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IGA NEWS

Newsletter of the International Geothermal Association

IGA ACTIVITIES

World Geothermal Congress 2005 - Findings and Recommendations

John Lund, President International Geothermal Association; James Koenig, Chairman WGC2005; Orhan Mertoglu, President Turkish Geothermal Association; Valgarður Stefánsson, Executive Director, International Geothermal Association

FINDINGS

1. Approximately 1,400 persons attended the World Geothermal Congress in Antalya, Turkey, during 24-29 April 2005. This was the largest meeting ever held devoted exclusively to geothermal energy. The Congress was sponsored by the International Geothermal Association (IGA) and the Turkish Geothermal Association (TGA). Delegates came from 81 countries, representing all 6 continents. Previous Congresses had been held in Italy (1995) and Japan (2000).

2. Over 700 papers were presented, and published in a CD, covering every aspect of resource exploration, well field development, electric power generation, district hot-water heating, direct-use and geothermal heat pumps, balneology and recreational uses, project finance and economics, public policy, and environmental benefits and protection, all related to geothermal energy.

3. Keynote speakers included the Government Ministers holding the portfolio for energy from Indonesia, Iceland, the Philippines and Turkey, as well as ranking representatives of the European Commission, and the Government of Germany, plus the Minister of Environment of Turkey. They, and leading representatives of industry and academia, stressed several congruent points:

a) There are significant environmental benefits from replacing fossil fuels with geothermal energy, including a reduction in greenhouse gas emissions.
b) There is an urgent need for increased investment in geothermal demonstration and development projects by government and international agencies.
c) There is an urgent need in many countries for legislation authorizing private investment in and ownership of geothermal energy projects.

d) The record shows an increasing level of successful development and utilization of geothermal energy, with utilization in over 75 countries worldwide, serving over 100 million people.
e) Development and utilization of abundant, indigenous geothermal energy is proving a means of freeing many countries from costly and often unreliable import of petroleum.
f) There is a need for policy statements by government and international agencies in which the preferential development and utilization of geothermal energy is promoted as a primary energy goal.
g) The utilization of geothermal energy will be accelerated if national energy development goals specify a fixed percentage of future energy consumption to be reserved for geothermal and other environmentally friendly energy sources.

4. Regarding technological developments, several speakers reported on:
a) improvements in electric power generation using low-enthalpy fluids, thus increasing the efficiency of utilization and the size of available reserves, and greatly expanding the geographical area in which use is economically attractive;
b) the sustainability of geothermal fields under various management strategies, reflecting either satisfying the immediate national needs for energy, or providing a long-term phased development;
c) the approaching commercial development of enhanced geothermal systems (including hot dry rock systems) in which water is injected into relatively impermeable rock to extract heat energy;
d) the economic advantages to be gained by trading carbon credits, based on the favourable chemistry and emissions profile of geothermal energy, and
e) increased utilization of heat pumps to extract heat energy from very shallow holes as an efficient and economically attractive means of home heating and cooling.

5. At present, the installed geothermal electric generating capacity is over 8,900 MWe in 24 countries. This has increased at about 6.5% annually since 1975, with fluctuations reflecting economic cycles. The leading countries in geothermal electric generation are the Philippines, the United States, Indonesia, Italy, Mexico, Japan, Iceland and New Zealand. Recent additions to geothermal electric generation also have come in Papua New Guinea, Portugal (the Azores), Kenya, Germany, Costa Rica, Russia and Austria.

6. Non-electric utilization ('direct use') of geothermal resources in 71 countries totals nearly 28,000 MWt, including the new geothermal heat pump technology. Growth in installed capacity has been about 11% annually since 1975. Leading nations include China, Sweden, the United States, Iceland, Turkey and Japan. In Iceland, over 85% of space heating comes from geothermal energy.

7. It was agreed that the next World Geothermal Congress will be held in Bali, Indonesia in the year 2010. In the interim, meetings will be held by regional affiliates of the IGA.

RECOMMENDATIONS

1. It is urged that nations and multinational groups adopt energy policy statements that give a preferred status to the development and utilization of geothermal energy. This can be done through a variety of ways:
a) Acknowledgement of the environmentally benign ('green') nature of geothermal energy.
b) Encouraging the trading of geothermal carbon credits.
c) Requiring that a minimum percentage of future energy supply be reserved for geothermal energy and related 'green' sources of energy.
d) Recognizing formally that the utilization of indigenous geothermal energy results in a reduction in oil imports, or conversely allows a greater percentage of domestic petroleum to be exported, both having favourable impact on national balance of payments.
e) Establishing a preferential pricing schedule for geothermal energy.

2. It is urged that national legislatures speedily adopt legislation:
a) allowing the investment by private organizations and individuals in the development of geothermal resources and in the ownership of facilities that produce and utilize geothermal energy;
b) streamlining the permitting and resource allocation procedures;
c) providing tax incentives for organizations or individuals that explore for, produce and sell or distribute geothermal energy within their national boundaries;
d) protecting geothermal energy developments from unfair competition from hydrocarbon imports and other high-pollution sources of energy by removing financial and other subsidies that help support the continued use of those non-renewable energy sources;
e) actively supporting geothermal energy development by:
   i) establishment of policies favouring geothermal energy;
   ii) placing a 'pollution tax' on hydrocarbon and other high-pollution energy sources;
   iii) providing grants for geothermal demonstration projects, new technology, and projects in regions not adequately served by existing energy suppliers;
   iv) provision of loan guarantees and insurance policies for environmentally benign geothermal energy projects.

3. Because of the growing need for geothermal scientists, engineers and technicians, it is urged that national legislatures and multinational institutions:

a) sponsor and financially support training programs at the technical institute and university level;
b) provide scholarships for students to attend these institutions;
c) sponsor and financially support lectureships at secondary schools to educate the youth about environmental aspects of energy utilization, especially regarding geothermal energy;
d) provide endorsement and financial support for international geothermal conferences, to encourage the development of new technology and the exchange of ideas and experiences, and
e) encourage participation by indigenous groups who are landowners and the guardians of the resource in many countries.

4. It is urged that national and multinational organizations continue to support programmes of geothermal exploration and development, even in high-risk environments, through grants, non-recourse loans, loan guarantees, and related financial measures, so that less-developed regions may benefit from the utilization of geothermal energy.

5. It is urged that, in nations experiencing energy shortages, the multinational organizations take an active role in speeding the development of geothermal energy. This can be done through accelerated programmes of financing, provision of technical and management expertise, and project reviews and approvals.

Editor´s Note: Invitation from Geothermics

Marcelo Lippmann and Marnell Dickson, Editor and Associate Editor of the journal Geothermics, the International Journal of Geothermal Research and its Applications, which is published under the auspices of IGA, have asked me to pass on an invitation to members of the Association to submit papers to Geothermics. You might be interested in reading their recent editorial.

Editorial published in Geothermics Vol. 35, No. 1 (February 2006)

The changes in recent years in the energy market and in business in general, along with government policies, have all had an influence, whether direct or indirect, on the type and number of manuscripts submitted to Geothermics.

