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**On the Visit of the Iranian Ministerial
Renewable Energy Delegation
to Iceland 3–7 July 2002**

**Þorkell Helgason
Maryam Khodayar**

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OS-2002/037



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ORKUSTOFNUN – National Energy Authority of Iceland

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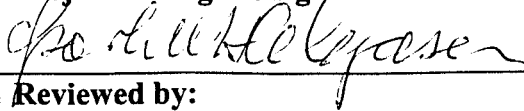
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| Abstract: The visit of an Iranian Ministerial Energy Delegation to Iceland in July 2002 is recounted. Meetings were held to inform about and discuss the geothermal energy development in Iceland and expert consultation to Iran in that field. The hydrogen programme in Iceland was also discussed. The main conclusions of the visit are summarised. | | |
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1. THE IRANIAN MINISTERIAL RENEWABLE ENERGY DELEGATION

An Iranian Ministerial Delegation visited Iceland from 3rd to 7th July 2002 at the invitation of the Director General of *Orkustofnun*, Dr. Þorkell Helgason. The Delegation was headed by the Deputy Minister for Energy Affairs, Ministry of Energy, Islamic Republic of Iran, and consisted of highly knowledgeable specialists in the field of renewable energies, as follows:

| | |
|--------------------|---|
| Mr. H. Chitchian | Deputy Minister for Energy Affairs |
| Dr. A. Kahrobaeian | Director General Renewable Energies Department Ministry of Energy Also Professor of engineering at the University of Tehran |
| Mr. Y. Armoudli | Managing Director Renewable Energies Organization of Iran, Ministry of Energy |
| Mr. M.A. Milani | Executive Director, Geothermal Energy Group |
| Mr. Kh. Khosravi | Site Manager, <i>Sabalan</i> Geothermal Power Plant |

Mr. Khosravi was the first Iranian *UNU* fellow to attend the *UNU* Geothermal Training Programme in Iceland in 1996, followed by six other Iranian *UNU* fellows from 1997 to 2000 (see list in Annex A).

A fact sheet, with background information about Iran and its natural resources is presented in Annex B of this report.

2. THE AGENDA OF THE VISIT

The visit of the Iranian Ministerial Delegation to Iceland, which lasted for three and half a day, proceeded as follows:

Wednesday 3rd July 2002

The Ministerial Delegation arrived in Iceland in the afternoon of Wednesday 3rd of July 2002. They were welcomed at *Keflavík* airport and accompanied to *Hotel Saga* by Dr. Maryam Khodayar and Mr. Jónas Heimisson. Dr. Þorkell Helgason greeted the Delegation upon its arrival at the hotel. The Delegation then had an informal dinner with Dr. Valgarður Stefánsson and Mr. Jónas Heimisson, hosted by *Orkustofnun*.

Thursday 4th July 2002

A meeting was held in the morning at *Orkustofnun* between the Iranian Ministerial Delegation and the following participants from *Orkustofnun*: Dr. Þorkell Helgason, Dr. Sveinbjörn Björnsson, Dr. Valgarður Stefánsson, Dr. Ólafur G. Flóvenz, Mr. Kristinn Einarsson, and Dr. Maryam Khodayar. During the meeting, Dr. Helgason and Dr. Flóvenz gave an introductory lecture outlining the geothermal resources and the organization of geothermal exploration and development in Iceland. The *United Nations University (UNU)* Geothermal Training Programme was also described, as well as the role of *ENEX hf.* Dr. Björnsson presented a brief overview of hydrocarbon exploration in Iceland.

Mr. Chitchian, presented his team of specialists, and expressed his wish that a fruitful co-operation between the Islamic Republic of Iran and Iceland on the issues of renewable energies could be established. The Delegation introduced a short overview of the current status of geothermal development in Iran, with special reference to the *Sabalan* Geothermal Power Plant Project. A few copies of the Iran Geothermal Status Report and the *Sabalan* project were distributed to the Icelandic participants. The Delegation then visited the divisions of Vatnamælingar (Hydrological Service), Rannsóknasvið (GeoScience), and the *UNU* Geothermal Training Programme at *Orkustofnun*. Icelandic specialists answered the technical questions of the Iranian Delegation on various aspects of geothermal drilling, power plants, water harnessing and related risks, as well as the *UNU* Geothermal Training Programme.

