



IGA NEWS

Newsletter of the International Geothermal Association

IGA ACTIVITIES

Highlight of the IGA BoD meeting 7-8 May, Castelnuovo Val di Cecina, Larderello Italy

IGA Secretariat

Guido Cappetti and Ruggero Bertani presented the rich schedule for the two days in Castelnuovo (see Figure 1) and the Saturday afternoon meeting in Larderello for the celebration of 100 years of geothermal energy utilisation.

The financial statement for year 2003 has been approved (see Table I).

	USD
Carry over from 2002	43'596
Net balance as of 31 st December 2003	41'067
Net income/loss 2003	-2'529
Financial Provision for WGC2005	5'000

Table I. Financial statement for year 2003.

The Enel expenses for supporting the Secretariat in 2003 are reported in Table II.

	USD
Mailing Expenses	9,592
Office Supplies/Photocopies	1,744
Phone, fax	295
Subtotal Expenses	11,631
In kind costs	55,176
TOTAL	66,807

Table II. Enel expenses in 2003.

One important commitment of the Secretariat was the preparation of the election material, printed and disseminated among the membership. A Web-Page for electronic voting has been organized in cooperation with the Information Committee.

The final version of the bylaws has been printed and circulated among the membership; the final result of the ballot is:

71 Yes, 1 No

**The new bylaw version is APPROVED
by the IGA Membership**

Two activities being carried out in cooperation with the World Bank are still in the preparation phase:

- the possibility of creating NIS-GA (New Independent States from the former Soviet Union Geothermal Association) with WB support;

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- a cooperation proposed by EuroBranchForum with WB for the Eastern Europe geothermal development (Geo-Fund).

An ad-hoc Committee, chaired by the President, and comprising Svalova, Sanner, Garnish, Horne, Teklemariam, Popovski and Zuñiga, will investigate the possibility of a multinational affiliated organization, with special focus on NIS and Central America countries.

The IGA asked the EC for support under the Marie Curie Large Conference Facility program umbrella, for financing 150 fellowships covering participation in WGC 2005; 75 from European countries and 75 from the rest of the world.



Figure 1. BoD at Castelnuovo: Ruggero Bertani, Kevin Brown, Guido Cappetti, Sachio Ehara, Ólafur Flóvenz, Michael Fytikas, John Garnish, Roland Horne, Riki Ibrahim F., Franciska H. Kármán, James Koenig, Adele Manzella, Orhan S. Mertoglu, Joseph Ng'ang'a, Hiroaki Niitsuma, Stanislaw Ostaficzuk, Kiril Popovski, Rosa Maria Prol Ledesma, Carlo Piemonte, Marcel Rosca, Ladsy Rybach, Burkhard Sanner, Valentina Svalova, Meseret Teklemariam, Kenneth Williamson, and Ariel Zúñiga.

Among the European fellows, we estimate that 25 can be selected from the new EU country members, and the remaining 50 will be from other Eastern European countries. According to the IGA gender policy, the 40% among the fellowships should be assigned to women. The total contribution requested from the EC is approximately 370,000 Euro.

The Bonn 2nd June 2004 Conference has been presented as the official follow-up to the Kyoto and Johannesburg meetings. The Conference has a governmental, rather than scientific makeup, where speakers are only invited ones. The UN Steering Committee has selected the topics, and a geothermal day has been inserted into the official program, which was a major result. GtV (on behalf of the IGA) is responsible for organizing this event. The Pomarance Conference, held in January 2004 in Italy, has been a preparatory event for Bonn.

IGA elaborated comments and suggestions on the "Environmental Due Diligence (EDD) Of Renewable Energy Technologies, UNEP/BASE Guidelines for Geothermal Energy Systems". The document has been submitted to UN- BASE office (Basel, Switzerland).

The estimated "In-kind contribution" of the IGA BoD members for the year 2003 is about **US\$ 390.000** including Enel's in-kind and cash contribution.

The following events have been, and will be, carried out in 2003-2004 with IGA financial support:

International Geothermal Workshop – IGW-2003, held in Sochi, Russia, between 6th and 10th October, 2003, organized by the Geothermal Energy Society. The IGA BoD approved a grant of 1,500 USD.

The International Course on Low-Enthalpy Geothermal Resources – Exploitation and Development, to be held between 13th and 17th September 2004 in Zakopane, Poland, organised by the International Summer School on Direct Application of Geothermal Energy. Financial support applied for 5,000 USD was approved.

International Conference for Renewable Energies/Renewables Bonn 2004, organised in Bonn, Germany, to be held between 1st and 6th June 2004. Financial support of 1,500 USD has been granted.

International Geothermal Workshop – IGW-2004, to be held in Petropavlovsk – Kamchatski, Russia, between 9th and 15th August, 2004. Support is still under discussion, due to the lack of funds.

A new version of the IGA website has been built, orga-

IGA Membership Dues

IGA Membership dues for the year 2004 should have been paid by 31st March. In order to keep your name on our mailing list, we advise you to pay as soon as possible!

See the application form on the back cover of this issue for renewal details.

nizing the old material in a different way, adding a web page relating to Election, preparing an electronic form for voting on the web, and presenting a new version of the document "What is Geothermal Energy", whose translation into a dozen of different languages is under development. Updated geothermal potential data and running capacity have been added. Geothermal events, useful links, Minutes and lists of Approved Motions are continuously updated. New geothermal congress databases have been added to those already available on-line and the electronic database relating to WGC1995 is under development.

The Membership Committee set a target in 2001, at the beginning of the present term, were to maintain and expand the current membership of the association. Particular objectives were to persuade the GRC to retain its affiliation with the International Geothermal Association, and to seek new membership from two very major geothermal countries, namely the Philippines and Japan. The Committee is pleased to report that all three of these specific targets have been met.

Table III is a "snapshot" of the present situation concerning the Membership Database, according to the standard IGA classification:

CATEGORY	NUMBER
AFFILIATED	2482
CORPORATE	21
INDIVIDUAL	331
INSTITUTE	5
STUDENT	8
SUSTAINING	7

Table III. IGA membership.

The strong increase of the affiliated members is due to the new affiliated organizations, mainly the contribution of IGAI.

In response to the initiative to encourage affiliates to endorse candidates for nomination to the IGA BoD in 2004, 28 candidates have been nominated. 18 first term BoD members have indicated their wish to be candidates for the next election (Eight of the 18 are already candidates proposed by the affiliates). Eight candidates have been proposed by the Nominating Committee and 1 by petition. The final number of candidates is 47.

As for the WGC in Turkey, the selection process for local organizing company (PCO) has been completed and it will start its activity soon. A grant of USD 200,000 from the Turkish government has been approved. Orhan Yesin, on behalf of TGA, presented Antalya and its Conference capability. There are 870 abstracts, a satisfactory number. The Second Announcement of the WGC2005 and the Invitation to Exhibitors are in final stages of preparation and will be

distributed by mail and posted on the website shortly.

André Gerard presented the Soultz activity and the new European Project: the identification of new HDR sites in Europe. Gerard asks all interested parties in Europe to fill in a form for identifying partners in each country that may be interested in cooperating in this task, under BRGM leadership. If you are interested, please contact the IGA secretariat or André Gerard [gerard@soultz.net].

The selected dates for the October 2004 meetings in Antalya are: **9th and 10th October** for 36th BoD; in the afternoon of 10 October, the 37th BoD meeting with the election of the new Chairmen of the IGA Committees.

The XV AGM will be held on 10th October. The settlement of the new BoD and Officers will take place on that occasion.

