



IGA NEWS

Newsletter of the International Geothermal Association

IGA ACTIVITIES

Pomaranze Conference

IGA Secretariat

On January 29-30 2004 an International Conference on "Geothermal Energy and Territory" was held at Pomaranze, Tuscany, Italy, under the patronage of the Italian Ministry of Environment and Territory, the United Nations Environment Program, the International Energy Agency, the Province of Pisa, the Mountain Community of Val di Cecina, the Municipality of Castelnuovo di Val di Cecina.

IGA and UGI (Unione Geotermica Italiana) collaborated to the organisation of the event, together with the Municipality of Pomaranze and ETA-Renewable Energies. ENEL gave its support too.

The event was organised within the context of the celebration of the centenary of the first world experiment regarding the production of geothermal electricity (Larderello 1904-2004). It was intended as a preparatory step to the International Conference on Renewable Energies to be held in Bonn on June 1-4, 2004.

The conference was a great success, with a very high qualified participation.

IGA ELECTION

Dear IGA members, the IGA BoD election process is started.

ELECTION SCHEDULE (approved at the 33rd BoD meeting)

- 1-15 April 2004: Check if all nominated candidates are eligible members.
- 15-30 April 2004: Preparation, printing and mailing of the election material; set up of the election package on the website.
- **1 May - 30 June 2004: Return of ballots.**
- 1 - 10 July 2004: Scrutinization of ballots, counting of votes, and validation of results.
- 11 - 15 July 2004: Notification to successful candidates, and publication of results on IGA News and on the website.

Please note that each ballot should reach the Secretariat not later than 30 June 2004.

We would like to remind you that this year voting will be possible by email, fax and on the IGA website. **All the IGA election material will be downloadable from the IGA website.**

As for the article 13.c of the bylaws, the acceptance of additional candidates is open ("Candidate by Petition"). Anybody willing to run for the election is requested to notify to the Secretariat its candidature with the sustain of 30 IGA members (it's necessary to supply a list with their original signature). **Deadline for submitting these nominations is 31st March 2004.**

YOUR VOTE COUNTS!

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IGA Membership Dues

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

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

The relevant presentations regarded:

- *Geothermal energy and Sustainable Development*, with a special review of the IGA President Guido Cappetti on the Italian case history: Larderello, after 100 years of exploitation, is still alive and has margins for new explorations and additional development.
- *Social Acceptance of geothermal energy and Integration models*.
- *The geothermal energy in Tuscany and in Italy*.
- *Environmental Indicators and Due Diligence Process*, with focus on the UNEP program on definition of international guidelines, under the coordination of BASE (Basel Agency for Sustainable Energy).
- *World Bank investment program*, with the presentation of two out of four major World Bank area of geothermal interest: Africa and East Europe/Asia. The financing process is on the starting line. Who is interested and has any geothermal project in these two areas, have the possibility of applying for support. Contact the world bank office in your country, or mail to Helmut Schreiber, Lead Environment Economist, Hschreiber@worldbank.org

A final round table on the future of geothermal energy was held. The opening and closing talks were given by Local and Regional authorities, with the participation of Tommaso Franci, Councilor for the Environment, Region of Tuscany and a message from Corrado Clini, General Director of the Italian Ministry of Environment and Territory.

Preserving the Geothermal Technical Literature

Dan Entingh, Princeton Energy Resource International, USA

Please help us to nominate geothermal technical reports for long-term preservation and electronic accessibility. Geothermists have produced a substantial amount of literature over the past 25 years. Important documents such as

U.S. geothermal technical publications and data, as well as the citations to them, are broadly scattered among a number of different national libraries. The Department of Energy Geothermal Technologies Program Managers are looking into consolidating this valuable information. They are considering converting the old DOE-sponsored reports into full-text, electronic format. The goal is to make this information available via the Internet.

The Geothermal Technologies Program asked Princeton Energy Resources International (PERI) to survey where the technical literature has ended up, how to find it, and what broad steps might be useful to ensure that important information remains accessible. PERI has already contacted several geothermal program managers at U.S. national laboratories and several information collection agencies. This research has yielded two reports. They can be accessed at the PERI website (<http://www.perihq.com>), and clicking on the Geothermal E-Archive Project link at the bottom of the page. You can support the E-archiving effort by completing the survey that is also available via the PERI website.

Various organizations have already begun to compile valuable geothermal information and make it accessible via the Internet. PERI researchers believe that the Geothermal Resources Council (GRC) publications site is by far the best source for U.S. geothermal information. The GRC Publications site boasts over 28,000 individual bibliographic citations from books, articles, papers and other publications. GRC website is <http://www.geothermal.org/>.

The International Geothermal Association (IGA) is currently posting PDF files of important geothermal meetings such as the 1995 and 2000 World Geothermal Congress meeting, as well as the Stanford Geothermal Reservoir Workshop. See the IGA website at <http://www.geothermal-energy.org>.

If you have any questions regarding the geothermal

International Conference
Geothermal Energy and Territory
After Johannesburg the contribution of geothermal energy to sustainable development

REGIONE TOSCANA
Organised by:
Region of Tuscany
Regional Council and Board

29-30 January 2004
Teatro Comunale dei Coraggiosi
Pomarance, Tuscany, Italy

organised within the context of the celebration of
the centenary of the first world experiment regarding
the production of geothermal electrical energy
(Larderello 1904-2004)



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E-archiving effort, please contact Dan Entingh at 301-468-8418 or via email at dentingh@perihq.com. We thank you for your support.

New contacts for "Geothermics"

Marcelo Lippmann, LBNL, USA

As of January 1st this year, I have taken over from Enrico Barbier as Editor of Geothermics. Enrico has retired after almost 30 years at the helm of the journal. I will be ably assisted in my task by our new Associate Editor for Europe, Dr. Stefano Bellani, a geologist with the Istituto di Geoscienze e Georisorse of CNR in Pisa. In the future, all manuscripts from Europe should be sent to Stefano. I can also count on the valuable support of our Associate Editor for the Americas, Dr. Joe Moore, with the Energy and Geoscience Institute in Utah, who has worked on the journal now for five years. All manuscripts from the Americas should still be sent to Joe. I will be responsible for manuscripts from the "rest of the world". We will all, Editors and authors, be assisted by Marnell Dickson, our Associate Editor, in the Editorial Office in Pisa. Our addresses and contact numbers appear at the end of this message.

I know you have contributed to Geothermics in the recent past, and sincerely hope that you will continue to do so in the future, and that you will consider our journal as a valid outlet for the results of your research in geothermal matters. Together, we can disseminate worldwide the latest advances made in geothermal R&D, and maintain Geothermics as the predominant source of state-of-the-art knowledge and information on geothermal energy.

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EUROPE

Kyoto protocol related uncertainties are not going to stop the EU

Roberto Vigotti - Vice President ISES ITALIA

Kyoto Protocol has coped with the dull Ninth Conference of the Parties (COP9) to the United Nations Framework Convention on Climate Change (UNFCCC) that was held in Milan, Italy, December 1-12, 2003. The World most famous Protocol is six of age, and is not walking yet. The long yearned Russian ratification has not arrived, therefore the celebrations of the first steps taken by the World governments toward a substantial realisation of the greenhouse gases reduction is delayed for another year. Hence let's get together in Buenos Aires in December 2004, passing through the World Renewable Energy Forum, Bonn June 2004, 1-4.

