

## Communications and Outreach for Public Acceptance of Complex Technical Projects: Experience from the Fallon FORGE Project

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### ABSTRACT

Enhanced Geothermal Systems (EGS) have the potential to greatly increase the use of geothermal energy in the United States and worldwide. The US Department of Energy has recognized that outreach and communications with stakeholders and the general public are key elements to realizing this potential, and therefore emphasizes this activity in its FORGE initiative. This paper presents the activities, challenges and successes associated with conveying complex scientific and engineering information to stakeholders and the public about the Fallon FORGE project, which is located near the City of Fallon in Churchill County, Nevada.

As part of a plan developed in Phase 1 of the project, the Fallon FORGE team developed a tiered approach to outreach that relies on local officials and civic leaders to identify additional stakeholders. With this guidance from our primary target audiences, we received positive feedback from nearly all parties we contacted or met with during the course of our outreach. Buoyed by the significant support for geothermal energy in the State of Nevada (from ordinary citizens, business leaders, local and State officials, and the Nevada congressional delegation), the Fallon FORGE team made a deliberate decision to communicate simply and honestly about complex technical subjects and potentially thorny issues such as water use and induced seismicity. The fact that our participation in local events engendered genuine interest was not only immensely gratifying, but showed that it can be possible to develop EGS in populated areas if communications and outreach clearly demonstrate local support, whether out of economic interest, a desire to be part of a project that develops new technology, support for clean energy, or some combination of these elements.

From the outreach and communications activities conducted to date, we conclude that politicians, local government officials, civic leaders and the public at large – at least in the Fallon area - are genuinely interested in geothermal development, including projects that aim to develop leading-edge technology, as is intended for FORGE. With respect to the Fallon FORGE project specifically, the local community is welcoming the project for reasons that both include and transcend the local benefits that would accrue from the project. We are grateful for this support, and have developed a deeper appreciation of why public acceptance is so important for the widespread development of EGS.

### 1. INTRODUCTION

FORGE (Frontier Observatory for Research in Geothermal Energy) is a major U.S. Department of Energy (DOE) initiative managed by its Geothermal Technologies Office (GTO) to establish a national field laboratory to test technologies for the development of Enhanced Geothermal Systems (EGS). As stated on the [FORGE website](#), FORGE's mission is to "enable cutting-edge research and drilling and technology testing, as well as to allow scientists to identify a replicable, commercial pathway to EGS" (US Department of Energy website). The proposed FORGE site at Fallon, Nevada, is located in and adjacent to the Naval Air Station Fallon (NASF), approximately 6 miles southeast of the City of Fallon. The project area lies within the Carson Sink, a broad inter-montane basin in west-central Nevada that hosts several operating geothermal projects. Prior geothermal drilling by the US Navy and Ormat Nevada Inc. (Ormat) in and around the proposed Fallon FORGE site indicates the presence of a low permeability, sub-commercial geothermal resource with temperatures greater than 350°F at depths of 5,000 feet. All wells drilled to date were found to have low permeability and were sub-commercial. A significant database from local and regional efforts to characterize its geothermal potential, attractive temperature, sub-commercial wells and a variety of lithologies in the Mesozoic basement rock in which to conduct EGS experiments make Fallon an ideal site for the FORGE EGS field laboratory.

Located within Churchill County, about 60 miles east of Reno, the City of Fallon is referred to as the "Oasis of Nevada" owing to the presence of wetlands and significant agricultural production. Fallon hosts numerous events throughout the year related to auto racing, birding, rodeos, art, hunting, bicycle racing, and off-road activities, among others. In addition, its annual Cantaloupe Festival and Country Fair showcases the prize melons grown in the area and other agricultural activities, and offers local products, a quilt show and contest, and many other interesting events and exhibits. In addition to being hard-working, involved and informed, the people of Fallon are friendly, and our outreach to date shows that many have a keen interest in the Fallon FORGE project. According to the 2010 census, Fallon's population is approximately 8,500, with 26.7% of people under the age of 18, and 8.2% under the age of 5. Fallon is a proud

owner and operator of utilities for its residents, including electricity, garbage disposal, sewer and water, and has a growing base of local businesses, technology companies, and agriculture. In addition, the NASF (sometimes referred to as the “Ship in the Desert”) is a comprehensive training facility whose mission is to train fighter pilots prior to their deployment to aircraft carriers, and to support other units participating in training events, including joint and multi-national training and exercises.

