



# IGA NEWS

*Newsletter of the International Geothermal Association*

## IGA ACTIVITIES

### *Message from the President*

*John W. Lund, President*

The IGA Steering Committee (SC) for the World Geothermal Congress 2010 (WGC2010) scheduled for Bali, Indonesia, met with the Indonesian Organizing Committee (IOC) in Bali on February 18-21, 2007. The meeting was jointly convened by SC Chair, Dr. Gordon Bloomquist, and IOC Chairman Dr. Herman Darnel Ibrahim and Secretary General Dr. Surya Darma. In addition to Dr. Bloomquist, the SC committee, representing the interests of IGA and responsible for the technical program and short courses, consists of Jim Lawless of New Zealand, Beata Kepinska of Poland, Roland Horne of the USA, Mahmut Parlaktuna of Turkey, James Koenig of the USA, and Eduardo Iglesias of Mexico. Your President will be serving as an honorary member of the OC. Planning for the meeting is well along, and the Indonesian hosts have met the obligations of the Memorandum of Understanding (MOU) between the IGA and INAGA (Indonesian Geothermal Association) and appear to be well along with raising funds for the congress.

The WGC2010 is now set for 25-29 April, 2010 with field trips and short courses either preceding or following the conference. The theme has been selected as: "Geothermal: the Energy to Change the World" with a sub theme of: "Accelerating Geothermal Development to Respond to the Energy Crisis." The Congress will be held at The Westin Resort on the Nusa Dua Peninsula on the southern tip of the Island of Bali. The Resort has an excellent conference center where up to eight simultaneous sessions can be held at one time, along with room for exhibits, posters and other functions. There are also numerous excellent hotels on the peninsula within walking distance of the Westin. Security is excellent, both entering the Nusa Dua Peninsula and at each of the hotels on the peninsula. I am satisfied that security at the congress will be more than adequate.

The first circular announcing the Congress, with a preliminary questionnaire on field trips and short courses to

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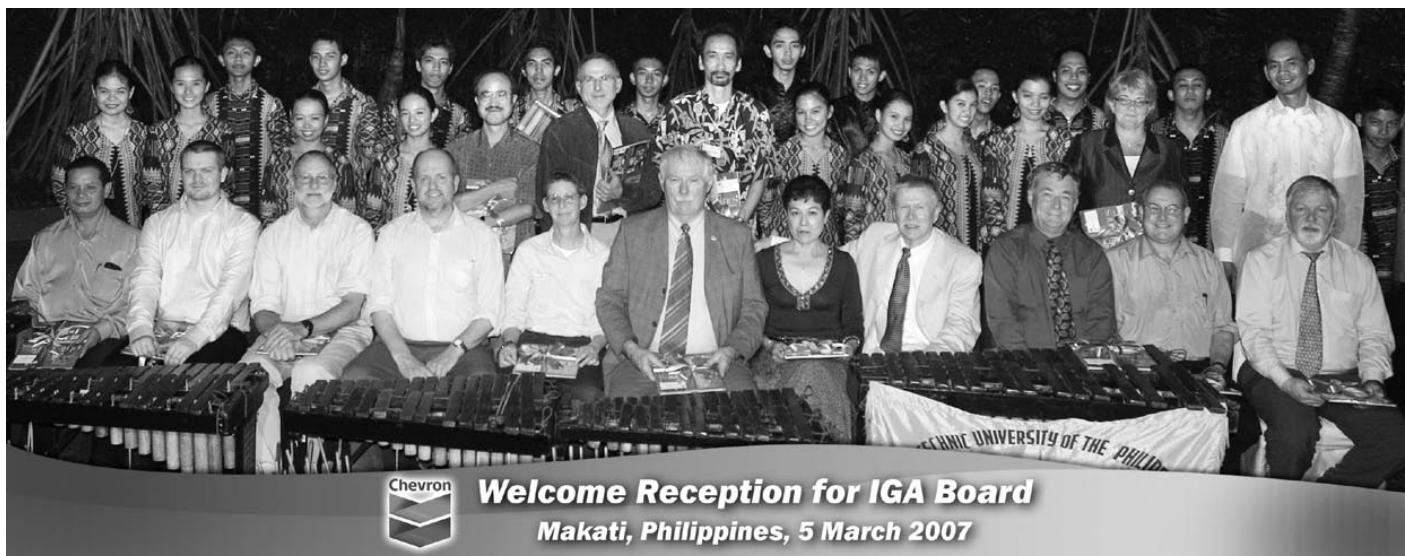
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be responded to by interested participants, will be issued shortly. Important dates are call for abstracts by June 30th, 2008; abstract deadline of January 31, 2009; notification of acceptance of abstract by March 31, 2009; draft papers due May 31, 2009; and final papers due October 30, 2009. For more information see the website [www.wgc2010.org](http://www.wgc2010.org).

The IGA Board of Directors held their 42nd meeting in Manila, Philippines on 5-6 March, 2007. Items discussed were the approval of the grant from the World Bank that will be implemented by IGA by this summer, the approval of the nomination list for the new Board of Directors election, the approval of affiliate contracts with the geothermal associations of Mexico (MGA), China (GCES), Poland (PGS) and Switzerland (SVG-SSG), a report by Jim Lawless on the first meeting of the Western Pacific Regional Branch in Auckland, New Zealand, a report on the WGC2010 meeting in Bali, and a discussion paper on definition of geothermal reserves. Board members also attended the Philippine Geothermal Association Annual meeting and the PNOG Annual Geothermal Conference. Your President presented a paper at each meeting on “Utilization of Geothermal Energy Worldwide – Its Contribution to Energy Security” and “Examples of Combined Heat and Power Plants Using Geothermal Energy.” A field trip to the Mak-Ban geothermal power plant was hosted by Chevron Corporation. We appreciated the excellent hospitality provided by our hosts in the Philippines.

Dr. Gordon Bloomquist represented the IGA at a renewable energy side event at the United Nations in New York hosted by the International Renewable Energy Alliance (IREA) which IGA joined recently. His report appears elsewhere in the IGA News.

Your President attended the International Energy Agency (IEA) meeting in Nice, France from 21-23 March as a member of the Geothermal subcommittee, was an advisor at a meeting at the University of Mexico in Mexico City from 16-19 April concerning a research project on the desalination of brackish water with geothermal energy, and presented a paper as an invited guest at the Italian National Congress of Geologists in Matera, Italy from 9-11 May on “Characteristics, Development and Utilization of Geothermal Resources”.

The ballots for the 2007 IGA Board of Directors election will be sent out in late May for members serving from 2007 to 2010. Eligible IGA voters will select 30 members from a list of 42 candidates. A unique password will be provided to each member so that they can vote by Internet. Mail-in ballots will also be accepted. The newly-elected board members will have their first board meeting in Reykjavik, Iceland on October 11, 2007, following the last meeting of the outgoing board on October 10, along with the Annual General Meeting.

