Quarterly No. 59 January – March 2005

IGA NEWS

Newsletter of the International Geothermal Association

IGA ACTIVITIES

Message from the President

John W. Lund, President

Since this issue of IGA News will be published in time for the World Geothermal Congress 2005 in Antalya, Turkey – I would like to welcome all of you attending the Congress, and I look forward to an excellent venue prepared by the Organizing Committee and our host the Turkish Geothermal Association. The Technical Committee received 705 papers and approximately half will be presented in five concurrent sessions and the remaining during the two poster sessions. The proceedings from the Congress will be available on CD along with the material from the three short courses. We anticipate that over 1600 delegates and accompanying persons will attend the Congress – so there will be many opportunities to meet with fellow geothermalists from other countries and exchange information – to promote, develop and utilize geothermal resources throughout the world.

The IGA Board of Directors met in Ankara, Turkey on February 14th and 15th, with 17 members attending. Several important issues were presented and discussed at the meeting, including:

- Presentations by both the Icelandic and Indonesian delegations in support of holding WGC2010 in their country.
- Presentation by the ad hoc committee Regarding Selection of Host Country for WGC2010 – Jim Lawless from New Zealand, chair.
- Considering a transition to publishing the IGA News in electronic form, with limited hard copies available for members who do not have Email.
- Presentation of the World Bank/GeoFund funding proposal for short course #4 at WGC2005 – "Developing Geothermal Projects: Resource Assessment, Drilling, Economic Feasibility Studies and Financing" – to be held in Antalya from 22 to 24 April – Dr. Gordon Bloomquist coordinator for the course.
- Presentation of the World Bank/GeoFund funding proposal for the "Mineral Extraction from Geothermal Brines" workshop in Petropavlovsk, Kamchatka, Russia from 12 to16 September 2005. A follow up workshop will be held at the University of Arizona in Phoenix, Arizona in either September or October of 2006. The Geothermal Energy Society of Russia and the U.S. Department of Energy are also supporting these two programs, coordinated by Dr. Gordon Bloomquist.
- Proposal to form a Western Pacific Regional Branch of IGA

- Approval to have an IGA booth at WGC2005 where membership applications, general geothermal information and the IGA News will be available.
- Participation of Dr. Beata Kepinska from Poland as the IGA representative at the dedication of the Klaipeda geothermal demonstration heating plant in Lithuania.
- Publication of the IGA Directory after WGC2005.

The IGA Secretariat, recently moved to Iceland and hosted by Samorka under the leadership of Dr. Valgardur Stefansson, is settled in and performing well. The IGA website is still hosted by CNR in Italy and administered by Dr. Zbigniew Malolepszy of Poland.

At this point it appears, from the recommendation of the ad hoc committee and a majority vote of the IGA Board of Directors, that WGC2010 will be hosted by Indonesia on the island of Bali. This selection is conditional upon signing of the Memorandum of Understanding (MOU) between the Indonesian Geothermal Association (INAGA) and IGA, and the commitment by various supporting agencies to adequately fund the Congress. The Board of Directors and the ad hoc committee will be working on these issues over the next year.

The Annual General Meeting of the IGA will be held during lunch on Wednesday, April 27th at WGC2005, the location to be announced at the Congress. This is open to the general membership of IGA, so please plan to attend and receive an update on IGA activities and a report on the success of the Congress.

Annual General Meeting

The 16th Annual General Meeting of the International Geothermal Association will be held on Wedensday 27th April 2005 in Antalya, Turkey. The AGM will take place from 12.30 to 13.00 (12.30 – 1.00 PM) in room D in the Pyramid. The following matters will be considered at the meeting:

1. Minutes of the 15th AGM
2. Annual report of the Board of Directors
3. Audited financial statement
4. Changes to the IGA rules*
5. General business

* It is necessary formally to approve two changes to the Rules of the Association, to bring them into line with recently adopted changes in the Bylaws.

Motion 1 *To bring Rule 7(b) into line with Bylaw 12(c).* Amend Rule 7(b) from the current wording *"The Board of Directors shall call a general meeting forthwith upon the requisition of 20 or more members."* to read *"The Board of Directors shall call a General Meeting forthwith upon the request of 50 or more Members or 5% of the Membership, whichever is greater."*

Motion 2 *To bring Rule 11 into line with Bylaw 7.* Amend Rule 11 from the current wording: *"The financial year shall be from February 1st each year to the succeeding January 31st."* to read *"The financial year of the Association shall be the calendar year, from the 1st of January to the 31st of December."*

The Secretariat

World Geothermal Congress 2005 Short Course #4

Developing Geothermal Projects: Resource Assessment, Drilling, Economic Feasibility Studies and Financing (250 USD)

The International Geothermal Association in cooperation with the Organizing Committee of World Geothermal Congress 2005 and with financial support from the World Bank is pleased to announce a fourth short course to be held in conjunction with the World Geothermal Congress 2005. The short course will be held in Antalya, Turkey beginning on the 22nd of April and running through midday the 24nd of April.

The course will cover aspects of resource assessment leading to and completing the drilling of a deep production test well including: (1) preparing a proposal to drill a deep production test well, selecting a drilling contractor, overseeing drilling and well completion, and evaluation of the well to determine adequacy to meet intended objectives; (2) identifying the factors that affect economic viability, gathering data, and completing feasibility studies to identify the most economically viable project; (3) financial modeling, types and purposes as well as various outputs, setting up models to best suit project specifications and what to do when the results don't meet expectations; and (4) financing projects, including the identification and analysis of those issues that are critical to obtaining financing, including the basic institutional framework and reforms that have been necessary in many countries to facilitate development, financing options, risk allocation principles, and finally critical terms of key commercial agreements and financial documents.

The cost includes attendance at the course, course materials, three nights' accommodation in a first class hotel with breakfast, two lunches, three-course dinner, and coffee breaks.

Registration for the Course
Registration is being limited to 60 participants and a priority will be given to attendees from the World Bank GeoFund eligible countries.

A **Request to Register** should be forwarded to the following address:

ISEV Consortium, WGC2005
Mete Cad. No: 16 D: 11 34437
Taksim Istanbul TURKEY
Tel: + 90 212 244 71 71
Fax: + 90 212 244 71 81
Email: admin-wgc@wgc2005.org
URL: www.wgc2005.org

For additional information on the course, contact Dr. R. Gordon Bloomquist (Course Convener) at bloomquistr@energy.wsu.edu. Fax : 1-360-956-2030

Mineral Extraction from Geothermal Brines Improving Economics and Reservoir Sustainability September 12-16, 2005

PETROPAVLOVSK - KAMCHATSKY, RUSSIA
Sponsored by the World Bank/Global Environmental Facility, the Kamchatka Scientific Center (Far East Division of the Russian Academy of Science), and the U.S. Department of Energy

Organized by the International Geothermal Association and the Russian Geothermal Society

First Announcement and Call for Papers

Join us in Petropavlovsk - Kamchatsky, Russia for the first International Conference and Roadmapping Workshop on Mineral Extraction from Geothermal Brines. Petropavlovsk is a city of about 300,000 on the Kamchatka Peninsula of Eastern Siberia.

The International Geothermal Association (IGA) and the Russian Geothermal Society (GES) invite you to this important event, as well as to present your latest research and/or technical work on the extraction of minerals from geothermal brines.

Note: The number of authors and other participants is being limited to 100.

This international conference and roadmapping workshop is organized by the IGA and the GES, and sponsored by the World Bank/Global Environmental Facility, the Kamchatka Scientific Center (Far East Division of the Russian Academy of Science), and the United States Department of Energy. The next conference will be held in the United States in the fall of 2006 at the University of Arizona.

The two-day conference will feature distinguished international experts and leaders in the field of geothermal development and mineral extraction. The conference will be followed by a one-day roadmapping workshop designed to identify and prioritize research and development needs related to the extraction of minerals from geothermal brines. The workshop will be facilitated by an expert in mineral extraction as well as the development of strategic plans for research and development. The last day will feature field trips to Mutnovsky (12MW + 50 MW) geothermal power plants and Pauzhetsky geothermal power plant (11MW).

