



## IGA ACTIVITIES

### Message from the President

#### Ladsi Rybach, President

Dear IGA member

This is the fifth message from your President.

IGA activities within the framework of the World Bank/GeoFund program are moving ahead. The Mineral Extraction task is finished and the Road Mapping Workshop was convened successfully by Prof. Leif Bjelm and Dr. Gordon Bloomquist in Moscow on 22nd September. The Geothermal Workshop 2008, planned for 15-18 December, has been postponed to be held in Istanbul, 16-19 February 2009

The GRC 2008 Conference and Expo (5-8 October, Reno/NV, USA) was a success. Although relatively few papers and posters were presented, the impact of the Exposition was impressive: the many interested visitors and more than 100 exhibitors reflected the increasing momentum of geothermal development in the US, also triggered by the renewed funding activities of US Department of Energy (DOE). At the Opening Session, I had the pleasure of receiving the GRC Henry J. Ramey Reservoir Engineering Award; in the recipient's speech, I acknowledged the renewal of GRC's affiliation agreement with IGA. The IGA Special Committee for co-organizing WGC2010 also met in Reno on 5th October.

The International Conference and Exhibition RENEWABLE ENERGY 2008 (RE2008, Busan, S.Korea, 13-17 October) hosted many paper/poster presenters and exhibitors and was held in the excellent convention facility BEXCO. Among the numerous sessions on hydropower,



Picture from the BoD meeting in Entebbe

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solar, wind, biomass, ocean energy, hydrogen and fuel cells there were five geothermal sessions, with presentations by Korean and international experts. As a side event the Distinguished Lecture Course on Geothermal Development and Utilization took place on 10th October, attended by local and foreign participants (lecturers: John Lund and Ladsi Rybach). Dr. Yoonho Song (KIGAM, Daejeon) earned great recognition for organizing both geothermal events in a most efficient and successful way.

In my function as IGA President I am frequently invited to present keynote lectures. Besides having delivered an invited paper at RE2008 on 11 October, I gave another at the 10th Anniversary Conference of the Geothermal Association of Ireland in Kilkenny on 5 November. A further one will be presented at the opening

of Geothermiekongress 2008 in Karlsruhe, Germany, on 12th November. This congress covers a lot of ground, including 10 thematic Workshops (among them the IGA-World Bank GeoFund Workshop on Geological Risk Insurance), one economic and 16 technical sessions with poster presentations. The conference and its accompanying exposition GeoEnergia 2008 impressively reflect the ongoing large-scale geothermal development in Germany.

The IGA Board of Directors held its 46th BoD meeting in Entebbe, Uganda, on 23rd November, with meetings of the IGA Committees being held on the preceding day. The meetings were followed by the Second African Rift Geothermal Conference (ARGeoC2), which took place at the Imperial Resort Beach Hotel in Entebbe from 24-25 November, followed by exciting field trips to geothermal-volcanic fields at Queen Elizabeth National Park and Rwenzori Mountains on 26-28 November. The IGA 2008 Annual General Meeting was also held in Entebbe on 24th November. Reports on these meetings will appear in the next issue of IGA News.

The high-level UNFCCC (United Nations Framework Convention on Climate Change) "Poznan Climate Change Conference COP14" took place in Poznan, Poland from 1-12 December. Among the numerous side events there was one on "Financing the Renewable Energy Transition" with BoD member Dr. Beata Kepinska representing IGA. Another United Nations-related meeting, organized by ICS-UNIDO, was the Workshop on "Geothermal Energy: Resources and Technology for a Sustainable Development", held in Trieste, Italy from 10-12 December. Several IGA members were invited as speakers. In view of the geothermal contribution to the new IPCC Report a joint IEA Geothermal Implementing Agreement / IGA Workshop "Geothermal Energy - Its Global Development Potential & Contribution to the Mitigation of Climate Change" is planned to take place in Madrid, Spain on 5-6 May 2009. The 47th IGA BoD will also take place in Madrid (7-8 May).

Finally some further news: a new FORSEO (forseo GmbH - Facilitating Sustainable Energy Finance, Freiburg i.Br., Germany) publication "The Investor's Guide to Geothermal Energy" has just appeared. This very timely book - endorsed by IGA - serves as a practical reference tool for the financial community, for industry and for stakeholders, and can be ordered through [www.forseo.eu](http://www.forseo.eu).

## UPCOMING EVENTS

**IASPEI GENERAL ASSEMBLY 2009, Symposium H1 "From Heat Flow to Geothermal Energy"**, Cape Town, South Africa, 10-16 January 2009. Website: [www.iaspei2009sa.com](http://www.iaspei2009sa.com)

**CEP Clean Energy Power**, Stuttgart, Germany, 29-31 January 2009. Website: [www.cep-expo.de](http://www.cep-expo.de)

**34th Stanford Workshop on Geothermal Reservoir Engineering**, Stanford, CA, USA, 9-11 February 2009. Website: <http://pangea.stanford.edu/ERE/research/geoth/conference/workshop.html>

**Renewable Energy Technology Conference and Exhibition**, Las Vegas, Nevada, USA, 25-27 February 2009. Website: [www.retech2009.com](http://www.retech2009.com)

**Renewable Energy World Conference and Expo North America**, Las Vegas, Nevada, USA, 10-12 March 2009. Website: [www.power-green.com](http://www.power-green.com)

**30th EDC Annual Geothermal Conference**, Makati City, Philippines, 11-12 March 2009. Contact: [geothermalcon@energy.com.ph](mailto:geothermalcon@energy.com.ph)

**2009 SPE Western Regional Meeting, Geothermal Resources Session**, San Jose, California, USA, 24-26 March 2009. Website: [www.spe.org/events/wrm/index.html](http://www.spe.org/events/wrm/index.html)

**Canadian Geothermal Energy Association Conference and AGM**, Vancouver, Canada, 16-17 April 2009. Website: [www.cangea.ca/events/](http://www.cangea.ca/events/)

**RENEXPO Central Europe**, Budapest, Hungary, 16-18 April 2009. Website: [www.renexpo-budapest.com](http://www.renexpo-budapest.com)

