



# IGA NEWS

*Newsletter of the International Geothermal Association*

## IGA ACTIVITIES

### Message from the President

*John W. Lund, President*

The Board of Directors held their 41<sup>st</sup> meeting in Chiba, Japan, October 8-9, 2006. Toshi Uchida and Kasumi Yasukawa hosted and organized the meeting for the Board. This meeting was held in conjunction with the “Renewable Energy 2006” Symposium held in Chiba from October 9-13, 2006. The Board approved new affiliations with the Netherlands Geothermal Association (*Stichting Platform Geothermie, Nederland*), and with the Polish Geothermal Society (PGS), a second Polish geothermal organization. The Board agreed to enter into an association with the International Renewable Energy Alliance (IREA) based on a presentation by Peter Rae, the Chair of IREA, and representatives of IREA have been invited to attend future IGA Board meetings with observer status. The other members of IREA are the World Wind Energy Association, the International Solar Energy Society and the International Hydropower Association. The IGA European Regional Branch was approved – changing the title from the European Branch Forum, as required by the bylaws. A new IGA membership roster will be formatted and available on the IGA website in conjunction with the election ballot that will be sent out in the spring of 2007. The site and ballot will be password protected. Finally, an ad hoc committee was set up to investigate if IGA should give special awards at the World Congresses or at other geothermal or renewable energy events. If you have suggestions on this subject, please contact the committee members: Gordon Bloomquist, Rosa Maria Barragan or the President.

A Special Symposium on Geothermal Energy “New Perspective of Geothermal Energy Utilization in Japan” was held in conjunction with the “Renewable Energy 2006” Symposium chaired by Sachio Ehara. Papers on the utilization and future of geothermal energy in Japan (M. Hanano, T. Fujikawa, K. Yasukawa, H. Muraoka, H. Niitsuma and K. Osato) along with status reports from the USA (J. Lund and G. Bloomquist), Europe (L. Rybach), New Zealand (J. Lawless) and Turkey (S. Simsek and O.

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Mertoglu) were presented. A panel discussion on geothermal development in Japan concluded the special symposium. The papers from this symposium are available from Toshi Uchida ([uchida-toshihiro@aist.go.jp](mailto:uchida-toshihiro@aist.go.jp)). The President made a keynote address at “Renewable Energy 2006” on *Present Utilization and Future Prospects of Geothermal Energy Worldwide – 2006*.

The Annual General Meeting (AGM) of IGA was also held at the Renewable Energy 2006 conference. The meeting was attended by approximately 30 persons.

The President, Gordon Bloomquist and James Lawless met with the Indonesian Geothermal Association (AGI-INAGA) members in Jakarta prior to the Board meeting. The purpose was to evaluate the progress of AGI-INAGA in planning and meeting the deadlines set in the MOU in preparation for the World Geothermal Congress 2010 (WGC2010) to be held in Bali, Indonesia, probably in April, 2010. Our delegation, representing the IGA Steering Committee for WGC2010, was pleased to learn that the Indonesian Organizing Committee (OC) for WGC2010 has been formed and that they were well along in meeting their obligations under the MOU. The Chairman of the Indonesian OC is Dr. Herman Darnel Ibrahim and the Secretary General is Mr. Surya Darma. The delegation also met with the Indonesian Minister of Energy and Mineral Resources, the Honorable Purnomo Yusgiantoro (photo). He was very

supportive of geothermal energy and had recently issued a proclamation in support of WGC2010. The Congress also has the support of the national energy authority (PLN) and Pertamina.

The President attended the dedication of the world’s lowest temperature geothermal power plant at Chena Hot Springs, Alaska on August 20<sup>th</sup>. This 200 kW United Technologies unit uses 72.5 degrees C water to supply electrical power to the resort and will replace diesel generators at about 25% of the cost per kWh. The details of this plant and the location are presented elsewhere in this issue.

The next IGA Board of Directors meeting will be held just prior to the PNOG Geothermal Conference in Manila, Philippines on March 5-6, 2007.



### **William Anthony John (Tony) Mahon**

*(28/03/1934 - 23/10/2006)*

Tony was born in March 1934, in Wellington but soon moved to England where, caught by the outbreak of WWII and unable to return immediately, he lived until returning to New Zealand in 1947. He received his secondary and tertiary education in Wellington and graduated in 1955 with an MSc (Hons) in Chemistry from Victoria University. Tony spent 1956-57 travelling and teaching in Europe, and on his return joined Chemistry Division of the N.Z. Department of Scientific and Industrial Research (DSIR) in April 1958. After a brief period in Wellington he moved to take charge of the chemistry section of the fledgling Wairakei Research Centre.

He quickly made a significant contribution to geothermal science with a series of influential papers on experimental water-rock interactions and the chemistry of New Zealand geothermal systems, many written in cooperation with Jim Ellis. The papers on “Natural hydrothermal systems and experimental hot-water/rock interactions”, published in the prestigious international journal *Geochimica et Cosmochimica Acta*, were particularly meritorious. His evaluation of drill hole geochemistry was critical in establishing the silica geothermometer as a reliable tool for the evaluation of reservoir temperatures. In 1965, Tony was awarded the Morcom Green-Edwards Memorial Prize by the NZ Institute of Chemistry



*Tony in the mid 60's, full of energy, young at heart, as many of us want to remember him.*

for the most innovative piece of applied chemistry research in New Zealand, and this led to a two-year National Research Fellowship to investigate high-pressure physics and chemistry under Prof. Ulrich Franck at the University of Karlsruhe in Germany.

