Geothermal Energy and its potential in Texas

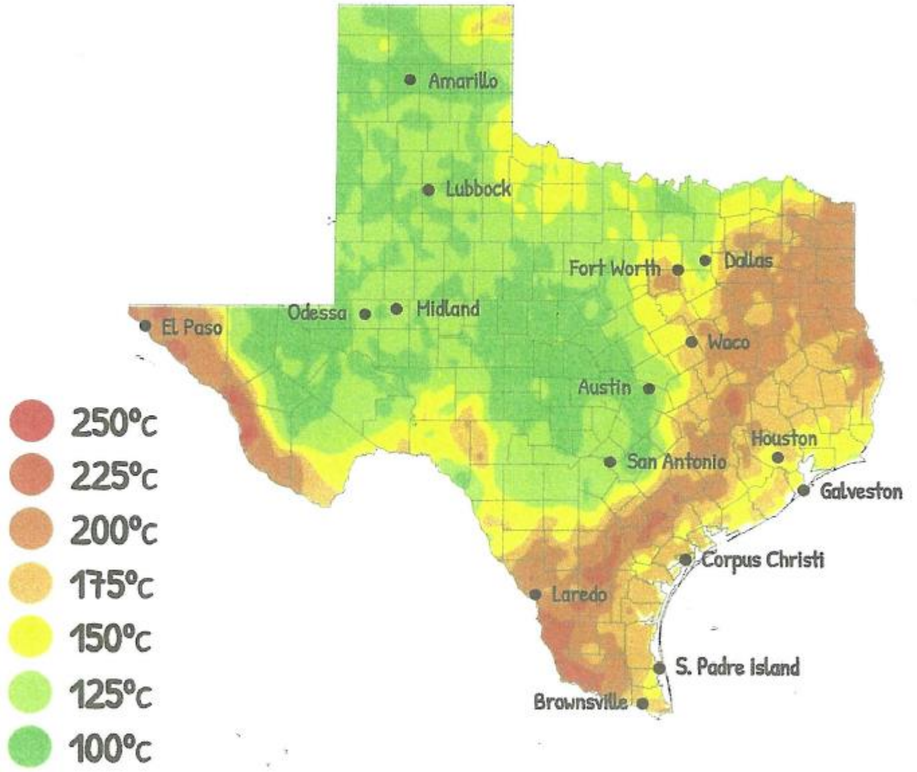
ERCOT Technology and Security Committee Meeting
September 22, 2025

Barry Smitherman	**Chairman Texas Geothermal Alliance (TXGEA)**
Cindy Taff	**CEO Sage Geosystems**
Dr Ken Wisian	**UT Austin – Bureau of Economic Geology, Jackson School of Geoscience**
Drew Nelson	**VP Project Innerspace**

What is Geothermal ?

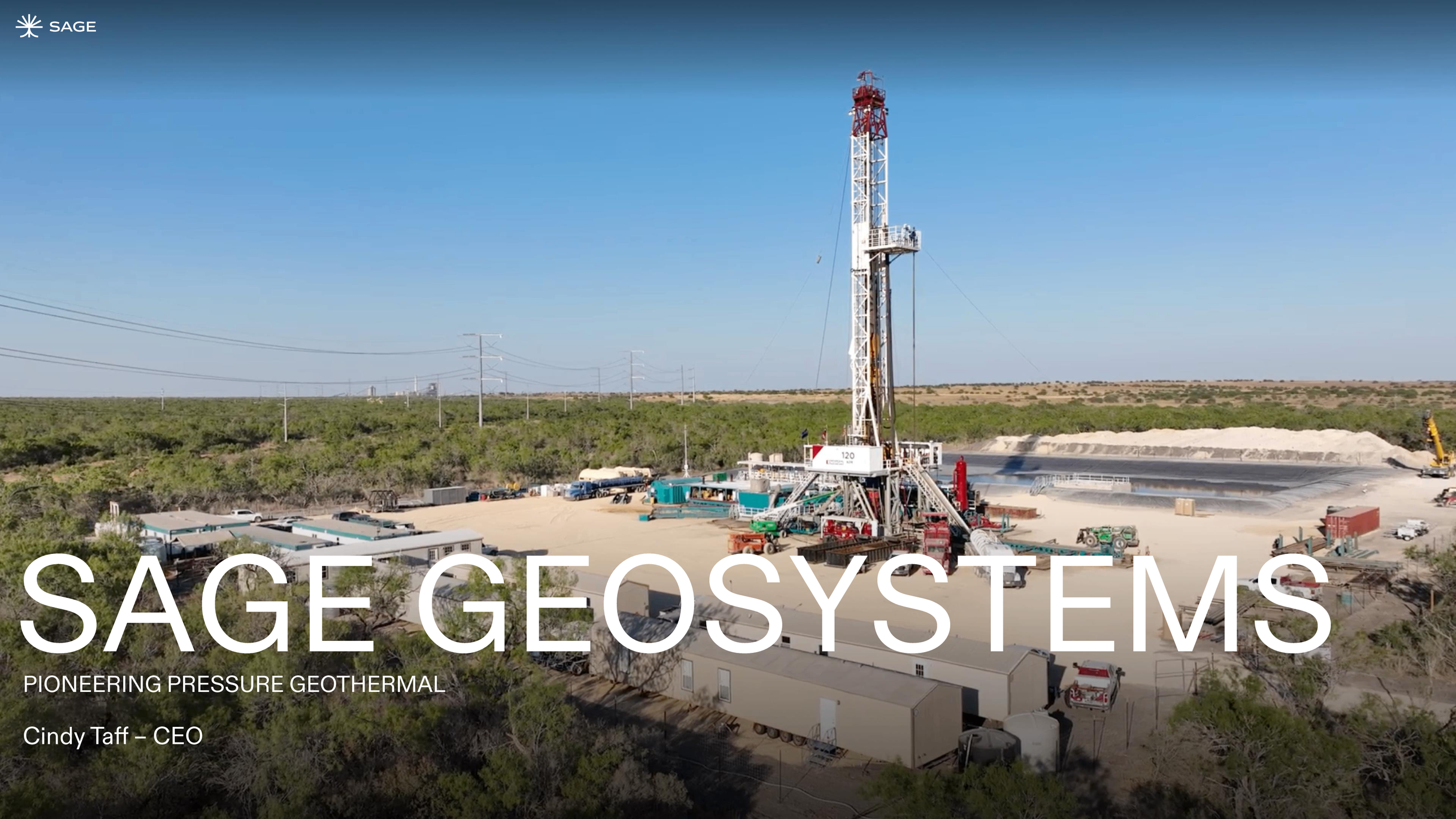
Geothermal Key Points

- Core of the earth is 6000 C, same as temperature at the surface of the sun.
- At 10 km of depth or shallower, almost every point on earth has sufficient heat for power generation
- In Texas, this massive heat resource is viable at approximately 6.5 km
- This is a typical drilling depth within the oil and gas industry
- Recent analysis suggest improved project economics and technical feasibility of geothermal development in the state



Temperature of Texas geothermal resources at 6.5 km depth.
As mapped, much of Texas is at or near conventional min viable temperature for geothermal generation. Source : Adapted from SMU Geothermal Laboratory

Geothermal energy is CO2 free, clean, always on and has a small surface footprint compared with other energy sources and is ubiquitous.



