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IGA NEWS

Newsletter of the International Geothermal Association

IGA ACTIVITIES

President's Message

John W. Lund, President

The World Geothermal Congress 2005 (WGC2005) in Antalya, Turkey was a tremendous success, thanks to the efforts of the Organizing Committee (headed by James Koenig), the Turkish Organizing Committee, and the Turkish Geothermal Association (headed by Orhan Mertoglu). Over 1500 persons attended the conference from over 80 countries. Three short courses were also held, two in Izmir and one funded by the World Bank held in Antalya. A detailed report on WGC2005 is presented by James Koenig elsewhere in this News.

The IGA held their Annual General Meeting (AGM) on 27 April in Antalya, which was attended by approximately 50 members. Highlights of this meeting included a summary of accomplishment since the last AGM by the President. These were:

- Negotiations with the World Bank/GeoFund for funding of fellowships and other activities of IGA as detailed in a previous IGA News.
- The transition of having the IGA News published in electronic form, with limited hard copies available for members who do not have Email.

***Photo 1**, from left to right, front row: Keyan Zheng, John Lund, Gestur Gislason, Meseret Teklemariam, Paul Brophy, Rosa Maria Barrigan, Marcel Rosca, Rosa Maria Prol-Ledesma, Kiril Popovski, Joseph Ng'ang'a, Beata Kepinska, Ruggero Bertani; 2nd row: Jim Lawless, Gordon Bloomquist, Kevin Brown, Shigeto Yamada, Toshihiro Uchida and Guido Cappetti.*

- Funding of short course #4 at WGC2005 – "Developing Geothermal Projects: Resource Assessment, Drilling, Economic Feasibility Studies and Financing" – that was attended by approximately 75 persons and organized by Gordon Bloomquist.
- Presentation of the World Bank/ GeoFund funding proposal for the "Mineral Extraction from Geothermal Brines" workshop in Petropavlovsk, Kamchatka, Russia from 12 to 16 September 2005. A follow-up workshop will be held at the University of Arizona in 2006.

***Photo 2**, from left to right, front row: John Lund, Olafur Flovenz, Valentina Svalova, Kiril Popovski, Burkhard Sanner, Sakir Simsek; back row: Keyan Zheng, Toshihiro Uchida, Valgardur Stefansson, Eduardo Iglesias, Paul Bropy, John Garnish and Gordon Bloomquist.*

Missing from the photograph, but present at WGC2005: Orhan Mertoglu, Manuel Ogena, Franciska Karman and Francois-David Vuataz.

This is also being coordinated by Gordon Bloomquist. Information on this workshop can be found at: http://geoheat.oit.edu/minerals/minerals.htm.

- Approval to have an IGA booth at WGC2005.
- Indonesia was tentatively selected as the host for WGC2010 to be held in Bali. A Memorandum of Understanding (MOU) was finalized for signing at WGC2005, prepared by Jim Lawless and his IGA ad hoc committee.
- The President and Roland Horne of the Stanford Geothermal Program obtained US$70,000 from USDOE for support of fellowships for WGC2005.
- The general information and membership brochures were updated and made available at the IGA booth at WGC2005.
- The Audit Committee (chaired by Antonio F. Yee) presented their report.
- The Treasurer (Kevin Brown) presented his report for the year 2004. The ending balance for 2004 is US$22,667.
- Two corrections to the Rules of the Association were presented by John Garnish and passed.

The IGA had a booth at WGC2005 staffed by Board of Director members and the Executive Director, to answer questions and to hand out our new membership forms and an eight-page general information brochure. If these brochures are needed by any member for distribution at renewable energy conferences/workshop, please contact the Secretariat in Iceland or the President. In addition, copies of the CD with all the 700 papers and the short course notes are also available from the Secretariat for a nominal price.

The final official event of WGC2005 was the signing of the MOU between IGA and the Indonesian Geothermal Association (API-INAGA) – the President signing for IGA and Alimin Ginting signing for API-INAGA, as President of the organization. The signing was officially witnessed by Orhan Mertoglu for IGA and Wimpy S. Tjetjep, Head of Research Development Agency, Ministry of Energy and Mineral Resources of Indonesia. Also present was His Excellency, Dr. Purnomo Yusgiantoro, Minister of Energy and Mineral Resources, Republic of Indonesia, and the Honorable Alaaddin Yuksel, Governor, Province of Antalya.

Finally, we tried to take a photograph of the IGA Board of Directors, as 29 of the 32 members were present at IGA. Unfortunately, not all members were available in one sitting, thus we have two photographs.

WGC2005 A Great Success

By James Koenig, Chairman Organizing Committee WGC2005

A highly successful World Geothermal Congress was held in Antalya, Turkey during the period 24-29 April 2005, attended by approximately 1,350 persons. Delegates were present from about 80 countries. The number of attendees and the countries they represent are record high totals for any geothermal conference. Not surprisingly, the largest delegation was from Turkey, with significant numbers also from Russia, Indonesia, the Philippines, Iceland, New Zealand, Japan, China, the United States and Germany in approximate descending order.

Major financial sponsors of the WGC2005 included the Government of Turkey, the United Nations University and the Iceland Geothermal School, the United States Department of Energy, Ormat Industries, the World Bank, Orme Jeotermal of Turkey, a group of Japanese entities including Fuji Electrical Systems, and Geoproduction Consultants of France.

Some 705 papers were submitted – also a record high – representing activities in 86 countries. Of these, 329 papers were scheduled as oral presentations, in 5 parallel sessions, while 376 papers were accepted as posters. 122 of the posters were held in reserve, to be presented orally if a scheduled paper was not given. About 50 such last-minute substitutions were required. All 705 papers have been published as a CD, available to all who attended the WGC2005. (Additional copies of the CD may be available from the IGA Secretariat.) The decision was taken at an earlier date by the Organizing Committee of the WGC2005 not to print hard copies of the proceedings unless a significant demand materializes. However, because the papers are posted on the WGC website, they can be downloaded as desired by interested parties.

The tone of the Congress was set by keynote speaker

Vincent Perez, President of PNOC-EDC and former Secretary of Energy of the Philippines, in his address at the Opening Session: Full Steam Ahead. Recounting the story of the amazing rise in output of geothermal electricity in the Philippines, Secretary Perez applauded the cooperation between private investors and public entities, and offered the Philippines as a model for other nations. He expressed the hope that the Philippines will soon pass the United States as the world's leader in generation of geothermal electricity.