Since the passage of the State’s Renewable Portfolio Standard (RPS) legislation in 1997, Nevada has actively sought to increase the production of clean energy in the State. The most recent legislation (NRS 704.7801, enacted in 2009) requires power providers to source 25% of their electricity from renewable energy sources by 2025. In 2016, geothermal resources contributed about half of the renewable energy in the state, and provided 11.3% of the total energy sold by NV Energy (an energy provided in Nevada) in its northern service area, and 9.7% in its southern area, yielding a state-wide geothermal contribution of 10.1% state-wide (NV Energy, 2017). All geothermal generation is from “conventional” geothermal resources (those requiring no enhancement owing to adequate heat and permeability in the same location), although a small portion of the production from the Desert Peak geothermal plant (1 to 1.7 MW) is attributable to a DOE-funded EGS stimulation of injection well 27-15.

With a geothermal heat resource potential of more than 100,000 MW (Williams *et al.*, 2008), there is significant additional potential for geothermal generation in Nevada. Some will be derived from conventional geothermal resources, but there is great potential for EGS development in Nevada owing to its high heat flow (which reduces the drilling depth required to reach suitable temperatures) and the widespread presence of competent rocks that are amenable to permeability enhancements. This significant potential for the development of clean power is recognized by Nevada’s elected representatives at the local, State and Federal levels, and by the US Navy, which has a history of geothermal development and actively seeks more geothermal energy for its facilities. Their combined support, along with the oversight and guidance by DOE, the expertise of the Fallon FORGE science team - and most importantly, the partnership with the City of Fallon - the Fallon FORGE project is poised and eager to play a significant role in expanding geothermal energy in Nevada and contributing important research that will increase national energy security. Recognizing that EGS has the potential to provide clean, locally derived energy to tens if not hundreds of millions of American homes, as well as resilient energy for military facilities, the FORGE project will develop methods and technologies needed to enable widespread EGS commercialization.

## 2. FORMING AN OUTREACH AND COMMUNICATIONS PROGRAM

The Fallon FORGE project has taken an agile approach in forming a program for outreach and communication, starting during Phase 1 and continuing into Phases 2a and 2b (information about the phases of FORGE can be found [here](#)). This allowed us to take some initial steps to identify the right outreach targets and develop the communication tools necessary for immediate outreach, later adjusting our approach as we began to build relationships and partnerships with various parties. As we ramp up for Phases 2c and 3, we are continuing to modify our approach and take advantage of the relationships we have developed.

During Phase 1, the Fallon FORGE team developed an initial plan for communicating with a diverse group of stakeholders. We identified our primary target audiences for outreach with the intent to seek their advice on defining secondary audiences. As an initial step, we developed a communications strategy that included brand development, key messaging, web presence, and additional marketing materials. With respect to the last, we developed a one-page flyer and distributed it widely to stakeholders and other interested parties to present the basic facts about the project and use as a vehicle for discussion. We considered the issues and questions that would likely come up during discussions with different stakeholders (water use, induced seismicity, community benefits, etc.), and responses were prepared in the form of frequently asked questions (FAQs) that were posted on the [Fallon FORGE website](#). Our local partners in the project - Ormat, University of Nevada Reno (UNR) and the US Navy at NASF - provided their knowledge and utilized their established relationships with the community to introduce the Fallon FORGE project and its technical team. At their suggestion, we focused on establishing relationships with local leaders (many of whom have since become ambassadors of the project), including Fallon’s Mayor, Deputy City Attorney and the City Engineer / Director of Public Works, the Director of the Churchill Economic Development Authority (CEDA), the Director of the Fallon Chamber of Commerce, the Superintendent of the Churchill County School District, and the Paiute-Shoshone Tribal Council and Members. In preparation for reaching out to the public, the team met with these individuals to better understand the most effective tactics for communicating with the public, and to understand the concerns that they and/or their constituents have (or are likely to have) about the project. Before these meetings, we had already developed the following 5 key messages that we thought would resonate with the community:

1. EGS can have a positive impact on our nation’s energy supply, and the FORGE project is needed to advance EGS technology.
2. The Fallon FORGE project will help maintain Nevada’s position as an international leader in renewable energy, particularly geothermal energy.
3. There are significant local benefits (economic, educational, etc.) associated with hosting a major R&D project at Fallon.
4. The US military is actively improving the resilience of the electricity supply for its facilities, and EGS could play a significant role with respect to energy resilience.
5. The Fallon FORGE site has the right suite of technical characteristics to develop EGS technology.