SAGE

SAGE GEOSYSTEMS

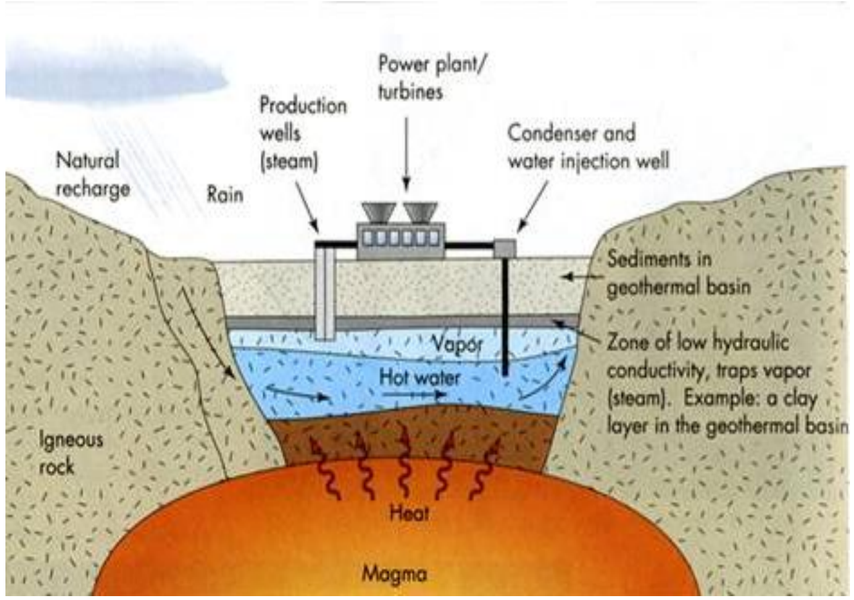
PIONEERING PRESSURE GEOTHERMAL

Cindy Taff – CEO

Geothermal is < 1% of Utility Power

Current: Conventional Geothermal

- Permeable rocks naturally flowing steam/water
- Geographically limited to areas near volcanoes
- Production rates often unpredictable

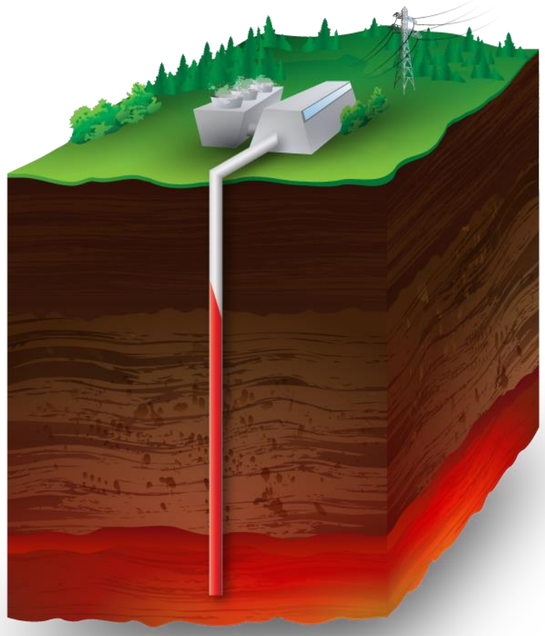


< 2%

of geothermal resources

Future: Hot Dry Rock (Next-Generation Geothermal)

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



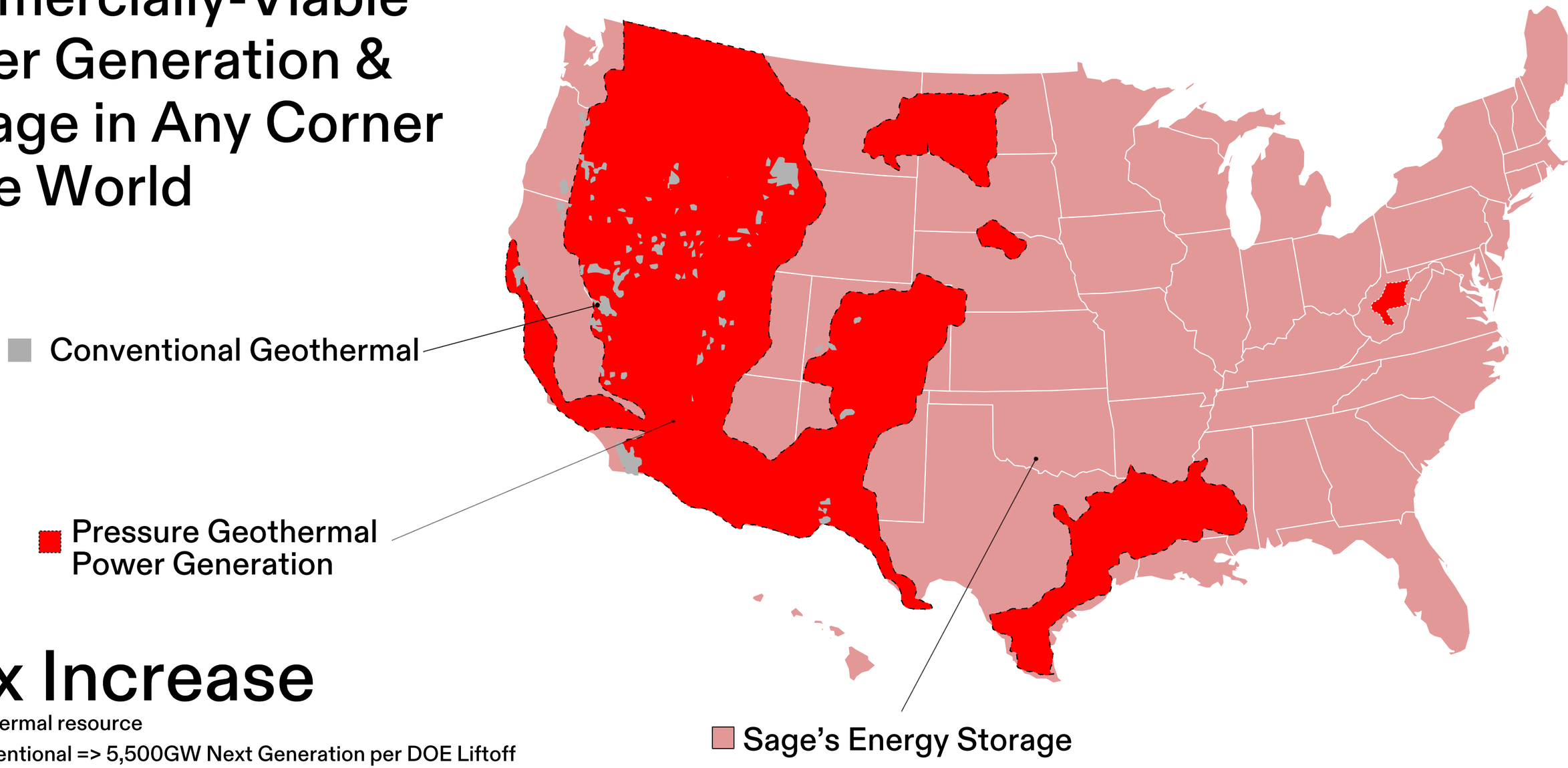
Hot Dry Rock technology can provide nearly unlimited geothermal power!

50-60%

of geothermal resources

PRESSURE GEOTHERMAL

Commercially-Viable Power Generation & Storage in Any Corner of the World

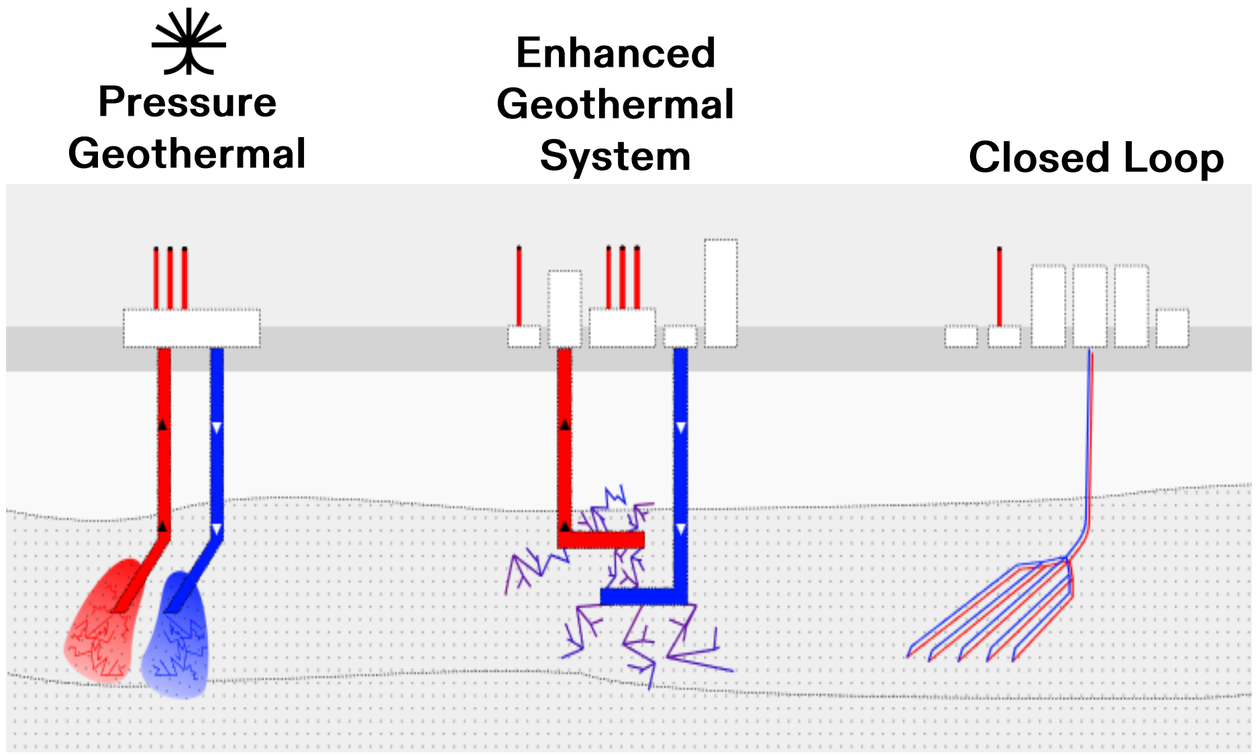


130x Increase

In U.S. geothermal resource

40GW Conventional => 5,500GW Next Generation per DOE Liftoff

Technology Approaches to Hot Dry Rock



Pressure Geothermal

- Net power output is significantly higher (25-65%), as leverages both the pressure and heat energy of the earth.
- Even fluid dispersion and lower friction pressure in fracture: Only company to operate above frac opening pressure.
- Water losses < 2%.
- Low risk of induced seismicity.

