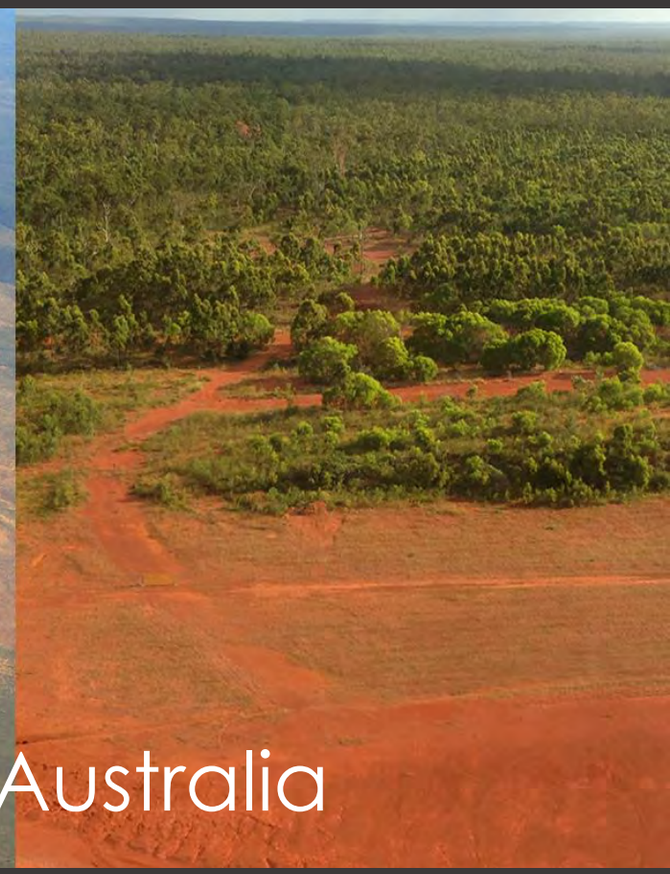
EMPIRE Energy

ASX:EEG





# The US shale oil & gas revolution is coming to Australia

# Corporate Snapshot

## Pro-Forma Capital Structure

| | |
|---|---|
| Shares on issue | 2,313m |
| Share price | A$0.018 |
| **Market cap** | **A$41.6m** |
| Net debt | A$32.4m |
| Enterprise value | A$74.0m |
| **Cash at bank** | **A$4.5m** |

## ASX Share Price


## Corporate Structure


## Pro-Forma Top 5 Shareholders

| | |
|---|---|
| Macquarie Bank Limited | 14.7% |
| Global Energy and Resources Development Limited | 10.7% |
| Liangrove Media Pty Limited | 5.3% |
| HSBC Custody Nominees (Australia) Limited | 2.9% |
| **Board & Management** | **6.4%** |

# 2018 Year in Review

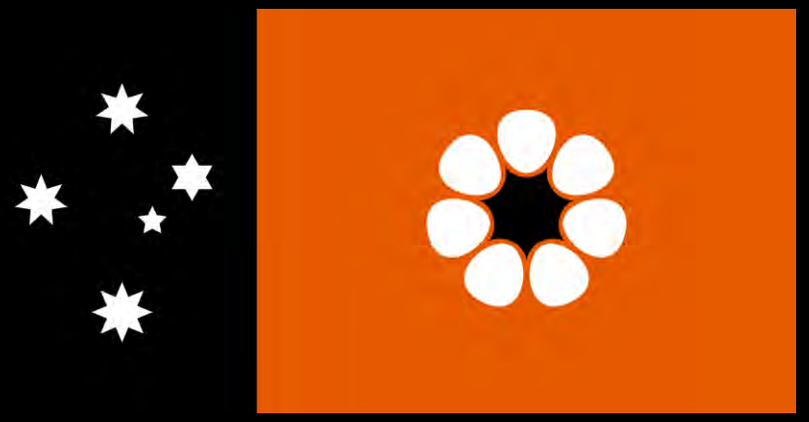
- April 2018: NT fracking moratorium lifted
- August 2018: Company recapitalisation reduced debt by > 30% and substantially improved cash position
- August 2018: Former CEO Bruce McLeod retired and sadly passed away
- August 2018: Alex Underwood became CEO
- November 2018: Board renewal commenced in November with appointments of John Gerahty and Paul Espie AO followed by John Warburton in early 2019
- November 2018: Successful Kansas Production Enhancement Program
- Full Year 2018 US EBITDA +A$5.9m
- Throughout 2018: Reduction in corporate overheads to preserve cash
- Late 2018: US asset sale process kicked off. Negotiations progressing well

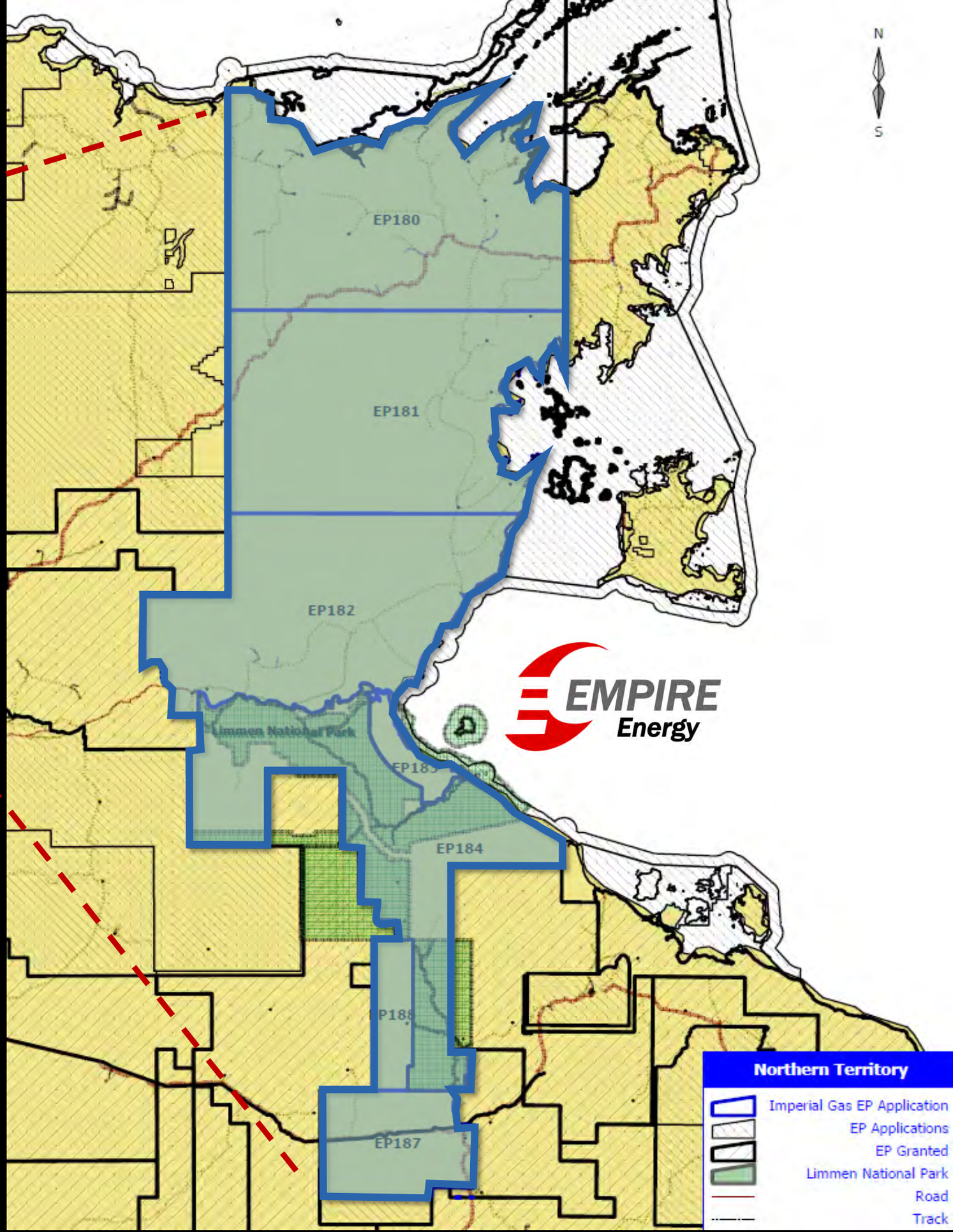
# Northern Territory has unshackled a vast hydrocarbon frontier: The McArthur and Beetaloo Basins

