

Geothermal Resources Council 37th Annual Meeting & GEA Geothermal Energy Expo



September 29 - October 2, 2013
MGM GRAND
Las Vegas, Nevada, USA

"A Global Resource, from Larderello to Las Vegas"



PRELIMINARY PROGRAM

Register Now!



Join Us in Las Vegas!

“The Entertainment Capital of the World”

The GRC Annual Meeting and GEA Geothermal Energy Expo promises to be the biggest and most anticipated geothermal energy event of the year. Don't miss it.

Connect for the latest news and event information on GRC's website www.geothermal.org

Registration Now Open

REGISTER ONLINE AT: www.geothermal.org

Register by August 30 and save up to \$100

GRC Annual Meeting & GEA Geothermal Energy Expo features:

Pre-Meeting Workshops

- New Developments in Power Plants (2-days)
- Geothermal Exploration in the 21st Century (2-days)

Field Trips

- Las Vegas Valley Geology Field Trip (Pre-meeting, 1-day)
- Hoover Dam, Red Rock Canyon and Goodsprings Recovered Energy Generation Power Plant (Pre-meeting, 1-day)
- Imperial Valley, California Geology & Geothermal Facilities (Post-meeting, 4-days)

Charity Golf Tournament (Angel Park Golf Club, Las Vegas – Shuttle available from MGM Grand)

GRC/GEA Opening Reception

GEA Geothermal Energy Expo

International Luncheon

International Session

Technical Sessions

Student Leadership Luncheon

Poster Session and Expo Networking Reception

First Annual Women in Geothermal (WinG) Reception

Party with the Geothermal Stars (Annual Banquet)

Membership Meeting & Awards Luncheon

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GRC 37th Annual Meeting & GEA Geothermal Energy Expo

"A Global Resource, from Larderello to Las Vegas"

The Geothermal Resources Council (GRC) invites you to be part of the biggest geothermal conference and expo in the world.

Promoting "A Global Resource, from Larderello to Las Vegas" the GRC 2013 Annual Meeting & GEA Geothermal Energy Expo will be held September 29- October 2 at the MGM Grand Hotel, Las Vegas, Nevada, USA.



On July 4, 1904, Prince Piero Ginori Conti tested the first geothermal power generator in Larderello, Tuscany, Italy. The world's first commercial geothermal power plant was built in 1913 and begun selling electricity to local industry in 1914. Come to Las Vegas and help us celebrate 100 years of commercial geothermal energy production!

Las Vegas is the undisputed entertainment capital of the world, star of many movies and TV programs. There is a wide range of cultural activities that will satisfy any taste. The MGM Grand is the largest hotel in the U.S. and hosts numerous dining opportunities, theaters, night clubs, bars, spas, swimming pools and stores. In addition the Las Vegas Monorail connects nine major resorts along its four-mile route starting from the MGM Grand.

Now in its 37th year, the GRC Annual Meeting was created for the fellowship of the leading voices and minds of the geothermal industry from every corner of the globe. Designed to encourage networking, business and educational opportunities for all attendees, the meeting is a technological showcase of the latest geothermal research, exploration, development and utilization.

Here are some of the highlights:

The GRC will be hosting pre-conference workshops on Friday and Saturday on *New Developments in Power Plants* and *Geothermal Exploration in the 21st Century*.

There will be two pre-conference field trips. One on Saturday to study Las Vegas Valley geology including the famous Great Unconformity on Frenchman Mountain, Valley of Fire State Park and Muddy Mountain. On Sunday we go to the Hoover Dam, Red Rock Canyon, and the Goodsprings Recovered Energy Generation Power Plant. In addition, there will be a post-conference trip to view the geology and geothermal features of the Imperial Valley, California including a Jeep tour into the desert.

On Sunday, the annual GRC Charity Golf Tournament will be held at the Angel Park Golf Club in Las Vegas, with a shuttle service picking passengers up from the MGM Grand. Proceeds from the tournament will go to the Make-A-Wish Foundation of Southern Nevada.

Back at the MGM Grand, the GRC and GEA will host an Opening Reception on Sunday night. Over the next few days the GRC will put on an Opening Session, followed by Technical Sessions, a Poster Session and Expo Networking Reception, a "Party with the Geothermal Stars", an International Luncheon and Session, a Leadership Luncheon for students, the Annual Membership Meeting and Awards Luncheon, and a showcase of the GRC Amateur Photo Contest winners.

The GRC Annual Meeting will feature distinguished international keynote speakers at its Monday Opening Session.

In tandem with the Annual Meeting is the U.S. Geothermal Energy Association (GEA)'s Geothermal Energy Expo hosting North America's largest gathering of vendors providing support for geothermal resource exploration, characterization, development, production and management. *Entry to the trade show is free with GRC Annual Meeting registration.*

An exciting addition this year is the inaugural meeting of the Women in Geothermal (WinG) group organized by the California Geothermal Energy Collaborative (CGEC).

With GRC's strong track record of bringing together the people and issues most relevant in the industry, attendees will find tremendous value in the GRC Annual Meeting & GEA Geothermal Energy Expo.

For more information visit our website at www.geothermal.org or call (530) 758-2360.

GRC 2013 Schedule of Events

Workshops

FRIDAY & SATURDAY, SEPTEMBER 27 & 28

New Developments in Power Plants

Room 121

8am - 5pm

Cost: \$450 (Member), \$475 (Non-member), \$100 (Student)

Led by: Ronald DiPippo, Professor Emeritus, University of Massachusetts, Dartmouth and Gregory Mines, Idaho National Laboratory

Objectives: Participants will receive an overview of the basic energy conversion systems appropriate for various geothermal resources. Fundamental principles and specific applications will be emphasized. Focus will then concentrate on the latest power plants and the innovative solutions that have been found for some of the challenges facing project engineers and developers.

Day 1 – Friday, September 27

1. Introductions/Agenda

2. Basic Geothermal Power Plants - *Ronald DiPippo*

- Quick review of relevant thermodynamics
- Generalized geothermal plant process flow diagram
- Specific systems:
 - Dry steam
 - 1-flash
 - 2-flash
 - 3-flash
 - basic binary

3. Advanced Geothermal Power Plants I - *DiPippo & Gregory Mines*

- Recuperated binary
- Dual-pressure binary
- Total-flow systems

4. Advanced Geothermal Power Plants II - *DiPippo & Mines*

- Kalina-type binary
- Combined flash-binary
- Integrated single- and double-flash steam
- Flash-crystallizer/reactor-clarifier (FC/RC) plants
- Hybrid plants: fossil/geothermal and solar/geothermal

5. Plant Equipment Selection I - *DiPippo & Mines*

- Geofluid gathering and steam separation options
- Cooling system options: Air cooling vs. water cooling

6. Plant Equipment Selection II - *Mines*

- Turbine design options: Impulse vs. reaction
- Gas removal choices: Steam-jet ejector vs. vacuum pump vs. compressor

7. Wrap-Up And Open Discussion - *DiPippo & Mines*

Day 2 – Saturday, September 28

8. Cases Studies I - Innovative flash plants - *DiPippo*

- Nga Awa Purua, 3-flash, North Island, New Zealand
- Featherstone (Hudson Ranch), 3-flash with mineral recovery, Imperial Valley, USA
- Miravalles, integrated, 4-unit, flash-binary, Guanacaste, Costa Rica

9. Case Studies II - Innovative binary plants - *Mines*

- Burdette binary plant with hybrid cooling system
- Heber 1 flash with bottoming binary and injection pumping
- San Emidio supercritical binary, Nevada

10. Plant & Equipment Costs I - *Mines*

- Introduction to GETEM code

11. Plant Equipment Costs II - *Mines*

- Applications of GETEM

12. Wrap-Up And Open Discussion - *DiPippo & Mines*

FRIDAY & SATURDAY, SEPTEMBER 27 & 28

Geothermal Exploration in the 21st Century

Room 124

8am - 5pm

Cost: \$450 (Member), \$475 (Non-member), \$100 (Student)

Led by: Jeff Witter, Senior Geoscientist at Mira Geoscience Ltd.

Speakers:

- Wendy Calvin, Professor, University of Nevada, Reno (UNR)
- Jim Faulds, Professor, (UNR)
- Nick Hinz, Researcher, (UNR)
- Joe Iovenitti, Vice President Resources, AltaRock Energy Inc.
- Nigel Phillips, Manager at Mira Geoscience Ltd.
- Andrew Rae, Geothermal Exploration Geologist, GNS Science
- Drew Siler, Post-doctoral researcher, (UNR)
- Nicolas Spycher, Geological Scientist, Lawrence Berkeley National Laboratory
- Nathalie Vigouroux, Post-doctoral researcher, Alterra Power Corp.

Objectives: The purpose of the workshop is to provide participants with a multi-faceted overview of modern exploration methods applicable to the discovery of geothermal resources.

We will cover a wide range of topics including: field mapping & structural geology, 3D geological and geophysical modeling, hydrothermal alteration, as well as novel geochemical methods.

We will discuss both volcanic-hosted and non-volcanic geothermal systems.