As of today, 120 countries, making up two thirds of the World population, have ratified the Kyoto Protocol, showing their commitment toward the sole international platform of action against climate change which, in turn, is denied by the Americans willing to do differently.

The European Union has clinched its pledge for complying with the Kyoto Protocol by implementing specific activities aiming at bearing the financial responsibility as agreed in Bonn. This means 369 million US dollars per year to be invested in interventions related to climate. The recent EU directive "Emission Trading" on the exchange of emission reduction credits is addressed to requiring member States, and also to the members-to be, a virtuous attitude. The "virtuous attitude" should be oriented to emission reduction by means of appropriate policy and measures for their domestic generation/consumption system. Other fields of intervention are trades and related services, in conjunction with integrative co-operation activities toward those countries where emission of greenhouse gases can be achieved at lower cost yet can be equally beneficial for the global environment.

The European Commission and the member States are working in synergy to reach the goals of the Kyoto Protocol. From 1990 to 2008-2012 the European Union has committed itself to reduce greenhouse gas emissions by 8% and from 1990 and 2001 has already achieved a 2.3% drop. However, according to the warning given by the Copenhagen European Environment Agency (EEA), with such runaway increase in emissions and the so far implemented or planned policies, the EU will reduce its total emissions in 2008-2010 to only 0.5 % below 1990 levels, leaving it 7.5 % short of the Kyoto target.

Therefore, other domestic policies and measures will be needed in the new term of the European Commission, that will be appointed by next June as well as the entire Stras-

bourg Parliament. The June World Renewable Energy Forum in Bonn is then a crucial venue for renewable energies, energy efficiency and production of the hydrogen vector from renewable sources, as well as distributed micro-generation and co-generation, aiming in the long term at a future characterised by clean energy sources only.

The first steps of the European Union are encouraging since important measures have been implemented for renewable energy promotion (2001/77 Directive), for the utilisation of biofuel in transportation and to improve building energy efficiency.

Alongside domestic policies that each state is called to undertake for the support and development of renewable energy, a wide potential is present also in the countries that surround the "old continent". For example, it is estimated that the only Mediterranean facing countries (including Mahgreb and Middle East) could develop a market worth some 4,5 billion € over the next ten years, that could boost renewable energies by kindling an efficient and profitable mechanism. This in turn could be especially apt to grant energy self-reliance at reasonable cost to remote/rural areas and to zones that are not grid-connected. Other economic activities could then develop (agriculture, fishery and cooling chain, and food processing/preservation) that can further support and expand this sustainable energy market.

In these international prospects Italy could take part with higher determination and a clearer regulation framework than in the recent past. In this respect, a new phase could have started with the approval of the law decree implementing the 2001/77 Directive (published in the January issue of the Official Gazette). It is deemed as an important step forward of the country for the development of this sector.

ALBANIA

Workshop "Directions of geothermal energy use in Albania"

Prof. Dr. Alfred Frasheri - Association "Albanian coastal and inland waters protection and conservation", Tirana, Albania

Geothermal energy resources in Albania and opportunities for their exploitation were the subjects of sixteen scientific papers presented by scientists, specialists and businessmen at the recent Workshop entitled: "Directions of geothermal energy use in Albania".

The workshop was organized under the framework of the UNDP-GEF SGP Tirana Office Sensitizing Project; "Use of environmentally friendly Geothermal Energy in Albania", and was held in the Albanian Academy Hall, in Tirana.

Sixty researchers, specialists and representatives from central and local state administration, Tirana Universities, Academy of Sciences, scientific institutions and balneological centres in Albania attended the Workshop.

Based on presented studies and discussions, the workshop determined that:

I. The significant occurrence of both high and low enthalpy geothermal resources and mineral water

sources represents the basis for successful and economic application of this modern technology in Albania. There are many thermal springs and wells, with temperatures that reach values of up to 65.5°C.

II. At present, the thermal waters of some springs and wells are used only for health purposes.

The workshop reached the following conclusions:

1. Albania has real potential for low enthalpy direct use geothermal developments that can be of benefit to the Country's economy.
2. The low enthalpy resources in Albania offers three potential applications for exploitation:
 - Space heating and cooling,
 - Integrated and cascaded use,
 - Greenhouses and aquaculture.

Direct use of the environmental friendly geothermal energy must be realized by integrated schemes of geothermal energy heat pumps and solar energy, and cascade use of this energy, from high to low temperatures.

3. The most important application is space heating and cooling. The ground heat can be used for space heating and cooling by modern systems using borehole heat exchanger geothermal heat pumps. The energy crisis prevailing in Albania, the increased demand for energy to heat and cool premises, and the gradual implementation of European standards of space heating, are all decisive factors which raise awareness of the need to find optimal solutions to the present energy situation. Like everywhere else in the world, the subsurface ground layers in Albania contain heat. This energy can be successfully exploited in heating public buildings (offices, hospitals, libraries, theatres, airports etc.), private ones (houses and apartment buildings), and greenhouses using heat pump modern systems.
4. Thermal sources of low enthalpy, from springs or wells, may be used in several ways:

- a. Modern spa clinics for the treatment of various diseases, and hotels, with thermal pools, for development of eco-tourism. Such centres may attract many visitors from Albania and abroad, particularly since many of the therapeutic water sources are in attractive locations.

The oldest and most important is Elbasani Llixha Spa, which is located in Central Albania and has good road communications. Thermal springs have been known here for 2000 years, located near the old road "Via Egnatia" from Durresi-Ohrid- to Constantinople. All seven groups of the springs in Llixha Elbasani and Kozani-8 well, near Saint John Vladimir Monastery at Elbasani, have the potential for modern complex exploitation. These areas are close to the well-known Ohrid Lake pearl and Gjinari Mountains, with their fantastic forests and good climate.

Ishmi 1/b geothermal well is located in beautiful Tirana field, close to Mother Theresa - Tirana Airport, near the Adriatic coastline and Kruja - Skenderbeg Mountains.

- b. Near these thermal springs it would be possible to build the greenhouses for flower and vegetable growing, aquaculture and food drying installations.
 - c. The hot water could also be used also for heating of hotels, spa and tourist centres, as well as for the provision of sanitary hot water used there. Peshkopia SPA was constructed using modern concepts as a geothermal centre. There are thermal pools for both medical treatment and recreation. Construction of the Peshkopia spa is a good example of the type of development that could take place in Albania.
 - d. From thermal mineral waters it is possible to extract very useful chemical microelements such as iodine, bromine, chlorine and other natural salts, necessary for preparation of treatments of many skin diseases as well as for beauty treatments. From these waters it is possible to extract sulphide and carbon gas.
 - e. There are some low temperature mineral water springs, for example in Langarica and Sarandaporo, near the Albanian-Greece border, where it may be possible to build installations for potable mineral water.
5. Greenhouse heating and aquaculture installations are possible using vertical heat exchangers in abandoned deep oil and gas wells, with heat pumps and solar energy systems.

Based on these conclusions, participants of the Workshop appeal to the state administration with responsibility for energy, the business community, and also to the scientific-technical community to make it possible to exploit geothermal energy in Albania, in particular with regard to the provision of economical space heating.

