

DOCKETED	
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Hydrocarbons and
Geothermal Energy Office

Technical challenges to geothermal development and new opportunities with technology advancements in California

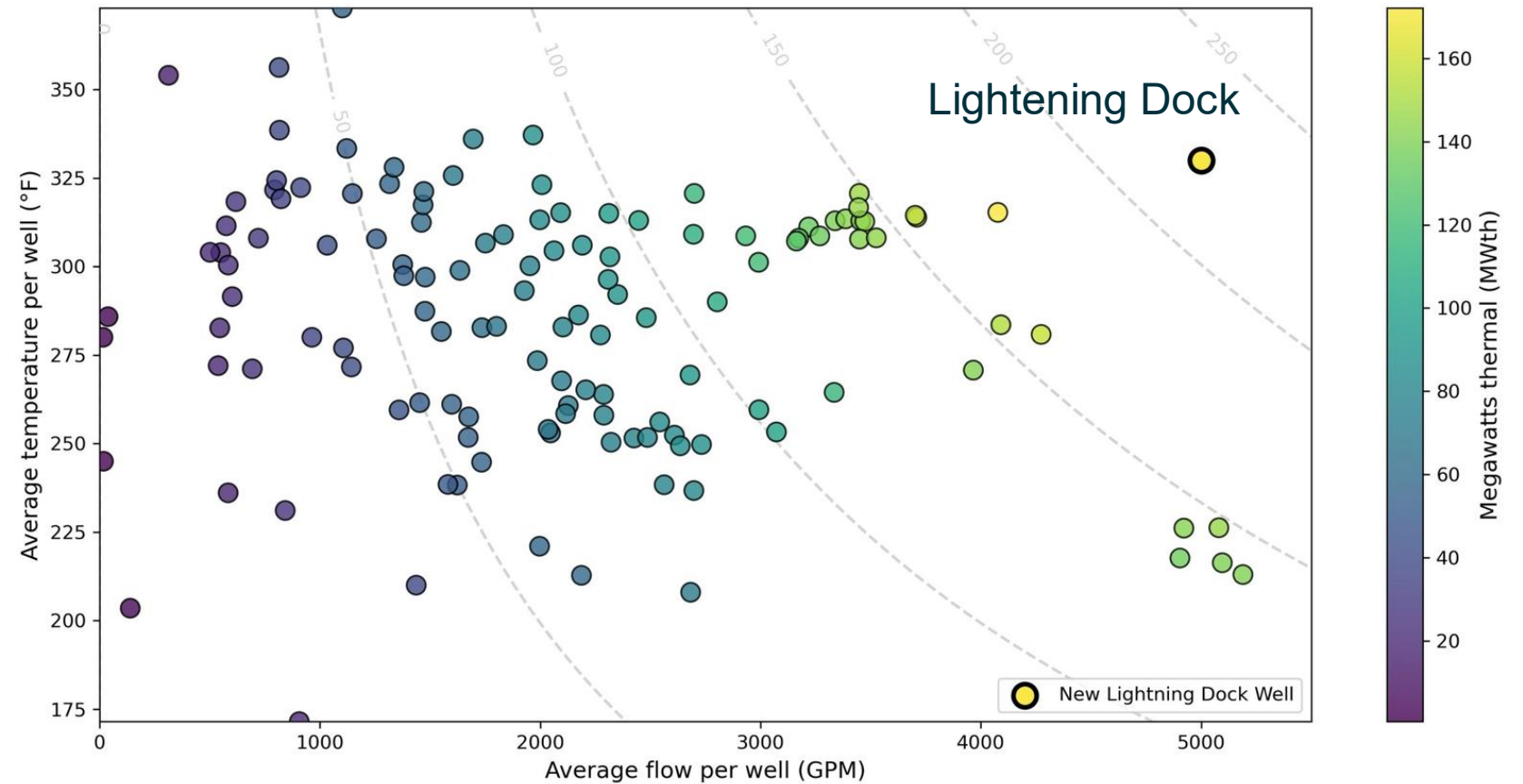
The Next Frontier of California Geothermal Energy