Mr. Helgi Bjarnason, Head of the Energy Division of the Ministry of Industry, invited the Iranian Delegation to lunch along with Dr. Porkell Helgason, Dr. Ólafur G. Flóvenz and Dr. Valgarður Stefánsson from *Orkustofnun*, and Mr. Jón Björn Skúlason from *Icelandic New Energy Ltd*. During the lunch, discussions were held on the general situation of energy in the Islamic Republic of Iran, on the Icelandic geothermal resources, and the Icelandic hydrogen projects.

In the afternoon, a visit was paid to the *Icelandic New Energy Company Ltd*. The Iranian Delegation was knowledgeable about the use of Hydrogen as a potential energy. They also had knowledge about the Icelandic initiative in this field, and were enthusiastic to learn more about that issue. Three presentations were made:

Mr. Hjálmar Arnason, Member of Parliament, introduced the background of the Hydrogen project and the original involvement by the Icelandic government. He also briefly presented the energy situation in Iceland, the prospects for future development, the Icelandic energy policy, as well as some ideas on how Hydrogen could play a greater role in that future. Mr. Jón Björn Skúlason, General Manager of *Icelandic New Energy (INE)*, introduced the company and its activities with specific reference to geothermal power. Mrs. Maria Maack, environmental manager of *INE*, described the social-economic and environmental research of the company and its other partners.

The Icelandic speakers outlined their efforts in making the Icelandic authorities and the decision-makers interested in participating in Hydrogen development and the possibility of success in the future. They also described the connection that *INE* has abroad. The outcome of the discussions is presented in chapter 3, below.

The meeting ended with a dinner, which was hosted by *Alþingi*, the Parliament of Iceland.

Friday 5th July 2002

Dr. Helgason organized a daylong field trip, guided by himself and by Dr. Khodayar. The first visit was to the *Nesjavellir* Geothermal Power Plant. Mr. Hólmsteinn Sigurðsson and his colleagues received the Iranian Delegation and outlined to them the history and the structure of the power plant. Technical details relating to the capacity, the design, and the operation of the power plant were then discussed. The visit was followed by a lunch at the invitation of *Reykjavík Energy*.

In the afternoon, the Delegation visited a hydro power plant on the river *Sog* at the invitation of the *National Power Company*. Mr. Þorsteinn Hilmarsson gave a presentation

on the power plant and answered the technical questions by the Iranian Delegation regarding the capacity, design, and the operation of the power plant.

The Delegation then visited *Kerið*, *Gullfoss*, *Geysir*, and the *Pingvellir* National Park.

Late in the afternoon, the Iranian Delegation had a meeting at *Pingvellir* with Dr. Þ. Helgason, Dr. V. Stéfansson, Dr. Ó. G. Flóvenz, Dr. M. Khodayar from *Orkustofnun*, and Mr. Claus Ballzus from *VGK*. The meeting summed up the visit of the Iranian Delegation to date and discussed in more detail possible co-operation between the Islamic Republic of Iran and Iceland. The outcome of the discussions is presented in chapter 3, below.

Dr. Helgason, *Orkustofnun*, then invited all present to a dinner at *Pingvellir* Hotel, after which the Delegation was taken to its hotel.

Saturday 6th July 2002

In the morning, Dr. Hjalti Franzson and Dr. Maryam Khodayar accompanied the Iranian Delegation to a drill site on *Hellisheiði* and visited a drill rig. The Delegation was given information on the geology of the geothermal area, on the drill site, and its related matters.

