



IGA ACTIVITIES

Message from the President

Roland N. Horne

With this letter to you, our members, I begin my three-year term as IGA President. I hope to justify your trust in electing me to this position, and I hope to emulate the many successes of my predecessors, especially the very effective Ladsí Rybach with whom I have just changed chairs. The International Geothermal Association is in robust good health, the geothermal industry is expanding, and geothermal energy is finally beginning to gain some of the attention it deserves among politicians, decision-makers and the public. I'm looking forward to three years of continued growth of geothermal energy, and continued growth of IGA. At the present time, IGA has more than 5000 members from 32 associations in 30 countries (with individual members included, the membership encompasses 65 countries). IGA is an association of associations, and our function is to promote geothermal energy by fostering education, information, and outreach.



Fig. 1: Prof. Roland Horne, IGA President 2010 – 2013

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These functions are also the common goal of many of our member associations, and IGA can represent the worldwide geothermal community collectively, for example by assisting with courses and conferences, and by participating in larger worldwide renewable energy events. During the past few years, IGA has joined the REN Alliance, and has participated in renewable energy conferences and congresses to make sure that geothermal energy is not forgotten!

An important event that will occur very soon is the transfer of the IGA Secretariat from Iceland to Germany. We are very grateful to Iceland for having supported the Secretariat over the past years, and we are grateful to

Germany for taking on the responsibility anew. We will bid a fond farewell to our Icelandic Executive Director Arni Ragnarsson, who nonetheless will remain active in IGA as he has been elected a member of the new Board (he will be the chairman of the Membership Committee). Then we will welcome a new Executive Director, who will take up the position in Bochum, Germany in January 2011 (or soon after). The German organizers are advertising now to fill this Executive Director position – if you are interested in the post, please check the advertisement at the IGA website (<http://www.geothermal-energy.org/files-259.html>). Note that the Executive Director will live in Bochum, Germany, but the position is open to non-Germans.

As you may know, one of my special interests in IGA has been the World Geothermal Congress. The 2010 Congress in Bali was a magnificent event, enjoyed by more than 2000 people, with more than 1050 papers. The 2010-2013 IGA Board will be responsible to launch the preparations for WGC2015 to be held in Australia and New Zealand – in fact the preparations have already begun. I hope to meet all of you there, and also hope that you'll bring your colleagues and friends.

Another special interest of mine is education (because my “other job” is as Professor of Energy Resources Engineering at Stanford University in California, USA). The new IGA Board has proposed the expansion of support for educational events such as short courses to be held at geothermal conferences, or independently. This is



Fig. 2: Incoming and outgoing Presidents Roland Horne (left) and Ladsí Rybach

UPCOMING EVENTS

36 Stanford Workshop on Geothermal Reservoir Engineering, 31 January-2 February 2011, Stanford, California, USA. Website: <http://pangea.Stanford.Edu/ERE/research/geoth/conference/workshop.html>.

ENERVIDA '11, Trade Fair and Conference on Renewable Energies and Energy Efficiency, Viseu, Portugal. Contact: sdsilva@enervida.org

GeoPower Americas, 24-25 February 2011, San Francisco, CA, USA. Website: www.Greenpowerconferences.Com/geoamericas

Renewable Energy World Conference and Expo North America, 8-10 March 2011, Tampa, FL, USA. Website: www.renewableenergyworld-events.Com/index.html

EGU2011 Annual Meeting, Sessions “Deep geothermal resources – development, operation and management” and “Deep geothermal resources – reservoir assessment and exploration”, Vienna, Austria, 3-8 April 2011. Website: <http://meetings.Copernicus.org/egu2011>

World Renewable Energy Congress (WREC) 2011, 8-13 May 2011, Linköping, Sweden. Website: www.wrec2011.com

7th International Geothermal Conference, IGC, 11-12 May 2011, Freiburg, Germany. Contact: agentur@enerchange.de

Geothermal Energy Utilization Associated with Oil and Gas Development, 13-15 June 2010, Dallas, TX, USA. Contact: blackwel@smu.edu

GRC 35th Annual Meeting, 23-26 October 2011, San Diego, CA, USA. Website: www.geothermal.org

a concept that I support wholeheartedly. The more people who know geothermal energy the better, and our geothermal community is short of qualified people as our industries expand and our more experienced professionals retire. IGA can make a difference by fostering the expansion of qualified personnel – greater in number, and stronger in expertise.

At our first Board meeting in Sacramento on October 29, the new IGA Board began to form the structures of the committees that will undertake the many functions of the association. Many of the committees include spaces for IGA members who are not on the Board of Directors, so if you have special interest in any of these functions, I encourage you to contact the committee chairs and let them know. IGA activities are completely accomplished by volunteers (except for the Secretariat), so participation by enthusiastic members is always welcome. The table on the opposite page shows the current line-up of volunteers.

In contemplating the tasks of the next three years as

IGA Permanent Committees 2010-2013 (Chairmen in bold)

Audit	Bylaws	Education	Finance
D. Chandrasekharam	Fernando S. Penarroyo	Juliet Newson	Graeme Beardsmore
Christian Boissavy	Graeme Beardsmore	Miklos A. Antics	Miklos A. Antics
Colin Harvey	Varun Chandrasekhar	D. Chandrasekharam	Paul Hirtz
Koichi Tagomori	John Garnish	Beata Kepinska	Horst Kreuter
	Luis C. A. Gutiérrez-Negrín	Horst Kreuter	Bjarni Pálsson
	Jim Lawless	Jim Lawless	Paolo Romagnoli
	Juliet Newson	John Lund	
	Ladislaus Rybach	Paul Quinlivan	
		Marcel Rosca	
		Horst Rüter	
		Noel D. Salonga	
		Nenny M. Saptaji	
		Benedikt Steingrímsson	
		Francois-David Vuataz	
Information	Membership	Nominating	Programme & Planning
Eduardo Iglesias	Árni Ragnarsson	Kasumi Yasukawa	Paul Quinlivan
Graeme Beardsmore	Miklos A. Antics	Miklos A. Antics	Miklos A. Antics
Paul Brophy	Surya Darma	Graeme Beardsmore	D. Chandrasekharam
Cully Cavness	Luis C. A. Gutiérrez-Negrín	Surya Darma	Varun Chandrasekhar
Surya Darma	Fernando S. Penarroyo	Eduardo Iglesias	Luis C. A. Gutiérrez-Negrín
Gestur Gíslason	Ladislaus Rybach	Juliet Newson	Colin Harvey
Luis C. A. Gutiérrez-Negrín	Anna Sowisza	Paolo Romagnoli	Paul Hirtz
Colin Harvey	Toshihiro Uchida	Ladislaus Rybach	Herman Darnel Ibrahim
Paul Hirtz		Silas Simiyu	Horst Kreuter
Roland N. Horne		Meseret Teklemariam	Juliet Newson
Árni Ragnarsson			Benedikt Steingrímsson
Horst Rüter			Richard B. Tantoco
Benedikt Steingrímsson			
Koichi Tagomori			
Richard B. Tantoco			
Kasumi Yasukawa			
Jim Lawless			
John Garnish			
Philippe Dumas			
Sylvia Ramos			
Alimin Ginting			

