THE ICELANDIC GEOTHERMAL CLUSTER, THE TRANSITION TO CLEAN ENERGY IN EMERGING MARKETS AND THE ROLE OF INTERNATIONAL FINANCIAL INSTITUTIONS

Hilmar Þór Hilmarsson, PhD, Professor
University of Akureyri, Iceland
University of Washington, USA

Introduction

Iceland’s progress in utilizing geothermal energy for space heating and electricity production has received international attention and Iceland has already become a significant player in the global geothermal energy market. During the transition to geothermal energy know-how has accumulated and a number of companies and institutions now have proven capabilities in, for example, exploring geothermal sites, drilling, constructing, operating and maintaining of geothermal power plants.

In November 2010 a groundbreaking conference in Reykjavík, attended by about 900 participants, discussed the potential of an Icelandic geothermal cluster to enhance Iceland’s competitiveness and create a new engine of Icelandic economic growth. Among the participants was the leading scholar on clusters, Professor Michael E. Porter at Harvard Business School. Other participants included the President of Iceland, Dr. Ólafur Ragnar Grímsson, as well as the minister of industry and representatives from the private sector (including the energy and financial sectors). The president of Iceland made strong statements about Iceland’s potential in this area with a primary focus on international or cross border engagement.

The development of the cluster continues and in February 2013 a legal entity for the Icelandic geothermal cluster initiative was established. According to the website of the new entity, called Iceland Geothermal, the role of the Icelandic geothermal cluster is to promote Iceland’s unique qualities as the land of geothermal energy and geothermal energy production. Among the entities aims are to:

“Increase the number of products and services within geothermal;
Increase domestic and foreign investments in the field of geothermal energy;
Increase exports of goods and services in the field of geothermal energy”

(Iceland Geothermal, 2013).

It is understandable why cross border engagement is being considered as an option for increased growth. A report prepared before Icelandic Geothermal was established titled: The Icelandic Geothermal Cluster; Cluster; Mapping and Mobilization, for example, states that “Foreign markets are important for Icelandic geothermal companies, especially in times when uncertainty and stagnation prevail for geothermal projects in Iceland” (Gekon, 2011, p. 35). This report also states that „The economic collapse and a certain opposition to any further investment in geothermal projects in Iceland, however, have created an uncertainty about further development of Iceland's geothermal energy knowledge“ (Gekon, 2011, p. 3). This report notes that "It is easier to get a project if one can help with its funding. However, the difficulty of Icelandic parties with the financing of projects is one of the weakest aspects of the cluster. One way to address this weakness is to strengthen the cluster's cooperation with foreign investors and financial institutions in a systematic manner." (Gekon, 2011,
Finally, the report states that "So far Icelandic participation in international projects through ownership has not been successful. This is explained in part by the parties not having been sufficiently coordinated or critical of the projects that had been selected." The report does not explain what projects were examined to arrive at this conclusion.

For Iceland to engage successfully in global markets there are issues that need to be analysed, such as coordination and the formation of consortia in emerging markets, as well as cooperation with foreign investors and financial institutions. Given that these are large and long term investments, funding and risk mitigation is also a critical issue that needs to be properly addressed and analysed.

The purpose of this article is to analyse and assess the potential of an Icelandic geothermal exporting cluster in engaging internationally for the benefit of Icelandic participants as well as partners in emerging countries. The focus will be on cross border activities of an organized exporting cluster to engage in the provision of consultant and advisory services, in construction, operators and maintenance of geothermal power plants as well as sponsors and shareholders in geothermal projects. These activities can thus both involve cross border trade and investment and the involvement of international financial institutions and export credit agencies may be useful.

**Definition and Some Theoretical Considerations**

It is well known that economic clusters exist in virtually every industry and in every part of the world. But what exactly is a cluster? According to Professor Michael E. Porter clusters are geographic concentrations of interconnected companies, specialized suppliers, service providers, firms in related industries, and associated institutions in a particular field that compete but also cooperate (Porter, 2000; for more discussion about clusters see for example, Porter, 1998, 2000, 2010; Ketels and Memedovic, 2008; Ketels, 2010). It seems reasonable to assume that society and industry could reap some benefits of reaching critical mass in experience and interactions in one place in a particular field.

