

2008 SYMPOSIUM

GREEN ENTERPRISE COMPUTING

Capitalizing on Current Opportunities and Exploring Future Trends in
Energy Efficiency

RESEARCH UNDERWRITER WHITE PAPER
INVEST IN ICELAND AGENCY

Invest in Iceland

**Uptime
Institute™**

Iceland

Iceland is a large island in the north Atlantic covering 1,108,682ft² of land with 307.000 inhabitants. But despite the uninviting name and common misconception it is neither cold nor is it very far away. The average temperature is around 57°F over the summer (31°F in winter) and flight time to London and Boston is three and five hours respectively.

World-renowned for its economic advancement, social stability, and technological innovation, Iceland is continually ranked as one of the preeminent societies on earth. It is a modern growing economy, politically stable and internationally competitive. The nation is young, educated, and multilingual and enjoys high living standards with a thriving cultural scene. The labor market is highly flexible with people willing to adopt new technologies. Iceland's nature is spectacular and the source of both inspiration and green competitively priced energy.

Over the past decades the Icelandic government has implemented changes to make the business landscape more attractive to foreign investors and today the Icelandic tax system is both simple and effective with a low 15% income tax on corporations and businesses.

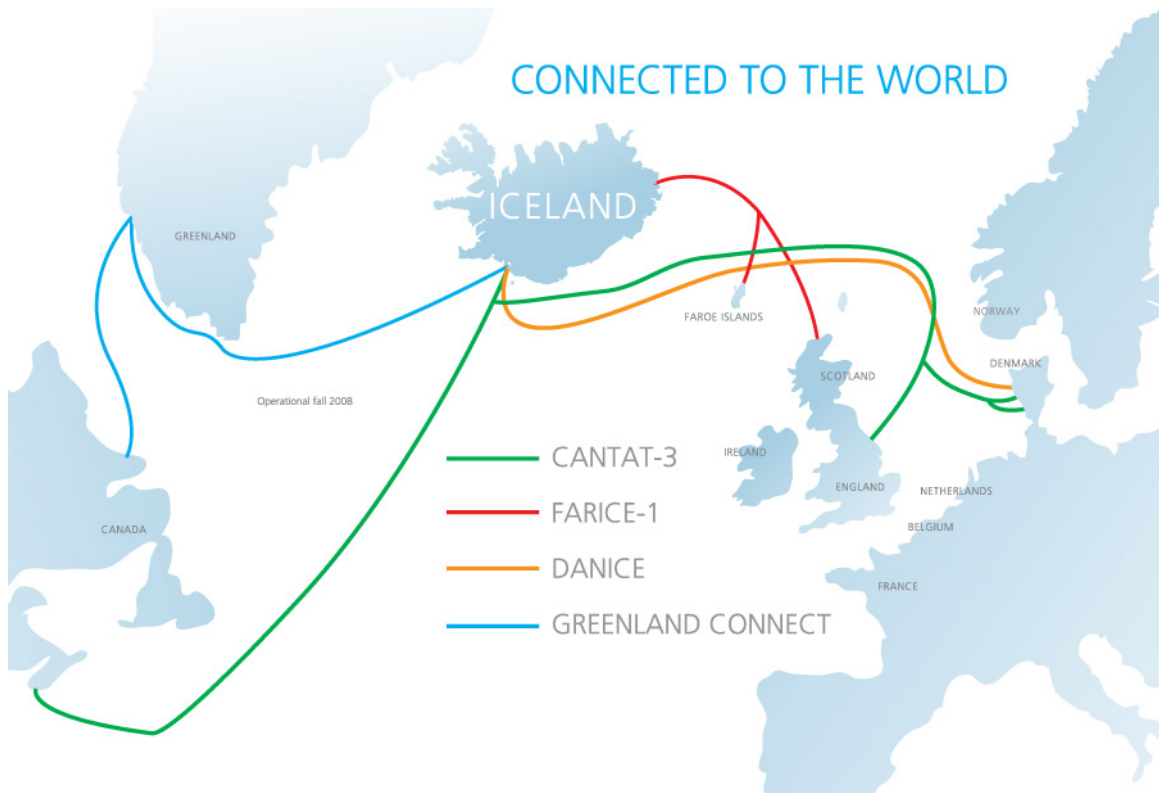
Connections

Currently Iceland is connected to other countries through two submarine fiber optic cable systems:

