

### Petrína Steingrimsdóttir

Where the land dips north of the Sigalda Station is a very unusual grave. It is the resting place of Petrína, a Dodge Weapon '42.

For the last years of her life, Petrína was owned by Halldór (Dóri) Eyjólfsson from the nearby farm of Raudalækur. When she expired in 1981, Dóri had her buried in Einarsdalur valley at Sigalda. A church minister was present at the ceremony but Halldór ritually sprinkled the first shovelfuls of earth into the grave himself.

Before Petrína came into Dóri's possession it was the main vehicle used by surveyors from the Directorate of Electricity (1951-1959) and was engaged on projects including surveying of the entire length of the courses of the glacial rivers. At this time there was no hydropower development in the area and all the roads were unbridged. Tungnaá was generally crossed at the Höfsvad fording point south of where Tungnaá now enters Krökslón.

On one of her last trips for the Directorate of Electricity, Petrína's gearbox broke. The car rolled



Petrína; b. 1942 - d. 15. Sept. 1981

backwards down Frostastadahlás ridge on the Landmannalaugar side, and ended up off the road. Petrína was not up to much after that, so Dóri from Raudalækur, who had always been her driver for the Directorate, bought her.

Surveyors nicknamed the car Petrína after Petrína Jakobsson, who ran the Directorate of Electricity's graphics department. The car was designated as the "daughter" of Steingrímur Pálsson, a surveyor at the Directorate in the 1950s.



Hrauneyjafosslón reservoir

## Key figures

### Sigalda station

First turbine on stream	1977
Drainage area	4210 km <sup>2</sup>
Average discharge	154 m <sup>3</sup> /s
Harnessed discharge	132 m <sup>3</sup> /s
Gross head	74 m
Installed capacity, Francis turbines	3x50 MW
Annual energy production	650 GWh
Headrace canal	1000 m
Tailrace canal	550 m
Sigalda dam	Crest 42 m
	Length 925 m
Krökslón reservoir at surface	498 m.a.s.
Surface	14 km <sup>2</sup>
Storage	140 GI

Design: Virkir hf, Iceland, and Electro-Watt Engineering Services Ltd., Switzerland

Architect: Guðmundur Kr. Kristinsson

Machinery and electrical equipment: Brown Boveri & Cie, West Germany and Energomachexport, Soviet Union

Gates and penstocks: Sorefame, Portugal

Main contractor: Energoprojekt, Yugoslavia

### Hrauneyjafoss Station

First turbine on stream	1981
Drainage area	4272 km <sup>2</sup>
Average discharge	155 m <sup>3</sup> /s
Harnessed discharge	154 m <sup>3</sup> /s
Gross head	88 m
Installed capacity, Francis turbines	3x70 MW
Energy production in 2000	1034 GWh
Headrace canal	1000 m
Tailrace canal	1100 m
Hrauneyjafoss dam	Crest 15 m
	Length 3000 m
Hrauneyjafosslón reservoir at surface	425 m.a.s.
Surface	8,8 km <sup>2</sup>
Storage	33 GI

Design: Verkfræðistofa Sigurðar Thoroddsen hf., Iceland

And Harza Engineering Company International, USA

Architects: Guðmundur Kr. Kristinsson and Gunnlaugur Halldórsson

Machinery and electrical equipment: ASEA, Sweden

Gates and penstocks: Magrini Galileo, Italy

Transformers: EFACEC, Portugal

Main contractor: Fossvirkir, Iceland

### Vatnsfell Station

First turbine on stream	2001
Drainage area	2833 km <sup>2</sup>
Average discharge	80 m <sup>3</sup> /s
Harnessed discharge	160 m <sup>3</sup> /s
Gross head	65 m
Installed capacity, Francis turbines	2x45 MW
Estimated energy production in 2001	450 GWh
Headrace canal	700 m
Tailrace canal	2400 m
Main dam	Crest 30 m
	Length 750 m
Vatnsfellslón reservoir at surface	563 m.a.s.
Surface	0,6 km <sup>2</sup>
Storage	3,2 GI

