IGA NEWS

Newsletter of the International Geothermal Association

Quarterly No. 102

IGA ACTIVITIES

Message from the President

Dear IGA members, welcome to 2016.

2015 was a big year for geothermal and for the renewable energy industry in general.

The conclusion of the COP21 meeting in Paris saw agreement on the long-term goal of keeping global temperature increases below 2°C, with a more ambitious target of capping global warming at 1.5°C degrees. It is worth noting that for two consecutive years, worldwide carbon emission rate from fossil fuels has grown only slightly despite relatively robust economic growth. Our success in meeting global environmental goals depends foremost on the rate of transition to renewable energy. With this goal in mind the IGA actively promotes geothermal energy in many renewable energy organizations and initiatives.

The IGA presence at COP21 was through partnership with Renewable Energy (REN) Alliance. The REN Alliance –a partnership of organizations representing the solar, wind, geothermal, hydropower and bioenergy sectors– demonstrated the realities of 100% renewables at all scales. The IGA Executive Director, Marietta Sander, presented case studies demonstrating how geothermal energy can work with other renewable technologies (http://www.geothermal-energy.org/publications_and_services/news/article/iga-at-the-cop21-in-paris.html).

The IGA takes an active role in representing the geothermal industry at the International Renewable Energy Agency (IRENA). Recent collaboration with IRENA has been a report 'Capacity Building Study for Andean Countries'; and a contribution to the workshop 'Financing Geothermal Development in the Andes'. Workshop objectives were to identify the main barriers which Andean countries face in financing geothermal projects and to look at options on how development risks can be minimized. More information is available at http://www.irena.org/menu/index.aspx?mnu=Subcat&PriMenuID=30&CatID=79&SubcatID=646.

The IGA is a partner of the Global Geothermal Alliance (GGA), which brings together public, private, intergovernmental and non-governmental parties to address investment, regulatory, infrastructure, technical, and human resource challenges. The objective is to

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accelerate utilization of geothermal energy. The GGA Concept note resulting from the September 2015 meeting in Nairobi, attended by the IGA Executive Director, notes that the IGA is a 'key technical partner that brings together a network of different national geothermal associations and other entities to support its scientific, technological and educational work in the areas of research, development and utilization of geothermal resources'.

The IGA is an active member of REN21, the Renewable Energy Policy Network for the 21st Century. The IGA Executive Director is a member of the REN21 Steering Committee, the central governing entity of the organization. Other members of the REN21 Steering Committee are from UNEP, the World Bank, national government energy ministries, NGOs, and academia. The IGA contributes to the REN21 annual Renewables Global Status Report, a comprehensive and widely referenced report on the status of renewables worldwide.

In April 2015, following a decision of the United Nations Economic and Social Council, the IGA officially regained United Nations Consultative status. This allows the IGA, on behalf of the geothermal industry, the opportunity to participate in events, conferences, and activities of the United Nations.

A Working Group of the IGA Resources and Reserves Committee, led by Professor Gioia Falcone, continued to work to produce a draft set of Geothermal Specifications (GS) for the United Nations' UNFC-2009 resource classification framework. This work is on track to deliver on a key goal of the IGA Resources and Reserves Committee to produce a set of 'Geothermal Specifications' for classifying, comparing and reporting estimates of geothermal potential, resources and reserves.

In addition to the above, the IGA had the very successful World Geothermal Congress in Melbourne, supported training events and supported national geothermal associations in a variety of ways; and the Board began IGA Strategy discussions with a view to ensuring the IGA provides the best possible outcome for our members.

In 2016 we will continue IGA activities that contribute to assisting countries and communities to develop the knowledge and tools for sustainable development, and working towards a low-carbon future for our planet.

Best wishes for the coming year, from myself and the IGA Board of Directors,

Juliet Newson
President, International Geothermal Association

Call for Voting on Further Amendment of the IGA Bylaws

At the IGA's BoD meeting held in Morelia, Mexico on

IGA Board member and Chair of the Information Committee, Eng. Luis Gutiérrez-Negrín, opens the International Seminar organized by the Mexican Geothermal Association 'Geothermal in Mexico and Worldwide'. Seated (from left) Eng. Luis Muñozcano, Dra. Georgina Izquierdo-Montalvo, Dra. Juliet Newson, MC Magaly Flores-Armenta, Dr. José Manuel Romo-Jones.

October 2015, it was moved to the following motion to include *Article 21* in the Bylaws.

Motion 62-4

That the IGA BoD approves the inclusion of one additional article to the current Bylaws, as follows:

"Article 21 – Winding up

In the event of the winding up of the Association, any surplus assets or funds shall be handed to the appropriate United Nations group associated with the promotion of geothermal energy. Should no such group exist at that time, then the surplus assets and funds shall be handed to the Geothermal Institute of the University of Auckland, or its successor, for the general purposes of the Institute."

The motion was moved by F. Peñarroyo, seconded by J. Newson and 16 votes were cast in favor. Ten more votes were collected by e-mail from BoD members not at the meeting. A total of 26 BoD (out of 29) voted in favor of the Bylaw change.

The necessity of this additional article follows:

- IGA is a non-profit company registered in the Register for Incorporated Societies, Companies and Charitable Trust Boards of New Zealand. Upcoming legal changes to the constitutional law in New Zealand will require that each incorporated society must include an article in their bylaws for the case of a winding up of the association.

- The current Rules of the IGA, which were officially filed on 21st July 1988 before the New Zealand Register, textually establishes in its Section 16: "16. Winding Up. In the event of the association winding up, any surplus assets or funds shall be handed to the appropriate United Nations group associated with the promotion of geothermal energy. Should no such group exist at that time, then the surplus assets and funds shall be handed to the Geothermal Institute of the University of Auckland for the general purposes of the Institute."

- IGA is also trying to get a non-profit status before the Germany fiscal office. Among other things, this requires that the bylaws include a specific statement regarding to whom the IGA's assets would be transferred in case of a closure of the association.

Thus regardless of the process in Germany, the IGA's Bylaws Committee and the BoD agreed it was necessary to align the IGA bylaws with the official IGA Rules as currently registered in New Zealand—by integrating a specific article in the on what to do in the case of closure of the association.

To complete the ratification process, IGA members are invited to vote on the amended Bylaws by sending e-mails to the Secretariat (iga@hs-bochum.de). The deadline for the vote is Friday, **February 26th, 2016.** The only option is to vote 'yes' or 'no'.

62nd BoD Meeting and International Seminar in Morelia, Mexico

Luis C.A. Gutiérrez-Negrín, Chair of the Information Committe

On October 16 through 20, 2015, the 62nd meeting of the IGA's Board of Directors was held in the city of Morelia, Mexico. On October 15, an international seminar, called Geothermal Energy in the World and Mexico, was held in the same venue.

The seminar was convened by the Mexican Center for Innovation in Geothermal Energy (CeMIE-Geo), the Mexican Geothermal Association (AGM) and the Earth Sciences Research Institute (INICIT) of the University of Michoacán (UMSNH). The objective was to present the current status and perspectives of geothermal in the countries with the most power plants in operation, including Mexico. The objective aligns with one of the main objectives of the CeMIE-Geo, the formation of human resources specialized in geothermal energy. It also helps fulfill one of the CeMIE-Geo's strategic objectives—spreading knowledge of geothermal energy to businesses and the general public.

Thus, the seminar was open to the public and specifically targeted professionals, students, investors, researchers and developers interested in geothermal energy, taking advantage of the presence in Morelia of the IGA BoD members to attend the 62nd meeting. Seven BoD members and the IGA's Executive Director were invited to present lectures on the current status of geothermal development in their respective countries or about a specific geothermal topic of general interest. These international presentations were complemented by conferences about topics of national interest presented by Mexican officers and experts.

The international portion was composed of six presentations on geothermal energy in the US, the Philippines, New Zealand, Italy, Iceland and Kenya, plus a lecture on the Enhanced Geothermal Systems (EGS) in Europe and another on geothermal incentives in Latin America. The presentations follow:

- Main Geothermal Fields of the United States and Current Status of the United States Geothermal Industry. By Paul Brophy, President of Geothermal Resources Council (GRC).

- Philippines Geothermal Industry: Current Status and Perspectives. By Fernando Peñarroyo.

Participants in the seminar. Photo by Toshi Uchida.

- New Zealand: Geothermal Update 2015. By Juliet Newson, President of the IGA.

- Italy: Current Status and Perspectives on Geothermal Development. By Paolo Romagnoli, Enel Green Power.

- Geothermal Energy in Iceland, Challenges and Opportunities. By Bjarni Pálsson, Landsvirkjun.

- Status and Strategies for Geothermal Resource Development and Utilization in the East Africa Rift System. By Meseret Zemedkun Teklemariam, President of the East African Geothermal Branch of the IGA.

- Recent developments in EGS projects in Europe. By Albert Genter, ES Geothérmie.

- Geothermal Support Initiatives & Market Trends in Latin America. By Marietta Sander, Executive Director of IGA.

The Mexican section of the seminar included presentations by the geothermal division of the CFE (Comisión Federal de Electricidad), the Energy Secretary (SENER), the CeMIE-Geo, the Electric Research Institute (IIE) and a private company. The topics follow:

- El futuro desarrollo geotérmico de la CFE como nueva empresa productiva (Future geothermal development of CFE as a new productive enterprise). By Magaly Flores Armenta, head of the Geothermal-Electric Projects Division of CFE.

- Perspectivas de desarrollo de la geotermia en México bajo la nueva regulación (Perspectives of geothermal development in Mexico under the new regulations). By Luis A. Muñozcano Álvarez, Deputy General Director of Clean Energies, SENER.

- Desarrollo de recursos de temperatura media y baja en la nueva regulación geotérmica mexicana (Development of low- and mid-temperature geothermal resources under the new regulations in Mexico). By Raúl Sánchez Velasco, Director of Sustentabilidad Energética Mexicana (SEM).

- The Mexican Center for Innovation in Geothermal Energy (CeMIE-Geo). By José Manuel Romo Jones, Technical Responsible of the CeMIE-Geo.

- Usos y beneficios de la energía geotérmica (Uses and benefits of geothermal energy). By Alfonso García Gutiérrez, IIE.

All of these presentations can be read and downloaded from the websites of the Mexican Geothermal Association (www.geotermia.org.mx) and CeMIE-Geo (www.cemiegeo.org.mx).

During the opening ceremony, the presidium was composed of Magaly Flores Armenta, Juliet Newson, Georgina Izquierdo Montalvo (AGM's president), José Manuel Romo Jones and Luis A. Muñozcano Álvarez. The latter declared officially open the seminar on behalf of Leonardo Beltrán Rodríguez, Under Secretary of Planning and Energy Transition of SENER. Luis C.A. Gutiérrez-Negrín, organizer of the event, explained the seminar's objectives and introduced the presidium members.

The closing ceremony was headed by Magaly Flores Armenta, Juliet Newson, Georgina Izquierdo Montalvo and José Manuel Romo Jones, accompanied by Víctor Hugo Garduño Monroy, director of INICIT and organizer of the seminar. The latter officially closed the event after noting the high attendance by students and young professionals.

Total participants, including speakers, were 150. About a third were students and researchers from Michoacán University, many participating in several CeMIE-Geo projects. Other attendees came from the CFE's Geothermal-Electrical Projects Division, whose national

headquarters is based in Morelia; the IIE; the national university (UNAM); the Center for Scientific Research and Superior Education of Ensenada (CICESE); the national polytechnic institute (IPN); the Iceland Consulate and representatives from private companies like Andritz, Comesa, Coperlasa, ENAL, Energy Forever, ENGIE, GEA, Geocónsul, Green Energy Group, Grupo Dragón, Grupo Point Verde, Jacobs Mexico, Jaslen, Mexxus-RG, Ormat, Permex, SEM, Soon Smart Group and Turboden.

The BoD meeting started on October 16th. The first day was devoted to discussions about IGA strategic planning. The agenda included a review of the IGA mission and objectives, a focused discussion of pre-defined broad themes by four groups of BoD members, the presentations of discussion outcomes, the acceptance and amendment of draft motions and action items among the entire BoD and finally discussions and decisions on how to move forward.

On October 17th and 18th, the usual BoD meeting agenda was followed, including the officers reports (President, Secretary, Treasurer and Executive Director), reports by the chairs of the permanent, technical and ad-hoc committees (Audit, Bylaws, Education, Membership, Finance, Nominating, Information, Programme and Planning, Resources and Reserves), and reports by the chairs of the regional branches (European, Asia-Western Pacific and East-Africa). The agenda was composed of the specific points dealing with the World Geothermal Congresses in 2015 and 2020, the 100% Renewables international campaign, a presentation by Women in Geothermal (WinG) and the decision on the place and date for the next meeting.

The following BoD members were present: Rolf Bracke, Paul Brophy, Albert Genter, Lúdvik S. Georgsson, Luis C.A. Gutiérrez-Negrín, Eduardo Iglesias, Juliet Newson, Bjarni Pálsson, Fernando S. Penarroyo, Paul Quinlivan, Arni Ragnarsson, Alexander Richter, Paolo Romagnoli, Toshi Uchida, Bruno Della Vedova and Meseret Teklemariam Zemedkun—16 in all, plus Horst Rüter as Managing Director of the IGA Service Company (IGA SC), Andy Blair as WING representative and Marietta Sander as IGA Executive Director. Apologies were received from D. Chandrasekharam, José Luis Henríquez, Roland Horne (ex officio member), Herman Darnel Ibrahim, Beata Kepinska, Zhonghe Pang, Abadi Poernomo, Koichi Tagomori, Alison Thompson, Shigeto Yamada and Sadiq Zarrouk.

Some motions and events at the meeting follow:

- The inclusion of an additional article in the bylaws (see more information in a separate note).

- Modification of the rules for Membership Association nominations for the 2016 BoD election: Associations up to 99 members: 1 candidate; Associations with 100-500 members: 2 candidates; and Associations with >500 members: 3 candidates.

- A transfer of up to US$ 200,000 into an interest-bearing account/reserves to cover organizational costs and fellowships of the 2020 World Geothermal Congress.

- Requests that the European, East African and Asia-Western Pacific regional branches modify the proper articles of their bylaws in accordance with the IGA bylaws.

- Presentation of a document on WGC 2015 feedback/lessons learnt with comments by BoD members and recommendations for the next WGC 2020. The institutional and contract set-up for the WGC 2020 were presented by the chair of the WGC 2020 Selection Committee.

On the evening of October 18th, the 26th IGA's Annual General Meeting (AGM) was held in the same room as the Board meeting. The President welcomed everybody and opened the meeting at 16:45 pm, with a total of 19 IGA members present. The agenda included the approval of minutes from the 24th AGM, the reports by the officers, the reports by the

permanent, technical and ad hoc committees, and the reports by the IGA Regional Branches. The AGM was formally adjourned 10 minutes later.

On October 19th, BoD members travelled to the nearby Los Azufres geothermal field, the second oldest and largest in Mexico, to pay a visit to the newest geothermal power plant (Unit 17) with a 50 MW capacity. It was commissioned in February 2015. The members were met by technical personnel of the Comisión Federal de Electricidad (CFE), the governmental company that owns and runs the steam field and power plants that generate over 220 MW. The field trip concluded the extensive agenda of the Board in Mexico.