Enhanced Geothermal System

- Conventional tech developed by the U.S. DOE.
- Lower net power output due to high friction in fractures.
- Added complexities of connecting multiple wells with fractures.
- Water losses of 10-20%.

Closed Loop

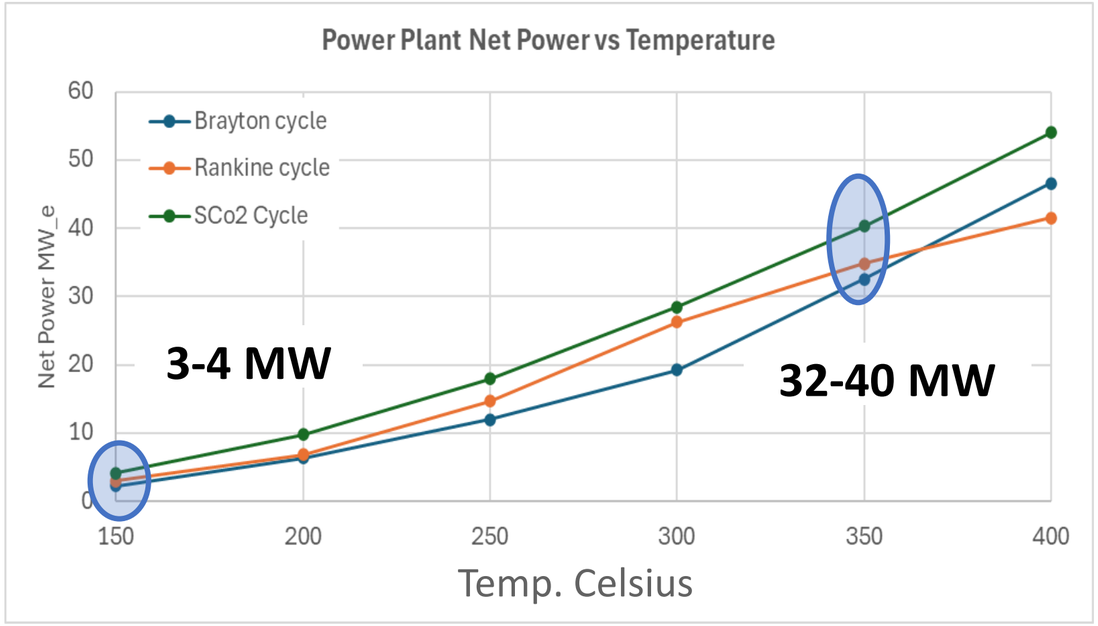
- Does not require fracturing.
- Complex drilling.
- Requires tens of kilometers of well length for sufficient surface area.
- Low risk of induced seismicity.

SAGE'S SUPER DEEP / SUPER HOT SOLUTION

Delivering Super Hot Pressure Geothermal by 2030

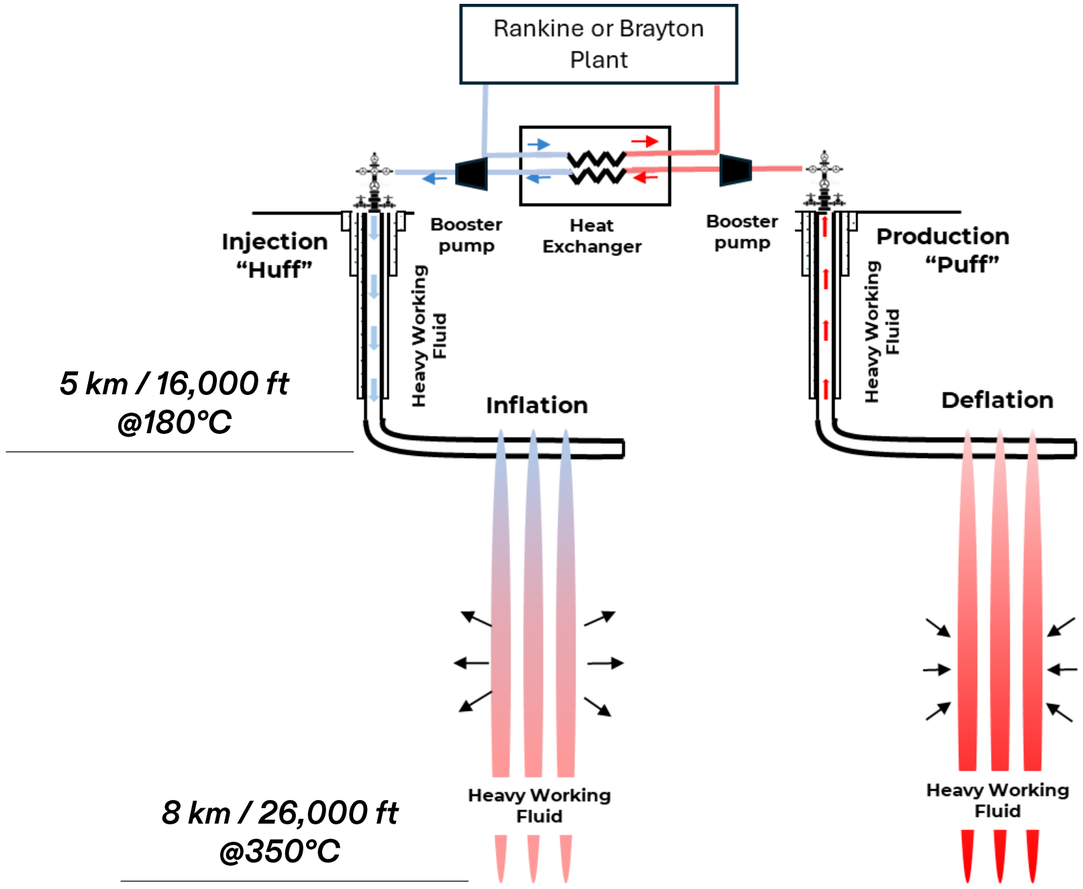
Relationship between Temperature and Net Power is not linear:

Super Hot Results in a 10x Increase in Net Power

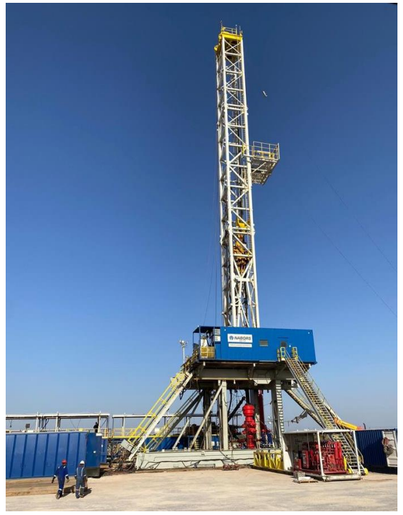


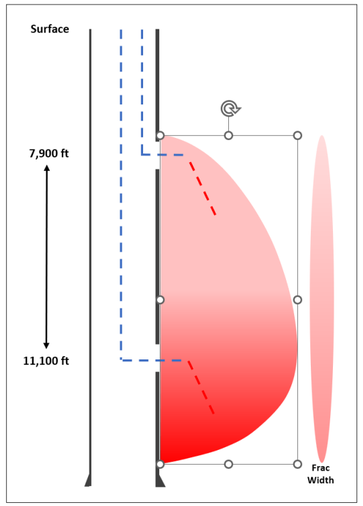
Sage Architecture:

