



## IGA ACTIVITIES

### Message from the President

#### Ladsi Rybach

Dear IGA member

This is the last message from your current President. With the term of office of the current IGA Board of Directors drawing to a close, we shall summarize below the main actions and achievements during this term (11 October 2007 – 28 October 2010).

The BOD held six meetings, in Reykjavik, Nusa Dua/Bali (twice), Entebbe, Madrid, and El Salvador. Also, two Annual General Meetings were held (2008 in Entebbe, and 2009 in El Salvador). In addition, the various IGA Committees performed their work in separate meetings, and by correspondence. Three further ad-hoc Committees were active: 1) Choice of the WGC2015 venue, 2) Reserves and Resources, 3) WGC2010 Steering Committee. Also, the two regional branches of IGA, the European Regional Branch and the Western Pacific Regional Branch, pursued their activities.

The GEOFUND project work based on the World Bank – IGA contract (GEF MSP Trust Fund No. TF057268 – “Regional Technical Assistance as part of the Geothermal Energy Development Program”) has been completed and the deliverables have been submitted. In order to implement similar contract work a special body, the IGA Service GmbH, has been established and registered in Köln, Germany. At the time of writing, a decision about the continuation of the WB – IGA cooperation (this time for ARGEO) is still pending.

Both of IGA’s visibility products, the IGA News and the IGA website, now appear in new, attractive looks.

IGA is a partner within the REN Alliance (International Renewable Energy Alliance), which assembles the international Biomass, Geothermal, Hydropower, Solar, and Wind associations. Hopefully, IGA can also cooperate with the new International Renewable Energy Agency IRENA. Furthermore, IGA was represented at key International Energy and Renewable Energy Conferences (World Energy Summits Abu Dhabi, World Renewable Energy Conferences in Busan, Glasgow, Washington, and Yokohama) as well as several other events together with our REN Alliance partners.

IGA also co-organized a Special Workshop on “Geothermal Energy – Its Global Development Potential

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& Contribution to Mitigation of Climate Change”, together with the IEA Geothermal Implementing Agreement. This workshop, held in Madrid in May 2009, was based on the report “The Possible Role and Contribution of Geothermal Energy to the Mitigation of Climate Change“, prepared previously for IPPC by IGA’s two Past Presidents, and the current President, Vice President, and Executive Director. The Workshop results are being incorporated in the Geothermal Energy Chapter of the “IPPC Special Report on Renewable Energy Sources and Climate Change Mitigation” which is currently under preparation, again through significant contributions from IGA experts.

The key event in the reporting period was certainly the World Geothermal Congress 2010 in Nusa Dua/Bali, Indonesia. Extensive reports about the Congress appeared in IGA News no. 80; let me only highlight the signing of the Bali Declaration and of the MOUs for WGC2015 in Melbourne, Australia 16-19 November 2010 and to move the IGA Secretariat to the Geothermal Center in Bochum, Germany by 1 January 2011.

During the term of the current IGA Board the number of national geothermal organizations affiliated to IGA has increased from 28 to 32. In the same period the total

number of IGA members has increased from about 3200 to over 5000.

All of the aforementioned activities and achievements were only possible thanks to the dedicated efforts of a great number of individuals who cannot all be named here. I am deeply grateful to all of them and would like to sincerely thank them for their excellent support and cooperation. Personally, I have pursued all of my IGA involvements with great interest and drew great satisfaction from them; alone the chance of being on stage with four State Presidents (from Ethiopia, Iceland, Indonesia, and Uganda) at high-level Conferences was a great experience.

The last meeting of the current Board will take place in Sacramento, California/USA on 28 October, followed by the 2010 Annual General Meeting the same day, and the first meeting of the new Board (appointed by the 2010 Election) on 29 October.

In the future, IGA will use its international network to further accelerate worldwide geothermal development, especially in the power generation sector. Support and cooperation is needed also at the regional level. Wind and solar energy provide impressive examples of exponential growth; geothermal should not lag behind. Please join me in wishing our new Board much success in these and other endeavours!

## Pre-Congress Short Courses – successful initiation of World Geothermal Congress 2010, 22 – 24 April 2010

### Beata Kepinska, WGC2010 IGA Steering Committee – Short Courses

We still come back to the World Geothermal Congress 2010 and related events. Undoubtedly, the most important among them were the Pre-Congress Short Courses organised in two days before the official opening of the Congress. The Short Courses are a strong and valuable



SC1 Participants

## UPCOMING EVENTS

**RENEXPO 2010**, 7-10 October 2010, Augsburg, Germany. Website: [www.renexpo.de](http://www.renexpo.de)

**15th Congress of the Mexican Geothermal Association**, 15 October 2010, Morelia, Mich., Mexico. Website: [www.geotermia.org.mx](http://www.geotermia.org.mx)

**34th GRC Annual Meeting**, 24-27 October 2010, Sacramento, California, USA. Website: [www.geothermal.org](http://www.geothermal.org)

**2010 GSA Annual Meeting-Topical Session 14: Enhanced Geothermal Systems**, 31 October-3 November 2010, Denver, Colorado, USA. Website: [www.geosociety.org/meetings/2010/](http://www.geosociety.org/meetings/2010/).

**2010 AIChE Annual Meeting – Session: Geothermal Engineering**, 7-12 November, Saly Lake City, UT, USA. Website: [www.aiche.Org/Conferences/AnnualMeeting/index.aspx](http://www.aiche.Org/Conferences/AnnualMeeting/index.aspx)

**Der Geothermiekongress 2010**, 16-18 November 2010, Karlsruhe, Germany. Website: [www.geothermie.de](http://www.geothermie.de)

**Australian Geothermal Energy Conference**, 16-19 November 2010, Adelaide, Australia. Website: <http://www.agea.org.au>.

**2010 New Zealand Geothermal Workshop and GeoNZ 2010**, 22-24 November 2010, Auckland, New Zealand. Website: [www.geothermal.org.nz](http://www.geothermal.org.nz)

**Exploring and Harnessing the Renewable and Promising Geothermal Energy**, Djibouti, 22-25 November 2010. Contact: [argeo-c3-djibouti@intnet.dj](mailto:argeo-c3-djibouti@intnet.dj)

**Renewable Energy Conference and Expo Manila 2010**, 2-3 December 2010, Dusit Thani Manila, Makati, Philippines. Contact: [secretariat@re2010.com](mailto:secretariat@re2010.com)

**36 Stanford Workshop on Geothermal Reservoir Engineering**, 31 January-2 February 2011, Stanford, California, USA. Website: <http://pangea.Stanford.Edu/ERE/research/geoth/conference/workshop.html>.

**Geothermal Energy Utilization Associated with Oil and Gas Development**, 13-15 June 2010, Dallas, TX, USA. Contact: [blackwel@smu.edu](mailto:blackwel@smu.edu)

tradition in the history of WGCs. Those held in 2010 will be remembered as record ones, similar to the Congress itself, with regard to the number of participants and the number of conducted Courses. It is enough to say that all five proposed Courses were held (!). From the statistical point of view the Courses were attended by almost 200 persons from various countries in 5 continents. This means that 8% of participants registered for the Congress (ca. 2500) took part in the Courses, too. The classes were conducted by 20 conveners and lecturers. It is also worth pointing out that one of the Courses was specially addressed to the participants from the WGC2010 host country and given in the Bahasa Indonesia language.