These messages have been used extensively and consistently in Phases 1, 2a and 2b of the Fallon FORGE project as a way to initiate discussions with different stakeholders, including government officials at the local, State and Federal levels. The Government Relations teams from Sandia National Laboratories (SNL, the lead organization for Fallon FORGE) and Lawrence Berkeley National Laboratory (LBNL) worked closely with the Fallon FORGE technical team to meet with government officials. This has resulted in universally positive support for the project. The project’s industry partners (Ormat, Itasca and GeothermEx) and the University of Nevada Reno (UNR) also participated in some of these meetings and held others separately to demonstrate the high level of interest and support from

the government, academic and commercial sectors. The Navy Geothermal Program Office (the Department of Defense’s lead organization for the exploration, development and management of geothermal resources on military land) has facilitated the project’s interactions with the US Navy, and NASF personnel have contributed significantly to our outreach efforts. In addition to its technical work on the project, the US Geological Survey (USGS, an important member of the Fallon FORGE technical team) has promoted the project within the USGS research community and beyond. Thus, each participant in the Fallon FORGE project has had an important role to play in outreach and communications.

### 3. SUMMARY OF OUTREACH AND COMMUNICATIONS TO DATE

After forming a deliberate plan and adjusting our message using guidance from the NASF and the City of Fallon, we have communicated in various ways with most of the primary and secondary audiences identified in our initial Communications and Outreach. Formats for communication and outreach have included face-to-face meetings, teleconferences, site visits and tours, presenting at scientific conferences, technical seminars, and media interactions, all of which are tracked on our website. To extend our reach to locals in the City of Fallon and Churchill County, the team made appearances at public meetings and events, as described below. In this section of the paper, the word “we” refers to one or more members of the Fallon FORGE team, and all engagements mentioned specifically included discussions of the FORGE project. We received almost universally positive responses during these interactions, as described below.

#### 3.1 State Governments and Government Agencies

As a state, Nevada has always been a dedicated supporter of geothermal energy, and not only conventional resources - the State of Nevada is also very keen to support the FORGE R&D project. We met with the Governor’s Office of Energy on several occasions in 2016 and 2017, during which strong support for the Fallon FORGE project was expressed. As a major demonstration of their support, the Governor’s Office of Energy has [committed \\$1 million in financial support](#) for drilling a test well at Fallon (the FORGE 21-31 well), which is underway at present.

In January 2017, we met with the Nevada Division of Minerals (NDOM) to keep them informed about the project, answer their questions, and ensure that we are cognizant of all applicable regulations and processes related to drilling and stimulating geothermal wells. Their staff has a positive attitude about the project, and offered their assistance to the team with respect to permitting and other regulatory actions that may be required.

#### 3.2 State Legislators

In May 2017, we met with Nevada State Senators James Settelmeyer (District 17, which includes Churchill County) and Pat Spearman (North Las Vegas District 1), and Nevada State Assembly Member Robin Titus (District 38, which includes Churchill County) to brief them on the project and solicit their advice regarding community engagement. Representatives from NASF participated in these meetings. All three had positive reactions, and the presence of the Navy at the meeting was specifically appreciated by Mr. Settelmeyer. Assembly Member Titus was particularly positive about the STEM educational opportunities related to the project.

#### 3.3 Fallon, Churchill County and Other Nearby Communities

Beginning with interviews, public meetings and articles to publicize the project, the Fallon FORGE team made a significant effort to “spread the word” about FORGE in Fallon and nearby communities, including Reno and Fernley. The following summarizes these activities.

- In August 2015, we gave a 2-minute television interview of on KRN TV (the NBC affiliate in the greater Reno area), specifically discussing the Fallon FORGE project and how it could lead to a significant increase in geothermal energy production in Nevada.
- A longer interview (“University research key to realizing Nevada’s geothermal potential”) was conducted in March 2016 with the Reno public broadcasting radio station, and included a discussion of the FORGE project.
- In February 2016, we presented information about the potential of EGS and our plans for the Fallon FORGE project at a monthly meeting of the Truckee Meadows Parks Foundation in Reno.
- In January 2017, we provided a FORGE update briefing for several local and community stakeholders, including the Mayor of Fallon, Fallon City Engineer, Churchill Economic Development Authority Executive Director, Churchill County Manager, and Churchill County School Superintendent. All expressed strong enthusiasm and support for the project.
- In February 2017, a meeting was held at UNR to present results to DOE that would enable them to make the Go/No-Go decision between Phases 2a and 2b. Stakeholders and community members were invited to this meeting to show their support for the project. In addition to the Fallon FORGE team and DOE, the participants at this meeting included:
  - UNR’s Executive Vice President and Provost, and UNR’s Vice President for Research and Innovation, who expressed pride in the work done by UNR personnel.
  - The Commanding Officer of NASF, who expressed support for the project (noting its benefits for the Navy, the State of Nevada and the nation), but also some concerns related to the proximity of the project area to the runway and induced seismicity (potentially causing damage the runway).
  - The Bureau of Land Management, which reiterated its willingness to assist with leasing, permitting or any other issues in their purview.