Other keynote speakers at the Opening Session included the Minister of Energy of Turkey, M. Hilmi Guler, and the Turkish Minister of the Environment, Osman Pepe. Both stressed the importance for their country – and for the entire world – of reducing greenhouse gas emissions, and the significant role open to geothermal energy in achieving this goal. Although the generation of geothermal electricity has lagged, partially because of a lack of legislation enabling private ownership of such facilities, there has been a rapid growth in geothermal district heating. This has involved both municipal and private interests, but here too there is a need for legislation to allow private ownership of facilities. Such legislation is now before the Turkish Parliament in draft form, according to the Chairman of the Parliamentary Committee on Energy.

The Icelandic Minister of Industry and Commerce, Valgerdur Sverrisdottir, told the Opening Session that Iceland is now almost completely served by geothermal district heating systems. The generation of geothermal electricity also is growing significantly, making Iceland the most intensively geothermal nation in the world.

In addition to the technical programme and the invited speakers, the WGC2005 featured 3 short courses and 3 field trips, given before and after the meetings. The topics covered in the courses were: geothermal power plants, integrated uses of geothermal resources, and preparation of a project for international financing. The latter was funded through the GeoFund Programme of the World Bank. The 3 field trips were fully subscribed, and late registrants had to be turned away. Before the Congress, one trip ran from Istanbul to Antalya. This was repeated, from Antalya to Istanbul, after the Congress. The third trip was to the geological and archaeological wonderland of Cappadocia.

There were approximately 45 organizations represented at the technical exhibition hall. This included groups (in alphabetical order) from China, Germany, Iceland, Indonesia, Italy, Japan, the Netherlands, New Zealand, Russia, Turkey and the United States.

Not everything at the WGC2005 was serious or technical. There was an opening cocktail reception for all registrants, held on the evening of 24 April on the grounds of the Glass Pyramid conference center, plus receptions held for several hundred guests by the Russian Geothermal Energy Association, and by Ormat Industries, respectively on the evenings of 25 April and 28 April. Another highlight of the Congress was the Turkish Night event on 26 April, in which an exciting exhibition by Turkish dancers was followed by a performance of the Antalya Symphony Orchestra, conducted by our own Professor Ladislaus "Ladzi" Rybach! Still another important event was the Congress Dinner, on the following night. On behalf of the German Geothermal Association, Dr. Burkhard Sanner presented its Patricius Medal to Orhan Mertoglu of Orme Jeotermal in recognition of his work to bring the WGC2005 to Turkey – and to make it a major success story. Dr. John Lund, President of the IGA, followed this by putting on a stunning performance with a belly dancer, to the delight and photographic rapture of the assembled diners.

The Closing Session, held in the afternoon of 29 April, was both serious and joyful. It represented both an end and a beginning. The Turkish delegation, headed by Governor of Antalya Province Alaadin Yuksel and Orhan Mertoglu, handed on to the Indonesian delegation, led by Minister of Energy Purnomo Yusgiantoro and head of the Indonesian Geothermal Association Alimin Ginteng, a symbol of the World Geothermal Congress. Indonesia will host the WGC2010 on the Island of Bali. Appropriately, there was a musical performance by Bali (not belly) dancers and a gamelan orchestra, and addresses by Minister Purnomo and Governor Yuksel. The Governor invited the geothermal community to return to Antalya to develop its geothermal potential. Minister Purnomo discussed the growing importance of geothermal energy to his nation. Oil production has dropped in recent years, while domestic energy consumption has grown markedly. Indonesia may soon cease to be a major oil exporter. New, non-polluting sources of energy are sought, including geothermal energy.

There were awards presented to Dr. John Lund on behalf of the IGA, and to Dr. James Koenig, Chairman of the Congress, for their efforts to make the WGC2005 a success. Although they were not mentioned by name at this ceremony, honor must be given to the members of the Organizing Committee, and its counterpart the Turkish Organizing Committee, for their outstanding efforts. Without their hard work and dedication there would have been no WGC2005. Their names are listed on the WGC2005 website and in the official programme of the Congress. It would be a welcome gesture to send each of them a note of thanks.

Not that everything went without error, of course. Some exhibitors had their display materials held in Customs until the office of Governor Yuksel interceded on their behalf. Shuttle bus service had to be changed to accommodate persons staying at distant hotels – and some persons unfortunately found themselves at hotels up to 25 km distant from the conference center. There were long lines on Sunday and Monday at the registration desk and at the counter for fellowship awards. (171 fellowships were awarded by the WGC2005, the same number as given in 2000 in Japan.) However, there were vastly more smiles than frowns at the closing cocktail reception on the

evening of 29 April, held in the gardens of the Sheraton Voyager hotel.

Throughout the Congress, our Turkish hosts acted with kindness and courtesy. Many of the registrants and their accompanying persons took the opportunity to visit the famous archaeological sites in the vicinity of Antalya, or to cruise the coast and swim in the waters of the Mediterranean Sea. The weather was ideal, with daytime temperatures reaching perhaps 25 degrees Celsius, and bright sunny skies. Hotel accommodations ranged from very good to excellent, as was the food. There were no security issues. Several registrants expressed their satisfaction with the Congress.

Chairman Koenig attempted to capture the spirit of the WGC2005 at the Closing Ceremony with a few lines of doggerel poetry:

"From Earth's rocky bosom comes natural steam,
Ecologically friendly, abundant and clean.
Larderel, the far-sighted,
Said towns could be lighted
And homes could be heated with plentiful steam.

A century later, our number is greater,
The roster of nations a strong, growing stream.
For you, homeward going,
The message is glowing:
The world needs geothermal, its future is green."

Fig.1 *Team of lecturers: Dr. Burkhard Sanner, Dr. Paul Roja, Dr. Subir Sanyal, Prof. Yimaz Savascin, Dr. Ron DiPippo, Prof. Kiril Popovski, Prof. John W. Lund (from left to right)*

Fig.2 *Course participants in front of the central building of the Educational and Recreational Centre of Dokuz Eylul University, in Doganbey (Izmir)*

PRE-CONGRESS SHORT COURSES (Doganbey - Izmir, April 22-23, 2005)

Prof. Kiril Popovski

In the frame of its educational activities, IGA organized two pre-congress short courses prior to WGC 2005: one on POWER GENERATION and one on INTEGRATED USES OF GEOTHERMAL ENERGY, in collaboration with the Turkish Geothermal Association (TGA) and the Dokuz Eylul University (DEU) in Izmir, Turkey. The courses were held in the DEU Educational and Recreational Centre in Doganbey, about 55 km from Izmir.

Attendance at the courses was rather low (14 for PG and 22 for IU), but participants were drawn from 20 countries from all the continents except Africa. Although there were no fellowships available specifically for these courses, a number of fellows used part of their fellowship award to attend one of the courses.