On his return to New Zealand, Tony became a key player in a set of multi-disciplinary investigations of New Zealand geothermal systems, setting the standards for geothermal evaluation that were subsequently emulated throughout the world. In 1977 his experiences led to the publication, in collaboration with Jim Ellis, of the classic textbook "Chemistry and Geothermal Systems". That year he was also elected Chairman of the N.Z. Geochemical Group.

While with the DSIR Tony was involved in the development of the Wairakei and Ohaaki geothermal power schemes and undertook investigations at Kawerau, Ngawha, Orakei Korako Rotokawa and Tokaanu. In addition he carried out major evaluation studies in Chile, El Salvador, Mexico, Panama, Nicaragua, Ethiopia, India, Kenya, Japan and Indonesia.

In 1982, he was appointed DSIR Geothermal Co-ordinator with responsibilities not only for geothermal science but also for the development of major aspects of geothermal policy in New Zealand. He played a major role in the development of the geothermal monitoring scheme at Rotorua and provided advice to government on how to legislate for the protection of the natural thermal features there.

In 1985, Tony left Wairakei and the DSIR for private industry, and became the Scientific Director for GENZL. This move did little to dampen his enthusiasm for travel as he undertook extensive field work in Indonesia, Kenya, Japan, Mexico and Poland. He continued to play an active role in the University of Auckland's Geothermal Institute as a lecturer and long serving member of the Board of Studies. His enthusiasm and personal interest in the progress of the international students reinforced the extensive training of local personnel that was an integral part of his overseas engagements.

Tony was an active member of the Geothermal Resources Council (GRC) and one of the initial group of five GRC International Board members who in 1986 launched an initiative within GRC to establish a new organisation to serve the worldwide geothermal community. To pursue this idea an Organisational Working Group (OWG) for the International Geothermal Association (IGA) was established, in which Tony took a key role. It was under his chairmanship, at the OWG meeting held in Auckland, New Zealand in February 1988, that the decision was taken to incorporate the IGA under the laws of New Zealand. In April 1989, the association was formally established at the OWG meeting held in Castlenuovo Val di Cecina, Italy. Tony served two terms (1989-91 and 1991-95) as a Director of the IGA, during the latter term as Secretary. He was also instrumental in establishing the New Zealand Geothermal Association (NZGA) in 1992, and was awarded an Honorary Life membership of the association in 2003. He was also awarded a Honorary Lifetime Membership by the IGA.

In 1995 Tony was presented with the Joseph W. Aidlin Award for outstanding contributions to GRC and to the development of geothermal energy, the first person outside the United States to receive this award.

When the news of Tony's death spread through the international geothermal community tributes had a central theme; his generous spirit, willingness to share his knowledge and life experiences with all and a commitment to inculcate the very best of things geothermal in all those with whom he worked:

"what a great scientist and a warm human being.."

"I respected him as a friend and a scientific colleague – we didn't always agree ...but he was always prepared to listen and consider what I and everyone had to say..."

"I can't envision the man without his ever-present friendly smile.."

"Tony was a gentleman with a great sense of humor and a kind heart.."

"the geothermal industry has lost one of its finest and classiest members with Tony's passing"

"Tony was gifted, engaging, helpful and fun and enjoyed the respect and affection of colleagues worldwide.."

"He had an immense knowledge which he willingly shared and took an active interest in my work and life aspirations..."

"Tony had the warmest heart, the twinkliest eyes and the best stories at morning tea time...he gave me confidence in my abilities and encouraged me, was never patronising and always gave you space to express your views.."

“Tony was an inspiration. He had a towering intellect, but also an uncanny ability to connect with clients of all cultures, turning them easily into friends.”

“He was one of those rare individuals who valued personal relationships above all else and he made every effort to ensure that his colleagues were happy and had an enjoyable environment in which to work”

There are no doubt many hundreds of others who will be saddened by Tony’s passing but fondly remember Tony as a warm and generous person, as much as for the legacy he has left within the geothermal community worldwide.

## **IGA Receives US\$ 810,000 Grant in Support of World Bank GeoFund**

### ***R. Gordon Bloomquist - Chair Finance Committee***

On 14 Nov. 2006 the World Bank announced that its Board of Directors had voted to authorize initiation of a US\$810,000 grant award to the IGA to support activities related to the GeoFund. The announcement signaled conclusion of two and a half years of often intense negotiations between the IGA Finance Committee and World Bank staff led by Helmut Schreiber.

The agreement between the World Bank and the IGA will be signed by the IGA Finance Committee Chair at the offices of the Secretariat on Dec. 3rd.

The GeoFund is a 25 million dollar initiative by the World Bank to foster and accelerate geothermal development throughout central and eastern Eurasia. The GeoFund will support initiatives to remove institutional legal and environmental barriers to geothermal development, help fund technical and economic feasibility studies and provide risk mitigation coverage for loans associated with reservoir confirmation drilling.

The US\$810,000 IGA grant will support capacity building activities in GeoFund eligible countries. The primary activities include:

1. Providing expert support to the World Bank/GeoFund project recipients.
2. Hosting of the GeoFund web site with links to national geothermal organizations in GeoFund eligible countries.
3. Supporting the International Summer School.
4. Developing and convening international workshops on the technical and economic ramifications of co-production of minerals on geothermal development.
5. Development of technical and educational publications on geothermal energy for GeoFund eligible countries.
6. Development of course material on ‘Successful Geothermal Project Development’.
7. Developing and convening a course on economic evaluation of geothermal projects.
8. Assisting World Bank staff in selection of projects for financial support.

Prior to the receipt of funds the World Bank requires that the IGA establish a management structure and team acceptable to the World Bank. In order to accomplish this the IGA Board voted unanimously to appoint IGA Executive Secretary Arni Ragnarsson as the Fund Manager. He is being assisted in developing the management structure and management procedures manual by John Lund, Paul Brophy and the author. It is anticipated that the IGA will receive authorization to begin to expend funds in early Jan. 2007 and funds will be available through 2008 at a minimum.