Energy from the Earth

IGA Secretariat

Last May 8th, 2004, in the framework of the initiatives for celebrating the first centennial of geothermo-electric generation, a round table meeting on the "Energy from the Earth" organised by Enel and the IGA was held in the Florentia Theatre at Larderello, birthplace of the geothermal energy exploitation for power production (see Figure 2).

Franco Barberi, Chair of Geothermal Energy and Volcanology at "Roma III" University (as well as former Head of the Italian Environmental Services Agency), did the honours focussing on the high significance of the meeting that was aimed at accounting for one century of geothermo-electric production.

Facing a packed audience of professionals and university students coming from every corner of Italy, Barberi recollected that this sector has attracted a growing interest in young people, and all the more so in current circumstances in Larderello where they also had a chance of meeting some top-level international experts.

Thanking Enel and the IGA, Barberi remembered the essential role of Tuscany in geothermal history, and noted that the use of the Earth's heat is underestimated inappropriately, as is the need for disseminating information on these facts, which are still poorly known. Today there is a crucial need to change the attitude toward geothermal to boost it anew and to strengthen the close relation between man and nature.

Following this exhaustive introduction Graziano Pacini, Mayor of Pomarance, greeted the auditorium with a heartfelt speech, noting that Larderello is recovering its leading role in the geothermal world. In fact, work is in progress for the realisation of a research centre on geothermal and the environment. Pacini ended by wishing that the studies in this field start with renewed effort not to dissipate an age-old heritage.



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Tommaso Franci, regional councillor for the environment of Tuscany, expounded the natural virtues of geothermal in the region, explaining how the use of geothermal resources represented a sustainable energy solution, with mutual benefits for the environment and for the development of local economies.

Guido Cappetti, president of the IGA, briefly introduced the association, underlining the aims of acknowledgement and promotion of geothermal energy. He remarked that the energy resource is probably poorly known because it is stored underground and, therefore, is not immediately visible, unlike wind and solar. The meeting "Energy from the Earth - 100 years of geothermal in the world" marks an important step in this communication route.

Lio Ceppatelli, Head of Enel Geothermal Production, emphasized how Enel has always credited and invested in this form of energy, and has a history of undisputable success. However, this is not the final stage, but a (new) starting point for a company that is conscious of the profound bond between this resource and the region.

Ruggero Bertani, Executive Director of the IGA, illustrated the present world geothermal energy situation and the contribution it makes to the reduction of carbon dioxide release into the atmosphere. Currently, geothermal energy generation occurs in 23 countries, accounting for 50 billion kWh per year, while direct uses of heat are found in 58 countries.

Then Guido Cappetti closed the first part of the roundtable, showing results, strategies and perspectives of geothermal energy in Italy. Starting from the first half of the '70s, and as a consequence of the fluid production decline recorded in the areas under exploitation, a research and development program was established, with deep drilling, reinjection, and stimulation wells with inadequate yield.

The positive results of these activities allowed a reassessment to be made of the geothermal potential of the mature exploited areas, the start of new developments and the refurbishment of some power plants. All these actions lead to a substantial increase in geothermo-electric production.



Figure 2. Speakers: F. Batini, K. Brown, J. Burgos, G. Cappetti, O. Flóvenz, R. Horne, R.M. Prol Ledesma, T. Meseret, H. Niitsuma, K. Popovski, L. Rybach, K. Williamson. Chairman F. Barberi.

LARDERELLO - 8 MAY 2004 "100 year of geothermal energy in the world"

Chairman: F. Barberi

14:30 Welcome Address the Local Authorities

14:40 Welcome Address IGA President, **G. Cappetti;**

14:50 Welcome Address Enel: **L. Ceppatelli;**

15:00 Highlight of world geothermal status: **R. Bertani;**

15:15 Geothermal Energy in Italy, presented by **G. Cappetti;**

15:30 Geothermal Energy in Iceland, presented by **O. Flóvenz;**

15:45 Geothermal Energy in Central-Eastern Europe, presented by EuroBranch Chair **K. Popovski;**

16:00 Geothermal Energy in Japan, presented by **H. Niitsuma;**

16:15 Geothermal Energy in Switzerland, presented by **L. Rybach;**

16:30 Geothermal Energy in New Zealand, presented by **K. Brown;**

16:45 Geothermal Energy in Africa, presented by **T. Meseret;**

17:00 Geothermal Energy in Indonesia/Philippines, presented by **K. Williamson;**

17:15 Geothermal Energy in USA, presented by **R. Horne;**

17:30 Geothermal Energy in Central America, presented by **R.M. Prol Ledesma;**

17:45 Presentation of the Enel Geothermal International Activities (**F. Batini/J. Burgos;**

18:10 Questions and discussion;

18:30 Closing Buffet and informal discussion with all the IGA BoD members and the participants.

On the basis of the acquired knowledge, there was a complete change in strategy, from a simple resource exploitation to a sustainable cultivation.

A new exploration program has recently begun in the Larderello-Travale area, aimed at the assessment of further development prospects. The program comprises 3D seismic surveys and the drilling of 11 new deep wells (3000 – 4000m). Finally, the new projects that Enel has set up for the easing of the environmental impact of geothermal were illustrated (installation of AMIS plants for the abatement of mercury and Hydrogen Sulphide gas emissions).

Barberi, after thanking the organisers, opened the technical session of the meeting. Mr. Olafur G. Flovenz, director of ISOR (Iceland GeoSurvey), spoke on the utilization of geothermal energy for domestic heating in Iceland, and gave the example of Reykjavik, which, since the year 2000, after some seventy years of experience, has all its houses heated by geothermal fluids: a result that gives the country the lowest energy cost in the entire northern Europe.

Subsequently, Kiril Popovski, professor at the Bitola University, Macedonia, explained the situation in central-eastern Europe, identifying the distinctive features among 22 countries. The geothermal potential is not thoroughly explored (Hungary is the nation with the higher expertise in this sector), and the biggest problem lies in the fact that all countries have the same needs. Therefore, as Popovski noted, there is a crucial need for setting a common strategy to the research, so that this part of Europe can develop the right role for geothermal in as short a time as possible.

This wish was shared by Barberi, who then introduced Hiroaki Niitsuma, Tohoku University Professor and vice-president of the Japanese Geothermal Research Society.

Niitsuma outlined Japanese geothermal history from 1925 to the present and spoke of the EIMY (Energy In My Yard) project; a concept aimed at the practical use of local sources of renewable energy, for the betterment of the environmental situation and a full exploitation of geothermal in conjunction with other renewable energies. Regrettably, since 2002 the Japanese government has cut the funds for geothermal research.

Ladsi Rybach, IGA vice president and professor of the ETH, Geophysical Institute in Zurich, illustrated proudly the great success in geothermal heat pumps of Switzerland. Heat pumps are installed in wells of modest depth and in roadway/railway tunnels, allowing both winter heating and summer air conditioning. He confirmed the commitment of his country toward such technologies which allow a noteworthy reduction in carbon dioxide emissions.

Kevin Brown, of the Geothermal Institute at Auckland University, synthesized past, present and future geothermal developments in New Zealand. Starting from the first uses that Maoris made of the natural manifestations, he continued to describe the present plants producing 329 MW for greenhouses, industries, prawn farms, and spas for tourists. In future additional small plants of 30-50 MW, are foreseen.

