ICELAND

By Fridrik Danielsson

Iceland has enjoyed strong economic growth in the past few years, well above the OECD average. GDP growth went from 3.9% in 1999 to 4.9% in 2000, creating some overheating and accompanying problems such as an increased current account deficit followed by a higher inflation rate during 2001. The economy has been stabilising lately, both the inflation and the deficit decreasing. The outlook is good for the near future, according to recent Central Bank forecasts. The larger public companies, registered on the Iceland Stock Exchange, turned in a healthy profit for the year 2001, much higher than 2000, despite the higher inflation, and considerable fluctuations in the exchange rate of the Icelandic krona. The value of the krona went down considerably during the second quarter of 2001, caused mainly by liberalisation of currency trade and monetary policies. This market driven devaluation has, however, turned out to be partly temporary and the krona has again stabilised closer to previous levels.

Although small, Iceland has for a number of years been in the top-five league (which includes also the US, Switzerland, Norway and Luxemburg) as measured by GDP *per capita*. Dependence on fisheries´ products, which was by far the dominating export during most of the twentieth century, has decreased steadily and now accounts for less than 40% of external trade. Besides power production and the output of energy-intensive products, new sectors are expanding, including biotechnology, information technology, specialised equipment and pharmaceuticals, as well as service sectors such as tourism.

Geothermal Research and Development

Over half of the primary energy used in Iceland is geothermal. The bulk is produced as hot water for residential heating, but an increasing share is used for electric power production and industrial processes. There has been a steady development in this field, both in extracting the heating medium (water, steam) from the crust reservoirs, optimising the geothermal field utilisation, and in developing equipment and technology for energy production. As only a fraction of the geothermal resource has been harnessed, continued development in this industry can be expected as the market expands.

The main geothermal energy companies and the National Energy Authority (NEA) have now joined forces in a new research project, Iceland Deep Drilling Project (IDDP). The plan is to drill holes 4-5 km deep into the high-temperature hydrothermal systems to reach 400-600°C supercritical hydrous fluid. Three areas in Iceland have been selected for drilling. They are on the rifted tectonic plate margin of the Mid-Atlantic Ocean ridge. The deep water masses are of both meteoric and seawater origin. This research could increase knowledge of the geothermal systems, both those present use, as well as the deeper ones, and thereby enable extraction of much more energy, potentially an order of magnitude higher production rate, and even chemicals from the hydrous fluid. Present high-temperature extraction fields are roughly half as deep and have half the temperature as compared with the deeper fields. The IDDP has support from the International Continental Scientific Drilling Programme (ICDP) and is working jointly with them on the project.

New Power Projects

Electric energy production, primarily hydro-electric but also geothermal power, is among the fastest growing sectors. Iceland now holds the world record in *per capita* production of electric power, followed by Norway and Canada. Many of the projects are a result of metallurgical plant projects, primarily aluminium.

There are a number of hydro-electric power projects in various stages of completion. National Power Co. (NPC) has recently commissioned a 90 MW plant and has several other projects, which will add several hundred MW to production capacity. The next will likely be the 110 MW Budarhals hydro- power plant. The 690 MW Karahnuka plant is nearing the construction phase and could come on stream 2005-2006.

The State Electricity Co. (RARIK) has plans for both small and large new power plants. In the northwest a 33 MW plant is approaching construction phase and could begin power production in 2005. A 185 MW plant in the same area is also planned and could come on stream a few years later.

Geothermal electric power production is also expanding. The NPC plans to expand its Krafla geothermal electric power plant by 40 MW, to 100 MW. It is also preparing a new plant in Bjarnarflag, which would add a further 40 MW to its geothermal electricity production.

The Reykjavik Utility (Orkuveita Reykjavikur) produces 90 MW, after a 30 MW expansion came on stream in 2001. It is drilling holes in new areas and is expected to increase production considerably in the near future, both for selling to industry and supply to a growing population centre in the Reykjavik area. Sudurnes Regional Heating Co. has new drill holes ready for steam production and plans to increase geothermal electric power production considerably, partly to furnish power for new expansion projects in the aluminium industry. The State Electricity Co. plans to build a geothermal electric power plant in Hveragerdi in the south, where a 10 MW plant will be the first step.

There are other energy projects in either the study or preparatory stage; geothermal and hydro-electric, large and small, and some of these could come on stream at relatively short notice as and when new buyers or market expansion demands.

Aluminium

Primary aluminium production has been the fastest growing sector in terms of energy consumption. A new record was set in 2001 when production reached 242,526 t.

The ISAL plant, owned by the Alcan Group, and the larger of the two aluminium plants operating in Iceland, produced a record of 168,276 t during 2001. ISAL is studying expansion of the plant to potentially 460,000 t/y, the studies include environmental and operating studies and power accessing.