Conference Websites

The official conference websites are being hosted by the Oregon Institute of Technology Geo-Heat Center and the Russian Geothermal Association. To access the website for the English version, refer to: http://geoheat.oit.edu/minerals/minerals.htm, for the Russian version, refer to: http://www.gesa.ru.

Information on the websites will be continually updated. See the websites relative to author instructions, conference and workshop and field trip registrations (there will be no registration fee), hotel accommodations, information on visas, etc. Authors and other participants if required will receive the necessary invitations from the Russian Geothermal Association in order to obtain visas.

Additional information can be obtained from R. Gordon Bloomquist (email at bloomquistr@energy.wsu.edu), from John Lund (email at lundj@oit.edu), from Oleg Povarov (e-mail at: povarov@geotherm.ru), or Yuri Trukhin (e-mail at: nigtc@kcs.iks.ru).

EUROPE

New Board of EGEC

By Burkhard Sanner

On October 20, 2004, the European Geothermal Energy Council (EGEC) held its annual meeting in conjunction with the technical day of the Swiss Geothermal Association (SVG) in Basel, Switzerland. At this meeting a new board was elected. Christian Boissavy, who was president of EGEC since its foundation in 1998, did not take another term. However, he accepted to serve on the board as a member. EGEC has to thank Christian Boissavy for his tremendous effort in order to plant EGEC firmly into the renewable energy landscape in Brussels, which meanwhile was achieved successfully.

The composition of the EGEC board for the next two years is:

Burkhard Sanner, Germany	president
Peter Seibt, Germany	vice president
Tevfik Kaya, Turkey	vice president
Christian Boissavy, France	treasurer
Miklos Antics, Romania	secretary
Jean-Louis Debeaumont, Belgium	member
Harald Gorhan, Switzerland	member

The board had a first meeting in Brussels on Nov. 18-19, 2004. For the year 2005, after 1999 (Ferrara), 2001 (Altheim) and 2003 (Szeged) another business seminar of

EGEC will be organised, with emphasis on the EU-directive on renewable power and the implications from the success of the related national legislation (EEG) in Germany, and on the activities towards a EU-directive on renewable heat.

A goal of the new president is to improve the communication between EGEC, its members, and the rest of the geothermal world. Over the past years, EGEC has had considerable success in bringing geothermal topics back into the EU policy and framework programmes. However, this success and the need for EGEC to be working in the EU arena, apparently was not visible and obvious to everybody. The new president, being also vice chairman of the IGA European Branch Forum, has set another goal to improve contacts and co-operation between EGEC and IGA-EBF. A first meeting already took place on Nov. 9, 2004, between the EGEC president and the IGA-EBF chairman, Kiril Popovski, in order to synchronise meetings and to establish co-operation and exchange of information.

Germany

An Update on the German Geothermal Activities

by Werner Bussmann and Burkhard Sanner

Aachen (Aix-la-Chapelle)
At the end of November 2004, on schedule, the drilling for a deep borehole heat exchanger reached the target depth of 2500 m. The borehole now will be equipped with the necessary heat exchanger pipes, and will supply heat to the new students' service centre "SuperC" of the Aachen Technical University (Rheinisch-Westfälische Technische Hochschule RWTH).

Neuruppin
In Neuruppin, situated north of Berlin in the state of Brandenburg, a hotel and spa centre will use geothermal energy for heating and balneological purposes. Construction work is scheduled to start in Spring 2005 and the design of the thermal water circuit including the boreholes/wells, the heating system and the brine supply to the spa will be completed meanwhile.

Pullach
The work for the project of the city Pullach in the vicinity of Munich advances successfully. A district heating net based on geothermal water is planned to supply heat to municipal facilities and to apartment buildings. The company created for that purpose, "Innovative Energie Pullach GmbH", will invest ca. € 14 million in the project. The work for the first drilling started on 4 December 2004 and 42 days later the target depth of ca. 3300m was achieved. The first pumping test produced water at 111°C, substantially higher than the expected 90°C. The start of operation of the district heating is scheduled for the heating season 2005/2006.

Offenbach/Pfalz
In this village near Landau (not to be confused with the much larger Offenbach east of Frankfurt/Main), the first drilling for a geothermal power plant project was launched in March 2005 by HotRock Erdwärmekraftwerk Offenbach/Pfalz. It expects to find 150°C water at a depth of 2800m, arising from the well-known geothermal anomaly in the Upper Rhine Graben. This should be sufficient to connect ca. 5 MW of installed electric capacity to the grid, equal to the electric power demand of about 20 000 households. The waste heat from the power plant will also be used. The economics of the plant are acceptable because of the German renewable energy act (EEG), securing a fixed feed-in tariff for the electric power. Offenbach is located in the geologically "hottest" region in Germany, the Upper Rhine Graben, where a kind of geothermal gold rush can be experienced. A number of further plants are in design or under construction, e.g. in Bruchsal, Ettenheim, Karlsruhe, Kehl and Speyer.

Llithuania

Inauguration of first geothermal plant in Lithuania

Feliksas Zinevicius, Alfonsas Bickus, Vita Rasteniene, Povilas Suveizdis Lithuanian Geothermal Association

Since it first regained its independence in 1990, Lithuania (population 3.5 million, territory 65 300 km^2) has been in transition to a free market economy. During the last fourteen years great efforts have been made to lay foundations for the market economy: privatization of companies, liberalization of trade conditions and the prices of almost all products.

Lithuania inherited a powerful energy sector based on foreign primary energy resources – crude oil, natural gas and nuclear fuel – imported from Russia. Lithuania has no transmission lines from or to Western countries.

The territory of Lithuania is in the marginal area of the western part of the Precambrian East European platform. The main tectonic elements in the Precambrian crystalline basement are the Baltic Syncline and its slope, the Masurian-Belarusan Anticline, and the Latvian Saddle. The western part of Lithuania is characterized by an average depth to the Moho of 40 km, with the depth increasing to 44-47 km in the central part. It was also established that the specified large geoblocks in the structure have a number of deep faults (penetrating as deep as the mantle) with a significant subvertical displacement in the deep strata though the amplitude is insignificant at surface. Increased

geothermal parameters are typical in the western part of Lithuania, with a heat flow of about 100 mW/m^2.

The first geothermal investigations in Lithuania began in 1987-9. The geothermal potential was estimated for three regional hydrogeothermal complexes: Cambrian ($5.1x10^{18}$ J), Lower-Middle Devonian ($5.0x10^{18}$ J) and Middle-Upper Devonian $1.5x10^{18}$ J). Petrogeothermal resources were estimated down to 7 km ($7x10^{21}$ J).

In 1992-4 the Government of Denmark financed the Baltic Geothermal Energy Project (covering Lithuania and Latvia). The geothermal aquifer zones within the Devonian and Cambrian strata were studied in detail. Twelve urban areas (Klaipeda, Palanga, Siauliai, Silale, Silute, Gargzdai, Radviliskis and Joniskis in Lithuania, and Liepaja, Riga, Jurmala and Jelgava in Latvia) were selected with a view to a ranking of preference with regard to a geothermal pilot project. On the basis of this study and other investigations the Klaipeda Geothermal Demonstration Plant (KGDP) was engineered.

The Danish Environmental Protection Agency, the Government of Lithuania and the World Bank (IBRD) (with a loan of $US 5.9 million) have contributed to the establishment of the financial package required for the construction of the plant. The EU PHARE programme and the Global Environmental Facility Trust Fund also granted money for the project. The total budget was $US 19.5 million.

KGDP has two production and two injection wells (KGDP-2P, KGDP-3P, KGDP-1I and KGDP-4I respectively). They are identical in construction, with depths of 1128 m to 1228 m.