- The FARICE-1 system lying from the east coast of Iceland to Northern Scotland, with a spur connection to The Faroe Islands. The traffic is backhauled through the UK and terminates in London. The FARICE-1 submarine cable is owned and operated by Farice hf, a company owned by Icelandic and Faroese shareholders. The design capacity of FARICE-1 is 720 Gbit/s.
- The CANTAT-3 system lying from the Westman Islands south of Iceland to North America and Europe. CANTAT-3 is owned by a consortium of a number of telecom operators. CANTAT-3 can provide Iceland with 2.5 Gbit/s connections to each direction, east and west.

The following submarine cable projects are ongoing and will be operational by end of 2008:

- A new submarine cable; "DANICE" will be implemented by Farice hf, between Iceland and Denmark. The DANICE system will be a state of the art high capacity system with a design capacity of 5,120 Gbit/s. The traffic of DANICE will be terminated in Amsterdam and other European cities. The system will be operational by December 2008.
- Another new submarine cable; "GREENLAND CONNECT", will be implemented by Tele Greenland in 2008. This submarine cable will be laid from Iceland to Greenland and onwards to Newfoundland, Canada. The GREENLAND CONNECT system will be able to provide connections from Iceland to North America.



Infrastructure

According to the IMD World Competitiveness Yearbook, 2007, Iceland has built up a large-scale infrastructure that is very well suited to meet the new technological requirements of enterprises. This infrastructure has served as a major support for fast growth in the ICT industry and the rapid adoption of technological solutions throughout society. Mobile phone and Internet penetration is very high, Iceland sits on a large future energy supply and Reykjavík is becoming the first fully fiber-optic connected capital in the world.

Renewable Carbon Neutral Green Energy

Iceland is the only country in Western Europe that still has large quantities of competitively priced, renewable carbon neutral green energy remaining to be harnessed. It is estimated that by 2010 only a third of the country's energy potential (50 TWh/yr) will be tapped. Setting Iceland apart from most, if not all other countries, is that its electricity is produced using exclusively hydropower and geothermal energy. These are sustainable, environmentally friendly, "green" resources, without the atmospheric emissions of fossil fuel. The energy infrastructure is state-of-the-art, using the latest technology, with great reliability and efficiency, and is ranked #1 in the world by IMD. In Iceland it is possible to do long-term energy contracts with known cost for 10 to 20 years.

Internet

The availability of broadband access creates possibilities for developing novel services. The development of broadband access to the Internet has been quicker in Iceland than in most countries and Iceland currently leads the world in both broadband subscribers and Internet users. More than 80% of Icelanders use the Internet on a regular basis.

Information Technology

In the past few years there has been a great emphasis on technological development in Iceland, leading to the creation of an advanced technology infrastructure. University education is highly rated, R&D spending is 2,83% of GDP, there are numerous qualified engineers, and communications technology is world class. This helps Iceland top the IMD rating for Information Technology Skills.

Education

Iceland is an educated society. The total public expenditure on education is the second highest in the world, literacy is near 100%, language skills are good, financial education is top class, and economic literacy tops the IMD world ranking. University education meets the needs of a competitive economy, knowledge transfer between universities and companies is excellent, and the education system is the second best in the world, according to IMD

Security

1) Social safety

Iceland is a safe country and its inhabitants are proud of the virtually crimeless society. The crime rate in Iceland is among the lowest in the world, and the governmental framework is transparent with minimal bureaucracy. And in international surveys Iceland receives excellent scores for both corruption and political stability.

