Translation from Icelandic of an article printed in Morgunblaðið 15 November 1998:

The people of Húsavík participate in preparations for three geothermal power plants.

Free Enterprise is the Condition for the Most Economical Power Plants

A new leader of energy matters has led the people of Húsavík to instigate the harnessing of nearby geothermal areas, where the possibility is at hand to produce electricity at the same price as in intended hydro power plants north of Vatnajökull. They plan to be ready for the privatisation of the energy sector or when a heavy industry company sees the area's good points. Mr. Helgi Bjarnason interviewed Húsavík's civil engineer, Mr. Hreinn Hjartarson, regarding plans and possibilities.

Húsavík Energy Utility is working, in conjunction with other energy companies and local governments, to prepare for three geothermal power plants in the vicinity of Húsavík. The Energy Utility is working on the transportation of 125° C hot water to Húsavík, for the renovation of the town's heating system, and also in preparation for a small electricity production plant. At the same time, the Company is participating in the preparations for a power plant in the Öxarfjörður geothermal area and has instigated preparations for the same type of power plants in the Þeistarreykir geothermal area.

"This is the result of our general interest in utilising the nearby natural resources to encourage the area's economy," says Mr. Hreinn Hjartarson, Húsavík's civil engineer. He is born and brought up in Húsavík and holds a master's degree in electrical engineering from the Aalborg University in Denmark. Mr. Hjartarson worked for Reykjavík District Heating for eight years, e.g. as local engineer for the Nesjavellir Power Plant, but took over the Chairmanship of Húsavík Energy Utility in March 1996, after the consolidation of the Heating Distribution and the Electricity Distribution of the municipality. It is therefore perhaps not surprising that a man with such a background should enter the energy harnessing matters with audacity.

He says that the possibility of using geothermal energy to produce electricity has not been considered to any extent. "I have managed to capture people's attention to the fact that these are resources which we should utilise. The political environment in Húsavík has been, and still is, positive. People understand that it is perhaps wiser to invest in the energy than in the fishing industry and see whether it will not create something new."

The Húsavík and Akureyri energy companies and the local municipalities have assured access to the largest remaining energy sources in the area; the Öxarfjörður and Þeistarreykir geothermal areas. Mr. Hjartarson says that it is actually deplorable how locals, at the time, more or less gave away the great resources in the Krafla and Bjarnarflag geothermal areas and the water power in Laxá.

The Heating Distribution's renovation

When Mr. Hjartarson took over the energy matters' direction, the most pressing project was the renovation of Húsavík's Heating Distribution. The water is piped a 20 km way from Hveravellir to Reykjahverfi. The Heating Distribution needs more water and the water main needs to be renovated. In the summer of 1997, 65-80 l/s of 124°C hot water came out of a drill hole made by the Energy Utility in Hveravellir. The area already had one drill hole from 1974, which yields 25-44 l/s of 129°C hot water.

Following this, a survey was done to check the economical feasibility of piping the water to Húsavík, to be able to offer 125°C hot water to industries and produce electricity from the leftover energy. The water is too hot for the Heating Distribution's general use, but after being used for producing electricity or for industrial purposes, it will be at the right temperature for the Heating Distribution. According to Mr. Hjartarson, survey's results were that this would be practical. The electricity price from the power plant would be just over IKR 2,0 per kWh, but the Energy Utility actually buys electricity from Iceland State Electricity for IKR 3,5 per kWh. The whole project's estimated cost is IKR 700 million, thereof IKR 250 million for the electricity power plant. The Energy Utility and its cooperators have received a IKR 50 million grant from the EC for the project, which is deemed to be of technical interest. The first industries, which plan to use the 125°C hot water, are the shrimp plant of Húsavík's Fish Industry Cooperation and the Milk Division of Þingeyjarsýsla's Co-op. The overheated water will replace steam, which the Companies now produce with fuel. "A new pipe will increase by four times the energy transportation from Hveravellir to Húsavík and many interesting industrial possibilities will be created when we can offer overheated water."
The new Heating Distribution and the electrical power plant's preparations are underway. E.g., a drill hole has been drilled at Hveravellir, but so far, not enough water has been found. Mr. Hjartarson says that the water is hot enough, the question is simply when it can be tapped. A deal has been made for the purchase of material for the water main and offers for the electrical power plant's turbines are being looked over. Initially, the plan was for a 1,2 to 1,5 megawatt plant, but the offers are for up to a 2,1 MW plant. This production would take care of 60-80% of Húsavík's electricity needs. At the moment, preparations are being made for an application to the Ministry of Industry for a building permit for the electricity power plant and Mr. Hjartarson is optimistic that the permit will be granted. "The pipe is almost useless – it was supposed to last for 20 years and it is now 10 years past that time. There is no way to renovate it without an effort such as this. On top of that, we have received a European grant for the project, which is considered of all-round general interest," says Mr. Hjartarson. He expects the power plant to be commissioned in a year and a half.
The Húsavík Heating Distribution has been one of the most economical in the Country. Recently, its prices were raised by 50%, to prepare for its renovation, but they still are only 80-90% of Reykjavík District Heating's prices. Also, industrial prices are only one fourth of the prices to the general public, or IKR 0,24 per kWh. The 125°C water will be offered at the same price. Mr. Hjartarson says that even if IKR 700 million is a great investment for a small community, the Energy Utility will be able to meet the loan payments with its own revenues, especially if they manage to attract new buyers, with favourable prices and new energy delivery possibilities.