After the field visit, the Iranian Delegation was taken to a lunch meeting in Hotel *Saga* at the invitation of Mr. Albert Albertsson, the Deputy Director of *Hitaveita Suðurnesja*. Dr. Einar Tjörvi Elíasson, Mr. Ólafur Kjartansson, and Dr. Maryam Khodayar also attended the lunch meeting. During this meeting, Dr. Elíasson presented in detail the Company *ENEX hf* to the Iranian Delegation. Discussions took place about the possible role of *ENEX hf* in a future co-operation between Iceland and the Islamic Republic of Iran in the field of geothermal development and consulting. Dr. Elíasson then introduced a draft Memorandum of Understanding to the Delegation for scrutiny and amendment.

Mr. Albertsson, Mr. Kjartansson, and Dr. Khodayar then took the Delegation on a guided tour of the *Reykjanes* Peninsula, visiting various Energy Facilities and the *Blue Lagoon*. The Delegation first visited the *Trölladyngja* Geothermal Site and the *Eldvörp* Geothermal Well. Then Mr. Júlíus Jónsson, the Director of *Hitaveita Suðurnesja*, joined the group and a meeting was held at *Svartsengi* Geothermal Power Plant. During the meeting, Mr. Albertsson presented the Iranian Delegation with technical information on the design and the operation of the plant. The Memorandum of Understanding was amended slightly, and subsequently signed by the Iranian Delegation and Mr. Júlíus Jónsson (see Annex C). After the signature of the Memorandum of Understanding by the Delegation and Mr. Jónsson, the Delegation visited the *Svartsengi* Power Plant.

Hitaveita Suðurnesja invited the participants to a dinner at the *Blue Lagoon*. Further discussions were carried out between the Iranian Delegation, Mr. Albertsson, Mr. Kjartansson and Dr. Khodayar about the medical benefits accruable from the *Blue Lagoon*, and the possibilities of constructing similar facility (ies) in Iran. Details of these discussions are presented in chapter 3, below.

The Delegation was accompanied to their hotel in *Keflavík* after the dinner.

Sunday 7th July 2002

The Delegation left Iceland early morning Sunday 7th July 2002.

3. OUTCOME OF THE VISIT

The following points emerged from discussions that took place during the visit of the Iranian Ministerial Delegation.

At the Hydrogen meeting

The Iranian Ministerial Delegation was interested to learn more about the Hydrogen Programme in Iceland, the timeframe, possible costs, and the future strategy within Iceland, though the development of Hydrogen was not the highest priority of their trip.

Hopefully, after developing a positive relationship between the Islamic Republic of Iran and Iceland, and exchanging experiences regarding renewable resources, especially in the field of geothermal, a co-operation in Hydrogen field might follow. The Iranian Delegation realized that Iceland is taking its first step in this field, and that in the near future *INE* will acquire more experience and be able to give advice on a broader basis.

The Iranian Delegation suggested that Mr. Arnason should visit Iran to for discussions with the Iranian authorities and decision-makers.

At the *Pingvellir* meeting

The Renewable Energies Group of Iran is preparing a high-temperature geothermal power plant in the *Sabalan* region, northwest of Iran near an earthquake belt. Kingston-Morrison of New Zealand serves as consultant for the exploration phase and until the drilling of three wells in *Sabalan* is completed.

The Iranian Ministerial Delegation is looking for experienced consultants for the production drilling, the design and construction phase of the *Sabalan* Geothermal Power Plant, as well as for the follow-up development phase of the plant. The Iranians need personnel training and plant commissioning assistance. Furthermore, they are also interested in hydropower development.

The Iranian Ministerial Delegation expressed interest in a co-operation with *Orkustofnun*, *ENEX* hf, and *VGK* Consulting Engineers, both with respect to the *Sabalan* Geothermal Power Development and the training of the Iranian personnel. The main points of the discussions were:

- The Iranian Delegation wishes to receive a proposal on reservoir modeling and training.
- There is a mutual interest in a formal bilateral agreement between the governments of the Islamic Republic of Iran and Iceland. Although such an agreement is beneficial, it is in the opinion of the Delegation not essential.
- Only Joint Venture project participation is permitted in Iran.
- The information about Icelandic consultants should be sent to the Iranian Delegation.
- It is important to have an Icelandic employee locally, or work through a local Iranian partner.

