**RESOURCE DEVELOPMENT COORDINATING COMMITTEE MEETING**

Public Lands Policy Coordination

**May 2, 2019**

**Department of Natural Resources**

**Room 112**

**MINUTES**

 **Attendees:**

**Members**

James Greer, DWRi, *Vice* *Chair*

Hollie Brown for Jan Morse, DOGM

Susan Zarekarizi, State Parks

Tom Chidsey, UGS

Tom Daniels for Hans Millican, DERR

Bradley Bartholomew, UDEM

Jodi Gardberg, DWQ

Tom Adams, UOOR

Joel Karamzyn, DAQ

Laura Haskell for Todd Stonely, DWRe

**Invited Federal Agencies**

Abbie Jossie, BLM

Tyler Ashcroft, Forest Service

 **Guests**

 Dr. Joseph Moore

 Hugh Hurlow, UGS

 Steve Erickson, Great Basin Water Network

**Staff**

Sindy Smith, PLPCO

Sheila Vance, DAQ

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**Welcome**

James Greer, *Vice* *Chair*, called the meeting to order at 9:00 a.m.

**Approval of Minutes**

The committee approved February 7, 2019 minutes.

**The FORGE Geothermal Project Update**

Dr. Joseph Moore, Research Professor, manages the FORGE project at the Energy & Geoscience Institute, a non-teaching group within the College of Engineering. Dr. Moore used a PowerPoint presentation, “*The Utah Frontier Observatory for Research in Geothermal Energy (FORGE): An International Laboratory for Enhanced Geothermal Reservoirs,*” to report on the different types of geothermal systems and the benefits of geothermal energy in the state of Utah. He described the Milford Utah FORGE site, the FORGE criteria, and the field activities. The discussion covered the following items:

* The Department of Energy (DOE) initiated the $161 million FORGE project in 2014; the second largest geothermal program DOE has ever launched.
* Resources of geothermal energy range from the shallow ground to hot water and hot rocks found a few miles beneath the earth's surface, and down even deeper to the extremely high temperatures. Geothermal power has the advantage of being a renewable energy source that provides baseload power without emissions and waste by-products. Additional benefits include:
	+ Peaking
	+ Vast resource
	+ Low costs once established
	+ Small geographic footprint
* Geothermal energy systems, such as electric generation, space heating, and spas are used in Utah and around the country. The different types of geothermal energy technologies include:
	+ Heat Pumps
	+ Direct Use
	+ Binary Plants
	+ Flash Plants and Steam Turbines
	+ Hot Sedimentary Basins Oil and Gas Co-Production
	+ Enhanced Geothermal System (FORGE)
* **Heat Pumps**

Geothermal heat pumps, the most familiar, use no water, but shallow ground to heat and cool homes and industrial buildings. The use of geothermal heat pumps has increased at a rate of 25 percent a year, and saves 30-70 percent when heating and 20-50 percent when cooling. The Carolyn and Kem Gardner Building located at the University of Utah uses geothermal heat pumps; 170 wells drilled to the depth of 350 feet, which saves $62,000 and 1,440,000 gallons of potable water a year and eliminates 4 tonnes of carbon dioxide (COs) from the air a year.

* **Direct Use**

More important are geothermal direct uses, which produce heat directly from hot water within the earth. Examples of space heating, using geothermal direct use, include:

* + Newcastle
		- 24 acres of greenhouses (largest in the country)
	+ Utah State Prison
		- Heating 330,000 square feet
		- Tropical fish (sold to Pet Smart)
	+ Current Direct Use: 52 MWt
		- Potential: 685 MWt (drying vegetables in Guatemala)
* **Electric Generation**

Geothermal energy can make electricity. A geothermal power plant works by tapping into steam or hot water reservoirs underground; the heat drives an electrical generator. Most geothermal plants are located in the western United States where hot water reservoirs are common. Electricity can be generated at temperatures >300 F/150 C to 300 C or 600-700 F. Three geothermal power plants in Utah include:

* + PacifiCorps’s 38 MWe Blundell Plant
	+ Cove Fort (Enel)
	+ Milford (Cryq Energy)

An Italian company owns the Enel Cove Fort geothermal plant near Sulphurdale. Electricity moves to Phoenix, Arizona. Utah locals own Cryq Energy located 15 miles south of Milford. Electricity moves to Anaheim, California.