### ***Election of IGA Board of Directors (2007-2010)***

The term of office of the current BoD expires in October 2007, so it is time to launch the election of a new BoD for the next term. This article will give members an idea of how the balloting will be carried out and also a list of

candidates for you to review. Ballots will be mailed out shortly and voting will be completed by July 15, 2007. You may vote for a maximum of 30 candidates. A personal IGA password will be provided for access to the website for the election. In addition to providing access to the IGA election page, the personal password can be used to access areas on the IGA website that will be reserved for members only in the future. Therefore, it is important that the password be preserved for future use. The following voting alternatives will be available:

1. Go to the IGA website: [www.geothermal-energy.org](http://www.geothermal-energy.org), and choose the link to the election page. There you can use your personal password enclosed with the election package to access the ballot, mark your vote and submit it through the internet. This method is preferred for all those who have access to the internet.

2. Mark your vote on the ballot paper enclosed with the package, fold it and insert it in an envelope (not enclosed). Write your name and address on the envelope as sender and mail it to: IGA Secretariat/Samorka, Sudurlandsbraut 48, 108 Reykjavik, Iceland. The vote will be treated as invalid if you do not write your name and address on the envelope. If you prefer, you can also send your ballot by fax or e-mail. In this case, you must also give your name.

Name	Country	Name	Country
Miklos A. Antics #	Romania	Orhan Mertoglu * #	Turkey
Godfrey Bahati &	Uganda	Francisco E. Montalvo L.#	El Salvador
Rosa Maria Barragán R.*	Mexico	Martin N. Mwangi &	Kenya
Lauro F. Bayrante #	Philippines	Ramon Allan V. Oca @	Philippines
Graeme Beardsmore &	Australia	Manuel S. Ogena * #	Philippines
Ruggero Bertani * #	Italy	Sanja Popovska V.#	Macedonia
Christian Boissavy &	France	Konstantin O. Povarov #	Russia
Paul Brophy * #	USA	Horst Rüter #	Germany
Surya Darma #	Indonesia	Ladislaus Rybach &	Switzerland
Alimin Ginting * #	Indonesia	Yoonho Song &	S. Korea
Gestur Gíslason *	Iceland	Benedikt Steingrímsson #	Iceland
Luis C. A. Gutiérrez-Negrín #	Mexico	Gábor Szita #	Hungary
Marek Hajto #	Poland	Koichi Tagomori #	Japan
Tamás Hámor #	Hungary	Tingshan Tian #	China
Colin Harvey #	New Zealand	Toshihiro Uchida *	Japan
Paul Hirtz #	USA	Francois-David Vuataz * #	Switzerland
Roland N. Horne #	USA	Shigeto Yamada *	Japan
Beata Kepinska *	Poland	Kasumi Yasukawa #	Japan
Mikhail D. Khutorskoy &	Russia	Keyan Zheng *	China
Horst Kreuter #	Germany	Feliksas Zinevicius #	Lithuania
Jim Lawless * #	New Zealand	Vladimir Zui &	Belarus

\* Current member of the Board re-nominated by the Nominating Committee

# Nominated by an affiliated organization

@ Candidate by petition

& Candidate from Nominating Committee

## 100% Renewable Energy Mix for Africa and Asia

*R. Gordon Bloomquist, Ph, D. Chair IGA Finance Committee*

The United Nations convened the 15th session of the Commission on Sustainable Development (CSD-15) in early May 2007. This year's session had an emphasis on energy sustainability and provided a venue for the first session convened and presented by the International Renewable Energy Alliance (IREA) of which IGA became a member in the fall of 2006. The focus of the special Side Event was how to achieve the goal of a 100% renewable energy mix for Africa and Asia. The session was chaired by IREA Chairman, the Honorable Peter Rae, and consisted of presentations by Robert Dixon, chair of the International Energy Agency on bioenergy options, Richard Taylor of the International Hydro Association on the hydro potential in Africa, Yogi Goswami representing the University of Florida on advances in solar technology, Brent Kopperson representing the World Wind Energy Association on recent break throughs in wind development and R. Gordon Bloomquist representing the IGA who stressed the potential for geothermal development in the African rift zone and highlighted the World Bank ARGeo program designed to accelerate geothermal developments in east Africa. The session was well attended and generated a number of questions and dialogue relative to the need for government incentives, political will and the impact that a non-renewable approach to meeting the needs of emerging economies would have on the environment and global climate.

A secondary but extremely important side benefit was the opportunity for all of the members of IREA to come together with a common voice for a renewable energy future.

## EUROPE

### Germany

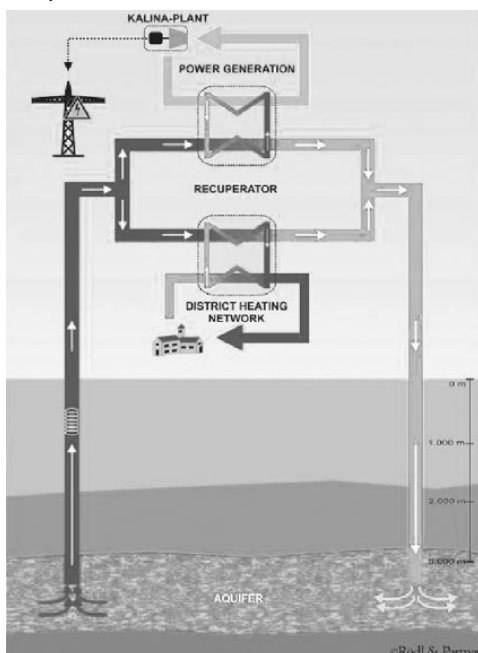
#### **Best practice project Unterhaching, Germany - Risk management and concept of geological risk insurance**

*Ch. Schönwiesner-Bozkurt, K. Imolauer, Rödl & Partner GbR, Germany*

#### **Deep-seated Hydrothermal Project Unterhaching**

In Bavaria, Southern Germany, geothermal energy projects are developed in the area of the geological formation of the Molasse Basin. The geothermal project of Unterhaching, near Munich, can presently be considered as the largest and ground breaking project of Germany. It is the first project that was designed from the beginning with the aim of power generation from low-enthalpy resources integrating innovative technology and risk mitigation concepts.

#### **Project Facts**



- realization of two deep drillings to a depth of approximately 3,500 m for a yield of 150 l/s thermal water (production and reinjection well)
- installation of a deep seated pump working at temperatures of more than 120°C and a production flow rate of 150 l/s (new development)
- heat supply for the community with a newly-built district heating network; length about 20 km
- power generation plant using “Kalina” technology with a gross capacity of 3.4 MWel
- project status: both wells highly productive at slightly higher temperatures than expected; heat supply started commissioning in May; power plant will be commissioned in August 2007

(For detailed information about the project, please see : [www.geothermal-projects.com](http://www.geothermal-projects.com))

#### **Special Requirements of Project and Risk Management**

The organization of this project was far more difficult than first expected. First of all it has to be pointed out that the investing party is the community of Unterhaching. In consequence great efforts were undertaken to minimize

in general the project related risks, and therefore it was of utmost importance to find a solution for the geological risk (especially exploration risk) related to the first production well - bearing in mind that there had been no geothermal deep drilling of such dimension realized before.

