

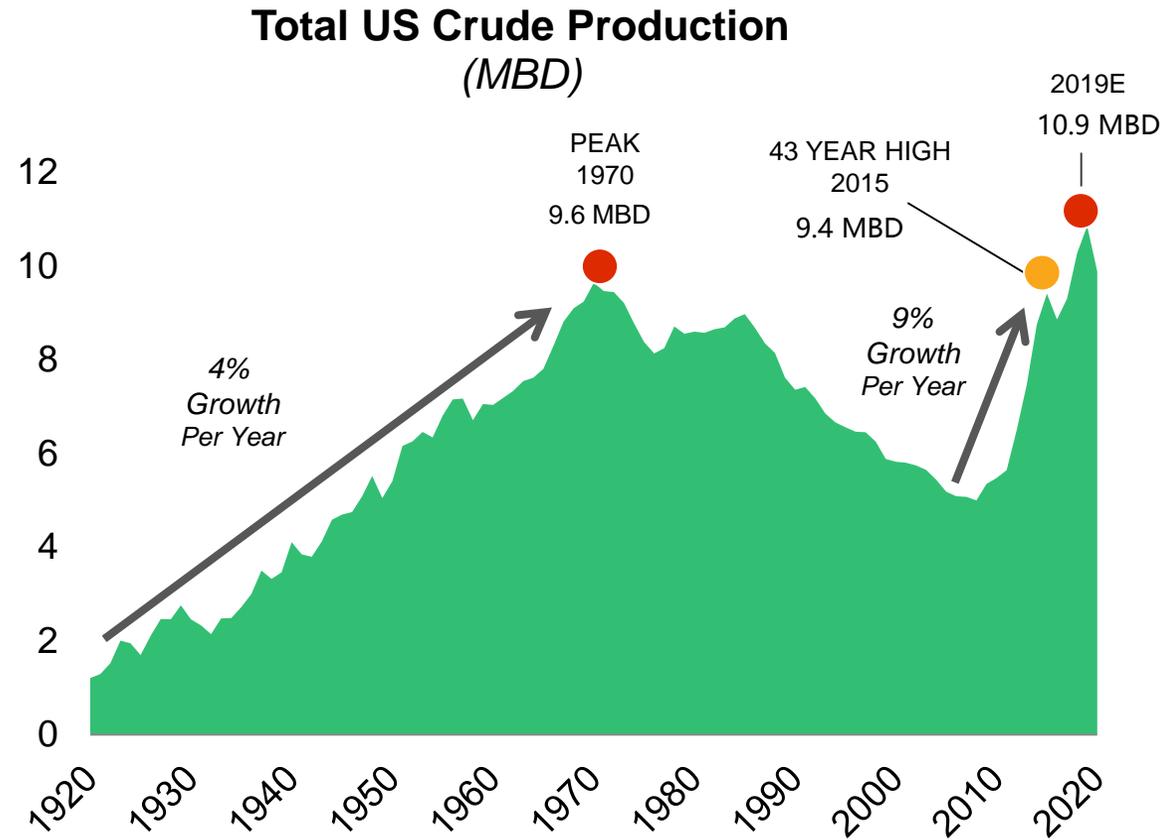
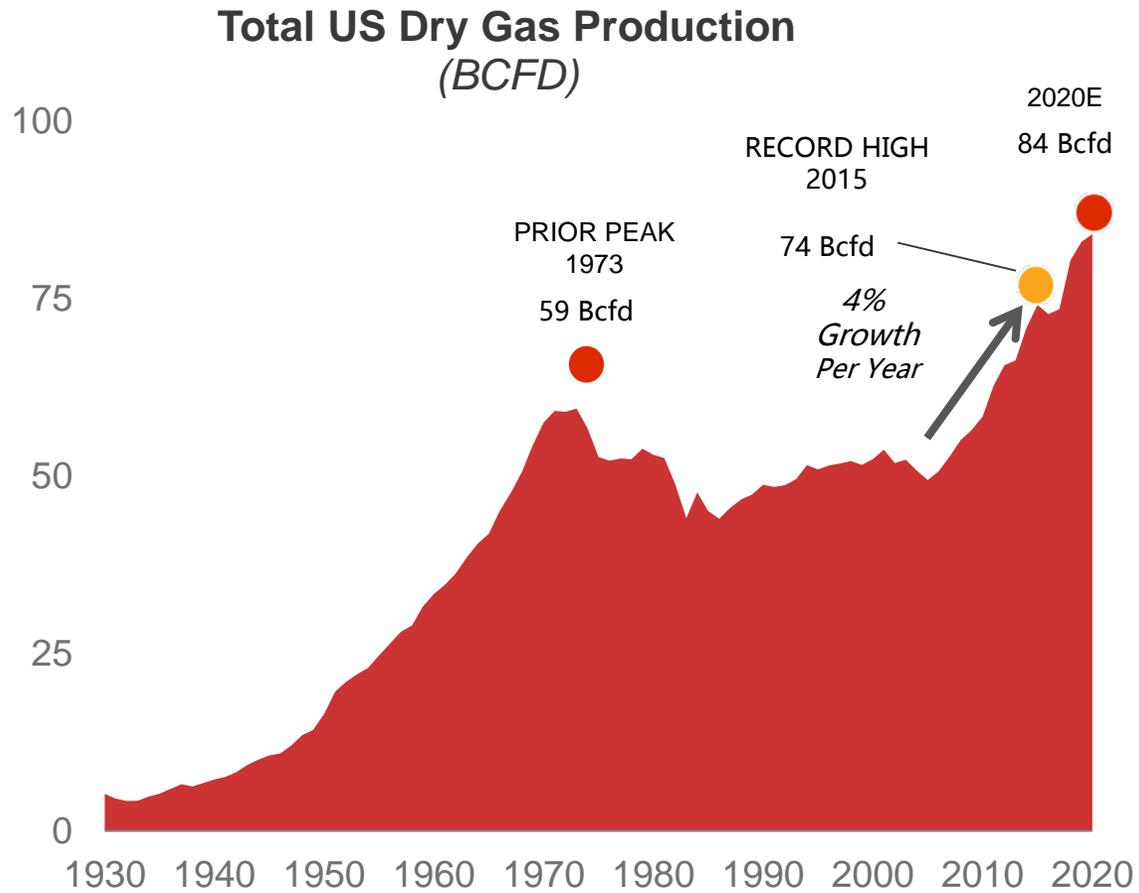
The Road Ahead for Shale Strategy and Innovation

