

# Geothermal Fracking, Hydro Shearing, and Hydraulic Fracturing

## Enhanced Geothermal Systems (EGS)

- ❖ A conventional geothermal resource requires hot rock, permeability to allow flow, and water. Conventional geothermal resource sites are difficult to find....there is one proven site in all of the State of Hawai'i
- ❖ Enhanced Geothermal Systems make geothermal possible at several orders of magnitude more sites. Dozens may be possible in the State of Hawai'i
- ❖ According to 2007 MIT study for the National Research Council, enhanced geothermal systems (EGS) plants could produce 15 % of the US electrical power by 2050. To take advantage of this the federal government will invest billions in research and risk mitigation financing for geothermal companies.

## EGS Technology

- ❖ Enhanced geothermal uses geothermal fracking (sometimes called hydraulic shearing or hydraulic fracturing) to break up the hot rock in order to increase its permeability.. After cold water cracks the hot rock, high pressure water propagates the cracks to create a reservoir in the hot rock. The needed size for the reservoir has been set at about 1 kilometer cubed.
- ❖ Enhanced geothermal provides water to the dry, hot rock by bringing the water from the ocean or from nearby water wells.

## Is Geothermal Fracking Really Fracking? A Legal Point of View

What follows is a quote from Sandra Tvarian Stevens, a Washington D.C. lawyer:

*In sum, due to the similarity of the basic fracking process utilized by both natural gas and geothermal companies, the likelihood for comparable claims and lawsuits being asserted against these industries is high, most notably with respect to claims arising out of earthquake damage and well blowouts. While both natural gas and geothermal companies alike face the potential for pollution claims, the kinds of allegations asserted may differ, at least in so far as geothermal companies reportedly rely more on saltwater injection and less on chemical additives in their fracking operations than natural gas companies. (Sandra Tvarian Stevens, August 31, 2011 | Coverage Insights)*

## **A Case Study to Identify Issues with EGS**

- ❖ Currently, the premiere EGS project is one at the Newberry Volcano National Monument (NVNM) near Bend, Oregon
- ❖ At this site EGS methods are being used to reinvigorate an existing geothermal resource so that it can make greater power.
- ❖ AltaRock (an EGS company that is exploring opportunities in the State of Hawai'i) will use geothermal fracking to increase the permeability of the resource
- ❖ What follows concerning challenges to geothermal fracking is based on the NVNM project's environmental assessment

## **What Are the Differences Between Oil/gas and Geothermal Fracking?**

- ❖ Most advocates claim geothermal uses fewer and less toxic chemicals, but:
  - ❖ Oil and gas companies use chemicals that are proprietary
  - ❖ AltaRock uses chemicals that are proprietary
- ❖ Some have said that geothermal companies will use salt water rather than fresh water, but:
  - ❖ AltaRock is using normal well water
- ❖ In geothermal fracking, cracking of rock is done by cold water against hot rock, but
  - ❖ AltaRock uses water at an over pressure of ~ 2000 psi to propagate the cracks throughout the rock. The exact pressure the water is pumped into the ground is determined by in-well testing that finds what pressure is needed.

## **AltaRock's Effort in Oregon--Water Use**

- \* AltaRock anticipates the fracking effort will use 24,000,000 million gallons of high pressure water over three weeks (24,000,000 gallons) (240 trips of the largest tanker trucks)(a home uses 400 gallons a day)(4 to 10 times the water used in fracking gas/oil well)
- \* AltaRock anticipates using 124,000,000 gallons of water to support the experimental project over two years (124,000,000 gallons) (1,240 tankers) (15 times the water used in the lifetime of a fracked oil/gas well)

## **AltaRock's Effort in Oregon--Water Contamination**

- \* Direction of cracks
  - \* A network of seismometers is supposed to determine which way and how far the hydraulically induced cracks propagate.
  - \* If the cracks propagate toward the fresh water layer risking contamination, it is assumed operations can be stopped with adequate buffer for safety.
- \* Blowouts
  - \* Wells to insert the fracking water are similar to injection wells at Puna Geothermal Venture (PGV), but overpressure will be higher than PGV's by 1500 psi.
  - \* PGV had a piping failure on an injection well in November 2012. The well pressure at the time of the PGV failure was considerably less than the pressure that will be used for fracking by AltaRock.

## **AltaRock's Efforts--History of Earthquakes**

- \* An effort in Basel, Switzerland, was terminated when earthquakes caused \$9M damage. A NY Times investigative report questioned whether AltaRock was forthcoming with data.
- \* Germany stopped development on several geothermal plants over concerns with earthquakes
- \* A fracking effort at Geysers in California was terminated shortly after problems with Basel became public.
- \* Near Middleton, California, 19 damage claims from small earthquakes have been settled by a committee mediation process.

## **AltaRock's Effort in Oregon--Earthquakes**

- ❖ In Oregon, AltaRock will monitor cracks in a nearby dam to ensure they do not worsen as a result of induced earthquakes.
- ❖ In less probable but possible earthquakes start to occur around the NVNM site, AltaRock plans to depressurize the geothermal reservoir by dumping water over a period of days. First the water would be dumped to empty storage tanks specified for that purpose and, if that were insufficient, then there is a contingency to dump the water to the ground

## **AltaRock's Effort in Oregon--Environment and Lifestyle**

- ❖ Other issues that need to be considered include:
  - ❖ Truck and other traffic on narrow roads
  - ❖ Noise to neighbors
  - ❖ Environmental issues with clearing of land for plant development and for water transport
  - ❖ Local water shortages or degradation of water quality from “over-use”
  - ❖ Unabated or abated release of steam during flow testing (H<sub>2</sub>S release)
  - ❖ Potential 930 foot steam and chemical plume during flow testing
  - ❖ Access to public trails and paths
  - ❖ Road building

## **AltaRock's Effort in Oregon--Community Involvement**

- ❖ In Oregon the community involvement included:
  - ❖ Two meetings and two locations
  - ❖ A tour of the site
  - ❖ Newspaper articles

## **Hawai'i Regulation of Enhanced Geothermal--Fracking**

- ❖ Senate Bill 375 to regulate hydraulic fracturing during 2013 legislature did not make it from committee. Testimony against the bill included Millilani Trask speaking for a geothermal company.

# Hawai'i Legislative Issues for Consideration

- \* Before allowing EGS projects the State might consider:
  - \* How to protect the environment and water resources while providing access to a substantial supply of water to form an artificial reservoir. The need for a constant supply of additional water to make up for expected constant lost of water during geothermal production must also be considered.
  - \* How to estimate risks of induced seismicity and to control and regulate those risks.
  - \* How to place a major industrial activity inside a framework that gives the community voice and protects social, cultural, and economic interests