May 24. 2011

3rd General Assembly

Sigurður Magnús Ólafsson
Chairman of the board
Agenda

13:15-13:20 Welcome note by the Chairman of the Board
13:40-13:50 Elections
13:50-14:00 Inauguration of new partners
14:00-14:10 Strategy workshop results
14:10-14:20 Other matters
Election of chair of the meeting

- Guðrún Sævarsdóttir - chair the meeting

- Hjalti Páll Ingólfsson, Operational Manager – take minutes
Sigurður Magnús Garðarsson, Chairman of the Board

ANNUAL REPORT PRESENTATION

REPORT OF THE BOARD
GEORG was founded early 2009 with the support of the Science and Technology Policy Council in Iceland through their Centers of Excellence and Research Clusters – program. The support amount to 70MISK per year for seven years.

GEORG is a partnership of 21 partners, combining all major players on geothermal research and utilization in Iceland and their key international collaborators.

GEORG creates a platform for joint effort to strengthen research and development of innovations in the field of geothermal energy.

GEORG has supported 19 projects on various aspects of geothermal research and utilization.
GEORG has the vision of being a

**International Leader in Geothermal Energy Research**

**MAIN OBJECTIVES:**

**Worldwide Reduction of GHG Emissions**
By contributing to significant increase in sustainable energy production and utilization from geothermal sources.

**Make Iceland a Case Study**
for near energy independent and a carbon neutral society.

**Create a Platform for Entrepreneurship**
and export for geothermal energy resources and education, both for partners in the group and in the ensuing creative environment established through its national and international operations.
**WP leaders**
WP1: Sigurður Magnús Garðarsson
WP2: Edda Lilja Sveinsdóttir
WP3: Ágúst Valfells
WP4: Ólafur Flóvenz
WP5: Halldór Pálsson
WP6: Guðni Axelsson
WP7: Sveinn Agnarsson (Brynhildur Davíðsdóttir)
WP8: Sigurður G. Bogason

**Board of Directors**
Auður Andrésdóttir
Edda Lilja Sveinsdóttir
Ernst Huenges
Guðrún Sævarsdóttir
Ólafur G Flóvenz
Rúnar Unnþórsson
Sigrún Hreinsdóttir
Sigurður Magnús Garðarsson

**Operational Manager**
Hjalti Páll Ingólfsson

**Chair of Science Academy**
Sveinbjörn Björnsson
GEORG Operations

• Four main pillars
  – Project support through calls
  – Hosting and supporting events and conferences
  – Taking part in EU strategy work and seeking funds from abroad
  – Disseminating and promoting GEORG work and geothermal energy in general
Supported Projects

- GEORG has published 3 calls during 2 years of operation
- 19 projects supported
  - Total grants 231,5 MISK,
    - grant agreement with projects renewed yearly
  - Total project cost 941,2MISK

80% Cofinancing
Supported projects

• 19 projects supported by GEORG,
• 9 project in reservoir modelling and simulation
  – Development of software and algorithm
  – Mapping and analysis of subsurface data (3D)
  – Methods to estimate sustainability of systems
• 2 Project researching the super critical fluids
  – Researches on two phase flow of super critical fluids and the utilisation of such fluids
• 8 Projects on other issues
  – Seismicity research
  – Development of high pressure and high temperature grouts for boreholes
  – CO₂ sequestration
  – Reduction of emission by using biochemical
  – Application of geothermal heat in aquaculture and building an ecological food park
  – Geothermal economical database
  – The sustainability of geothermal utilization: sustainability indicator for geothermal utilization
Collaboration pattern of supported projects
3rd call focus points

Task 4.3: Effects of tectonic movements and volcanic activity on geothermal systems
   (a) System stress analysis by using break-out information from borehole televiewer data;
   (b) Analysis of reservoir pressure changes observed during major earthquakes;
   (d) Studies of the effects of magma intrusion into the roots of a geothermal systems and its
degassing on the chemical and isotopic properties of the geothermal fluid;

Task 4.6: Development of methods for exploitation of deep geothermal systems
   (c) Evaluation of scaling potential upon depressurization of the fluid;

Task 5.2: Direct use of geothermal heat for industrial processes
Task 5.6: Maintenance procedures in geothermal utilization
Task 5.7: Offshore drilling and utilization