The concept was developed by the overall project management of Rödl & Partner. The approach was new and ground-breaking, because until this time a private insurance solution for covering the risk of temperature and flowrate did not exist. The key question of the concept was: *at which point does a project have to be considered to be unsuccessful?*

The approach in Unterhaching was the definition of specific minimum requirements of the ROI of the project depending on flowrate and temperature with the integration of a non-technical and non-geological parameter.

As the project's output - heat and electric power - depend strongly on the parameters temperature and yield of the thermal fluid, the definition of the minimum yield for e.g. heat supply was influenced by the planned distribution network. In a similar way the minimum size of a power plant could be calculated. Even the case of a heat-only plant was considered. The definition of different yields on the base of economic evaluations created three basic steps for decision:

- 1) power generation and heat supply still possible
- 2) only heat supply possible
- 3) no project possible at all (rebuilding of wells; insured event)

A further aspect was the integration of stimulation measures into the insurance contract, as the probability of success is also influenced by the efforts undertaken to reach the yield. The question was: which measures would have to be undertaken to achieve the minimum requirements?

On the base of this concept the first European private insurance contract was signed. Based on the results of this first contract and the further strong geothermal development in Germany, there are available now several options for such insurance solutions. The successful drilling in Unterhaching and the concept for a private enterprise insurance in combination with the increased feed-in tariff led to an unexpected development. By May 2007, about 80 exploration claims were confirmed by the Bavarian mining authorities, which consequently will lead to several geothermal projects for heat and power production.

The further development in risk management of geothermal projects led to the question as to how far the technical risks of drillings can also be covered by private enterprise insurance solutions to reach a minimum risk for investing parties. Solutions have been developed together with Rödl & Partner based on the experiences of Unterhaching and are presently available on the market.

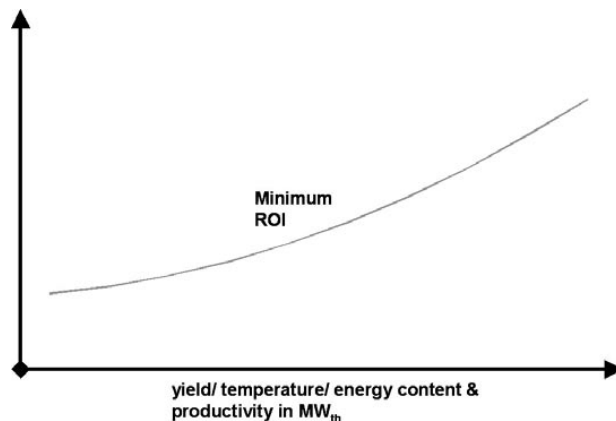
The next step will be to transfer the concepts to other countries. Presently first efforts are undertaken in Eastern Europe which will support hopefully the further development of geothermal projects.

## Poland

### ***Atlases of geothermal resources in the Polish Lowlands – The compendium of knowledge for specialists and future investors Wojciech Gorecki, Marek Hajto, Joanna Ci-gło***

During recent years a considerable increase in interest in renewable energy sources, including geothermal energy, has been observed. It is the role of scientific circles engaged in problems of geothermal energy utilization to carry out research work as well as to spread knowledge based upon solid scientific foundations.

One of ways to this end is represented by the "Atlases of Geothermal Resources in the Polish Lowlands" that have recently appeared. It has been published in two parts, Mesozoic formations (the 1<sup>st</sup> part) and Palaeozoic formations (the 2<sup>nd</sup> part) (Fig 2), with more than 720 pages altogether. In December 2006, the AGH-University of Science and Technology in Krakow, Poland, published (in A3 format and 1000 copies) this newest, detailed study concerning problems of





exploration, production and utilization of geothermal waters in the Polish Lowlands. The study area covers more than 87 percent of the territory of Poland (Fig 1). The Atlases were commissioned by the Ministry of the Environment and paid through the National Fund for Environmental Protection and Water Management.

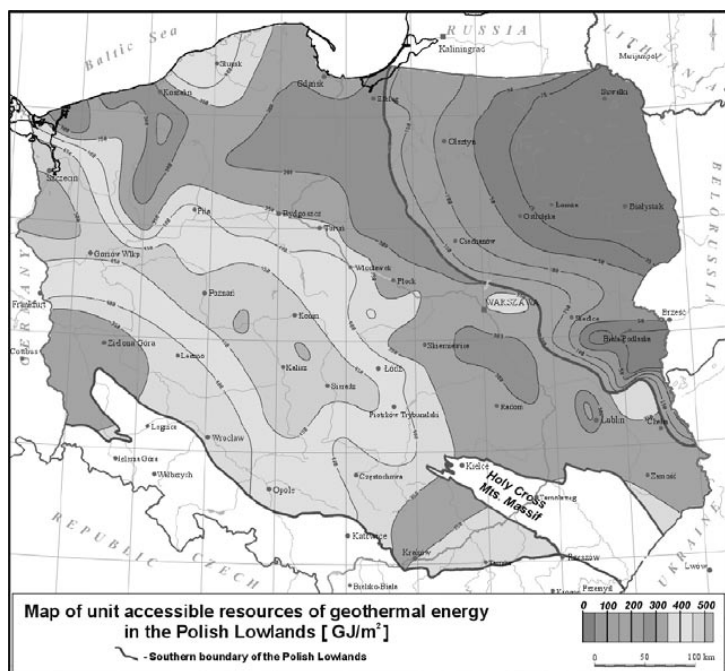


Fig 1. Extent of study area in the background of distribution of unit accessible resources of geothermal energy in the Polish Lowlands.



Fig 2. Cover pages of the Atlases

The research team appointed to carry out the undertaking was composed of 38 persons representing the biggest Polish Universities (the AGH-University of Science and Technology, Warsaw University and the Warsaw University of Technology), scientific institutions (Mineral and Energy Economy Research Institute - Polish Academy of Sciences, the Polish Geological Institute), the Association of Communes: Polish Network “Energie Cites”, private companies (e.g. Eko-Invest S.A. – Geotermia Stargard) and practitioners in the spheres related to geothermal energy.

The Atlases are the result of co-operation between specialists in geology, hydrogeology, geophysics, geochemistry, geothermics, drilling engineering, reservoir engineering, heat engineering, computer science, automatics, economics and law.

The core of the team was formed by the consortium of the AGH-University of Science and Technology and the Polish Geological Institute in Warsaw. The whole research team was managed by Professor Wojciech Gorecki, head of the Department of Fossil Fuels at the Faculty of Geology, Geophysics and Environment Protection at the AGH-University of Science and Technology, who was also the scientific editor of the Atlases. The team work was coordinated by Marek Hajto.

The team from AGH-UST has been carrying out researches into geothermal waters and energy since the 1980s. The work has been reflected by numerous publications, unpublished reports and conference materials. The summary of these studies was published in the “Atlas of Geothermal Waters in the Polish Lowlands” (Gorecki et al. 1990) and the “Atlas of Geothermal Resources in the Polish Lowlands” (Gorecki et al. 1995) which characterized the Lower Jurassic and Lower Cretaceous aquifers. Research workers of the Department of Fossil Fuels were also co-authors of the “Atlas of Geothermal Resources in European Communities” published in 2002 by the European Commission.