- The Nevada Governor’s Office of Energy, which expressed its excitement about the project and how it fits with their mission to promote the development of more renewable energy in the State.
- The Nevada Division of Minerals, which expressed its support of the project and its willingness to work on any new regulations that could be needed to enable EGS technology to advance.
- The Churchill Economic Development Authority, which expressed its pride in Fallon being chosen as a FORGE finalist, invited the FORGE team to address the business round-table discussion hosted by the county’s Energy Program Director, offered help in setting up monitoring stations, and noted that Fallon is a very informed community (and the FORGE team has done a good job communicating with the community).
- In May 2017, we made a presentation about the Fallon FORGE project at the annual Nevada Geothermal Day event in Carson City.
- Our most successful community outreach was undertaken when we exhibited at the annual Fallon Cantaloupe Festival and Country Fair, an event attended by nearly 15,000 people from Fallon, Fernley, Reno and other Nevada cities and towns. Equipped with core samples, a binocular microscope, thin sections, and some modest giveaways (including wrist bands, stickers, and 300 water bottles that were appreciated and used owing to the very hot weather), all of which attracted visitors to our booth. The cores and the microscope helped us initiate conversations with many booth visitors. We discussed the project with approximately 400 people, who responded very favorably (with less than a handful of exceptions) and asked dozens of thoughtful questions. The team was available over the four-day period of the Festival to answer questions of all kinds frankly and honestly, including questions about potentially difficult subjects (such as water use and induced seismicity). We distributed nearly 200 marketing brochures about the project that were developed specifically for this event, and ate cantaloupe in its native form and as an element of beer, ice cream, cocktails and barbeque sauce (among others). Although we beat the heat by visiting the indoor quilt show and art competition, and enjoyed meeting friendly people, listening to live music, and the overall vibe of the event, the positive response from nearly everyone who stopped by the Fallon FORGE booth and spoke to us - including representatives from DOE and Senator Heller’s office – was our main take-away.



**At the Cantaloupe Festival, Bridget Ayling explains the project to visitors (L); the Fallon FORGE team and booth (R)**

- In November 2017, the Fallon FORGE team provided an overview of the projects and its status related to permitting requirements and permit approvals to the Churchill County Commissioners, during a regularly scheduled business hearing, which was open to the public. The Commissioners were unanimous in their support for the Fallon FORGE project.
- In September 2017, we met with the Churchill County Museum and Archives, which seeks to partner with the project to develop exhibits about geothermal energy, EGS and the Fallon FORGE project specifically, and has offered to provide public access to project information and research directions (*e.g.*, data monitoring stations, adult learning, project update presentations). In addition, the William Pennington Life Center (a senior center in Fallon) has offered use of its meeting and banquet facilities to the Fallon FORGE team. In addition to serving as a senior center, the Life Center is a primary meeting hub for the Fallon community and, as such, has several meeting rooms and a fully equipped kitchen. The Director of the Life Center was very accommodating and envisions the Life Center being used as a focal point for FORGE activities, including community outreach, scientific workshops and meetings relevant to the FORGE mission.
- In January 2018, we met initially with the Fallon City Engineer and staff to request assistance in identifying any data that the City may have on ground motion thresholds and identifying critical infrastructure to be monitored for ground motion. Staff agreed to initiate work on this request.
- Later in the same month, we met with the City Engineer again, plus the Mayor, the Deputy City Attorney, and the Director of CEDA to provide them with an update on the project, and determine if there had been any changes in their opinions on the best ways to conduct outreach in the Fallon community. At the culmination of this meeting, Mayor Tedford and his staff reiterated their strong support for the project. The Churchill County Manager also agreed to use the County’s resources to provide the needed data.
- The most recent meeting with local stakeholders (also in January 2018) included the Churchill County Manager and Superintendent of Schools, and the Director of CEDA to discuss outreach targets and present educational opportunities for

Churchill County students. Once again, the project received a positive response. The inclusion of CEDA (which strongly and vocally supports the project) in these meetings was very helpful.



**Gussied up tractors (old and new) at the Cantaloupe Festival**

To demonstrate their support, Churchill County has posted a [summary of the Fallon FORGE project](#) on its website. The document includes links to the FORGE pages on DOE's website, and to the Fallon FORGE website.