Barberi then introduced Meseret Teklemariam, geologist and geochemist of the Ethiopian Geological Survey, who was one of Barberi's students some ten years ago in Pisa. She gave an overview of the eastern Africa situation, using the examples of Djibouti, Eritrea, Ethiopia, Tanzania, Uganda, Zambia and Kenya, the last being the continental leader in this field. According to Teklemariam, this energy source is complementary to the hydroelectric generation, which is unfortunately affected by the drought, but the biggest problem for the development of geothermal in Africa is related to financing.

Ken Williamson, Unocal General Manager, described the state of geothermal in Indonesia and the Philippines, explaining the reasons for the enormous geothermal potential in the region and showing the power plants already in operation. As for the Philippines, the second biggest producer of geothermal energy in the world, he defined the features of the four most important areas, i.e., Luzon, Leyte, Negros and Mindanao, that have recorded important growth trends over the last 30 years.

Ronald N. Horne, Stanford Geothermal Program Director, described the USA situation, focussing on California, Nevada, Utah and Hawaii. He showed that California provides about six percent of the State's energy demand with its 46 geothermal plants and outlined the contributions from the main areas: the Geysers, with 970 MW, Salton Sea with 350 MW and Coso, with 270 MW. Geothermal energy in USA seems to be ready for a new boost after having suffered because of natural gas proliferation.

Rosa Maria Prol-Ledesma, of the UNAM, Instituto de Geofísica, Ciudad Universitaria, Mexico, explained the situation in Mexico, for Guatemala, Costa Rica, Nicaragua and El Salvador. These countries need a regulation of the private companies involved in geothermo-electric generation. In Mexico the first geothermal production dates back to 1956 but today contributes only 3% of total production. To the uneasy situation must be added the opposition to the construction of new plants by the environmentalists, as in the case of the "La Primavera" geothermal field.

Fausto Batini (responsible for Enel international business development - geothermal branch) spoke of the new Enel strategy aimed at expansion abroad, in the developing countries, with the support of its own expertise acquired in Larderello. Among the targets, Enel has highlighted the Americas, where it already has two subsidiaries: Enel Latin America and Enel North America.

Batini also reported on projects in progress in El Salvador, in collaboration with the largest geothermal company of Latin America, La Geo, for the formation of an international technical team. The challenge is to improve competitiveness of geothermal, cost abatement, and optimisation of production performance.

Jorge Burgos, the La Geo representative, illustrated the exploration in Berlín, Oriente and Ahuachapán fields, explaining the drilling of wells that will increase production by 63 MW between 2005 and 2008 in El Salvador.

Concluding, Prof. Barberi resumed the meeting highlighting the importance of research in this sector, and pinpointing the need for correct information on a scientific basis, so that geothermal potential can be thoroughly evaluated.

One hundred years history of geothermal power production at Larderello

Pierdomenico Burgassi, Guido Cappetti

The industrial utilisation of the geothermal resource in the Larderello area, identified through the natural manifestations, dates back to the beginning of the eighteenth century. It was then used as thermal energy in the process of extraction of chemicals from the same geothermal fluids by Francesco de Larderel, and, at the same time, the Larderello village was growing in conjunction with the expansion of the factory itself (see Figure 3).

The chemical industry continued uninterrupted growth through the construction of the covered lagoons and of the so-called "caldaie Adriane" (Adrian boilers), the beginning of drilling activity in order to reach more fluid and the use



Figure 3. 100 years of geothermal electricity.

of the geothermal steam for domestic and public spaces. In 1904, the Prince Piero Ginori Conti began the period of transition from the chemical industry to electricity production by his first experiments supplying geothermal steam to a small HP piston engine coupled to a dynamo. He achieved his goal on July 4th, 1904 with lighting the first five bulbs.

In 1905 and 1906 a 40 HP Cail reciprocating engine and a Neville engine were installed in the factory which, when coupled to a few tens kW dynamo, were able to provide electricity to most of the factories and houses.

In 1912 the first Tosi Parsons turbine was installed, coupled to a 250 KW Ganz alternator, with an indirect cycle. The natural steam was conveyed to 4 Prache & Bouillon evaporators, and the resulting condensed fluid supplied the chemical plants. In 1916 two 3000 kW units started up at the Larderello 1 power station, followed by a third unit in 1917, equipped by Tosi turbines, and supplied by clean steam (produced by Kestner type evaporators).

At the same time, through the use of new rotary drilling equipment with mud circulation, the production wells were able to reach greater depths and access fluid at flow-rates over 200 t/h, having also better thermodynamic characteristics. This provided new impetus for testing the direct feeding of natural fluid into the turbine, without the evaporation step.

Such experiments started in 1921 with a 50 HP turbine and led, after a few years, to equipping the new power stations at Castelnuovo (1926) and Serrazzano (1927) with the first Ansaldo back-pressure units. Subsequently the same happened for the power plants of Sasso and Monterotondo.

In 1928 a Geological Department was established, aimed at the definition of the geology of the area and at the study of the reservoir rock characteristics for a better location of the new wells.

In 1939 Larderello 2 plant (69 MW capacity) started operation and, for the first time the architectural design of a station was considered. With the start up of the 50 MW Castelnuovo power plant in 1941, by 1943 a total of 132 MW installed capacity was achieved, with the associated 900 GWh generation per year.

During the Second World War all the geothermo-electric plants were bombed, being considered of significant strategic importance. The only surviving turbine was of 50 HP, built in 1921, and its return in to operation marked the beginning of reconstruction.

In the post-war period, a systematic application of geophysical surveys and new criteria for well siting allowed the discovery of considerable fluid quantities, leading to the commissioning of the 120 MW Larderello 3 plant in 1950, followed by the new Travale, Sasso, Lago and Monterotondo plants. In 1957 new researches began outside the traditional area, and allowed to the construction of the Baginore 1 power station in 1959.

In 1963, when Enel replaced the Larderello company, 11 power plants were in operation with 310 MW total capacity. Since then the research and exploitation area has undergone a constant expansion. Studies in the areas surrounding the traditional boraciferous region made it possible to provide production for the power stations of Radicondoli, Carboli and Monteverdi and to discover the Piancastagnaio field. Research in the Lazio and Campania regions identified the Latera, Torre Alfina, Cesano and "Phlegrean Fields".

Also the number of power stations has been constantly growing. There were 17 stations in 1975 with 420 MW; to which must be added the 15 – 20 MW so called unified units that increased the number to 25 plants in the '80s.

In the '90s, beside the development of new areas, a plant renewal program was initiated, with new plant construction and dismantling of the old (obsolete) ones, for the Larderello area, and with the replacement of the machinery in other sites. This program, ended in 2003, brought to 34 plants and 862 MW installed capacity, with yearly production of over 5000 GWh.

EUROPE

ICELAND

In memoriam

Dr. Gudmundur Palmason

On 11th March 2004, the international geothermal community lost one of its most prominent members. Gudmundur Palmason passed away after a short stay in hospital in Reykjavik, Iceland. He leaves behind his wife Olof Jonsdottir, their two sons and six grandchildren.

Gudmundur Palmason was born in 1928. He graduated from the Secondary Grammar School in Reykjavik in 1949. He graduated in physical engineering from the Royal Technical University in Stockholm in 1955, and with an M.Sc. in physics at Purdue University in Indiana (USA) in 1957.