**International Symposium on Convective Heat and Mass Transfer in Sustainable Energy**, Yasmine Hammamet, Tunisia, 26 April-01 May 2009. Website: [www.ichmt.org/conv09](http://www.ichmt.org/conv09)

**IEA Geothermal Implementing Agreement - IGA Workshop "Geothermal Energy - Its Global Development Potential & Contribution to the Mitigation of Climate Change"**, Madrid, Spain, 5-6 May 2009. Contacts: [mongillom@reap.org.nz](mailto:mongillom@reap.org.nz), [iga@samorka.is](mailto:iga@samorka.is)

**World Geothermal Congress 2010**, Bali, Indonesia, 25-29 April 2010. Website: [www.wgc2010.org](http://www.wgc2010.org)

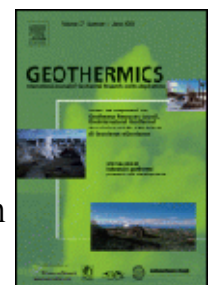


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## GEO THERMICS

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Content of the latest issues: <http://www.elsevier.com/locate/geothermics>



IGA BoD member Dr. F.-D. Vuataz has created a new look for IGA News that was unanimously welcomed by the BoD and will be used for future IGA News. The IGA website will also soon undergo some reshaping.

And, last but not least: our members should be aware that the deadline for Abstract submissions to WGC2010 will be 31st January 2009; submission forms can already be downloaded from [www.wgc2010.org](http://www.wgc2010.org), along with the Second Circular with all the information about the congress, exhibition, field trips etc. Hopefully many of our members will contribute to this key geothermal event in Bali, Indonesia (mark your calendars: 25-30 April, 2010).

I look forward to continuing to work with you in our joint effort to promote geothermal, and thank you all for your support.

December 12, 2008

## IGA News refreshed design

### **Eduardo Iglesias, IGA News Editor**

At its 46th meeting (Entebbe, November 22, 2008) the IGA Board of Directors approved the new design for IGA News that we are presenting in this issue. The new design was led by Francois-David Vuataz and discussed among all Information Committee members. We hope you will like its modern look, renewed colors and improved readability. Let us know what you think.

## EUROPE

### Germany

## The Herrenknecht Vertical Terra Invader 350

### **Jürgen Binder and Martin Ruder, Chief Executive Officers, Herrenknecht Vertical GmbH,**

Demanding and deep wells down to a depth of 2,500 to 5,000 meters are necessary to efficiently exploit geothermal energy in Germany. So far, conventional drilling rigs from the oil and natural gas industry have been employed for the exploration of these deep geothermal reservoirs. These are, however, not sufficiently adapted to the special requirements of deep drills for geothermal energy. Drilling equipment with a hook load of between 250 and 450 tonnes is particularly suitable for the exploration of the relevant deep drilling areas. However, systems of this size have hardly been available on the German and European market so far. Motivated by the demand from the geothermal energy industry, Herrenknecht Vertical GmbH, a subsidiary of Herrenknecht AG, was established in the year 2005 and has developed the Terra Invader 350, a semiautomatic

drilling rig with a hook load of 350 tonnes, which outmatches both the conventional requirements of an onshore drilling rig and the special requirements of geothermal energy projects. The current discussion on the progressing climate change and the necessity of developing renewable energy sources caused the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) to promote this project as part of the energy research program of the German Federal Government.

The development of the TI-350 is based upon the existing drilling technology of oil, gas and well construction rigs and the experience and requirements gained in former geothermal energy projects. Herrenknecht Vertical GmbH has managed particular improvements in the further development and advancement of deep drilling technology in the areas of automation, energy saving, flexibility when setting up the drilling site and energy supply to the rig, reduction of sound emission and integration of all systems into a rig. The following items are of particular relevance for geothermal energy sites:

### Drilling site

Geothermal energy must be generated in the vicinity of consumers, i.e. it must be possible to operate the rig in densely built-up areas. The derrick of the TI-350 requires only very little space with an area of 9 x 10 m. The parts of the rig can be allocated flexibly around the drilling tower, so that the entire drilling rig only requires an area of 30 x 80 m; furthermore, the remaining space can be used optimally. The size of the drilling site is large enough to carry out the assembly and dismantling of the almost 52 meter-high TI-350, which weighs 370 tonnes.



Figure 1: The drilling site of the TI-350 only requires an area of 30 x 80 m.



*Figure 2: The automatic pipe handling system increases safety at work and reduces the number of staff required.*

### **Noise protection measures**

In comparison to oil wells, geothermal energy drillings must be carried out close to the consumers in order to guarantee the efficient use of the heat. Therefore, special emphasis was placed on a comprehensive noise protection concept when developing the TI-350. The integrated noise protection system makes it possible to operate the drilling rig even in the direct vicinity of commercial and residential areas. The maximum permissible values for noise emission are not only adhered to, but the emissions even lie below these values. The noise protection measures include mud pumps with enclosure, generators with optimized exhaust noise suppression and exhaust routing, as well as hydraulic cylinder lifting equipment with pulsation damping. The introduction of these measures has led to a decrease in the noise pressure level at a distance of 150 meters from the drilling site, making it not louder than a low volume TV or radio. Both the staff operating the drilling rig and the residents in the closer vicinity benefit from the noise protection measures.

### **Energy efficiency**

A comprehensive energy management concept was implemented for the TI-350 to improve the overall energy balance in a geothermal energy project. The deep drilling rig can be operated alternatively using electricity from the public grid or generators available on the market, which

has led to a decrease in emissions in the closer vicinity. Energy is only provided if and when it is actually needed. The major part of the energy - approximately 80% - is used to operate the mud pumps for the conveyance of the cuttings. The pump pressure necessary for a given flowrate depends on the inner diameter of the drill pipes. The larger the diameter, the lower the pressure loss, and therefore the less energy needed. The TI-350 can also be operated with particularly large drill pipe diameters up to 6 5/8" in order to save energy and costs.

