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Sustainable asset portfolio of E&P Companies

Some aspects of more efficient oil & gas field development planning

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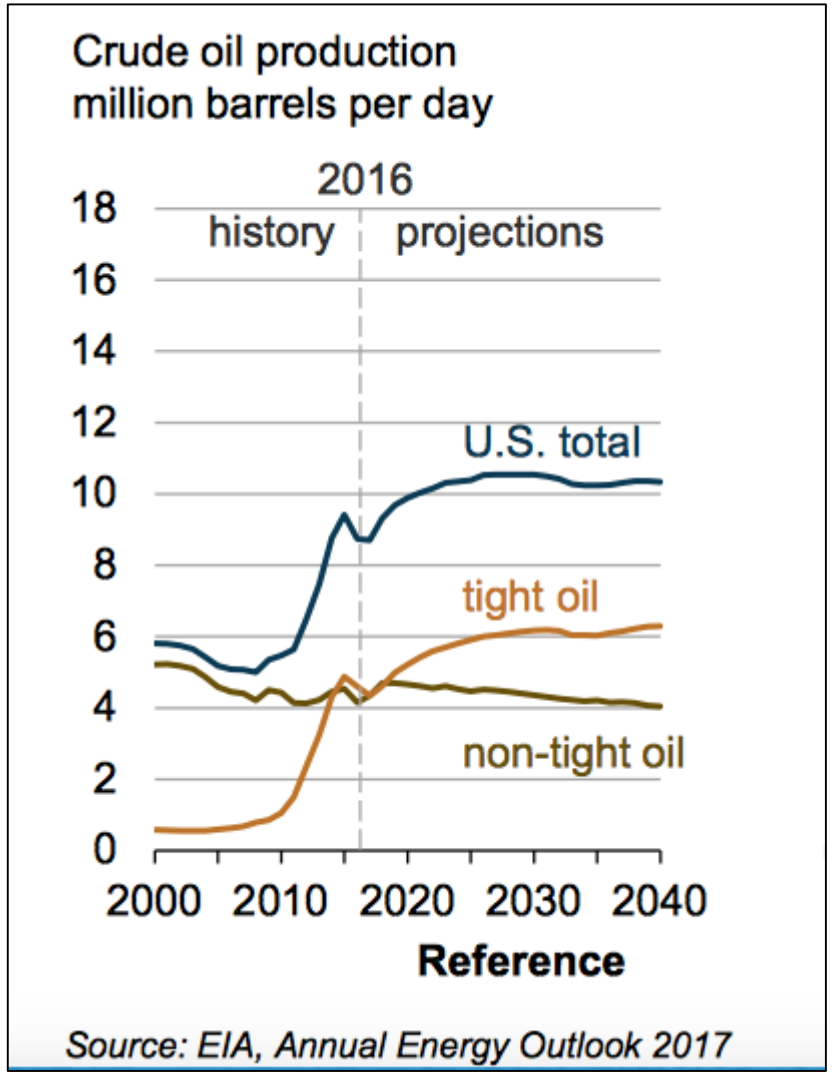
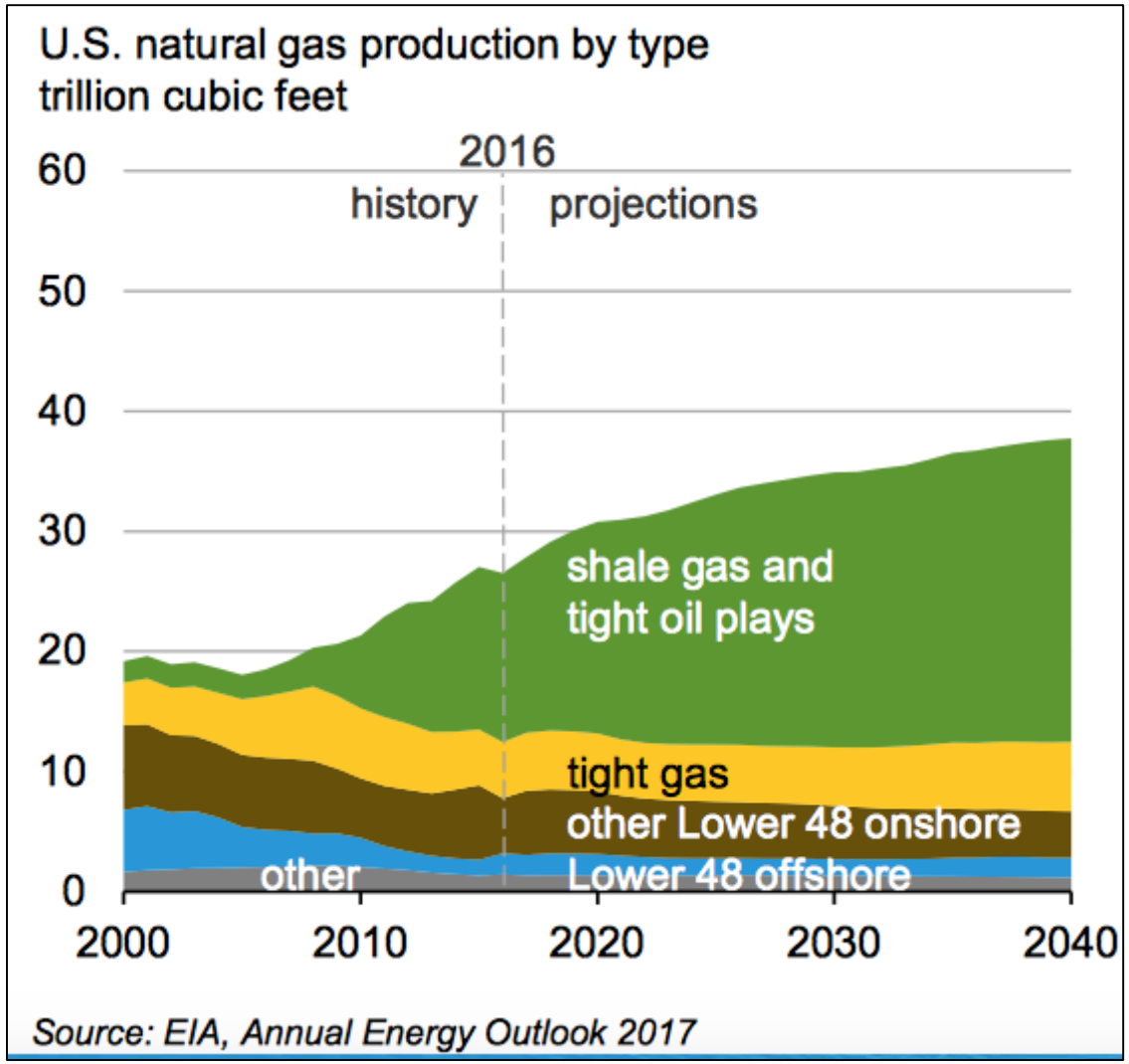
Agenda