Gudmundur started working as a geophysicist at the Geothermal Division of the fore-runner of Orkustofnun (National Energy Authority) in 1955, and served as Director of the Geothermal Division 1964-1996. During this time, there was a transformation in Icelandic as well as

international geosciences and geothermal development. Gudmundur realised early on in his geothermal career, that the key to understanding the behaviour of the geothermal systems was to understand the geology and the physical processes in the crust. He was not only a key person in the geothermal development, but also in the research on the crustal structure of Iceland and the oceanic rift systems. He received the degree of D. Sc. in Geophysics from the University of Iceland in 1971 for his fundamental work "Crustal Structure of Iceland from Explosion Seismology". Furthermore, he developed a mathematical model of the crustal formation in Iceland and described its application to submarine mid-ocean ridges. He was also very active in heat flow studies and gravity mapping in Iceland. He published over 50 articles in refereed journals, numerous reports, and edited books.

During Gudmundur's directorship of the Geothermal Division of Orkustofnun, geothermal utilisation in Iceland expanded very much. At the onset of the energy crisis in the 1970s, about 45% of houses in Iceland were heated by geothermal and over 50% by imported oil. With the enormous increases in oil prices, a national policy was developed in Iceland to replace space heating with oil by geothermal heating where possible. The government and the municipalities increased the funding for geothermal exploration and development significantly, and the results became better than even the most optimistic could envisage. By the time of Gudmundur's retirement, about 85% of houses in the country were heated by geothermal and the remainder mostly by electricity (produced by hydro and geothermal), and electricity was produced in four geothermal fields. Under Gudmundur's directorship, the Geothermal Division grew from a few to over forty experts covering most fields of geosciences and engineering related to geothermal development. The Geothermal Division became one of the foremost geothermal centres in the world. In 1978, when the United Nations University (UNU) and the Government of Iceland signed an agreement on the establishment of the UNU Geothermal Training Programme (UNU-GTP) in Iceland, it was decided that the UNU-GTP would be hosted by Orkustofnun (NEA) and its Geothermal Division.

Gudmundur Palmason was very active in international cooperation both in earth sciences and geothermal energy. He was a good lecturer and was invited to a large number of international conferences. He was also much sought after as a member of international committees dealing with crustal structure as well as geothermal energy. He was highly respected for his theoretical knowledge, long and wide ranging experience, logical mind, and his gentle manners. In his committee work, he sometimes planned several moves ahead, as he had learned during his substantial international chess career.

Gudmundur was a member of the Royal Swedish Academy of Engineering Sciences, the chairman of an international working group on the Earth's rift systems, a member of the European Science Foundation's consor-

tium of the Ocean Drilling Program, and active in the IUGG as well as the International Heat Flow Commission. He served on national and international committees on behalf of the Government of Iceland, dealing with a variety of issues, including the Law of the Sea Conference. For over three decades, he was very active in the international geothermal community. He served as a geothermal consultant for United Nations agencies in several countries. He was one of the founders of the International Geothermal Association, served on its Board of Directors 1989-1995, and was the Chairman of the Programme Committee of the World Geothermal Congress in Italy in 1995. He was the first President of the Geothermal Association of Iceland. In recognition of Gudmundur's great contribution to the geothermal community, he was awarded an honorary membership of the association at the International Geothermal Conference held in Reykjavik in September 2003.

After his retirement in 1997, Gudmundur started writing a comprehensive book in Icelandic on all aspects of geothermal energy in Iceland, its nature, exploration, development, utilisation and history. He completed the fully edited manuscript of the book two weeks before his death. The book will be published in the autumn of 2004.

Ingvar B. Fridleifsson, President of the Geothermal Association of Iceland.



Figure 4. Gudmundur Palmason.

RUSSIA

International Geothermal Workshop IGW-2004 - Russia

Oleg Povarev, RUGA-GES

The International Geothermal Workshop – IGW-2004 – will take place in Petropavlovsk-Kamchatski, Russia on August 9-15, 2004. The Organizers of the Workshop are: the Russian Association "Geothermal Energy Society", the RAO "UES of Russia", the Administrations of Kamchatka region and Elizovo district, the Kamchatka Scientific Center and institutes of Far East Division of Russian Academy of Sciences, the SC Geotherm.

The International Geothermal Workshop will be sup-

International Geothermal Workshop in Russia
«Heat & Light from the Heart of the Earth»
Russia, Kamchatka, August 8-15, 2004



Logos: IGA, Association of Geothermal Energy Society, GEOTERM, Kamchatka Scientific Center, FED of RAS, Global Environment Facility.

МЕЖДУНАРОДНЫЙ ГЕОТЕРМАЛЬНЫЙ НАУЧНО-ТЕХНИЧЕСКИЙ СЕМИНАР
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 INTERNATIONAL GEOTHERMAL WORKSHOP

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Local geothermal heat and power supply systems

ported by the Russian Academy of Sciences, the Ministry of Industry and Science of RF, the Ministry of Economic Development and Trade of RF, the RAO UES of Russia, the SC DVEUK, the World Bank (WB), the Global Environmental Facility (GEF), the International Geothermal Association (IGA), the Center of Energy Technology Russia-EU.

Main themes of the Workshop:

1. New geothermal projects in Russia and other countries.
2. Local district heating of towns and settlements based on geothermal resources; complex utilization of geothermal resources.
3. Binary power plants.
4. Geothermal reservoirs, methods of their investigation and modeling. Drilling efficiency.
5. Environmental aspects of geothermal energy and CO₂ market in Europe and in the world.
6. Economical and financial aspects of geothermal projects.
7. Organization of financing for new geothermal projects.

Information on the International Geothermal Workshop can be found on the web-site:

<http://igw2004.gesa.ru/>.

The organizers cordially invite the entire geothermal community, and in particular energy companies, local/regional authorities, research institutions, geothermal equipment operators, financial international organizations to participate to the IGW.

POLAND

International Geothermal Days 2004 in Poland

Beata Kepinska and Kiril Popovski, PGA

The organisers are pleased to inform all the IGA friends that this year the International Summer School on Direct Application of Geothermal Energy (ISS) will work in Poland together with the Polish Geothermal Association (PGA).

The following events will be organized in Zakopane, September 13-17, 2004:

- International Course on "Low Enthalpy geothermal resources - exploitation and development"
- Technical field trip to the Podhale region
- International Workshop on "Geothermal energy Resources in Central and Eastern European Countries: State-of-the-Art and Possibilities for Development"

For more details, please refer to the Website:

<http://homepage.mac.com/kpopovski/PhotoAlbum15.html>

which will be updated in the last week of each month before September. You can also write your questions directly to the co-organizers:

Dr. Beata Kepinska labgeo1@tary.net.pl

Prof. Kiril Popovski isskiril@sonet.com.mk

With the hope that some or all of the events will be of your interest and many will join in to work and have good time together. See you in the beautiful Zakopane!

GERMANY

Bonn Conference on Renewable Energies

W. Russman, B. Sanner, GtV

On 1-4 June 2004, Germany will host the International Conference for Renewable Energies, Bonn 2004, as announced by Chancellor Gerhard Schröder in September 2002 at the World Summit on Sustainable Development in Johannesburg. The conference – *Renewables 2004* – will chart the way towards an expansion of renewable energies worldwide, responding to the call made at the Johannesburg Summit for the global development of renewable energy. It will also keep up the momentum generated by the coalition of like-minded countries for the promotion of renewable energies (known as the Johannesburg Renewable Energy Coalition, JREC and its declaration "The Way Forward on Renewable Energies"). More than 1,500 participants are expected to meet in Bonn, among them official governmental delegations including energy, environmental and development ministers, representatives of the United Nations and other international and non-governmental organisations, civil society and the private sector.

Conference issues: how to increase renewable energies globally?

Renewables 2004 will focus on how to increase the share of renewable energies by concrete action -significantly and globally. The key issues are:

Policies for market development: What can governments, international organisations and stakeholders do for better developing the market and creating a level playing field for renewable energies?