Task 6.2: Environment and health impacts of geothermal energy utilization:
Task 6.4: Geothermal sustainability assessment protocol:

Task 7.3: Regional development and local capacity building
Task 7.4: Macroeconomic effects:
Task 7.6: Cost-benefit analysis and environmental impact:
Third Call Projects

- Published on September 22\textsuperscript{nd} 2010
- Deadline on November 30\textsuperscript{th} 2010
- 13 project proposals submitted and 4 projects awarded
  - Total support to these project amounts to just over 52 MISK
  - Total project cost is 215MISK

<table>
<thead>
<tr>
<th>Project Name</th>
<th>Coordinator</th>
<th>Other Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mapping interaction between magmatic and hydrothermal system with fluid inclusion analysis</td>
<td>Anette K. Mortensen</td>
<td>ÍSOR, USGS, ORMAT</td>
</tr>
<tr>
<td>Sustainability Assessment Protocol for Geothermal Utilization</td>
<td>Brynhildur Davíðsdóttir</td>
<td>ÍSOR, USGS, ORKUSTOFNUN</td>
</tr>
<tr>
<td>GeoChem</td>
<td>Bernhard Örn Pálsson</td>
<td>Controlant ehf</td>
</tr>
<tr>
<td>Green Geothermal Growth</td>
<td>Sjöfn Sigurgísladóttir</td>
<td>Íslensk Matorka; ORKUSTOFNUN</td>
</tr>
</tbody>
</table>
Events and Conferences Y2

• Open Conferences at General Assembly
• 2nd European PhD day supported
  – EGPD in Iceland 2011
• Roots of Geothermal Systems
  – 7 seminars held weekly, winter and spring 2011
  – Follow up conference planned in August 2011
• Frá gufu til gjaldeyris
  – 6 mini conferences on Geothermal Energy innovation
• Strategy workshops
  – WP leader workshop in August 2010 - 3rd call preparation
  – Strategy meeting in January 2011
Events and conferences Y2

• Frá Gufu til gjaldeyris
  • 6 mini conferences on Geothermal Energy innovation

10. mars 2011 Jarðhiti og matvælaframleiðsla, Háskólanum í Reykjavík
16. mars 2011 Jarðhiti og ferðajónusta, Háskólanum í Reykjavík
23. mars 2011 Jarðhiti og iðnaður, Háskólanum í Reykjavík
6. apríl 2011 Jarðhiti og ráðgjafastarfsemi, Orkuveit luego Reykjavíkur
13. apríl 2011 Jarðhiti, menntun, Mannauður, Orkuveit luego Reykjavíkur
5. maí 2011 Jarðhiti og vöruþróun, Orkuveit luego Reykjavíkur
Event and conferences Y2

- Roots of Geothermal Systems
  - 7 seminars held weekly, winter and spring 2011
  - Follow up conference planned in August 2011

15.02.11 Volcanic Roots of Krafla and Hengill,
24.02.11 Properties of intrusives,
03.03.11 Use of Magneto-Telluric prospecting,
09.03.11 Pressure and temperature of volcanic geothermal systems and their roots
17.03.11 Energy transfer to the deep roots The conceptual model for central volcano fields
24.03.11 Heat Sources - Fluid Interactions
07.04.11 Heat extraction in the roots
EU ACTIVITIES

• 7th Framework Program Committee for Energy
  – great advantage to explore and facilitated the opportunities in FP7
  – change to promote geothermal as an important energy source within the renewable energy portfolio

• EERA - JPGE
  – Aims at providing an outstanding contribution bringing together the 14 leading European geothermal research institutions in a single strategically oriented Joint R&D Programme
  – Out of the 14 EERA – JPGE partners 4 are participating in GEORG
  – EERA – JPGE and GEOTHERMAL ERA NET will work formally together forming future European Research strategy through the ERA NET cooperation.

