Why an Open-Source Approach to Technical Knowledge Sharing is Crucial for Rapidly Expanding Geothermal's Share of the Power Production Market

Greg Leveille

February 10, 2026

Photo from Ormat's website

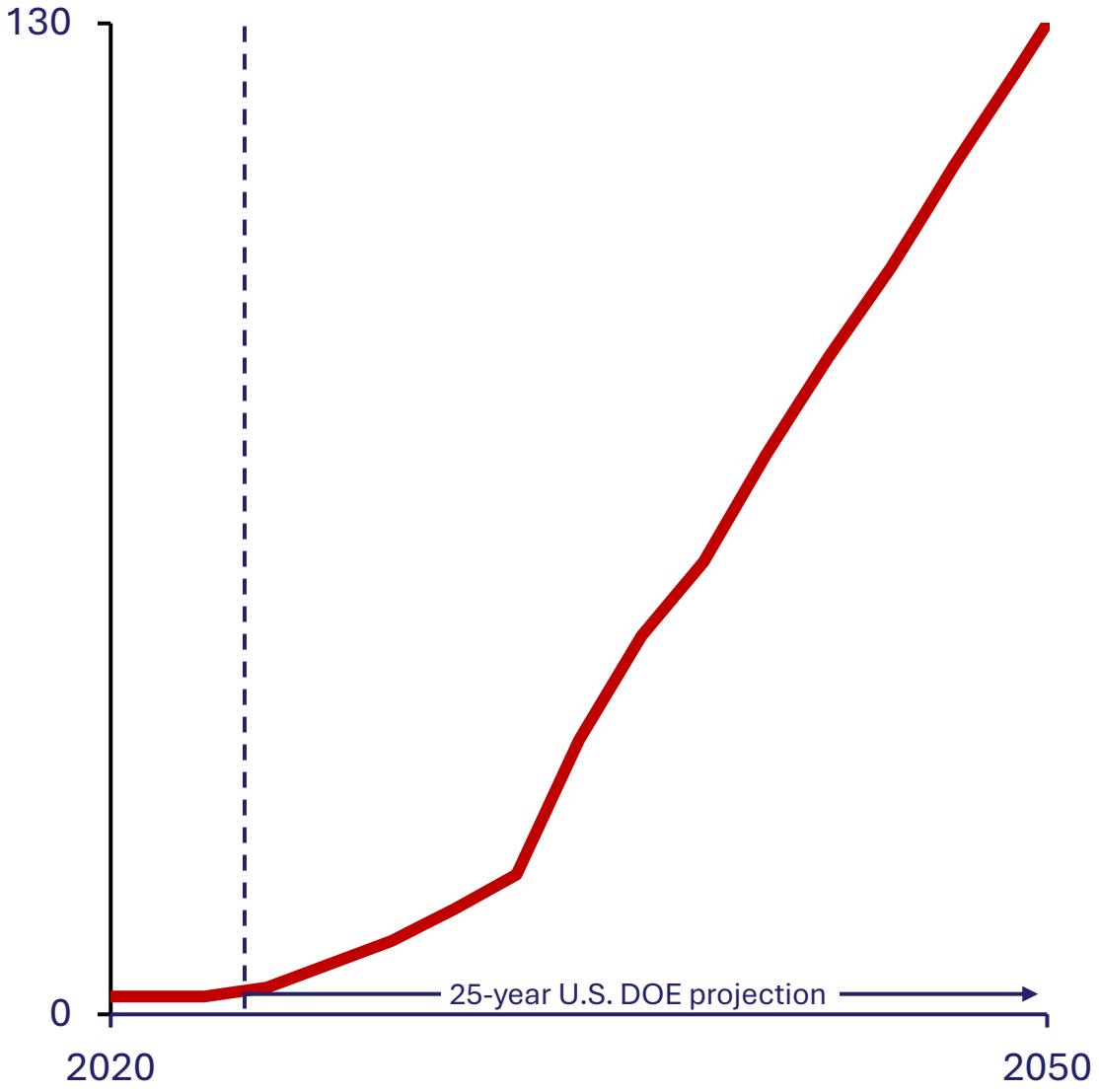
Photo from IFP's website

Photo from Think GEOENERGY's website

U.S. geothermal power: aiming for > 30X growth in 25 years starting from a low base