Announcement of the UNFC-2009 White Paper

Graeme Beardsmore, Chairman of the IGA Resources and Reserves Committee

In September 2014, the IGA signed a Memorandum of Understanding (MoU) with the United Nations Economic Commission for Europe (UNECE) to develop and maintain a globally applicable harmonized standard for reporting geothermal resources. Such a standard will facilitate greater consistency and transparency in financial reporting and will enhance the management of geothermal resources. A copy of the MoU can be found at: http://www.geothermal-energy.org/resources_and_reserves/working_groups/unfc_2009_working_group/documents/uneceiga_mou.html.

In response to the MoU, and after a global call for expressions of interest, in January 2015 the IGA appointed a 12-member voluntary Working Group under the leadership of Professor Gioia Falcone to draft 'Geothermal Specifications' aligned with the United Nations Framework Classification for Fossil Energy and Mineral Reserves and Resources 2009 (UNFC-2009). The Working Group has made significant progress toward that end, supported by the World Bank's Energy Sector Management Assistance Program (ESMAP), the US Department of Energy, the International Renewable Energy Agency (IRENA) and the Geothermal Resources Council (GRC). A second White Paper summarizing the Working Group's progress, including the text and tables so far drafted for the 'Geothermal Specifications' and examples of their application, has been uploaded to the IGA website. It can be accessed here along with a copy of the first White Paper from April 2015:

http://www.geothermal-energy.org/resources_and_reserves/working_groups/unfc_2009_working_group/documents/white_paper.html.

The Working Group has provided these White Papers for transparency. It is pursuing a timetable to complete the draft 'Geothermal Specifications' for submission to the United Nations in February 2016. The United Nations will manage the public comment and feedback process in 2016, with the assistance of the IGA, to ensure the global geothermal community is fully aware and engaged in the process.

Call for Applications for IGA Funds for Educational Events

The IGA Education Committee wishes to remind members who are considering holding short training courses on any aspect of geothermal energy that they can apply to IGA for financial assistance to run the proposed courses. Applications will be considered by the IGA Board at the meeting scheduled for late April 2016. The funding is intended for courses offered after April 2016.

Applications need to be submitted not later than by Saturday, **March 12th, 2016**.

Possible support is 25% of the total estimated costs, up to a maximum of US$5,000 for one application. Please note that an application does not guarantee funding. For information or application forms, send an e-mail to Ludvik S. Georgsson, Chair of the Education Committee, at: lsg@os.is.

IGA Participation in the SAIREC

Marietta Sander, IGA's Executive Director, participated on October 6th on a side session on geothermal energy at the South African International Renewable Energy Conference (SAIREC), held in Cape Town, South Africa. In her keynote address, Sander said the direct uses for geothermal energy in 82 countries include heat pumps, space heating, greenhouse heating, aquaculture pond heating, agricultural drying, industrial uses, bathing and swimming, cooling and snow melting among others.

Sander also pointed out that Kenya is among the top10 countries in the world with geothermal power capacities and additions, adding that "the top five geothermal power producers in the world are the US, Philippines, Indonesia, Mexico and New Zealand".

Sander said Africa and the Middle East were "hotspots" for future geothermal investments. The region has 611MW installed power capacity, with 60 projects in progress. Twenty of the projects are in the East African Rift Valley System, extending from Kenya to Ethiopia.

Kenya is among the top 15 countries in the developing world with geothermal potential. Sander said these countries often encounter barriers as they seek to further develop geothermal energy projects. They include credit risk barriers, currency instability, institutional barriers and political uncertainties. As a result, multinational institutions are often the only sources available for financing geothermal projects in emerging markets.

The multinational institutions include the World Bank, Inter-American Development Bank Group, European Bank for Reconstruction, African Development Bank, and Nordic Development Fund, plus the OPEC Fund for International Development.

Sander said the projects were all about the "development of bankable projects that enable capacity building and engage investors at an early stage".

The side session included keynote presentations by Philippe Niyongabo, African Union Commission head of the Energy Division and the Project Manager for the Geothermal Risk Mitigation Facility (GRMF), Markos Melaku, an Independent Geothermal Consultant from Ethiopia, and Safiatou Alzouma Nouhou of the International Renewable Energy Agency (IRENA) and the Global Geothermal Alliance.

Source: http://www.iol.co.za/business/news/think-geothermal-for-power-1.1926320#.VihRt34rK00

IGA at the COP 21 in Paris

Marietta Sander, IGA Executive Director

Geothermal energy was well represented at the COP 21 where stakeholders had the opportunity to kick off the Global Geothermal Alliance (GGA). On December 1, a high-level event related to the GGA was held in the Peru Pavilion at the Paris conference center in Le Bourget. On December 6, Susan Petty, CEO of Alta Rock, gave a speech to conference attendees on Re-Energizing the Future. On December 7 during Energy Action Day, the GGA was officially launched, and the Energy Day was celebrated. The IGA, together with the other REN Alliance partner associations, showcased viable, joint-renewable-energy case studies. The lessons learnt included demonstrations of how renewables can work together in regions and countries to mitigate climate change.

The climate change conference in Paris (COP 21) reaffirms these recent findings:

- Renewables provide viable ways to decarbonize economies.

- RE costs have decreased dramatically.

- Strategic alliances, such as the Global Geothermal Alliance, help mitigate climate changes.

- Technical, financial and other barriers can be overcome – politics is the driving force in decarbonizing economies and stopping climate change.

- Countries representing over 90% of the global economy have submitted pledges (INDCs in COP terminology) to reduce emissions.

One solution was the formation of strategic partnerships. To this end, IRENA launched the Global Geothermal Alliance to address policy and investment challenges and help create conditions for a rapid expansion of geothermal resource use. The Alliance aims to overcome existing barriers. Working with the Alliance will help to overcome knowledge gaps and create practical people's networks across continents.

Geothermal Energy Science (GtES)

Horst Rüter, Editor of GtES

The IGA's journal Geothermal Energy Science (GtES) developed well in 2015. Until November the following articles were published in the Volume 3, issue 1. Their abstracts or full versions can be consulted and/or downloaded free of charge.

Geothermal resources and reserves in Indonesia: an updated revision. A. Fauzi (pp. 1-6). Read the Abstract or the Full article.

Proposal of a consistent framework to integrate geothermal potential classification with energy extraction. G. Falcone (pp. 7-11). Read the Abstract or the Full article.

Classification of geothermal resources by potential. L. Rybach (pp. 13-17). Read the Abstract or the Full article.

Overcoming challenges in the classification of deep geothermal potential. K. Breede, K. Dzebisashvili, and G. Falcone (pp. 19-39). Read the Abstract or the Full article.

Reservoir characterization of the Upper Jurassic geothermal target formations (Molasse Basin, Germany): role of thermofacies as exploration tool. S. Homuth, A. E. Götz, and I. Sass (pp. 41-49). Read the Abstract or the Full article.

Convective, intrusive geothermal plays: what about tectonics? A. Santilano, A. Manzella, G. Gianelli, A. Donato, G. Gola, I. Nardini, E. Trumpy, and S. Botteghi (pp. 51-59). Read the Abstract or the Full article.

Geochemical study on hot-spring water in West New Britain Province, Papua New Guinea. M.M. Lahan, R.T. Verave, and P.Y. Irarue (pp. 61-69). Read the Abstract or the Full article.

There are about 20 more manuscripts in the review process. If you want to submit a manuscript, visit: http://editor.copernicus.org/index.php?_mdl=msreg_md&_jrl=513&_lcm=ms_reg_form&_acm=open&salt=19031425771586821582

AFRICA

New AU Renewable Energy Fund Plans 1500 MW Geothermal by 2020

The African Union (AU), an alliance of 54 countries, announced a plan to mobilize $20 billion to develop at least 10 gigawatts of renewable energy on the continent by the end of the decade. The African Renewable Energy Initiative was announced at the United Nations climate summit (COP 21) in Paris. It will be hosted by the Abidjan, the Ivory Coast-based African Development Bank, which will act as a trustee, according to Alex Rugamba, director of energy, environment and climate change at the AfDB. According to Akinwumi Adesina, president of the African Development Bank, Africa has the potential "… to deploy 11 terawatts of solar energy, 350 gigawatts of hydro, 110 gigawatts of wind and 15 gigawatts of geothermal." The initiative is likely to develop geothermal projects in East Africa's Rift Valley, wind in North Africa in areas such as in Egypt and hydropower across the continent, Rugamba said. It doesn't have an established pipeline yet. France has pledged to give more than €2 billion (US$2.1 billion) over the next four years to the African Renewable Energy Initiative, and Germany says it is mobilizing €3 billion, also until 2020.

Source:
http://www.bloomberg.com/news/articles/2015-12-01/african-union-introduces-20-billion-renewable-energy-plan

Ethiopia: JICA to Support Geothermal Development in the Country

Japan is ready to support the geothermal development activities of Ethiopia, according to Japan International Cooperation Agency (JICA). Speaking at the opening of a geothermal development workshop in early November in Addis Ababa, JICA Representative Mayumi Hayashi

UPCOMING EVENTS

41st Annual Stanford Geothermal Workshop
22-24 February 2016, Stanford, California, USA

23rd Annual Congress of the Mexican Geothermal Association (AGM)
10-11 March 2016, Morelia, Mich., Mexico

12th Exhibition and Conference on Energy Efficiency and Renewables (EE&RE 2016)
5-7 April 2016, Sofia, Bulgaria

Power Plays: Geothermal Energy in Oil and Gas Fields
25-26 April 2016, Southern Methodist University, Dallas, TX, USA

3rd Iceland Geothermal Conference (IGC 2016)
26-29 April 2016, Reykjavik, Iceland

European Geothermal Congress (EGEC 2016)
19-24 September 2016, Strasbourg, France

40th GRC Annual Meeting & GEA Geothermal Energy Expo
23-26 October 2016, Sacramento, CA, US

6th African Rift Geothermal Conference (ARGeo-C6)
31 Oct-6 Nov 2016, Asmara, Eritrea

Note: Please check the IGA website for more events.

said the government of Japan is ready to support Ethiopia as it generates more geothermal energy. JICA has finalized maps for 22 geothermal sites in Ethiopia, the representative added. Hayashi stated that Japanese companies will come to Ethiopia to invest in the energy sector.

Japanese Business Alliance for Smart Energy (JASE) General Manager, Shuji Kimura, said on his part the collaboration in the energy sector will continue.

Geological Survey of Ethiopia (GSE) Director-General, Masresha Gebreselassie, pointed out that Ethiopia is eager to learn from Japan about the generation of electrical power from geothermal energy. Ethiopia will start expansion activities to produce 70MW from Aluto Langano, with an outlay of over 30 million USD. He added that preparations for the geothermal master plan are well underway. The master plan helps to identify geothermal sites that produce more energy from geothermal. The government of Japan is providing new technologies, skills, knowledge and monies, as well as appraisal studies to generate geothermal electricity.

Source: http://www.geeskaafrika.com/ethiopia-japan-business-investment-for-geothermal-activities/12084/

Kenya: Wellhead Plants, Record Geothermal Generation and New Areas to Develop

Wellhead plants of GEG at Olkaria, Kenya (source: GEG/Lydur Skulason).

Geothermal Wellhead Power Plants Already Account for 56MW - Kenya is one of the first countries in the world to make use of temporary, geothermal-wellhead power plants. Such plants are currently adding 56MW to the national grid.

According to engineers at the Kenya Electricity Generation Company (KenGen), geothermal wells are often drilled and left open for years awaiting completion of the main power plant. But now, "We are taking advantage of these single wells to generate power using the steam, which would otherwise have gone to waste while the main plant is being constructed," said Johnson Ndege, the Chief Engineer in charge of wellheads at KenGen. The wellheads will act like a normal geothermal power plant —but smaller. Once a main plant is fully constructed, the wellhead units can be removed and deployed at different stations, allowing steam from the wells to be fed into the main plant. So far, the company has mounted 11 wellhead units now accounting for 56.1MW of Kenya's total geothermal energy production.

The sixth and seventh geothermal power plants are under construction at the Olkaria site in the Rift Valley —scheduled for completion by 2018. Meanwhile four more wellhead units are being affixed. Experts say they will produce a total of 20MW more of electricity in the next few months.

Source: http://www.thinkgeoenergy.com/wellhead-geothermal-plants-are-a-key-pillar-of-kenyas-renewable-success/

Kenya Will Sell Power to Uganda - Kenya will start exporting power to Uganda, following the recent increase in production from geothermal sources. This is a deal under the Northern Corridor Infrastructure Power pool, under which the three heads of state of Kenya, Rwanda and Uganda agree to begin by exploring 30 MW. Under the East African Power Pool project, countries are expected to export surplus electricity, whenever available, to neighboring states in need, given the fact that power production in the region is normally unstable due to its dependence on hydroelectric power generation, whose performance is currently affected by climate change.

The geothermal power will be transmitted through a new high-voltage line linking the two nations. The grand 400 kV regional, electricity power-exchange line will run from Olkaria in Kenya through Uganda to Birembo in Rwanda. Uganda and Kenya are already connected by older lines. The latest project will add to the new sections. Kenya has become the world's eighth largest supplier of

geothermal energy with a total installed capacity of 585MW.

Source:
http://allafrica.com/stories/201511020473.html

New Areas to Be Developed in Baringo County - The Geothermal Development Company (GDC) plans to generate more than 3,000 megawatts of electricity in Baringo County. GDC has identified Silale, Paka, Korossi/Chepchuk and areas around lakes Baringo and Bogoria as potential areas for geothermal development. Ms. Ruth Musembi, GDC's Corporate Communications Manager, said by 2030 the county will be able to supply more than 20,000 MW of electricity to the national grid. She said the company is in the process of drilling more than 42 geothermal wells and the first phase of the project will start at the Bogoria-Silale Geothermal Block, which is expected to generate more than 200 MW by 2016. Out of the 5,000 MW of electricity the government plans to generate by 2016 from various agencies, 810MW will be developed by GDC in Baringo (200MW), Menengai (460MW) and Suswa (150MW), respectively.

Source:
http://allafrica.com/stories/201511140180.html

Geothermal Provided 49% to 51% of Power Consumed in Kenya - Data from the Kenya's Energy Regulatory Commission (ERC) shows consumers used 402.1 gigawatts-hour (GWh) of geothermal power in October 2015, the highest level ever, accounting for 49 per cent of total power consumed in the country, although other sources state the share is 51%. The amount is up from 377.5 GWh in August 2015 and 388 GWh in January 2015 –just a month after Kenya added 280MW of geothermal power to the national grid. "This is the highest level of geothermal power ever generated and consumed," said John Mutua, ERC senior manager in charge of economic regulation. Mutua said the increase in geothermal power produced by KenGen and offered by Kenya Power to consumers is translating to lower bills.

Sources:
http://www.businessdailyafrica.com/Geothermal-power-consumption-hits-record-level-in-October/-/539546/2960542/-/fm8vepz/-/index.html,
http://www.coastweek.com/3849-Kenya-geothermal-generation-surges-to-402-million-KWh-a-month.htm

GDC Officer and IGA BoD Member to Be Charged over Tender – By the middle of November 2015, the Director of Public Prosecutions in Kenya approved charges against the Managing Director of GDC and eight other officials over irregular procurement processes. The GDC's Managing Director, Silas Simiyu, is also a member of the current IGA BoD and will be charged alongside the entire Tender Committee members and the General Manager of Drilling Services of GDC. All of them are accused of irregularly procuring rig move services from a private company in the last financial year, and they were suspended in early November 2015 following a recent finding by the GDC's Ethics and Anti-Corruption Commission (EACC). Of course, Silas Simiyu and the other officers remain non-guilty while the charges are not proved.