Workshops *continued*

Day 1 – Friday, September 27

1. Introduction/Opening

2. Geothermal Exploration in the Southwest Pacific - *Andrew Rae*

- Volcanic-hosted geothermal systems in the TVZ (New Zealand) and island arc-settings (Philippines, Indonesia). Highlighting differences in geology, hydrogeological structure, surface manifestations
- Exploration techniques: geology, hydrothermal alteration mapping and application of fluid geochemistry and geophysics leading to establishment of a conceptual model
- Information from well-logging, including alteration petrography (thin sections, XRD, SWIR, MeB), fluid inclusions, and borehole logging (AFIT) that will assist modification/development of a conceptual model

3. New Geochemical Methods for Geothermal Exploration - *Nicolas Spycher*

- Multi-component geothermometry and comparisons to traditional Geothermometry - *Nathalie Vigouroux*
- Review of cutting-edge research on new geochemical field methods for early stage geothermal exploration

4. Structural Geology and Field Mapping: Part 1 - *Jim Faulds, Nick Hinz, and Drew Siler*

- Basin & Range-type geothermal systems
- Geologic mapping
- Structural analysis of fault zones, including slip and dilation tendency analysis
- Integration of well data

5. Structural Geology and Field Mapping: Part 2 - *Jim Faulds, Nick Hinz, and Drew Siler*

- Building 2D cross sections
- 3D geologic models and 3D fairway models
- Selecting drill targets
- Geothermal exploration workflow

Day 2 – Saturday, September 28

6. Geophysics and 3D Earth Modeling: Part 1 - *Jeff Witter, and Nigel Phillips*

- Summary of geophysical surveys for geothermal exploration and their relevance
- Importance of rock physical properties
- Introduction to forward and inverse geophysical modeling and its relevance
- Unconstrained vs. constrained geophysical inversions

7. Geophysics and 3D Earth Modeling: Part 2 - *Jeff Witter, and Nigel Phillips*

- Geologically-constrained geophysical modeling
- Physical property-constrained geophysical modeling
- Generation of 3D Common Earth Models
- Geothermal Exploration Targeting

8. Infrared spectroscopy as a tool for mapping alteration mineralogy - *Wendy Calvin*

- Use of IR spectroscopy to map alteration mineralogy in geothermal settings
- Satellite and airborne sensors to identify surface exposures of structurally-controlled hydrothermal fluids
- Portable IR systems to identify alteration mineralogy in drill core and cuttings
- Future developments: commercial systems and automated mineral mapping

9. Calibrated geothermal exploration methodology Part 1: using baseline (existing) data - *Joe Iovenitti*

- Development of a baseline calibrated geothermal exploration methodology through integrated geoscience analysis using the Basin and Range Dixie Valley Geothermal System in Nevada as a laboratory test site
- Development and use of baseline favorability and trust maps in exploration to decrease drilling risk
- Use of geostatistics to identify geothermal system attributes

10. Calibrated geothermal exploration methodology Part 2: using enhanced (new baseline) data - *Joe Iovenitti*

- Development of an enhanced calibrated geothermal exploration methodology through integrated geoscience analysis at Dixie Valley, Nevada. The enhanced methodology involves, among other results, new gravity, magnetotellurics, and ambient seismic noise findings.
- Use of enhanced favorability and trust maps in exploration to decrease drilling risk
- Discussion of geostatistics based on enhanced data to identify geothermal system attributes

GRC Workshop attendees are invited to a hosted lunch on Friday and Saturday from 12pm-1pm, and a workshop reception on Friday hosted from 5pm-7pm.

The workshop presentations will be given by experts from private industry, national laboratories and universities.

Visit the GRC Annual Meeting web page for the full Workshop Agendas. www.geothermal.org/meet-new.html

Field Trips

SATURDAY, SEPTEMBER 28

Las Vegas Valley Geology Field Trip

7am-5pm Cost: \$140

- Valley of Fire State Park
- Muddy Mountain
- Frenchman Mountain (The Great Unconformity)

The first stop on this day-long field trip is the **Valley of Fire**, named for its red sandstone formations, formed from great shifting sand dunes during the age of dinosaurs, 150 million years ago. Complex uplifting and faulting of the region, followed by extensive erosion, have created a scenic geologic wonderland. Fine examples of rock art left by the Basket Maker people and later the Anasazi Pueblo farmers can be found at several sites within the park.

Next stop is the **Muddy Mountains**, an area of amazing geological formations over-looking Lake Mead. Narrow slot canyons are a signature of this semi-desert landscape and bighorn sheep, the banded Gila monster and the desert tortoise represent the animals of the Mojave Desert in this colorful wilderness.

Finally, a geological treat. There are few places where so much of the Earth's geology can be seen in one place. **The Great Unconformity on Frenchman Mountain** fits that bill. An unconformity is a buried erosion surface, a surface of rock that was exposed on the Earth's surface and was then covered by younger layers. Unconformities are important because they represent missing intervals of the geologic record, like pages missing from a history book. This Great Unconformity represents about 1.2 billion years, which is more than one fourth of the age of the Earth. From the top of Frenchman Mountain there is a great view of Las Vegas in the valley below.

Trip includes: transportation, continental breakfast and lunch.



Valley of Fire State Park (Courtesy Wikipedia Creative Commons/Denise Westerfield)

SUNDAY, SEPTEMBER 29

Hoover Dam, Red Rock Canyon, and Good-springs Recovered Energy Generation Power Plant

8am-5pm Cost: \$165

- Hoover Dam Tour
- Red Rock Canyon
- Goodsprings Recovered Energy Generation Power Plant



Hoover Dam (Courtesy Wikipedia Creative Commons)

Built in 1935, the **Hoover Dam** is an iconic U.S. monument. When built, it was the world's largest hydro-electric installation; today, it is still one of the country's largest, with a nameplate capacity of about 2,080 megawatts. A tour takes you down into the depths of the dam to see the 17 main turbines that provide electricity for over a million people in the south-west of the United States.

From a man-made marvel we travel to a masterpiece from Mother Nature. **The Red Rock Canyon** is an area of worldwide geologic interest. Many experienced and amateur geologists alike who visit are amazed by the rock formations, natural beauty, and the vivid colors of the rocks. The park is also famous among paleontologists for fossils of the tracks of small bipedal (two-footed) theropod dinosaurs that can be seen on the Aztec Sandstone.



Red Rock Canyon National Conservation Area (Courtesy Wikipedia Creative Commons/Denise Westerfield)

Please note: The Hoover Dam Tour is not wheelchair accessible and people with mobility issues may have problems moving around. The tours are NOT RECOMMENDED for anyone who suffers from claustrophobia, or has a pacemaker or defibrillator. Tours are conducted in confined spaces and in a powerplant with generators emitting electromagnetic fields.

Field Trips *continued*

The day ends at the **Goodsprings Recovered Energy Generation Power Plant**. Using technology provided by geothermal energy giant, Ormat Technologies, an energy converter captures waste heat generated from the compression of natural gas in the Kern River pipeline, and generates up to 7.5 megawatts of electricity.

Trip includes: transportation, continental breakfast and lunch.



Goodsprings Recovered Energy Generation Power Plant (Courtesy Ormat)

WEDNESDAY TO SATURDAY, OCTOBER 2- 5

Imperial Valley, California

Cost: \$610

Departs Oct. 2 at 2:30pm. Arrive back Oct. 5 at 3:30pm

- Ormat Heber Complex
- EnergySource - John L. Featherstone Geothermal Plant (Hudson Ranch I)
- Simbol Materials Lithium Extraction Facility
- Salton Sea Geothermal Mud Volcanoes at Niland
- Overland Jeep tour to Coyote Mountains, Elsinore Fault Zone and Agua Caliente State Park



EnergySource - John L. Featherstone Geothermal Plant (Courtesy Ian Crawford)

This three night trip takes us to Southern California to witness the success of the geothermal energy industry in developing an agricultural oasis in the desert of the American south-west. We will also go off-road to see some of the distinctive geology of the Anza Borrego State Park.

The **Imperial Valley** likes to be seen as the “renewable energy capital of the world”. Geothermal energy was the first to arrive in the 1980’s

and today the region is host to a growing number of solar arrays and wind farms.

The area around the Salton Sea is one of the most productive geothermal fields in the world. We will visit the 92 megawatt Ormat owned **Heber Complex**, which first began generating in 1985. Next, the new kid on the block, the 49 megawatt **EnergySource - John L. Featherstone Geothermal Plant** and next door, the site of the proposed **Simbol Materials Lithium Extraction Facility** which will borrow geothermal brine from the EnergySource plant to harvest valuable minerals. A reminder of the processes responsible for this geothermal industry can be found in nearby mud volcanoes.

Finally, we will transfer to Jeeps and go off the road to explore some of the distinctive geology of the **Anza Borrego State Park**. The area is caught in the middle of two tectonic plates resulting in numerous fault zones, including the infamous San Andreas fault. We pause on the dusty trail to visit the **Agua Caliente hot springs**, famous for its soothing therapeutic mineral waters.

This trip includes 3 nights lodging in El Centro (double occupancy is required), snacks, refreshment, transportation, breakfast, lunch and 2 dinners (Friday night dinner is on your own with a variety of eateries available nearby).

Visit the GRC Annual Meeting Web Page for Field Trip Schedules: www.geothermal.org/meet-new.html

Please note: Field Trip itineraries are subject to change.



GRC Field Trips are fun and informative! (Courtesy Tim Gladson)

All field trips depart from the south entrance of the MGM Convention Center. Please arrive 45 minutes early to check-in. Please dress accordingly.

Sunday Events

SUNDAY, SEPTEMBER 29

GRC Annual Charity Golf Tournament

7:30am - Late Afternoon
Angel Park Golf Club, Las Vegas

\$150 per individual or \$550 per foursome

Situated 8 miles from the MGM Grand, the Angel Park Golf Club in Las Vegas is one of the best golf courses in the region. A shuttle leaves from the MGM Grand at 7:15am, registration and breakfast at the Angel Park Golf Club is at 7:30am and the first group tees off at 8:30am with a shotgun start. An Awards Luncheon and raffle follows this fun event, this year supporting the Make-a-Wish Southern Nevada Chapter.

Please visit the GRC web site at www.geothermal.org to register.



