

# Energy Storage and Geothermal Baseload in Hot Dry Rock

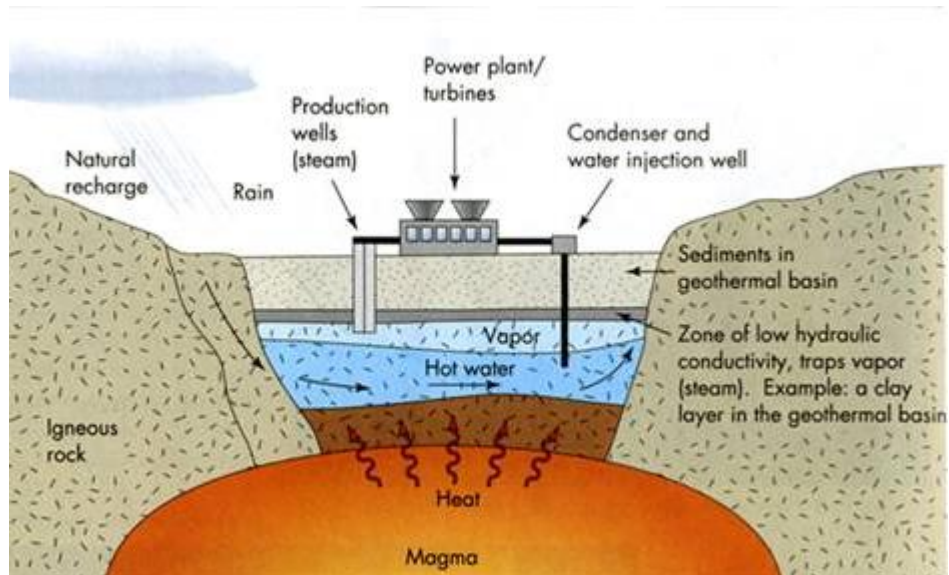
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*Cindy D. Taff*

# Geothermal is < 1% of Utility Power Generation

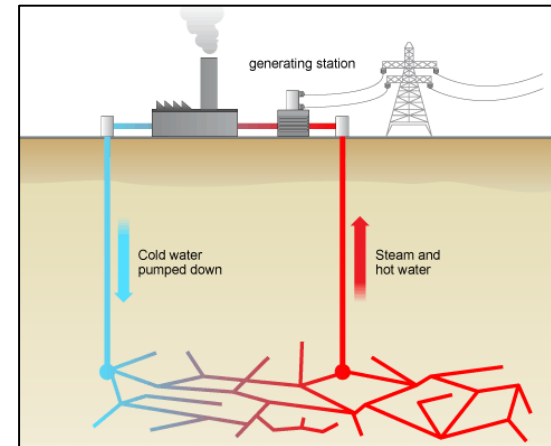
## Hot Aquifer - Conventional Geothermal

- High permeability rocks that naturally flow steam or water
- Geologically limited to areas near volcanoes
- Production rates/volumes are often unpredictable



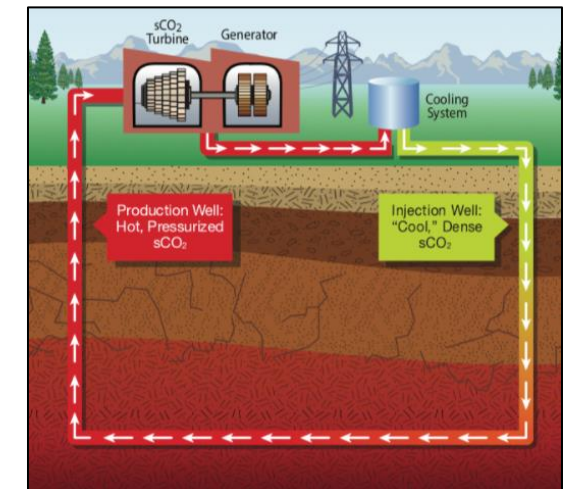
## Hot Dry Rock - Enhanced Geothermal Systems (EGS)

- Rocks that do not naturally flow steam or water
- Drilling for temperature, not water production



Fracturing is used to create an artificial reservoir

*If Hot Dry Rock technology is proven, there is an opportunity for UNLIMITED geothermal power!!*