### **Costs**

Drilling costs are the major cost factor in the development of geothermal energy reservoirs; therefore, a decrease in these costs is an important prerequisite and an essential challenge to promote the successful implementation of geothermal energy projects in Germany. With the development of the TI-350, supported by its numerous improvements and innovations, an enormous potential for saving costs has been created. The complex drilling rig can be operated by a team of only four members of staff. The automatic pipe handling system, the maintenance-reduced cylinder hoisting system and the hands-off technology of the iron roughneck for make-up and break-out of the drill pipes make sure that the operation runs smoothly, safely and with few personnel. The drilling rig is designed in such a way that the derrick can be relocated by up to ten meters without having to move the entire rig. This means that no costly and time-consuming assembly or dismantling work is necessary. Further cost-saving opportunities are provided by the proximity to the electricity and heat consumers - an essential feature of successful and cost-efficient geothermal energy projects - and the fact that no costs are necessary for comprehensive noise protection



*Figure 3: The first deep drilling rig of the TI-350 type*

measures. It is assumed that the overall savings potential, compared with conventional systems, amounts to 15-20%.

## Funding

The German Federal Government has set itself the target of increasing the percentage of geothermal energy in the overall energy consumption of the Federal Republic of Germany considerably in the next few years. In this respect, the optimization, further development and testing of an adapted and cost-efficient deep drilling technology, particularly for the exploration of geothermal energy resources at depths of 2,500 to 5,000 meters, will play a decisive role. Because of the high demand, the geothermal energy market prompted the realization of an innovative design concept for this task as early as the year 2006. The project is in line with the grant policy objectives of the German Federal Government concerning a cost-saving and environmentally friendly extension of renewable energies and climate protection. Therefore, the development of the Terra Invader 350 drilling rig was funded by the BMU to the tune of approximately 1.6 million euro (research project "Development of a new drilling rig technology for deep geothermal energy", promotional reference 0327549, project start: 01.08.2005). The planned improvement of the feed-in tariff for electricity generated by geothermal energy systems after the Renewable Energy Sources Act (EEG) comes into force in 2009 may also promote the increased exploitation of deep geothermal energy.

## Practical experiences

The rig proved its efficiency at the Herrenknecht Vertical GmbH plant site in Schwanau with a test borehole at a

depth of 600 m already at the beginning of October 2006. The first TI-350 deep drilling rig is currently in operation as part of the common geothermal energy project of Hekla Energy GmbH and Exorka International Ltd. in Mauerstetten 90 km southwest of Munich.

In August 2008, the first well in Mauerstetten reached a depth of 4,160 m.

Changes to the deep drilling rig have been made in the course of the drilling activities in order to master the challenges encountered, amongst others imposed by the Upper Freshwater Molasse sediments at the site. The improvements include the refinement of the hydraulic system, software updates, a Herrenknecht internal repair of a contractor's Top Drive as well as constructional changes, e.g. at the pulsation damping of the mud pumps. Through these developments, the cooperation of all rig components could be improved significantly. During fishing works in Mauerstetten, the sensitive and accurate hydraulic cylinder hoisting equipment proved to be very advantageous.

A second drilling rig of the type TI-350 was delivered to its customer, the German Research Centre for Geosciences (GFZ) Potsdam, in May 2007. The research drilling rig named InnovaRig was optimized in particular with a view to the requirements of scientific deep drilling activities. It is operated with a Top Drive by Herrenknecht Vertical which allows for wireline coring through the large inner diameter (3 1/2") of the hollow shaft. In addition to scientific applications, the system is also made available for commercial projects in industry to achieve a maximum utilization capacity. The InnovaRig has been employed for a geothermal energy project in Dürnrhaar since November

## Joint GIA-IGA Workshop Geothermal Energy - Its Global Development Potential and Contribution to the Mitigation of Climate Change

The International Energy Agency Geothermal Implementing Agreement (IEA-GIA) and the IGA are holding a joint 2-day workshop in Madrid, Spain, on 5-6 May 2009, to discuss the global potential of geothermal energy and its possible contribution to the mitigation of climate change. The results will contribute to the geothermal chapter of the Intergovernmental Panel on Climate Change (IPCC) Special Report on Renewable Energy and Climate Change to be published in 2010.

Though still in the planning stages, the current draft Workshop discussion topics includes: Definitions of Geothermal Potential; Geothermal Potential for Power Generation and for Direct Use; Challenges and Barriers to Attaining Geothermal Potentials; and the Potential Contribution to Mitigation of Climate Change. The plan is to have a limited number of experts from the GIA and IGA, and possibly other invited experts, make short presentations on these topics based upon their current work and/or published (peer reviewed) papers, to be followed by in-depth discussions. A "wrap-up session" will firm up conclusions, assign actions and set deadlines for completion of outputs, which are expected to include: a formal "Madrid" statement on geothermal's potential contribution to climate change and final reviewed summary documents presenting the participants' agreed conclusions.

For the IEA GIA: Mike Mongillo, Secretary. Contact: [mongillom@reap.org.nz](mailto:mongillom@reap.org.nz)

For IGA: Ladislaus Rybach, President. Contact: [rybach@geowatt.ch](mailto:rybach@geowatt.ch)