The rising cost of fossil fuels, particularly of oil derivatives and natural gas used in the generation of electricity, in space heating and in industrial processes, has admittedly given a welcome boost to geothermal development, though this has not been felt uniformly across the board. The direct uses are growing at a faster rate, in terms of numbers of projects, than the geothermal electric power sector. Our readers will no doubt have noticed a corresponding rise in the number of articles dealing with direct applications, which are only a part of the many manuscripts submitted in recent years on this topic.

Governments all over the world have been implementing laws and regulations and offering incentives (or disincentives) that promote (or ignore) the development and use of renewable energy resources; these differ significantly from country to country. In the case of geothermal there has been an overall reduction in the funds allocated to R & D by governments and international agencies. In a few cases the decision-makers have adopted the view that geothermal is a "mature industry" and consequently no longer in need of government support, while continuing to help the fossil fuel and nuclear industries and the development of other renewables. This has led to cutbacks in funding for research groups that have been involved in geothermal energy for many years, and even to the closure of the training courses held annually (for almost 25 years) in Auckland, New Zealand, in Kyushu, Japan, and in Pisa, Italy. The net result of these policies is that there are fewer researchers and students working on geothermal-related issues these days. On top of that, and paraphrasing one of our Board members, "despite the great legacy of some countries, mine is terribly underfunded, with aging demographics trending towards a reduction in overall knowledge and capability".

Another negative influence on the number of manuscripts submitted to the journal is the increasing tendency to withhold permission to publish data. In many countries, privatization of geothermal activities has meant less incentive to spend funds on R&D, and a distinct reluctance to disseminate information that might prove useful to the competition. Although major research is still being done, the companies are driving their technical personnel to complete exploration and development work as fast as possible, leaving very little time for them to gather their wits and prepare manuscripts that are good enough for publication.

The combined result of all these factors is, unfortunately, a reduction in the number and breadth of R&D projects, and the drafting of far fewer scientific papers providing information on the latest theoretical, laboratory and field studies.

Despite the bleak scenario that we have just described, not all hope is lost, neither for geothermal R&D, nor for Geothermics. Three important geothermal conferences were held in 2005, whose participants were able to present the results of their projects and share their problems and successes with colleagues. All three were well attended: about 130 registered participants at the 30th Stanford Workshop on Geothermal Reservoir Engineering, around 1300 at the World Geothermal Congress 2005, and about 500 at the Geothermal Resources Council 2005 Annual Meeting. Attendance at the GRC meeting was indeed the largest since 1997. This shows that there is still a strong interest in geothermal energy and encourages us to think that, with appropriate "prodding", our colleagues could be convinced of the importance of publishing the results of their work. We can all benefit from the experience of others.

During this last year, the "editorial team" of Geothermics (i.e., Stefano Bellani, Joe Moore and ourselves) has invited potential authors to send in manuscripts on a number of occasions. The results have not been as positive as we expected, probably because of the factors we have just discussed. To keep Geothermics as the leading "international journal devoted to the research and development of geothermal energy", however, we must have a ready supply of good quality material. In an Editorial exactly a year ago, you were all invited to submit your papers to the journal. We would like to extend this invitation once again, with the promise that we will do our best to process and publish them as soon as possible.

Editor-in-Chief	AssociateEditor
Marcelo J. Lippmann	Mary Helen (Marnell) Dickson

If you have any comments or questions about this matter, please contact Marcelo (mjlippmann@lbl.gov) or Marnell (marnell@igg.cnr.it). "

EUROPE

Renewable Energies for Heating and Cooling: Dinner Debate in the European Parliament in Brussels

Burkhard Sanner, President EGEC

EUFORES (a group of Members of the European Parliament interested in renewable energies) and EREC, the European Renewable Energy Council, organized a meeting of relevant people from politics, administration and industry on 6 December in the restaurant of the European Parliament in Brussels. Mechthild Rothe, German MEP and president of EUFORES, welcomed MEPs from different parties, officers from the European Commission, policy and energy experts, industry representatives, and others, including former MEP Eryl McNally, one of the key supporters of renewable energies in the last decade. Among the MEPs were some key actors for renewable energy; beside Mechthild Rothe, Fiona Hall (UK), Peter Liese (Germany) and Claude Turmes (Luxembourg) were also present.

The goal of the event was to show the importance of the still-missing pillar in the EU's renewable energy support activities - the heating and cooling sector. A European Directive on Electricity from Renewable Energies has existed since 2001 and the Biofuels Directive is on its way for the transport sector, but for the largest energy consumption sector - heat, with almost 40 % of the total - no EU-wide support regulations are in place. Without the heating and cooling sector, the targets set for the European Union in the Kyoto process (the "White Book" targets) and the target of 12.5 % of renewables in all energy supply by the year 2010 cannot be met. It is even more critical to the longer-term targets for 2020 (Turmes-report) and 2040.

EGEC and fellow EREC members have called for a suitable European Union directive to increase the share of renewable energies in the heating and cooling sector. This was underlined at the EGEC Business Seminar 2005 in Berlin, where the relevant EREC-brochure had been presented on 6 April, listing all the reasons and need for such a directive. It can be downloaded from:

http://www.erec-renewables.org/documents/RES-H/EREC_RES-H.pdf.

At the dinner debate in Brussels the main speaker, Ole Pilgard, president of the European Solar Thermal Industry Federation and one of the directors of EREC, explained again the need to foster renewable sources for heating and cooling in order to achieve the targets. Three speakers from the associations for geothermal, solar thermal and biomass promoted the potential of their respective technologies, while the participants enjoyed a light but tasty dinner. A lively discussion followed, and in total the event was a clear signal to the MEPs to discuss favourably the draft initiative report on the need for such a directive. This draft report is currently before the relevant committee of the European Parliament and will be put to the vote in the plenary early next year. It is also hoped that the representatives of the European Commission will acknowledge this clear signal and follow the Parliament report by submitting a draft directive on heating and cooling from renewable energy sources.

On the day after the dinner debate, the European Commission released a statement concerning the RES-Heat directive, in item 2.1 ("Legislation on renewable energy in heating") of the EC Communication on the Biomass Action Plan: "This is the missing piece of the jigsaw, alongside existing directives covering electricity and transport. The Commission will work towards this legislation in 2006."

European committee adopts report calling for a Green Heat target

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BRUSSELS, Belgium, February 1, 2006 (Refocus Weekly) The energy committee of the European Parliament has adopted a report which recommends countries set ambitious targets to increase the share of green heat technologies by 2020.

The Committee on Industry, Research & Energy adopted the Initiative Report on Renewable Heating & Cooling presented by German member of Parliament, Mechtild Rothe, by a vote of 39 to 0, with three abstentions. The report calls on the European Commission to propose a directive to promote heating and cooling from renewable energies, which would substantially contribute to increasing the security of the continent's energy supplies and to reducing dependence on oil and natural gas.

