The Road Ahead for Shale Strategy and Innovation

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The Long Road: U.S. Energy Supply

**Total US Dry Gas Production (BCFD)**
- Prior Peak 1973: 59 Bcfd
- Record High 2015: 74 Bcfd
- 4% Growth Per Year
- 2020E: 84 Bcfd

**Total US Crude Production (MBD)**
- Peak 1970: 9.6 MBD
- 43 Year High 2015: 9.4 MBD
- 9% Growth Per Year
- 2019E: 10.9 MBD

Source: EIA: Annual Energy Outlook 2017 Reference Case, January 2018 STEO
Actively developing a diverse, global unconventional portfolio
Highly Committed to the Permian

- 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

PERMIAN AND BAKKEN PRODUCTION, 2019 OUTLOOK

Koebd net
1,500

Peruian
Bakken

Actual production

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

HYDROCARBON DENSITY MAP FOR PERMIAN TIGHT OIL

Midland Basin
Delaware Basin

ExxonMobil acreage
Our Thesis for Winning with Technology

Average breadth of unconventional data and experience

Resolve key uncertainties with unique lab tests

Push the bounds of modeling

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Today

Tomorrow?

Execute smart and timely field tests

Samples for testing conductivity of regional sand
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

Exxon Mobil, Chevron help form new methane emissions consortium

EDF
EXXONMOBIL
NCAR
TENXAS
COLORADO STATE UNIVERSITY
OGC
API
THE WALL STREET JOURNAL

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

HOUSTON CHRONICLE
Making Shale Better: Water

Maximizing Re-Use of Produced Water

Enabling the Industry to Manage Seismicity

Seismic computing & mapping fault lines

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

The tool
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 need 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

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 lateral flow lines.

Differentiated 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