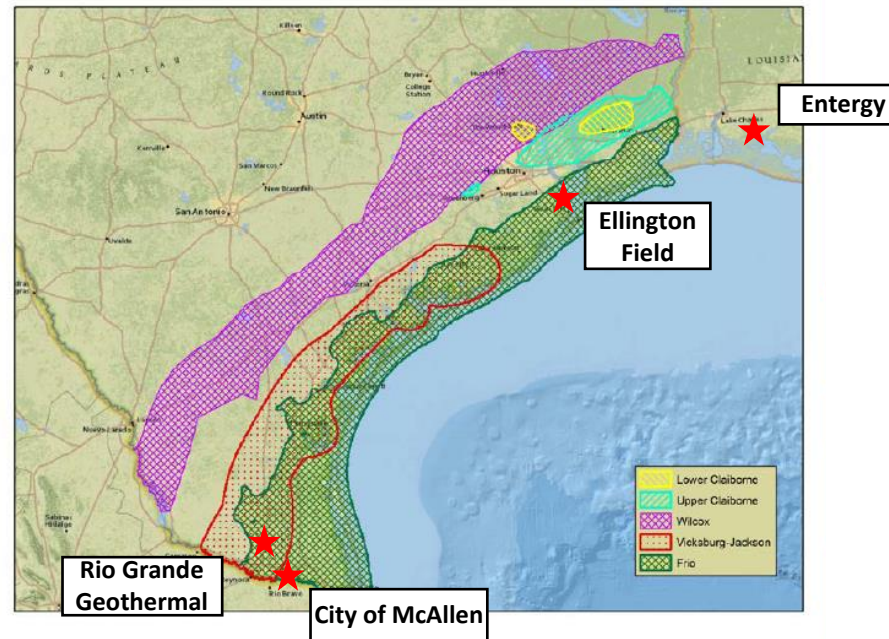
Closed Loop



# DOE Studies along Gulf Coast since 1970s

## Texas Geopressured Formation Areas

Multiple formations are present at the same location but at different depths



★ Current Sage projects in Gulf of Mexico region

**DOE Studies**  
*5GW of geothermal  
 potential along US  
 Gulf of Mexico coast!*



# Mind the Storage Gap

## Utility grid with wind and solar needs storage now

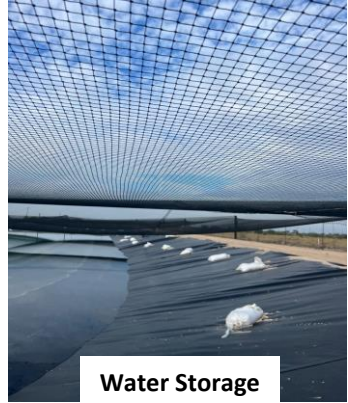
- Solar and wind installations are outpacing baseload renewables and **curtailments continue to increase**
- Solar and wind energy **require storage** to fully enable these assets
  - Solar - Drives daily storage needs
  - Wind - Drives storage needs of up to a week
- Projected **growth of global energy storage capacity**
  - Bloomberg - 100x increase from 2018 to 2040
  - Wood Mackenzie - Growth of > 30% through 2030
- Inflation Reduction Act - Tax incentives that include **energy storage** is a game changer.





# Mechanical Storage Field Test in Starr County, Texas

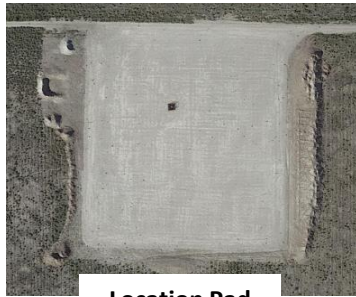
## Ongoing!!



Water Storage



Ongoing Operations



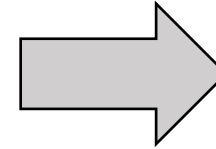
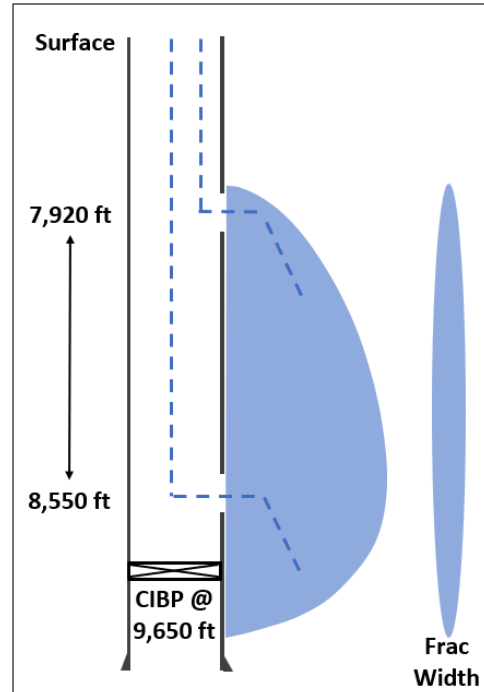
Location Pad



### Pump-in/Flowback Testing with Water

Perform pump-in/flowback tests with water, varying pad sizes.

