary energy supply comes from renewable resources (hydro, geothermal)
  - 99.9% of electricity production
  - 99% of space heating
- Remaining 20% comes from imported fossil fuels, used mainly in transportation and fisheries

Source: Iceland National Energy Authority
Geothermal Energy in Iceland

Space Heating

Geothermal Utilization

Source: Iceland National Energy Authority
Hellisheidi Geothermal Plant
2nd largest geothermal plant
303 MW electricity
133 MW hot water
# Electricity Profile (2010)

## Installed Capacity

<table>
<thead>
<tr>
<th>Source</th>
<th>MW</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydro</td>
<td>1,883</td>
<td>73.0</td>
</tr>
<tr>
<td>Geothermal</td>
<td>575</td>
<td>22.3</td>
</tr>
<tr>
<td>Fuel</td>
<td>121</td>
<td>4.7</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>2579</td>
<td>100.0</td>
</tr>
</tbody>
</table>

## Electricity Production

<table>
<thead>
<tr>
<th>Source</th>
<th>MW</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydro</td>
<td>12,592</td>
<td>72.9</td>
</tr>
<tr>
<td>Geothermal</td>
<td>4,465</td>
<td>27.0</td>
</tr>
<tr>
<td>Fuel</td>
<td>2</td>
<td>0.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>17,059</td>
<td>100.0</td>
</tr>
</tbody>
</table>

## Electricity Consumption

- Aluminum Industry: 73%
- Public Service: 6%
- Ferrosilicon Industry: 6%
- Residential Consumption: 5%
- Utilities: 4%
- Other Industries: 3%
- Aluminum Foils Factory: 2%
- Agriculture: 1%
- Fishing: 0%

Source: Iceland National Energy Authority
Kárahnjúkar Hydropower Plant
4,6000 GWh annually
690 MW installed capacity
Fjardaál Aluminum Smelter
940 tons of aluminum a day
~1% of world aluminum production
Iceland Exports (2011)

Total ca $8.5 billion

Positive Trade Balance, 14%
Iceland Energy Planning

• Comprehensive Energy Strategy for Iceland
  – Having renewable energy sources replace imported energy
  – Support diversified industry
  – Precautionary and protective approach in energy production

• Master Plan for Utilization of Renewable Energy Resources
  – 80 different possibilities for hydropower and geothermal power plants have been listed and analyzed
    • Sustainability issues, preservation of natural environments and historic sites, tourism and alternative land use, regional development and economy
  – Sites put in three categories:
    • **Green** – Proceed with utilization process (apply for licenses etc.) – 8.5 TWh
    • **Yellow** – Site subject to further research – 12.5 TWh
    • **Red** – Site shall be preserved and not utilized for energy purposes – 11.3 TWh
UAF Energy Policy Research

• 4 graduate students conducting targeted policy analysis papers for legislators

• Overcoming barriers to transformation
  • District heating in Reykjavik
  • Geothermal development and knowledge economy
  • Kárahnjúkar project
  • Food security
Who should own the grid?

• Circumferential electric transmission grid serves almost all communities
• Government of Iceland as a guarantor, not financier
• “Power” of the grid—meet community needs and anything is possible
• Institutional innovation: access to transmission system creates a framework so competition can occur
Lessons for Alaska

• Fiscal prudence
  – Big projects (both public and private) are only pursued with financing/buyer is in place
  – Spend less than you earn

• **Long-term decision-making** on infrastructure investment
  – Icelanders have been willing to sacrifice in the short term for future prosperity
  – No subsidies but state-supported infrastructure

• **Strategic planning**
  – Identify areas that the region can lead on and be intentional to make steady careful progress in developing essential expertise
  – Economic development strategy: diversification of national economic portfolio with cluster development
  – Master Plan for Energy Development: weighing all options before deciding which to energize, need more information, to conserve
Next Steps

• Continue **bridge building** between Alaskan and Icelandic government agencies, private companies and universities
  – Encourage international investment—service contracts and pilot projects that highlight Icelandic expertise in geothermal and export Alaskan expertise in oil/gas and mining
  – Share policy frameworks and support of international agreements (such as Arctic Council, UNCLOS)
  – Host reception to celebrate and highlight Icelandair’s seasonal direct flight between Reykjavik and Anchorage
  – Plan follow-up trip to focus on fisheries and rural development, possibly in conjunction with Greenland Policy Tour in June 2013

• Alaska as **influencer**
  – Implement liaison to act as Alaska state consulate to Iceland that maintains continuous presence in Iceland
  – Strategically plan to position an Alaskan for role as next Director of the Arctic Council Secretariat