IGA NEWS

Newsletter of the International Geothermal Association

Quarterly No. 104

IGA ACTIVITIES

Message from the President

Dear IGA member:

Welcome to the 104th IGA News. I've had many opportunities during my travels in the last month, to observe and participate in many renewable energy conversations, and to gauge attitudes to renewable energy in general.

Renewable energy is becoming an increasingly important part of international, ministerial-level conversations. Barriers to renewable energy developments are being addressed, not just spoken to. The World Bank's ESMAP group has produced a Global Geothermal Development Plan (http://www.esmap.org/Global%20Geothermal%20Development%20Plan) that focuses on identifying and reducing financial and technical hurdles to geothermal development. To date, eleven countries have benefited from technical assistance. At the 3rd GGDP Roundtable meeting in Reykjavik in April, representatives from 12 countries presented on financing geothermal exploration and development. EnergyAccessX, an initiative of the Clean Energy Ministry 7 meeting (http://www.cleanenergyministerial.org/Events/CEM7/Initiative-Events) in San Francisco, identified national policy and regulation as major obstacles to renewable energy projects. National policy-level discussions are making a real difference, and changes happen.

The third Iceland Geothermal Congress was held on 26-29th April. Over 740 delegates from 46 countries participated in the event. The conference had three main themes: Operability – Plant and field management, and solutions; Feasibility – Funding, policy, and case studies; and Practicality – Direct and cascade use projects. Iceland is a country of geothermal experts, and it was a pleasure to be at this conference which featured many technically interesting and innovative ideas. It was also inspiring that three of the four opening session speakers were women, and all the conference sessions were chaired by women.

In the spirit of Icelands leadership with respect to gender equality, I want to recognise three Māori women, who are significant contributors to the New Zealand geothermal industry. Ms Aroha Campbell, Chief Executive of Tauhara North No. 2 Trust is consider

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the key driver behind the successful development of geothermal projects on the trusts land, including the Nga Awa Purua 138 MW geothermal power station. The economic benefits of which, has enabled significant investment in wellbeing initiatives for the owners and descendants of the trust. Ms Campbell was recognised with the Queens Service Medal in December 2014 for her service to iwi and Maori land trusts.

Dr Charlotte Severne, Deputy Vice Chancellor for Māori, Lincoln University (NZ) was the first Māori woman to graduate with a PhD in geothermal science. In June, Dr Severne was recognized for her efforts in the Queens Birthday Honours, and received the Officer of the New Zealand Order of Merit for her services to science and Māori.

Ms Tina Porou, Head of Sustainability at Contact Energy, was also recognized in the Queens Birthday Honours, and became a Member of the New Zealand Order of Merit for her contributions to Māori and the environment.

These women exemplify commitment to their people and the geothermal industry, which benefits all of us. I salute them.

Mrs Aroha Campbell, QSM.

Dr Charlotte Severne, ONZM.

Ms Tina Porou, MNZM.

Regards to all,

Juliet Newson, President
International Geothermal Association

63rd IGA BoD Meeting and Iceland Geothermal Conference (IGC)

The IGA Board meeting No. 63 took place in Reykjavik, Iceland on 29-30 April 2016, immediately after the Iceland Geothermal Conference (IGC). The topics discussed included the IGA Board elections (*see* note below), bylaws amendments, the continuation of the IGA strategy discussion started in Morelia in October 2015, the election of the Steering Committee for the World Geothermal Congress (WGC) 2020, and a visit to the Harpa Conference Centre, where WGC 2020 will be held.

Twenty-two members of the Board of Directors attended the meeting. They were: Rolf Bracke, Paul Brophy, Albert Genter, Lúdvik S. Georgsson, Luis C.A. Gutiérrez-Negrín, José Luis Henríquez, Herman Darnel Ibrahim, Beata Kapinska, Juliet Newson, Bjarni Pálsson, Zonghe Pang, Abadi Poernomo, Paul Quinlivan, Arni Ragnarsson, Alexander Richter, Paolo Romagnoli, Bruno Della Vedova, Alison Thompson, Shigeto Yamada, Sadiq Zarrouk, Meseret Teklemariam Zemedkun and Roland Horne. Also attending were: Horst Rüter (Managing Director of the IGA Service Company, IGA SC), Andy Blair (WING representative), Marietta Sander (IGA Executive Director) and Karolina Andersson (IGA Assistant).

On May 1st, most of the BoD members who attended the meeting participated in a day-long fieldtrip to northeastern Iceland whose main purpose was to visit the site where the new Theistareykir geothermal power plant is being constructed by Landsvirkjun, the Icelandic National Power Company that was created 50 years ago. The trip started at the Reykjavik domestic airport to fly up to Akureyri from where the group was taken to the unique landscape of Lake Myvatn, and to the Krafla and Theistareykir geothermal fields. The trip included a visit of the Myvatn Natural Baths and a short spin on snow scoters. The group returned to Reykjavik in the evening.

The 2016 Iceland Geothermal Conference attracted around 700 participants from 50 countries, and was the largest geothermal event ever held in Iceland. The IGC, held in Reykjavik, comprised four days of insightful presentations and speakers that covered critical geothermal development issues. Keynote speakers included Lilja Alfredsdóttir, Minister for Foreign Affairs of Iceland; Rachel Kyte, CEO & Special Representative of the UN Secretary General for Sustainable Energy for All; Dr. Hördur Arnarson, CEO of Landsvirkjun; Ásgeir Margeirsson, CEO of HS Orka; Prof. Michael Porter of Harvard Business School, Adnan Z. Amin, Director General of IRENA, and Ólafur Ragnar Grímsson, the President of Iceland, who gave the final speech. With over 30 side events, including one hosted by the *Women In Geothermal* (WING) group, paired with a networking dinner, IGC provided a great environment to generate discussions on important geothermal topics. The IGA Secretariat had a booth at the IGC and contributed with five interesting international coffee break/lunch break talks at the venue. There were a number of field trips to geothermal power plants and district heating installations, and to the Reykjanes Geothermal Resources Park.

Some of the Board members attended and contributed to the WB ESMAP Global Geothermal Development Plan: Roundtable 3, held in Reykjavik from 25-26 April. Juliet Newson presented the keynote on 'Geothermal Markets, Financing and Technology Trends'. The Roundtable provided a platform for donors, multilateral financing institutions, government officials, industry experts and practitioners.

As the World Geothermal Congress 2020 will be held in Iceland, the IGA WGC2020 Steering Committee used the opportunity to meet the Icelandic WGC2020 Organizing Committee on site on 2nd May, subsequent to the exciting geothermal week.

Sources:
http://icelandnaturally.com/article/recap-iceland-geothermal-conference-april-26-29-2016,
http://www.geothermal-energy.org/publications_and_services/news/article/iga-board-in-reykjavik-iceland.html

Board members and companions during the field trip to the Theistareykir geothermal field, in northern Iceland.

IGA Geothermal Expert & Company Pool

Marietta Sander, IGA Executive Director

In late April, the IGA launched its Geothermal Expert & Company Pool, an online tool aimed to help project developers, geothermal companies, development partners, international organizations to find suitable personnel fast and directly. Geothermal experts and companies are invited to register their profiles with the IGA via the online registry: http://www.geothermal-energy.org/iga_service_gmbh/geothermal_expert_pool.html.

The search function allows online searches of the consultant and company database for by the following categories: (a) Country where the expert resides; (b) Key expertise; and (c) Language skills. By the end of June 2016, nearly 100 geothermal experts from a range of countries registered their profiles in the IGA Geothermal Expert & Company Pool.

Over the last years, the need for a matchmaking platform was expressed by project developers, government representatives, development banks, international organizations, regional commissions and IGA members, all in need for consultants with specific expertise. Thus, the IGA created the geothermal expert pool with the aim of providing hints on geothermal expertise for the geothermal industry, project developers and govern-mental institutions.

IGA herewith wishes to open networking and recruitment opportunities for entities in need of consultants, and for geothermal companies and consultants looking for short or long term business/employment opportunities. It is hoped this matchmaking platform will help partners to recruit suitable personnel fast and directly.

The IGA Geothermal Expert & Company Pool is filled in by consultants and companies. The details marked with a star (*) need to be filled in by the applicant and are displayed on the website. Other information is optional. The applicants can upload technical papers, CV and photo, which then will be made also visible to website users.

In case an applicant does not wish his/her name and other mandatory details to be displayed, he/she can add a comment or send an e-mail to iga@hs-bochum.de explaining the reason(s) of the request. It is understood that people in employment do not wish their employers to see their profile displayed online. IGA will then impersonalize the profile and only publish certain details to others after the applicant's written approval.

The applicant has two options to register, either by filling out the online form or by downloading the application form (a Word document). To register online, please follow the link: http://www.geothermal-energy.org/iga_service_gmbh/geothermal_expert_pool.html.

Election of the New IGA Board of Directors for the Period 2016-2018

According to the Article 8 of IGA's bylaws, the Board of Directors (BoD) is the governmental body of the Association and consists of a minimum of 20 and a maximum of 30 elected members, plus its past President. They hold office for a term of three years and are elected amongst the membership by ballot. The election is carried out by the Secretariat under the supervision of the IGA's Secretary. The same article provides that no elected member of the Board can serve more than two consecutive three-year terms. Once elected, the new BoD enters into office at the end of the Annual General Meeting (AGM) following its election, and then selects the President, the Vice-President, the Secretary, the Treasurer and the chairs of the Permanent Committees from its members.

Since May 20th the online voting platform for the Board election has been accessible to the membership, and is open until Tuesday, 19 July, 12 pm CEST. The IGA's Nominating Committee, which is one of the Permanent Committees, assembled a final list of 43 candidates from several countries, whose photos and statements were displayed online. The candidates ares displeyed in alphabetical order:

Bjarni Bjarnason (Iceland)
Andy Blair (New Zealand)
Rolf Bracke (Germany)
Paul Brophy (USA)
Jane Brotheridge (New Zealand)
Louis Capuano, Jr (USA)
Varun Chandrasekhar (India)
Gustavo Cuéllar (El Salvador)
Bruno Della Vedova (Italy)
Surya Dharma (Indonesia)
Ariel D. Fronda (Philippines)
Albert Genter (France)
Lúdvík S. Georgsson (Iceland)
Marek Hajto (Poland)
Markus O. Häring (Switzerland)
Colin Harvey (New Zealand)
José Luis Henríquez Miranda (El Salvador)
Li Hongying (China)
Georgina Izquierdo-Montalvo (Mexico)
Liu Jiurong (China)
Beata Kępińska (Poland)
Kristín Vala Matthíasdóttir (Iceland)
Peter Meier (Switzerland)
George Melikadze (Georgia)
Abraham III Molina-Martínez (Mexico)
Diego Morata (Chile)
Paul Moya (Costa Rica)
Ali Mundakir (Indonesia)
Paul Mustakim (Indonesia)
Peter Omenda (Kenya)
György Pátzay (Hungary)
Abadi Poernomo (Indonesia)
Alexander Richter (Iceland)
Horst Rüter (Germany)
Andrew Sabin (USA)
Noel Salonga (Philippines)
Saulius Sliaupa (Lithuania)
Valentina Svalova (Russia)
Gábor Szita (Hungary)
Toshihiro Uchida (Japan)
Massimo Verdoya (Italy)
Shigeto Yamada (Japan)
Sadiq J. Zarrouk (New Zealand)

The new Board of Directors will commence their work in October 2016, after the 2016 AGM to be held in Addis Ababa, Ethiopia, at the end of October. There, the current and the new BoDs will meet.

Invitation to the IGA Annual General Meeting (AGM)

The 2016 AGM will be held in Addis Ababa, Ethiopia, most likely on 30 October 2016 (specific date and location will be confirmed closer to time). It is organized in close partnership with the ARGeo C6 regional geothermal conference (http://theargeo.org/C6/). The IGA Board of Directors wishes to take this opportunity to inform you about IGA activities over the last year and offer room for information exchange with IGA members. The 2016 AGM will be held jointly with the 64th and 65th Board of Directors meeting. According to Article 12 of Bylaws, the general agenda of the AGM will be as follows:

1. Minutes of the preceding AGM.

2. Annual report of the Board of Directors.

3. Audited financial statement.

4. General business.

The AGM is open to all IGA members. If you plan to attend the meeting, please send a message to Marietta Sander, the IGA Executive Director, to IGA@hs-bochum.de.

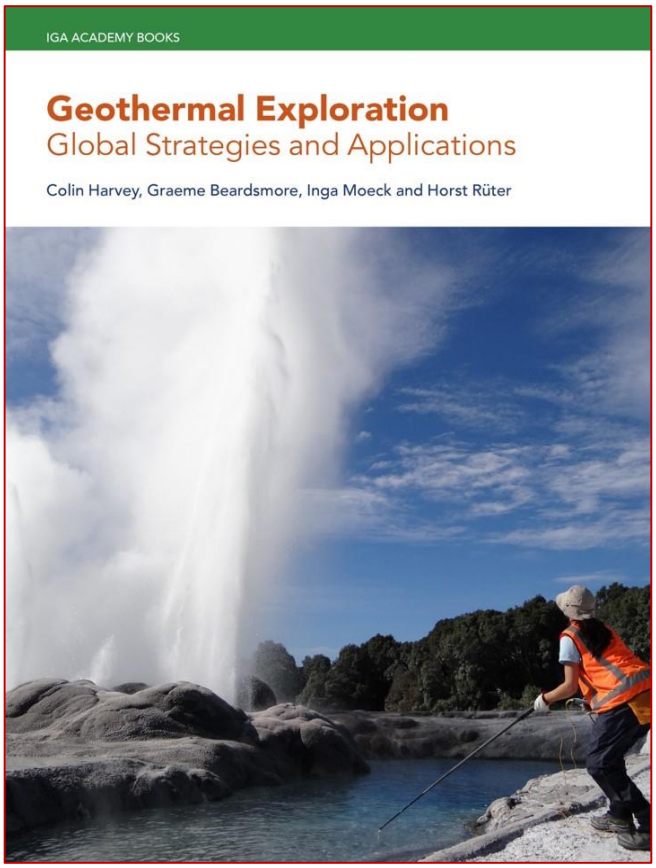
IGA Academy: Call for Lecturers

The IGA Academy is looking for geothermal specialists who would like to offer academic or technical geothermal courses on behalf of the IGA Academy. The IGA Education Committee and the IGA Secretariat will review all the applications received, to ensure that the IGA Academy will only offer courses led by highly qualified lecturers. The pool of lectures and their fields of expertise will be the basis for the upcoming IGA Academy Course Program. Some courses will be offered in cooperation with international universities and shall be evaluated for future certification and accreditation. If you would like to apply to become a lecturer on behalf of the IGA Academy, please feel free to apply via the following website: http://www.geothermal-energy.org/iga_academy/geothermal_experts.html?no_cache=1.

IGA's New Textbook on Geothermal Exploration

Geothermal Exploration, Global Strategies and Applications, is a 200-page textbook on geothermal that is about to be published by the IGA/IGA Academy; it contains useful information on exploration methods and strategies. It is authored by Colin Harvey, Horst Rüter, Graeme Beardsmore and Inga Moeck.

The new book arose from an initial request from the International Finance Corporation (IFC) division of the World Bank, which was seeking a guide to geothermal exploration to assist both developers and funding agencies in reducing the risk of geothermal exploration throughout the world. Two versions of the *Best Practices Guide for Geothermal Exploration* were published in 2013 and 2015, and were made freely available through the IGA and IFC websites.



It responds to a desire of the IGA and the Geothermal Academy at the Bochum University of Applied Science to produce a textbook to use in geothermal training programs throughout the world. This book would not have been possible without funding support from the IGA and the U.S. Department of Energy (DOE).

The textbook introduces the subject of geothermal energy, its development around the world and defines a series of 'geothermal play types' based on geologic setting. It presents strategies and methodologies appropriate for each play type to move a geothermal exploration program to the stage of committing to exploration drilling. These methodologies include permitting, environmental, geology, geochemistry, geophysics and remote sensing techniques routinely used throughout the world for specific play types. The

book covers a large number of geoscientific techniques and focuses on their applications to both convective and conductive geothermal systems, with extensive references to the international literature.

The authors of the 2nd Edition of the *Best Practice Guide for Geothermal Exploration* (2014) have renewed their association to prepare this text book. Dr. Colin Harvey from New Zealand has an extensive background in geothermal exploration in over 25 countries for over 30 years. Prof. Ing. Dr. Horst Rüter from Germany is an expert in geophysical exploration. Dr. Graeme Beardsmore has managed a geothermal exploration company in Australia for a decade and has chaired the IGA's Reserves and Resources Committee for the past 6 years. Prof. Dr. Inga Moeck chairs currently the section Geothermics at the Leibniz Institute for Applied Geophysics in Hannover, Germany and holds a professor position in Geothermal Exploration at the Bochum University for Applied Sciences.

Call for Voting on IGA Bylaws Amendment

Marietta Sander, IGA Executive Director

At the IGA's BoD meeting held in Reykjavik, Iceland on 29 April 2016, the following bylaws amendments were proposed and are herewith tabled to all IGA members. Motion 63-2 was carried by the IGA Board and reads as follows:

"To approve the bylaws changes as recommended by the bylaws committee with the exception of Art. 15 c which shall read: '*The geographic boundaries of Regions will be defined by the IGA Board of Directors, may not overlap geographically, and shall include at least two countries located in the same region of the world*'.

Moved by Gutierrez-Negrín, seconded by Sadiq. 1 abstention, 0 against. Carried."