2) Physical safety

Iceland is a non-military island with one major point of entry. Both the main energy and fiber grids are circular and all major connections are via loops to ensure maximum reliability and efficiency. The Post and Telecom Administration in Iceland, oversees security, efficiency and safety standards in operating the communications nets, with strict safety demands on all Internet Service Providers in Iceland.

3) Skills and know-how

Computer literacy in Iceland is very high and it has the most internet users in the world (per capita). Icelandic communications technology well equipped in meeting business requirements; development and application of technology is world class; and cyber security is effectively being addressed by corporations. An ample supply of skilled IT people and qualified engineers help Iceland lead the IMD rating for IT skills.

4) “Weakest links”

Standards applied and general awareness of possible cyber crimes and corporate guidelines regarding data security

This level is supported by skills and know-how. The Post and Telecom Administration has a special website dedicated to data security with educational material, info and advice; all service providers are forced by law to adhere to best practices in save IP communications; special procedures in cases of emergency or successful cyber crimes are in place; and financial institutions were among the first to use the internet for B2B and business-client, making data security a determining factor from the onset.

Comparison

In May 2007 PricewaterhouseCoopers, Belgium, delivered its report where Iceland was benchmarked against the United States, the United Kingdom, and India as a location for Data Center activity. Iceland scored extremely well in the report and was found to be “Best in Class”. The study evaluated two dimensions for comparison: quality and cost.

Quality

In the overall quality score there are 5 main factors that were looked at:

Geopolitical environment

Based on the selected location factors in this category, Iceland scores best when compared to the peer group. The situation in Iceland results in better or equally good scores on each of the factors in this category. Seen the relatively high attributed weights, especially the attractive situation in terms of corporate taxation of 15%, low natural disaster risk, and environmental awareness are to be noted.

People

The low score for Iceland in terms of general availability of IT staff is the single factor to explain the relative position in the People category. The total number of persons employed in the ICT industry in Iceland is 6,145 based on Statistics Iceland.

This number on general employment being low to any standard in the comparison, the free availability in the labor market is moreover quoted to be close to non-existing. The overall good scores for Iceland on the other location factors in the category are apparent. In terms of competitive position, the country however does not benefit from this performance as both the UK and the USA provide for an equally good business environment in this respect.

Technology

The overall performance of Iceland with respect to the Technology location factor is good, though when compared to the USA and the UK, the country's offer is less compelling for mobile investment projects dependent upon international telecommunication services. The limited number of international links was identified to be the limiting factor for good performance of Iceland in the international competitive game for data centre operations. The new Danice cable will clearly take away stress in this respect. Yet in the overall benchmark to the UK and the USA, the connectivity of Iceland remains fragile.