**Empire Energy's 2019**

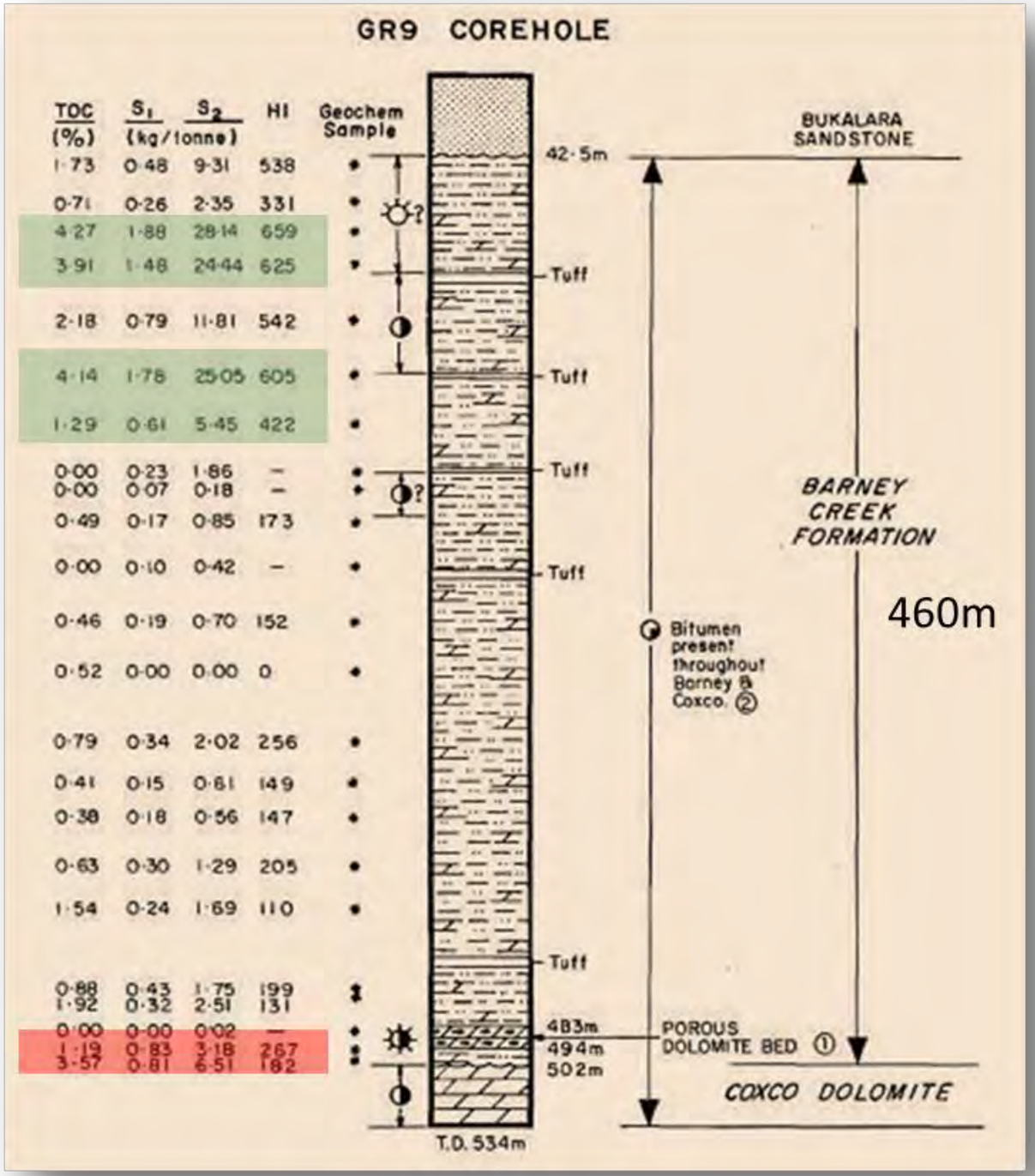
- Selling down US assets
- Cutting debt
- Focusing on the NT
- Acquiring seismic
- Streamlining corporate

# The heart of NT's big hydrocarbon frontier



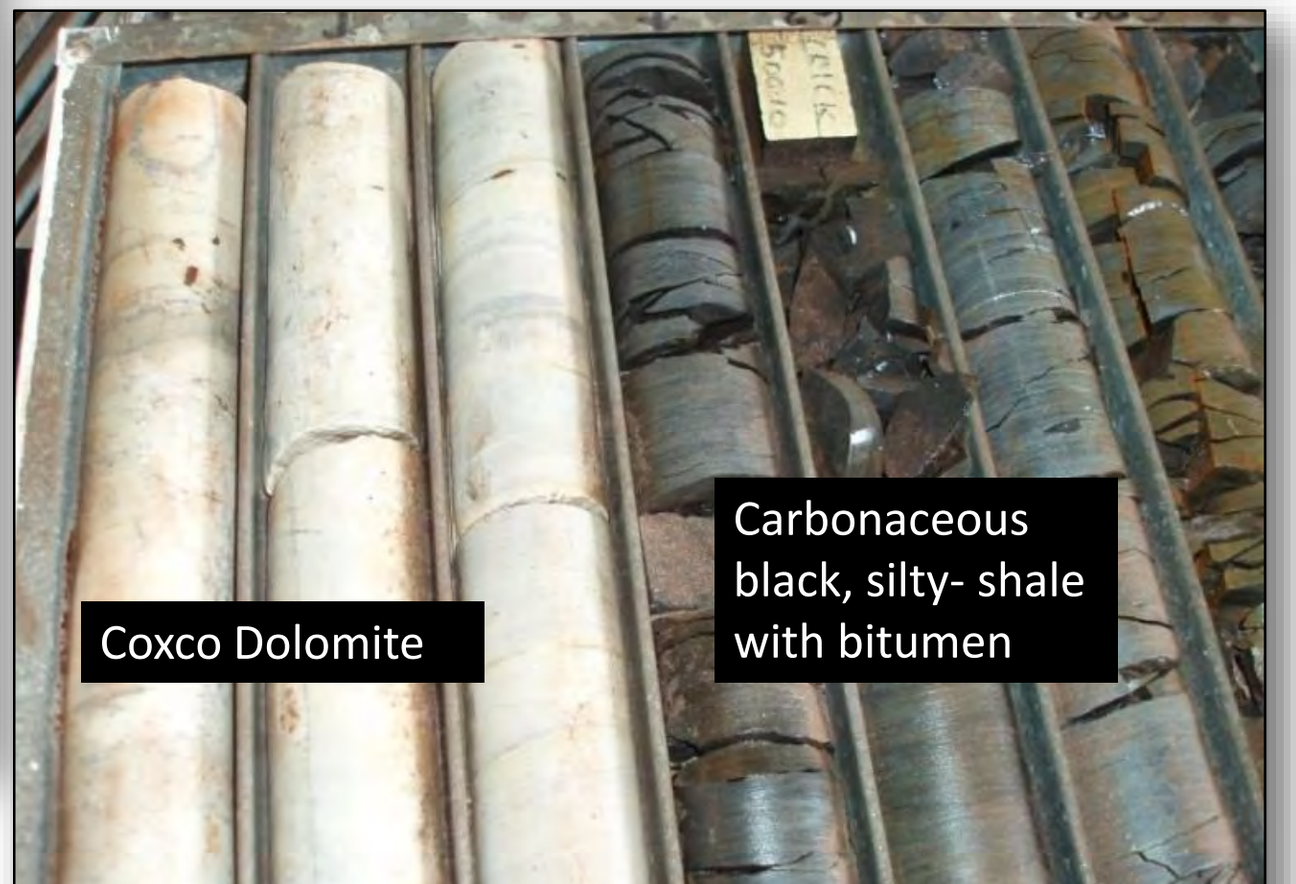
# Where the story starts… An April 1980 mineral drillhole gets a strong gas strike