"We expect that Rothe's Initiative Report will receive a similarly clear vote in the European Parliament's plenary and hope that the European Commission will soon present a Directive proposal," says Raffaele Piria of the European Solar Thermal Industry Federation. The group expressed satisfaction with the vote despite a significant weakening of some issues in Rothe's original text that was released late last year.

Targets for green heat should consider the current national shares of space conditioning and water heating, and the potential for solar thermal, earth energy / geothermal, and biomass in each country. The committee had debated the term 'binding' but a vote of 21 to 15 agreed to retain "binding targets" contained in the original version. The report does not suggest that national support schemes be harmonized at the EU level, but it proposes to agree on general principles for support schemes to be adopted and a range of instruments such as tax breaks, financial incentives or regulatory measures. It also proposes measures to reduce the administrative barriers to the use of green heating and cooling.

ESTIF represents manufacturers and service providers in the solar thermal sector, and promotes acceptance for solar thermal as a key element for heating and cooling in Europe.

Russia

Obituary - Vladimir Kononov 01.01.1932 – 25.12.2005

Scientific Council on Geothermal Problems of the Russian Academy of Sciences

Vladimir Ivanovich Kononov, Main Reseacher of the Geological Institute of the Russian Academy of Sciences, Doctor of Sciences (Geology and Mineralogy), Member of the Russian Academy of Natural Sciences and the pre-eminent scientist in the field of hydrogeology, hydrochemistry and hydrogeothermics died on December 25, 2005.

V.I. Kononov graduated from the hydrogeological faculty of the Moscow Geological Prospecting Institute in 1954 and joined the Laboratory of Hydrogeology and Engineering Geology Problems of the USSR Academy of Sciences, where he studied the influence of water and other natural factors on the process of underground gasification of coals. After reorganization of this Laboratory in 1961 he worked in the Geological Institute of the Russian Academy of Sciences until the end of his life.

There were some basic directions in his scientific activity.

The first one was development of general theoretical questions of hydrogeology: hydrophysical zonation of the Earth's crust, formation of chemical compounds of underground waters, their genesis and classification.

The second direction consisted in regional researches based on the comparative analysis of thermal waters from different areas of modern volcanism in Kamchatka, Kuriles and many foreign countries. He took part in long-term geodynamic expeditions of the USSR Academy of Sciences to Iceland. Then he studied thermal fluids in the Transmexican volcanic belt and its surroundings during several field trips. He revealed the distinctions in composition of deep high-temperature fluids in island arcs and rift zones, he identified some genetic types of fluids (including earlier unknown "hydrogen" v. "methane" steam-water mixtures), and he proposed a new classification of thermal waters in volcanic areas, reflecting specificity of their interaction with rocks and with heat sources in various geo-tectonic conditions.

The third direction involved studying various aspects of hydrothermal activity, i.e. the basic regularities of formation of thermal waters, their roles in transfer of deep heat, mass balance in hydrothermal systems and the effect of their discharge at the ocean floor. He carried on marine geothermal researches in the Caribbean-Mexican region of the Atlantic Ocean and in the area of the Central-American trench of the Pacific Ocean, heading several cruises of the RV "Academician Nikolay Strakhov".

Finally, the fourth direction was connected with an estimation of the prospects for use of hydrothermal resources in a national economy as an energy source and a mineral raw material. With this purpose he carried out researches in the Caucasus, in CisCaucasia, Baykal Rift Zone, Kuriles-Kamchatka region and in other areas of the country. One result of his long-term efforts on the organization of practical use of deep heat was the construction of the large Mutnovsky geothermal power station on Kamchatka.

V.I. Kononov published over 200 scientific works and 12 monographs, which are widely known in Russia and abroad. About 30 of his works are issued in English, French, Spanish and Icelandic. His monograph " Geochemistry of thermal waters of areas of modern volcanism (in rift zones and island arcs)", in Science, 1983, received wide acclaim.

V.I. Kononov gave much force and a lot of time to organization of scientific work. In the Geological Institute he managed the Laboratory of Geothermics (1972-1986) and the Laboratory of Geoenergy and Hydrogeochemistry (1986-1997). Since 1989 he was the Chairman of the Scientific Council on Geothermal Problems of the Russian Academy of Sciences. V.I. Kononov was also a member of the Scientific Council of the USSR Academy of Sciences on Engineering Geology and Hydrogeology, the Bureau of the hydrogeology section of National Committee of Geologists of the USSR, the Scientific Councils of the Geological Institute RAS and VSEGINGEO, editorial boards of magazines "Proceedings of the Academy of Sciences, 'A' series, Geological" (1990-1992), "Lithology and mineral resources" (1992-2005), and "Geothermics".

V.I.Kononov had wide international popularity. He was a member of the International Association on Hydrogeology (IAH) and the International Geothermal Association (IGA). He worked in the Commission of thermal and mineral waters of IAH, he was a member of the IGA Board of Directors (1992-1995) and he headed a number of the international projects.

V.I.Kononov's activity was marked by the Diploma of Presidium of the USSR Academy of Sciences and the Russian Academy of Sciences in connection with the 250th and 275th anniversary of the Academy of Sciences, by medals «the Veteran of Labor», «300 years to the Russian fleet» and «In memory of the 850th anniversary of Moscow ».

In recent years V.I.Kononov did not limit his activity to scientific work only. He wrote and published three editions of "Geological etudes" in which the sparkling humour and literary talent of the author was shown.

Memories of Vladimir Ivanovich Kononov will remain forever in the hearts of his colleagues, friends and relatives.

Russia

Heat and electricity from Hot Dry Rocks of Avachinsky Volcano for the Center of Kamchatka

Dr. Prof. Oleg A. Povarov, Russian Association of Geothermal Energy Society,

Dr. Viktor M. Sugrobov, Nauka SC

At the International Mineral Extraction Conference held in September this year in Petropavlovsk-Kamchatsky City, experts and scientists discussed a proposal to radically solve the problem of heat and power supply of densely populated Petropavlovsk-Kamchatsky City by utilizing geothermal resources located not far from the city. The proposal rests on the idea of using accumulated heat of Hot Dry Rocks forming the magma chamber of Avachinsky Volcano. The idea was first brought forward by V.V. Averev (1964-1967), who justified deep drilling in the pre-chamber area to study geothermic conditions and develop a heat extraction system. By that time the interbedded magma chamber under Avachinsky Volcano had been discovered by geophysical methods (Institute of Volcanology, Siberian Branch of the Academy of Sciences, USSR, Schteinberg, Zubin, 1963).

Assumptions of high temperatures in the HDR chamber (600-1000°C) and its big area, derived from geophysical and petrological data, implied that the chamber has a big energy potential. The idea of V.V. Averev was further developed in the report on "Possibilities for utilizing heat of Avachinsky Volcano magma chamber" (Fedotov, at el,) made at the Second United Nations' Symposium on the development and use of geothermal resources (San Francisco, USA, 1975) (see Fig. 1).

