

Questions to Explore: Iceland Policy Tour 2012

Answers from Iceland

| | Questions to Explore: Iceland Policy Tour 2012 | Answers from Iceland |
|--|---|---|
| <p style="text-align: center;">Geothermal</p> | <p>How is Iceland handling corrosion abatement in their geothermal developments? What has been the long term economic impact of replacement costs? What does that cycle look like?</p> | <p>Geothermal companies are meticulous in their rotation of systems and cleaning. Replacement costs are sustained by current market.</p> |
| | <p>Has the growth of the geothermal industry been organic, or was it supported by the state?</p> | <p>Initial development of geothermal was focused on direct heating and developed by fishing communities. From 1970, geothermal power has been used for electricity for other industries such as aluminum, fishing, and agriculture; 45% of geothermal is consumed by space heating. Current development is supported by a geothermal cluster and a government energy plan. The government does not provide direct financing of the projects, which generally are led by municipal-owned energy companies.</p> |
| | <p>Did Iceland face major challenges when developing geothermal (specifically with EII)? Were there naysayers-internally or from abroad? What were/are these challenges, how to overcome them, what was the source of leadership behind the decision to develop geothermal?</p> | <p>The development of resources in Iceland has always been a political issue, but Icelanders have valued the economic development as well as energy savings that come with direct heating and geothermal power. They've focused on value-added from geothermal in order to maximize benefit. There has been some push back more recently as resources are developed closer to urban centers, with talk of pollution (smell and steam). Site selection is related to distance of transmission lines.</p> |
| | <p>What are the environmental views around Hydro? Hydro is not necessarily seen as innocuous; are all the dams in perfectly harmonious locations?</p> | <p>Icelanders are generally supportive of new energy projects as they lead to community and economic development. The environmental movement is still latent in Iceland, but growing. New hydro development is currently halted as planning takes place; planned energy projects are centered on 1) resource and 2) need - geothermal is planned for the Northeast, which has both.</p> |
| <p style="text-align: center;">Hydro</p> | <p>How to deal with silt, debris in glacially-fed streams</p> | <p>All dams have silt and the engineering accounts for this. Iceland's is no different. In fact, the hydro dam has allowed the river below to become a salmon run.</p> |
| | <p>How was the Karahnjukar hydropower dam financed?</p> | <p>The Karahnjukar project planning has taken place over 30 years, waiting for the right buyer of the power. The current design and development was begun once the deal with Alcoa was signed.</p> |
| | <p>Where did the workforce/materials come from for the Karahnjukar project? Poland? China?</p> | <p>Projects of this size are global, with the workforce coming from over 13 companies and many different countries. Materials, as well, were globally procured.</p> |

| | | |
|--|--|--|
| Energy Intensive Industry | Seeking better clarity on fertilizer plant and sourcing materials? Alaska has vast phosphate reserves in the northern regions too. | Aluminum smelters bring their raw material in from as far away as South America and as close as Spain. Shipments occur twice a week, roughly. |
| | Explore background/specifics on smelting, data centers, etc. | It is important for small and open economies such as Iceland to diversify; EII currently somewhat dominant at 1/3 and fishing is 1/3. The focus now is on diversifying, with some investment in: data centers, biotech, post production (film) That said, the aluminum industry consumes about 73% of electricity produced (2010). |
| | Is Iceland trying to attract new industries? | Rio Tinto Alcan was the first to come in 1966; all smelters are expanding, with about 2% of world production. Iceland is definitely talking about new investment opportunities from this and new industries. New spin-off industries that are benefitting from geothermal energy include carbon fiber production, renewable methanol/carbon recycling, algae production, fish farming, and industrial scale green houses. There are four areas that Iceland can use to attract industry: 1) land intensive, 2) energy dependent, 3) tourism related, 4) knowledge based. Also, the temperate climate is a benefit for attracting data centers. |
| Iceland Energy Policy Framework | Describe the lessons learned from the transition: “there have been three major amendments to the legal energy framework. The first is that ownership of public resources can no longer be sold although utilization rights can be leased. The second is that electricity producers compete in an open market. Last, the NEA can grant licenses on behalf of the Ministry of Industry, Energy and Tourism.” | Note - now Ministry of Industry and Innovation. |
| | Are there incentives for small scale energy use, agriculture, aquaculture, etc. | Not that we could find, other than assurance of low-cost energy. |
| | Financing - Power Cost Equalization across Iceland - Cost of power at individual level? | The government does not provide PCE or direct subsidy of energy cost. Instead, they own the infrastructure and regulate costs. There is a fixed cost of .11/kwh that can be raised depending on the community/distribution center. |
| | Competition between energy providers? | Yes. |
| | Is there a strategic focus by the government or universities in energy development | Yes! The government and private sector recognize the value here. Private sector has the experience and knowledge. Surprisingly, the University played a much smaller role in this area. |
| Global partnerships? Engineers, etc. | Iceland is very deliberate in its development of resources, bringing in global leaders who transfer knowledge to Icelanders, who then build up their own expertise. | |