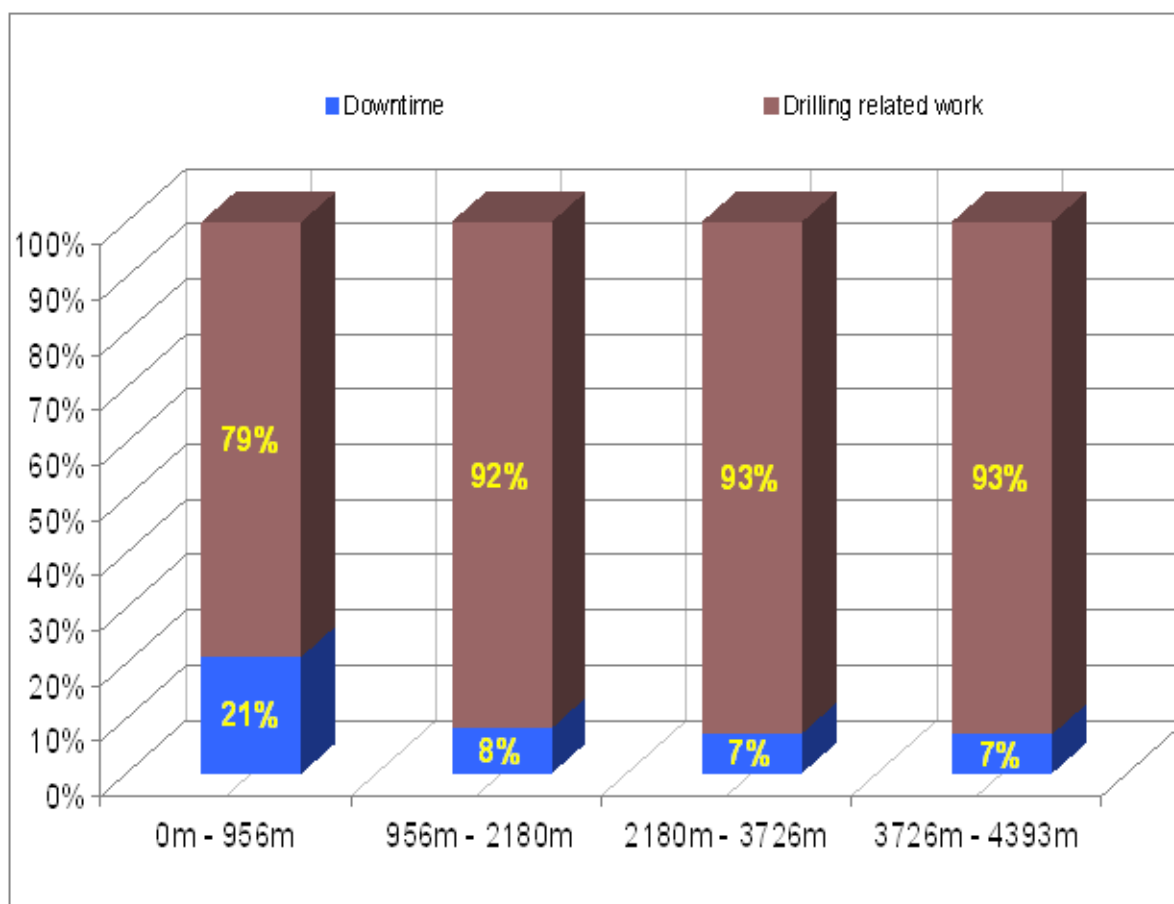


Figure 4: Availability during the geothermal energy drilling at Dürrenhaar

2007. The first of two wells was successfully completed with a final depth of 4,390 m in March 2008. The subsequent transport of the measuring equipment sets through the borehole confirmed the immaculate condition of this first drilling. The second well was drilled to a depth of 3,660 m in August 2008. The InnovaRig is scheduled to work for the GFZ in Hanover in the second half of 2008. Furthermore, it is planned to use the InnovaRig as part of the International Continental Scientific Drilling Program (ICDP) in the future.

Another drilling rig was delivered to HOCHTIEF Construction AG in June 2008, which, as shareholder of the Southern German Geothermal Energy Project Organization (SGG), will carry out a project for geothermal energy production in the Bavarian municipality of Kirchstockach. With the help of the TI-350, it is planned to carry out two wells down to a depth of 3,730 and 3,750 meters for the planned geothermal doublet.

Even the oil industry is impressed by the efficiency, the technological innovations and the broad spectrum of applications this drilling rig offers. Herrenknecht Vertical GmbH recently received a further order for two Terra Invader 350 drilling rigs. The customer is the Brazilian company Petrobras, the third largest mineral oil company in the world. The rig, which is adapted to the special requirements in remote areas, is currently under production and will be delivered on time.

Herrenknecht Vertical GmbH has been able to enter

the geothermal energy market successfully with the Terra Invader 350. In general, the drilling rig and its overall concept as well as its functionality have been praised by the users. The hydraulic cylinder hoisting system enjoyed special attention in this respect. It proved to be an improvement especially for works involving jars, as it is well suited for shock absorption and damping. Only a few initial problems have so far arisen during the practical implementation, which is usual when introducing new technologies and commissioning new systems. These difficulties can and will, however, be solved by means of targeted improvements to the process technology. During its first months in operation, the rig already spanned a steep learning curve: if one considers, for example, the availability of the rig during its use in Dürrenhaar, it becomes clear that its availability increased significantly in the course of the drilling work (image 4). The technological innovations, such as the pipe handling system and the iron roughneck have demonstrated their value during operation. Terra Invader 350 has clearly shown its numerous advantages over conventional rigs already in its first applications.

## Summary

The Terra Invader 350 which has the ideal size and design concept for implementation in geothermal energy projects has to a large extent met the expectations placed on it; the rig will be continuously optimized to remove the weak

points recognized during its use. The drilling has shown new ways for the targeted development and improvement in the deep drilling technology for use in geothermal energy projects. The manufacture of further TI-350 units will help to overcome the shortage of appropriate drilling rigs on the German geothermal energy market.

The project which forms the basis of this report was subsidized by funds of the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety under the promotional reference 0327549.

## Italy

### UPDATE ON THE ITALIAN GEOTHERMAL UNION (UGI)

#### *G. Passaleva, UGI's President*

#### Background, Mission and Membership

UGI is an independent, non-political and non-profit Association, which is open to Natural and Legal Persons involved in non-conventional energy sources and wishing to promote the development of all the applications of the Earth's heat. UGI was founded in February 2001 and registered with the Milan Court.

UGI's mission is to: i) collect information and publish reports on the development of geothermal energy in Italy and abroad; ii) disseminate knowledge about the nature and uses of geothermal energy, so as to raise public awareness of the advantages of developing this indigenous energy source to the maximum possible extent; iii) exchange information and data with Italian and foreign Agencies, Companies, Societies, Industries, Professional Associations, Organizations, and Institutions operating in the geothermal sector; iv) establish contacts with National and Regional Governments and with the European Union, to provide information on the Italian geothermal potential and to promote research on and development of the Earth's heat; v) cooperate with international Associations (IGA/International Geothermal Association, EREC/European Renewable Energy Council, EGEC/European Geothermal Energy Council and others), as well as with foreign National Associations sharing UGI's goals.