Drill Shallow / Frac Deep



FIELD DEMONSTRATION OF SAGE'S PRESSURE GEOTHERMAL TECHNOLOGY
STARR COUNTY, TEXAS

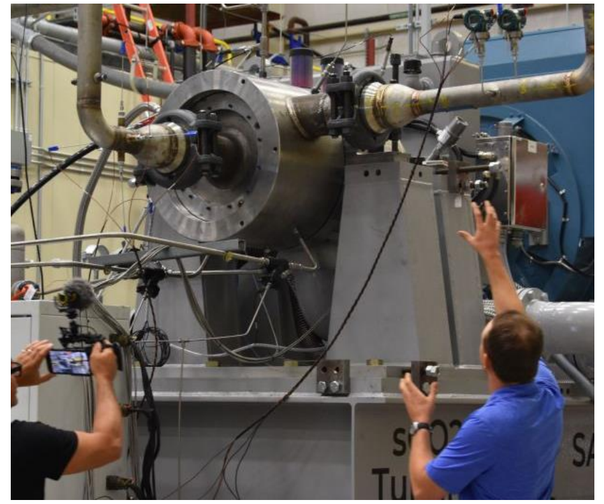




Proprietary Technology & Field Testing

SAGE HEADQUARTERS
HOUSTON, TEXAS

SAGE'S PROPRIETARY sCO2 TURBINE
SAN ANTONIO, TEXAS



GEOTHERMAL DEMONSTRATION FOR U.S. AIR FORCE
HOUSTON, TEXAS

Ellington Field
Future Drilling Site

MQ-9 REAPER UAV of the 147th Attack Wing

Projects

PARTNERSHIP WITH SAN MIGUEL ELECTRIC COOPERATIVE
ATASCOSA COUNTY, TEXAS

SMECI Lignite
Coal Plant

CASE STUDY

Energy Storage: Proven in the Field

Sage's SMECI facility is commissioned with all equipment, anticipating hook-up to the grid and selling electricity by December 2025.

We are the only cost-effective, long-duration energy storage product on the market today.

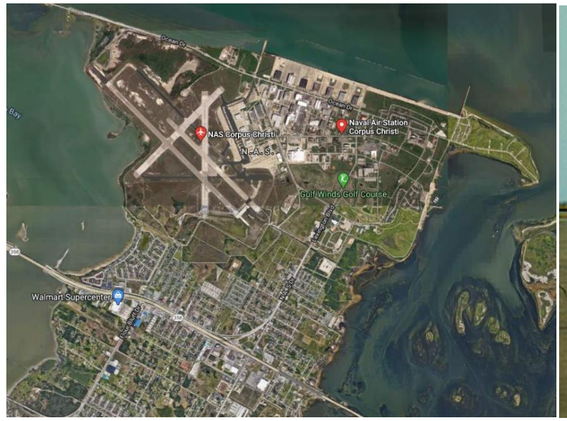
Operating a 3MW storage facility at an existing, approaching end-of-life 410MW coal plant.

SMECI will be installing 400MW+ of solar starting in 2026 and is encouraging the development of the system as a solution for 24/7 baseload power when paired with future solar.

FIRST COMMERCIAL FACILITY

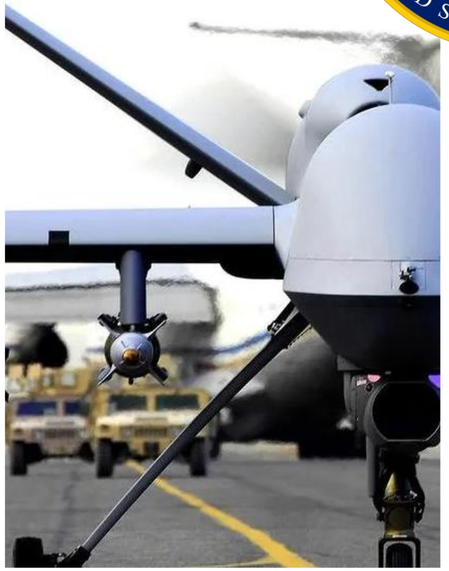
3 MW

FEASIBILITY STUDY FOR FORT BLISS |ONGOING|

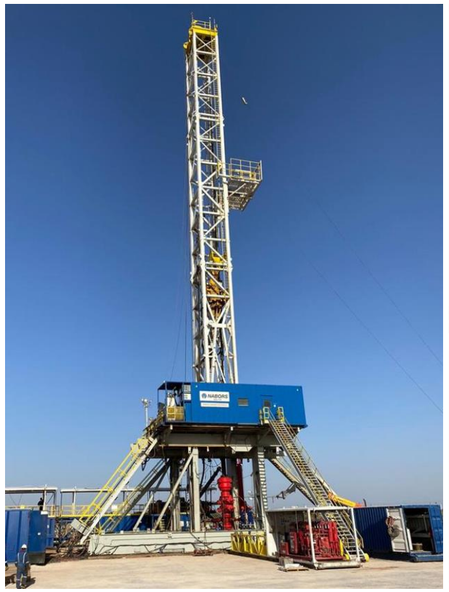


FEASIBILITY STUDY FOR NAVAL AIR STATION CC |ONGOING|

FEASIBILITY STUDY FOR ELLINGTON FIELD |COMPLETED|



GEOTHERMAL DEMONSTRATION FOR U.S. AIR FORCE |Q1 2026|



One Big Beautiful Bill Act (OBBA) | Signed July 4, 2025

Headline: Unlocking momentum for next-generation geothermal

What has changed

- Extended clean energy tax credits: ITC and PTC extended at full 100% through 2033; with a gradual phaseout by 2036.
- Transferable tax credits: Can be transferred in partnerships *or* sold for cash on the open market.
- Foreign equipment sourcing: Fewer restrictions overall – but tightened limitations on Chinese content. Our technology isn't China-dependent.

Why is this important

- Unlocks financing: Improves project bankability with predictable returns and tradable incentives.
- Differentiates from wind and solar: China sourcing restrictions hit wind/solar hardest, whereas geothermal avoids this impact.
- Momentum towards storage pairing: As wind/solar pivot to storage to maintain output and optimize their assets, momentum grows for LDES and geothermal solutions.

Presidio County Geothermal Assessment

A Prime Rural Use Case

Ken Wisian, Malcolm Ross, Shuvajit Bhattacharya, Mohamed Khaled, Bisset Young, David Chapman, Aysegul Turan

Ken Wisian Ph.D., Major General USAF (ret)

Associate State Geologist & Associate Director, Bureau of Economic Geology

Jackson School of Geoscience

The University of Texas at Austin

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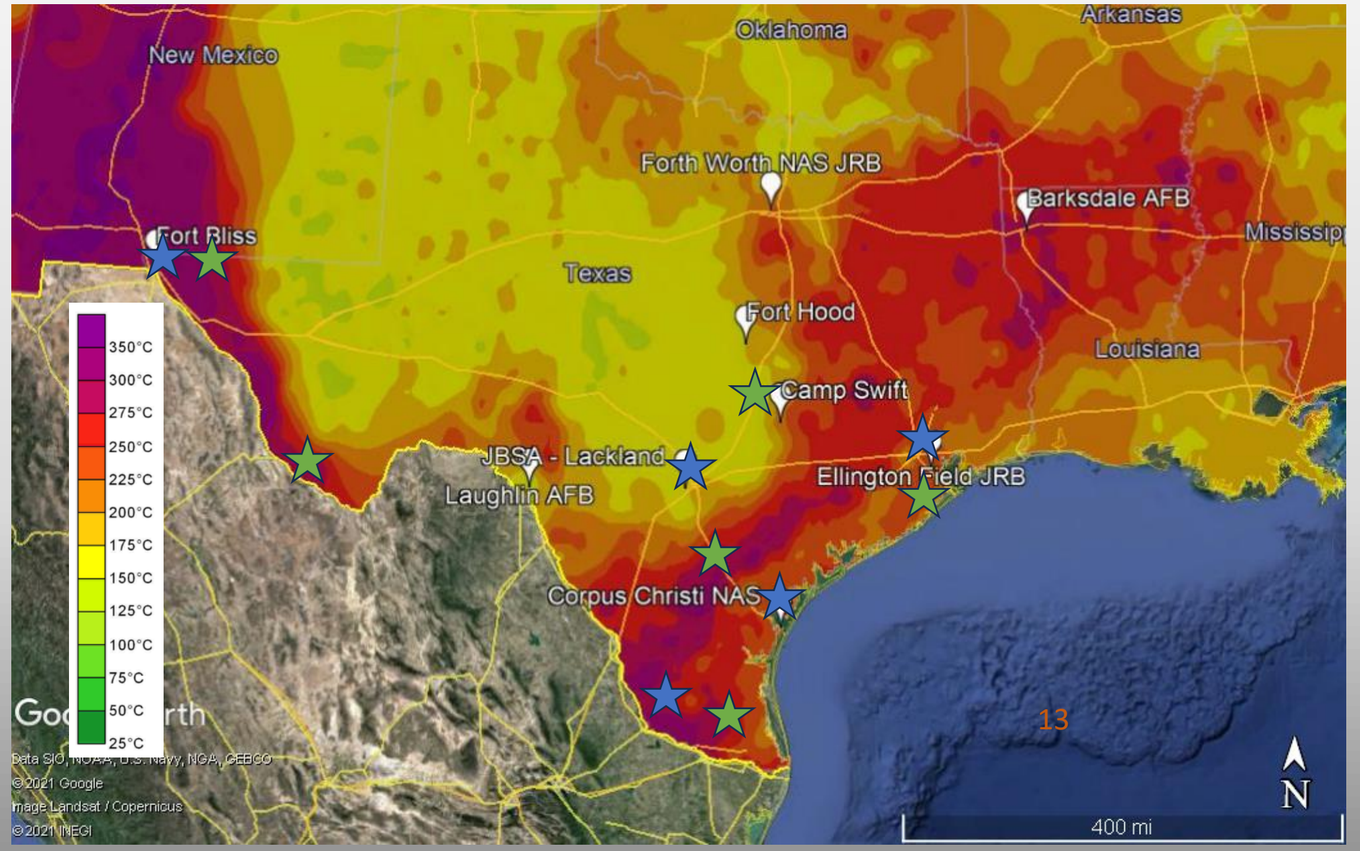
What is happening in the region