Eva Schill – Geothermal Systems Program Lead



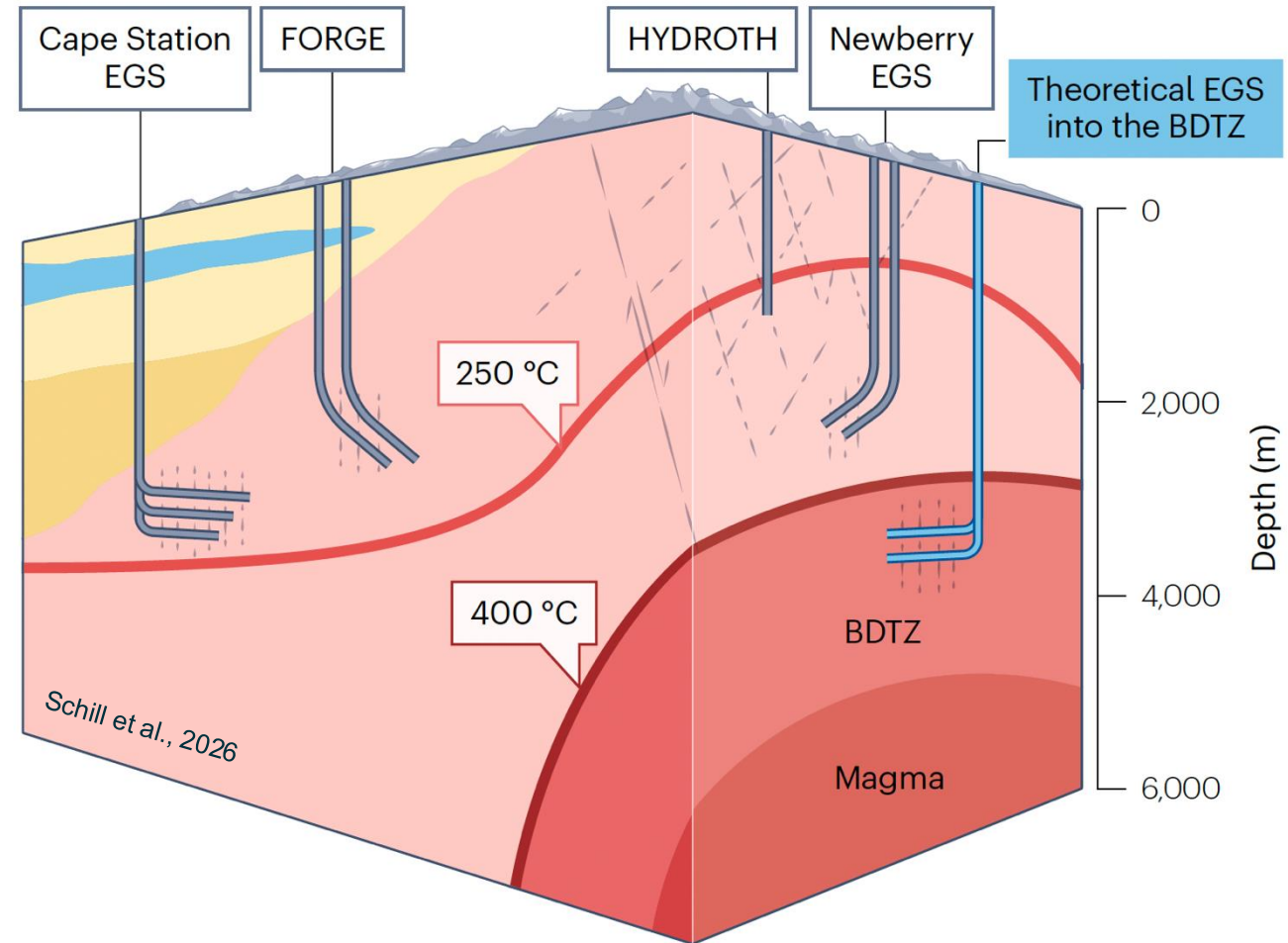
Recent Breakthrough – Enhancement of Productivity using Artificial Intelligence

- 2024
Lightening Dock, NM
(Zanskar)