President, I'm mindful of the words of Winston Churchill, "Courage is what it takes to stand up and speak; courage is also what it takes to sit down and listen." I'd like to know how IGA, its Board, and I its President, can best serve the members and help them to advance the development of clean, green, geothermal energy. I encourage you to keep us all informed of your ideas, your interests, your questions and, yes, your complaints. We are here to hear them.

IGA BoD meetings in Sacramento 28-29 October 2010

Arni Ragnarsson

In conjunction with the 2010 GRC Annual meeting IGA held three meetings in Sacramento, California on 28 -29 October 2010: (1) the last meeting of the previous BoD,

(2) the IGA Annual General Meeting (AGM 2010) and (3) the first meeting of the newly elected BoD (2010-2013). 32 members of the old and new Board attended the meetings.

As usual, the IGA officers and the Chairmen of the eight permanent committees reported to the Board on the activity since the last Board meeting. Also, the European Regional Branch, the Western Pacific Regional Branch and the ad hoc Reserves and Resources Committee reported to the Board. Affiliation agreements with two new national geothermal associations in Kenya and Chile were approved by the Board, increasing the number of affiliated organizations to 32. New committee chairs and committee members were elected for the three-year term that has just started.

The organizing Committee of WGC2015 gave their final report to the Board about the congress in Bali 25-30



Participants in the Sacramento meetings

April 2010. There was general agreement that the congress was an extremely successful event. The Board discussed the preparations for the next world congress that will be held in Melbourne, Australia in 2015 (WGC2015). An MoU between IGA and an Australian/New Zealand consortium (ANEGA) for organizing the congress was signed at WGC2010 in Bali. A Steering Committee, responsible for certain functions of the congress (technical programme, short courses, fellowships and fund raising) will be formed by IGA at the next Board meeting.

The term of the IGA Secretariat in Iceland will expire at the end of 2010 when it will be transferred to Bochum, Germany. It will be hosted by a consortium of four partners, represented towards IGA through the GtV-BV. It will be located at the Geothermal Center of the Bochum University of Applied Sciences. The process of hiring a new IGA Executive Director is ongoing.

In June 2009 IGA established a subsidiary, IGA Service GmbH. It is registered in Germany and the sole shareholder is IGA. An Advisory Group was set up to be the Board's contact towards the company. One of the main reasons for establishing the company was the plan for implementing an ARGeo project in Africa for the World Bank. Due to delays in the ARGeo programme the

activity of the company has so far been limited to small projects together with other REN Alliance partners. The Board decided that IGA Service should apply for membership in EGEC (European Geothermal Energy Council) and that could open the possibilities for participation in EU projects in the future.

IGA is a member of the REN Alliance (International Renewable Energy Alliance) together with other world organizations within solar, wind, hydropower and bioenergy. The main activity so far has been participation in different renewable energy events and organization of side events at climate change meetings. It also provides a forum for a joint representation of the RE sector towards international organizations within the energy sector. The IGA Board agreed on the importance of participating actively in this cooperation.

A preliminary budget for 2011 was approved by the IGA Board. Due to IGA's share of the registration fee and surplus of WGC2010 (approximately USD 130,000) we are financially in a much better position than before. Therefore, the Board agreed to increase the annual budget to almost USD 60,000 from the present level of about USD 40,000. More funds will be allocated for educational events and possibly fellowships as well as other activities.



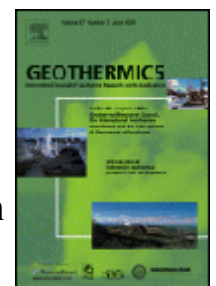
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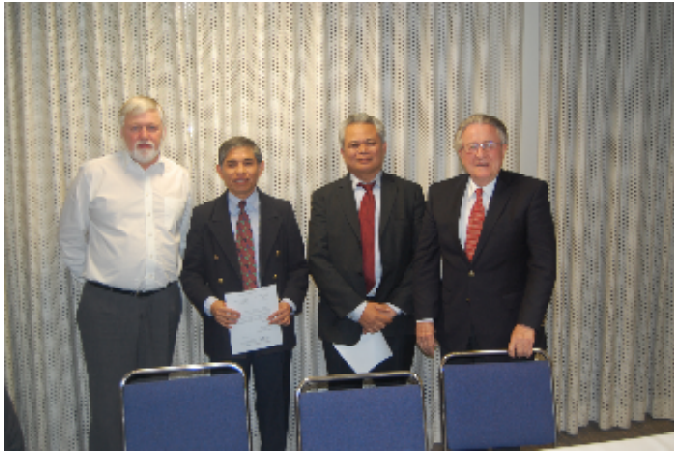
GEO THERMICS

International Journal of Geothermal Research and its Applications

Published under the auspices of the International Geothermal Association

Content of the latest issues: <http://www.elsevier.com/locate/geothermics>





Ladsi Rybach, past-president (right) handed a letter of thanks to Herman Darnel Ibrahim, Chairman of the WGC2010 OC (center right), and to Surya Darma, President of INAGA (center left), assisted by Arni Ragnarsson, IGA Executive Director (left).

Among the decisions taken by the Board is to accept paid commercial advertisements on the IGA website. In case this will be implemented it will be taken care of by the IGA Secretariat. The Education Committee raised the idea of creating some kind of young members' activity within IGA and also to form a new research activities committee. This will be discussed further at the next Board meeting.