*Angel Park Golf Club with the Las Vegas skyline in the distance
(Courtesy Angel Park Golf Club)*

GRC & GEA Opening Reception

6pm - 8pm
Marquee Ballroom Cost: Free with GRC Registration

On Sunday evening, all registered meeting attendees are encouraged to join colleagues, friends and old acquaintances at this grand reception hosted by the GRC & GEA in the Expo Hall.

Opening Reception sponsored by Power Engineers



Opening Reception Bar Station sponsored by Cameron International Corp.



Hotel Accommodations

MGM Grand Hotel

Telephone: (877) 880-0880

www.mgmgrand.com



*Discounted room rates at the MGM Grand end August 16.
(Signature rooms at the MGM Grand are sold out)*

Located less than 2 miles from the Las Vegas' McCarran International Airport, the MGM Grand is the largest hotel in the U.S. and hosts numerous dining opportunities, theaters, night clubs, bars, spas, swimming pools and stores. In addition the Las Vegas Monorail connects nine major resorts on "the Strip" along its four-mile route starting from the MGM Grand.

Guests of MGM Grand can check-in/register and receive their room keys while they wait for their luggage at the satellite MGM Grand Registration/Hotel Check-in Center at Las Vegas' McCarran International Airport.

Through a special arrangement with the MGM Grand, the GRC room rate (single and double) this year starts at an affordable \$89 (plus applicable fees and taxes).

- If you make your reservations over the phone make sure you mention you are part of the Geothermal Resources Council/ Geothermal Energy Association group to get the special rate. OR
- **We strongly recommend making your hotel reservations on-line through a dedicated Webpage** available from the GRC website at www.geothermal.org. The preferred rate is automatically applied.

A Special Thanks to Our Sponsors & Contributors

The success of the Geothermal Resources Council Annual Meeting depends on the generous sponsorships and contributors of corporate and individual members. The GRC would like to thank the following for their generous support.

MUTUAL GRC/GEA SPONSORSHIPS

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GRC SPONSORSHIPS

OPENING SESSION BREAK:



ABSTRACTS:



INTERNATIONAL LUNCHEON:



GENERAL CONTRIBUTION:



A complete list will be posted at the Annual Meeting, in the event's *Final Program*, and in the November/December issue of the *GRC Bulletin*. If you would like to make a contribution to the GRC 2013 Annual Meeting, please contact Estela Smith at (530) 758-2360 or E-mail at grc@geothermal.org. We are still accepting sponsorships and contributions!

Annual Meeting Schedule

MONDAY MORNING, SEPTEMBER 30

GRC Opening Session

8am - 12 Noon

Rooms 111-117

Cost: Free with GRC Registration

The GRC Opening Session will feature top-ranking government officials and industry representatives from around the world, who will put current geothermal events into perspective for the future. Tentative as of August 1, 2013.

- Andy Sabin – General Chairman
- Carolyn Goodman – Mayor of Las Vegas (Confirmed)
- Senator Harry Reid - U.S. Senate (Invited)
- Senator Dean Heller - U.S. Senate (Confirmed)
- Governor Brian Sandoval (Invited)
- Michael Yackira - CEO, NV Energy (Confirmed)
- Gregg Rotenberg - Vice President, Chevron Renewable Energy Investment (Confirmed)
- Paolo Romagnoli - Manager Geothermal Center of Excellence ENEL Green Power (Confirmed)
- Dennis Gilles - CEO, U.S. Geothermal, Inc. (Confirmed)
- Pierre Audinet - World Bank Geothermal Development Plan (Confirmed)
- Doug Hollett – Program Manager, U.S. DOE Geothermal Technologies (Confirmed)
- Tom Hicks - Deputy Assistant Secretary Department of the Navy (Invited)
- Neil Kornze – Acting Director, BLM (Invited)
- Rebecca Wagner – Commissioner, Nevada Public Utilities Commission (Confirmed)
- Lou Capuano, Jr. - GRC President, (Confirmed)
- Paul Thomson - GEA President, (Confirmed)



Steve Ponder, Executive Director of the Geothermal Resources Council at last year's Opening Session

Opening Session Break sponsored by BPS



MONDAY AFTERNOON, SEPTEMBER 30

International Luncheon

12 Noon - 1:30pm

Room 119

Cost: Free with GRC Registration

Hosted by the GRC and GEA, the sixth annual International Luncheon will bring together experts from around the world with U.S. private and public sector stakeholders to discuss the latest developments in harnessing East Africa's considerable geothermal energy resources. Attendees will be able to meet and greet these experts, and explore partnership opportunities.

International Luncheon sponsored by Geothermal Development Associates and the U.S. Department of State Bureau of Energy Resources



International Session

Updates on International Geothermal Development

1:30pm - 4:45pm

Room 120

Cost: Free with GRC Registration

Experts from around the world present the latest geothermal energy developments in regional markets.

North America, Central America, South America, Europe, Middle East, Australasia, Indonesia, Philippines and the Caribbean.

Featured Speakers:

- Allison Thompson, CanGea
- Gustavo Cuellar
- Alfredo Lahsen, University of Chile
- Niklos Antics, GPC Instrumentation Process
- Caglan Kymshyu, BM Holdings
- Brian Carey, GNS New Zealand
- Bret Mattes, OTB
- Manny Ogena, EDC
- Paul Brophy, EGS

The timing for each presentation can be seen in the Technical Session schedule for Monday afternoon on page 15.

Annual Meeting Schedule *continued*

MONDAY, TUESDAY & WEDNESDAY SEPTEMBER 30, OCTOBER 1 & 2

Technical Sessions:

Monday	1:30 - 4:40pm
Tuesday	8am - 3:50pm
Wednesday	8am - 12:10pm

All the Technical Sessions are in the Grand Ballroom. See the Preliminary Technical Session schedule on pages 14-23. For more information on the topics, schedule and associated speakers go to the GRC Website at www.geothermal.org.

GEA Geothermal Energy Expo Schedule:

Monday	12 Noon - 5pm
Tuesday	9am - 6pm
Wednesday	9am - 12 Noon

Marquee Ballroom Cost: Free with GRC Registration

North America's largest gathering of vendors providing support for geothermal resource exploration, characterization, development, production and management. *Please Note: Entrance to the GEA trade show is free with GRC Annual Meeting registration. See page 24 for a listing of exhibitors.*

MONDAY, SEPTEMBER 30

Party with the Stars of the Geothermal Industry (Annual Banquet)

6pm - 8pm Cost: \$125
Room TBA VIP Corporate Table: \$1,500

(A VIP Corporate table for 8 with your own special entrance, prominent company signage and 3 drink tickets per person)

Mingle with your colleagues dressed as your favorite celebrities and live your Vegas dreams. Business casual is suggested but a fun celebrity costume is highly recommended!

Vegas is glamour, entertainment, famous mobsters, outrageous movie characters – for one night only, come dressed to impress as your favorite Vegas icon! Walk up the red carpet to a glitzy night with the stars. Pose with your favorite celebrity (cut-out figure). A photo booth will be available to record the hilarity. Dance the night away to music provided by a DJ.

Cost includes Hors d'oeuvres, a carvery station, desserts, cocktails, non-alcoholic beverages and great entertainment - Vegas style!

Purchase your tickets with your GRC Annual Meeting registration.

TUESDAY, OCTOBER 1

Student Leadership Luncheon

12 Noon - 1:30pm
Room 119 Cost: Free for students

Industry leaders will meet with students attending the GRC Annual Meeting during Tuesday's lunch hour. Discussions between the leaders and students over lunch will provide one-on-one opportunities to share ideas about key topics on a variety of geothermal interests. *Only 100 students will be able to attend so register early!*

Poster Session/Expo Networking Reception

4pm - 6pm
Marquee Ballroom Cost: Free with GRC Registration

Meet with colleagues in the global geothermal community in the Expo Hall and view this year's selection of Posters. *Please note: The posters are also available for viewing during Expo hours.*

First Annual Women in Geothermal (WinG) Reception (California Geothermal Energy Collaborative)

5pm - 7pm
Room 120 Cost: Free by Registering with CGEC

Both women and men in geothermal are invited to join in the first annual reception to network and discuss WinG's mission and activities moving forward. The primary objective of WinG is to promote the education, professional development, and advancement of women in the geothermal community.

Please note: You do not need to be registered for the GRC/GEA Event to attend this reception. Please visit the CGEC web site at cgec.ucdavis.edu to register.



Courtesy, the Neon Museum in Las Vegas

Annual Meeting Schedule *continued*

WEDNESDAY, OCTOBER 2

Annual Membership Meeting & Awards Luncheon

12:30pm - 2:30pm

Room: 119

Cost: \$65

The GRC will honor the best and brightest of the global geothermal community at its Annual Membership Meeting & Awards Luncheon. The GRC will present its prestigious Aidlin, Holt, Pioneer, Ramey, and Special Achievement awards, as well as awards for Best Technical Session Presentations and Photo Contest.



Last years winners of the GRC Awards

National Geothermal Data System Workshop

2pm to 5pm,

Grand Ballroom - Room 118

Cost: Free

Drilling Down: How Data Can Advance Geothermal Exploration & Development: The Power of the National Geothermal Data System (NGDS)

The National Geothermal Data System's (NGDS) formal launch in 2014 will provide open access to millions of datasets, sharing technical geothermal-relevant data across the geosciences to propel geothermal development and production. With information from all of the Department of Energy's sponsored development and research projects and geologic data from all 50 states, this free, interactive tool can open new exploration opportunities and shorten project development by making data easily discoverable and accessible. Join our workshop for an overview of how your company can benefit from using this free, online digital data network. For more information contact Kim Patten at: kim.patten@azgs.az.gov

Field Trip to the Imperial Valley, California

Departs 2:30pm from the south entrance of the MGM Grand Convention Center.