Source:
http://allafrica.com/stories/201511150040.html

AMERICAS

Argentina: Possible Reactivation of Geothermal and Other Renewable Projects

The enactment of Argentina's new renewable energy law could reactivate old projects of the Genren Program said Roberto Sarquis from the state-owned energy company, Energía Argentina, SA (Enarsa). In 2010, the government awarded power purchase contracts for nearly 1,000MW of renewable-energy projects under the program, the bulk of which have not attracted financing.

In May 2009, the Federal Secretariat of Energy launched the Genren Program, whose aim was to incorporate up to 1,000MW to the MEM (Mercado Eléctrico Mayorista or Wholesale Electric Market) by purchasing electricity from renewable-energy generators previously selected under a public tender. The 1,000MW are composed as follows:

- Energy from Biofuels: 150MW
- Urban solid waste: 120MW
- Biomass energy: 100MW
- Small hydroelectric energy plants: 60MW
- Geothermal energy: 30MW
- Solar energy: 20MW
- Biogas energy: 20MW
- Wind energy: 500MW

However the Genren energy auctions have led to the installation of only some wind, photovoltaic and mini-hydro plants, including the 80MW Rawson and 50MW Loma Blanca wind farms.

Many of the projects may resume if they can find financing, for which the law will be very helpful, according to Sarquis. Among other measures, the government will direct 50% of the savings from fuel imports resulting from renewable generation to a new fund supporting the renewables, which Sarquis believes will stimulate old projects too.

Sources: http://renewables.seenews.com/news/new-renewables-law-in-argentina-may-reactivate-projects-report-498723,

http://www.rmlex.com/media/201078_The%20Genren%20Program.pdf

Caribbean: Ormat to Acquire Geothermal Power Plant on the Island of Guadeloupe

Ormat Technologies, Inc. announced in early December 2015 it has signed a binding Memorandum of Understanding (MOU) to acquire, gradually, 85% of Geothermie Bouillante SA (GB) at a total company enterprise value of up to around €52 million (about US$56 million). GB owns and operates a 14.75MW geothermal power plant and owns two exploration licenses with a total additional potential capacity of up to 30MW, all located in Guadeloupe Island, a French territory in the Caribbean. The MOU was signed with the owner of GB, Sageos holding (Sageos), a fully owned subsidiary of the Bureau de Recherches Géologiques et Minières (BRGM), the French geological survey. Upon closing, Ormat will hold about 80% of GB, which will be increased to 85% within two years by capital investment agreed upon in the MOU. On the basis of the MOU, Ormat and Sageos will negotiate a definitive Investment Agreement (IA) subject to customary employee and Board consultation processes according to French law. Closing is expected by May 2016.

GB has two Power Purchase Agreements (PPAs) with Électricité de France SA (EDF), the French electric utility. A new 15-year PPA with EDF with improved energy rates is expected to enter into force in January 1, 2016, replacing the current PPAs.

Ormat is confident it can optimize the use of the resource and existing facilities and increase its current approximate production of 10MW to its designed production of 14.75MW by mid-2017. Additionally, Ormat plans modifications to the existing equipment as well as to further developing the asset, with a potential of reaching a total of 45MW in phased development by 2021.

As a major renewable plant in Guadeloupe Island, the Bouillante geothermal plant is entitled to certain benefits from the French Government set to promote renewable energy, mainly through feed-in tariff and tax benefits. The BRGM group's decision to partner with Ormat as the majority owner and industrial operator in GB is part of the French Government's strategy to support the development of geothermal energy in Guadeloupe and globally, as a contribution to energy transition and lower CO_2 emissions.

Source: http://www.ormat.com/news/latest-items/ormat-acquire-geothermal-power-plant-island-guadeloupe

Chile: Mariposa Geothermal Project Drilling Postponed for Economic Reasons

The Philippine company Energy Development Corp. (EDC) has postponed its campaign of drilling thee geothermal wells at the Mariposa Geothermal Project in Chile. "This," said EDC, "was due to the challenging project economics resulting from the recent fall in prices of competing fossil fuels."

The drilling campaign, intended to prove the availability of geothermal resources in the area, was originally scheduled for mid-October in 2015 and has been rescheduled for late 2016.

Earlier the company had said it would invest US$85 million to conduct exploratory activities within a geothermal prospect in Chile. EDC, however, noted it continues to pursue development activities with greater focus, including conducting further environmental and technical studies for the steam field, power plant and transmission line interconnection.

"EDC continues to be committed in developing the Mariposa Project and remains optimistic on the long-term prospects of the Chilean electricity market," the company said in a statement.

To advance the development of Mariposa, EDC said it

Photo by BRGM, taken from: http://www.brgm.eu/brgm/brgm-group/geothermie-bouillante

would prioritize investing in technical studies for the front-end engineering design (FEED) for the steam field, power plant and for the transmission line connection. It will also proceed with the Environmental Impact Assessment (EIA) for the project. EDC is also negotiating with the Inter-American Development Bank (IDB) to secure funding support under the exploration risk-mitigation program administered by the bank.

In the meantime, EDC and its partner, Alterra, will continue developing the project through engineering work for the power plant and transmission inter-connection and proceed with an environmental impact assessment and other development activities. Under the joint venture agreement, EDC is currently funding all project activities up to a total of US$58.3 million.

The project, located in the Andes Mountains about 300 km south of Santiago, covers two geothermal exploitation concessions, Pellado and Laguna del Maule. Compañía de Energía Limitada (ENERCO) owns the rights to the project. ENERCO is held by affiliates of EDC, 70 percent, and Canada-based Alterra Power Corp., 30 percent. In 2013 EDC signed a joint venture agreement with Alterra Power Corp. for the development of the Mariposa geothermal concession area in Chile.

Drill site MP-02 at the Mariposa geothermal Project (Courtesy of Alterra Power; taken from GRC's Global Geothermal News).

In other news, Italy's Prime Minister Matteo Renzi paid a state visit to Chile in late October, as the first step of a Latin America tour that encompassed Peru, Colombia and Cuba. As part of his visit he inaugurated several renewable energy projects promoted by the Italian group Enel Green Power (EGP), and also set the first stone of the geothermal power plant project of Cerro Pabellón. In this site, the drilling contractor Petreven has already signed a drilling contract with EGP for the supply of drilling services for the project, with the aim of drilling about 20 wells over 34 months. The value of the contract is about US$40 million.

Sources: http://www.manilatimes.net/edc-suspends-drilling-for-chile-geothermal-project/223843/, http://www.alterrapower.ca/news/Press-Release/News-Releases/News-Releases-Details/2015/Alterra-Power-Announces-Rescheduling-of-Mariposa-Drilling-to-2016/default.aspx, http://www.thinkgeoenergy.com/italian-prime-minister-to-set-first-stone-of-cerro-pabellon-project-on-visit-to-chile/?utm_source=ThinkGeoEnergy+List&utm_campaign=8f284aafb3-TGE_Newsletter_RSS1_12_2015&utm_medium=email&utm_term=0_657e42f767-8f284aafb3-415210497, http://www.thinkgeoenergy.com/34-months-drilling-campaign-planned-for-cerro-pabellon-chile/?utm_source=ThinkGeoEnergy+List&utm_campaign=8f284aafb3-TGE_Newsletter_RSS1_12_2015&utm_medium=email&utm_term=0_657e42f767-8f284aafb3-415210497

Costa Rica: IDB's Loan to Be Used for Geothermal Projects

The Costa Rican Instituto Costarricense de Electricidad (ICE) wishes to ensure the geothermal future of Costa Rica by accepting a loan credit from the Inter-American Development Bank (IDB) of up to US$500 million available between 2017 and 2025. The first tranche of the credit, for US$200 million, will be used by ICE to conclude the development of the geothermal-electric projects of Borinquen I and Las Pailas II in the province of Guanacaste, and to improve the connection of the transmission line from Guanacaste to Central America. The loan needs to be approved by the Legislative Assembly, but in the meantime the regional energy specialist at the IDB, Carlos Echevarría, said "... Guanacaste is the area of Costa Rica with the best conditions and natural resources for generating renewable energy." According to Echevarría, the country needs to safeguard its renewable-energy future. This means that it should stop relying solely on hydroelectric power, which depends on rainfall and other climatic factors. If the country's rivers do not have sufficient flow and geothermal projects are not developed, ICE would have to produce energy using fossil fuels such as bunker fuel, "…an option that they would prefer to avoid," Echeverría said.

Source: http://www.elfinancierocr.com/economia-y-politica/ICE-asegurar-geotermico-prestamo-BID_0_857314263.html

Ecuador: Developmental Activities Started at the Chachimbiro Geothermal Area

The Corporación Eléctrica del Ecuador (Celec) has signed a contract to improve 9 km of road access to the Chachimbiro geothermal exploratory field. The Chachimbiro project is currently at the stage of pre-feasibility studies in the Urcuqui canton, Imbabura province. According to preliminary estimates, Chachimbiro represents a potential of around 100MW. Ecuador is in talks with the Japan International Cooperation Agency (JICA) about technical cooperation for the advanced stage of pre-feasibility studies, including the first deep geothermal drilling. In July, Celec signed a framework cooperation agreement with the company LaGeo from El Salvador.

Source: http://renewables.seenews.com/news/ecuador-celec-contracts-imbavial-for-road-to-geothermal-project-505572

El Salvador: Using Geothermal Residues to Empower Women

Women from rural communities in El Salvador are increasing their incomes and tackling climate change through a unique project that uses waste heat and steam condensates from nearby geothermal plants. Women living in communities near the geothermal plants use waste heat from the geothermal steam to dehydrate fruit for themselves and for commercial sale. They also grow and sell plants watered with geothermal condensates. Four women are permanently employed as rangers in a wildlife protection park, which has been established in the geothermal field. Through this project, women are able to run a productive business while earning a sustainable income.

Traditional agricultural practices have low production rates in rural areas of El Salvador. As a result, female farmers' incomes are very low. Employment opportunities in the communities next to the geothermal fields are scarce. In addition, the traditional agricultural practices in El Salvador's rural areas are carbon intensive. Wood and other fossil fuels are typically burnt to dehydrate fruit and pump water, which releases greenhouse gas emissions and causes climate change. Deforestation is also an issue in the region as wood is cut down for fuel.

LaGeo is an electricity generation company with two geothermal fields and power plants: Berlín and Ahuachapán, which produce 27% of El Salvador's electricity using renewable geothermal energy. LaGeo created an action plan to empower women living next to the geothermal fields.

Women from rural communities in the Berlin Municipality are involved in various projects using geothermal energy and its derivatives. Using waste-heat from the geothermal plants to dehydrate fruit displaces fossil fuels and reduces greenhouse gas emissions. The dehydrator has a capacity for 25 kg of fruit and the women produce 15 kg of dehydrated fruit per batch. They invest about US$50 and have a profit of US$75 for each batch. The amount produced depends on the demand. On average, they produce one batch per month. Although the amount of sales is small, it is making a big difference because the minimum wage for agricultural activities in El Salvador is around US$4 per day.

About 1.8 tons of CO_2 are avoided per year due to fuel displacement. The initiative is also reducing deforestation due to the establishment of a wildlife protection park and several reforestation projects in the geothermal field. The four women employed as rangers in the park were trained in environmental conservation, animal health care, forest protection and English language skills. The women are in charge of forestry activities, feeding wild animals, maintaining the park, assisting during veterinary operations, environmental projects and the visitors' center. They earn US$ 400 per month, a salary significantly above minimum wage.

The protected forest has an area of 111,824 m². Water services for the wildlife protection park are provided by surplus steam condensates.

The Harvesting Geothermal Energy initiative, sponsored by the United Nations Framework Convention on Climate Change, has the potential to be replicated in LaGeo's new geothermal projects in El Salvador and in other Latin American countries with similar socioeconomic conditions. LaGeo expects to

enter into an agreement with the Ministry of Environment and Natural Resources to ensure the long-term sustainability of the initiative.

Source:
http://unfccc.int/secretariat/momentum_for_change/items/9259.php

Guatemala: Authorization to Build 50MW Geothermal Plant

Final approval has been given to Geotermia Oriental de Guatemala, SA (Geoguat), to install and operate a geothermal power plant for 50 years in the county of Asunción Mita in southeastern Guatemala. The geothermal project is known as Cerro Blanco will have an installed capacity of 50MW and be built on an area of 13 square kilometers, as indicated in the ministerial decree published in the Official Gazette of Guatemala. The contract between the Ministry of Energy and Mines and the company Geoguat was signed in late December 2015. It is indicated that once the contract is signed, the company must submit a deposit, on behalf of the ministry, valued at US$375,000 or its equivalent in national currency.

Cerro Blanco is a gold and silver mining project located 153 km east of Guatemala City in the Department of Jutiapa and the municipality of Asunción Mita. It was developed by the mining company Entre Mares de Guatemala, SA, a subsidiary of Goldcorp, Inc. During exploratory drilling, the company found hot water and decided to conduct more exploratory surveys to define the geothermal potential. Its subsidiary Geoguat found a shallow (~1000 m deep) geothermal reservoir that is expected to be tapped with 14 production wells to feed 10 power units of binary cycle (ORC) of 5MW each. The project includes the construction of a 22 km long transmission line.

Sources:
http://www.centralamericadata.com/en/article/main/Guatemala_Authorizes_50_MW_Geothermal_Plant?u=aab8b4488d77652c0c67fedfccf1ed2a&s=n&e=3&mid=[MESSAGEID], http://goldcorpguatemala.com/entre-mares/geotermia/

Latin America: The future of Geothermal in Latin America (and Elsewhere)

Marcelo Lippmann, IGA's Information Committee

Exploration for commercial-size geothermal resources continues to be a risky and expensive endeavor, which has become a barrier to the development of this clean and renewable type of energy.

According to a recent note*, there is a need for the public sector to be involved in some sort of risk reduction as many geothermal projects have failed that had been financed entirely with private monies. Thus, and because of the growing interest in renewable energy and environmental sustainability, Germany and a consortium of development banks have formed a $75 million risk fund with financing commitments of $1 billion for geothermal development—with a special focus on Latin America.

To the same end, the Inter-American Development Bank recently has provided financing of $85 million to Mexico to manage different risk reduction options and incentivize private investment. The World Bank is leading the formation of a risk fund in Nicaragua as well, contributing $15 million of seed money to promote exploration.

An earlier comment ends by saying: "The question is if, with the low price of oil today, geothermal can still be attractive, and whether there are going to be enough risk mitigation alternatives to attract the still large quantities of private capital required." Time will tell…

*http://www.thedialogue.org/wp-content/uploads/2015/10/LEA151009.pdf

México: Geothermal Program, Auctions and New Contract Awarded

First Call for a Geothermal Program Funded by EU – In mid-November, the Mexican Energy Ministry (SENER) and the European Commission of Energy unveiled the call under a Geothermal Program that guarantees funding up to EUR 20 million (US$22 million). The program and funding will be available for the next three years and is primarily committed to the promotion of renewable energy and deployment of clean technologies. The initiative for cooperation

between Mexico and the European Commission provides a platform for creating an international consortium to carry out research, technological development and innovation of advanced technologies in geothermal. The first call within this framework was initiated at a meeting of the head of SENER with the European Commissioner for Research, Science and Innovation. At the meeting, the Mexican officer stressed this new form of international cooperation with the European Union (EU) has the potential of transforming research in this field and providing a network of international collaboration for experts, institutions, companies and national scientific associations aligned to harness the potential of Mexico in this area.