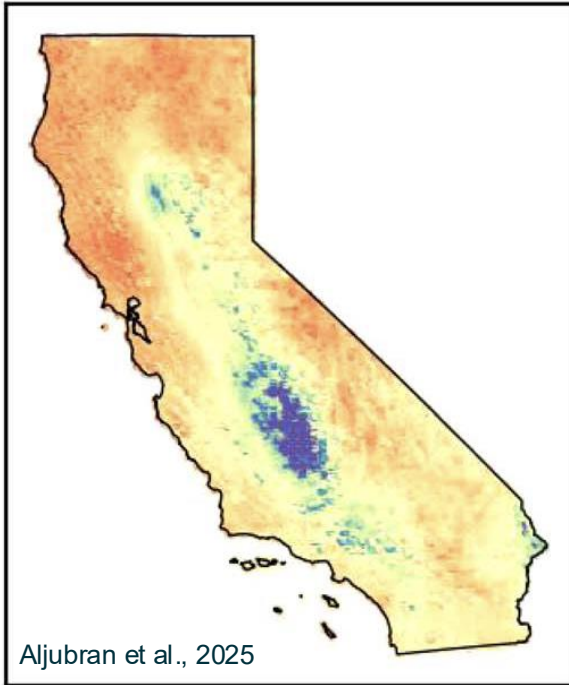


Advances in Enhanced Geothermal Systems (EGS) and Towards Supercritical Condition

- **2024 Cape Station, UT (FERVO Energy)**
 - Flow test confirms about 100-120 L/s (10 MW_{el}) per doublet
- **2025 Newberry, OR (Mazama Energy)**
 - Successful hydraulic fracturing and circulation test of a 331 °C EGS reservoir at Newberry



Techno-Economic Impacts of Integrating EGS into California's Electricity and Gas End-Use Sectors



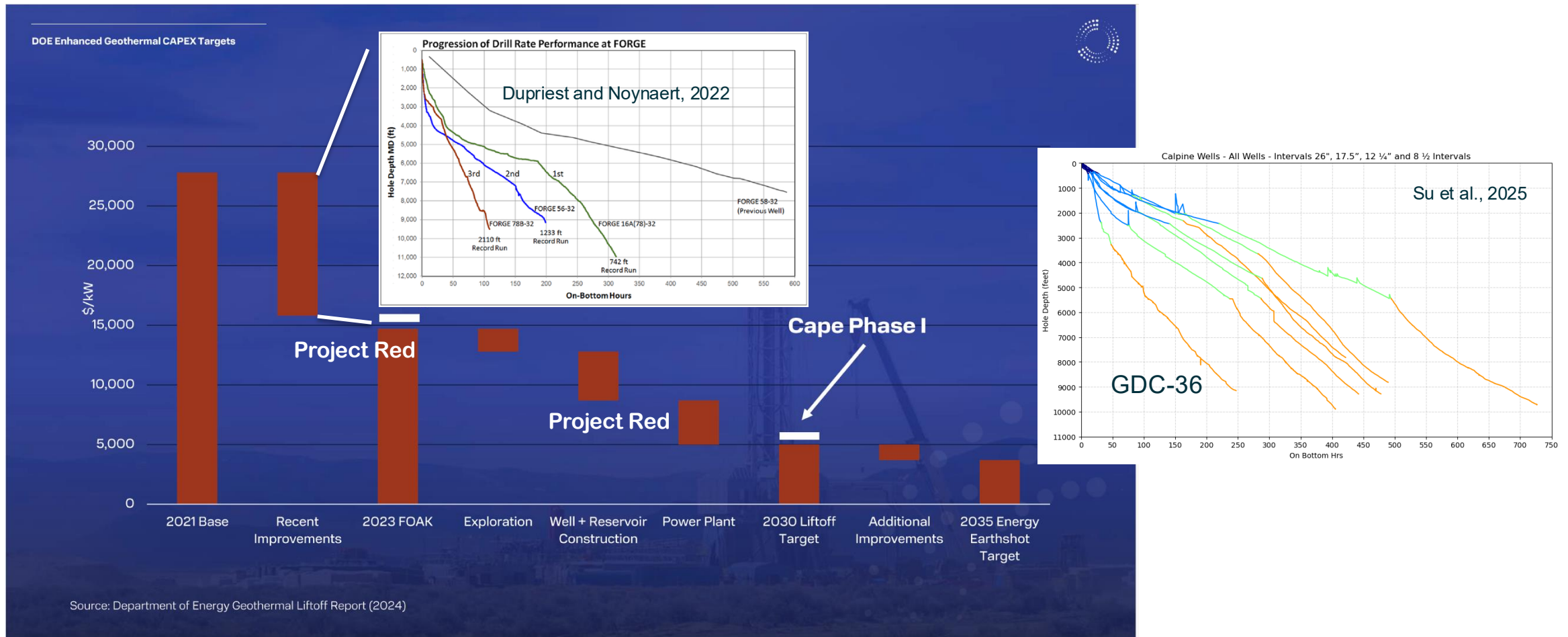
- Use of BRIDGES gas-electric capacity expansion model – a multisector energy model optimizing energy system investment, retirements, and hourly dispatch over multiple time horizons
- EGS supply curves based on recent commercial EGS designs and deployments which involved significant cost reduction in drilling and stimulation.
- Supply curves were associated with noticeably lower costs compared to other estimates, such as the 2024 NREL Annual Technology Baseline (ATB)