Finance: How and under which preconditions could public and private capital providers improve financing of renewables both in industrialised as well as developing countries?

Strengthening of human and institutional capacity: What is necessary to bring capacity building, research and technology development and institutional improvements high on the agenda?

Conference character: open for participation of private sector

Renewables 2004 will be an intergovernmental conference with a broad stakeholder participation. The German Government as convener invited official government delegations headed by ministers responsible for energy, environment and development, as well as representatives from the United Nations (UN) and other international organisations.

The involvement of the private sector, non-governmental organisations and other stakeholders active in renewable energies in presenting their considerations, demands, own activities and support to the outcomes of the conference will be taken care of. Hence, a number of conference elements will be dedicated to these groups. Numerous activities, actions and events in and around the *Renewables 2004* will be currently under preparation.

The role of the private sector, especially business and industry and the finance sector is of vital importance in the transition towards a more efficient and sustainable energy system. Therefore, the German Government encouraged the private sector, i.e. businesses as well as business and industrial organisations, to participate actively in the *Renewables 2004* conference and to meet officials, decision makers and stakeholders from all over the world.

Expected Outcomes

The conference aims at three key outcomes:

A **Political Declaration** describing common political objectives, offering a vision on how renewable energy can play a greater role in a more efficient and sustainable energy system, and including agreements on a follow-up process.

An **International Action Plan** in which various governments and other actors propose concrete actions and commitments for developing renewable energies.

"Guidance for Good Policy" leading to greater impact and coherence of the policy strategies employed.

The International Action Plan

The International Action Plan by proposing actions and commitments that will help to substantially increase the use of renewable energies. These actions and commitments should help overcome the obstacles that exist. In combination with the other conference outcomes, the International Action Plan will signal the participants' determination to

increase the share of renewable energies in energy supply, including the promotion of efficient energy systems, and will show how political commitments are translated into concrete action. This will also help implement the Johannesburg Plan of Implementation and achieve the Millennium Development Goals. The conference conveners will collect proposed contributions in the run-up to the conference. All actions and commitments included in the International Action Plan will be of a voluntary nature. The conference will aim at achieving differentiated actions and commitments that reflect specific regional conditions, capacities of actors or specific sectoral objectives and overall development targets. Actions and commitments will be expected to emerge in a bottom-up approach. The following list of potential Actions and Commitments indicates what the conveners imagine the International Action Plan to contain; however, this list is by no means designed to limit the imagination and creativity of all actors to come up with other concrete ideas:

- The EU may present their results of the current considerations to extend the renewable energy target to 2020 based on the existing targets of 21 % of electricity production or 5.75 % for biofuels from renewable energies by 2010.
- Other supporters of the Johannesburg Renewable Energy Coalition (JREC) present their voluntary targets for RE extension and present actions to reach those targets (extension of JREC).

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- An alliance of donors offers a facility designed to enhance strategic cooperation between donors and developing countries and to support actions recommended by the G8 Task Force on Renewable Energy.
- Innovative financing tools involving private equity and venture capital are presented.
- Initiatives for RE market development are presented (e.g. the Global Market Initiative for Concentrating Solar Power).
- Government presents a plan to extend access to modern energy services by Solar Home Systems or other technologies.
- International R&D cooperation agreements.
- A group of private-sector corporations presents a plan to restructure corporate energy consumption and/or investment working towards more energy from renewable resources and enhanced efficiency.
- Networks linking policy analysts and advisors, researchers and practitioners in the field of RE are strengthened and extended.

What is expected? – Turning Political Commitments into Action!

In recognition of the challenges involved in the promotion of renewable energies at a global level and in appreciation of the high-level participation at *Renewables 2004*,

proposed actions and commitments should generally satisfy the following criteria:

Significance

While the conveners recognise that in order to increase the use of renewable energy sources, innumerable actions are required by a very large number of actors, the International Action Plan should bring together Actions and Commitments that are significant in terms of the impact they are likely to have. Monitoring of implementation of the International Action Plan is envisaged to become an integral part of the follow-up process to the conference. There should be a timetable indicating how the actions and commitments are to be implemented.

Supported by Financial Resources

Actions and Commitments should be supported, wherever relevant, by an indication of the availability of financial resources for their implementation. This indication should be realistic and may also mention possibilities for expansion and further development.

International Conference for Renewable Energies,
Bonn 2004

Conference Secretariat c/o Mike Enskat
Postfach 5180 - 65726 Eschborn, Germany
Fax: +49-(0)6196-79-4405
e-mail: actions@renewables2004.de

RENEWABLE 2004: FIRST RESULT

From 1-4 June 2004 more than 1400 delegates from 154 countries, including 121 heads of states and ministers, attended the inter-governmental conference *Renewables 2004*. At the conclusion of the International Conference for Renewable Energies in Bonn, Federal Environment Minister Jürgen Trittin and Federal Development Minister Heidmarie Wiecek-Zeul see positive results. "The conference was a complete success", they declared on Friday, 4 June. "Together the delegates have paved the way for a global transformation in energy structures and for a massive increase in the use of renewable energies. This will alleviate global poverty and protect the climate".

The outcomes of the conference, including the proposed 11th paragraph of the Political Declaration and updated Policy Recommendations, are:

The **Political Declaration** of *Renewables 2004*.

The declaration contains definitions of common political objectives for promoting the role of renewable energies.

http://www.renewables2004.de/en/2004/outcome_declaration.asp

In the **International Action Programme**, governments, international organisations and stakeholders have committed to a plethora of activities that are geared towards the increased use of renewable energies. So far, 165 of the proposals for voluntary measures have been endorsed while many further submissions for action are being screened at present.

http://www.renewables2004.de/en/2004/outcome_actionprogramme.asp

The **Policy Recommendations** give practical advice on how to promote the development of the market for renewable energies in the North and in the South.

http://www.renewables2004.de/en/2004/outcome_recommendations.asp

Many speeches and presentations held at the plenary sessions, including the key note of Tony Blair, Prime Minister of the United Kingdom, are available as video streams and pdf files:

http://www.renewables2004.de/en/programme/speeches_presentations.asp

IISD was the correspondent of renewables 2004. All reports of the plenary sessions, round tables, the closing session, and reports from many side events are published on the IISD web site, including numerous photos of the events.

<http://www.iisd.ca/sd/ren2004/>

For more information on the International Conference for Renewable Energies, Bonn 2004, please visit

<http://www.renewables2004.de>

AMERICAS

USA

In memoriam

William E. (Bill) Brigham (1929-2004)