The public administration must stimulate the usage of modern systems for space heating and cooling, and the integrated and cascaded use of the thermal water energy.

The business community should understand and invest in the construction of borehole heat exchanger-geothermal heat pump systems, leading to a new business in Albania. We appeal to this community to use modern architecture and technology in new buildings in the thermal areas, so that they become profitable and attractive for tourists.

ICELAND

25 years of geothermal training in Iceland

Ingvar Birgir Fridleifsson, UNU, Iceland

An International Geothermal Conference on Multiple Integrated Use of Geothermal Resources was held to celebrate the 25th anniversary of the United Nations University's Geothermal Training Programme in Iceland in Reykjavik 14th to 17th September 2003.

The first official statement on establishing a UNU geothermal institute in Iceland was made in 1975 when the United Nations University (UNU) had just been established. After a first proposal in 1976 and an international workshop in 1978, the Government of Iceland decided in October 1978 to ask Orkustofnun, the National Energy Authority (NEA), to sign the Agreement on Association with the UNU

and establish the UNU Geothermal Training Programme (UNU/GTP). The first two UNU Fellows from the Philippines arrived in Iceland in May 1979. Since then, the UNU/GTP has held annual six month courses for professionals from developing countries. Specialized training is offered in geothermal utilization and drilling technology. The trademark of the UNU/GTP is to give university graduates engaged in geothermal work intensive on-the-job training in their chosen field of specialization. The aim is to assist developing countries with significant geothermal potential in building up groups of specialists that cover most aspects of geothermal exploration and development. During 1979-2003, 300 scientists and engineers from 39 countries have completed the six-month courses, and over 80 have received shorter training. A MSc programme in geothermal science and engineering was opened in 2000 in cooperation with the University of Iceland. A second UNU training programme, the UNU Fisheries Training Programme (UNU/FTP), was established in Iceland in 1998, based on the experience of the UNU/GTP. Over 40 UNU Fellows from developing and transitional countries come annually to Iceland for specialized training at the UNU/GTP and UNU/FTP. In 2003, the Icelandic Government contributed about 1.7 million USD to the UNU activities in Iceland, thus covering about 90% of the total annual cost.

The participants at the 25th UNU Geothermal Training Course are shown in Figure 1.



Figure 1. Fellows of the 25th annual and anniversary course of the UNU Geothermal Training Programme in 2002. The photo is from the Geysir high-temperature field, S-Iceland, with the Strokkur geyser erupting in the background. From left: Ariel Fronda (Philippines), Patricia Jacobo (El Salvador), Alper Baba (Turkey), Jaime Austria (Philippines), Jaroslaw Kania (Poland), Yohannes Demissie (Ethiopia), Francisco Asturias (Guatemala), Hou Haiyan (China), Masoud Eshagpour (Iran), Flora Mwawughanga (Kenya), Mohsen Taghaddosi (Iran), Zhang Yuandong (China), Li Jun (China), Leyner Chavarria R. (Costa Rica), Iderbat Lkhagvadorj (Mongolia), Oyun-Erdene Gendenjamts (Mongolia), Olga Vereina (Russia), Agnieszka Rogowska (Poland), Martha Kariuki (Kenya), Mahnaz Rezvani Khalil-Abad (Iran).

GERMANY

Eurelectric Delegates play active role at European Conference in Berlin

Mihai Paun, EURELECTRIC

EURELECTRIC experts played an active role at the European Conference for Renewable Energy entitled "Intelligent Policy Options" in Berlin on 19-21 January, hosted by the German Federal Ministry for the Environment, in cooperation with the European Commission, Nature Conservation and Nuclear Safety and European Renewable Energy Council (EREC). Some 650 delegates from 45 countries analysed the situation for renewable energies in Europe and evaluated experiences, including the impact of the political measures designed to boost the share of renewable energies, implemented to-date at Community, national and local level. At the opening session of this conference, which was intended to help prepare the European Union contribution to the Renewables 2004 Conference in Bonn in June, Günther Hanreich, Director at the Commission's DG for Transport & Energy, stressed that "renewable energy is in line with the European Union strategy for sustainable development and economic and social growth, as well as with the efforts and commitments to tackle climate change at worldwide level".

Referring to the 2001 Renewables Directive, EU Energy Commissioner Loyola de Palacio explained that "the Commission departments have not yet finished appraising

the reports sent in by Member States on progress made towards meeting the targets set by the Directive", but she nevertheless made an "appeal to every Member State to take responsibility for implementing faster the recommendations made in this Directive to enable them to meet the targets set for 2010".

EURELECTRIC experts made a significant contribution to the programme and the debate. Roberto Vigotti, chairman of the EURELECTRIC Working Group on Renewables & Distributed Generation, was one of the moderators at a session on "Implementation of RES Policies in Europe", while Christian Schneller, chairman of the Sub group on Energy Subsidies, spoke on "Integrating Wind Power into The Power Supply System". The Conference concluded with a recommendation to proceed without delay in setting new ambitious targets for 2020. The conference conclusions stress that "to increase the use of RES forms part of the strategy of the EU and other countries for sustainable development, climate change prevention, economic growth and social cohesion". The text also states that "a target value of at least 20% of gross inland energy consumption by 2020 for the EU is achievable". Although RES lobbyists were jubilant, it remains however unclear whether political support from the conference for the target is as clear as they assume.


Germany joins the geothermal power club

Werner Bussmann, GTV

A new name can be added to the list of countries producing electric power from geothermal energy: Germany. In November 2003 the first geothermal power plant in Germany has been inaugurated officially in the Neustadt-Glewe, a city in the state of Mecklenburg-Vorpommern.

The geothermal site in Neustadt-Glewe is one of the oldest and best investigated in Germany. As early as in 1984 plans were considered to use for heat production the saline thermal water in a deep, porous sandstone layer. After a design phase starting in 1986, in 1989 a first borehole more than 2 km deep was drilled, followed soon after by a second one. Since the beginning of 1995 the geothermal heating plant with installed capacity of 11 MW_{th} delivers heat to industry, commercial customers and almost 2000 private households, via an extensive district heating net. Thus the majority of the 7000 inhabitants of the city is supplied with geothermal heat from 2400 m depth. However, in summer and sometimes during spring and autumn, the heat production had to be lowered due to decreasing heat load. Therefore, the thermal load factor of the plant was not too satisfactory.

Thermal water temperatures close to 100°C and a high production volume up to 125 m³/h allowed the application of combined heat and power production (CHP), making better use of the geothermal energy source. The CHP system works only when is available more heat than can be used by the customers. The small power plant with about 250 kW electric output will produce ca. 1400 MW of electric power each year. The power is first employed in the heating plant



Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit, 11055 Berlin

To Participants from the private sector per Email

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Berlin, 10 February 2004

International Conference for Renewable Energies, Bonn 2004
Information for the Private Sector to Participate in the Conference

Dear Madam / Sir,

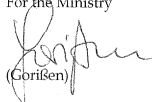
From June 1 to 4, 2004, the German Government, represented by the Federal Ministry for Economic Cooperation and Development and the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, will host the International Conference for Renewable Energies, Bonn 2004. The conference - *renewables 2004* - will prepare the ground for a global expansion of renewable energies, integrated into a broader strategy to create a highly efficient and sustainable energy future.

renewables 2004 is an intergovernmental conference with broad stakeholder participation. The involvement of the private sector, especially business and industry and the finance sector, is of vital importance in the transition towards a more efficient and sustainable energy system. Therefore, the German government encourages the private sector to participate in, and actively contribute to, *renewables 2004*.