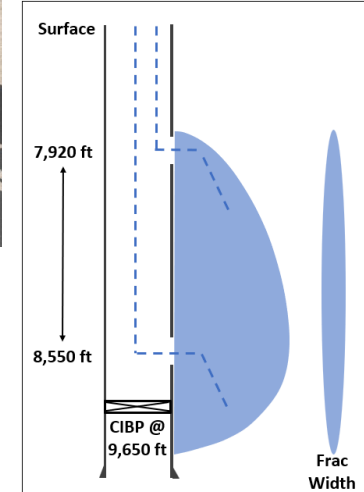
Demonstration of discharge rate and system efficiency and data to size turbine/generator.



## Next Steps



Pump



Turbine



Generator

### Demonstration

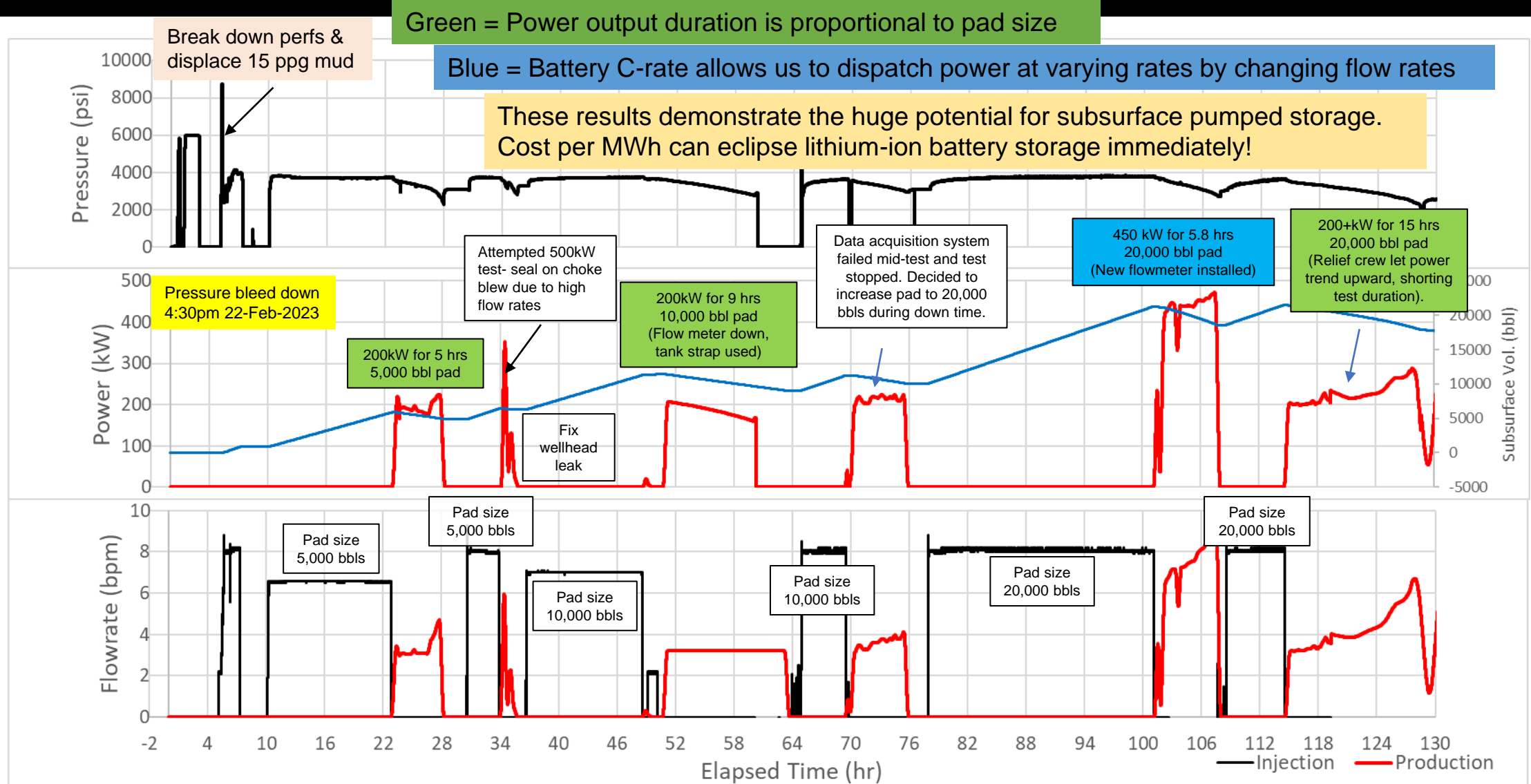
Rig-up mechanical turbine and generator to produce electricity.

## Mechanical Storage Demonstration in Sage's Starr County, Texas Well



# Geothermal overdelves by delivering everything you want in a battery!!!!

Early testing at Sage's Starr County well has overdelivered and exceeded capacity of the testing equipment!





# Visible Power from Pressure Energy



