APRIL 2020

UTAH FORGE
NEWSLETTER

# AT THE CORE

This is the inaugural issue of At the Core, the quarterly Utah FORGE newsletter. At the Core aims to keep our diverse and wide-ranging audience up-to-date about Utah FORGE. Every issue will include updates from the Principal Investigator, technical discoveries, outreach news, announcements, data, events and much more! You can always learn about the latest happenings at Utah FORGE and sign up for news alerts on our website. Be sure to follow us on Facebook, Twitter and LinkedIn.

## Word from the PI

From spring to fall of 2020, we will begin full deployment of the Utah FORGE laboratory consisting of two deep wells.

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## Technical Discoveries

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## Outreach News

A team of undergraduate students from the University of Utah's Department of Chemical Engineering have achieved an outstanding result at the 2019 AIChE Competition.

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AIChE K-12
STEM Outreach Competition

## Announcements

The first solicitation for R&D funding on Utah FORGE is nearing finalization. Interested parties should monitor the Utah FORGE website for updates, as well as Facebook and Twitter.

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# Word from the PI

This spring heralds a flurry of activities at Utah FORGE!

From spring to fall of this year we will begin full deployment of the Utah FORGE laboratory. Ultimately, the underground laboratory will consist of two deep wells: one for injection of cool water; and the other for production of the water after it has been heated by the hot rocks at depth. Additional wells will be drilled to deploy deep seismic sensors, which are used to monitor the development of the reservoir.

The program of drilling in the coming months starts with completion of a seismic monitoring well, and it will be followed by the drilling of the first deep well for injection. The drilling program is planned to begin soon, after the drill pads have been prepared and roads completed.

The seismic monitoring well will be drilled to a depth of 4,500 ft and it will be engineered with state-of-the-art seismic sensors that have very low detection limits and that can withstand the subsurface temperature and pressure. This technology will support the diligent monitoring of any microseismic activity during the drilling of the first deep well. In the longer term, other seismic monitoring wells, to only a few hundred ft deep, will be drilled at distances of up to several miles away from Utah FORGE site to test for distal signals of subsurface activity.

The first deep injection well will be drilled to a vertical depth of about 8,000 ft. The well will deviate sub horizontally and achieve a measured length of some 11,000 ft and reach a temperature of approximately 400° Fahrenheit.

Once the first deep well is drilled, tests will be conducted to determine how easily water can be pumped into it. In 2022, the second well, the producer, will be drilled and linked to the first well by interconnected pathways between them.

Utah FORGE will provide updates on progress on its website and social media.

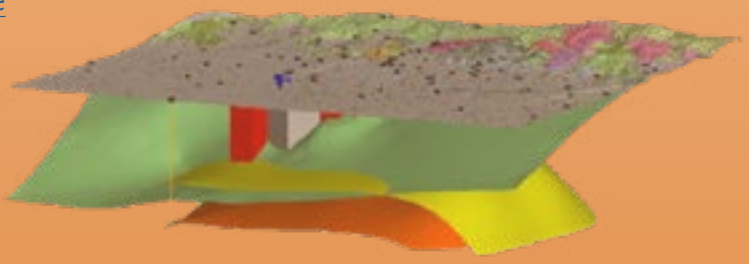
# Modeling and Simulation Forum

The inaugural Modeling and Simulation Forum was held April 15 and a video recording can be found on the Utah FORGE website. Topics that were covered include an overview of the Utah FORGE project, a description of the numerical methods and codes that have used, and a summary of modelling results dealing with discrete fracture network, the distribution of stress, and the planning of well trajectories.

Read More:
https://utahforge.com/2020/03/30/introducing-modeling-and-simulation-forum/

This is recurring event to keep the EGS community updated on our activities and, most importantly, to gain the community's feedback. To find out when the next Forum will be held, please sign up for news on our website.