The Finance Committee is continuing to pursue other sources of funding to be able to provide support to geothermal development throughout the world. At the present time the Committee Chair is in discussions with the team leader for another World Bank managed program - the ARGeo initiative. ARGeo is being developed to provide assistance to several countries in the East African Rift Zone.



## **Amendment of the Bylaws - 2006**

Very soon after the membership ratified the last version of the IGA Bylaws, in March 2004, it became apparent that further changes would be necessary to help IGA respond to changing circumstances. There were two major drivers:

- the Board of Directors' decision to enter into partnerships with other organizations for the purpose of staging the five-yearly world congress, with a separation of financial and technical responsibilities and therefore requiring a different organizational structure from that envisaged in the Bylaws, and
- the opportunity for locally-based groups of IGA members to undertake work on contract, and hence the need for such groups to establish themselves as legal entities.

Accordingly, the Bylaws Committee spent most of 2005 devising further modifications that would meet these needs. They also took the opportunity to clarify a few other minor points. The Board of Directors considered these modifications at its meeting in October 2005 and agreed on the final version in April 2006.

Under the terms of Article 17 (unchanged since IGA was inaugurated), alterations to the Bylaws take effect immediately on acceptance by the Board but must subsequently be ratified by the membership in a postal or electronic ballot. (If a majority of the members who vote oppose the alterations, they cease to have effect and the earlier version is reinstated.)

The ratification process has been delayed by the sad illness and death of Valgardur Stefansson, but the 2006 Bylaws are now available on the IGA web site ([http://iga.igg.cnr.it/iga\\_about.php](http://iga.igg.cnr.it/iga_about.php)). To help members see what is new, the altered text is marked in red.

As indicated earlier, one major change is an amplification and clarification of the section on Regional Branches (Article 15). The key amendments include:

- clarification of the membership rules, including the voluntary nature of membership and the right to vote on Branch affairs (and perhaps pay a subscription);
- to avoid any possible confusion, a distinction between 'participation' in Branch activities (open to all IGA Members - Art.15h), and 'membership' (for the purpose of maintaining the quorum, voting rights, etc.) - Art.15d
- increased autonomy for Branch members in choosing their officers (Art.15h-j);
- clarification of a Branch's ability to become a registered legal entity and enter into contracts (Art.15m-n).

The other important change concerns arrangements for the World Congress. Now that the relative responsibilities of IGA and the host organization for a World Congress have been redistributed by comparison with those foreseen for the earlier WGCs, it is inappropriate to require that IGA will automatically provide the Chairmanship. Accordingly, Article 18 has been rephrased to permit more equitable arrangements.

The other changes are more minor, but the following may be mentioned:

- Art.6d has been introduced to bring the 'Loss of Membership Status' of Affiliated Organizations into line with those of other IGA members.
- Art.8c & h makes explicit the ability of the Board to co-opt any individuals whom it considers valuable to its function, even if this were to take the size of the Board above its maximum of 30 *elected* members.

To complete the ratification process, IGA members are invited to vote on these amended Bylaws, either by e-mail to the Secretariat ([iga@SAMORKA.is](mailto:iga@SAMORKA.is)) or by returning the form below by fax (+354-588-4431) or mail (International Geothermal Association Secretariat, c/o Samorka, Sudurlandsbraut 48, 108 Reykjavik, Iceland).

The deadline for receipt of the vote is 15 February 2007. **Please note the only option is to vote 'yes' or 'no' to the entire package.**

### Ratification of IGA Bylaws - 2006

I accept the modification of the IGA Bylaws as agreed by the Board of Directors in April 2006

YES NO

Name ( <i>please print</i> ):		<i>(for Corporate members) representing</i>	
Address:			

### **Nominations for the IGA Board of Directors 2007-2010**

The present announcement is to inform the IGA Membership that nominations for the IGA Board of Directors 2007-2010 are now being sought. The nominations fall in the following three categories:

1. Approximately 30 candidates will be nominated by the affiliates according to rules set out by the BoD. According to them affiliates with less than 100 members may nominate one candidate, others may nominate up to 5 candidates in accordance with their number of members. These nominations have already been provided by the affiliates.
2. Approximately 30 candidates will be nominated by the IGA Nominating Committee by majority vote of the Committee.
3. An unlimited number of candidates can be nominated by IGA members. These nominations, signed by at least 30 members of the Association, should reach the Secretariat by 28 February 2007.

All nominations should be accompanied by a "Candidate Statement". These should be of no more than 150 words, describing what the candidates propose to do if elected to the BoD, indicating on which IGA committee they would be willing to serve, and suggesting what they feel should be the main activities of IGA in the near and long-term future. Nominees are expected to be able and willing to attend at least one BoD meeting every year.

The election schedule is as follows:

November 2006	Affiliates provide a list of nominees to the Nominating Committee.
January 2007	Nominating Committee obtains nominations and selects candidates.
February 2007	Additional nominations, signed by at least 30 members, are received by the Executive Director.
March 2007	Executive Director mails and e-mails ballots to all IGA members.
June 2007	Elections completed.
September 2007	2007 Annual General Meeting of IGA. Old BoD retires, new BoD takes over.

### **New contributions to the IGA Geothermal Conference Papers Database**

*Eduardo Iglesias, Chairman IGA Information Committee*

We have recently added the Proceedings of the 1999 European Geothermal Conference to the IGA Geothermal Conference Papers Database, bringing to 5053 the number of papers in it. This most useful addition was an initiative of Dr. François-David Vuataz, at CREGE, Neuchatel, Switzerland, a member of the Board of Directors and of the Information Committee. Dr. Vuataz provided *pdf* files for all the papers in the Proceedings and the corresponding copyright permission. Prof. Roland Horne at Stanford University processed the files for inclusion in the database and uploaded them. Take a look in the IGA website at "IGA Services/Geothermal conference papers search engine".