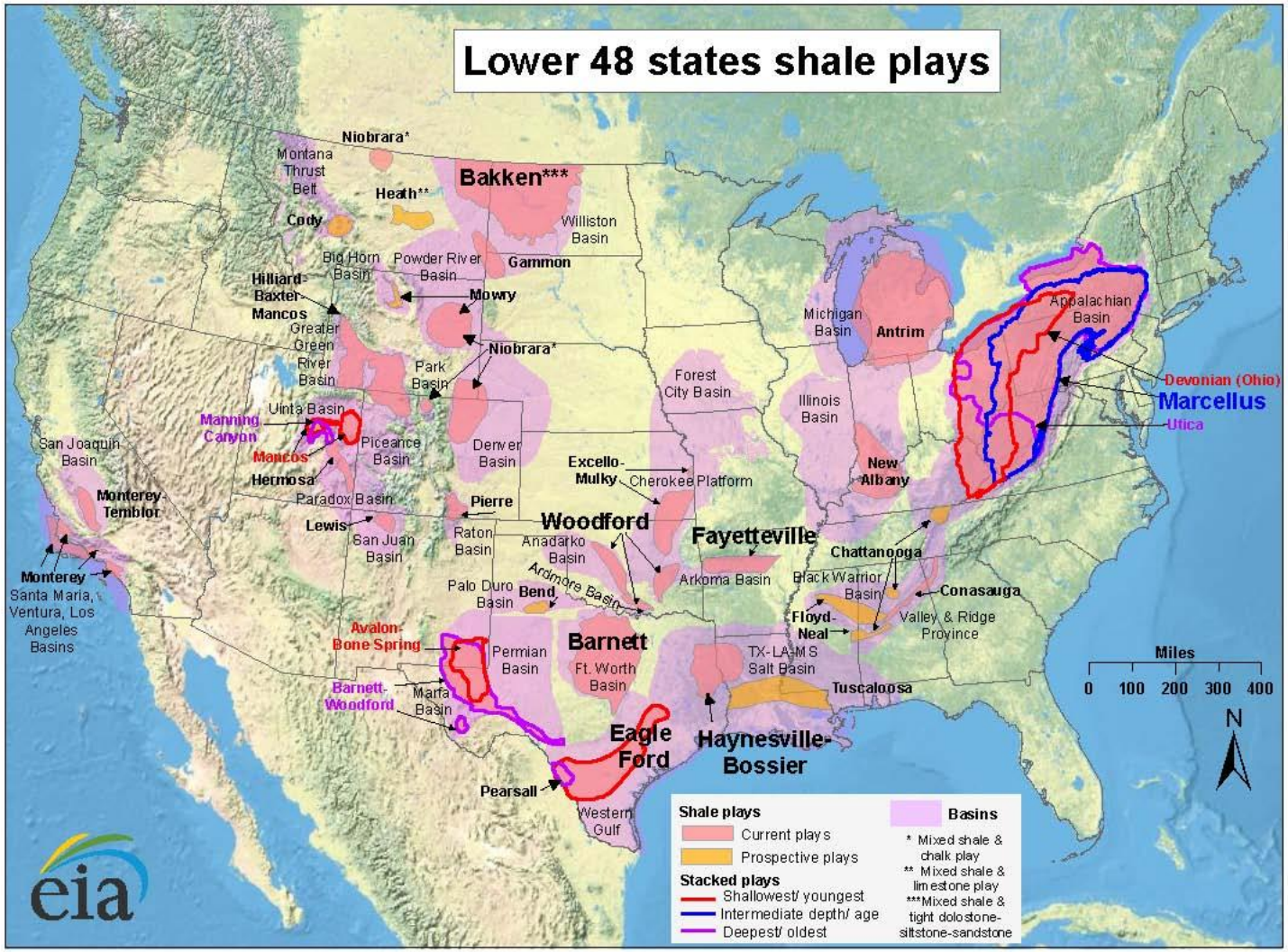
- Discuss economic, & technical aspects of developing conventional vs unconventional projects
- Why oil firms should take on some conventional projects rather than only unconventional opportunities
- Discuss an example of a conventional deep-water project vs. an unconventional play development
  - SNE: Capital efficiencies and resource assessment approach that allowed co-ventures to proceed to FID
  - Permian: approach to identify sweet spots and enabling technologies to reduce overall development cost
- Summary

UNCONVENTIONAL RESOURCES IS EXPECTED TO DOMINATE U.S. LIQUIDS & GAS PRODUCTION INTO 2040





UNCONVENTIONAL PLAYS AND SEDIMENTARY BASINS



Source: Energy Information Administration based on data from various published studies.
Updated: May 9, 2011

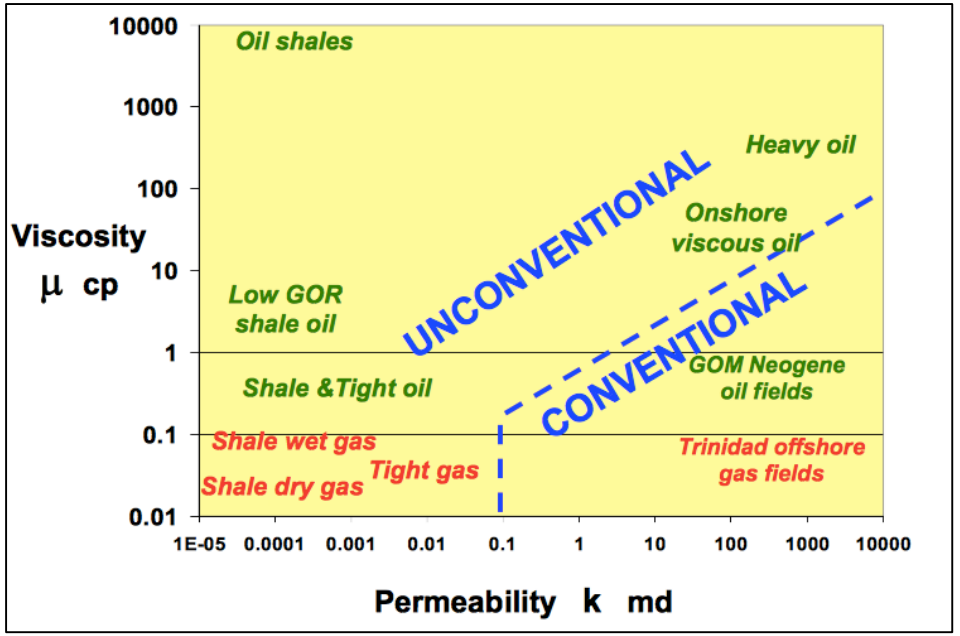
- We know were they are
- Perception of no risks
- We just need to develop them profitable.