August 8, 2019

Monte Dobson



The Long Road: U.S. Energy Supply

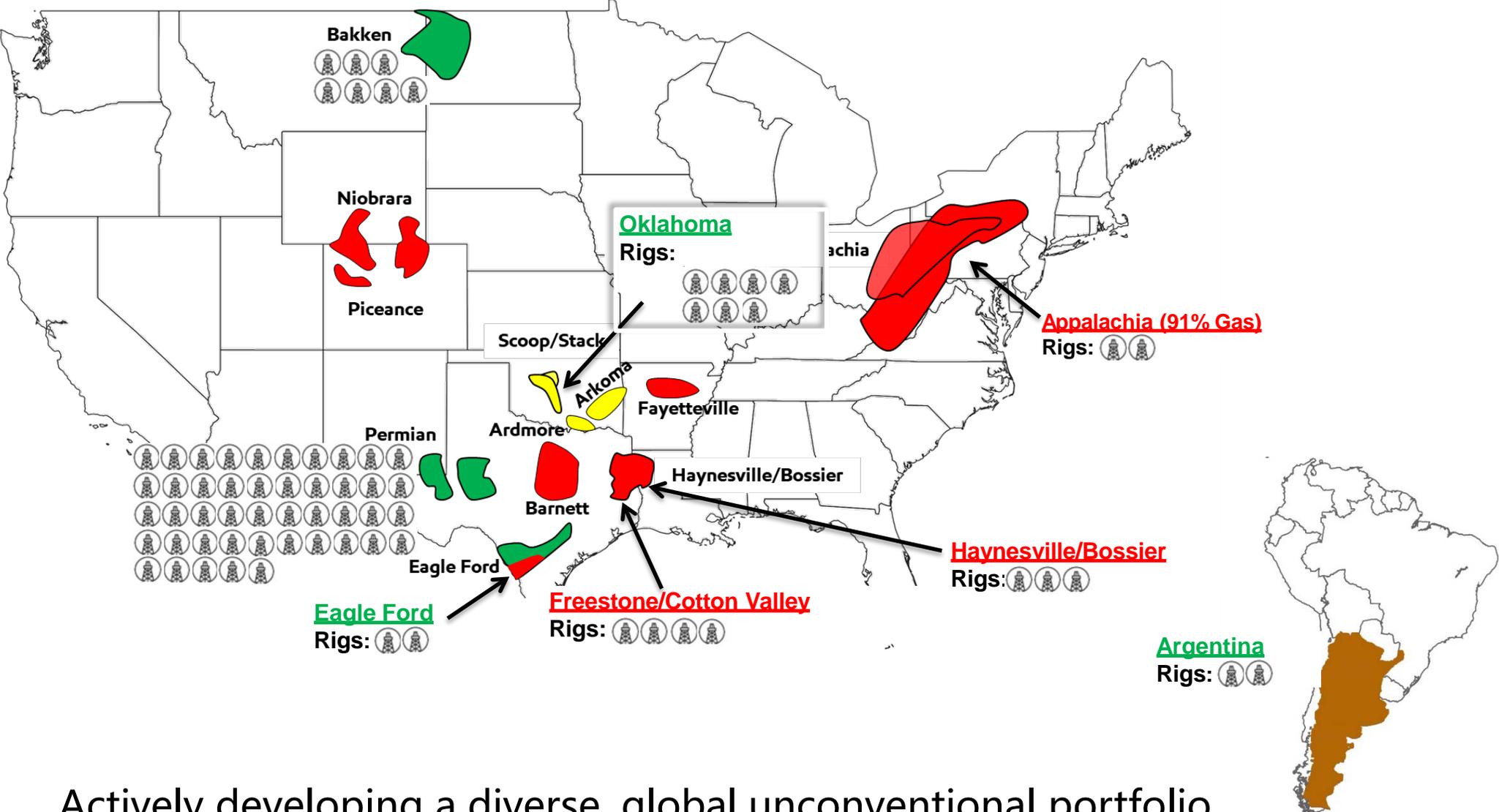


Source: EIA: Annual Energy Outlook 2017 Reference Case, January 2018 STEO