The “new” Atlases of geothermal resources of the Mesozoic and Paleozoic formations in the Polish Lowlands are results of long-term studies on utilization of geothermal waters and energy accumulated in the Lower Cretaceous, Upper Jurassic, Middle Jurassic, Lower Jurassic, Upper Triassic and Lower Triassic aquifers of the Mesozoic formations, and in the Lower Permian, Carboniferous and Devonian aquifers of the Palaeozoic formations. Description of these aquifers is an essential supplement to the knowledge of domestic resources of geothermal energy in the Polish Lowlands. The Atlases were elaborated with application of the newest techniques of digital processing of geological data and digital mapping, as well as software resources, among others the special software from the Landmark Graphics Corp.

At the same time, the work represents a compendium of knowledge in the sphere of technical issues related to exploration, development and exploitation of geothermal waters. The information can be useful first of all for those who deal professionally with geothermal energy utilization, but also for those who seek fundamental information on geothermal energy.

The publication presents, among others, characteristics of geothermal systems, ways of using the geothermal waters

and energy (e.g. heat engineering, electricity production, heat pumps, recreation, therapy) in Poland and in the world, degree of the waters and energy utilization, description of the geothermal installations and plants operating in Poland, and the classification and estimation methodology of different types of geothermal energy resources. Taking up more detailed issues of this discipline, the authors describe technical and technological conditions of exploitation, transmission and injection of geothermal waters and heat perception (e.g. technique and technology of drilling geothermal wells, their design, surface infrastructure of heating systems, etc.).

Problems arising from corrosion of construction materials and precipitation of solids in geothermal water transmission systems are also described. Methods for reduction of unfavourable phenomena related to production and utilization of geothermal waters, e.g. using proper steel in the installations, monitoring of changes in chemical composition of geothermal water etc., are indicated.

The authors did not confined themselves to the strictly technical approach. They also gave their attention to other aspects relevant to recovery of resources coming under geological concessions and the geological and mining law. Legal conditions of exploration and exploitation of geothermal waters and energy are discussed, as well as barriers for development of business initiatives based upon geothermal energy, factors affecting the profitability of geothermal ventures, relevant investment costs, sources of funds for geothermal projects in Poland and other EU countries. The cost effectiveness of utilization of heat from waters of particular aquifers for heating purposes is also evaluated.

The separate geothermal aquifers are characterized, among others, from the point of view of their geological setting (lithology, stratigraphy and tectonics), extent and depth of the aquifers, their thickness, temperature, water mineralization, discharge of water intakes and calculated reserves.

To construct maps of 11 structural surfaces, 5030 wells from the Polish Lowlands were used, data of which were taken from archives of the Polish Geological Institute and Polish Oil and Gas Company S.A. and from the database of the Department of Fossil Fuels. 2831 wells were selected as best documenting the geothermal aquifers. Results of analyses are illustrated with a number of appendices: more than 150 maps and approximately 30 geological and hydrogeological cross-sections.

In order to diversify forms of the information transfer and facilitate its reception by "common" readers, who sometimes are not involved professionally in the problems discussed in the Atlases, the text is enriched with approximately 90 figures, schemes (e.g. of geothermal installations) and photographs and roughly 30 tables. Each chapter is written in Polish and in English. This bilingual character is an additional advantage in the context of the interest in utilization of Polish resources of geothermal waters and energy among institutions, businessmen, foreign banks etc.

The Atlases are intended principally for representatives of the state administration, local authorities, and institutions or private firms interested in geothermal heat energy recovery or other ways of geothermal water utilization. They constitute a source of information on distribution of the geothermal aquifers, their parameters and water and energy resources in particular areas of the Polish Lowlands.

The knowledge derived from the Atlases can make decisions much easier for local authorities and/or private investors in planning geothermal ventures, their localization and the matching of technical parameters of a project to the needs of a local heat market. Necessary knowledge can be acquired also by university staff and students of various specializations: renewable energy sources, unconventional power engineering, environment protection and others.

Owing to such studies we have a broader and broader view of geothermal resources in Poland. The information assembled in the Atlases may contribute to rational and economically justified utilization of geothermal resources and the authors are hopeful that it will be instrumental in increasing the share of renewable, environmentally-friendly geothermal energy in the energy balance of Poland.

1) Gorecki W. (Eds.), 1990 - Atlas of geothermal waters in the Polish Lowlands. Institute of Fossil Fuels, AGH-University of Mining and Metallurgy in Krakow,

2) Gorecki W. (Eds.), 1995 - Atlas of geothermal resources in the Polish Lowlands. Department of Fossil Fuels, AGH-University of Science and Technology in Krakow.

3) Hurter, S., Haenel, R. (Eds.), 2002 - Atlas of Geothermal Resources in European Communities: Publication no. EUR 17811 of the European Communities, Luxembourg.

## Iceland

### *Geothermal symposium and BoD meeting in Reykjavik*

The Geothermal Association of Iceland will organize a symposium in association with IGA BoD meetings in Reykjavik, Iceland in October 2007. The symposium will be held October 9 and deals with international geothermal development in the near future with emphasis on questions like the financing of geothermal projects, new opportunities for conventional geothermal fields and green energy as the driving force for geothermal development.

## **AFRICA**

### **Ethiopia**

#### ***The First International Conference on Geothermal Energy in the East African Rift Region (ARGeo-C1)***

*Meseret Teklemariam ( Geological Survey of Ethiopia)*

#### **INTRODUCTION**

ARGeo is a project for the development of the geothermal resources of the East African Rift region. It has been under preparation since February 2003. A large number of attractive resource areas have been identified and project guidelines prepared by the subscribing countries with the assistance of the United Nations Environment Program. The subscribed countries are: Djibouti, Eritrea, Ethiopia, Kenya, Tanzania and Uganda. Other countries of the region are also expected to subscribe to the project over time. It is envisaged that project implementation will commence during 2008 with UNEP and the World Bank acting as co-implementing agencies.

The fact that geothermal energy is a clean, renewable and economically competitive energy resource with high developmental potential in the countries of the East African Rift region encouraged the initiation of the project as a means for addressing constraints regarding: (a) awareness including the availability and potential benefits of the resource, and (b) awareness of the technical capacities in the region, and the insufficient availability of the required investment resources for resource development.

It is expected that, through this project, countries in the East African Rift region will be able to develop their geothermal resources. In some cases this would be their sole indigenous energy resource. In other cases, where other energy resources are also utilized, it would be a means to supplement their energy supply and to improve the energy-supply mix.

It is envisaged that the institutional, infrastructural and human resource capacities already existing in the region will be networked to: (a) facilitate regional cooperation, mutual assistance, exchange of information and experience, training, pooling of appropriate capacities, and (b) serve as means for sourcing international technical and economic support and participation in geothermal resource development and utilization.