Avachinsky Volcano is located in the vicinity of Petropavlovsk-Kamchatsky City. The distance between the volcanic crater and the city is 25-28 km. Avachinsky Volcano, forming part of the Avachinsky Group of volcanoes, lies in a volcano-tectonic depression. The maximum depth of Upper Cretaceous igneous-sedimentary rocks constituting the base-

ment is registered directly under Avachinsky Volcano (1.5 km below the sea level). The abnormal zone associated with the peripheral magma chamber creates a big local gravity anomaly, does not produce a significant positive magnetic anomaly, but induces anomalies in seismic-wave propagation. Interpretation of geophysical data allows the suggestion that the peripheral magma chamber of Avachinsky Volcano is deposited between the Upper Cretaceous basement and the volcanogenic overburden. From seismic data, the depth of the chamber top edge is 1.5 km below the sea level, while gravimetric data show that the center of the gravity anomaly is located at the depth of 4 km. Seismic surveys reveal that the chamber area at the basement level is about 5.2 ± 0.9 km in radius, with the most "heated" part of the chamber being 3.6 km in radius.

Continuous seismic refraction and deep seismic profiling across Avachinsky Volcano performed in 1982-84 in a south-easterly direction proved the existence of a zone with higher absorption properties and seismic waves velocity inversion at depths between 1.5-3 km.

The size of the Avachinsky Volcano chamber along the seismic profile can be evaluated to be within the range of 2 and 5.2 km in radius. A smaller radius is determined using the total magma consumption data over the recognized chamber life-period of 60 thousand years.

It is impossible to measure precisely the geometrical size and form of the chamber by geophysical methods, due in particular to an inability to evaluate rock density. Given the depth of the main anomaly (2-6 km) and the above radii, one can assume that the larger anomaly has an ellipsoidal form while the smaller anomaly has the form of sphere. Respectfully the size of the chamber can be estimated within 35-350 km^3.

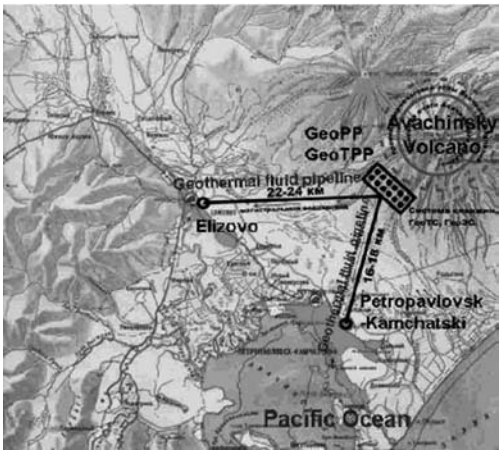


Figure 1. Petropavlovsk-Kamchatsky district heating system operating on HDR technology.

At present utilization of the huge heat reserves of the magma chamber (of the order of 1-10 ·10^{20} J) can hardly be realized without a technology of drilling at high temperatures. At the same time in the pre-chamber zone the temperature of 250°C, even in non-stationary conditions and given the chamber life-period of 20 000 years (Fedotov, at el, 1976), can be assumed to extend over 2 km (see Fig. 2). Based on the temperature profile survey of the area around the magma chamber, the accumulated heat potential is estimated to be of the order of n·10^{21} J. It becomes obvious that we should utilize the accumulated HDR energy of the nearest pre-chamber area. For example, from 1 km^3 of rocks at the depth of 5 km and 6 km distance from the volcano one can produce about 8·10^{17} J in non-stationary conditions.

To utilize HDR heat it is envisaged to create within the pre-chamber area an underground circulation system comprising deep wells. Model temperature profiles around the magma chamber justify possibilities of uncovering by 4 km-deep wells high-temperature areas (250-400°C), including in non-stationary conditions. If we assume the chamber radius to be 5 km, vertical wells should be drilled at a distance of 6-8 km away from and south of the volcano. Inclined wells should be drilled at a greater distance - 7-9 km from the volcano (see Fig. 2).

At the first stage of the project implementation, drilling of one parametric well is envisaged, aimed at confirming the existence of the temperature anomaly in the pre-chamber zone. Further, in case of positive results, one or two more wells will be drilled to perform hydraulic frac tests and form an underground circulation system. The system's parameters will be determined by heat demand, HDR properties and the wells' output.

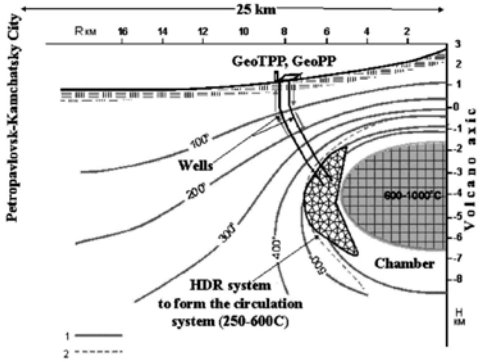


Figure 2. Temperature profiles under Avachinsky Volcano at different depths and the allocation plan of deep wells.

Presently heat demand in Petropavlovsk-Kamchatsky City reaches 700 Gkal/h (0.8 GJ/s). Assuming an average temperature in the pre-chamber zone of around 300°C and its cooling by 50°C, the circulation system's rock volume will be about 20 km^3. Based on preliminary guidelines from French specialists from BRGM, assuming a well output of some 25 kg/s from the circulation system and assuming a fluid enthalpy of 1080 kJ/kg, drilling at least 45 injection and production (vertical and inclined) wells to depths between 3.5-4 km will be needed. To support the operation of the geothermal circulation system some 1000 l/s of water will be required, which can be taken from water flows streaming down the volcano.

At the meetings held in July and August this year in Moscow specialists from Moscow, France and Germany decided to prepare jointly an international report on utilization of HDR of Avachinsky volcano to produce heat and electricity for the center of Kamchatka (see Fig.1), in which exploration and exploitation of the petrothermal energy source, technical and economic parameters of the project, and other associated issues will be thoroughly studied.

THE AMERICAS

Mexico

2005 Annual Congress and XIII Ordinary General Assembly of the Mexican Geothermal Association (AGM)

Luis Gutiérrez-Negrín, Mexican Geothermal Association

On November 25, 2005, the Mexican Geothermal Association (AGM: Asociación Geotérmica Mexicana) held its Annual Congress and its XIII General Ordinary Assembly at the facilities of the Comisión Federal de Electricidad (CFE) of the Los Azufres geothermal field, located in the State of Michoacan, in central Mexico. Seven technical papers were presented during the congress, regarding some aspects of the Cerro Prieto and Los Azufres geothermal fields, the Mexican histories and legends related to geothermics and the submarine geothermal resources. The proceedings were collected on a CD. Some of those papers will be published in the Mexican magazine Geotermia (which can be read at the Geothermal Resources Council website: http://geothermal.org).

During the opening of the congress, Alejandro Abril-Gaspar, President of the AGM, read a salutation letter sent by John W. Lund, President of the International Geothermal Association (IGA), to which the AGM belongs as a national association.

