Thirty years of geothermal training in Iceland

Ingvar Birgir Fridleifsson
Director
UNU-GTP
History

• First official statement on establishing a UNU Geothermal Institute in Iceland was made by Ambassador Ingvi S. Ingvarsson in Tokyo, at the UN Committee on Natural Resources 25 March 1975

• The UNU had just been established and the first Rector appointed, Mr. James R. Hester

• Only two governments had made pledges on financing the UNU: Japan 100 million USD; and Senegal 25 thousand USD
First proposal in 1976

January 1976

• First proposal from Government of Iceland to UNU on possible venues of cooperation, geothermal energy and fisheries technology

June 1976

• Vice-Rector Walter Manshard and Dr. James M. Harrisson visited institutions in Iceland which might become Associated Institutions of UNU

• UNU showed preference for geothermal energy to start with
Establishment of UNU-GTP in 1978

April 1978
• Government of Iceland adopts proposal for establishment of UNU-GTP which is submitted to UNU in Tokyo

July 1978
• UNU Workshop on Training Needs in Geothermal Energy. Participants from El Salvador, Germany, Hungary, Iceland, India, Italy, Japan, Kenya, New Zealand, Philippines, and USA

• Dr. Guðmundur Pálmason, director of the Geothermal Division of NEA, chaired the organizing committee for the Workshop
UNU Geothermal Training Programme

UNU Workshop on Training Needs in Geothermal Energy

Laugarvatn
2008
Establishment of UNU-GTP ....

October 1978
• Government decided in October to ask Orkustofnun, the National Energy Authority (NEA), to sign an Agreement on Association with the UNU, and to operate the UNU-GTP

December 1978
• Agreement signed in Tokyo 27 December 1978 and in Reykjavik 13 February 1979

May 1979
• First UNU Fellows from Philippines arrive in Iceland
UNU Geothermal Training Programme

1979

UNU Fellows Agnes Reyes and Nelson Bagamasbad
UNU Special Fellows Xin Kuide and Huang Shangyao P.R. China
Ingvar B. Fridleifsson, Stefan Sigurmundsson and Hjalti Franzson
United Nations University Geothermal Training Programme

• Has operated in Iceland since 1979

• Aims at assisting developing countries with significant geothermal potential to build up or strengthen groups of specialists that cover most aspects of geothermal exploration and development

• Offers annually six month specialised courses for professionals in geothermal work

• Is hosted at Orkustofnun – National Energy Authority NEA
Organization

- UNU-GTP is operated as an independent unit within NEA
- Four permanent staff members (employed by NEA)
- Academically governed by Studies Board
- About 50 individuals work part-time each year
- Teachers hired from Orkustofnun, ISOR, University of Iceland, energy utilities, consulting companies and other agencies

The success of the UNU-GTP is mainly due to the excellent teachers and facilities
<table>
<thead>
<tr>
<th>Name</th>
<th>Institution</th>
<th>Field</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guðmundur Ó. Friðleifsson</td>
<td>HS</td>
<td>Geological Exploration</td>
</tr>
<tr>
<td>Hjalti Franzson</td>
<td>ISOR</td>
<td>Borehole Geology</td>
</tr>
<tr>
<td>Knútur Árnason</td>
<td>ISOR</td>
<td>Geophysical Exploration</td>
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<tr>
<td>Benedikt Steingrímsson</td>
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<td>Borehole Geophysics</td>
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<tr>
<td>Guðni Axelsson</td>
<td>ISOR</td>
<td>Reservoir Engineering</td>
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<tr>
<td>Halldór Ármannsson</td>
<td>ISOR</td>
<td>Environmental Studies</td>
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<td>Sverrir Þórhallsson</td>
<td>ISOR</td>
<td>Drilling Technology</td>
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<tr>
<td>Stefán Arnórsson</td>
<td>UI</td>
<td>Chemistry of Thermal Fluids</td>
</tr>
<tr>
<td>Páll Valdimarsson</td>
<td>UI</td>
<td>Geothermal Utilization</td>
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</table>

Members of Studies Board set academic standards and design training schedules for each UNU Fellow.
1979 - 2008

- 402 scientists and engineers from 43 countries have completed the 6 month specialized course
- Thereof 67 women (17%)
- MSc programme offered with University of Iceland since 2000. 15 graduates
- PhD programme offered with UI from 2008

Participation UNU-GTP

- Asia 44%
- Central & Eastern Europe 15%
- Central America 15%
- Africa 26%
UNU Geothermal Training Programme

Class of 2003 – 8 ladies

China
Russia
Mongolia
Kenya
Iran
El Salvador
Poland
UNU Geothermal Training Programme

Number of Fellows 1979 - 2008

- UNU Fellows for 6 Months Training
- MSc Fellows
- PhD Fellows

Yearly distribution of fellows from 1979 to 2008.
Fellows of the UNU Geothermal Training Programme in Iceland 1979-2008
### Top five countries and specializations

