Landsvirkjun

The founding of Landsvirkjun in 1965 may be traced to the Icelandic government's interest in increasing the utilisation of energy resources by attracting foreign investors for power-intensive industry in Iceland. At this point, Landsvirkjun was established for the purpose of constructing and operating power plants which could both sell electricity to power-intensive industries and provide the general market with electricity at reasonable prices. Up to this time, the electrification of Iceland had been managed by government and municipalities around the country; however, these utilities were incapable of financing new energy projects.

Through its own means, Landsvirkjun has managed to develop its power system since 1965, with installed capacity expanding from about 90 MW to 1212 MW, rising to ower 1900 MW with the new Kárahnjúkar Hydro Station. At the same time, electricity prices on the general market have declined in real terms, while electricity sales in foreign currency to power-intensive industries have increased up to about 80% of the company's electricity production. Furthermore, the quality and security of supply from Landsvirkjun's ranks among the best in the world.

Production and demand of electricity

From the time the company was first started until the end of the 1970s, the company built three power stations on the rivers Thjórsá and Tungnaá. During these early years, electricity sales were increasing to the Straumsvík aluminium plant, and sales were also negotiated with the company Icelandic Alloys at Grundartangi. Towards the end of the period, weather conditions and mushrooming demand resulted in a power shortage in Iceland, making construction of the Sigalda and Hrauneyjafoss plants in the late sventies a race against time.

In 1983, Landsvirkjun became a national electricity company, whereas its operation up till then had been limited to the south and west of Iceland. The period of 1982 to 1996 was characterised by only a small increase in electricity demand and no success in attracting foreign investors to power-intensive industry projects in Iceland. It was in those years that Landsvirkjun built the Blanda Hydro Station, with many criticising the resulting surplus supply of electricity.

In 1995-96, however, circumstances became favourable for attracting foreign investors in heavy industry. Landsvirkjun negotiated contracts for increased energy purchases by the Straumsvík aluminium plant, Icelandic Alloys and a new aluminium plant, Norðurál. All those contracts were completed in just under a year. This introduced a period of intense development at Landsvirkjun, which increased its production by about 60% in five years. The power plants at Blanda, Búrfell and the geothermal plant, Krafla, initieally built by the Icelandic State, were enlarged, and new plants were constructed at Sultartangi and Vatnsfell in south Iceland.

In 2002 negotiations were concluded for electricity sales to Alcoa Fjardaál at Reydarfjördur. Construction therefore began on Kárahnjúkar Power Plant at the beginning of 2003, which results in another 60% increase in Landsvirkjun's electricity production.

Environment

Plentiful electricity supplies are one of the cornerstones of the living standards that a modern society requires. Iceland is more fortunate than most countries in being able to produce its electricity by harnessing hydropower, a renewable and nonpolluting source. It has no need to produce electricity from energy sources that cause atmospheric pollution or ecological damage, such as the burning of fossil fuels, or involve the risk of radioactive contamination that accompanies nuclear reactors. Construction of hydropower plants nonetheless inevitably results in some disruption of land and vegetation. Hydropower development generally calls for the creation of reservoirs to level out daily and seasonal fluctuations in water flow, along with canals to carry the water to and from power houses. Landsvirkjun strives to plan its development projects so as to minimize environmental impact and maintain the existing ecological balance.

Blanda
hydropower station

Specifications:

Catchment area :	1,520 km^2
Average discharge:	39 m^3/s
Gross head:	287 m
Main reservoir:	56 km^2
Usable storage capacity:	400 Gl
Intake reservoir:	5 km^2
Usable storage capacity:	20 Gl
Installed power capacity:	
3 (50 MW) Francis turbines	150 MW
Annual production capacity:	720 GWh
Commissioned:	1990 ??

	height	Length
Blanda dam:	44 m	800 m
Kolka dam:	25 m	1,300 m
Gilsá dam:	34 m	1,000 m
Diversion canals:		9,800 m
Intake canal:		1,300 m
Tailrace canal:		1,200 m
Access tunnel:		800 m
Tailrace tunnel:		1,700 m

Planning and Design:
Buildings and equipment: Verkfrædistofa Sigurdar Thoroddsen hf.
Electrics: Rafteikning hf.
Architecture: Arkitektastofan hf.
Main contractors:
High-voltage switchgear: Merlin Gerin, France
Turbines, generators and control equipment:
Sumitomo Corporation, Japan
Gates and pipes: Vélsmidja Orms og Víglundar, Metalna, Slovenia.
Dam building and waterway construction: Fossvirki hf., Hagvirki hf.
Manufacturers of turbines, generators and transformers:
Fuji Electric Co. Japan, EB National Transformer, Norway.

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Landsvirkjun
National Power

Blanda station

The idea of harnessing the River Blanda in north Iceland was first raised in 1950, when systematic planning began for hydropower development in Iceland. Extensive studies were conducted during the 1970s aimed at establishing the most economical arrangement for harnessing the river. The basic design of the project was published in 1980. The Blanda power station is the first major hydropower project in Iceland which is in all respects designed by Icelanders.