Theoretically the assertions is that significant advantages accrue to companies from being in proximity to complementary products and service within reach of all the suppliers and partners in the product value chain. The emphasis on location and geographic concentrations though seem to contradict the modern and global thought on the mobility of capital and knowledge. This seems like a paradox in an era of global competition. Here, however, the competitive advantages are gained through interconnected companies and institutions locally and competitiveness is driven by the strength of the cluster, not only the strength of individual companies. According to Czinkota et.al, cluster theory suggests that competition is altered in at least three ways when clusters form successfully: (i) by increasing the productivity of the companies based in the area; (ii) by driving and supporting the momentum of innovation in the area; and (iii) by stimulating the creation of new companies and new configurations of business in the area (Czinkota, et al., 2009).

**Porter and Challenges for the Geothermal Cluster**

Michael E. Porter, the leading scholar in cluster theory, made a comprehensive presentation during the geothermal conference in Reykjavik on November 1, 2010.
While his comments were made shortly after the global economic and financial crisis hit Iceland (in October 2008) many of the same economic obstacles still remain in Iceland, including capital controls.

A large follow up geothermal conference took place in Iceland in March 2013 but for some reason Porter did not attend this time. This was unfortunate given that Porter had initiated much of the work in mapping and analysing the Icelandic Geothermal cluster and its future potential. His presence in 2010 undoubtedly helped mobilize a large number of participants for this endeavour in the beginning. The discussion below is based on his 2010 presentation that still remains very relevant for the cluster.

When discussing investment to leverage Icelandic expertise in the geothermal sector, Porter stated that the “lack of capital is a key constraint” (Porter, 2010, p. 28). This was not surprising given that Iceland’s major banks had all collapsed during the 2008 crisis and many companies in the geothermal sector faced financial difficulties. When commenting on the potential for exporting services Porter observed that Icelandic “Companies tend to lack size and capital to lead large projects” (Porter, 2010, p. 28). In addition to this, and related to his discussion on operational management, Porter correctly commented that “Skills (are) more technical than commercial” (Porter, 2010, p. 28).

These are all important observations. It is true that Icelandic companies tend to be small and even the biggest companies are faced with severe capital constraints, including large companies like Landsvirkjun and Orkuveita Reykjavíkur. It is doubtful whether these companies could and should try lead large cross border projects in emerging markets or developing countries. They have little experience in this area except when Orkuveita Reykjavíkur, through Reykjavík Energy Invest, tried to do engage in Djibouti and failed, wasting Icelandic taxpayer money. Also while Icelandic technical and engineering skills seem strong, financial and commercial expertise necessary for resource mobilization for energy projects is limited. Knowledge of, and skills in, applying risk mitigation instruments for capital mobilization in emerging markets, that often have a difficult investment and business climate, are key to success.

Porter also emphasised the need to “Clarify the role of publicly-owned companies in exports” (Porter, 2010, p. 32). This is an important point especially for Landsvirkjun that is in government ownership and Okruveita Reykjavíkur that in owned by municipalities. Why should companies with public ownership take risks from cross border activities and pass the bill to the taxpayer like Orkuveita Reykjavíkur did via Reykjavík Energy Invest when it failed in Djibouti.

Porter also talked about how important it was to “Identify potential international partners” (Porter, 2010, p. 32), to “Address capital shortages” and the “creation of a special financial instrument with government or foreign partners” (Porter, 2010, p. 32). This is especially important for companies coming from a small country that has capital controls, lacks funding and experience in emerging markets and can be vulnerable in dealing with host governments from and emerging countries that are much larger.

In spite of these obstacles Porter expressed strong confidence in the Icelandic Geothermal Cluster, including cross border engagement. He took as an example of Huston Texas that has lost all its oil and gas, but remains the global capital of oil and gas technology in the world. As Porter stated, Huston is now exporting knowledge,
skills, technology, capital and project management skills.