At the Annual General Meeting of IGA (AGM 2010), which was attended by about 30 members, brief reports were given on the activity of the organization. The President of IGA, Ladsi Rybach, handed over a letter of thanks to Herman Darnel Ibrahim, Chairman of the WGC2010 Organizing Committee and Surya Darma, President of INAGA. In the letter IGA thanks and congratulates the organizers of WGC2010 for the outstanding success of the congress. Also, IGA gratefully acknowledges the substantial transfer of funds to IGA from the WGC2010 balance. Installation of new IGA officers took place at the AGM. Roland Horne replaced Ladsi Rybach as President, Colin Harvey replaced Ruggero Bertani as Vice President, Horst Rüter replaced Gestur Gíslason as Secretary and Herman Darnel Ibrahim replaced Colin Harvey as Treasurer.

The next meeting of the IGA Board will be held at the site of the new Secretariat in Bochum, Germany, 18-19 March 2011.

Field trip to the Geysers for the new IGA BoD

Luis C.A. Gutiérrez-Negrín, IGA BoD

The newly elected IGA Board of Directors (2010-2013) held its first meeting in Sacramento, CA, taking advantage of the 2010 Annual Meeting of the US-affiliated organization, the Geothermal Resources Council (GRC). This annual meeting was held in that city, capital of the



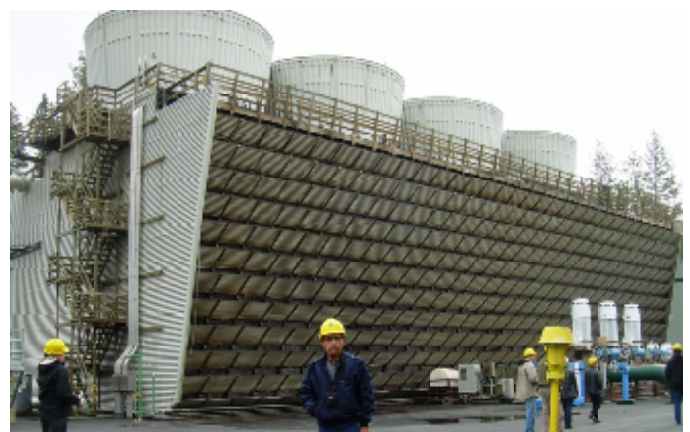
Control room of Calpine's Unit No. 14, named West Ford Flat.

state of California, through October 24-27. The theme was "Celebrating 50 years of clean, renewable energy", marking the fact that the first geothermal power plant in the US started to operate in 1960, at The Geysers geothermal field. Thus, it was appropriate that the IGA BoD meeting finished by paying a visit to this field.

The field trip was kindly organized by EGS, Inc., a consulting company based in Santa Rosa, and conducted by its President, Paul Brophy, who provided the transport and lunch, and made the proper arrangements. Paul was a member of the past IGA BoD, and is an experienced geologist who spent several years working at The Geysers. Twelve members of the new BoD, three of the past one and some accompanying guests gathered at 8 am on Saturday October 30, and headed to Middletown, bordering the southern shores of Clear Lake. Middletown is the small village east of Sacramento where Calpine's Visitor Center is located.

Presently, The Geysers geothermal field is owned and operated mostly by Calpine Corporation. The public utility Northern California Power Agency (NCPA) operates the southeastern part of the field, as well as two power plants. Calpine Corporation was founded in San José, CA, in 1984 and is a major US power company that operates 29,000 MW in 21 US states and Canada.

Once at the visitor center, the multinational IGA group (bringing together visitors from Germany, Iceland, Indonesia, Japan, Mexico, New Zealand, Philippines, Romania, and the US) was welcomed by two kind guides



Cooling tower of Calpine's Unit 14

who offered a wide and well-documented explanation about the geothermal field, the power plants and the general operation of the same. This opening explanation was provided in the exhibition room of the center that contains a model of the field and ingenious schemes showing the basic operation of geothermal power plants. The visitors were then provided with helmets, safety specs and ear protectors, and went to the field located a few kilometers northwest of Middletown.

The Geysers geothermal field is located in northern California, in the Mayacamas Mountains 150 km north of San Francisco, covering the north portion of Sonoma County and some small portions of the neighboring Lake County (to the east) and Mendocino County (to the north). The currently known boundaries of the geothermal reservoir comprise a northwest-southeast oriented, kidney-shaped area of roughly 115 km² defined by two main faults of the same direction: the Mercuryville Fault to the east and the Collayomi Fault to the west. Inside this area is a complex lithology that has been grouped in the following units: Ultramafic, Franciscan Sediments and Melange, Mesozoic Sediments, Franciscan Volcanics, and Quaternary Volcanics. The geothermal fluids, composed of dry or superheated steam at an average temperature of 218°C and an average pressure of 110 psig, are hosted by the Franciscan formations whose rocks present good primary permeability.

The visitors were conducted to Calpine's Unit No. 14, named West Ford Flat. It is a 28 MW unit composed of two turbo-generators commissioned in 1987. They operated at an average capacity factor of 92% during 2009. The unit was attended by one single operator who kindly answered the several questions of the group, who then moved on to the Geysers Administrative Center. Here also is the central control room where almost all the production and injection wells and power plants are constantly monitored and can be remotely operated.

Calpine owns and operates most of the field (around 100 km² of the total) and 17 out of the 19 power units currently in operation. The remaining two operating units are NCPA 1 and NCPA 2, located in the southeastern field. Calpine owns also another five power plants, currently inactive. The total installed operating capacity of Calpine's 17 power units is 725 MW, the first of which, Unit No. 1 (named Aidlin after Joseph Aidlin, one of the pioneers of the US geothermal development), started to operate in September 1960. These plants produced 5949 GWh in 2009 at an average annual capacity factor of 93.5%. This electricity generation represents around 20% of all the renewable energy generated in California.

Calpine's control room has two main terminals. One monitors and controls all the power plants and the other does the same with the steam-field. There are currently 345 production wells and 50 injection wells in operation, at an average depth of 2590 meters (although the deepest well is 3930 meters deep). The average steam production per well

is approximately 17.3 tons per hour (t/h) or 4.8 kg/s, and the total steam production of the part of the field managed by Calpine is around 5900 t/h (1640 kg/s). Therefore, the average specific consumption of Calpine's power plants during 2009 was approximately 8.7 tons per MWh, which implies a high efficiency. The Geysers being a steam-dominated reservoir, the production wells do not produce liquid phase. However, some time ago it was decided to start to inject water into the reservoir to recharge it, enhance the production and help to sustain the geothermal resource. Currently the 50 injection wells are injecting daily 11 million gallons (~1735 t/h or 482 kg/s) of treated municipal wastewater from Santa Rosa County, located south of the field, and 5.2 million gallons per day (~818 t/h or 227 kg/s) from the neighboring Lake County. Thus, the total injected volume of water (2550 t/h) represents more than 40% of the extracted volume of steam.