| | | |
|--|--|--|
| | RE: strategic positioning – Iceland is in a place to make connections with ALL Arctic players including non-Arctic states. | Iceland is in a similar position to Alaska - it has or is near valuable resources, has access to or is developing markets, and global transportation routes are increasingly looking at the Arctic as a thoroughfare. |
| Risk | How to share the risk between state and private industry in renewable resource development | The private sector develops energy projects in Iceland. These are highly effective state-owned companies that are sophisticated and not tied directly to national politics. The state acts as the guarantor on loans when necessary. |
| | When did Iceland stop saying "No" to geothermal and hydro ideas/proposals/projects, and decide to take a risk? | Initial projects were scoffed at but the results proved how sound the process was and development slowly began. Iceland made the biggest leap during the oil embargo of the 1970s. |
| Conservation/ Sustainability | How is Iceland dealing with energy efficiency? Conservation. Easy to be relaxed when there is an abundance of renewables, but it can cost a lot of money to be energy inefficient. | It's not particularly focused on energy efficiency or conservation because the cost of energy is so low. Doors and windows are left open, heat is turned up, light left on... |
| | Long term sustainability plan? | The Icelandic government is currently debating the long-term energy plan, but it recognizes special features of its energy sector: no gas production, infrastructure or market; no cross border connections; no coal production; no crude oil imports or oil refineries; no nuclear power plants or research reactors; inclusion of Iceland in the EU internal energy market (Iceland has been a party to the EEA Agreement since 1994). Long-term sustainability rest on low-cost, renewable energy. |
| Energy Infrastructure Development | Explore starting up the infrastructure. | Community-led projects that state-owned companies have grown into as economies of scale developed and broader societal goals realized. |
| | Ownership, access rules: of resources, transmission lines, energy generation plants; How has Iceland dealt with this? | One example - Landsvirkjun is one of Europe's ten largest generators of renewable energy; generates 73% of all electricity in Iceland; owned by Icelandic state ; 100% renewable; 12.4 Twh generated in 2011. |
| | Is all of Iceland hooked up to one grid? Stand alone utilities? | They are unique in that everything put on grid is renewable. Benefit not only for EII but also for small/medium firms who wish to minimize carbon footprint. Iceland offers the most competitive power prices in Europe (predicted to remain the same in future) and can offer long-term (15yr) contracts, distributed on 2nd best distribution network, uninterrupted power supply with additional large untapped resources. There are stand alone utilities who develop/distribute power/heating/water but don't control transmission. |

| | |
|--|---|
| <p>District heating – how does it work, how does AK make it work?</p> | <p>Communities (community-owned companies) develop these resources and put in place the infrastructure. Initial investment is large but the savings is incredible. Icelanders spent in a year what they had earlier been spending in a month.</p> |
| <p>HVDC to Europe – who is talking about this, what is the cost, how serious, etc.?</p> | <p>Landsvirkjun is exploring the possibility for subsea interconnector to the UK; would mitigate risk in the Icelandic power sector and be an additional market. This would be a transformational project for Iceland. The project has been under examination since 1980, has been technically feasible since 1995 (but not economically feasible until recently due to rising electricity prices and demand in Europe). A working group has been established with all political parties and stakeholders to examine feasibility; if a political decision is made to go ahead (must have general consensus in government and public), the construction will take at least five years; environment large part of submarine cable study.</p> |
| <p>Is there a certain Industry attraction? “If you build it they will come”</p> | <p>Contracts are secured before development, but the presence of current infrastructure helps to step up investment. The grid is critical because it benefits the local population. Iceland goes out and markets itself for EEI.</p> |
| <p>What about wind power? Why is wind not developed like geothermal and hydro?</p> | <p>Landsvirkjun R&D project - two 900 kw wind turbines up in 2012; additional studies needed (wind, icing, snow, ash, soil erosion, wildlife, community); initially, showing great potential for wind energy. That said, they don't really need the extra power.</p> |
| <p>What is the labor cost? What are their labor sources?</p> | <p>Low unemployment with European workforce in some cases. Good quality of life attracts labor.</p> |
| <p>What is the breakdown of total energy sources? Percentage hydro, geothermal, other?</p> | <p>Iceland generates substantially more electricity per capita than other European nations--and it's all renewable; 80% of primary energy supply is from renewable (hydro/geothermal); 99.9% electricity production; 99% of space heating; the remaining 20% come from imported fossil fuel (mainly used in transportation and fisheries, which continues to decrease over the years).</p> |