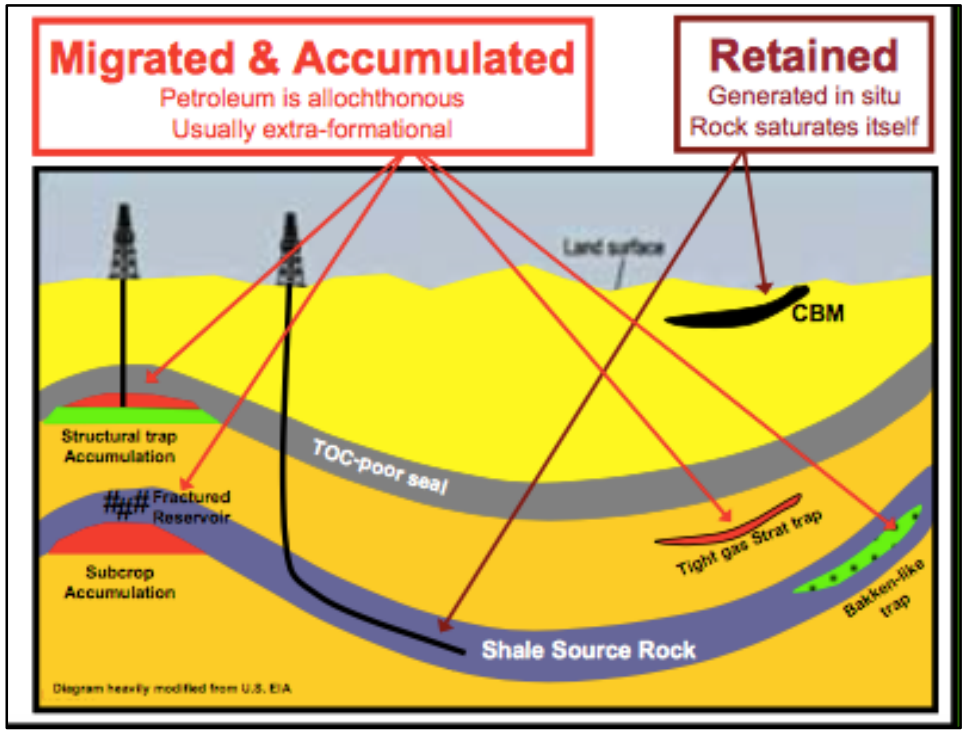
UNCONVENTIONAL RESOURCES DEFINITION

Conventional and Unconventional Plays do not have different petroleum system rules:

- Field movement is governed by buoyancy, capillary pressure and hydrodynamics
- Petroleum is either retained in source rocks (shale and coal) via absorption and adsorption or migrated and accumulated in structural, stratigraphic and, diagenetic traps.

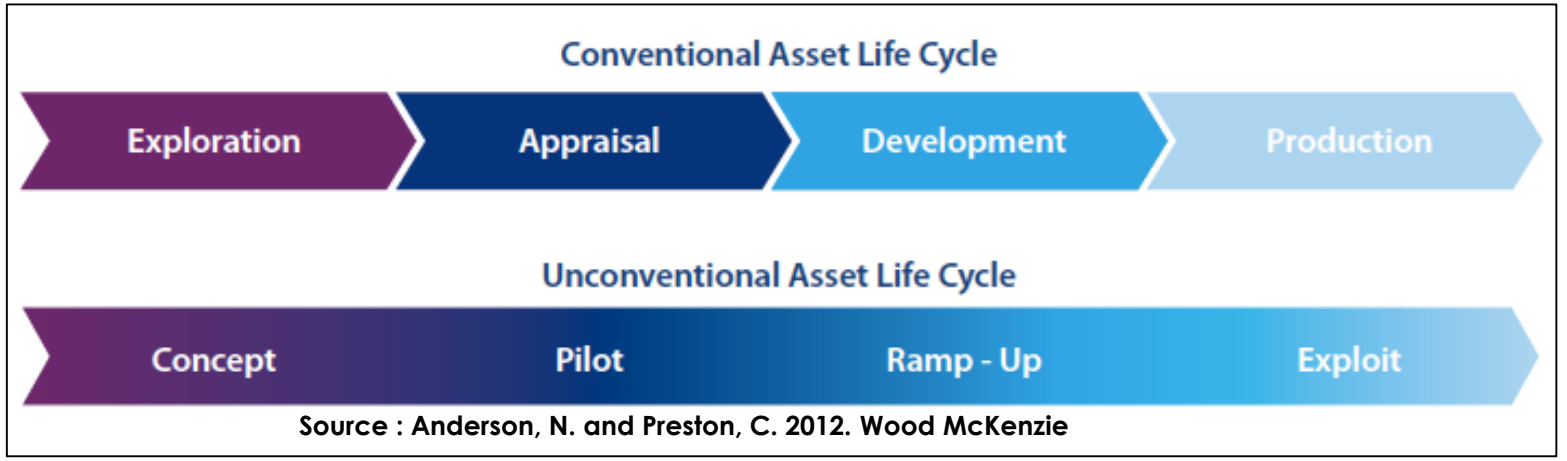
In unconventional resources, technology is required to increase k and/or decrease viscosity to achieve commercial flow rates