Subscribe Here

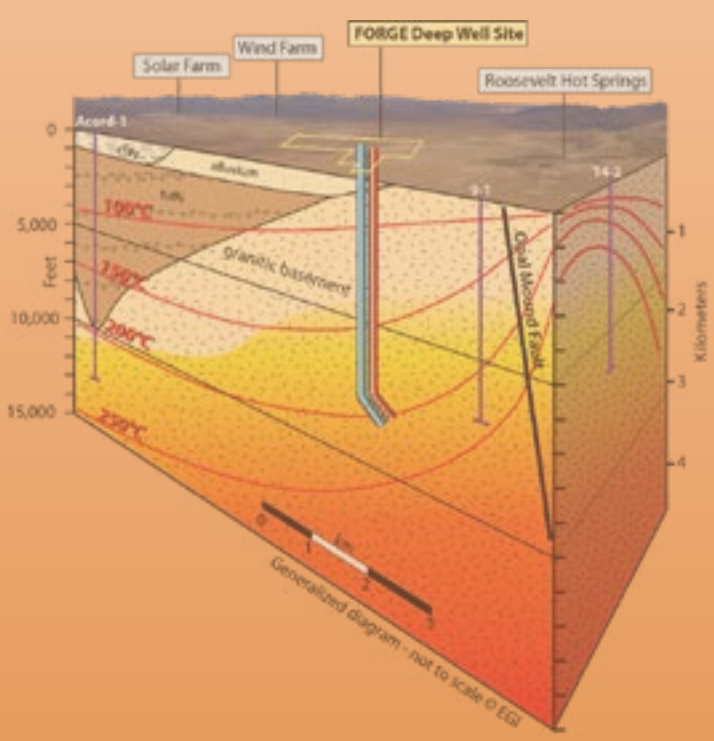


# Technical Discoveries

**The Utah Frontier Observatory for Research in Geothermal Energy: A Laboratory for Enhanced Geothermal System Development**

Recent results of work at the Utah FORGE site were presented over seven talks at the 45th Stanford Geothermal Workshop on Reservoir Engineering which was held February 10-12 on the Stanford University campus. This annual geothermal conference is one of the premier venues for sharing the latest R&D findings, and this year's event was well attended by over 200 participants, representing National Labs and agencies, universities, the private sector, and overseas institutions. With the pending release of the first Utah FORGE R&D Solicitation, the papers presented by the Utah FORGE team were very well attended.

The papers covered a spectrum of important topics, including the 2019 campaign of reservoir stimulation and flow testing in the deep test well, 58-32. To kick it off, the paper by Joe Moore and others was delivered in the Introductory session and supplied a big picture perspective of the field and lab-based results obtained in 2019, including those from geoscientific surveys, seismic monitoring, well testing and reservoir modeling, plus a brief mention of the efforts applied to outreach and communication.




The remaining papers were scheduled for Day 2, being grouped into two sessions, the first being dedicated solely to Utah FORGE and a second to EGS technologies. Kris Pankow reviewed the time series and catalogue of induced microseismicity detected by borehole and surface seismometers associated with 58-32 well testing. Rob Podgorney provided an update on the reservoir modeling, covering the discrete fracture network, the thermal-hydro-mechanical attributes, and stimulation testing. Stuart Simmons presented production chemistry evidence of EGS type heat transfer at the nearby Roosevelt Hot Springs hydrothermal system. Phil Wannamaker gave an update on all the geophysics data sets, including gravity, 3D seismic reflection, InSAR, geodesy and MT. Aleta Finnila reported on the details of the discrete fracture network modeling based on the current understanding about the 3D stress field. Lastly Pengju described the results of stimulation testing and flowback analysis in well 58-32. Although not usually newsworthy, Kurt Feigl gets a special mention for his expert performance of the chair of the Utah FORGE session.

The next big geothermal meeting was scheduled to be the World Geothermal Congress, but it has been postponed to 2021 due to the COVID-19 situation.

The full schedule and papers are accessible at:
https://utahforge.com/rd/publications/

# Outreach News

A team of undergraduate students from the University of Utah's Department of Chemical Engineering have achieved an outstanding result at the November 2019 National American Institute of Chemical Engineers (AIChE) Competition, proudly taking 2nd place in the K-12 STEM Outreach Competition.


The three member team, Andy Simonson, Emily Mei, and Marcus D'Ambrosio, presented a Utah FORGE module that demonstrates the principles of thermoelectric power and how heat transfer can be used to generate electricity. The module uses human body heat which is transferred from hands to the "Peltier Device" that sits in an ice tub. The temperature difference creates electricity and lights a lightbulb. This is the same module that has been demonstrated at Utah FORGE booth at the last two Geothermal Resources Council meetings.

The Peltier engine module was developed under the supervision of Dr. Tony Butterfield, who also supervised the first place winning team for their portable air quality sensor module.

More information about the modules created by the Chemical Engineering students and Dr. Tony Butterfield can be found at https://vstem.org/modules/.

Reference:
https://www.coe.utah.edu/2019/11/22/students-win-national-aiche-competition/

# Solicitations

The first solicitation for R&D funding on Utah FORGE is nearing finalization. Interested parties should monitor the Utah FORGE website for updates, as well as Facebook and Twitter. The announcement will be broadly publicized. Check back on our webpage regularly for updates and information about new releases.