Many possibilities in the geothermal areas

The Húsavík Energy Utility is the second largest participant in the research of the geothermal area at Bakkahlaup in Öxarfjörður, a project which has been dubbed "By the Öxar river". [From an old, very well known song]. The Company's other shareholders are the NPC, Akureyri Heating and Water Distribution, Akureyri Electricity Distribution, Jarðboranir, [Earth Drilling] Iceland State Electricity and the two municipalities in Öxarfjörður, but the project was started at the locals' instigation. Mr. Hjartarson says that the intention was to drill 400-600 m investigative holes this autumn, but because of Jarðboranir's busy schedule, there has been a delay. Now, the weather conditions and the danger of slush blockage in Jökulsá, make the drilling too risky. Instead the alternative of drilling an intial research hole of 1.500-2.000 m,

which could possibly be used as a production hole, is being considered. Jarðboranir are receiving a new medium-sized drill, which will make the drilling of such holes possible, with a more manageable cost frame, than when using huge drilling machinery.
The Orkustofnun has estimated that the Öxarfjörður area has energy sources for electricity production of around 250 MW for 50 years. Even closer to Húsavík is the Þeistarreykir geothermal area in Reykjaheiði. Its energy sources for electricity production are estimated at around 150 MW for 50 years. A survey, which the Energy Utility had made, gave the results that it would be practical to harness the geothermal heat to produce electricity or pipe the hot water over 25 km to Húsavík for direct industrial use. Steam transportation is considered a less inviting possibility, since steam transport is more expensive. Mr. Hjartarson says that since the geothermal working uses the energy much better than the electricty working, or almost ten times better, it is considered desirable to pipe 150-180° heated water to Húsavík to use in high energy industry.
The Þeistareykir geothermal area is at 300-500 m altitude and only a half-buried trail leads there. Mr. Hjartarson and other inhabitants of Húsavík have discussed the pros and cons of building a new road between Öxarfjörður and Húsavík through Reykjaheiði instead of the Tjörnes road, which the intention is to renovate. He says that unfortunately, the powers that be, do not seem to want to consider this possibility. The Reykjaheiði road would be at a 300 m altitude. He does not believe that this road would be more expensive and would have no more snow-blockage problems than the Tjörnes road, in spite of the altitude. Also, it would have the advantage of shortening the road east to Öxarfjörður by 20 km. This would put the Þeistareykir geothermal area next to a main road and the possibilities of building an industrial plant there would increase the energy's value.

A Company for building a power plant at Þeistareykir

Even if Þeistareykir is between Reykjahverfi and Öxarfjörður, the land belonged to Helgastaðir district and after its division into Aðadalur district and Reykjadalur district before the turn of the century, it is believed to belong to the Aðaldælir district. The farm at Þeistareykir was abandoned around 1870, but the two districts bought the land communally from the State in 1915, apart from the sulphur mines and its mining rights. The land has been used by the districts' farmers for grazing.
Mr. Hjartarson was the instigator for Húsavík's cooperation with the district committees in Aðaldalur and Reykjadalur on research and harnessing of the geothermal area. At a later stage, the Akureyri Heating and Water Distribution and Akureyri Electricity Distribution wished to join in. At the moment, a Company is being founded around the project. Húsavík Energy Utility will own 40%, the Akureyri Distributions a total of 40% and the local districts 10% each. A draft has been made for a contract, based on the contract which was made for the founding of the company for research in Öxarfjörður, with the local landowners. The local district counsils for Aðaldalur and Reykjadalur, have requested certain changes and a positive result is expected soon.
Road improvements should start next summer, along with search for cold water, which is necessary for drilling. Hopes are that a 1.500-2.000 m drilling hole can be drilled in the year 2000.