One of the means proposed for furthering regional cooperation and exchanges is the holding of periodic conferences on the development and utilization of geothermal resources in the ARGeo region, with international participation, to serve as fora for the exchange of information, experiences and case histories, as well as for staying abreast of new developments at the international level, and coupled with appropriate training programs that address specific issues of particular relevance to the region.

On the occasion of the “ARGeo Steering Committee” meeting held in Nairobi in April 2004, during the preparatory stage of ARGeo, it was decided that the Geological Survey of Ethiopia (GSE) should convene the first such international conference. The conference was designated “ARGeo-C1” to indicate (a) its context as being the ARGeo Project, and (b) to term it “C1” to reflect that it would be the first of GSE's intended series of similar conferences that may be followed by sequels that could be organized by other ARGeo-subscribing countries.

#### **THE CONFERENCE (ARGeo-C1)**

The ARGeo-C1 was organized by GSE in collaboration with the Ethiopian Electric Power Corporation (EPPCO), Ethiopian Electric Agency (EEA), Ethiopian Environmental Protection Authority (EPA), Ethiopian Rural Energy Promotion and Development Center (EREPDC), Ethiopian Geoscience and Mineral Engineering Association (EGMEA) and International Geothermal Association (IGA). It was held at the United Nations Conference Center in Addis Ababa, Ethiopia from November 24 to December 2, 2006. The theme of the conference was “Geothermal Energy: An Indigenous, Environmentally Benign and Renewable Energy Resource”.

The objective of the conference was to share and exchange ideas and experiences on how to overcome the barriers and constraints that hinder the exploration, development and utilization of geothermal energy resources in the East African region. During the conference, all technical issues concerning the resource from initial exploration to development and utilization, including case histories, as well as the key elements related to environmental, social, legal, institutional, economic and financing issues, private sector participation, and other direct resource utilization schemes and possibilities were discussed in detail.

Given the worldwide recognition of the magnitude and quality of the geothermal resource base of the East African Rift



and the interest to contribute to its development, a large number of specialists engaged in the exploration, development and utilization of geothermal resources worldwide as well as representatives of bi- and multilateral institutions engaged in geothermal project financing and implementation participated in the conference. In addition to international participation, a large number of participants, both from within the current ARGeo region and from other African countries, attended the conference.

During the conference there were various relevant programs including: (i) a pre-conference field trip (November 24 to 26, 2006); (ii) technical meetings during the conference (November 27-29, 2006); and (iii) a post-conference field trip (November 29-December 2, 2006).

**(i) The Pre-Conference Field trip (November 24 to 26, 2006):** The Finfine thermal well area and public bath in Addis Ababa were visited at the first stop. In Ethiopia, there is a long history of use of geothermal waters and steam for bathing and curative purposes, often with attributes embedded in religious beliefs. In line with this tradition, Addis Ababa was founded in 1887, at the initiative of Empress Tayitu, near the site of the Finfine thermal springs. One hundred and seventeen years later, in 2004, the thermal springs were commercially developed for a public bath. This visit was followed by a travel along the highway to the northeast, part of the way into the northern sector of the Main Ethiopian Rift (MER). The next day there was a visit to the Aluto volcanic center and the geothermal field including the fluid gathering system, the pilot power plant, and wells nos. 3, 6, 8 and 4. On the third day, there was a visit to the large cluster of coalesced volcano-tectonic collapse structures that host the 256m deep Lake Shalla and the area of hydrothermal activity on the western shore of the lake. There were about 40 local and foreign participants during this field trip.

**(ii) The Technical Meetings during the Conference (November 27-29, 2006):** The conference was held at the United Nations Conference Center in Addis Ababa. There were 200 conference participants from more than 15 countries from the continents of Africa, Asia, Europe, North and South America. During the conference about 80 scientific papers were presented in eleven technical sessions that included both oral and Poster presentations.

**Session I: Opening Session:** The chairperson of the Organizing Committee of the ARGeo-C1, Dr. Meseret Teklemariam, delivered a welcome address. Then she invited His Excellency Ato Alemayehu Tegenu, the Minister of Mines and Energy to officially open the conference. During his speech, the Minister stressed that this first international conference is aimed at furthering the purposes of the greater knowledge, development and utilization of the rich geothermal resources of the East African Rift region. He also invited all participants to share their experience in the vision of enriching African life with increasing use of clean and affordable geothermal energy and to collaborate in working toward geothermal energy assuming its proper role in that scheme.

Following the opening speech the Secretary of the Organizing Committee of the ARGeo-C1 and Master of the Opening Ceremony, Ato Solomon Kebede, announced the whole program of the technical session to the participants.

Then, three keynote speeches were given by international geothermal experts on various subjects: (i) History, Present Utilization, and Future Prospects of Geothermal Energy Worldwide by John Lund ; (ii) Factors Critical to Economic Feasibility by Gordon Bloomquist and (iii) Crustal Structural Setting of Geothermal Resources in Africa by Getahun Demissie.

**Session II:** This session was chaired by His Excellency, Ato Alemayehu Tegenu, Minister of Mines and Energy. Presentations were mainly focused on the Ethiopian Energy Scene. Ato Amenti Abraham, Chief Geologist of the Geological Survey of Ethiopia (GSE) gave a brief introduction on GSE and its activities. This was followed by various presentations on Energy Policy, Energy Master Plan and status and trends of the rural electrification of Ethiopia.

**Session III:** In this session, several papers were presented by international experts on direct uses, economic benefits of mineral extraction from geothermal brines, and geophysical exploration, drilling, well completion and testing of deep aquifers in Sweden. Furthermore, experts from the Federal Institute for Geosciences and Natural Resources (BGR) of Germany (GEOTHERM program) and from the United Nations University Geothermal Training Programme (UNU-GTP) of Iceland discussed their activities and contribution to geothermal energy resource exploration and development in the East Africa Region.

**Session IV:** Presentations were focused on subjects of regional interest, mainly on the overview of geothermal resource exploration, utilization and potential in the East Africa region and their challenges to develop the resource. In these presentations, it was reported that most of the East African countries are dependent on traditional biomass fuel (70-90%) that causes deforestation and environmental degradation. Renewable energy sources (hydro, geothermal, solar) represent a small portion of total energy production, averaging 2%.

**Sessions V and VI:** In these sessions, a number of Ethiopian geothermal experts presented more than ten scientific papers on the status of geothermal exploration and development in various geothermal prospect areas of Ethiopia. Emphasis was given to the geoscientific and reservoir engineering studies of the two more advanced explored geothermal fields of Ethiopia: Aluto-Langano and Tendaho geothermal fields. This was followed by geoscientific studies of Corbetti, Dofan-Fantale, TuluMoye and Abaya Geothermal Prospect areas.

**Session VII and VIII:** A number of Kenyan researchers from the Kenyan Electric Power Generating Company (KENGEN) shared their experiences and knowledge by presenting papers on the Kenyan geothermal prospect areas that include Olkaria, Bogoria, and Eburu. Furthermore, experts from Ormat international Company shared their experiences of technology transfer of Olkaria III geothermal power plant facility.