U.S. DOE geothermal power growth target

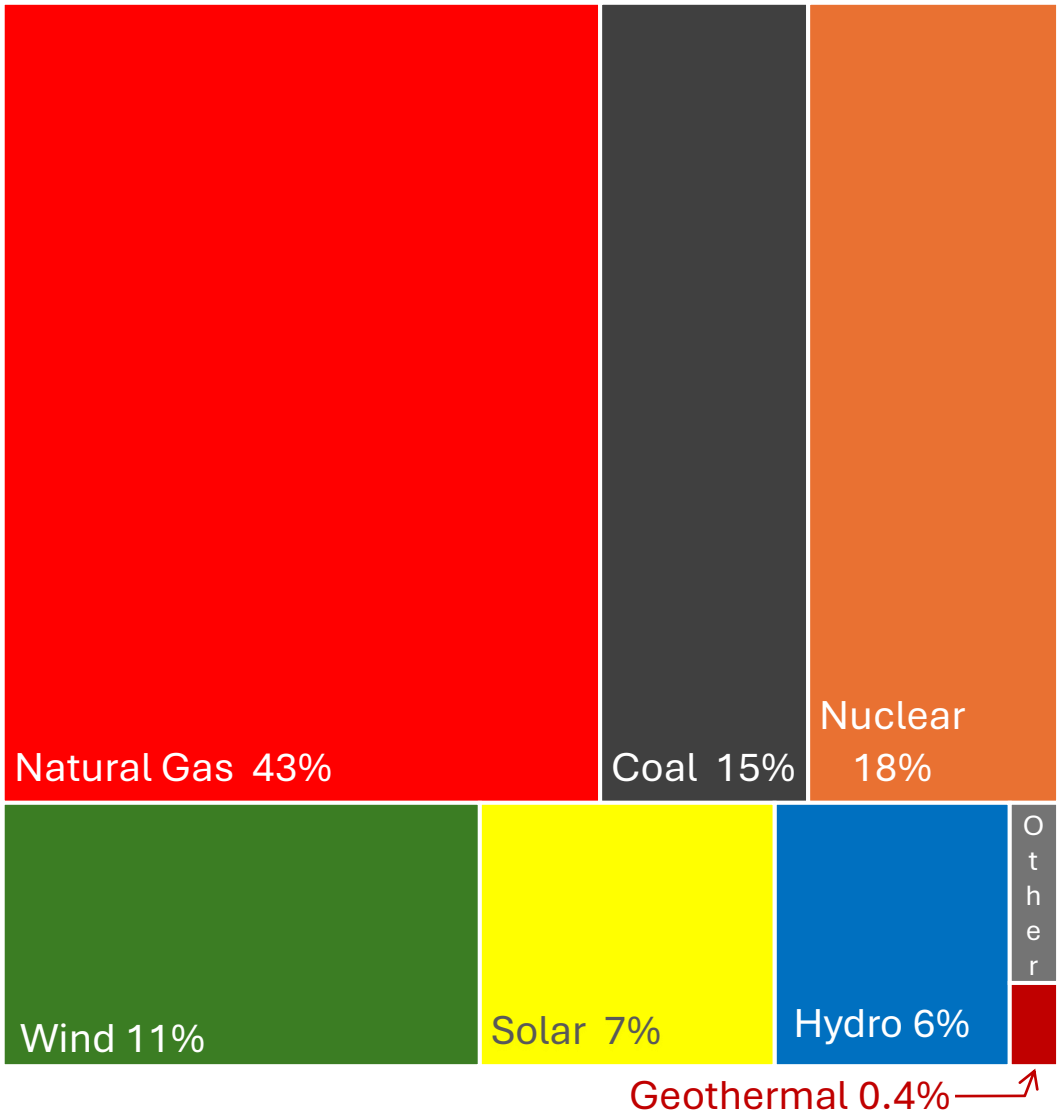
(GWe capacity)



Source: DOE 2024 report *Pathways to Commercial Liftoff: Next-Generation Geothermal Power*

Sources of power generated in the U.S.

(2024)