ExxonMobil Global Unconventional Portfolio

Montney/Duvernay

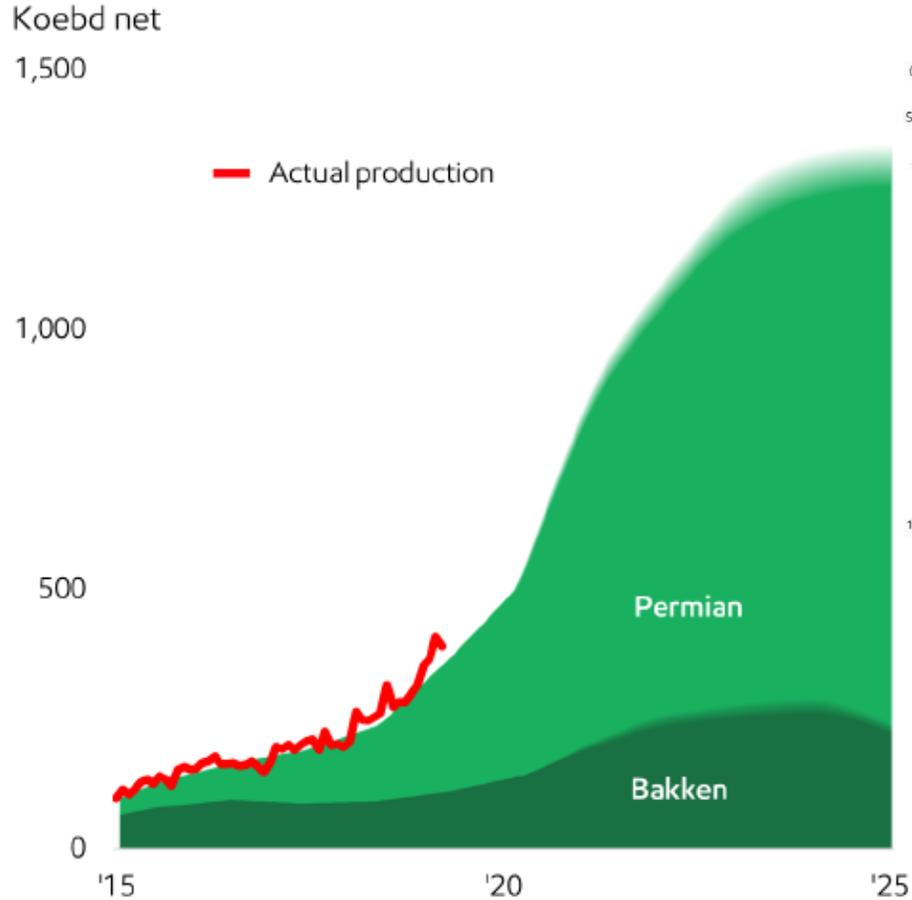
Rigs: 



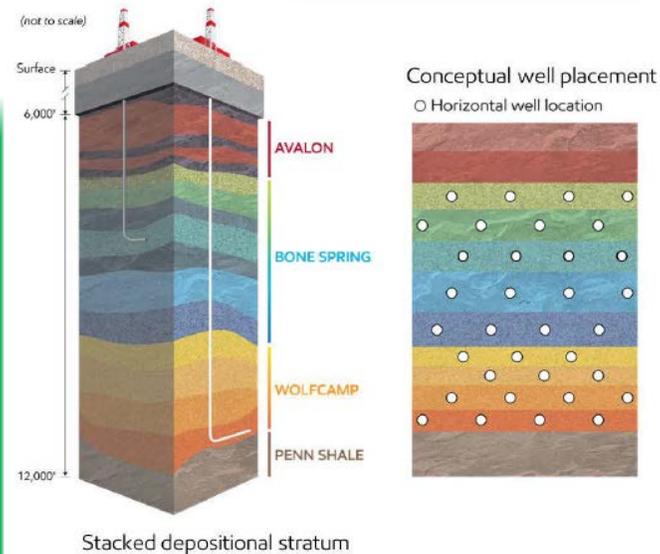
Actively developing a diverse, global unconventional portfolio