The municipal wastewater is conducted to the injection wells by 105 km of water pipelines. Water from Santa Rosa is concentrated into a high-elevation tank located in the southern field and then is injected by gravity. The produced steam is conducted to the power units through approximately 129 km of steam pipelines. All of these surface installations are real-time monitored and can be remotely operated from the control room, where also are monitored and controlled approximately 95% of the almost 400 operating wells (production plus injection).

Although the wells present very steady conditions over time (some currently operating wells were drilled more than 30 years ago), and therefore no make-up wells are required, Calpine has drilled a total of 575 wells in the field. Presently, the average cost of a 2600 m-depth well is US\$ 6.5 million and it is completed in 85 days (75 days drilling plus 10 days for erection and removal of the rig). Most of these wells are directional, using a single pad to drill up to five wells.

After lunch and the visit to the control room, the IGA visitors were conducted to the Sulphur Springs thermal area and then to the Geysers Rock. The slightly rainy weather of the afternoon allowed only a quick stop at the area of surface manifestations. The group then returned to the Visitor Center in Middletown to finish the field trip around 4 pm.

On the way back to Sacramento, the bus headed to the south of Middletown in order to pass through the famous Napa Valley where most of the finest Californian wines are produced. No stop had been scheduled, but the IGA visitors, led by its New Zealand section, got the proper authorization to make a quick stop in one of the vineyards in the valley and taste one or two Californian wine samples. That was a perfect end for a very interesting trip, and ultimately for a busy week that comprised the GRC annual meeting and the IGA BoD meetings.

AMERICAS

Mexico

The Mexican Geothermal Association held its XVIII congress and assembly

Luis C.A. Gutiérrez-Negrín, MGA Vice President

On October 15, 2010, the Mexican Geothermal Association (AGM: Asociación Geotérmica Mexicana) carried out its XVIII annual congress and assembly at the headquarters of the geothermal division of the Federal Commission for Electricity (CFE: Comisión Federal de Electricidad) located in Morelia, Mexico.

The AGM was founded in 1992, and since then has organized one congress and assembly yearly with some additional extraordinary assemblies. It is currently an affiliated organization with the IGA, whose affiliation agreement extends up to 2012. Its eighteenth meeting gathered around 40 participants from the CFE, the Electrical Research Institute (IIE: Instituto de Investigaciones Eléctricas), and the National and Michoacán universities. Most participants were researchers and engineers who have long been involved in geothermal, including some now retired from the CFE, but there were also a significant number of young CFE employees, among them one of the speakers.

Ten technical papers were presented, covering subjects such as the national assessment of low- and intermediate-temperature geothermal resources in Mexico; the results of sampling and analyses of radon in soils of the Las Tres Vírgenes geothermal field; a new code called GeoSteamNet for simulating steam flow in steam



Alfredo Mañón (left) delivers the 2010 Pathé Award to Ramón Reyes.

pipelines; the changes in the steam composition in wells from Los Azufres field due to injection; the utilization of a GIS to compile the actual conditions of the thermal insulation on the Cerro Prieto field pipelines; the determination of heat losses in those pipelines, due to failures in their insulation, and in the accessory valves and other devices; some experimental results on changes in reservoir rocks of the Los Humeros field after acid treatment; the general effects of injection in the southern Los Azufres field according to results of tracer studies; and some practical models for geothermal reservoirs.



Technical presentations during the congress

After the lunch, those members of the AGM attending the congress started the annual assembly under the previously distributed agenda. The AGM President for 2009-2010, Raúl Maya-González, who is currently in charge of the CFE's geothermal division, called to order and read the minutes of the last assembly in 2009, which were approved. The Secretary, Luis Gutiérrez-Negrín, presented the Board of Directors' report for the last year, and the Treasurer, José Luis Quijano, presented his yearly report. Both were also approved.

Raúl Maya-González then presented the 2010 Pathé award. This award was instituted by the AGM in 2005 to recognize the career and activities of relevant persons involved in geothermal in Mexico during at least 15 years. The 2010 Pathé award went to Ramón Reyes-Suárez, who graduated as a chemical engineer from the National Polytechnic Institute in 1959. In 1976 he joined the then CFE's Geothermal Department where he was in charge of the exploratory and development drilling in all the geothermal fields and zones of the Mexican Volcanic Belt (central Mexico), based in the Los Azufres geothermal field. In 1982, when the CFE's geothermal division was formally founded, he was appointed as general manager of the Los Azufres field, where he was in charge of the installation of the first back-pressure power units, some of them being still in operation. In 1989 he was appointed as head of the Drilling Department based in Morelia, being responsible for all the drilling programs of geothermal wells in Mexico. He left CFE in 1991 and started to work as Technical Director for the Mexican drilling company Latina, having as his main duty all the geothermal drilling operations of this company in Mexico (especially in the Cerro Prieto geothermal field) and Latin America up to 1996. Since then he has been an independent consultant for several private companies and regional institutions, such as the Latin American Organization for Energy (OLADE) and the Inter-American Development Bank (IDB). The Pathé award was delivered to Ramón Reyes-Suárez, in a simple but emotive ceremony, by Alfredo Mañón-Mercado who was the recipient of the 2009 Pathé award.

The new board of directors for the period 2011-2012 was then elected. According to its by-laws, the new President of the AGM is the Vice-president of the previous board, and therefore this post is not subject to election. All the remaining posts have to be elected. Ballot papers had been sent previously to the membership, and others were completed during the assembly. Two members volunteered to scrutinize and count the valid votes, and the new board is as follows:

President: Magaly Flores-Armenta (from CFE and former 2009-2010 Vice-president)

Vice-president: Luis C.A. Gutiérrez-Negrín (consultant)

Secretary: Alfredo Mañón-Mercado (Geocónsul)

Treasurer: José Luis Quijano-León (consultant)

Pro-secretary: Georgina Izquierdo-Montalvo (IIE)

Pro-treasurer: José Manuel Romo-Jones (CICESE)



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If you have any questions, please contact Penny Hunt at penny.hunt@nrel.gov

Magaly Flores-Armenta addressed the assembly and presented the general goals of her two-year tenure. The assembly finished by discussing some old and new business and taking the traditional photo in the recent offices of the CFE's geothermal division.