* **Binary and Flash Geothermal Power Plants**

Almost all of the power plants built in the United States in last 10 years or so are binary power plants. Binary cycle power plants transfer the heat from geothermal hot water to another liquid. The heat causes the second liquid to turn to steam, which is used to drive a generator turbine. Flash steam plants take high-pressure hot water from deep inside the earth and convert it to steam to drive generator turbines. When the steam cools, it condenses to water and is injected back into the ground to be used again.

* **Conventional Geothermal Systems**

A conventional geothermal system consists of a heat source, a fluid to transport the heat, and pathways for the fluid to move through (permeability). Most of the country lacks the permeability like hot springs to make natural geothermal systems.

* **Enhanced Geothermal System (EGS) Resource Base (FORGE)**

An EGS involves creating or expanding a geothermal resource through the high-pressure injection of a fluid without the need for natural convective hydrothermal resources. Rocks store an enormous amount of energy. If you use only two percent of this energy, you would still have 2000 times the amount of energy used in 2005. Ideally, if you drill deep enough and can extract the heat, then you could power the United States; you could power Mumbai.

* + USGS Estimated Potential in Western States = 518,000 MWe
	+ EGSs lack permeability for natural convection
* ***Over 40 Years of EGS Stimulations***

Since the 1970s numerous attempts to make a geothermal system reservoir has been futile. To-date no commercial systems have been found. The FORGE team has learned granite is very hard. Most researchers now think that the only way to make an EGS is to look for existing faults or fractures and cause those fractures to slip to allow water to move through the rocks to extract the heat. The current status of EGS development includes:

* + No commercial EGS Systems
	+ Very low heat recoveries
	+ Low flow rates (<40 L/S)
	+ Natural fractures dominate
	+ Stimulated reservoirs dominated by single natural fracture zones
	+ Fracturing granite is difficult; reopening existing fractures will be required
* ***Engineering a Geothermal Reservoir includes:***
	+ Drill the 1st well
	+ Create permeability
	+ Drill the 2nd well
	+ Inject into first well /Produce
* Given over 40 years of failed attempts, the FORGE team must learn how to use fracturing technology to make a reservoir. This fall the first of two deep wells will be drilled and monitored for seismicity. The wells will be highly deviated; not the 90° as in oil and gas fields, but 60°. The wells will be about 12,000 feet long with a 5.5 inch casing. After the well is drilled, the toe will be fractured. Next year, the second well will be drilled into the fractures to connect both wells, which will enable circulation between the wells and actually demonstrate a geothermal system reservoir.
* ***Milford Utah FORGE Site***

The FORGE project is located in south central Utah near the town of Milford. The FORGE team has lots of partners: DOE, National Labs, Universities, and regulatory agencies. BLM, PacifiCorp, and SITLA have been very supportive of the FORGE project. The FORGE team works closely with Smithfield pig farmers in southern Utah and collaborates with people around the country as well as with a group in New Zealand.

* The Milford Utah FORGE site met DOE’s criteria. These criteria include:
	+ Temperature >350F at depths >5000 ft.
	+ Low permeability rocks (granite)
	+ Low risk from induced seismicity
	+ Low environmental risks
	+ No connection to hydrothermal system
* The Milford site includes two geothermal fields, a windfarm, a solar field, and a biogas facility—Utah’s renewable energy corridor. The area is highly accessible, and always open for a tour.
* ***Field activities in 2017-2019 include:***
	+ Drilled 3 wells to 7536, 3280, and 1000 ft.
	+ Completed cultural and biological surveys
	+ Performed stimulation tests in deep well
	+ Monitored seismicity
	+ Completed geoscientific characterization of site
	+ Tested aquifer
* ***Field activities in 2019-2024 would include:***
	+ DOE to invest $130M in next 5 years
	+ 50% on operations; 50% on research
	+ Drill and stimulate injection/production pair
	+ Stimulate 2-3 stages at toe
	+ Circulate between wells
	+ Monitor reservoir development
* DOE will invest $35 million next year, $35 million the following year, and then $30 million. The first well will cost about $14 million to drill. At the end of five years, the FORGE team hopes other geothermal companies or other groups will take over the property. Otherwise, the wells will be abandoned.