The new bylaws text reads as follows. The underlined parts are the proposed amendments:

Art. 15 - Regional Branches

(…) c. A Regional Branch must consist of at least 50 IGA Members (of any category defined in Art. 4) based or working in a country located within a Region. The geographic boundaries of Regions will be defined by the IGA Board of Directors, may not overlap geographically, and shall include at least two countries located in the same region of the world. Members of a Regional Branch must all be IGA Members.

d. Membership of the Branch is voluntary; all IGA Members living or working within the area covered by the Regional Branch (including members of the founding Affiliated Organizations) are free to become members or otherwise. Only Members who have notified the Secretariat of the Regional Branch of their wish to join the Branch shall be considered members of the Regional Branch for the purposes of establishing this quorum or having voting rights, etc., within the Branch.

e. The IGA Secretariat of the Regional Branch shall maintain a list of IGA members who have opted to become members of the Regional Branch. This list shall be the only official list of Regional Branch members. The IGA Secretariat shall inform all IGA members whenever a Regional Branch is formed, or dissolved.

f. Members wishing to resign from a Regional Branch must notify the Secretariat of the Regional Branch in writing to this effect. The Branch Forum (see Art. 15(h) and (l) below) may establish a rule specifying a period of notice before resignations can take effect, such period of notice not to exceed 6 months.

(…) p. Should membership, defined as the number of IGA Members residing or working in the region and

UPCOMING EVENTS

4th Indonesia International Geothermal Convention & Exhibition (IIGCE 2016)
10-12 August 2016, Jakarta Indonesia
(Special fee for IGA Members: US$400)

CHARGE, World's First Energy Branding Conference
19-20 September 2016, Reykjavik, Iceland

European Geothermal Congress (EGC2016)
19-24 September 2016, Strasbourg, France

5th Polish Geothermal Congress
11-14 October 2016, Mszczonow, Poland
Held by the Polish Geothermal Society (Mainly in Polish)

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, Addis Ababa, Ethiopia

German Geothermal Congress (DGK 2016)
29 Nov-1 Dec 2016, Essen, Germany

Note: Please check the IGA website for more events.

who are registered with the Secretariat of the Regional Branch as wishing to participate in the Branch activities, fall below the level defined in Art. 15(c), the Board of Directors may decide to abolish the Branch. The Regional Forum shall be given six months' written notice of such a decision, within which period the Executive Committee may reverse the decision should it consider that the circumstances leading to the decision have changed materially. On abolition, any financial assets of the Branch may be reassigned at the sole discretion of the Board of Directors.

To complete the ratification process on the amended bylaws, IGA members are invited to vote by sending an e-mail to the Secretariat (iga@hs-bochum.de). The deadline for the vote is Thursday, **1st September 2016**. Your voting options are 'yes' or 'no'. If you do not send an e-mail until the indicated deadline, it will be assumed that your vote is positive regarding the Bylaws amendment.

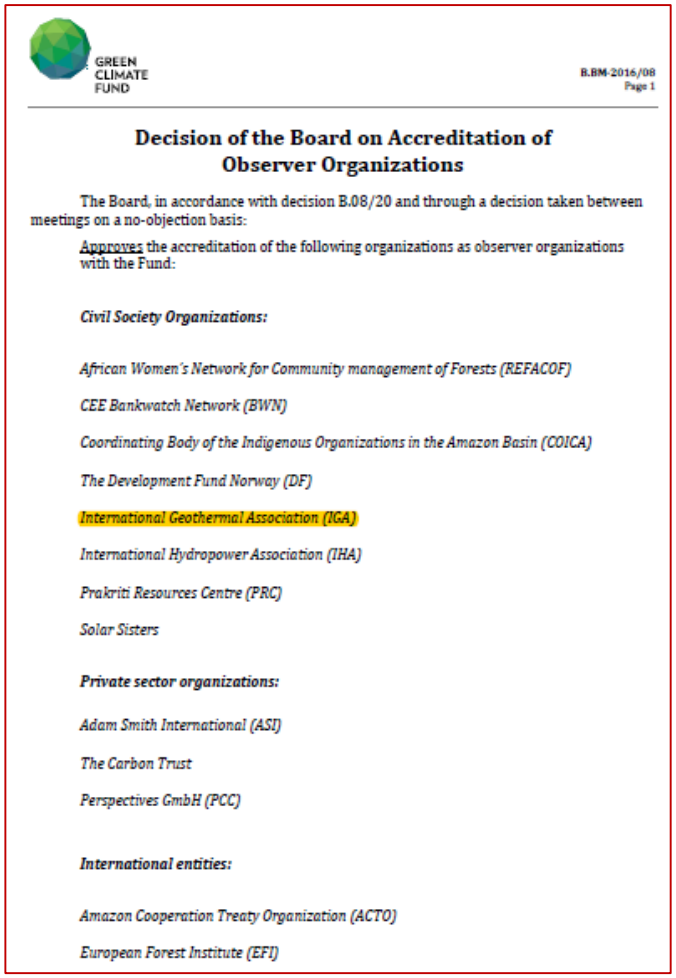
The IGA is Now an Accredited Observer of the Green Climate Fund

Marietta Sander, IGA Executive Director

On 8th June, the Green Climate Fund (GCF) informed the IGA about its new status. The Association is now an officially accredited observer organization to the GCF, which means that it now belongs to a vibrant network of partners and decision makers on global funding. Rights of GCF observers include the participation in GCF Board meetings, providing strategic advice on the design, development and implementation of the strategies, projects and activities to be financed by the Fund. The IGA is also entitled to make interventions relating to geothermal energy or other matters under consideration by the GCF Board.

The Green Climate Fund is the designated governing instrument created by the United Nations Framework Convention on Climate Change (UNFCCC) and was established by 194 countries during the international climate change negotiations (COP 17) in Durban, South Africa. The Fund is designed to act as the operating entity of the Convention's financial mechanism. It aims to support a paradigm shift in the global response to climate change by allocating financial resources to low-emission and climate-resilient projects in developing countries. Renewable energy projects using geothermal energy are supported as well.

As of May 2016, the GCF has raised US$10.2 billion equivalent in pledges from 42 state governments. The objective is for all pledges to be converted into contribution agreements within one year from the time at which they are made. In November 2015, the GCF Board reached an important milestone in approving the first US$168 million of GCF funding for climate adaptation and mitigation projects.



GREEN CLIMATE FUND

B.BM-2016/08
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Decision of the Board on Accreditation of Observer Organizations

The Board, in accordance with decision B.08/20 and through a decision taken between meetings on a no-objection basis:

Approves the accreditation of the following organizations as observer organizations with the Fund:

Civil Society Organizations:

African Women's Network for Community management of Forests (REFACOF)

CEE Bankwatch Network (BWN)

Coordinating Body of the Indigenous Organizations in the Amazon Basin (COICA)

The Development Fund Norway (DF)

International Geothermal Association (IGA)

International Hydropower Association (IHA)

Prakriti Resources Centre (PRC)

Solar Sisters

Private sector organizations:

Adam Smith International (ASI)

The Carbon Trust

Perspectives GmbH (PCC)

International entities:

Amazon Cooperation Treaty Organization (ACTO)

European Forest Institute (EFI)

The GCF observer status fits in well with the strategic IGA functions on advising on geothermal matters. Since the foundation of the IGA, advisory services were continuously provided to international organizations and donor agencies such as the World Bank, IFC, KfW, and others. On a technical/policy level close collaborations exist with renewable energy entities like IRENA, REN21, the REN Alliance and the 100% Renewable Energy initiative. In 2015, the IGA received the official UN observer status and liaises closely with the UN Economic and Social Council. The IGA regularly attends UNFCCC COP events and shows its presence with side events and booths shared with REN Alliance partners.

UNFC Geothermal Energy Specifications Open for Public Comment

Specifications for the application of the United Nations Framework Classification for Fossil Energy and Mineral

Reserves and Resources 2009 (UNFC) to geothermal energy resources were released on June 6th for public comment until August 4th.

Growing interest in renewable energy has highlighted a need to harmonize the way in which renewable energy potential is reported. Investors, regulators, governments and consumers need a common comparison framework for both renewable and non-renewable energy resources to assess energy sustainability scenarios at project, company, country, region or world levels. With no globally agreed geothermal standards, guidelines or codes existing prior to the development of these specifications, the inclusion of geothermal energy within UNFC (United Nations Framework for Classification for Fossil Energy and Mineral Reserves and Resources 2009) will improve global communication in the geothermal sector as part of the larger energy sector.

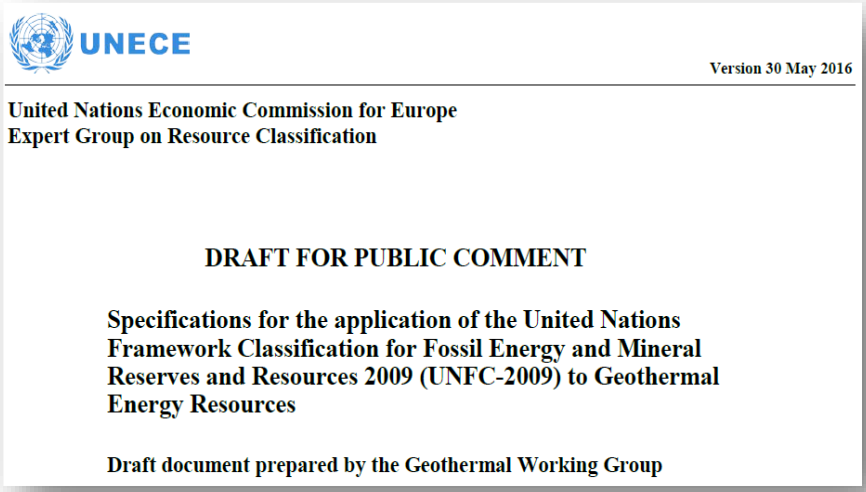
Whilst there is great potential for the development of geothermal energy, both for direct use of heat and electricity generation, particularly in the developing world, a lack of clear guidelines and standards is an impediment to geothermal energy becoming a viable option at a global scale. Through this public comment, the views of all stakeholders are being sought to ensure development of robust specifications that could be used by governments, regulators, industry and financiers alike.

A Working Group, led by Professor Gioia Falcone of Cranfield University, United Kingdom, prepared these geothermal specifications. The Working Group comprises representatives from the United States National Renewable Energy Laboratory, Geological and Geophysical Institute of Hungary, TNO of the Netherlands, Energy Development Corporation of the Philippines, University of Pisa of Italy, GPC Instrumentation Process, Hogarth Energy Resources, JACOBS, Landsvirkjun National Power Company of Iceland, MAGAK and Mil-Tech UK Ltd. The International Geothermal Association (IGA), with whom UNECE has a Memorandum of Understanding to develop the Specifications and Guidelines for the application of UNFC to geothermal energy, was also a key contributor. The Working Group operates jointly under the Task Force on Application of UNFC to Renewable Energy Resources of the Expert Group and the IGA's Resources and Reserves Committee. David MacDonald, Chair of the Expert Group on Resource Classification and Vice President for Segment Reserves at BP, noted "There is currently no universally accepted classification system for geothermal energy resources and UNFC offers a good starting point."

Twelve application examples from Australia, Germany, Hungary, Italy, the Netherlands, New Zealand, the Philippines and Russia are included with the specifications to facilitate understanding of the applicability of UNFC to geothermal energy resources.

Graeme Beardsmore, Chair of the IGA Reserves and Resources Committee stated, "The application examples illustrate how UNFC can be used to classify a wide range of different geothermal projects. We now want the public to test the framework by classifying their own projects, and let us know of any issues that still need to be addressed."

UNFC has been developed by the Expert Group on Resource Classification under the auspices of UNECE and is applicable to all extractive activities worldwide, including coal, gas, oil and uranium. Work has progressed significantly to broaden its application to encompass renewables. Generic specifications for application to renewables were recently agreed on by the Expert Group at its annual meeting in April. In September they will be submitted to the Committee on Sustainable Energy for approval. This work on specifications for geothermal energy is an important stepping stone. Similar work on bioenergy is currently underway and activities on hydro, solar and wind are being launched.


UNECE

Version 30 May 2016

United Nations Economic Commission for Europe
Expert Group on Resource Classification

DRAFT FOR PUBLIC COMMENT

Specifications for the application of the United Nations Framework Classification for Fossil Energy and Mineral Reserves and Resources 2009 (UNFC-2009) to Geothermal Energy Resources

Draft document prepared by the Geothermal Working Group

The draft specifications are available for public comment on the UNECE website at: http://www.unece.org/energy/se/reserves.html.

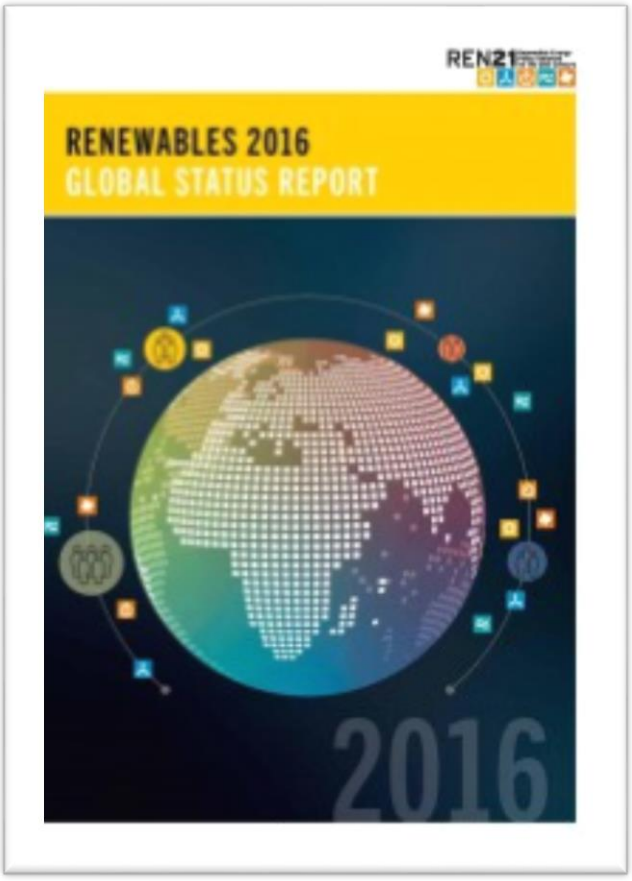
For further information please contact Charlotte Griffiths, UNECE Sustainable Energy Division, at: reserves.energy@unece.org.

Source: http://www.unece.org/?id=42942

Launching of REN21 GSR 2016

In early June, REN21 published the most comprehensive annual overview of the state of renewable energy: Renewables 2016 Global Status Report (GSR). REN21 is a global network, being the IGA one of its members. The annual Renewables Global Status Report was first published in 2005 and has become the most comprehensive and timely overview of the status, recent developments and trends in renewable energy markets, industries, investments, and policy developments worldwide. GSR does not provide analysis or forecast, and a network of 700 contributors, researchers, and authors from all over the world provide the data. Several IGA members are among them.

The 2016 GSR reveals that renewables are now firmly established as competitive, mainstream sources of energy in many countries around the world. 2015 was a record year for renewable energy installations. Renewable power generating capacity saw its largest increase ever, with an estimated 147 gigawatts (GW) added. Modern renewable heat capacity also continued to rise, and renewables use expanded in the transport sector. Distributed renewable energy is advancing rapidly to close the gap between the energy haves- and have-nots.



These results were driven by several factors. First and foremost, renewables are now cost competitive with fossil fuels in many markets. In addition, government leadership continues to play a key role in driving the growth of renewables, particularly wind and solar, in the power sector. As of early 2016, 173 countries had renewable energy targets in place and 146 countries had support policies. Cities, communities and companies are leading the rapidly expanding "100% Renewable" movement, playing a vital role in advancing the global energy transition.

Additional growth factors include better access to financing, concerns about energy security and the environment and the growing demand for modern energy services in developing and emerging economies.

Christine Lins, Executive Secretary of REN21, said, "What is truly remarkable about these results is that they were achieved at a time when fossil fuel prices were at historic lows, and renewables remained at a significant disadvantage in terms of government subsidies. For every dollar spent boosting renewables, nearly four dollars were spent to maintain our dependence on fossil fuels."

2015 was a record year not only for new installations, but also for investment –reaching US$286 billion worldwide in renewable power and fuels. With China accounting for more than one third of the global total, developing countries surpassed developed countries in total renewable energy investments for the first time.

With increased investment came an increase in technological advances, cost reductions and jobs. There are now 8.1 million people working in the renewable energy sector –representing steady growth in stark contrast with depressed labor markets in the broader energy sector.

REN21's Renewables 2016 Global Status Report presents developments and trends through the end of 2015, as well as observed trends from early 2016 where available. This means that accelerated action to reduce greenhouse gas emissions stemming from the Paris Climate Agreement in December is not reflected in the results.

While trends are generally positive, the report highlights several challenges that remain to be addressed if governments are to fulfill their commitments to achieve a global transition away from fossil fuels. These include: achieving effective integration of high shares of renewables into the grid; addressing policy and political instability, regulatory barriers, and fiscal constraints. Further, there is far less policy focus on transport and, particularly, heating and cooling, so these sectors are progressing much more slowly.

Arthouros Zervos, Chair of REN21, said: "The renewables train is barreling down the tracks, but it's running on 20th century infrastructure –a system based on outdated thinking where conventional base-load is generated by fossil fuels and nuclear power. To accelerate the transition to a healthier, more-secure and climate-safe future, we need to build the equivalent of a high-speed rail network –a smarter, more flexible system that maximizes the use of variable sources of renewable energy, and accommodates decentralized and community-based generation."

The full report and Key Findings can be freely consulted and/or downloaded at www.ren21.net/gsr. There it is also possible consult REN21's Interactive Map, which contains detailed country data and uses an interactive interface, as well as Infographics.

Source: Press release of REN21.

AFRICA

Eritrea: Funding for Exploration of Alid Geothermal Field

A national energy plan for Eritrea was signed within the framework of the 11th European Development Fund (EDF). As part of it, Eritrea will get up to €175 million (US$200 million) for investment in the energy sector, including renovating the national power grid, building stand-alone photovoltaic and wind power supply systems in rural areas, and exploring for geothermal resources. Additional €20 million will be provided to support the financial management activities of Eritrean financial entities.