Please find enclosed the information for the private sector to participate in the conference with a description of the different modes.
 A central part of the outcomes of the conference will be an International Action Plan, collecting actions and commitments from governments, international organisations and stakeholders. For further information on the International Action Plan, in particular for contributions from the private sector, a Call for Actions and Commitments is attached as well.

We hope to see you in Bonn at *renewables 2004*.

For the Ministry


 (Gorißen)

itself (pumps, etc.), the remaining will be sufficient to supply power to 500 households. The ORC-system is located in a 40' container beside the production well, accompanied by two cooling towers 6 m high and a transformer station.

Other steps will soon follow this first, rather small one. New power plants are currently under design and construction in areas where geothermal uses are particularly favourable. One such area is the Upper Rhine Graben between Basel in Switzerland and Frankfurt/Main. In Speyer the results of the first exploration drilling for an 8-MW-powerplant are under evaluation at present. The seismic exploration work for a plant in Offenbach/Pfalz has been successfully concluded. In Bad Urach, already outside the Upper Rhine Graben, drilling of a second borehole 4400 m deep is under way. Here the first electric power production is expected in early 2005. Also, at the turn of 2004/05, the geothermal heat and power plant in Unterhaching, close to Munich, is scheduled to become operational. In Unterhaching thermal water up to 120°C is expected, which would allow an installed electric power of 3.1 MW and the supply of 16 MW of heat to a district heating net. Energy utilities, municipalities, and private investors provide the financial basis for these plants. Research still needs to be defined in the area of subsurface exploration, simulation, and well stimulation techniques.

THE AMERICAS

NICARAGUA

Regional Geothermal Workshop

Ariel Zúñiga Mayorga, INE

The Instituto Nicaraguense de Energía (INE), the Empresa Nicaraguense de Electricidad (ENEL) and the Comisión Nacional de Energía (CNE) jointly hosted an International Atomic Energy Agency (IAEA) regional workshop entitled "Application of Isotopic and Geochemical Techniques in Geothermal Development and Environmental Management".

The meeting was held from 10 to 14 November 2003 at the Hotel Princess, Managua. Twelve delegates from Central American countries (Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua and Panama) participated in the workshop, which was chaired by Ing. Ariel Zúñiga (INE). Two IAEA representatives, Project Officer Mr. Oscar Acuña and Technical Officer Dr. Zhonghe Pang, attended the meeting (Figure 1).

The ultimate goal of IAEA's assistance is to improve geothermal resource management and increase the sustainability of geothermal reservoirs. The purpose of the workshop itself was to review the results of geothermal studies carried out with IAEA support in each of the six countries in 2003 and to plan 2004 activities.

Ing. Octavio Salinas (INE) and Ing. Raul Solorzano (CNE) delivered opening speeches on behalf of the Nicaraguan government. Their talks focused on Nicaragua's energy policy, which in part is directed toward



Figure 2. Participants to the Regional Workshop held in Managua on November 2003. From left to right. Sitting in the front row: Melba Su, Karla Miranda, Mayela Sánchez and Glenda Castillo. Standing, first row: Julio Guidos, Danilo Vargas, Ricardo Perdomo, Ariel Zúñiga, Ernesto Martínez, Oscar Shaversz, José Quiel, Alfredo Mainieri, Zhonghe Pang, Alfredo Roldán and Antonio Matus. In the back row: Antonio Yock, Oscar Acuña, Jerónimo Calero and Róger Arcia.

creating favorable conditions for the development of the country's geothermal resources by the private sector.

The delegates from participating countries presented the results of their 2003 field investigations. Data interpretation and final reports should be completed in 2004.

The workshop offered a good opportunity for the participants to learn more about the geothermal resources of the host country and their development. Under the IAEA project Nicaragua studied the Mombacho-Tipitapa area. In addition, and as a result of an improved understanding of the Momotombo geothermal system and a better field management plan, electrical power output increased from 10 MW_e in 2000 to 30 MW_e in 2003.

Local professionals and officials also presented other aspects of the geothermal program in Nicaragua, such as tracer and scaling inhibition studies, and the national master plan for future development of the country's geothermal resources. Additional information was provided during the workshop's field trips to the Momotombo and Mombacho areas.

USA

ORMAT acquisition in California

Graciela Sapiro, ORMAT

ORMAT Nevada, Inc. announced today that its subsidiaries were successful in an auction for all the geothermal assets of Covanta Energy Corporation, an unrelated third party. Covanta Energy Corporation has filed for bankruptcy protection in April 2002. The US Bankruptcy Court for the Southern District of New York, which has jurisdiction over Covanta's Chapter eleven case, has approved the purchase agreement.

ORMAT's bid for \$ 214 M (including a deposit of \$40M) was declared the "best and highest", and ORMAT

was approved as the winner on November 21, 2003.

The assets included in the sale are the following:

- 100% ownership in the Heber Geothermal power plant, having a nameplate capacity of 52 MW and located near Heber in Imperial County, Southern California,
- 100% ownership in the lessee position of the SIGC geothermal power plant having a nameplate capacity of 48 MW, adjacent to the Heber Geothermal plant,
- 50% ownership interest in the 40 MW Mammoth Geothermal power plant, located near the city of Mammoth, Mono County, California.

All the above power plants have long-term power purchase agreements with Southern California Edison for the sale of electricity until the years 2015-2022.

The expected revenues from sale of electricity for all the above assets is approximately \$ 80 Million per year.

In order to finance the acquisition, on November 14, 2003 an ORMAT subsidiary received a loan commitment from a US bank for an amount of approximately \$ 155 million secured by the acquired assets.

The acquisition of these geothermal assets, along with the completion of the acquisition of the Steamboat Nevada geothermal assets currently under way, will bring the total geothermal power plants owned and operated by ORMAT and its subsidiaries in the USA to over 250 MW, with an additional 30 MW under development in Nevada.

For more information contact Rany Raviv at (775) 356-9029 or rraviv@ormat.com.

COSTA RICA

First Ormat Geothermal Plant in Costa Rica

Graciela Sapiro, ORMAT

At an inauguration ceremony honored by the attendance of Dr Abel Pacheco, President of Costa Rica, the first ORMAT Geothermal Binary Power Plant in Costa Rica was formally commissioned on January 30, 2004.

The ORMAT Energy Converter (OEC) plant will add 15,5 MW to the power output from the existing Miravalles geothermal field, without increasing steam consumption or necessitating the drilling of new wells (see Figure 3).

ORMAT supplied the power plant, construction materi-



Figure 3. *Miravalles OEC plant.*

als, and engineering services to the Instituto Nacional de Electricidad, ICE.

The Miravalles V plant consists of two binary cycle water-cooled non-polluting and fuel-free OEC's that convert into electric power the presently unexploited energy contained in the hot brine discharged from the existing Miravalles plants.