The geothermal water is extracted from the Devonian aquifer with submersible pumps in the production wells, passed through heat pumps and returned via injection wells to the same aquifer. Low-temperature geothermal heat is extracted from the geothermal water (38°C) using an absorption heat pump and is transferred to the Klaipeda district heating network. The total installed capacity of KGDP is 41 MW_t: 18 MW_t of geothermal and 23 MW_t from boilers (the drive for the absorption heat pumps). In June 2004 the State Commission confirmed a plant capacity of 35 MW_t (geothermal 13.6 MW_t).

The configuration of the absorption heat pump comprises an evaporator, an absorber, a condenser and a working fluid generator. The pump uses lithium bromide (LiBr) solution as the heat absorbent working fluid. The absorption heat pumps (4 x 4.5 MW_t capacity) are driven by hot water (175°C, 10 bar) from three hot water boilers (16.2 MW_t each).

In spite of technical problems, the Klaipeda Geothermal

Figure 1: *View of KGDP.*

Demonstration Plant (Fig. 1) is a reliable heat supplier capable of competing with traditional heat suppliers. The total amount of heat produced by KGDP has grown from 103 000 MWh in 2001 to 215 000 MWh in 2003. (Fig. 2).

In addition, more than 200 systems of ground-source heat pumps have been installed for heating in single family houses (total capacity - more than 3 MW_t).

The 6th conference of the Lithuanian Geothermal Association (LGA), convened to celebrate the inauguration of KGDP, was held in Klaipeda on 25-26/11/2004. The conference began on 25 November in the Hotel Klaipeda, which is the biggest and tallest in the old part of the city. A tour (bus trip) to KGDP was organized after the opening of the conference. During the official Inauguration ceremony at KGDP the participants were welcomed on behalf of the President of the International Geothermal Association (IGA), Dr. John Lund. In his absence, IGA Board member Beata Kepinska read out his welcoming address.

The technical part of the conference continued on 26 November with 15 papers being presented by authors

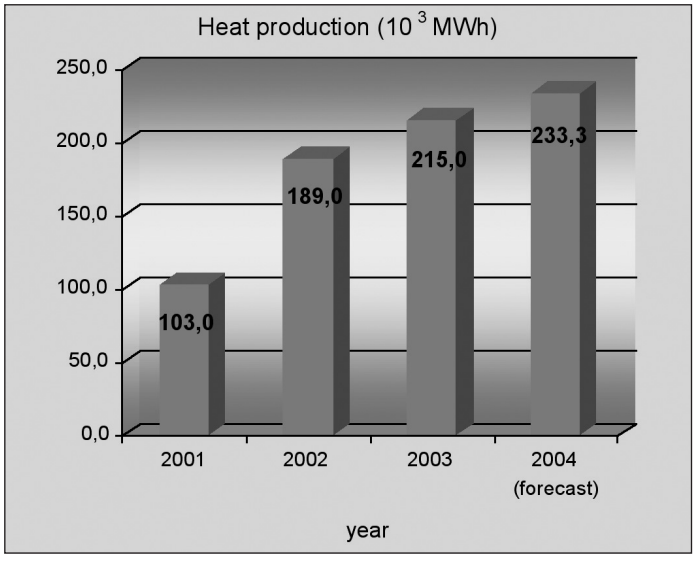

Figure 2: *Heat production at KGDP.*

from 7 countries: Denmark (Allan Mahler, DONG A/S), Iceland (Gudni Axelsson, ISOR), Poland (Beata Kepinska, LMA MEETI), Latvia (Indra Skapare, RTU), Belarus (Vladimir Zui, IGS), Slovenia (Peter Kralj, Gejzir Consulting) and Lithuania. Over 20 papers are available in the 133-page Proceedings distributed to 63 participants of the conference. Special thanks are due to authors who were unable to present their papers in person – Raffaele Cataldi (Italy), Kiril Popovski (Macedonia), Guido Cappetti (Italy), Mikhail Khvorov and Georgyj Zabarnyj (Ukraine).

Participants of the conference were given a city tour which included the Castle at the mouth of the Dane river. Built in 1252, the Castle gave birth to Klaipeda city so, on 1 August 2002, Klaipeda celebrated its 750th anniversary. Klaipeda, situated on the shore of the Baltic Sea, is the third largest city of Lithuania with more than 200 000 inhabitants. It covers 98.4 km2 and is an ice-free port, the only seaport in Lithuania. The average annual temperature is +8.4°C (January –0.6°C, July +19.4°C).

Cordial thanks are given to the Sponsors: Ministry of Economy; DONG A/S, Denmark; AB "Geonafta"; UAB "Genciu nafta"; AB "Klaipedos energija"; UAB "Sildymo technologiju centras"; UAB "Alropa"; AB "Montuotojas"; UAB "SOMIS".

Poland

GEOTHERMAL DIRECT USES IN POLAND, 2004

Beata Kepinska, Polish Academy of Sciences

GENERAL

In Poland, geothermal water has been used in several localities mainly for heating, balneotherapy and bathing and it is implemented on a semi-industrial scale for other purposes (the PAS MEERI Geothermal Laboratory's cascaded system, Podhale region). At the end of 2004, the total installed geothermal capacity amounted to 170.9 MW_t while heat sales were about 838.4 TJ (Table1). The main contributors to these figures were the Podhale

Table 1. *Poland – summary of geothermal direct uses (end of 2004)*

Type of use	Installed thermal power, MW_t	Energy use, TJ/yr
Space heating and warm water supply*	82.8	306.5
Balneotherapy and bathing	6.8	26.9
Greenhouses, fish farming, drying	1.0	4.0
Other – extraction of CO_2, salts	0.3	1.0
Ground-source heat pumps	~ 80.0	~ 500
TOTAL	170.9	838.4

* including 23.56 MWt and 74.45 TJ/y from absorption heat pumps

Figure 1. *Poland, 2004: geothermal plants in operation or under construction, and spas using geothermal waters (division into geothermal provinces after Sokolowski, 1993).*

plant (41.2 MW_t, and 187 TJ) and ground-source heat pumps, a technology that has recently begun to develop in the country (about 80 MW_t and 500 TJ in 2004).

Geothermal space heating plants

Five geothermal space heating plants are operational: in the Podhale region (since 1992); in Pyrzyce (since 1996); in Mszczonow (since 1999); in Uniejow (since 2001); in Slomniki (since 2002).

As each of these plants is based on geothermal waters with different characteristics and serves different numbers of consumers, they operate on the basis of different schemes and vary considerably as far as thermal capacity and heat production are considered. Among them are plants with slight gas peaking (Podhale), integrated plants with considerable gas contribution (Pyrzyce, Mszczonow, Uniejow) and plant integrating geothermal heat pumps with gas and fuel oil boilers (Slomniki). Three plants are based on well doublets with spent geothermal water being injected back to the aquifers, while two of them use single wells and and the cooled geothermal water is used for drinking (Table 2).

Podhale region. In that region, the biggest geothermal heating project in the country has been underway since the beginning of the 1990s. Its pilot stage was launched in 1992. Heat supply is based on geothermal, with gas peaking. The main aquifer (artesian) lies in the Triassic and Eocene carbonates at depths of 1 to 3.5 km. Reservoir temperatures reach 80-90°C. The maximum flowrates vary from 50 to 150 l/s of 82-86°C water. The TDS are around 0.1-2.5 g/l.