The team of experienced lecturers prepared in advance an excellent textbook, which was delivered to the students (set of lectures can be found in the WGC2005 CD as well), and delivered very interesting and interactive lectures, resulting with full satisfaction both for lecturers and students. Technical trips to the Kizildere geothermal power plant (for the course on PG) and to the Balçova district heating system (for the course on IU) were also arranged.

In view of the interest expressed for participation in the courses (more than 180), and their successful organization, the follow up for the next congress should be that short courses should be organized again. However, much more attention should be paid to the organization of a good fellowship program for the participants of developing countries and Indonesia, if the intention is to have a sufficiently large number of participants, i.e. students.

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EUROPE

EGEC Business Seminar 2005

Report by Burkhard Sanner

On April 6, 2005, participants from 12 countries gathered in Berlin to attend the 4th Business Seminar of the European Geothermal Energy Council (EGEC). This time the topic was how to create a level playing field for geothermal energy in the heating sector, and to prepare a request for a relevant directive from Brussels. The continuation and increased application of the directive on electricity from renewable sources of 2001 was also an issue.

The European Renewable Energy Council EREC had prepared position papers on both directives:

- a position paper of EREC and its member associations

on the evaluation of the directive on electricity from renewable sources (RES-E), and

- a joint declaration of EREC, its members, and as supporters a large number of other associations and organisations (including IGA), containing the request for a directive on heat and cold from renewable energy sources (RES-H)

Both papers are published as very nice brochures and were presented for the first time to the public in Berlin on April 6, 2005. The official presentation with press conference took place the next day, April 7, in Brussels. EREC policy advisor Oliver Schäfer had travelled to Berlin and spoke towards the end of the seminar about background and content of the two brochures.

The first session of the EGEC Business Seminars was dedicated to policy and politics. Karl Kellner, Head of Unit with DG-TREN of the EU-Commission and responsible for short-term R&D on renewable energies, explained the existing support mechanisms and directives of the EU and spoke about the relevant future development. Two very vivid and dedicated speeches of two parliamentarians followed: Mechthild Rothe, who was caught by unexpected, urgent business in Brussels, sent her assistant Tilman Schwencke to give her speech, and Hans-Josef Fell from the German Parliament (Bundestag) delivered his speech personally. Both manuscripts can be downloaded from the EGEC homepage.

The following session focused on the economic and legal framework. Christian Schönwiesner-Bozkurt from Rödl+Partner had a look at the economic situation of geothermal power generation in Germany in the wake of the EEG-revision, and had a closer look at the current project Unterhaching. Miklos Antics of Geoproduction Consultants investigated the economic possibilities of geothermal energy in the new member states and accession countries. Thomas Kohl from Geowatt AG in Switzerland gave an overview of the legal framework in some European countries.

After lunch break, in two presentations each, the technical basics of power generation and heating concepts were explained. Electric power was dealt with by Guido Cappetti from the Italian power producer ENEL and by Konstantin Karytsas from CRES in Greece. The past EGEC president Christian Boissavy and this reporter both spoke on heat.

The last session was opened with some country statements; Austria, The Netherlands, Sweden and Poland were in focus. Then the presentation of the EGEC-brochures followed (see above), and in the final discussion a broad support by the persons present towards the request of EREC and EGEC became obvious.

The EGEC brochures can be ordered via the GtV-secretariat (postage compensation required) or directly at EREC, (European Renewable Energy Council), Renewable Energy House, 26, rue du Trône, B-1000 Brussels, fax: +32 2 546 1934, or they can be downloaded as pdf from the EREC website at (www.erec-renewables.org); links to the download are also found on the Homepages of GtV (www.geothermie.de) and EGEC (www.egec.org).

Germany

The geothermal train steams ahead

By Werner Bussmann and Burkhard Sanner

Geothermal development in Germany is gaining momentum. In the past, political support came mainly from the federal level (federal government and federal parliament) in Berlin but, more recently, several states (Länder) have increased their own efforts to make use of the geothermal potential beneath their territory.

For Bavaria, a geothermal atlas of deep resources was published in April 2005. For the shallow resources, another kind of atlas is in preparation. Further R&D efforts at the state level are a geothermal study for the greater Munich area, which will provide a geological and hydrogeological model as a basis for thermal models and reservoir prognosis in the Malmkarst (Upper Jurassic limestone), and a joint project with Austria, co-funded by the EU and intended to investigate the consequences of the thermal water use in the border region of the Molasse basin.

Baden-Württemberg has presented a program for support of shallow geothermal applications, and the state parliament of Niedersachsen is currently discussing a proposal pointing in the same direction. Rheinland-Pfalz is pushing ahead with the use of deep resources for electric power production. In Nordrhein-Westfalen the installation of a pilot plant for road de-icing and snow melting is being considered, while Saarland is looking into possibilities for geothermal use of the many abandoned coal mines in the Saar region.

In early April the German Association for Renewable Energy (BEE, an umbrella organization of which GtV is a member) and the Federal Ministry of Environment (BMU)

launched a joint initiative to popularize Renewable Energy Sources. The patron is Klaus Töpfer, head of the United Nations Environmental Program (UNEP). Geothermal energy is a part of that initiative, of course, and GtV is an active partner (see: http://www.unendlich-viel-energie.de/). Furthermore, the BMU published a comprehensive brochure on the use of geothermal energy in Germany, which is now among the most requested of the ministry's publications.

Geothermal power production

Following the amendment of the Renewable Energy Act in August 2004 (EEG, for download in English at: http://www.bmu.de/english/documents/doc/3242.php), a run on the exploration licences for geothermal power plants could be observed. Focal areas are the region between Munich and the Alpine foreland, and the Upper Rhine Graben. Meanwhile a total of more than 100 licences have been granted by the relevant mining authorities, with more than 20 in the city of Munich or its immediate neighborhood alone.

Numerous new power generation projects have been made public in the recent months, among them several where the necessary experience of the initiators concerning the underground part is in doubt. The motivation for those groups is the economic basis which the EEG provides. However, such plans are destined to fail, starting with the fact that the authorities are not likely to grant exploration licences to obscure companies (here the German mining law shows some advantages!).

Much better chances for realization can be attributed to the plans of Montanes GmbH, Karlsruhe, to install a geothermal power plant with 5 MW capacity in Hagenau (Rheinland-Pfalz). It is known from oil wells of the 60s and 70s that temperatures of up to 140 °C can be expected at only about 2500 m depth. The company HotRock, also located in Karlsruhe, plans a power plant south of Frankfurt in Riedstadt (Hessen). Here also temperatures of 140 °C are expected at ca. 2300 m depth. Seismic exploration will be concluded in May 2005, and the drilling is scheduled to start later this year. The waste heat from power production will supply heat to a district heating grid. Currently, HotRock is busy with the construction of a power plant in Offenbach/Pfalz (see IGA NEWS 59).