After the congress, the AGM assembly was conducted by its President, under the following agenda:

1. Approval of the Minutes from the General Extraordinary Assembly of June 15, 2005.
2. Report of the Directive Board.
3. Report of the Treasurer.
4. Presentation of the 2005 Pathé Award.
5. General issues.

The Pathé Award was recently instituted by the AGM to honour annually a person with a minimum of 15 years working in Mexican geothermics, whose professional trajectory or contributions are regarded as important. In this, its first year, the Pathé Award went to Héctor Alonso-Espinosa. He is a 69 year old Mexican geologist who has been involved in geothermics since 1958. Between 1977 and 1989, as head of the Cerro Prieto field and of the Mexican geothermal division of the Comisión Federal de Electricidad (CFE), he was the executive responsible for the construction and commissioning of almost 600 MW of geothermal-electric units in the Mexican fields of Cerro Prieto and Los Azufres. Presently, Héctor Alonso-Espinosa is a consultant for the CFE's geothermal division.

The AGM finished its business by taking the traditional photo, this time having as background the first geothermal-electric unit installed in the American continent, the one of 3.5 MW formerly operating in the Pathé, Mexico, geothermal field, which is now on exhibition in Los Azufres.

Photo 2. Members of the AGM in the Los Azufres geothermal field. In the background is the first geothermal power plant in the American continent.

ASIA/PACIFIC RIM

Indonesia

INAGA Geothermal Seminar

Alimin Gintin

On 29 September 2005, the Indonesia Geothermal Association (INAGA), in cooperation with the Indonesian Chamber of Commerce (KADIN) and the Indonesia Electricity Society (MKI), held a one-day seminar with the title "Geothermal Breakthrough for Fuel (BBM) Crisis Solution and Security of Energy Supply" in Indonesia.

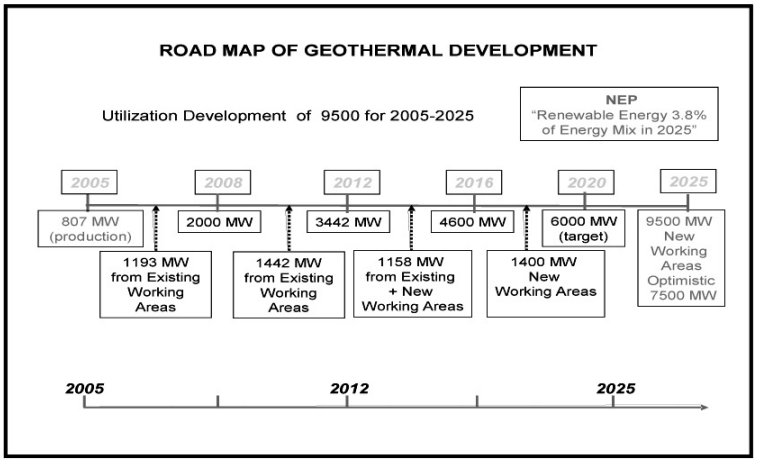
The Seminar was opened by Mr. Wimpy S. Cecep on behalf of Coordinating Minister for Economy Mr. Aburizal Bakrie and the closing remarks were made by the Minister of Energy and Mineral Resources, Mr. Purnomo Yusgiantoro.

Background

The Indonesia archipelago has numerous active volcanoes associated with a 7,000 km long plate boundary along which there is both convergent and strike slip movement. This has given rise to a large concentration of high temperature geothermal systems. Indonesia may have the highest geothermal potential of any nation, with a geothermal resource of about 27,000 MWe. It is estimated to constitute 40% of the world geothermal resources.

Although Indonesia has abundant geothermal resources, which are known to produce environmentally clean energy, development of geothermal energy in Indonesia is facing many challenges. Over a span of 20 years, Indonesia has developed 807 MWe of geothermal power or 4% of its geothermal potential. INAGA and IGA, as part of the world geothermal society, need to promote geothermal utilization in Indonesia.

To date, the government program of removing subsidies for electricity and petroleum fuel have considerably aided progress toward geothermal development. Since the fuel price is high and Indonesian oil production is limited, and there is a need to import some fuel for domestic consumption, geothermal energy may be able to replace fossil-fired base power plant to generate electricity.



Objectives of the Seminar were:

1. to present the current situation of geothermal development in Indonesia from all aspects i.e. legal/regulatory, commercial, technical, institutional, etc.
2. to review and analyze whether the present situation has a positive or negative influence on achieving the 4,000 MWe target for geothermal power plant in Indonesia.
3. to make recommendations to the government of Indonesia and to the business community regarding what kind of challenge, change, and improvement should be made to the current situation to support and create a business environmental condusive to geothermal power development reaching 4,000 MWe by 2010.

Factors and challenges to develop geothermal in Indonesia:

1. High investment cost.
2. Limited funding and incentive mechanisms.
3. Gasoline products remain below the market price.
4. Legal and fiscal uncertainties.
5. Uncompetitive energy prices.

Speakers at this one day seminar came from geothermal developers, government (Director General of Electricity and Energy Utilization, Secretary for Director General of Geology and Mineral Resources, Tax Department, and Indonesia National Development Plan Board), a state-owned company, geothermal industries, observers, and others.

Some recommendations (API's general and specific recommendations) were formulated by API as follows.

General recommendations:

- Outlining road maps and master plan according to energy and energy mix, with clear time and period and targets. The road maps and master plans are binding for all related institutions to develop geothermal energy (the Geothermal Road Map is attached).
- The role of renewable energies is expected to be enhanced, especially for renewable energies like geothermal that have achieved economic scale, through an integrated program.
- In response to the energy crisis in Indonesia, there is a need to simplify procedures and bureaucracy in order to accelerate energy conservation and diversification.
- As skyrocketing oil prices in the world market have exceeded USD 50 per barrel, geothermal - renewable energy utilization needs to be implemented soon, to reduce oil usage for electricity purpose.
- As a developing country, Indonesia has to produce policies on consolidated energy prices so as to increase added value in the real sectors.

Among the specific or special recommendations are:

- To accelerate the issuing of the Government Regulation to implement Geothermal Law #27/2003 on geothermal resources, to attract new investment - especially for new or green field sites.
- Honour and resolve all issues related to existing geothermal contracts in Indonesia.

All the above recommendations were submitted to the Minister of Energy and Mineral Resources during the closing ceremony of the seminar. In his closing remarks, the Indonesian Minister of Energy and Mineral Resources warmly welcomed the Seminar and expected that the global oil price hike will drive and create opportunities for renewable energy enhancement like geothermal energy.

Japan

GRSJ Annual meeting at a local spa resort

Kasumi Yasukawa, AIST, Japan

The Geothermal Research Society of Japan (GRSJ) held its 2005 Annual Meeting at Obama, Nagasaki from 18 to 20 November, 2005, followed by a 2-day excursion to geothermal sites. Approximately 150 members, including five international participants, participated in the meeting for technical presentations (20 posters, 74 oral presentations), special lectures and general meeting. Technical sessions cover as wide an area as ever: scientific and engineering studies from exploration to sustainable operations. Among them, the number of presentations on geothermal heat pump applications has been increasing in recent years.