The most spectacular indication of live hydrocarbons encountered to date in the McArthur Group was in the Kennecott-Amoco mineral exploration corehole GR 9, drilled in the Glyde area. A summary log of this drillhole is shown as Figure 5, and the location is shown in Figure 2. Upon unintentional swabbing at the end of drilling (in December 1979), the corehole experienced a gas blow-out which yielded a 5-6m (15-20 ft) long flame. Condensate flow accompanying the gas, was indicated by the bright orange-yellow colour of the flame, and by an accompanying sooty tail. The hole flowed gas for an indeterminate period during the immediately following "Wet" season. By the end of the "Wet" the hole was filled with water and the gas flow had degenerated to a series of gas bubbles percolating through hydrostatic head. A sample of the gas taken at this stage yielded the following analysis:-

| | |
|---|---|
| Methane | 74.25% |
| Ethane | 10.25% |
| Propane | 3.25% |
| Iso-Butane | 0.175% |
| N-Butane | 0.60% |
| N-Pentane | 0.105% |
| Hexane | 0.165% |
| Heptane | 0.08% |
| Nitrogen | 10.75% |
| Carbon Dioxide | 0.20%. |

The hole was plugged with cement in April 1980.



# An April 1980 mineral drillhole gets a strong gas strike

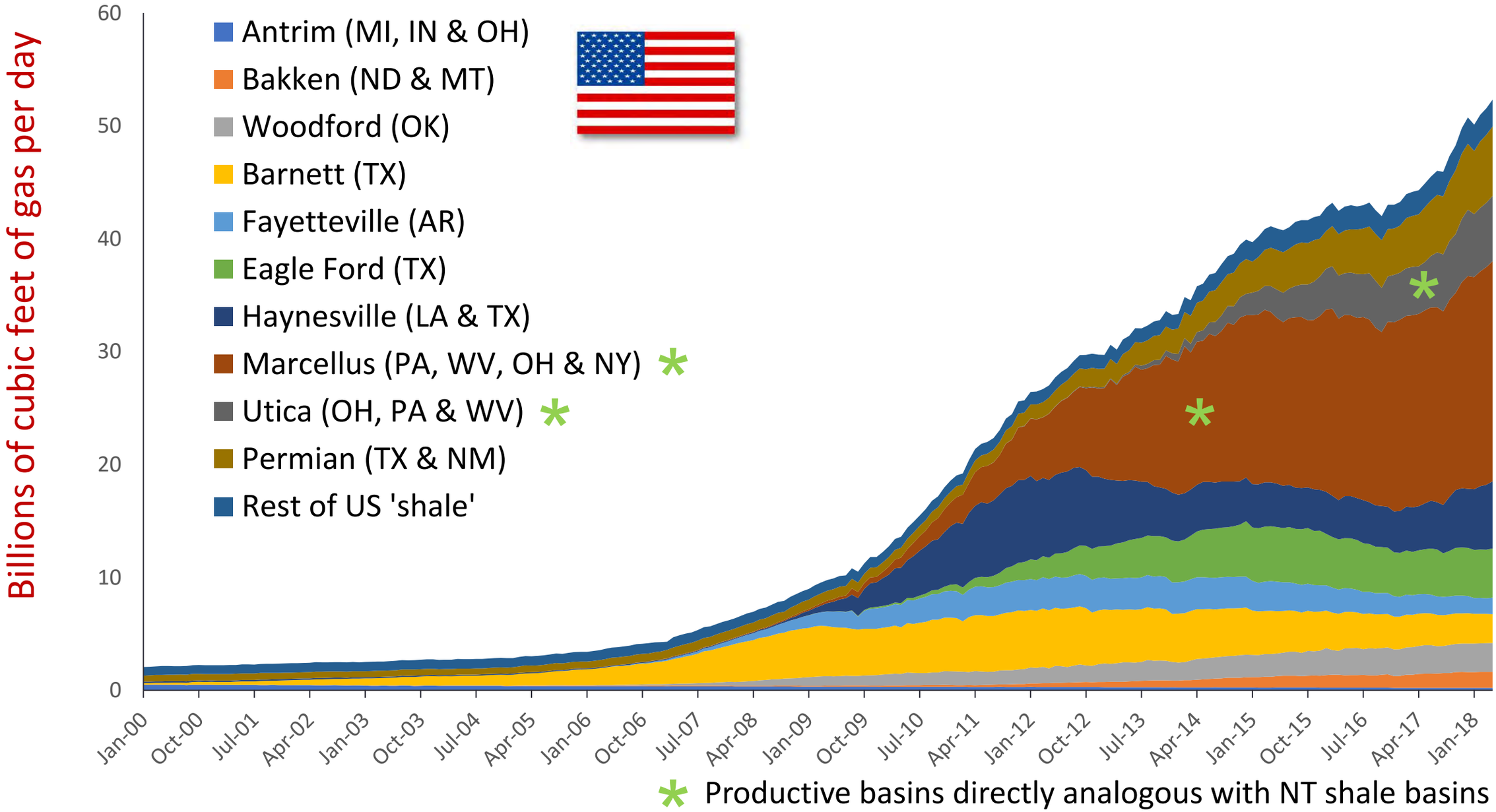

Armour Energy ASX announcement 11th October 2010

- GRNT-09 Mineral Well flowed gas & condensates at 140psi for 6 months at ~ 6 mm scfd, for ~2 bcf/yr
- Subsequently over 30 hydrocarbon wells have been drilled
- And over **$800m** committed to exploring a new hydrocarbon province
- The 2018 lifting of the NT fracking moratorium is about to transform the basin potential