Eritrea is receiving funding for preliminary studies and exploration of the Alid geothermal field, which are expected to be completed by 2020; €8 million (US$9 million) are available for this project. Previous work on this area was conducted at the Alid Volcanic center. In 1902, the Italian Institute for Military Geography conducted a preliminary study of the Alid geothermal manifestations. No further geothermal exploration studies were done until 1973, when a reconnaissance survey was carried out by the Geological Survey of Ethiopia, sponsored by the United Nations Development Program (UNDP). Between 1973 and 2005 several other studies were conducted. In 2008, an MT/TEM resistivity survey was completed at Alid under the sponsorship of ICEIDA (Icelandic International Agency), which detected an anomaly at the rift floor.

Currently, Eritrea relies on wood and charcoal to supply 78% its energy needs. Nationally, electricity coverage is 38%, among the lowest in the world; in rural areas it is only 10%. 98% of the small amount of electricity generated in the country is based on imported fossil fuels, putting a heavy financial burden on the government. Therefore, the exploitation of geothermal is seen as a great opportunity to develop its own source of energy.

Source: http://geeskaafrika.com/2016/04/11/eritrea-receives-9m-in-eu-funding-for-geothermal-exploration-work/

Ethiopia: AU Hosts Geothermal Seminar

A seminar was held at the African Union headquarters in Addis Ababa on late June, organized by the Geothermal Risk Mitigation Facility, which was established in 2012 by the African Union Commission, the German Federal Ministry for Economic Cooperation and Development and the EU-Africa Infrastructure Trust Fund. The conference was organized to highlight the importance of improving access to equity or other funding sources and therefore play a catalytic role in establishing geothermal energy as a strategic option in power expansion planning for the region.

Commissioner for infrastructure and energy Dr. Elham

AU Commissioner for infrastructure and energy, Dr Elham Ibrahim.

Ibrahim welcomed the delegates, among which were Gary Quince head of the EU delegation to the African Union, Bruce Shepherd of New Zealand, Thomas Terstegen, deputy head of mission of Germany, deputy director general of the International Renewable Energy Agency (IRENA), energy ministers and ambassadors of the East African Rift System.

While addressing delegates, Ibrahim noted the need to increase the deployment of geothermal projects to increase the rate of energy access in Africa, especially with the growth in populations. She further called to increase the rate of energy access with reliable and

competitively priced modern energy, such as geothermal.

"It is our responsibility as a continent to work together, join hands and coordinate our efforts to develop our short, medium and long term plans to efficiently exploit the resources thereby satisfy the continent's energy needs", she concluded.

New Zealand diplomat Shepherd emphasized the African Union code of practice for Geothermal Drilling, which allows for explorations of new modes of sustainable energy.

Ambassador Quince stated that geothermal is a strong potential contribution to renewable energy development in Africa. He also noted that with the growing population, geothermal energy is a unique option as it provides a base load alternative with high capacity factor to fossil fuel based electricity generation.

Source: http://www.esi-africa.com/news/ethiopia-au-hosts-geothermal-seminar/

Kenya: Baringo-Silali, Olkaria and New Energy Act

Phase 1 of the Baringo-Silali Project - Johnson P. Ole Nchoe, CEO of the Geothermal Development Company (GDC) stated that "I am happy to report that GDC has signed a land agreement with affected communities thus paving way for completion of a legal opinion to KfW, and the subsequent disbursement of funds for the project". KfW, a German government-owned development bank, is financing GDC's Baringo-Silali geothermal project at a cost of €80 million (US$91.2 million).

Dr. Klaus Liebig, KfW Director noted that "due to the importance of the Baringo-Silali project, KfW deliberately decided to finance exploration drilling which is one of the riskiest phases of geothermal development which, when successful unlocks further financing." He added that "we are ready to start the project and we are happy to partner with GDC in this very important project for Kenya, for GDC and for KfW."

GDC has already signed contracts for a water supply system and for drilling services. The contractor is getting ready to start drilling 15-20 wells in the Baringo-Silali Block. GDC reported that drilling operations will commence in January 2017, that it will produce up to 200 MW of electricity, and that the total potential of the block is estimated at 3000 MW.

Source: http://www.ae-africa.com/read_article.php?NID=7198, http://www.standardmedia.co.ke/business/article/2000204753/geothermal-works-to-commence-in-bogoria-silali-block

Olkaria V Project to Be Started this Year – Last May, Albert Mugo, Managing Director of the Kenya Electricity Generating Company (KenGen), indicated that the 140 MW Olkaria V geothermal project was currently in the tendering process. "We expect to sign the contract in October (…) so that construction can begin by the end of year," Mugo said. He added that the power plant project was expected to take 30 months and that KenGen had secured about US$410 million for it.

Mugo said that the firm hoped to connect 720 MW of new power to the national grid in the next four years. He also invited banks and others to invest more in KenGen, saying its "dividend scheme" is "one of the most competitive, reliable and sustainable in the country." He stated, "With the country's power demand expected to cross the 4000 MW mark by 2020, success in the future is dependent on early planning and that is why we are asking shareholders to take up their rights at this time so that we can have enough capital for expansion."

KenGen, which is 70% owned by the Government, has a current installed power generating capacity of 1617 MW, out of which 509 MW are from geothermal. Kenya's current installed generation capacity is based on geothermal (46.4 %), hydro (38.1 %), thermal (14.8 %), and wind (0.4 %).

Source: http://www.china.org.cn/world/Off_the_Wire/2016-05/23/content_38518548.htm

New Energy Act Will Allow more Private Geothermal Projects - The Kenyan Government will limit its participation in the country's geothermal development as it seeks to open up the sector to private investors. Energy Cabinet secretary Charles Keter said that the ministry is currently constrained in funding geothermal projects. This, along with the dearth of qualified Kenyan geothermal technicians, makes it more costly to produce electricity from geothermal sources,

despite geothermal being cheap. Thus, the need to open up the sector to the private sector.

"We want Government participation to be limited, which will in the end open up the sector for private investors… this will only be possible if the new policy is fast-tracked," Keter said. The new Energy Bill is currently before the Senate and upon its enactment, Independent Power Producers are expected to be the standard model for future renewable energy development.

Source:
http://www.mediamaxnetwork.co.ke/business/222587/state-moves-to-woo-geothermal-investors/

Zambia: Update on Geothermal Exploration in the Bwengwa River Region

The Zambian-headquartered geothermal exploration company Kalahari GeoEnergy Ltd provided an update on its ongoing geothermal exploration in the Bwengwa River area, within the Kafue Trough.

The Trough is a sedimentary basin filled by the Permian Karoo sequence that overlies metamorphic basement rocks; is located to the west of Lusaka and extends westward into the Barotse Basin. The Company has already identified six Geothermal Resource Areas, including Bwengwa River.

The surface manifestations at the Bwengwa River Geothermal Resource Area include geothermal springs that extend over 7 km and lie on the southern bounding fault of the Kafue Trough. To date ongoing exploration has included the drilling of five temperature gradient holes totaling 1980 m.

Results confirm a geologic setting conducive for geothermal hydrothermal systems and indicate a strong probability of a medium-to-low enthalpy geothermal resource that can support a power generation project of at least 10MW. Heat-in-place, power density and heat flow methods were used, providing a consistent estimated usable resource capacity in the range of 10-20MW.

The Bwengwa River Geothermal Resource Area presents evidence for a minimum reservoir temperature ranging from 130°C to more than 150°C, based on fluid chemistry and temperature gradient hole data. Permeability is confirmed by the discharge of the hot springs along the regional bounding fault and the associated geologic structures. The reservoir is in fractured basement rocks at a shallow-to-medium depth adjacent to the bounding fault. The source of water is local meteoric water that is plentiful.

In order to test the conceptual geothermal reservoir model for the Bwengwa River Geothermal Resource Area, further characterize the geothermal reservoir temperature, permeability, and size, and confirm initial estimates of reservoir capacity, Kalahari GeoEnergy will drill up to four additional slim exploration boreholes. If the wells and subsequent testing are successful, the results will be used in a feasibility study that could be completed by July 2017.

Zambia and the surrounding countries are currently facing severe energy deficits. Additional generating capacity and distribution is considered essential for Zambia to achieve its development goals. The Zambian Government and other relevant institutions are taking determined measures to engage the private sector and diversify the country's power industry.

Source: http://www.thinkgeoenergy.com/kalahari-geoenergy-gives-positive-update-on-the-geothermal-resource-assessment-in-the-kafue-trough/

AMERICAS

Bolivia: Loan for a Pilot Plant in Laguna Colorada

On late April, the Central Bank of Bolivia (BCB) signed a loan agreement with the National Electricity Company (ENDE) for the construction of 65 MW of renewable energy plants in the Potosi department. The bank will lend a total of BOB849 million (US$122.8 million) to ENDE to build the 60 MW Solar Uyuni photovoltaic (PV) plant and the initial 5 MW pilot plant at the Laguna Colorada geothermal field. ENDE has plans for a 50 MW geothermal power plant in the first phase of the project, expanding to 100 MW in phase two.

Currently, the country has approximately 40 MW of installed renewable energy capacity. According to the government, it expects to reach a total of about 500 MW of clean energy in 2018-2019.

Source: http://renewables.seenews.com/news/central-bank-of-bolivia-to-provide-loan-for-65-mw-of-renewables-522821

Canada: Energy Discovery Center in Alberta, High Geothermal Potential in Yukon

Conversion of Abandoned Oil Well to Capture Geothermal Energy - The Leduc #1 Energy Discovery Centre in Devon, Alberta is converting an abandoned oil well to capture geothermal energy—a first in Canada. It is part of the US$1.4-million Living Energy Project, which will put the Centre on a path to become the world's first carbon neutral oil museum, using renewable energy systems built by Western Canadian oil service firms.

"Alberta has nearly 170,000 abandoned oil wells. Converting them to geothermal energy helps oil companies' bottom line, cuts down methane leakage, produces free energy and gets oil service firms back to work," says Mitchell Pomphrey, manager of the Living Energy Project. "It's win-win-win for the industry, taxpayers and the environment."

The project's features include North America's largest sun-tracking solar power unit, and a wind turbine mounted on an oil rig derrick powering the geosystem's pumps.

It will allow visitors to stand surrounded by live energy production of geo, solar, wind, oil, and gas, which they smell, feel, hear and see as they interact with the energy systems through a touch display. They can use voice commands to tell the systems to store power, give more heat, or turn off lights.

At the heart of the project beats an ultra-smart energy operations system, featuring gas-fueled advanced combined heat and power technology that provides heat and power on command. The energy operations platform also calls out to the converted well's pump telling it to speed up or slow down as it anticipates the building's heat needs and power peaks –Canada's first smart geo-system.

This hydrocarbon-to-renewable bridging technology, invented for Leduc #1, includes the first deployment in Canada of leading hybrid-inverter AC-DC technology, which boosts efficiency at the interface of the central power storage system and the renewable energy units that feed it. The solar systems are mobile, built by oil service firms and designed for Alberta's oil patch and harsh climate —renewable energy is cheaper at remote, off-grid oil fields, than trucking in diesel for generators.

Source: http://www.albertaoilmagazine.com/2016/04/alberta-site-canadas-first-abandoned-oil-well-geothermal-conversion/

Yukon Geothermal Potential Could Be 1700 MW - The Government of Yukon and the Canadian Geothermal Energy Association (CanGEA) released a report on the potential for geothermal energy in Yukon. The Yukon Geothermal Opportunities and Applications Report, researched and written by the CanGEA, addresses the economic, social and environmental feasibility of harnessing renewable geothermal energy for heat and power generation.

According to the report, Yukon's geothermal potential could be more than 1700 MW of energy. This is equivalent to 18 times the current energy supplied by Yukon's renewable electrical system (90 MW).

"Yukon is the third jurisdiction in Canada to assess and identify its geothermal resource potential," said Scott Kent, the Minister of Energy, Mines and Resources. "Based on limited, available data, CanGEA's conservative estimate of Yukon's geothermal energy potential represents an important renewable resource in meeting the territory's current and future energy needs."

New favorability maps published on the Canadian National Geothermal Database provide geological, geophysical and environmental information for identifying and evaluating Yukon's geothermal potential. The project was funded by the Canadian Northern Economic Development Agency, the Government of Yukon and the CanGEA, with contributions from the Yukon Energy Corporation and the Takhini Hot Pools.

Source: http://www.gov.yk.ca/news/16-170.html#.VzZ3ovl9600

Caribbean: Developments in Monserrat and Dominican Republic

Third Well to Be Drilled in Monserrat - On late April, the Government of Montserrat and the UK Department for International Development (DFID) announced that the contract for the drilling of the third exploratory well at St Georges Hill in Montserrat was awarded to the Iceland Drilling Company (IDC), at a cost of £5.1 million (US$7.3 million). It is anticipated that IDC will mobilize in July 2016 and drilling to

commence in August 2016. Activity on the proposed site has already begun with work starting on site clearance, construction of the drilling pad, fencing, water supply and drainage.

The first two wells drilled on Montserrat are capable of providing approximately 2.4 MW of base load power. The main purpose of the third well is for the reinjection of the waste water from the power generation process.

However, if following drilling and testing, the third well offers more potential as a production well, one of the first two wells will be used for reinjection purposes, which will ensure that the geothermal brine water, separated from the steam will, be disposed of in an environmentally safe manner.

Whilst the drilling of the 3rd well is being undertaken, The Geothermal Steering Committee will be developing the business case for the next phase of power generation and distribution.

Source:
http://www.discovermni.com/2016/04/contract-signed-for-the-drilling-of-the-3rd-geothermal-exploration-well-on-montserrat/

IDB Grants Geothermal Survey in Dominican Republic - The Inter-American Development Bank (IDB) will grant the Energy and Mines Ministry US$200,000 for a 12-month study of the country's geothermal potential. France's National Geologic Survey (BRGM) executive Philippe Gombert and Inter-American Development Bank (IDB) representative Flora Montealegre signed the agreement, witnessed by Energy and Mines minister Antonio Isa, and French ambassador Jose Gomez.

The 'Specific Agreement to Evaluate the Geothermal Potential of the Dominican Republic' aims to determine where there is enough geothermal energy to produce electricity in areas that were defined as priority and secondary in 1980. The areas to be assessed are Yayas de Viajama – Constanza (central), Canoa, areas of San Juan de la Maguana (west), Enriquillo (southwest) and Pedro Santana, San José de las Matas (northcentral) and Surzacuyo.

Source:
http://www.dominicantoday.com/dr/technology/2016/4/29/59108/IDB-wants-to-know-if-the-country-can-tap-its-geothermal-energy

Guatemala: Probable RFP for 40 MW

US Geothermal is expecting the Guatemalan government to release a 40 MW request for proposals (RFP) exclusively for geothermal in the second quarter of 2016, according to the company's President and Chief Operating Officer Doug Glaspey. He said the Guatemalan government, through the National Electrical Energy Commission, announced that it is preparing to issue the RFP at the request of the country's large power distributors.

US Geothermal is currently developing its 25 MW El Ceibillo phase-one geothermal project, a flash steam power plant that will be located southwest of Guatemala City. Glaspey said that the company has retained Iceland-based Mannvit Engineering to advise on development of the wellfield and to construct the reservoir model for the project.

Flowing well EC-1. Photo by US Geothermal.

"El Ceibillo was located within a large volcanic complex, and Mannvit has specific expertise in volcanic host of geothermal systems," he said. "We have identified the location for a large diameter well, which will intersect the production zone…" Drilling of this new well, EC-5, began in early June. Well EC-5 is targeting the production zone previously encountered in well EC-2A. It will be used to test the geothermal reservoir's flow characteristics and provide critical data required for the numerical reservoir model being developed by Mannvit. The size, production characteristics, and power production capability of the reservoir will be decided after the results of the reservoir model.

According to the company, phase one of the El Ceibillo project will cost approximately US$140 million. The company has not secured a power purchase agreement for the project yet.

Sources:
http://www.renewableenergyworld.com/articles/2016/05/guatemala-will-seek-40-mw-of-geothermal-in-second-quarter-us-geothermal-exec-says.html?cmpid=renewable05182016&eid=291021978&bid=1407677,
http://www.usgeothermal.com/News.aspx

Latin America: Germany to Back CAF's Financing in Geothermal Projects

The German Ministry for Economic Cooperation and Development (BMZ) and CAF (Corporación Andina de Fomento), which is the development bank of Latin America, signed in early May an agreement by which they shall promote the development of projects that will benefit, in the case of energy, countries such as Colombia, Ecuador, Peru, Bolivia and Chile. The strategic alliance for the promotion of sustainable development in Latin America between CAF and KfW was deepened with the signing of an agreement in which better conditions will be offered for financing geothermal projects (€250 million or US$281 million). The agreement's signing was lead by the institution's president, Enrique García, and the German ambassador to Venezuela, Stefan Herzberg.

Stefan Herzberger, the German Ambassador to Venezuela (left), and Enrique García, CAF President, during the signing of the agreement.

The first credit line of €250 million shall be allocated to lowering financing that CAF grants to geothermal projects in the region, whether for supporting drilling for measuring the potential of energy generation, or for the very construction of the geothermal plant. This credit line constitutes part of a program lead by KfW and CAF, in which other agencies also participate and which arose in 2013 in order to identify the potential of geothermal energy in Latin America.

Afterwards, KfW announced the launch of this initiative, known as the Geothermal Development Facility (GDF), Latin America (Fund). The GDF was originally announced in December 2014 in the framework of the Sustainable Innovation forum of the UN's Conference of the Parties (COP) 20 in Lima, Peru, with more supporters (see IGA News 98, pp. 15-16). Now, the Fund includes both straight grants for exploration surface studies as well as contingency grants for exploration drilling. Initially €50M (US$56 million) will be provided with follow-on funding anticipated. It will also include technical assistance forums for the various stakeholders.