As presented by Mr. Paul Moya and Mr. Diego Perez from ICE at the GRC annual meeting in October, 2003: "Because the selected binary plant is composed of two separate modules, it allows for reduced generation using just one module when the liquid water supply decreases in the future, and the relocation of the other module to a different sector of the field or even to a different geothermal area".

At the inauguration, Mr Yossi Shilon, ORMAT's Executive Vice-President said: "Miravalles is joining a list of more than 100 MW of Optimization Projects implemented worldwide by ORMAT in which no additional drilling of wells was required."

The Miravalles V Project is one more step in ORMAT's ongoing contribution to the development of renewable power generation in Latin America, and complements ORMAT's existing plants in Zunil, Guatemala and Momotombo, Nicaragua.

The Miravalles V plant will add to the ORMAT geothermal record of over 250 OEC units and more than 700 MW in 18 countries, including close to 400 MW of owned or operated plants in 5 countries.

Over 50 ORMAT Power Plants have been constructed around the world in 23 countries, from California in the USA to Thailand and from Iceland to New Zealand. Till now, these plants have saved over 7,000,000 tons of fuel, and avoided emission of over 17,500.000 tons of CO₂.

MIDDLE EAST

IRAN

Hundred MW potential for geothermal in Iran

Power News Release

The history of geothermal exploration in Iran started in 1975 when ENEL experts identified the areas of Mount Sabalan, Khoy-Maku and Sahand in Azarbaijan and Damavand. Then gravimetric surveys by ENEL (1983) and geological, geochemical, and resistivity surveys by Kingston Morrison Ltd. (1998) have allowed SUNA, the Renewable Energy Organization of Iran, to recognize the most promising sites for drilling activities in the Meshkin shar area, NW Iran.

Meshkin shahr 100 MW Geothermal power plant was launched in 1998, with an investment of 250 million dollars, 40% of which to be financed in rials. Construction of access roads, pads, water pumping stations and a 9 km long water pipe stretching from the pumping station to drilling sites have been already completed. The project included drilling of three wells with a depth of 3000 m (see Figure 4).

New Zealand experts are collaborating with the Iranian

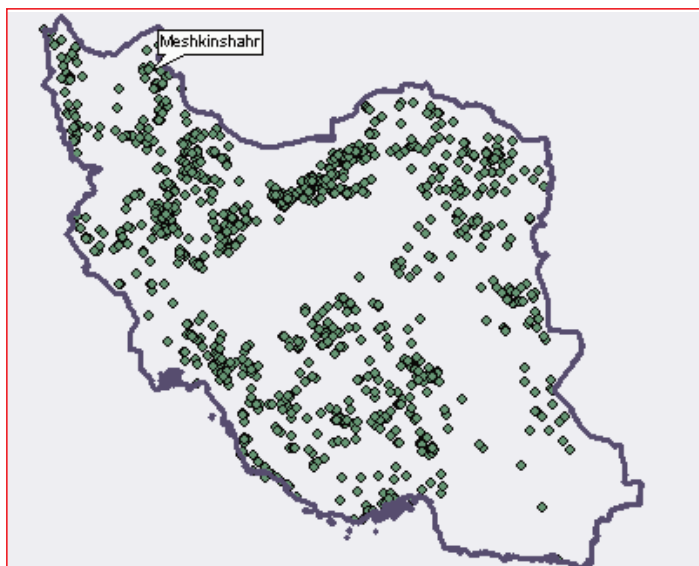


Figure 4. Iran geothermal manifestations and Meshkin shahr area.

geothermalists. Two out of three wells have already been drilled, finding temperature of about 230°C.

Reservoir engineers will evaluate the results and, by next year, start design of the power plant whose construction should be carried out in 2006 and 2007, as reported by Eng. Benham Talebi (December 2003 issue of Power News, #54, the monthly publication of Tavanir organization).

Another project is under investigation in Damanvand, although still in preliminary stage.

ASIA/PACIFIC RIM

PHILIPPINES

NGAP holds 1st General Assembly

Jim Stimac, NGAP

The National Geothermal Association of the Philippines (NGAP), which was officially registered with the Philippine Securities and Exchange Commission on June 19, 2003, held its first General Membership Assembly on November 21, 2003 in Manila. The meeting served as an opportunity for the general membership to track the current and future plans of the organization and to help fostering a sense of community as they promote renewable energy in the country. Eighty seven members joined the inaugural event.

In his keynote address, Energy Undersecretary Eduardo V. Mañalac, recognized the relevance of NGAP in the government's push for the development of renewable and indigenous energy sources. "Renewable energy accounts for 42% of the country's energy mix, strongest of which is geothermal with 27%," Mañalac said. "We at the Department of Energy hope that an organization such as yours will further promote private sector participation towards a stronger power industry anchored on renewable energy, among them, geothermal."

Believing that the organization will play a key role in the success of geothermal power in the country, NGAP

President and Philippine Geothermal, Inc. General Manager Antonio F. Yee elucidated on the organization's mission of championing the development of geothermal energy as a clean, viable, renewable and indigenous energy source. With over 200 members from among the key players of the industry, Yee stressed that NGAP is working to expand to include educators, students, environmentalists and other individuals interested in contributing to greater awareness of renewable energy. He added "With the Philippines being the second largest producer of geothermal energy in the world, it is but proper that an organization dedicated to the study, promotion, and development of geothermal resources be formed in the country".

In the long term, the NGAP will advocate enhancement of government policies and reforms in geothermal resource exploration, development and production. "Through the NGAP, we aim to solidify the position and prestige of the Philippines in the geothermal world map," Yee said. The second NGAP General Assembly meeting will be held March 9, 2004 in coordination with the 25th Annual PNOC-EDC Geothermal Conference scheduled for March 10 and 11, 2004.

NGAP Launched Website

Sylvia Ramos, NGAP

The National Geothermal Association of the Philippines (NGAP) launched its website last January 10, 2004. The website address is <http://ngap.netfirms.com>.

NGAP website contains information on the current trends of geothermal development in the Philippines. It also contains short features on the operating geothermal fields in the Philippines, as well as areas currently under development. Events and listings of members and officers of NGAP are also found in the pages of the site.

Visitors are also welcome to send comments or inquiries to the web master, which can be contacted using the links in the web page.

Philippines DOE to bid out geothermal fields

Lenie Lectura, Today Reporter, Philippines

In the next few months, the Department of Energy (DOE) is set to bid out geothermal fields in the country to interested local and foreign firms.

Energy Undersecretary Eduardo Mañalac said the department is planning to conduct the first Geothermal Bid Round in the second quarter after the Philippine Public Contracting Round (PCR-I) bid is done in March. The DOE launched the PCR-I, a new bidding scheme in August 2003.

The DOE has received offers from 14 oil and gas exploration and production companies, including foreign companies operating in the country, to participate in the bidding of 46 new exploration blocks adjacent to oil discoveries and producing fields within the Philippine territory. The bidding is set on March 5.

"We have identified at least 10 possible geothermal development areas in Luzon, Visayas and Mindanao. We are also preparing a package for prospective investors," Mañalac said.

Being the world's second largest producer of geothermal energy, the official is confident the country will be able to attract a number of interested investors. He said, "there are some Japanese firms that have signified interest to look at the bidding procedure."

Preparations for the Geothermal Bid Round are underway, with the department likely to adopt the PCR-1 as basis in developing such scheme.