**Session IX:** Presentations were mostly focused on other ARGeo countries. Experts from Djibouti, Tanzania and Uganda presented papers on the status of geothermal resource exploration in their respective countries. The chemistry of fluid and well testing of the Assal geothermal field, Djibouti, were discussed in detail by experts from Djibouti and Iceland.

**Session X:** Various international experts from Iceland, Mexico, Yemen and Hungary shared their knowledge and experiences by giving presentations on their respective countries.

**Poster Sessions:** About 15 poster presentations were displayed and explanations were given by various researchers from different parts of the world.

**Closing Ceremony:** The conference was officially closed on November 29, 2006 at 4:00 PM by the General Manager of the Ethiopian Electric Power Corporation (EEPCo) - Ato Mihret Debebe. During his closing speech, he mentioned that Ethiopia is committed to developing geothermal energy as an alternative energy resource mainly to augment energy supply from hydropower plants and to improve the generation mix. He also stressed that experts from Ethiopia and other African countries were able to gain knowledge and experience from the pre-conference field trip and the discussion and presentations held during the last three days of the conference.

Following the closing speech a senior expert from the Geological Survey of Uganda (GSU), Mr. Godfrey Bahati, declared that the GSU will host the second international conference on Geothermal Energy in the East Africa Region (ARGeo-C2) in Kampala, Uganda, in the year 2008.

**Round-Table Discussions by the Financiers:** Following the Closing Ceremony, a round table discussion was held on the status and the way forward for the African Rift Development Facility Project (ARGeo-C1). Representatives from the Executive and implementing agents of the project, from the World Bank and UNEP, led the discussion. These included: Mr. E. Fernstrom (ARGeo Task Manager, World Bank), Mr. B. Jamet (Project Manager, United Nations Environmental Protection), and Mr. K. Shimazaki (GeoFund, World Bank).

#### **Post Conference Field Trip (November 30-December 2, 2006)**

It was regretted that the post-conference field trip to the Tendaho geothermal field had to be cancelled due to unforeseen logistical problems that arose. However, a special truncated post conference field trip was then arranged for eight participants including the Project Manager of ARGeo from UNEP, BGR experts from Germany and other experts from USA, Iceland and France.

During this special trip, the Tendaho geothermal field (including discharging wells) and surface manifestations in the surrounding area were visited. Experts also saw the various equipment available in the Tendaho geothermal camp site including the Massarenti deep drilling rig and its accessories.

After their visit to the Tendaho geothermal field and camp site, detailed discussions were held on the current activity and plan for the future of the Tendaho geothermal field.

## **ASIA/PACIFIC RIM**

### **Western Pacific Regional Branch of IGA**

*Jim Lawless, President WPRB*

The second Regional Branch of the IGA has now been established to cover the Western Pacific Region. This will complement the existing European Forum.

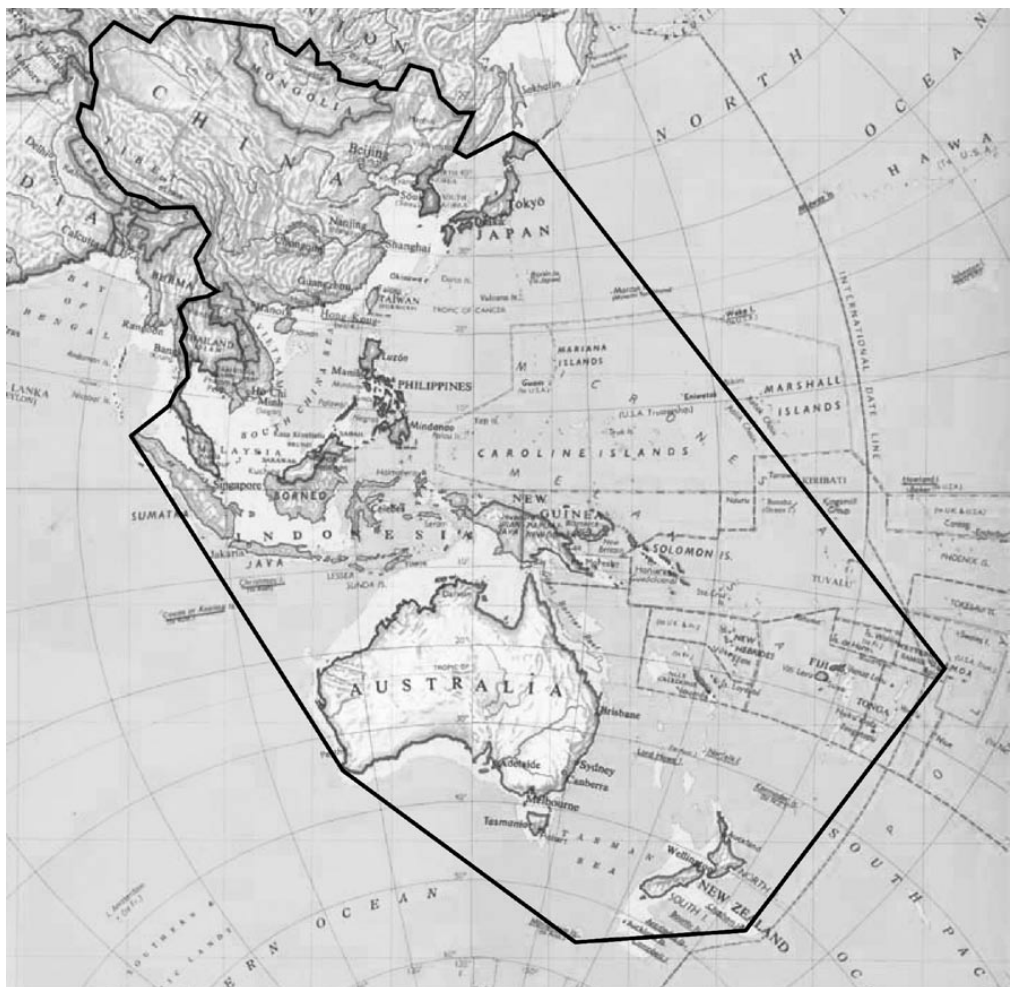
The intention of a Regional Branch of IGA is to provide a close regional focus for members with common interests not only geographically but also in terms of similar types of geothermal resources and technical applications. In the case of the Western Pacific Branch there will be a strong focus on electricity generation and higher enthalpy resources.

The founding members of the Western Pacific Regional Branch for IGA are those members of the affiliated national Geothermal Associations of Indonesia, Japan, the Philippines, China and New Zealand who opt to join the Regional Branch, plus other member of IGA living or working within the geographical area defined who wish to join.

Current membership exceeds 400.

The geographical coverage of the Western Pacific Regional Branch is the area outlined by joining the national boundaries of: Thailand, China, Mongolia, Japan, Samoa, New Zealand, Australia and Indonesia, and all other countries within that area.