Geothermal manifestation at Unzen hot spring area near Unzen Volcano: the first stop of the excursion following the GRSJ annual meeting. The latest major activity of Unzen Volcano continued from 1990 to 1995, including eruptions.

Obama is a traditional beachside spa resort, located in Shimabara Peninsula, at the foot of Unzen Volcano, the latest eruption of which occurred in 1990. Although NEDO confirmed a geothermal reservoir of over 200°C in this area by co-operation with the local authority as a result of "Geothermal Development Promotion Surveys" (see IGA News, No. 57, p. 10), further drilling was interrupted by Nagasaki prefecture due to negative pressure from hot spring owners in Unzen, a neighboring district.

The 2005 meeting was the first GRSJ annual meeting held at a local spa resort since it was founded in 1978, by collaboration with the local authority. Two of four organized sessions were open to the public free of charge. One was titled "Multiple utilization of hot springs as geothermal energy" After introducing a variety of usages of hot springs, a smart choice for the authority about multi-purpose utilization was suggested in the open discussion. In the other one, titled "Volcano, geothermics and hot springs in

Shimabara Peninsula", recent studies on Unzen Volcano were presented and questions about the location of the magma chamber and passage of geothermal fluid were discussed enthusiastically. GRSJ hopes these open discussions will help to break an "invisible wall" between geothermal society and local hot spring owners. 'It was very successful! I believe these collaborations at Obama really helped the mutual understanding between local residents and geothermal society,' said Hiroaki Niitsuma, GRSJ Director, Tohoku Univ., after an informal discussion with hot spring authorities from the region.

Two other organized sessions were titled "Problems and their solutions on steam supply operations for geothermal power plants" and "Introduction to the technical lecture series on geothermal heat pumps on the GRSJ journal." The former session was planned and organized by Japan Geothermal Developers' Council. Also a special lecture "Eruption of Unzen Volcano and its scientific drilling" by invited speaker Prof. H. Shimizu, Kyushu Univ. was of interest.

An IGAJ (IGA-Japan) general meeting was also held during the period. Toshihiro (Toshi) Uchida, AIST was selected as the new representative of IGAJ, succeeding Sachio Ehara, Kyushu Univ.

GRSJ 2006 Annual Meeting is to be held in Ten-ei, Fukushima, another local spa resort, known as a village of renewable energies. Ten-ei is a target area of NEDO's promotion survey as well.

Philippines

Unocal Philippines now part of Chevron

Edgar P. Sevilla

On August 10, 2005, the stockholders of Unocal Corporation approved the merger agreement between Unocal and Chevron Corporation.

The Chevron-Unocal merger paves the way for the creation of a combined company that is now the fourth-largest publicly traded company in terms of oil and gas production and the third-largest reserve holder among international oil companies globally.

With the acquisition, Unocal Philippines, Inc. (UPI) officially became a member of the Chevron family. UPI is now part of the Geothermal and Power group of Chevron's Indonesia-Asia strategic business unit.

Unocal operates geothermal assets located at Tiwi (232 MW) and Mak-Ban (402 MW) in the Philippines and at Salak (377 MW) on West Java, Indonesia. Chevron operates geothermal and associated power generation assets at Darajat (145 MW) also on West Java and a cogeneration facility in North Duri. Consolidation of these geothermal assets positions Chevron as the leading geothermal energy company in the world with 1,156 MW of installed capacity in Southeast Asia.

Chevron Corporation is one of the world's leading energy companies. With more than 53,000 employees, Chevron subsidiaries conduct business in over 180 countries around the world, producing and transporting crude oil and natural gas, and refining, marketing and distributing fuels and other energy products. Chevron is based in San Ramon, Calif. More information on Chevron is available at www.chevron.com.

China

Geothermal Serves the Development of Renewable Energy in Tibet

Keyan Zheng, Geothermal China Energy Society (GCES)

The Tibet Autonomous Region is located on the southwestern border of China. There is a lack of coal and oil resources, and previously there were small power plants that used diesel. Yangbajain Geothermal Power Plant started generation in 1977 and reached a capacity of 25.18 MW in 1991. A big hydropower plant at Yamzho Yumco Lake started generation in 1997 and reached a capacity of 90 MW in 2004. After that, the Lhasa diesel power plant stopped running. Therefore, the Central Tibet Grid connecting the main cities of Lhasa (capital city of Tibet), Rikaze etc., basically carries electricity from renewable energy.

The Qinghai-Tibet railway has just been completed and will start operation this summer. Given the cheap cost of railway transportation and the large potential of transportable load, is there a need to transport coal to Tibet to meet the developing local electricity demand? Chinese scientists specializing in energy and renewable energy recently made a combined proposal. In order to protect the local blue sky, they advocate developing local renewable energy sources to solve the electric power demand in Tibet, and also solve the problem of local space heating in winter, rather than transporting coal into Tibet.

There is a load capacity of 24.18 MW in Yangbajain Geothermal Power Plant now, and it has generated 1,880 GWh of electricity since 1977. It generated 115.4 GWh in 2005. Although its real capacity has decreased to 75 % of design

capacity (say about 18.5 MW now) it has run for about 6,000 hours annually in the last 2 years. The Tibetan Bureau of Geological Exploration has explored the Yangbajain deep reservoir and another Yangyi geothermal field. Both high temperature geothermal fields have the same potential of load capacity of about 30 MW. In addition, several geothermal fields along the Qinghai-Tibet railway have been surveyed in detail and showed a potential total capacity of 41 MW.

It is predicted that the future demand for power will call for an additional 1,200 MW capacity in 2020. There are rich hydropower resources of about 100 GW capacity that can be developed in Tibet. It is sufficient for the power demand of the Tibetan main grid, and would also solve the problem of small hydropower supply in decentralized villages. Hydropower usually runs about 2,000 hours per year, the problem being that there is a lower flow rate in winter. However, geothermal power generation can fill the peak demand. In addition, for the rather decentralized population in northwestern Tibet where there is a lack of hydropower, solar and wind energy would be able to meet local power demand.

Another big energy demand in Tibet is space heating in winter. Only about 10 % of buildings in Lhasa now have space heating facilities. Most local residents burn cow (yak) dung and firewood for heating. From the point of view of energy resources, the huge waste heat from Yangbajain geothermal power plant could be transported after heat exchange and sent by pipeline to Lhasa. This could provide space heating for 35% of all Lhasa's buildings. If ground source heat pumps (GSHP) were used on the returned warm water, local groundwater plus GSHP would be able to provide space heating for the rest of the buildings and houses in Lhasa and other areas where there is a power supply. For some remote areas without electricity supply, solar and wind energies can solve local space heating.