The actual procedures and terms for the bidding of the geothermal fields are still being looked at, he added.

Under the fiscal terms for PCR-1, a contractor recover its exploration and development costs from 70% of gross proceeds and get a maximum of 40% percent net proceeds while the government share is equivalent to 60 percent. Also, the contractor shall be exempted from paying the national taxes except income tax. Income tax shall be paid out of the government share.

The contractor can also get a Filipino Participation Incentive Allowance (FPIA) of up to a maximum of 7.5 percent with a minimum of 15% Filipino participation.

INDIA

First International Conference Renewable Energy - 6-8 October 2004, New Delhi, India

Uday Chander, CBIP, India

Organised by Central Board of Irrigation and Power and National Power Training Institute in association with International Association for Small Hydro Sponsored by Indian Renewable Energy Development Agency Limited.

Energy is one of the basic inputs for accelerated economic development. Fossil fuels have "powered" the tremendous industrial and economic development of the countries that are now called developed countries. The ever-increasing demand of energy due to development process and diminishing sources of conventional fuels make it obligatory to utilize new energy technologies that are renewable in nature and have sustainable characteristics. Apart from its renewable nature that does not deplete the natural resources, renewable energy is also environment-friendly and meets the rising concern of potential environmental change and CO₂ emission, and does not require any gestation period for its exploitation.

Considerable worldwide efforts have continued in the search for viable energy alternatives based on renewable and non-conventional energy sources. These include Solar Energy - Solar Thermal and Photovoltaic, Wind Energy,

Small Hydro Power, Geothermal and Ocean Energy (Tidal, Ocean - Thermal and Wave), Cogeneration and Biomass. The last few years have seen tremendous progress in the application of renewable energy. Energy forecasts for the European Union and the United States indicate this share to reach 12% by the year 2010.

Considering the rapid advances in technology for harnessing these resources and to provide a forum for exchange of experiences to facilitate flow of technology from one country to another, The Central Board of Irrigation and Power (CBIP), as part of its activities, is organizing the present conference from 6-8 October 2004 in New Delhi.

Call for papers

Intending authors may send the full text of their paper(s) on any of the above or allied topics, as per the guidelines given below, so as to reach the Organisers by 15 August 2004. The papers accepted for presentation will be notified by 31 August 2004. Contact: cbip@vsnl.com

INDONESIA

Indonesia's Pertamina to invest US\$200 mln in Geothermal project

Yahoo News. Press release

Jakarta - PT Pertamina Geothermal, a geothermal subsidiary of the state-owned oil company Pertamina, said it will invest US\$200 million to increase production capacity and build a new geothermal power plant. Company general manager Sukusen Soemarinda said Tuesday the investment will be used to increase geothermal production in Lahendong, Sulawesi by 40 MW, expand the power generating capacity of the Kamojang plant by 60 MW and build a new geothermal plant in Wayang Windu with a capacity of 110 MW. The company earlier agreed with Philippine National Oil Company and Marubeni Corp. to build three new geothermal power projects with an investment of US\$750 million.

JAPAN

First ORMAT Geothermal Plant in Japan

Graciela Shapiro, ORMAT

ORMAT Group has announced the commissioning of a 2 MW ORMAT Energy Converter (OEC) binary geothermal power plant at the Hatchobaru facility of Kyushu Electric Power Co., Inc. ORMAT supplied the equipment to Kyushu Electric's subsidiary Nishinippon Environmental Construction Co., Inc. (NECCI) who constructed the plant (see Figure 5).

This plant represents the first commercial application in Japan of a geothermal binary cycle power plant.

Mr. Matsumoto, Executive VP of Kyushu Electric Power Co., Inc. and General Managing Director of the Thermal Power General Division was quoted by the Japan Electricity Journal (Denki Shimbun) on November 18 as stating: "Binary geothermal power generation facilities are qualified under the Renewable Portfolio Standard (RPS)

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Figure 5. Hatchobaru OEC plant.

and this R&D is very meaningful for Kyushu Electric. Should the results of this field test be satisfactory, these types of plant will be applicable to other places.”

The plant utilizes both the steam and separated brine from a lower pressure well not being utilized for Kyushu Electric’s existing Hatchobaru double flash power plant, thereby optimizing the overall performance of the facility.

The Hatchobaru OEC plant uses air-cooled condensers to achieve 100% geothermal fluid reinjection, which serves to sustain the reservoir and to produce electrical power with virtually no environmental impact.

The Hatchobaru plant will add to the ORMAT Group’s geothermal record of over 250 OEC units and over 700 MW in 17 countries, including over 360 MW of owned or operated plants in 5 countries.

OCEANIA

NEW ZEALAND

Greenhouse gas emissions from the exploitation geothermal systems

Doug Sheppard, Geochemical Solutions, and Ed Mroczek, IGNS

The Problems

While new geothermal energy extraction is commonly considered to be a means of reducing net greenhouse gas emissions to the atmosphere, this is by no means the whole story, and in order to be able to tell that story confidently, we need more information on and better models of the behaviour of these gases in undisturbed and exploited geothermal systems. In this paper we describe the issues, we present some data to illustrate work that we have done, and we suggest how the exploitation of systems could be managed to minimise the gas discharges.

The greenhouse gases of significance in geothermal fluids are limited to carbon dioxide (CO₂) and methane (CH₄). The dominant fluids in geothermal systems are water (95–99%) and carbon dioxide (up to 5% by weight). Methane is generally found in concentrations up to 0.05% by weight. The gases will concentrate in a vapour phase if pressure is

reduced, in steam zones in geothermal systems, for instance, or in the steam produced when geothermal fluid boils.

For this report we will concentrate on CO₂ but methane should not be forgotten, as, while its concentration may be low in comparison to CO₂, its “greenhouse” gas properties (essentially, the ability to adsorb infrared radiation) is 15 to 20 times higher than that of CO₂, and in some systems has an appreciable additional atmospheric heating impact (e.g. the Ngawha geothermal field in New Zealand).

Undisturbed geothermal systems discharge gases to the atmosphere, through water, steam and diffusive gas discharges. The gases originate from the deep fluid, and can be derived from local rock dissolution and other reactions, or from deeper magmatic sources, depending on the individual systems. The gases are initially dissolved in the geothermal fluid, but their fate depends on where this fluid goes and the physical and chemical changes that this induces. As mentioned above, any pressure reduction which initiates boiling will favour partitioning of the gases into the vapour phase. Cooling and mixing of the fluid can result in precipitation of carbonate phases, and this commonly occurs on the boundaries of geothermal systems. Some gases are entrained in groundwater aquifers and may be transported some distance before being discharged, as soda springs. The quantification of the discharge of gases from geothermal systems is problematic. Two approaches have been taken: the “gross” methods of authors such as Kerrick *et al.* (1995), and Seward and Kerrick (1996) in which total fluxes have been estimated on the basis of heat flows and deep geothermal fluid compositions. They used two geothermal regions (Taupo Volcanic Zone, New Zealand, and the Salton Trough, California, U.S.A.) as the basis for extrapolating over the entire earth. They estimated that the TVZ contributes 10¹⁰ mol/a CO₂. Such an approach might be expected to be able only to give a maximum value for the flux, since it excludes mechanisms which reduce the quantity of the gas which reaches the surface. Such mechanisms would include reversible reactions such as mineralisation (e.g. calcite formation in veins), dissolution in groundwaters, direct fixing in vegetation and soils, and dissolution in surface waters, especially ocean waters.