### **IGA Membership Dues**

IGA Membership dues for the year 2006 should have been paid by 31st March. In order to keep your membership status, we advise you to pay as soon as possible! See the application form on the back cover of this issue for renewal details.

## EUROPE

### Germany

#### **Geothermal Energy in focus in Europe – come and join us in Unterhaching!**

From May 30th to June 1st, 2007, the area around Munich, Germany, will see the gathering of all the geothermal sectors in Europe. The European Geothermal Congress EGC 2007 will provide a stage to present and discuss new developments in science, technology, industry, and policy of geothermal energy on our continent. The congress continues the series of European geothermal events under the IGA umbrella, the most recent of which have been EGC 1999 in Basel, Switzerland, and EGC 2003 in Szeged, Hungary. European geothermal conferences will now return to Munich, where one of the first relevant conferences, the “European Geothermal Update”, was organized by the European Commission as early as 1983.

Unterhaching, located on the southern outskirts of Munich, offers perfect conditions for concentrated work at the congress, and invites you also to explore geothermal energy use on site and in the vicinity, as the Munich area is one of the focal points of geothermal energy development in Germany.

With the inclusion of the EGEC Business Seminar 2007 into EGC 2007, the organizers demonstrate the growing economic weight of geothermal energy, and the high importance of close links between science and industry, in order to increase the share of geothermal energy within the European energy portfolio.

We invite all players in the geothermal sector to contribute to EGC 2007, to present their newest findings and ideas, to discuss scientific results as well as new project developments and to consider necessary steps in policy and regulation; in short, to help in the growth of the geothermal energy network in Europe.

#### ***The congress:***

EGC 2007 is a joint activity, organised under the auspices of the European Branch Forum of the International Geothermal Association IGA (IGA-EBF), by Geothermische Vereinigung e.V. – Bundesverband Geothermie (GtV-BV) and the Swiss Geothermal Association (SVG/SSG), with partner organisations the Macedonian Geothermal Association (MAGA) and the Serbian Geothermal Association (GEAS).

EGC 2007 will also include the EGEC Business Seminar 2007 of the European Geothermal Energy Council (EGEC). The exhibition “GEOEnergia Europe 2007” for geothermal equipment, services, etc. will be held alongside the congress.

The organizers invite abstracts for papers concerning all areas of geothermal energy use, from very shallow systems to deep drillings and high-enthalpy fields. Both the technological and the economic side will be in focus:

#### ***Technology:***

- Geothermal power in Europe – projects, ideas, experiences (low-temperature binary cycles, Enhanced Geothermal Systems (EGS), high-enthalpy fields, etc.)
- Direct geothermal uses – district heating, agriculture and more
- Geothermal heat pumps – currently the largest market sector in the geothermal field (status and development in Europe, innovative ideas)
- Exploration and planning – geological subsurface data, documentation, access to data
- Country updates (special format, please contact the secretariat; convenor: Miklos Antics)
- Other topics

#### ***Economy:***

- Financing, corporate structures
- Legal aspects (licenses, mining rights, etc.; secure legal basis for geothermal energy – continuation of the “Kistelek”-process)
- Policy, evaluation of national and EU support opportunities
- New assessment of potential and use of geothermal energy in Europe
- Other topics

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These papers will be grouped into the EGEN Business Seminar, dedicated to economic items

*Please send your abstracts (1 page) to:*

*GtV-BV e.V., EGC 2007, Gartenstrasse 36, D-49744 Geeste, Germany*

*e-mail: mail@egc2007.de*

*Electronic submission will be available at <http://www.egc2007.de>*

*The language of the congress will be English.*

**Scientific Committee:**

***Chairman Kiril Popovski, Macedonia***

Miklos Antics, France/Romania; Christian Boissavy, France; Walter Eugster, Switzerland; Markus Häring, Switzerland; Ernst Huenges, Germany; Beata Kepinska, Poland; Horst Kreuter, Germany; Orhan Mertoglu, Turkey; Mihailo Milivojev, Serbia; Kathy Riklin, Switzerland; Marcel Rosca, Romania; Horst Rüter, Germany; Ladislaus Rybach, Switzerland; Burkhard Sanner, Germany; Martin Sauter, Germany; Rüdiger Schulz, Germany; Peter Seibt, Germany; Valentina Svalova, Russia; Pierre Ungemach, France; François Vuataz, Switzerland; Roland Wyss, Switzerland

**Executive Committee**

***Chairman Burkhard Sanner***

***Werner Bußmann, Mihailo Milivojev, Kiril Popovski, Horst Rüter, Roland Wyss***

**Venue and organisational details:**

The venue of the congress, Unterhaching, is a "geothermal city" in the vicinity of Munich, Bavaria, Germany. Wells more than 3 km deep give access to hot water of >120 °C. A large district heating system and a binary power plant are under construction. Unterhaching is conveniently located in the Munich area, accessible both by road (Autobahn) and within the Munich rapid transport rail network (S-Bahn) from Munich airport or from Munich central rail station. The location in the middle of Europe, with excellent connections also to the southeast, makes the Munich area ideal for a European Geothermal Congress in times when the geothermal family in the "old" European Union countries, the new member countries, the existing and future candidates, and the neighbours continue to become integrated in research, development, and application of geothermal energy

For hotel reservations, please contact the EGC2007 Secretariat.