- Military Projects
  - Ellington Field (Houston) is shovel-ready, might break ground next year
  - JBSA (San Antonio stopped – not economical)
- Civil Projects
  - Multiple additional projects not public yet

Estimated Temperature at 10 km depth



Modified after SMU Geothermal Lab

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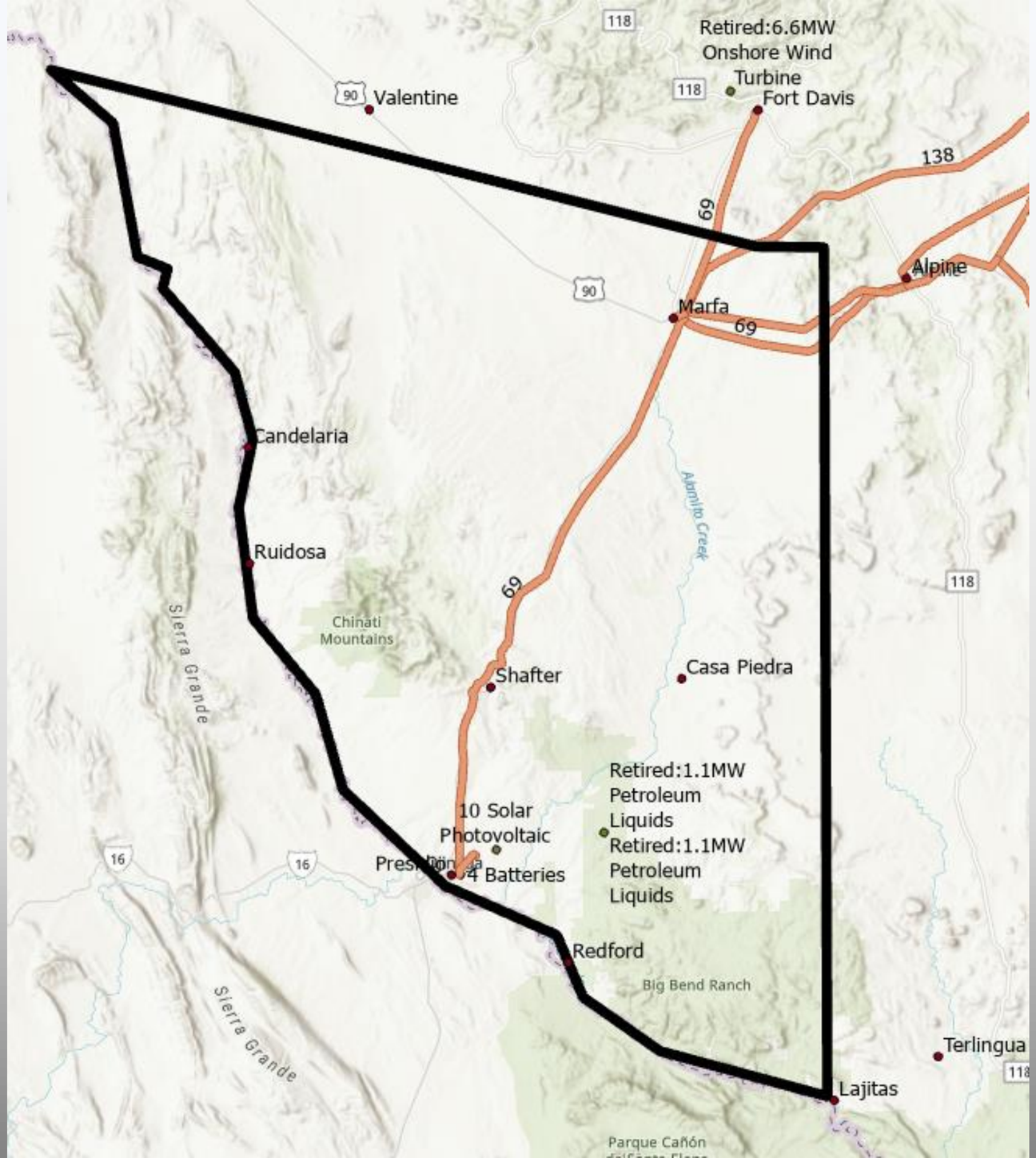
Bureau of Economic Geology

Study Motivation

- County/municipal Leadership wants to develop good resilient energy sources as a spur to economic growth

- The purpose of this study is to …enable the county government and citizens … as well as for prospective developers to understand the resource and appropriately evaluate and develop proposals



Bureau of Economic Geology

Setting

- Divided into three regions
- Border – Hot
- Interior – Warm
- Big Bend – Mostly unknown

Bureau of Economic Geology

GEOPHIRES modeling of e^- generation

Scenario	Style	Region	Zone	Electricity (MW)	LCOE (cents/kWh)	NPV (M$)	IRR (%)	VIR=PI=PIR	Temperature (degC)	CAPEX (M$)	OPEX (M$)
1	EGS (250)	Border	Basement	20.83	3.71	316.75	40.98	6.55	241.7	57.08	3.2
2	EGS (200)	Border	Basement	12.25	4.61	173.43	33.92	5.34	196.7	39.98	2.43
3	AGS (200)	Border	Basement	5.54	13.53	7.32	7.07	1.1	173	71.24	2.3
4	AGS (175)	Interior	Basement	5.46	15.28	-6.35	5.6	0.92	172	80.78	2.48

- Takeaways
  - Profitable electricity generation options
  - LCOE is competitive
  - Border zone is clearly better, but the interior could work also
    - These do not take into account IRA tax credits!
  - Caveats – not a detailed subsurface model, the drilling & completion model needs update

Conclusion

- Presidio is an excellent development target
  - The county clearly has substantial, undeveloped geothermal resources.
  - These resources could prove economically viable to develop in a wide range of scenarios for electricity production, and for industrial/agricultural and heating/cooling use

- Thanks to the Presidio Municipal Development District and the State of Texas' Advanced Resourrce Recovery program for funding this work