Opposing activity can be felt currently in particular from the Association of German Power Plants (VDEW), which is working to substitute the EEG with another system (tendering or bonus system). These systems have examples in other European countries, where experience shows that they are drastically slowing down renewable energy development. VDEW is obviously waiting for a change in the federal government after the elections in autumn 2006, and hoping for a conservative-liberal government that might turn back the current development. However, this would result in substantial problems, as in recent years about 130 000 jobs have been created in the sectors of wind, solar, hydropower, biomass and geothermal, which will be jeopardized by a change in policy. In addition, because some state governments led by conservatives are part of the positive geothermal development, a total rollback, if planned at all, would meet substantial opposition.

New geothermal district heating plants

The municipality of Unterschleissheim, a northern suburb of Munich, inaugurated the new geothermal district heating plant on April 11, 2005. Thermal water of 81 °C and a production rate of 90 liters per second is supplied by a well 1960 m deep. The water is reinjected after use through a second well. Residential areas and public buildings are supplied with heat through a district heating network with a peak demand of 31 MW. The project cost added up to about 21.5 Mio Euro; the heating plant is owned by Geothermie Unterschleißheim AG, a company 100 %-owned by the municipality. The plant and the heating network is leased to STEAG Saar Energie, a company also involved in the existing geothermal heating projects in Erding and Simbach/Braunau.

The end of April 2005 saw the completion of the second well of the doublet in Pullach (south of Munich). The well (Pullach-Thermal 2) has a final depth of 3300 m, and is a deviated well with a total length of 4120 m. The thermal water is intended for district heating use, and has a temperature of 110 °C (see IGA NEWS 59).

Shallow geothermal applications

The shallow geothermal sector becomes more interesting from an economic point of view. Increasing prices for fuel oil and natural gas convince many house owners to change to renewable energies. In this case ground source heat pumps (GSHP) with e.g. borehole heat exchangers can show their advantages. They are a secure option for the future, need little maintenance, permit economic operation, and provide good comfort. In 2004, for the first time more than 10 000 new GSHP were installed in one year in Germany. This is almost a five-fold increase in one decade, and the trend is stable. In commercial applications and office buildings, where a cooling load usually also exists, geothermal plants can be more economic than competing systems.

A typical example is the freight logistics center of Panalpina Welttransport GmbH in Kornwestheim near Stuttgart. Drilling commenced in May, and on an area of 22 500 m^2 a storage- and loading-terminal with office building will be constructed, providing 250 jobs. The required heating load is about 600 kW. The storage hall with 8 400 m2 floor area has to be kept at ca. 10 °C in wintertime, and the office area to be heated and cooled totals 4 500 m^2. 60 borehole heat exchangers each 100 m deep will be installed. The geothermal plant is planned by EWS Erdwärme-System GmbH, Delbrück, and the Bremer Systembau GmbH, Stuttgart, will build the whole project as general contractor.

Hungary

The Kistelek Workshop

Tamás Hámor, Franciska H. Kármán, Mihály Kurunczi

A report of the workshop on "Regulatory and Economic Tools Governing the Enhanced Exploitation of Geothermal Energy in the European Union" organised by the European Commission TAIEX Unit and the Hungarian Geological Survey, Kistelek (Hungary), 6-8th April 2005

General

Geothermal energy is a promising component of the renewable energy mix in the European Union. As set by Directive 2001/77/EC on the promotion of electricity produced from renewable energy sources in the internal electricity market, the overall EU target is to double the share of renewables to 12% of gross energy consumption by year 2010 and in particular to achieve a 22.1% indicative share of electricity produced from renewable energy sources, with published reference values for each Member State.

50 experts from 14 countries attended the workshop, representing the European Parliament, the European Commission, and a wide spectrum of government agencies, industrial enterprises, research institutes and professional associations, e.g. European Geothermal Energy Council and EuroGeoSurveys. The presentations addressed

- an analytical evaluation of relevant Community legislation and R&D programmes;
- national figures on exploitation of geothermal energy and development programmes;
- national inventory and assessment methodologies of geothermal resources;
- relevant regulatory authority and legislation framework;
- economic instruments, including fiscal burdens, waivers and financial support tools.

The three thematic working groups discussed

- regulatory framework and environmental legislation;
- economic barriers and supportive instruments;
- assessment and national inventory methodologies.

Conclusions and Recommendations

As a result the "Kistelek declaration" was issued and signed by Tamás Hámor (Hungarian Geological Survey) Burkhard Sanner (EGEC), Patrice Christmann (EuroGeo Surveys), Zsolt Becsey (European Parliament), Franciska H. Kármán (IGA) and Ladislaus Rybach (IEA). The major conclusions are as follows:

Geothermal energy is a specific natural resource because:

a) it is on the border-zone of managing mineral commodities, groundwater reserves and other energy sources by being bound to geological formations and to thermal waters;
b) it is a fossil heat of radioactive decay and other geological processes, therefore it is a conditionally renewable flow-type resource;
c) the property rights over geothermal energy are owned by the State but in some countries landowners can exploit shallow subsurface resources for their own use;
d) the utilisation of geothermal energy is still in its infancy on the European scale.

The relevant national legislation is spread throughout the mining, energy, environmental, water management and geological acts, sometimes in a contradictory fashion, and the licensing authority framework for geothermal facilities is rather complex in most countries. ⇒ ***A Community level communication should encourage Member States to adopt a coherent legislation system and to designate a rational framework of competent authorities in order to ease application for geothermal energy use.***

The definition of geothermal energy is lacking in the acquis communautaire and the national practice is diverse – some authorities consider it as a type of energy carried by thermal waters exclusively – which hampers the distribution of most up-to-date technologies using shallow reserves via heat-pumps or deeper closed-circuit heat-exchanger fluids. ⇒ ***A broad legal definition of geothermal energy is needed in a relevant piece of Community legislation, e.g. the heating-cooling legislation in preparation.***

As in the case of other state-owned territorial commodities, low-resolution static inventories of geothermal resources are available or being prepared by water research institutes or geological services. These inventories are not adequate to meet the requirements of either the investing enterprises or the licensing environmental protection and water management authorities. In some countries, there is not even a legal requirement for the competent agency hosting the geoinformation and/or the inventory to be given access to the data. ⇒ ***The development of national dynamic inventories of geothermal energy resources and reserves, able to register annual changes and allow country-scale modelling, is highly recommended. To make such inventories comparable on a pan-European level a common basic methodology should be elaborated, preferably via the assistance of Community level professional associations, e.g. EuroGeo Surveys.***