By autumn 2001, the heating network was based on one doublet of wells and supplied heat to over 220 buildings and cascaded system (about 21 TJ/y) (Kepinska et al., 2000). In late 2001 it was extended by two new wells (Table 3), other surface facilities (including, among others, a 14 km main transmission pipeline, geothermal base load plant and gas peak load plant, and distribution networks)

Plant	Open in year	Reservoir $T_{wellhead}$, TDS	Installed power, MW_t		Working scheme	Remarks
			geothermal	total		
Podhale	1992/93	Carbonates, Triassic / Eocene 82-86ºC, TDS<3 g/l	38	42	Geothermal, Gas peaking	Under extension; Target 80 MW_t, 600 TJ (or even more); 2 production + 2 injection wells
Pyrzyce	1996	Sandstones, Jurassic 61ºC, TDS 120 g/l	13	48	Integrated: Geothermal + heat pumps + gas boilers	Completed; 2 production and 2 injection wells
Mszczonow	1999	Sandstones, Cretaceous 40ºC, TDS 0.5 g/l	3.8	10.2	Integrated: Geothermal + heat pumps + gas boilers	Abandoned well adapted for geothermal use; Cooled water for drinking; 1-well system, no injection
Uniejow	2001	Sandstones, Cretaceous 60ºC, TDS 8 g/l	3.2	5.6	Integrated: Geothermal and gas boilers	Under extension; 1 well doublet
Slomniki	2002	Sandstones, Cretaceous 17ºC, TDS 0.4 g/l	0.3	2.3	Integrated: Heat pumps + peak gas boilers	Shallow aquifer; Low investment costs; Cooled water used for drinking; 1-well system, no injection

Table 2. *Poland – main data on geothermal space heating plants, 2004*

Well	Banska IG-1	Banska PGP-1	Bialy Dunajec PAN-1	Bialy Dunajec PGP-2
Year of drilling	1979-1981	1997	1989	1996-1997
Year of starting	1992	2001	1992	2001
Role in the system	Production	Production	Injection	Injection
Total depth	5261 m	3242 m	2394 m	2450 m
Reservoir depth	2565-3345		2113-2394 m	2048-2450 m
Lithology	Carbonate conglomerates, limestones, dolomites (Middle Eocene - Middle Triassic)			
Production casing	Casing 6 5/8", perforated interval 2588-2683 m	Casing 6 7x75/8", perforated interval 2772-3032 m, open hole 3032-3242 m	Casing 9 5/8", perforated interval 2117-22132 m, open hole 2132-2394 m	Casing 9 5/8", perforated interval 2040-2450 m
Maximum production	120 m^3/h	550 m^3/h		
Maximum wellhead temperature	82ºC	87ºC		
Static wellhead pressure	26 bar	27 bar	55-60 bar	55-60 bar
TDS	2.5 g/dm^3	2.7 g/dm^3		
Maximum injection capacity			200 m^3/h	400 m^3/h

Table 3. *The Podhale region – main data on geothermal wells exploited for space heating*

and linking a considerable fraction of the consumers in Zakopane – the main city of the region (population 30 000, over 3 million tourists per year). As a result, the heat use has increased significantly: in 2003 and 2004 the installed geothermal capacity was 41 MW_t (not fully used yet) and heat sales amounted to 187 TJ in 2003 (the total including peak gas was 247 TJ). By the end of 2003, over 400 individual consumers, 120 large-scale receivers and 25 local coal-fired space heating plants that supplied over 100 blocks of flats were connected to geothermal network.

According to the initial project assumptions, geothermal was planned to supply the majority of buildings in the region by 2005. In 2003, the project's target capacity was reviewed and defined as ca. 80 MW_t, and heat production as ca. 600 TJ/y (Dlugosz, 2003). In 2004, further activities were undertaken to determine the ultimate geothermal capacity and heat sales that could be achieved under current economic and market circumstances. It appears that these figures may increase if proper sources of financing are available. Along with the construction of a regional heating network, R&D has been carried out on cascaded uses (PAS MEERI Geothermal Laboratory). The system comprises wood drying, greenhouse, fish farming and foil tunnels on a heated soil.

In the case of Zakopane town, thanks to the introduction of geothermal heating annual average concentrations of particulate matter PM_{10} and SO_2 have dropped by about 50% in comparison to the period before this heating type was put on-line. Moreover, during the heating season of 2001/2002 the SO_2 concentration dropped by 67% as compared to the situation prior to geothermal heating. The ecological effect is expected to increase along with the growing geothermal heat sales as a result of connecting new consumers.

Pyrzyce. The heating plant has been in operation since 1996. The aquifer is situated within the Jurassic sandstones at the depths of 1.5-1.6 km. It is exploited by two production and two injection wells. The maximum flowrate is 100 l/s of 61°C water. The TDS are 120 g/l. The plant's maximum installed capacity is 48 MW_t including 14.8 MW_t geothermal and 20.4 MW_t from heat pumps and 12.8 MW_t from gas boilers. The plant supplies district heating and warm water to 12 000 users out of the town's total population of 13 000. The network water parameters are 95°C/40°C (winter) and 60°C/45°C (summer).
In 2003 geothermal heat sales were 72 TJ/y, about 42 TJ extracted directly by exchangers and 30 TJ from heat pumps (Table 3) while the total heat sales were 146 TJ/y. Basically, the exploitation and technical parameters of the plant remain these same as during the past years.
However, both the thermal capacity and heating network were oversized during project planning in the early 1990s. The current maximum thermal demand is ca. 27 MW_t. Thermal demand decreased significantly after the plant had been launched because of the closure of several factories (planned to be supplied with geothermal heat), thermal modernisation of buildings, bigger energy saving due to installation of thermostatic valves and water-meters by individual heat receivers and, last but not least, by higher outside temperatures in recent years The relatively high costs of produced heat and its price are the result of partial utilisation of installed capacity and the large share of gas. Introducing geothermal energy for space heating pur-

poses resulted in reduction of CO_2 emissions to 4 500 tonnes/y as compared to 85 000 tonnes/y before the geothermal plant was launched.

Mszczonów. The heating plant was launched in 1999. A maximum 12.5 l/s of 41°C water is produced from the Cretaceous sandstones through a single well drilled in the 1970s and refurbished for geothermal production in 1996-7. The adaptation of an abandoned well (instead of drilling a new one) significantly reduced investment costs (Bujakowski, 2000). The plant, with a total installed capacity of 10.2 MW_t, uses geothermal water both for heating and drinking. The heating part of the plant operates as an integrated system: the district heating water is heated to the required temperature by the heat extracted from geothermal water and gas boilers fitted with a 2.7 MW_t absorption heat pump and a 0.6 MW_t cooler. When cooled, geothermal water is supplied to the water works and then to consumers as a potable supply (TDS 0.5 g/l). In the heating season, ca. 30–35% of total heat sales comes from geothermal water (27 TJ in 2003). The plant replaced three traditional, low-efficiency heating plants based on coal dust- (ca. 4 500 tonnes/y). Other emissions were reduced by 75–100% (Bujakowski, 2003). Assuming identical work conditions and overheads, the costs of producing 1 GJ of heat in the gas boiler plant and in the coal-based plant are similar (gas being slightly more expensive) while in the case of Mszczonow geothermal plant, the cost of producing of 1 GJ is 25% lower.

Recently, the Municipality of Mszczonow has initiated activities aimed at construction of geothermal swimming and recreation facilities.

Uniejow. The integrated space heating plant was opened in 2001. The geothermal aquifer is situated within the Cretaceous sandstones at the depth of 1.9-2km. The maximum production is 18.8 l/s of 68°C water, and the TDS are 5 g/l. The water is exploited in one doublet system. The installed capacity of the plant is 5.6 MW_t, including 3.2 MW_t from geothermal and 2.4 MW_t from peak oil boilers. In 2003 about 50% of heat consumers in the town were supplied by this plant, while the number of connected clients amounted ca. 60%. The total heat sales in 2003 was ca. 20 TJ, with ca. 15 TJ from geothermal (Table 3). Work to connect some new consumers is planned. Because of valuable curative features, geothermal water started to be used for recreation and balneotherapy and research of its healing features are in progress.

Slomniki. A small heating system was launched in late 2002. It works as integrated one: a 17°C water produced from the Cretaceous sandstones and sandy limestones by a shallow (314 m) well – heat pumps – gas and fuel oil boilers. The total installed capacity amounts 2.3 MWt, including 0.3 MW_t from geothermal water being a low source for heat pumps, while the rest comes from gas and fuel oil boilers. The system supplies the school building and two blocks of flats.