While Porter saw a potential in growing the domestic resource in Iceland, he saw a bigger long run opportunity for the Icelandic Geothermal Cluster in deploying skill, technology and its expertise cross border. According to Porter someday soon Icelandic companies and Icelandic partnerships should be operating geothermal facilities all over the world. And as he stated “We have every opportunity to be one of the globalizers of this business” (Porter, 2010).

**Some Potential Participants in Iceland**

There are several Icelandic companies and institutions that possess knowledge and experience in utilizing geothermal energy for space heating and electricity production. They could form an Icelandic geothermal exporting cluster where they would not only compete with each other but could also cooperate and potentially enhance each other’s international competitiveness. Some of those companies and institutions are listed in table 1 below.

| GeoScience | ISOR, Mannvit, Vatnaskil. |
| Business Consulting | KPMG, Capacent Corporate Finance, Islandsbanki. |
| Drilling | Jarðboranir, Ræktunarörsamband Flóa og Skeiða. |
| Construction | ISTAK, ÍAV and Loftorka |
| Energy Audit & Law Firms | KPMG, Pricewaterhouse Coopers, Deloitte, Lex (law firm), Logos (law firm). |
| Financing | Arion banki, Islandsbanki, Landsbankinn. |
| Geothermal Research | ISOR, Mannvit, Vatnaskil, Utilities, Universities. |
| Research Funding | Orkusjóður, Geothermal Research Group, Landsvirkjun’s Energy Fund, Orkuveita Reykjavíkur Energy Fund, Rannis. |
| Training and Education | University of Akureyri, University of Iceland, Reykjavik University, Reykjavik Energy Graduate School of Sustainable Systems, Kellir – Atlantic Center of Excellence, United Nations University – Geothermal Training Programme. |

If some of the above players would cooperate in cross border operations they could engage in different activities or a combination of those activities, including as: (i) consultants providing advisory services, (ii) operators of power plants, including maintenance, (iii) contractors for drilling and construction, and (iv) sponsors and shareholders. Activities (i) to (iii) would not necessarily require cross border capital investment but (iv) would. In addition to providing equity capital, sponsors and shareholders would also often need to ensure that loans are available, for example, from investment banks, and provide adequate guarantees for lenders. It is not unusual for energy investments involving the private sector that 70% of the investment is funded by loans.

Creating an effective exporting cluster can result in opportunities and efficiency gains for the participating companies and enhance their competitiveness. However, there are also institutional challenges involving for example the simultaneous investments in various industries as well as coordination among companies providing
goods and services within the cluster. Overseas geothermal energy engagement can provide a global market opportunity for Iceland that could potentially result in stronger economic growth in the coming years. Several Icelandic companies are internationally respected, have highly experienced employees and have developed international networks over the years.

Among the weaknesses within the Icelandic geothermal cluster to engage overseas is limited production of machinery and equipment associated with the utilization of geothermal energy. One wonders if it would be possible to produce machinery and equipment within the cluster like has already happened in the fishing industry. In the fisheries sector, Marel, a company that originated in Iceland, is a major supplier of processing equipment and solutions internationally for the food industry, including in fisheries.

To engage internationally, stakeholders from Iceland will need to develop a concerted strategy and an action plan for engagement. This is complicated, requires strong coordination and simultaneous investments. It remains to be seen if Iceland Geothermal has the capacity to take the lead here. The government can only have a limited role here. It should avoid picking favoured clusters or companies and get involved in defining priorities in a cluster action plan. It is also doubtful if Icelandic companies in public ownership should be involved here at all.

**Geothermal Resource Risk Constraints**

Geothermal power projects suffer from risks not found in other thermal power generation projects including higher up-front development costs associated with uncertainty as to site capacity (Delmon, 2009). The whole bankability of a geothermal project relies on the geothermal resource economical potential. This potential has to be assessed. It can never be fully and accurately assessed until drilling has taken place. As a consequence, drilling is required and high upfront investments have to be made before and without certainty as to the geothermal resource bankability, which may eventually be unfit for economical production (Vernier and Jaudin, 2013).