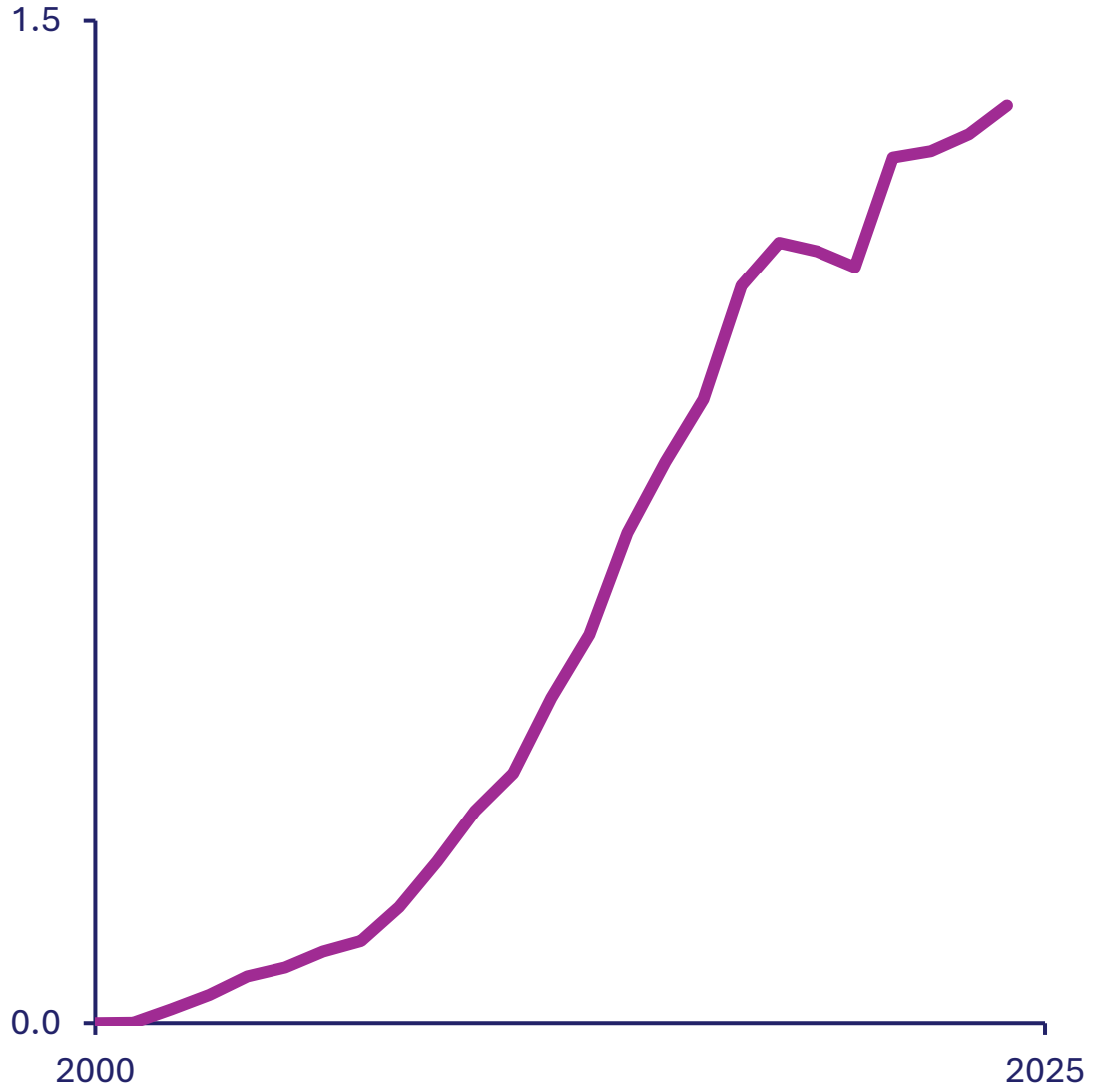


Source: U.S. Energy Information Administration

Examples of dramatic growth from technically challenged oil & gas resources

Canadian SAGD oil sands production

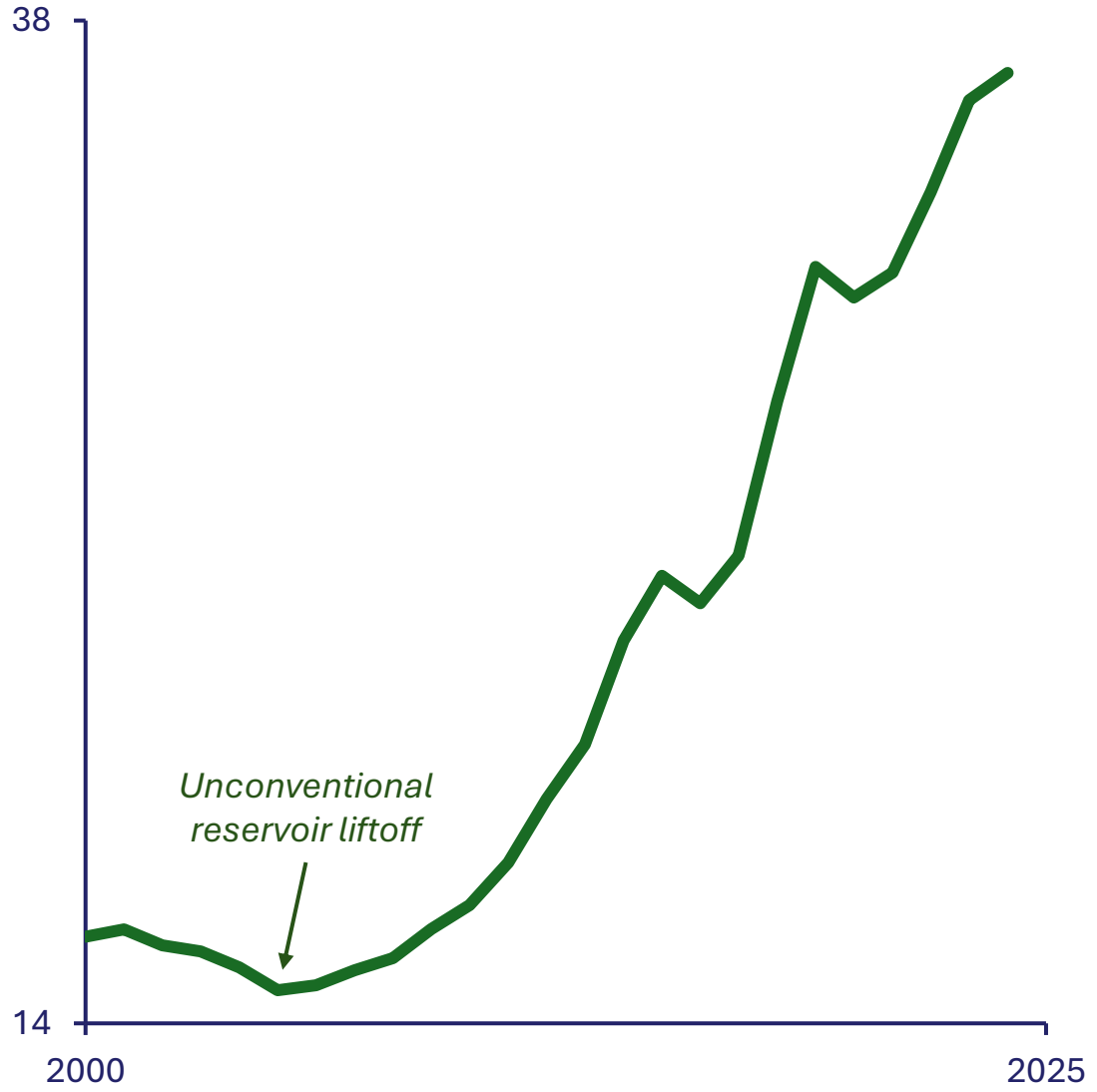
(Million barrels of oil per day)



Source: Alberta Energy Regulator; SAGD = steam assisted gravity drainage

U.S. hydrocarbon production

(Million barrels of oil equivalent per day)



Source: Energy Institute and U.S. Energy Information Administration (EIA)

The unconventional reservoir journey – a story best told in three parts

1976 - 2001

GOVERNMENT WORKS WITH INDUSTRY TO CREATE KNOWLEDGE

2002-2014

INDUSTRY TAKES THE LEAD; HOLDS NEW KNOWLEDGE EXTREMELY TIGHT

2015-present

NEAR-DEATH EXPERIENCE LEADS TO OPEN-SOURCE KNOWLEDGE SHARING

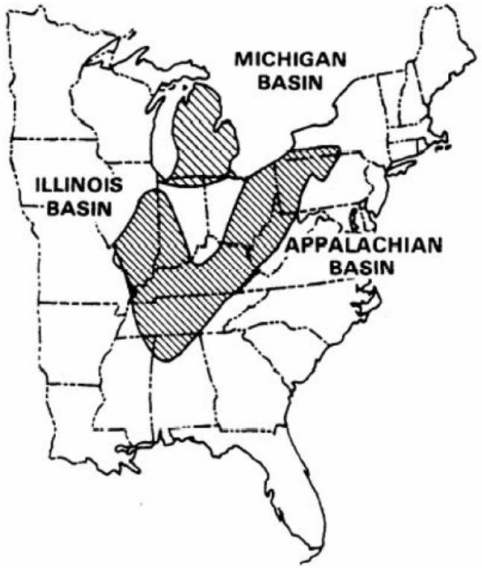
How the Gas Research Institute (GRI) Helped Transform the US Natural Gas Industry