Currently, UGI has about 120 members (Corporate members account for 20%).

UGI's Bodies (June 2008-May 2011)

- **Board of Directors:** G. Passaleva (Chairman), W. Grassi (Deputy Chairman), G. Buonasorte (Treasurer), B. Della Vedova, T. Franci, A. Pizzonia, A. Rauch and B. Toro (Members).
- **Secretary:** F. Angeli.
- UGI's Honorary President: R. Cataldi.
- **Board of Auditors:** A. Sbrana (Chairman), C. Benincasi and P. Chiellini (Members)

### Recent, On-Going and Planned Activities

Follow-up of the Centenary of the geothermal power industry - the program of celebrations concluded with a solemn ceremony held in Florence, in the prestigious Salon of the Five Hundreds (Palazzo Vecchio) on 10 December 2005 (IGA News no. 64, pp. 8-12). Aware of the need to undertake a special effort to promote systematic use of the Earth's heat for direct applications in Italy, the previous UGI Board decided to conduct this activity under the general umbrella of a project called Dissemination of Geothermal Energy. The project includes a number of initiatives, such as publication of plainly-written technical booklets and posters, distribution of flyers and information material, preparation of a new DVD on geothermal energy for teaching and illustration purposes, promotion and co-organization of geothermal meetings and workshops, participation in national and international events dealing with geothermal and renewable energy sources, meetings with political and institutional representatives involved in energy matters and preparation of the document called The Italian Geothermal Manifesto. This document describes the goals proposed by UGI for the development of geothermal energy in Italy by December 2020, as well as the measures needed to achieve them. Moreover, UGI issues a quarterly bulletin (Notiziario UGI - UGI News).

Most of the above activities were carried out or started in the past 2-3 years, except for the DVD, which will be produced after gathering the required financial resources. Other activities are being implemented and will be continued in the next few years. In particular, the Manifesto was issued in many thousands of copies and published on a number of technical and information journals, as well as on UGI's and other websites. It will be widely disseminated for one more year at least. Its English version is attached to the current issue of IGA News.

Finally, it is worth mentioning that, jointly with the Department of Energetics of the University of Pisa, UGI initiated a questionnaire-based investigation on awareness of, and use of geothermal heat pumps in Italy as the starting point for wider deployment of this technology.

#### To know more...

UGI/Italian Geothermal Union; c/o University of Pisa / Dept. of Energetics; 2, Via Diotallevi; 56126 Pisa.

website: [www.unionegeotermica.it](http://www.unionegeotermica.it).

### THE ITALIAN GEOTHERMAL MANIFESTO

The position of UGI/Unione Geotermica Italiana (Italian Geothermal Union), CNG/Consiglio Nazionale dei Geologi (Italian National Council of Geologists) and ATI/Associazione Termotecnica Italiana (Italian Thermotechnical Association) on the development of Italian geothermal resources



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## Geothermal Energy within the National Energy Framework

In the past few years, energy has become a priority issue in Italy, and its economic, environmental and supply security implications have a strong impact on national growth.

In 2006, total gross energy consumption amounted to about 200 million tonnes of oil equivalent (TOE). The contribution of fossil fuels (especially oil and natural gas and, to a lesser extent, coal) was 87%, whereas the contributions of imported electricity and of non-conventional and renewable energy sources were 6 % and 7%, respectively.

Among non-conventional sources, geothermal energy accounted for 0.6% of total gross energy consumption. Over four-fifths of this figure consists of electricity generation, whereas the remaining one fifth refers to the use of natural heat for thermal balneology, space heating, agriculture and other direct applications.

## The Italian Geothermal Potential

In spite of the above-said small contribution, the Italian geothermal resources that can be harnessed down to cost-effective depths are considerable: high-temperature resources (> 150 °C) are concentrated in the Tuscany-Latium-Campania pre-Apennine belt and on some volcanic islands of the Tyrrhenian Sea; conversely, medium- and low-temperature resources (< 150 °C) can be found in large areas of the country.

Hence, given its geological conditions, Italy has a notable geothermal potential, which can be tapped much more than has been done so far.

High-temperature resources are suitable for both electricity generation and direct uses, while medium- and low-temperature ones can be exploited mostly for heat applications.

## Development Projections and Targets by 2020

Geothermal energy is one of Italy's few primary energy sources. These resources are always sustainable, often renewable and everywhere environmentally benign. Moreover, these resources have also become cost-effective at practically all levels of temperature.

As a result of the above and taking into account that a further increase in the prices of conventional energy sources is likely to occur in the next years, the following targets may be set in Italy for the two forms of utilization of geothermal resources:

- *electricity generation*: in 2006, installed capacity was 810.5 MWe and generation totaled 5.5 billion kWh (1.1 million TOE). By 2020, installed capacity may rise to 1500 MWe, while generation may reach 10 billion kWh/year, which corresponds to the electricity requirements of 9 million inhabitants. This figure represents twice the generation of 2006 and a saving of over 2 million TOE;

- *direct uses*: in 2006, installed capacity was 650 MWt and its heat production enabled over 190,000 TOE to be saved. By 2020, installed capacity (geothermal power generation remaining at the same level as indicated above) may reach 6000 MWt and its heat production may climb to 1,800,000 TOE, which corresponds to the heating



requirements of 800,000 apartments. These values are roughly 10 times higher than those of 2006.

Therefore, development prospects for direct uses of geothermal energy in Italy are definitely wider than those quoted above for electricity generation.

Overall electric and non-electric uses of geoheat may thus pass from 1.3 million TOE in 2006 to nearly 4 million TOE in 2020, i.e. to over 1.2% of the country's total gross energy consumption expected in 2020.