The Fund will be modeled after the existing risk mitigation fund in East Africa. Qualified developers could apply in Chile, Bolivia, Peru, Ecuador, Colombia, Costa Rica, Nicaragua, El Salvador, Honduras and Guatemala.

IDA Fund Management, LLC, which includes Interlink Capital, Inc., Dewhurst Group, LLC, and Ambata Capital Partners, will serve as the Fund managers with oversight from KfW. Chris McCormick, a partner with Ambata, will serve as the Senior Investment Officer in the consortium. The Fund expects to be up and fully operational by November 2016.

Sources:
https://www.caf.com/en/currently/news/2016/05/germany-to-back-cafs-financing-in-geothermal-projects-and-urban-transportation-for-latin-america-with-350-million/, http://us9.campaign-archive1.com/?u=aff654a498350dbc38701ffd5&id=07f036850b&e=8a5d15d9ea

México: Discouraging Perspectives for Geothermal Projects in the Current Wholesale Power Market

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

In early April, Mexico's national energy control center (CENACE) published the results of the first long-term electric power auction for the wholesale power market held under the new energy regulations. Contracts were awarded to 11 firms for renewable power generation projects.

CENACE conducted the auction, requesting offers to supply 6300 GWh annually to be acquired by the Comisión Federal de Electricidad (CFE), starting in 2018, through 15-year power purchase agreements (PPA). It also asked for bids for the acquisition of 6.3 million 20-year Clean Energy Certificates (CEC), one per MWh produced using clean energy sources, and for 500 MW of backup power.

Clean energy sources are defined in the recently passed law of energetic transition (Ley de Transición Energética) as renewable sources (solar, wind, geothermal, biomass, less than 30 MW hydro, and ocean energy), plus large hydro, nuclear, Carbon Capture and Storage (CCS) projects, co-generation, energy-efficient projects and other low-emitters of GHG.

The buyer, CFE, had set in advance a top acquisition price of less than US$0.07 per kWh, including the price of energy plus CEC. This unitary price looked low for power produced from clean sources, but the final prices that won the auction resulted even lower. Out of the final 18 bids considered to be valid, CENACE awarded 11 companies almost 85% of the total 6300 GWh and CECs, i.e. 5386 GWh and 5.38 million CEC, at an average unit price of less than US$0.05 per kWh (including energy plus CEC): US$0.045/kWh for solar and US$0.055/kWh for wind.

The projects awarded were 11 solar (PV) plants (74% of the total) and five wind farms (the remaining 26%), totaling ~1900 MW of capacity to be installed in the states of Aguascalientes, Baja California Sur, Coahuila, Guanajuato, Jalisco, Tamaulipas and Yucatán. The awarded firms were from Mexico, Spain, France, Italy, Canada, the US and China, among which are Aldesa Energías Renovables, Enel Green Power México, Jinkosolar Investment, SunPower Systems México and Vega Solar 1.

The second auction for long-term electric power generation contracts was launched in May, and the winner will be announced on September 30, 2016. Winning projects must begin delivering power through their contracts with CFE in 2019. This auction will follow the same model as the first one, with firms competing for long-term contracts with state utility CFE. The utility may participate as an electricity generator, through its subsidiaries.

According to SENER (Mexico's Energy Secretariat), the second auction will also take into account the differences in the cost of electricity generation in different regions of the country so that power is to be purchased where the grid most requires it. The initial version of the conditions for the auction were published on mid-May and the final version in June. Accepted offers to purchase power will be revealed on July 4. Technical and economic proposals will be presented on August 1-5 and September 21, respectively, and offers to sell power will be analyzed starting on September 22.

Of course, no geothermal project can compete with unitary prices as low as US$0.05/kWh, especially for greenfield projects, not only in Mexico but in most parts of the world. The front investments for geothermal projects, which include the cost of initial exploration, drilling production and injection wells, is much higher than that of other renewable projects like PV and wind, whose resources (sun and wind) are freely available. In addition, it is known that a greenfield geothermal project takes twice the average time it takes for a wind or PV project. All of it prevents geothermal projects to be competitive with prices as low as those in this first public auction.

However, there is a particular feature of clean technologies that was not included in the final price of the offers: the intermittency of energy production, i.e. the availability-reliability of the power plant. Generation by PV and wind plants is intrinsically intermittent and unpredictable, and does vary daily and seasonally. Even though CFE did not buy installed capacity but produced electric power, it is not the same to get 200 GWh per year with daily variations from zero to 40 MW, or to get 20 MWh steadily 24 hours a day, 365 days a year. In the first case, the buyer (CFE) has to have some flexible backup, which is costly, while in the second case can it simply forget it.

It can be concluded that the results of this first public auction for Mexico's wholesale electric market were discouraging for geothermal projects. The outcome of the second action may be different if the availability and reliability of geothermal power plants as baseload are taken into account when assessing the final price per kWh. It is recommended that SENER and CENACE in some way will value this important geothermal power generation feature in further public auctions. Otherwise, geothermal projects will be restricted to PPAs with private off-takers… and the actual price in the Mexican wholesale electric market will remain artificially low.

Mexico: New Geothermal Plant, Research Project with the EU & Agreement with New Zealand

25MW Power Unit in Operation in Domo San Pedro – The Mexican private company Grupo Dragón has announced that a 3rd unit has been completed and was being commissioned at the Domo San Pedro geothermal field, located in Nayarit, the first private geothermal field in Mexico. It is a condensing, flash unit with a net capacity of 25MW, whose construction

Domo San Pedro - Aerial view of Unit 3. Photo by Grupo Dragón.

started in October 2014 and it is currently under the final performance tests. The power plant construction as well as the manufacturing of the turbines and generators was made under a "turn-key" contract with the Japanese Mitsubishi.

As of now, two back-pressure units of 5MW each have been in operation but they will be shut down and all the steam flow will be redirected to the new condensing unit. Even when back-pressure units have a higher specific steam consumption per megawatt compared with condensing units, they offer flexibility, operational and time advantages that the tailored large condensing type units cannot offer. These two factors allow project developers and utilities the possibility of a quick deployment to start electricity generation directly at the wellheads or even in a centralized arrangement. The size, simplicity and portability of these units, decreases installation and commissioning time and costs for about a third of that compared to standard condensed units, mainly because the units can be utilized in different projects without major adaptation.

This is the reason why in 2015 two 5MW 'second hand' back-pressure units were bought, installed and commissioned at the Domo San Pedro geothermal field. These units were manufactured originally in 1990 by ACEC in Belgium, were in service in fields of Central America and were thoroughly serviced and upgraded in 2014 by Grupo Dragón. The overhaul required a deep cleaning of blades, rotor balancing, cooling system enhancements and replacement of the control equipment with a cutting edge digital control system with semi-automated features. The quick deployment of these two back-pressure units helped Grupo Dragón test well behavior and start commercial power generation more than one year ahead of expectations.

Grupo Dragón plans to keep one of the two back-pressure at the Domo San Pedro as a backup unit for programmed shutdown maintenance works of the condensing Unit 3, and the other unit is available to be used in other geothermal projects worldwide.

Source: http://www.thinkgeoenergy.com/grupo-dragon-to-commission-25-5-mw-unit-3-at-domo-de-san-pedro-in-mexico/?utm_source=ThinkGeoEnergy+List&utm_campaign=fde186022a-TGE_Newsletter_RSS1_12_2015&utm_medium=email&utm_term=0_657e42f767-fde186022a-415210497

First Joint Geothermal Research Project with the EU - European and Mexican researchers will work together on tapping into new sources of geothermal energy in the context of GEMex, an international project that was selected in a joint call launched by the European Union and Mexico in November 2015. Carlos Moedas, European Commissioner for Research, Science and Innovation, and Pedro Joaquín Coldwell, Mexican Secretary of Energy, announced it at the time of the Clean Energy Ministerial Meeting held in San Francisco, California on 2 June 2016.

The EU and Mexico will contribute equally to the €20 million (US$22.7 million) project. The EU's share will come from Horizon 2020, its €77 billion (US$87.5 billion) research and innovation funding program (2014-2020); that of Mexico from its Fondo de Sustentabilidad Energética SENER - Consejo Nacional de Ciencia y Tecnología (Conacyt).

GEMex will develop innovative methods for accessing geothermal resources such as superheated fluids and hot dry rocks hosted in different types of geologic formations. The ultimate objective of the project is to make geothermal cost-effective and affordable both for electricity and heat production. The project will adhere to the strictest environmental standards and address issues related to the social acceptance of the technology.

The three-year project will start in the autumn of 2016. Mexican researchers are part of the CeMIE-Geo, the Mexican Center for Innovation in Geothermal Energy.

Source: http://ec.europa.eu/research/index.cfm?pg=newsalert&year=2016&na=na-030616

Mexico-New Zealand Educational Agreement - Twenty Mexican students will have a chance to begin study toward their doctorates at the University of Auckland each year as a result of a new agreement. In late June the University signed with Mexican agency Conacyt providing sponsorship for Mexican students wishing to study full PhD degrees and also promoting post-graduate fellowship visits between the two countries. The new agreement will allow PhD studies for 12 months in any of the eight faculties at the University. Mexican masters students may also propose visits of up to six months for the purpose of gaining experience in

research projects while University of Auckland students can also propose visits of similar duration to accredited Mexican universities.

The agreement further strengthens ties between Mexico and New Zealand. Mexico is New Zealand's largest trading partner in the Latin American region and one area of considerable potential benefit between the two countries is in the field of renewable energy research. The University of Auckland hosts an Energy Centre and its Geothermal Institute is actively engaged in research and exchanges in Mexico. Head of Engineering Science, Professor Rosalind Archer sees potential for even more collaboration with the signing of the Conacyt agreement.

Source: http://www.scoop.co.nz/stories/ED1606/S00102/auckland-signs-landmark-agreement-with-mexico.htm

North America: The Region Will Produce 50% of Electricity from Clean Energy Sources by 2025

The United States, Mexico and Canada have agreed a new regional deal to produce 50% of their combined electricity generation by 2025 from clean energy sources, including wind, solar, nuclear, hydropower, geothermal among other minor sources. The agreement was announced in late June at a summit of the U.S. and Mexico Presidents and the Canadian Prime Minister.

The deal builds on a slate of climate efforts from the Obama administration, including the EPA Clean Power Plan (CPP) and signing of the Paris Climate Agreement last year. The CPP, currently under a judicial stay imposed by the Supreme Court, will be necessary in meeting the 50% goal.

The deal is most ambitious for Mexico, which got less than a fifth of its power from non-fossil resources last year. The nation is in the midst of privatizing its electricity sector, with the state-owned power agency selling off generation assets and opening new market opportunities for independent suppliers. The U.S. currently sources about a third of its power generation from renewable and nuclear resources, and Canada is over 80%. The climate accord did not limit itself to carbon. Mexico would also sign on to provisions agreed between Canada and the U.S. last year to cut methane emissions by up to 45% by 2025.

Source: http://www.utilitydive.com/news/us-mexico-canada-pledge-50-renewables-and-nuclear-by-2025-in-new-climate/421713/

United States: Geothermal Projects in Salton Sea and North Dakota, EGS Breakthrough and Proposed EPA's Rule

Hell's Kitchen restaurant on Mullet Island, at the Salton Sea. (Photo: Courtesy of Salton Sea History Museum, taken from the referred source.)

Plans to Develop a 250MW Power Plant in the Salton Sea Area - The Salton Sea was accidentally formed when the Colorado River broke through an irrigation canal and created this large "artificial" lake in 1908. Over time, water has been receding, leaving a hot and empty terrain that becomes filthier as the Salton Sea shrinks and which has allowed gusting winds to kick up dust from the exposed lakebed. Fish carcasses line the increasingly salty lake, giving the area the typical rotten-egg stench. And yet, beneath the parched landscape lies a geothermal reservoir at temperatures as high as 700°F (370°C) that has been only partially tapped. Now, the Australian firm Controlled Thermal Resources (CTR), based in Brisbane, is planning to develop a massive power plant that will have the name of the once famous restaurant and dance hall Hell's Kitchen, built in 1908 on the so-called Mullet Island –which is actually an active volcano.

There are already 11 geothermal plants by the southern shore of the lake, the largest in California, but only one new power plant has opened since 2000. CTR plans to build its Hell's Kitchen power plant five times bigger than any of the other geothermal facilities in the area:

i.e., 250MW instead of 50. That would allow the company to sell the electricity at a relatively low price, which in turn could make a bank more likely to offer a loan.

Last March, the Australian company leased 1880 acres (760 hectares) from the Imperial Irrigation District, which owns the land where the project would be built. CTR's chief engineer, Jason Czapla, has moved from Australia to El Centro, south of the lake, to oversee operations. The company plans to drill exploratory wells this fall, to start construction by 2018 and to open the plant by 2020.

Source: http://www.desertsun.com/story/tech/science/energy/2016/05/05/salton-sea-dreaming-big-geothermal/83845318/

First Permanent Facility to Co-produce Electricity from Geothermal Resources at an Oil and Gas Well - The US Department of Energy (DOE) announced the launch of the nation's first commercial enterprise to co-produce electricity from geothermal resources at an oil and gas well. With support from DOE's Geothermal Technologies Office (GTO), researchers at the University of North Dakota (UND) successfully generated geothermal power from hot water that flows naturally from petroleum wells in the Williston Sedimentary Basin in western North Dakota. This technology offsets the need for costly transmission construction and reduces energy costs at remote oil fields. The facility started generating electricity for the first time in late April.

UND's process to co-produce electricity involves the use of hot fluid —a by-product of oil, gas, and other material harvesting processes. UND's technology features a special engine that can make steam from warm water pumped out of the ground with oil. The heat in the water flashes into steam and drives a turbine to generate electricity.

Low-temperature geothermal resources between 150°F and 300°F (66 to 149°C) are widely available, having historically been used in direct-use applications, such as heating. The coproduction of lower temperature geothermal electricity from oil wells holds the potential to produce more than 30 GWh of electricity nationwide. GTO continues to work with industry, academia, and national laboratories to develop and deploy new low-temperature and coproduction technologies that will help the geothermal community achieve this potential.

UND and DOE were recognized by the Geothermal Energy Association (GEA) with its 2016 Technological Advancement Award in the ceremony held as part of the Baseload Renewable Energy Summit in Reno, NV on June 7.

Source: http://energy.gov/eere/success-stories/articles/eere-success-story-doe-funded-project-first-permanent-facility-co

Enhanced Geothermal Technology Breakthrough in Idaho – The U.S. Department of Energy's Geothermal Technologies Office (GTO) is funding the Raft River EGS project, in Idaho, to facilitate new, innovative technology deployment and validation to reduce costs and improve performance of these man-made geothermal reservoirs. The Energy & Geoscience Institute at the University of Utah is demonstrating stimulation techniques that connect a previously isolated injection well, RRG-9, to the existing power production wells. This makes existing geothermal reservoirs larger, and more electricity can be added to the grid.

As of June 2016, the team observed more than a 50-fold increase in well injectivity, from approximately 20 gallons per minute (gpm) (1.06 liters per second) to nearly 1,000 gpm at RRG-9. Regular fluid samples collected from nearby production wells indicate new, man-made connections between the RRG-9 and the existing reservoir.

The fluid samples and increased well injectivity have several important implications:

The RRG-9 ST-1 wellhead fitted with a lubricator. A distributed temperature sensor was run through the lubricator to measure well bore temperatures. (Photo: GTO)

- The stimulation of RRG-9 has successfully enlarged the size of the existing geothermal reservoir.

- The injection well, which was initially isolated, or sub-commercial, has been incorporated into the existing geothermal field. RRG-9 has greatly exceeded the project teams' target flow rate of 500 gpm. Pressures within the reservoir have decreased with time, also indicating that the reservoir is growing.

- The increased reservoir size and added injectivity will yield an estimated 2.5 megawatts electric and eliminate the need for drilling another US$3 million-US$4 million injection well closer to the bore field.

- The team's success demonstrates the importance of low pressure thermal stimulation as the primary mechanism for improving well injectivity, in conjunction with strategic high rate stimulation techniques.

Broad collaboration on this EGS demonstration project has contributed significantly to its success. Collaboration between the academic community, geothermal industry, and National Laboratories has ensured a successful well stimulation project, and facilitated collection of an immense amount of temperature, pressure, flow, seismic, and tracer data. This data will continue to be used for analysis, data interpretation, and modeling efforts for years to come.

The final phase of this project will consist of long-term data collection and analysis activities to understand the creation and evolution of an EGS reservoir that is connected to an existing geothermal reservoir. The data collected here will further advance EGS technologies and deployment, further contributing to the advancement of EGS commercialization.

Source: http://energy.gov/eere/articles/eere-success-story-geothermal-technology-breakthrough-idaho-building-upon-previous-egs

EPA Includes Geothermal in Its Proposed Rule for the CEIP - The U.S. Environmental Protection Agency (EPA) has issued its proposed rule for the Clean Energy Incentive Program (CEIP), and it includes geothermal energy. Section III.C of the proposed rule proposes the expansion of eligible CEIP projects to include, in addition to wind and solar, two other renewable energy technologies: geothermal and hydropower. Ben Matek, Industry Analyst of the Geothermal Energy Association (GEA), said: "While GEA is still reviewing the proposed rule, we are pleased the EPA has proposed to include geothermal technology as part of its CEIP program…" Karl Gawell, GEA's Executive Director, commented: "We applaud the EPA for proposing to include geothermal power in its CEIP under the Clean Power Plan (…) There are a significant amount of geothermal projects that could be under development if provided market incentives as proposed in the CEIP."

The proposed rule of EPA can be downloaded at: https://www.epa.gov/sites/production/files/2016-06/documents/ceip-design-details-nprm.pdf.