The environmental impacts of geothermal installations are limited; it is a green energy source. In terms of environmental sustainability, the maintenance of stable, close-to-original temperature and pressure status of an

exploited groundwater reservoir is of prime importance, as is protection of surface waters against pollution by untreated outflow of saline or used thermal waters. However, the national emission limit values and provisions for reinjection show a certain diversity. ⇒ ***The new Groundwater Directive and its implementing measures should provide more detailed prescriptions on surface discharge and re-injection criteria for used geothermal waters. This environmental action, together with the need for harmonised inventories, technology development and raising of public awareness should preferably be accompanied by a more definite availability of EU funds for the above objectives.***

There is a wide variety of economic instruments in the studied countries which either support or inhibit the enhanced use of geothermal energy in Europe. There are countries where the fiscal burdens (e.g. mining royalty, sewage penalty, groundwater use fee, environmental tax) are multiple, which breaches general taxation law. The arsenal of supporting instruments is colourful too, including tax exemptions, guaranteed take-over prices, green certificates, direct subsidies, to mention a few. The German example shows clearly how much these supportive tools can contribute to the high growth rate of renewables in a country with moderate natural setting. Moreover, there is a relatively low rate of return on investment in geothermal energy and the economic risk is higher as compared to other energy sources. These economics do not ensure the security of interested stakeholders and lead to a serious distortion of equal and open competition on the European level. It is foreseen that Community institutions and Member States will face a growing number of related legal disputes at the European Court of Justice in the near future. ⇒ ***There is an immediate need to highlight the economic discrepancies at the Community level and to urge Member States to harmonise financial solutions in reaching their indicative targets and in improving the energy mix in order to be less dependent on outside sources.***

As a general conclusion and recommendation, all participating experts agreed that under the realm of the IPPC Directive a best available technology reference document on geothermal energy describing the state-of-art of geothermal energy exploitation, the up-to-date technologies and their environmental aspects, and the economic instruments could serve as strong, quasi-legal document to which all stakeholders could refer in their future activities in the direction of the enhanced, sustainable use of geothermal energy.

The Kistelek declaration will be delivered to responsible personnel of European Union institutions and bodies.

More information is available on http://www.mgsz.hu/english/index.html

Italy

The Centenary of the Geothermal-Electric Industry:

Historical Review of the Initial Steps and Celebration Program

Raffaele Cataldi, Vice-President of the Italian Geothermal Union

Initial steps of the geothermal-electric industry

Soon after being appointed General Director of the Larderello Comp. in early 1903, Prince Piero Ginori Conti (son in law of Count Florestano de Larderel) launched a program of studies and lab tests aimed at assessing the technical feasibility of using geothermal fluids to produce both electric energy and a variety of boric compounds. Implemented at fast pace, the program concluded that the most convenient thermodynamic cycle for this purpose was the "indirect cycle".

As a consequence of this conclusion, the following activities were started by P. Ginori Conti:

• **Late 1903:** Based on experience from 1875 onward, new experiments were conducted with advanced steam-driven pumps to produce mechanical energy for well stimulation and for pumping boric brines to chemical processing plants;

• **Early 1904:** a carriage-mounted laboratory was organized to collect fluid and solid samples, and to carry out field analyses *(Figure below, left)*;

• **July 4th, 1904:** first experiment of geothermal-electric generation. A piston engine fed by pure steam produced in a small heat exchanger supplied with steam from a well near Larderello was used for this purpose. The engine was coupled to a 10 kW dynamo, by which five small light bulbs were lit *(Figure below, center)*;

• **1905:** installation of the first prototype geothermal group. It was a Cail reciprocating piston engine driven by pure steam obtained with heat exchangers fed by natural steam produced from a well near Larderello, and coupled with a 20 kW dynamo. The Ginori Conti-De Larderel main palace and other residential buildings at Larderello were lit by this group for about ten years;

• **1908:** installation of a second prototype geothermal group, different from the previous one. It was a Neville piston engine, still driven by pure steam and coupled with

a 20 kW dynamo, which enabled electrification of some chemical plants in the Larderello area.

Information on the behaviour of the production wells, gathered through several years' safe operation of the two experimental groups above, provided the electro-mechanical firm Franco Tosi with the basic elements to design in 1912 the following plant.

• **1913:** installation of the first geothermal power station in the world: an "indirect cycle" 250 kWe turbo-alternator that could be operated with a running pressure of up to 3 atm abs at well head *(Figure page 9, right)*. It enabled electrification of all chemical plants and most villages in the area;

• **1914-1916:** construction of the world's first electric line fed by geothermal energy. It was a 25 km-long line supplied by the Larderello power station, by which the towns of Pomarance, Saline di Volterra and Volterra were electrified;

• **1916:** installation of two "indirect cycle" geothermal turbo-alternators of 3.5 MWe each.

These activities and their results form together a milestone in the history of science and technology in the geothermal sector.

The centenary of the geothermal-electric industry and its celebration program

The experiment of the five bulbs lit by the earth's heat, and demonstration of the technical feasibility to produce electric energy by hot natural fluids, have a relevance that goes beyond the simple technological innovation in the use of geothermal resources. And indeed, the photo recalling the experiment of the five bulbs is so familiar a picture for all specialists in the sector that it can be considered the symbol itself of electric generation by means of geothermal energy. The centenary of the geothermal-electric industry is thus an event that from the cultural and professional view point represents the legacy of whole geothermal community.

Format and scope of the program

When starting to discuss the celebration program in question, most interested parties agreed that it was useless to consider a "one shot" event (e.g. unveiling a plaque on a wall, or emitting a special stamp, or similar) to acknowledge the outstanding merits of Piero Ginori Conti. Therefore, it was suggested to consider the centenary as *an opportunity to take*, i.e. as an occasion to debate present problems and future development of geothermal energy in Italy in the frame of the logical continuity with achievements obtained in past centuries in several geothermal areas in Italy, with particular reference to Larderello.

Thus, it was recommended that the celebration program should be wide in scope, with a number of linked manifestations capable of raising interest in as many as possible parties involved in energy matters, including institutions and politicians, energy decision-makers, industries and companies operating in the geothermal sector, as well as scientific, cultural and environmental organizations.

Moreover, it was considered opportune to rejuvenate the pride for their cultural traditions in people residing in important geothermal areas, aimed also at creating improved conditions for the social acceptance of geothermal energy in their territory.

In short, the Italian geothermal community decided that the program recalling the first centenary of the geothermal-electric industry should be organized as a cultural event at large; not so much the celebration of an ending century, but the base to start a new geothermal century.

As a result of the above, the following multi-faceted program was devised for implementation in the 3-year period 2003-2005.

Manifestations already held

* *Opening ceremony* with a conference on "History of geothermal energy in Italy, from Prehistory to Roman Times", organized by UGI (Pomarance, 11 Oct. 2003). Over 250 persons attended.