**Conference fees:**

Regular fee: EUR 270

Early bird fee (until 15.03.2007): EUR 220

Student fee: EUR 75

**Excursion:**

During the congress, visits to the Unterhaching geothermal district heating system will be available each day.

On June 2nd, 2007, an excursion to other geothermal plants in the Munich area is planned (Erding, Unterschleissheim, Pullach, Munich-Riem). The exact schedule, fee, and info on these plants will be published through the website <http://www.egc2007.de> soon.



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**Exhibition GEOEnergia Europe 2007:**

The European Congress will be accompanied by an exhibition integrated in the conference venue. Space rental EUR 50.50 per m<sup>2</sup>. For booking space, and if you need any equipment, please ask the conference office.

***Conference Office EGC2007******EGC 2007, c/o Geothermische Vereinigung e.V. – Bundesverband Geothermie******Gartenstr. 36, 49744 Geeste, Germany******Tel: +49 (0) 5907 545******Fax: +49 (0) 5907 7379******Email: mail@egc2007.de***

EGC 2007 is supported financially by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

**Turkey*****A lecturer's impressions of the  
International Summer School of Geothermal Exploration - Prospecting  
- Reservoir Engineering - Monitoring (28 May - 11 June 2006 - Izmir /TURKEY)***

I have very pleasant memories about this Summer School. The course was well prepared and organized, in every respect: interesting program, well selected and knowledgeable lecturers, valuable course material, modern facilities (Internet room), and last but not least an ideal site: the education and recreation center of Dokuz Eylul University at Payamli, located directly on the Aegean shore. The students and lecturers enjoyed the chance to relax on the beach after course hours and to discuss at the seaside bar.

The course content was rich and varied; the lecturers covered a wide range of topics, techniques, and experiences. The students actively participated in discussions at the sessions as well at other occasions like the gatherings after dinner. A special feature of the Summer School was the comparable number of lecturers and students, so many students used the opportunity to discuss their problems and to receive advice from experts. It is regrettable that many registered foreign participants could not make it to the course (for various reasons like visa problems); so the participants were mainly Turkish.

The Summer School was a further, seriously needed opportunity for know-how transfer to a younger generation from experienced but now ageing specialists. It is hoped that further Geothermal Summer Schools will be held at such an ideal setting. GERAC – Geothermal Energy Research and Application Center and TGA-Turkish Geothermal Association, who were the Organizers of this year's Course, particularly Prof. Y. Savaşın, must be congratulated for all efforts and achievements.

*Zurich, 18 September 2006*

*Ladsi Rybach  
(ETH Zurich, Switzerland)*

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## United Kingdom

### *Formation of the Ground Source Heat Pump Association*

Almost 200 delegates attended the inaugural meeting of the Ground Source Heat Pump Association, organized by the UK's National Energy Foundation (NEF) in Milton Keynes on 20th June. The new association has been formed to promote and develop the Ground Source Heat Pump (GHSP) industry in the UK. This industry is already growing rapidly, with installations in the UK increasing by more than 60% each year.

Dr Tim Lunel of NEF said in his keynote address that demand for Ground Source Heat Pumps will continue to surge as more and more houses are built to a target of using at least 10% renewables in response to Local Government energy strategies.

Karl Drage of Geothermal International, who was elected as Chairman of the new association, noted that recent gas price rises mean that homes with Ground Source Heat Pumps now cost less to run than with any other fuel. The Metropolitan Housing Association, who have been installing GHSPs since 2001, have found that lifetime costs can also fall below gas, owing to the greater reliability of heat pump units compared to condensing boilers.

Many attendees at the launch event signed up as members of the newly formed association. It is open to anyone involved in the industry, including potential customers, installers and suppliers. It will replace the Ground Source Heat Pump Club, which was set up by the NEF to provide a forum for the industry in 2004. Its principal aims, which will be carried on by the new association, were to:

- promote the concept of using Ground Source Heat Pumps as an environmentally preferable means of heating and cooling buildings, and to act as an impartial source of information about the ways in which this might be done
- assist in developing standards for, and provide support to, the growing industry of manufacturers, importers and installers of Ground Source Heat pumps

In furtherance of these aims, the club has worked with all the major companies and organizations, making a series of promotional presentations, and provided information on GHSPs via a telephone helpline and website. Secretariat functions were provided by the NEF from its offices in Milton Keynes, which are themselves heated by a Ground Source Heat Pump. The Foundation, with the support of the Department of Trade & Industry and Powergen, reviewed the markets for GHSPs and developed a marketing strategy, which recommended the establishment of a formal association.

For further information about the association, please contact the National Energy Foundation, Davy Avenue, Knowlhill, Milton Keynes, MK5 8NG, UK, [www.gshp.org.uk](http://www.gshp.org.uk), contact [theresa.quinn@nef.org.uk](mailto:theresa.quinn@nef.org.uk)

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## THE AMERICAS

### USA

#### *Chena Hot Springs – Low temperature power plant dedication*

*John W. Lund. Geo-Heat Center*

Chena Hot Springs is located approximately 100 km northeast of Fairbanks, Alaska, in the interior of the state. This past August a low temperature power plant was commissioned to provide power for the isolated resort. The 200 kW plant, a binary or organic Rankine cycle unit built by United Technology Corporation, is the first geothermal power plant in Alaska, and uses the lowest temperature geothermal resource in the world at 74°C for power generation.