One third of NPC price

The continuation of both projects, By the Öxar river and Þeistarreykir, will depend entirely on whether there is a market for the energy, either for energy intensive industry in NE Iceland, or through access to the general market by founding a so-

called Countrynet, based on the Country's electrical distribution systems. "We want to be ready, when the market appears," says Mr. Hjartarson.
Mr. Hjartarson believes most likely that both places will start with a 30MW power plant. Most geothermal power plants are based on 30MW stages, e.g. at Krafla, Nesjavellir and Svartsengi. Smaller units are much less practical. A power plant of this size would cost around IKR 2,5 billion. If the drilling yields generally good results, electricity could be produced in a 30 MW power plant at Þeistareykir and in Öxarfjörður for around IKR 1,0 per kWh. Geothermal energy could be sold even cheaper. Thus, hot water, piped from Þeistareykir to Húsavík, could cost IKR 0,20-0,35 per kWh, but the price would depend on the plant's size. Piped steam would cost double the price of hot water. On the other hand, steam bought on site, could be sold for just over IKR 0,20 per kWh.
Húsavík Energy Utility presently purchases its electricity from Iceland State Electricity for IKR 3,5 per kWh, which they, in turn, purchase from the NPC for IKR 3,1 per kWh. It is interesting what an economical choice the geothermal power plants seem to be. In comparison, they can produce electricity at half the price of the hydro power plants of similar size, such as the Villinganes and the Skagafjörður power plants, and at a similar price to the intended large hydro power plants north of Vatnajökull. Mr. Hjartarson says that the NPC has always put the main emphasis on hydro power plants and shown little interest in geothermal power plants, in spite of their obvious practicality. He agrees with the journalist that the difficulties in obtaining energy for the Krafla power plant will have scared people off and delayed the development in this sector. Mr. Hjartarson considers it ambiguous to start hydro power plant projects, especially if they are under debate for environmental reasons, when such good possibilities as goethermal power plants exist.

Not afraid of eruptions

A part of the geothermal areas in Þeistareykir and Öxarfjörður are registered as natural memorials, but the intented power plant areas are not specifically protected. Mr. Hjartarson believes it possible to build power plants there without any considerable disturbance to the nature. He points out that the Öxarfjörður power plant would be built on a desert, about 10 km from the sea and far away from habitation. On the other hand, Þeistareykir is a beautiful area, which would be somewhat spoiled by a power plant. Still, not many people visit the area and the Nature Preservation Society has included a power plant there, in its planning. Also, the nature of geothermal power plants is such, that there are no reservoirs, only blue lagoons, if people choose to have them, and the main constructions would be underground.
On the other hand, the emittance of greenhouse gases, CO_2 and HS is an unavoidable accessory to geothermal power plants. These gases exist in the geothermal system and will be released into the atmosphere over the time, whether the energy is harnessed or not, and Mr. Gestur Gíslason, geologist with Reykjavík District Heating, came to the conclusion that environmental effect from of greenhouse gases' emittance will be little from geothermal power plants.
Mr. Hjartarson believes that from an environmental point of view, it is much more desirable to build power plants in Þeistareykir and Öxarfjörður than submerge some of the areas north of Vatnajökull under a reservoir, as has been discussed.
The Þeistareykir and Öxarfjörður geothermal areas are situated in active volcanic areas. The Ministry of Industry's report on power plant possibilities mentions that Þeistareykir is a major active volcanic area. On the other hand, the volcanic acitivity has been very little in modern times, and the most recent lava in the area is 3.000 years old. It is also mentioned that there are no modern volcanic areas in Öxarfjörður,

the closest are 11 km away. Still, the Öxarfjörður area is very broken and a lot of fissure movement occurred at the beginning of the series of upheavals which started in 1975, when the well-known Krafla fires took place.
Mr. Hjartarson is not concerned with volcanic activity, since it is difficult to talk about active volcanic areas in this regard. No volcanic areas are known in the close vicinity of Öxarfjörður. And 3.000 years have passed since the last eruption in the Þeistareykir area, which can therefore not possibly be compared to Krafla, where there is activity every 200 years.
In researching the Öxarfjörður geothermal area, oil gases were found, which is unique in Iceland. When asked how people were preparing for eventually finding oil, Mr. Hjartarson says that provisions will be made for collecting gases, but that the drilling location will be chosen with regard to heat, and are much less likely to yield oil than the edges of the geothermal area.