This was the first of four initiatives to be organized by UGI, including three conferences and the publication of a volume on "History of Geothermal Energy in Italy". They will take place in four different towns of Tuscany with significant geothermal traditions, and will deal with the influence that the presence of natural manifestations and the exploitation of geothermal resources had in time on socio-economic development and on cultural formation of people in Italian geothermal areas.

* *International conference* on "Geothermal Energy and the Territory: After Johannesburg, the contribution of Geothermal Energy to Sustainable Development", organized by the Government of the Tuscan Region (Pomarance, 29-30 January 2004). It was a very important event, attended by Government representatives from 30 countries, UNEP, WB, energy decision-makers and industry managers from Italy and abroad, national and regional institutions, environmentalists, geothermal experts, and a public of 200 persons. One thousand copies of the proceedings have been printed and distributed at no cost. A brochure on "Geothermal energy in Italy: a 5000-years long history" was also prepared by the Tuscan Region in collaboration with UGI, and distributed at the conference.

* *International workshop* on "One Hundred Years of Geothermal Energy in the World", organized by IGA (Larderello, 8 May 2004). Over 300 persons attended.

* *Photo exhibition* on "Larderello: a Century of Geothermal Energy" organized by the Photographic Group of

Pisa (Pisa, 27 May-7 June 2004). More than 1000 persons visited the exhibition.

* *Geothermal festival.* Organized by Enel and held at Larderello on July 4th 2004 (the exact day of the centenary of the first geothermal-electric light), it represented the high point of the celebration program, with the following events: inauguration of the new geothermal museum, opening of the restored palace of the De Larderel-Ginori Conti family, repetition of the experiment made on July 4th 1904 by P. Ginori Conti, projection of a new geothermal movie, visits to plants and to the remote-control center, aerial view of the Larderello area on a Montgolfiere, distribution of technical material, band concert, a sport competition consisting of a geothermal game for teen-agers, and pyrotechnic fires in the night. The festival was attended by several thousand Italian and foreign people.

• *Historical review of the geothermal-electric industry*, presented by UGI at the International Geothermal Days Poland 2004, organized by the Polish Geothermal Association and the IGA European Branch (Zakopane, 13 Sept. 2004).

• *Special geothermal session* to celebrate the centenary at the XXI Congress of Merceology, organized by the Italian Society of Merceology (Foggia, 23 Sept. 2004).

• *Second conference* on "History of geothermal energy in Italy: from the end of the Roman Empire through Middle Ages" (Massa Marittima, 6 Nov. 2004). Organized by UGI, it was attended by 300 persons. The first-day cancellation of stamps on a special envelope with Italian and English text was made on this occasion. Interested geothermalists and philatelists can address their request to Dr. Umberto Rossi, UGI Secretary: e-mail rossi.umberto @ enel.it.

Planned mainfestations

• *Third conference* on "History of Geothermal Energy in Italy: from Renaissance to Modern Times". It will take place in early summer 2005 in a town near Larderello in the Siena Province.

• *Closing ceremony.* It will be organized by UGI in collaboration with other parties and held at Pisa or Florence in December 2005. The detailed program of this event will be defined soon; but during the ceremony the presentation is already envisaged, and a complimentary copy will be given to the participants, of a special volume on "History of geothermal energy in Italy" that UGI and IMSS (Insitute and Museum of the History of Science, Florence) are preparing as a contribution to the celebration program of the centenary.

Sponsors

More than thirty institutions, organizations, industries, companies and cultural associations have taken part so far in the celebration program, and others are expected to take part. Some of them have also supported UGI to cover part of the expenses incurred and underway.

Regardless of their support to UGI, the following are to be quoted among the main sponsors: the Government of the Tuscan Region, the Governments of the Pisa and Grosseto Provinces, UNEP (United Nations Environmental Program), IGA, the Institute of Geoscience and Georesources (IGG) of the National Research Council of Italy, the Institute and Museum of the History of Science, the descendants of the De Larderel and Ginori Conti families, Enel, General Electric Oil & Gas / Nuovo Pignone, and Ormat.

Thanks are due to all of them.

Results as of today

The manifestations held so far to recall the centenary of the geothermal-electric industry have given the following significant results:

• *Participation of people.* Altogether, at least 5000 people attended the events;

• *Dissemination of information on geothermal energy.* Media, and scientific and cultural journals have widely reported on the above events, taking the opportunity to speak about geothermal energy and to stress the need to accelerate its use;

• *Development Plan of Direct Uses in Tuscany.* Based on suggestions made at the International conference on "Geothermal Energy and the Territory" (see previous para. on manifestations already held), the Tuscan Region has started a study to bring up to date the resource assessment, and to evaluate the market conditions of the low-to-moderate temperature geothermal resources in Tuscany. The study will represent the technical document of reference for the Government of the Tuscan Region to set up the development plan in question;

• *Project on the Social Acceptance of Geothermal Energy.* As a follow-up of ideas discussed at the international conference mentioned above, the University of Pisa is studying the technical-economic feasibility of a project dealing with social constraints hampering the development of geothermal resources in Italy and abroad. Should the feasibility be proven, the project would be implemented by the "Interdepartmental Center on Studies for Peace" of the University of Pisa;

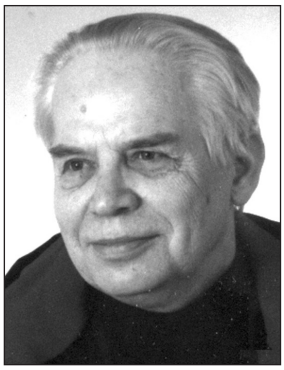
• *International Center of Excellence on Geothermal Energy.* An initiative has been announced by the Tuscan Region to promote the creation of the center in question in Tuscany, with the support of the Italian Government (already promised) and of some important international organizations. The feasibility study of this initiative is underway.

Poland

IN MEMORIAM

Professor Julian Sokolowski

23.01.1932 - 26.11.2004
By Stanislaw Ostaficzuk and Beata Kepinska



On 26 November 2004 died Professor Julian Sokolowski, a member of the Polish Geothermal Association, its president from 1993 to 2001 and then an honorary member. In the years 1995 to 1998 Professor Sokolowski was a Board member of the International Geothermal Association.

Professor Julian Sokolowski was a petroleum geologist, specializing in subsurface geology, who was aware of the social implications of the processes taking place in nature. He was a graduate of the AGH-University of Science and Technology in Krakow, Poland, where he was granted the MSc degree in geology in 1955, then PhD in 1964. In 1967 he became an associate professor, and in 1980 obtained the title of a full professor of natural science.

Professor Sokolowski's work concentrated on structural geology, petroleum and geothermal geology. He specialized in prospecting and management of liquid resources: oil, natural gas and geothermal waters. He had a great and original impact in these disciplines.

