



**ENERGY &
MANUFACTURING®**
— in Appalachia —

Energy Supply Chain Overviews

Nov 20 AI Data Centers: Structural Steel

Dec 4 Seizing Growth and Opportunity in
the Plastics Supply Chain

Dec 18 Solar Supply Chain & 2026 Outlook

Coming Soon - Natural Gas: Midstream, Circular Plastics,
Hydrogen, Chemicals, and Electric Grid Components

www.wemakeithere.org/energy/





INDUSTRY
OVERVIEW
SEGMENTS

GEO THERMAL



Today's Agenda

- ▶ The Basics of Geothermal
- ▶ Resource Potential
- ▶ Enhanced Geothermal Systems
- ▶ Barriers & Catalysts to Deployment
- ▶ Manufacturing Opportunities
- ▶ Key Developers & Suppliers
- ▶ Questions & Answers



The Basics of Geothermal

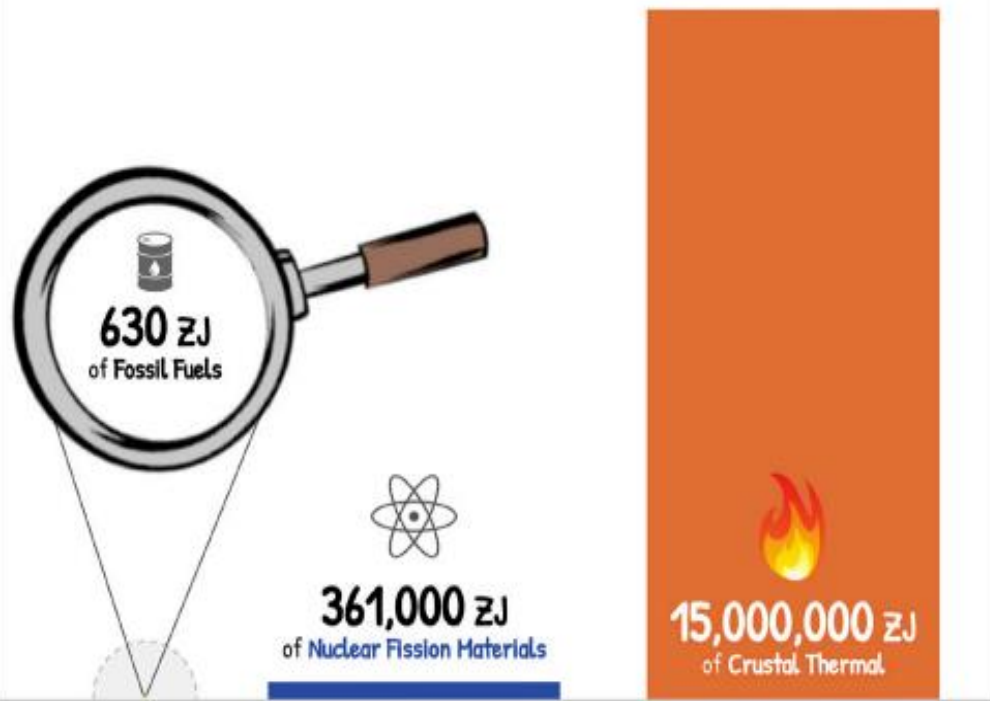
- ▶ Using wells (deep or shallow) to tap steam and heat for:
 - ▶ Direct use
 - ▶ Heating and cooling
 - ▶ **Electricity generation**
 - ▶ Energy storage
- ▶ US geothermal production is ~0.4% of total U.S. electricity generation
- ▶ The United States and Indonesia produces the most electricity from geothermal (17 billion kWh). Kenya has the highest share of any country of geothermal in its portfolio (45%).