SC1 – Peter Danielsen explaining details of borehole logging

The high attendance of the Short Courses was really impressive, especially if one recalls the serious problems with flight delays and cancellations due to volcanic ash generated by the Eyjafjallajokull eruption in Iceland.

The WGC2010 Short Courses were a challenging task, successfully prepared and accomplished by the cooperation of the IGA WGC2010 Steering Committee and WGC2010 Indonesian Organising Committee. From IGA SC side Beata Kepinska (supported by Gordon Bloomquist and Jim Lawless) was responsible for the programs, arrangement and invitations of conveners and lecturers, teaching material and coordination. The Indonesian OC Short Courses team represented by Sayogi Sudarman, Yunus Daud and several other persons together with Surya Darma – secretary general of the Indonesian OC - were involved in many logistic and technical issues.

The topics, teams of conveners and lecturers of WGC2010 Short Courses were as follows:

***Course 1. Drilling, completion and testing of geothermal wells:***

- Pierre Ungemach (France)
- Miklos Antics (Romania/France)
- Hagen Hole (New Zealand)
- Peter E. Danielsen (Iceland)

***Course 2. Design, construction and operation of geothermal plants:***

- Richard Campbell (USA)
- Max Walenciak (USA)

***Course 3. Geothermal heat pumps:***

- John Lund (USA)
- Olof Andersson (Sweden)
- Leif Bjelm (Sweden)

***Course 4. Financing geothermal projects:***

- Gordon Bloomquist (USA)
- Paul Quinlivan (New Zealand)
- Markus Christen (USA)

- Joseph Bevash (USA)
- Michael Yoshii (USA/Japan)

***Course 5. Introduction to geothermal energy:***

- Sayogi Sudarman (Indonesia)
- Yunus Daud (Indonesia)
- Nenny M. Saptadji (Indonesia)
- Adiatma Sardjito (Indonesia)
- Susilawati (Indonesia),
- Agus Danar (Indonesia).

Course 5 was addressed to an Indonesian audience and conducted in Bahasa Indonesia.

Courses 1 – 4 were held in Bali International Convention Centre (the WGC2010 venue) on 24 – 25th April 2010 while Course 5 was held in Jakarta, Java, on 22 – 23rd April. CDs with Course teaching material were given to each participant. The participants were awarded Certificates of attendance.

The cooperation and involvement of teams responsible for the preparation and running of the Short Courses, the key geothermal topics, the presence of world-class experts as conveners and lecturers, excellent conference facilities, Indonesian hospitality as well as great attendance and the active interaction of participants resulted in the fact that the Courses were significant events that broadened and updated knowledge on several geothermal topics. Indeed, they created a sound introduction to the main part of WGC2010 and to many current and prospective geothermal issues and sectors presented during the Congress sessions. They greatly contributed to the success of the WGC2010 as a whole and to the worldwide education and promotion of geothermal energy.

Some brief notes from WGC2010 Short Course 1 and WGC2010 Short Course 5, prepared by their conveners (Miklos Antics and Sayogi Sudarman), are given below. It is a special pleasure to present also some impressions shared by Marta Mburu who attended WGC2010 Short Course 3.



SC2 – Max Walenciak during a lecture



SC3 – Gordon Bloomquist introducing geothermal heat pumps



C4 – Michael Yoshii and Joseph Bewash, lecturers

## Short Course 1: Drilling, completion and testing of geothermal wells

(by Miklos Antics, Course co-convenor and lecturer)

WGC2010 Short Course 1 (WGC2010 SC1) dedicated to Geothermal well drilling/completion/testing and related reservoir engineering topics was attended by seventy two persons (!), far above expectations. They attended the course in spite of the volcanic ash, flight delaying episode and the late arrival of Pierre Ungemach (convenor) and Miklos Antics (co-convenor) who gave their lectures on the second day thanks to a slight course rescheduling perfectly handled by SC1 lecturers Hagen Hole and Peter Eric Danielsen.

Participants and lecturers managed to have the sessions thoroughly interactive and therefore rewarding for both sides.

## Short Course 5: Introduction to Geothermal Energy

(by Sayogi Sudarman, Course co-convenor and lecturer)

The objective of the Course was to give basic knowledge about geothermal energy in the sense of awareness and basic principles of the resources, technology use and business evaluation. By knowing the basics, someone can understand what is geothermal energy and why we should develop it.

The course was held at Patra Jasa Hotel in Jakarta from 22 to 23 April 2010, covering five topics and discussing the advantages, disadvantages, and limitations of each method, including:

- Exploration technology used for the exploration phase, development and production stages,
- Exploitation and production, and reservoir management throughout a 30 year production period,
- Policy of geothermal development in Indonesia to match the 4,000 MWe development target,



SC4 Participants



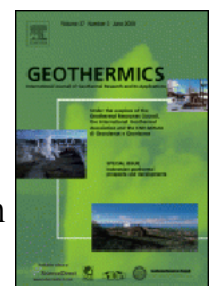
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## GEO THERMICS

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- Lessons learned about community development and CSR,
- Economic evaluations of geothermal projects, assumptions and economic sensitivities.

About 60 persons participated in this Course which was given in Bahasa Indonesia. Almost half of them came from 12 universities in Java and Lampung that teach geothermal energy either in earth sciences or engineering or both disciplines. Other participants were from Local Governments that have the authority to execute tender concessions, or were developer candidates, reporters or NGOs.

### **WGC-2010 Short Course 3 on Geothermal Heat Pumps – some impressions**

(by Martha Mburu – Course participant)

My name is Martha from Kenya. A reservoir engineer by training (New Zealand-2000 and Iceland-2003), I'm currently working for the Geothermal Development Company (GDC), Kenya. I have worked in the geothermal industry for 12 years. This was the first time that I have attended a WGC and it was a memorable and rewarding



*SC5 Participants*

opportunity that I will always treasure. It was technically very rewarding, especially when coupled with the 2 day Pre-Congress Short Courses and the field trips. I have a personal interest in direct utilization of geothermal energy; in fact my MSc research was on direct utilisation of energy from geothermal brine. Being an engineer, I have always wanted to understand the technology and applications of geothermal heat pumps and this became a reality when the organizers of the WGC-2010 offered, among others, a Short Course on Geothermal heat pumps! My employer GDC was kind enough to sponsor me for this Course.

A team of 12 senior technical staff from GDC attended the WGC2010 Short Courses. We distributed ourselves in all the four Courses offered, depending on personal interest as well as our technical orientation. The feedback I got from my colleagues is that the Courses were well organized and delivered. They were also very beneficial at a personal and cooperative level.