Highly Committed to the Permian

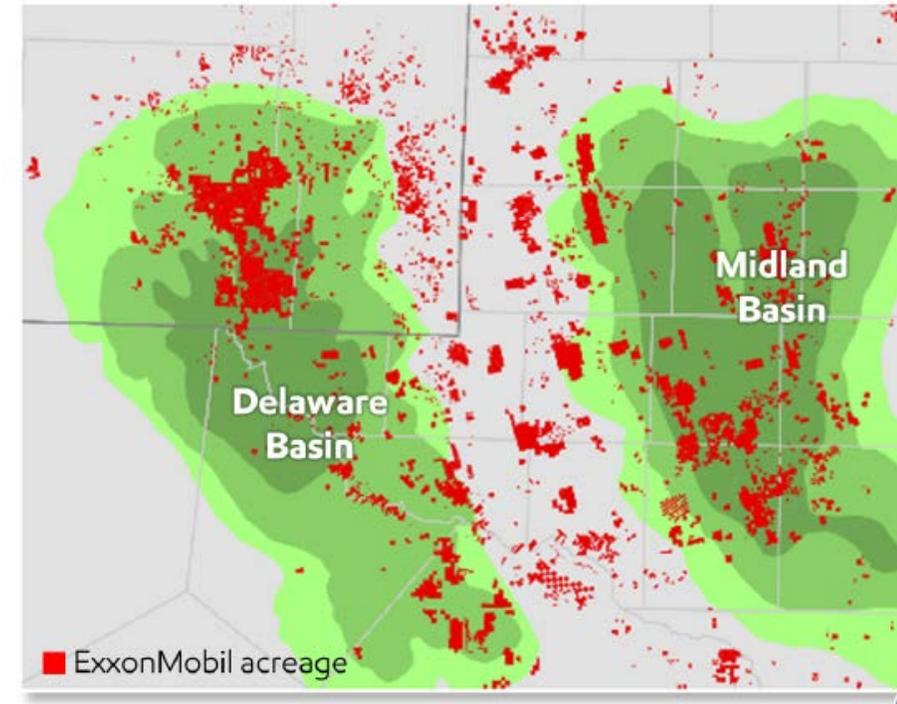
PERMIAN AND BAKKEN PRODUCTION, 2019 OUTLOOK¹



¹ Potential production as communicated at 2019 Investor Day
Permian includes Midland and Delaware basins



HYDROCARBON DENSITY MAP FOR PERMIAN TIGHT OIL

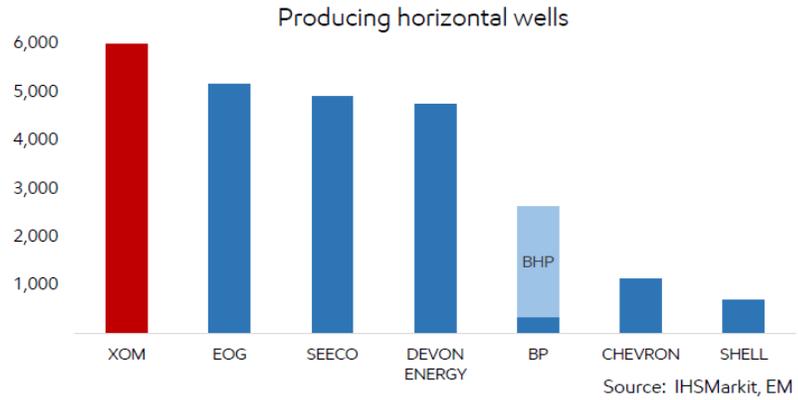


- 10+ BOEB resource base and growing
- Highly-contiguous acreage position enabling unique development plan
- Leveraging full capability of ExxonMobil research organizations to enhance the development