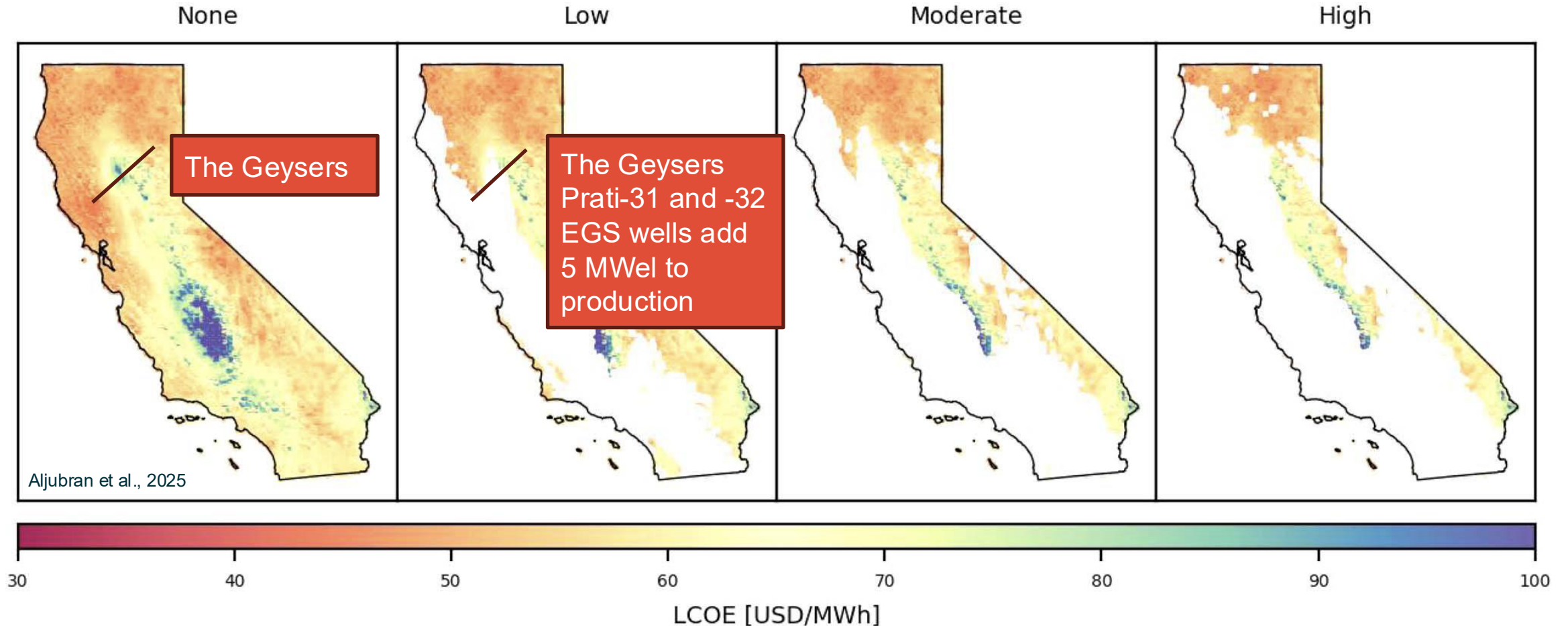
**Close loop
\$136/MWh**

Recent Breakthrough – Development of EGS

CAPEX California specific opportunities: Well GDC-36



Land exclusion scenarios based on the chance of any level of damaging natural earthquake in 100 years