As figure 1 shows the risk associated with geothermal projects are high during the pre-survey, exploration and test drilling phases. Validating geothermal resource through test drilling is capital intensive. Commercial financing for test drilling is generally hard to find and private equity (and government support) are the only capital to undertake test drilling. These risks are not specific to emerging markets, but it often more challenging to obtain private and public capital in these markets, than in high income countries. International financial institutions have so far done little to mobilize funding for resource risk mitigation for geothermal projects in developing and emerging market economies (World Bank, 2012).

Scaling-up geothermal by addressing the resource risk through sustained international effort is being discussed at the World Bank, including raising US$500 million for exploration and drilling activity, but limited progress has been made so far (for more detail see World Bank, 2012 and 2013). In Europe a European Geothermal Risk Insurance Fund (EGRIF) is being discussed (GEOELEC, 2013). The EGRIF is a proposal to member States and the EU institutions. For the moment, it is just the start of the discussion between the countries (According to an email received from Philippe Dumas, Secretary General, European Geothermal Energy Council dated January 8, 2014.)
Can International Financial Institutions Help?

If Icelandic companies that are a part of a geothermal exporting cluster engage in cross border investments in emerging markets, capital shortages will be among key challenges that they face. How could they possibly solve this problem, and in partnership with whom?

Among the most obvious partners to help solve that problem are international financial institutions (IFIs) that have strong presence in emerging markets and can offer financial instruments, such as, equity, loans, guarantee/insurance instruments, etc., to support investment projects. The involvement of IFIs could also facilitate participation of private international investment banks, (ECAs), as well as potential co-sponsors providing equity capital (for more discussion about the structure of projects support by IFIs see Hilmarsson, 2012 and 2013).

Among the institutions of the World Bank Group are; the International Bank for Reconstruction and Development (IBRD) and the International Development Association (IDA) who work with host governments (requiring government guarantees). The private sector arms of the World Bank Group are the International Finance Corporation (IFC) and the Multilateral Investment Guarantee Agency (MIGA) that support private sector investment (without government guarantees). There are also IFIs with regional focus including the African Development Bank (AfDB), the Asian Development Bank (AsDB), the European Bank for Reconstruction and Development (EBRD), the Inter-American Development Bank (IDB), etc. The European Union also has an investment bank, the European Investment Bank (EIB).
If Icelandic companies sponsor a geothermal project in an emerging market, or maybe more likely, form a consortium with investors from other countries to sponsor a project, an IFI such as the World Bank would be an ideal partner to help mobilize funds. Guarantees to facilitate the participation of private investors could be important here. However, Icelandic companies have so far not been successful in working with the IFIs, that Iceland is member of, i.e. the World Bank Group and the European Bank for Reconstruction and Development (EBRD). In fact, Icelandic companies, banks and the government are novices in the field of international development cooperation and lack knowledge and experience in doing business with international financial institutions. Furthermore, unlike the other Nordic countries, Iceland is not a member of the regional development banks, i.e. the Asian Development Bank (AsDB), the Inter-American Development Bank (IDB) and the African Development Bank (AfDB).

IFI participation can help projects in emerging markets in two ways: (1) making them more commercially viable through, for example, better finance, improved risk mitigation, advice; and (2) improving their developmental outcomes by, for example, providing the advice and standard setting that lead to better operations, products, and services; stronger environmental, social, and corporate governance activities; or projects that are more inclusive (IFC, 2011). IFIs also tend to provide finance with longer maturities, which is generally beyond the risk appetite of private capital (IFC, 2011).

The Role of Export Credit Agencies
In most developed countries there are export credit agencies (ECAs) that have been established by the countries to help finance export of their national goods and services as well as to support cross border investments. The inherent risks in cross border trade, especially to emerging markets, and the importance of global trade have made states supported guarantees and finance, where there is lack of private sector capacity, necessary.

Almost all OECD countries have national ECAs. ECAs can provide guarantees in connection with projects where there are deliveries of equipment and/or services to the project from the home country. Within Nýsköpunarsjóður atvinnulífsins in Iceland, such unit exists, and is called Tryggingardeild útfútningss (TRÚ). To make the story short TRÚ services have never been used by Icelandic exporters or cross border investors. In contrast the demand for the services of ECAs has sharply increased in many other countries especially during the crisis that started in the fall 2008 (Dinh and Hilmarsson, 2012 and 2013).

