



Iceland's competitive advantages as a global Data Centre location

Introduction

BroadGroup has undertaken an independent analysis of Iceland as a global data centre hub, comparing it using a wide variety of criteria with today's leading data centre locations from around the world.

BroadGroup has advised many global companies on data centre location and analyzed the competing attractions of many countries.

Why data centres are so important

Data centres have been described as the 'physical part of the virtual economy' – the mission critical, purpose built facilities that support and enable the computing power that drives all business, consumer and government development.

The continuing growth in Internet usage and development of cloud applications is key to data centre growth. Cisco estimates that the annual Internet growth is 40-60% (by traffic volume) in developed countries and even higher in less developed countries. Even stronger growth may come from mobile applications. Indeed, mobile data growth is faster than the comparative early days of the Internet, at over 100% a year.

Data centres need to work. The financial and reputational cost of any downtime in IT systems and Internet presence can quickly run into millions of dollars. A high end data centre could have an 'expected' downtime equivalent to just 26 minutes a year. A particular reason for the importance of data centres is the high cost of ensuring such security and reliability is in place. Each component, from power distribution to chiller units to uninterruptible power systems, needs to have at least one redundant element. An 'average' data centre of 2,000m² could cost US\$16-20m to build and fit out. The growth in data centre needs means that the number of sites continues to increase. Recent research published by Microsoft suggests that annual global spending in data centre construction will increase from around US\$50 billion today to about US\$78 billion by 2020.

Data centres are also very power-hungry. It has been estimated by the Lawrence Berkeley National Laboratory in the US that up to 1.5% of all global power usage is due to data centres, and could hit 2% in the next five years.

This means that data centre costs are closely linked to power prices, with power accounting for typically 20-40% of data centre operating costs, which could be US\$2-3m for a 2,000m² data centre. It also means that power availability is of major concern for data centre users.

Why location of data centres is so important

It is not surprising that the choice of location for a data centre is such an important issue given they are so critical to supporting business and government, and the need for high security and reliability. The **data centre investment decisions need to be based on a period of at least 15 years**, given the complexity and cost of the build. Therefore, it is not just the issues of today, but how they will evolve in the next 15+ years. Such is the complexity of such decisions, that Microsoft has over 300 criteria in place to choose data centre locations, reflecting the potential changes to current data points over a 15 year period.

In simple terms, these decision criteria could be divided into the 'basic' and 'differentiating' factors.

A data centre needs to fulfill a number of basic requirements. These include power, connectivity, safe climate, reliability, accessibility and business /legal environment factors.

Power availability is clearly an issue in many countries today. A country such as the UK will require an investment in its national power infrastructure estimated at around US\$200-300bn over the next ten years, while it has been estimated India will need at least \$210bn in the next five years. Data centre users need to select locations that do not just have power availability today, but clearly will have such availability in the future.

In terms of reliability, businesses typically look at the risk of natural disasters over a 100 year period. When the impact of climate change is included in the calculation, many parts of the world can be discounted as potential data centre locations.

For differentiating factors, cost, and particularly the ongoing operational costs become the important criteria. Power pricing is very important here, as it can contribute up to 40% of annual operating expenditure. Property and people costs are also important, as are taxes, and how such costs may change over the 15+ year timeframe of the data centre.

Iceland as a leading data centre hub

The results of BroadGroup's analysis show that Iceland is a highly attractive place to locate a data centre.

On the key issue of power, encompassing everything from costs to quality to regulation, Iceland scores more highly than leading global data centre locations such as the US, UK, Sweden, Singapore and Hong Kong.

Iceland power costs can be halve those in Scandinavia, and significantly more competitive than other European countries. Iceland's power costs remain very likely to stay much lower than other countries, particularly given the opportunity to cap such prices for ten years or even longer for greenfield projects.

Power reliability and quality are extremely high. Iceland has a long history with a key group of power-intensive users already – the aluminium smelters. Such users, including global leaders such as Rio Tinto and Alcoa, can have requirements of >400MW and have expanded their sites in Iceland due to the strong reliability and availability. These are users for whom an outage of more than an hour would cause serious damage, and have selected Iceland and expanded in Iceland due to its power reliability. For these businesses, there have no disruptions due to natural disasters since the first smelter started operating in Iceland in over 40 years ago.