| | | |
|--------------------------------------|--|---|
| Energy History and Background | What is the history of energy use in Iceland | With low-cost energy has come less emphasis on efficiency or conservation. |
| | How energy independent is Iceland? | Iceland has already fulfilled its renewable energy goals; harvesting more renewable energy because of economic impact it can have on the country (rather than to secure energy as other European nations)--"not because we need it, but because it's for the good of the country economically." Successful build-up in the past has strengthened the energy security in Iceland and delivered a solid platform for the future. Customers are large international companies-- customer group growing and diversifying. |
| | Does Iceland have plans to become energy independent in the transportation sector? | Yes, part of master plan. |
| Alaska – Iceland | What are the cultural differences between AK and Iceland? How might these impact the energy policy of the two places? | The biggest difference is a fairly unified and homogenous society in Iceland, without an indigenous population. The similarities, though, are striking. They are located far away from decision-makers in Europe, as Alaska is from D.C. They became a nation ten years before Alaska became a state, with the same energy and dynamism - and responding to opportunity - that comes with that. They are also cognizant of their natural environment, social impact of development, and economic prosperity in the same way that Alaska is. |
| | Alaska is a state, Iceland is a sovereign nation – how does this impact energy policy? What are the fundamental differences between the way Alaska/U.S. and Iceland operate? | This didn't appear to be an issue. Decision-making is the same, overall. Sovereignty or not, the only difference is the level of complexity. Basic lessons that Iceland applies - like spend less than you earn, prioritize long-term benefit over short-term (banking notwithstanding) - are applicable. |
| | AK: many conflicting views/industries/sectors and we hit gridlock before being able to work on solving a problem – Iceland seems to have dealt with this. How? Decision-making framework, energy plan or policy? | Common vision for economic prosperity as they worked toward becoming a developed nation. Total focus on improving livelihood of people and, in looking forward, continued opportunity. |
| | Alaska lacks and energy plan. Iceland appears to have one. How can we learn from Iceland to develop a successful Alaskan energy plan? | Three long term policy documents: 1) Comprehensive Energy Strategy for Iceland (support diversified industry, having renewable energy sources replace imported energy); 2) Energy change in the transport sector (10% of all fuel use for the transportation sector be from renewable energy sources in the year 2020); 3) Master Plan for Utilization of Renewable Energy Resources (80 different possibilities for hydro and geothermal power plants have been listed and analyzed and categorized as: green/go ahead, yellow/further research, red/site preserved) |

| | | |
|-----------------------------|---|--|
| | <p>Economic rebound – was there a role for energy?</p> | <p>Tariff on energy (implemented after crisis) just renewed for another 3 years; consumers pay but also creates large contribution by EII -- who otherwise contribute to the economy of the nation at a lower net amount than other industries (because they import raw materials and are foreign-owned unlike things such as fishing and tourism).</p> |
| | <p>Are there rural Icelandic communities that might model rural energy development for AK?</p> | <p>EEI was extremely important in the recovery; and it was noted that the import of oil during this time would have made recovery extremely difficult. The temporary economic crisis does not impact Landsvirkjun's long term vision although it impacts the company's decisions in the short term.</p> |
| | <p>Explore: AK and Iceland are both small communities dealing with larger geopolitical forces</p> | <p>Yes. This model of developing a local geothermal source for direct heating - with billions of dollars saved each year - is very applicable for rural Alaska. The other aspect to look at is the grid and entry opportunities, as well as low cost power. Iceland is quick to point out that they're not perfect, but they are happy to share what they've done to benefit others.</p> |
| <p>Beyond Energy</p> | <p>Fisheries? Natural rights, etc.</p> | <p>Iceland is a relatively large landmass with a low population density. There are great distances between it and Europe/North America, which it is able to use to its advantage as a strategic location. It responds to European Union regulations, considers itself northern European, but is positioned to respond to greater outside investment opportunities.</p> |
| | <p>Broadband and telecommunications?</p> | <p>Modeled off of Alaska (or other way around?), Iceland introduced volume restrictions and individual transferable quota system--first year of allotting ITQs was 1984. Fisheries require extremely detailed information for predictions and approximately 2/3 of fisheries budget is used for research. 97% of fish harvest is exported; in general the remaining meets local demand but there is some import such as shrimp. Private ownership of rivers (farms) with individuals able to fish with permit (no salmon fishing allowed offshore). Interest now in public ownership of all resources not privately owned currently.</p> |
| | <p>Trans-shipment</p> | <p>The whole country is wired.</p> |
| | <p>Icelandair – now flying to Alaska in summer – maybe could foster trade, year round?</p> | <p>With interest from China growing, not just in Iceland but in Greenland, Iceland is positioning itself to build a port in the north able to assist in transshipment.</p> <p>70% of the market flying this route will be European. The opportunity is to respond to these tourists. Icelandair is working toward increasing winter traffic, with Iceland as a year-round destination - building transatlantic traffic to</p> |

| | | |
|-----------------|---|---|
| | | increase frequency and tourism to Iceland. |
| | Mining industries? Basalt? Sulfur? | No mining. Cheaper to bring resources from half-way around the world for development/manufacturing because of cheap energy. |
| Research | What is the role of research in policy formation? | There was much discussion emphasizing education and research; with the overall goal to not buy outside knowledge but to build Iceland's own (including with patents). R&D personnel per thousand leads Europe and is 4% of budget. Iceland is proud of its University system though it wasn't clear how that related to policy development. |
| | Knowledge based economy. How/Do they "export" this? | Through state-owned companies like Landsvirkjun, who have the experience in developing geothermal and hydro resources. |