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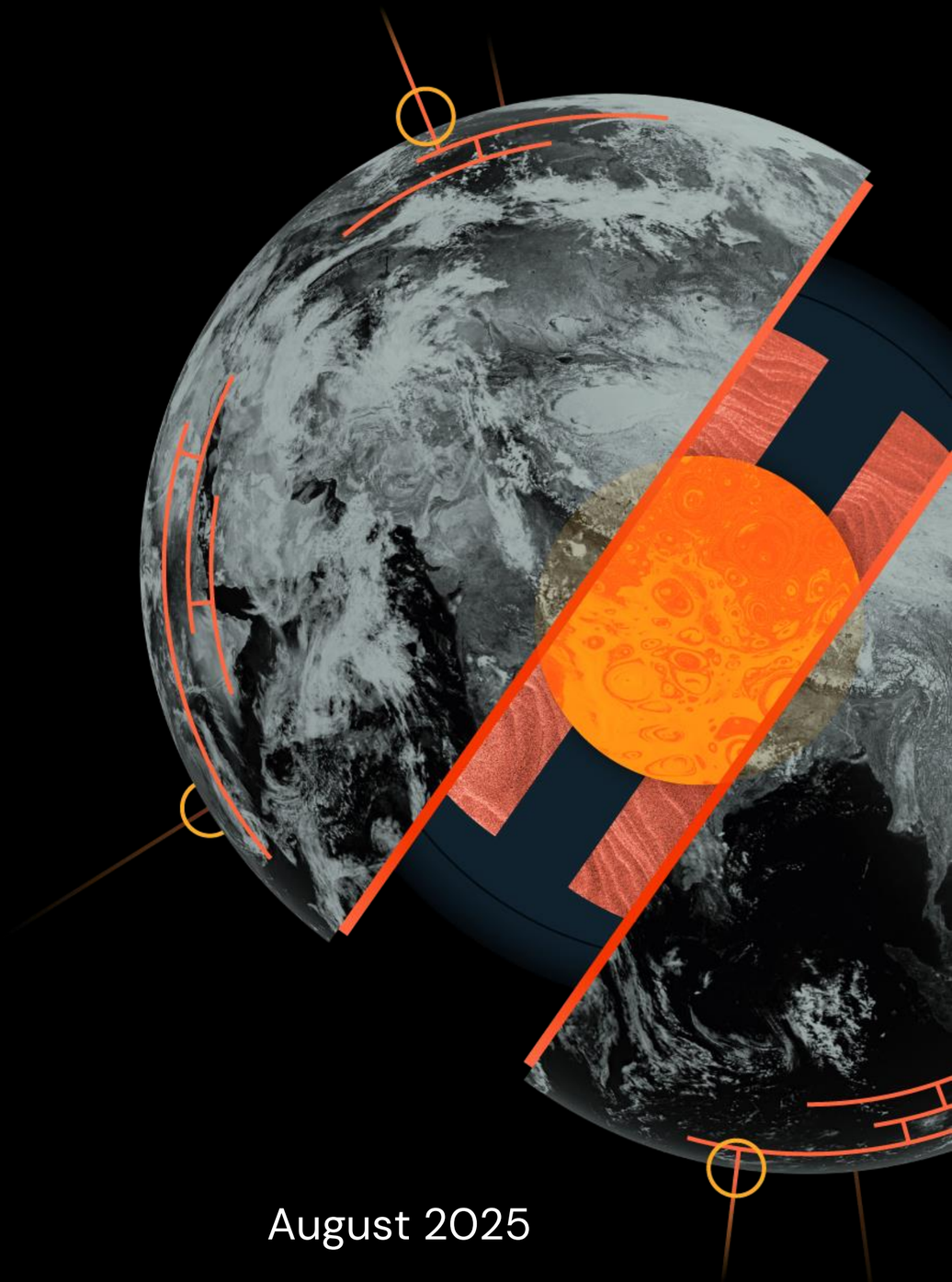
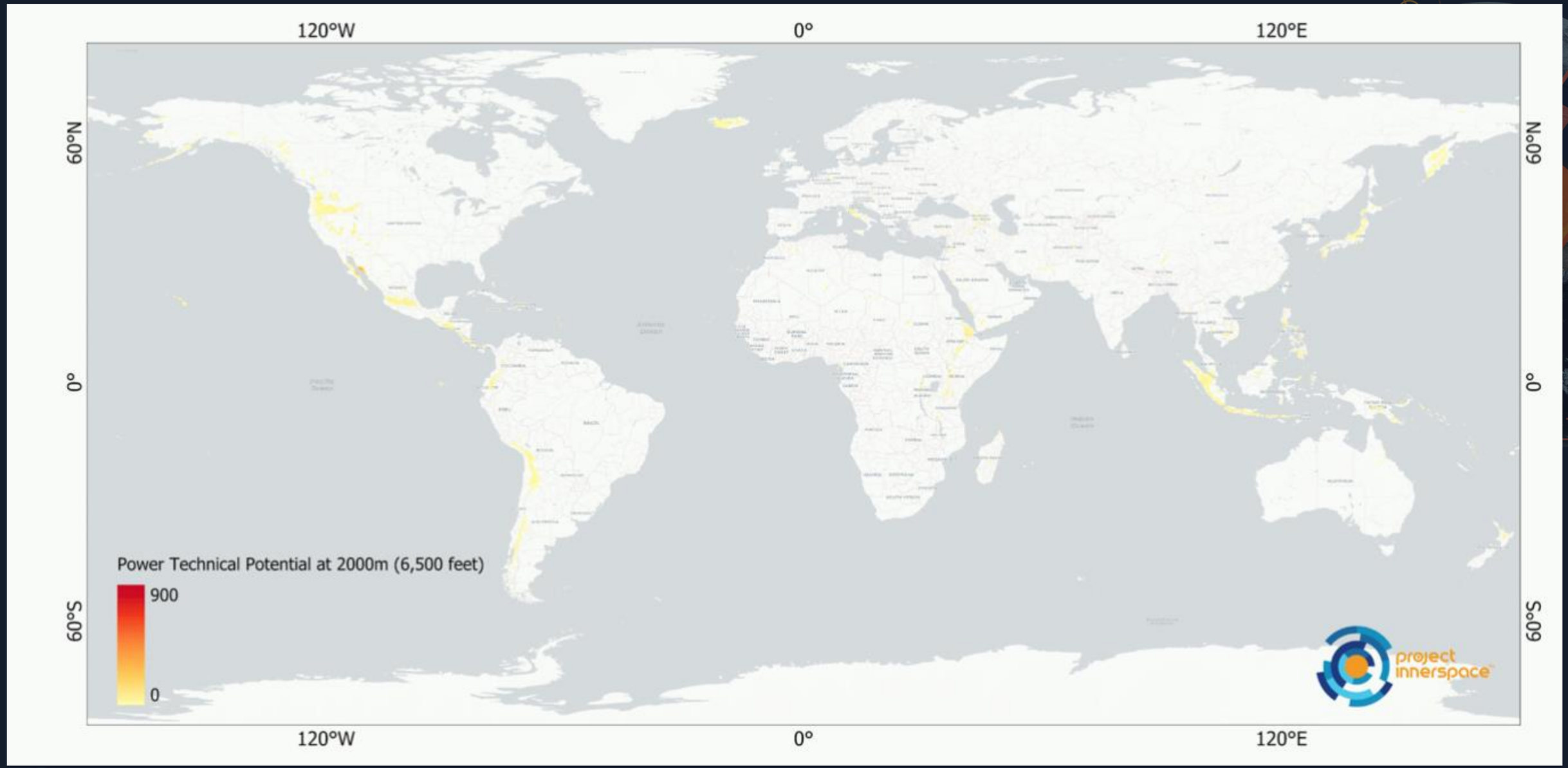
GEOTHERMAL Opportunities in Texas