The second method is direct measurement, and some studies have been attempted, using atmospheric concentration profiles, usually on active volcanoes rather than specifically on geothermal systems – e.g. Allard *et al.* (1991) on Mt Etna, – or by ground-based measurements using accumulation chambers and the like (e.g. Bergfeld *et al.* (2001) in Dixie Valley, Nevada; Chiodini and Frondini, 2001, in the Albani Hills in Italy; Gerlach *et al.* 2001 at Mammoth Mountain in California).

In order to ascertain the effects of the exploitation of geothermal systems on the discharges of the gases to the atmosphere, the natural discharges need to be assessed, as well as the post-exploitation discharges. This is not easy – for a start, the different styles of discharge will need to be measured or otherwise assessed, and it will be rare that such measurements can be made before exploitation and

throughout the lifetime of any power plant, to say nothing of for extended periods afterwards. These “styles” include from water discharges (springs and pools), from steam discharges (geysers, fumaroles, steaming ground), and diffuse discharges through soils. The complete gas budget may also need to be assessed – how much of the CO_2 ends up in groundwaters, for instance, and does this end up in the atmosphere? Methods for making these measurements directly are not readily apparent, except perhaps those using atmospheric profiling techniques (e.g. Werner *et al.*, 2000), but these are not always available, or the terrain may not be suitable. Ground-based techniques, especially for measuring diffuse discharges, are being developed, but have some way to go, and this will be discussed later in this report.

We wish to dispel some misapprehensions and indicate some of the issues which will need to be considered in the field of evaluation of the greenhouse gas discharges consequential on the development of geothermal resources. We have seen some strange arguments to justify the contention that geothermal energy is greenhouse friendly. The central consideration must always be whether the activity will increase the concentration of CO_2 in the atmosphere over what it would be if the development did not occur. It is generally true that geothermal energy developments will produce less CO_2 per unit of energy than fossil fuel, and this is an advantage that needs to be exploited with the argument that replacing fossil fuel generation with geothermal will result in a net reduction in CO_2 emissions for the same energy production. However, it also follows that additional generation capacity sourced from geothermal resources will add some greenhouse gases to the atmosphere, using current technologies. The question then is, how much? Without knowing that, decisions will need to be made on the basis of inadequate, or more likely, incorrect, information.

We have seen it argued that the CO_2 discharged is natural and so is not a greenhouse gas problem. This is a strange argument as it ignores the fact that any CO_2 in the atmosphere will act as a greenhouse gas. It may be confusing with the concept of cycling of gases through biological systems – where CO_2 from consumption of plant material which is continuously produced results in no net gain to the atmospheric concentration. This is not comparable to the geothermal gas, as this is not recycled in the time frames of concern.

IGA SHORT COURSES GRANT PROGRAMME

The IGA Education Committee is pleased to announce the availability of grants to support short courses and training programs. Application forms can be obtained by contacting:

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The argument that the geothermal CO_2 would have reached the atmosphere anyway and so is not an issue is not valid either. It is not necessarily true as some of the gas may have been incorporated in carbonate minerals, for instance, but the important point is that even if all the CO_2 enters the atmosphere naturally, exploitation will cause that to happen very much more quickly and so the greenhouse effect will be accelerated.

We have also seen it argued that since the CO_2 does not result from a chemical change, such as burning, it has effectively been in the biosphere and so cannot contribute additionally to the greenhouse gas build up. This is patently false because it is the concentration in the atmosphere only which is the issue, and moving the gas from a subsurface reservoir to the atmosphere increases the atmospheric concentration.

And finally, it is not adequate to just measure the discharge of CO_2 from plant (gas stacks, bleed valves, silencers and the like), as this represents only a fraction of the total discharge. Exploitation of a geothermal system must be expected to affect both the quantity and style of gas discharges from the overlying land.

The temporal issue is one that needs thought and investigation, however. Is the total quantity of CO_2 entering the atmosphere from a geothermal system which has been exploited greater or less than if it had not been exploited? We can imagine scenarios where it could be either. The answer will depend on the individual systems, especially their geological structure, and how they are developed. Addressing the question will not be an easy exercise, yet it needs to be done if all the advantages of using geothermal energy are going to be able to be reliably demonstrated.

Assessment is required of the magnitude (and the significance) of short-term increased CO_2 fluxes that result from the exploitation of geothermal fluid. These fluxes will be both from production fluid itself and from the change in direct or diffusive gas flow to the ground surface. Increased flow heat and steam flow to the surface is seen in exploited geothermal systems where a steam zone is created in permeable lithologies e.g. Wairakei, NZ.

Better knowledge of the long-term variability of gas discharges from geothermal systems, both pre- and post-exploitation is required and this in turn requires a much better understanding of the various sources and sinks of geothermal CO_2 , the various reservoirs, flow paths, mass balance and the effects of perturbations.

Measurement of CO_2 flux

The measurement of the flow of gaseous CO_2 from the earth's surface is not simple. There are two basic measurement techniques: atmospheric and discrete. The most technically sophisticated uses laser infra-red beams to measure adsorption due to CO_2 in the airspace above the region to be assessed, but other methods using towers with multiple sampling points at different heights are available. Atmospheric profile monitoring is essential, along with complex mathematical modelling of the data.

The discrete site techniques consist of making direct measurements at a number of sites, and integrating these

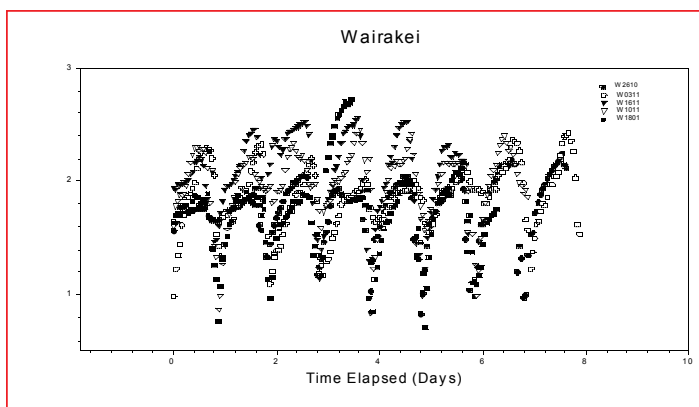


Figure 6. CO_2 flux measurements from a site near the Wairakei Power Station. The time refers to the time elapsed from the initiation of each run and has no other significance. The absolute flux value is unreliable.

measurements to derive an estimate of the flux over an area. The technique suffers from uncertainties due to inhomogeneities in the diffusive characteristics of the area, as well as problems with the effects of the measurement technique itself on the fluxes. Interference from CO_2 produced by soil biota and plants is a factor in both methods. The effects of soil biota and atmospheric variations (barometric pressure, rainfall) are also significant.