USA

Paul Kruger (1925-2010)

Roland Horne, Stanford Geothermal Program

The Stanford Geothermal program regrets to inform the worldwide geothermal community of the passing of Professor Paul Kruger, who died on September 17, 2010, at the age of 85. Prof. Kruger was the last surviving founder of the Stanford Geothermal Program, which was founded by Profs. Paul Kruger, Lou London and Hank Ramey in the 1970s. In addition to founding the program, Prof. Kruger was the architect of the annual Stanford Geothermal Workshop, which began in 1975 and continues to this day. Prof. Kruger wrote two well-known books on geothermal and renewable energy, firstly "Geothermal Energy; Resources, Production, Stimulation" in 1973 with Carel Otte and secondly "Alternative Energy Resources: The Quest for Sustainable Energy" in 2006. He also wrote a book on "Principles of Activation Analysis" in 1973.



Prof. Paul Kruger

Prof. Kruger served the nation in the US Air Force, as well as by leading the geothermal division of the Energy Research and Development Administration (ERDA, now DOE) when it was first formed in the 1970s.

With a BS from MIT (1950) and PhD from University of Chicago (1954) Prof. Kruger worked in nuclear physics and chemistry before joining the Stanford faculty in 1962. As Professor of Civil and Environmental Engineering at Stanford University, Prof. Kruger led a large number of students to the completion of their MS and PhD degrees. After becoming Emeritus in 1987, Prof. Kruger remained active in energy research, undertaking studies in both geothermal and hydrogen energy.

GRC Annual Meeting - Sacramento, California, USA. Oct 24th-27th 2010

John Galbraith, GRC and Paul Brophy EGS, Inc.

Celebrating 50 years of clean, geothermal energy at The Geysers and buoyed by continued worldwide industry optimism and growth, the 34th GRC Annual Meeting was a stirring success. Held in conjunction with the GEA Trade Show on October 24-27, 2010 at the Sacramento Convention Center, California, the GRC Annual Meeting showcased advancements in geothermal research, exploration, development, technology and policy. Themed “Celebrating 50 Years of Clean, Renewable Power,” the meeting’s Opening Session gathered local, state and federal officials, along with worldwide industry leaders who discussed current geothermal energy production and delivered inspired perspectives.

Following the Opening Session, GRC members from every corner of the globe working in every facet of the industry participated in a broad variety of technical tracks including: EGS, The Geysers, Power Operations, Reservoir Engineering, Utility and Transmission, Exploration, Environmental, European, Heat pump/Direct Use,



GRC Annual Meeting – Opening Session.

Business Development and Economics, Drilling, Geophysics and Geochemistry. A full report of the Technical and Poster Session highlights, GRC Awards, International Luncheon, Photo Contest winners and optional events including workshops, the Charity Golf Tournament, and field trips to The Geysers will be included in the November/ December issue of the Bulletin.

One of the many highlights was the Annual GRC Banquet. More than 325 people were treated to an unforgettable night of geothermal history as GRC saluted The Geysers and five decades of clean, renewable power. Representatives Karen Curry Pettigrew, Ted Wilmsen, Lou Capuano, Tom Box, Charlene Wardlow, and Dennis Gilles from the 1960s, '70s, '80s, '90s and 2000s respectively described the sights, sounds and astonishing accomplishments of each decade leading up to present day.

Tsvi Meidav (1930-2010)

William Teplow, U.S. Geothermal

Tsvi Meidav was a visionary and pioneering force for commercial geothermal development in the United States and worldwide. He passed away on September 29, 2010.

Born in Poland in 1930, he emigrated to Palestine with his family in 1934. As a youth of 17 he fought in the Israel War of Independence. After the war, he attended college in the US, starting at San Mateo City College and received his Ph.D in geophysics from Washington University, St. Louis, Missouri.

After working for the United Nations geothermal program, developing geothermal resources in Asia and Africa, he founded his own geophysical consulting firm, Geonomics. Geonomics performed exploration work throughout the Western US and abroad. Many of the detailed datasets generated by Geonomics during the '70s are still useful today in the exploration and development of geothermal fields throughout the West. Several key leaders of the geothermal industry today got their start at Geonomics.

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In 1980 Tsvi formed Trans-Pacific Geothermal Inc. (TGI), a commercial geothermal development company, with the backing of private investors. TGI acquired 230,000 acres of federal and private geothermal leases throughout the Western US and initiated an aggressive exploration program. TGI success in drilling two of the hottest wells ever drilled in Nevada was key to the development of the Dixie Valley 50 MW geothermal project. After being rebuffed by the local Nevada utility Sierra Pacific Power for a power purchase agreement for the Dixie Valley resource, Tsvi forged ahead with the routing and permitting of a 230 mile private power line, at the time the longest in the US, to deliver the power to Southern California Edison at Bishop, California. This facilitated the sale of Dixie Valley power under a lucrative 40 MW Standard Offer Number 4. Oxbow Geothermal, purchaser of the project from TGI, constructed the Dixie Valley power plant and power line which went into service in 1987.

After the sale of Dixie Valley, Tsvi's newly constituted company, Trans-Pacific Geothermal Corporation, TGC, continued geothermal development throughout the Western US and in Central America. His efforts resulted in successful completion of the Stillwater, NV and Amedee, CA geothermal power projects.

In 1996 Tsvi acquired a large geothermal concession in Nicaragua and executed an extensive geophysical exploration program. This program identified several high quality commercial geothermal prospects within the concession. A similar effort in Honduras entailed the acquisition and exploration of the Platanares geothermal resource.

Tsvi is survived by his wife, Dr. Mae Ziglin Meidav, their children, Tamar of California, Professor Edie Meidav of New York, and Dr. Josh Meidav of Washington, and grandchildren, Eliana, Shira and Dalia.