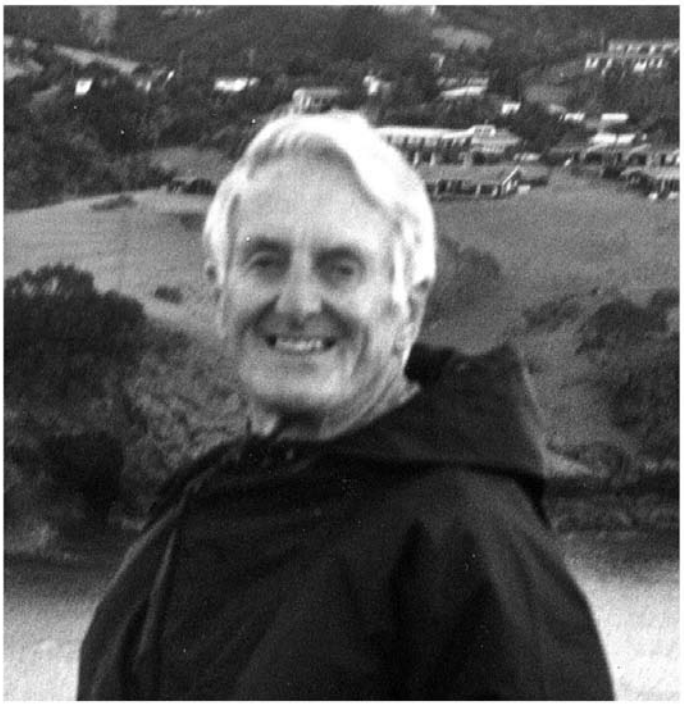
Therefore, we can use renewable energy to solve all power and heating demands in Tibet.

OCEANIA

New Zealand

Obituary - Neville Dench 1927-2005

Manfred Hochstein and Richard Bolton



It is with regret that we record the death of Neville Dench on 17 October 2005 at his home in Auckland, New Zealand. He was well known in the international geothermal community for the great contribution he made to the development of geothermal energy not only in New Zealand but in many other, mainly developing countries. The cause of his death was asbestosis, almost certainly the result of exposure to asbestos during his early career in geothermal engineering.

Educated at Christ's College and Canterbury University College in Christchurch, New Zealand, Neville graduated Bachelor of Engineering (Civil) in 1949. He was elected a Fellow of the Institution of Professional Engineers of New Zealand and became a member of the Institute of Petroleum Engineers and of the NZ Geothermal Association.

Shortly after graduating, he joined the New Zealand Ministry of Works (MoW), transferring to the Wairakei geothermal project in 1954 at a stage when the investigations were very much in their infancy. While he was primarily responsible for measurements, quality control and engineering research, the small staff and limited resources meant that everyone contributed to the solution of problems as they arose. Thus, Neville laid the foundation on which he built his wide knowledge of the technology he applied so ably in later years. Among his many contributions at this time was the design of the twin tower silencers for noise and waste water control, now in wide use overseas as well as in New Zealand. While at Wairakei, he was awarded the 1963 W.A.Stevenson Award enabling him to visit geothermal installations in the USA, Italy and Iceland and attend a fluid production course at Texas A & M University.

Neville transferred to the MoW Head Office in Wellington in 1964 where he was involved with the planning, costing and assessment of projects within the geothermal programme. During this period he began his long association with geothermal developments overseas, providing technical support to United Nations Development Programme (UNDP) and New Zealand Ministry of Foreign Affairs (MFA) geothermal aid projects. In 1971, this involved six weeks in New York preparing the specification for and assisting in the procurement of the large drilling rig for the UNDP project at El Tatio in Chile. The following year, at the request of the UNDP, he was granted leave to take up a two year appointment as drilling engineer with the Olkaria investigation project. Among other things, this gave him valuable experience in the application of new drilling techniques as well as beginning his long association with Kenya. On his return, as well as his continued involvement with local geothermal schemes, he visited Indonesia and the Philippines to advise on New Zealand's bilateral aid projects then in progress.

In 1975, he was offered and accepted the position of General Manager of Geothermal Energy (N.Z.) Ltd (GENZL). The firm had just been awarded the contract for the development of the 30 MW(e) pilot plant at Kamojang in Indonesia and Neville's first task was to take this through to a successful conclusion. However, as General Manager, he had much wider responsibilities than Kamojang. Over the next few years, he traveled extensively, promoting GENZL's interests in fresh projects as well as providing technical advice on those already underway.

In1984, the Kenyan Power Company asked GENZL to assist with further developments at Olkaria and Eburru, at the same time asking that Neville be closely involved in the management of the project. He therefore spent the next two years in Nairobi as Project Director responsible for the overall coordination of these projects. On his return from Kenya, Neville continued to provide technical support to the GENZL's work, again requiring much overseas travel. He retired from GENZL in 1992 as Engineering Director, following which he undertook part time consulting work, finally retiring in 2004.

Neville contributed much more to geothermal technology than just the hands-on activities he enjoyed so much. His input as a member of the technical committee which developed the Code of Practice for Deep Geothermal Wells (New Zealand Standard 2403-1991) was invaluable. This code is still in use both in New Zealand and a number of countries overseas. Neville also authored or co-authored a wide range of papers and reports on geothermal development, beginning with his paper on silencers given to the 1961 UN Rome Conference on New & Renewable Sources of Energy. As an indication of the breadth of his geothermal knowledge, a few of the topics he covered include casing string design, the relationship of law and geothermal development in New Zealand, well measurements and an assessment of the geothermal resources in the Pacific.

But of possibly even more value to the international geothermal community was the contribution he made to the formation and operation of the Geothermal Institute at the University of Auckland. Following the 1977 decision to establish the Institute, Neville was asked to join the Founding Committee, where he took an active part in the development of training policies and the syllabus. He became a member of the Board of Studies monitoring the activities of the Institute and, from the initial course in 1979 until 1998, was a part-time lecturer. Over 500 ex-Diploma students received the benefit of his block lecture "Introduction to Well Siting and Field Development Strategies." His wide experience gave him a deep understanding of the learning and adjustment problems of students from developing countries which, together with his own ability in transferring his knowledge, made him an excellent lecturer.

Throughout his career, Neville continued to extend his understanding of geothermal technology. He was never reluctant to share the knowledge he gained and had the great ability to do so easily. This, together with his warm interest in other people won him many friends among the international geothermal community.

He will be sadly missed.

WORLD

New EGS Project Handbook (EGS-PMDA) from IEA-GIA Annex III

Mike Mongillo, Secretary, IEA Geothermal Implementing Agreement and

Thomas Mégel, Alternate Member, GIA Executive Committee and GEOWATT Ltd.

The International Energy Agency Implementing Agreement for a Cooperative Programme on Geothermal Energy Research and Technology, or Geothermal Implementing Agreement (GIA), provides a flexible framework for extensive international cooperation in geothermal research and development. Now in its second 5-year term of operation, the GIA's major goal is to support and advance the worldwide use of geothermal energy by breaking down barriers to its development. In this pursuit, the GIA is currently directing its activities to the coordination of members' national research programmes for exploration, development and utilization of geothermal resources. As of January 2006,

the European Commission (EC) and ten countries: Australia, Germany, Iceland, Italy, Japan, Mexico, New Zealand, Republic of Korea, Switzerland and the United States, were members.