EMPIRE Energy

# Horizontal drilling and fracking shale transformed the US energy market, and its geopolitics

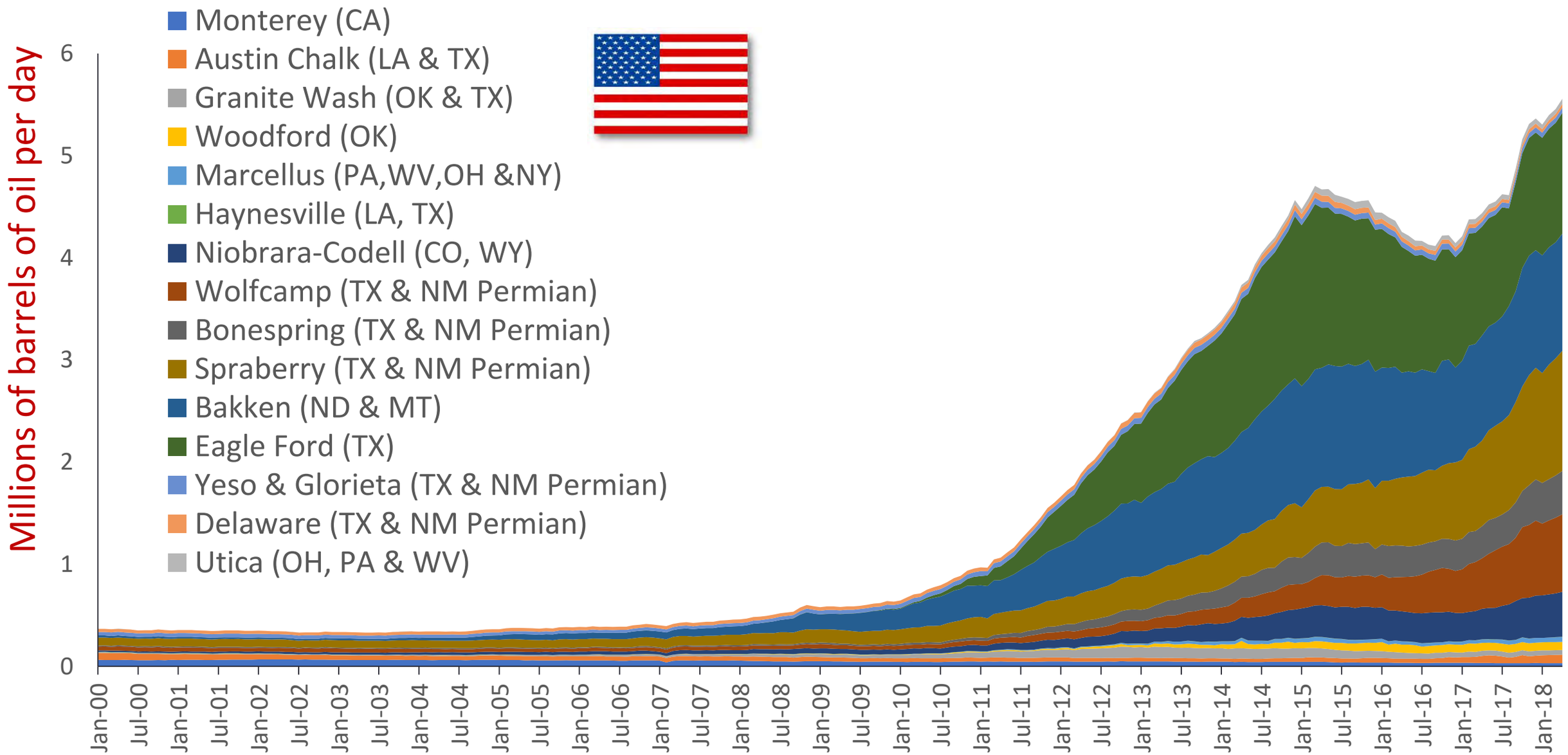
## Monthly US shale gas production figures since 2000 coloured by shale formation




*Source: US Energy Information Administration*

# Horizontal drilling and fracking shale transformed the US energy market, and its geopolitics

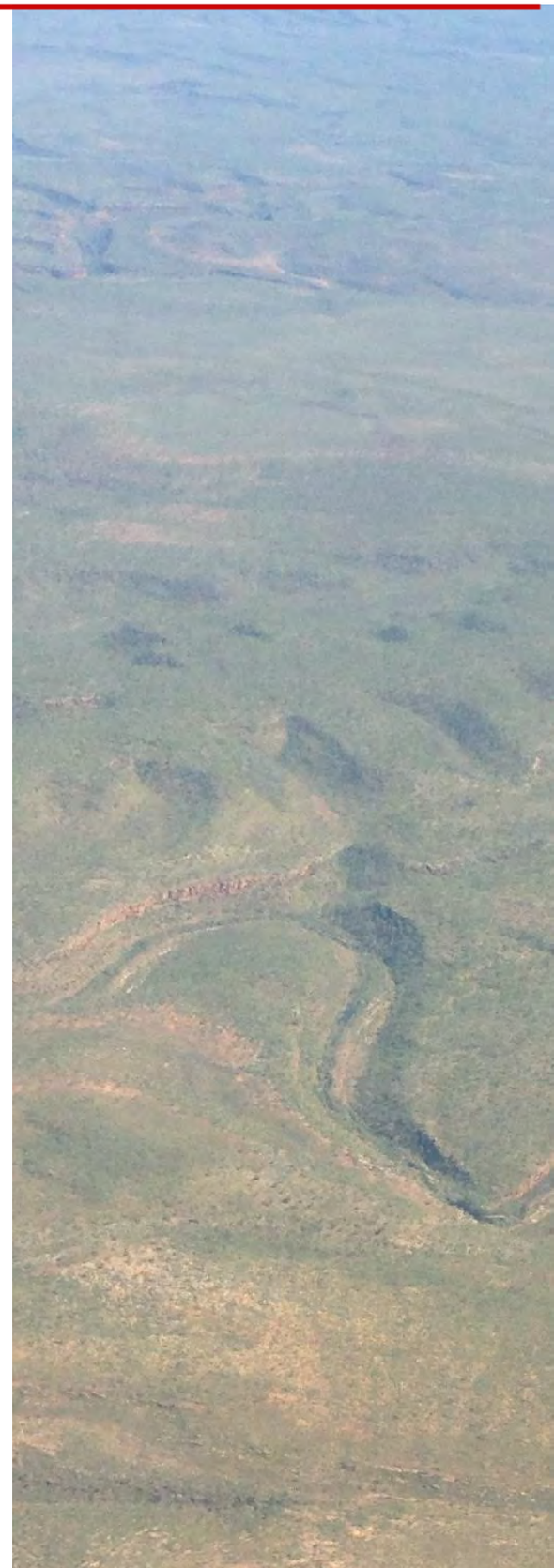
## Monthly US shale oil production figures since 2000 coloured by shale formation




*Source: US Energy Information Administration*

# Horizontal drilling and fracking shale transformed the US energy market, and its global geopolitics

- Over 60 billion cubic feet of US gas per day and 70% of total US gas production from shale in 2018
- Over 7 million barrels of US oil per day and 60% of total US oil production from shale in 2018
- Production is from a diverse array of US basins
- Technological advancements in hydraulic fracturing and horizontal drilling have been instrumental
- US fracking technology and experience is now directly available to NT operators
- Opening Australia's McArthur and Beetaloo Basins offers Eastern Australia gas supply, more supply to a booming gas export sector, and could make Australia energy independent with petroleum
- NT Resources Minister Paul Kirby at APPEA 2019: "If just 20% of this resource is recoverable, this is twice the current proved and probable reserves of all of Australia"



# Touchdown Northern Territory, open for oil & gas business

# Empire an early entrant in NT's new frontier

- 2010 tenement applications covering 14.6 million acres (~6,000 km$^2$)
- 100% working interest
- Proven petroleum system with strong gas and liquids potential
- 2016 Origin Amungee NW-1H well flowed gas strongly from target Velkerri Shale in the Beetaloo Basin
- Two tenements awarded 2013
- Successful partnership arrangements with supportive Traditional Owners