The Course on Geothermal heat pumps was very well organized. The class was small (several participants) and this made the learning very interactive and conducive. We had three very able, technically knowledgeable and dedicated lecturers under the leadership of Prof. John Lund. The Course covered the theory behind the uses of geothermal heat pumps, applications and case studies. It was a very educational Course. I would recommend such a Course to as many persons as possible, not only the technical team but also those that are biased to renewable energy uses in heating and cooling buildings.

To sum up - all persons and parties who contributed to the preparation and successful running of WGC2010 Short Courses deserve thanks and appreciation for their dedicated work and efforts. Last but not least, thanks go also to all Short Course participants who were the most important part of the game and by such numerous participation made these Courses so successful – a true “overture” to WGC2010 and its final outcomes.

### **Election results**

#### ***Árni Ragnarsson and Gestur Gíslason***

A new IGA BoD for the period 2010-2013 has been elected. Information about the election procedure and personal passwords for voting through the IGA web were sent by individual e-mails to IGA members with voting rights. Most members received their e-mail in mid June and others on July 1st 2010. As decided by the BoD the election material was not sent out by postal mail as before. Thus, only members with a registered e-mail address received a personal message, but the election was also announced in IGA News and on the IGA web. Out of the total number of eligible voters 361 are not registered with an e-mail address or about 7% of the total. The deadline for voting was July 26th. After closing of the election the votes were processed at the Secretariat under the supervision of the IGA Secretary.

Table 1. Main election statistics

Votes received through the web	1,679	98.9%
Paper and e-mail ballots received	19	1.1%
<b>Total votes received</b>	<b>1,698</b>	100.0%
Unknown sender	1	
Votes from non-members	3	
Double votes	7	
<b>Total invalid ballots</b>	<b>11</b>	
<b>Total ballots counted</b>	<b>1,687</b>	32.5%
<b>Total number of eligible voters</b>	<b>5,195</b>	100.0%
<b>Total number of valid preferences</b>	<b>23,281</b>	

The main election statistics are reported in table 1. The total number of eligible voters was 5,195 IGA members. We received 1,679 votes through the web and additional 19 paper and e-mail ballots. Thus, the total number of votes received was 1,698. Of the total number of ballots received 11 were invalid (double votes, votes from non-members and unknown sender). Thus the total number of ballots counted was 1,687 or 32.5% of the number of eligible voters, covering 53 countries. The total number of valid preferences was 23,281.

The geographical distribution of the counted ballots is reported in Table 2, which also shows the percentage of ballots received from each country out of the total number of eligible voters from the respective country. In Table 3 the distribution of votes received from the affiliated organizations is shown, along with the percentage of the eligible voters participating in each of them. The difference between the totals in tables 2 and 3 represents the number of votes from individual and corporate members (73).

Table 4 shows the election results. The names of those elected are listed in alphabetical order and similarly for non-elected candidates. The results have been approved by the IGA President and the candidates have been notified. The geographical distribution of the new BoD members is reported in tables 5 and 6.

It should be pointed out that the number of IGA members has increased considerably since the last election in 2007. The number of eligible voters increased from 3,269 to 5,195 in this period or by 59%. The number of valid ballots increased from 904 to 1,687 or by 87%. Thus, the election participation was now 32.5% compared to 27.7% in 2007. We send our best congratulations to the new board.

Table 2. Ballot distribution per country. Ballots were received from 53 countries.

Country	Total	% voters
Australia	72	21%
Belgium	4	100%
Brazil	1	100%
Canada	7	10%
Chile	4	20%
China	26	37%
Costa Rica	9	45%
Denmark	2	50%
Djibouti	1	100%
Ecuador	2	100%
Egypt	1	100%
El Salvador	26	49%
Ethiopia	8	19%
France	10	50%
Georgia	5	26%
Germany	130	16%
Greece	3	43%
Honduras	1	100%
Hungary	45	27%
Iceland	76	47%
India	2	50%
Indonesia	125	28%
Ireland	5	23%
Israel	1	100%
Italy	71	40%
Japan	61	55%
Kenya	7	37%
Latvia	1	33%
Lithuania	18	53%
Macedonia	30	67%
Malaysia	1	25%
Mexico	36	42%
Netherlands	7	11%
New Zealand	113	42%
Nicaragua	2	67%
Pakistan	1	50%
Papua New Guinea	2	33%
Peru	1	100%
Philippines	325	62%
Poland	97	41%
Romania	15	45%
Russia	7	30%
Singapore	1	9%
S-Korea	14	78%
Slovakia	11	35%
Slovenia	1	100%
Spain	3	50%
Sweden	1	33%
Switzerland	30	33%
Turkey	50	52%
United Kingdom	3	23%
USA	211	22%
Vietnam	1	100%
<b>Total</b>	<b>1687</b>	<b>32%</b>

Table 3. Ballot distribution from Affiliated Organizations

Affiliation	Country	Total	% voters
AGEG	Australia	58	20%
CanGEA	Canada	5	14%
GCES	China	25	37%
AGC	Costa Rica	9	47%
ESGA	El Salvador	25	50%
EGA	Ethiopia	8	19%
GGA	Georgia	5	26%
GtV	Germany	127	16%
HGA	Hungary	33	33%
HTES	Hungary	11	17%
GAI-IS	Iceland	64	47%
API-INAGA	Indonesia	116	28%
IGEA	Iran	0	0%
GAI	Ireland	5	23%
UGI	Italy	63	39%
IGAJ	Japan	60	58%
LGA	Lithuania	18	53%
MAGA	Macedonia	30	67%
MGA	Mexico	26	47%
SPG	Netherlands	7	13%
NZGA	New Zealand	114	42%
NGAP	Philippines	322	62%
PGA	Poland	23	17%
PGS	Poland	73	74%
RGA	Romania	15	47%
RUGA-GES	Russia	7	29%
SGA	Slovakia	10	33%
SVG-SSG	Switzerland	30	32%
TGA	Turkey	48	55%
GRC	USA	277	24%
<b>Total</b>		<b>1614</b>	<b>32%</b>

Table 5. Elected BoD members distribution per continent

Continent	New Board	Retiring Board
Africa	2	2
America	5	5
Asia	8	7
Europe	11	13
Oceania	4	3
<b>Total</b>	<b>30</b>	<b>30</b>

Table 4. IGA BoD election results 2010. The names of those elected are listed in alphabetical order and similarly for non-elected candidates.