Connect to the GRC on your Smartphone

Easy access to the GRC website
wherever you go!



We now have a mobile version of the GRC website especially designed for your Smartphone, or other web-enabled device, to give you easy access to essential information.

Navigate to

m.geothermal.org

and browse information on the Annual Meeting & Expo, GRC membership benefits, and link to our social media websites.

Scan the QR code below and link straight to the GRC website.



m.geothermal.org

GRC Annual Meeting Committee

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Preliminary Technical Program

Monday afternoon, September 30

	ROOM 121	ROOM 122	ROOM 123
	GEOLOGY Chair: Kelly Blake	EGS 1 Chair: Pat Dobson	GEOCHEMISTRY 1 Chair: Joe Moore
1:30	Invited Speaker: Patrick Muffler	<i>Stimulation Results From the Newberry Volcano EGS Demonstration</i> , Cladouhos, Trenton T. & Petty, Susan & Nordin, Yini & Moore, Michael & Uddenberg, Matt & Swyer, Michael W.	<i>The Geology of Paka Volcano and its Implication on Geothermal</i> , Mutonga, Marietta W.
1:50		<i>Investigating the Volume and Structure of Porosity in Fractured and Unfractured Rock From the Newberry Volcano, Oregon, USA: Evaluation of two- and three- dimensional methods</i> , Roth, Justin & Davatzes, Nicholas C. & Krull Davatzes, Alexandra E.	<i>Chemical Characteristics of Thermal Fluids of Homa Hills and Mwananyamala Geothermal Prospects - Kenya</i> , Ochieng, Leakey & Mibei, Geoffrey
2:10		<i>The Peculiar Shut-in Behavior of the Well GPK2 at Soultz-Sous-Forets</i> , Schoenball, Martin & Kohl, Thomas	<i>Fumarole Gas Geochemistry of Paka Geothermal Prospect, North Rift, Kenya</i> , Kipngok, Jeremiah & Nyamongo, Jared
2:30	<i>Distribution of Clay Minerals Through a Conductive (MT) Zone on the Margins of a High-Temperature Geothermal Reservoir, Wairakei Geothermal Field, Taupo Volcanic Zone, New Zealand</i> , Correa, Nicholas & Rae, Andrew J. & Sepulveda, Fabian	<i>Application of the ETAS Seismostatistical Model to Microseismicity From Geothermal Fields</i> , Eto, Tai & Asanuma, Hiroshi & Adachi, Masaho & Saeki, Kazuhiro & Aoyama, Kengo & Ozeki, Hitoshi & Mukuhira, Yusuke & Haring, Markus	<i>Fluid Chemistry of Menengai Geothermal Wells, Kenya</i> , Malimo, Sylvia
2:50	<i>Reservoir Review of the Rendingan-Ulubelu-WayPanas Geothermal Field, Lampung, Indonesia</i> , Shuharno	<i>Heat Transfer Between Fluid Flow and Fractured Rocks</i> , Li, Wei & Yost, Keith & Sousa, Rita	<i>Hydrogeochemisry of Shallow and Deep Water Aquifers of Menengai Geothermal Area, Kenya Rift Valley</i> , Kanda, Isaack & Suwai, Janet
3:10	<i>The Structural Controls of the Emerson Pass Geothermal System, Washoe County, Nevada</i> , Anderson, Ryan B. & Faulds, James E.	<i>Advantages of Choosing a Sedimentary Basin as the Site for an EGS Field Laboratory</i> , Morgan, Paul	<i>Chemistry of Thermal Fluid of Suswa Geothermal Prospect, Southern Rift Kenya</i> , Lawrence, Ranka & Evans, Bett
3:30	BREAK (3:30 – 3:50)		
3:50	<i>Structural Controls on the Geothermal System at Gerlach, Washoe County, NV</i> , Hazelwood, Lyndsay A. & Cashman, Patricia H. & Faulds, James E.		<i>Sulfide Mineralization in the Reykjanes Geothermal System, Iceland - Potential Applications for Geothermal Exploration</i> , Libbey, Ryan & Williams-Jones, A.E.
4:10	<i>Use of LiDAR Data for Neotectonic Evaluation of Superstition Hills and Superstition Mountain, Salton Trough, California</i> , Unruh, Jeff & Gray, Brian & Bozkurt, Serkan & Lutz, Andrew & Bjornstad, Steve & Tiedemann, Andrew		<i>Fluid, Gas, and Isotopic Variation of Thermal Springs in the Southern Rocky Mountains: Colorado</i> , Easley, Elisabeth & Morgan, Paul
4:30	<i>High Heat Generating Granites of India</i> , Chandrasekhar, V. & Chandrasekharam, D. & Singh, H.K. & Garg, G.		<i>Reformulation and Performance Evaluation of the Sulfate-Water Oxygen Isotope Geothermometer</i> , Fowler, Andrew P.G. & Hackett, Logan & Klein, Christopher W.

Monday Lunch Menu

Tuscany Buffet

Garden

- Romaine, Shaved Parmesan, and House-made Caesar Dressing
- Italian Bread Salad
- Cannellini Beans, Pancetta, and Rapini

Seared & Simmered

- Breast of Chicken Saltimbocca, Ragoût, and Porcini Cream
- Shrimp Fra Diavolo and Creamy Polenta
- Beef "Vesuvio", Potatoes, Peppers, Onions, Peas, and Lemon

Preliminary Technical Program

Monday afternoon, *continued*

	ROOM 124	ROOM 118	ROOM 120
	EXPLORATION 1 Chair: Jim Faulds	DRILLING Chair: Andrew Tiedeman	INTERNATIONAL UPDATES Chair: Gene Suemnicht
1:30	<i>Geothermal Potential of Deep Sedimentary Basins in the United States</i> , Anderson, Tom C.	<i>Reverse Foam Latex Cementing 11-3/4 Inch Casing PGV Well KS-15</i> , Peters, Brad & Samuel, Abraham & Rickard, Bill & Sauter, Mark	<i>North America – Geothermal Developments And Opportunities</i> , Allison Thompson, CanGea
1:50	<i>Testing Methods For Geothermal Exploration in the Pacific Northwest</i> , Cashman, Patricia H. & Peterson, Christopher D. & Louie, John N. & Pullammanappallil, Satish K. & Pancha, Aasha & Sladek, Chris & West, Travis	<i>Corrosion-Resistant Foamed Cements for Carbon Steels in Enhanced Geothermal Systems</i> , Sugama, Toshifumi & Gill, Simerjeet K. & Muraca, Pyatina, Tatiana	<i>Central America – Current Generation And Future Plans</i> , Gustavo Cuellar
2:10	<i>The Blackfoot Volcanic Field, Southeast Idaho: A Hidden High-T Geothermal Resource Revealed Through Data Mining of the National Geothermal Data Repository</i> , Welhan, John & Garwood, Dean & Feeney, Dennis	<i>Non-Destructive Testing Applied To Rig Inspection</i> , Mulama, Desmond & Khaemba, Abraham	<i>South America – Geothermal Progress</i> , Alfredo Lahsen, University of Chile
2:30	<i>Development of Online Map of 2 Meter Temperatures and Methods for Normalizing 2 Meter Temperature Data for Comparison and Initial Analysis</i> , Sladek, Chris & Coolbaugh, Mark	<i>The Effect of CO2 Exposure and Curing Time on the Cement-Rock Interaction in Geothermal Wells</i> , Silva, Joao & Milestone, Neil & Johnston, James	<i>Europe – Historic Legacy; Lasting Future</i> , Niklos Antics, GPC Instrumentation Process
2:50	<i>Measurement of Heat Loss Associated With Shallow Thermal Aquifers in Nevada, USA</i> , Coolbaugh, Mark & Sladek, Chris	<i>Evaluation of Thermal Spray Coatings and Shape Memory Alloys as Pressure Seals For Downhole Tools</i> , King, Dennis & Henfling, Joseph	<i>Middle East – Expanding Development</i> , Caglan Kymshyu, BM Holdings
3:10	<i>Testing of Two Exploration Wells at NAS Fallon, Nevada</i> , Tiedeman, Andrew & Arcedera, Brian & Meade, David	<i>Progress on a 300C Directional Drilling System for EGS Well Installation</i> , Dick, Aaron & Schnitger, Jochen & Otto, Mike & Klotzer, Sundaie & Schroder, Jon & Macpherson, John	<i>Australasia – Long-Term Progress</i> , Brian Carey, GNS New Zealand
3:30	BREAK (3:30 – 3:50)		
3:50 - 4:30	<p>National Geographic Documentary Video: <i>The Boiling River</i></p> <p><i>This new documentary tells the story of the scientific discovery of a sacred geothermal manifestation deep in the Amazon rainforest, that is still considered legendary.</i></p> <p><i>Made by National Geographic Young Explorers, Peter Koutsogeorgas and his friend Andrés Ruzo of the SMU Geothermal Lab, the documentary is 45 minutes long. The producers will take questions afterwards.</i></p>		<p>3:50 <i>Indonesia – Resource Opportunities</i>, Bret Mattes, OTB</p> <p>4:10 <i>Philippines – Prolonged Generation And Opportunity</i>, Manny Ogena, EDC</p> <p>4:30 <i>Caribbean – New Discoveries And Future Developments</i>, Paul Brophy, EGS</p>

Monday Lunch Menu *continued*

Veggies & Pasta

- Rigatoni Pillows, Garden Vegetables, and Vodka Tomato Sauce
- Seared Italian Field Squash and Tomato Ragoût