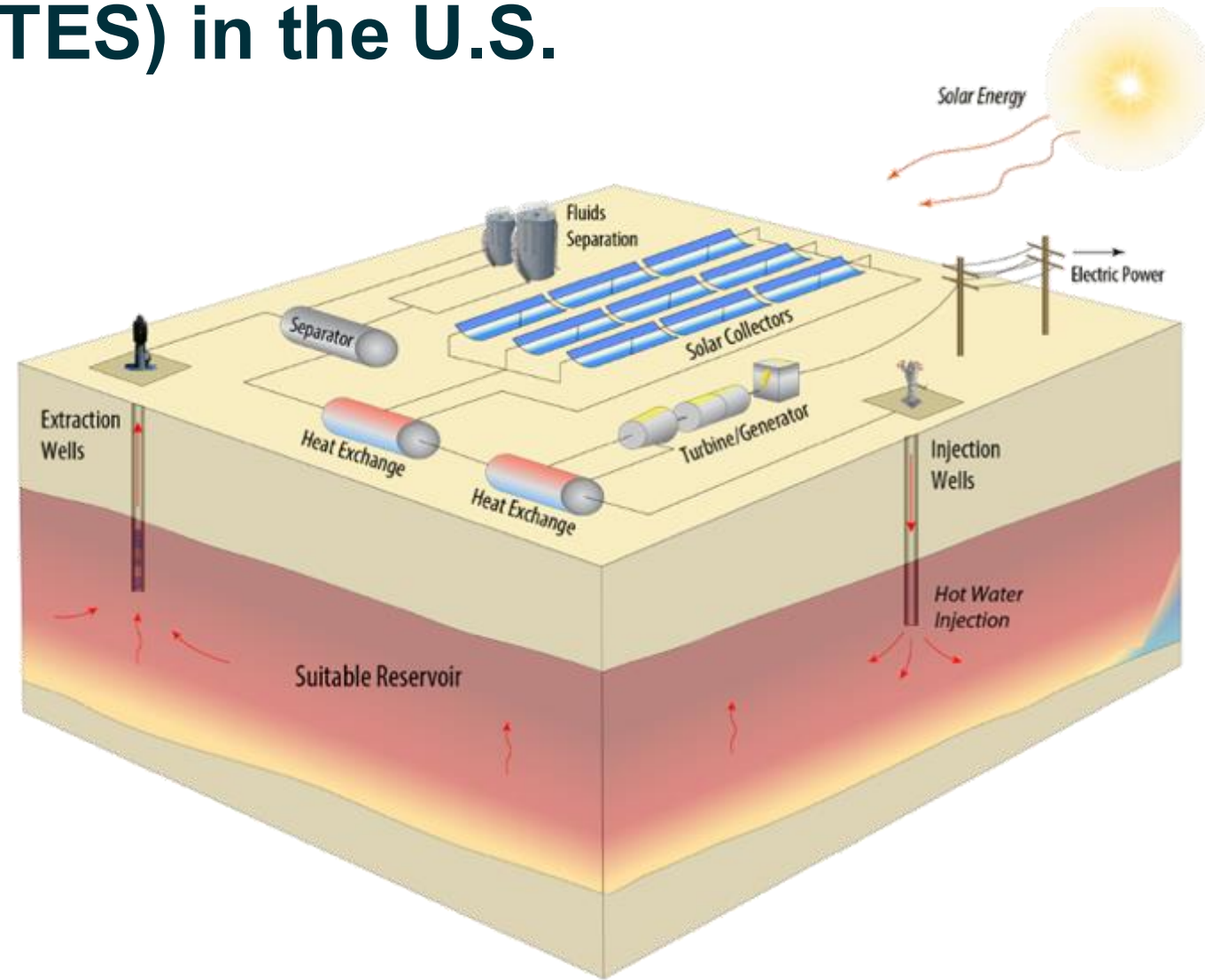
California specific challenges and opportunities

	Conventional	EGS	Supercritical
Technical barriers/opportunities	Larger magnitude induced seismicity Co-production of critical minerals or hydrogen	Reactivation of natural faults – Induced seismicity Favorable temperatures at shallow depth	Deeper-seated resources due to high salinity (Salton Sea) and low pressure (The Geysers)
Different technical requirements and cost profiles	Corrosion and scaling resistance (Salton Sea)		

- What opportunities could future research and technology advancements help unlock around geothermal applications?
 - California resource management plan
 - Management of induced seismicity
 - Large storage capacity in Central Valley

Development of High-Temperature Underground Thermal Storage (UTES) in the U.S.

- **Bakersfield, CA
(Premier Resource Management, PRM)**
 - Concept 1000+h storage
 - 250°C water into sandstone reservoir





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Thank You