Global Unconventional Potential at $50 Oil
What are you missing?

August 2017
Ian Cockerill
Presentation Outline

GLOBAL PERSPECTIVE

PLAY MAPPING

QUANTIFICATION

NORTH AMERICAN PERSPECTIVE

RESOURCE OPTIMISATION

PLAY PERSPECTIVE

GLOBAL PERSPECTIVE

NORTH AMERICAN PERSPECTIVE

PLAY PERSPECTIVE
What is Unconventional?

There are no hard lines between conventional and unconventional resources. Unconventional reservoirs share a lot of similar characteristics to conventional reservoirs:

- Zones of higher Porosity / Permeability
- Zones of higher Resistivity
- Zones of higher Pressure
- Regional structures or structural highs

It's not just a game of finding a shale and fracking the bejeezus out of it.
What is Unconventional?

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It's not just a game of finding a shale and fracking the bejeezus out of it.
In-place versus Recoverable Hydrocarbons

Comparison of remaining in-place resource versus recoverable hydrocarbons. The diagram illustrates the increasing price and reserves, with a shift from easy to hard recovery as the amount of remaining resource decreases.
In-place versus Recoverable Hydrocarbons

INCREASING PRICE

BIG
CONVENTIONAL RESERVOIRS

EASY
RECOVERY

HARD

MORE

INCREASING RESERVES
INCREASING PRICE = INCREASING RECOVERY

LESS

INCREASED DEMAND (PRICE)
IMPROVED TECHNOLOGY

BIGGER

OIL SHALE
BITUMEN
HEAVY OIL

TIGHT GAS
BASIN CENTRED GAS
COAL SEAM GAS
SHALE GAS
GAS HYDRATES

BITUMEN
OIL SHALE

INCREASING RESERVES

BITUMEN
OIL SHALE

INCREASING PRICE

BITUMEN
OIL SHALE
In-place versus Recoverable Hydrocarbons

INCREASING PRICE

EASY

CONVENTIONAL RESERVOIRS

DECREASED DEMAND (PRICE)

INCREASED SERVICE COSTS

RECOVERY

BIGGER

HEAVY OIL

TIGHT GAS

BITUMEN

BIG

OIL SHALE

EASY

COAL SEAM GAS

BASIN CENTRED GAS

EASY

SHALE GAS

GAS HYDRATES

HARD

INCREASING RESERVES

LESS

MORE

INCREASING PRICE

DECREASING PRICE = DECREASING RECOVERY

INCREASING PRICE
$50 Oil: The new norm

Proven North American unconventional resources supplying demand in the near-mid-term

"PERMANIA"
Good Oil trends – ASX Unconventional focused companies

Company presentations at the Good Oil Conference with a focus on ‘Unconventional’

Percentage of R!SC projects classified as ‘Unconventional’

WHAT ARE WE MISSING?

“PERMANIA”

INFLATION ADJUSTED OIL PRICE

YEAR

The Second Coming: North American Shift to Liquids

Oil versus Gas split of North American Rotary Rig Count

- % GAS
- % OIL

YEAR

ASSOCIATED GAS
14 12 10 8 6 4 2

HENRY HUB NATURAL GAS SPOT PRICE $/MMBTU
$3/MMBTU

MARCELLUS DRY GAS MARKET SATURATION
14 12 10 8 6 4 2
Global unconventional ‘potential’

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<th>Technically Recoverable Shale Gas Resource (Tcf)</th>
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<td>Others</td>
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<td><strong>Total</strong></td>
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Prepared for:
U.S. Energy Information Administration
U.S. Department of Energy

Prepared by:
Advanced Resources International, Inc.
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P: 703.528.8420 | W: www.adr-ries.com

EIA/ARI World Shale Gas and Shale Oil Resource Assessment
Technically Recoverable Shale Gas and Shale Oil Resources: An Assessment of 137 Shale Formations in 41 Countries Outside the United States

Legend
- Assessed basins with resource estimate
- Assessed basins without resource estimate
Global unconventional ‘interest’

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<th>Rank</th>
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OIL PRICE

RELATIVE COMMERCIAL INTEREST
Leading North American unconventional plays
Leading North American unconventional plays
Break-even oil prices for new wells in North American plays

**KEY PLAYS**

- MONTNEY (CANADA)
- WOLFCAMP MIDLAND
- WOLFCAMP DELAWARE
- EAGLE FORD
- CRETACEOUS (CANADA)
- BAKKEN
- BONE SPRING
- NIOBRARA
- SCOOP/STACK
- DUVERNAY (CANADA)
- THREE FORKS

**RANGE OF BREAK-EVEN IN THE NORTH AMERICAN UNCONVENTIONAL PLAYS ($/BBL)**

- **SWEET-SPOTS**
- **FRINGE**
Breaking point in the Eagle Ford

100% of Eagle Ford break-even at $70> Oil (8,000,000 acres)
Breaking point in the Eagle Ford

58% of Eagle Ford break-even at <$70 Oil (4,634,000 acres)
Breaking point in the Eagle Ford

46% of Eagle Ford break-even at <$60 Oil (3,653,000 acres)
Breaking point in the Eagle Ford