Name	Country
<b>Elected</b>	
Miklos A. Antics	Romania
Nilgun Bakir*	Turkey
Graeme Beardsmore	Australia
Christian Boissavy	France
D. Chandrasekharam*	India
Surya Darma	Indonesia
Luis C. A. Gutiérrez-Negrín*	Mexico
Colin Harvey	New Zealand
Paul Hirtz	USA
Roland N. Horne	USA
Herman Darnel Ibrahim*	Indonesia
Eduardo Iglesias*	Mexico
Horst Kreuter	Germany
Francisco E. Montalvo L.	El Salvador
Juliet Newson*	New Zealand
Zhonghe Pang*	China
Bjarni Pálsson*	Iceland
Fernando S. Penarroyo*	Philippines
Paul Quinlivan*	New Zealand
Árni Ragnarsson*	Iceland
Paolo Romagnoli*	Italy
Horst Rüter	Germany
Ladislau Rybach	Switzerland
Silas Simiyu*	Kenya
Benedict Steingrímsson	Iceland
Valentina Svalova*	Russia
Koichi Tagomori*	Japan
Richard B. Tantoco*	Philippines
Meseret Teklemariam*	Ethiopia
Kasumi Yasukawa	Japan
<b>Non-elected</b>	
Marek Hajto	Poland
Valiya Hamza	Brazil
Ryszard Henryk Kozłowski	Poland
Zbigniew Malolepszy	Poland
George Melikadze	Georgia
György Pátzay	Hungary
Sanja Popovska V.	Macedonia
Burkhard Sanner	Germany
Yoonho Song	S. Korea
Gábor Szita	Hungary
Roland Wyss	Switzerland
Feliksas Zinevicius	Lithuania

\* New BoD member

Table 6. Elected BoD members distribution per country

Country	New Board	Retiring Board
Australia	1	1
China	1	1
El Salvador	1	1
Ethiopia	1	
France	1	1
Germany	2	2
Iceland	3	2
India	1	
Indonesia	2	2
Italy	1	1
Japan	2	3
Kenya	1	1
Macedonia		1
Mexico	2	1
New Zealand	3	2
Philippines	2	1
Poland		1
Romania	1	1
Russia	1	1
Switzerland	1	2
Turkey	1	1
Uganda		1
USA	2	3
<b>Total</b>	<b>30</b>	<b>30</b>

## EUROPE

### European Geothermal News

#### *Philippe Dumas, European Geothermal Energy Council*

#### **GtV position paper on Induced Seismicity in Geothermal projects**

GtV, the German geothermal association, has published a paper concluding that geothermal installations have until now never caused hazardous earthquakes causing structural damage or putting human life at risk. Particularly in Germany, only minor damages have been reported and have until now not even been proven in court. Geothermal projects are carried out under the Mining Act, which states that care must be taken that no personal harm occurs, that traffic or general infrastructure is not damaged and that no damage is done to public goods. Compensation must be paid for lesser damage to buildings if it occurs. Nevertheless induced seismicity that has been experienced in a few isolated cases is a serious acceptance problem. The natural fear of 'earthquakes' is deeply rooted; they are regarded as (and are) unpredictable and not manageable. In contrast, geothermal installations can be produced and run in a way that makes even small noticeable seismic events unlikely. The entire process (installation and production) can be controlled. The controlled operational approach (step-by-step) is

recommended, including seismological monitoring. Experts may find that at some locations the seismic risk is unacceptable because of very special geological conditions. No geothermal project should be established in those (rare) areas. Those special areas could be areas of superficial and uncompacted alluvial deposits or areas with an extensive history of natural seismicity with catastrophic results

#### **New geothermal countries in Europe: Croatia, Slovakia, UK, Ireland, Serbia**

A first geothermal power plant in Slovakia to be built: Slovakia is planning development of its first geothermal power plant by Geoterm, a joint venture of local players and the Ministry of the Economy, in the eastern part of the country, the Košice basin.. The project expects a plant of 8-9MW for a cost of EUR30 million.

*First geothermal power plant project in Croatia:* The first geothermal power plant in Croatia is going to be constructed in Velika Ciglena, Bjelovar. The construction licence for the plant should be obtained by the end of 2010 and it has been assessed that the construction of Marija 1 geothermal power plant will be completed in two years with an installed power generation capacity of 4.7MW and 10MW heat production. A new project is being prepared with a second geothermal power plant to be constructed in south Slavonia.

*United Kingdom:* A team of scientists and engineers today (23 June 2010) pumped out the first hot water from the depths of Weardale as part of a landmark project to investigate the potential of geothermal energy as a source of renewable heat.

The twin borehole system is the first of its kind in the UK and will allow warm groundwater – heated by the hot granite rocks hundreds of metres below ground – to be continually cycled through a 1,000m underground heating system. Led by Newcastle University, the geothermal borehole is one of five forms of land-based renewable energy sources being considered for the proposed Eastgate eco-village in Weardale.

The University team believes it could not only provide renewable, clean energy for homes and businesses, but also some of the natural hot water could be used in a spa - the first such development in the UK since the Romans tapped the hot springs at Bath.

Following a grant from the Department of Energy and Climate Change earlier this year, the team has drilled a second - or 're-injection' - borehole to complement the 995m deep exploration borehole which was originally drilled three years ago. Water at a temperature of around 30-40°C is brought up to the surface where it passes through a heat exchanger before being sent back underground to be re-heated. Used water is reintroduced to the granite at about 420m deep, and heated up again as it flows through a complicated maze of fractures on its way back to the pumping borehole.



## From the Secretariat

### Geothermal knowledge community

[Geothermalcommons.org](http://Geothermalcommons.org) is an open source knowledge community on the web for the geothermal sector. The idea is to create a platform where people can share geothermal knowledge and experiences interactively. The functions of the platform enable not only the connection of information and knowledge, but also the connection of knowledge and people. It establishes a database which helps the geothermal sector to bring people from all over the world together or to attract new people to this exciting and growing sector. Furthermore, people who are already working with geothermal will get the opportunity to extend or refresh knowledge of their unknown fields. Geothermalcommons.org is free of charge and can only be used with a valid email address, a username and a password. Geothermalcommons.org does not provide information itself, rather, it encourages everyone to add, edit, share and discuss information.

Professor Younger said the next step was to go even deeper. "There is every reason to suppose that if we drill even deeper here in future we will find water at boiling point, which is hot enough to generate electricity."

### *GT Energy and ESBI sign partnership to build Ireland's first geothermal energy plant:*

GT Energy, a member of EGEC, has entered into a Technology Partnership Agreement (TPA) with ESB International (ESBI), the Irish electrical utility. Under the agreement, GT Energy will generate up to 50 megawatts (MW) of electricity using geothermal energy by 2020, and ESBI will assist the company with the design of the generating equipment and grid connection design work. The two companies will work together to share information, expertise and resources to support GT Energy's plans to develop a number of deep geothermal electricity projects across the island of Ireland. GT Energy has identified a number of sites on the island of Ireland, including Dublin, that offer potential for the development of geothermal energy plants. In addition to delivering energy for heating purposes, many of these would have the capacity to generate about 5 MW of electricity. This additional renewable generation capacity would assist in meeting Ireland's renewable energy obligations and delivering on the National Renewable Energy Action Plan for 2020. GT Energy announced in April that it had raised first round funding through NCB Corporate finance and secured grant aid from the British Government.