When the outside temperature is above -5∞C, heat supply is based on geothermal heat pumps (0.25 TJ in 2003) and if it is lower than this value, the system is switched into gas and oil boilers. After cooling in heat pumps, water is sent to the water works as a potable supply (TDS 0.4 g/l). Several other public buildings and a residential housing estate will be connected to the system (Bujakowski, 2003).

Geothermal heat pumps

The country is seeing a growth in the use of geothermal heat pumps. Absorption pumps have been working in three geothermal plants: in Pyrzyce two pumps of 20.4 MW_t total capacity produced about 42 TJ in 2003. In the case of two other plants, geothermal heat production is entirely based on these devices: in Mszczonow, the installed capacity is 2.7 MWt and heat sales were 27 TJ in 2003, while in Slomniki the respective values were 0.35 MW_t and 0.25 TJ/. These pumps contribute to 23.5 MW_t and 69.25 TJ total.

Ground-source and groundwater heat pumps have also been installed for individual consumers and office buildings. According to the available data (Rubik, 2004; Rubik, *personal communication*) one can estimate at least 8 000 ground-source pumps within the country. Their total installed capacity is at least 80 MW_t and heat production can be estimated at 500 TJ/yr. Interest in heat pumps has increased in recent years especially after their purchase and installation started to be supported by the national and regional environmental protection funds or by profitable credits offered by the Bank of Environmental Protection. The observed growth is also connected with the fact that several domestic companies entered the market offering heat pumps cheaper then those made by the foreign producers.

REFERENCES

Bujakowski, W. (2000). The first in Poland reconstruction of deep well Mszczonow IG-1 to heating targets. Proceedings of the World Geothermal Congress 2000, Japan. pp.3385-3390.

Bujakowski, W. (2003). Geothermal energy: a review of Polish experience. *Proceedings of the International Conference 'Cleaner energy systems through the use of renewable energy sources'*. Krakow. pp. 97-108.

Dlugosz, P. (2003). Podhale – S-Poland – Geothermal District Heating System. Geothermics 32, pp. 527-533.

Kepinska, B., Bujakowski, W., Ney, R. (2000). Geothermal energy country update report from Poland, 1995 –1999. *Proceedings of the World Geothermal Congress 2000 Japan*, pp. 253-259.

Rubik, M. (2004). Heat pumps in Poland - implementation and development. Magazyn Instalatora. No. 10 (74). October 2004 (in Polish).

Rubik M. (2004). Personal communication.

Sokolowski, J. (1993). Geothermal resources in Poland and possibility of their utilization in environmental protection. *Exploration Geology, Geosynoptics and Geothermal Energy.* No. 5-6. pp.67-80.

Sokolowski, J., D_ugosz, P., Bujakowski, W. (1992). The first in Poland Experimental Geothermal Plant. Exploration *Geology, Geosynoptics and Geothermal Energy.* No 6. pp. 9-18.

The Strategy for Renewable Energy Resources Development. The Ministry of Environment. Poland (2000)

THE AMERICAS

Mexico

XII Annual Meeting of the Mexican Geothermal Association

Luis C.A. Gutiérrez-Negrín, Mexican Geothermal Association

On November 5, 2004, the twelfth ordinary annual meeting of the Mexican Geothermal Association (Asociación Geotérmica Mexicana : AGM) was held in Juriquilla, State of Querétaro, Mexico. This meeting occurred within the IV National Meeting of Earth Sciences (IV RNCT: Reunión Nacional de Ciencias de la Tierra).

The IV RNCT was organized by the Mexican Geological Society (SGM: Sociedad Geológica Mexicana) to celebrate its centennial and was supported by nine other Mexican associations related to Earth Sciences, including the Asociación Geotérmica Mexicana. There were more than 800 participants and 745 papers were presented, arranged in four *simposia*, 14 regular sessions and 21 special sessions. Thirteen invited conferences were presented, one of which was *Electric generation from geothermal origin in Mexico*, by Alejandro Abril, head of the geothermal division of the Comisión Federal de Electricidad (CFE) and the new president of the AGM.

The Special Session 15 was devoted to geothermics, under the theme *One hundred years of geothermal energy*, and eleven papers were presented orally. These papers were presented by members of the AGM, involving geochemical, geophysical and modelling studies on the Mexican geothermal fields and zones of Cerro Prieto, Los Azufres, Los Humeros, Las Tres Vírgenes, Maguarichic and Bahía Concepción, and some exploratory studies and methods.

The official meeting of the AGM then took place under the leadership of the President of the AGM, Rosa María Barragán. One item of the agenda was the election of the new Directive Council of the AGM for the period 2005-2006. Election ballots had been previously distributed among the membership, and the results of voting led to the following council:

Some participants of the AGM meeting.

President: Alejandro Abril-Gaspar (CFE)
Vice-president: José Luis Quijano-León (CFE)
Secretary: Rogelio Vázquez-González (CICESE: Centro de Investigación Científica y Estudios Superiores de Ensenada)
Treasurer: Luis C.A. Gutiérrez-Negrín (CFE)
Pro-secretary: Alfonso García-Gutiérrez (IIE: Instituto de Investigaciones Eléctricas)
Pro-treasurer: Octavio Lázaro-Mancilla (UABC: Universidad Autónoma de Baja California)

USA

The 30th Stanford Workshop

By Roland Horne, Stanford University

The Stanford Geothermal Workshop took place for the 30th time, on January 31 to February 2, 2005, on the Stanford University campus. First held in 1975, the Stanford Geothermal Workshop is a scientific and technical meeting attended typically by 100-150 geothermal scientists and engineers from the US and from across the globe. As an international meeting, the Stanford Geothermal Workshop has become one of the primary forums for presentation and discussion of new ideas associated with geothermal energy development. The workshop format, less formal than a conference, promotes interaction among participants, and encourages attendees to offer their ideas under development as well those already completed. In three days of meetings, approximately 70 papers were presented, involving 120 participants from 12 countries overall. Participants at the conference banquet were treated to a dramatic performance of Taiko drums, from Stanford Taiko, the student musical performance group.

The 30th Workshop celebrated the persistence of the scientific endeavor in developing and improving this important renewable energy source. The current energy future of the western US, like that in much of the world, holds strong hope for green energy sources. In this environment, interest in the benign use of geothermal energy has been renewed. With only a tiny fraction of the greenhouse emissions of conventional fuels, and minimal environmental impact, the geothermal energy field is expanding. Geothermal developments already represent the largest implementation of renewable energy worldwide, and exceed the production of energy from wind and solar.

The Stanford Geothermal Program was founded in 1974 by Profs. Paul Kruger, Lou London and Hank Ramey, as an interdisciplinary research program between the Departments of Civil Engineering, Mechanical

Engineering and Petroleum Engineering. Over the 30 years since its inception, more than 120 geothermal engineers have graduated from the program with MS or PhD degrees, and this cadre of engineers has formed an important backbone of the geothermal industry worldwide. Graduates of the Stanford Geothermal Program have taken positions in the US, Mexico, Costa Rica, Turkey, Kenya, Japan, Philippines, Indonesia, and New Zealand, and many have been involved as consultants or expatriates in several other geothermal countries.

The program has maintained its level of research and student participation throughout its 30 year life. Profs. Kruger and London have since retired, and Profs. Ramey is deceased. The program is headed currently by Prof. Roland Horne and Senior Research Engineer Kewen Li in the Dept. of Petroleum Engineering, and has five graduate research students pursuing either the MS or PhD degrees. A number of undergraduate students have worked in the geothermal laboratories also, in undergraduate research projects.