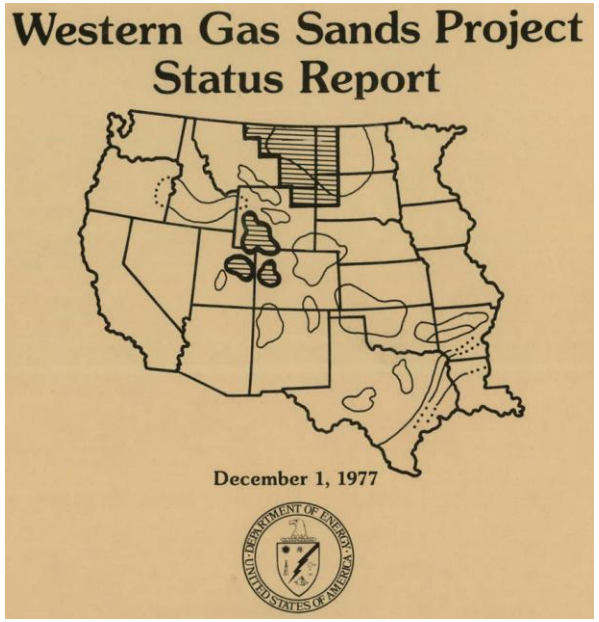
WILLIAM M. BURNETT — *Gas Research Institute, 8600 W. Bryn Mawr Avenue, Chicago, Illinois 60631*

DOMINIC J. MONETTA — *800 25th Street N.W., Washington, DC 20037*

BARRY G. SILVERMAN — *Institute for Artificial Intelligence, George Washington University, Washington, DC 20052*

Eastern Shale Gas Project





Barnett Shale breakthrough kicks off scramble to secure acreage and grow production

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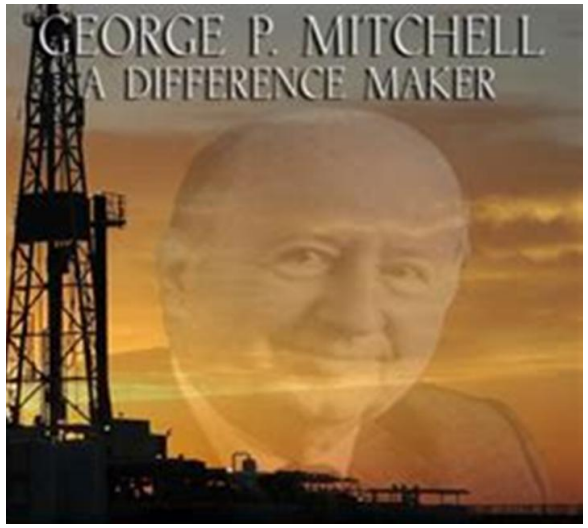

U.S. oil and gas production grows from 15 MMBOE in 2002 to 25 MMBOE at YE 2014

OPEC organizes an oil price collapse to reverse U.S. production growth

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From The Economist

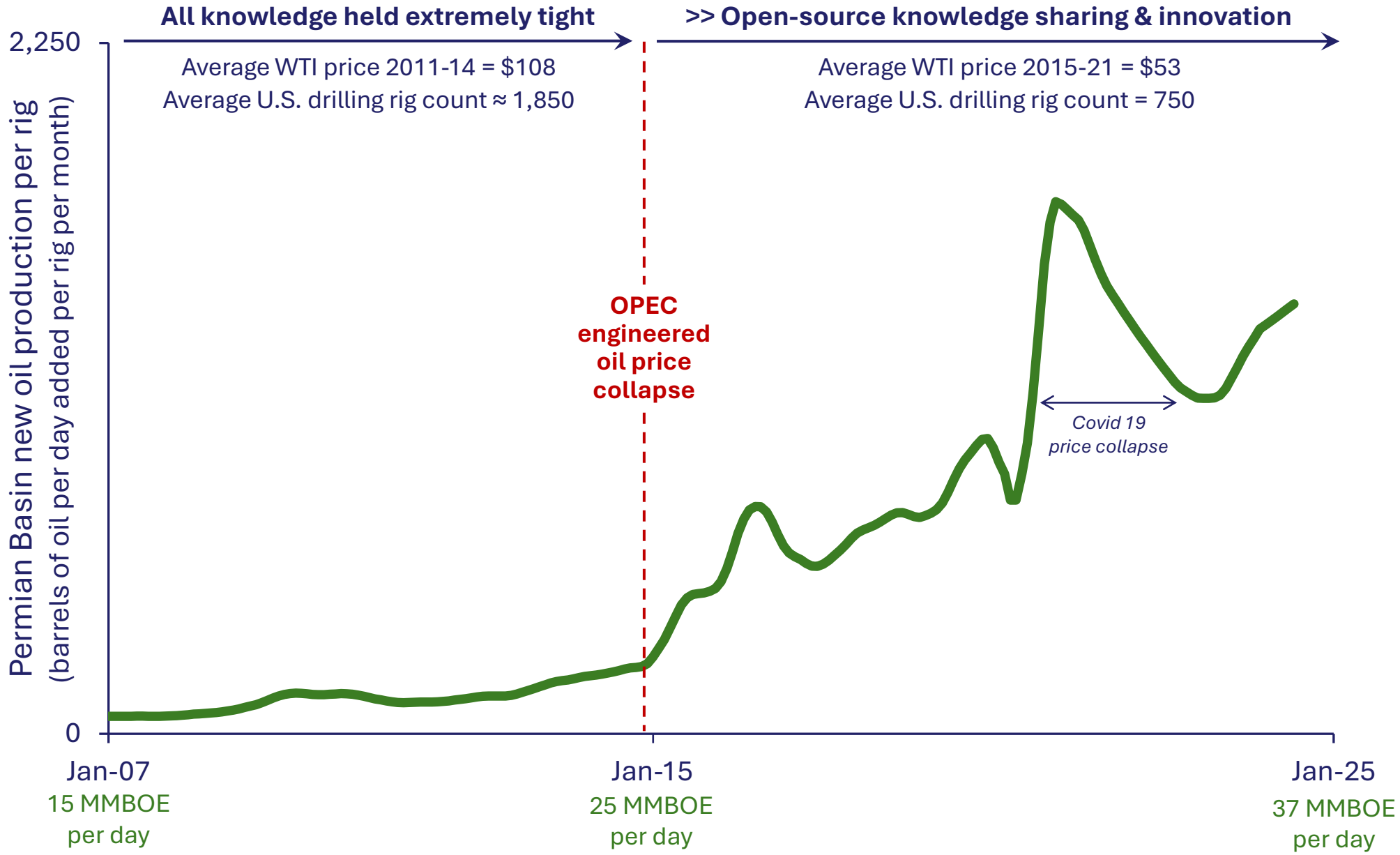
WTI oil price = **$105 per barrel** on July 1, 2014