Good industrial area

The prerequisite for harnessing the geothermal energy in Þeistareykir and Öxarfjörður is, as mentioned earlier, an existant market, either with new industry through access to the general energy distribution system.
Húsavík has not been on the top of the places mentioned with regard to energy intensive industries' location. Mr. Hjartarson finds this strange, since Húsavík is an ideal place for energy intensive industry of any size. There is abundant hot and cold water, possibilities for electrical production in the vicinity, abundant land for building, good conditions for harbour projects and a labour market of 4.000 people, as well as being close to a labour market of 20.000 people in the Eyjafjörður area.
The Húsavík municipality has bought the land Saltvík, adjacent to the town, south of it. It is a large area suitable for building, e.g. for industry, and the sea is deep close to the shore, which makes it possible to build a harbour for large vessels. In Húsavík, harnessable cold water exceeds 1.000 l/s and the possibility exists to obtain more water than all the municipalities in the Capital area use today.
Still, the energy remains Húsavík and surroundings' most important resource. In areas within a 50 km radius from Húsavík, e.g. in Öxarfjörður, Þeistareykir, Gjástykki, at Krafla, in Bjarnaflag and Laxá, around 1.000 MW can be harnessed to produce electricity. Presently, only one tenth of the energy capacity is utilised. The area's energy capacity totals all the existing power plants of the Country today and is similar to the three large power plants under discussion north of Vatnajökull. "The heavy industries should, of course, be located where it is easy to produce the energy and where other advantages are in place. This saves the building of power lines and transport costs, which are considerable," says Mr. Hjartarson and points out that not enough consideration has been given to the energy aspect in various decisions.

Free enterprise in the energy sector

Mr. Hjartarson also covets the general market and says that access to it would strengthen the foundations for power plants in the area, since they would be able to produce the electricity at a lower price than the NPC seems to be able to. There are still quite a few obstacles. Firstly, the line cannot take more transport to the SW corner of the Country. But Mr. Hjartarson believes that this will be taken care of, since the NPC cannot start their plans for a 90 MW enlargement of the Krafla power plant without considerable improvements.
The most important prerequisite is finally that the production and distribution of electricity be privatised. Mr. Hjartarson emphasises that he means real competition and that the NPC should not receive any priority to the existing market. It has been discussed to take the distribution system out of the NPC and use it, and the Iceland

State Electricity's distribution system, as well as the distribution system of the Vestfirðir Energy Collection, to found a so called Countrynet, into which all and sundry could buy access.

"The NPC wants to protect its position and limit competition buy only giving power plant permits for an increased energy market. This kind of competition is of little use, where one party has monopoly in most of the market. The NPC is waking up to the fact that they have not given enough consideration to cheaper energy production possibilities, such as geothermal harnessing, and other energy companies and municipalties have ensured national rights in the best areas, which will make the competition tough for the NPC. Still, the utilisation of these new areas depends entirely on the total privatisation of the energy sector. If this does not happen soon, the Country's best choices in energy harnessing could go unused," Says Mr. Hreinn Hjartarson.

One reason for the existing production and distribution companies' high prices is the balancing of the Country's energy prices. Mr. Hjartarson believes that it should only be fair that the people who live close to the energy sources should benfit from it, in the same way that the inhabitants of Reykjavík benefit from low consumer prices, the inhabitants of the Vestfirðir benefit from the closeness of the fishing grounds and the people of South Iceland benefit from the vicinity of the Country's biggest market, to name a few examples. "We should use the energy sources to attract people," he says.

A rewarding job

It can be said of Mr. Hreinn Hjartarson that he is the right person in the right place, at the right time. When he returned to Húsavík, he made a lot of people realise what the area had to offer with regard to nearby energy sources and the people of Húsavík have now instigated their utilisation. Mr. Hjartarson himself considers his job very rewarding and exiting because of the imminent changes. Now, the inhabitants of Þingeyjarsýsla, and their cooperators work systematically to be prepared for new times in the energy matters and to build power plants when the right situation arises.