William E. (Bill) Brigham Professor of Petroleum Engineering, Stanford University died February 15, 2004 at his home on the Stanford campus. He is survived by his wife of 49 years Carol, daughters Nancy Blattel, Laurie Jester, and Sarah Fletcher, as well as sons Bill Brigham, and David Brigham. Grandchildren Douglas and Lynn Weil, Katie and Sam Brigham, Elizabeth and Rebecca Jester, Joel and Amanda Fletcher, and Nathaniel and Nicole Brigham; and step grandchildren Arran, Colin and Ainsley Blattel. Brigham was born April 1, 1929 in Murphysboro, Illinois and later received a B.S. in Chemical Engineering from Iowa State University. In 1951 he was drafted into the U.S. Marine Corps and stationed on Treasure Island in San Francisco. It was during this time that he met Carol Cobb whom he married in 1954. After completing his service with the Marine Corps, he pursued graduate studies in Chemical Engineering from 1956 to 1962 at the University of Oklahoma while working simultaneously for Continental Oil Company in Ponca City, OK. Upon completion of his Ph.D. he continued to work for Conoco. In 1971, he accepted an offer from Stanford University and joined the faculty in the Department of Petroleum Engineering. From 1979 to 1990 he served as Associate Chairman of the Department. In his more than 30 years at Stanford he taught countless hours of formal courses to undergraduates and graduate students as well as supervised the graduate research of numerous individuals. Brigham served as the principal advisor of 25 Ph.D., 3 Engineer, and 37 M.S. students. His students remember fondly the "ring of fire" (cigarette, coffee, and Brigham himself) that characterized the front of the classroom while he lectured. In reflection about the graduate students with whom he had worked Brigham once stated that, "They make a mediocre professor look like a Nobel Prize winner". His research into the physical mechanisms of recovery from oil reservoirs was highly regarded and cited by his colleagues worldwide. Among other awards he received the John Franklin Carl Award from the Society of Petroleum Engineers (SPE), the Homer H. Lowry Award in Fossil Energy from the U.S. Department of Energy. He was designated a pioneer in the area of thermally enhanced oil recovery and received both the Thermal Recov-

ery Pioneer and the Improved Oil Recovery Pioneer Award SPE, and he was an Honorary Member of AIME and SPE. He was the author of over 250 papers and technical reports. Bill was a fine scientist, but he was a very down to earth and generous man. His family came first. He and his wife loved to travel and enjoyed duplicate bridge. In place of flowers, the family suggests donation to The William E. Brigham Fund at the Department of Petroleum Engineering at Stanford University or to the American Cancer Society. A Memorial Service will be held March 11, 2:00 pm at the Stanford Memorial Church. There will be an opportunity for people attending the service to say a few words to remember Bill. We have created a web page for people to write a paragraph of their remembrances of Bill. These words of remembrance will be collected into a volume for his family, and will be available at the Memorial Service. Please click here to record your comments. On February 9, 2004, the Department of Petroleum Engineering inaugurated the Brigham Laboratory on the concourse of Green Earth Science building, to honor Bill's many technical and academic contributions spanning more than 30 years as a professor at Stanford.

HAWAII

Ormat buys Puna Geothermal plant, Hawaii, for \$71 million

Graciela Shapiro, ORMAT

Ormat Industries Ltd. keeps expanding. Its Ormat Nevada subsidiary will buy the Puna Geothermal Venture power station in Hawaii for \$71 million.

The Yavne-based company plans to invest another \$22 million to boost the plant's capacity once the deal is completed.

The agreement was reached with Constellation Power, one of the largest suppliers of wholesale power to large commercial and industrial customers.

The plant produces 30 MW of electricity and the annual revenues are around \$2 million.

Within 18 months from the closure of the deal, Ormat will invest \$22 million to increase its capacity by 6.5 MW by 2006.

This should boost annual revenues to \$24 million. Currently, Puna supplies about 10% of the energy consumed in its home city, Pahoa, delivering it through the Hawaii Electric Light Co. under a long-term agreement through 2027.

The plant began commercial operations in 1993, and is equipped with Ormat machinery. Ormat believes that the site, hosted in a well know volcanic area, has the potential to support an additional 20 MW plant.

The sale is expected to be completed in the second or third quarter, and Ormat has been on an acquisition spree over the past few months.

To finance the purchases, Ormat held a \$190 million bond offering to US-based institutional investors in February, and there have also been rumours that the TASE-traded company will issue stock in the US.



Figure 5. William E. (Bill) Brigham.

MEXICO

In memoriam

José Antonio Sampedro Garcia

Member of IGA and ex-president of The Mexican Geothermal Association who passed away in April 2004 in Mexicali, Baja California México.

We have lost a good friend, incredible colleague. May his soul rest in peace close to the creator.

Members of The Mexican Geothermal Association.

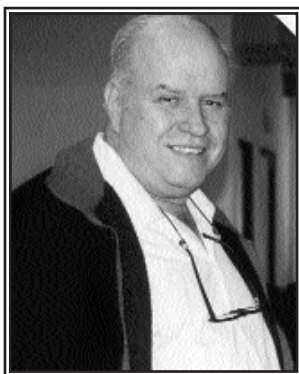


Figure 6. José Antonio Sampedro Garcia.

AFRICA

KENYA

Kenyan Government to encourage and support investment in geothermal

Kenyan President, Mwai Kibaki, opened the 2004 Kenya International Investment Conference in Nairobi last March.

He reiterated his government's commitment toward a better operation environment, thus enabling the flow of new investments into the country. The aim is set at Public-Private Sector Partnership and at reinforcing physical infrastructure, among which power.

On the following day, in this framework, Kibaki commissioned also the 70 MW geothermal project from the Menegai crater in Naivasha, which had been delayed for 12 years because of lack of money.

President Kibaki retained geothermal energy as the only available source of electricity generation at competitive costs.

At present, the Olkaria I and II power projects in Naivasha have more than 120 MW capacity. With the addition of the 70 MW plant the total power generation capacity of KenGen will grow to 1100 MW, which means 280 MW surplus of demand, according to the President.

In addition, some 600 million shillings have been granted to KenGen by the government for geothermal exploration and developments in different areas, while the World Bank will ensure 320 million shillings for a feasibility study on Olkaria expansion.

ASIA

INDONESIA

Agreement to expand Darajat Plant signed

Riki Ibrahim, API-INAGA

In Jakarta on May 17, 2004 Amoseas Indonesia Inc., a subsidiary of ChevronTexaco, signed a contract with the State owned company for oil and gas, Pertamina, and the Indonesian National power company, PT PLN, for the expansion of the environmentally friendly geothermal plant of Darajat, West Java. The Minister of State Enterprise and Board Commissioner for PT Pertamina and PT PLN, Laksmana Sukardi, and the Minister of Energy and Mineral Resources, Purnomo Yusgiantoro, witnessed the event. The expansion plant, Darajat III, will imply an investment of around 100 million USD and the start up is foreseen approximately two years after the beginning of construction. Darajat III is expected generating 110 MW, which is enough for about one million people. The President of PLN, Eddie Widiono, expressed his satisfaction for the partnership with Amoseas, which has already proved successful for Darajat I and II, and the new contract is in line with the efforts to meet the increasing energy demand of Indonesia. The plant will generate clean power to be sold to PLN, as already happens with the two units on site that are capable of supplying 145 MW. Mr. Ariffi Nawawi, Pertamina President, stated that it is time for Indonesia to exploit its abundant geothermal energy for domestic purposes and make a better use of oil and gas resources on the export side. Moreover, geothermal energy is clean, renewable, and yield 90% less carbon dioxide than a typical coal-fuelled plant. Amoseas and its parent company, ChevronTexaco, have a long record of partnership and investment in Indonesia, as reported by ChevronTexaco's representative McCloskey, and hope that the plant will be a benefit for the people of Indonesia. As a fact, Amoseas Indonesia has been among the pioneer companies that have developed the country's geothermal potential since 1984. Its investments in this sector sum up to over 250 million USD. Its parent company, Chevron Texaco, is dealing with every facets of the energy industry. Amuses and its sibling PT Cortex Pacific Indonesia, have been operating for some 70 years in Indonesia and employ over 5,400 people and 20,000 business partner employees.