EUROPE

European News

Pilippe Dumas, European Geothermal Energy Council

10.11.2010: Start-up of new ENEL GREEN POWER geothermal power plant in Italy

Today saw the start-up of the new Radicondoli 2 geothermal power plant in the town of the same name in the province of Siena. With its 20 MW of capacity, the new unit adds to the 40 MW produced by the existing power plant, giving the facility a total of 60 MW of installed capacity. Once operating at full output, the plant will be able to produce more than 140 million kilowatt hours per year of electricity, equivalent to the consumption

of 55,000 households, and avoid the emission of 200,000 tonnes of CO₂, in addition to saving 55,000 TOE (tonnes of oil equivalent) of fossil fuels. The project also includes the drilling of three new wells and the deepening of an existing well, work that is still under way.

26.10.2010: Development of geothermal energy in the Mezzogiorno

The Italian Minister of Economic Development and the National Research Centre (CNR) has signed an agreement to harness geothermal energy in some regions of southern Italy. This agreement aims to identify and implement actions to expand the potential of geothermal energy in Campania, Calabria, Puglia and Sicily. This VIGOR project has a budget of €8 million for 2 years. Project results will be disseminated online through a website, which will also be a help desk for the public and private companies wishing to explore the possibility of investing in geothermal projects.

23.09.2010: EU and African leaders launch a new renewables cooperation programme

At a meeting of the Africa-EU Energy Partnership (AEEP) in Vienna on 14 Sept., EU commissioners launched the Renewable Energy Cooperation Programme (RECP) with €5 million funding. This programme aims to bring relevant renewable energy technologies (among them geothermal) to Africa to contribute to the African renewable energy targets for 2020.

During the conference, Kenya urged the European Union to set up an insurance fund to cushion the African governments against investments in energy production projects. Energy minister Kiraitu Murungi told the African-EU high level partnership meeting that lack of such an insurance was holding back most developing countries from venturing into such projects.

06.09.2010: Miskolc: energy resource found to exceed expectations

PannErgy Plc reported that on 23 August 2010 the geothermal drilling at Miskolc-Mályi reached the targeted bottom depth at 2310 meters. After further deepening, the geophysical measurements and primary tests have confirmed that in the vertical range of 2270-2310 meters there is a geothermal reservoir with hot water of 110-120 degrees Celsius temperature, and its yield reaches 4200-5400 liters/minute (cc. 70-90 l/s). The result of the drilling significantly exceeds PannErgy's former conservative expectations, being approximately three times larger.

26.08.2010: News on deep geothermal projects in Netherlands and Denmark

Deep geothermal projects are making a new start in traditional regions like France (Paris Basin) and Hungary, and new countries are developing geothermal energy:

The Netherlands: During July, Huisman's LOC 400 drilling rig began a second geothermal project in the Netherlands, this time in the city of The Hague.

Denmark: Sonderborg Geothermal dig breaks ground! Sonderborg Fjernvarme and DONG Energy are drilling on this new geothermal site. It will host the geothermal well and facility that will supply a large portion of Sonderborg's heating in the future from a climate-friendly source. It will not be long now! Sonderborg will soon become the third place in Denmark where clean, CO₂-neutral heat will be literally pumped right out of the ground. If all goes according to plan the facility will supply Sonderborg city with a third of its annual consumption of district heating by the year 2012. The Project is an important part of the Sonderborg-areas vision of ZEROcarbon and THE ROAD TO ZERO.

16.08.2010: UK; Cornwall grants planning permission for a first EGS project

Plans to build the UK's first geothermal energy plant have been given the go-ahead. Members of Cornwall County Council's strategic planning committee unanimously voted in favour of Geothermal Engineering Ltd's plan. Work is now expected to begin on the United Downs Industrial Park near Redruth, West Cornwall.

The plant is being developed by London-based Geothermal Engineering and is intended to generate 55MW of renewable heat energy and 10MW of electricity when it becomes fully operational in 2013. Approval of the planning application last week (August 13) means the company can drill three wells 4.5km in depth at the United Downs industrial estate, which is an existing brown field site. Work is set to start in early 2011.

Ryan Law, managing director of Geothermal Engineering Ltd, said: "With the development of our plant we want to make deep geothermal energy a significant contributor to the UK's energy portfolio. Not only can we contribute renewable, continuous power to the grid, we also want to change the way the UK meets its heat demands by offering energy-efficient, decentralised heat. The Department of Energy and Climate Change has already estimated that deep geothermal technology could supply between one and five GW of baseload, renewable electricity by 2030."

EGS in 'ground-breaking' deep drilling tie-up

The following is based on a report published by Newsco Insider Ltd on 3 November 2010:

Cornish geothermal energy firm EGS Energy, which is currently awaiting planning permission to build a £25m geothermal scheme at the Eden Project near St Austell, Cornwall, England, has partnered up with a Slovakian company to develop a ground-breaking new form of deep drilling technology that it hopes to use on its geothermal projects in the South West of England. EGS Energy, which is based in Penzance, has teamed up with Geothermal Anywhere to work together on applications for European grants in the coming months.

Bratislava-based Geothermal Anywhere is developing a new deep drilling technology for the geothermal sectors based on non-contact methods of rock disintegration. One of the main issues for the deep geothermal industry is the cost of drilling to the required depths as a result of the time that this takes, but EGS said that Geothermal Anywhere's drilling method avoids the inherent limitations of conventional rotary drilling.

EGS Energy said: "This deep drilling approach is a rock crushing technology based on bringing together an electrical discharge, pulsed plasma and a jet of water in appropriate combination." Roy Baria, technical director of EGS Energy, said: "We are excited to have the opportunity to work with Geothermal Anywhere on a project that could improve significantly the commercial returns in the nascent deep geothermal sector.

"Our experience of deep drilling for geothermal targets is extensive and we believe that we can add substantially to what is already an excellent team and a ground-breaking technology."

Igor Kocis, CEO of Geothermal Anywhere, said: "Geothermal Anywhere is now entering a new stage of the company development. We have the essential financial coverage of our R&D costs for the creation of a drilling prototype. We now need international partnerships and common projects with experienced companies from the drilling and engineered geothermal system fields. EGS Energy is such a partner and we expect mutual benefits from this alliance."

A video from Geothermal Anywhere, showing a laboratory demonstration of plasma spallation drilling, can be seen at www.geothermalanywhere.com/demonstration.