Source:
http://sener.gob.mx/portal/Default_blt.aspx?id=3323

First Post-reform Electricity Auction – Mexico's National Energy Control Center (CENACE) has announced the first electricity auction, following the national energy sector reform, will begin in January 2016. At this auction, clean energy certificates (CEL: Certificados de Energías Limpias) will be auctioned, plus energy and capacity. After the process of questions and answers, the last day to register bids will be on January 20, 2016, and the process must be resolved on March 31, 2016. This is the first national auction within the framework of energy reform through which an electricity market will be created. The auctions will be carried out annually and will be convened in April.

At this first auction, 4 to 6 million 20-year renewable energy certificates (CELs) will be auctioned, as well as 15-year contracts for energy and power, according to a government announcement. For this auction, the only buyer will be the state electric utility CFE, responsible for covering at least 5% of its customers' electricity demand with clean energy in 2018. Other buyers will participate in future auctions. The Mexican Wind Energy Association (AMDEE) estimates that half of the CELs will correspond to wind projects.

Mexican law has set a goal of 35% for clean electricity in 2024 but does not provide specific goals for each renewable technology. The complete set of goals included in the almost passed Energetic Transition Law is as follows: 25% of clean energy in 2018, 30% in 2021, 35% in 2024, 40% in 2036, and 60% in 2050. According to that law, the term clean technologies include all renewable sources and also nuclear and efficient co-generation technologies. Currently, only 20.4% of the electricity generation in Mexico is produced by clean technologies, out of which 17% are renewables (hydro, wind, geothermal and solar) and 3.4% are nuclear and bio-energy.

Source: http://www.pv-magazine.com/news/details/beitrag/mexico-to-hold-its-first-post-reform-electricity-auction_100022077/#ixzz3sdNK4M4r

New 25MW Plant to Be Built in Los Azufres - The Mexican Comisión Federal de Electricidad (CFE) has awarded the 25MW Los Azufres III, Phase II project to the Spanish company TSK Electrónica y Electricidad, SA. The power plant will have an average annual generation of 186.15 gigawatt-hours per year. The project includes engineering, civil engineering, assembly and supply of main equipment and materials for the comprehensive construction of a geothermal power plant in Los Azufres, in the state of Michoacán. The estimated execution time is 30 months. The total cost of the EPC contract is US$51.29 million, equivalent to US$2.05 million per MW. It is expected the LCOE will be around 0.75 Mexican pesos per kWh (around US$5.17 cents per kWh). The awarded company TSK Electrónica y Electricidad will use Fuji turbines.

Source:
http://www.aztecanoticias.com.mx/notas/finanzas/238356/cfe-adjudica-central-geotermica-los-azufres

US: Direct Uses and Contributions of Geothermal Energy

Dispute for Possible Affectation by Shallow Injection in New Mexico - The Oil Conservation Commission (OCC) of New Mexico, USA, has temporarily resolved a dispute over use of a geothermal water resource in the Animas Valley of southern New Mexico.

AmeriCulture Inc., a desert fishery that raises tilapia fingerlings, and a local water conservation board protested a plan by Cyrq Energy Inc. to drill new shallow injection wells for its geothermal power plant. The OCC has accepted the Cyrq's plan, with conditions that seem to have appeased all parties.

The tilapia fish farm and US$43 million Lightning Dock binary cycle power plant are very close to each other in

the Animas Valley. Both draw water in the area: the fishery from a shallow water source and the power plant from a 250-plus-degree, deep geothermal source.

The two businesses have been coexisting somewhat uncomfortably since the Lightning Dock plant began producing power in 2014 under a deal to supply the Public Service Co. of New Mexico with 10MW of electricity. So far the plant has been able to produce only 4MW through its "closed loop" scheme. Under its initial operating permits, Lightning Dock was to re-inject the hot water —known to contain potentially dangerous levels of fluoride— from where it came, without allowing it to mix with groundwater used for domestic wells, crop irrigation and for livestock.

By the 2015 summer, Cyrq requested Oil Conservation Division permits to construct new wells to re-inject the geothermal water at shallower intervals. They apparently couldn't inject hundreds of thousands of liters of water deep enough or fast enough to ramp up the energy production to 10MW.

The local Soil and Water Conservation Commission joined AmeriCulture's protest out of concern over how groundwater quality might be affected by the proposed shallow injection wells. Finally, the OCC approved the three new injection wells under the condition that Lightning Dock places the casing of the wells at least 150 feet below the shallow water resource. The commission's final order on the matter was expected later.

View of the Lightning Dock geothermal power plant in southern New Mexico. Photo by Cyrq Energy Inc., taken from Albuquerque Journal.

Source: http://www.abqjournal.com/660290/news-around-the-region/geothermal-water-dispute-settled-for-now.html

EERE Announced Funds for Critical Materials Recovery from Geothermal Fluids - The US DOE's Office of Energy Efficiency and Renewable Energy (EERE) announced it will spend up to US$4 million for critical materials recovery from geothermal fluids. Critical materials like rare-earth elements and lithium play vital roles in many clean-energy technologies, including solar panels, wind turbines, electric vehicles, and energy-saving lighting. The DOE is pursuing a range of research and development efforts to secure and diversify the supply of critical materials; identify substitute materials; and develop better ways to recycle the materials. One exciting area of this research is examining how to recover critical materials from fluids and brines produced from geothermal exploitation and other energy or mining projects.

The funding opportunity is titled "Mineral Recovery Phase II: Geothermal Concepts and Approaches to Validate Extraction Technologies." The funds will go for about three research projects to assess the occurrence of rare earth and other valuable materials dissolved in geothermal or other high-temperature fluids and validate methods for extracting them. By extracting and purifying these critical materials, it is possible improve the economic and production benefits of geothermal energy projects, making them more cost-effective at a wider range of locations.

The work aims to find breakthrough approaches for identifying the resource potential and validating methods to recover dissolved materials contained in geothermal fluids. The DOE also seeks to expand the nation's library of information about the occurrence of these materials in geothermal and elevated temperature fluids, which may encourage further development of America's geothermal resources.

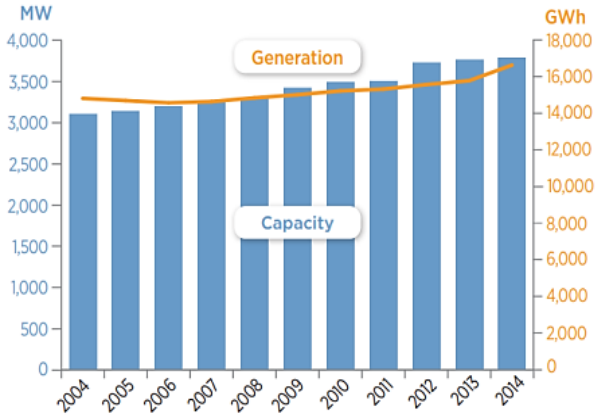
Source: http://energy.gov/eere/articles/eere-announces-4-million-critical-materials-recovery-geothermal-fluids

Geothermal Power in the Country is 3,910 MW – The Energy Infrastructure Update report released by the US Federal Energy Regulatory Commission (FERC) said renewable energy accounted for 60.2% of the 7,276 MW of new generation capacity placed in service in the US during the first nine months of 2015. Wind power accounted for 26 new units with 2,966 MW or 40.8% of all new capacity in January-September 2009. Solar followed with 1,137 MW (142 units), biomass with 205MW (16 units), geothermal steam with 45MW (1 unit) and hydropower with 27MW (18 units). The report said renewable energy sources now account for 17.4% of the total-installed operating generating capacity in the US –hydro 8.59%, wind 5.91%, biomass 1.43%, solar 1.13% and geothermal steam 0.34% (total installed capacity is 3.91GW).

During 2014 according to the 2014 Renewable Energy Data Book, the US renewable electricity grew to 15.5%

of the total installed capacity and 13.5% of the total electrical generation. The report, published annually by the National Renewable Energy Laboratory (NREL) on behalf of the DOE's EERE, indicates that in 2014 hydropower produced nearly half of the total, renewable-electricity generation, wind produced 33%, biomass produced 12%, solar photovoltaics (PV) and concentrating solar power (CSP) produced 6%, and geothermal produced 3% (16,628 GWh). At the end of 2014, geothermal energy in the US provided 3,789 MW of capacity (see table below).

It was noted that total carbon pollution in the US energy sector has dropped below the levels set in 1996, according to data included in the Natural Resources Defense Council's (NRDC) third annual energy report published in early October 2015. The group reports that carbon dioxide pollution has dropped by a full 10% in the period between 2005 and 2014 and that oil consumption has fallen to levels equal to those in 1973 when the US population was about one-third its current size. The US burned less coal in 2014 than it did in 1990 and annual consumption is down 21% since coal burning reached a peak in 2005. The NRDC also praises the Clean Power Plan recently issued by the Obama Administration, saying it ensures that by 2030 the United States will reduce its carbon dioxide emissions to a level one-third below the 2005 emissions.



	U.S. Geothermal Electricity Generation (GWh)	U.S. Geothermal Electricity Capacity and % Increase from Previous Year	
		Total (MW)	% Increase
2000	14,093	3,100	–
2001	13,741	3,100	0.0%
2002	14,491	3,108	0.2%
2003	14,424	3,108	0.0%
2004	14,811	3,108	0.0%
2005	14,692	3,143	1.1%
2006	14,568	3,195	1.7%
2007	14,637	3,259	2.0%
2008	14,840	3,306	1.4%
2009	15,009	3,421	3.5%
2010	15,219	3,498	2.3%
2011	15,316	3,500	0.1%
2012	15,562	3,724	6.4%
2013	15,775	3,761	1.0%
2014	16,628	3,789	0.7%

Sources: http://renews.biz/100228/re-dominates-new-us-capacity, http://247wallst.com/energy-economy/2015/10/09/renewables-account-for-10-of-us-energy-supply/#ixzz3pFzADxf1

2015 Ends with Positive Progress for Geothermal Energy: GEA –Geothermal Energy Association released a positive balance sheet for 2015, not only in the US but internationally. It said important policy progress was made nationally, "particularly in the final weeks of 2015. Congress extended the production tax credit (PTC) to provide incentives for geothermal power plants that start construction by January 1, 2017. This is sure to encourage new U.S. projects next year and Congress is expected to discuss further extensions next year… Congress also increased funding to support critical research programs of the Department of Energy's Geothermal Technologies Office." It stressed that 150 companies member of the GEA "worked in the US and globally in 2015 to increase the use of geothermal energy through their work on many of the 15 new geothermal power plants and the 50 projects under construction." The GEA also highlights the "Environmental Protection Agency filed its Clean Power Plan in late 2015, and states have begun planning their individual responses to meet its goals."

Source: http://www.geo-energy.org/

ASIA/PACIFIC RIM

China: Geothermal to Be Part of an Energy Revolution in the Country

The Fifth Plenary Session of the 18th Central Committee of the Communist Party of China, which ended on October 29, 2015, adopted the 13th Five-year Plan (2016-2020) on National Economic and Social Development. In this plan the next five-year period is described as decisive for building a "moderately prosperous society" by 2020.

China aims to double its 2010 GDP and the 2010 per capita income of both urban and rural residents by 2020. The document analyzes the decisive stage and sets guidelines and targets for the next five years. It highlights innovation, coordination, green development, opening up and sharing. Ensuring a moderately prosperous society by 2020 requires medium-high economic growth, higher living standards and a better quality environment, the document says.

China will continue to encourage mass entrepreneurship through major scientific and technological projects, and by building a number of national laboratories, hoping they will lead to new technologies. The government plans better allocation of its resources, including labor, capital, land, technology and management.

There will be more official moves to upgrade the economy into a global manufacturing power, cultivate strategic industries and modernize the agricultural and

services sectors. The government will intervene less in price formation, deregulating pricing products and services in competitive sectors.

Regarding the energy sector, geothermal energy is explicitly mentioned as part of an "energy revolution" that will include clean and safe energy sources replacing fossil fuels. The document also calls for a system to control consumption of energy, water and construction land. Energy-intense industries, such as power, steel, chemical and building materials will be subject to carbon emission-control regulations.

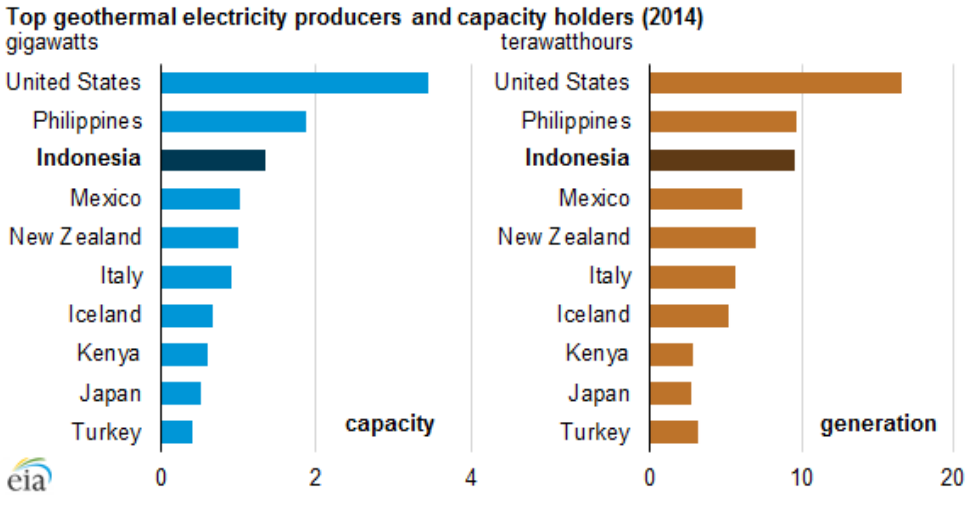
The document vows to lift more people out of poverty, saying that alleviating poverty in rural areas is the most difficult aspect of building a well-off society. It also promises a "healthy China" by reforming the health system, and promotes the balanced development of its population through the two-child policy. It calls for retaining family planning as a basic state policy, allowing all couples to have two children, while improving public services for reproductive health, maternal and child health, nurseries and kindergartens.

Source: http://www.ecns.cn/2015/11-03/186947.shtml

Indonesia: Review of Geothermal Status and New Favorable Policies

The Geothermal Market after the US' EIA – *The following excerpts are from* Today in Energy*, published by the US Energy Information Administration (EIA) in October 2015.* Indonesia ranked third in the world in both geothermal electricity production and geothermal generating capacity in 2014, behind only the United States and the Philippines. The country is located at the convergence of several tectonic plates in Southeast Asia, giving it significant geothermal potential, although most of its potential reserves remain unexplored.