Sweet

- Cappuccino Slices
- Pistachio-Strawberry Panna Cotta
- Traditional Tiramisu
- Sicilian Cannoli Cup

Focaccia and Assorted Hearth-Baked Breads

- Freshly Brewed Coffees and Teas
- Iced Tea

	ROOM 121	ROOM 122	ROOM 123
	POWER PLANT 1 Chair: Halley Dickey	RESERVOIR ENGINEERING 1 Chair: Sabodh Garg	CASE STUDIES Chair: Brian Fairbank
8:00	<i>Real-Time DCS Calculation of Reservoir Enthalpy and Temperature, Specific Work, Optimal Flash Pressure, Flash Percent, Turbine Efficiency and the Effect of Condenser Backpressure on Specific Work</i> , McAuliffe, Thomas & Escalante, Juan & Hernandez, Josue	<i>Fracture Network Response to Injection Using An Efficient Displacement Discontinuity Method</i> , Verde, Alexander & Ghassemi, Ahmad	<i>Repowering of the Cove Fort Power Plant</i> , Sacerdoti, Ariel
8:20	<i>Philosophies of Geofluid Valuation</i> , Long, Mike & Davtyan, Artur & Harvey, William	<i>Numerical Simulation of Instability of Geothermal Production Well</i> , Itoi, Ryuichi & Katayama, Yasunari & Tanaka, Toshiaki & Kumagai, Naoto & Iwasaki, Takaichi	<i>Multiple Zone Geothermal Stimulation Case Study: Fluid Diversion Using Thermo-Degradable Zonal Isolation Materials</i> , Nordin, Yini & Petty, Susan & Swyer, Michael & Cladouhos, Trenton & DeRocher, Ted
8:40	<i>Energy Recovery Using Turboexpanders in Production Wells and Gathering Systems With High Pressures</i> , Garcia-Gutierrez, Alfonso & Martinez-Estrella, Juan I. & Ovando-Castelar, Rosember & Canchola-Felix, Ismael & Gutierrez-Espericueta, Sergio & Vazquez-Sandoval, Abelardo & Rosales-Lopez, Cesar	<i>Adaptive Mesh Refinement Strategies for Incorporating Discrete Fracture Networks Into A High Performance Computing Framework for Geothermal Reservoir Simulation</i> , Smith, Katherine & Plummer, Mitch & Bradford, Jacob & Podgorney, Robert	<i>The McGinness Hills Geothermal Project</i> , Nordquist, Josh & Delwiche, Ben
9:00	<i>Automatic Generation Control and Ancillary Services</i> , Nordquist, Josh & Buchanan, Tom & Kaleikini, Michael	<i>Numerical and Laboratory Studies of Fluid Transport Between Two Matted Rough Surfaces and Realistic Assessment of Permeability of Fractured Medium</i> , Gholizadeh, Nima & Rahman, Sheik S.	<i>Geothermal Relief Well at the Onikobe Geothermal Power Station</i> , Takizawa, Kengo & Iwasaki, Osamu & Todaka, Norifumi & Shimizu, Isao & Tezuka, Shigeo & Nakanishi, Shigetaka
9:20			<i>The Wairakei Binary Power Plant: First Seven Years of Operation</i> , Montague, Ted & Legmann, Hilel
9:40	BREAK (9:40 - 10:10)		
	POWER PLANT 2 Chair: Ron DiPippo	RESERVOIR ENGINEERING 2 Chair: John Pritchett	GEOCHEMISTRY 2 Chair: Lisa Shevenell/Anna Crowell
10:10	<i>Thermal Performance of the Los Humeros Geothermal Field Fluid Transportation Network</i> , Garcia-Gutierrez, Alfonso & Martinez-Estrella, Juan I. & Ovando-Castelar, Rosember & Vazquez-Sandoval, Abelardo & Rosales-Lopez, Cesar	<i>Numerical Modelling to Assess the Sustainability of Direct Use at Tauranga Low-Temperature Geothermal System, New Zealand</i> , Pearson, Sophie & Alcaraz, Samantha	Invited Speaker: Paul Hirtz
10:30	<i>Calpine Geysers' Units 18 and 20's Stretford System Froth and Balance Tank Level Measurement</i> , Derenia, Anthony & Ershen, Catherine & Carroll, Patrick	<i>Tracer Response of Injection Test in Hot Spring Fluid Layer at Minami-Izu Geothermal Field, Shizuoka, Japan</i> , Yanagisawa, Norio & Matsuyama, Kazuo & Takeda, Yasuto & Tomita, Kazuo & Yasukawa, Kasumi & Sakaguchi, Keiichi	
10:50	<i>High Temperature Brushless DC Motor Controller</i> , Cieslewski, Grzegorz & Lindblom, Scott & Maldonado, Frank & Echert, Michael	<i>Sustainable Yield and Its Assessment of Geothermal Reservoirs in China</i> , Kang, Fengxin & Jin, Menggui	
11:10	<i>The Reduced Pumping Power Requirements From Increasing the Injection Well Fluid Density</i> , Adams, Benjamin & Kuehn, Thomas H. & Randolph, Jimmy B. & Saar, Martin O.	<i>A Three-Dimensional Thermal-Poroelastic Model For Natural Fracture Geothermal Reservoir Stimulation</i> , Xiaonan Wang & Ghassemi, Ahmad	<i>Development of the MultiGAS for Determining Fumarole Gas Chemistry in Geothermal Systems</i> , Vigouroux, Nathalie & Williams-Jones, Glyn & Hickson, Catherine J.
11:30			<i>Geochemical Data Collection and Evaluation as Part of the National Geothermal Data System</i> , Shevenell, Lisa & Zehner, Richard

	ROOM 124	ROOM 118
	SEISMICITY 1 Chair: Andy Sabin	RESOURCE ASSESSMENT 1 Chair: Wendy Calvin
8:00	<i>Aquatronic Solutions Ohaaki Electro-Seismic Geophysical Paper</i> , Du Preez, Michael & McKendry, John	<i>Invited Speaker: David Blackwell</i>
8:20	<i>Ambient Noise Cross-Correlation Study of Menengai Caldera: Geothermal Prospect in the Central Kenya Dome</i> , Patlan, Ezer & Wamalwa, Antony & Kaip, Galen & Velasco, Aaron A.	
8:40	<i>Imaging Faults Using Elastic Reverse-Time Migration With Updated Velocities of Waveform Inversion</i> , Chen, Ting & Huang, Lianjie	
9:00	<i>Accurate Velocity Estimation for Steep Fault Zones Using Full-Waveform Inversion With Edge-Guided Regularization</i> , Lin, Youzuo & Huang, Lianjie	<i>Lognormally Distributed K/TH/U Concentrations- Evidence for GeoCritical Fracture Flow, Los Azufres Geothermal Field, MX</i> , Leary, Peter & Malin, Peter & Shalev, Eylon & Ryan, Graham A. & Lorenzo, Cecilia & Flores, Magaly
9:20	<i>Virtual Receivers From Seismic Interferometry; First Steps Toward Improving Microseismic Locations</i> , Horowitz, Frank & Brown, Larry	<i>GIS-Based Geothermal Resource Assessment of the Denver Basin: Colorado and Nebraska</i> , Crowell, Anna & Gosnold, Will
9:40	BREAK (9:40 - 10:10)	
	SEISMICITY 2 Chair: Jim Combs	HEAT PUMPS/DIRECT USE Chair: Toni Boyd
10:10	<i>Development of 300°C Fiber Optic Seismic Sensors For Geothermal Reservoir Imaging & Monitoring</i> , Paulsson, Bjorn & Toko, Julio & Thornburg, Jon & Slopko, Frank & He, Ruiqing & Zhang, Chang-Hua	<i>Geothermal Heat Pumps: What They Are, How They Work and Why They Are Worth Using</i> , Geyer, John
10:30	<i>Role of Seismic Reflection Profiles in Delineating Basin-Centered Geothermal Reservoirs</i> , Schelling, Daniel D & Allis, Rick & Sprinkel, Douglas	<i>Comparison of Geothermal Energy Production Technologies</i> , Bobok, Elemer & Toth, Aniko N. & Balajti, Laszlo
10:50	<i>Targeting Geothermal Resources in the Lahontan Valley, Nevada; Analysis of Neogene Faulting Through 2D Seismic, Topographic, and Satellite Imagery Analysis</i> , Gray, Brian & Uruh, Jeff & Bjornstad, Steve & Blake, Kelly & Alm, Steve & Shoffner, Jeff	<i>Improvement of the Capacity of Ground Heat Exchangers by Water Injection</i> , Fuji, Hikari & Komaniwa, Yoshihito & Onishi, Kyosuke & Chou, Naokatsu
11:10	<i>Temperature Dependent Injectivity and Induced Seismicity. Managing Reinjection in the Hellisheidi Field, SW-Iceland</i> , Gunnarsson, Gunnar	<i>Development of Geothermal Use for District Heating in Europe</i> , Buscher, Eckehard
11:30		<i>Geothermal Heat Pump Opportunities in New Zealand</i> , Seward, Anya & Carey, Brian & Climo, Melissa

Tuesday Lunch Menu:

Farmhouse Buffet

Garden

- Iceberg Lettuce, Sprouts, Candied Nuts, and Creamy Bleu Cheese Dressing
- Tomatoes, Cucumbers, Red Onions, and Cider Vinaigrette
- Carrot Salad with Golden Raisins

“New” South

- Pork Loin, Cheddar Cheese Grits, Roasted Apples, and Apple Demi
- Blackened Butterfish, Black Bean Ragoût, and Brown Butter