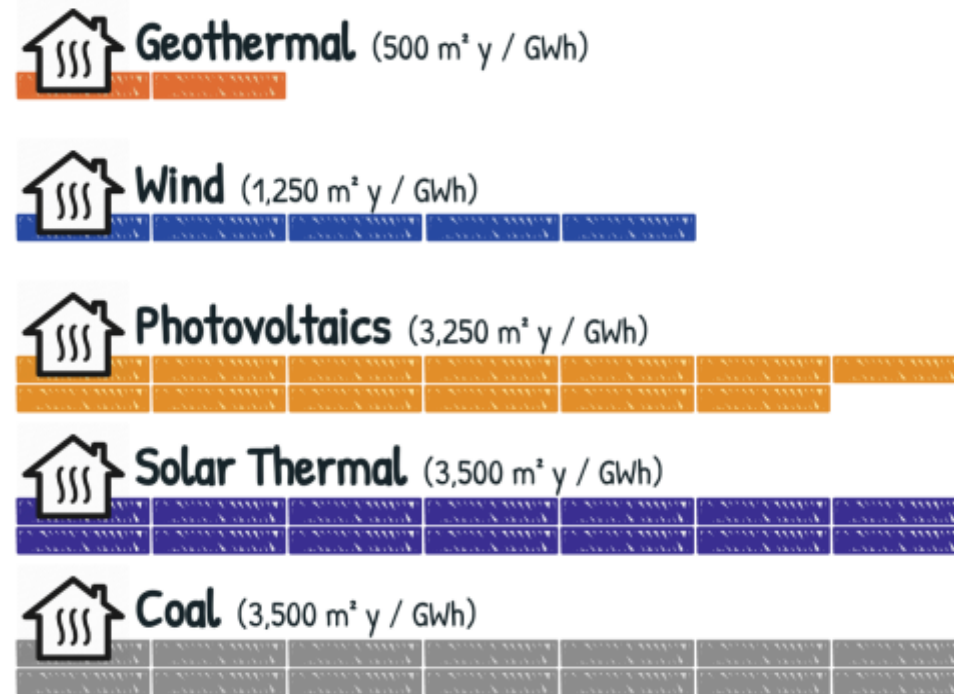
- ▶ Leading states include:
 - ▶ California, Nevada, Idaho & Hawaii
- ▶ Emerging states include:
 - ▶ Texas, New Mexico, Utah & Colorado