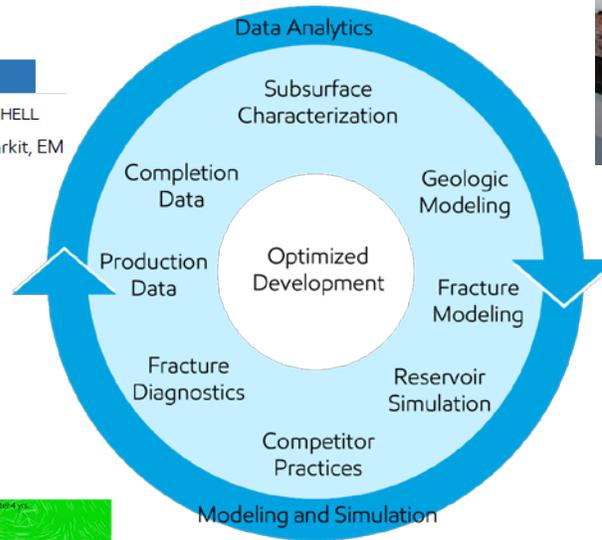
Our Thesis for Winning with Technology

average breadth of unconventional data and experience

Resolve key uncertainties with unique lab tests



Samples for testing conductivity of regional sand



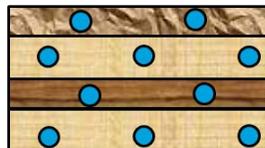
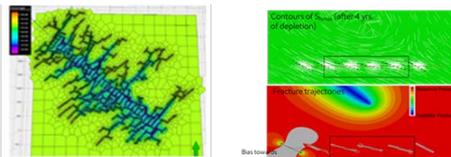
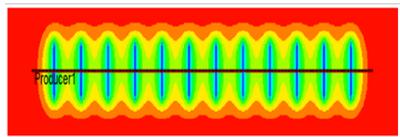
Execute smart and timely field tests



Push the bounds of modeling

Today

Tomorrow?



Making Shale Better: Reducing Methane Emissions



Steady progress toward external commitment

- 80% of high-bleed pneumatic valves replaced (100% by YE19)
- Surveyed over 1.7-million pieces of equipment through voluntary leak detection and repair program
- Jointly testing advanced technologies



THE WALL STREET JOURNAL.

BUSINESS

Exxon Pledges to Cut Methane Emissions 15% by 2020

Plan, which also includes 25% flaring reductions, is latest in effort by oil companies to voluntarily lower releases of the potent greenhouse gas



Exxon Mobil, Chevron help form new methane emissions consortium

Making Shale Better: Water



Maximizing Re-Use of Produced Water



Enabling the Industry to Manage Seismicity

Seismic computing & mapping fault lines

Energy producers working below the earth's crust encounter fault lines, some more active than others. In oil and natural gas production, companies remove, process and then inject water back into the subsurface, possibly creating pressure against those faults. Today, the industry can know where that water goes thanks to a new tool developed by Stanford University's Center for Induced and Triggered Seismicity.



The challenge

Identify and avoid sensitive fault lines within oil and natural gas plays as a way to prevent induced seismic activity.



The goal

Provide industry and regulators a science-based, integrated technology to improve seismic risk assessments by using probabilistic calculations.



The tool

The fault-slip-potential software estimates the probability of fault slips based on geological data and is downloadable without charge.

The user



Energy producers usually operate in environments that are isolated, but they also need data to help reduce the risk of future events. Regulators need to balance stakeholder concerns, while responding to anomalous seismicity.

The data



Operators needed to see a range of possible outcomes, based on data inputs such as stress and hydrology levels, and well locations.

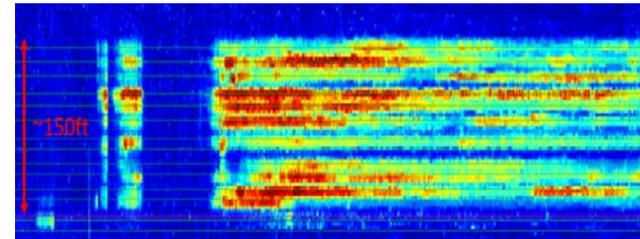
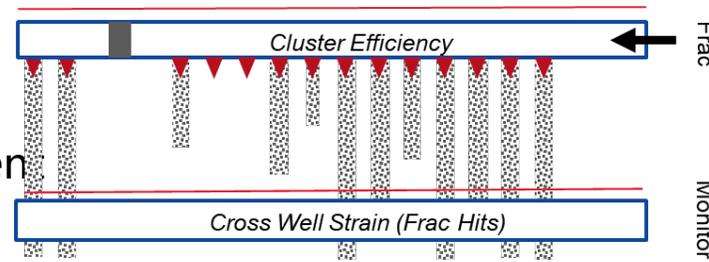
ExxonMobil