The principal research focus of the program has followed a number of different paths over its 30 year life, however the common thread has been improving the efficiency of geothermal energy utilization by better understanding of how fluid and energy are transported through permeable rocks. The production of fluid from the ground, and the reinjection of spent water and dissolved materials, remains a significant source of uncertainty in geothermal energy development. The geological complexity of volcanic rocks makes it difficult to predict in advance how the geothermal reservoir is likely to perform. This uncertainty causes delays in development, raises the project costs, and makes financing more difficult. Improving the forecast of reservoir behavior will render geothermal energy a more viable and a more efficient resource.

GRC 2005 Annual Meeting and GEA Geothermal Energy Trade Show

The Geothermal Resources Council (GRC) will convene its 2005 Annual Meeting at the Reno Hilton in Reno, Nevada, on September 25-28, 2005. With co-sponsorship by the U.S. Department of Energy Geothermal Technologies Program, the GRC 2005 Annual Meeting will feature a 3-day Technical Program and poster session, a companion Geothermal Energy Association (GEA) Trade Show, workshops, field trips, and a number of optional events. Complete GRC Annual Meeting details are posted on the GRC website at: www.geothermal.org. Or contact the GRC directly at P.O. Box 1350, Davis, CA 95617-1350. Phone: (530) 758-2360. Fax: (530) 758-2839. E-mail: grc@geothermal.org. Exhibitors should contact the GEA, 209 Pennsylvania Ave. SE, Washington, DC 20003. Phone: (202) 454-5261. Fax: (202) 454-5265. E-mail: Daniela@geo-energy.org. Website: www.geo-energy.org.

AFRICA

Uganda

Geothermal Energy in Uganda

Godfrey Bahati, Department of Geological Survey and Mines, Entebbe, Uganda.

INTRODUCTION

Uganda is one of the countries located in the western branch of the East African Rift System and based on surface manifestations has great potential for geothermal energy development. For more than a decade, the Government of Uganda (GoU) has supported a geothermal exploration programme to provide electricity or direct heat to rural areas for domestic power, agriculture and industrial processing. The three main areas under investigation are Katwe, Buranga and Kibiro (Figure 1). A summary of the current results is presented in this paper.

Figure 1: *Three main geothermal areas of Uganda.*

RESULTS

The results so far obtained can be described under four disciplines; geology, geochemistry, hydrology and geophysics.

Geology

Geological settings and geotectonic studies have shown Uganda as very promising for geothermal development. The Katwe prospect is characterized by explosion craters and ejected pyroclastics and tuffs with abundant granite and gneissic rocks from the basement. The deposit is grayish, generally coarse-grained and calcareous. Also present are occurrences of lava in Lake Kitagata and Kyemengo craters which is evidence for a powerful heat source. Kibiro and Buranga lie in a tectonically active belt and recent aero-magnetic surveys have mapped magmatic intrusions in the vicinity of the two prospects which are believed to be the source of heat for the two areas.

Geochemistry

The Kibiro hot spring water is characterized by a neutral pH and low total dissolved solids (TDS) of about 4-5g/l suitable for most types of utilization. The Buranga waters have salinity of about 14-17 g/l and pH of 7-8 while the Katwe waters have higher salinity of 19-27 g/l and a pH of about 8. Deep reservoir temperatures based on solute geothermometry and mixing models are 140-200˚C, 120-130˚C, and 200˚C for Katwe, Buranga and Kibiro respectively. The fluids are suitable for electricity generation and direct heat application in agriculture and industry. The possibility of mineral recovery from the Katwe and Buranga brines has yet to be investigated.

Hydrology

Katwe and Buranga are possibly recharged from higher elevations most likely in the nearby Rwenzori Mountains while the source for Kibiro is possibly from a higher elevation represented by the Mukihani-Waisembe ridge, 20 km southeast of Kibiro. Isotope geothermometry predicts temperatures of 130–140°C, 200°C and 110–135°C for Katwe, Buranga and Kibiro respectively. The highest temperatures at Buranga might reflect an older system which has probably cooled over time to 120–130°C. The Kibiro results probably reflect low temperatures due to mixing with cooler groundwater while the Katwe results probably reflect a true subsurface temperature since they are not in conflict with solute geothermometry temperatures. Reservoir rock types in Katwe are most likely basalt (leucites and melilites) and ultramafic xenolith; but granitic gneisses in Buranga and Kibiro. The major source of salinity in the three areas is rock dissolution, but some magmatic input is suggested.

Geophysics

The GoU with support from the African Development Bank and the Government of Iceland have carried out preliminary geophysical surveys in Katwe and Kibiro in 2003 and early 2004 respectively. The results of the geophysical surveys indicated the existence of geothermal systems in the two areas which is supported by the low resistivity and high gravity anomalies. In both areas, the areal extent of the low resistivity proved larger than expected, an indication that the anomaly is somewhat larger and extends beyond the surveyed area. The GoU is soliciting further support from the World Bank and Government of Iceland to complete the geophysical surveys in Katwe and Kibiro. The German Geological Survey (BGR) is supporting geophysical surveys in Buranga. The results of the surveys will update the geothermal models of the three areas to pre-feasibility status.

CONCLUSIONS

1. Chemical and isotopic geothermometry has revealed high subsurface temperatures in all the three areas suitable for electricity generation and direct heat application.
2. Preliminary results from geological and geophysical surveys in Katwe and Kibiro indicate a large extent of the geothermal anomalies whose boundaries have yet to be delineated by additional geophysical mapping.
3. The pre-feasibility studies in the three areas will soon be completed. The results will be a basis for the design of the feasibility study that will involve drilling of exploration wells and installation of the first geothermal power plants in Uganda.

ASIA/PACIFIC RIM

Indonesia

The Bedugul Geothermal Field, Bali (Indonesia)

M. P. Hochstein (Geology Dept., Univ. of Auckland, NZ),

R. Mulyadi and E.J. Joenos (Bali Energy, Denpasar, Indonesia)

The 2.45 km deep well, BEL-03, in the Bedugul Geothermal Field (Bali) has been successfully discharged since May 2004. The well (9 5/8 inch diameter) discharges c. 40 t/h fluids at 14 bar separation pressure with a 'flowing enthalpy' of c. 2600 kJ/kg. The fluids are produced from a 2-phase zone within a liquid-dominated reservoir lying below 2 km depth (bottom-hole temperature is c. 300 deg C). A second well of similar design and depth (BEL-02) has been stimulated, also using liquid nitrogen, and it produces fluids with variable flow and a somewhat lower enthalpy since October 2004. Both wells have been brought to discharge more than 6 yr after their completion in early 1998. A third, nearly 2.7 km deep well (BEL-01) was drilled near a small volcanic cone and encountered > 310 deg C at the bottom; however, the well is not productive. The location of the three deep wells, with their well

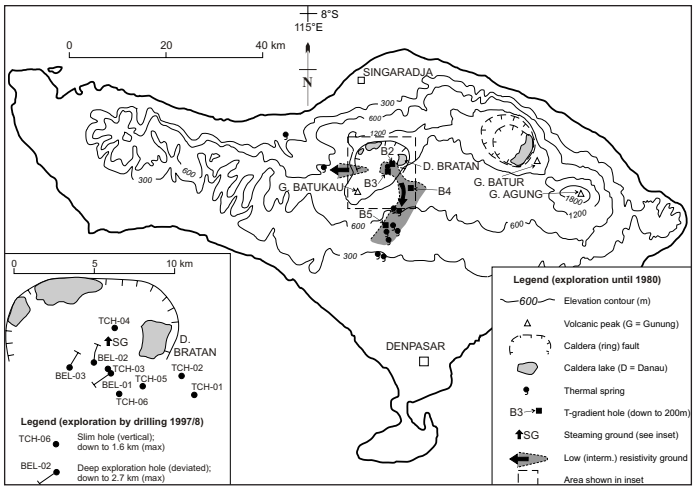

Fig.1. *Map of Bali showing the location of the geothermal prospect in the Bratan Caldera and preliminary exploration results (until 1980); inset A shows the location of slim holes and large diameter exploration holes in the Bedugul Field drilled in 1997/98.*

heads at elevations between 1470 to 1570 m, is shown in the inset on Fig.1.