Significant Subsurface Potential

Geothermal Energy Abundance

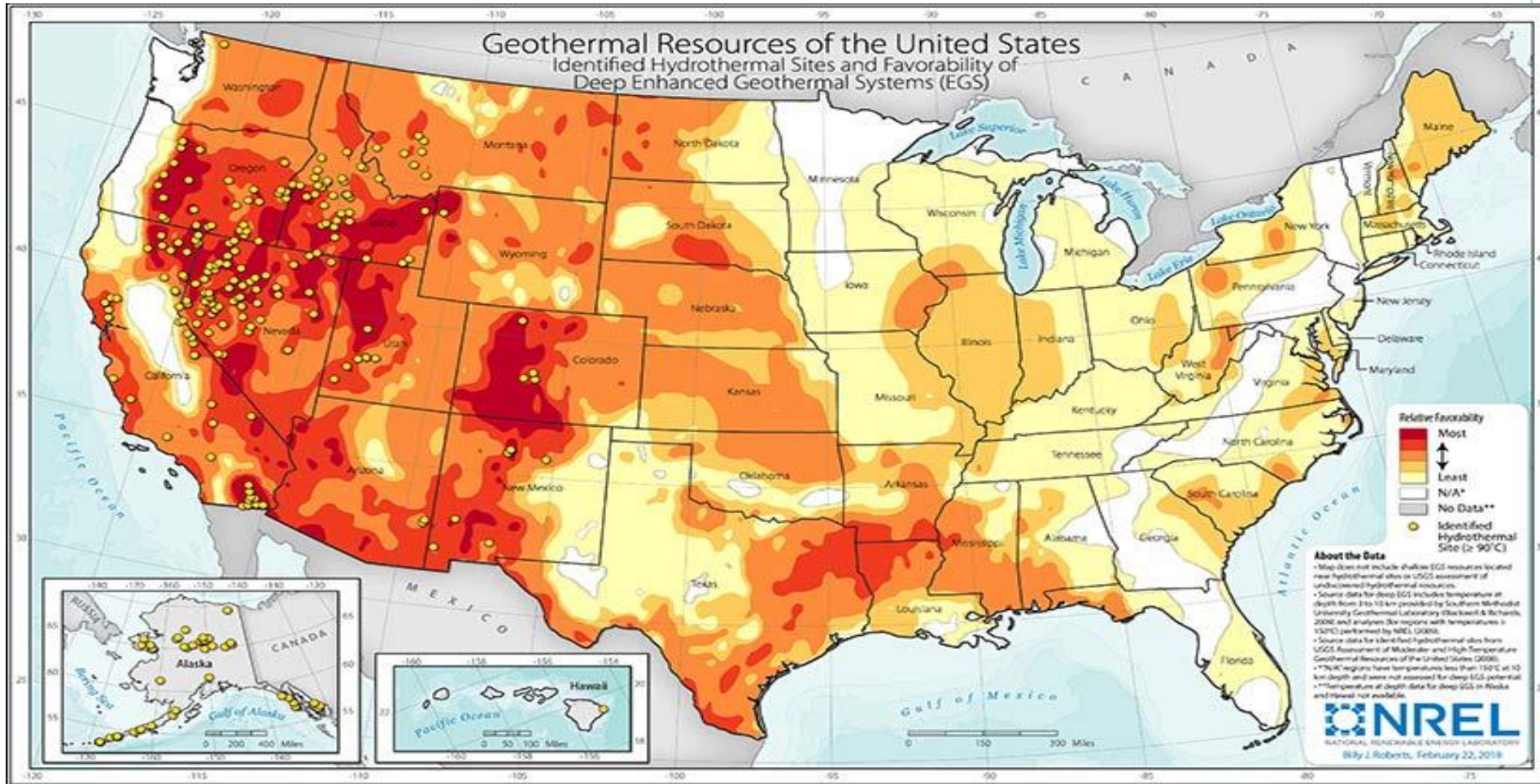


Comparing Surface Footprint



The Future of Geothermal Energy in Texas, 2022

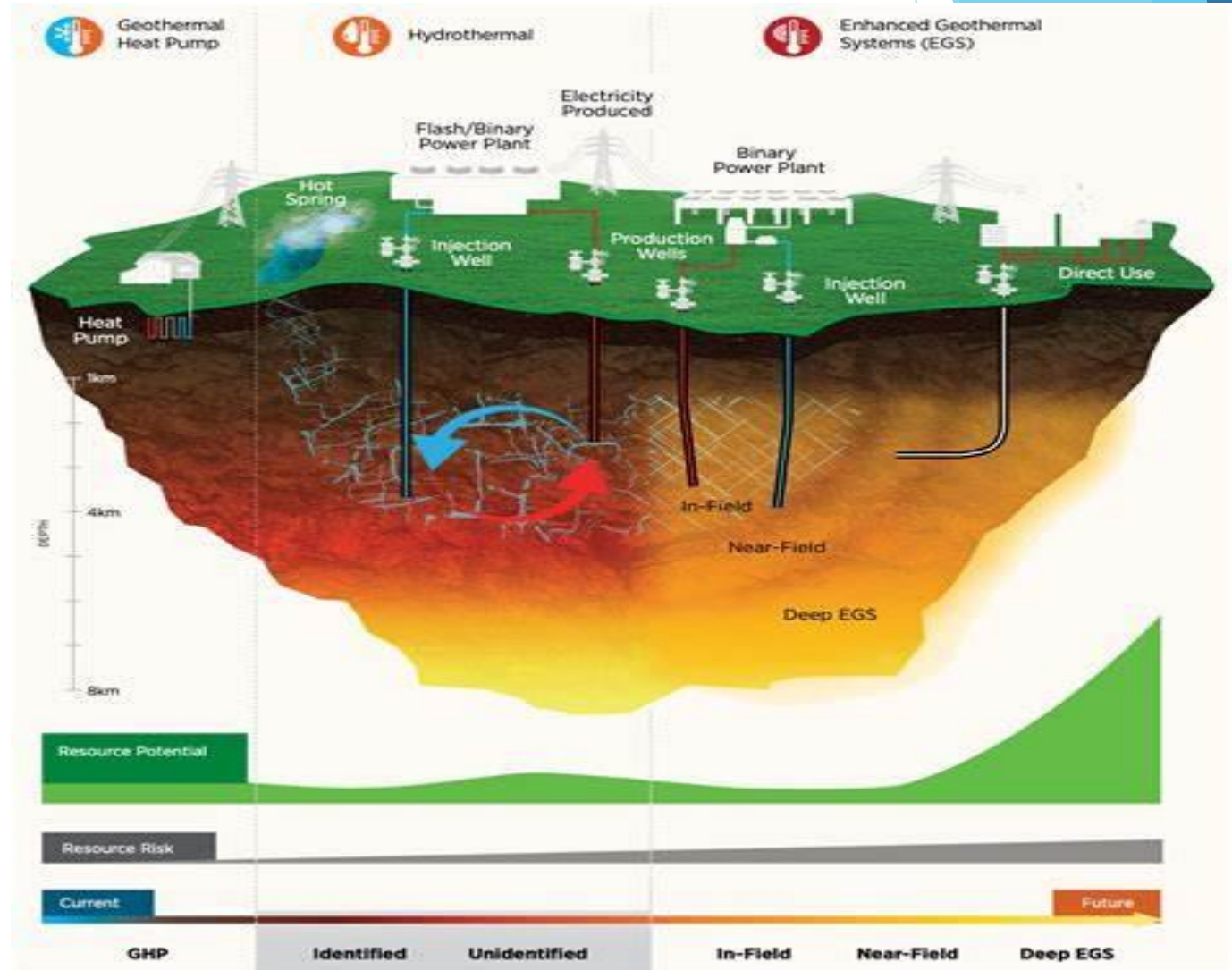
Significant Subsurface Potential



Utilization of Geothermal Resources

Applications

- Ground source heat pumps
- Conventional hydrothermal
- District heating
- Enhanced geothermal systems
- Closed loop geothermal
- Super hot rock systems