Design: Hönnun hf., VST hf., Rafhönnun hf., Iceland

Architect: Gláma-Kim, Iceland

Machinery and electrical equipment: GE Hydro, Canada and Clemessy, France Gates and penstocks: Alstom Hydro, France

Main contractor: slenskir adalverktakar ehf., Arnarfell ehf., Iceland

Project supervision: Lahmeyer International, Germany

VSO ráðgjöf ehf. and Almenna verkfræðistofan hf., Iceland

### Lake Thórisvatn

Reservoir entered service	1972
Average drainage over 8-month period 1999-2000	80 m <sup>3</sup> /s
Thórisvatn at surface	577 m.a.s.
Surface	83 km <sup>2</sup>
Storage	1400 GI
Drainage area	2783 km <sup>2</sup>

### Hágöngulón reservoir

Reservoir entered service	1998
Hágöngulón reservoir at surface	816 m.a.s.
Surface	34 km <sup>2</sup>
Storage	320 GI
Drainage area	600 km <sup>2</sup>

### Kvíslaveita diversion

Diversion entered service	1981-85, 1996
Average drainage over 8-month period 1999-2000	44 m <sup>3</sup> /s
Surface area of Kvíslavatn	24 km <sup>2</sup>
Surface area of Thjórsárlón	3,5 km <sup>2</sup>
Diversion length	
from Thjórsá dam to Lake Thórisvatn	53 km
Drainage area Thjórsá dam	823 km <sup>2</sup>
at Köldukvísl	1256 km <sup>2</sup>

## Landsvirkjun

Landsvirkjun was established in 1965 on the basis of plans for development of power-intensive industrial projects in Iceland. Its mission is to provide its customers with the best energy solutions to create the basis for the modern quality of life they desire. Employees and management at Landsvirkjun strive to make it a reliable and environment-friendly company, a leader in its field, which is prepared to tackle new challenges for the benefit of its customers, staff and owners. The aim is to create an increasingly flexible company, which knows its customers' needs and fulfils them in accordance with individual requirements. Landsvirkjun is jointly owned by the Icelandic State (50%), City of Reykjavík (45%) and Town of Akureyri (5%).

Due to hydro development in remote places such as the Thjórsá/Tungnaá basin, roads have been built which open up access for the general public to new areas. Thjórsárdalur is a good example of a popular sightseeing spot for travellers, which was linked up by road following work on the Búrfell project. Traffic has also grown at the Tungnaá basin stations as travel increases and communications improve. More visitors mean more responsibility. Landsvirkjun emphasizes good cooperation with the community. Efforts are made to improve the environment and also to care for sensitive places, which are visited by large numbers of travellers.

In recent years Landsvirkjun's stations have been open to the public in summer and thousands of people have taken advantage of the opportunity to visit them. A wide range of cultural events have been set up at the stations, such as exhibitions in partnership with the National Museum of Iceland and Association of Icelandic Visual Artists, concerts and chess tournaments. Visitors have learnt about energy and environmental issues as well as finding out about the electricity production process. Admittance to Landsvirkjun power stations is free of charge.

## The Tungnaá area



## The Tungnaá area



*Hrauneyjafoss Station*

### Hrauneyjafoss Station

Construction of Hrauneyjafoss Hydro Station began in 1977 and it went on stream in 1981-82. Its three 70 MW turbine units are the most powerful employed in the Icelandic electricity system. A dam has been built on the River Tungnaá, on a plain between Hrauneyjafoss waterfall and the Sigalda Station, to create an 8.8 km<sup>2</sup> reservoir. A 1 km headrace channel runs northwards through a dip in the Fossalda hill to an intake point by its northern edge. Three steel penstocks with a diameter of 4.8 m convey the water 272 m down the slope to the powerhouse. The harnessed head is 88 m. The tailrace channel, just over 1 km in length, enters the Spordöldukvísl waterway, which leads to the old course of the River Tungnaá. Gas-insulated switchgear is housed inside the powerhouse. One 220 kV transmission line links Hrauneyjafoss to Sigalda Station and another to Sultartangi Station. The powerhouse wall is decorated with the artwork “Against the Current” by Hafsteinn Austmann.