The recent tests mark the end of a 30 year long period of 'on and off' geothermal exploration of the Bratan Caldera prospect, as it was called in 1974, taking its name from a nearby quasi-ephemeral caldera lake (Danau Bratan) , when the prospect was first investigated as part of a New Zealand bilateral aid project. Exploration was continued after 1976 by Pertamina, the Indonesian State Oil company. Until 1981, low resistivity rocks had been located by DC-resistivity surveys beneath the central part of the caldera (Soetantri and Prijanto, 1982). It was inferred that the associated thermal reservoir feeds two concealed outflows with bicarbonate waters that discharge at elevations between 650 and 300 m from numerous thermal springs over the southern and the western flanks (Fig.1). Temperature-gradient holes, down to 200 m deep, were drilled inside and outside the caldera (Fig.1). Extrapolated data from holes B2 and B3 located inside the caldera indicated that temperatures > 100 deg C would occur at depths > 0.5 km in the central part of the caldera and that any high temperature reservoir lies at much greater depth. This setting explains the lack of surface manifestations except for a small patch of steaming ground (SG in Fig.1) near an old temple (Candi Terataibang) at c. 1400 m elevation which is active only during the dry season. The first exploration model was described by Mulyadi and Hochstein (1981).

Further deep resistivity surveys (MT studies) were conducted in 1987; however, exploration drilling was stalled until 1994 when the project attracted investment by a major US developer. In November 1994, Bali Energy, a joint venture between California Energy and a local company signed a Joint Operation Contract with Pertamina and an Energy Sales Contract with the State Electricity Co. PLN to develop a 4 x 55 MW electrical power plant (a contract signed in the absence of any discovery well). The project was re-named after the Bedugul tourist resort, c. 2 km south of Danau Bratan, and became known as the Bedugul project. The project was re-started with additional geophysical surveys (TDEM-MT surveys) leading in 1997 to the drilling of 'slim holes' (TCH-1 to TCH-6, see inset on Fig.1) to delineate the temperature- and geological structure of the prospect. The holes had a diameter of 2 and 3/8 inch and were fully cored; they were drilled down to between 1.3 and 1.6 km depth (except for TCH-2 which is only 0.7 km deep). The slim holes confirmed the earlier model that high temperatures only occur at great depths inside the caldera. Low temperatures (< 50 deg C), for example, were still encountered down to 1.0 km depth in TCH-04, drilled c. 1 km north of the small steaming ground area (see inset in Fig.1). Below 1 km depth, temperatures increase in this hole almost linearly to c. 240 deg C at 1.6 km depth. The three large diameter exploration wells were sited using the results of the slim holes and of a TDEM-MT survey; they were drilled in late 1997 and early 1998, immediately after completion of the slim hole program. Well BEL-01 was sited near slim hole TCH-03 and was deviated to the SW to intercept at the bottom some fractures beneath a small young volcano.

As a result of the 1997-1998 financial crisis, the Indonesian Government suspended seven geothermal projects with foreign investments; the list included the Bedugul project. California Energy stopped all operations in Bali and did not test any of the completed three deep wells (BEL-01, 02, 03) which were pressurized and sealed to allow for later testing. The Indonesian government invited investors to continue with the Bedugul Project whose assets were taken over in 2002 by the re-constituted 'Bali Energy' company (mainly Indonesian owned). 'Bali Energy', as the present developer of the field, started with testing of the deep wells in 2004. In a strict sense, well BEL-03 is the 'discovery well' of the Bedugul Field. The well is also the discovery well of one of the deepest high temperature geothermal reservoirs ever explored successfully.

References

Mulyadi, R., and Hochstein, M.P. (1981). Exploration of the Bratan Caldera geothermal prospect (Central Bali). Proceedings NZ Geothermal Workshop 1981, Univ. of Auckland, pp. 189-193.

Soetantri, B. and Prijanto (1982). Assessment of the reservoir potential of Bali Geothermal Field, Indonesia. Transactions (3rd) Circum-Pacific Energy and Mineral Resources Conference, pp.459-464.

Philippines

IN MEMORIAM

Nemesto Noel A. Urmeneta
By Jim Stimac

Our dear friend and colleague, Noel Urmeneta, passed away on December

15, 2004 at 1:20 p.m. He left behind his parents and his sisters Adette and Jet. Noel obtained his Bachelors degree in Physics from the University of the Philippines, and his Masters in Petroleum Engineering from Stanford. He worked as a Reservoir Engineer for both PNOC-EDC and Unocal Philippines, Inc. during his career and was known by everyone in the Philippine geothermal community. He was a "founding father" of the National Geothermal Association of the Philippines through his participation in the Ad Hoc Committee that guided the organization's inception in 2002. He was a cherished friend to many, and ebullient spirit and his warmth will be missed by all. A website in his honor can be found at http://www.noelurmeneta.com/

Antonio Yee named President and General Manager of Unocal Philippines, Inc.

Ed Sevilla, Unocal Philippines

Unocal Philippines, Inc. (UPI) has announced that Antonio F. Yee has been appointed president and general manager, effective Jan. 1, 2005. Yee, 47, is a Filipino national who joined UPI in 1979 as a warehouseman and thereafter held a series of positions with increasing responsibilities at Unocal geothermal facilities in Indonesia and the United States. In 1992, he was assigned to lead the Salak start-up team in Indonesia. He returned to UPI in 1995 as Manager of Engineering and Construction Processes. In 1996, he became the Operations Manager at the Mak-Ban field. In 1997, he was assigned to the Geysers in Northern California as its Asset Manager.

Tony returned to UPI as Mak-Ban Asset Manager in 1999, leading Mak-Ban to record generating performances, and was named Senior Vice President and General Manager in August, 2002.

This advancement affirms Unocal's commitment to advancing national employees in its global operations. Currently, 10 of 13 UPI senior managers and 98 percent of its 416-employee workforce are Filipino nationals and are among the most capable members of the energy industry worldwide.

Yee has a Bachelor of Science degree in Mechanical Engineering from the University of Santo Tomas in Manila. He completed the Executive Development Program at the Kellogg School of Management, Northwestern University in the United States.

UPI is currently managing a US $26 million capital project to enhance the steam field capabilities in both Tiwi and Mak-Ban geothermal facilities. The projects include upgrades to facilities and new drilling to ensure the sustained and long-term commercial production of this clean, reliable, and affordable energy source.

OCEANIA

New Zealand

NZGA holds AGM, Elects new Board, Holds Successful Seminar

Jim Lawless, Past President NZGA

In December the New Zealand Geothermal Association held its annual general meeting Many of the existing Board stepped down after serving two terms, and a new Board and officers were appointed. The new Board comprises:

Colin Harvey (President), Mike Mongillo (Vice-President), Alison Jäppinen (Secretary and Chair of the Information and Education Committee), Bruce Carswell (Treasurer), Judith Magyari, John Bottomley, Alistair Maxwell, Greg Raasch (Chair of Nomination Committee), John Burnell, Kevin Brown, Pat Brown, Mike Glucina, Murray Stanley and Jim Lawless (Past President and Chair of Regional Branch Formation Committee).

At the AGM Members voted to endorse and ratify a paid Executive Officer position which will enable the Association to operate at a professional level unable to be achieved in the past by voluntary labour alone. Brian White was selected for the position. Successful fundraising will be crucial to make the position viable and already many in the Industry have contributed generously in support.

A highlight was the Members voting Honorary Life Membership on Trevor Hunt, Derek Freeston and Manfred Hochstein for their substantial contributions to geothermal in New Zealand.