WTI oil price = **$53 per barrel** on January 2, 2015

WTI oil price = **$26 per barrel** on January 20, 2016

WTI = West Texas Intermediate (which is a heavily traded variety of crude oil)

Near death experience leads to increased innovation and knowledge sharing



Data from U.S. Energy Information Administration (Permian new oil production), Baker Hughes (rig count), and Energy Institute (total U.S. oil output)

Unconventional industry lessons learned from late 2014 price collapse

1. Large established players will take action to protect their market share

2. High-cost producers growing rapidly are imperiled if prices collapse

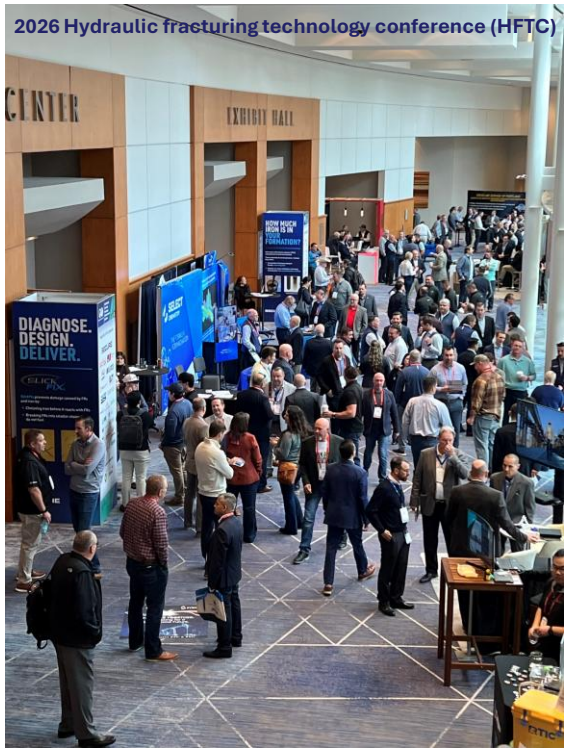
3. Operators should jealously guard knowledge useful for identifying the best acreage

4. **Operators should share knowledge that can reduce development cost and/or increase per well output**

Join forces with peer companies to improve ability to deliver economic outcomes

The sharing of knowledge and technology development costs took many forms

Sharing knowledge



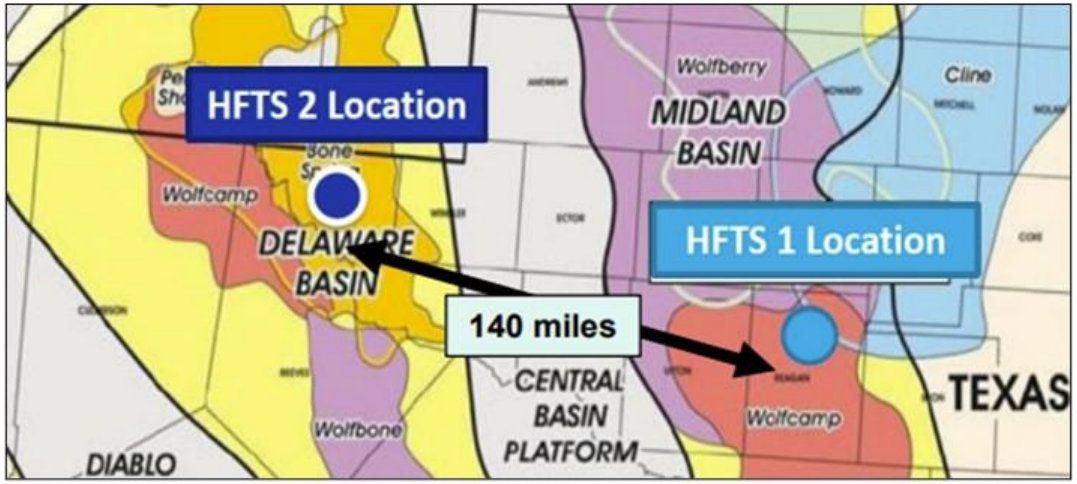
Technology leaders promoting collaboration (e.g., URTeC EAB)

bp, Chevron, CONCHO, ConocoPhillips, devon, HESS, PIONEER NATURAL RESOURCES, saudi aramco, Shell

URTeC EAB = Unconventional resources technology conference executive advisory board