Baked

- Country Style Meatloaf, Onions, and Mushrooms
- Lemon Herb Chicken, Peas, and Carrots
- Classic Macaroni and Cheese
- Butter-Roasted Cauliflower and Parmesan Cheese

Soft Sweet Rolls and Cornbread

Sweets

- Seasonal Fruit Cobbler
- Carrot Cake Cupcakes
- Peanut Butter and Jelly Cup
- Brownie Pudding

Freshly Brewed Coffees and Teas Iced Tea



	ROOM 121	ROOM 122	ROOM 123
	REGULATORY/ENVIRONMENTAL Chair: Charlene Wardlow	BASIN & RANGE Chair: Drew Siler	POLICY/MARKET ANALYSIS/UTILITY Chair: Sandra Anderson/Mike Lazaro
1:30	<i>Impact of Well Field Exploration on the Life Cycle of Geothermal Power Production</i> , Sullivan, John L. & Wang, Michael Q.	<i>Shallow Temperature Surveys at Four Sites in Nevada as Part of the National Geothermal Data System</i> , Shevenell, Lisa & Zehner, Richard	<i>Nobody Puts Geo in a Corner</i> , Thomsen, Paul
1:50	<i>Geothermal Gas Emission From Hellisheidi and Nesjavellir Power Plants, Iceland</i> , Gunnarsson, Invi & Aradottir, Edda Sif & Sigfusson, Bergur & Gunnlaugsson, Einar & Juliusson, Bjarni Mar	<i>Structural Controls of the MacFarlane Geothermal System, Humboldt County, Nevada: A Progress Report</i> , Kraushaar, Sabina M. & Cashman, Patricia	<i>Funding Mechanisms for Federal Geothermal Programs</i> , Witherbee, Kermit & Young, Kate & Levine, Aaron
2:10	<i>Utilizing Federal Policy Documentation to Obtain Project-Level Water Data for Geothermal Energy Facilities</i> , Schroeder, Jenna & Harto, Christopher & Clark, Corrie	<i>Structural Controls on Geothermal Reservoir Deformation at Stillwater, Nevada From InSAR and GPS Data</i> , Hammond, William C. & Bell, John	<i>Interpretations of U.S. Geothermal Industry Data - Analysis of capacity, net production, and efficiency trends: 2002-2011</i> , Richard, Christopher
2:30	BREAK (2:30 - 2:50)		
2:50	<i>Coordinating Permit Offices and the Development of Utility-Scale Geothermal Energy</i> , Levine, Aaron & Young, Katherine & Witherbee, Kermit	<i>Basin and Rift Structure of the Central Black Rock Desert, Utah, and Initial Thermal Implications, From 3D Magnetotellurics</i> , Wannamaker, Philip E. & Maris, Virginie & Hardwick, Christian L.	<i>Understanding Permitting Impacts on the Levelized Cost of Energy For Geothermal</i> , Wiedmeyer, Jared & Schwabe, Paul & Williams, Tom
3:10	<i>Community Engagement in Suswa Geothermal Prospect</i> , Sharon, Chebet	<i>Structural and Stratigraphic Controls on the Geothermal System Near Paisley, Oregon</i> , Makovsky, Kyle & Snyder, Walter & Mink, Leland	<i>Utility Geothermal Working Group 2013 Update</i> , Bony, Paul & Johnson, Steve & Nelson, Guy
3:30	<i>Worker Involvement methodology to Catalyze Development of Positive Safety Culture</i> , Oyugi, Patrick	<i>The Hybrid Model - The Most Accommodating Structural Setting For Geothermal Power Generation in The Great Basin, Western USA</i> , Faulds, James & Hinz, Nicholas & Dering, Gregory & Siler, Drew	<i>Energy Factors For Geothermal Development in Peru</i> , Munoz-Carmona, Fernando & Hickson, Catherine J. & Bona, Paolo & Reyes, Jackeline & Gomez, Luzgarda
4:00	POSTER SESSION (4:00 - 6:00) MARQUEE BALLROOM		



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If you have any questions about the GRC Library, please contact the GRC Librarian, Brian Schmidt, at bschmidt@geothermal.org.

	ROOM 124	ROOM 118
	EXPLORATION 2 Chair: Nick Hinz	RESOURCE ASSESSMENT 2 Chair: Ted DeRocher
1:30	<i>Value of Spatial Information For Determining Geothermal Well Placement</i> , Trainor-Guitton, Whitney J. & Ramirez, Abelardo & Ziagos, John & Mellors, Rob & Roberts, Jeffery & Juliusson, Egill & Hoversten, G. Michael	<i>A Critical Look at Geothermal, Solar and Wind Power Generations</i> , Li, Kewen
1:50	<i>Evaluation of a Geothermal Prospect Using a Stochastic Joint Inversion Modeling Procedure</i> , Tompson, Andrew F.B. & Mellors, Robert J. & Ramirez, Abe & Chen, Mingjie & Dyer, Kathleen & Yang, Xianjin & Wagoner, Jeff & Trainor-Guitton, Whitney	<i>Project Development in Tanzania: Geothermal Resources, Surface Exploration, Conceptual Models and Potential - Status Report</i> , Kraml, Michael & Kreuter, Horst
2:10	<i>A Proposed Collaborative Initiative to Promote the Development of Higher Enthalpy Geothermal Systems in the USA</i> , Elders, Wilfred	<i>Risk Assessment for Geothermal Wells - A Probabilistic Approach to Time and Cost Estimation</i> , Lentsch, David & Schubert, Achim
2:30	BREAK (2:30 - 2:50)	
2:50	<i>A Comprehensive List of Geothermal Reservoir Properties for the Development of Geothermal Occurrence Models</i> , Salwen, Greg & Witherbee, Kermit & Young, Katherine	<i>Updated Surface Heat Flow map of Alaska</i> , Batir, Joseph & Blackwell, David & Richards, Maria
3:10	<i>Developing Systematic Workflow From Field Work to Quantitative 3D Modeling For Successful Exploration of Structurally Controlled Geothermal Systems</i> , Hinz, Nicholas H. & Faulds, James E. & Siler, Drew L.	<i>Geothermal Art in the N-German Sedimentary Basin: Grafting EGS with Aquifers</i> , Ghergut, Julia & Herold, Maria & Sauter, Martin
3:30	<i>Three-Dimensional Geothermal Fairway Mapping: Examples From The Western Great Basin, USA</i> , Siler, Drew L. & Faulds, James E.	<i>Investigating Low-Temperature Hydrothermal Alteration in Drill Cuttings From Pilgrim Hot Springs, Alaska, Using a Suite of Low Cost Analytical Techniques</i> , Miller, Joshua K. & Haselwimmer, Christian & Prakash, Anupma
4:00	POSTER SESSION (4:00 - 6:00) MARQUEE BALLROOM	



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Marquee Ballroom (Expo Hall) Chair: Timothy Reinhardt

BASIN & RANGE

- *Implications of Shallow Temperature and Soil Gas Surveys at Lee-Allen Geothermal Field, Churchill County, Nevada*, Skord, Justin
- *Structural Controls of the MacFarlane Geothermal System, Humboldt County, Nevada: A Progress Report*, Kraushaar, Sabina M. & Cashman, Patricia*

CASE STUDIES

- *Geothermal Relief Well at the Onikobe Geothermal Power Station*, Takizawa, Kengo & Iwasaki, Osamu & Todaka, Norifumi & Shimizu, Isao & Tezuka, Shigeo & Nakanishi, Shigetaka*

DRILLING

- *Non-Destructive Testing Applied To Rig Inspection*, Mulama, Desmond & Khaemba, Abraham*

EGS

- *Enhanced Geothermal System Potential For Sites on the Eastern Snake River Plain, Idaho*, Podgorney, Robert & McCurry, Mike & Wood, Thomas & McLing, Travis & Ghassemi, Ahmad & Welhan, John & Mines, Greg & Plummer, Mitchell & Moore, Joe & Fairley, Jerry*
- *Deep Geothermal Heat Storage Under Oilsands, Can We Use it to Help Oilsands Industry? New EGS Concept Proposed*, Majorowicz, Jacek & Hofmann, Hannes & Babadagli, Tayfun*

EXPLORATION

- *A New Investigative Approach to Understanding Heat Migration Pathways Within the Shallow Subsurface at Orakei Korako, New Zealand*, Lynne, Bridget Y. & Smith, Gary J.
- *A Proposed Collaborative Initiative to Promote the Development of Higher Enthalpy Geothermal Systems in the USA*, Elders, Wilfred*
- *Development of Online Map of 2 Meter Temperatures and Methods for Normalizing 2 Meter Temperature Data for Comparison and Initial Analysis*, Sladek, Chris & Coolbaugh, Mark*
- *Further Advances for the MMR Gas Analysis Geothermal Exploration Technique in an Extensive Rock Regolith Environment*, Klingel, Eric J. & Fischer, Tobias
- *Geological Overview of Lokitaung Area in Turkana Kenya and its Geothermal Potential*, Mibei, Geoffrey & Ochieng, Leakey
- *Geothermal Anomalies in the Gaspesie Peninsula and Madeleine Islands, Quebec*, Majorowicz, Jacek & Minea, Vasile
- *High Versus Low Altitude Hot Spring Settings and Associated Sinter Textures From El Tatio, Chile and the Taupo Volcanic Zone, New Zealand*, Lynne, Bridget Y. & Morata, Diego & Reich, Martin*
- *Laboratory Experiment of Tracer Test in the Vertical Two-Dimensional Porous Media With Newly Developed Tracer Sensors*, Takaki, Masahiro & Itoi, Ryuichi & Tanaka, Toshiaki & Maruo, Takumi