Professor Sokolowski was a precursor of geosynopsis – a geological research tool enabling a complex analysis of all elements of animate and inanimate nature, social and geographic conditionings and topography with the objective of proposing optimum solutions for prospecting and exploitation of resources in a studied area. This discipline turned out to be visionary; unlike universal GIS methods, based solely on planes, new computational technologies also offered the possibility to use solids for analyzing geological space. Being an initiator, co-author, designer and head of Poland's first Experimental Geothermal Plant in Banska – Bialy Dunajec in Podhale, he contributed greatly to geology and environmental protection. Established in 1992/1993, the Plant laid the basis for the ongoing project of a regional heating network – one of the biggest and most advanced in Europe.

Professor Sokolowski started his scientific and professional career in the years 1955 to 1966 when he worked as a geologist and head of departments in the petroleum industry. In the period 1966 to 1986 he worked in the Polish Geological Institute in Warsaw and Krakow, heading, among others, research programs devoted to regional surveys of geological conditions, and estimation of liquid resources. In 1962 to 1992 he was a member of the Committee for Geological Projects Evaluation – first, at the Central Geological Office, then at the Ministry of Environmental Protection, Natural Resources and Forestry. In the years 1970 to 1988 he also presided over the Committee Evaluating Syllabuses and Handbooks for Professional Schools at the Ministry.

In the years 1986 to 2002 Professor Sokolowski worked in the Mineral and Energy Economy Research Institute of the Polish Academy of Sciences (MEERI PAS). Within the PAS structures, he established and headed the Department of Geosynopsis and Geothermal Energy. Accompanied by a team of co-workers, he was the first to assess the resources of geothermal energy in Poland with a view to their practical implementation. He worked out the methodology of geothermal energy exploitation, and designed and constructed the Experimental Geothermal Plant in the Podhale region. He also authored concepts of geothermal plants all over Poland, e.g. in Szczecin, Zyrardow, Skierniewice and Warsaw. Professor Sokolowski initiated and worked out research standards for the regional and local evaluation of resources and applicability of geothermal energy. This created a basis for him and his co-workers to carry out numerous studies for various counties and districts across Poland.

In the years 1986 to 2002 he was the editor-in-chief and then a member of the Editorial Board of a bimonthly "Exploration Technology – Geosynopsis and Geothermal Energy". Thanks to him, a number of recognized authors from Poland and abroad participated in the edition of the magazine.

Professor Julian Sokolowski was an active propagator of the versatile use of ecological, clean heat from geothermal waters in Poland. He made efforts to create institutional and legal frameworks for geothermal development both on local and on central level.

Professor Sokolowski supervised five PhD theses. He wrote over 150 scientific papers, books and atlases published in Poland and abroad. Among the most important ones are: *Geological conditions in the Goplo anticline* (1957), *Role of halokinesis in the development of Mesozoic and Cenozoic sediments of Mogilno structure and Mogilno-Lodz synclinorium* (1966), *Geological and structural characteristic of regional units in Poland in view of bitumen prospecting* (1968), *Geological and structural characteristic of the Fore-Sudetic area* (1967), *Geothermal energy – a chance for the Podhale region* (1984), *Polish atlas of petroleum geosynopsis* (1987), *Conditions of geothermal waters' occurrence in Poland and program of their utilization in the Podhale region* (1988), *Regional and formation geology of Poland (1990), Geosynopsis atlas of Poland* (1992), *Geothermal provinces and basins in Poland* (1995).

Professor Julian Sokolowski was granted numerous awards, in that National Group Award of second rank, Award of Department III of Polish Academy of Sciences, Golden Medal of Merit for Polish Geology, Bachelor Cross of Order of Restitution of Poland.

We will remember Professor Julian Sokolowski as a

man of great knowledge and experience, merited for the Polish science. His impact on the concept and geothermal energy development in Poland is invaluable.

THE AMERICAS

Mexico

Upcoming MGA Annual Meeting

2005 Meeting of the Mexican geothermal Association

By Luis Gutiérrez-Negrín

The Mexican Geothermal Association (AGM: Asociación Geotérmica Mexicana) is preparing its 2005 Annual Meeting and has published the first Call for Papers. The meeting will be held in the facilities of the Los Azufres geothermal field, one of the four Mexican fields in operation, with an installed capacity of 188 MW. Los Azufres is located in the central part of Mexico, in the State of Michoacán, surrounded by a spectacular pine-forest at 2800 meters above the sea level. There are 39 production wells and 5 injection wells, all of them operated by the Comisión Federal de Electricidad (CFE), the governmental facility in charge of generation and distribution of electricity, which also operates the power plants and is sponsoring the AGM meeting.

The AGM meeting is scheduled on November 27-28, 2005. It is expected to present around 15 technical papers, and then celebrate the formal assembly stated in the official AGM Bylaws. The Directive Board is calling for papers, with the following considerations:

- Papers have to be related to geothermics.
- Abstracts, in Spanish or English, must be sent before September 30 as MSWord attachments to the email addresses given below. Maximum length for abstracts is one double-spaced page.
- Selected papers will be notified on October 14. Oral presentations will be limited to 25 minutes, including questions, and can be in Spanish or English. Some papers can be selected for poster presentation.
- Complete papers must be sent to the emails below before October 31. Text must be submitted without special format as MSWord file, figures and graphs as graphic files in *.jpg or *.gif attached files. If the paper is written in English, a Spanish abstract has to be included and vice versa. Papers will be peer-reviewed.
- Complete papers will be edited and published in a CD to be distributed during the meeting, but some (or all) of them will be published in the magazine Geotermia. Please refer to the more recent number of this magazine (http://www.geothermal.org) to see the Author Instructions.

Abstracts, papers or requests for more information can be directed to:

José Luis Quijano-León:
luis.quijano@cfe.gob.mx, or
Luis C.A. Gutiérrez-Negrín:
luis.gutierrez03@cfe.gob.mx.