Technology Lever: imaging fractures in the subsurface

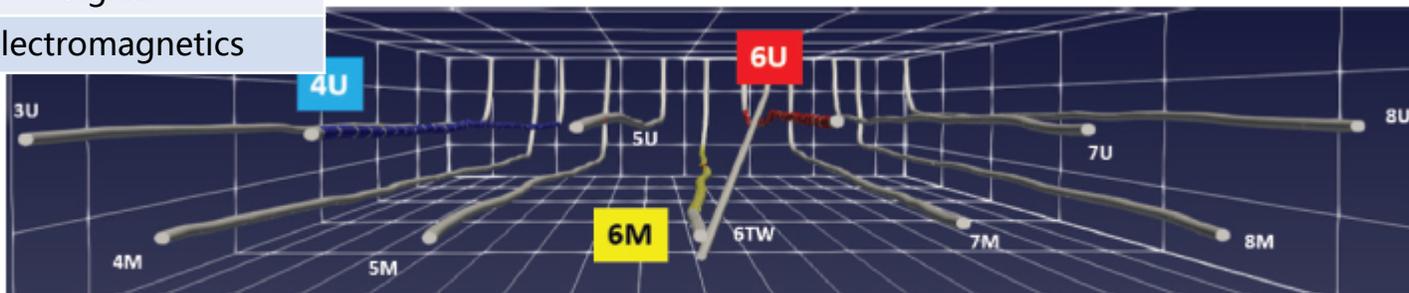
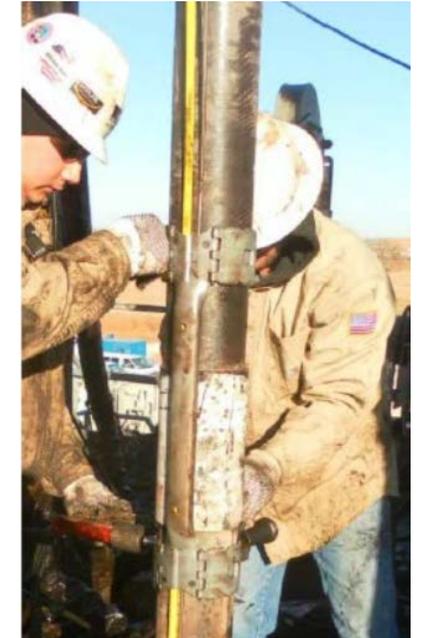
Why does this matter?

- Optimizing well spacing is key driver of profitability
- Most spacing errors emerge slowly in production data
- Modeling can accelerate answers, but heavily dependent on assumed geometry of fractures

Frac Diagnostic Technologies
Core-back wells
Fiber Optics (DAS,DTS)
Microseismic
Production Geochemistry
Image Logs
Analysis of Pressure Signals
Electromagnetics



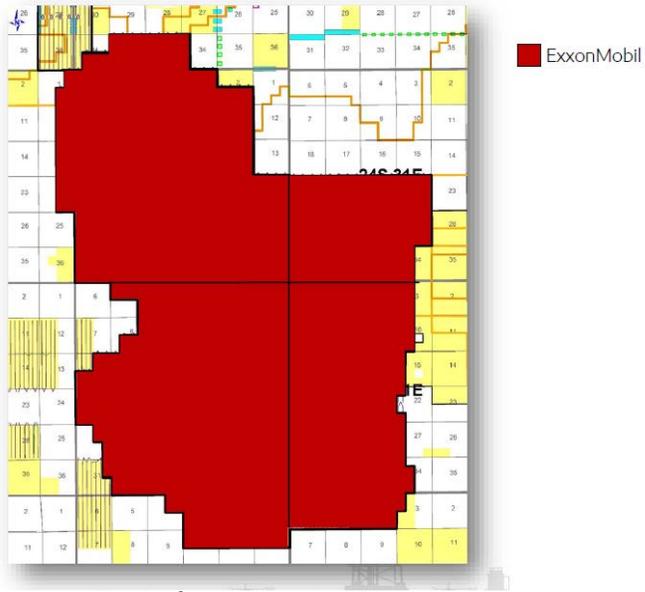
Cluster Efficiency (DAS)