Indonesia's Ministry of Energy and Mineral Resources estimates that the country holds a potential 29 gigawatts (GW) of geothermal capacity reserves, only 5% of which is currently being used. Indonesia's current geothermal capacity of 1.3 GW consists of plants clustered around Java, Bali, North Sumatra, and North Sulawesi. Geothermal currently makes up less than 3% of Indonesia's total electrical generation capacity, but Indonesia plans to increase geothermal capacity by 2025 as part of a plan to increase electrification in the country.



Indonesia still has a low electrification rate compared to countries with similar income levels. In 2014, about 84% of Indonesia's population had access to electricity, and the latest energy policy aims to achieve nearly complete electrification of the country by 2020. In recent years, electrical capacity additions have not kept pace with electricity demand growth, leading to power shortages in grid-connected areas. Inadequate infrastructure as a result of insufficient investment and regulatory hurdles contributes to lower electrification rates, primarily in eastern Indonesia.

Fossil fuels power most electrical generation in Indonesia (88%), while renewables, primarily in the forms of hydropower and geothermal resources, account for the remainder. Plans to increase renewable energy use to at least 23% of the energy portfolio by 2025 depend heavily on further developing the country's geothermal and hydropower resources.

Indonesia has included several geothermal power plants in its fast-track program, which is meant to accelerate the development of more than 27 GW of total power capacity in the next several years. Indonesia has focused on geothermal in particular, signing an agreement with New Zealand in 2012 for joint development of geothermal energy projects.

About 5 GW of new geothermal capacity is slated to come online in Indonesia by 2022, including the 330MW Sarulla power plant, potentially the world's largest geothermal power plant. Successful completion of these geothermal projects could result in Indonesia becoming the world leader in both geothermal electric capacity and generation.

One impediment to unlocking the country's vast geothermal resources has been the definition of geothermal development as a mining activity, which has restricted new projects in conservation areas. Indonesia passed a law in 2014 that eliminated this limitation on geothermal development while streamlining the permitting process and alleviating land acquisition issues. The law also attempted to raise private sector

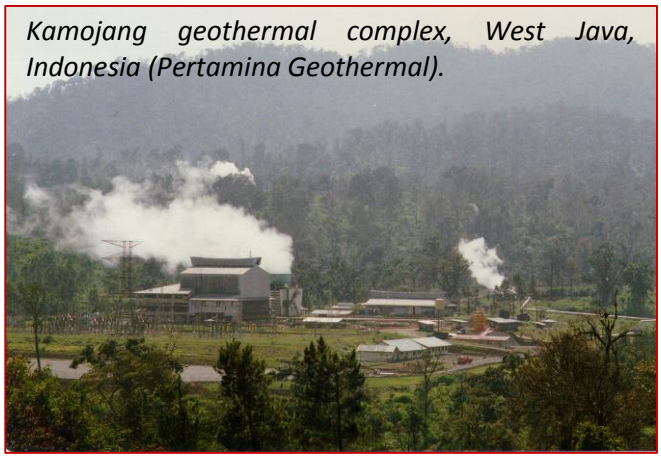
investment in geothermal projects by matching the price more closely with development costs.

Source:
http://www.eia.gov/todayinenergy/detail.cfm?id=23392

New Policy to Speed up the Development of Geothermal Projects - The government is preparing a legal instrument that will allow PT Pertamina Geothermal Energy (PGE), a subsidiary of the oil and gas company Pertamina, to develop geothermal-fueled power plants without a tender. The policy aims to speed up the development of geothermal power plants.

The Energy and Mineral Resources Ministry's director general for new and renewable energy and energy conservation, Rida Mulyana, confirmed the plan, saying the regulation was expected to be completed before the end of the year. "We have met Pertamina to discuss giving a direct assignment for geothermal working areas to state-owned enterprises. We will give it to Pertamina, but operations will be carried out by PGE as the company's subsidiary," Rida said.

Under current practice, the new and renewable energy and energy conservation directorate general regularly holds bids for concessions on a number of geothermal working areas in the country. In July 2015, for example, the directorate general opened tenders for five geothermal working areas with a total estimated potential of 730MW. The areas are in Kepahiang in Bengkulu, Marana in Central Sulawesi, Way Ratai in Lampung, Mount Lawu on the border between Central and East Java, and Lake Ranau on the border between Lampung and South Sumatra.



Kamojang geothermal complex, West Java, Indonesia (Pertamina Geothermal).

The directorate general's chief of geothermal power, Yunus Saifulhak, said the direct appointment of PGE to carry out the projects was expected to boost geothermal use in Indonesia. "This is a breakthrough to accelerate geothermal projects. To date, geothermal development is left to stagnate in tenders. When the regulation is passed, we will have several options, from open bids to appointing Pertamina," Yunus said.

He added that as long as Pertamina, through PGE, considers itself capable of working on a given geothermal working area, the government will give the direct assignment to the company, avoiding a protracted tender.

According to Yunus, there are currently 27 geothermal working areas available, with five tendered this year. Eight working areas will be available for bids next year. "Once we have issued the regulation as a legal instrument, we won't have to put all of the working areas out to tender. Instead we can assign a state-owned firm," he said.

Source:
http://www.thejakartapost.com/news/2015/10/05/govt-speed-geothermal-power-projects.html

Proposal for eliminate the property tax - In parallel news, the Energy and Mineral Resources Ministry has sent a proposal to Indonesia's Ministry of Finance asking it to abolish the property tax (PBB) for geothermal exploration areas. It expects this move could promote investment into geothermal development. "Geothermal investment is high cost and high risk," said the Energy Ministry's geothermal director. Exploration has been considered a taxable activity, even though there is no guarantee that investors will find geothermal potential.

The government has already made geothermal investment easier by removing the value-added tax and import duties for imported goods used in geothermal activities. The changes will help reach the high target of 4,600MW of geothermal power generation over the next five years.

The Indonesian Geothermal Association approved of the proposal to remove the PBB. Abadi Purnomo, the association's chairman, said the proposal would help alleviate the burdens for investors interested in developing national geothermal energy."

Source:
http://en.tempo.co/read/news/2015/11/04/056715771/Finance-Ministry-Asked-to-Scrap-Geothermal-Exploration-Tax

Philippines: Governmental Subsidies, Italian Turbines for a New Project

Governmental Subsidies for a 40MW Geothermal Project – The State-run National Power Corp. (NPC) will give renewable energy company Emerging Power Inc. (EPI) a subsidy for providing geothermal power to the province of Mindoro. The undisclosed amount will come from the Universal Charge for Missionary Electrification (UCME) fund, a provision under the

Electric Power Industry Reform Act (EPIRA) designed to ensure the delivery of reliable electricity to marginalized areas and those not connected to the main grid.

EPI received the subsidy on recently starting construction of its geothermal power plant in Mindoro. It has signed a power supply agreement with two electrical cooperatives in the province, Oriental Mindoro Electric Cooperative (ORMECO) and Occidental Mindoro Electric Cooperative (OMECO). The subsidy will allow EPI to deliver its 40MW geothermal power plant in Naujan, Oriental Mindoro.

EPI's 40MW geothermal project is expected to cut the cost of power generation in the island by half, as it would no longer be dependent on rising world oil prices. EPI claims that at 92% plant utilization levels, the UCME subsidy allotted for Mindoro would decrease significantly. The first 10MW of the project is expected to be on line by April 2017.

The majority of EPI is owned by Nickel Asia Corporation (NAC), one of the country's biggest mining firms listed at the Philippine Stock Exchange. EPI is also putting up a 100MW geothermal power plant in Biliran, among other renewable projects in Philippines.

Source: http://www.manilatimes.net/epi-obtains-subsidy-for-mindoro-power-project/226461/

Turboden Plants to Be Installed in Oriental Mindoro - The Italian firm Turboden, which is associated with Mitsubishi Heavy Industries (MHI), announced in December that, along with the Spanish Company TSK, it has been awarded the turnkey construction of the 50MW geothermal power plant in Oriental Mindoro, Philippines, where four ORC turbogenerators will be installed before the end of 2017. The turbogenerators will be installed at two different well pads where geothermal resources are separated into steam and brine. Turboden has optimized the machines by tailoring them to the geothermal resources, to the ambient conditions and to the environment.

The firm also announced the successful operation of an innovative 6MW (gross) geothermal power plant in Japan, built in cooperation with MHI for the largest geothermal power generation developer in Japan. This seems to be Kyushu Electric and the power plant is apparently the Sugawara Binary Cycle Power Station, inaugurated in August 2015 in the town of Kokonoe, Oita Prefecture (*see* IGA News No. 101, p. 17). This is the first Turboden plant in Japan and it is fed by a two-phase geothermal resource measuring around 140°C. After separation, the steam phase condenses in the evaporator and the preheater receives only a liquid phase. For the project, Turboden supplied its highly efficient ORC turbine and process engineering and undertook plant commissioning and start-up.

Source: http://www.turboden.eu/en/public/press/20151214_Turboden_Asian_Market_ENG.PDF

Vietnam: Cooperation Agreement between Vietnamese and Icelandic Companies

In conjunction with the state visit of the President of Iceland to Vietnam, Icelandic law firm BBA and Baker & McKenzie (Vietnam) have signed a Cooperation Agreement. The agreement entails work on a comparative study on the geothermal regulatory framework in Iceland and Vietnam for the purposes of reforming the regulatory framework in Vietnam. During the events of the visit, Iceland's Ministry of Foreign Affairs and the Ministry of Industry and Trade in Vietnam signed a Memorandum of Understanding on cooperation in geothermal development.

Signing ceremony with representatives of BBA and Baker & McKenzie (source: BBA).

Vietnam is preparing to begin harnessing its geothermal reservoirs. The country chose to re-work its regulatory framework by drawing on the experiences of Icelandic authorities very experienced in using geothermal-energy resources for district heating and electricity production. As part of the cooperation activities, the law firms will seek funding to implement the reforms.

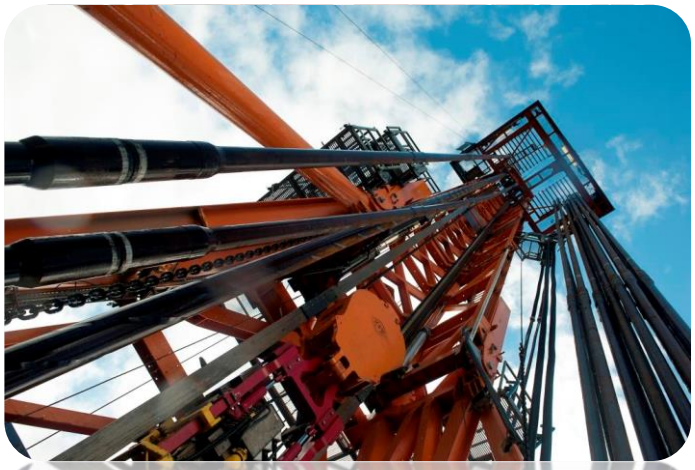
BBA Legal is an Icelandic law firm and specializing in mergers and acquisitions, capital markets, banking and corporate finance, bankruptcy law, PFI projects and general corporate and commercial law. The company has been involved on several contracts related to geothermal energy in Iceland and other countries.

Source: http://www.thinkgeoenergy.com/icelandic-and-vietnamese-law-firms-to-cooperate-on-geothermal-regulatory-reform-and-funding/

EUROPE

Belgium: Starts Drilling of a Deep Geothermal Well in Flanders

A gigantic rig is drilling to depths of about 4 kilometers beneath Flanders' soil. The drilling in Mol, Antwerp province, is the first phase of a pioneering large-scale deep geothermal energy project in Flanders.



View of the drilling rig. Photo by Flanders Today.

The Flemish Institute for Technological Research (Vito) has been preparing the region's first large-scale deep geothermal energy project for about five years. The researchers first mapped in detail the deep subsurface of the Mol region to a depth of more than 4km, using seismic data obtained from ground impact systems known as thumper trucks. Vito's prognosis is that hot water will be found at a depth of about 3.5km and temperatures of over 120° Celsius.

The Kempen region, in the north of Antwerp and Limburg, is the most attractive area in Flanders for drilling because the hardest layers of rock are much deeper than elsewhere.

To learn if its estimates are correct, Vito has launched a pilot project at its Balmatt site in Mol. About 20 engineers from the Flemish Smet Group and Germany's THV Balmatt Drilling are working to reach the deep waters under the sedimentary layers. The 60m drilling rig at the Balmatt site is among the most energy-efficient in Europe and doesn't create noise pollution.

By December 2015, the Vito researchers should have the information they need on the flow rate and water temperature. "If the water is at least 90° Celsius, we can use it for heating purposes," says Geert De Meyer, Vito's geothermal development manager. "If it's about 120°, we can convert the heat to electricity."

If the results of the pilot project are positive, a second drilling project will be launched in January 2016. By next October, the energy will be used to heat the headquarters of Vito itself. "By 2017, the headquarters should be completely heated in a sustainable way," says De Meyer. "Part of our electricity consumption will then be covered to geothermal energy."

The next step is to provide energy to about 16,000 households in Mol and the nearby town of Dessel in a few years. "By 2050, we want to supply energy to the whole of the Kempen in Antwerp and Limburg, an area of about 1,600 km²," says De Meyer. To reach this goal, there should be about 100 geothermal power plants set up in the Kempen by the middle of the century. Each power plant uses five wells, called production wells if hot water is pumped up from them and injection wells if they are used to dispose of cooled water.

The investment for the Balmatt project, resulting in an operating deep geothermal energy plant, would amount to €22 million. The exploratory drilling project, costing €7 million, is funded by Vito and the government of Flanders, which contributed €2 million. The construction of about 100 power plants is expected to require an investment of about €6 billion.

Source: http://www.flanderstoday.eu/innovation/vito-drills-deep-under-flemish-soil-tap-geothermal-energy

Croatia: First Power Plant to Operate in 2016

Turboden announced it has been awarded the Velika Ciglena geothermal project, to be developed in Croatia, to Turkish developer MB Holding. The firm will build Croatia's first geothermal power plant, a 16.5MW ORC solution based on a single axial multi-stage ORC turbine designed by Turboden. The project is located in the municipality of Bjelovar, in western Croatia.

After winning a bid in January 2015, MB Holding holds the permit to construct the country's first geothermal plant. The company, founded in 1968, operates the first private geothermal energy plant in operation in Turkey since 2006. Currently MB Holding's portfolio consists of three other geothermal power plants.

The plant will be completed and fully functional by the end of 2016, generating electrical power from a medium-enthalpy geothermal source. Turboden will be responsible for the Engineering, Procurement and Construction of the power plant.

Source: http://www.turboden.eu/en/public/press/20151103_Turboden_MB%20Holding_ENG.PDF

France: New Geothermal Heating Projects

A new geothermal heating project was inaugurated in Arceuil and Gentilly in the greater Paris region in France. Early planning began about 10 years ago and ArGéo, the geothermal heating network of Arcueil and Gentilly, is the first project of its kind created from scratch in 30 years in the Ile-de-France. Operation of the project started in mid-October 2015, and it now heats around 7,500 housing units, including municipal buildings and buildings of group homes in the two towns.

The plant is fuelled by hot water derived from wells at a depth of 1,600 meters and a network of 15 km of piping and about 120 delivery points. The new system fuels around 60% of the energy demand, avoiding emissions of 14,600 tons of CO_2 per year, equivalent to the annual emissions of 8,000 vehicles. The water derived from the wells has a temperature of 62°C. The liquid then passes through the exchangers that take the heat. The liquid is discharged once it is cooled by a second well. The total project cost was more than €32 million (US$36 million), of which 23% was supported by the Environmental and Energy Management Agency (ADEME) and the regional government.