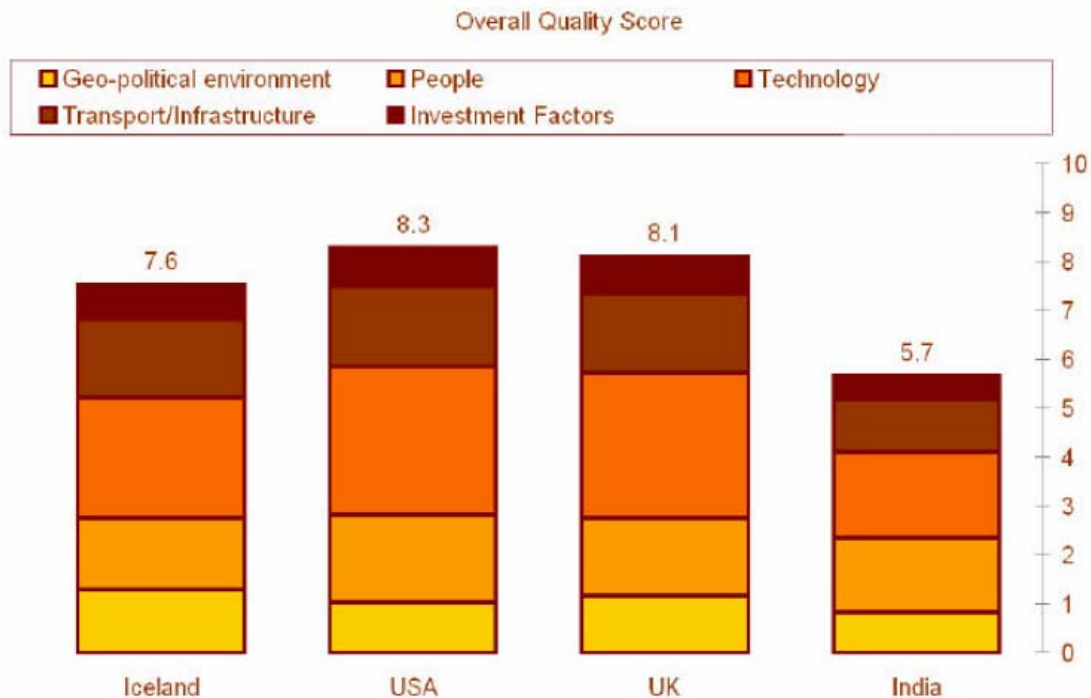
Transport & Infrastructure

Based on international and domestic transport infrastructure, the situation in terms of physical security and confidentiality of electronic data, possibilities to expand data centre operations over time and the existence of disaster recovery facilities plan, Iceland's score is close to the Western benchmark locations. Compared to the USA and the UK, only the score on disaster recovery facilities plan is lower.

Investment Factors

This location category covers a number of enabling factors in terms of existence of qualifying physical- technical space, in terms of market and proof of concept and equally so the perceived strength of commitment of these enabling factors over the longer run. Finally the category assesses the ease of mobility of investments, in case of withdrawal decision of

service or investment. The existing data centre operations in Iceland are well functioning, though small to international standard. More importantly, there is no identified need for larger operations based on local demand and as a consequence, limited qualifying free data centre space is identified. Regulatory as well as business commitment is recognized to be supportive.



Cost

When evaluating cost PwC set up four scenarios. They defined four different size datacenters and calculated the cost associated with each.

Scenarios:

1) Captive (single company) centre – 150m²

- 3 Operators rotating shifts max 12 hours per day
- 2 Back office (1 ops mngr, 1 sr analyst)
- 1 Data centre manager
- 1 Administrator

- 1 Senior business manager
- 2 Administrators

2) Medium size centre – 300m²

- 5 Operators rotating shifts
- 5 Back office (2 ops mngr, 2 sr analysts, 1 support desk)
- 1 Data centre manager

3) Large hosting only centre – 800m²

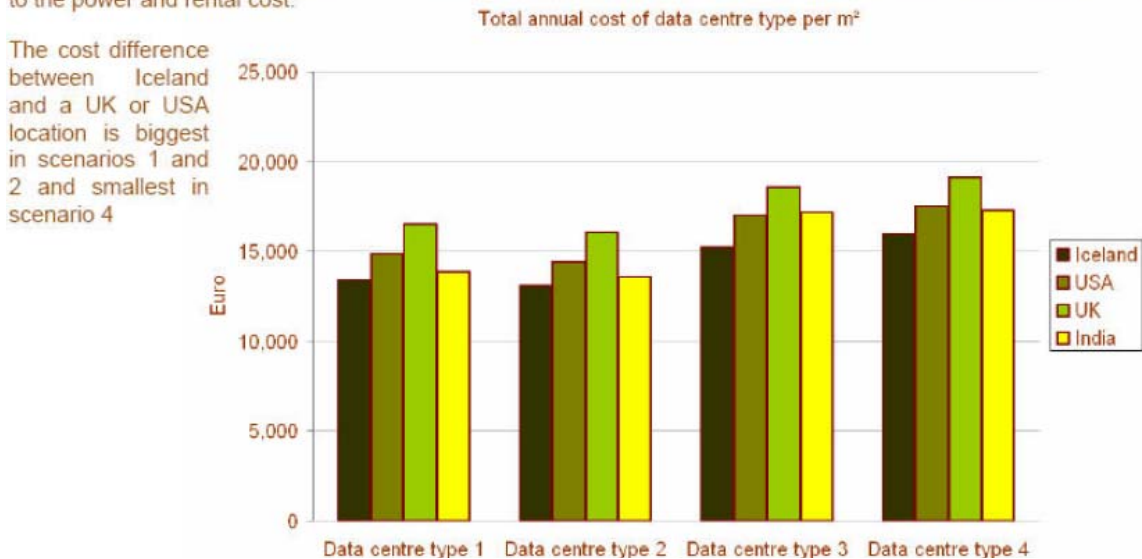
- 5 Operators rotating shifts
- Back office (2 ops mngr, 2 sr engineers/analysts, 2 support desk)
- 1 Data centre manager
- 1 Senior business manager
- 2 Administrators (one senior performing HR functions)