#### *Chena Hot Springs and Pools*

In 1905 Robert Swan, looking for a place where he could ease the pain he suffered from rheumatism, set out in a boat loaded with supplies on the Chena River looking for the hot springs that had been reported by a surveying party the year

before. Traveling the North Fork of the Chena and then into Monument Creek, he found the hot springs in August of 1905. This led to the development of the hot springs and, by 1911, the property had a stable, bathhouse and twelve small cabins for visitors. Later the waters were analyzed and found to contain silica (85 ppm), sulfate (68 ppm), chloride (29 ppm), sodium (110 ppm) and bicarbonate (115 ppm), similar to water of one of the famous springs at Carlsbad in the former Czechoslovakia. Today the resort consists of the main lodge with a dinner area, bar and conference room, an Activity Center, the office/storage building, a large lodge building with numerous well furnished rooms, six cabins, the pool/spa building, the Ice Museum, the power plant building, dog kennels and numerous other smaller buildings such as a massage and renewable energy center. The hot springs which are fed into an outdoor pool average around 43°C, and the indoor pool around 34°C. Several hot tubs are also available. Visitors in the winter, especially from Japan, love to see the beautiful display of the northern lights or aurora borealis, as there is little background lighting to interfere with the display.

At present there are 20 geothermal wells on the property, the deepest at around 300 m and producing up to 74°C. Much of the reservoir analysis and drilling supervision has been done by Dick Benoit of Sustainable Solutions, Reno, Nevada, and David Blackwell of Southern Methodist University, assisted by the resort's engineer, Gwen Holdmann. All of the buildings are heated with the geothermal waters, saving about \$183,000 per year.

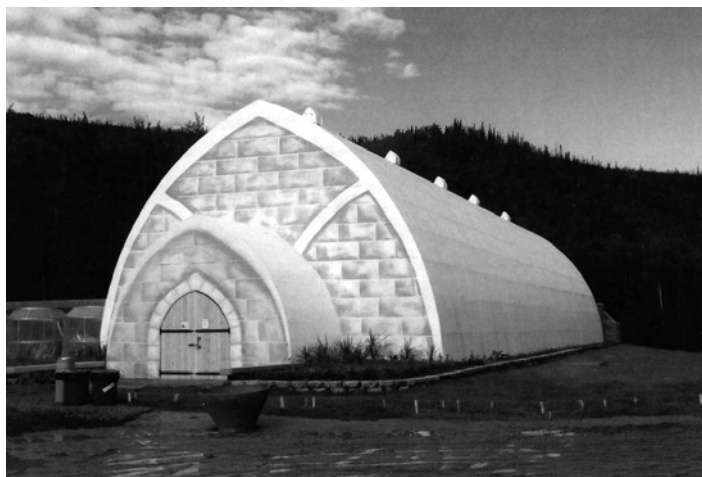
### ***Geothermal Power Plant***

The approximately 200 kW binary power plant was installed at the resort in July and has been running ever since. The secondary fluid in the plant is R-134a, which has a lower boiling point than water and is heated by geothermal water at 32 l/s through a heat exchanger at 74°C. Cooling water from a shallow well or infiltration gallery is around 40°C, providing a large temperature difference ("delta T") which improves the efficiency of the system. As the resort is isolated from the electric grid, it has used diesel generators in the past, costing around 30 cents/kWh with a daily average cost of \$1,000 for the \$0.66 per liter diesel fuel. The new power plant will provide electricity at 7 cents/kWh, a major saving for the resort. The high cost of diesel energy and the large "delta T" certainly make this unit economical. Maintenance is estimated to be \$50,000 per year. The unit uses Carrier chiller components to dramatically reduce the cost of production and allow for modular construction. The total unit cost around \$1,300 per installed kW. Plans are to add another 200 kW unit, and then shortly to reach one MW. Bernie Karl, the owner, is looking at expansion in the future, depending on sustainable production from the geothermal resource. With this project, the bar for geothermal electric power generation has been lowered from around 98°C to 74°C (see Geo-Heat Center Quarterly Bulletin, Vol. 26, No. 2 – September 2005 for a description of other lower temperature combined heat and power uses at <http://geoheat.oit.edu/bulletin/bull26-3/bull26.3.pdf>).

The insulated supply and disposal pipelines for the power plant are each about 1,000 m long but, fortunately, the cold water supply is gravity fed from a large collection gallery so there are no pumping costs for the condenser side of the plant.

### ***The Aurora Ice Museum***

The Aurora Ice Museum was built as a way to boost tourism at the resort, along with offering year-around employment for many of the ice artists in the area. The museum, a structure made of ice blocks cut from a local beaver pond in winter, is open all year around – even in the summer when the temperatures reach 32°C! The museum features a great hall and lounge area, chandeliers made of individually carved ice crystals, countless sculptures including a gigantic functional chess set, life sized jousting knights, an observation tower made of ice and four galleries with varying themes. The architect of most of the art is 13-times World Ice Art Champion Steve Brice, and his wife, four-time champion Heather Brown. One room even has an ice toilet. A 15-ton (53 kW) absorption chiller designed by Energy Concepts Co., powered by the geothermal resource, keeps the museum frozen by providing 53 kW of cooling. The 13 l/s geothermal water is then cascaded to the pool supplementing the pool heat, and may be sent to the greenhouse in the future. The Ice Museum has 10,000 visitors annually, and hosts numerous weddings.



### ***Horticulture Projects***

Chena Hot Springs Resort is working toward becoming a self-sustaining community, which includes independence in food production. A small test greenhouse was installed in 2004, heated by the geothermal resource. They were able to maintain the greenhouse temperature of 29°C while the outside temperature dropped to -43°C, typical for interior Alaskan winters. The resort recently added a two-bay 400 m<sup>2</sup> greenhouse where tomatoes, lettuce, green beans, peppers, cucumbers and numerous greens and herbs are grown. During my visit I tasted fresh raspberries and had lettuce and tomatoes in my salads at dinner. It is managed by a trained horticulturist, Rusty Foreaker.