The AGM was held in conjunction with this year's Geothermal Workshop, the 26th. A departure from past custom saw the workshop held in Taupo rather than Auckland. It was combined with the New Zealand Geological Society and Geophysical Society annual conferences to constitute the "GEO3 Conference". A particularly pleasing aspect from the geothermal point of view was that the other Societies made a point of running special sessions on the Taupo Volcanic Zone, the heart of New Zealand's geothermal power. We are a long way from a full understanding of this unique part of the Earth's crust but recent research presented at the conference has moved us well down that path.

The NZGA also held a on-day seminar with an industry focus at which policy issues in relation to geothermal were discussed. It was well attended including representatives from local and cental Government. The Associate Minister of Energy gave a keynote address Among many other interesting presentations two that were a change of focus from the more technical discussions were on the Maori (indigenous) perspective on geothermal development, and one by a journalist on public perceptions of geothermal in New Zealand. The day wrapped up with some in-depth discussion on the way forward.

Geothermal exploration and development is more vigorous in New Zealand than it has been for some time. We look forward to exciting things happening in geothermal in New Zealand over the next year.

UPCOMING EVENTS

26th Annual PNOC-EDC Geothermal Conference. Manila, Philippines, 9-10 March 2005. Contact: Arnel Mejorada, email: geothermalcon@energy.com.ph

The Cairo 9th International Conference on Energy and Environment. Cairo and Sharm El-Sheik, Egypt, 13-19 March 2005. Contact: Abdel Latif El-Sharkawy, email: president@sat-eng.com . Website: http://ee9.sat-eng.com

TAIEX Workshop "Regulatory and Economic Tools Governing the Enhanced Exploitation of Geothermal Energy in the European Union". Kistelek, Hungary, 6-8 April 2005. Contact: Tamás Hámor hamort@mgsz.hu. Website : http://taiex.be

World Geothermal Congress and Exhibition WGC2005. Antalya, Turkey, 24 – 29 April 2005. Website: www.wgc2005.org

International Conference "Mineral Extraction from Geothermal Brines", Petropavlosk-Kamchatsky, Russia, September 12-16, 2005. Websites: English version http://geoheat.oit.edu/minerals/minerals.htm, Russian version http://www.gesa.ru. Contacts: R. Gordon Bloomquist (bloomquistr@energy.wsu.edu), John Lund (lundj@oit.edu), Oleg Povarov (povarov@geotherm.ru), or Yuri Trukhin (nigtc@kcs.iks.ru).

Symposium of the Geothermal Council of China Energy Society. Beijing, China, 14-18 September 2005. Contact: Keyan Zheng, e-mail kzheng@public3.bta.net.cn

International Geothermal Conference "Renewable Energy: **Problems and Prospects".** Makhachkala, Republic of Daghestan, 19 – 22 September 2005. Contact: Alibek Alkhasov, email: danterm@xtreem.ru website: http://www.geoterm.iwt.ru/info-e.htm

GRC Annual Meeting. Reno, NV, USA, 25 – 28 September 2005. website: www.geothermal.org.

International Conference and Exhibition "Renewable Energy 2006". Makuhari Mese, Chiba, Japan, 9-13 October 2006. Website: www.re2006.org.

This issue of IGA News was edited by Eduardo Iglesias. John Garnish proofread the articles. Valgardur Stefansson at the IGA Secretariat produced it. Layout and printing by Gutenberg, www.gutenberg.is

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 consist of the IGA Information Committee:

Eduardo Iglesias, Mexico (Chairman)
Nilgun Bakir, Turkey
Werner Bussmann, Germany
John Garnish, United Kingdom
Alimin Ginting, Indonesia
Gestur Gíslason, Iceland
Luis Gutiérrez-Negrín, Mexico
Roland Horne, USA
Beata Kepinska, Poland
Jim Lawless, New Zealand
Marcelo Lippmann, USA
Zbigniew Malolepszy, Poland
Adele Manzella, Italy
Rosa María Prol-Ledesma, Mexico
Sylvia Ramos, Philippines
Tingshan Tian, China
Joaquin Torres-Rodriguez, Mexico
Francois-David Vuataz, Switzerland
Kasumi Yasukawa, Japan

Note: The Information Committee is seeking new members from regions of the world not represented by the above membership. If you would like to join us and are ready to collaborate as indicated below, please contact Eduardo Iglesias at iglesias@iie.org.mx

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 Samorka
Sudurlandsbraut 48, 108 Reykjavík, Iceland
fax: +354-588-4431
e-mail: iga@samorka.is

Contributions to the next issue of IGA News must be received by 10 May 2005.

APPLICATION FOR MEMBERSHIP

Please complete the following form and return it with payment to:
International Geothermal Association Secretariat
c/o Samorka
Sudurlandsbraut 48, 108 Reykjavik, Iceland
tel: +354-588-4437; fax: +354-588-4431; e-mail: iga@samorka.is
IGA Home Page: www.geothermal-energy.org

❒ Enrol me as a new member of IGA ❒ Renew my membership to IGA

Dr Mr Mrs Ms (circle) _____ (family name(s)) _____ (first name(s)) Profession _____

Business/Organization/Enrolled at (for students) _____

Address: ❒ Work ❒ Home _____

phone (area code) _____ fax (area code) _____ e-mail _____

MEMBERSHIP CATEGORY

❒ Individual / USD 30 ❒ Corporate / USD 300 ❒ Sustaining: individual / USD 100
❒ Student / USD 5 ❒ Institutional / USD 750 ❒ Sustaining: corporate / USD 1000

Note: the information you provide will be held on the IGA database. It will be used to update you on the activities of the Association, and may be changed or cancelled at any time upon your request. It will be included in the IGA Directory, which may be circulated in printed or electronic form to IGA members only. If you do not wish your details to be used for this purpose, please tick the box **(in which case your name will not be printed in the IGA Directory)**. ❒

REPRESENTATIVES (Corporate and Institutional only. Both are entitled to three representatives.)

Name (contact person) _____

Name (other) _____ Name (other) _____

All payments must be made to the International Geothermal Association by:

❒ International Wire Transfer in USD to the Secretariat of the International Geothermal Association (Please notify the Secretariat by fax or e-mail when you wire funds).
Account # 1154-38-100550, SPRON - Skeifan 11, P.O. Box 1150, 121 Reykjavik, Iceland.
SWIFT Code: LSIC IS RE IBAN IS94 1154 38 100550 460395 2679

❒ Bank draft, company or personal check in USD.

❒ Master Card ❒ American Express ❒ Visa

Card # _____ Expiration date _____
Signature _____ Date of signature _____

2004 dues USD _____ 2005 Dues USD _____ 2006 Dues USD _____ 2007 Dues USD

Contribution USD _____
TOTAL USD _____

These financial data will not be stored on a database, and will not be recorded in any electronic form.

REDUCED SUBSCRIPTION RATES FOR *Geothermics*

Elsvier Science-Pergamon is pleased to offer members of the IGA a preferential subscription rate to the journal Geothermics.

Geothermics is published six times a year, with a normal 2004 subscription rate of USD 1124. IGA members, however, are eligible for one of the following yearly rates:

Individual / Student member **USD 76**
(saving USD 1048)
Corporate / Institutional member **USD 175**
(saving USD 949)

For more information on Geothermics and other publications by Elsevier, please check our Internet page "Elsevier Science Complete Catalogue of Journals and Books" (more than 12,000 at: *http://www.elsevier.nl)*
Please make your check payable to "Elsevier Science" and send it with your name and address to:

Elsevier Ltd., The Boulevard, Langford Lane,
Kidlington, Oxford OX5 1GB, UK

Rates for advertising in GA *News*

Space/Format	Size mm	Number of Issues	
		1	4 (per issue)
Full Page	185 x 245	USD 450	USD 350
Half Page (horizontal)	185 x 120	USD 310	USD 215
Half Page (vertical)	90 x 245	USD 310	USD 215
Quarter Page (horizontal)	120 x 90	USD 195	USD 155
Quarter Page (vertical)	90 x 120	USD 195	USD 155