In 1992 and 1993 attempts were made to measure the CO_2 fluxes at five sites at three locations in the Taupo Volcanic Zone. The sites were selected on the basis of being within contours of elevated soil- CO_2 concentrations as mapped by Sheppard *et al.* (1988), initially in areas of low soil- CO_2 concentrations and finally in a hot zone within much higher soil- CO_2 concentration contours. The method of measurement of the CO_2 flows is described in Sheppard and Mroczek (2002a and b), but in essence the flow was measured from an area of ground over extended periods of time. The equipment is currently being calibrated against a modern accumulation chamber since it has become apparent that the technique used may bias the results. However, what has been shown is that diffuse CO_2 flows to the atmosphere vary widely over diurnal cycles – see Figure 6. The observations suggest that these CO_2 fluxes are biologically controlled, at their minimum when photosynthesis is at a maximum, and are not specifically temperature related. This was observed despite the removal of vegetation and top few centimetres of soil (5–10 cm) from under the apparatus.

Some isotopic carbon measurements in areas of diffuse discharge indicated that any geothermal component is more or less completely overwhelmed by biogenic modification ($^{13}\text{C} = -25\text{‰}$). Whether these CO_2 gases are geothermal CO_2 modified by organisms or contact with biogenic carbon has to be addressed, but it is notable that Sheppard *et al.* (1988) found variable concentrations of soil gas related to the underlying geothermal systems in terms of distributions even though the carbon had biogenic isotopic compositions. Other CO_2 samples measured from hot areas had isotopic carbon compositions which clearly indicated that

the source was geothermal ($^{13}\text{C} = -5$ to -6‰).

The extended measurement periods give additional confidence to the measurements when compared to the single “spot” measurements usually employed, especially when the diurnal variability found is taken into account. In fact, we are currently of the opinion that the use of the instantaneous “spot” measurements only at a site cannot be relied on to indicate the average flow from a site.

The use of heat flow measurements to proxy for gas flow measurements may be the easiest way to derive estimates of CO_2 flows over an extended area such as a geothermal system, especially if research indicates that surface temperature images can be calibrated reliably.

For example, diffuse surface heat flow from the Wairakei system increased significantly following the initiation of exploitation in 1956, as has the nature of the discharges, and the gas content of surface steam, at one increasingly active site (Karapiti) increased markedly. If heat-flow is a valid proxy for CO_2 discharge this would suggest that exploitation of this system has resulted in significantly increased diffuse CO_2 discharge from the field, of the same scale as the CO_2 discharged from the power station itself. For further details and references, contact d.sheppard@xtra.co.nz; E.Mroczek@gns.cri.nz

25th NZ Geothermal Workshop 12-14/11/2003

Stuart F Simmons, University of Auckland

The New Zealand Geothermal Workshop celebrated its silver anniversary with a large turnout of more than 100 registrants and excellent sponsorship from industry and government organisations. Many participants came from New Zealand, representing government, industry and university sectors. The overseas contingent included participants from Australia, Papua New Guinea, USA and Japan. The large group of 17 participants from Japan were encouraged by the efforts of Professor Sachihiro Taguchi who is a visitor in the Geothermal Institute on sabbatical leave from Fukuoka University.

Thirty-three technical papers were delivered on a wide range of topics: Drilling, Epithermal Mineralisation, Geochemistry, Geology, Geophysics, Hydrothermal Minerals and Reservoir Engineering. New was the presentation of 6 papers under the heading of Thermophiles and Siliceous Hot Spring Deposits. Characterization and understanding of microbial ecosystems in hot spring environments is an important emerging area of interest, which will likely become a fixture of Workshops to come.

This year's theme “Managing New Zealand's Geothermal Resources” was highlighted by keynote presentations from Brian White, Mark Brockelsby and Charlotte Severne, in representing government, local government and Maori perspectives, respectively. For much of the 1990s, geothermal development in New Zealand was stagnant but since the late 1990s we have been in a growth phase with power station installation and expansion at a number of fields. In the last year, interest in geothermal energy accelerated in response to threats to electricity sup-

ply, and related price spikes, associated with the reported premature run down in gas supply, and also in response to new government initiatives to promote renewable energies. Accordingly, the conference theme provided a platform for discussing a wide range of resource and environmental issues that concern management of our geothermal resources. As a warm up for the Workshop, the Geothermal Institute ran a one-day short course on the Basics of Geothermal Technology designed for non-specialists, covering geoscience, engineering and environmental topics. This was well attended by over 25 registrants.

The Workshop used to be the mark the end of the academic year for students taking the 9-month long Diploma Course in Geothermal Technology. As part of this tradition, the final session was devoted to oral presentations of research projects from a few selected Diploma Students. Their absence this year was felt by everyone. Despite the prominent role that New Zealand has played over the last quarter century in training engineers and scientists in geothermal technology, there is little indication of continued government support for this program. The future of the NZ Geothermal Workshop, however, is not in doubt as indicated by the strong support by sponsors and participants. The next Geothermal Workshop will be announced on the website (www.auckland.ac.nz/gei) early next year. A few bound copies of this year's Proceedings volume are available as are electronic copies on cd for \$50. Contact Stuart Simmons (sf.simmons@auckland.ac.nz) to review the Table of Contents and to obtain a copy.

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2004 Asia Renewable Energy Conference & Exhibition (REAsia 2004), 7-9 April 2004, Beijing, China. Contact: Grace Fair International Limited.
Tel: +86-10-64390338, Fax: +86-10-64390339.

5th International Symposium on Eastern Mediterranean Geology, 14-20 April 2004, Thessaloniki, Greece. Contact: Dr. Alexandros Chatzipetros, Department of Geology, Aristotle University of Thessaloniki, 54 124 Thessaloniki, Greece.
e-mail: ac@geo.auth.gr
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2nd World Renewable Energy Forum: Policies and Strategies, 30-31 May 2004, Bonn, Germany. Contact: Hermann Scheer, MP WCRE Office, c/o EUROSOLAR, Kaiser-Friedrich-Str. 11, 53113 Bonn, Germany. Tel: +49-(0)-228-362373, Fax: +49-(0)-228 361213.
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International Conference for Renewable Energies, 1 - 4 June 2004, Bonn, Germany. Contact: Mike Enskat, Postfach 5180, 65726 Eschborn, Germany. Fax: +49-(0)-6196-79-4405
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Goldschmidt Geochemistry, Conference on Processes in Geochemistry: Forces, Fluxes and Structure, 5-11 June 2004, Copenhagen, Denmark. Contact: Goldschmidt 2004, Geological Institute, University of Copenhagen, ØsterVoldgade 10, DK-1350 Copenhagen K, Denmark. Fax: + 45 33 14 83 22.
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1st International Conference on Geoparks, 27-29 June 2004, Beijing, People's Republic of China. Contact the Secretariat at: tel: + 86 10 6655 8776 or + 86 10 6655 8777; fax: + 86 10 6655 8625;
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7th Workshop of the European Society for Isotope Research (ESIR), 26 June -1 July 2004, Seggau, Styria, Austria.
website: www.kfunigraz.ac.at/geopal/aktuelles/veranstaltungen/viiiisotopenworkshop/main/

International Geothermal Workshop - IGW-2004, 9-15 August 2004, Petropavlovsk-Kamchatski, Russia.
website: igw2004.gesa.ru

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

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

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

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

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

International Geothermal Days "Poland 2004", 13-17 September 2004, Zakopane, Poland.
e-mail: isskiril@sonet.com.mk

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

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

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

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

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

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

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

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

Send IGA News contributions to:

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