- 11 Back office (2 ops mngr, 3 sr engineers/ analysts, 3 junior engineer/analysts, 3 support desk agents)
- 2 Data centre managers
- 1 Senior business manager
- 1 Marketing
- 1 HR
- 4 Facilities and building support staff
- 2 Administrators

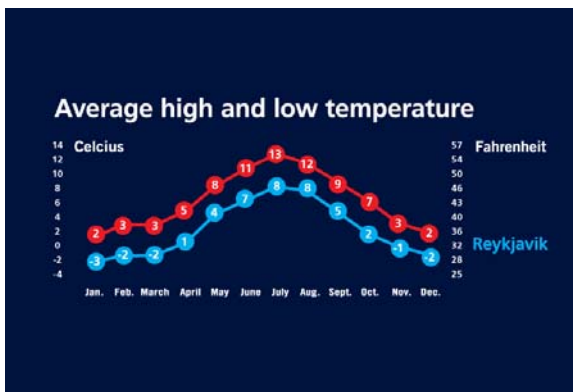
4) Large size full hosting centre – 800m²

- 6 Operators rotating shifts

The combination of the 4 detailed cost components results in a favourable position for Iceland, especially thanks to the power and rental cost.



It is important to note that the cost calculations omit that fact that the need for cooling is substantially less in Iceland, due to a cooler climate and relatively dry air. Furthermore, the price for cooling is considerably lower because of abundant cold water.



“The ability to reduce the power cost on cooling ... is a clear add-on to the attractively priced and plentiful availability of power as it lowers the total consumption, takes away the risk of meeting the maximum capacity later in time and allows for even further green image building”.

PricewaterhouseCoopers, Belgium

When combining the quality and cost dimensions on a single graph one can see that Iceland is “best in class”.

The combination of the quality scores of the 4 locations and the most conservative input from scenario 4 allow for a cost – quality comparison:



“By almost any international comparative assessment focusing on IT competitiveness of the society and the IT use of the population, Iceland scores best in class.”

“Iceland provides a clear and attractive offer to the question where the power and cooling issue can be managed at attractive cost and without operational impacts in terms of growth and stability. With Iceland having plentiful supplies of low cost green power, cold air/water as well as hot water, the benefits to large data center operators would soon pay back.”

“Existing telecommunications services throughout Iceland are plentiful and reliable. These are in the process of constant improvement and of the highest modern standards.”

“Regarding energy all three interested companies have the ability to deliver supplies to any part of the island, services including hot and cold water are also abundantly available as part of the required utility supply.”

PricewaterhouseCoopers, Belgium

The cost calculations omit that fact that the need for cooling is substantially less in Iceland, due to a cooler climate, and that the price for cooling is considerably lower because of its abundant cold water. Studies have shown that half of the energy cost of a Data Center is for cooling, making Iceland an even more ideal location.

“The ability to reduce the power cost on cooling ... is a clear add-on to the attractively priced and plentiful availability of power as it lowers the total consumption, takes away the risk of meeting the maximum capacity later in time and allows for even further green image building”.

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