Enhanced Geothermal Systems (EGS)

- ▶ DOE estimates ~2% of geothermal resources are in conventional hydrothermal.
- ▶ EGS uses hydraulic linkages between two or more boreholes.
- ▶ Advances in hydraulic fracturing and related technology (expertise, drill bits, advanced materials, and fiber optics) have significantly advanced the potential for **Geothermal Anywhere**.
- ▶ DOE is targeting a 90% reduction cost in EGS by 2035.

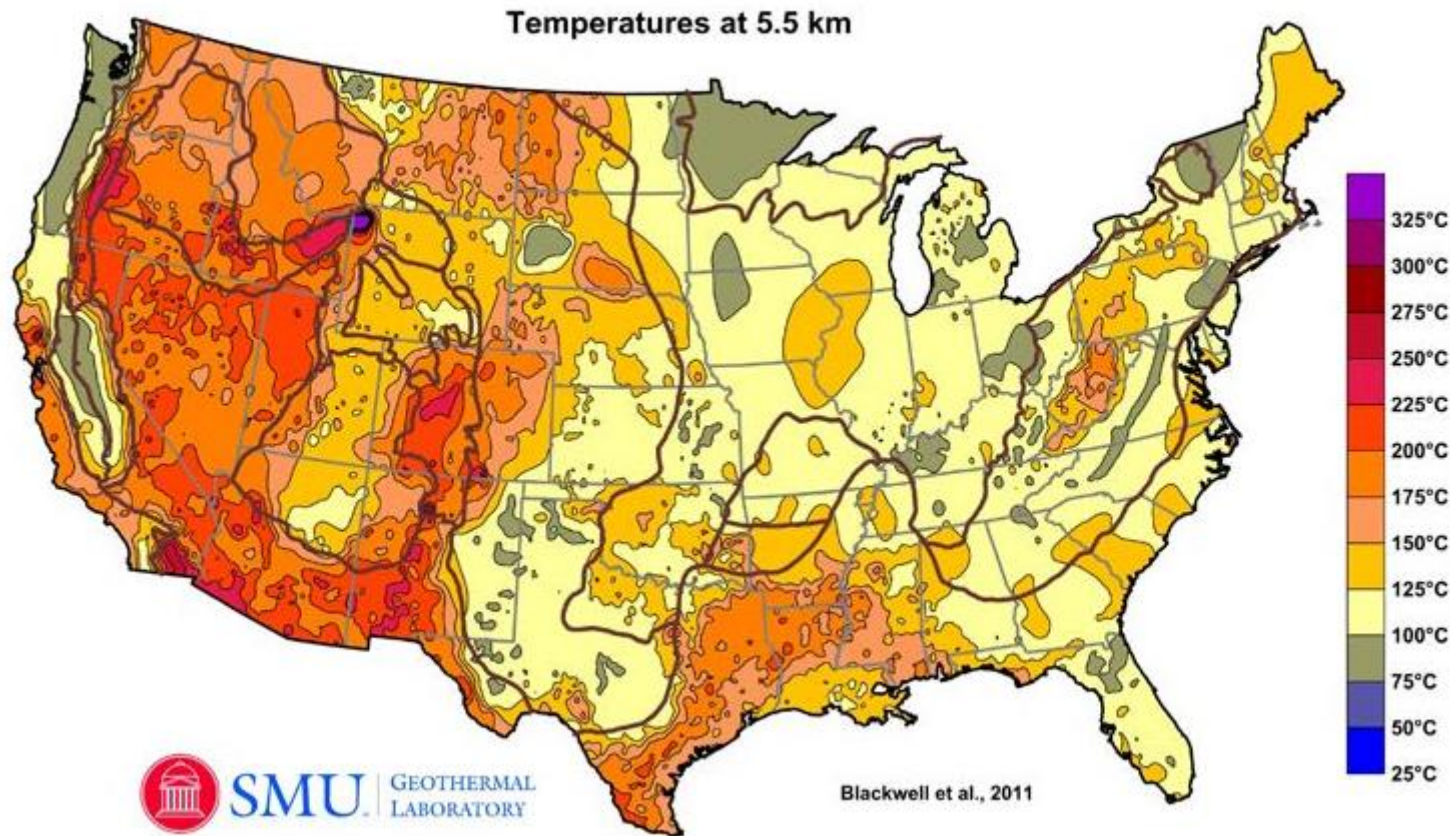
EGS Market Share and Investment Trends

- ▶ There is ~3.7 GW of installed geothermal capacity in the United States - largely conventional hydrothermal.
- ▶ EGS represents the next generation of harnessing this resource, and could compound at ~5-7% per year, with global estimates for 2030 of a \$4 to \$11 billion market.
- ▶ DOE has invested ~\$60 billion in pilot projects, and companies like Google, Meta and Microsoft have invested in geothermal projects for their data centers.