# Major players are joining the party in a big way

EMPIRE Energy

Santos

origin

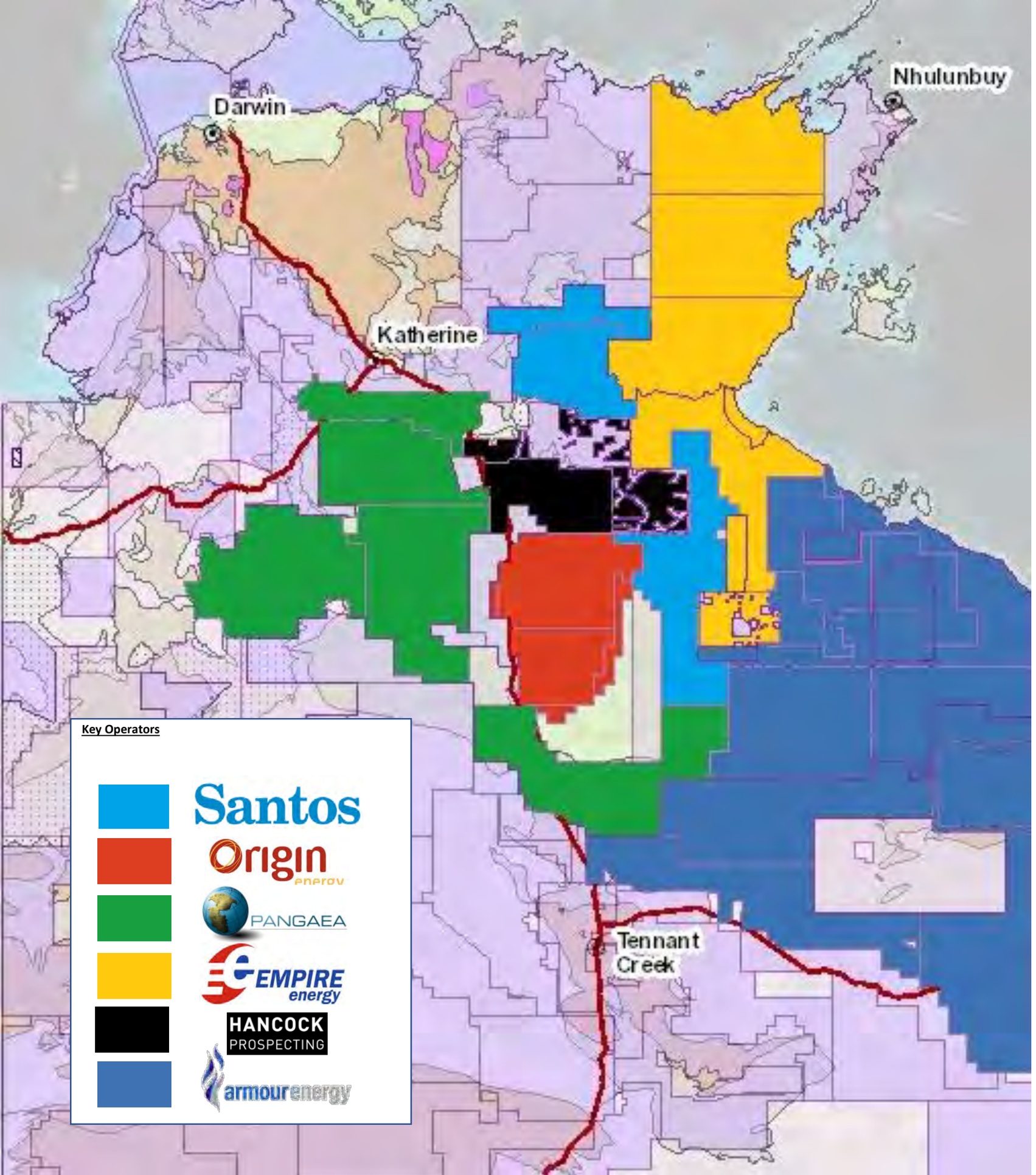
PANGAEA

armour energy

Tamboran

FALCON OIL & GAS

AMERICAN ENERGY PARTNERS




# 2019 the watershed moment – drilling ramping up with the lifting of the fracking moratorium

- Numerous large independent oil and gas companies hold substantial acreage positions in the Greater McArthur Basin
- Drilling activity is ramping up
- Santos to drill 2 fracked horizontal wells in 2019 testing Velkerri Shale
- Origin to drill 2 fracked horizontal wells in 2019 testing Velkerri Shale and Kyalla Formation
- Hancock Prospecting has indicated it may invest A$150m - A$200m in exploration

EMPIRE Energy

# McArthur Basin, a Vast & Proven Petroleum System

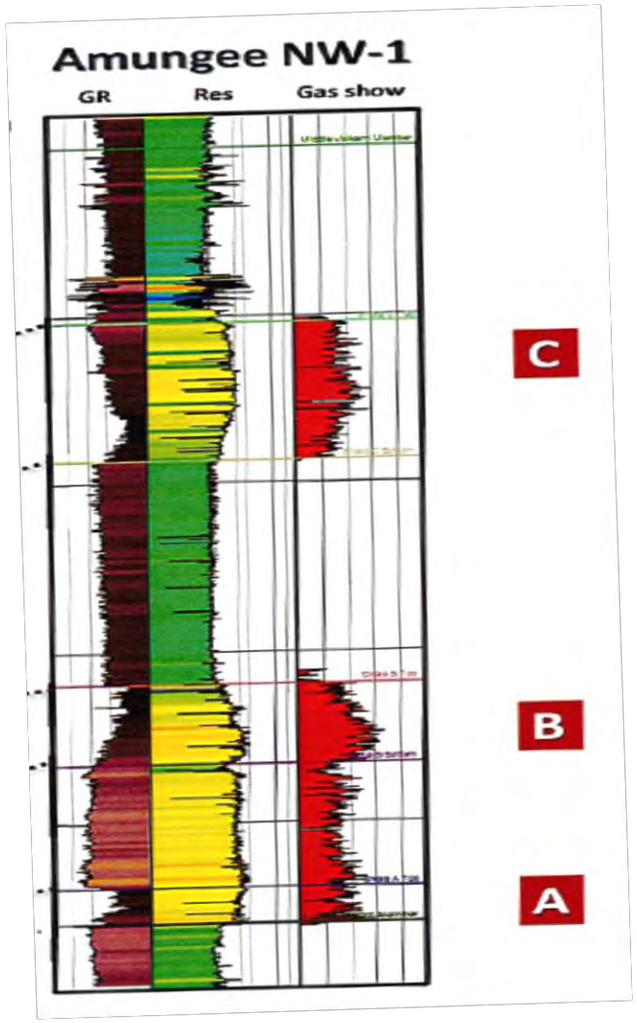
A useful geological reference profile of the Barney Creek formation is available at Glencore's McArthur River lead-zinc-silver mine

# Beetaloo's Amungee 2016 well is a gas superstar

Drilled by Origin Energy Amungee NW-1H was the first fracked horizontal well in the Beetaloo Basin. It flowed at similar rates to the US wells that sparked the shale gas revolution there in 1998. The reservoir engineers loved it.

- Drilled in Dec 15 - TD 3,808m, incl. 1,100m horizontal section in the B Shale of the Middle Velkerri formation
- Hydraulically fracture simulated in Nov 2016
- 11 Hydraulic stimulation stages completed across approx. 600m
- 95% of programmed proppant placed
- Successful production test in February 2017
- Av TOC ~4%; Porosity 4% to 7.5%; Permeability 50 to 500 nD
- **IP averaged 1.10MMscfd over 57 days**
- **Final average production rate 1.07mmscfd**
- Cumulative production 63mmscf
- Estimated dry gas composition of 92% methane, 3% ethane, 5% carbon dioxide
- **2C Contingent Resource Estimate is 6.6TCF (486,000 acres)**
- Three organic rich shale intervals (A, B & C shales) within the Middle Velkerri Formation with gross thickness up to 500m and net pay in B & C shales >30m each
- Average TOC 3% to 4%, Favorable geo-mechanics for hydraulic stimulation.
- 20% to 25% overpressure, excellent for volumetric and reservoir productivity
- Good porosity and gas storage

**2,000m**




**2,600m**

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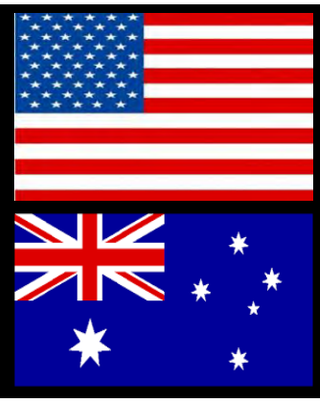
*Source: Falcon Oil & Gas, Origin Energy*

# Amungee is big news against the breakout well in the US

S.H. Griffin #4 Initial Production averaged **1.3MMscfd over 90 days**

Amungee's Initial Production averaged **1.1MMscfd over 57 days**



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The S.H. Griffin #4 produced 1.3 million cubic feet of natural gas per day for the first 90 days, an unbelievable amount for the time.[36] Steinsberger, in an interview with The Atlantic, said,

> *"This was the 'aha moment' for us, it was our best well ever in the Barnett, and it was a slick water frack. And it was my baby!"* [37]

This was a revolutionary moment, marking the beginning of modern-day fracking in shale as we know it. Since the S.H. Griffin, more than a hundred thousand wells have been fracked in the United States, and most of them use a technique similar to what was first done in the Barnett Shale.[38] Steinsberger had finally figured out how to get shale rock formations to give up their natural gas and do so in an economical way.