This contribution may appear to be negligible in percentage terms; however, if it is referred to the cost of the displaced fossil fuel, it is economically important. And it is even more important considering that the projected development of geothermal energy by 2020 will avoid 8-10 million tonnes/year of CO<sub>2</sub> emissions into the atmosphere.



*The Geysers geothermal field, California.*

## Necessary Measures

In the country's critical energy setting, achieving the above targets requires political forces promptly to adopt legislative instruments which foster a fast development of all non-conventional energy sources, foremost among them geo-heat. Indeed, this source is available throughout the year and over wide areas and can be exploited with decade-proven and environmentally friendly technologies.

In view of the above, the Governments of Italian Regions should formulate specific energy plans and enact legislation encouraging an accelerated development of all possible applications of natural heat.

In such a national and regional framework, harnessing medium- and low-temperature geothermal resources also requires having recourse to experts in: exploration for and exploitation of natural hot fluids; survey of areas of concentrated energy consumption; engineering of thermal installations and heat distribution grids; and environmental protection.

Finally, the need arises for designing and implementing a far-reaching national campaign to build public awareness of the opportunities offered by geothermal energy for mitigating greenhouse gas and harmful solid particulate emissions, as well as for reducing the balance-of-payments deficit in the energy sector.

## In brief

UGI, CNG and ATI emphasize the strategic role that utilization of natural heat can play in relieving the country's energy difficulties.

This Manifesto is intended for members of the Italian Parliament and Institutions involved in energy matters, so that legislative instruments are adopted to incentivize an immediate and massive development of all possible applications of geothermal energy.

If the strategic role of geothermal energy is not readily understood, then the country's difficulties in the market of energy supplies may worsen and the achievement of the Kyoto Protocol environmental targets may be jeopardized.

Many countries have a geothermal potential lower than the Italian one. Nonetheless, they have already grasped the opportunities offered by a sustained development of natural heat to alleviate dependence on imported energy sources and improve the environment. As a consequence, their Governments have long adopted measures to further an accelerated development of geothermal energy.

In view of the above, UGI, CNG and ATI are ready to provide national energy authorities with technical support in preparing the "geothermal energy" section of a desirable new National Energy Plan. They are also ready to cooperate with Regions wishing to design operational programs for developing natural heat in their territories.

A final point should be made with regard to the target of an over 1.2% contribution of geothermal energy to total national energy consumption by 2020.

This is just the first step towards much more ambitious targets to be pursued in the decades after 2020. Indeed, the natural heat resources that could be tapped for direct uses in Italy are at least 100 times higher than those needed to attain the targets indicated above.

On the other hand, Italy is endowed with all the technical and scientific skills that are needed to make these resources available to the benefit of its citizens.

## AMERICAS

### United States

### Current US Geothermal Power Production and Development

**Luis Gutiérrez Negrín, Editor, "Geotermia, Revista Mexicana de Geoenergía"**

According to a document (Update on US Geothermal Power Production and Development) recently released by the Geothermal Energy Association (GEA), based in Washington, DC, geothermal electric capacity in the US as of May 2007 was of 2851 MWe. This means the US continues to be the world leader in electric capacity of geothermal origin.

The main highlights of this document are as follows:

- 87% of the total geothermal-electric installed capacity in the US is in the geothermal fields of California, with 2492 MWe.
- The installed capacity in California is larger than that of every country in the world.
- Despite that capacity, the operating geothermal power plants in California in 2005 totaled 2030.5 MWe. This means there were 462 MWe in standby.
- Other geothermal-electric states are Nevada (297 MWe), Hawaii (35 MWe), Utah (26 MWe), and Alaska (0.4 MWe).
- Total geothermal electric generation in the US was 16,010 GWh in 2005, which represented 0.37% of the national electric consumption in that year.
- There are currently 12 geothermal-electric projects in production drilling and under construction in five US states with a total between 336 to 371 MWe. They are: Alaska (Chena Hot Springs: 0.6 MWe), California (Bottle Rock: 17-55 MWe, Heber: 18 MWe), Idaho (Raft River: 13 MWe), Nevada (Blue Mountain-Faulkner 1: 35 MWe, Buffalo Valley: 24 MWe, Carson Lake: 24 MWe, Galena II: 10 MWe, Hot Sulphur Springs-Tuscarora: 48 MWe, Rye Patch: 12 MWe, Salt Wells-Lee Allen: 120 MWe), Utah (Roosevelt Hot Springs: 11 MWe).

The entire document can be reviewed in: [http://www.geo-energy.org/publications/reports/Geothermal\\_Update\\_August\\_7\\_2008\\_FINAL.pdf](http://www.geo-energy.org/publications/reports/Geothermal_Update_August_7_2008_FINAL.pdf)

## ASIA/PACIFIC RIM

### Indonesia

### Indonesian Government Effort and Geothermal Production Capacity

**Alimin Ginting, IGA Information Committee**

Indonesia, with an estimated capacity about 27,000 MWe, has the world's largest geothermal reserve, equal to 40 % of the world total. This reserve is distributed across 256 locations along Indonesia's volcanic belt. However, as of now only 4 % of its total reserve has been developed for electricity production. The Indonesian Government has made several efforts to enhance its geothermal utilization by issuing some policies like Geothermal Law no 27/ 2003, which gives authority to local government to tender a geothermal working area; Government Regulation no. 5/2006, in which the Government decided that 5% of total national electricity used would come from geothermal energy; Government Regulation no. 59/2007, which contains a mechanism for geothermal bidding; and Energy and Mineral Resources Ministerial Decree no.14/2008, setting guidelines for geothermal energy/electricity price. The government also freed geothermal energy from import duty/import tax/value added tax through Finance Ministry Decree no. 177/2007 and Finance Decree 178/2007.

Beside the above mentioned regulations, the Indonesian Government followed its First 10,000 MWe Crash program by a Second 10,000 MW Crash Program of Indonesian Electricity, under which at least 30 % of the electricity is expected to come from geothermal energy.

The first geothermal project began at Kamojang field in 1978 with an initial capacity of 250 kWe but, after 30 years of geothermal development, Indonesia is only able to produce 1,058 MW of its electricity from geothermal energy.