Barriers to Deployment

U.S. geothermal resource – a wide range of quality and location



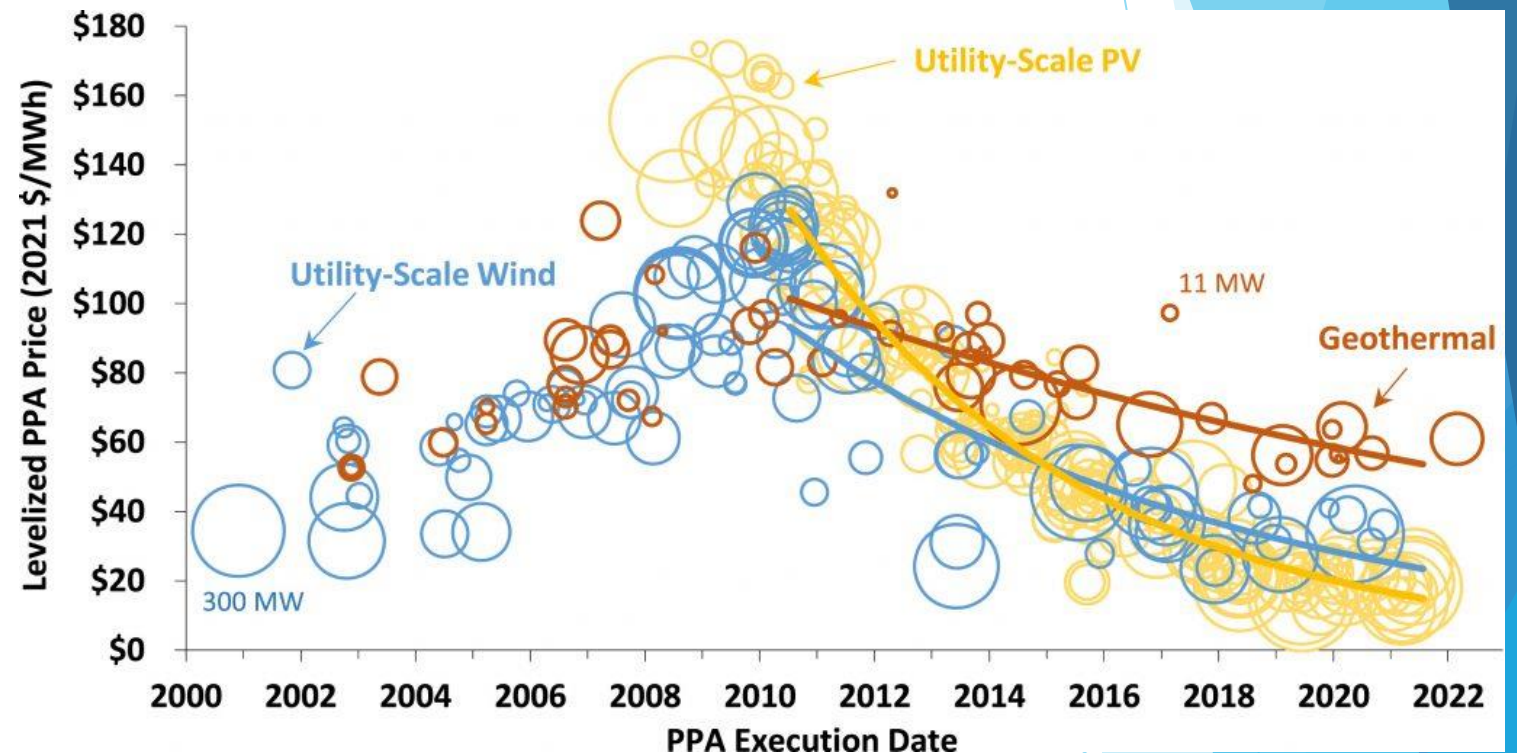
Context

5.5 km = ~18k feet

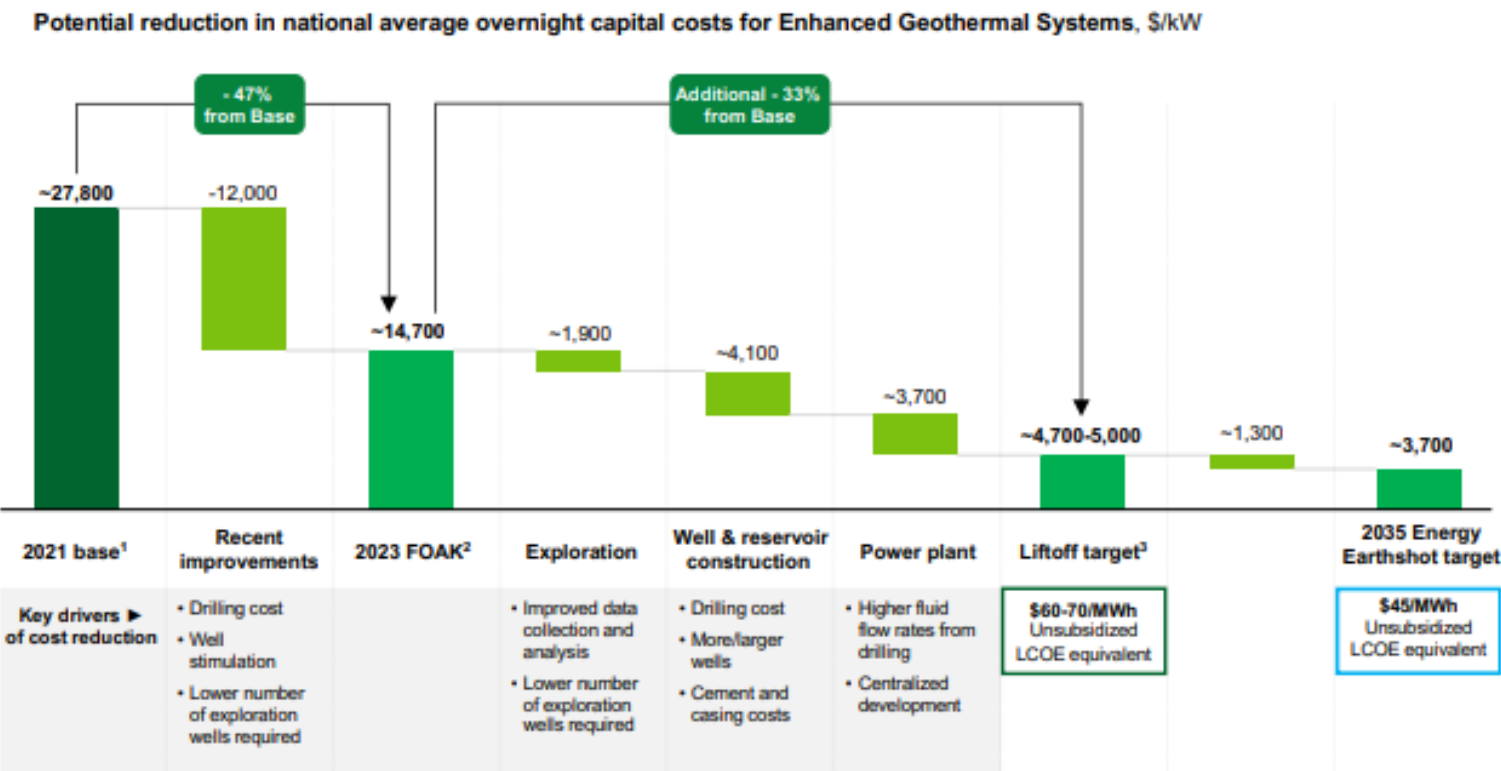
Marcellus shale well
is ~5k to 9k feet
deep

Barriers to Deployment

- Drilling costs
- Characterization of resources
- Policy equity
- Regulatory clarity & certainty, including on mineral rights
- Grid integration
- Finance
- Awareness & workforce



Barriers to Deployment



Executive Summary Figure 4: Cost reduction waterfall for EGS

Catalyzing Deployment

FEDERAL: With help from Chris Wright, geothermal is spared in the [One Big Beautiful] budget bill