There is a strong tradition of co-operation between several of the countries in the region for geothermal development. For example during the period of rapid geothermal development in the 1980's and 1990's, there was a high degree of participation by New Zealand and Japan in geothermal research and development in Indonesia and the Philippines. With the maturing of the geothermal industries in those countries it is now much more of a partnership role, but strong linkages remain.



IGA Western Pacific Regional Branch Map

### *Meetings*

All of the five core countries concerned currently individually hold at least annual geothermal conferences or seminars. Under the aegis of the Regional Branch, one of those conference will be named as the Regional Branch Conference for that year, on a rotating basis. That will foster closer relationships and give a boost to international participation in the conferences. In 2006 year the Geothermal Workshop in Auckland was designated as the first of the Regional Conferences, and in 2007 it was the Annual PNOC-EDC meeting in Manila. In 2008 it will be the Indonesian Geothermal Association Annul Meeting, in Bali. The date of that is yet to be finalised but will be between late March and the end of May. Watch this space for details.

### *Officers and Committee Members*

The WPRB is governed by a Forum for 2006-2007 consisting of:

Jim Lawless	New Zealand	Chairman
Alimin Ginting	Indonesia	
Glen Golla	Philippines	
Toshi Uchida	Japan	
Tingshan Tian	China	
Kevin Brown	New Zealand	Treasurer
Graeme Beardsmore	Australia	

The following standing committees have been established:

- Nominating (Election) Committee: Toshihiro Uchida, Bill Wood, Larry Bayrante
- Finance Committee: Alimin Ginting, Murray Stanley
- Audit Committee: Tingshan Tian, Mike Glucina

Elections for the Forum 2007-2010 will be held in late 2007 after the IGA Board elections.

How do you join the Regional Branch ?

If you are in one of the five core founding countries, that have affiliated Geothermal Organisations, you can expect to be contacted by your appointed representative, or send an Email to the following::

China: Dr. Tingshan Tian: [tiants@mail.cigem.gov.cn](mailto:tiants@mail.cigem.gov.cn)  
 New Zealand: Jim Lawless: [jlawless@skm.co.nz](mailto:jlawless@skm.co.nz)  
 Japan: Toshihiro Uchida : [uchida-toshihiro@aist.go.jp](mailto:uchida-toshihiro@aist.go.jp)  
 Indonesia: Alimin Ginting: [aliming@unocal.com](mailto:aliming@unocal.com)  
 Philippines: Glenn Golla: [glenn.golla@chevron.com](mailto:glenn.golla@chevron.com).

If you are an IGA member who lives or works within the Western Pacific region, but who is not within one of the above five countries, or have any questions, please send an Email directly to Jim Lawless at the address above.

A small annual membership fee is charged over and above the local association fee or annual IGA membership fee

## **Australia**

### ***Peninsula Hot Springs – A developers story***

*Charles Davidson*

*Peninsula Hot Springs, Victoria, Australia*



*Main Pool.*

## **INTRODUCTION**

In the gold rush state of Victoria, there's a new rare find: liquid gold. It's pretty much a given that you'll find hot mineral springs in relatively young lands of vaulting geological upheaval like New Zealand, Alaska, and Japan. But in the ancient, stable rock strata of the Great Southern Land, it is thought a rare find, truly liquid gold. The Australian state of Victoria was the destination for waves of gold miners in the 1850's, Californians, British, Irish and Chinese among them seeking their fortunes with pick and shovel. In February 2002, Victoria's ground again yielded excitement, when Melbourne television news stations captured the moment that hot mineral water gushed from a 2,090 feet (637m) bore at Rye on the Mornington Peninsula, about one hour's drive south of Melbourne. The sight of the 122°F (50°C) geyser was a hugely satisfying waypoint on a fascinating journey for Charles Davidson and his brother Richard. The brothers still meet with incredulous hydrologists and geologists from younger lands amazed that they have tapped a natural hot water spring in a country where 'mountains' are more akin to the old weathered molars of some ancient, tired beast. In fact, Japanese hydrology experts went so far as to say 'no way' to Charles when he first began to investigate spa culture and bathing, with dreams of returning from his job in Japan to build a natural hot spring center at home. Opening on 28 June, 2006 with brothers Norm and Bruce Cleland joining the Davidson brothers, Peninsula Hot Springs is a facility employing 75 people by tapping 122°F(50°C) geothermal waters from an aquifer 2,090 feet (637m) below the 42 acre (17 hectare) Mornington Peninsula property. It is the first hot spring bathing facility in Victoria, and the only one in Australia to integrate therapeutic spa, bathing, accommodation, food and beverages. The facility includes public and private hot spring baths, a massage spa center, relaxation rooms, café and juice bar, gift shop and a booking office for activities and accommodation.

## THE LEARNING EXPERIENCE

The inspiration for the project began when Charles visited several hot springs while in Japan in 1992, working for Mitsubishi Corporation. This sparked off several years of touring and studying hot springs around the world. In May 1997, Charles heard a rumor that hot geothermal water had been discovered on the Mornington Peninsula in 1979, and a search of Department of Minerals and Energy records substantiated it.

Melbourne is a wonderfully multi-cultural city, having the benefit of various waves of immigration throughout its history. Similarly, Peninsula Hot Springs could be said to reflect a multi-cultural bathing experience with the benefit of Charles Davidson's worldwide research into hot springs and spas. In his research, Charles visited spas in Japan, China, Europe, Yemen, Egypt and Turkey. He talked with spa experts in Russia, the United States and Canada. In Japan, at a visit to Daimaru Hot Springs, he met Professor Sato, Chairman of the Organization for the Preservation of Japanese Hot Springs, who taught him the sustainable nature of the business.

For 1500 years the Sato family had been operating the Daimaru Hot Springs Inn, where they provided rest, food, shelter, and a hot bath to travellers before they set out on the trek through the high, snow covered mountain pass from Kyoto to Tokyo. The modern day concept of needing to continually grow and expand had been surpassed by the desire to serve and to exist in harmony with the environment. A harmony with nature seemed to be their key to longevity. Based on an introduction by John Lund after a visit to his home in Klamath Falls, Charles met with Dr. Vladimir Adilov, Principal of the Russian Mineral Authority, who in turn introduced him to several geothermal experts, including Nikolai Strozhenko, Vice Minister of Tourism in Russian and President of the Russian Spa Federation. Mr. Strozhenko had a photo on his office wall with him and Boris Yeltsin arm in arm at a health retreat at the Black Sea, confirming their belief in the healing powers of bath in Russia. Charles also undertook a two week spa education course in Karlovy Vary (Karlsbad) in Czechoslovakia (1998) now the Czech Republic, coordinated by Dr. John Paul De Vierville, the Education Director of the International Spa Association (ISPA).