- *Preliminary Geothermal Gradient Mapping in Alaska's Cook Inlet Forearc Basin*, Peterson, Shaun
- *Seferishisar Geothermal Reservoir Discovery By Utilizing Slim-Hole Wells*, Kyumcu, O. Caglan & Atalay, Ozan & Solaroglu, Umut Z.D. & Akar, Sertac
- *Suswa Geothermal Prospect Suitability Map Development Using GIS*, Shako, Levi & Wamalwa, Wafula
- *The Blackfoot Volcanic Field, Southeast Idaho: A Well-Hidden-T Geothermal Resource Revealed Through Data Mining of the National Geothermal Data Repository*, Welhan, John & Garwood, Dean & Feeney, Dennis*
- *The Domuyo Geothermal Area, Neuquen, Argentina*, Pesce, Abel Hector
- *The Use of Non-Parametric Analysis of Subsoil Temperature Data at the Las Pailas Geothermal Field For Low Impact Geothermal Prospection*, Hakanson, Edward Charles*
- *Thermal Overview of an Area N-W of the Larderello Geothermal Field, Italy*, Bellani, Stefano & Gherardi, Fabrizio

GEOLOGY

- *The Effect of North-South Trending Kayrandere Fault Zone to Pamukoren Geothermal Field, Turkey*, Kyumcu, O. Caglan & Solaroglu, Umut Z.D. & Akar, Sertac & Atalay, Ozan
- *Structural Controls on the Geothermal System at Gerlach, Washoe County, NV*, Hazelwood, Lyndsay A. & Cashman, Patricia H. & Faulds, James E.*
- *Use of LiDAR Data for Neotectonic Evaluation of Superstition Hills and Superstition Mountain, Salton Trough, California*, Unruh, Jeff & Gray, Brian & Bozkurt, Serkan & Lutz, Andrew & Bjornstad, Steve & Tiedemann, Andrew*

GEOCHEMISTRY

- *Development of the MultiGAS for Determining Fumarole Gas Chemistry in Geothermal Systems*, Vigouroux, Nathalie & Williams-Jones, Glyn & Hickson, Catherine J.*

GEOPHYSICS

- *Detecting Spatial Trends in Thermal Conductivity in the Williston Basin*, Crowell, James "Josh" & Gosnold, Will*
- *Geo-Spatial Trends of Permanent Survey Controls in a Geothermal Field: Case Study Menengai Geothermal Field*, Ouko, Edna & Ndongoli, Calistus

GEOHERMAL DATABASE

- *Increasing Access to Federal Data Through the DOE Geothermal Data Repository*, Weers, Jon & Anderson, Arlene*

*Also an oral presentation

Marquee Ballroom (Expo Hall) Chair: Timothy Reinhardt

- *Thermo2Pro: Knowledge Dissemination For Deep Geothermal Exploration*, Calcagno, Phillippe & Chamaret, Aurelie & Chauvin, Nicolas & Gabalda, Sunseare & Gabillard, Santiago & Guillen, Antonio & Michea, David & Pasquier, Fabien & Poudroux, Joachim & Bouchot, Vincent
- *Utah Contributions to the National Geothermal Data System*, Blackett, Robert & Gwynn, Mark & Hardwick, Christian & Thomas, Kevin & Weaver, Lance & Allis, Rick

HEAT PUMP/DIRECT USE

- *Comparative Experiment of Different Backfill Grouts For Concentric Ground Heat Exchangers*, Lei, Haiyan & Dai, Chuanshan
- *Performance Test of a Ground-Air Heat Exchange Fresh Air System for an Office Building in Tangshan*, Wang, Huajun & Wu, Juntao & Zhao, Bing & Zhan, Wenxian & Zhao, Ling

POLICY/MARKET ANALYSIS/UTILITY

- *Business Development Strategy For Geothermal/Solar Thermal Hybrid Power Plants in Eastern Oregon*, Maddi, Phillip & Davis, Jeffrey & Gibbons, Nora & Miranda, Joseph & Wrublik, Rachel
- *Geothermal Well Cost Update 2013*, Mansure, Arthur & Blankenship, Douglas

POWER PLANT

- *Analysis and Optimization of Kalina Cycle*, Niu, Chengke & Zhu, Jialing & Zhang, Wei & Fu, Wencheng
- *Big Iron in Nicaragua: A Muscular New Geothermal Plant! The San Jacinto-Tizate Geothermal Project*, Chin, Chun & Wallace, Kevin & Harvey, William & Dalin, Bridget & Long, Mike*
- *Compatibility of Binary Geothermal and Solar PV Power Plants*, Allis, Rick & Larsen, Garth*
- *Digital Elevation Models Applications in Menengai Geothermal Field*, Mboin, Irene & Yator, Esther
- *Performance of Variable Phase Cycle in Geothermal and Waste Heat Recovery Applications*, Boyle, Patrick & Hays, Lance & Kaupert, Kevin & Welch, Phil*
- *The Reduced Pumping Power Requirements From Increasing the Injection Well Fluid Density*, Adams, Benjamin & Kuehn, Thomas H. & Randolph, Jimmy B. & Saar, Martin O.*

REGULATORY/ENVIRONMENTAL

- *Air quality and plant eco-physiological responses around geothermal power plants in Iceland and Kenya*, Mutia, Thecla & Jonsdottir, Ingibjorg Svala & Fridriksson, Trainn
- *Coordinating Permit Offices and the Development of Utility-Scale Geothermal Energy*, Levine, Aaron & Young, Katherine & Witherbee, Kermit*
- *Updating GETEM to Include a Hybrid Cooling Option and Local Climate Variability for Binary Power Plants*, Harto, Chris B. & Clark, Corrie E. & Schroeder, Jenna N. & Mines, Greg

RESERVOIR ENGINEERING

- *Adaptive Mesh Refinement Strategies for Incorporating Discrete Fracture Networks Into A High Performance Computing Framework for Geothermal Reservoir Simulation*, Smith, Katherine & Plummer, Mitch & Bradford, Jacob & Podgorney, Robert*
- *Natural state Modeling of Geothermal Reservoir at Dieng, Central Java, Indonesia*, Hino, Takeshi & Itoi, Ryuichi & Tanaka, Toshiaki & Pam-budi, N. Agung & Khasani
- *Numerical and Laboratory Studies of Fluid Transport Between Two Matted Rough Surfaces and Realistic Assessment of Permeability of Fractured Medium*, Gholizadeh, Nima & Rahman, Sheik S.*
- *Numerical Modeling to Assess the Sustainability of Direct Use at Taurangi Low-Temperature Geothermal System, New Zealand*, Pearson, Sophie & Alcaraz, Samantha*
- *Tracer Response of Injection Test in Hot Spring Fluid Layer at Minami-Izu Geothermal Field, Shizuoka, Japan*, Yanagisawa, Norio & Matsuyama, Kazuo & Takeda, Yasuto & Tomita, Kazuo & Yasukawa, Kasumi & Sakaguchi, Keiichi*

RESERVOIR MANAGEMENT/MODELING

- *Continuation of Survey GPS Measurements and Installation of Continuous GPS Sites at The Geysers, California, For Geothermal Deformation Monitoring*, Floyd, Michael & Funning, Gareth*
- *Numerical Simulation on Deveolution of steam-water two-phase zone in a fractured geothermal reservoir at Ogiri, Japan*, Tateishi, Yohei & Itoi, Ryuichi & Tanaka, Toshiaki & Hiraga, Naoto & Takayama, Junichi

RESOURCE ASSESSMENT

- *A Geothermal Favorability Map For Chile, Preliminary Results*, Aravena, Diego & Lahsen, Alfredo
- *Case Study and First Look: Contemporary Magnetotelluric Studies Within Nereidas Valley, Nevado Del Ruiz Volcano, Colombia*, Jimenez, R.D. & Yermanos, S.L. & Perez, E.R. & Ospina, L.T. & Dewhurst, Warren T. & Lopez, Julian, P.
- *GIS-Based Geothermal Resource Assessment of the Denver Basin: Colorado and Nebraska*, Crowell, Anna & Gosnold, Will*
- *Pre-exploration geothermal Resource Assessment for the Raton Basin, Colorado- The Rest of the Story*, Bohlen, Karoline
- *Updated Surface Heat Flow map of Alaska*, Batir, Joseph & Blackwell, David & Richards, Maria*

SEISMICITY

- *Development of 300°C Fiber Optic Seismic Sensors For Geothermal Reservoir Imaging & Monitoring*, Paulsson, Bjorn & Toko, Julio & Thornburg, Jon & Slopko, Frank & He, Ruiqing & Zhang, Chang-Hua*