At the peak of construction activity, 640 people were employed on the site. Now roughly two dozen people are

employed at the power station, and are also responsible for monitoring and servicing the Sigalda and Vatnsfell Stations.

#### *Leisure and travel*

Hrauneyjar is conveniently situated on the edge of the highlands, a focal point where roads diverge to all the most popular sights in the region. It is not far from the Landmannalaugar nature reserve and the Veidivötn lakes, and also lies on the main Sprengisandur route across the Central Highlands. Communications with this part of Iceland have improved enormously in recent times and there is now a surfaced road on the Ring Road out of Reykjavík and all the way to Vatnsfell Station.

The visitors' centre at Hrauneyjafoss Station includes a large-scale relief model of the South Central Highlands, which gives a clear presentation of the landscape south of the glaciers. About 1 km from the powerhouse is the Hrauneyjar Highland Centre, which provides services for travellers year-round. There is good angling to be had in Lake Thórisvatn and many of the pools in the region, and close by are Veidivötn, whose name (“Fishing Lakes”) shows that the lakes there have always been a favourite with fishermen.

### Sigalda Station

Sigalda is Landsvirkjun's second major hydro plant. Construction began in 1973 and the station's three 50 MW turbines went on stream in 1977-78. The river Tungnaá is dammed at the top of the chasm above Sigalda hill to form a 14 km<sup>2</sup> reservoir, Krókslón. The Sigalda dam is 925 m long, an earth-fill dam with asphalt covering on the reservoir side. Water from the reservoir is channelled along a 1 km headrace canal through the hill to the intake point on the western edge of Sigalda. From there, three 216 m penstocks, 4.3 in diameter, lead to the powerhouse which is located north of the old river course and partially underground inside Sigalda. The harnessed head is 74 m. A tailrace canal leads from the powerhouse to the Hrauneyjafoss reservoir. The Sigalda Station is linked to the national grid by 220 kV transmission lines to the Sultartangi, Hrauneyjafoss and Vatnsfell stations, and a 132 kV line to the southeast. Personnel at Hrauneyjafoss Station service Sigalda.

*Sigalda Station*



### The River Tungnaá

The Sigalda and Hrauneyjafoss stations utilize the head of the River Tungnaá as it falls over the tuff ridges at Sigalda and at Fossalda by Hrauneyjafoss respectively. Long, rounded tuff hills characterize the River Tungnaá hydro area. They were formed during the Ice Age by subglacial eruptions and lie parallel to the SW-NE trending North Atlantic Ridge. After the Ice Age, major lava flows followed the course of the river down from the highlands, the Tungnaárhraun lava fields. Gradually they filled up depressions in the land and diverted Tungnaá northwards towards Sigalda. There the river formed a lake, which has now been restored as Krókslón, and had drained some 3,000 years ago when Tungnaá carved a chasm through Sigalda. Before the site was developed for hydropower, the river flowed through the area between Fossalda and Sigalda where Hrauneyjalón reservoir is now located. The river's bedload gradually blocked the porous lava and a number of islets were formed from which Hrauneyjafoss (“Lava island waterfall”) derives its name.

*The river Tungnaá*



### Vatnsfell Station

Construction began at Vatnsfell Station in June 1999 and the turbines went on stream in autumn 2001. It utilizes the head in the diversion canal between Lake Thórisvatn and the Sigalda Station reservoir Krókslón. A 730 m long and 30 m high dam lies across the canal, plus two side dams, to create a small intake reservoir. Water is carried from the intake in two 126 m steel penstocks, 4.5 m in diameter, to two turbines in the powerhouse with a capacity of 45 MW each. The harnessed head is 67 m. A tailrace canal leads from the station to the Krókslón reservoir. A 220 kV transmission line links the station to the Sigalda Station. Personnel from Hrauneyjafoss Station service the station.

Unlike other hydropower stations in Iceland, Vatnsfell only produces electricity in the winter when water is diverted along a canal from Lake Thórisvatn to Krókslón. This reflects the fact that electricity consumption in Iceland peaks in the winter. Vatnsfell is therefore a “peak station”, mainly producing during periods of heavy load.

*Vatnsfell Station in September 2001*