In nearly all of our community-facing outreach, we have highlighted how the City of Fallon and Churchill County will benefit from the FORGE project. As a world-class R&D facility that will operate over a 5-year period, Fallon FORGE will support economic prosperity in the area through employment opportunities and increased commerce in the area. Leading researchers from across the United States and the world will rely on the tourism and hospitality industries and local businesses, and the City of Fallon will become a world-renowned hub of geothermal research. Thus, Fallon will be an important partner in helping DOE to increase awareness about geothermal energy as a major source of clean, renewable energy for Nevada and the nation.

Longstanding education and outreach programs offered through DOE and new educational initiatives being developed specifically by the Fallon FORGE Team will contribute to STEM literacy, in Fallon and beyond. In addition, the Fallon FORGE project will provide opportunities to:

- Broaden the knowledge of renewable energy technologies for K-12 students through new educational curricula, outreach and field trips.
- Provide internships for high school and college students in the areas of renewable energy, national security, and more.
- Expand research options for graduate students, including postdoctoral positions in the project.
- Develop local workforce experience in geothermal-related activities.

Expressing these benefits to stakeholders and the local community is one reason why so much support for the project has been generated.

### 3.4 Tribal Representatives

Although we met a few members of the Paiute-Shoshone Tribe at the Cantaloupe Festival in August 2017, a formal meeting was held with the Tribal Council in September 2017 to provide a technical briefing on the project, a summary of the progress made to date, and the future activities at the site, if the project is selected to advance into Phases 2c and 3. Although we focused on the benefits to the Tribe, the possible impacts of the project (induced seismicity and water use) were also discussed in an open manner. The response of the Tribal Council was generally positive, and they look forward to hearing more about the project.

### 3.5 Congressional Delegations

Our engagement with members of the US Congress began in June 2015, when team leader Doug Blankenship gave an overview of the Fallon site to the Senate and House Renewable Energy and Energy Efficiency Caucus. Since then, we have continued our efforts with positive results, as follows.

- In April 2016, we provided an introduction and overview of the Fallon FORGE project to the staff of Senators Dean Heller and Harry Reid of Nevada, Senators Barbara Boxer and Dianne Feinstein of California, California Congressman Paul Cook, and Nevada Congressman Mark Amodei (whose district includes a large area of northern Nevada, including Reno, Fernley and Fallon). All were very keen on the project; Senator Heller and Representative Amodei met with us personally to express their support directly.
- In January 2017, we provided an overview of the Fallon FORGE project to the Reno district staff of Senators Dean Heller and Catherine Cortez Masto, and Representative Mark Amodei. Particular attention was given to potential community concerns, and all Congressional staff expressed strong support for the project.
- In February 2017, we organized and led a briefing and tour of the Fallon FORGE site for Nevada Senator Catherine Cortez Masto. Despite the cold and windy weather, Senator Cortez Masto expressed her enthusiasm for hosting a significant geothermal R&D project in Fallon, and asked a number of insightful questions, the first of which was how could she best support the project?

- In June 2017, we traveled to Washington DC to provide an update to congressional staff, including members of the Nevada delegation (Senators Heller and Cortez Masto, and Representative Amodei), Senator Martin Heinrich of New Mexico, majority and minority staff for the Chair (Senator Lisa Murkowski of Alaska) and Ranking Member (Senator Maria Cantwell of Washington) of the Senate Energy & Natural Resources Committee, and majority and minority staff for the Chair (Senator Lamar Alexander of Tennessee) and Ranking Members (Senator Dianne Feinstein of California) of the Senate Energy & Water Appropriations Subcommittee.
- Shortly after this visit (in August 2017), Senator Heller and other members of the Nevada congressional delegation sent a [letter to Energy Secretary Rick Perry](#) in support of choosing the Nevada site for FORGE, noting that “. . . the existing education and economic infrastructure for geothermal in Northern Nevada will provide the strongest possible conditions for these innovations to proliferate into the commercial market” (Heller, 2017).



**Nevada Senator Catherine Cortez Masto meets with the Fallon FORGE team at NASF, February 2017**

### 3.6 Federal Agencies

The first group we met with was the US Navy, in March 2015 in Fallon. NASF was considering the project, and needed assurance that we understood both the critical nature of the NASF mission and the operating requirements for the FORGE project at NASF. With facilitation by US Navy command from Washington DC, it was agreed at this meeting that the Fallon FORGE project should proceed, and a letter of support was subsequently provided by Rear Admiral Lorge.