Dr. Joseph Moore answered questions.

**West Desert Groundwater Monitoring Project Update**

Hugh Hurlow, Senior Scientist and Geologic Program Manager at Utah Geological Survey (UGS), is part of the UGS groundwater monitoring crew. Hugh used a PowerPoint Presentation, “*Utah Geological Survey’s West Desert Groundwater Monitoring Project and Hydrogeologic Studies*,” to talk about the Snake Valley water dispute and to report on UGS’s West Desert Groundwater Monitoring Project and Hydrologic Studies. The discussion covered the following items:

* Southern Nevada Water Authority (SNWA) supplies culinary water to the Las Vegas area. Over the past 30 years SNWA has filed numerous applications for water rights in Snake Valley and four other hydrologic basins in Nevada proposing to pump water from water wells and transport the water to the Las Vegas area in a 72” trunk pipeline. SNWA would be using the water that recharges in Snake Range in Nevada and flows downward towards the valley floor; basically capturing groundwater in its flow path from recharged to discharged areas. The amount of water SNWA has applied for exceeds the availability of water. The proposed groundwater development includes:
	+ **Total Proposed Annual Withdrawals:**

346,000 acre-feet/year

* + **Total Estimated Annual Discharge:**

224,000 acre-feet per year 296,000 acre-feet/year including hydraulically connected hydrographic area

*(These numbers are from 2015 – there have been some additional local applications and development)*

* You can only develop what is discharging plus what is coming out of storage. If you consider the groundwater in the entire area to be regionally connected, and there is good science to support that connection, the 296,000 acre-feet per year discharging, including hydraulically connected hydrographic areas, contains far less water than SNWA’s applications.
* The Snake Valley water dispute involves many different factors and issues. SNWA has been granted water rights in these basins three times, has been challenged, and has been overturned three times. The Snake Valley water dispute is complicated and the magnitude of the problem is enormous. Litigation has the project on hold. The SNWA’s applications have not been withdrawn.
* Some regional context include:
	+ Fish Springs is 80 miles from the proposed well field, which UGS believes is regionally connected in part to this water that recharges over very long time and space scales.
	+ The springs support aquatic conservation.
	+ A national wildlife refuge, at risk to thousands of acres of wetlands, is associated with federal water rights; and
	+ Utah agriculture exists in the area and the extraction of groundwater would affect Utah ranchers and families.
* UGS has invested a lot of time and effort trying to sort out the regional flow paths. UGS has shown where regional flow is and is not connected in the area. There is also more local flow systems from the ranges to the adjacent valleys where there is discharges as springs.
* The water well SNWA proposes would intercept water as it flows and depress the groundwater levels around the well field, removing water from storage and causing other problems with local operations already in place. The lowering of that potential metric surface reduces the hydraulic gradient between the recharge area and the discharge area, which drives spring discharge.