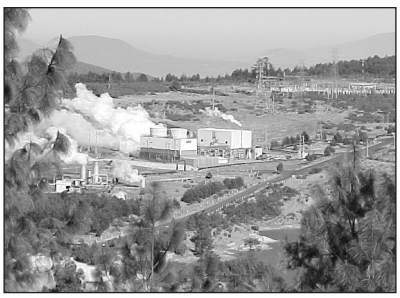


Photo 1: *View of the Unit 14, 25 MWe.*

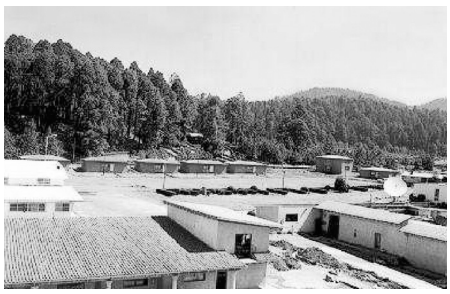


Photo 2: *Cabins for lodging in Los Azufres.*

ASIA/PACIFIC RIM

China

Reinjection in Xiaotangshan Geothermal Field,

Tingshan Tian, China Institute of Geo-Environment Monitoring

Geothermal reinjection is one of the important measures for sustainable development of geothermal resources. In the Urban, Xiaotangshan and Liangxiang etc. geothermal fields in Beijing, thermal water levels were found to be falling as a result of exploitation that started in the 1970s. Since the implementation of a management policy for geothermal resources in Beijing in the mid-1980s, each well has been planned with a permitted extraction rate. The total exploitation of a geothermal field has been controlled to maintain stable exploitation. As a result, the thermal water drawdown has trended toward stability; it drops about 1.5 meters per year.

Medium-to-low temperature geothermal direct use lends itself to decentralized development in China. Several dozen developers have invested in one or two wells each on their own land, but within a geothermal field. They operate their own geothermal business. This increased the problem of implementing geothermal reinjection. In order to promote a sustainable development of geothermal resources, the Beijing Administration of Geothermal Resources gives favourable terms to the user who carries out reinjection. Initially, geothermal extraction needs to pay the resources compensatory fee, but reinjection quantity can offset the user's extraction quantity. It is equivalent to waiving the payment for a corresponding extraction. This policy has promoted the implementation of geothermal reinjection, and it has encouraged neighbouring users to combine to carry out reinjection – one well for extraction and the other for reinjection.

Collecting the return water from the radiators after geothermal space heating to use for reinjection is encouraged in the Xiaotangshan Geothermal Field. Such reinjection was carried out in one pair of wells from the winter of 2002 to the spring of 2003. This then increased to three pairs of wells for the winter of 2003 to the spring of 2004. During the period, a total 248 000 m^3 of returned water was reinjected. This corresponds to about 7.6% of annual exploitation. During the past heating season, from the winter of 2004 to the spring of 2005, reinjection was carried out in 6 pairs of wells in Xiaotangshan Geothermal Field. The quantity reinjected reached 103 000-208 000 m^3 for single well. The total reinjected quantity has reached 982 000 m^3. It corresponds to about 35.0% of the annual exploitation of the field.

Geothermal reinjection has resulted in a real benefit. The water level decline has slowed. During 2003, the water level dropped 1.46 m in the field. During 2004 the decline decreased to 1.28 m. It should decrease further in 2005. In addition, reinjection monitoring has revealed new information about two aspects:

1. Water level and temperature monitoring in reinjection wells showed the water level rising and temperature falling when reinjection started; but the water level dropping about 20 m and the temperature rising 10-12ºC rapidly in the first 2-3 hours after reinjection stopped.
2. The thermal water quality changed in the reinjection well. When pumping after reinjection stopped, the compositions of Na^+ and $SO_4^=$ increased in the reinjection well. This represents an increase of typical hot water components.

The above monitoring discovery confirms the mechanism of reinjection: low temperature water sinks into the deeper reservoir, then typical hot water from the deeper part rises up to the top level of the reinjection well.

OCEANIA

New Zealand

News from NZGA

By Jim Lawless

The New Zealand Geothermal Association is pleased to hear of the announcement by Contact of further geothermal drilling at Te Mihi. This is a further step in the ongoing development of the geothermal resources available in New Zealand, and should help Contact generate more electricity from its existing stations at Wairakei and Poihipi.

There has been increasing interest in generation from geothermal power in New Zealand, as its cost is competitive with other forms of generation. While its capital cost is relatively high, its operating costs are relatively low (say compared to gas or coal fired generation). Geothermal generation typically supplies about 7% of all electricity generation nationally, and this is normally baseload generation. Geothermal energy is reliable and not dependent on the weather. There are many fields in New Zealand that are currently untapped or underdeveloped, and that could be readily developed. Geothermal energy is expected to make an even greater contribution to supplying New Zealand's increasing demand for electricity. Conservative estimates that take account of likely consent restrictions have indicated that more than 600MW of new geothermal power stations could be installed.

The New Zealand Geothermal Association is an independent, non-profit industry association with a wide membership covering developers, regulators, researchers, consultants, Maori interests, manufacturers, etc. It provides information on geothermal phenomena and utilisation for industry, government and educational organisations. The NZGA supports appropriate sustainable devel-

opment of geothermal resources, and works with industry and government to achieve this.

For more information, contact Brian White (Executive Officer of the NZGA) phone 0274 771 009, email brian.white@eastharb.co.nz

UPCOMING EVENTS

Green Power – Central and Eastern Europe, 7-9 September 2005, Prague, Czech Republic. Website: http:// www.green powerconferences.com/events/greenPowerCEE.htm

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 (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.

27th New Zealand Geothermal Workshop, early November 2005. Exact dates and venue will be defined shortly. Contact Stuart Simmons. E-mail sf.simmons@ auckland.ac.nz.

Mexican Geothermal Association Annual Meeting. Los Azufres, Mich., México, November 27-28, 2005. Contact: José Luis Quijano-León (luis.quijano@cfe.gob. mx) or Luis C.A. Gutiérrez-Negrín (luis.gutierrez03@ cfe.gob.mx).

Stanford Geothermal Workshop. Stanford, California, USA, January 2006. Contact: Laura Garner (lgarner@pangea.stanford.edu).

27th Annual PNOC-EDC Geothermal Conference. Manila, Philippines, March 2006. Contact: Arnel Mejorada, email: geothermalcon@energy.com.ph

International Heat Transfer Conference IHTC-13, 13-18 August 2006, Sydney, Australia. Contact Graham de Vahl Davis. Tel: +61 2 9327 5706; fax: +61 2 9327 5710; e-mail: ihtc-13@unsw.edu.au. Website: http://ihtc-13.mech.unsw.edu.au/

World Renewable Energy Congress IX & Exhibition, 19-25 August 2006, Florence, Italy. Contact Prof Ali Saigh, WREN. Tel: +44 1273 625 643; fax: +44 1273 625 768; e-mail: asayigh@netcomuk.co.uk. Website: http://www.wrenuk.co.uk/menu.html

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

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
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Rosa María Prol-Ledesma, Mexico
Sylvia Ramos, Philippines
Tingshan Tian, China
Joaquin Torres-Rodriguez, Mexico
Francois-David Vuataz, Switzerland
Kasumi Yasukawa, Japan

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

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

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 August 2005.

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

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

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Business/Organization/Enrolled at (for students) _____

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