- The Iranian Delegation can point out reliable companies that possess good experience in thermal and hydropower works. Related information will be sent to *Orkustofnun*.
- Obtaining Work Permits in Iran is not a problem.
- The Iranian Ministerial Delegation intends to invite a delegation from *Orkustofnun* and *ENEX hf* to visit the site in Iran, to define possible projects, and to find local partners.
- The Iranians wish to have more fellows attending the Icelandic *UNU* Geothermal Training Programme in Iceland.
- The Iranians also wish Icelandic specialists to hold special short courses in Iran.

At the Hotel Saga meeting

During this meeting, the following points were expressed:

- The Iran Delegation is interested in multiple use of geothermal energy and would like to enlist Icelandic assistance with that.
- The use of geothermal in Iran is very limited at present, and developing this type of energy faces competition with oil and gas energies. Hence the need for a good geothermal demonstration project in the Islamic Republic of Iran, and for well-trained Iranian personnel.
- The Iranian Delegation is interested in a visit of Icelandic geothermal specialists to Iran, to explore the situation and assist in specifying a good competitive geothermal project.
- The Iranian Delegation expressed its interest in engaging the assistance of *ENEX hf* in procuring international financing for their project.
- The draft of a Memorandum of Understanding was delivered to the Delegation for scrutiny and approval.

At the Svartsengi meeting

The Iranian Delegation and Mr. Júlíus Jónsson signed the Memorandum of Understanding. This document summarizes the main points of discussions of the *Pingvellir* and the *Hotel Saga* meetings (see Annex C).

At the Blue Lagoon meeting

The Iranian Delegation showed interest in building facilities similar to the *Blue Lagoon*. The pool (s) can be located near the *Sabalan* Power Development and/or in other areas with geothermal potential. Such pool must, however, be conform with the Islamic rules in Iran that require completely separate areas for ladies and gentlemen.

4. SUMMARY AND CONCLUDING REMARKS

During the discussions with the Iranian Ministerial Energy Delegation it emerged that, most likely, co-operation between the Islamic Republic of Iran and Iceland would be in the following fields:

1. Geothermal Development

- Consulting in geothermal drilling, power plant construction, maintenance and commissioning;
- Training of Iranian personnel;
- Building facilities similar to the *Blue Lagoon* for bathing and for medical treatment;
- Multiple integrated geothermal development;
- Financing of projects.

2. Air pollution

3. Hydropower work

4. Drilling and consulting in oil and gas fields (Mostly an Icelandic interest)

Iran has technical and scientific know-how on geological and geophysical explorations as well as on exploitation of oil and natural gas fields. The deepest drilling, experienced during these operations, reaches 6 km.

List of Iranian *UNU* fellows, 1996-2000

1966

Mr. Khosro Khosravi
Renewable Energy Organization of Iran (SUNA)

1997

Mr. Amir Tamjidi
Electric Power Research Center (EPRC), now Niroo Research Institute (NRI)

Mr. Bayazid Azizi
Ministry of Energy (Renewable Energy Department)

1998

Mr. Masoud Soltani-Hosseini
Niroo Research Institute (NRI)

1999

Mr. Younes Noorallahi
Renewable Energy Organization of Iran (SUNA)

Mr. Bijan Mostaghel
Ministry of Energy (Renewable Energy Department)

2000

Mr. Javad Nooraliee
Niroo Research Institute (NRI)
Renewable Energy Department

Background Information about Iran

Basic Facts

Known as Persia until 1935, Iran became an Islamic Republic after the 1979's Islamic revolution ending more than 2500 years of monarchy. During 1980-88, Iran fought an indecisive war with Iraq over disputed territory.