Additional information on Chena Hot Springs Resort can be found on their webpage: [www.chenahotsprings.com](http://www.chenahotsprings.com) or by calling 1-800-478-4601. Chena also has a geothermal projects website at [www.yourownpower.com](http://www.yourownpower.com), which gives more detail on all of their renewable energy and sustainable development projects.

## **ASIA/PACIFIC RIM**

### **China**

#### ***China Tibet will build Yangyi Geothermal Power Plant***

*Keyan Zheng, GCES, China*

There are rich high temperature geothermal resources distributed in Tibet, China. Two geothermal fields have been explored. Yangbajain geothermal power plant started power generation in 1977 and reached an installed capacity of 25.18 MW in 1991. It still runs well up to the present. It generated 115.4 GWh of power in 2005. Geothermal power provides an important support to the power supply of Lhasa in winter, because of the decreased availability of hydro-power during that season.

Exploration of another geothermal field, Yangyi, was completed in 1990. It is located 72 km west of Lhasa and 55 km south of Yangbajain. The field covers an area of 10.8 km<sup>2</sup>. The reservoir is in fractured volcanic rocks. Exploration wells reached a depth of 1,000 m. The wellhead working temperature is 105-190°C with most wells reaching 170-190°C and the highest 201.67°C. Geothermal resource assessment showed a potential generating capacity of 18 MW for the existing wells. The whole geothermal field has a potential of 30 MW. Compared with Yangbajain geothermal field, the Yangyi geothermal field has some advantages: high temperature, high pressure, no scaling and high yield from a single well.



*An exploration well in Yangyi geothermal field, Tibet, China*

The Law of Renewable Energy of the People's Republic of China came into force on 1st January 2006 in our country. The law promotes the use of renewable energies, including solar, wind, geothermal, etc. The government will give priority of policy and funding support in these domains. Such a policy attracted a private investor from Zhejiang Province. The investor intends to invest CNY 400 million to build Yangyi geothermal power plant with an installed capacity of 25 MW. He has signed an agreement with the Tibet Bureau of Geological Exploration and Development for further cooperation. This application report has been submitted to Tibet Autonomous Region Government and has obtained written support with a signature from Mr. Hao Peng, the Standing Vice Chairman of the Government. Therefore the plan will be put into implementation progressively.



## Chinese Learn and Develop GSHP

*Keyan Zheng, GCES, China*

The importance of Ground Source Heat pumps (GSHP) was recognized in many countries due to their energy saving, high efficiency and environmentally friendly features. During recent decades GSHP has grown rapidly in the world, especially in U.S. and Europe. In order to facilitate GSHP development in China, the Geothermal China Energy Society (GCES) organized a series of activities for its members in 2006.

Nearly 80 participants from Beijing, Tianjin, coastal and inland provinces, and even Tibet, attended the National GSHP Technology Training Course in Tianjin Geothermal Research and Training Center (TGRTC) of Tianjin University in May. GCES organized this training, including 6 days of lectures and site visits. Doctors and professors of TGRTC taught basic principles and design for GSHP applications. The participants consisted of various geothermal engineers and technicians from geothermal exploration teams, geothermal or heating companies, and a few GSHP users. They were interested in the GSHP technology and intended to enter this new domain in the future.



On September 15th, a Geothermal Heat Pump Heating and Cooling Seminar was held in Beijing. China UBI France Association and GCES etc. hosted the seminar, which was attended by about 60 participants. The Science and Technology Counsellor of the French Embassy, Bernard Belloc, attended the opening ceremony. Dr. Gordon Bloomquist, IGA Board member from the Extension Energy Program of U.S. Washington State University, was a specially invited expert who presented two lectures: one on 'the Economics of Geothermal Heat Pump System for Commercial and Institutional Buildings' and the other on 'Commercial Geothermal Heat Pumps Design, Operation and Maintenance

Issues: What 50 Years of Experience Has Taught Us'. Additional Chinese and French experts presented their lectures too. The seminar specially organized a Question and Answer session for one hour. Dr. Bloomquist and other experts answered various questions from participants. Participants visited the China International Heating Exhibition which includes GSHP products and GSHP application sites. Participants were happy to learn from foreign experts. They felt a good harvest.

## Promulgation and enforcement of "Technical Code for Geothermal Heat Pump System Engineering (GB50366-2005)"

China's first technical code for geothermal heat pump system engineering, "Technical Code for Geothermal Heat Pump System Engineering (GB50366-2005)", has been promulgated and took effect on January 1st, 2006. The code plays a significant role for the development of geothermal heat pump industry.

The area of new building in China is around 2,000,000,000 m<sup>2</sup> per year, and energy consumption in buildings accounts for 27.8% of total energy use in China. Building heating used to take a relatively large proportion of the energy consumption but has been overtaken in recent years by building cooling which consumes even more energy. Taking advantage of the relatively steady ground temperature, heat pump systems applied for heating and cooling in the building industry are a major measure for energy saving and environmental protection. To normalize the technology of geothermal heat pump engineering is of great importance for the effective use of this renewable energy source.

The code is composed of 8 parts, including general principles, technical terms, engineering exploitation, buried pipeline heat exchange systems, groundwater heat exchange systems, surface water heat exchange systems, indoor systems, equipment operation and trial running, etc. Domestic and international experiences as well as relevant thematic studies and investigations have been taken into consideration during the course of formulating the code; emphasis has been given to ensure the leading standard of the code and the feasibility of operation.

The Ministry of Land and Resources is now drafting a "Technical Code for Exploitation of Shallow Geothermal Energy" to normalize and advance the scientific exploitation and rational utilization of shallow geothermal energy.