<table>
<thead>
<tr>
<th>Specialization</th>
<th>China</th>
<th>Kenya</th>
<th>Philippines</th>
<th>El Salvador</th>
<th>Ethiopia</th>
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<tr>
<td>Geological Exploration</td>
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<td>1</td>
<td>3</td>
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<td>9</td>
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<td>5</td>
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<tr>
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<td>Reservoir Engineering</td>
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<td>3</td>
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<td>5</td>
<td>6</td>
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<tr>
<td>Chemistry of Fluids</td>
<td>9</td>
<td>8</td>
<td>3</td>
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<td></td>
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<tr>
<td>Environmental Studies</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>70</td>
<td>42</td>
<td>31</td>
<td>27</td>
<td>26</td>
</tr>
</tbody>
</table>
Top fourteen countries with the highest % share of geothermal in their national electricity production

- El Salvador: 27
- Kenya: 42
- Philippines: 31
- Iceland: 15
- Costa Rica: 15
- Nicaragua: 7
- Guadeloupe: 5
- New Zealand: 5
- Indonesia: 24
- Mexico: 5
- Guatemala: 3
- Italy: 3
- USA: 2
- Japan: 2

Number of UNU Fellows
UNU Fellows from China

1980-2008
70 UNU Fellows

- Reservoir eng.: 24
- Chemistry: 14
- Geothermal eng.: 15
- Environmental: 9
- Geology: 3
- Geophysics: 3
- Drilling eng.: 2

Map showing United Nations University Fellows Trained in Iceland 1980 - 2008 with 6 fellows from China.
Contact with UNU headquarters

• Operational contact mainly between UNU-GTP director and senior staff in Tokyo

• Very good cooperation

• Particular thanks are due to Dr. Abraham Besrat who was the main contact 1986-1998 and key person in establishing UNU-FTP in Iceland
UNU-GTP graduates

.. are among the leading specialists in geothermal research and development in many countries in Africa, Asia, Central America and Eastern Europe

.. have been very successful, and have contributed significantly to renewable energy development in their parts of the world

.. are very active in the international geothermal community
UNU Geothermal Training Programme

World Geothermal Congress 2005
77 UNU Fellows from 25 countries presented papers
Short courses as Contribution to UN Millennium Development Goals

Government of Iceland has secured core funding for the UNU-GTP to organize annual workshops/short courses in geothermal development in:

- Central American countries (held in El Salvador 2006, 2007)
- Asian countries (starting in China in May 2008)

A part of the objective is to increase cooperation between geothermal specialists in different countries and continents.

The courses may in the future develop into regional geothermal training centres.
Short Course on Surface Exploration in Kenya 2007

Participants from 10 East African Countries
UNU Geothermal Training Programme

Workshop for Decision Makers on Geothermal Projects in Central America El Salvador 2006
UNU Geothermal Training Programme

Short Course on exploration, resource assessment and environmental issues
El Salvador 2007
118 participants on the first day of the Workshop
Members of the UNU family in Iceland

UNU Fisheries Training Programme

- Established in 1998
- Based on same model as UNU-GTP
- Core activity six month specialized training
- 167 graduates from 30 countries
- MSc and PhD programmes in cooperation with UI
- Short Courses in developing countries
Proposed New UNU programme in Iceland

Land Restoration Training Programme

• Based on same model as UNU-GTP and UNU-FTP
• Core activity six month specialized training
• Pilot phase started 2008 with 6 Fellows
• Will be financed by Government of Iceland like UNU-GTP and UNU-FTP
Icelandic contribution 1979-2008

UNU Fisheries  
UNU Geothermal

Year

Thousand USD

0 500 1000 1500 2000 2500 3000 3500 4000 4500 5000

79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07 08
UNU-GTP plans for 2008-2012

- Core activity will continue to be specialized six month training with about 20 Fellows annually
- MSc programme (18-24 months) with University of Iceland with about 12 MSc Fellows per year
- PhD programme starting with University of Iceland 2008 with 1-2 Fellowships per year
- Annual Workshops/Short courses in Africa, Asia, and Central America will involve considerable expansion of the activities
- These may develop into sustainable regional geothermal training centres
UNU-GTP plans for 2008-2012............

- To meet requests of developing countries for expansion of capacity building and degree oriented research, the UNU-GTP must strengthen further its ties with the University of Iceland, ISOR and the geothermal industry
- The excellent network of UNU Fellows in over 30 developing countries is of great value for promotion of geothermal worldwide
- This rather unique network needs to be nurtured and expanded
- To meet these tasks, the UNU-GTP has to be strengthened as an institution both in Iceland and within the UNU
Thank You

Many thanks to all who have participated in and supported the UNU-GTP