During the normal course of the project, the Fallon FORGE team has held discussions with and submitted reports to DOE as specified for Phases 1, 2a and 2b. In addition, we facilitated a visit to NASF for GTO’s Program Director Dr. Susan Hamm and GTO’s EGS Program Manager Lauren Boyd in August 2017. These senior members of the GTO met with the Commanding Officer (CO) at NASF (CAPT David Halloran) and the Public Works Officer (CDR Scott Beyer). The purpose of the visit was to meet the CO to understand how the US Navy views the project, and to get the “lay of the land” at the Fallon FORGE site. CAPT Halloran reiterated his support for the project, while acknowledging that it is peripheral to NASF’s mission. We have also been in regular communication with the Navy Region Southwest Command, to keep them apprised of progress on the project and to maintain their support.

In addition to DOE and the US Navy, we met with representatives of the Bureau of Land Management (BLM) in April 2016 to inform them about the work planned for Phases 2a and 2b, which led to a discussion of land status and the procedures and time frames for permitting.

### 3.7 Local Water Agencies

As reported during Phase 1, the Fallon FORGE project will use geothermal water for injection and stimulation activities supplied from one of the non-commercial geothermal wells drilled by Ormat. Because water will be consumed by the Fallon FORGE project, we reached out by phone and e-mail to the two water regulators in Nevada: the Nevada Division of Water Resources, which oversees the use and permitting of surface and groundwater, and the Nevada Division of Minerals, which oversees injection permits for geothermal projects and related permits for geothermal production wells. As is typical in most jurisdictions, the main issue is one of the quality of the water that would be injected into the FORGE wells vs. the quality of the water encountered in the injection/stimulation zone of the FORGE wells. It is expected that water quality of the supply well will be similar or better than that encountered at depth in the FORGE wells; therefore, this fundamental requirement should be met by the project, as it has for many other geothermal projects in the Carson Sink.

Nevertheless, because water is a precious commodity in Fallon, we felt it was important to evaluate any possible impact that the production of geothermal water (for injection/stimulation activities) could have on other water users in the area. We concluded that there would be no such impact for the following reasons.

- The FORGE water supply wells are 5 to 7.5 miles southeast of the Basalt Aquifer (Fallon’s drinking water source), and production from the Basalt Aquifer is obtained from significantly shallower depths (200-600 feet; Maurer and Hetch, 2001) than the planned FORGE water supply wells.
- All other groundwater wells in the area for which depth data are available on the NDWR website are even shallower (the deepest is 165 feet, and most of the others are significantly shallower)

This analysis was conducted to understand existing groundwater use and to prepare us to discuss groundwater issues with residents and other stakeholders around the Fallon FORGE project area.

### 3.8 Geothermal Research and Development (R&D) Community

This category includes publications, presentations, interviews, and exhibitions that are of interest to the geothermal R&D community at large. As noted below, there has been significant outreach in this category.