ASIA/PACIFIC RIM

India: The Country Looks to Harness 10GW of Geothermal Power by 2030

In its quest to increase its renewable energy portfolio, India proposes to harness 10,000 MW (10 GW) of geothermal energy by 2030 through active international collaboration with countries such as the U.S., Philippines, Mexico and New Zealand.

The Indian government's ministry of new and renewable energy (MNRE) released on early June a document titled *Indian Geothermal Energy Development Framework*, deemed as the first step to define a 'National Policy for Development of Geothermal Resources in India'. The document states, "The geothermal policy envisages to make a substantial contribution to India's long-term energy supply and reduce our national greenhouse gas emissions by developing a sustainable, safe, secure, socially and environmentally responsible geothermal energy industry (…) by the means of deployment of 1000 MW geothermal energy capacity in the initial phase till 2022 and 10,000 MW by 2030." The entire 18-page document is freely available by visiting http://mnre.gov.in/file-manager/UserFiles/Draft-Geothermal-frame-work-for-comments.pdf.

In the run-up to the Paris Climate Change summit in December 2015, the Indian government announced its target of achieving 175 GW of renewable power by 2022 and 350 GW, or 40% of its total installed power

capacity, through renewable energy sources by 2030.

India's central government has been actively supporting geothermal research for over two decades. Systematic efforts to explore for geothermal resources first commenced in India in 1973, and several promising sites were identified. Some of these are Cambay Graben in Gujarat, Puga and Chhumathang in Jammu and Kashmir, Tattapani in Chhattisgarh, Manikaran in Himachal Pradesh, Ratnagiri in Maharashtra and Rajgir in Bihar.

The draft policy also stresses on the role and active participation of states. The respective state governments will facilitate land acquisition at determined prices and decide on the royalties to be paid for the utilization of geothermal resources.

Source:
http://www.livemint.com/Industry/qFWtAToDvYCYqtKjTcfixH/India-looks-to-harness-10-GW-geothermal-power-by-2030.html

Indonesia: Geothermal Projects in Aceh and Seulawah and Others to Be Tendered

State Companies to Cooperate on Geothermal Power Project - The government companies Semen Indonesia and Pertamina signed a memorandum of understanding (MOU) on developing a potential partnership in the oil and gas business. Among other projects, the two state firms would also work together in the use of geothermal energy in Aceh, where Pertamina would build a 50 MW geothermal power plant. The electricity produced would be sent to Semen Indonesia's factory in the province.

Pertamina's president director Dwi Soetjipto explained that this was in compliance with the government directive to reduce the use of fossil fuel. He stated that this partnership would be able to ascertain which energy is the most efficient and look at related environmental issues.

Source:
http://en.katadata.co.id/news/2016/04/25/converting-to-gas-will-save-semen-indonesia-idr-1-trillion-a-year

More Geothermal Projects to Be Tendered - The Indonesian government will tender eight geothermal power plants countrywide this year as part of efforts to reach a target of 7156 MW of electricity from geothermal energy.

On late April the Energy and Mineral Resources Ministry's geothermal director, Yunus Saefulhak, stated that the geothermal power plant projects tendered in 2016 amounted to approximately 1160 MW and were expected to start operations in 2024. He said: "The bidding for three of the geothermal power plants has been completed, while the remaining five will be offered in stages." The projects completed are Way Ratai (55MW) in Lampung, Marana (20MW) in Central Sulawesi and Gunung Talang Bukit Kili (20MW) in West Sumatra. The remaining five are Gunung Gede Pangrango (West Java), Gunung Hamiding (North Maluku), Gunung Wilis (East Java), Graho Nyabu (Bengkulu), and Gunung Geureudong (Aceh).

On the other hand, the Ministry's director general of renewable energy and energy conservation, Rida Mulyana, said that the government was preparing three regulations in the hope of increasing investment and speeding up the development of geothermal resources. The first government regulation would allow regions to reap economic benefits from geothermal power plant projects, while the second regulation would cover the direct use of geothermal resources for tourism, agriculture and industry. The third regulation would allow private companies to conduct surveys and exploration of potential geothermal reserves with a minimum of three wells. If activity was successful, the companies would receive the right to a direct appointment over the area. The regulation would stipulate that tenders should prioritize a company's proposed work program and commitment to exploration over electricity selling prices.

Source:
http://www.thejakartapost.com/news/2016/04/20/more-geothermal-power-projects-tender.html

Agreement on the Seulawah Geothermal Project - After two years of negotiations, PT Pertamina Geothermal Energy (PGE) and Perusahaan Daerah Pembangunan Aceh (PDPA) signed a Shareholders Agreement on the Seulawah geothermal power project. As the winner of the tender for this project, PGE was required to form a partnership with

PDPA to build and operate the geothermal power plant in the field. PT Pertamina and PDPA will establish a joint venture company to be called PT Geothermal Energy Seulawah (PT GES) to implement the project. Pertamina as the capital provider will have a 75% share with PDPA holding the remaining 25%. PDPA will pay for the share with a grant from KfW, a German government-owned development bank based in Frankfurt.

The PDPA-PGE partnership is a concept under the Public Private Partnership scheme. The German government through KfW is expected to provide a loan of €56 million (US$64 million) to finance the project. The Seulawah Agam concession, in the regency of Aceh Besar, around 50 km southeast of Banda Aceh, is estimated to have a geothermal reserve equivalent to 165 MW. The first unit would have a capacity of 55 MW, and the exploration stage will cost around US$40 million according to PT Pertamina.

Source:
http://www.antaranews.com/en/news/104611/aceh-pertamina-sign-seulawah-geothermal-shareholders-agreement

Three More Geothermal Plants for PGE - PT Pertamina Geothermal Energy (PGE) is ready to operate three geothermal plants with a total capacity of 165 MW this year. These plants are Unit 3 in Ulubelu, Lampung, with a capacity of 55MW, the Lahendong Unit 5 in North Sulawesi with a capacity of 55MW, and the Karaha Unit 1 in West Java with a capacity of 55MW.

The Ulubelu unit 3 is scheduled to begin operations in August, while the other plants in December 2016. PGE has also completed drilling of exploration wells in these three fields; i.e., two wells in Ulubelu Unit 3, two in Lahendong Unit 5, and three in Karaha Unit 1.

According to Tafif Azimudin, PGE's Corporate Secretary, "These geothermal projects are meant to boost the national energy security program. "The total additional capacity installed in these geothermal plants is 160MW. Currently, the installed capacity of geothermal power plants managed by PGE is 437MW."

Source:
http://www.antaranews.com/en/news/105249/pertamina-to-operate-three-geothermal-plants-in-2016

Japan: Commissioning of Mini Plant, Insurance to Reduce Concerns & Exploratory Drilling in Fukushima

Geothermal Mini Plant Commissioned - In early May, the Reno-based firm ElectraTherm hosted the Opening Ceremony for the commissioning of a Power+ Generator™ 4400 at a hot spring (onsen) in Beppu, Japan. This is the first Power+ Generator in the country; it utilizes geothermal heat to generate fuel-free, emission-free electricity.

Commissioned in March, the Power+ runs off low-temperature geothermal steam from a small district heating system. The power is sold to the local utility at an attractive feed-in-tariff rate for renewables

ElectraTherm utilizes Organic Rankine Cycle (ORC) and proprietary technologies to generate up to 110 kWe of electricity from low temperature water ranging from 77-122°C. At this site, the onsen provides geothermal steam at 110°C. Instead of expensive cooling equipment to lower the resource to a suitable temperature for heating, the water runs through the Power+ Generator that simultaneously cools the water up to 20°C while producing clean electricity.

"The Power+ Generator not only generates power and profit it also solves a problem –cooling onsen water that is otherwise too hot for human use", said Kazunori Ueda, Project Lead and Director of Sales & Marketing, Sankou Denki. "With Japan's feed-in-tariff rate for

geothermal at 40 Yen/kWh (~US$0.33/kWh), we see a strong opportunity for profit at this site and approximately 40 plus similar sites in the prefecture of Oita alone –and hundreds more at other districting heating systems and onsens (hot springs) throughout Japan. The minimal impact to the property with a small footprint and quiet sound profile make this a hidden gem for the local community, serving as a resource and providing a fixed profit at a district heating system that has been in operation for many years, and will continue for many more."

Source: http://electratherm.com/electratherm-power-generator-commissioned-in-japan-on-geothermal-district-heating-system/

Insurance to Reduce Concerns of Hot Spring Operators - Tokio Marine & Nichido Fire Insurance

Co. has begun offering a type of insurance intended to ease the concern of hot spring operators about the impact of new geothermal power stations. According to Takeharu Kikuchi, a spokesman for the Tokyo-based company, developers of geothermal power projects can now buy an insurance policy that covers the cost of surveys to determine if their projects are the cause of changes in the quality and volume of the waters in hot springs. Until now, hot spring operators must pay for such surveys if they want to claim a nearby geothermal power station is causing problems. Surveys can usually cost between 5 and 30 million yen (US$47,000 to 282,000). The expansion of geothermal power in Japan has been slow despite ample resources and even after the country introduced an incentive program for clean energy in 2012.

Source:
http://www.renewableenergyworld.com/articles/2016/06/tokio-marine-insures-geothermal-developers-from-hot-springs-risk.html?cmpid=renewablegeothermal06162016&eid=291021978&bid=1434878

Exploratory Drilling in the Fukushima Prefecture - Two exploration wells will be drilled at 1.9 kilometers at the Bandai-Asahi national park, located in the Fukushima Prefecture, 230 kilometers north of Tokyo later this year, said Hisashi Jotaki, head of the geothermal section at Idemitsu Kosan Co. The project has gathered other 10 Japanese companies, joining efforts to promote clean energy in the prefecture after an earthquake in 2011 triggered the worst nuclear accident since Chernobyl. Jotake said that surface surveys began in 2013 to identify areas suitable for drilling, and that they "decided to do this as we want Fukushima to use geothermal power to help their reconstruction efforts." Companies will decide by March 2018 whether to move on to drilling wells, depending on the results of the current survey, and the project would come online in the 2020's. Idemitsu is also exploring the feasibility of two other geothermal projects in the northern prefectures of Hokkaido and Akita.

Source:
http://www.bloomberg.com/news/articles/2016-06-24/idemitsu-to-begin-drilling-survey-for-fukushima-geothermal-plan

Malaysia: First Exploration Well at the Apas Kiri Project

Tawau Green Energy (TGE) is developing Malaysia's first geothermal power plant project at the Apas Kiri Geothermal Field in Sabah, Malaysia. Recent results from the first exploratory well show very positive indications of a commercially exploitable reservoir, with a temperature of 191°C at a depth of 1359 meters. In addition, the geological analysis of the well coring is also strongly supportive of a medium temperature reservoir. The exploration well will be deepened up to 1700 meters. The drilling campaign currently plans for 2 exploratory, 7 production and 4 injection wells, and is being undertaken by Strada Energy International. TGE plans to install a 30MW net binary ORC power plant to be supplied by its partner, Exergy Spa of Italy.

View of the wellpad (Photo: TGE).

Source: News release from TGE, 22 June 2016

Philippines: Mabini & Maibarara, Probable Geothermal FiT, Withdraw from Coal Plants, EDC Plans

Drilling in Mabini and Maibarara - By early April, the consortium formed by Basic Energy Corp., Trans-Asia Oil and Energy Development Corp. received approval from the Department of Energy (DoE) for their plan to drill an exploratory well in Mabini, Batangas. The well is being drilled by Diamond Drilling Corporation of the Philippines (DCCP) under a contract valued at P48 million (US$ 1.04 million).

The 3841-hectare covered by the Mabini geothermal service contract No. 8 is located in the Calumpang Peninsula, and is projected to yield up to 60 MW based on the pre-feasibility study. Basic Energy, the operator of the service contract, has a 75% stake in the project. Trans-Asia Oil's equity participation is 25%. Basic Energy previously said the decision to award the contract to DDCP "followed the consortium's rigorous assessment of the technical capabilities of shortlisted contractors vis-a-vis its approved budget."

Drilling activities started in mid-May. According to Trans-Asia Oil, the exploratory well is expected to be completed by mid-August. It is planned to reach a depth of 1500 meters to test the potential geothermal

resource, which was previously identified by geological and geophysical surveys.

Source: http://www.bworldonline.com/content.php?section=Economy&title=basic-trans-asia-win-erc&8217s-approval-for-exploratory-well-in-mabini-batangas&id=125900

On the other hand, Maibarara Geothermal Inc. (MGI) has signed a contract with Desco Inc. to drill injection well MB-17RD in the MGI's Maibarara geothermal field in Santo Tomas, Batangas. Drilling started in late May and is programmed to reach a total depth of 1900 meters. MGI, the owner and developer of the Maibarara geothermal-power facility, is a joint-venture company owned 65% by PetroGreen Energy Corp. (PGEC), 25% by Trans-Asia Oil and Energy Development Corp. (TAO) and 10% by PNOC Renewables Corp. (PNOC RC). MGI President, F.G. Delfin Jr., said that the impending drilling comes after the final investment decision (FID) was issued for the 12 MW Maibarara-2 project (M2) was approved by the MGI board on January 18. Construction of the expanded steamfield pipeline system by several contractors has been ongoing since early February. The company's 20-MW Maibarara-1 integrated geothermal power facility was commissioned in February 2014.

Source: http://www.businessmirror.com.ph/maibarara-taps-desco-to-drill-geothermal-field-in-batangas/

EDC Asked for Geothermal FiT - Renewable energy producer Energy Development Corp., a subsidiary of First Gen Corp., asked the government to provide a feed-in-tariff (FiT) for geothermal power projects. EDC president and COO Richard Tantoco said that future geothermal projects would require a modest feed-in tariff, "nowhere near where wind and solar are today but in reality is significantly cheaper when the costs of intermittency are factored in."

"The whole EPIRA (Electric Power Industry Reform Act) is geared toward competition to reduce cost. But we have to get people to accept and acknowledge that fact that there are other costs not factored there, intermittency, carbon costs," Tantoco said. It was unveiled later that EDC is seeking a FiT charge of P5.00 (US$ 0.11) to P6.00 (US$ 0.13) per kilowatt-hour.

Source: http://thestandard.com.ph/business/205460/geothermal-fit-pushed.html

On its part, the Department of Energy (DOE) is acquiescent to proposals of including geothermal technology in the array of renewable energy (RE) projects that shall be incentivized under the FiT system. However, the Energy Secretary Zenaida Y. Monsada said such set of perks may only be granted to project developers based on the recommendation of the National Renewable Energy Board (NREB), which must carry out an extensive study on the proposal, and shall subsequently lodge its policy recommendations to the DoE for approval.

Monsada said: "It (FiT for geothermal) can be considered… we will have to review it." The FiT subsidy is typically extended to qualified projects at a fixed rate for 20 years. She indicated that at this stage they may only be amenable to granting FiT incentives to low-enthalpy geothermal resources and to those developments of smaller capacities, adding that the NREB must also assess what could be a more prudent policy approach; whether FiT shall be based on steam temperature, or the capacity or scale of the resource.

Source: http://www.mb.com.ph/doe-open-to-fit-perks-for-geothermal/

Main Energy Group Drops Coal Power Plants - Owners of EDC have announced that they "would not invest in coal-fired power plants and called for a decarbonized economy." The Chairman and CEO of First Philippine Holdings Corp. (FPH), Federico Lopez, made the announcement during the company's annual stockholders' meeting, stressing the negative effect of emissions from coal-fired power plants on the environment.

Lopez said: "We are setting a higher bar for ourselves but, for us, it cannot be any other way. We will help power our nation's growth ambitions yet achieve this in ways that recognize the need for a livable Philippines and a livable planet. Today let me state unequivocally and for the record that the FPH and its subsidiaries will not build, develop or invest in any coal-fired power plant. I am certain that without having to look too far, this country already has many alternatives that do not mortgage the future of our children and the future of our planet." Instead of building coal-fired power plants, FPH would push with the development of geothermal power plants, as well as renewable energy sources like wind, solar and hydro.

Source: http://thestandard.com.ph/business/206348/lopez-group-drops-coal-plants.html

EDC's Programs and Plans - Energy Development Corp. (EDC) will complete by the first half of 2017 the strategic technology optimization of its geothermal power plants, which will augment the company's capacity by 50 MW. Richard Tantoco, president and COO of EDC, said that the capacity of the Tongonan geothermal power plant in Leyte will increase from 120 MW to 140 MW, that of Nasulo, in Negros Oriental, from 49.4 MW to 69.4 MW, and that of Palinpinon, also in Negros Oriental, from 192.5 MW to 202.5 MW. Tantoco also mentioned that the BacMan (Bacon-

Manito) geothermal power plant has completed its rehabilitation from the damage of super typhoon 'Yolanda' (or Haiyan).

In other news, Tantoco indicated that EDC was looking at geothermal business opportunities in Mexico. He said: "In Mexico, we are not doing anything yet, but we are considering it. The country's energy sector is privatizing and deregulating, so we want to take a look, but we do not have concrete plans yet." He indicated that while low oil prices had made the company to put on hold its overseas geothermal projects, EDC was optimistic it would benefit from supporting cleaner technologies.

In Chile, due to the recent downtrend in commodity prices EDC decided to postpone its two-to-three well drilling campaign for the Mariposa project originally set for October 2015. Tantoco said that the company would continue to pursue development activities at the Mariposa project with greater focus, including conducting further environmental and technical studies of the steam field, power plant and transmission line interconnection.