## Japan

### **Special symposium on geothermal energy “New perspective of geothermal energy utilization in Japan”**

*Sachio Ehara, Kyushu University*

A special symposium on geothermal energy was held on 10 October 2006 at Makuhari, Chiba Prefecture, Japan on the occasion of the 41st IGA BoD meeting. More than 120 people including 21 people from abroad participated in the symposium (Fig.1). This symposium was also one of the events of “Renewable Energy 2006” which was a joint international conference and exhibition with the International Solar Energy Society ISES (held 9 to 13 October). The total number of participants in the conference was more than one thousand. Over sixty papers were presented in the geothermal session.

In Japan, commercial geothermal power generation started at Matsukawa Geothermal Power Station in 1966 and at Otake Geothermal Power Station in 1967. We reached over 500 MWe at eighteen geothermal power stations by the middle of 2000. However, we have had no new geothermal power stations since then.

The Japanese Islands belong to part of the Pacific Ring of Fire and Japan is a country rich in geothermal resources. We have a very large geothermal resource amounting to over 20,000 MWe, and more than 27,000 hot spring sources all over the Japanese Islands. Furthermore, research on ground-coupled heat pump systems has been started both in the northern and southern part of Japan. We shall be able to contribute much more to constructing an environmentally friendly sustainable society if we are able to utilize much more geothermal energy.

We, all the geothermists in Japan, are now struggling to promote the utilization of geothermal energy. On the occasion of IGA BoD Meeting, in which many overseas geothermal experts participated, we planned to have a symposium to



*Special symposium*



*Panel discussion*

promote geothermal energy development in Japan. The objective of this symposium was to review the past developments of geothermal energy in Japan and also to investigate the new direction of geothermal energy developments in Japan in the future with advice and suggestions from overseas geothermal experts.

In this symposium, ten papers were presented. Six of them were from Japanese scientists and engineers in the first session which was chaired by Dr. Toshihiro Uchida. The titles and the names of presenters were as follows: *Geothermal energy developments in Japan* (Dr. Mineyuki Hanano), *Development of geothermal power generation system* (Prof. Takuji Fujikawa), *Direct use of geothermal energy in Japan* (Dr. Kasumi Yasukawa), *Problems on geothermal power generation; economy, national parks, hot spring communities, and RPS* (Dr. Hirofumi Muraoka), *Energy in my Yard (EIMY)*, Prof. Hiroaki Niitsuma) and *Project on Kalina cycle power plant utilizing hot spring water* (Dr. Kazumi Osato). In these papers the history, the present situation and some of the recent developments of geothermal energy in Japan were presented. Several problems which retarded the growth of the utilization of geothermal energy in Japan were also shown.

In the second session, four papers were presented from overseas scientists and engineers. This session was chaired by Dr. Kasumi Yasukawa. The titles and the names of presenters were as follows: *The United States of American country update* (Prof. John Lund and Dr. Gordon Bloomquist), *Recent geothermal development in Europe and comments to Japan* (Prof. Ladislaus Rybach), *Supplementary injection to mitigate environmental effects : Can it be applied in Japan?*

(Dr. Jim Lawless) and *Present status and future plan of geothermal development in Turkey* (Prof. Sakir Simsek). They introduced and discussed recent developments of geothermal energy in the respective countries and also gave many useful comments and suggestions to the Japanese geothermal society.

After the presentations, we had a panel discussion on future geothermal energy development in Japan with six panelists (Prof. J. Lund, Prof. L. Rybach, Dr. J. Lawless, Prof. H. Niitsuma, Dr. M. Hanano and Dr. H. Muraoka and chaired by Prof. S. Ehara, Fig.2). The audience also joined the discussion from the floor. In this panel discussion, the problems retarding the developments of geothermal energy were clarified and also many suggestions and comments were presented. These discussions will be very helpful in promoting future geothermal energy utilization in Japan.

The Japanese geothermal society would like to express hearty thanks to all the participants, especially those from overseas.

## UPCOMING EVENTS

4th International Congress on Numerical Methods in Engineering and Applied Sciences, Morelia, Mexico, January 17-19, 2007. Contact: Dr. César Suárez msuarez@zeus.umich.mx, <http://congress.cimne.upc.es/morelia07>

32nd Stanford Workshop on Geothermal Reservoir Engineering, Stanford, California, USA, January 22-24 2007. <http://ekofisk.stanford.edu/geoth/workshop2007.htm>

Clean Energy Power 2007 (CEP), Berlin, Germany, January 24-25, 2007. [www.energiemessen.de](http://www.energiemessen.de)

28th PNOC-EDC Geothermal Conference, Makati City, Philippines, March 7-8, 2007. Contact: Mr. Ernie Gagto [geothermalcon@energy.com.ph](mailto:geothermalcon@energy.com.ph)

Enertec 2007, Leipzig, Germany, March 13-16, 2007. [www.eventseye.com/fairs/trade\\_fair\\_event\\_711.html](http://www.eventseye.com/fairs/trade_fair_event_711.html)

67th Annual Meeting of the German Geophysical Society, Aachen, Germany, March 26-29, 2007. [www.dgg2007.rwth-aachen.de](http://www.dgg2007.rwth-aachen.de)

China Eco Expo, April 4-6, 2007, Beijing, People's Republic of China. [www.ecoexpo.com](http://www.ecoexpo.com)

European Geothermal Congress EGC2007, Unterhaching, Germany, May 30-June 1st, 2007. [www.egc2007.de](http://www.egc2007.de)

GRC 2007 Annual Meeting, Sparks, Nevada, USA, September 30 - October 3, 2007. [www.geothermal.org](http://www.geothermal.org)

20th World Energy Congress, Rome, Italy, November 11-15, 2007. [www.rome2007.it/home/home.asp](http://www.rome2007.it/home/home.asp)

## IGA News

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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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**Contributions to the next issue of IGA News must be received by 10 February 2007.**

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