### *Agreement Signed for Vranjska Banja Geothermal Wells (Serbia):*

Reservoir Capital Corp. reported that its wholly-owned subsidiary, Southern European Exploration D.o.o. has signed a Business and Technical Cooperation Agreement with Jumko A.D., to evaluate the existing geothermal wells

operated by Jumko, within the Company's Vranjska Banja exploration permit located in Southern Serbia. Jumko holds a two hectare exploitation permit with two geothermal wells (VG-2 and VG-3) that were drilled for district heating of an industrial complex. The VG-2 well intercepted several hot water aquifers, the best of which measured 126°C between 864-890 metres depth. The VG-3 well intercepted a zone containing three intervals with measured temperatures of 124°C, between 1,500 and 1,575 metres depth. Under the terms of the Agreement, the Company has an exclusive one-year period to complete detailed technical and feasibility studies. The Company's Vranjska Banja exploration permit covers 1,750 hectares in area and completely surrounds the Jumko permit. Since receiving the exploration permit in November 2009, the Company has used existing geophysical data (magnetics and gravity) to define target areas and this March began detailed magnetic surveys, mapping and water geochemistry studies.

Reservoir Capital Corp. is a Canadian public company whose operations are focused in Serbia with a mandate to acquire and develop natural resource opportunities in Serbia and Southeast Europe. It is a Southeast Europe focused project generator, investing primarily in renewable energy. The Company holds two hydroelectric projects, Brodarevo 1 and 2, with 55MW of potential capacity undergoing pre-feasibility studies and an application in process for a third at Vrutci with 32MW potential capacity, all in southwest Serbia. Reservoir currently holds four geothermal licenses and a portfolio of precious and base metal exploration projects. Reservoir's common shares trade on the TSX Venture Exchange under the symbol "REO" and on the Frankfurt and Berlin exchanges under the symbol "ROC".

## A new feed-in tariff in France

### *A French decree presents the new French FiT for geothermal power:*

Announced in January 2010, the [French arrêté](#) detailing the Feed-in-tariff for geothermal electricity production has been published at the Journal Officiel on 24 July. The reference tariff in metropolitan France is 20 c€/kWh and in French overseas departments is 13 c€/kWh. A bonus for energy efficiency can be added: 8 c€/kWh in metropolitan France and 3 c€/kWh elsewhere.

## Scenario 2050

### *Re-thinking 2050: 100 % RES*

EREC's new report on "RE-thinking 2050 – A 100 % Renewable Energy Vision for the European Union" has been published on 15th of April 2010.

You can download the full version of RE-thinking 2050 from [www.rethinking2050.eu](http://www.rethinking2050.eu)

In this scenario 2050, geothermal energy will be an important player (ca 20%). Furthermore, you are cordially invited to join the list of supporters and to declare your

support for 100 % renewables in 2050 on the website via designing your own free electronic postcard.

## ASIA

### Indonesia

## The First Joint Geothermal Course "Geothermal energy development – where science and engineering meet"

### Pri Utami, Geothermal Research Center, Gadjah Mada University

The Faculty of Engineering Gadjah Mada University/GMU (Indonesia), GNS Science and The University of Auckland (New Zealand) organized their first joint geothermal course with a theme "Geothermal energy development – where science and engineering meet" (12 – 17 July 2010). The course was held at Gadjah Mada University Campus, Yogyakarta, and was officially opened by the New Zealand Ambassador to Indonesia, H.E. Mr. David Taylor.

The self-funded joint course aims to build the capacity of the Indonesian geothermal human resource in order to support the Indonesian Government's program for acceleration of geothermal electricity generation, i.e. up to



*Class photograph of the first Gadjah Mada University – GNS Science – The University of Auckland geothermal joint course (12 – 17 July 2010) taken after the official opening by the Ambassador of New Zealand to Indonesia, H.E. Mr. David Taylor (front row, middle).*

6,000 MWe by 2020. The collaboration between one of the oldest and largest universities in Indonesia with the two New Zealand institutions well known for their strength in geothermal education and research helps to cement Indonesia's and New Zealand's long tradition of collaborative education, research, and business in the geothermal sector.

The course was attended by 60 participants: 32 from geothermal companies, 1 from a local government office, 1 private participant, 15 junior academic staff of Gadjah Mada University, 2 external observers (New Zealand Aid and New Zealand Trade and Enterprise), and 9 internal observers from the Geothermal Research Center, Faculty of Engineering GMU.

There were nine instructors, two of whom came from Indonesia, and seven from New Zealand. The geothermal



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If you are interested in this opportunity or other geothermal opportunities based in Australia please contact Sonia Parancin on +61 7 3858 0214 or email [sonia.parancin@originenergy.com.au](mailto:sonia.parancin@originenergy.com.au)

Origin Energy is a top 20 ASX listed company in Australia and has experienced significant growth year on year since forming in 2000 which continues. Operating as a fully integrated energy provider and employing approximately 4500 employees across Australia, New Zealand and the Pacific with major projects including oil and gas exploration and production, power generation and energy retailing. Origin currently holds 51.4% of Contact Energy, which has 304 MW operating geothermal and a number of projects under development.

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geoscience instructors were: Greg Bignall, Rob Reeves, Supri Soengkono, Ed Mroczeck (GNS Science) and Pri Utami (GMU). Mike Sullivan, Sadiq Zarrouk, Juliet Newson (The University of Auckland), and Khasani (GMU) were instructors for geothermal engineering. Ed Mroczeck delivered his lecture via video conference. The course material covered both geoscience and engineering aspects of geothermal energy development, and was delivered through class and laboratory activities, group discussions, and field trip to the Dieng Geothermal Field, Central Java. A lecture on the Dieng Geothermal Field was given by Soewondo Koesoemo (General Manager of the PT. Geo Dipa Energi Dieng), and the trip was led by A. Harijoko (GMU).

Beside teaching, the New Zealand guest lecturers also visited the research and education facilities at GMU and held discussions with several research groups at GMU, i.e., the Geothermal, Coal Bed Methane, Volcanology and Geophysics, as well as the Geo-hazard Research Groups. These aimed to strengthen the existing collaborations and to explore the possibilities of the new ones.

A cultural night was held in the middle of the course's busy week to give the participants, the guest lecturers, and the GMU staff a chance to build a network in a more relaxing atmosphere. The course was concluded after the field trip with certificate presentations to the successful participants.

## AFRICA

### Djibouti

## Djibouti Energy Challenge: Can Geothermal Resources solve the problem?

**By Eng. Farah Ali Ainan, Secretary General, Ministry of Energy and Natural Resources, Republic of Djibouti**

### Introduction

Djibouti has always been very important, not only because of its geostrategic location but also because of there was a supply of coal for both commercial and war ships on the Europe-Asia maritime route. Unbelievably, then, availability of energy was an integral part of Djibouti.

The modern electricity supply in the City of Djibouti and five other interior towns started in the early 60s with



Figure 1: Boulaos thermal power station, Djibouti.

the formation of the utility electricity company, Edd, which celebrated its 50th anniversary in January, 2010. The electricity is generated wholly from fossil petroleum.

### The energy challenge

Djibouti requires investment for the benefit of its people. However in order to do this, it equally requires huge investment in infrastructure projects which in return require a huge and reliable supply of energy, which is also not available. This is the energy challenge facing the decision makers in Djibouti.