Sources:
http://news.pia.gov.ph/article/view/1141465737011/edc-to-optimize-geothermal-power-plants-by-first-half-of-next-year,
http://thestandard.com.ph/business/208123/edc-studying-mexico-project.html

EUROPE

Armenia: Exploration Well in the South of the Country

In the second half of June, Armenia launched reconnaissance drilling of geothermal wells near Kyarkyar City in the southern part the country, according to Hayk Harutyunyan, Deputy Minister of Energy and Natural Resources. He said the location is the first of two sites selected with previous studies. Preliminary research indicates that a power plant at the site would be able to produce between 30 MW and 50 MW of energy. "The purpose of this drilling is final confirmation of the presence of geothermal resources underground," Harutyunyan said. "In case that result of preliminary studies would be confirmed, we will launch here construction of a geothermal station with the capacity of at least 30 MW."

At the beginning of 2016, Armenia received a Strategic Climate Fund Grant of US$8.55 million from the World Bank for implementation of the project. According to estimates by Armenia's Energy Ministry, the potential capacity of the geothermal sector in the country totals 150 MW. This potential was identified in 2009 when Armenia conducted magnetotelluric sounding of hot groundwater indicating good potential for obtaining energy from geothermal sources. In addition, some experts say that that potential is steadily growing every year, so it could be even bigger as of today.

"Due of the rapid development of relatively new volcanic processes in the country, Armenia is considered one of the most promising areas for the development of geothermal power," Tamara Babayan, head of Armenian Renewable Energy and Energy Saving Fund, said. "We expect the station construction will be funded through private investments."

The overall investment amount of the project is estimated at US$ 45 million, but the final figure is yet to be determined, since without a confirmed investor, it is hard to assess the actual cost for construction, according to representatives of the ministry. Construction should be launched in 2017, so the station could be commissioned by 2020. The project is believed to be the biggest geothermal power station in the Caucasian region and one of the biggest in post-Soviet Union space.

Armenia has been promoting the development of renewable energy resources since 2009, when the country's government adopted a program for promoting construction of small hydro power plants across the country in order to cut dependence on imported hydrocarbons.

Source:
http://www.renewableenergyworld.com/articles/2016/06/armenia-begins-drilling-for-major-geothermal-station.html

Croatia: Proposed Hybrid Geothermal Power Plant

Recently, a new investment project in Croatia recently began construction activities in Draskovec/Medjimurje. In early April, the opening ceremony was held at the

construction site, where AAT Geothermae, the investor funding the project, welcomed the Croatian Minister of Economy, Tomislav Panenić and the Minister of Environment and Nature Protection, Slaven Dobrović.

AAT Geothermae is supported by the Ministry of Economy of Croatia, the Medjimurje County and the City of Prelog, and is a technology pilot project that puts the Republic, the County and the City on the international landscape of producing power from renewable sources. The geothermal undertaking is one of a handful of major projects currently under development in the country. Overall, it will attract entrepreneurs, and create business opportunities and jobs that will lead to a better quality of life in the region.

In about two years, the initial Prelog customers are scheduled to receive heat from the hybrid power plant being built in Draskovec. It will be the first such plant in Croatia that will supply geothermal heat to companies in economic/industrial zones, to households, and to farms interested in growing vegetables in geothermally heated greenhouses. Peter Vesenjak, advisor to AAT Geothermae said, "Works in Draskovec are already underway. We want to complete the power plant by the end of the year (2016) and the project is currently in the deep drilling phase. We started working on other infrastructural parts of the project, such as cables connected to the main power line, and we are preparing for the construction of the access road and drainage system for the power plant".

The power plant is the first phase of a much wider project named Hortus Croatiae, or Garden of Croatia. The next scheduled phase is a health resort/spa center, water park, and mineral water bottling plant. The cost of the project is about US$86 million.

Source: https://www.total-croatia-news.com/business/10753-the-garden-of-croatia-hortus-croatiae-renewable-energy-project

Europe: Promotion of an ETIP on Deep Geothermal

In early April, more than 50 experts from all over Europe met in Brussels to begin the process of creating a European Technology and Innovation Platform (ETIP) for deep geothermal. During the meeting, participants discussed the draft terms of reference and selected the members of the provisional Steering Committee. The chair of this ETIP is Ruggero Bertani (Enel Green Power), Vice Chairs are Marco Baresi and Jan Diederick VanWees; other members are Miklos Antics, Roy Baria, Fausto Batini, Chistian Boissavy, Sylvie Gentier, Ernst Huenges, Peter Kovacs, Bruno Leray, Adele Manzella, Hjalti Pall, Paul Ramsak, Pierre Vergnes, and Paul Younger.

European Technology
Deep Geothermal
& Innovation Platform

Recently, the European Commission (EC) recognized the ETIPs as a tool to strengthen cooperation with stakeholders under the Strategic Energy Technology Plan (SET-Plan), as part of the Horizon 2020 program. The EC expects the ETIPs to provide strategic recommendations to and inputs for the SET Plan Steering Group on its 10 priorities, mobilize actors towards implementation activities, and contribute to future updates of the SET Plan Integrated Roadmap.

Existing European Industrial Initiatives don't include geothermal energy, although the EC has recognized the need for measures, such as an ETIP, to support the deployment of the next generation of geothermal power and heat plants. The European geothermal sector should therefore create an ETIP on deep geothermal, and ask for its official recognition and support from the EC authorities.

Enel Green Power, one of the main geothermal operators in Europe and the world, with the active support of the European Geothermal Energy Council (EGEC), have been asked by the EC to be the promoter of such an initiative. An application for recognition as an official ETIP by the Commission will be made by the provisional steering committee before this summer.

Source: http://egec.info/successful-kick-off-event-for-etip-deep-geothermal/

Europe: Project GRETA

The EU-Project GRETA –Near-surface **G**eothermal **Re**sources in the **T**erritory of the **A**lpine Space-- started early this year. Its main aim is to foster the near-surface geothermal energy use in the Alpine region, improving energy efficiency and the sustainable production of geothermal energy.

GRETA is built on three specific objectives:

- Increase the knowledge of the spatial distribution of Near-Surface Geothermal Energy (NSGE) potential in the Alpine region.

- Exchange knowledge and best practices for the utilization of NSGE on a transnational basis.

- Develop a knowledge base for the inclusion of NSGE in planning tools.

These objectives will be accomplished by creating geothermal potential maps that act as a decision support tool for the integration of NSGE into policy

instruments, e.g. energy plans and strategies, and can be used for the spatial planning of geothermal installations by public and private stakeholders.

In addition, guidelines will be developed to encourage the harmonization of regulations, authorization procedures and operational criteria for NSGE utilization in the Alpine region. Strategies for the inclusion of NSGE in policy instruments will also be formulated, thus contributing to a growth of NSGE utilization.

GRETA is co-financed by the European Regional Development Fund through the Interreg Alpine Space Programme, a transnational cooperation program for the Alpine region. It provides a framework to facilitate the cooperation between economic, social and environmental key players in seven Alpine countries, as well as between various institutional levels such as academia, administration, business and innovation sectors, and policy making. In the current 2014-2020 period the program is investing €139 million (US$155 million) in projects through which key actors develop shared solutions for prevalent Alpine issues.

Dr. Kai Zosseder (TU Munich), coordinator of the GRETA Project, said, "The GRETA project will bring new opportunities to the utilization of near-surface geothermal energy and foster the efficient implementation and operation of near-surface geothermal systems in the Alpine Space. We are looking forward to achieving this with close interaction and continuous feedback of our observers and stakeholders." More info at www.alpine-space.eu/projects/greta.

Source: Press release.

France: ECOGI Project Inaugurated

ECOGI (**E**xploitation de la **C**haleur d'**O**rigine **G**éothermale pour l'**I**ndustrie; Exploitation of heat of geothermal origin for the industry, in English), is a joint initiative of Electricité de Strasbourg (ES), the local utility in the city of Strasbourg (Alsace), the biorefinery Roquette Frères, and the bank Caisse des Dépôts. ES and the biorefinery each hold 40% of the shares and the bank the remaining 20%.

The initiative is focused on a project at the commune of Rittershoffen, Strasbourg, in north-eastern France, within the Upper Rhine Graben, that started in 2011. The project consists of two geothermal wells (GRT-1 and GRT-2), heat exchangers, conduction pipes and a 24 MWth steam generator.

GRT-1 is a 2600 m-deep vertical re-injection well whose original ~25 l/s (liters per second) capacity was hydraulically enhanced to ~80 l/s (~280 t/h). GRT-2 is a 3200 m long directional well (2500 m deep), whose bottom is 1200 m away from well GRT-1; it produces ~70 l/s (~250 t/h) of geothermal fluids at 170°C, and did not need stimulation. The geothermal fluids are sent through the heat exchanger, located on the outskirts of Rittershoffen, and then reinjected into GRT-1 at a temperature of ~70°C. The heated fresh water leaving the exchanger is sent to the biorefinery located on the outskirts of Beinheim, through a 15 km-long, high-temperature pipeline with a minimum loss of 4°C. Afterwards, the fresh water is returned to the heat exchanger through another 15-km pipeline to repeat the cycle.

The ECOGI project is the first EGS (Enhanced or Engineered Geothermal System) project for industrial applications in France, with a total cost of €55 million (US$62.5 million), 43% of which was financed by the Renewable Heat Fund from ADEME (Agency of Environment and Energy Management). It will provide about 25% of the heat needed by the biorefinery and will replace some 16,000 tons of oil equivalent of fossil fuel, thus preventing 39,000 tons of CO2 emissions each year. The project was officially inaugurated by Ségolène Royal, the France Minister of Environment, Energy and Marine Affairs, on June 7.

Ségolène Royal in the opening of the ECOGI project.

Sources: http://renewables.seenews.com/news/france-opens-deep-geothermal-power-plant-527829, http://www.geothermaleranet.is/media/publications-2015/3_Lacirignola-ADEME---ECOGI.pdf

Germany: New Professor at the International Geothermal Centre Bochum

The International Geothermal Centre Bochum could strength the collaboration with the Leibniz Institute for

Applied Geophysics (LIAG). The Faculty of Civil Engineering at the Bochum University awarded an Honorary Professorship to Dr. Inga Moeck for the research field "Exploration and Geology from Geothermal Reservoirs". She is the Director of the LIAG's section for Geothermic and Information Systems. The focus of her research is the characterization and exploration of geothermal reservoirs and the influence of geological fault zones on the expression of geothermal reservoirs.

Dr. Moeck and the International Geothermal Centre Bochum look forward to the new collaboration and for the infrastructure and competence opportunities. The new collaboration will combine research efforts on application-oriented topics at a national and international level. The honorary professorship was celebrated at the International Geothermal Centre in Bochum in early June.

Rolf Bracke, Director of the International Geothermal Centre Bochum (left), Prof. Dr. Jürgen Bock, President of the Bochum University of Applied Sciences, and Dr. Inga Moeck. Photo by Bochum University of Applied Sciences.

Source: Press release.

Hungary: First Geothermal CHP to Be Developed in Tura

The Turawell geothermal project is located in the city of Tura, about 50 km from Budapest; it will be the first geothermal combined heat and power plant (CPH) in the country. Geothermal fluids will be used for power production and then for heating of greenhouses and buildings in the power plant area. Then, the fluids will be injected back into the geothermal reservoir, which results in sustainable pollution-free heat and power production.

In early May, KS Orka Renewables Pte Ltd of Singapore announced that it had signed an agreement to acquire 51% of Turawell Kft. (Turawell) from the Hungarian owner and project developer Miszori László. It was also unveiled that the firm had contracted the Icelandic engineering group Mannvit for the project's complete engineering services.

Eirikur Bragason, KS ORKA's CEO, said, "KS Orka aims to be the leading global developer and operator of geothermal projects. KS Orka has prioritized investments in Asia and Europe and is targeting development of 500 MW of power generation capacity over the next five years. The Turawell Project is an important first step in Hungary towards achieving this goal and the first phase 3 MW is planned to be operational within a year."

KS Orka is a joint venture between Hugar Orka ehf, an Icelandic company and Zhejiang Kaishan Compressor Co., Ltd (Kaishan). It combines Hugar Orka's geothermal and project development expertise with Kaishan's power plant technology and manufacturing expertise to form a vertically integrated geothermal and waste energy company.

Source: http://www.thinkgeoenergy.com/ks-orka-acquires-majority-in-hungarian-geothermal-heat-and-power-project/?utm_source=ThinkGeoEnergy+List&utm_campaign=184e621ec9-TGE_Newsletter_RSS1_12_2015&utm_medium=email&utm_term=0_657e42f767-184e621ec9-415210497

Iceland: Sulfur-free CO_2, Deep Drilling Contract, Cornell-GRP Agreement & Financing of Theistareykir

New Catalyst Produces Sulfur-free CO_2 from Geothermal Facility - Icelandic geothermal power company HS Orka hf has signed a contract with Danish Haldor Topsoe for a plant to transform excess CO_2 into a commercial product. The plant is the first to use Topsoe's new selective oxidation catalyst SMC™ to remove sulfur from the CO_2 contained in geothermal fluids. The presence of sulfur (i.e., H_2S) prevents the industrial use of the CO_2, and also can cause unpleasant odor. The new process removes sulfur from the off-gas, eliminates smell, and produces commercial-grade CO_2, which is an attractive commercial opportunity for many geothermal power plants around the world.

"It is our aim and responsibility to fully utilize the environmental and commercial possibilities from the geothermal sources we manage. The agreement with Topsoe should allow us, as we have done with other streams of resources, to exploit the CO_2 sources to its

full extent. As an added benefit, the CO2 will be made available in the local market," says Kristín Vala Matthíasdóttir, VP Resource Park, HS Orka hf.

The new SMCTM catalyst will be at the core of a new demonstration plant that will be placed next to HS Orka's existing geothermal power plant at Svartsengi, Iceland. The plant will process 10% of the total off-gas stream to produce commercial-grade CO_2. HS Orka will market the CO_2 to local greenhouses and algae producers, who can grow products for export and local consumption even in the dark Icelandic winter, aided by high CO_2 levels in the greenhouses and low cost electric lighting and heat, all from green geothermal power.

The contract is for a lease agreement based on an integrated solution from Topsoe that delivers engineering and process design, equipment and complete services, including remote monitoring and catalyst replacement. HS Orka will pay Topsoe per ton of CO_2 that meets specific purity requirements, whilst Topsoe will design, engineer and deliver all the equipment and services for the plant, including remote monitoring and catalyst replacement.

The Icelandic market has potential for more projects using Topsoe's SMC™ catalyst, which is also relevant to geothermal plants worldwide.

Source: http://www.gasworld.com/new-plant-to-capture-co2-from-geothermal-facility/2010320.article

HS Orka and Jardboranir Signed a Contract for Deep Drilling at the Reykjanes Geothermal Field - HS Orka and Jardboranir have signed a contract for drilling of a 5 km deep, high-temperature well at the Reykjanes geothermal field. Jardboranir's biggest drilling rig 'Thor' will be used for the project. The well is intended to be the country's deepest and hottest geothermal well, with temperatures up to 500°C. Drilling operations are scheduled to start before the end of this year.

HS Orka's existing 2.5 km deep well at Reykjanes, Well 15, will be deepened to around 5 km. The contract realizes the next step of the Icelandic Deep Drilling Project (IDDP) with the purpose of demonstrating the possibility of harnessing deep hydrothermal high-enthalpy reservoirs to augment the current conventional geothermal fields. If the chemistry of the superheated steam can be dealt with, the well will be used directly for power production, potentially increasing the output of the Reykjanes plant. If not, the well may be used as an injector expanding the output of the existing shallower production wells. New technology will be introduced for the drilling, testing and harnessing the deep well, in collaboration with domestic and international partners.

HS Orka manages the project in cooperation with Statoil of Norway and the IDDP consortium partners.

Drilling rig 'Thor' (photo by Jardboranir).

The IDDP project was recently awarded an over €9 million research grant from the European Union research program "Horizon 2020". The project is led by HS Orka in cooperation with Isor, Landsvirkjun, Georg, Statoil and number of European companies (*see* IGA News 103, pp. 21-22).

The IDDP project has being ongoing the last 15 years. The consortium consists of the Icelandic power companies HS Orka, Landsvirkjun, Orkuveita Reykjavikur together with the National Energy Authority and Statoil. HS Orka is the Icelandic subsidiary of the Canadian renewable energy firm Alterra Power Corp., which is contributing US$2.4 million to the project.

Source: https://globenewswire.com/news-release/2016/04/26/832792/0/en/HS-Orka-and-Jardboranir-sign-a-contract-on-deep-drilling-at-Iceland-s-Reykjanes-geothermal-field.html, http://www.canadianmanufacturing.com/sustainability/vancouvers-alterra-to-drill-5000-metre-geothermal-borehole-at-iceland-plant-166868/

Cornell and GRP to Cooperate in Geothermal Research and Education - With an aim to create clean, renewable geothermal energy projects and to cooperate in research and education, Cornell University and Geothermal Resource Park (GRP) of Iceland have signed a memorandum of agreement (MOA) that mirrors the successful Icelandic model for integrating

energy solutions. GRP Ltd. facilitates that model within the Iceland Geothermal Cluster to promote clean energy globally.

In late April, the MOA was signed in Reykjavik by Jefferson W. Tester, Cornell's Croll Professor of Sustainable Energy Systems and director of the Cornell Energy Institute, Albert L. Albertsson, chairman of the Iceland Geothermal Cluster, and Ríkharður Ibsen, director of GRP. Ragnheiður Elín Árnadóttir, Iceland's minister of industry and commerce; U.S. Ambassador Robert Cushman Barber witnessed the agreement.

"Sustainability is more than just a concept in Icelandic society," said Tester, leading author of the seminal 2006 MIT report *The Future of Geothermal Energy*. "Sustainability has shaped the country and laid the groundwork for this flourishing nation. Iceland has a fiscal infrastructure that is unlike any other in the world. This island is a global leader with over 95 % of its electricity and heating provided by renewable hydro and geothermal energy."