- In September 2015, we presented a paper on the evolving geologic model of the Fallon FORGE area at the Geothermal Resources Council (GRC) Annual Meeting in Reno.
- In August and November 2015, we participated in interviews about the Fallon FORGE project for UNR’s Nevada Silver and Blue magazine, which is published quarterly by the UNR Alumni Association and is widely read by the UNR student body.
- LBNL exhibited at the American Geophysical Association (AGU) meeting in San Francisco in December 2015, presenting several areas of active research at the lab, including the Fallon FORGE project, with a specific emphasis on future internships, post-doctoral appointments, and collaboration with academia and industry.
- In February 2016, we met with Dr. Hiroshi Asanuma, who has been involved in EGS projects in Japan and elsewhere during his tenure at Tohoku University, and is currently the Geothermal Team Leader at the Fukushima Renewable Research Institute, which is part of the National Institute of Advanced Industrial Science and Technology (AIST), an agency of the national government of Japan. Dr. Asanuma presented an overview of AIST’s plans for EGS research and reiterated AIST’s commitment to partnering with DOE.
- In addition, a paper presented in February 2016 at the annual Stanford Geothermal Workshop (where we met with Dr. Asanuma) served to inform the geothermal R&D community about the progress made to date on the geologic model of the Fallon FORGE project area, and its relevance to future FORGE operations.
- In September 2017, Fallon FORGE team member Dr. Bridget Ayling made an invited presentation to the Department of Geological Sciences and Engineering at UNR specifically on the Fallon FORGE project, generating interest from students and faculty members.
- LBNL is actively engaging on geothermal projects with two European research entities that have a significant interest in EGS and FORGE: BRGM (Bureau de Recherches Géologiques et Minières, the French geological survey); and ETH (Eidgenössische Technische Hochschule, the Swiss Federal Institute of Technology) Zürich. Considering Europe’s interest in EGS, specific collaboration agreements will be put in place between LBNL and these two European institutions if the Fallon FORGE project proceeds to the next phase.
- In September 2017, one of the Fallon FORGE team members (Kelly Blake of the Geothermal Program Office) made a presentation about geothermal energy (including FORGE) at an alumni event at Slippery Rock University in Pennsylvania. In response to a question about induced seismicity, she described the Induced Seismicity Mitigation Plan and the “stop light” system for monitoring and control of induced seismicity.
- In October 2017, we shared the vision of the Fallon FORGE project with the geothermal research community during the GRC Annual Meeting and GEA Expo in Salt Lake City, where we presented updates on project progress (during the conference) and discussed the project with researchers and industry people at the Fallon FORGE booth (in the Expo).
- In December 2017, Fallon FORGE team member Dr. Jeff Witter attended an event hosted by Geoscience BC, an independent, non-profit organization that supports the development of the British Columbia’s natural resources by conducting public domain scientific research and data collection. At the event, Dr. Witter spoke with the Director of Energy Planning for BC Hydro (the largest electricity generator in BC, and an entity that has long had an interest in realizing BC’s geothermal potential) and the Geoscience BC’s Energy VP. Both were intrigued by EGS generally and the Fallon FORGE project specifically, and they are keen to learn about (and potentially participate in) the planned research program at the Fallon FORGE site.
- At this year’s Stanford Workshop on Geothermal Reservoir Engineering, we are presenting three other papers (in addition to this paper) on the Fallon FORGE project that will be of interest to the EGS research community:
  - Phase 2 Update for the Fallon FORGE Project Site (Ayling *et al.*, 2018);
  - The Geologic and Structural Framework of the Fallon FORGE Site (Siler *et al.*, 2018); and
  - Using Borehole Induced Structure Measurements at Fallon FORGE Combined with Numerical Modeling to Estimate In-Situ Stresses (Blanksma *et al.*, 2018).

The Fallon FORGE team is dedicated to publishing its results and otherwise engaging with the geothermal research community.

### 3.9 Geothermal Developers and the Geothermal Industry

As noted above, we began publishing and presenting about the Fallon FORGE project at the GRC Annual Meeting in December 2015, and have continued to present information about the project at various industry events frequented by researchers and geothermal developers. Other examples of outreach to the geothermal industry are presented below.

- In March 2016, we made a presentation at the Geothermal Energy Association (GEA) US and International Geothermal Showcase in Washington DC about the geographic limitations of conventional geothermal resources, an overview of EGS potential and the EGS projects undertaken in the United States, and how we chose Fallon as a site for FORGE.
- As noted above, the Fallon FORGE project had a booth at the 2017 GEA Expo and presented updates on project progress during the GRC Annual Meeting in Salt Lake City in October 2017. This event is attended by many representatives of the geothermal industry.
- As noted above, in addition to this paper, three others are also being presented at the 2018 Stanford Geothermal Workshop: an update on progress at the project (Ayling *et al.*, 2018); an update to the geologic model based primarily on recent geophysical data (Siler *et al.*, 2018), and the results of analyses undertaken to estimate stress magnitudes at the Fallon FORGE site (Blanksma *et al.*, 2018). The Stanford Geothermal Workshops attract a mix of attendees from academia, industry and the research community, making it an excellent venue for presenting information about the Fallon FORGE project.

### 3.10 Educational Initiatives

Beginning in April 2016, we have been in discussions with the Lawrence Hall of Science (LHS), a public science center located near the University of California (Berkeley) and LBNL that hosts hands-on science exhibits, designs science curricula, provides teacher training, and offers science resources to students of all ages (with a particular focus on K-12). After a presentation about geothermal energy generally and the Fallon FORGE project specifically, LHS expressed its strong interest in collaborating with the project to develop science curricula.

This information has been conveyed to the Churchill County Superintendent of Schools, who (like State Assembly Member Titus) is particularly interested in STEM curricula for Churchill County students. Therefore, in February 2018, we facilitated a conversation with LHS staff and the Churchill County School District Superintendent to discuss the District's needs as it relates to the development of educational opportunities as part of the FORGE project.

### 3.11 Other Engagements of Interest

This category includes items that have been important to the FORGE team but do not fit in any of the categories above. The Fallon FORGE project was a subject of discussion at all the engagements listed below.