*Extract page 7 - An Energy Fracking Revolution: 35 Years of Fracking in the Barnett Shale – How North Texas Fracking Turned America Into an Energy Superpower (1 June 2016)*

# Clear USA shale analog with Velkerri Shale with original gas in place equal to three stacked Marcellus Shale plays

**US Marcellus Shale (blue line)**
**NT Velkerri Shale (green line)**

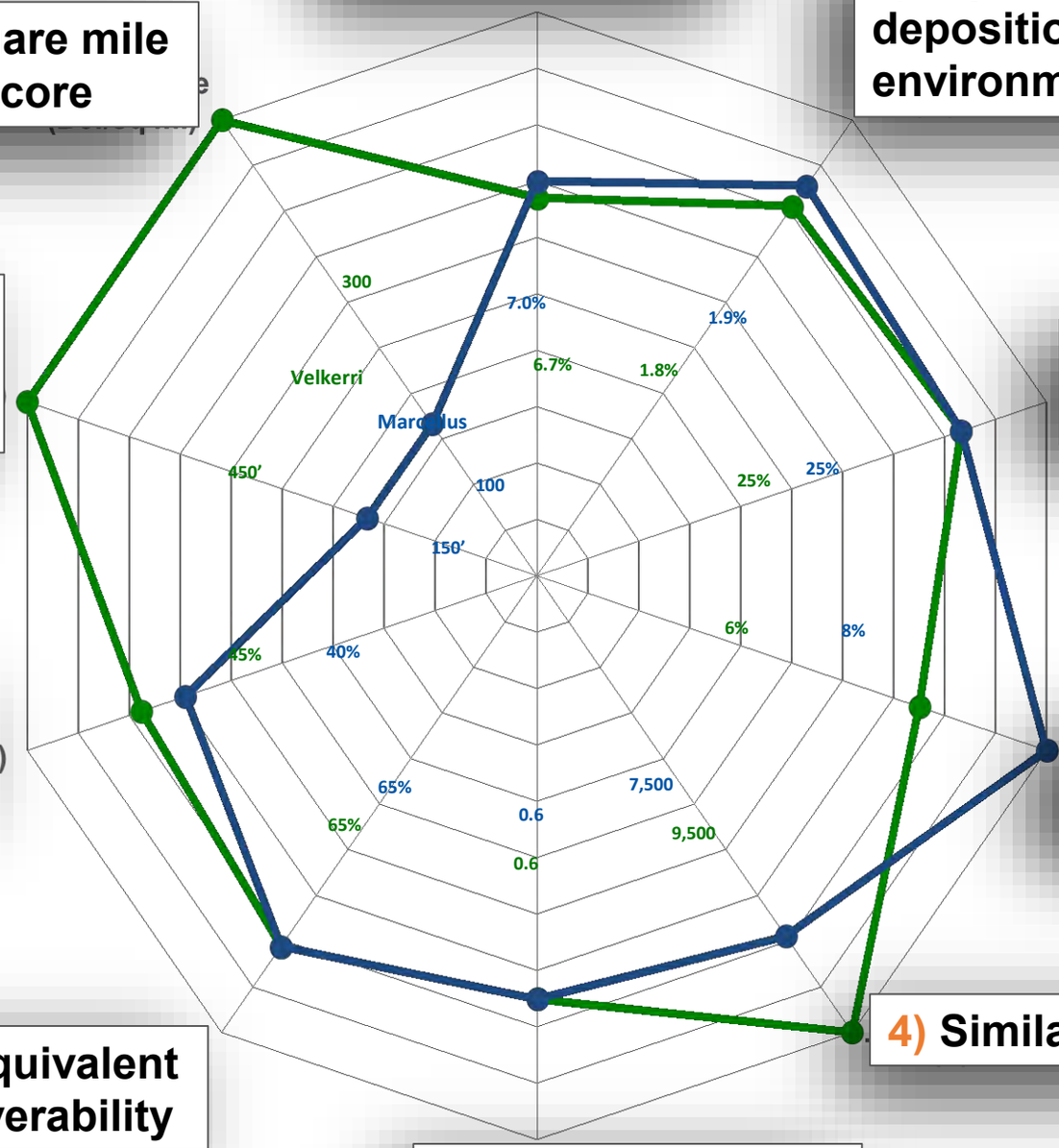
**10) Equivalent porosity and maturity**