- 31% of Eagle Ford break-even at <$50 Oil (2,508,000 acres)
Breaking point in the Eagle Ford

18% of Eagle Ford break-even at <$40 Oil (1,482,000 acres)
Breaking point in the Eagle Ford

31% of Eagle Ford break-even at <$50 Oil (2,508,000 acres)
Breaking point in the Eagle Ford

46% of Eagle Ford break-even at <$60 Oil (3,653,000 acres)
Growth of the Eagle Ford

Eagle Ford 2007

Eagle Ford 2017

- OIL WELL
- GAS WELL
Cost efficiencies: Multi-lateral drilling

- Laterals up to 3km long
- 1350m PERMIAN BASIN COLUMN
- 235m (Brookfield Place)
Cost efficiencies: The rise of pad based drilling

7G (Montney)
Super pads designed to House 36 wells. Four active rigs on one pad at any one time
Wellhead break-even prices for key North American Unconventional Plays

Development in wellhead break-even prices for key Unconventional Plays

Average WTI break-even price for NEW Unconventional wells per play ($/bbl)

Source: Rystad Energy NASWellCube
Mexico Eagle Ford extension

OIL WELL

GAS WELL

50km

50km
### Unconventional challenges outside of North America

- Higher costs / Smaller service industry
- Poor regulatory framework
- Lack of infrastructure
- Lack of security
- Water shortages
- Low prices – Mexican gas prices are linked to those in the US. 4.5 BCF/D US Gas exported to Mexico*
- Contract sanctity (July 2018 presidential election, where energy nationalist Andrés Manuel López Obrador has been leading in the early polls)

*US gas prices would be around $2 without Mexico exports

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<th>SERVICE SECTOR</th>
<th>REGULATORY FRAMEWORK</th>
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Understanding heterogeneity and finding sweet-spots

OIL PLAYS

GAS PLAYS

BREAK EVEN PRICE

LOW

HIGH

1000km

1000km

MONTNEY

DUVERNAY

BAKKEN

NIORARARA

STACK

SCOOE

PERMIAN

PEMIENTA

MONTNEY

HORN RIVER

COLORADO

ANTRIM

NEW ALBANY

FAYETTEVILLE

HAYNESVILLE

MARCELLUS

HAYNESVILLE

NEW ALBANY

FAYETTEVILLE

HAYNESVILLE

MARCELLUS

HAYNESVILLE

NEW ALBANY

FAYETTEVILLE

HAYNESVILLE

MARCELLUS

MONTNEY

HORN RIVER

COLORADO

ANTRIM

NEW ALBANY

FAYETTEVILLE

HAYNESVILLE

MARCELLUS

MONTNEY

HORN RIVER

COLORADO

ANTRIM

NEW ALBANY

FAYETTEVILLE

HAYNESVILLE

MARCELLUS
Finding and quantifying sweet-spots

MAPPING PLAY CHARACTERISTICS

CALIBRATION

ESTIMATING ULTIMATE RECOVERY
Finding and quantifying sweet-spots

COMMON RECOVERY SEGMENT MAP

CALIBRATION

ESTIMATING ULTIMATE RECOVERY

RISC
Finding and quantifying sweet-spots

MONTNEY - LIQUIDS ESTIMATED ULTIMATE RECOVERY POTENTIAL
The Montney Play Atlas

Phase 1 – North-East British Columbia

- A full suite of interpreted maps at section level detail characterising individual Montney zones.
- Phase 1 is complete and comprises petrophysical interpretation of 400 wells.
- Calibrated attribute, in-place, and recovery mapping across the play.
- The atlas can be delivered as hard copy maps and digitally as .shp files ready for import directly into your interpretation package of choice.
Montney EUR per Company

Acreage Positions

Estimated Ultimate Recovery
Montney EUR per Company

Acreage Positions

Montney EUR per Company

- Total EUR Liquids (mmbls)
- Total EUR Gas (tcf)

COMPANY (DISCLOSED ACREAGE)
Development Optimisation

Source: Transerv Energy
Development Optimisation

UPPER MONTNEY COMMERCIAL LOCATIONS

94 locations

LOWER MONTNEY COMMERCIAL LOCATIONS

72 locations

OIL PRICE SLIDER BAR

$30  $40  $50  $60  $70  $80
Development Optimisation

**UPPER MONTNEY COMMERCIAL LOCATIONS**

- 7 locations

**LOWER MONTNEY COMMERCIAL LOCATIONS**

- 7 locations

OIL PRICE SLIDER BAR

- $30
- $40
- $50
- $60
- $70
- $80

$55 OIL
Development Optimisation

UPPER MONTNEY COMMERCIAL LOCATIONS

- 94 locations
- $75 OIL

LOWER MONTNEY COMMERCIAL LOCATIONS

- 72 locations
- $75 OIL

OIL PRICE SLIDER BAR
- $30
- $40
- $50
- $60
- $70
- $80
North America Unconventional production will be the short/medium term kingmaker for oil price. Understanding heterogeneity and sweet-spots in unconventional plays is key. Opportunities still exist in North American unconventional plays. Providing you do your homework. Global unconventional opportunities will require a niche market and technical and commercial understanding and expertise.