*Also an oral presentation

	ROOM 121	ROOM 122	ROOM 123
	POWER PLANT 3 Chair: Steve Eneedy	EGS 2 Chair: Marcelo Lippmann	GEOTHERMAL DATABASE Chair: Arlene Anderson
8:00	<i>Performance of Variable Phase Cycle in Geothermal and Waste Heat Recovery Applications</i> , Boyle, Patrick & Hays, Lance & Kaupert, Kevin & Welch, Phil	<i>EGS Model Adaptation and Forecasting Studies with MULTIFLUX</i> , Danko, George & Baharmi, Davood	<i>Developing a Universal Geothermal Data Management System</i> , Anderson, Errol
8:20	<i>Optimum Selection of Steam Turbine and Condenser For Geothermal Power Plant</i> , Toshiyasu, Tanoguchi & Saito, Shojiro & Iwai, Koji	<i>Insights into Cold Water Injection Stimulation Effects through Analytical Solutions to Flow and Heat Transport</i> , Plummer, Mitchell	<i>National Geothermal Data System (NGDS) Geothermal Data: Community Requirements and Information Engineering</i> , Anderson, Arlene & Blackwell, David & Chickering, Cathy & Boyd, Toni & Horne, Roland & MacKenzie, Matthew & Moore, Joseph & Nickull, Duane & Richard, Stephen & Shevenell, Lisa A.
8:40	<i>Innovative Integration of Pumping and Power Production in the Binary Cycle</i> , Pierce, Michael & Sanchez, Angel & Ram, Hezy & Marshall, Dave	<i>Sensitivity Study For Evaluation of Potential For Stimulation of Enhanced Geothermal System</i> , Riahi, A & Damjanac, B.	<i>NGDS User Centered Design: Meeting the Needs of the Community</i> , Boyd, Suzanne & Zheng, Xianjun Sam & Patten, Kim & Blackman, Harold
9:00	<i>Axial Turbine For Low-Grade Heat Source</i> , Eliott, Ryan & Dickey, Halley	<i>Flow Modulation For Enhancing Power Generation</i> , Bakane, Piyush & Bahrami, Davood & Danko, George	<i>Increasing Access to Federal Data Through the DOE Geothermal Data Repository</i> , Weers, Jon & Anderson, Arlene
9:20			<i>Sustaining the National Geothermal Data System: Considerations for a System Wide Approach and Node Maintenance</i> , Allison, M. Lee & Anderson, Arlene & Chickering, Cathy & Patten, Kim & Richard, Stephen M.
9:40	BREAK (9:40 - 10:10)		
	POWER PLANT 4 Chair: Dave Meade	EGS 3 Chair: Joe Iovenetti	GEOPHYSICS Chair: Jeff Witter
10:10	<i>Compatibility of Binary Geothermal and Solar PV Power Plants</i> , Allis, Rick & Larsen, Garth	<i>The Future of Geothermal Energy: The Shale Gas Analogy Significant Electrical EGS Resource Areas in the Western US</i> , Blackwell, David & Frone, Zachary & Richards, Maria	<i>Application of Radar Interferometry to Detect Subsidence and Uplift at the Heber Geothermal Field, Southern California</i> , Eneva, Mariana & Adams, David & Falorni, Giacomo & Morgan, Jessica
10:30	<i>Hybrid Geothermal and Wind Power Generation</i> , Jalilinasrabady, Saeid & Itoi, Ryuichi & Ohya, Yuji	<i>Enhanced Geothermal System Potential For Sites on the Eastern Snake River Plain, Idaho</i> , Podgorney, Robert & McCurry, Mike & Wood, Thomas & McLing, Travis & Ghassemi, Ahmad & Welhan, John & Mines, Greg & Plummer, Mitchell & Moore, Joe & Fairley, Jerry	<i>Quantitative 3D Modeling and Interpretation of High Resolution Aeromagnetic Data Over Superstition Hills and Superstition Mountain, Imperial Valley, CA</i> , Ruder, Michal & Blake, Kelly & Hobbs, Michael & Unruh, Jeff & Lutz, Andrew & Gray, Brian & Sabin, Andrew & Lazaro, Michael & Tiedeman, Andrew
10:50	<i>Geothermal Energy Potential From Oil Fields in the Los Angeles Basin and Co-Located Renewable Resources</i> , Glassley, William E. & Brown, Elise & Asquith, Adam & Lance, Tucker & Perez, Gabriel	<i>Assessment of Engineered Geothermal Systems For Water Management and Power Production</i> , Garrison, Geoffrey & Uddenberg, Matthew & Cladouhos, Trenton & Petty, Susan & Coleman, Travis	<i>Correlating Resistivity and Gravity Geophysical Surveys at Suswa Geothermal Prospect in Kenya</i> , Mwakirani, Raymond
11:10	<i>Co-Produced Geothermal Resource and EGS in the Williston Basin</i> , Gosnold, Will & Crowell, Anna & Crowell, James & Bubach, Bailey & Sarnoski, Anthony & Barse, Kirtipal & Jabbari, Hadi & Wang, Dongmei	<i>Deep Geothermal Heat Storage Under Oilsands, Can We Use it to Help Oilsands Industry? New EGS Concept Proposed</i> , Majorowicz, Jacek & Hofmann, Hannes & Babadagli, Tayfun	<i>Comparison of 1-D, 2-D and 3-D Approaches of Interpreting Electromagnetic Data of Silali Geothermal Area</i> , Lichoro, Charles Maturia
11:30	<i>Geothermal Power Generation Using Thermoelectric Effect</i> , Li, Kewen & Liu, Changwei & Chen, Pingyun	<i>Multi-Fluid Geothermal Energy Production and Storage in Stratigraphic Reservoirs</i> , Buschecka, Thomas A. & Chena, Mingjie & Haoa, Yue & Bielickib, Jeffrey M. & Randolpbc, Jimmy B. & Suna, Yunwei & Choic, Hyungjin	<i>Distortion Effects on Magnetotelluric Sounding Data Investigated by 3D Modeling of High-Resolution Topography</i> , Stark, Mitchel & Soyer, Wolfgang & Hallinan, Stephen & Watts, M. Don
11:50			<i>Detecting Spatial Trends in Thermal Conductivity in the Williston Basin</i> , Crowell, James "Josh" & Gosnold, Will

ROOM 124	
RESERVOIR MANAGEMENT/MODELING Chair: Mike Hillesheim	
8:00	<i>An Empirical Injection Limitation in Fault-Hosted Basin and Range Geothermal Systems</i> , Benoit, Dick
8:20	<i>Geothermal Well Stimulation Using Water Jet Cutting in Mexico</i> , Hernandez, Isaias & Del Valle, Juan & Espindola, Salvador
8:40	<i>Simulated Down-hole Casing Corrosion Protection Tests by Addition of Filming Amine Products into Geothermal Injectate at The Geysers</i> , Sonnevile, Allen & Benn, Brian & Conant, Tim
9:00	<i>Inhibition of Antimony Sulfide (Stibnite) Scale in Geothermal Fields</i> , Gill, Jasbir & Muller, Logan & Rodman, David
9:20	<i>Continuation of Survey GPS Measurements and Installation of Continuous GPS Sites at The Geysers, California, For Geothermal Deformation Monitoring</i> , Floyd, Michael & Funning, Gareth
9:40	BREAK (9:40 - 10:10)
EXPLORATION 3 Chair: Neil Peterson	
10:10	<i>High Versus Low Altitude Hot Spring Settings and Associated Sinter Textures From El Tatio, Chile and the Taupo Volcanic Zone, New Zealand</i> , Lynne, Bridget Y. & Morata, Diego & Reich, Martin
10:30	<i>The Use of Non-Parametric Analysis of Subsoil Temperature Data at the Las Pailas Geothermal Field For Low Impact Geothermal Prospecption</i> , Hakanson, Edward Charles
10:50	<i>Preliminary Exploration Results of the Kalinga Geothermal Prospect, Luzon, Philippines</i> , Crisostomo, Jonelle Nikolai & Calayag, Angelica Marie & Sunio, Eugene & Vicedo, Ronald
11:10	<i>High Resolution Airborne Thermal Ifrared Remote Sensing Study, Silali Geothermal Prospect, Kenya</i> , Mutua, Joseph & Lopeyok, T. & Mutonga, M.
11:30	<i>Akutan Geothermal Area Exploration Results and Pre-Drilling Resource Model</i> , Ohren, Mary & Bailey, Alan & Rickard, Bill & Hinz, Nicholas & Oppliger, Gary & Hernandez, Jonathan & Dering, Gregory
11:50	<i>Use of a Portable Photometer for Accelerated Exploration: Testing for Geothermal Indicators in Surface Waters</i> , Yehia, Ron & Vigouroux, Nathalie & Hickson, Catherine

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GRC 2013 ANNUAL MEETING

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“A Global Resource, from Larderello to Las Vegas”

MGM Grand Hotel Las Vegas, Nevada USA
September 29 - October 2

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PLEASE TYPE OR PRINT CLEARLY - All correspondence and a list of participants will be sent to the address provided below.

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As of August 31, registration will require an additional fee of up to \$100 per person.

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GRC 2013 ANNUAL MEETING

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- International Luncheon** (free to registrants) \$ _____
Monday, Sept. 30, 12-1:30pm
- Non meeting Registrants (\$60 per person) \$ _____

Party with the Geothermal Stars (Annual Banquet)

- Monday, Sept. 30, 6pm-8pm (\$125 per person) \$ _____
- VIP Corporate Tables (\$1,500 per table) \$ _____
(Table for 8, VIP entrance, 3 drink tickets per person
& company signage)

Student Leadership Luncheon (student only)

- Tuesday, Oct. 1, 12-1:30pm (FREE) \$ _____

Membership Meeting & Awards Luncheon

- Wednesday, Oct. 2, 12:30-2:30pm (\$65 per person) \$ _____
- Check here if you would like vegetarian meals.

FIELD TRIPS: (Limited Seating)

Saturday, September 28th

- Las Vegas Valley Geology (\$140 per person) \$ _____
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Sunday, September 29th

- Hoover Dam, Red Rock Canyon and Goodsprings
Recovered Energy Generation Power Plant
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Wednesday, October 2nd - Saturday, October 5th

- Imperial Valley, California (\$610 per person) \$ _____
(Including an off-road Jeep tour into the desert)

CANCELLATIONS: If you must cancel your registration for the GRC Annual Meeting, Optional Events or Field Trips, please notify the GRC by September 6 in order to receive a refund (minus a \$50.00 handling fee). **Cancellations received after September 6 can not be refunded.** Substitution(s) can be made at any time, with prior approval.

WORKSHOPS:

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Friday & Saturday, September 27 & 28

- New Development in Power Plants
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