**1) Equivalent depositional environment**

**9) 3x gas per square mile With more in the core**

**8) Velkerri 'B' interval alone equivalent to the Marcellus Shale**

**2) Minimal water production**




**7) Equivalent minerology**

**3) Similar organic content**

**4) Similar depth**

**6) Equivalent deliverability**

**5) Identical pressure gradient**

**A 10/10 Match**
**Equal or better in all parameters**

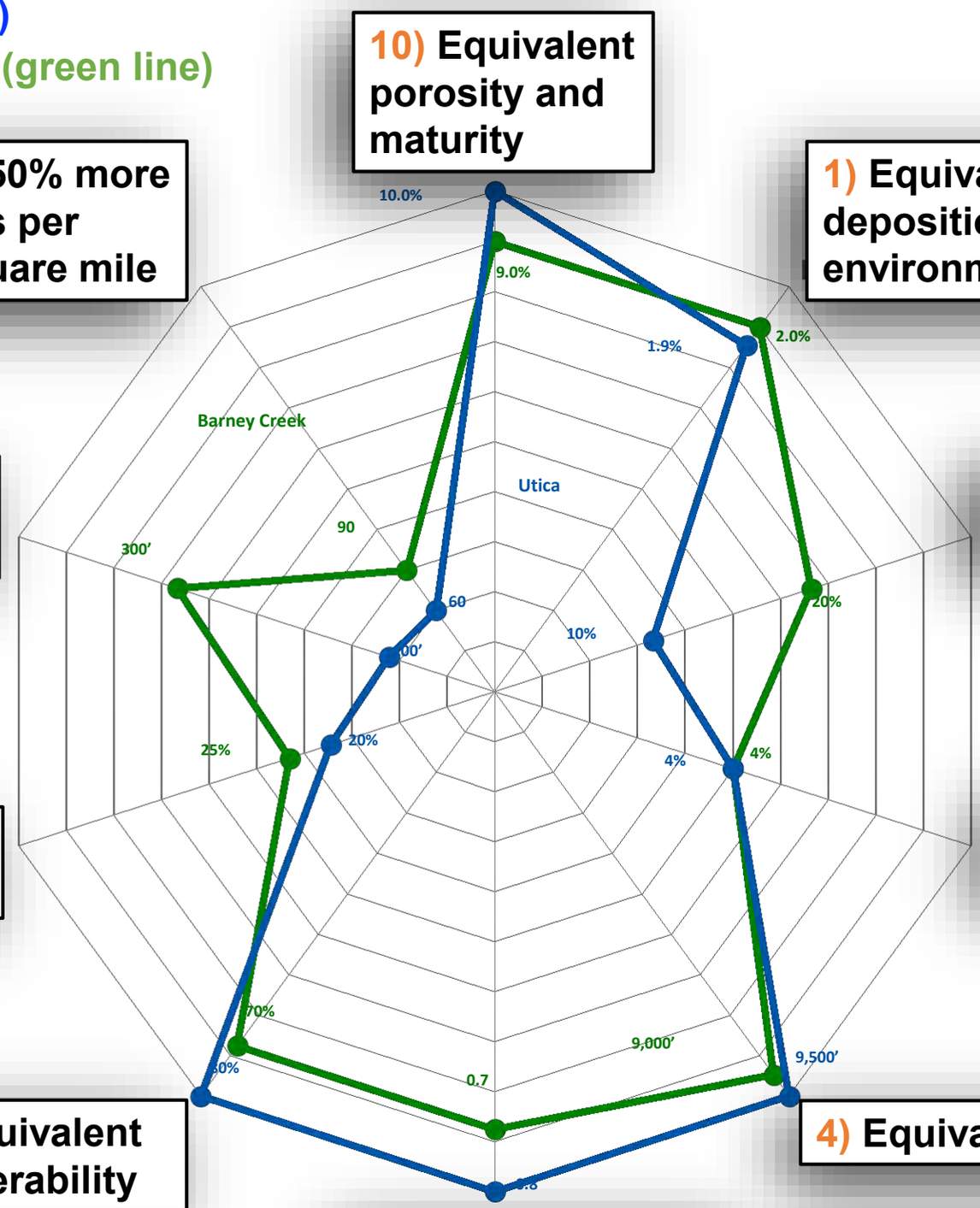
AMERICAN ENERGY PARTNERS

EMPIRE Energy

*Source: American Energy Partners*

# Clear USA shale analog of Utica Shale identified in the NT's Barney Creek Shale - with 50% more gas equivalent

**US Utica Shale (blue line)**
**NT Barney Creek Shales (green line)**




**A 10/10 Match**
**Equal or better in all parameters**

AMERICAN ENERGY PARTNERS

EMPIRE Energy

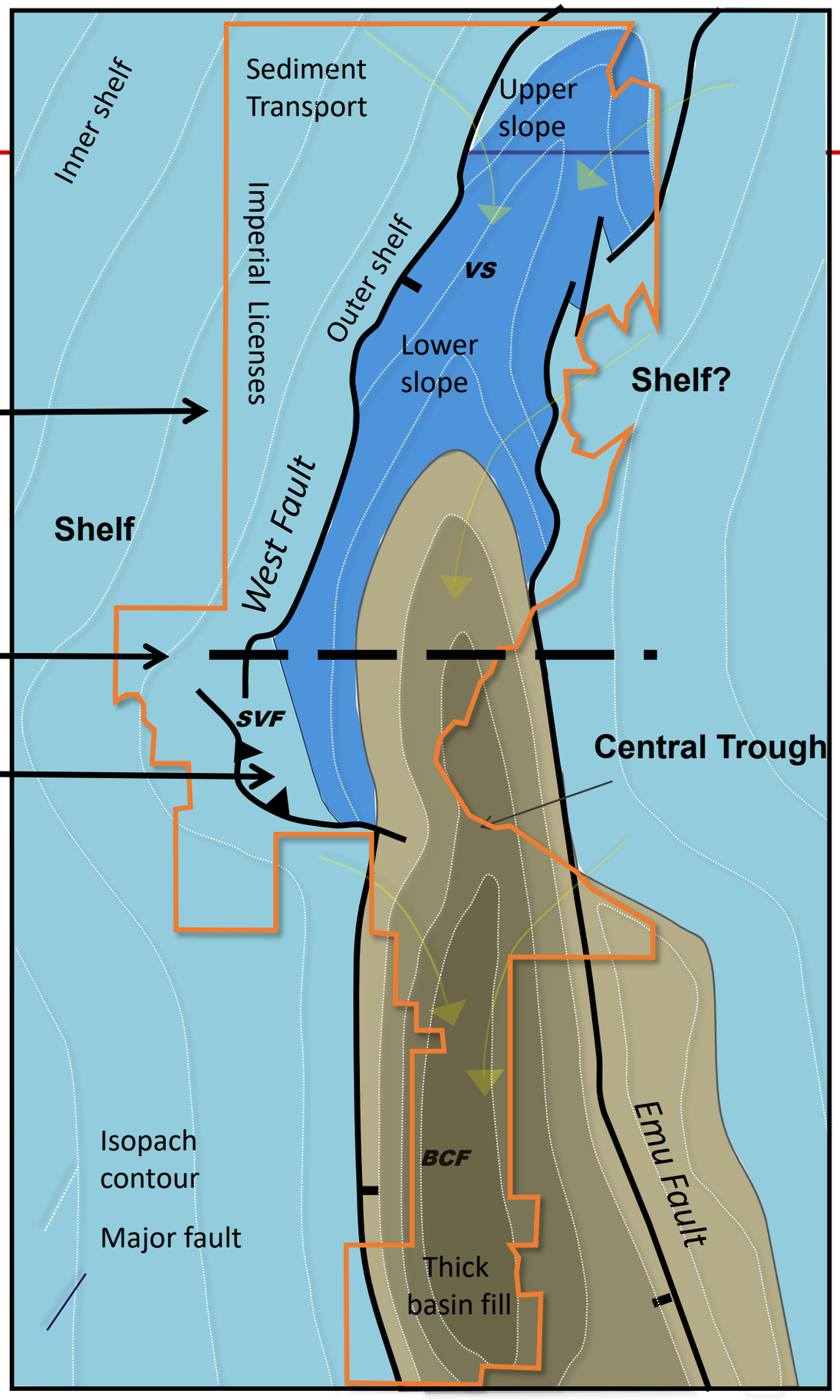
*Source: American Energy Partners*

# Formation of an extensive undisturbed petroleum basin

Tenement boundary

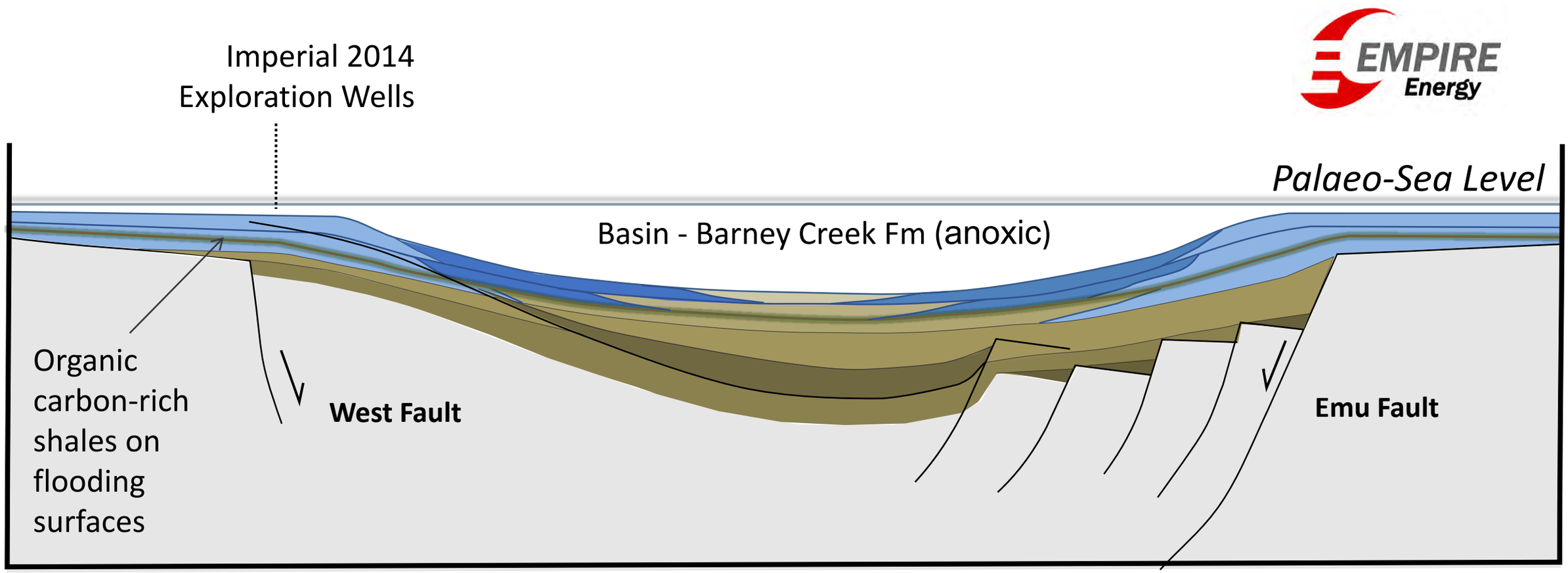
Trough Cross Section

Empire Energy 2014 Exploration Wells



# Formation of an extensive undisturbed petroleum basin

NW ← McArthur Basin Central Trough → SE



# The McArthur and Beetaloo Basins could make Australia self-sufficient in oil…

Northern Territory Government

MINERALS & ENERGY GROUP
FARRELL CRESCENT COMPLEX

- Geology Field Services Equipment Store
- Geology Core Library
- Mines Division Technical Support