Those 1,058 MWe are produced from various fields and islands, such as Sibayak geothermal field (North Sumatra island): 12 MWe production capacity; Salak (West Java island) : 377 MWe production capacity; Wayang Windu (West Java island) : 110 MWe production capacity; Kamojang (West Java island) : 200 MWe production capacity; Darajat (West Java island) : 259 MWe production capacity; Dieng (Central Java island) : 60 MWe; and Lahendong (North Sulawesi island) : 40 MWe production capacity.

One new power plant is currently under construction in Indonesia : Wayang Windu Unit 2 which is operated by Star Energy and expected to be operational in 2009 with an installed capacity of 110 MWe.



# 30 YEARS OF GEOTHERMAL ENERGY PROGRESS AND INNOVATIONS

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- November 7, 2008 ..... Announcement of Acceptance of Papers
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8936001 loc. 3306 or thru email: [geothermalcon@energy.com.ph](mailto:geothermalcon@energy.com.ph)

Three new area-tendering processes in West Java island have been completed recently. These are for Tangkuban Parahu geothermal field (won by PT. Indonesia Power) with reserves capacity of 100 MWe, Tampomas geothermal field (won by PT. WIKA in cooperation with PT. Jasa Sarana) with reserves capacity of 50 MWe, and Cisolok - Sukarame geothermal field (won by PT. Rekayasa Industri in cooperation with PT. Jasa Sarana) with reserves capacity of 45 MWe.

Two other areas are under tender in Indonesia now i.e. Jailolo geothermal field with a capacity of 75 MWe, located in West Halmahera, and Sokoria geothermal field with a reserve capacity of 30 MWe, located in East Nusa Tenggara. Both of these areas are in the eastern islands of Indonesia.

Beside those two areas, others administratively ready for the tendering process in the near future are Telaga Ngebel (with reserve capacity of 120 MWe) in east Java, Gunung Ungaran (50 MWe) in Central Java, Jaboi (50 MWe) in Sabang Island and Seulawah Agam geothermal field (160 MWe) . Jaboi and Seulawah Agam are both located in Aceh province, on the northern tip of Sumatra Island. PT. Pertamina Geothermal Energy, the state enterprise company that owns existing contract areas or joint operation contract/partnerships with IPPs (Independent Power Producers) also plan to develop, among others, Ulubelu geothermal field (110 MWe), Lumut Balai (110 MWe), Sarulla (330 MWe) - all located on Sumatra island - and Kota Mobagu (60 MWe) - located in Northern Sulawesi.

Indonesia, home of the World Geothermal Congress 2010, is willing to increase its geothermal capacity year by year as much as possible.

## Philippines

### Philippine Congress approves Renewable Energy Bill

#### ***Ed Sevilla and Ronnie Penarroyo. National Geothermal Association of the Philippines***

Nearly twenty years after it was first filed, the Renewable Energy Bill (RE Bill) was finally approved by the Bicameral Conference Committee in the Philippine Congress on 07 October 2008 paving the way for a speedier and more aggressive development of the country's renewable energy resources.

Sen. Edgardo J. Angara, one of the bill's principal authors in the Senate, said that its passage could not have come at a more opportune time. "The future is in clean, renewable energy, which is predicted to be one of the biggest industries in the next five years," Angara said. "The benefits of renewable-energy use are considerable. It will foster sustainable growth, energy independence and

economic security for the country, and unite us with the global effort to stop climate change."

The bill, which has been pending in its various forms for nearly two decades, was in the end approved by the bicameral conference committee in which representatives of both chambers agreed to provide a generous package of incentives for renewable energy players. The House of Representatives approved the bill in June, while the Senate passed its own version on third and final reading in late September.

The bill provides fiscal and non-fiscal incentives for renewable energy investors, with mechanisms to help ensure a market for renewable energy, and aims to set up a system that will allow consumers to choose green sources of energy.

Fiscal incentives provided for under the bill include a seven-year income tax holiday followed by a reduced 10% corporate tax rate for new renewable energy investments; duty-free importation of components, parts and materials; tax credits on domestic capital equipment and services; and special realty tax rates on equipment and machinery.

The consolidated bill also provides for the establishment of a Renewable Portfolio Standard (RPS) system, which would require electricity suppliers to source a certain amount of their energy supply from renewable resources. The RPS will also be complemented by a feed-in tariff system to encourage the speedy entry of renewable energy projects.

The most notable provision in the bill with respect to geothermal energy is the classification of geothermal energy as a mineral resource, thus paving the way for the entry of foreign-owned corporations in the exploration, development and utilization of geothermal resources.

The Philippine DOE's medium-term Renewable Energy Policy Framework aims to develop more than 4,000MWe of additional renewable energy capacity, some 1,200MWe of which are planned to come from geothermal. While renewable energy development has been slow in the past years, the passage of the bill is expected to attract more investors to the industry, and help cement the plans of those investors who have been waiting for the bill's approval.

Catherine Maceda, Renewable Energy Coalition spokesperson, also lauded the passage of the bill. "This bill has been the product of productive and constructive engagement among our legislators, government agency representatives, civil society organizations, and other stakeholders that are working for a cleaner and more sustainable pursuit of development," she said. "We're now looking forward to working with the stakeholders to ensure the effective implementation of this measure."

The measure is expected to be signed into law by Philippine President Gloria Macapagal-Arroyo before the end of the year.