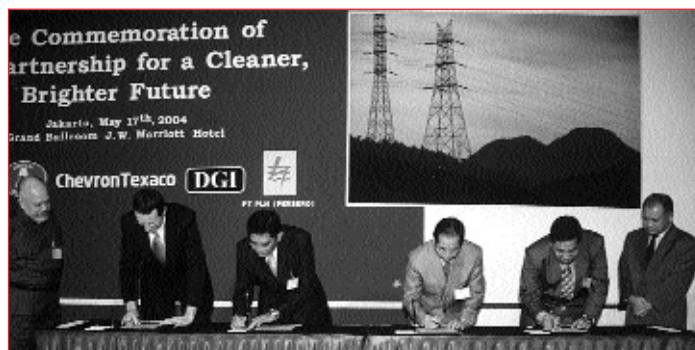


Figure 7. Amoseas, Pertamina and PT PLN signing ceremony.

OCEANIA

NEW ZEALAND

Geothermal energy and manpower

M.P. Hochstein, University of Auckland, NZ

Recently we looked at the possible impact of fellows from developing countries trained at the Geothermal Institute (University of Auckland) upon professional manpower in their countries. Required was a connection between geothermal energy produced and manpower. Such relation has apparently not been published although data are available which contain information about produced geothermal energy and the number of professionals (with academic background) for countries listed in the overview papers and many country reports in the Proceedings of the World Geothermal Congress 2000. However, this information contains many uncertainties. Without considering the actual abstraction of geothermal fluids, one cannot obtain a meaningful figure for the total geothermal energy produced by a country using separate entries for produced electric energy and direct utilization. The manpower figures quoted also contain significant uncertainties or are not listed for many countries (this applies to several countries with large geothermal energy production).

However, one can obtain an approximate value for the total geothermal energy produced by a country for a given year by converting the value of the produced electric energy, listed as GWh generated (per year) (see Table 3 Huttrer, 2000), into abstracted geothermal energy (PJ/yr) to which the directly used thermal energy (Table 1 Lund and Freeston, 2000) can be added. For this, appropriate assumptions (for example: mean enthalpy of the produced fluids, conversion efficiency, volume and enthalpy of waste fluids) have to be made. Since the extent of re-injection is poorly documented, I assessed the extreme cases where all waste fluids are either fully re-injected or fully discharged at the surface (neglecting cascade use). In New Zealand, for example, the electric energy generated in 1999 from geothermal fluids was 2268 GWh/yr; conversion points to a net abstraction between about 20 PJ/yr and 39 PJ/yr for the two waste fluid scenarios cited. Since significant re-injection occurs, it was assumed that about 30 $\pm$ 10 PJ/yr of geothermal energy was produced. Adding to this the directly used geothermal energy of 1967 GWh/yr (7.1 PJ/yr), the total energy abstracted from NZ geothermal reservoirs was therefore 37 $\pm$ 11 PJ/yr.

Similar estimates were made for other countries listed in the WGC 2000 summary papers. The uncertainty of the produced (net) geothermal energy is reduced where electricity production is from vapour dominated or natural two phase reservoirs. For Italy, for example, an energy abstraction rate of 50 $\pm$ 7 PJ/yr is indicated (with about 37 PJ/yr from vapour dominated reservoirs). The uncertainty is even less where direct use is dominant (for Turkey the rate is 17 $\pm$ 0.5 PJ/yr).

Manpower figures (cited in the WGC 2000 Proceedings)

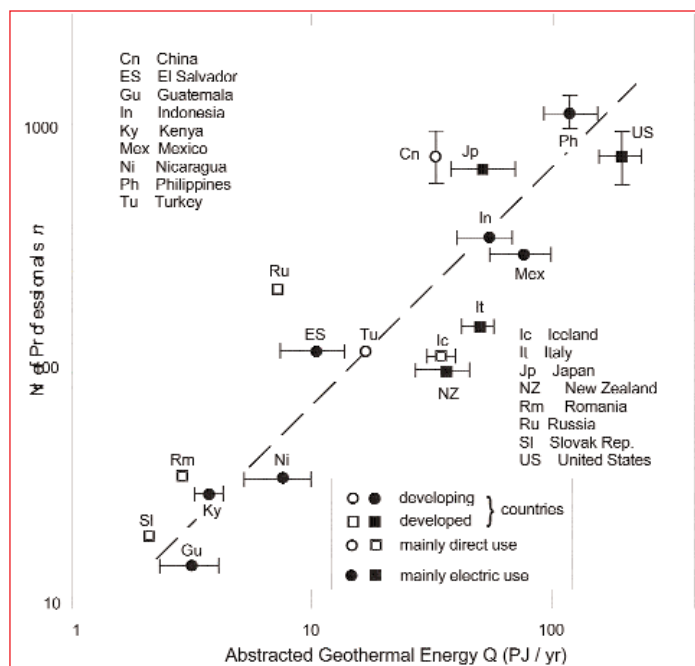


Figure 8. Plot of 'abstracted geothermal energy Q (PJ/yr)' versus 'professional manpower' for countries where $Q > 1$ PJ/yr in 1999 (1 PJ = $E15$ J).

refer to professional staff with an academic background; the term 'manpower' is used here with this definition. Previously quoted manpower figures are often uncertain or were missing for countries with large geothermal manpower. Alumni and friends of the Geothermal Institute were asked to check present-day manpower figures of their own country. Error bars in Figure 8 are based on 2003 estimates (extrapolated for 1999). Estimates for the US are still uncertain.

The geothermal energy of countries producing more than 1 PJ/yr varies by almost two and a half orders of magnitude. A log-log plot was therefore used to display 'Abstracted Geothermal Energy Q ' versus 'Nr of Professionals n ' (Figure 8). Data from nine developing countries (past or present) and eight developed countries were selected for Figure 8; these countries produced together about 98 % of all electric energy using geothermal fluids and about 74% of directly used thermal energy. Figure 8 therefore represents the worldwide geothermal energy production in 1999 which amounted to about 730 PJ and involved at least 5,000 staff with academic backgrounds. Normalized for energy production this points to a median 'specific manpower ratio' (n/Q) of about 7 staff per PJ/yr (broken line in Figure 8).

Despite the uncertainties, the data allow interesting comparisons. According to Figure 8, two thirds of all geothermal manpower is employed in four countries (China, Japan, Philippines, and the US). The rather high manpower ratio for Russia and China (about 30 and 24.5 staff per PJ/yr respectively) probably reflects planning policies of the past although the proportion of academic staff is higher in Russia than elsewhere. The manpower figure for Japan ($n=690$) reflects, in part, the demands of the NEDO projects at that time (1999). On the opposite, specific manpower figures for New Zealand, Iceland and Italy are all 'below par' with n/Q

< 3.3 which could be interpreted by economists as a criterion of efficiency. Considering the likely demands for future developments and research, the low manpower (better: normalized manpower) figures of countries with significant geothermal energy production can also be seen as an impeding factor. In the case of New Zealand (n/Q about 2.7), the low figure reflects lack of employment opportunities which reduced demand for, and support of, geothermal training.

Some countries with significant direct utilization of geothermal energy, such as France, Georgia, and Sweden (with $Q > 4$ PJ/yr in 1999), are not included in Figure 8 because representative manpower data could not be obtained. Hence, I like to encourage potential contributors to the next World Geothermal Congress (2005) to produce and refer to actual and representative manpower data which might allow predictions about future trends in development and research.

Acknowledgement: the help of S. Ehara, J. Lund, A. de Jesus, Keyan Zheng and S. Sudarman in checking manpower data is gratefully acknowledged.

References

- Huttrer, G.W. (2000). The status of world geothermal power generation 1995-2000. Proceedings WGC, Japan, vol.1., pp. 23-37.
 Lund, J.W., and Freeston, D.H. (2000). World-wide direct uses of geothermal energy 2000. Proceedings WGC, Japan, vol.1., pp. 1-21.