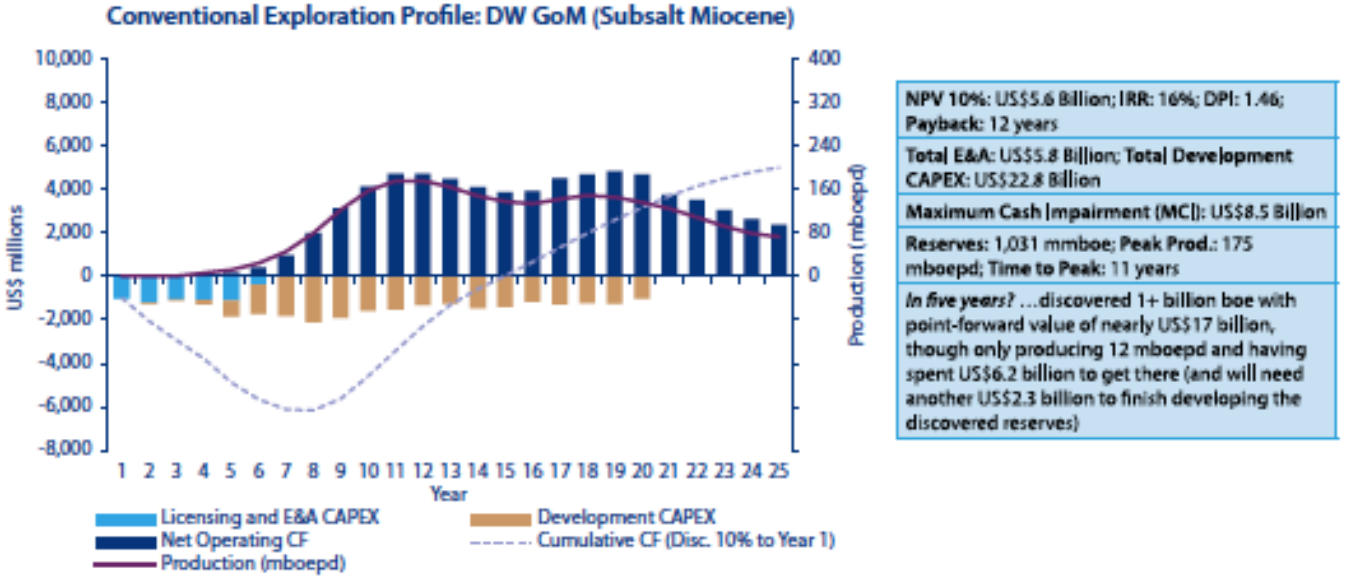


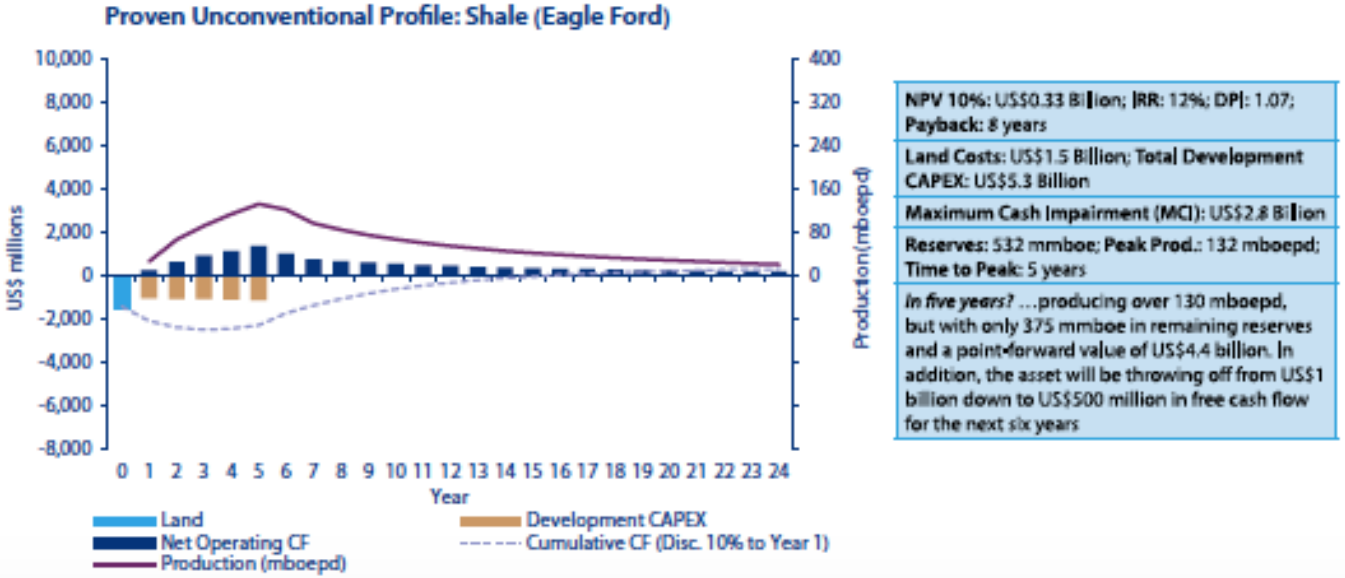
DIFFERENCES IN THE ASSESMENT

CONVENTIONAL	UNCONVENTIONAL
Housed in discrete accumulations	Ubiquitous resource. The problem is to find the "sweet spot"
Basic unit is • Play - The characteristics of field(s) EUR • Prospect - Volume	Productive boundaries extend well beyond acreage. • A well is a repeatable unit of the play. Type curve – is the expectation for what each well or well set will recover over its life (EUR)
Key driver in economic analysis is uncertainty in success case volumes and rates	Uncertainty comes in IP, decline rates, Acreage capture strategy, completion strategy.
Go / No-go hinges on • Well – initial test • Play – After initial test program (appraisal) for few prospects	Full development depends on Pilots Tests. It is an ongoing activity with option to cease: How representative the pilot results are of the future development. True +/- vs. False +/-



Source : Anderson, N. and Preston, C. 2012. Wood McKenzie

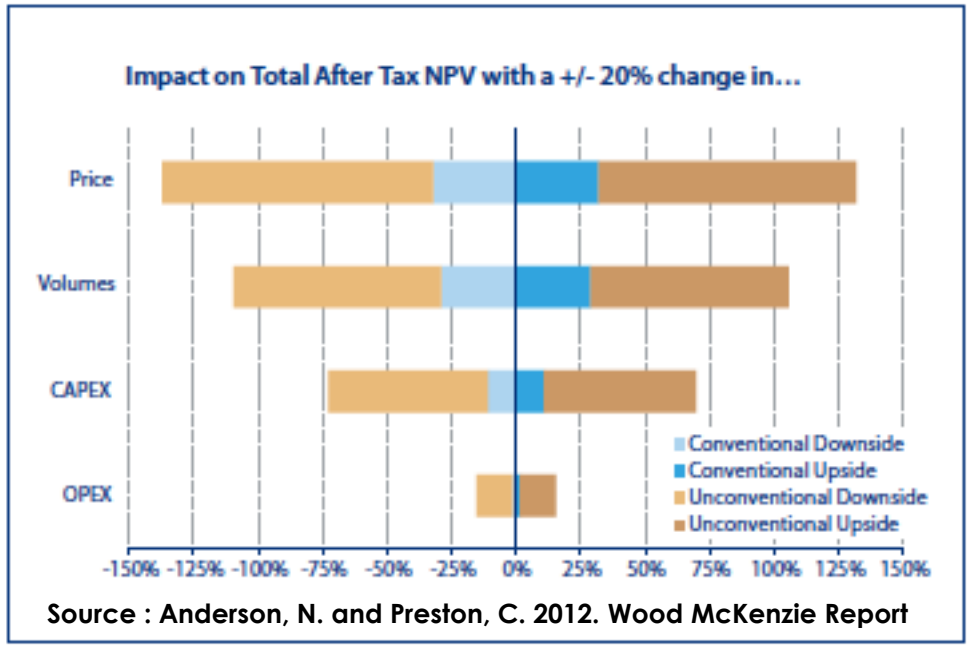




Source : Anderson, N. and Preston, C. 2012. Wood McKenzie Report

Development Schedule Comparison

- Conventional projects provide larger volume rates thus great profitability but longer time to first cash flow. Therefore, longer cycle-time.
- Unconventional projects entails **lower capex and quicker cash flow**, therefore, they can be **turned on & off** w/o much (-)impact. Also unconventional projects can be stacked up.
- Sensitivity to commodity prices moves is more critical in unconventional projects, likewise volume rate and capex.



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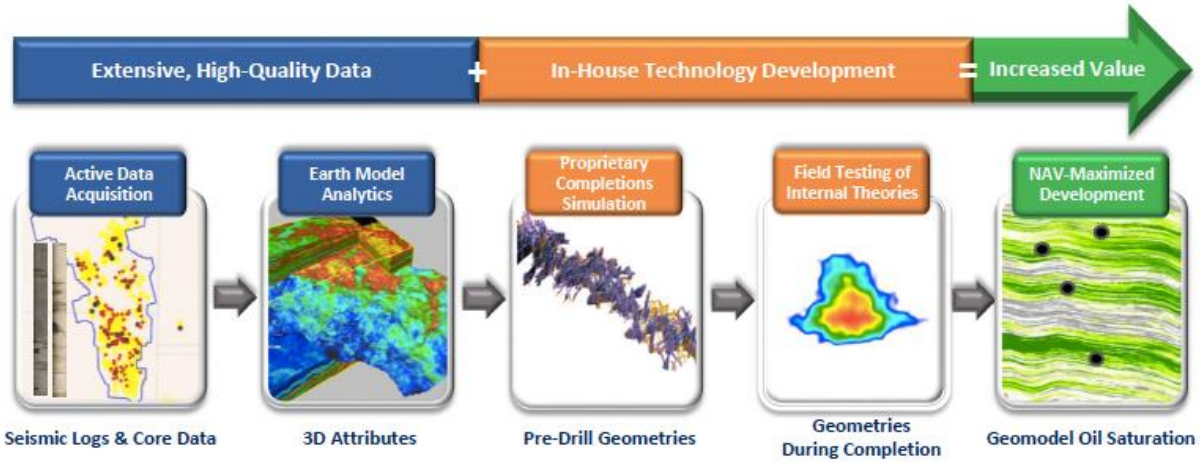