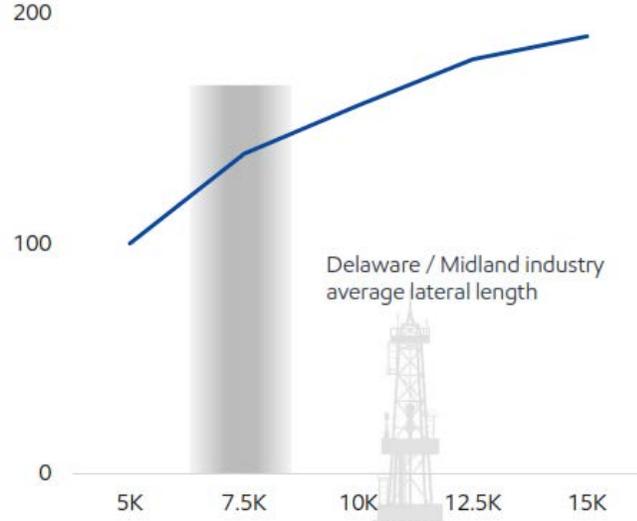
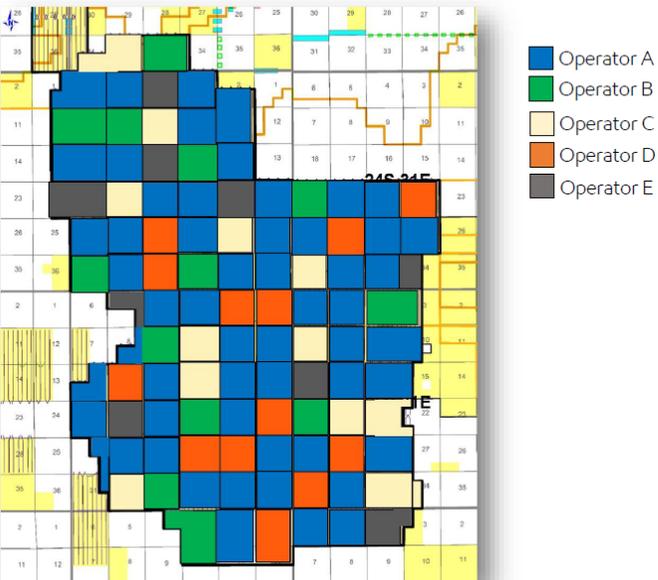
At the heart of the Hydraulic Fracturing Test Site was a test well (6TW) used to collect about 450 ft of fractured rock from near an upper Wolfcamp well (6U) and 150 ft of core from a middle Wolfcamp well (6M). Proppant tracer was pumped while the three highlighted wells were fractured. *Source: URTeC 2902960.*

Technology Lever: maintaining constant recovery per foot in long lat

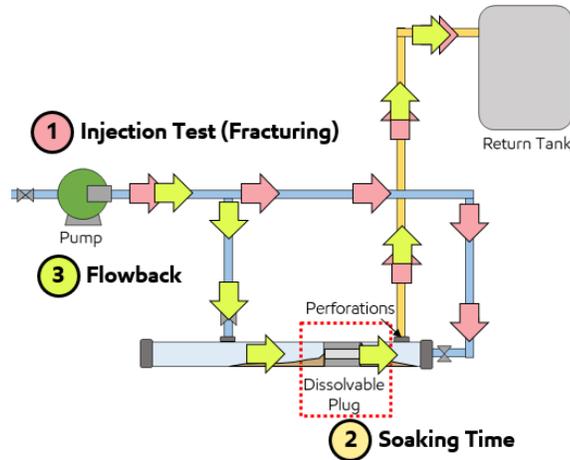
Differentiated Acreage Position



Typical acreage position



Increased Value in Success Case



Flow Loop for Sand Plug Evaluation



Coiled Tubing Tractor



Bakken Coil Connector Achieving 25,500-ft reach

Conclusions

- Shale has been transformational for our industry, providing tremendous benefits to society
- The Permian is a transformational asset, with incredible potential and a richer set of technical challenges
- EM is actively operating a broad, global portfolio of unconventional assets
- We are actively developing technology to address sustainability challenges and to increase profitability