One of the agreement's key aims is to employ the Icelandic experience of integrating geothermal and hydro resources as a model to transform carbon-based U.S. energy into sustainably harnessed, green systems. GRP will assist Cornell in designing a renewable energy park for possible deployment on the Cornell campus in Ithaca, NY, with an eye toward transforming the campus into a zero carbon model for other campuses and communities.

Tester stated: "This is a vital step for Cornell's Climate Action Plan and aligns with Cornell's mission to promote sustainability by developing renewable approaches for supplying and using clean energy… Iceland's renewable energy represents more than 85% of Iceland's primary energy supply, in contrast to our global primary energy supply where about 80% is derived from fossil fuels… The whole world should look to Iceland for lessons in sustainability and its effort to fulfill our social responsibility of going green."

Source: http://www.news.cornell.edu/stories/2016/05/cornell-and-iceland-team-model-geothermal-energy

Landsvirkjun Closes Financing of Theistareykir Project - Landsvirkjun, the National Power Company of Iceland, said in late June it has completed the financing for the 90MW Theistareykir geothermal power project after agreeing a US$50 million loan with the Nordic Investment Bank (NIB). The state-owned company has signed an agreement for a 16-year loan without a guarantee of collection. In early June, Landsvirkjun secured a €125 million (US$ 139 million) loan from the European Investment Bank (EIB) for the same purpose. The project will be carried out in two 45MW phases. In early 2015, Landsvirkjun signed a contract for the purchase of a 45MW power generating unit, marking the start of construction for the initial phase. "The construction on the Theistareykir site is going well and the power station will commence operations in the fall of 2017", said Horour Arnarson, CEO of Landsvirkjun.

Source: http://renewables.seenews.com/news/icelands-landsvirkjun-completes-financing-for-90-mw-geothermal-project-530776

Turkey: Umurlu and Kizildire III Plants, and PLUTO Initiative

Umurlu 1 Geothermal Plant Proves Higher Efficiency than Expected – In May, the Italian firm Exergy announced that the Umurlu I geothermal plant, commissioned in late 2015 in Turkey for its client KARKEY Karadeniz Elektrik Uretimis, was producing power with higher efficiency than expected. Tests, validated by the third-party company Power Engineers, confirmed that the plant was running with an over performances between 8 and 12% due to the Radial Outflow Turbine, and is therefore producing up to 1.5 MW more than the amount guaranteed to the client.

This power increase over the guaranteed figure, combined with the increased feed-in tariff (FiT) for locally manufactured turbine and auxiliary equipment, provides the customer with revenues approximately 25% higher than initially anticipated. The turbine was built at the Exergy's factory in Izmir, supplying the first certified made-in-Turkey turbine in the market.

Located in the geothermal area of Umurlu, near Denizli, Umurlu I is the first of two 12MW binary plants in Exergy's contract with KARKEY. The second one will be operational during the second half of this year. Exergy has utilized an Organic Rankine Cycle (ORC) module equipped with two Radial Outflow Turbines (ROT) connected to a common generator and an air-

cooled system sized to maximize the efficiency of the plant.

Source: http://exergy-orc.com/communication/news/exergys-rot-proves-higher-efficiency-in-umurlu-1-geothermal-plant

News and Changes in the Kizildere III Geothermal Power Plant - Toshiba Corp. said that it will supply a flash-steam turbine system and generator for the Kizildere III Geothermal Power Plant (GEPP). Zorlu Energy, an independent power producer and member of Turkey's Zorlu Energy Group, will construct the plant in Kizildere, in the Aydin province of West Anatolia, approximately 150 km from the Aegean Sea.

According to Toshiba, Kizildere III is a 95 MW, high-efficiency triple-flash, combined-cycle geothermal power plant, one of the largest under development in Europe and the Middle East. The plant will integrate two systems; i.e., a 72 MW flash-steam generation system using high-pressure steam and an approximately 23 MW binary-cycle power generation system that uses the flash turbine's exhaust steam to vaporize a lower boiling point working fluid to drive a turbine. Toshiba will supply the flash-steam turbine generator system, and Ormat Technologies the binary system. Toshiba said that it will deliver the equipment in December; the plant is scheduled to start operations in October 2017.

The Turkish government is seeking to meet the country's growing energy demand by promoting energy capacity expansion that includes 2500 MW of geothermal power generation capacity by 2023. Toshiba said it will continue to work with Zorlu Energy Group to develop Turkey's power sector, not only in geothermal but also in the thermal and hydro power generation sectors.

In further news, Zorlu disclosed that its 100% owned subsidiary Zorlu Doğal Elektrik Üretimi AŞ (Zorlu Doğal), will include the Kizildere VI GEPP Project within the scope of the Kizildere III GEPP Project, which is currently under construction on the same site. Accordingly, Zorlu Doğal withdrew its pre-license application to the Energy Market Regulatory Authority (EMRA) for the Kızıldere VI GEPP Project. Since the two projects will be merged, an application has been made to EMRA to amend the generation license of the Kizildere III GEPP Project to increase the installed capacity from 95.2 MW to 165 MW with the addition of a second unit with an installed capacity of 69.8 MW.

Sources:
http://www.renewableenergyworld.com/articles/2016/05/toshiba-wins-generator-contract-for-geothermal-project-in-turkey.html,
http://www.zoren.com.tr/EN/INVESTORS/haberler.asp?year=2016&fPage=1&fId=1002

Multimillion Initiative Supports Investments in Exploratory Drilling - The European Bank for Reconstruction and Development (EBRD) has presented its innovative financing scheme in support of geothermal energy projects at a three-day conference IGC Turkey 2016 held in Izmir on early June. The new US$125 million PLUTO initiative provides finance and advice to private developers at the exploratory stages in a move to tap Turkey's significant potential for geothermal energy and help the country meet its growing electricity demand.

Geothermal energy projects face high risks, particularly in their initial stages, including high investment costs and development risks and very limited access to project finance once drilling has confirmed the existence of the resource. PLUTO, named after the ruler of the underworld in classical mythology, helps minimize these risks. It combines US$100 million from the EBRD with US$25 million from the Clean Technology Fund, a funding window of the Climate Investment Funds. The program is part of a global push by multilateral development banks to scale up geothermal energy production.

Under the PLUTO initiative, EBRD aims to develop at least five new geothermal power plants with a combined capacity of at least 60 MW, generating more than 450 GWh of renewable electricity per year. It will increase the amount of installed geothermal capacity in Turkey by more than 10%, thereby contributing substantially to reach the country's renewable energy targets.

Source: http://www.ebrd.com/news/2016/ebrd-presents-financing-scheme-for-geothermal-projects-at-

izmir-conference.html

Oceania

Australia: Drilling for New Geothermal Project in Toowoomba

Specialist drilling company Geothermal Industries drilled five 100 m-deep geothermal boreholes and utilized patented Swedish turbo pipe design at the future site of their new commercial office to establish a geothermal system, prior to start the facility's construction. The system's continuous loop that is filled with tap water uses the natural ground energy to heat and cool efficiently commercial spaces.

The boreholes are drilled with a new drill rig and drilling methods from Sweden, designed in part by Geothermal Industries, made installing the geothermal system more affordable. Once the boreholes are completed and the turbo pipe design is installed, a custom-made cement grouting unit seals the holes, allowing contact from the earth to the turbo pipe design.

After the construction of the building is finished, interested parties will be able to observe the system working through a range of temperature and pressure sensors, and energy draw graphs on a screen in the reception area.

The geothermal system has been designed by Australia's leading supplier and proponent of the technology GeoExchange Australia. Geothermal Industries has partnered with GeoExchange Australia to deliver a new dimension to drilling processes.

Geothermal Industries managing director Nigel de Veth was excited to bring the technology to the region. He commented, "Using this new drilling technology to create a geothermal system allows a building to obtain all of its hot water, under floor slab heating, air heating and cooling from natural ground energy sources. This new system allows us to decrease electricity consumption by 70% in the winter and 50% in the summer."

Sources: GEA Weekly, No. 16, 2016, http://www.thechronicle.com.au/news/australian-first-toowoomba-company-showcases-new-d/2996062/

New Zealand: Drilling Starts at Te Ahi O Maui Geothermal Project

Drilling is underway on the first of three wells for the Te Ahi O Maui geothermal power project near Kawerau. Following completion of this well, the other two will be drilled later this year. Project Manager, Ben Gibson, said that the drilling process will target known sources of geothermal fluid, which could be as hot as 200-300°C.

Eastland Group's board of directors visited the Te Ahi O Maui drilling site.

The 20MW Te Ahi O Maui geothermal project is located 2.3 km north-east of the Kawerau township in the eastern Bay of Plenty, in the Whakatāne District, on land owned by the A8D Ahu Whenua Maori Trust. The Trust is working in partnership with the Eastland Group to bring the project to fruition. The project team is working with internationally recognized drilling specialists including the New Zealand owned and operated rig contractor, MB Century; ancillary service provider, Halliburton; and supervising engineers, Jacobs (formerly SKM).

On the other hand, Ormat Technologies, Inc. announced that one of its subsidiaries has signed a US$36 million Supply, Engineering, Procurement and Construction, (EPC) contracts, with Eastland Group for the project; construction is expected to be completed in 2018. Under the Supply & EPC contracts, Ormat will provide its air-cooled Ormat Energy Converter.

Eastland Generation owns the Geothermal Developments Limited (GDL) plant at Kawerau, which was built by Ormat in 2008.

Sources: http://www.voxy.co.nz/business/5/253947, http://business.scoop.co.nz/2016/04/21/excitement-brewing-for-geothermal-project/, http://www.ormat.com/news/latest-items/ormat-technologies-secures-36-million-supply-epc-contracts-geothermal-power-plant-

Other

Technology: SPX Heat Transfer LLC Recognized for Outstanding License Technology

During its annual Innovation and Technology Transfer Awards ceremony in early May, the US Department of Energy's (DOE) National Renewable Energy Laboratory (NREL) recognized researchers and staff for 169 new innovations. One of them was the advanced direct contact condenser (ADCC) technology, developed by the firm SPX Heat Transfer LLC. After entering into a collaborative research and development agreement (CRADA) with NREL in 1998 to improve geothermal power plant condenser technologies, SPX Heat Transfer has successfully commercialized the ADCC technology for geothermal and thermoelectric applications. This technology has been deployed in the 45MW geothermal power plant in Germencik, Turkey; the 38MW geothermal plant in San Jacinto, Nicaragua, and four 70MW steam turbines in Kenya's Rift Valley.

According to SPX Heat Transfer, ADCC is a licensed technology designed for geothermal power that condenses steam directly from geothermal wells or steam flashed from hot brine. It uses a turbulent film to condense the steam. The higher thermal efficiency of the ADCC technology has many benefits and saving features like:

- It can be designed for lower condenser pressure and/or less cooling water flow to reduce the size of major components;

- Reduces parasitic power consumption for the gas removal system, maximizing the net power generation;

- Reduces unit height, leading to smaller building heights, potentially aiding with tight space requirements;

- Low susceptibility to fouling and/or corrosion;

- Low liquid side inlet pressure and low vapor side pressure drop;

- Minimal degradation of heat transfer by non-condensable gases;

- Prediction of absorption of non-condensable gases;

- Lower cooling water usage, minimizing cooling water circuit first costs and power consumption or lower condenser pressure, increasing power generation;

- Lower exiting vapor temperature and lower vapor side pressure drop, minimizing gas removal system first costs and steam consumption for ejectors and/or electrical consumption for vacuum pumps, typically 8-15% parasitic power savings.

Sources:
http://www.nrel.gov/news/press/2016/26682,
http://spxheattransfer.com/products/detail/advanced-direct-contact-condensers

Technology: MiniGeo, Off-Grid Small-scale Geothermal Power Plants

The Dutch firm IF Technologies has developed a small-scale geothermal power plant specifically for remote communities, the MiniGeo system. The goal is to provide an alternative to diesel generators that are expensive, as well as polluters.

MiniGeo is a small, modular geothermal power plant the size of a shipping container. Besides power, the system produces heat for all kinds of local applications. Units are being designed to generate between 100kW and 1MW of electricity. Exactly how much power can be produced from one unit depends mainly on the characteristics of the geothermal resource and the local demand for electricity.

At the moment, the cost of power from a MiniGeo cannot compete with grid-scale electricity production, but it can in an off-grid scenario. IF estimates the current cost of electricity from a MiniGeo system to range between US$0.10 - $0.20/kWh, depending on the geothermal resource and the size of the installation. The cost of power from off-grid PV-battery systems is at least US$0.30/kWh and diesel generated power costs even more at over US$0.50/kWh. The most important condition is that the geothermal gradient at the location allows for relatively high temperatures at reasonable depths. According to preliminary calculations a gradient of 50°C/km or more will suffice in most cases.

The MiniGeo concept has been developed under the wings of the GEOCAP program, a geothermal capacity building program between The Netherlands and

Indonesia. Because the inspiration for this concept came from GEOCAP, the first pilot project will most likely be installed in Indonesia, since this country is also ideally suited for this type of project.

IF plans to install its first pilot project at the island of Haruku in the Moluccas region in Eastern Indonesia. This island has a dormant volcano in its center and is currently using 1.5MW of diesel generators to provide electricity for some of its 25,000 inhabitants. The MiniGeo system would at least reduce the need for these generators and provide clean and stable power at lower costs. Additionally it could produce drinking water, refrigeration, as well as providing an Internet connection.

Before the Haruku project can be built, IF will perform a feasibility evaluation consisting of geological exploration, environmental and social impact assessments, and preliminary engineering studies. After that, the project can be tendered by the local government or an independent power producer.

Source: http://www.iftechnology.nl/off-grid-electricity-production-with-minigeo

Technology: Use of Plasma to Quicken Geothermal Drilling Operations

In well construction, section milling is a time-consuming operation required as part of plugging and abandonment (P&A) operations. Sometimes, the operation has to be carried out when there is uncertainty over the annular cement in the well, which has the potential to cause flows, cross flows, or seepage of water, gas or oil. To avoid such risks, section milling is used to remove casing and cement to allow placement of new isolations. Standard milling operations currently involve removing the wellhead and the Christmas tree, then pulling the production tubing, before deploying a section milling tool, often requiring a sizeable and costly rig.

The Slovakian company GA Drilling says its solution, Plasmabit, will be able to mill out sections of tubing or casing, without having to remove wellheads, Christmas trees or production tubing. The tool, which could be deployed using a light well intervention vessel, uses a non-mechanical electrical arc rotating at up to 800 revolutions per second, to create a plasma that will fragment steel, cement, rock or other material, inside the well. The plasma arc is created by passing electricity through a plasma forming media, typically water, which is heated to 3000-6000°C. Hydrodynamic and magnetic forces are then used to either radially or axially direct the plasma arc, for either milling or drilling operations, respectively. The impact and speed of disintegration is computer controlled.

During tests on simple and multi-string casing samples in brine environments, a 3½" tool was able to mill a range of casing sizes including 4½", 5½" and 7" in diameter. Rate of penetration was achieved at similar rates to traditional section milling techniques, but because one tool can mill various casing dimensions, tripping time is reduced. Testing also found the tool could mill carbon steel as well as steel alloys without significant difficulty. According to the company, the operation generates a finer powder, compared to the rock cuttings created by traditional milling. Fluid management is integrated within the Plasmabit device, which also has a movement and anchoring sub-assembly, which can also enable milling of wider diameters.

Assembly of a plasma testing prototype. Photos by GA Drilling.

GA Drilling is looking at two different ways to lower the tool into the borehole, either using coiled tubing or a hybrid cable, which could perform under downhole conditions. The hybrid cable would contain a fluid line and electrical and fiber optic elements for power and data transmission. At longer term, the company anticipates the technology will be a solution for geothermal well drilling.

GA Drilling intends to try out the technology onshore before running offshore field tests in early 2018, with offshore operational deployment planned for 2019.

Source: http://www.oedigital.com/technology/item/12622-plasma-power

Technology: MIT's Center Proposes Microwave Technology to Tap Geothermal Energy

Paul Woskov, a senior research engineer at the Massachusetts Institute of Technology (MIT) Plasma Science and Fusion Center (PSFC), is using a gyrotron, a specialized radio-frequency (RF) wave generator developed for fusion research, to explore how millimeter RF waves can open holes through hard rock by melting or vaporizing it. Drilling into hard rock is a difficult and expensive process, and today's mechanical drilling technology has limitations. Woskov believes that powerful millimeter-wave sources could increase deep hard rock penetration rates by more than ten times at lower cost over current mechanical drilling systems, while providing other practical benefits.

Current rotary technology is a mechanical grinding process that is limited by rock hardness, high pressures and temperatures. Specially designed "drilling mud," pumped through the hollow drill pipe interior, is used to enable deep drilling and to remove the excess cuttings, returning them to the surface via the annular space between the drill pipe and borehole wall. The pressure of the mud also keeps the hole from collapsing, sealing, and strengthening the hole in the process. But there is a limit to the pressures such a borehole can withstand, and typically holes cannot be drilled beyond 30,000 ft (9 km) depths.

With the proposed Woskov's gyrotron technology is theoretically possible drill beyond that limit; i.e., up to 10 km depths. In the gyrotron, high-temperature physics will replace the mechanical functions of low-temperature mud, allowing drillers to extract rock matter through vaporization or displace the melt through pressurization. Similarly, the high-temperature melted rock will seal the walls of the borehole, and the high pressure from the increased temperature will prevent collapse. In principle, because an increase in temperature in a confined volume will always result in an increase in pressure over local pressure, drillers could maintain the stability of a borehole to greater depths than is possible with drilling muds.

Woskow is planning to move his base of operation from the PSFC to the Air Force Research Lab (AFRL) in Kirkland, New Mexico, in order to take advantage of a microwave source that would allow him to perform experiments at a power level a factor of 10 higher than is currently possible in the laboratory at MIT.