In order to turn this long lasting challenge into real opportunity for development, the government has ranked the research and development of energies in the very top priority of its development strategy.

The country benefited from unexpected growth with major foreign direct investment (one of the highest per capita in the continent) during the 2000s. Unfortunately, this was followed by multiple international crises of oil price rises and the food shortage of 2008. These crises hit the country when the whole region was suffering a humanitarian drama caused by several consecutive years of severe drought.

Table 1 shows that the cost of heavy fuel oil (HFO) for power generation of in Djibouti increased from US\$13.2 million in 2002 to US\$70.2 million in 2008, an increase of 431%. The cumulative total increase was US\$113 million. In addition, the cumulative increased cost of gasoil for generation was US\$ 35 million, making the total cumulative increase in fuel cost for generation about US\$ 148 million. Fuel costs for electricity generation alone account for 1/3 of the national budget or 1/5 of GDP. Between 2004 and 2008, kerosene consumption, which is

Table 1. HFO Impact on Djibouti's Economy with focus on Electricity Production

	2002 Ref	2003	2004	2005	2006	2007	2008
<b>HFO Fuel Cost In US\$ Million</b>	13.220	15.715	16.573	25.787	31.138	33.251	70.225
<b>% Increase in HFO cost</b>		+18.9%	+25.4%	+95.06%	+135.5%	+151.5%	431.20%

Figures from Edd databases

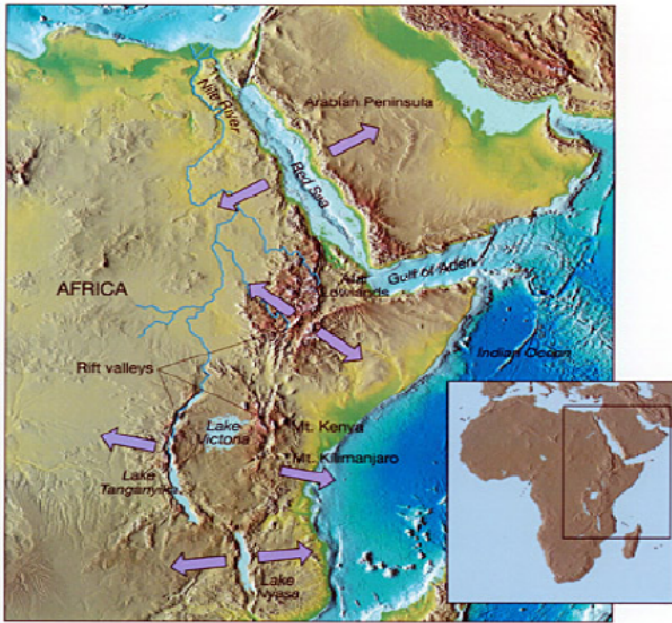


Figure 2: African Great Rift system.

now used mainly for cooking, more than doubled. The increase in cost of all the fossil fuels consumed in the country for cooking, transportation and electricity over this period was more than US\$600 million.

### Energy Resources

Fortunately Djibouti has abundant proven energy resources from wind, solar, geothermal and wave which can meet the country's energy needs adequately for some time to come. However, please note that Djibouti does not have hydropower potential neither does it have other traditional sources of energy. Except for hydrocarbons and wave, which have not been investigated, the other sources of energy are as follows:

1. Solar energy is abundant (average insolation 5.38 kw.h/sq.m/day) for nearly 365 days per year.
2. Wind energy with estimated potential of over 10MW in at least five (5) sites
3. High enthalpy geothermal resources with an estimated potential of about 350- 800MW
4. Wave with an expected potential of more than 100MW from initial estimates at the strait of Ghoubet.

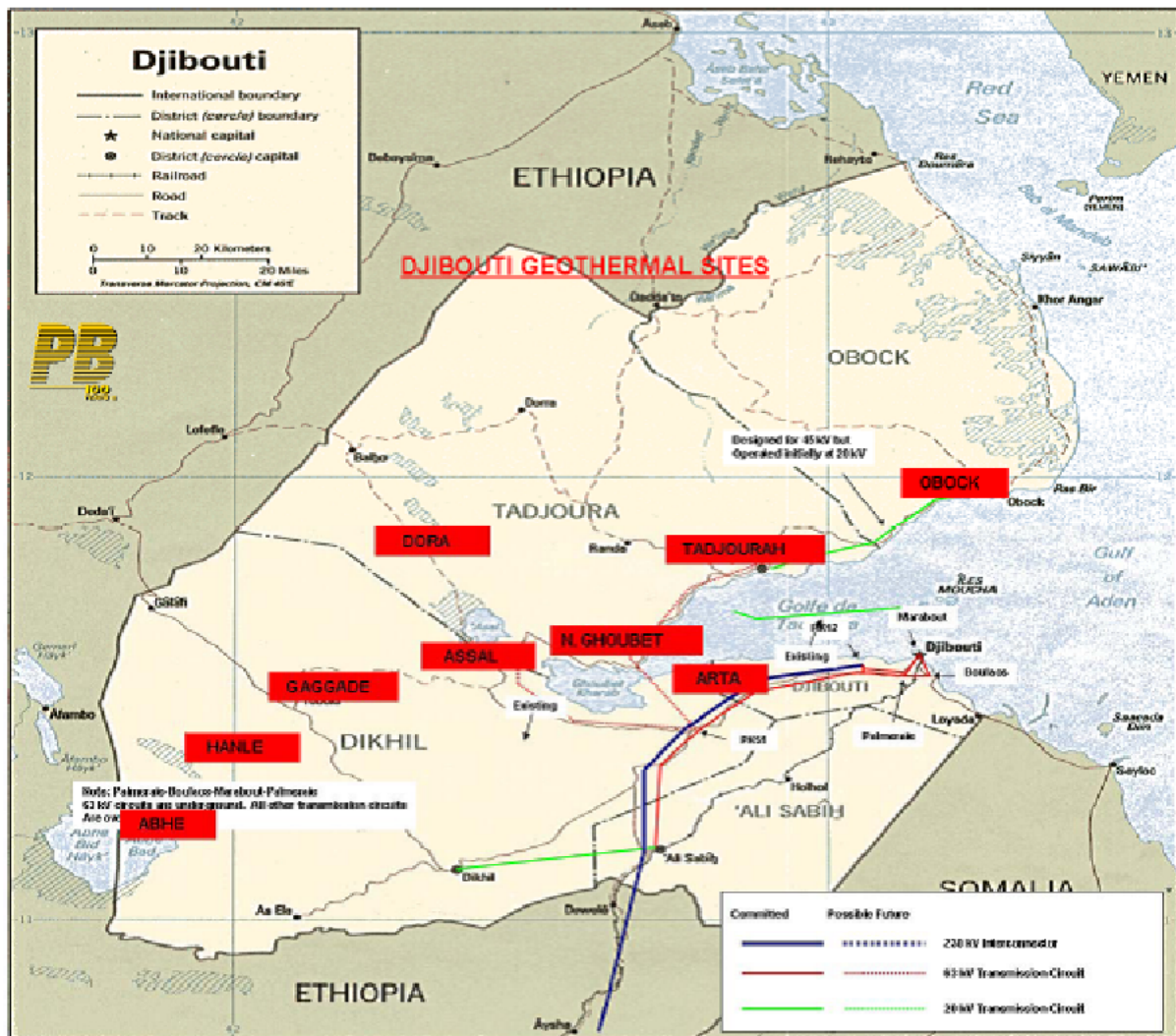


Figure 3: Geothermal areas of Djibouti (Courtesy of Parsons Brinkerhoff, 2009).