Nordural, owned by Columbia Ventures of the US, commissioned an expansion during 2001 which brought the capacity up to 90,000 t/y. Nordural has already obtained permits to expand the plant further and is now in discussions with power companies. The plant could eventually be expanded to about 300,000 t/y. An expansion to 180,000 t/y is likely to be the next step. Preparations are presently gaining momentum and could reach a go-ahead decision shortly.

The Noral project in east Iceland, where Icelandic investors together with Norsk Hydro have been planning a 240,000 t/y plant, has now been delayed. New partners could potentially be joining the Noral project, which is the biggest aluminium project in Iceland hitherto. Project preparations, including the Karahnuka power plant and other infrastructure preparations, have reached a stage where implementation could begin with a short lead time.

Aluminium Production (t)

	1999	2000	2001
ISAL	163,653	168,028	168,276
Nordural	57,780	57,693	74,250
Total	**221,433**	**225,721**	**242,526**

Ferroalloys

The Icelandic Alloys plant, now owned 72.6% by Elkem of Norway, has three furnaces in

operation with total capacity of 114,000 t/y of 75% FeSi. The production increased during 2001 to 112,600 t (smaller quantities of lower and higher Si-content are also produced) with output from a new third furnace.

Ferroalloy production (t)

	1999	2000	2001
FeSi (as 75%)	68,754	108,400	112,600

Industrial Minerals

The diatomite plant on Lake Myvatn, owned by Allied Efa Ltd, set a new production record of 30,434 t of diatomite during 2001. Allied Efa has plans to produce precipitated silica by a proprietary process it has been developing.

The Steinullarverksmidjan mineral wool plant commissioned a new packaging system during 2001, which will enhance both production and efficiency. The wool is spun from electrically melted basalt sand sourced near by. The government and the local council, who are shareholders in the plant, are selling their stock to private interests.

The cement production of Icelandic Cement Ltd decreased somewhat during 2001.The plant now has competition in the Icelandic market, after Alborg Portland of Denmark established a storage and distribution system in Iceland during 2000. Icelandic Cement Ltd uses shell sand, abundant in seabed sediments off the west coast of Iceland, and local rhyolite. The shell sand, a low-cost source of calcium carbonate, is also used as a lime source for other purposes inside Iceland. Off the northwest coast of Iceland are layers of maërl, which are now being studied as a source of carbonates. The maërl contains more magnesium than the shell sand, and could find numerous uses inside the country as well as for some exports.

Pumice exports decreased again after an increase in 2000. Pumice is sensitive to fluctuations in exchange rates, freight costs and conditions in the European light weight building aggregate market.

Industrial minerals production (t)

	1999	2000	2001
Diatomite	28,482	27,614	30,434
Mineral wool	7,850	8,250	7,812
Cement	133,647	142,600	127,660
Pumice (export)	77,285	123,837	76,699

Scrap and Recycling

Export of ferrous scrap as well as aluminium increased during 2001. Some scrap is used for remelting and casting purposes inside the country, in small quantities.

Metal scrap exports (t)

	1999	2000	2001
Ferrous	21,206	28,726	32,919
Aluminium	4,916	6,136	8,366
Copper	288	373	355
Lead	111	108	1.3*

** figures exclude recycled car batteries*

Search for Oil and Gas

Iceland is neither an oil nor a gas producer. Some research is, however, going on into potential gas or oil fields in Iceland and on the ocean floor north and east of Iceland. Some indications are that similar formations could be found there as in the North Sea off the Norwegian coast. A Norwegian company has done seismic measurements in an area northeast of Iceland. The results of those measurements, which are expected shortly, could create further interest and research projects, if they turn out to be positive. Organic gases have been found from drill holes on land in northeast Iceland, further research effort is being mounted to determine the extent and type of potential oil and gas fields.

Layers of methane hydrates are also expected to be found on the ocean floor, close to the slopes of the continental shelves. The studies of these are, however, at an early stage.

Studies have been conducted on establishing an oil refinery in Iceland, potentially for refining crude from northern Russia or even the North Sea or other sources.

New and Future Projects

Primarily energy intensive projects are continuously being studied in Iceland by various interested parties. Local advantages other than power costs also draw attention from investors, including low cost industrial land, a flexible labour market, liberal laws and taxation, good trade relations with the rest of the world and political stability. Many of these projects are based on importation of mineral products into Iceland and the use of various electrically powered reduction processes, such as thermic or electrolytic, to produce metallic elements.

Icelandic Magnesium Co.'s. magnesium project is based on favourable local conditions, such as low energy cost of both electricity and steam. Australian Magnesium Co., a partner in the Icelandic Project, has now started construction of the 90,000 t/y Stanwell plant in Queensland, Australia.

In northeast Iceland, alumina production is being studied in co-operation with Russian participants, including the potential for an aluminium smelter. Many smaller energy-intensive projects are being studied, most of them in connection with planned electric power projects.