Drew Nelson



August 2025



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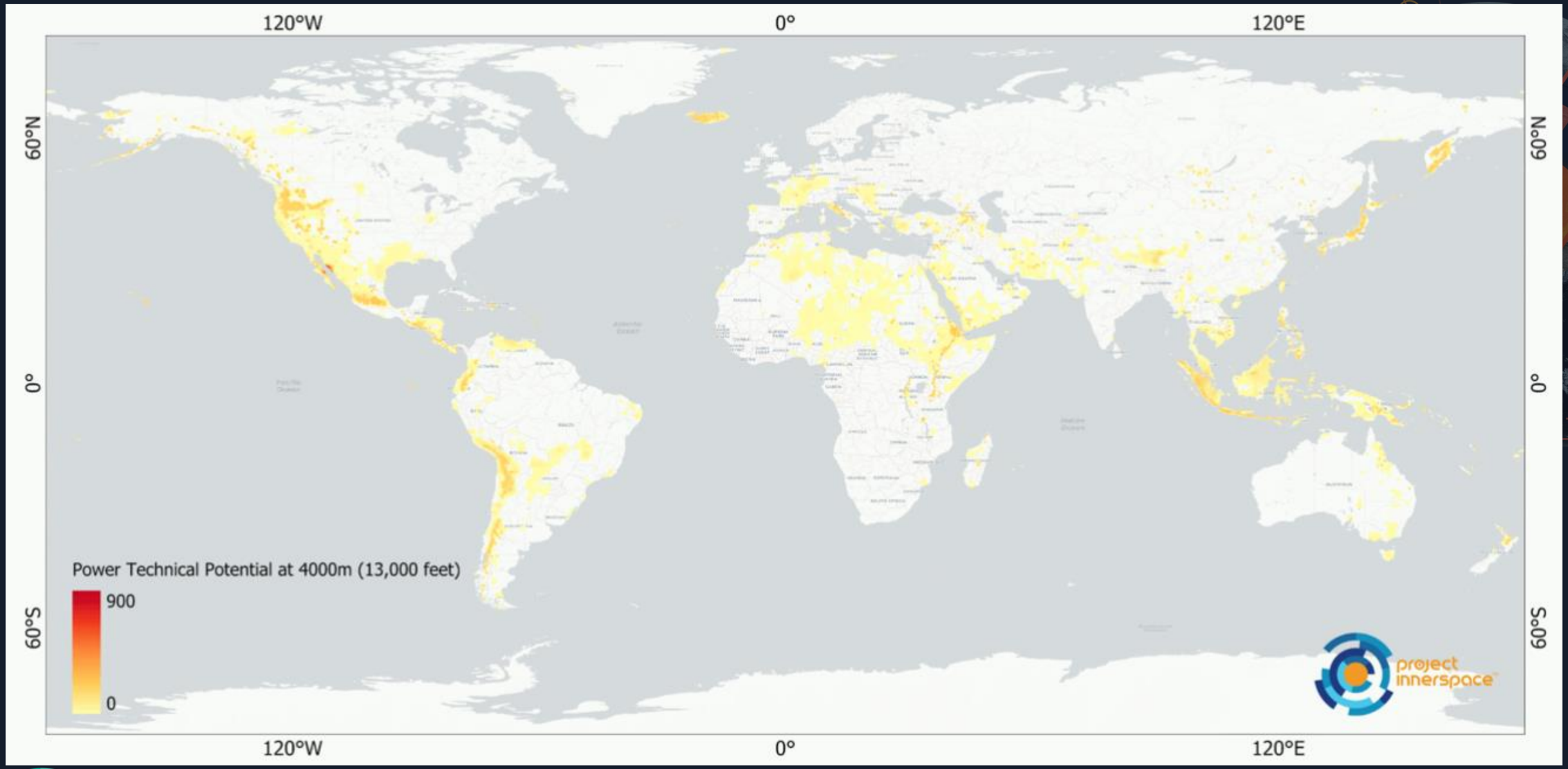
What “Truly Global” Looks Like – at 2 KM



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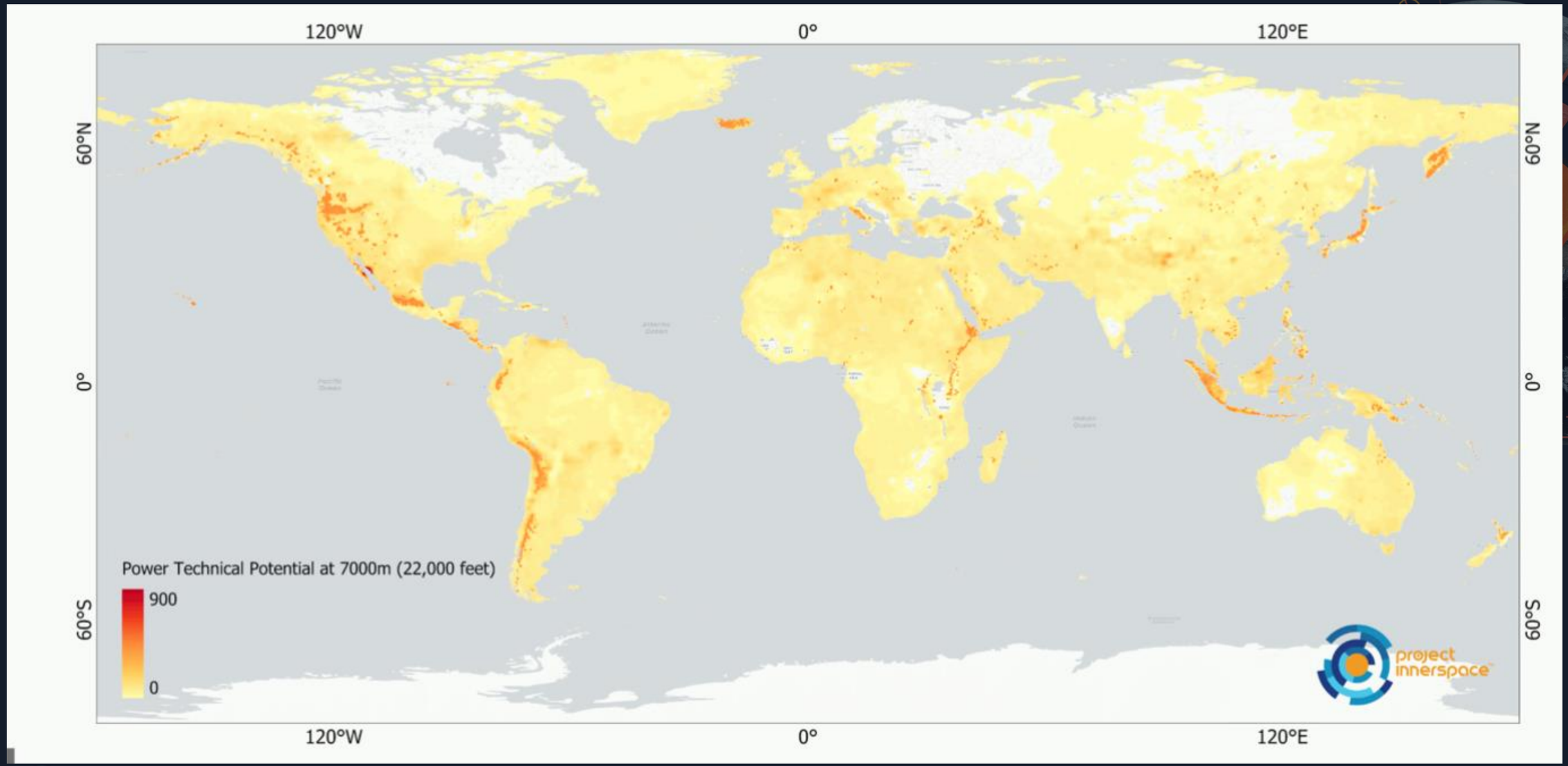
What “Truly Global” Looks Like – at 13 KM



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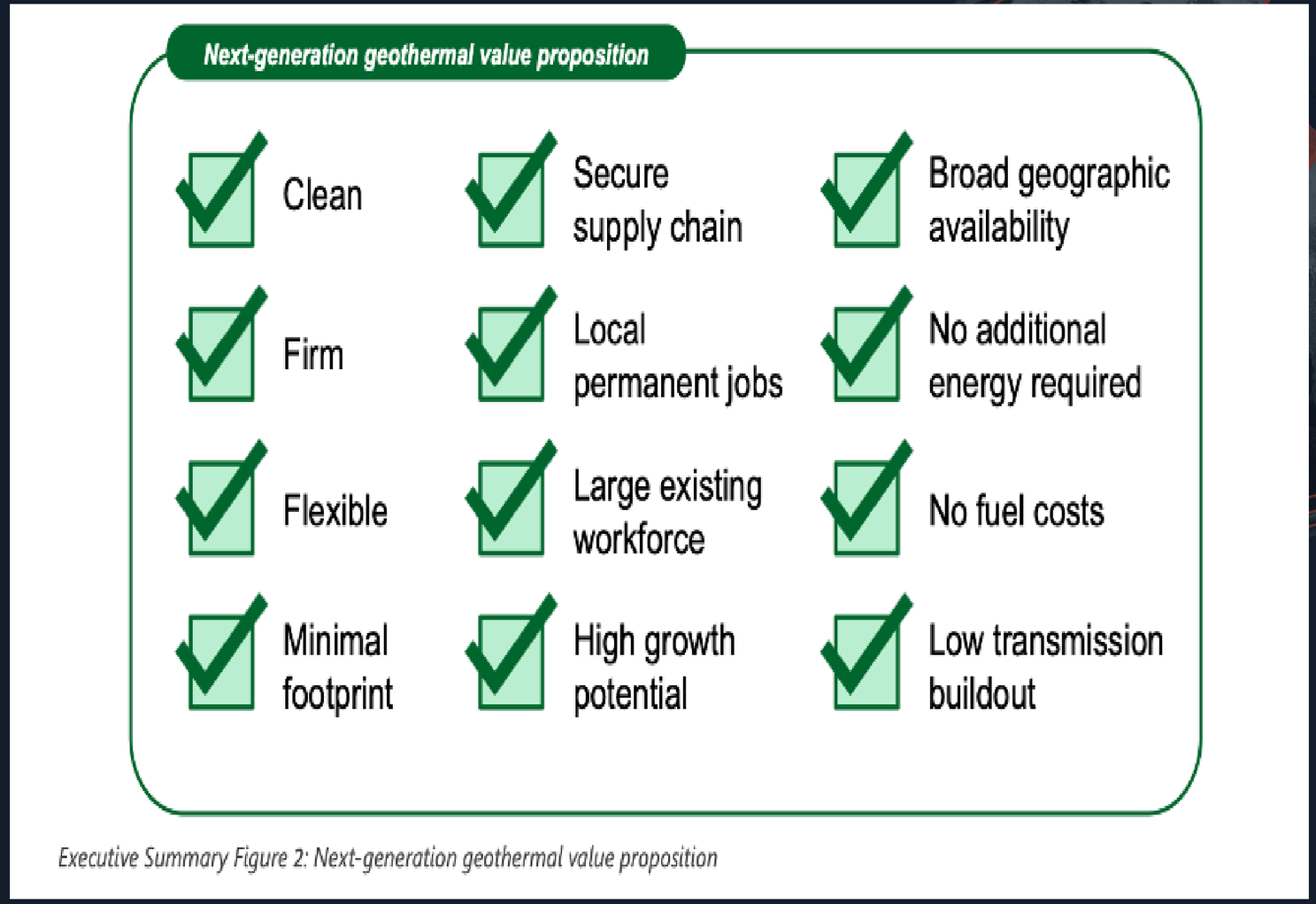
What “Truly Global” Looks Like – at 22 KM