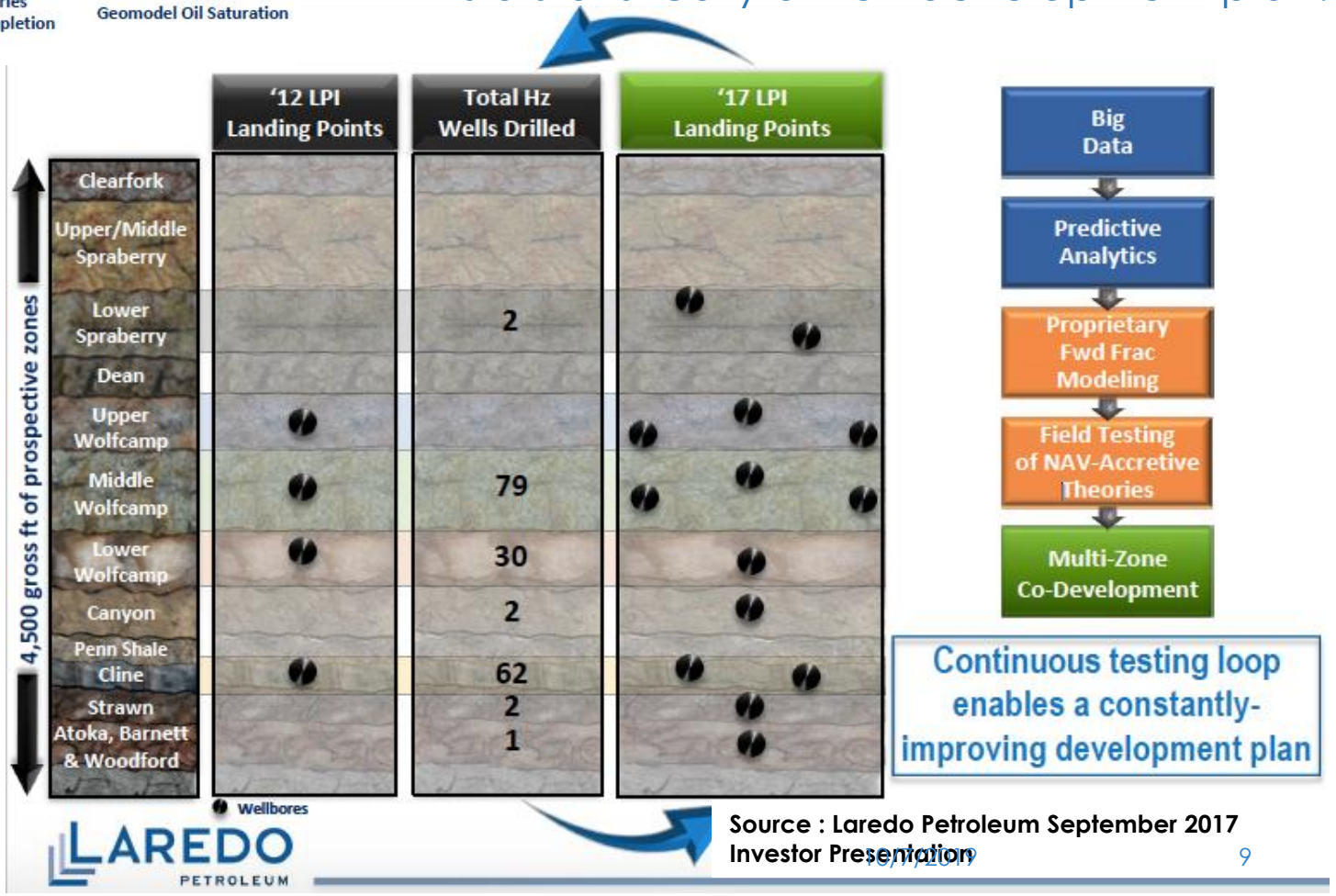
Source : Laredo Petroleum September, 2017 Investor Presentation

The Development Plan Seems Simple, But…

- Need to pick the horizons to land the horizontals and the sequence them while simultaneously maximizing rate, not necessarily volume.
- It is a statistically driven development plan.

Integrated models to better define the "Sweet Spots"

- Calibrated with thousands of feet of core data sets and well logs.
- Production of thousands of locations to feed in the Development Plan a.k.a. the rig line

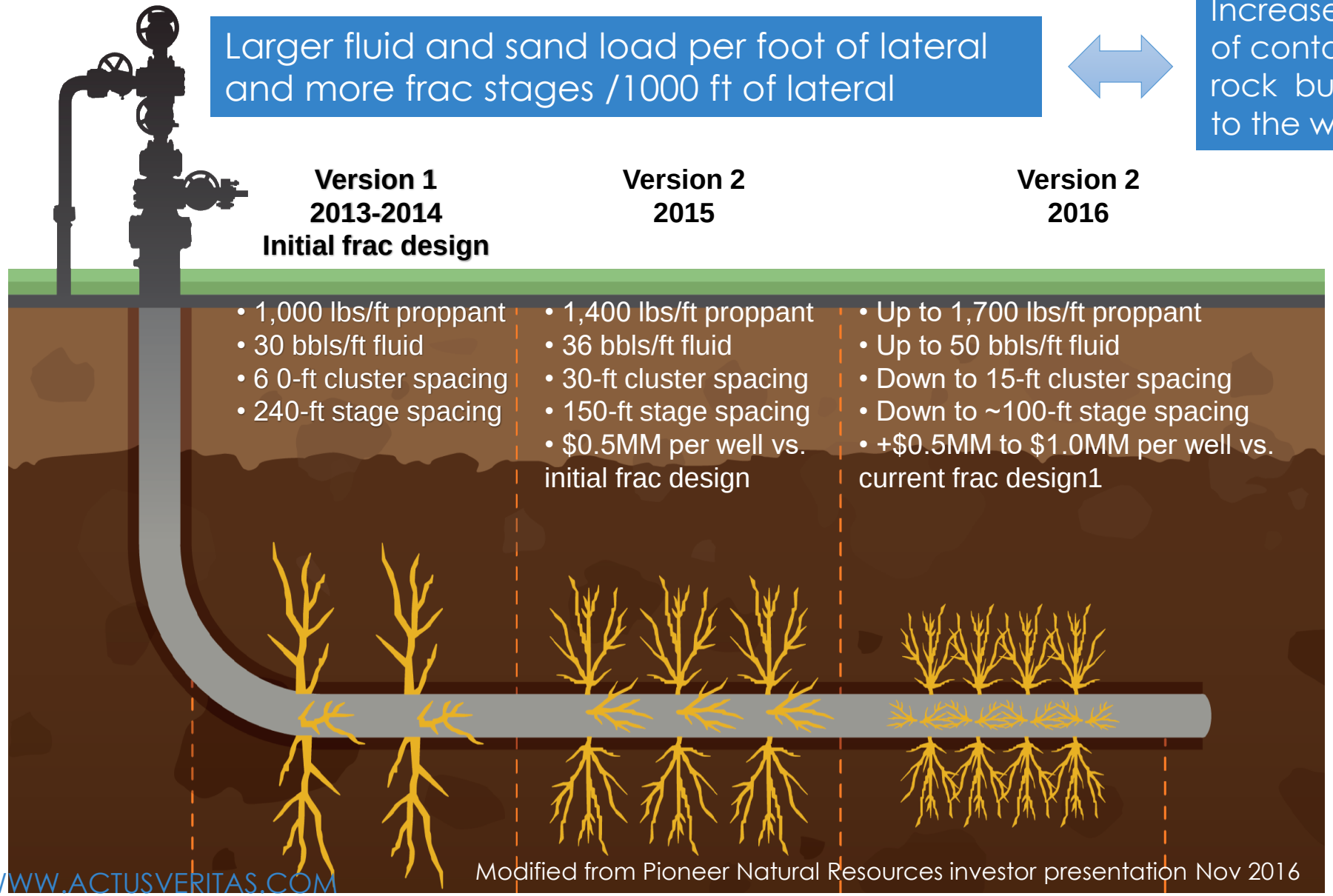


Source : Laredo Petroleum September 2017 Investor Presentation

KEY IMPROVEMENTS IN COMPLETION DESIGN

Larger fluid and sand load per foot of lateral and more frac stages /1000 ft of lateral

Increased area of contact with rock but closer to the wellbore



Modified from Pioneer Natural Resources investor presentation Nov 2016

Contiguous acreage position allows infrastructure investment to reduce OpEx.