• EU CIP call: Strand 1 – Promoting international cluster activities in the CIP participating countries
  – GEORG submitted, together with Iceland Innovation Centre, Gekon, INNOVA ÉSZAK-AFÖLD (Hungary) and BUNDESVERBAND GEOTEHERMIE (Germany) a Concept Note on Geothermal Cluster in the EU CIP call - 3/G/ENT/CIP/11/C/N04C011.
  – Aims at fostering European cluster cooperation in view of internationalization strategies outside Europe, by building upon and further developing successful support schemes already implemented in some Member States
• **GEORG** coordinated a proposal submission in the EU call “FP7-ERANET-2011-RTD”.
  – The duration of the ERA NET is 4 years and the support for the EU amounts to 2M€. ERA NET is a coordination action and is 100% financed by the EU Commission

• Participating in this ERA NET gives a golden opportunity to deepen the cooperation of national program owners and administrators and thus be an enabler for the integration of national research and development agendas into a coherent European geothermal R&D program.

• Partners

<table>
<thead>
<tr>
<th>National Energy Authority (coordinator)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agentschap NL</td>
</tr>
<tr>
<td>Swiss Federal Office of Energy</td>
</tr>
<tr>
<td>The National Research Council of Italy</td>
</tr>
<tr>
<td>Project Management Jülich</td>
</tr>
<tr>
<td>ADEME (French Agency for Environment and Energy Management)</td>
</tr>
<tr>
<td>Icelandic Centre for Research (RANNIS)</td>
</tr>
<tr>
<td>The Energy Efficiency, Environment and Energy Information Agency</td>
</tr>
<tr>
<td>Scientific and Technological Research Council of Turkey (TUBITAK)</td>
</tr>
<tr>
<td>Ministry of Education, Science, Research and Sport of the Slovak Republic</td>
</tr>
</tbody>
</table>
The Geothermal ERA-NET is aimed to deepen the cooperation on national and administrative level, be an enabler for the integration of national research and development agendas into a coherent European geothermal R&D programme.

The Geothermal ERA-NET will focus on the utilization of geothermal energy, from direct heating use up to higher enthalpy resources and their corresponding use (e.g. power generation).
Clusters Cooperation

• The “Icelandic Geothermal Cluster – Porter style”
  
  – GEORG is participating in the preparation work of creating the “Icelandic Geothermal Cluster”
  
  – An expert panel was established and Edda Lilja Sveinsdóttir is appointed as GEORG representative
  
  – GEORG is willing to continue exploring the possibilities of further and broader cooperation in this field
• Nordic-German-Polish Cluster Excellence Project
  – GEORG is taking part in a Nordic-German-Polish Cluster Excellence Project on Benchmarking of clusters in cooperation with Rannís.
  – GEORG participated in an interview conducted by Dr. Gerd Meier zu Köcker, Managing Director of the Agency Competence Networks Germany,
  – The project has organized an intensive cluster conference Copenhagen later this week Hjalti Páll will attend on behalf of GEORG
Dissemination

- GEORG has been presented in several conferences and meetings, in Iceland and abroad
- GEORG has an website: [www.georg.hi.is](http://www.georg.hi.is)
  - Information on calls and conferences etc.
  - ...and is active on Facebook as well
Hjalti Páll Ingólfsson, Operational Manager

ANNUAL REPORT PRESENTATION

ANNUAL ACCOUNTS
### GEORG - Cost and financing account
#### Year 2, 2010-2011

<table>
<thead>
<tr>
<th>Cost</th>
<th>Note</th>
<th>GEORG</th>
<th>Partners</th>
<th>Total</th>
<th>GEORG</th>
<th>Partners</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grants</td>
<td>1</td>
<td>10.958</td>
<td>31.731</td>
<td>42.689</td>
<td>53.452</td>
<td>218.921</td>
<td>272.373</td>
</tr>
<tr>
<td>Contracted services</td>
<td>2</td>
<td>957</td>
<td>0</td>
<td>957</td>
<td>537</td>
<td>537</td>
<td>537</td>
</tr>
<tr>
<td>Travel expenses</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>433</td>
<td>433</td>
<td>433</td>
</tr>
<tr>
<td>Conferences, dissem. &amp; outreach.....</td>
<td>4</td>
<td>724</td>
<td>845</td>
<td>1.569</td>
<td>308</td>
<td>3.500</td>
<td>3.808</td>
</tr>
<tr>
<td>Overhead total</td>
<td>5</td>
<td>6.505</td>
<td>8.700</td>
<td>15.205</td>
<td>8.829</td>
<td>6.200</td>
<td>15.029</td>
</tr>
<tr>
<td><strong>Total operation cost</strong></td>
<td></td>
<td><strong>19.144</strong></td>
<td><strong>41.276</strong></td>
<td><strong>60.420</strong></td>
<td><strong>63.559</strong></td>
<td><strong>228.621</strong></td>
<td><strong>292.180</strong></td>
</tr>
</tbody>
</table>