At present, the GIA participants are working on five broad research areas specified in what are termed "annexes", with specific activities of each, defined in "subtasks". The five current annexes are:

(1) Annex I: Environmental Impacts of Geothermal Energy Development
- To clearly identify possible environmental effects and devise and adopt methods to avoid or minimize their impacts

(2) Annex III: Enhanced Geothermal Systems (EGS)
- To investigate new and improved technologies that can be used to artificially stimulate geothermal resources to enable commercial heat extraction

(3) Annex IV: Deep Geothermal Resources
- To investigate the commercial development of geothermal resources at depths greater than 3,000 m

(4) Annex VII: Advanced Geothermal Drilling Techniques
- To conduct advanced geothermal drilling research and investigate all aspects of well construction, aiming to reduce the costs associated with this essential and expensive part of geothermal exploration, development and utilization

(5) Annex VIII: Direct Use of Geothermal Energy
- To improve the implementation, reduce costs and enhance the direct use of geothermal resources for heating and cooling applications

Annex III and the EGS-PMDA

The exploitation of high enthalpy geothermal systems through the use of EGS technologies is one of the most promising options for providing sustainable and environmentally acceptable electricity generation and direct use applications. Recognition of this prospect led the GIA to create Annex III in 1997, to investigate various aspects of EGS. The acquisition and processing of EGS data, and its dissemination in useable form, are fundamental components of the Annex III work.

For over 30 years, scientific, technical and organizational data and knowledge have accumulated from a succession of long-lived EGS research projects in different countries. In the present period of transition from R&D to commercial exploitation, it is extremely important that new project teams have access to a synthesis of this data, knowledge and experience to help ensure a smooth and successful start of their projects. To this end, the first version of an EGS- Project Management Decision Assistant (EGS-PMDA) tool was developed as part of the work in Subtask C of Annex III.

The EGS-PMDA

The EGS-PMDA is a handbook for starting new EGS projects. It provides an information framework for the project planning and construction of the first generation of commercial EGS power plants. It assembles an overview of data, data analyses and experiences (as a reference database of reports and publications, including many abstracts) obtained from the major EGS projects worldwide since the early 1970s. It also includes an example index of suppliers of services and equipment, which can be developed specifically for the user's requirements and local part of the world. A very important aspect of the EGS-PMDA is that it indicates what and when items of data and information must be obtained during a project in progress, and where to obtain that data and the currently available experiences.

Specifically, the EGS-PMDA consists of five major sections:

(1) *Introduction*- provides a description of the tasks and targets and the general status of the EGS-PMDA

(2) *Generic Project*- includes the principal milestones within the whole lifecycle of an EGS plant (from the concept to abandonment phase), and presents the data requirement for each project phase and the first point of need of a specific data set

(3) *Index of Suppliers*- contains an introduction to the list of suppliers of services and equipment for Western Europe and an explanation of the information assembled for each of them

(4) *Collected Experiences*- contains the historical, public funded EGS R&D information for Fenton Hill (USA), Rosemanowes (GB) and Soultz-sous-Forêts (F); with the integration of information for Hijiori (J) now underway

(5) *Bibliography*- includes 2,638 references, ~ 30% with abstracts, for all the terminology variations related to EGS, such as Hot Dry Rock (DHR), Hot Wet Rock (HWR), Hot Fractured Rock (HFR), Deep Heat Mining (DHM), etc. The majority of references concern one of the past or present EGS programmes such as Fenton Hill (USA), Rosemanowes (GB), Bad Urach (D), Hijiori and Ogachi (J), Soultz-sous-Forêts (F), Fjaellbacka (S), Deep Heat Mining (CH), Hunter Valley and Cooper Basin (AUS).

To read a more detailed overview of the EGS-PMDA and/or find out more about the IEA-GIA, please go to the IEA-GIA homepage at: http://www.iea-gia.org/.

UPCOMING EVENTS

World Sustainable Energy Days. Wels, Austria. Mar. 1-3, 2006. Contact: www.wsed.at

27th Annual PNOC-EDC Geothermal Conference. Manila, Philippines, Mar. 8-9, 2006. Contact: Jem Austria, austria.jjc@energy.com.ph, www.energy.com.ph/Geoscientific/geocon2006.htm

Meeting on Geothermal Energy Generation in Oil and Gas Settings. Southern Methodist University, Dallas, Texas, USA, Mar. 13-14, 2006. Contact: David Blackwell, blackwel@smu.edu, www.smu.edu/geothermal/Oil&Gas_SMUmeeting.htm

3rd Annual POWER-GEN Renewable Energy. Las Vegas, Nevada, USA, Apr. 10-12, 2006. http://pgre06.events.pnnnet.com/

ASME ATI Conference. Milan, Italy, May 14-17, 2006. www..asmeati2006.it

TOUGH Symposium 2006. Berkeley, California, USA, May 15-17, 2006. www-esd.lbl.gov/TOUGHsymposium

International Summer School of Geothermal. Izmir, Turkey, May 28 – June 11, 2006. Contact: jenarum@deu.edu.tr, www.deu.edu.tr/DEUWeb/English/Icerik/Icerik.php?KOD=8425

The Seventh Asian Geothermal Symposium. Qingdao, China, July 25-26, 2006. Contact: asia7@m.aist.go.jp, http://unit.aist.go.jp/georesenv/asia7.html

International Heat Transfer Conference IHTC-13. Sydney, Australia. August 13-18, 2006. Contact: Graham de Vahl Davis, ihtc-13@unsw.edu.au, http://ihtc-13.mech.unsw.edu.au/

World Renewable Energy Congress IX & Exhibition. Florence, Italy, August 19-25, 2006. Contact: Ali Sayigh, asayigh@netcomuk.co.uk, www.wrenuk.co.uk/wrecix.html

GRC 2006 Annual Meeting. San Diego, California, USA, September 10-13, 2006. Contact: Geothermal Resources Council grc@geothermal.org, www.geothermal.org.

International Summer School Workshop/Conference "International Geothermal Days Ukraine 2006". Odesa, Ukraine, Sep. 17-22, 2006. Contact: Kiril Popovski, isskiril@sonet.com.mk

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

Sustainable Energy & Energy Efficiency Expo 2006, London, UK, October 10-12, 2006. Contact: www.energy-expo.info

3rd BSME-ASME International Conference on Thermal Engineering. Dhaka, Bangladesh, December 20-22, 2006. Contact: www.iutoic-dhaka.edu/bsme_asme_icte2006/index.html

4th International Congress on Numerical Methods in Engineering and Applied Sciences, Morelia, Mexico, January 17-19, 2007. Contact: Dr. César Suárez msuarez@zeus.umich.mx, http://congress.cimne.upc.es/morelia07

Enertec 2007, Leipzig, Germany, March 13-16, 2007. Contact: www.eventseye.com/fairs/trade_fair_event_711.html

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:

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