- Gas compression & oil & water gathering system
  - Higher netbacks
  - Reduced transportation costs

- Centralized water treatment
  - Cost reduction in water disposal
  - Sustainable (economic & environmentally sound) supply of water for hydraulic fracturing - by recycling it

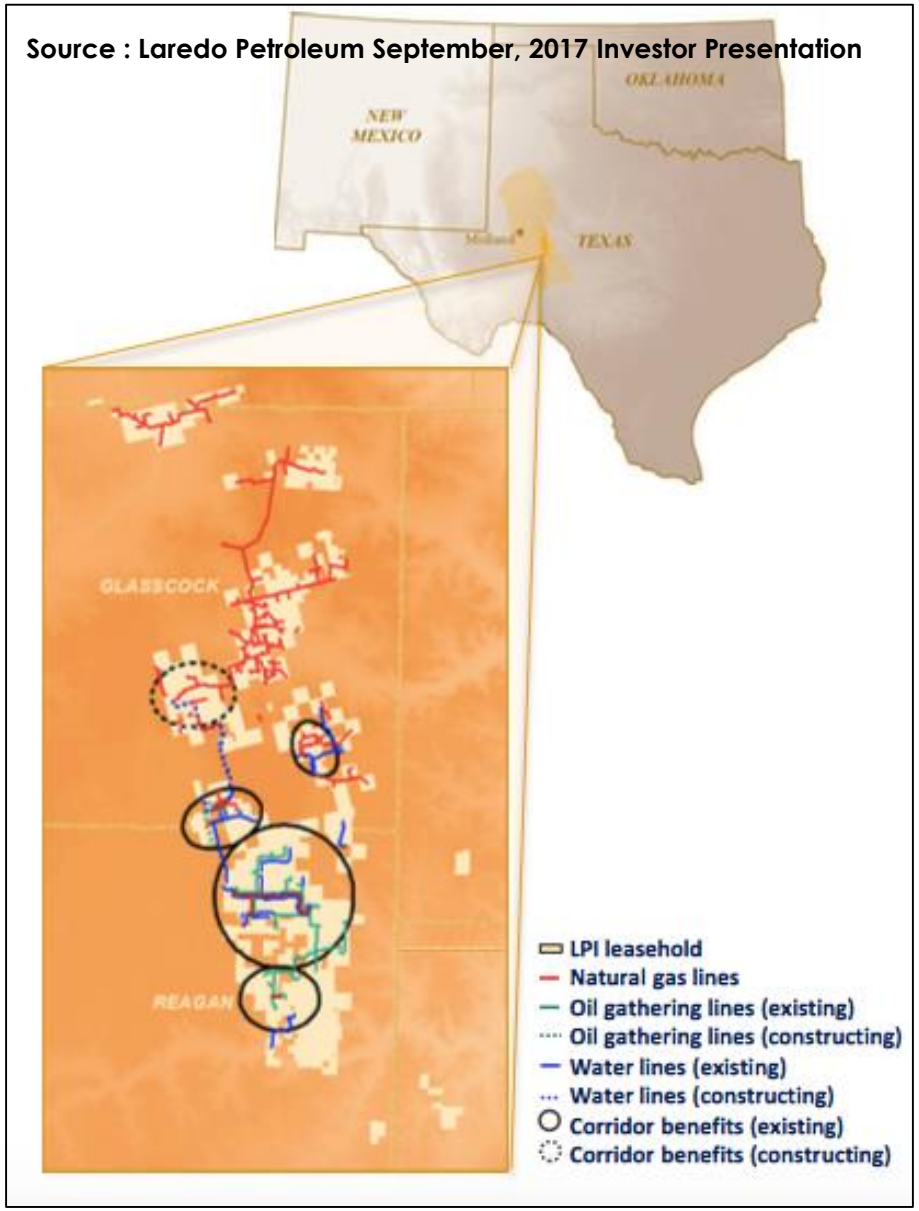
Source : Laredo Petroleum September, 2017 Investor Presentation

Water Treatment Plant

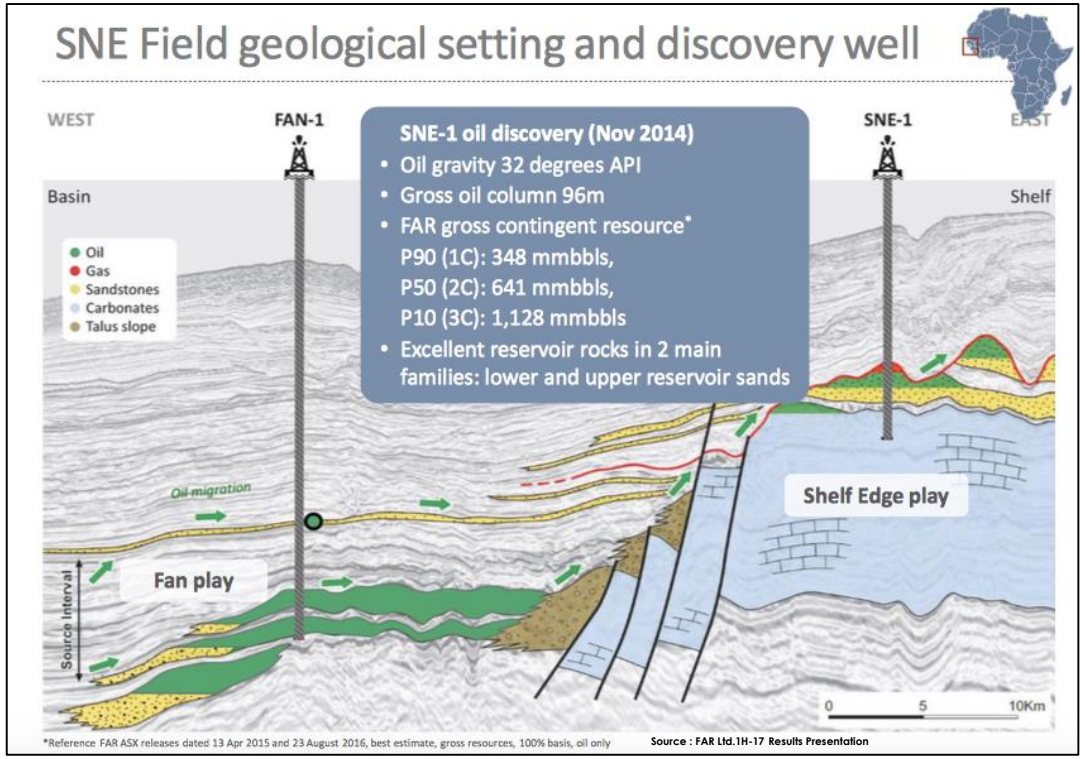
Centralized Crude Gathering Tanks at Reagan Truck Station