#### Financing

<table>
<thead>
<tr>
<th>Financing</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Partner Co-financing</td>
<td>6</td>
<td>50.000</td>
<td>40.931</td>
<td>400</td>
<td>228.621</td>
<td>229.021</td>
</tr>
<tr>
<td>Funding from Rannis</td>
<td></td>
<td>50.000</td>
<td>50.000</td>
<td>76.000</td>
<td>76.000</td>
<td></td>
</tr>
<tr>
<td><strong>Total financing</strong></td>
<td></td>
<td><strong>50.000</strong></td>
<td><strong>41.276</strong></td>
<td><strong>90.931</strong></td>
<td><strong>76.400</strong></td>
<td><strong>228.621</strong></td>
</tr>
</tbody>
</table>

**Results of operational activities**

<p>| | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>30.856</td>
<td>0</td>
<td>30.856</td>
<td>12.841</td>
<td>0</td>
<td>12.841</td>
</tr>
</tbody>
</table>

co financing 78%
## GEORG - Balance sheet
### Year 2, 2010-2011

<table>
<thead>
<tr>
<th>Assets</th>
<th>Note</th>
<th>31. March 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash and cash equivalents</td>
<td>7</td>
<td>43.697</td>
</tr>
<tr>
<td>Unpayed funding from Rannís</td>
<td>6</td>
<td>14.000</td>
</tr>
<tr>
<td>Unaccounted co-financing of R&amp;D projects</td>
<td>1</td>
<td>61.289</td>
</tr>
<tr>
<td><strong>Total assets</strong></td>
<td></td>
<td><strong>118.985</strong></td>
</tr>
</tbody>
</table>

| Debts and liabilities                       |      |               |
| Unpayed grants for projects                 | 1    | 26.844         |
| Unaccounted co-financing of R&D projects    | 1    | 61.289         |
| **Total debts and liabilities**             |      | **88.133**     |

**Total assets**                             |      | **30.853**     |
# GEORG - Budget Plan
## Year 3, 2011-2012

### Cost

<table>
<thead>
<tr>
<th>Item</th>
<th>GEOR</th>
<th>Partners</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grants</td>
<td>101.412</td>
<td>352.705</td>
<td>454.117</td>
</tr>
<tr>
<td>Contracted services</td>
<td>700</td>
<td>700</td>
<td>700</td>
</tr>
<tr>
<td>Travel expenses</td>
<td>200</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>Conferences, dissem. &amp; outreach</td>
<td>200</td>
<td>3.500</td>
<td>3.700</td>
</tr>
<tr>
<td>Overhead total</td>
<td>9.298</td>
<td>6.200</td>
<td>15.498</td>
</tr>
<tr>
<td><strong>Total operation cost</strong></td>
<td><strong>111.810</strong></td>
<td><strong>362.405</strong></td>
<td><strong>474.215</strong></td>
</tr>
</tbody>
</table>

### Financing

<table>
<thead>
<tr>
<th>Item</th>
<th>GEOR</th>
<th>Partners</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Partner Co-financing</td>
<td>200</td>
<td>362.405</td>
<td>362.605</td>
</tr>
<tr>
<td>Funding from Rannis</td>
<td>70.000</td>
<td>70.000</td>
<td></td>
</tr>
<tr>
<td><strong>Total financing</strong></td>
<td><strong>70.200</strong></td>
<td><strong>362.405</strong></td>
<td><strong>432.605</strong></td>
</tr>
</tbody>
</table>

### Results of operational activities

<table>
<thead>
<tr>
<th>Item</th>
<th>GEOR</th>
<th>Partners</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-41.610</td>
<td>0</td>
<td>-41.610</td>
</tr>
</tbody>
</table>
ELECTIONS
# Election of Board of Directors