U.S. DEPARTMENT OF ENERGY

Pathways to Commercial Liftoff: Next-Generation Geothermal Power



Executive Summary Figure 2: Next-generation geothermal value proposition

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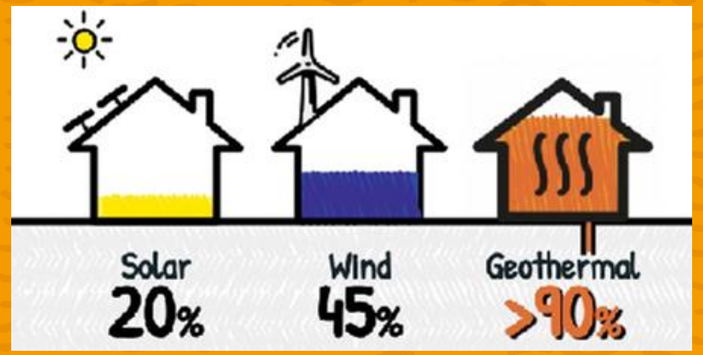
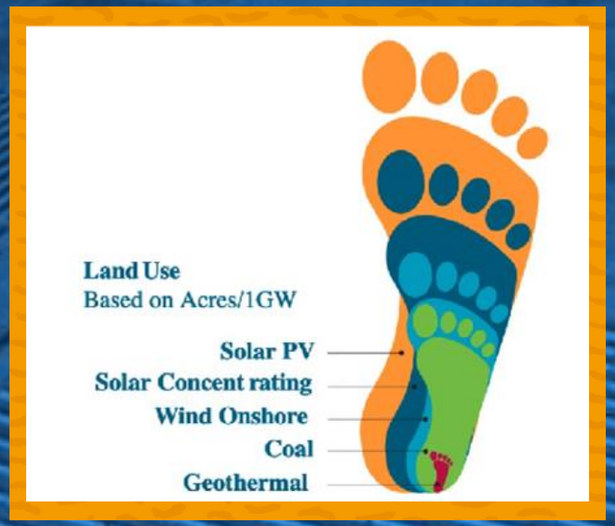
Comparing Capacity Factor



27MW PV
55% Capacity Factor



33MW Geothermal
90-95% Capacity Factor

2MW PT
55% Capacity factor

Geothermal produces electricity as well as direct heat.

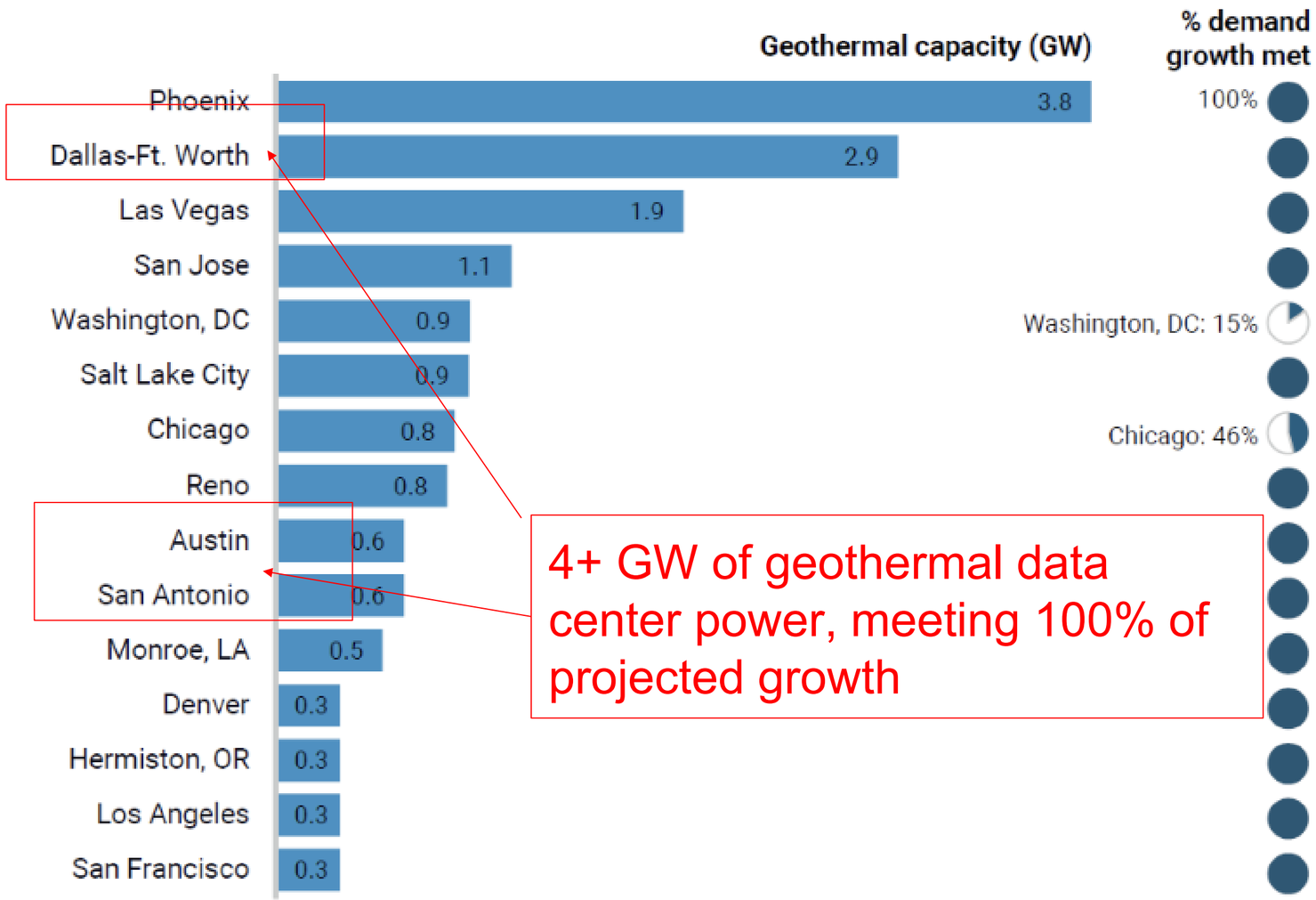
- Texas geothermal potential matches with urban loads

Source: GeoMap geomap.projectinnerspace.org

FIGURE 3

Behind-the-meter geothermal potential at data centers in 15 largest markets, clustered siting approach

GW, % of total projected demand growth



Source: Rhodium Group. Note: The chart represent capacities using dry cooling plus optional solar and battery cooling approach with Project InnerSpace temperature-at-depth maps.

- Texas has significant potential for geothermal powered data centers

- Texas has 480 GW of geothermal power at rates being paid for clean firm in other states.
- More than any other state.

Questions?

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