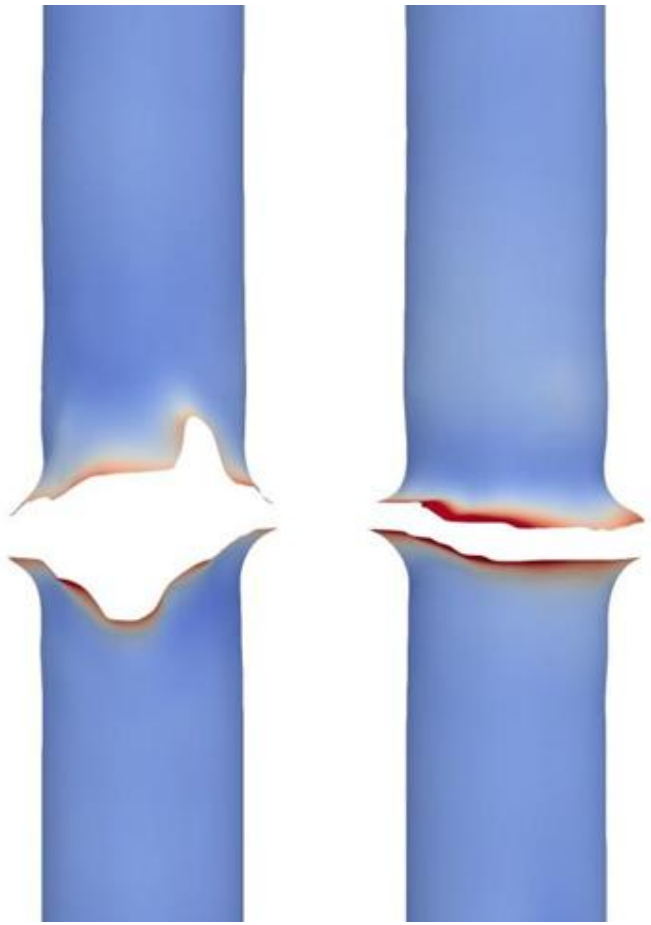
Sharing technology development costs

Permian Basin hydraulic fracturing test sites (HFTS)



Industry "solved" unexpected and underappreciated challenges by working together

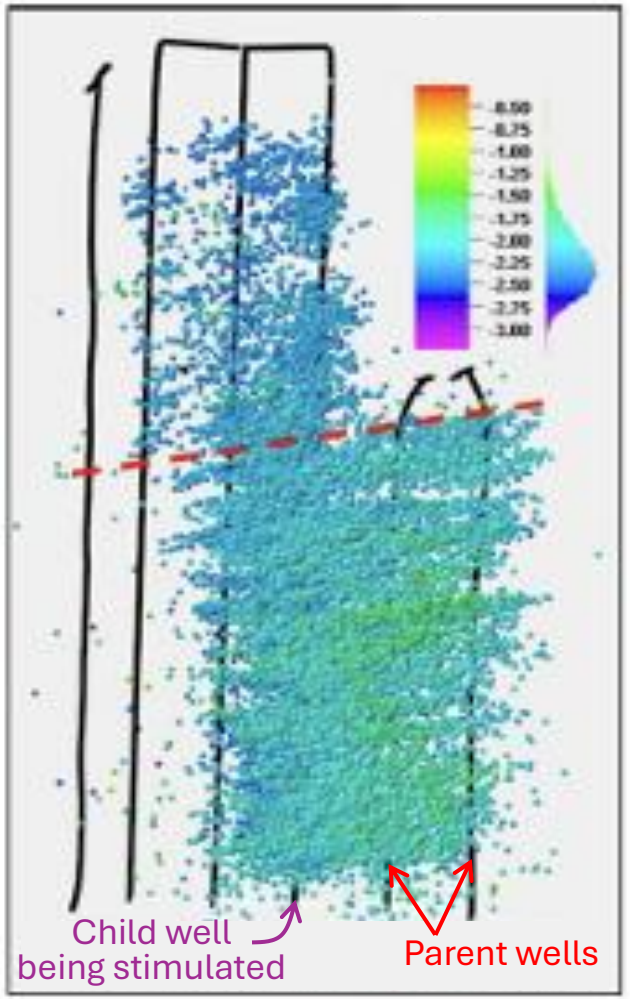
Casing deformation during fracturing



Permian Basin – HFTS 1

Source: GTI Energy Hydraulic Fracturing Test Site 1 (HFTS 1) final report

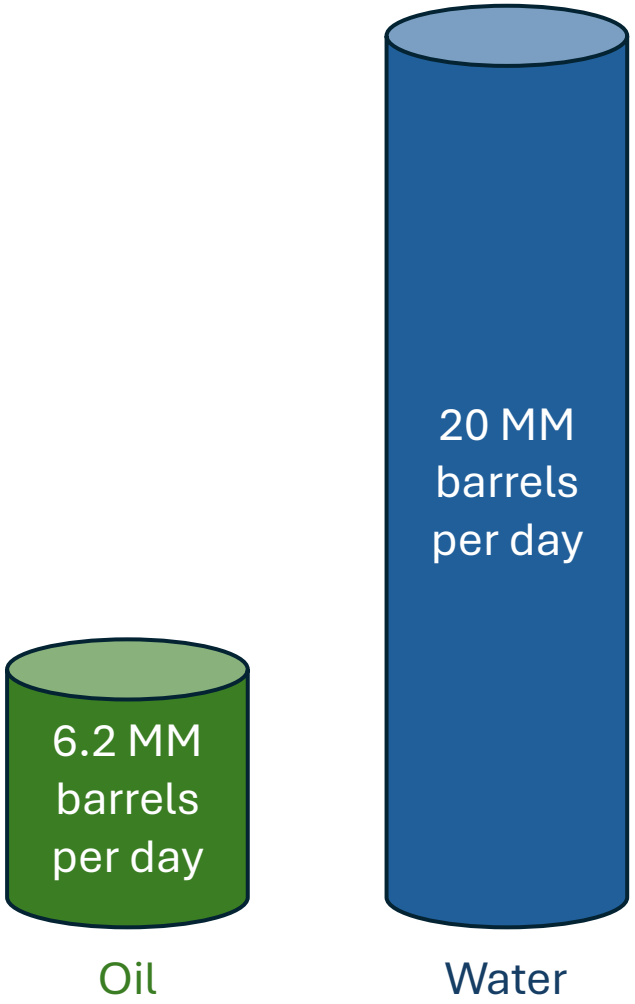
Parent-child production degradation



Permian Basin – HFTS 2

Source: GTI Energy Hydraulic Fracturing Test Site 2 (HFTS 2) final report

Excessive produced water



2025 Permian Basin

Oil production data from U.S. EIA; Water data from James Ritchie, ExxonMobil

Transferable learnings for geothermal power producers

1. Avoid exuberance early on after a technology breakthrough; be on the **lookout for unexpected and underappreciated challenges**