The country spans 1.636 millions km², its inhabitants number about 67 million, and Farsi is the official language. Most of the population lives in Tehran, the capital, and along one of the two mountainous chains, i.e. Alborz in the north and Zagros stretching from northwest to the central southeast of Iran. Uninhabited deserts separate these mountain chains. The climate is continental with hot summers when the temperature reaches 52°C locally, and cold winters with the temperature down to -25°C.

Strong earthquakes, mainly along the northwest, western and northeastern borders; periodic droughts; floods; dust and sandstorms constitute the country's natural hazards. Volcanoes, some even dormant, are present in both mountain chains, but do not pose major risks.

Iran's main natural resources are petroleum, natural gas, coal, chromium, copper, iron ore, lead, manganese, zinc, and sulfur. The Ministry of Oil and Gas, and the Ministry of Mining, are responsible for administration of these resources. The Ministry of Energy administers renewable energies such as geothermal, water, wind, solar and atomic.

Presently, the chief environmental concerns are air pollution caused by transport and general energy consumption, sea pollution due to the oil and chemical industries, and the supply of potable water.

Brief summary on the Status of Geothermal Energy

Energy for the heating and electricity production is mostly derived from oil and natural gas, Iran being OPEC's second largest oil producer and having 9% and 15% of the world's oil and natural gas reserves, respectively. In some regions of Iran, rivers or lakes were harnessed to provide electricity. In 1974, however, Mr. James R. McNit, a United Nation geothermal expert, visited Iran and pointed out the promising prospects for geothermal energy development. Since then the utilization of this energy resource has gained interest in Iran.

At the recommendations of Mr. McNit, a contract was signed between the Ministry of Energy (MOE), ENEL (Entes Nazionale per L' Energia Elettrica of Italy) and TB (Tehran Berkeley consulting Engineers of Iran) in 1975, to carry out geothermal explorations in two regions, namely *Damavand* (Alborz mountain chain) and *Azarbaijan* (northwest of Zagros mountain chain). Final reports on these investigations that were carried out by ENEL (Italy) were submitted in 1980-1983. Based upon these and investigations made by the Electric Power Research Center (EPRC), the regions of *Sabalan*, *Damavand*, *Khoy-Maku* and *Sahand* were given priority. Dr. Valgarður Stéfansson, then an Inter-

regional Adviser on Geothermal Energy at the United Nation, visited Iran in 1989 and approved these findings.

Today, about 10 areas in Iran are considered to have geothermal potential. The Iranian Renewable Energies Group has given the development of the high-temperature *Sabalan* geothermal area first priority, mainly for electric generation and direct use. The site is located in the northwest of Iran near an active earthquake belt. The *Sabalan* Geothermal Development Project has been divided into four stages spanning the early exploration to construction of the facility and its commissioning. Since 1998, Kingston-Morrison Ltd. of New Zealand has been the prime consultant for the *Sabalan* geothermal project.

Annex C**Memorandum of Understanding****Preamble**

An Iranian Ministerial Delegation visited Iceland from July 3 to July 7, 2002 under the leadership of the Deputy Minister for Energy Affairs Mr. H. Chitchian. Besides the Deputy Minister the Delegation comprised a strong group of energy experts in the field of renewable energy.

During the mission the Delegation visited the Ministry of Trade and Industry and subsequently Orkustofnun (the National Energy Authority of Iceland) where it met with Dr. Thorkell Helgason, Orkustofnun's Director General, and a number of his specialists. The mission also met with Mr. Jón B. Skúlason of the Iceland New Energy (Hydrogen development) Company and MP Mr. Hjálmar Árnason chairman of the Icelandic Parliament's Industry and Energy Committee. The Delegation moreover visited the Nesjavellir and Svartsengi Geothermal CHP plants, the Sog hydro Power Plant, and the drill site at Hellisheiði.