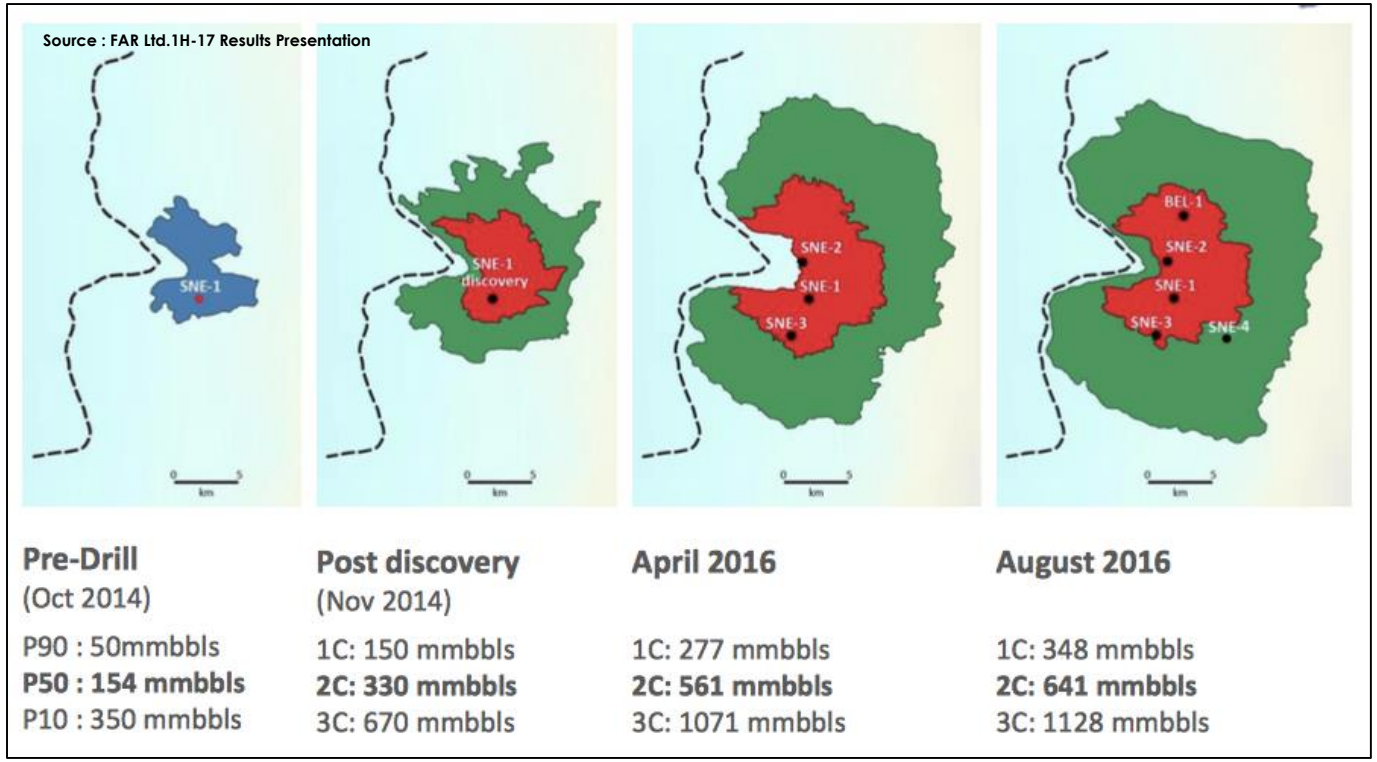
Centralized Natural Gas Compressor

Source : Laredo Petroleum September, 2017 Investor Presentation



EXAMPLE OFFSHORE PROJECT - SNE FIELD OFFSHORE SENEGAL





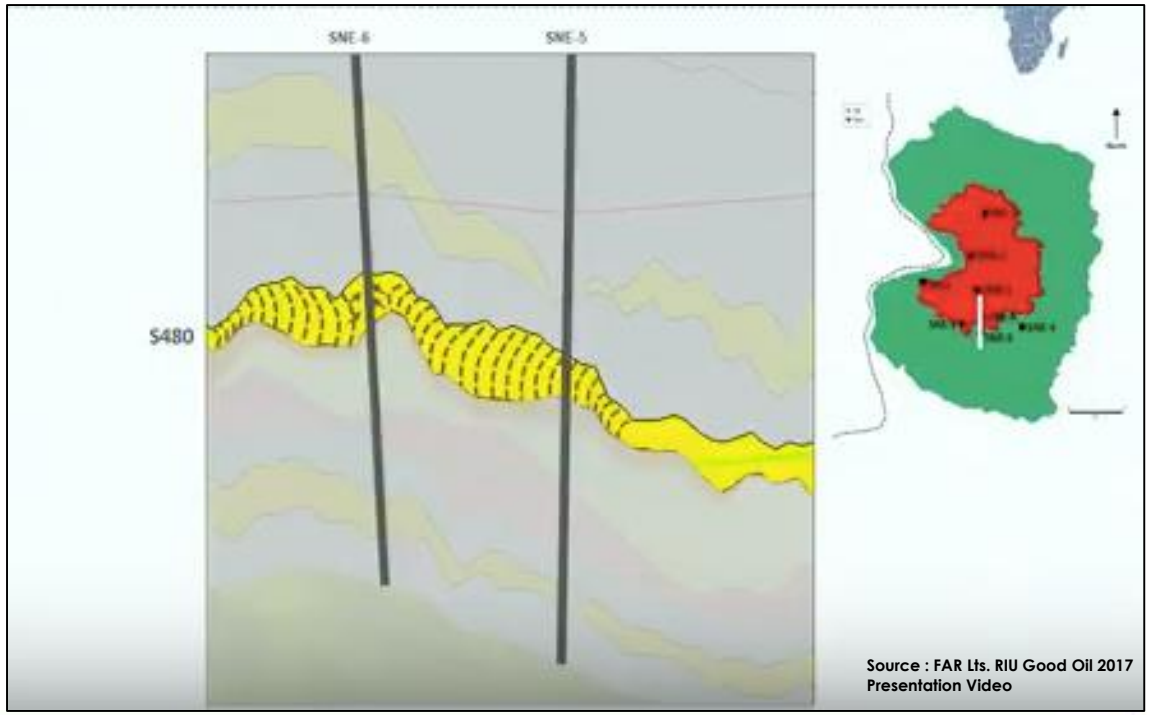
Exploration & appraisal program accelerated progression of field volume