All board members are willing to continue working for GEORG

<table>
<thead>
<tr>
<th>BoD</th>
<th>Icelandic Universities, research institutions and governmental agencies – 5 BoD seats</th>
<th>Energy companies – 1 BoD seat</th>
<th>Private companies – 1 BoD seat</th>
<th>Other EEA based participating collaborators and Associate members – 1 BoD seat</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sigurður Magnús Garðarsson  Chair (2)</td>
<td>Edda Lilja Sveinsdóttir (1)</td>
<td>Auður Andrésdóttir (1)</td>
<td>Ernst Huenges (2)</td>
</tr>
<tr>
<td></td>
<td>Sigrún Hreinsdóttir (1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Guðrún Sævarsdóttir (2)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rúnar Unnþórsson (1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ólafur G Flóvenz (2)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The Board proposes that following individuals be elected to the Science Academy:

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Name</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sveinbjörn Björnsson</td>
<td>Chair</td>
<td>Ingólfur Örn Þorbjörnsson</td>
<td>Innovation Center Iceland</td>
</tr>
<tr>
<td>Brynhildur Davíðsdóttir</td>
<td>University of Iceland</td>
<td>María S Guðjónsdóttir</td>
<td>Reykjavik University</td>
</tr>
<tr>
<td>Sigurður Reynir Gíslason</td>
<td>University of Iceland</td>
<td>Guðni A Jóhannesson</td>
<td>OS</td>
</tr>
<tr>
<td>Guðni Axelsson</td>
<td>Iceland GeoSurvey</td>
<td>Einar Gunnlaugsson</td>
<td>OR</td>
</tr>
<tr>
<td>Halldór Pálsson</td>
<td>University of Iceland</td>
<td>Kristinn Ingason</td>
<td>Mannvit</td>
</tr>
<tr>
<td>David Mainprice</td>
<td>CNRS</td>
<td>David Bruhn</td>
<td>GFZ</td>
</tr>
<tr>
<td>Hrefna Kristmannsdóttir</td>
<td></td>
<td>Árný Erla Sveinbjörnsdóttir</td>
<td>University of Iceland</td>
</tr>
<tr>
<td>Ólafur Guðmundsson</td>
<td>HR</td>
<td>Sæunn Halldórsdóttir</td>
<td>ISOR</td>
</tr>
</tbody>
</table>
INAUGURATION OF NEW MEMBERS
Admission Rules Proposed by the BoD

- Additional members of GEORG should be companies or institutions that conduct research and/or development in the field of geothermal science, technology and utilization and can contribute to the overall objectives of GEORG.
- The admission of a new member is subject to the payment of an admission fee, decided by the BoD.
- Indicative admission fee for 2010 is $2,000
- Admission of a new member must be approved by 2/3 of votes at General Assembly.
New Members

• Vatnaskil
  – Vatnaskil Consulting Engineers specialize in geothermal reservoir, groundwater, surface runoff, air pollution and environmental modelling

• Íslensk Matorka
  – Íslensk Matorka ehf. is a company that focuses on utilization of renewable energy sources in Iceland and energy-intensive food production.

The BoD recommends to the GA that these companies become members of the cluster.
STRATEGY WORKSHOP RESULTS
**STRATEGY WORKSHOP RESULTS**

- **Session 1 GEORG existence**
  - Identity: Possible organisational forms discussed including, Consortium, SES, EHF, EPC
    - BoD assigned to review and analyse and make recommendation to partners.
    - Strong emphasis on some kind of business identity (kt.)
  - Image and branding
    - Image created by reputation (láta verkin tala)
    - Understand/analyse the added value of the Cluster

- **Session 2**
  - GEORG as a Project.
    - Strengthen the inner work of GEORG
    - GEORG is a project and has responsibility to fulfil the grant agreement
    - Modify tasks according to lessons learnt
    - Increase visibility of products
    - Identify the span of GEORG
    - Define a procedure how to mobilise direct funding within GEORG, combined modality approach.

- **Session 3**
  - Possible future scenarios discussed with a focus international connections
    - E.g. BONUS EEIG, JPI OCEANS, DoE, NSF........
  - Realise new sources of income...
OTHER MATTERS?
THE GENERAL ASSEMBLY IS CONCLUDED