Latitude Media, July 2, 2025

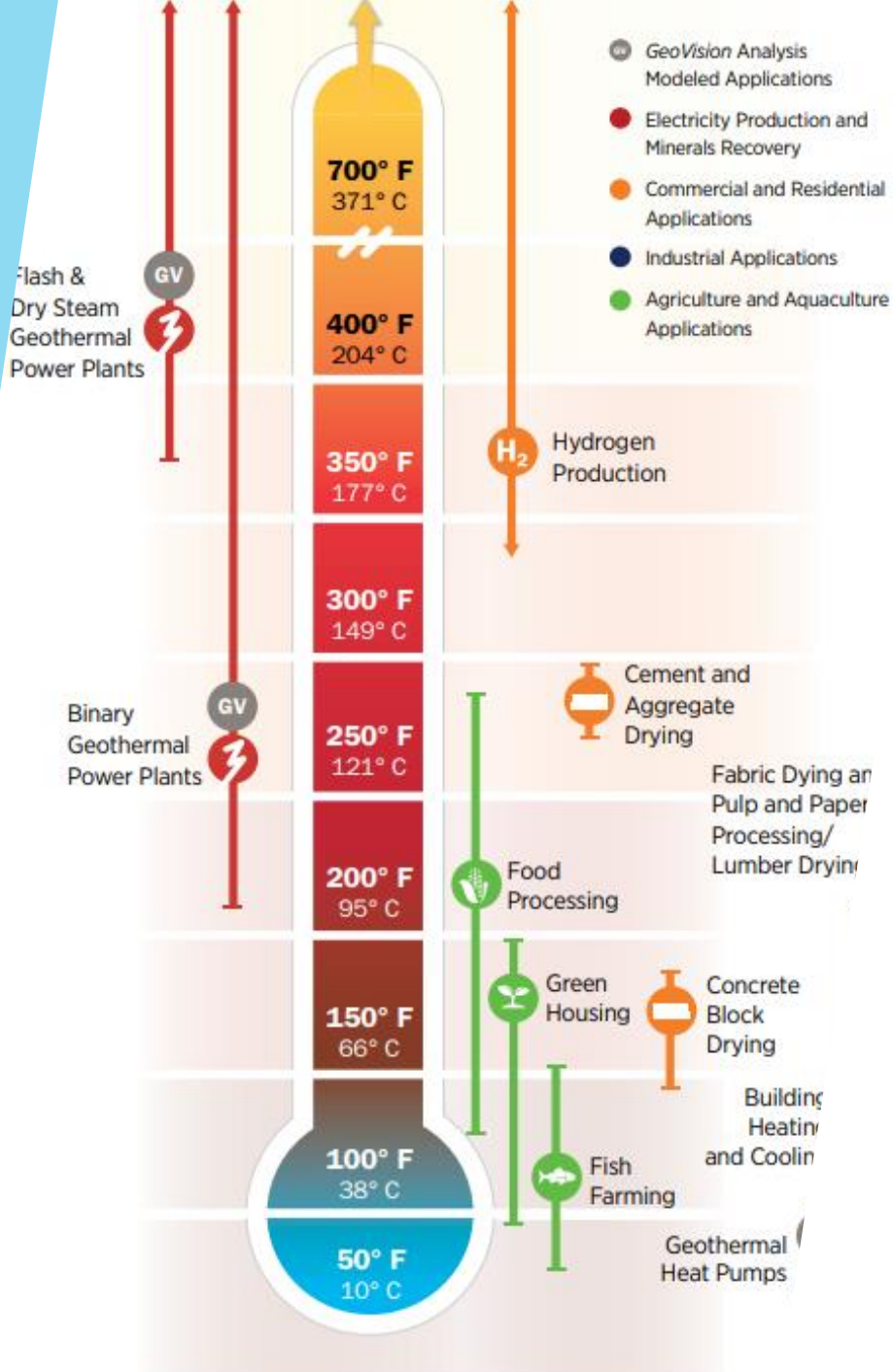
The One Big, Beautiful Bill of 2025 modified many clean energy tax and loan provisions of the Inflation Reduction Act. Geothermal power generation is eligible for the 45Y production tax credit and the 48E investment tax credit.

Federal research labs & military installations are also a market driver.

STATE: Various state renewable portfolio standards and grants and loans may provide additional support for geothermal development.
geothermal.

PRIVATE MARKETS: 24/7 power generation source for data centers, industrial facilities and the grid.