The Blanda hydropower project was launched on the basis of a parliamentary resolution of May 6, 1982, which entrusted its construction and operation to the State Electric Power Works, along with design supervision and negotiations with local landowners. In August 1982, an agreement was signed between the Government of Iceland and Landsvirkjun, whereby the latter undertook construction and operation of the Blanda station. Construction work began in 1984 with a schedule providing for completion in 1988, but owing to market conditions the completion was postponed for three years. On July 1, 1990, the President of Iceland, Mrs. Vigdís Finnbogadóttir, laid the cornerstone of the Blanda power station.

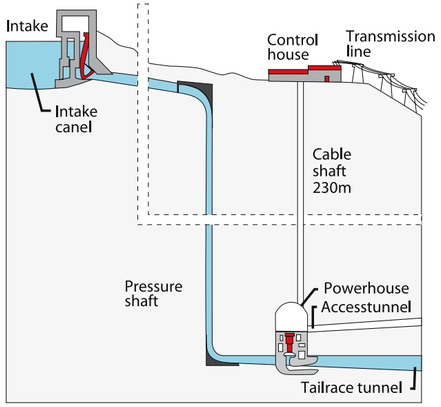
The first turbine unit went on-line in autumn 1991 and the station entered operation at full capacity with three turbine units in March 1992. Initially the main dam was not built to its full height and the reservoir was 39 km2 with a storage capacity of 220 Gl. In 1996 the dam was raised by 4 m and the reservoir grew to its designed size of 56 km2 with a storage capacity of 400 Gl.

The dam on the river Blanda is located roughly halfway between its source and estuary, at Reftjarnarbunga, a highly suitable area for creating a large main reservoir. Another dam was built to the west at the source of the Kolkukvísl tributary of the River Vatnsdalsá. Between them, the two dams created a reservoir measuring 56 km2 in area with a usable storage capacity of 400 Gl.

From the Kolka dam, the water is directed along channels and via a series of lakes for a total distance of 25 km. Created by a dam on the River Gilsá at Eidsstadabuga, the intake reservoir measures 5 km2 in area, having a usable storage of 20 Gl.

Water is diverted from the intake reservoir along a 1,300 m headrace canal to the intake. After entering an inclined steel penstock, the water drops down a 230 m long vertical steel-lined pressure shaft to the three 50 MW turbines in the power house. The powerhouse is located in a cavern more than 200 m below ground level, and measures 12 by 66 m in area and 28 m in height. From the turbines, the water is conveyed through a 1,700 m long tailrace tunnel, entering the river again which has been deepened along a 1,200 m stretch.

Power cables have been installed in a vertical shaft leading from the powerhouse turbines to the control house on the surface directly above it. Control cables linking the control house and powerhouse, along with a staircase and lift, are also installed in the shaft. Transformers are located at the control house as well as switchgear for transmission of the generated electricity.



A 132 kV double circuit transmission line links the Blanda power station to the national grid 12 km to the north. Electricity production by the Blanda station is remote- controlled via optical cable and microwave link from a dispatch centre in Reykjavík. Station personnel, engineers and electricians, are primarily responsible for maintenance and supervision.

Vegetation once covered a large part of the land that was flooded by the Blanda power station main reservoir and intake reservoir. Under an agreement with the local communities, the developer compensated for the loss of vegetation with a reclamation project on eroded land on the heaths of Audkúluheidi and Eyvindarstadaheidi on either side of the River Blanda. Since 1981, Landsvirkjun has cultivated over 3,000 hectares of land by fertilizer treatment and sowing, under the most extensive reclamation project ever undertaken in Iceland's highlands.

Environment

Landsvirkjun emphasized careful preparation of hydropower projects with detailed studies covering as extensive a field as possible. In connection with its largescale reclamation programme on the heaths above the Blanda power station, Landsvirkjun has funded studies of soil and grass stocks, and of the grazing tolerance and nutritional value of revegetated land compared with natural pastures. All this work is part of a comprehensive research project into reclamation of eroded highland areas, which is the most extensive and detailed study ever made of the results of reclamation in Iceland and its ecological impact on the barren desert wilderness. The findings enable more systematic reclamation measures to be implemented in the entire central highlands of Iceland.

Landsvirkjun has also commissioned extensive studies of the Blanda ecosystem, beginning before development commenced, in order to assess the impact of the power station on fish migrations and catches in the river. Iceland's central highlands are a sensitive area whose development clearly calls for caution to be exercised. No major environmental accidents have occurred during harnessing of Iceland's energy resources, but constant alertness to the risk is necessary in order to avoid them. This should be possible to achieve by close cooperation among all interested parties, guided by a desire to reconcile different viewpoints and avoid conflicts. Only in this way can Iceland successfully increase its energy utilization in harmony with nature and the environment, which is vital for maintaining high living standards in the future.