***UGS Groundwater Monitoring Network***

* UGS began work in late 2004 looking at the hydrogeologic framework for all of these problems. In 2007 UGS installed groundwater monitoring system. Between 2007 and 2009 UGS collected extensive geochemical data. UGS continues water level monitoring. The UGS Bulletin 135 report, *Hydrogeologic Studies and Groundwater Monitoring in Snake Valley and Adjacent Hydrographic areas, West-Central Utah and East-Central Nevada*, presents hydrologic, groundwater-monitoring, and hydrochemical studies by UGS in Snake Valley, Tule Valley, and Fish Springs Flat located in Millard and Juab Counties. The study delineates groundwater levels, flow, and chemistry in Snake Valley and adjacent basins to a much greater degree than previously possible, and emphasizes the sensitivity of the groundwater system to possible increases in groundwater pumping.
* UGS groundwater monitoring network objectives include:
	+ Current baseline conditions in agricultural areas and critical springs
	+ Local to regional scale groundwater flow systems
	+ Data point in any 3M (monitoring, management, mitigation) plans
	+ Current and future impacts of groundwater development
* Hugh Hurlow and Lucy Jordan devised the network of surface flow—spring flow monitoring. It is groundwater discharge to the surface and then becomes springs, which UGS monitors at six sites. The network extends from northern Hamlin Valley all the way up to Fish Springs and Callao.
* All of the groundwater level data are available on the UGS website at <https://apps.geology.utah.gov/gwdp>. It is called the *Groundwater Monitoring Data Portal.* You can download the data. It also shows a graph of the data and the location of springs. UGS has all of their chemistry online as well. There are links to all kinds of information about the wells and the current water level record.
* One of the challenges for UGS will be extracting out the climatic signal, year to year variations and decade long variations and recharge, from the pumping signal, which is not straight forward. UGS can use far field sites to get an estimate of what the decline might be outside of the influence of pumping. Paul Inkenbrandt is working on another level of sophistication analyzing these data to extract out a periodic regular seasonal signal, called trend, to see if long term changes exist. UGS will analyze the current pumping data and compare it to the climate signal to provide a basis for any major changes.
* UGS’s monitoring network has the capability to measure and evaluate the potential impacts of increased groundwater development.

***Conclusions***

* Groundwater levels are declining in areas of current use. Some of the decline is caused by pumping, some is caused by low recharge post-1983.
* UGS groundwater-monitoring network will provide data to better understand the effects of pumping, changes in pumping, and climate.
* Groundwater quality is good close to the recharge areas, and gradually degrades down gradient.
* Most groundwater is “old” (a few hundred to ten thousand years), i.e., long-term recharge and flow rates are slow.
* Groundwater is connected at regional scales over complex flow paths. Interbasin flow occurs where geologic and hydraulic-potential conditions are favorable. Groundwater recharged in Snake Valley is one of several sources of flow at Fish Springs.
* Proposed large-scale pumping projects would significantly reduce current spring flow and groundwater discharge; lower groundwater levels; change plant assemblages; and degrade grazing and wildlife habitat.