Lorraine Devouton, responsible of exploitation department in the area of heat recovering (photo by Anne-Laure Abraham, Le Parisien).

In other news, it was learned a new urban area will be built in Issy-les-Moulineaux, a municipality in the southwestern suburb of Paris, France. All the buildings, shops, two schools, and a media library will be built in compliance with the highest environmental standards. Green buildings, waste collection, electric cards in self-service, everything will be designed to reduce the carbon footprint of the buildings. To heat the 1,500 homes in the new neighborhood, the city and its Dalkia operator are optimizing the geothermal heating system. They are planning to use a water table, found 750 m deep at a constant temperature of 28°C, for supplying about 80% of the hot water needs, reducing the need for fossil fuels and eliminating 2,000 tons of CO_2 per year.

Sources: http://www.thinkgeoenergy.com/new-geothermal-heating-project-starts-operation-in-paris-france/, http://www.thinkgeoenergy.com/a-new-eco-district-in-paris-to-be-entirely-heated-by-geothermal/?utm_source=ThinkGeoEnergy+List&utm_campaign=4b40b95680-TGE_Newsletter_RSS1_12_2015&utm_medium=email&utm_term=0_657e42f767-4b40b95680-415210497

Hungary: Feed-in-Tariffs and New Heating Center

Geothermal Heat Feed-in-Tariffs for PannErgy Subsidiaries - The Minister for National Development announced –in the Hungarian Official Gazette, Magyar Közlöny— the detailed official heat tariffs for the district heat supply season of 2015-2016 applicable to PannErgy's subsidiaries, in effect from 1 October 2015. The officially fixed district heat feed in tariffs applicable to PannErgy's subsidiaries are changed from the previous heating period in accordance with the following table:

PanErgy Subsidiary	Tariff in US$/GJ
Szentlőrinci Geothermal Ltd.	13.11
Miskolci Geothermal Ltd.	8.79
KUALA Ltd.	8.79
Arrabona Geothermal Ltd	9.51

Source: http://www.thinkgeoenergy.com/pannergy-geothermal-heat-feed-in-tariffs-for-2015-2016-hungary/?utm_source=ThinkGeoEnergy+List&utm_campaign=d96d96f9e5-TGE_Newsletter_RSS1_12_2015&utm_medium=email&utm_term=0_657e42f767-d96d96f9e5-415210497

Inauguration of the Bőny Heat Distribution Center - PannErgy announced it has inaugurated a power supply center in Bőny, on the outskirts of Győr in northeastern Hungary. It was built as part of a HUF 10.2 billion (US$34.7 million) investment project in Győr. Thermal energy from the power supply center will supply 60% of the heating required by the vehicle-manufacturer, Audi Hungaria's plant in Győr, as well as provide heating for 24,000 households in the city. As part of the project, PannErgy drilled two extraction wells (BONY-PE-01 at 2470 m depth, output 150 liters per second at 105°C, and BONY-PE-02 at 2450 m depth, output of 128 l/s at 100°C), two reinjection wells (PER-PE-01 at 2396 m, and PER-PE-02 at 2324 m), a power supply center and a 17-kilometer-long pipeline network, said Dénes Gyimothy, acting CEO of PannErgy, at the inauguration event. The estimated heat capacity of the center is 52MW_{th}.

Source: http://pannergy.com/wp-content/uploads/2015/11/et_PE_gygp_atado_20151124_final-ENG.pdf

Italy: Drilling the World's Hottest Geothermal Well

Researchers and technologists from all over Europe are joining forces to pursue a common cause –to make sure that the world's potentially most energy-rich geothermal well becomes a reality. A deep well will be drilled in Larderello in Tuscany, Italy, and €15.6 million of research funding has been earmarked for the project.

Global green energy producer Enel Green Power is heading the project called DESCRAMBLE (Drilling in dEep, Super-CRitical AMBients of continentaL Europe). The goal is to extract the maximum possible energy from the well. The extreme heat in the rocks deep beneath northern Italy means that both pressures and temperatures will be right at the limit of what even innovative technologies can currently cope with. However, such conditions also mean that the energy output from such a well can be as much as ten times greater than for standard geothermal wells, and will help to ensure that the new well will be very profitable if the project succeeds.

Nobody has previously managed to control a well under such extreme temperature and pressure conditions. Specially developed equipment will be needed. "One of the major uncertainties is the presence of what we call supercritical fluids," explains physicist Roar Nybø at SINTEF Petroleum Research. At depths of two to three kilometers in the earth's interior, ambient physical conditions change dramatically. Temperature increases and so does the pressure. Something very special happens when temperatures reach 374°C and the pressure is 218 times the air pressure at the surface. We encounter what we call supercritical water.

It isn't a liquid, and nor is it steam. It occurs in a physical form incorporating both phases, and this means that it takes on entirely new properties. Supercritical water behaves like a powerful acid, and will attack anything –including electronics and drilling equipment.

But supercritical water has its advantages too. It can transport from depths up to ten times more energy than normal water and steam achieve in a standard geothermal well. It also flows more easily through rock fractures and pores. If researchers can succeed in controlling the forces involved without the technology breaking down, we may be on the verge of a deep earth technological breakthrough.

If all this wasn't enough, supercritical water can also transport valuable minerals to the surface in solution. This could provide potential incidental revenues.

The drilling operation requires highly advanced technical preparation. For this reason, the major breakthrough must first be modeled in a specially designed simulator. This has already been developed by SINTEF for drilling operations for oil and gas in a machine similar to an aircraft flight simulator. The simulator will be given all available data on the planned well and its location.

The supercritical water must be controlled. To predict as accurately as possible how this fluid will behave both at depth in the well and on its journey to the surface, the entire process has to be modeled in a flow simulator. The flow simulator 'LedaFlow' makes it possible to analyze more detailed and complex flow scenarios involving so-called multiphase transport, where oil, gas and water all flow along the same pipeline.

While work on the modeling and simulation of the advanced drilling operation continues, yet another research team will be coming to grips with completely different problems. A specialized probe will be developed and lowered into the well to log and measure how a well behaves if it is capable of withstanding temperatures of up to 450°C and very high pressures. To do this, the team is developing custom-designed, high-temperature electronics enclosed in a kind of thermos flask—also called a Dewar flask. The container must be well insulated to protect the measuring

instrument recording conditions in the well over periods of several hours in ambient temperatures of 450°C—250°C in the interior of the container. The countries are working with manufacturers to produce batteries safe for use at these temperatures.

The project was launched in Pisa in mid-May and drilling is planned to start in fall 2016. If everything goes as planned, the completed well will provide ten times the output of a standard, shallow-geothermal well.

Facts about the DESCRAMBLE project: The aim of the project is to achieve a ten-fold increase in output compared with traditional, shallow geothermal wells. Participating countries: Italy, Germany and Norway. The Norwegian research partners are SINTEF ICT located in Oslo, and SINTEF Petroleum Research in Trondheim and Bergen. Coordinator: Italy's Enel Green Power, represented by Ruggero Bertani. Duration: 36 months following the project kick-off in May. Total budget: €17.6 million, funded via the EU program, Horizon 2020.

Source:
http://www.sciencedaily.com/releases/2015/10/151023094414.htm

Italy: Inauguration of the CEGLab in Larderello

Dario Bonciani, CEGLa info@ceglab.it

On 14 November 2015, a new center of advanced expertise in geothermal energy was inaugurated in Larderello (Pisa), the centenarian geothermal energy world cradle.

Autoclave in the CEGLab. Photo provided by Dario Bonciani

In the heart of the Tuscan geothermal area, a new on field research laboratory, aimed at contributing to the dissemination of innovation and to the technology transfer concerning the exploitation of heat of the Earth (with a special focus to its direct uses), was inaugurated by the Tuscany Region Councillor for Environment and Soil Protection.

The CEGLab has been equipped by CoSviG (Consortium for the development of geothermal areas), with the support of the Tuscany Region, and it is managed in collaboration with EnerGea, a company consisting of CoSviG, University of Pisa, CNR (National Research Company) and the School of Advanced Studies Sant'Anna of Pisa. Thanks to the collaboration with these partners, the CEGLab can afford to offer services at a very high quality level in different sectors for the study of resources, of geothermal fields, in geology/hydrogeology field, and of related plant engineering.

As well as qualifying geothermal resources and fluids through an ultra-high precision isotopic water analyzer and other multi-parametric field devices, the CEGLab can perform studies aimed at testing new materials and experimenting innovative engineering solutions, in order to optimize the use of the geothermal resources and to enhance the direct uses of geothermal heat, for civil and productive uses. The laboratory has indeed a new conception autoclave simulating geothermal plant operating conditions, in static and dynamic fluxing conditions, with controlled pressure and temperature and changing CO_2 pressure.

The CEGLab addresses both to public bodies involved in geothermal projects, geothermal and district heating companies, engineering and geology research bodies and it is a facility to support the training and updating of new technician generations in the geothermal field.

The Netherlands: The Use of Geothermal Heat Has Increased in the Last Five Years

The use of geothermal heat and energy in the Netherlands is always increasing. Although the share of these new energy sources is still very modest, the production of geothermal heat has more than doubled between 2009 and 2014, according to Statistics Netherlands (CBS).

Last year, these relatively new energy sources accounted for more than 4% of the total renewable energy consumption. In turn, renewable energy accounts for less than 6% of the total energy consumption in the Netherlands. Thus the share of geothermal heat and energy is still very modest.

In the Netherlands, geothermal heat has been used since the end of 2008 to pump up hot groundwater from deeper layers of the earth. Today this technology is applied in 10 locations. Over the past half-decade, generation of heat from geothermal energy has soared by 80%. Nearly 30% of the geothermal heat is used for heating homes.

The generation of geothermal energy uses hot or cold air which is stored in the upper layer of the soil, depending on the season. The technology, well known as Geothermal (Ground Source) Heat Pumps, was already used in the Netherlands before geothermal heat was sought. It is commonly applied in large, new office buildings and is cost-effective because in this type of non-residential buildings there is often a demand for both heat and cold air.

The horticultural sector also uses extensive geothermal systems to heat greenhouses.

The government has introduced the Guarantee Scheme for Geothermal Heat to encourage the use of geothermal energy and reduce the risks for people using the technology. The scheme partly covers the risks of unsuccessful drilling attempts.

Since 2012, geothermal heat projects also qualify for subsidy schemes. On 1st March 2015, a total amount of €1.1 billion in subsidies was granted to 36 projects, although it is as yet uncertain whether all the projects will in fact be undertaken.

Source: http://www.cbs.nl/en-GB/menu/themas/industrie-energie/publicaties/artikelen/archief/2015/use-geothermal-heat-doubled-in-the-past-5-years.htm

Portugal: New 4MW Plant to Be Built in the Azores

Exergy has signed a contract with EDA Renováveis to build a 4MW geothermal binary plant in the Azores, Portugal. The plant will be sited on Terceira Island in an area called Chambre-Pico Alto. The plant is planned to be fully operational by the beginning of 2017.

The contract calls for a turnkey solution for the construction of the Pico Alto geothermal power plant, using geothermal resources available from the existing wells in the most efficient way possible. The design and manufacture of the ORC plant and the engineering, procurement and construction phases will be carried out by Exergy together with CME, a well-established international EPC company with headquarters in Lisbon, Portugal.

The resources, at high enthalpy and vapor and liquid phases, are exploited after the phases are separated. The use of the binary technology is preferable over the traditional flash power plants because this better fits the environmental constraints and it has more ability to adapt to variations in resource flow rates and pressures.

The plant will exploit the resource by means of an efficient cycle design that uses the heat available in the geothermal brine and in the steam flows within the heat exchangers. No extra water will be used, thanks to the direct air cooling of the working fluid. The highest possible conversion efficiency will be reached thanks to the Radial Outflow Turbine specifically designed for EDA Renováveis by Exergy's engineers.

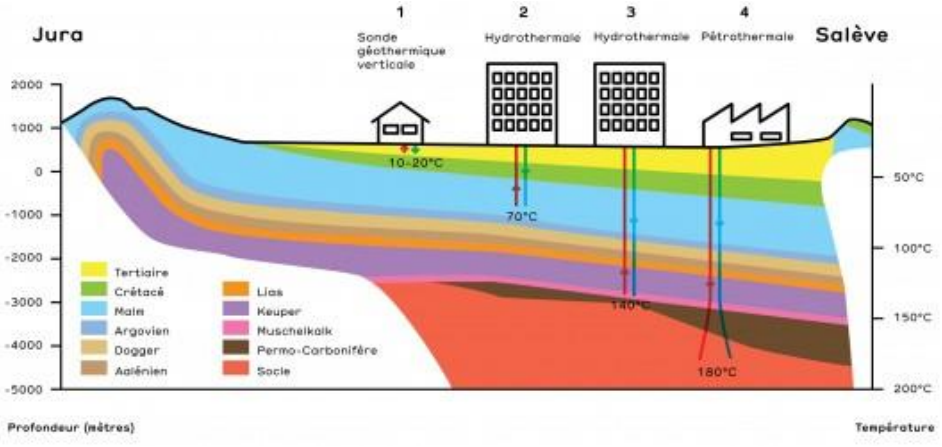
Source: http://futurenergyweb.es/exergy-signs-contract-with-eda-renovaveis-for-4-mw-geothermal-plant-in-portugal/?lang=en

Switzerland: Geneva is Exploring for Geothermal Sources

The canton of Geneva's utility company launched an ambitious exploration program to seek potential sources of geothermal energy in 33 municipalities. The program is part of the 20-million-franc (US$20.1) GEothermie 2020 project launched last year by the Services Industriels de Genève (SIG) to find naturally occurring sources of hot water beneath the earth's surface. Heat can be extracted from this water to power electrical power generators or to provide heating.

SIG said that initial tests last year in an eight-kilometer zone between the municipalities of Chancy and Bernex concluded that hot water is available in the Lake Geneva basin in limestone rock at levels more shallow than once thought —as little as 500 meters deep.

The exploration involves beaming sound waves into the earth to detect, in a manner similar to sonar imaging, where the areas of hot water are most readily accessed.



The work, which SIG stated will have no harmful impact on residents, will continue through November and will then resume next year with more targeted exploration.

SIG said the potential for geothermal energy is high in the country. The canton of Geneva estimates it could, over time, cover two-thirds of its heating needs through geothermal energy.

Geothermal energy is already used to heat more than 50,000 buildings in Switzerland, including individual homes, apartment buildings, offices and hotels. But attempts to develop larger geothermal projects by drilling boreholes into the ground have failed in the cities of Basel and Saint Gallen.

A planned power plant in Basel was scrapped in 2009 after earlier drilling triggered earth tremors. Saint Gallen also abandoned a geothermal project last year because of concerns about seismic risks.

Source: http://www.thelocal.ch/20151026/geneva-utility-launches-hunt-for-geothermal-sources

Turkey: New Binary Cycle Power Plant to Be Installed

Exergy announced the sale of a 24MW geothermal plant to Bestepeler Enerji Üretim Ticaret A.s., Project Company of Karizma Enerji. This company, with several geothermal licenses in Turkey, is part of Çevik Group, which deals with several businesses that include mining, marble production, energy, tourism and construction. The binary plant designed by Exergy will exploit a medium enthalpy geothermal fluid. It is characterized by two pressure levels, each equipped with a high-capacity Radial Outflow Turbine. The power plant is planned to be operational by the end of 2016. The plant will be built in the Exergy's facilities in Izmir, announced Celal Tugcu, managing director of Exergy Turkey A.S.