Macedonia

KIRIL POPOVSKI (1943-2010)

John Lund, Renewable Energy Laboratory, Golden, CO

Kiril was born in Macedonia on July 17, 1943. He attended the University of Edvard Kardelj, in Ljubjana, Slovenia and received a BSc in Mechanical Engineering in 1967, an MSc in Mechanical Engineering – Energetics in 1975, and a PhD in Technical Sciences in 1984. His major work at the university was in the design of district heating systems and the heating of greenhouses with geothermal energy. He did two post-PhD studies, one in Italy and the other in New Zealand. He became a lecturer at St. Kliment Ohrid University in 1989 and later became the chair of the Thermoenergetics & Thermotechnics department and dean of the Faculty of Technical Sciences.

In 1989 he started the International Summer School on Direct Application of Geothermal Energy under the International Geothermal Association (IGA). He organized all the annual conferences which were held in many European countries with invited lecturers teaching students from local universities. The Summer School was held in Klamath Falls, Oregon in 1999, the only time it was held outside Europe. He was the president of the Macedonian Geothermal Association, a member of the International Geothermal Association Board of Directors and Chairman of the European Forum under IGA. He was also the Manager of the Central Organization for Development and Investments in the Agriculture of Macedonia, and Technical Manager of the District Heating Company of Skopje, Macedonia. He was responsible for editing and publishing many proceedings from geothermal conferences. He wrote the geothermal country update paper on Macedonia for the World Geothermal Congresses along with many other papers on geothermal

energy. He was best known for his expertise on the design of geothermally heated greenhouses.

He was working on geothermal projects, often late into the night, right up until he died on October 22, 2010. He was truly one of the geothermal pioneers.

ASIA

China

National Geothermal Conference and Symposium held in Beijing, China

Keyan Zheng, GCES, China

Although there was a very long history of hot spring use in China, development of geothermal as an energy resources began only at the beginning of the 1970s, initiated by J. S. Lee, the then-Minister of the Ministry of Geology. In the intervening 40 years geothermal development has expanded greatly. China has been at the top of the world list for direct use of geothermal for over two decades, and GHP applications have reached the second position in the world at present. In order to celebrate these achievements and commemorate the 40th anniversary, a conference in commemoration of the 40th anniversary of modern geothermal energy development initiated by J. S. Lee and a symposium on geothermal growth in China was held successfully on 16-18 October 2010 in Beijing, China. The Department of Geo-Environment of the Ministry of Land and Resources (MLR) hosted the activities. The China Geothermal Energy Society (GCES) and other institutions organized the events. A total of 244 participants from all over China attended the conference. Invited foreign guests from Iceland and New Zealand, and Ambassador Kristin Arnadottir of Iceland, attended the conference as well. Vice Director Chen Xiaoning of the Department of Geo-Environment, MLR hosted the opening ceremony, and



The Opening Ceremony



2010 Chinese Geothermal Conference held in Beijing

Director Guan Fengjun gave the keynote speech. He reviewed the history of geothermal development in China, and demonstrated the great achievements in geothermal exploration, utilization and research over the past 40 years following J.S. Lee's initiation and mobilization. He explained that this success was due to preferential national policy and international aid and support. He hoped Chinese geothermal workers would continue their efforts to deliver further excellent performance, as a commemoration of J.S. Lee.

Dr. Ingvar Fridleifsson, as a former IGA President and Director of the Geothermal Training Program (Iceland) of the United Nations University, and Prof. Manfred Hochstein, as the former Director of the Geothermal Institute of Auckland University in New Zealand, and Dr. Hongliang Yang as representative of the Asian Development Bank were invited to give speeches during the opening ceremony. The Conference presented a Special International Award to both Ingvar Fridleifsson and Manfred Hochstein to express great thanks to them for their special contribution in China's geothermal career.



The Special International Award was awarded to Ingvar Fridleifsson and Manfred Hochstein.

There followed the Symposium on Geothermal Growth in China, spread over 5 sessions that covered 40 years of Chinese geothermal, geothermal heat pumps, geothermal management and exploration, geothermal utilization, and new technology and new equipment. All presentations expounded comprehensively on the history, status and future prospects for each topic. The proceedings, "Geothermal Energy in China: Past and Future", and a book, "Memorabilia of Geothermal in China (1950-2010)", were published during the conference and symposium.

The series activity expressed our respect to the former Minister J.S. Lee, showed fully our achievement, and at the same time expressed our gratitude for the international help.

Japan

Accelerated geothermal exploration in Wasabizawa-Akinomiya field in Japan

Chitoshi Akasaka (J-POWER) and Shigetaka Nakanishi (YGP)

The Electric Power Development Co., Ltd. (J-POWER), Mitsubishi Materials Corporation (MMC) and Mitsubishi Gas Chemical Company, Inc. (MGC) established the Yuzawa Geothermal Power Corporation (YGP) on 12 April 2010 to accelerate geothermal exploration and feasibility studies in the Wasabizawa-Akinomiya geothermal field in Japan. YGP is planning a production test within this year, as the first milestone toward further exploitation. YGP is a joint stock company between J-POWER (50%), MMC (30%) and MGC (20%); Mr. Shigetaka Nakanishi, seconded from J-POWER, serves as the company president.

The Wasabizawa-Akinomiya field is a promising high enthalpy geothermal field in Akita Prefecture, northeastern Japan (Figure 1). New Energy and Industrial Technology Development Organization (NEDO) conducted Geothermal Development Promotion Surveys (so-called



Figure 1. Location map of the Wasabizawa-Akinomiya geothermal field

“C” Surveys) in the Wasabizawa geothermal area from 1993 to 1997, and in the adjacent Akinomiya area from 1996 to 2000. A “C” survey is a large-scale survey involving several geophysical and geochemical surveys, several pilot drillings (including 2 or 3 production size wells) and long term production tests.

After the surveys by NEDO, in April 2008 J-POWER and MMC entered into an agreement to carry out joint



Figure 2. Drilling rig at Wasabizawa-Akinomiya in FY 2009

studies to examine the feasibility of developing an electrical power project using geothermal fluid from the Wasabizawa-Akinomiya geothermal reservoirs. Since the reservoir systems beneath both areas are interconnected, pressure interferences were observed between wells in both areas.

Two exploratory wells were drilled in FY 2009 utilizing a subsidy from NEDO (Figure 2). YGP is preparing a production test using one of the exploratory wells this year. Based on the results of the production test, YGP plans to advance the project toward the next stage for commercial production of geothermal steam in the future.