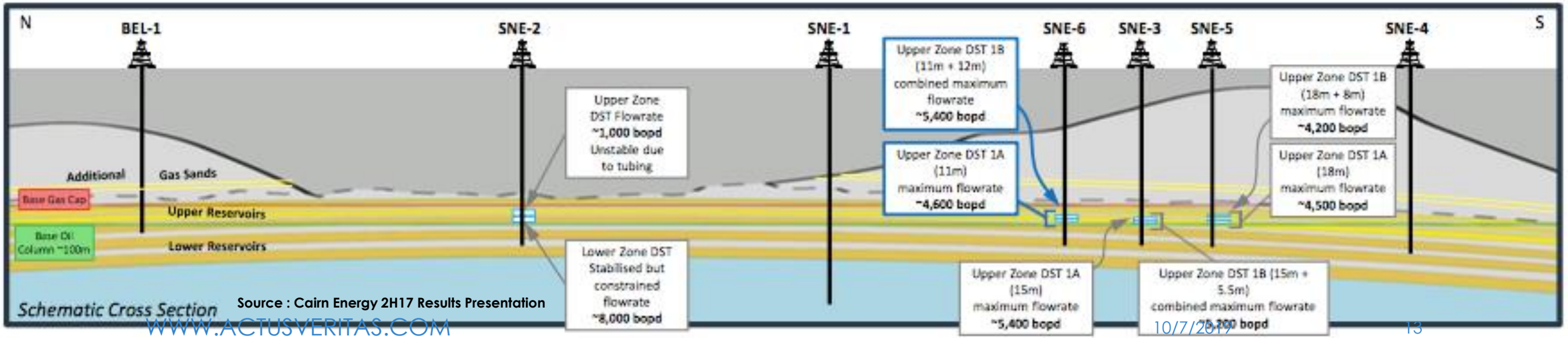
- Field volume > than MEFS 200 MBO
- Gas & water contacts
- Two productive levels : Upper & Lower reservoirs
- Light sweet crude >30 API

EXAMPLE OFFSHORE PROJECT - SNE FIELD OFFSHORE SENEGAL

Volume, rate & reservoir architecture defined in 3-4 years

- Well productivity and reservoir connectivity assessed via DST's & interference test
  - Lower reservoir fully connected / highest perm
  - Upper reservoirs well connected / good perm
- All key uncertainties and risks resolved for concept selection & development plan

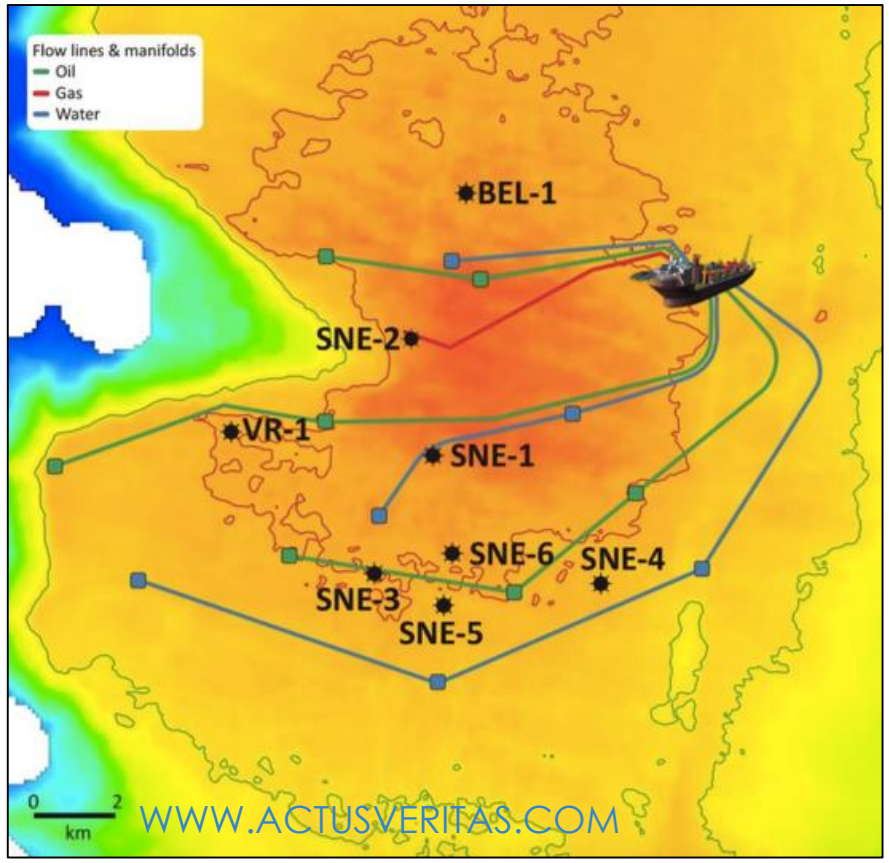


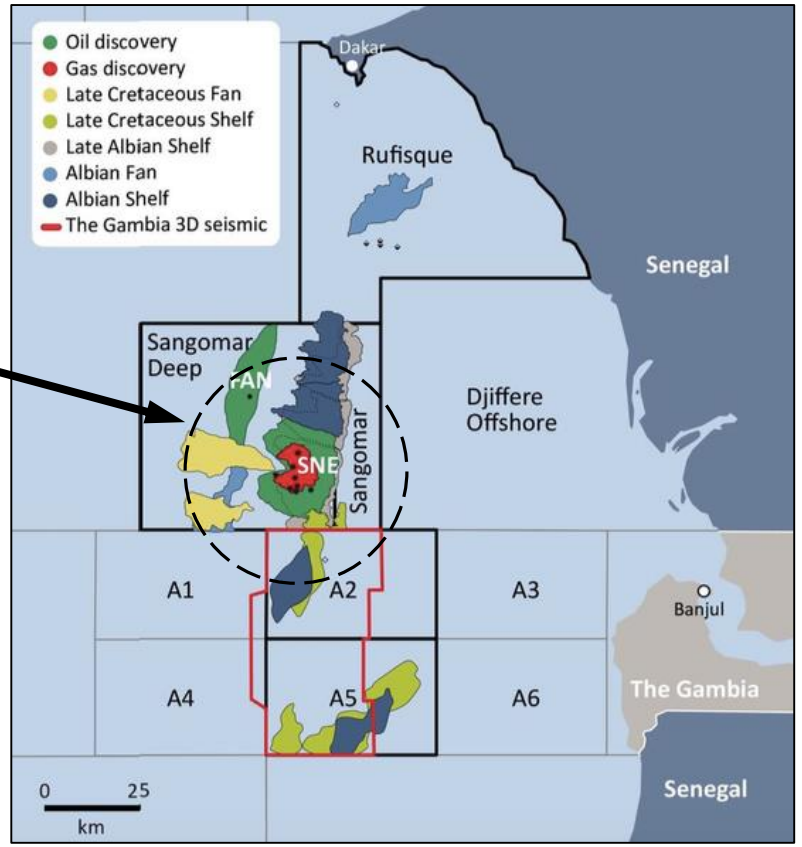


EXAMPLE OFFSHORE PROJECT - SNE FIELD OFFSHORE SENEGAL

Phased Development Plan

- Water flood 32 API low sulphur crude
- Phase 1: Lower reservoir (highest quality) + partial upper reservoir (lower quality). Limit initial Capex
- Scalable SS Dev. Option to bring other prospects
- FPSO 75 – 140 Kbo/d & 1 -2 MBO storage





Economically Robust

- **Low breakeven development cost 35 $/BOE**
- DevEx: US$13- US$15/bbl (~60% driling)
- OpEx: US$12-14/bbl (including FPSO lease costs)
- Benefit from cost deflation and design optimization (e.g. **drilling cost 70% lower that 2014**)

SUMMARY

- A combination of unconventional & conventional assets in the company portfolio provides **flexibility in management of capital life cycles** and achieving cash neutrality while meeting the chief corporate metrics
- **Unconventional opportunity** development cost could be reduced by better identification of the sweet spots with aid from portfolio of technologies
- F&D and time till first oil in **conventional exploration opportunities** could be efficiently managed by early characterization of volume & rate & phased development scenarios

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