Source: http://www.pennenergy.com/articles/pennenergy/2015/11/exergy-sells27-mw-geothermal-plant-to-bestepeler-enerji-in-turkey.html?cmpid=EnlWeeklyPowerNovember132015&eid=291021978&bid=1233535

UK-Iceland: Plan to Power UK by Harnessing Iceland's Geothermal Resources

British Prime Minister David Cameron is poised to launch an ambitious project that could see Britain harnessing the power of Iceland's volcanoes within the next 10 years, according to *The Independent*. The plan would involve the construction of 750 miles (1200 km) of undersea cable, allowing the UK to exploit Iceland's renewable geothermal energy.

British officials said a new "UK-Iceland Energy Task Force" has been set up to examine the feasibility of the scheme and will report back in six months. The announcement came in late October after Prime Minister Cameron held meetings with his Icelandic counterpart, Sigmundur David Gunnlaugsson, before the Northern Future Forum summit in Reykjavik.

Landvirkjun, the National Power Company of Iceland, provides the following information on the IceLink project:

- The interconnector will be over 1000 km long, capable of transmitting 800-1,200MW of high voltage direct current (HVDC), connecting Iceland to GB, and offering bi-directional flows.

- IceLink will deliver a volume of more than 5 terawatt-hour of flexible renewable electricity per annum.

- It is expected that the total cost to the UK consumer will be competitive with other domestic low-carbon

alternatives.

- IceLink will deliver reliable and flexible energy into the GB system at times of thin supply margins.

- IceLink will allow energy to flow to Iceland at times of low hydro generation potential, e.g. due to unusually low precipitation levels.

In further news, it was reported that the financier behind the scheme expects the details of the financial support deal to be in place by next May. The power cable is expected to take at least seven to ten years to build, once construction starts, and the cost of the whole project is estimated at £5 billion (US$7.7 billion).

Sources:
http://www.independent.co.uk/news/uk/home-news/david-cameron-to-announce-plan-to-power-uk-by-harnessing-icelands-volcanoes-a6712961.html,
Global Geothermal News, 30 Oct 2015.

OTHER

Business: Toshiba Teaming up with Ormat Technologies

By mid-October, the Japanese Toshiba Corporation and the US-based company Ormat Technologies signed a Strategic Collaboration Agreement (SCA) to develop strategic opportunities for collaboration in the areas of geothermal power-generation systems and related equipment. Toshiba will collaborate with Ormat to build plants around the world from the ground up, bringing down project times and growing its involvement in previously thin markets. Ormat will handle all stages of geothermal plant construction, from taping geothermal resources to building facilities and producing and selling plant technology. The company operates a number of geothermal power plants around the world.

Ormat has produced roughly 12% of the world's installed geothermal power capacity, making it the fourth largest player in the market, Toshiba says. Ormat boasts strong sales of binary geothermal plants, which are able to draw power from relatively low-temperature fluid of around 100°C. Toshiba itself holds a 26% market share, making it the world's geothermal leader. The company focuses mainly on flash systems that use high-temperature steam to spin generator turbines.

Toshiba's business has so far been centered on the production and sale of turbines, generators and other plant components. Teaming with Ormat will enable Toshiba to provide its customers with drilling, geothermal resource evaluation and other initial services. By covering the beginning of the process along with plant construction and the production of equipment, Toshiba will be able to complete projects that would ordinarily take five years or more in half that time. The two companies aim to collaborate on projects in Latin America, Africa and other markets where Toshiba lacks a strong presence.

Under the terms of the agreement, the parties expect to offer potential customers a more competitive solution for comprehensive supplies and services related to geothermal developments, from resource assessment, field development, power plant engineering, procurement and construction (EPC) to power plant operation. Toshiba and Ormat's partnership will also let the companies respond to diverse demand by combining complementary technologies. Toshiba will use the partnership to raise its sales of plants combining binary and flash systems for more efficient power production. Such combined plants are gaining attention worldwide.

The first project expected to be implemented under this collaboration is the Menengai geothermal project in Kenya to be constructed and operated by the Ormat - Symbion Power LLC - Civicon Ltd Consortium, majority owned by Ormat. The parties have already initiated negotiations on the supply agreement and the plant design is at an advanced stage.

Annual sales by Toshiba's geothermal power business are thought to be around 20 billion yen to 30 billion yen (US$165 million to US$248 million), though the company does not release official figures. Toshiba aims to grow that number by 15% or more per year, using the Ormat partnership to roughly double sales by 2020. Ultimately, Toshiba is looking to raise its own share of the geothermal market to around 50%.

Sources:
http://asia.nikkei.com/Business/Trends/Toshiba-teaming-up-with-US-player,
http://investor.ormat.com/file.aspx?IID=4087066&FID=31452798

Financing: Goldman Sachs Lifted its Financing and Investment Goal in Clean Energies

US investment bank The Goldman Sachs Group Inc. said in early November it has lifted its clean energy financing and investments goal for 2025 to US$ 150 billion (€136bn). The new target was set in an update of the investment banking, securities and investment management firm's Environmental Policy Framework.

It expands a US$40 billion, clean-energy target announced in 2012.

As part of its efforts to contribute to a sustainable future, Goldman Sachs also aims to make US$2 billion in green operational investments by 2020 and source 100% renewable power for its global electricity needs. The updated framework also includes a plan to support the deployment of clean energy solutions to underserved markets to facilitate more equitable and affordable access through the launch of a Clean Energy Access Initiative. The bank will further focus on initiatives to facilitate capital for water, climate risk solutions and other environmental opportunities, and to develop innovative applications for green bonds.

Since 2006, Goldman Sachs has invested and financed US$65 billion in clean energy globally.

Source:
http://renewables.seenews.com/news/goldman-sachs-sets-2025-clean-energy-goal-at-usd-150bn-499941#

Debate: A 100% Renewable Goal is Achievable

By 2050, 139 countries will generate all the energy needed for homes, businesses, industry, transportation, agriculture—everything—from wind, solar and water power technologies, according to the work of Mark Jacobson and Mark Delucchi. Their national blueprints, released on middle November 2015, list the exact numbers of wind turbines, solar farms, hydroelectric dams and such that each of the countries would need to deploy to achieve this 100% renewable goal.

Jacobson, who talked in the past COP 21 climate meeting in Paris, is a civil and environmental engineering professor at Stanford University and director of the school's Atmosphere and Energy Program. He points out that although international agreements to reduce carbon dioxide emissions are worthwhile, they would not even be needed if countries switched wholesale to renewable energy, ending the combustion of coal, natural gas and oil that creates the vast majority of those emissions, and without any nuclear power. "The people there are just not aware of what's possible," says Jacobson.

Jacobson thinks the 139 national plans will get traction not only because they offer a path to lower emissions, but because, in total, they would create 24 million construction jobs and 26.5 million operational jobs, all spanning 35 years, offsetting 28.4 million jobs lost in the fossil fuel industries. That would leave a net gain of about 22 million jobs. Going 100% renewable would also prevent 3.3 to 4.6 million premature deaths a year through 2050 that would have happened because of air pollution from those fossil fuels. "These numbers are what get people's attention," Jacobson says.

Jacobson and Delucchi, a research scientist at the University of California at Davis, presented their '100 percent renewables' construct to the public for the first time in a 2009 feature article in *Scientific American*. It explained how the world could derive all of its power, including transportation, from 1.7 billion rooftop solar systems, 40,000 photovoltaic power plants, 3.8 million wind turbines, 900 hydroelectric plants, 490,000 tidal turbines, and so on. "The whole idea originated with the *Scientific American* article," Jacobson says. "Now there are five or six nonprofit organizations that use '100%' in their name. Walmart, Google and Starbucks have said they want to go to 100% renewable energy. So have a number of cities. The goal of our plans for U.S. states and the 139 countries is to have places set their own '100%' goals."

According to Jacobson and Deluchi, the energy demand across the 139 nations by 2050 would be met with a broad set of wind, water and solar technologies: 19.4% onshore wind farms, 12.9% offshore wind farms, 42.2% utility-scale photovoltaic arrays, 5.6% rooftop solar panels, 6.0% commercial rooftop solar panels, 7.7% concentrated solar power arrays, 4.8% hydroelectricity, and 1.47% geothermal, wave and tidal power. Jacobson, Delucchi and more than a dozen colleagues from around the world have posted the details, country by country, in a self-published paper they have released online.

The big problem with most renewables is their intermittence, but Jacobson has an answer. By using a smart mix of technologies that complement one another during different parts of the day and different weather conditions, energy storage can be kept to a minimum. He, Delucchi and two colleagues explain how this can work across the U.S. in a paper in the Proceedings of the National Academy of Sciences published on November 23. The blueprints for all 50 US states are available at The Solutions Project website: http://thesolutionsproject.org/.

The engineering detail in all these papers and plans is staggering. The document released for the 139 countries provides an itemized mix of technologies and costs for every nation, as well as how much land and rooftop area would be required. Since 2009 the two researchers, working with many others, have honed the numbers again and again. Now what is needed most, Jacobson says, is exposure. "We have talked to hundreds of expert and politicians. Now we need to reach hundreds of millions of people," in hopes that they will see the possibilities and begin to call for them.

Source:
http://www.scientificamerican.com/article/139-countries-could-get-all-of-their-power-from-renewable-sources1/

Technology: New Process Uses High Voltage for Deep Geothermal Drilling

Drilling activities can account for up to 90% of the investment costs in geothermal projects. Existing commercial drilling methods, however, advance slowly through crystalline, hard rocks and the drill bits wear out quickly. Scientists at Dresden University of Technology in Germany are developing an alternative drilling procedure using a high-voltage impulse that fragments the rock. This method causes little wear to the drill bits and can enable up to 30% lower drilling costs. Every technical improvement and cost reduction in the drilling process brings new geological heat reservoirs within economic reach.

When drilling with the electric impulse process (EIP), two electrodes are positioned below ground on the rock layer. Through them, 400-kV impulses are shot into the rock. In the impulse's breakdown channel, the pressure and temperature within the rock increase and the rock breaks up. The resulting drill cuttings are removed by a non-conductive drilling fluid. The EIP drill bit has been successfully tested on a test stand under wellbore-like conditions. The aim of the ongoing follow-up project is to develop a complete drilling system and to test it in a real borehole.

More information about the BINE Projektinfo can be found in the brochure "Electric impulses fragment hard rock", accessible at:

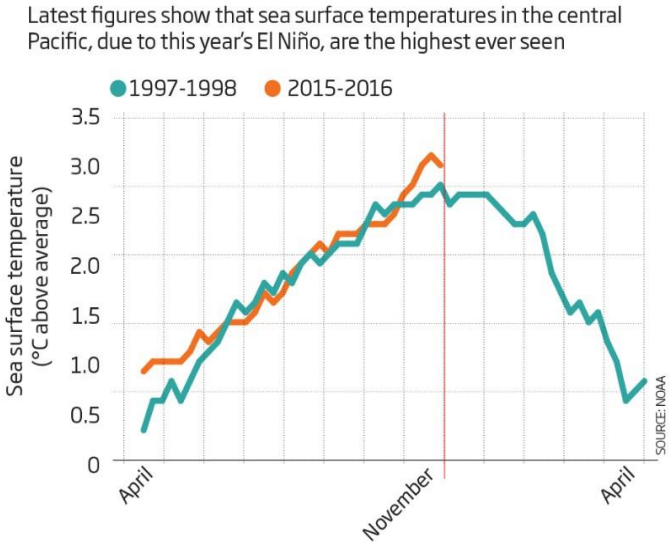
http://www.bine.info/fileadmin/content/Presse/Projektinfos_2015/PM_13_2015/ProjektInfo_1315_engl_internet.pdf

Climate Change: Are human activities the main cause of global warming?

Shaun Lovejoy (McGill University, Montreal, Canada), using a scientific (i.e., statistical) approach shows that the only viable explanation of global warming is that is largely caused by human activities, rejecting the deniers' hypothesis that it is simply a giant, natural fluctuation. A short summary of the study can be found at: https://eos.org/opinions/climate-closure

Climate Change: Records of High Temperatures and El Niño Impacts in 2015

The strongest El Niño ever recorded - The current extreme El Niño is now the strongest ever recorded, smashing the previous record from 1997-8. Already wreaking havoc on weather around the world, the new figures mean those effects will probably get worse. Climate change could be to blame and is known to be making the extreme impacts of El Niño on weather more likely.



Graph showing the sea surface temperatures in the central Pacific. In November 18 2015 ocurred the highest ever seen due to El Niño. Graph by NOAA, taken from The New Scientist.

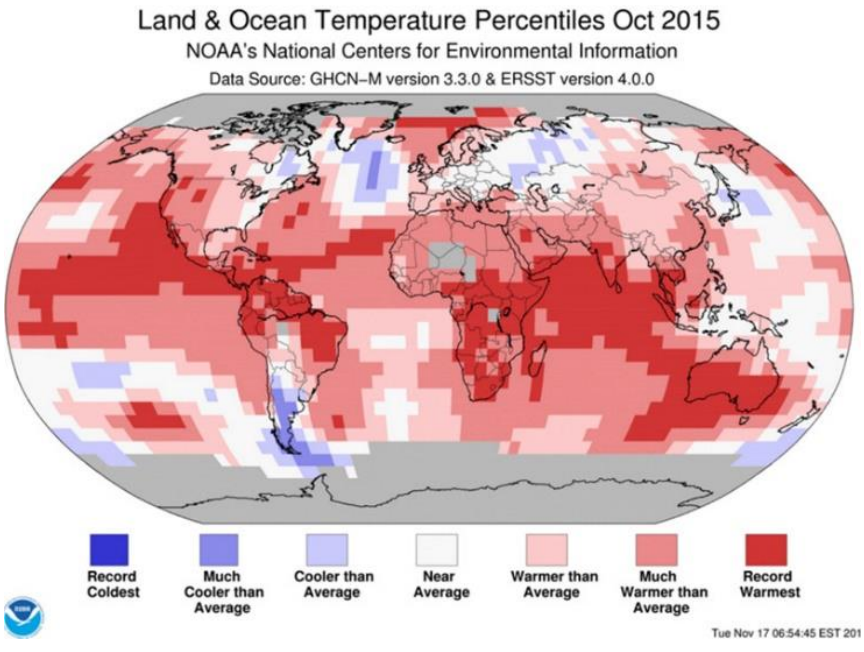
The 1997-8 El Niño killed 20,000 people and caused almost US$97 billion of damage as floods, droughts, fires, cyclones and mudslides ravaged the world. Now the current El Niño has surpassed the 1997-8 El Niño on a key measure, according to the latest figures released by the US National Oceanic and Atmospheric Agency (NOAA). This key measure of its intensity is the warmth of water in the central Pacific. In 1997, at its peak on 26 November, it was 2.8°C above average. According to the latest measurements, it reached 2.8 °C on 4 November 2015, and went on to hit 3.1°C on 18 November –the highest temperatures ever seen in this region.