The possibilities of future co-operation on matters relating to energy development between the Islamic Republic of Iran, on the one hand, and Orkustofnun, Iceland New Energy and ENEX hf. on the other hand were discussed. During the present visit the following was concluded:

By the Iran side:

1. The wish to initiate co-operation between the Ministry of Energy and some of the universities of Iran, in one hand, and Orkustofnun through the United Nation University as well as the University of Iceland with regards to postgraduate studies and short courses of Iranian geothermal experts on the other hand.
2. That Icelandic-Iranian geothermal co-operation be established to facilitate significant geothermal development in the Islamic Republic of Iran.
3. Close co-operation in the field of hydrogen energy development particularly in the area of inter-city transportation.

By the Icelandic side:

1. Significant resources of geothermal energy have been found in Iran, which might be of significant benefit to the national economy if properly researched and developed.
2. Iran has made very significant scientific and engineering achievements in the petroleum industry. This is a field, in which Icelandic entities are taking their very first tentative steps. A close co-operation with some of the Islamic Republic of Iran's organizations in this field would be most beneficial.

The Iranian Delegation was informed of the fact that all international marketing of Icelandic energy expertise and services is and will be affected through Enex Ltd.

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Agreement

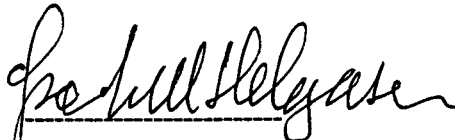
After friendly negotiations the four sides, i.e. the Ministerial Delegation from the Republic of Iran, Orkustofnun, Icelandic New Energy Co. and Enex hf, unanimously came to the following agreement:

1. The Ministerial Delegation confirms its interest in utilising Icelandic geothermal and hydrogen experience and assistance in developing its geothermal energy resources and countering transportation induced atmospheric pollution in its cities.
2. Orkustofnun and Enex hf confirmed their willingness to activity support and facilitate the development of geothermal energy resources in the Islamic Republic of Iran via service contracts and/or project-by-project Joint Venture, BOO or BOT agreements.
3. The Icelandic side agrees to help facilitate inter-University postgraduate geothermal training of Iranian scholars.

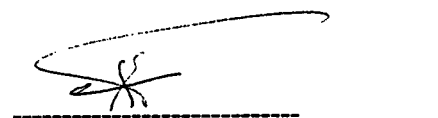
Signed on the sixth day of July in the year two thousand and two.

Orkustofnun

Ministry of Energy of Iran, I.R.I



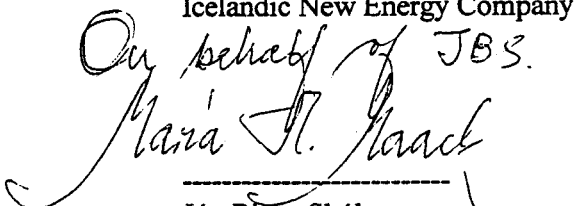
Thorkell Helgason
Director General



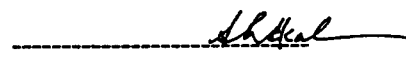
H. Chitchian
Deputy Minister for Energy Affairs

Icelandic New Energy Company

Ministry of Energy of Iran, I.R.I

On behalf of JBS.


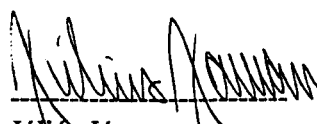
Jón Björn Skúlason
Director Iceland New Energy Co.



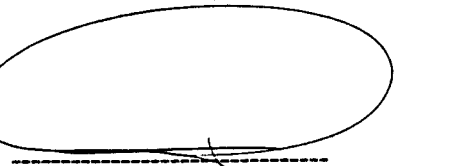
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Enex hf

Renewable Energy Organization of Iran



Júlíus Jónsson
Chairman of ENEX hf



Y. Armoudli
General Manager, Renewable Energy
Organization of Iran (SUNA)