PAPUA NEW GUINEA

More Geothermal for Papua New Guinea

A 30 MW new geothermal power plant is planned for Lihir Gold Limited (LGL) on Lihir Island, Papua New Guinea. As for the previous and already operational 6 MW back-pressure unit engineered by Geothermal Development Associates (GDA), Reno, Nevada the new plant will be equipped with General electric machinery and is expected to be completed and commissioned by early 2005.

The contract between LGL and GDA was signed in December 2003. As stated by the Chairman of Lihir Management Company, Ross Garnaut, during the company's 2004 annual general meeting in April, the project is aimed at reducing costs by minimisation of the company's dependence on volatile fuel and oil prices. The new plant cost will be partially covered by the share placement of November, last year. Considering the substantial savings and the environmental benefits, the company is also delving on possible expansion up to cover its entire energy need through geothermal. In fact, this could give way to carbon credits ascribed for its geothermal operations, and then to trading on the international carbon markets.

Moreover, it is noteworthy that the wells feeding the current plant were initially drilled for the purpose of cooling and depressurise the mine, and now enable the exploitation of areas once deemed to hot and yield the steam for power generation. As for the design, the additional power plant will be made of three General Electric 11 MW condensing units, with generating package similar to those supplied by Geothermal Power Company, Elmira, New York and GDA to 250 kW-25 MW projects in USA, Indonesia and the Philippines.



Figure 9. Earlier days in the construction of the 30MW geothermal unit.

UPCOMING EVENTS

II International Geothermal Workshop - IGW-2004, 9-15 August 2004, Petropavlovsk-Kamchatski, Russia. Contact: Dr. Prof. Oleg A. Povarov, 9/1, Krasnokazarmennaya Str., Moscow, 111250, Russia. Tel. ++095-918-1561; Fax ++095-918-1560
 e-mail: igw2004@geotherm.ru
 website: igw2004.gesa.ru

32nd International Geological Congress, 20-28 August 2004, Florence, Italy. Contact: Chiara Manetti, Scientific Secretariat, Casaitalia, Borgo Albizi, 28, 50121 Florence. Tel/fax: + 39-055-2382146.
 e-mail: casaitalia@geo.unifi.it
 website: www.32igc.org

International Symposium on Quality Assurance for Analytical Methods in Isotope Hydrology - IAEA, 25-27 August 2004, IAEA headquarters, Vienna, Austria. Contact: Dr. Zhonghe Pang, International Atomic Energy Agency, Wagramer Strasse 5, A-1400, Vienna, Austria. Tel: +43-1-2600-21742; Fax: +43-1-26007
 e-mail: z.pang@iaea.org
 website: www.iaea.org/programmes/ripc/ih

World Renewable Energy Congress VIII and Exposition, 28 August - 3 September, 2004 Denver, CO, USA.
 website: www.nrel.gov/wrec

GRC 2004 Annual Meeting, 29 August - 1 September 2004, Palm Springs, California, USA. Contact: Geothermal Resources Council, P.O. Box 1350, Davis, California 95617, USA. Tel: ++530-758-2360; Fax ++530-758-2836
 e-mail: grc@geothermal.org
 website: www.geothermal.org

19th World Energy Congress, 5-9 September 2004, Sydney Convention and Exhibition Centre, Darling Harbour, Sydney, Australia. Tel: + 61-2-9262-2277; Fax: + 61-2-9262-3135
 e-mail: energy2004@tourhosts.com.au
 website: www.tourhosts.com.au/energy2004

International Workshop on the Application of Isotope Techniques in Hydrological and Environmental Studies, 6-8 September 2004, Paris, France.
 e-mail: michelot@geol.u-psud.fr

International Geothermal Days 2004 "Poland 2004", 13-17 September 2004, Zakopane, Poland. Contact: Dr. Beata Kepinska, Prof. Kiril Popovski.
 e-mail: labgeo1@tary.net.pl; isskiril@sonet.com.mk
 website: homepage.mac.com/kpopovski/PhotoAlbum15.html

8th International Congress on Applied Mineralogy (ICAM 2004), 19-22 September 2004, Aguas de Lindoia, Sao Paulo State, Brazil.
 website: www.appliedmineralogy.org/icam.htm

International Workshop on New and Classical Applications of Heat Flow Studies, 4-7 October 2004, Aachen, Germany.
 website: www.rwth-aachen.de/geop/Tagung_AC/invitation.htm

1st International Conference on Renewable Energy, 6-8 October 2004, New Delhi, India. Contact: G.N. Mathur, Secretary, Central Board of Irrigation and Power, Malcha Marg, Chanakyapuri, New Delhi 110 021, India. Tel/fax: 91-11-2611 6347
 e-mail: cbip@vsnl.com

Industrial Applications of Renewable Resources, 11-14 October 2004, The Fairmont Hotel, Chicago, Illinois, USA. AOCS. Tel: +1 217 359 2344, fax: +1 217 351 8091
e-mail: meeting@aocs.org
website: www.aocs.org/meetings/ia

6th Asian Geothermal Symposium - Mutual Challenges in High- and Low-Temperature Geothermal Resource Fields, 26-27 October 2004, Daejeon, Korea. Contact: Dr. Takeshi Uemoto, Clean Energy Division, MRC, 1-297 Kitabukuro-cho, Omiya-ku, Saitama-shi, Saitama 330-0835, Japan.
e-mail: tuemoto@mmc.co.jp
website: staff.aist.go.jp/hiro-muraoka/AsianSymposium6E.html

Unconventional & Renewable Energy Sources Trade Fair, 3-6 November 2004, Moscow, Russia. Contact: Jefferson Reszetylo (USA). Tel.: 203 357 1400.
e-mail: jreszetylo@iegexpo.com
website: www.iegexpo.com/rus_unconventions1.html

30th Stanford Workshop on Geothermal Reservoir Engineering, 24-26 January 2005, Stanford University campus, Stanford, USA. Contact: Laura Garner, Dept. of Petroleum Engineering, Stanford University, CA, USA. Tel: +1 650 725 2716; fax: +1 650 725 2099
e-mail: lgarner@pangea.stanford.edu
website: ekofisk.stanford.edu/geoth/workshop2005.htm

The Cairo 9th International Conference on Energy & Environment (EE9): Technological Advances for a Sustainable Clean Environment, 13-19 March 2005, Cairo and Sharm El-Sheikh, Sinai Peninsula. Contact persons: Abdel Latif El-Sharkawy, National Research Center, Dokki, Cairo, Egypt, Tel: +20 7617590 – 7614150, Fax: +20 3370597 and Ralph H. Kummeler, Interim Dean, College of Engineering, Wayne State University, Detroit, MI 48202, Tel: +1 313 577 3775, fax: +1 313 577 5300
e-mail: President@sat-eng.com and rkummeler@eng.wayne.edu

World Geothermal Congress WGC2005, Antalya, Turkey, 24-29 April 2005. Accepted draft papers are due by May 2004.
website: www.wgc2005.org

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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.

Send IGA News contributions to:

IGA Secretariat, c/o Enel

120 Via A. Pisano, 56122 Pisa, Italy

fax: + 39-050-618-893 or 618-290

e-mail: igasec@enel.it

Contributions to the next issue of IGA News must be received by 15 August 2004.

This issue of IGA *News* has been produced and edited by the IGA Secretariat: Ruggero Bertani and Iris Perticone.



Editorial coordination by Adele Manzella.

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