The link between the medical profession and the spa industry was almost total, as in then-Czechoslovakia all medical doctors were required to study balneology (the use of water in health and healing) as an element of their undergraduate training. Spa programs were prepared and coordinated by medical doctors. As in much of Europe, the spa is integral to national health programs and plays a vital role in the health and wellbeing of its citizens. Charles' next stop was to Yemen, as he wanted to prove a theory that all cultures with hot springs would have bathing as an element of their living ritual, no matter their economic state. As it turned out, the Arabic way of the bath in this, one of the world's poorest countries, proved like the culture itself to be incredibly developed and sophisticated. In Sanah, the capital of Yemen, there were 17 public baths, one of which was 2,200 years old and still operating. While none of the city baths were fed by hot springs, he was able to visit three natural hot springs within a few hours' drive from the capital. The Arabian bathing culture saw women and men allocated separate times to bath and at all times bathing costumes were worn.

Later in 1998, Charles visited "New World" baths in Canada and the United States, as the day spa boom was starting to gain momentum in these countries. Major cosmetic companies and their branded retail muds, oils, creams, and lotions were part of this growing economy. The conclusions of his observations were that hot spring spas could be categorized into three types: (1) the European medical spas, (2) the Asian nature-based relaxation spas, and (3) the American beauty spas. Medical spas provide programs that follow a prescribed health routine including elements of outdoor exercise and drinking the waters for their mineral benefits. Relaxation spas draw people out into the environment where contemplation, reflection and calm are to be found.

Beauty spas tickle and pamper the mind, body and spirit while driving home a branded retail product sales pitch.

## THE PLANNING

After traveling to 45 countries and researching spas in 15, Charles has seen the diversity and possibilities of bath life. The simplicity of the bathing experience in thermal water and the relaxing sound of "aaaaahhhhhh!" as you immerse yourself into the warm water was the central experience. Back in Australia, Richard worked on the land and the planning application. Through 1998 and 1999 Richard oversaw the planting of 7,000 indigenous trees on the Mornington Peninsula property. The number has since grown to more than 20,000 plantings. Having a Masters Degree in Environmental Science, Richard shared Charlie's vision of a center that worked with its local environment, enhancing but not dominating it. The brothers felt that a bath in nature, at Peninsula Hot Springs, would have to be one in the nature of their Mornington Peninsula land and one that shares with their customers the peaceful and gentle world knowledge of the bath. The brothers wanted time in the outdoor baths to be a 'timeless zone' where birds come to visit, and at night inquisitive possums would walk through the trees above the bath under the southern stars. They envisioned an experience that would transform people from their busy world into a place where a connection with nature can be found. "The realization that we are part of the universe and not separated from it will provide a sense of connection and self. Visitors to this place will not know the passage of time and will almost forget to leave," Charles wrote for a spa association paper before the center was completed.



## THE CONSTRUCTION

Award winning Australian architects, Gregory Burgess Architects, brought their extensive experience with the Australian environment and in particular indigenous Aboriginal connections translating to the project a living cultural experience. They worked closely with Taylor Cullity and Lethlean, Landscape Architects to design the building, pools and surrounding landscape. Hot, warm and cold baths, steam rooms and saunas along with indoor and outdoor mineral baths in both private and public configurations were made available. This, coupled with features gleaned from overseas, provided a diversity of cultural bathing experiences with quiet spaces and tranquil places for discovery and creativity.



*Small soaking pool.*



*Small soaking pool.*

In addition the buildings are heated with the geothermal waters, and a greenhouse and fish farm will also be developed to provide a living example of what is possible with geothermal waters. These will be complemented with a Center for “Geothermal and Environmental Demonstration and Education” that will share the knowledge gained with many people with an interest in what the Peninsula Hot Springs trio have learned along the way. With the Mornington Peninsula recently receiving UNESCO accreditation as the world’s first “Urban Biosphere”, education on the possibilities of a sustainable future is more than a responsible activity, it is a community expectation. The thermal waters flow from Selwyn Fault and out into Bass Strait. Ten thousand years ago, when it was possible to walk from the present day Mornington Peninsula to Tasmania, one was greeted with the joy of natural hot spring pools along the way. With the rising of the waters the natural springs are now found under the ocean where they form their own micro climates of warm, fresh water zones. The only way to reach the thermal waters was to bore down. The drilling program started in late 1998, and after several failures, was completed in 2002. The final bore was drilled to a depth of 2,090 feet (637m) through a variety of sands, limestone, marls, brown and black coal, and finally to a basalt basin. The bore has a capacity of (872 gpm (55 l/s)) producing 122°F (50°C) geothermal waters. The water has a total dissolved solids (TDS) content of 3200 mg/l (ppm) and a pH of 7.09. It is classified as sodium chloride bicarbonate water and also contains 95 mg/l magnesium, 81 mg/l potassium and a wide variety of other minerals and trace elements. The water rises under its own pressure to a depth of 29 feet (9m) from the bore head, which is approximately 60 feet (18m) above sea level.

Future plans will see an expansion of the pools and spa center, construction of 180 rooms of accommodation, a wellness center spa, as well as a wellness school, and a variety of satellite spas with country themes including Maori from New Zealand, Japanese, Arabic and Indian. The facility seeks to be fully sustainable with an underpinning belief of treading lightly. It has an egalitarian philosophy offering an experience that is available to and welcomes everyone.

## REFERENCES

Davidson, Charles, 2003. Peninsula Hot Springs Biography of an Australian Hot Springs, presented at the United National World Health Organization, 1st FEMTEC, Asia Hot Springs Conference, Taiwan, December 13-19, 2003.

## UPCOMING EVENTS

ENGINE Workshop 4. Drilling costs effectiveness and feasibility of high-temperature drilling, Reykjavik, Iceland, June 28-29, 2007. <http://conferences-engine.brgm.fr>

ENGINE Workshop 6. Increasing policy makers awareness and the public acceptance, Athens, Greece, September 13-14, 2007. <http://conferences-engine.brgm.fr/>

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

International Geothermal Development in the near Future, Reykjavik, Iceland October 9, 2007. [www.samorka.is/iga](http://www.samorka.is/iga).

First European Geothermal Review, Mainz, Germany, October 21-31, 2007. Contact: [review@bestec-for-nature.com](mailto:review@bestec-for-nature.com)

ENGINE Workshop 7. Risk analysis for development of geothermal energy, Utrecht, The Netherlands, November 8-9, 2007. <http://conferences-engine.brgm.fr/>

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

29th New Zealand Geothermal Workshop, Auckland, New Zealand, November 11-15, 2007. [www.nzgw07.auckland.ac.nz](http://www.nzgw07.auckland.ac.nz)

Mineral extraction from geothermal brines, Rotorua, New Zealand, November 22-23. Contact: Dr. Kevin Brown [kevin@geokem.co.nz](mailto:kevin@geokem.co.nz)

33rd Stanford Workshop on Geothermal Reservoir Engineering, Stanford, CA, USA, January 28-30, 2008. <http://pangea.stanford.edu/ERE/research/geoth/conference/workshop.html>

ENGINE Final Conference, Vilius, Lithuania, February 13-14, 2008. <http://conferences-engine.brgm.fr/>

33rd International Geological Congress, Oslo, Norway, August 6-14, 2008. [www.33igc.org](http://www.33igc.org)

## IGA News

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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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**Contributions to the next issue of IGA News must be received by 8 August 2007.**

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