- In August 2015, Ormat participated on a panel with DOE at a meeting for Nevada's Clean Energy Project ("Nevada's Innovation System: Accelerating Clean Energy and Economic Development").
- In January 2016, Dr. James Faulds made a presentation about geothermal energy, including EGS and the FORGE project, at a monthly meeting of the Nevada Petroleum and Geothermal Society in Reno.
- In January 2017, Dr. Bridget Ayling gave an [interview](#) about her new position as Director of the Great Basin Center for Geothermal Energy to the Nevada Independent newspaper. The article specifically mentions that Fallon FORGE project.
- In April 2017, Dr. Ayling made a presentation at the Association of Environmental and Engineering Geologists (southern Nevada chapter) dinner meeting in Las Vegas, including a discussion of EGS and FORGE.
- May 2017, Dr. Ayling made a presentation about EGS and FORGE at a monthly meeting of the Nevada Petroleum and Geothermal Society in Reno.
- In September 2017, Dr. Ayling made a presentation about the Fallon FORGE project at a meeting of the Association of Environmental and Engineering Geologists in Las Vegas, and gave an [interview](#) about geothermal energy in Nevada (including the Fallon FORGE project) to the Nevada Independent newspaper.
- In November 2017, Dr. Ayling and Fallon FORGE team leader Doug Blankenship were the subjects of an [interview](#) about the Fallon FORGE project by the Nevada Independent newspaper.

## 4. A VISION FOR OUTREACH DURING PROJECT EXECUTION (PHASE 3)

Upon successful selection of the Fallon FORGE site for Phase 3 of the FORGE initiative, we intend to execute an aggressive communications and marketing campaign that will elevate the visibility of the Fallon FORGE project. Specific activities have been developed as a result of discussions with stakeholders, the City of Fallon, and Churchill County, and are designed to create an even greater and more visible presence for the FORGE project in Fallon. Although technical activities will take place at the field site location, we plan to open an office within the City proper and/or at the Fallon FORGE field site that can serve as a visitor and information center for the public, project stakeholders and researchers who will ultimately use the site for EGS experimentation and technology development.

To support ongoing communication strategies and to provide the general public with access to project information (including immediate access to real-time seismic data), interactive computer displays will be created and installed in key locations in the City of Fallon, and possibly at the Nevada State Legislature in Carson City, and at the Churchill County Museum and Archives. These displays will allow



easy access to data and other information about the Fallon FORGE project, and will serve as education tools for all ages to learn about induced seismicity and how EGS works.

Face-to-face public meetings will remain a core tactic of our outreach strategy. This includes updates with City and County leaders in advance of well stimulation and other activities, holding meetings around the stimulation period, and periodic public and media relations. In preparation for important on-site activities, the project will leverage existing information and distribute it via our established communication outlets in Fallon (social media, newsletters, monthly business networking meetings, etc.) to provide status updates and describe the Fallon FORGE team's expectations for the activity. The Fallon FORGE website will provide clear information on how to contact the project team, and an escalation process will be in place to allow the public to receive answers to urgent questions promptly.

The Fallon FORGE team is already investigating ways to provide educational opportunities for the community, as described above. In addition to STEM-related curricula and science fairs, we plan to offer site tours and hands-on activities for K-12 students, and host internships for high school and college students. Fallon FORGE will build on its relationship with the Churchill County School District and educators who are ready to include geothermal and EGS technology as part of their curriculum in the classroom or as after-school learning activities. Our initial work with Lawrence Hall of Science has inspired us to make geothermal and EGS education a priority for the Fallon FORGE project. In addition, post-graduate research will be supported by the project.

Finally, the economic benefits mentioned above will be monitored and quantified to help demonstrate the value of hosting R&D activities.

## CONCLUSIONS

Although FORGE is a highly technical project, the Fallon FORGE team has executed an effective communications and outreach campaign to convey the project's importance at all levels, from the typical Fallon-area resident, to local and State officials, to members of Congress. Support for the Fallon FORGE project has been overwhelmingly positive. Although we have presented consistently positive messages, we have not shied away from discussing complex issues (such as induced seismicity and water use) with stakeholders and the Fallon community.

From the outreach and communications activities we have conducted to date, we conclude that politicians, local government officials, civic leaders and the public at large are genuinely interested in geothermal development, including projects that envisage the development of leading-edge technology like FORGE. With respect to the Fallon FORGE project specifically, the local community is welcoming the project for reasons that both include and transcend the local benefits that would accrue from such a project. We have been open and honest with everyone about the possible impacts and benefits, and the general consensus is that the benefits far outweigh the possible negative impacts.

As a final note, if FORGE successfully develops and demonstrates suitable technology, EGS may be developed in many locations that are close to populated areas. Thus, Fallon is ideal not only from the technical perspective, but also from the perspective of gaining public acceptance for a new energy source that may have short-lived impacts but long-term benefits.

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