Power is 100% green. Iceland is one of few countries in Western Europe with large quantities of competitively priced, renewable carbon neutral electricity. Setting Iceland apart from most countries, it produces electricity using exclusively hydropower, geothermal energy and onshore wind. These are sustainable, environmentally "green" resources with zero carbon trade-offs. This makes it an ideal location for addressing corporate responsibility considerations.

On telecoms, existing connectivity, Greenland Connect, FARICE and DANICE are being substantially upgraded, while significant new capacity is planned to be added over the next several years, enabling up to 30 Tbit/s of full capacity.

In terms of telecoms pricing, large international users are able to negotiate prices which are comparable with transatlantic prices into mainland Europe. For example, Icelandic prices are close to the Telegeography Median 10G transatlantic prices reported in Q4 2012. The telecoms pricing attractiveness is illustrated by existing users in Iceland, such as Opera Software, which uses >50 Gbit/s of capacity.

Iceland network latencies are shown below.



Yes, Iceland does have earthquakes – but most are tiny (<2 on Richter scale). They also tend to be well away from data centre sites, and the electricity production and distribution infrastructure has been developed in such a way that it is not vulnerable to earthquakes or strong winds. Indeed, Earthquakes and volcanic eruptions of the last decades have caused little damage and had no disrupting effect on the services of electric power transmission, power production or telecommunication in the country as a whole and no effect on local services for the potential sites.

Iceland also has had the Eyjafjallajökull volcanic eruption. A detailed independent study has shown that estimated risk from earthquakes and volcanoes is still relatively low, especially compared with places like California. Indeed, even New York State had 400 earthquakes with Richter magnitude greater than 2.0 recorded between 1700 and 1986. Iceland also has negligible risks from other natural disasters such as hurricanes, heat waves, droughts, wildfires and tsunamis.

Iceland is ideally situated between the US and Europe, and is highly accessible with 20+ airlines landing on the island. Many of the Iceland data centres are also within a short drive of Reykjavik airport.

Flight times to major cities and the key flight routes into Iceland, for just one airline (Icelandair) are shown below.

City	Flight time to Reykjavik
Amsterdam	2 Hours 45 minutes
Frankfurt	3 Hours 5 minutes
London	2 Hours 45 minutes
Moscow	4 Hours 15 minutes
Paris	2 Hours 50 minutes
Washington	5 Hours 55 minutes



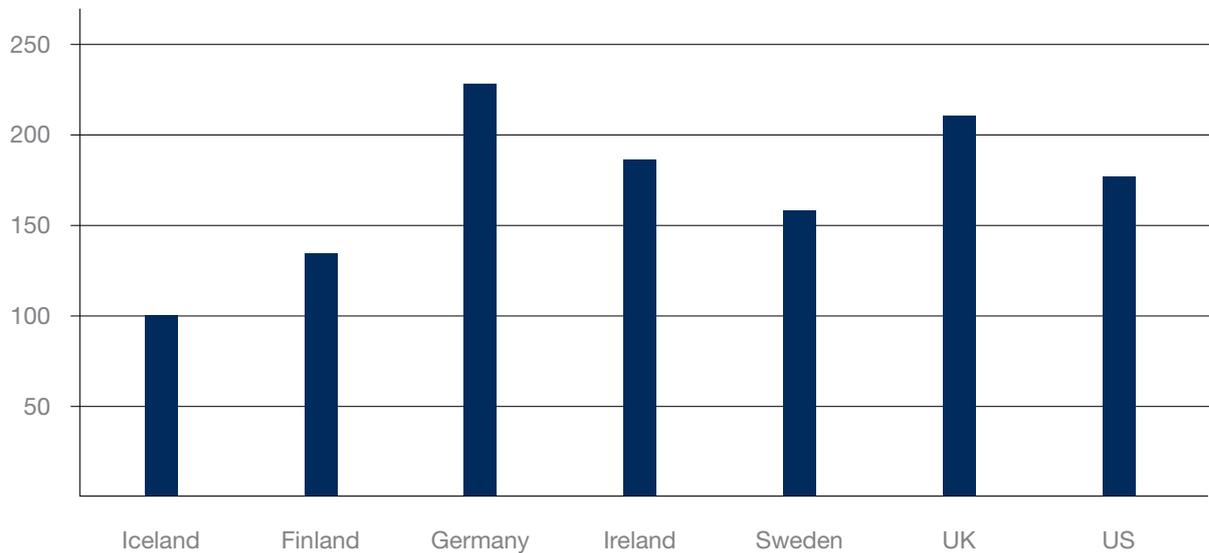
The Icelandic economy is strongly supportive of IT investment, and has particularly looked to ensure it is attractive to those looking to site data centres in the country. This has attracted an impressive range of global companies who already have data centres in the country, including Opera Software, COLT Telecom, BMW, Datapipe and the Joint Nordic Supercomputer. It has also attracted data centre outsourcing companies such as Advania and Verne Global. The Iceland government has also developed specific incentives for the industry.