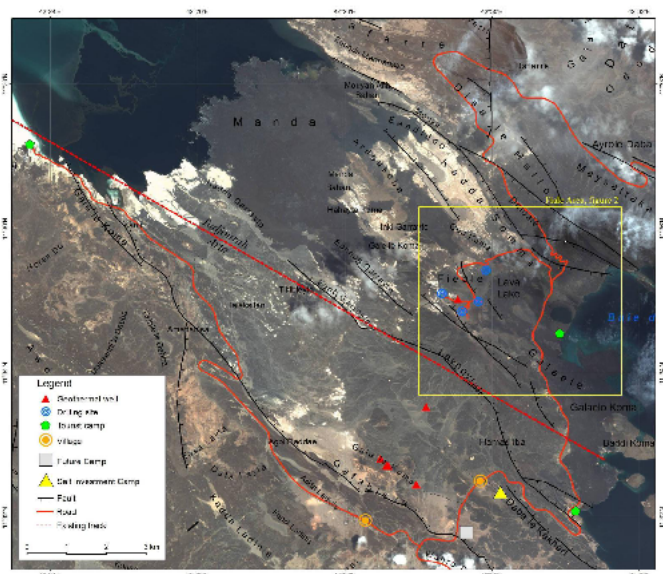


Figure 4: Lake Assal Prospect ( Courtesy of Reykjavik Energy Invest 2009).

## Current Electricity capacity and future demands

All the electricity in Djibouti is generated from two thermal power stations, Bouloas and Marabout, located within Djibouti city (Figure 1). Bouloas is the larger of the two. The total installed capacity is about 100MW but the effective capacity is close to the peak demand of 57MW. This is complemented by other small public or private diesel generators. Hence the generation is wholly dependent on imported oil. In addition Djibouti will be interconnected this year with Ethiopia through a 230kV double circuit interconnector and provide “non-firm” supply. In the short term, twice the installed capacity (219MW) is required to meet the increasing demand due to increased population and economic activities (Parsons Brinkerhoff 2009).

Several planned infrastructures projects are on hold due to lack of power, for example Port of Doraleh and the Free Zone and water desalination. These projects could attract more investors in the manufacturing sector with huge opportunities for processing for the hinterland regional market if low priced and abundant electricity were available in Djibouti. In addition other projects which could benefit immensely from an adequate supply of power are mineral processing, salt processing at Lake Assal and perlite ore which could earn more money if it were semi-processed in the country. Other examples include the cement industry in Ali Sabih and building stone processing.

## Can Geothermal Resources help to tackle the energy Challenge?

Certainly. In the search for energy solutions, mainly nationally-based sustainable resources, geothermal resources have been given the most attention since independence. There has also been a clear renewed interest in recent years. This is due to the commitment at

the highest level of the State, that of H.E the President Ismail Omar Guelleh. Towards these efforts, the president visited Iceland in February, 2007 to see what that a small and remote country has achieved with its geothermal resources. This was an eye-opening experience indeed.

The Djibouti government understands very well that the government role is essential for supporting and boosting the development of geothermal resources which require very costly and risky upfront investments in addition to the requirement of adequate technical expertise.

The other renewable energy resources, for example Solar, Wind and Tidal, are in various stages of assessment and have also benefited from marked policy attention similar to Geothermal. However, it is well known that geothermal energy is the most reliable and efficient of the other renewable energies.

Djibouti is exceptionally well located in the world, along with the Andean region of South America, having the highest exploitable geothermal potential given its young and frequent volcanic activity within the East African Rift System (Figure 2). It is unfortunate though, that the geothermal resources at these two regions are still the least developed.

At the southern end of the Rift Valley is the most important geothermal energy field in the region, Olkaria in Kenya, followed by Ethiopia and Djibouti in terms of progress in research and exploration resource.

Djibouti’s geothermal potential is estimated at between 350MW and 800MW of high enthalpy geothermal energy. The potential areas ( about 12, Figure 3) include Ghoubet, Assal, Lake Abbe, Obock, Arta, Hanlé and Gagadé among others (Ainan 2010).

Assal is the most investigated geothermal prospect in Djibouti (Figure 4). Six exploration wells were drilled between 1975 and 1988 in Assal and a high enthalpy, high salinity resource was found. It has a potential for bore scaling, but the resource potential is estimated at more than 150-300MW. The problems of high salinity and scaling (Virkir-Orkint 1990) have had an unnecessarily negative impact on further development of Assal. It is understood that the technology to address this problem is now available. Other strategies have been formulated with the intention of achieving better drilling results by an IPP

## From the Secretariat

### IGA Annual General meeting 28 October 2010

IGA will hold the Annual General Meeting in the afternoon of 28 October 2010 in Sacramento, California, USA, following the GRC Annual Meeting. The meeting venue will be the Sacramento Convention Center. All IGA members are welcome to the meeting. More details will be given on the IGA web.



*Figure 1: A section of Djibouti City*

who carried out prefeasibility studies between 2007 and 2009. New appraisal wells have yet to be drilled.

Lake Abhe prospect is believed to be a low enthalpy resource which can be developed using binary power plants. The area has been licensed to an IPP and investigations are currently under way. An IPP has proposed to develop 50MW - 150MW of Binary geothermal plants after carrying out further exploration work.

In Hanlé prospect, surface exploration work was done and two deep wells drilled together with 3 gradient wells between 1982 and 1988. Low temperatures were intersected by the deep wells.

From the three areas alone, it is estimated that over 400MW of geothermal power can be developed. This is substantial power which can provide all the electricity required for Djibouti for many years to come and therefore save huge amounts of foreign currency being spent on imported fuel.

## Conclusion

In order for Djibouti to proceed with its development agenda, adequate infrastructure investments are required which must include power generation. Currently Djibouti depends on imported fuel to generate its power and consequently spends a substantial fraction of its GDP on fuel. The electricity tariff is also relatively high.

Luckily, Djibouti is endowed with what is believed to be substantial amount of both high and low temperature geothermal resources which, if developed, can replace the current thermal power and meet ever increasing future demands. Geothermal can therefore meet and exceed the energy challenge facing the decision makers.