Read More:
www.utahforge.com/rd/solicitations

# Did You Know?

Do you know how geothermal energy is utilized? The three most common applications are heat pumps, direct use, and electricity generation.

Geothermal heat pumps extract heat from the shallow subsurface for heating in the winter and reject the heat back into the ground in the summer for cooling. Heat pump systems are the fastest growing use of geothermal energy in the world. They can be installed in individual homes or large buildings. Gardner Hall at the University of Utah is one of several large buildings in Utah using heat pumps for heating and cooling. Heat pumps do not require a source of hot water, instead they use the natural thermal energy in the ground at less than 5 feet depth.

Where hot water occurs in the shallow subsurface at temperatures between 35° and 150°C (95-300°F), it can be used directly for bathing and spas, heating buildings, and for industrial purposes such as vegetable drying and raising fish. The poinsettias and chrysanthemums sold in grocery and garden stores are grown in a 24 acre geothermally heated greenhouse complex in Newcastle, Utah.

Geothermal power plants produce electricity from hot water with temperatures ranging from about 150° to 320°C (300 to 600°F). The lower temperatures can be found throughout the western USA; the highest temperatures are common around volcanoes, including those making up the Pacific Ring of Fire.

The hottest geothermal wells produce steam, which is used to spin turbines for electric generation. Where just hot water is produced, a heat exchanger is used to boil a secondary fluid to produce vapor that spins the turbine. Once the electricity is generated, the water is injected back into the hot subsurface reservoir where it is reheated. Recently, the University of Utah signed a contract with Cyrq Energy for 20 megawatts of geothermal electricity. This geothermal electricity will provide about one third of the University of Utah's power requirements.

Read more:
https://attheu.utah.edu/sustainability/epa-ranks-u-no-8-for-green-power-use-among-universities/
https://www.eia.gov/energyexplained/geothermal/use-of-geothermal-energy.php

# Data Archive

The seismic data collected from well 78-32 during the 2019 stimulation campaign (Phase 2C) are hosted by the Center for High Performance Computing (CHPC) at the University of Utah. The scripts for accessing the 15TB of data are available from the Geothermal Data Repository (GDR). These comprise the datasets from the 12-string geophone array acquired by Schlumberger and the DAS Carina fiber acquired by Silixa.

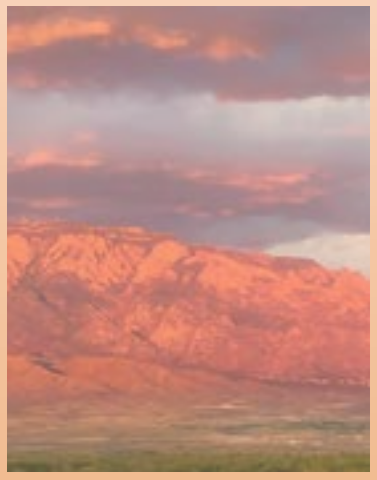
View Data:
https://gdr.openei.org/search?pj%5B%5D=utah_forge&sort=pub_date_desc

# Word of the Week

## Renewable Energy

Geothermal energy is an important renewable energy resource. These are sources of energy that have endless supply, which are commonly used to generate electricity, including hydro, solar, and wind. Geothermal energy is available day and night and irrespective of weather, complementing the other forms of renewable energy.

# Upcoming Events



April 27 - 30
**Seismological Society of America Annual Meeting**

Albuquerque, New Mexico

[Canceled]
due to COVID-19

April 27 - May 1
**World Geothermal Congress 2020**

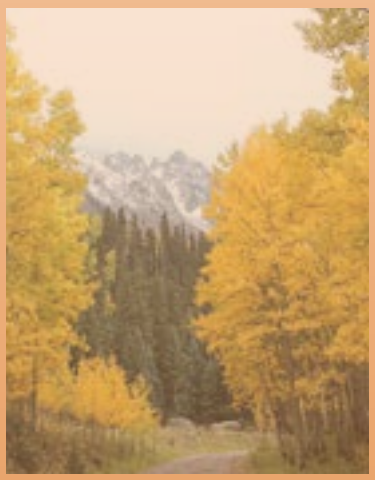
Reykjavik, Iceland

[Postponed]
to 2021
due to COVID-19

May 18
**Utah Governor's Energy Summit**

Salt Lake City, Utah

[Postponed]
to October 21, 2020
due to COVID-19



June 28 - July 1
**ARMA 54th US Rock Mechanics/ Geomechanics Symposium**

Golden, Colorado