In Summary

Iceland has become an extremely attractive location in which to site a data centre. Reasons include:

1. All the basic factors in place – some locations talk about particular factors such as cheap energy or strong connectivity, but the reality for most data centre users is that they need all basic issues to be in place. For data centres, this includes such areas as telecoms, power, reliability, taxation and business environment, and the legal/regulatory framework. **Iceland has these factors in place.**
2. **Iceland is also highly attractive in terms of differentiating factors** such as power costs and availability, government support and incentives, and operating costs. Power is the biggest operating cost item for data centre users – Iceland is highly competitive on power pricing today, and can provide commitments for ten years or potentially more.
3. There is a high education level in Iceland and **strong availability of highly skilled technical staff**
4. A major issue for data centre users is how a location will evolve over the 15+ years of the facility. Some of the large, existing data centre locations are facing key challenges such as lack of land, power availability and the threat from natural disasters. By contrast, **Iceland is rapidly developing as a global data centre location**, with a highly committed, stable and democratic government and clear focus on the sector, and a legal system in line with the European Union. There is also land available at suitable locations close to Reykjavik and the Keflavik International Airport
5. **Iceland also offers two of the other key requirements of many data centre users – space and flexibility.** Space to build data centres of different designs, rather than being forced to use refurbished buildings or multi-storey sites. Flexibility to provide different solutions, from high-connectivity, purpose-built technology parks to sites that are close to energy sources and offer a green and low-cost option.
6. **Major cost advantage** – factoring in all data centre cost factors over a ten year period, shows the significant savings available in choosing Iceland (as per chart)

10 year cost of data centre operations



Key assumptions:

- Large corporate
- 400 rack deployment
- Each rack at 3kW
- Own build
- Central urban location in each country
- Power costs at 40% annual opex
- Power usage consistent throughout 10 year
- Telecoms costs at 6% annual opex
- Telecoms includes international connectivity to New York (or London, in case of Virginia)
- Does not include impact taxes, inflation, currency risks
- 10 year cost of data centre operation compared, with Iceland at 100.

About BroadGroup

Established in 2002, BroadGroup has achieved rapid recognition and growth through delivering quality research and insight in a number of niche and emerging areas of the telecommunications and technology sector. The Data Centre practice has been the main focus of the company since 2002. BroadGroup has now become the leading global research and consultancy group in this area, through three divisions; events, reports and consultancy.

The events business was launched at the end of 2004, both extending its value chain and market reach. In 2013, it will hold 15 events around the world, across Europe, Middle East and Asia. The flagship event, Data Centres Europe, attracted over 900 delegates and is now in its eighth year. Other events looked at different aspects of the data centre market from investment to power and cooling to demand in different regions of the world.

The reports business has produced a series of depth reports covering data centre markets in the UK, Europe and Eastern Europe, Asia and Latin America, the rise of managed services, the migration of outsourcing to third parties, and needs of particular vertical markets such as financial services.

The consulting business has expanded rapidly over the last five years, providing bespoke and customized services to users, operators, investors and development and government agencies, specifically in the data centre area.



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