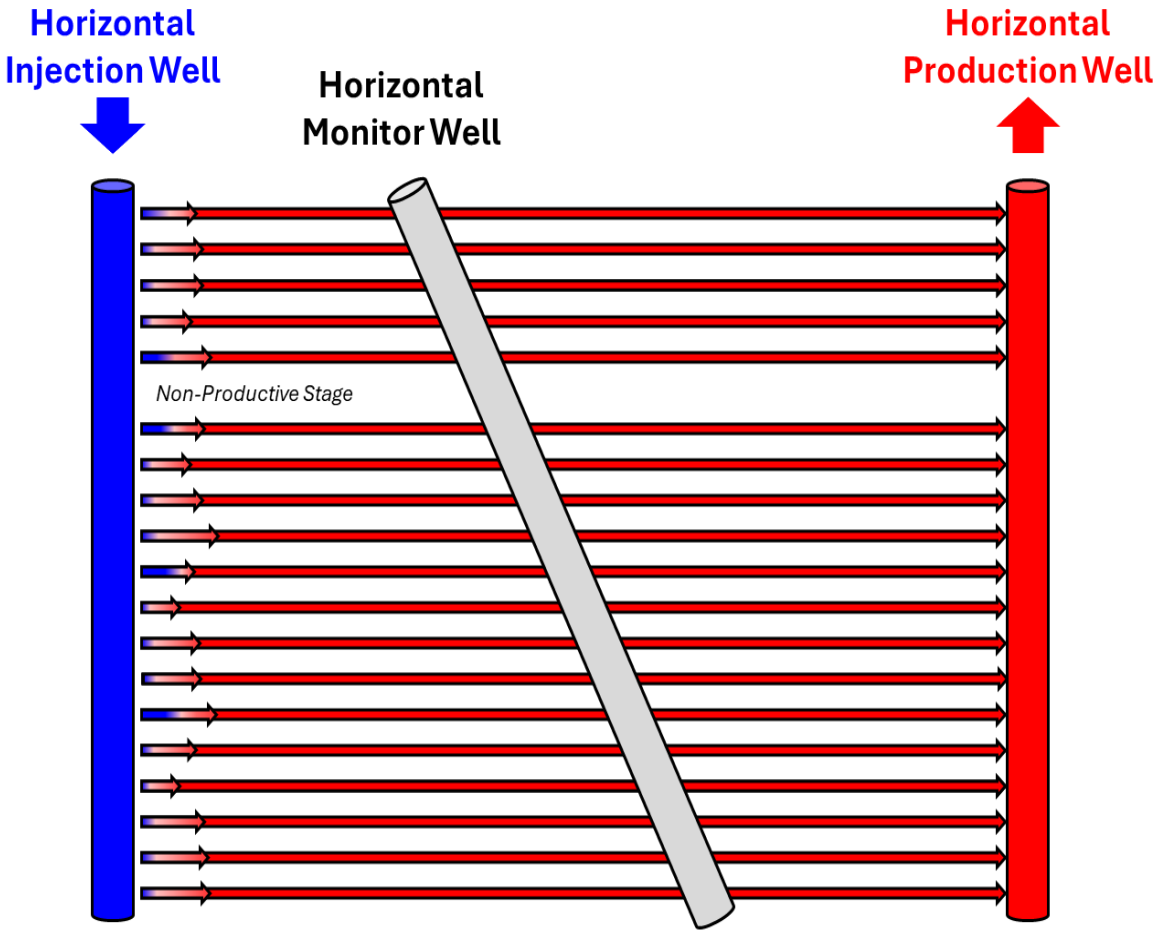
2. Companies that require a high product price to be profitable are at great risk when prices collapse; **focus innovation on reducing cost of supply**

3. **Don’t wait for an existential crisis to share knowledge** useful for reducing development costs and increasing per well output

4. **Industry-led, multi-company field test sites can be highly leveraging**; great way to share cost and develop a network of technical experts

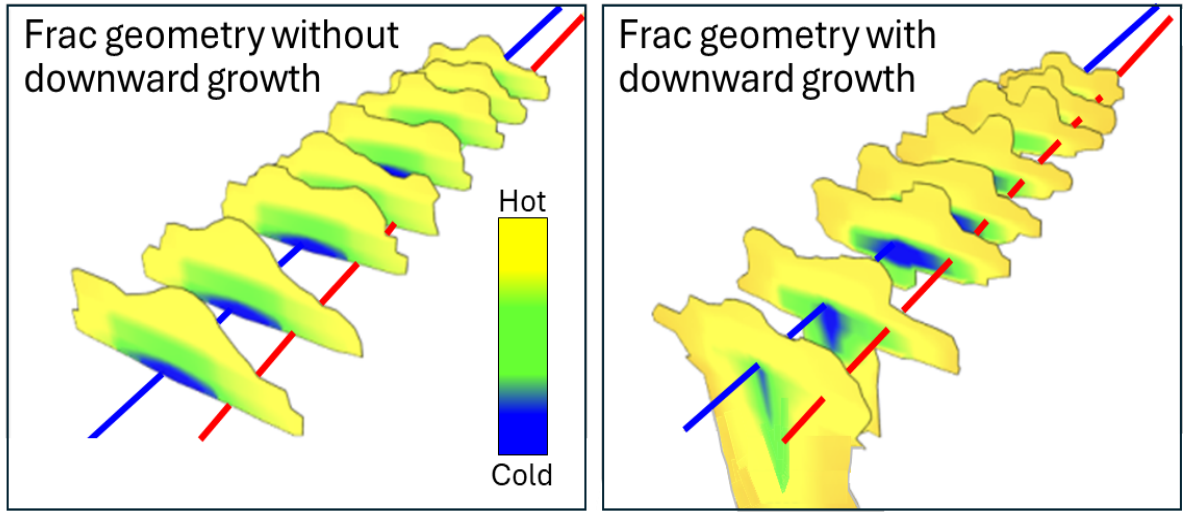
Examples of technical challenges that an EGS HFTS type project could address