As with the international financial institutions, Icelandic exporters and investors are not using the risk mitigation instruments that have been available. Nevertheless, it seems obvious that an Icelandic ECA could be very useful to support trade finance to cross border projects where Icelandic companies would be involved as providers of equipment and services.

Conclusions
Iceland has made an impressive transition from fossil fuel to clean energy and has a high share of geothermal energy in its overall energy use. Many Icelandic geothermal companies and institutions have considerable experience in geothermal activities and exporting Iceland’s know-how and experience could increase export
revenues. In fact, several companies have already provided services in this area internationally. Additional engagement via a geothermal exporting cluster could be beneficial, including for foreign partners in emerging markets. However, the global economic and financial crisis has severely affected the balance sheets of key Icelandic energy companies which limits their capacity to engage.

Capital shortages will be difficult to overcome, especially for companies that intend to engage in cross border investments in emerging markets. Cooperation with international financial institutions remains a possibility but so far Icelandic companies have not been successful in forming partnerships with them and Iceland is not a member of key regional development banks. In fact, Icelandic companies, banks and the government are novices in the field of international development cooperation and lack knowledge and experience in doing business with international financial institutions and working in complex emerging country situations. It is doubtful that energy companies in public ownership should engage in cross border projects in emerging markets when losses would eventually be imposed on taxpayers. International financial institutions, including the World Bank, tend to be bureaucratic and risk averse and their involvement in clean energy, including geothermal, remains very small.

The stakeholders in an Icelandic geothermal exporting cluster will need to develop a concerted strategy and an action plan if they intend to turn geothermal energy into a truly international opportunity. There still is a lack of a formal platform for collaboration and coordination to form an effective exporting cluster that would have the capacity to engage in cross border investments in emerging market economies. It remains to be seen to what extent Iceland Geothermal can help here but currently that entity is small. An Icelandic geothermal exporting cluster would require a concerted effort of many different players in Iceland, public as well as private, who engage in consulting, construction, finance, research, education, etc.

It will probably take years of organization and coordination before any significant benefits could materialize from an exporting cluster. Currently the possibility to engage in energy investments in emerging markets seems limited. This is due to the limited capacity and experience that Icelandic companies have in forming international consortia and in cooperating with international financial institutions (IFIs) that Iceland is a member of. Such cooperation is particularly important to overcome the capital constraint that will severely affect many Icelandic firms post crisis. Cooperation with IFIs is also important for proper risk management that is key for successful capital mobilization from investors including international investments banks. The government of Iceland has neglected its relationship with IFIs and can provide little support or guidance on how to proceed. The absence of a functioning national export credit agency is also an obstacle for Icelandic cross border trade in this area. In short Iceland lacks the institutional infrastructure to engage successfully in large cross border energy investments in emerging markets.

In the short term it seems more likely that Icelandic companies could continue selling geothermal expertise overseas, provide advice and possibly participate as operators, in maintenance or in constructing of geothermal power plants. This is unlikely to generate large revenues in the context of national accounts but it could certainly make a difference for individuals and companies most of which remain small. Private sector cooperation with IFIs in cross border investments could be feasible in
some cases but seems unlikely to materialize in the short term.

References


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Hilmar Þór Hilmarsson
University of Akureyri, Iceland
University of Washington, USA

Abstract

Iceland has received international attention for its use of geothermal energy for space heating and electricity production. The focus of this article is on the potential of an Icelandic geothermal exporting cluster engaging cross border in emerging markets. This could include provision of consultant and advisory services, construction, operations and maintenance of geothermal power plants, as well as sponsors and shareholders in geothermal projects. Being a sponsor/shareholder would require cross border capital investments. Given the higher risk profile in emerging market countries, than in many high income countries, the participation of international financial institutions and export credit agencies will be discussed as sources of funding and risk mitigation for geothermal projects.

Keywords: Geothermal cluster, Iceland, emerging markets, cross-border trade and investment, funding and risk mitigation instruments