## OCEANIA

### Australia

## The inaugural Australian Geothermal Energy Conference

### Graeme Beardsmore, Hot Dry Rocks PTY Ltd, Australia

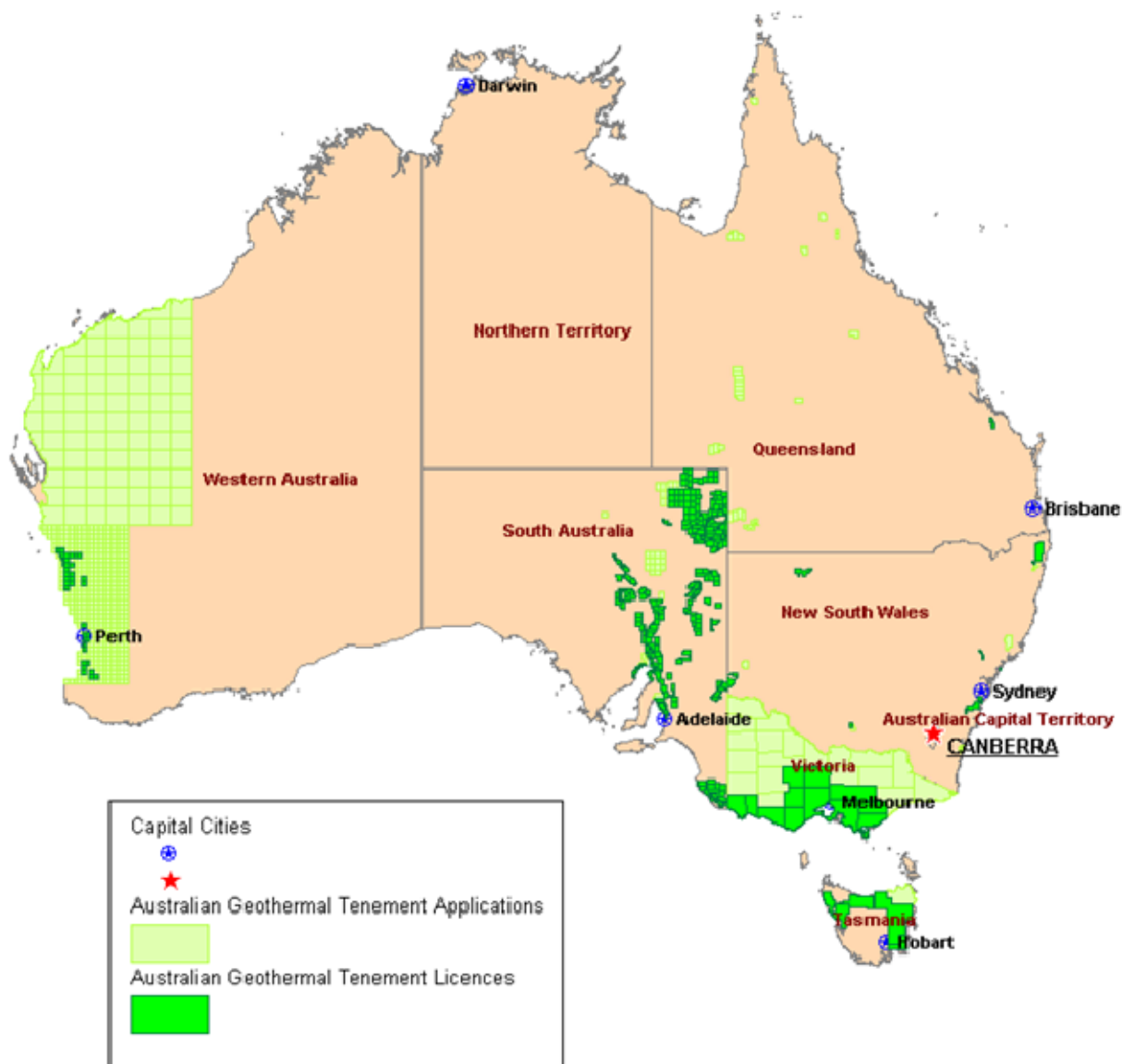
The inaugural Australian Geothermal Energy Conference (AGEC) was held in Melbourne from 19th to 22nd of August. The event was organised jointly by the Australian Geothermal Energy Association (AGEA) and the Australian Geothermal Energy Group (AGEG) and endorsed by the Western Pacific Regional Branch of the IGA.

Attendance figures topped 300 over the four-day event, and drew participants from around the globe and across a range of sectors. Sixty five presentations were delivered from Wednesday to Friday during which the

breadth and depth of the Australian geothermal sector was showcased, along with keynote presentations from international guests Jeff Tester (USA), Roy Baria (UK), Hiro Asanuma (Japan) and Subir Sanyal (USA).

The growing maturity and profile of the geothermal sector in Australia was reflected in the strong attendance numbers and the variety of backgrounds of registrants. Only 40% of registrants were from companies directly engaged in geothermal exploration and development. The majority were drawn from universities, the finance sector, the media, government and service companies. The Energy Ministers of the State of Victoria and the Australian Government, as well as high-ranking federal government officials, also addressed the conference. The message from all was clear - geothermal energy is viewed as an attractive technology to help Australia transition to a low emissions energy profile.

Proceedings began on Tuesday 19th with a full-day workshop on Geothermal Reservoir Management by Cedric Malate of the Philippines National Oil Company, attended by 42 people. The conference proper followed over the



next three days. A notable highlight of the proceedings was the launch of the world's first Code for Geothermal Resources and Reserves Reporting (see IGA News 73). The document is recognised by the IGA as a useful and appropriate way to standardise the reporting of geothermal resources to investment markets. While observance of the Code is currently voluntary, all member companies of AGEA have committed to comply with it, and the Australian Securities Exchange (ASX) has encouraged the sector to work with it to include compliance within the ASX listing rules. This would make it a legal requirement for all listed geothermal companies within Australia to comply with the Code.

Considering Australia has no 'conventional' geothermal resources, the optimism and enthusiasm for developing Engineered Geothermal Systems and deeply buried sedimentary aquifer across the country is unique in the world. An economic study of the Australian geothermal sector, also released during the conference, predicts that the emerging Australian Geothermal Energy Industry can be expected to provide at least 1,000 MW and potentially up to 2,200 MW of base-load capacity by 2020 into the National Electricity Market; the cost of generating electricity from geothermal resources is expected to move rapidly down the cost curve, commencing at around \$120 /MWh at small scale (10 MW to 50 MW) and decreasing to around \$80/MWh at large scale (300 MW or greater) by 2020; that price is expected to be lowest cost of any form of renewable energy.

It is an exciting time to be in the geothermal sector in Australia.

## IGA News

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

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

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

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

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