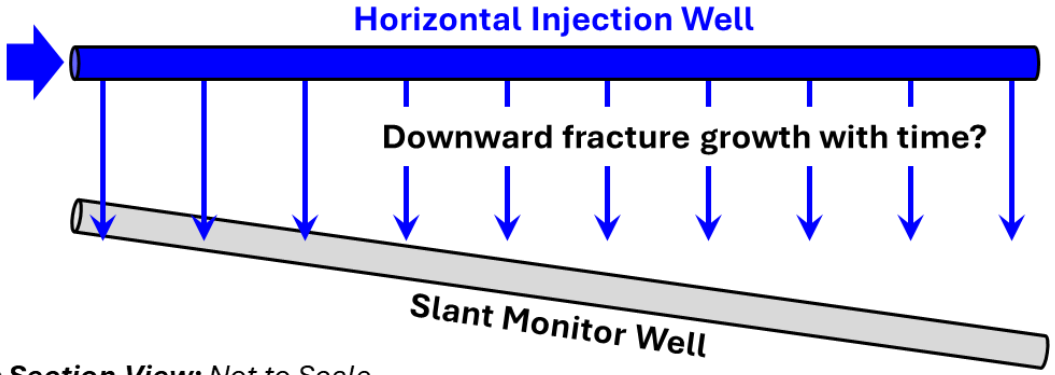
Flow between EGS injectors and producers



Map View *- Not to Scale*

Downward growth of fractures beneath EGS injectors





Cross Section View; *Not to Scale*

Source: Diagrams at top modified after ones copied from ResFrac website

Horizontal hydrothermal wells test site

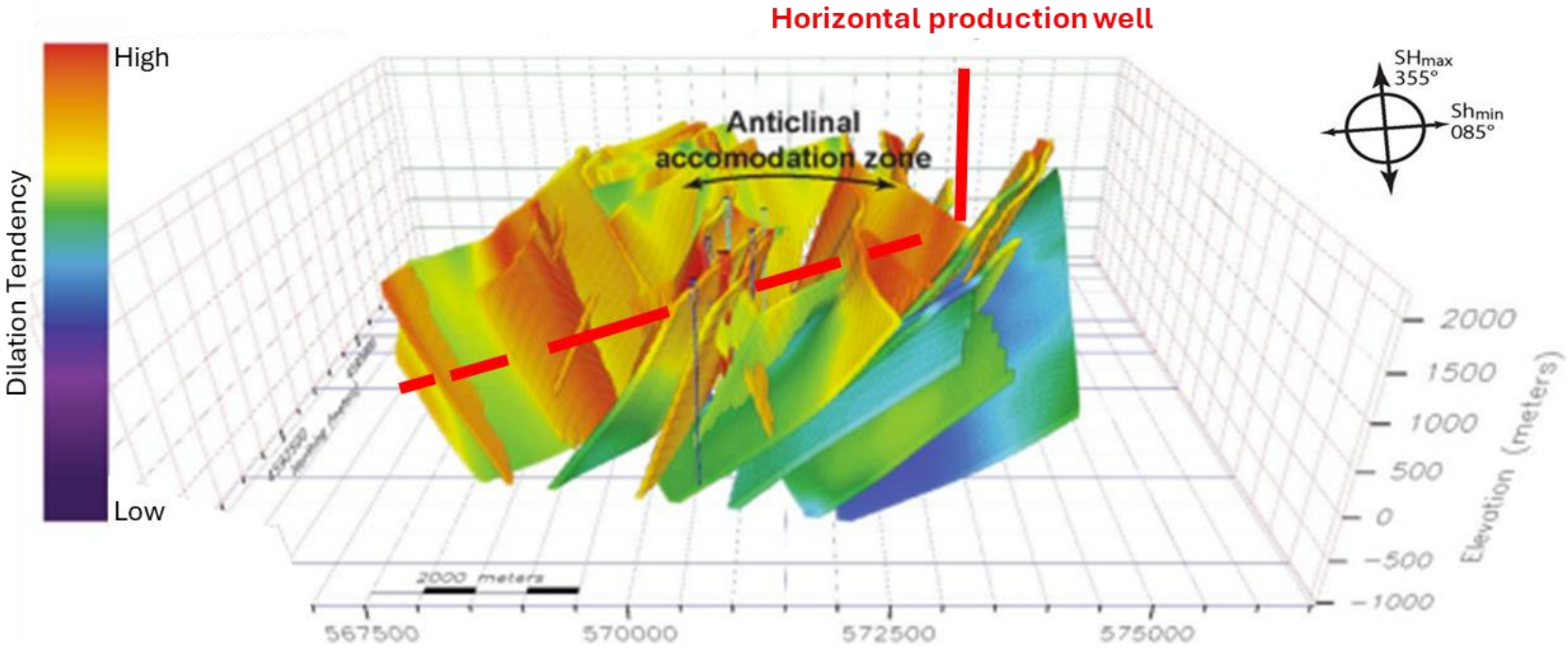


Diagram modified after Siler et al. (2018).

Conclusions and recommendations

1. **For geothermal power producers, one's fiercest competitors are not one's peers**, but rather large, established power producing industries like gas, coal and nuclear

2. While companies should **closely guard acreage acquisition related knowledge**, **development optimization related knowledge should be shared in an open-source manner**

3. Who a company's technical experts know is as important than what they know; **encourage interaction with peer company, academic, and government technical experts**

4. **Don't wait for an existential crisis to start sharing** knowledge and technology development costs; by then it may be too late

STOP BUILDING MOATS – BUILD BRIDGES INSTEAD

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