**Agency Reports**

* James Greer reported the following from the Division of Water Rights (DWRi):
	+ DWRi will convene a public meeting this summer or fall in Snake Valley to discuss a groundwater management plan and the data collected. This meeting does not concern SNWA’s project, but involves Utah water rights applications and what Utah intends to do with those applications.
	+ The Cedar City Groundwater Management Plan continues to move forward.
	+ DWRi has initiated a groundwater management plan for Parowan Valley.
	+ Water rights policy changes are occurring in Park City in the Snyderville Basin. A public meeting will be held at the end of May.
	+ The Central Iron County Water Conservancy District received water rights applications for Pine Valley, Wah Wah Valley and the West Desert. There was litigation. The conflicts have been settled. The state engineer approved those water rights applications with conditions for the project in those valleys.
* Susan Zarekarizi reported the following from the Division of State Parks and Recreation (State Parks):
	+ State Parks’ grant season closed May 1, 2019 for motorized and non-motorized and out-door recreation.
* Abbie Jossie reported the following from the Bureau of Land Management (BLM):
	+ Washington granted the BLM an extension of time to continue coordination and outreach for the proposed Monument Management Plans and Final Environmental Impact Statements for the Bears Ears and Grand Staircase-Escalante National Monuments and the lands that are no longer part of the Grand Staircase-Escalante National Monument.
	+ BLM recruits for statewide Resource Advisory Council members and again for Monument Advisory Council members for the Grand Staircase-Escalante. If you know people interested in advising the BLM, those are two excellent opportunities to volunteer. BLM does not pay people to participate as a citizen representative or interest group representatives, but will pay travel costs.
	+ Sage-grouse plans are under protest and litigation. The state of Utah has filed as an intervener.
	+ BLM is weighing-up the land exchanges and conveyances, among other things, in the proposed John D. Dingell, Jr. Conservation, Management, and Recreation Act and preparing an implementation plan, as well as designating a new advisory committee for one of the designations.
* Tom Adams reported the following from the Office of Outdoor Recreation (OOR):
	+ OOR awarded about $4.6 million for 55 out-door recreation infrastructure projects in 20 counties; 60 percent rural communities and 40 percent urban populations.
* Laura Haskell on behalf of Todd Stonely reported the following from the Division of Water Resources (DWRe):
	+ The Millsite dam under construction has structural concrete issues with the spillway. Natural Resources Conservation Service (NRCS) is assisting with a plan to fix the structural concrete issues by this fall. DWRe will deliver full water shares this year as the Division of Wildlife Resources has allowed the use of conservation pool water.
	+ DWRe is preparing the state water plan, which includes a new format as well as an online release. The plan will be shorter with links to other organizations and documents. Regional water goals will also be included. DWRe expects to complete the plan by the end of the year.
* Jodi Gardberg reported the following from the Division of Water Quality (DWQ):
	+ DWQ recently closed its grant applications for Nonpoint Source Projects. DWQ received proposals totaling $4 million in contrast to the $1.5 million available.
	+ DWQ has a large project on Utah Lake, with a Steering Committee and Science Panel, to develop site specific numeric nutrient water quality criteria to protect the recreational aquatic life and agricultural beneficial uses. The project is in the research phase.
* Joel Karamzyn reported the following from the Division of Air Quality (DAQ):
	+ The complex Sevier Playa Potash project is close to a Final EIS. Everyone seems satisfied. Water is an issue. There is not enough water that comes down from the Sevier River. Crystal Peak Minerals intends to buy water.
	+ Last year DAQ received the largest air shed grant from EPA ever issued--$9.4 million--to convert solid fuel devices, such as home fireplaces and wood stoves to gas. DAQ sold out within 12 hours. The state legislature gave DAQ over $9 million dollars to continue the effective program into 2020. DAQ has submitted a proposal to EPA for the current air shed grant.
* Sheila Vance reported the following from the Division of Air Quality (DAQ):
	+ EPA recently designated the Uinta Basin as marginal non-attainment for ozone. With the winter inversion DAQ expects to be bumped up to moderate. DAQ is planning for what that means for the basin and likely the Wasatch Front.
* Tom Chidsey reported the following from Utah Geological Survey (UGS):
	+ As a result of the fires last year and the snow this winter, UGS will monitor for potential landslides this spring.
* Tyler Ashcroft reported the following from the U.S. Forest Service:
	+ The Forest Service and the state of Utah are working together to create a Stewardship Agreement to achieve land management goals for the national forests. The Secretary of Agriculture, Sonny Perdue, charged each state to come up with an agreement that takes into consideration states’ specific concerns. A big emphasis in Utah is protection of communities and watersheds. Forestry, Fire and State Lands and the Forest Service have been working on the agreement. Secretary Perdue arrives in Utah May 22nd. One of the primary reasons is to sign the Stewardship Agreement.
	+ Independent of shared stewardship, priorities of this administration involve fuels, fire, and timber. The Forest Service has increased the pace and scale of restoration activities. This year the Forest Service submitted a record number of proposals for Utah’s Watershed Restoration Initiative program.
	+ It is unknown if Secretary Perdue will accept Utah’s Roadless Rule Petition. The Forest Service has worked with the state providing information on how to submit a well written petition.
	+ The Forest Service anticipates the Final EIS sage-grouse plan will be complete and released mid-May.
* Tom Daniels for Hans Millican, reported the following from the Division of Environmental Response and Remediation (DERR):
	+ DERR has four chlorinated solvent contaminated groundwater sites in Utah; two Bountiful dry cleaners, Hill Air Force Base mechanic shop, and a Veteran Administration dry cleaners.
	+ The Jacob’s Smelter superfund site in Stockton under remedial design will go out for bid and construction this fall.
	+ DERR has an emergency room response ongoing at the Swift Building in Ogden. Activities started today.
	+ DERR is involved with the Kennecott project.
* Bradley Bartholomew reported the following from the Division of Emergency Management (UDEM):
	+ UDEM’s Emergency Management Conference is May 21-22nd.
	+ The State Hazard Mitigation Plan was approved.
	+ UDEM plans to re-map the flood plains of Utah Lake and Great Salt Lake.

**Other Business**

Next meeting: August 1, 2019

**Adjourn**

The meeting adjourned at approximately 10:55 a.m.