Having arrived at this conclusion, it is important to



*Figure 2: Assal Rift with Lake Assal at the background.*



Figure 4: Geophysical exploration work at Assal geothermal area

point out the unique opportunity Djibouti offers to investors and developers in geothermal energy:

- A country with infrastructure facilities (Ports, Telecom, Roads..) with growth potential. Every geothermal prospect is located less than 150km from the Port and with good access roads.
- Substantial investigations and reconnaissance work has already been completed so developers will not start from scratch.
- ARGeo will provide a risk mitigation fund in the exploration phase.
- There is government commitment at the highest level.
- A successful geothermal project in Djibouti will offer

its owners and partners the unique chance to have an incomparable “Show Case” or “Show Room” that will surely support them to implement other geothermal projects in the Great East Africa Valley Countries.

**References**

Ainan, F.A., 2010. Djibouti Potential Status and Perspectives in Geothermal Resources Development,. Proceedings World Geothermal Congress, Bali 25-29 April 2010.

Parsons Brinkerhoff, 2009. Least Cost Electricity Master Plan, Djibouti. A Ministry of Energy and Natural Resources Report financed by World Bank.



Figure 5: Sheraton hotel in Djibouti



Figure 3: Well testing at Assal



Figure 6: Beach area in front of La Siesta Hotel, Djibouti

Reykjavik Energy Invest, 2009. Environmental Impact Study.

Virkir-Orkint, 1990. Djibouti geothermal scaling and corrosion study.

## Welcome to Djibouti for ARGEO-C3, November 22-25th

By Mohamed Jalludin, Director General, CERD

### The Conference

The African Rift Geothermal facility (ARGEO) regional project is dedicated to the development of clean geothermal resources, mainly for energy production in the East African Rift region. ARGEO-C3 Djibouti 2010 is the third biannual conference organized within this framework of ARGEO, following the Addis Ababa 2006 and Entebbe 2008 conferences. The aim of the ARGEO-C3 conference is to create an information exchange platform on the exploration, development and utilization of the geothermal resources in the region. It is also expected to attract a broad participation from the international geothermal community from both public and private sectors.

The papers will be based on surface and deep exploration development and utilization of the geothermal resources, including new technologies and direct uses along with environmental and financial issues.

The ARGEO-C3 will be held on 22nd to 25th November 2010 in the town of Djibouti (Figure 1), capital of the Republic of Djibouti, located strategically at the Horn of Africa. The conference is organized by Centre d'Etude et de Recherche de Djibouti (CERD) under the office of the President with sponsorship from IGA, BGR, IAHS-AISH and UNEP.

Participants will benefit from the fresh season during the month of November and will have the opportunity to visit the worldwide famous emerged rift of Assal with its brine lake which is 150m below the sea level. This is a most fascinating location for geologists where volcanic activity is comparable to Iceland.

### General Information

The Republic of Djibouti is located in the Eastern part of Africa at the crossing of the Red Sea and the Gulf of Eden. The territory of 23,000 km<sup>2</sup> area abuts on the sea with more than 370km of coastal zones: the Gulf of Tadjourah in the north and Goubjet at Kharab. Djibouti is the largest town of the country with more than 600,000 inhabitants, 65% of the total population. The climate is arid to semi-arid and the average rainfall is about 150mm. The conference is timed to take place during the beginning of a new season when the temperatures might be between 25 - 30°C.

The peculiar geodynamic situation of East Africa is characterized by rifting that has given the various types of landscapes in the form of successive plateaus and plains in the western part, some mountains surrounding the Gulf of Tadjourah, and the coastal plains. The Assal rift (Figure 2) is located in the central part of the country.

The government of Djibouti is committed to developing the environmentally benign geothermal energy to replace the heavy dependence on imported oil in order to overcome the growing energy demand of the country and to support economic development. Twelve (12) prospects have been identified in the country. The potential areas include Assal, Lake Abhe, Manda-Inakir, Obock, and Arta. The Assal geothermal area is the most studied where several exploration wells were drilled in the 80s. Currently, two private firms are involved in geothermal work in Djibouti. One is preparing to start exploration drilling in Assal and the other is planning to undertake surface exploration work at Lake Abhe.

#### Themes of the Conference

The papers are prepared according to the following themes:

## From the Secretariat

### IGA Membership Dues

IGA Membership dues for individual and corporate members for the year 2010 were due 31 March. In order to keep the membership status, we advise those of you who have not paid to do that as soon as possible. See the application form on the back cover of this issue for renewal details.



- Exploration methods in geology, tectonics, geophysics, geochemistry and isotopes, hydrology and remote sensing.
- Drilling and well design
- Well testing, injection, reservoir engineering, reservoir modeling, tools and technologies
- Field development, production technology, power generation and operations
- Low enthalpy geothermal resources development
- Economics and financing, private sector participation
- Environmental, social, legal and institutional aspects
- Direct use: agri- and aquaculture, space heating

## Side Event

The program will also include a Side Event on “**What does geothermal cost?**”

## Registration Fees

Participants from ARGEO Countries	US\$ 150
Other participants	US\$ 200
Excursion (all participants)	US\$ 150

## Hôtels

Several hotels, listed below with telephone and fax numbers and email addresses, are available within Djibouti City. Participants are requested to make their own hotel reservations. Note that the country code for Djibouti is: 253

- KEMPINSKI. Phone: 325555 ; fax: 325556; [reservation.djibouti@kempinski.com](mailto:reservation.djibouti@kempinski.com)
- SHERATON. Phone: 32.80.00 ; fax: 32.88.88; [sheratondj@intnet.dj](mailto:sheratondj@intnet.dj)
- IMPERIAL. Phone: 35.22.20 ; fax: 35.40.70; [mkmcomesa@yahoo.com](mailto:mkmcomesa@yahoo.com)
- EUROPE. Phone: 35.50.60 ; fax: 35.61.08; [Heurope@intnet.dj](mailto:Heurope@intnet.dj)
- PLEIN CIEL. Phone: 35.38.41 ; fax: 35.68.57;
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- LA SIESTA. Phone: 32.23.00 ; fax: 35.03.03; [Siesta.hot@yahoo.fr](mailto:Siesta.hot@yahoo.fr)
- MENELIK. Phone: 35.11.77 ; fax: 35.46.82

## IGA News

IGA News is published quarterly by the International Geothermal Association. The function of IGA News is to disseminate timely information about geothermal activities throughout the world. To this end, a group of correspondents has agreed to supply news for each issue. The core of this group consists of the IGA Information Committee:

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 Kasumi Yasukawa, Japan

The members of this group submit geothermal news from their parts of the world, or relevant to their areas of specialization. If you have some news, a report, or an article for IGA News, you can send it to any of the above individuals, or directly to the IGA Secretariat, whatever is most convenient. Please help us to become essential reading for anyone seeking the latest information on geothermal worldwide.

While the editorial team make every effort to ensure accuracy, the opinions expressed in contributed articles remain those of the authors and are not necessarily those of the IGA.

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This issue of IGA News was edited by Eduardo Iglesias. John Garnish proofread the articles. Produced by Gestur Gíslason for the IGA Secretariat. Design layout by François Vuataz.

## Application for membership

Please complete the following form and return it with payment to:

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c/o Samorka  
Sudurlandsbraut 48, 108 Reykjavik, Iceland  
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