El Niño occurs when warm water that has piled up around Australia and Indonesia spills out east across the Pacific Ocean towards the Americas, taking the rain with it. The temperatures in the central Pacific have the biggest impact on the global atmospheric circulation, and therefore the biggest impacts on global weather.

El Niño has been implicated in a host of extreme weather events across the globe. Combined with global warming, it's partly responsible for 2015 being the hottest year on record. In India, more than 2000 people died in a heat wave where temperatures topped 40°C, caused by a delayed monsoon –an effect of El Niño. Now the region is experiencing unusually heavy rains as the monsoon has finally arrived –also an expected impact of El Niño. Heavy rainfall has sparked flooding in Africa and South America, with countries receiving a month's rain in a day. Dry conditions brought forest fires in the US and tropical storms, including October's Hurricane Patricia, the strongest ever to make landfall. El Niño is also probably making record-breaking illegal fires in Indonesia worse by reducing rainfall in that country. And in some Pacific Islands, water levels have dropped so much that coral reefs are exposed, in a phenomenon known as Taimasa, Samoan for "smelly reef". Across the globe, the El Niño has also begun a mass coral bleaching.

And once the El Niño is over, it might not be time for celebration, since it's likely to be followed by a strong La Niña, which will bring roughly the opposite effects to the world's weather. La Niña's also expected to be about twice as common as a result of climate change this century.

Source:
https://www.newscientist.com/article/dn28595-massive-el-nino-sweeping-globe-is-now-the-biggest-ever-recorded/?cmpid=NLC%7CNSNS%7C2015-1012-GLOBAL&utm_medium=NLC&utm_source=NSNS



October 2015 'Warmest on Record' – Data released in November 2015 from the US climate agency, the National Oceanic and Atmospheric Administration (NOAA), indicates October 2015 was the warmest month in 136 years, i.e. since records began, continuing a record-breaking trend this year and adding a layer of urgency to a new UN deal. It was the sixth consecutive month a monthly global temperature record has been broken and the "greatest departure from average for any month in the 1,630 months of record keeping" NOAA reported.

The month recorded temperatures 0.74°C above the 20th century average of 14°C when both land and sea measurements were taken into account. "The record high October temperature was driven by warmth across the globe over both the land and ocean surfaces and was fairly evenly distributed between the Northern and Southern Hemispheres," according to a NOAA annual review. October global, sea-surface temperatures reached 0.62°C above the global average.

Source:
http://www.climatechangenews.com/2014/11/20/october-2014-warmest-on-record-noaa/

2015, the Warmest Year in History - 2015 is poised to be the warmest in recorded history, according to the World Meteorological Organization (WMO). Man-made climate change and a strengthening El Niño are set to ensure world surface temperatures reach 1°C above pre-industrial levels in 2015. "2015 is likely to be the hottest year on record, with ocean surface temperatures at the highest level since measurements began," said Michel Jarraud, head of the Geneva-based agency in a statement. "This is all bad news for the planet."

Temperatures have breached a "symbolic threshold," the WMO warned. Levels of greenhouse gases caused by burning fossil fuels passed a barrier of 400 parts per million for the first time this year, it said. A strengthening El Niño led scientists to determine 2015 will make history. "The overall warming impact of this El Niño is expected to continue into 2016," Jarraud added. Estimates based on data from January to October show average temperatures this year to be 0.73°C above the 1961-1990 average of 14°C, and about 1°C above the pre-industrial period of 1880-1899. Warmer temperatures have fueled extreme weather around the globe, according to the agency.

Source:

http://www.climatechangenews.com/2015/11/25/world-headed-for-hottest-year-on-record-wmo/

Climate Change: Main Outcomes of COP 21

On 12th December 2015, the twenty-first session of the Conference of the Parties (COP 21), assembled in Paris from November 30 to December 11, adopted the Paris Agreement under the United Nations Framework Convention on Climate Change, requested the Secretary-General of the United Nations to be the Depositary of the Agreement and to have it open for signature in New York, US, from 22 April 2016 to 21 April 2017. The Secretary-General was invited to convene a high-level signature ceremony for the Agreement on 22 April 2016. The document stating the adoption of the agreement is composed of 140 clauses in 19 pages, with the Paris Agreement attached as an Annex of 29 Articles and 31 additional pages.

Thus 13 frantic days were ended of discussions and intense negotiations among the delegates from nearly 200 countries in the official forum and in another set of parallel activities developed in the several forums comprising side events. A deal to attempt to limit the rise in global temperatures to less than 2°C was finally agreed upon, the first to commit all countries to cut carbon emissions. The agreement is partly legally binding and partly voluntary. Earlier, key blocs, including the G77 group of developing countries, and nations such as China and India said they supported the proposals.

The Paris Agreement acknowledges the need to promote universal access to sustainable energy in developing countries, in particular Africa, through the enhanced deployment of renewable energy. Measures in the agreement include:

- To peak greenhouse gas emissions as soon as possible and achieve a balance between sources and sinks of greenhouse gases in the second half of this century.

- To keep global temperature increase "well below" 2°C and to pursue efforts to limit it to 1.5°C.

- To review progress every five years.

- To allot US$100 billion a year in climate finance for developing countries by 2020, with a commitment to further finance in the future.

More than 100 countries vulnerable to the impacts of global warming were pushing for a 1.5°C limit at UN negotiations. That is necessary to prevent low-lying islands being swallowed by rising seas and African farmers facing frequent drought and food shortages. But this required a total phase-out of fossil-fuel use worldwide by 2025-30, scientists have warned, followed by large-scale use of negative emissions technology.

However, Germany and France backed the 1.5°C global warming limit. At a press conference on the sidelines of the COP 21 summit, Jochen Flasbarth said that the official German position was 1.5°C and it "must be mentioned" in a UN treaty. France president Francois Hollande also asserted that global warming should be limited to 1.5°C "if possible" in his speech to world leaders.

The deal has been deemed without parallel in terms of climate change or of the environment, since it sets out a clear, long-term temperature limit for the planet and a clear way of getting there. It includes money for poor countries to adapt and a strong review mechanism to increase ambition over time, which seems to be critical if the deal is to achieve the aim of keeping warming well below 2°C. "More than anything, the deal signifies a new way for the world to achieve progress –without it costing the earth. A long term perspective on the way we do sustainability is at the heart of this deal. If it delivers that, it truly will be world changing", summarized Matt McGrath for the BBC.

Christiana Figueres, Ban Ki Mon and the French President Francois Holland during the closing of the COP (Photo by Reuters, taken from http://www.bbc.com/news/science-environment-35084374).

Sources:
http://www.climatechangenews.com/2015/12/07/scientists-1-5c-warming-limit-means-fossil-fuel-phase-out-by-2030/,
http://www.climatechangenews.com/2015/12/03/germany-and-france-back-1-5c-global-warming-limit/,
http://www.bbc.com/news/science-environment-35084374

As part of the COP 21 aftermaths, the EU's Climate Action and Energy Commissioner, Miguel Arias Cañete, said the historic accord was the "first-ever truly global climate deal". He said also that the European Union will stick to its goal to cut emissions by at least 40% by 2030

for the moment, and any decision to change that will not be taken till after 2020. That goal is linked to the EU's long-term target to cut emissions by at least 80% on 1990 levels by 2050.

In addition, a group of 114 companies announced they will cut their carbon footprint in line with science-based advice. The group, called the Science Based Targets Initiative, is a joint effort of the World Resources Institute, WWF, the Carbon Disclosure Project and the United Nations. The group of 114 companies setting science-based targets includes Acciona, China Steel Corporation, Eneco, Enel, Gas Natural Fenosa, Iberdrola, National Grid, NRG Energy and SSE, as well as non-energy sector companies such as Coca-Cola, Commerzbank, Danone, GlaxoSmithKline, Hewlett-Packard, IKEA, Kellogg, Proctor & Gamble, Sony, Unilever and Walmart.

From that group, 10 member companies including Enel, NRG Energy, Proctor & Gamble and Sony have already set targets to cut their emissions from operations by 799 million mt of CO_2 equivalent by 2030, equivalent to 1.86 billion barrels of oil not burned.

Sources: http://www.platts.com/latest-news/electric-power/brussels/eu-to-stick-to-40-co2-cuts-by-2030-after-paris-26310200?utm_campaign=epgl201512-snapshot-cop21&utm_medium=email&utm_source=eloqua, http://www.platts.com/latest-news/electric-power/paris/paris-2015-114-companies-commit-to-science-based-26303865?utm_campaign=epgl201512-snapshot-cop21&utm_medium=email&utm_source=eloqua

On the other hand, the International Renewable Energy Agency (IRENA) Director-General Adnan Z. Amin issued a statement after the adoption of the Paris Agreement. In this statement, Amin said that "IRENA welcomes the Paris Agreement as a watershed for the global energy transition. Renewable energy has made remarkable progress in the last decade. Combined with energy efficiency, it provides an immediate, viable and affordable solution to the challenge of climate change. But to meet the ambition set forth in the Agreement, accelerating the deployment of renewable energy across all sectors must start now. In January 2016, we will welcome global energy leaders at the 6th Session of the IRENA Assembly to move the Paris Agreement to the next phase, setting the global renewable energy agenda and establishing a blueprint for action to meet climate goals and set the world on a path to a sustainable energy future."

Source: http://www.irena.org/News/Description.aspx?NType=A&mnu=cat&PriMenuID=16&CatID=84&News_ID=439#sthash.wKKaPWNU.dpuf

International: GGE Officially Launched in the COP 21

Thirty-six countries gave the official start to an initiative to promote geothermal energy in developing economies as a cleaner alternative to oil, gas and coal. The Global Geothermal Alliance (GGE), launched on the sidelines of the UN climate talks in Le Bourget, aims at a sixfold increase in geothermal electricity production and a tripling of geothermal-derived heating by 2030.

The alliance said its members will seek to overcome "political uncertainty" about geothermal and strengthen the industry's skills base. Members include countries on thermal "hotspots" in Africa, Southeast Asia and Latin America, ranging from Kenya and Tanzania to Malaysia, the Philippines and Guatemala.

Obstacles to geothermal development are the high cost of drilling and risks entailed in the exploration phase. "Geothermal energy development particularly in developing countries faces important challenges," the alliance said. "Due to risks related to geological drilling during the exploration phase, along with the associated costs, financing the early stage of the process is limited to investors that understand and accept the possible associated risks."

The GGE launched the following ***Joint Communiqué***

On the occasion of the 21st Meeting of the Conference of the Parties of the United Nations Framework Convention on Climate Change, we, Members and Partners of the Global Geothermal Alliance:

- Note that geothermal energy is a proven clean energy technology that provides stable and affordable electricity and offers flexibility and direct use of geothermal heat in domestic, commercial and industrial sectors, yet the modest pace of its deployment hinders reaping the potentially game changing benefits of geothermal technologies.

- Note that despite the vast global geothermal energy potential, with identified resources in nearly 90 countries, only 24 of those countries are producing geothermal electricity, corresponding to around six percent of the estimated global geothermal power potential.

- Acknowledge that policy uncertainty, a shortage of skilled professionals, environmental concerns, licensing delays, and timely development of dedicated long-distance transmission infrastructure, as well as a lack of awareness and limited information about geothermal technologies, are preventing wider adoption of geothermal energy.

- Further acknowledge that the main obstacle remains the high upfront costs of drilling and risks associated with the uncertainties from the exploration phase.

- Recognise that a global platform that facilitates enhanced dialogue, cooperation and coordination among the key stakeholders can spearhead collaborative action that is essential to overcome hurdles for accelerated geothermal development.

Therefore, we join forces in the Global Geothermal Alliance as a platform for enhanced dialogue and knowledge-sharing within the constituency as well as for coordinated action to increase the share of installed geothermal electricity and heat generation worldwide.

We will focus our efforts towards realising geothermal energy potential to achieve a five-fold growth in the global installed capacity for geothermal power generation and two-fold growth for geothermal heating by 2030.

We call on all stakeholders to support our efforts to realise this global geothermal potential.

Members in the Global Geothermal Alliance: Burundi, Comoros, El Salvador, France, Guatemala, Iceland, Indonesia, Italy, Kenya, Malaysia, Mexico, Netherlands, New Zealand, Nicaragua, Pakistan, Papua New Guinea, Philippines, Poland, Saint Vincent & Grenadines, Solomon Islands, Switzerland, Tanzania, Tonga, Turkey, Uganda, United States of America, Vanuatu, Zimbabwe.

Partners in the Global Geothermal Alliance: African Development Bank, African Union Commission, AGH University of Science and Technology (Poland), Eastern Africa Power Pool, Energy Institute Hrvoje Pozar (Croatia), Energy Institute of Hungary, European Geothermal Energy Council, Iceland GeoSurvey ISOR, International Geothermal Association, International Renewable Energy Agency, NEA of Iceland, New Partnership for Africa's Development, Nordic Development Fund, Serbian Geological Society, Secretariat of the Pacific Community, Southern Africa Power Pool, United Nations Environment Programme, United Nations University – Geothermal Training Programme, US Geothermal Energy Association, World Bank – Energy Sector Management Assistance Program.

Sources:
http://www.capitalfm.co.ke/business/2015/12/36-countries-launch-world-alliance-for-geothermal-energy/,
https://cop20.files.wordpress.com/2015/07/irena_cop21_gga_2015_web1.pdf,
http://www.irena.org/EventDocs/GGA%20Joint%20Communique_COP21.pdf

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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Application for membership

Please complete the following form and return it with payment to:
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Tel.: +49 (0)234 32 10712; Fax: +49 (0)234 3214809
E-mail: iga@hs-bochum.de
IGA Home Page: www.geothermal-energy.org
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❒ Enrol me as a new member of IGA
❒ Renew my membership to IGA
Dr Mr Mrs Ms (circle)
Family name _____
First name _____
Profession _____
Organization _____
Address ❒ Work ❒ Home
_____
_____
Phone (area code) _____
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Note: The information you provide will be held on the IGA database. It will be used to update you on the activities of the Association, and may be changed or cancelled at any time upon your request. It will be included in the IGA Directory, which may be circulated in printed or electronic form to IGA members only. If you do not wish your details to be used for this purpose, please tick the box (in which case your name will not be printed in the IGA Directory) ❒

Membership category
❒ Individual – USD 40
❒ Student – USD 10
❒ Corporate – USD 500
❒ Institutional – USD 500
❒ Sustaining: individual – USD 100
❒ Sustaining: corporate – USD 1000
Representatives of Corporate and Institutional members:
Contact person _____
Second person _____
Third person _____
Payment
There are three ways to make payment to IGA:
1. Credit card
❒ Master Card
❒ American Express
❒ Visa
Card # _____
Expiration date _____
Signature _____
Date of signature _____

2. Bank draft.
3. International Wire Transfer in US$ to the International Geothermal Association
Please notify the Secretariat by fax or e-mail when you wire funds.
Bank: Helaba
Address: Friedrichstr. 74
40217 Duesseldorf, Germany
Account # 1007100413
SWIFT: WELADEDD
IBAN: DE77 3005 0000 1007 1004 13

2014 dues USD _____
2015 dues USD _____
2016 dues USD _____
Contribution USD _____
TOTAL USD _____
These financial data will not be stored on a database, and will not be recorded in any electronic form.

Rates for advertising in IGA News

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

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