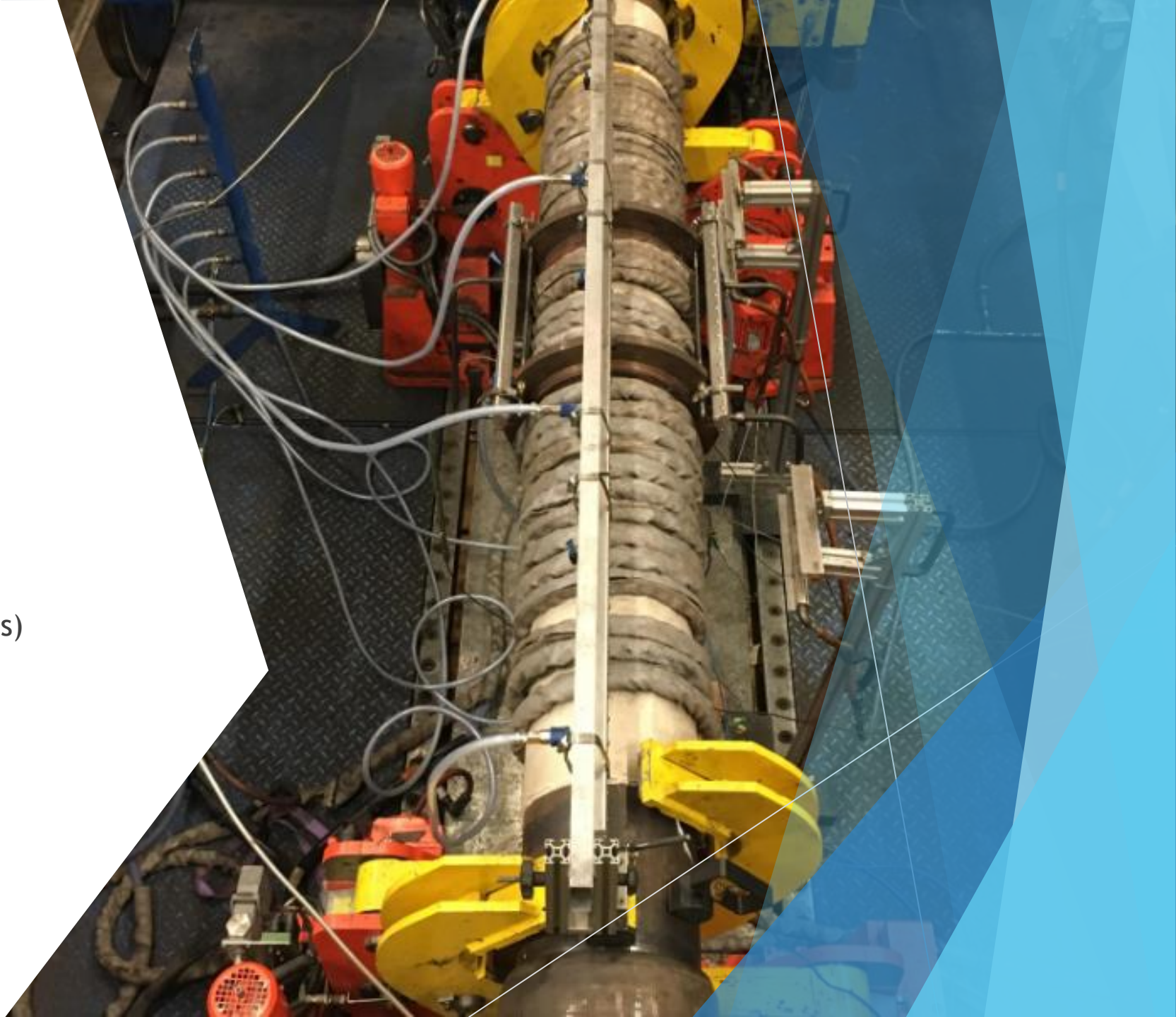
Other Geothermal Deployments



- Closed Loop Geothermal
- Lithium & critical mineral extraction from geothermal brines
- Minepool / thermal storage + solar/wind
- H2 storage
- Abandoned & orphaned well reclamation

Manufacturing Opportunities

- ▶ Technology transfer from oil and gas field services & electrical equipment:
 - ▶ Pipes
 - ▶ Pumping Equipment
 - ▶ Compressors
 - ▶ Heat Exchangers (ORC Turbines)
 - ▶ Subsurface Fiber Optics
 - ▶ Control Systems
 - ▶ Electrical Infrastructure



EGS Developers & Vendors



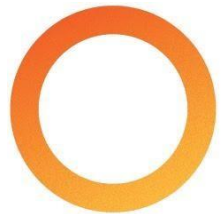
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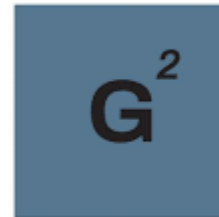
ORMAT



SAGE GEOSYSTEMS™



Eavor™



Gradient
Geothermal

Baker Hughes™



HALLIBURTON

GeothermEx

A Schlumberger Company



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Resources

- ▶ Trade groups & associations
 - ▶ Geothermal Rising
 - ▶ Project Innerspace
 - ▶ Society of Petroleum Engineers
- ▶ Government Resources
 - ▶ National Renewable Energy Laboratory
 - ▶ US DOE Geothermal Technologies Office
 - ▶ Utah FORGE
 - ▶ Western Governors' Association
 - ▶ Groundwater Protection Council
 - ▶ Interstate Oil and Gas Compact Commission

Questions?

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GOVERNMENT RELATIONS