Support for this project originally came from the MIT Energy Initiative (MITEI). Although Woskov continues to pursue ways his technology can advance geothermal energy research, his current support is from the U.S. DOE's Office of Nuclear Science, through Impact Technologies LLC, which funds him to explore deep borehole storage of radioactive and nuclear wastes.

Woskov foresees a number of other uses for the microwave technology. The high-temperature pressures of microwaves could be used to break apart rocks for mining, or excavate rock to create tunnels and canals. It could also be used for fracking in place of pressurized water, which is controversial due to limited water supply and resulting water contamination.

Source: http://news.mit.edu/2016/paul-woskov-explores-new-path-through-earth-crust-0412

Costs: Actual Construction Costs Published by the US' EIA

In early June, the U.S. Energy Information Agency (EIA) published construction costs for new utility-scale electric power plants installed in the United States in 2013 that used several technologies. The agency indicated that "industry reports and other EIA publications have included various estimates of electricity generation technology capital costs, but this is the first time EIA has collected and reported actual construction costs, which include capital and financing costs, for all new generators. Government grants, tax benefits, or other incentives were excluded from these costs. Because the data are business-sensitive and protected, the analysis presents averaged costs for select groupings and excludes certain generation technologies to avoid disclosure of individual company data. The reported costs reflect a snapshot of market prices for generation technologies at the time the projects were developed and built."

The following table presents the results obtained by IEA, for power plants **installed in 2013 only in the United States**. As indicated before, they are actual construction costs including capital and finance:

Technology	Average cost (US$/kW)
Solar PV	3705
Biomass	3495
Geothermal	2851
Hydro	2294
Wind	1895
Natural gas	965
Petroleum liquids	765

Source: U.S. Energy Information Administration, Form EIA-860, Electric Generator Construction Costs

Note: Average costs are weighted by nameplate capacity. Solar photovoltaic (PV) data are based on reported alternating current (AC) capacity and do not include distributed generation capacity.

EIA stresses that "Construction costs alone do not tell the full story of the relative economics of each

electricity generation technology. For fuel-consuming electricity generation technologies, fuel costs often make up a substantial portion of the plant's total costs. For nonfuel-consuming technologies such as wind and solar plants (and geothermal, we add), the initial construction cost constitutes most of the plant's total costs. In addition, federal, state, and local programs may provide incentives to lower the cost of certain technologies. Finally, different types of plants often run at different utilization rates, which affects the relative economics of generation technologies…"

Source:
http://www.eia.gov/todayinenergy/detail.cfm?id=26532

Costs: GETEM Tool Updated

The Geothermal Technologies Office (GTO) of the U.S. Department of Energy (DOE) has uploaded an earlier version of the Geothermal Electricity Technology Evaluation Model (GETEM) provided by the Idaho National Laboratory. GETEM is an Excel-based tool used to estimate the Levelized Cost of Energy for definable geothermal scenarios.

Electrical power generation is the sole geothermal use considered by GETEM and does not provide assessment capabilities for geothermal direct-use or geothermal heat pumps. The model evaluates either a Hydrothermal or an Enhanced Geothermal System (EGS) resource type, and then either a flash-steam or air-cooled binary power plant based on specific resource parameters.

GETEM aids GTO in understanding the performance and the cost of the technologies it is seeking to improve. It is a detailed model of the estimated performance and costs of geothermal power systems currently available in the U.S. GETEM can be used to analyze and evaluate the state of existing technologies and estimate the cost of certain technologies five to 20 years in the future, given the direction of potential RD&D projects. The model is intended to help GTO determine which proposed RD&D programs and projects might offer the most efficient improvement when based on taxpayer funding.

Recent modifications include:

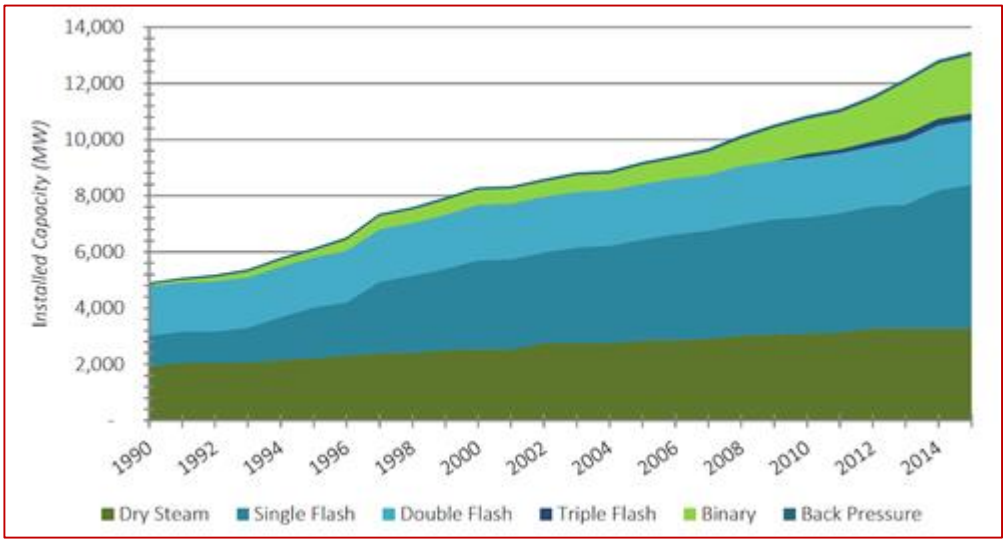
- The updated design centers on inputs variables related to both Hydrothermal and EGS resources using either flash-steam or air-cooled binary power plants
- A schedule of the main project activities with graphical representation showing the timeline for incurring pre-operational capital costs
- A 're-finance' option for expenses incurred at the time of the power purchase agreement
- The model defaults to using failed full-size production wells as injectors wells to supplement the evaluation of Hydrothermal resources
- The model allows injection, production, or both well types for stimulation
- A drilling success rate and a stimulation success rate are used to determine the proportion of 'successful' wells drilled.

The updated GETEM tool is available for download by visiting:
https://www1.eere.energy.gov/geothermal/getem/DownloadTools.aspx

Industry: Most Geothermal Plants Installed in 2015 Were of Binary Type, According to GEA

Of the approximately 313 MW of new geothermal capacity that came online last year, most of it was from small binary/Organic Rankine Cycle (ORC) projects. Yet the dominance of new binary/ORC installations in 2015 is not indicative of how the geothermal market will grow in the future, according to a report from the Geothermal Energy Association (GEA) (2016 Annual US & Global Geothermal Power Production Report).

Flash technologies account for about 58% of global geothermal production, dry steam about 25%, and binary/ORC 16%, the report said (see attached figure). Flash and dry steam technologies are suited to high-temperature resources, while binary/ORC can produce



power from lower temperature resources.

Benjamin Matek, the report's author, explained that "The way geothermal gets developed is that higher temperature resources are developed first, then lower temperatures are developed second. In the U.S., we're developing a lot of binary now because we built out our high-temperature resources — except, for example, in the Salton Sea." Some other countries, such as Indonesia, the Philippines and Kenya, for example, are still building out high-temperature fields with flash/dry steam systems, and later may start to build in lower temperature fields with binary/ORC systems, he said. He added that some countries only have low-temperature resources, and therefore are only using with binary/ORC technology.

Providers of high-temperature turbine technologies include Toshiba, Mitsubishi and Fuji, the report said. In addition, Ormat Technologies currently covers most of the lower temperature turbine installations, but other providers, such as Electratherm, Exergy and Turboden, have entered the market.

The GEA's report found that the global geothermal market currently is at 13.3 GW of operating capacity in 24 countries, and planned capacity under development is 12.5 GW in 82 countries. In addition, the geothermal market is expected to reach 18.4 GW and 32 GW by 2021 and the early 2030s, respectively. According to GEA's Matek, that growth has been estimated by measuring increased support for geothermal at the government level around the world.

Source:
http://www.renewableenergyworld.com/articles/2016/05/market-insight-the-status-of-commercial-and-progressive-geothermal-technologies.html

Industry: Companies Interested in Purchasing Chevron's Asian Geothermal Assets

Sovereign fund China Investment Corp., Malakoff Corp. and Ormat Technologies Inc. are among the companies weighing bids for Chevron Corp.'s Asian geothermal assets, which could fetch as much as US$3 billion. Philippine geothermal energy producers Energy Development Corp., Aboitiz Power Corp. and Japanese trading house Marubeni Corp. are also weighing offers for the assets. Mitsubishi Corp. and Jakarta-based PT Medco Power Indonesia are separately studying potential bids, according to company officials, as well as the Indonesian state energy company Pertamina. Two Chevron subsidiaries now own and operate geothermal projects in Salak and Darajat fields — two geothermal working areas in West Java in which Pertamina also has a minority interest —with a capacity to generate 647 MW.

The CEO of the Filipino group Aboitiz Power, Erramon Aboitiz, said that his company would look into the terms of the sale once they are released, while the COO, Antonio Moraza, said the group would likely bid on its own for the Philippine assets, but it would seek a partner for the Indonesian projects. Chevron has a 40% stake in Philippine Geothermal Production, which supplies geothermal steam to the 692 MW Tiwi-Makban power plants in southern Luzon, which are both owned by Aboitiz Power.

Chevron, the largest U.S. oil producer after Exxon Mobil Corp., has slashed headcount and canceled drilling projects to slow the exodus of cash as oil prices in the world energy markets spiral downward. The company would also seek buyers for its stake in an Indonesian oil and natural gas field and for a 75% stake in its South African unit. Chevron, based in San Ramón, California, joins ConocoPhillips and Apache Corp. in selling assets as oil prices hover near the lowest level in more than a decade. Brent, the global benchmark, dropped 35% in 2015 for a third annual loss.

Citigroup Inc., which is advising Chevron on the geothermal asset sale, called for indicative bids at the end of May. In mid-May the list of potential buyers included: Aboitiz Power Corp. and Energy Development Corp. (EDC), Philippines; Banpu Power, Thailand; China Investment Corp. (Sovereign Fund from China); Engie (formerly GDF Suez), France; Malakoff Corp., Malaysia; Marubeni and Mitsubishi Corp, Japan; Ormat Technologies Inc., U.S.; and Pertamina and PT Medco Power Indonesia.

Sources: Excerpt from ©2016 Bloomberg News, and

http://www.renewableenergyworld.com/articles/2016/04/ormat-said-to-consider-chevron-s-asian-geothermal-assets.html,
http://jakartaglobe.beritasatu.com/business/pertamina-joins-medco-power-pursuits-chevrons-geothermal-assets/, http://asia.nikkei.com/Business/AC/Aboitiz-Power-likely-to-bid-for-Chevron-s-geothermal-assets,
http://www.thinkgeoenergy.com/aboitiz-power-interested-in-chevron-assets-in-indonesia-and-the-philippines/

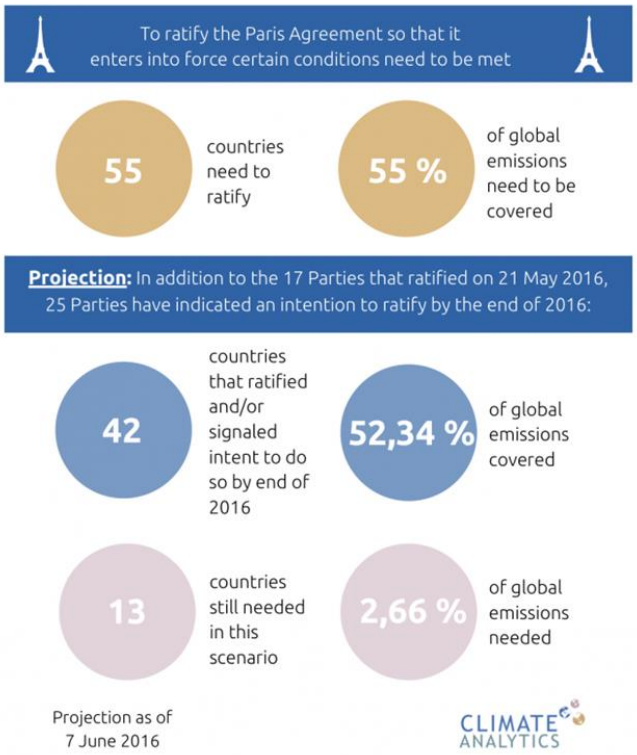
Climate Change: 175 Countries Ratified the Paris Agreement

The Paris Agreement on climate change was signed by 175 countries in New York on April 22. China challenged fellow G20 members to formally approve the UN pact by September 2016. The strong show of support for a deal to end the era of fossil fuels was welcomed by an emotional UN secretary general Ban Ki-moon, who urged countries to accelerate their climate plans.

France's president Francois Hollande described the signing as "more than a commitment". Hollande said that France would be a "role model", adding that he would reveal plans for a higher price, talking of a "path" to €100 per ton of carbon. With the price on Europe's emissions trading scheme languishing at €5/ton, it will be interesting to see whether he is pushing EU-wide reform or supplemental domestic measures.

On a day full of symbolism, it was China's call for countries to formally approve the deal within months that underlined Beijing's desire to be seen as leader in this issue. Vice premier Zhang Gaoli outlined plans for a greenhouse gas emissions peak earlier than its 2030 target, and urged other major economies to join the agreement this year.

U.S. Secretary of State John Kerry, who signed the deal with his granddaughter perched on his lap, said that the US administration "looks forward to joining" this year, likely via a presidential decree.



Secretary Kerry said that two billion Euros on top of an existing €3 billion would be allocated towards climate projects in developing countries, he said, while a new financial transaction tax will raise €1 billion to fight desertification.

Hailed as a diplomatic triumph, the 175 countries who signed in one day makes it a record for the UN, beating the 119 that backed the UN Law of the Sea in 1982.

Fifteen countries officially ratified the agreement, including Barbados, Belize, Fiji, Nauru, Palestine, St Kitts and Nevis, St Lucia. To come into force, 55 countries covering 55% of the emissions must ratify. According to the World Resources Institute, the April 22 pledges get us up to 25 countries and 45% of the emissions. But in a year likely to set another heat record, with concentrations of CO_2 in the atmosphere at new highs, few were quick to proclaim victory.

India's Prime Minister Narendra Modi affirmed a desire to seal the deal "as early as possible" in a visit to Washington in June, potentially adding 4%.

The European Commission published a draft motion for the Council of leaders to consider. With the US and China promising to join the pact in 2016 and India not far behind, the pressure is on for the EU to keep up.

Climate commissioner Miguel Arias Canete said: "After Paris, the EU is doing its homework. We are determined to maintain the momentum and spirit of Paris and ensure the early ratification –and the swift implementation– of this historic agreement.

No timeline has been agreed, however. Lawyers are still debating whether the EU can ratify before each member state has its laws in place.

France and Hungary have completed their parliamentary processes, and President Holland signed a law in a ceremony at the Elysee Palace on mid-June. Others, including Sweden, Portugal and Austria are prepared to do the same this year.

Bulgaria, Czechia and Croatia are among those unwilling to formally endorse the deal before the bloc's 2030 carbon target has been divided up.

The UK's plans are currently on hold, after the triumph of the Brexit when voters decided to leave the EU in late June. However, the Parliament is set to approve a 57% emissions reduction from 1990 levels by 2032, one of the most ambitious targets in the world, as commented Amber Rudd, the Britain's climate and energy chief.

Amid the applause, smiles and relentless positivity, some noted the absence of nearly 20 countries from the signing ceremony; including Saudi Arabia, Qatar and

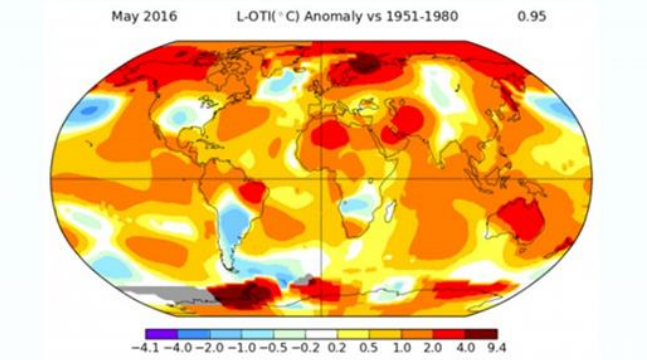
Nicaragua. "One has to wonder why there are some countries that did not attend the meeting or did not sign yet," said UN climate chief Christiana Figueres, who leaved her post in July and is expected to formally announce her candidacy for UN Secretary General.

Sources:
http://www.climatechangenews.com/2016/04/22/un-record-as-175-countries-sign-climate-deal-but-hard-graft-remains/,
http://www.climatechangenews.com/2016/06/10/eu-gears-up-to-approve-paris-climate-agreement/,
http://www.climatechangenews.com/2016/06/30/uk-carbon-target-soothes-investor-nerves-amid-brexit-confusion/

Climate Change: Another Month, another Round of Broken Climate Records

Data from NASA suggests May's temperatures were the hottest for that month globally and made it the warmest northern hemisphere spring on record.

"The state of the climate so far this year gives us much cause for alarm," said David Carlson, head of the World Meteorological Organisation's (WMO) climate research program.



"Exceptionally high temperatures. Ice melt rates in March and May that we don't normally see until July. Once-in-a-generation rainfall events. The super El Niño is only partly to blame. Abnormal is the new normal."

The news comes a day after scientists at the UK Met Office published research indicating global levels of carbon dioxide have passed the 400 parts per million milestone for good.

"The strong El Niño –which has now dissipated– fuelled the high temperatures witnessed so far in 2016.

"But the underlying cause of global warming remains greenhouse gases in the atmosphere due to human activities."

Source:
http://www.climatechangenews.com/2016/06/14/nasa-world-just-baked-in-hottest-may-on-record/

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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International Geothermal Association (IGA)
c/o Bochum University of Applied Sciences
Lennershofstr. 140, 44801 Bochum, Germany
Tel.: +49 (0)234 32 10712, Fax: +49 (0)234 3214809
E-mail: iga@hs-bochum.de
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