OCEANIA

Australia

Update from Australia

Graeme Beardsmore, Monash University

At the time of writing, I am anticipating attending the upcoming third annual Australian Geothermal Energy Conference. The three-day event this year is in Adelaide, South Australia, from 17–19 November. A number of associated short courses are scheduled for Tuesday 16 November. Approximately 300 people are expected to attend the Conference, attracting participants from all parts of the geothermal industry across the country, and a number of international visitors.

Day 1 of the Conference is entirely in plenary format and is devoted to ‘big picture’ talks about where the Australian geothermal industry currently sits and where it is heading. The afternoon will provide up-to-date information on projects from a number of development companies - Geodynamics Ltd, Petratherm Ltd, Panax Geothermal Ltd, KUTh Energy Ltd, New World Energy Ltd, Torrens Energy Ltd, Granite Power Ltd and Greenerth Energy Ltd.

Day 2 of the Conference begins with an update on the International Partnership for Geothermal Technology, a collaborative effort between Australia, Iceland and United States to tackle R&D issues surrounding unconventional geothermal resources, and some of the specific challenges Australian groups are working on. The Conference then splits into three parallel streams of technical talks for the next day and half.

Day 3 wraps up with an up-to-date account of reservoir stimulation in Jolokia 1 by Geodynamics Ltd; and an update on climate change science and the view of the Intergovernmental Panel on Climate Change by Professor David Karoly, just to remind us of why we are all doing what we are doing.

Over 60 technical talks fill the majority of Days 2 and 3. It will be difficult for me to see all the talks that look

interesting, with presentations ranging across a spectrum of topics, including:

- Possible legal liabilities associated with fracture stimulation
- Hydrothermal spallation drilling
- Introduction of the second edition of the Australian Geothermal Reporting Code, and a review of experiences under the first edition
- An historical perspective of EGS 'success'
- How to target faults for geothermal systems
- Numerical modelling of fracture stimulation
- Progress in using CO₂ as an EGS working fluid

I myself won't get off lightly either. As well as chairing a session on the geology of Hot Sedimentary Aquifers and Engineered Geothermal Systems, I will also be presenting the results of the first application of a new Global Protocol for estimating the power potential for EGS around the world. The Protocol itself, prepared with support from Google.org's 'Renewable Energy cheaper than Coal' initiative, was launched at the Geothermal Resources Council Annual Meeting in Sacramento, California, in October and provides a standardised set of assumptions for estimating and mapping the world's EGS potential. Australia has been the first 'test bed' for applying the Protocol, and I expect the results to generate some robust discussion.

New Zealand

Derek Harry Freeston (1929-2010)

Patrick R. Browne, University of Auckland

Derek Freeston died peacefully at home with his family nearby on October 9, 2010. He had been unwell for some time but his loss still came as a shock to his colleagues, former students and many friends.

Derek was a major contributor to the geothermal communities, both national and international, in multiple ways, including academic (both research and teaching), commercial and administrative. He combined these components effectively to the benefit of all three.

Derek grew up in Leicester, England and never quite lost his accent. He graduated from the University of London and was an engineering officer in the Royal Air Force based at Hendon. After leaving the RAF, Derek helped design the air intakes for jet aircraft, including the Concorde Airliner. Derek long maintained his interest in aircraft design and the history of the RAF.

Derek and his young family migrated to New Zealand in 1969 when he took up an appointment in the Department of Mechanical Engineering at the University of Auckland where he established a wind tunnel. This was



used for a wide variety of purposes, including understanding wind flow patterns in down town Auckland. In this period he also designed the condenser pots subsequently widely used in several steam fields. However, Derek also became interested in two-phase flow and was seconded to the staff of the newly established Geothermal Institute in 1978. He was the sole engineer and responsible for organizing and teaching the engineering component of the new courses as well as guiding masters and doctoral students in their research. He was able to continue his own research, which he did through his students and by cooperating with engineers directly involved with steam production.

Although the results of his research were important and have practical benefit for the geothermal community, Derek became better known for his teaching and mentoring of students. He taught several hundred during his time at the Geothermal Institute but retired from the University in 1992. He then held an honorary position, giving lectures and advice to students and staff for many years. Derek also took the opportunity to teach courses in other countries that were then establishing their own geothermal programmes. He visited Indonesia on several occasions where he both taught and learnt. His legacy persists there and no doubt in other countries where he spent time, including Kenya, Iceland (UNU), Philippines, China (Geothermal Department, Tianjing University), El Salvador, Mexico and USA (Geo-Heat Center, Oregon Institute of Technology).

Derek took for granted that students wanted to learn and in almost all instances his expectation was realized. It was a personal disappointment for him if a student did not try 100%. If a student was having trouble but wanted to learn, however, then Derek would spend hours helping her/him. He was, in fact, an ideal teacher both in the classroom and the field but also because he really cared about students, recognizing that many were a long way from home, living in a hostel with other, mostly younger, students who had a different culture and language. Students and staff always enjoyed visiting him and his wife, Yvonne, for a barbecue at their home on the beach east of Auckland city.

Derek liked to be in the field and over the years developed an interest in geology. On joint field trips with engineers and earth scientists he was often more attentive at an outcrop than were some of the geology students.

Derek contributed to the national and international geothermal communities. He was instrumental in founding the New Zealand Geothermal Association and served on its Board for several years. He was also active within the International Geothermal Association as a Board Member and, with John Lund, wrote country updates for the World Geothermal Congress meetings. With John and Toni Boyd he even wrote the country update for WGC2010, testimony to his continued interest in geothermal technology. Derek was on the Peer Review Panels for the Rotokawa and Ngawha Geothermal Fields and received both life membership of the NZGA and a Special Award from the Geothermal Resources Council.

Derek had many interests outside geothermal, most notably his family. He had a yacht for many years and very reluctantly gave up sailing a couple of years ago. Derek was devoted to his church where he was a bell ringer and followed rugby and other sports intently.

Derek was a good friend to many who will have fond memories of his cheerful presence and wise counsel. We extend our deep sympathy to Yvonne, his son Mark and his daughters, Marion and Janet and their families.

IGA News

IGA News is published quarterly by the International Geothermal Association. The function of IGA News is to disseminate timely information about geothermal activities throughout the world. To this end, a group of correspondents has agreed to supply news for each issue. The core of this group consists of the IGA Information Committee:

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