*ALL VISITORS TO REPORT TO OFFICE*

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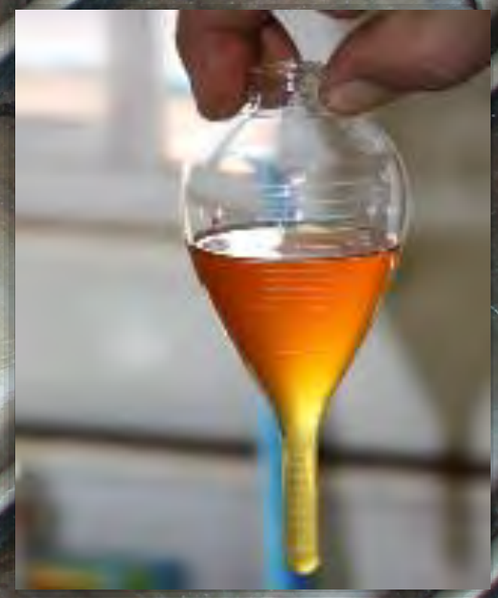
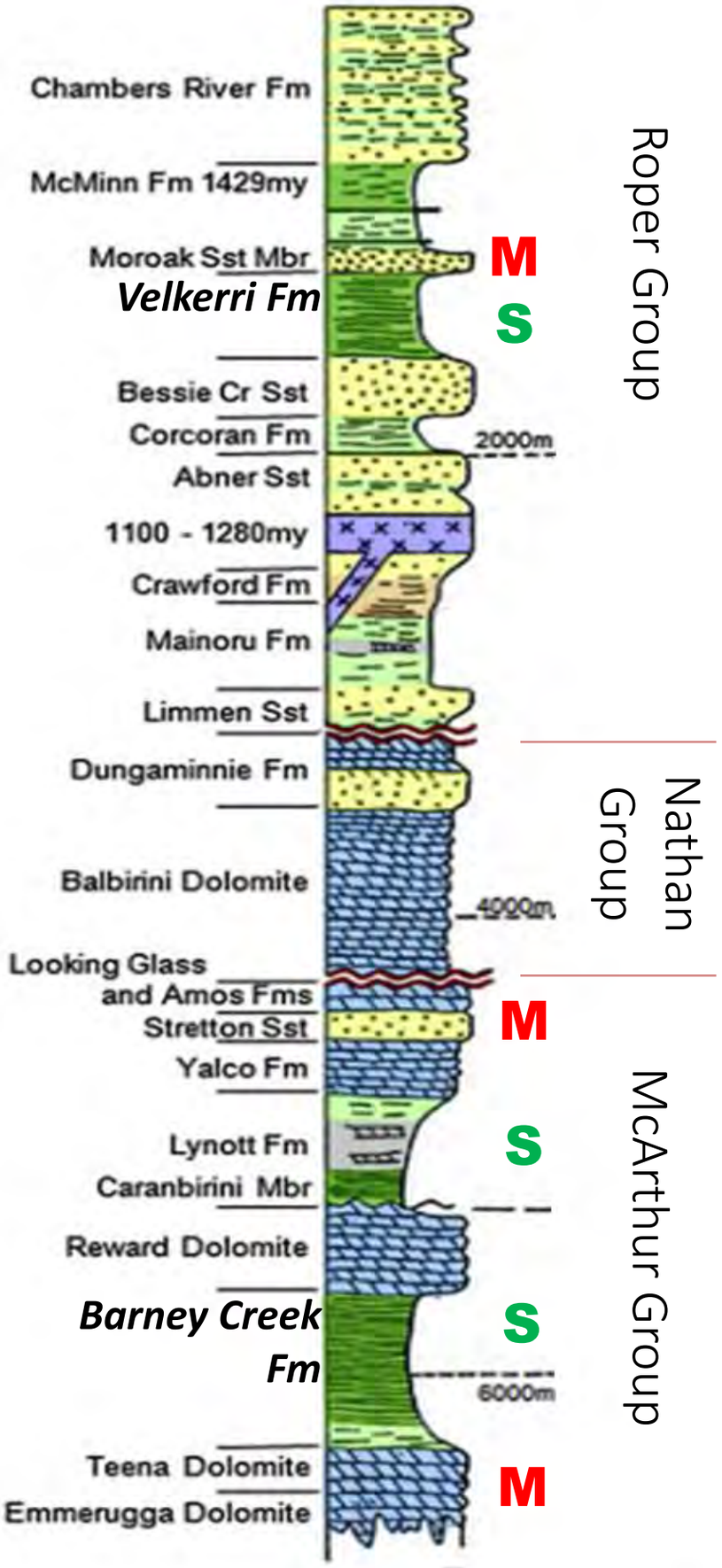


Darker bands in this Barney Creek Formation core are oil-rich

# Very thick, stacked sequences with abundant Organic Carbon preserved and mobilised



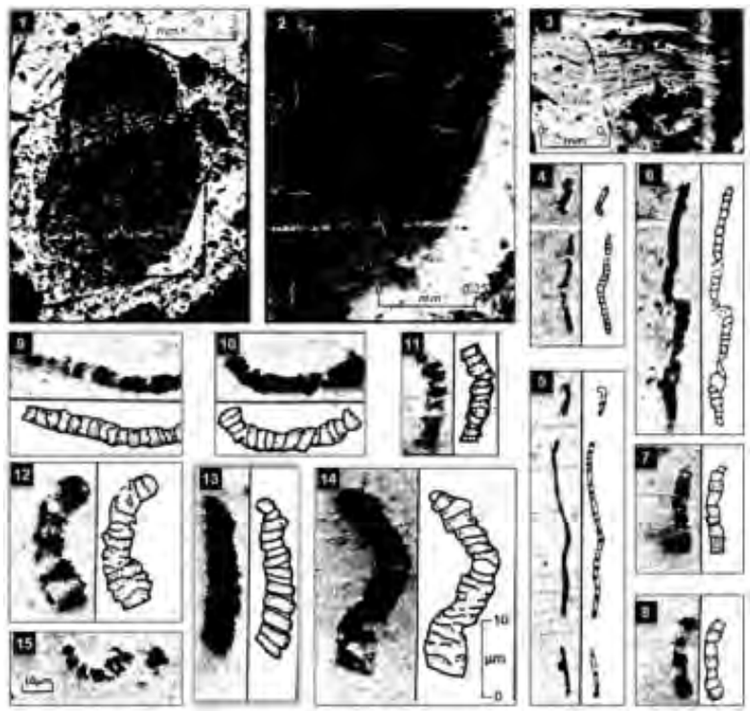

**Modified after Craig et al. 2013**

- Stromatolitic carbonate
- Sandstone
- Carbonaceous shale

**S** Source Rocks

**M** Migrated hydrocarbon

Typical microscopic life forms from the Era



Brock J.J. 2007. Molecular fossils and early life on Earth

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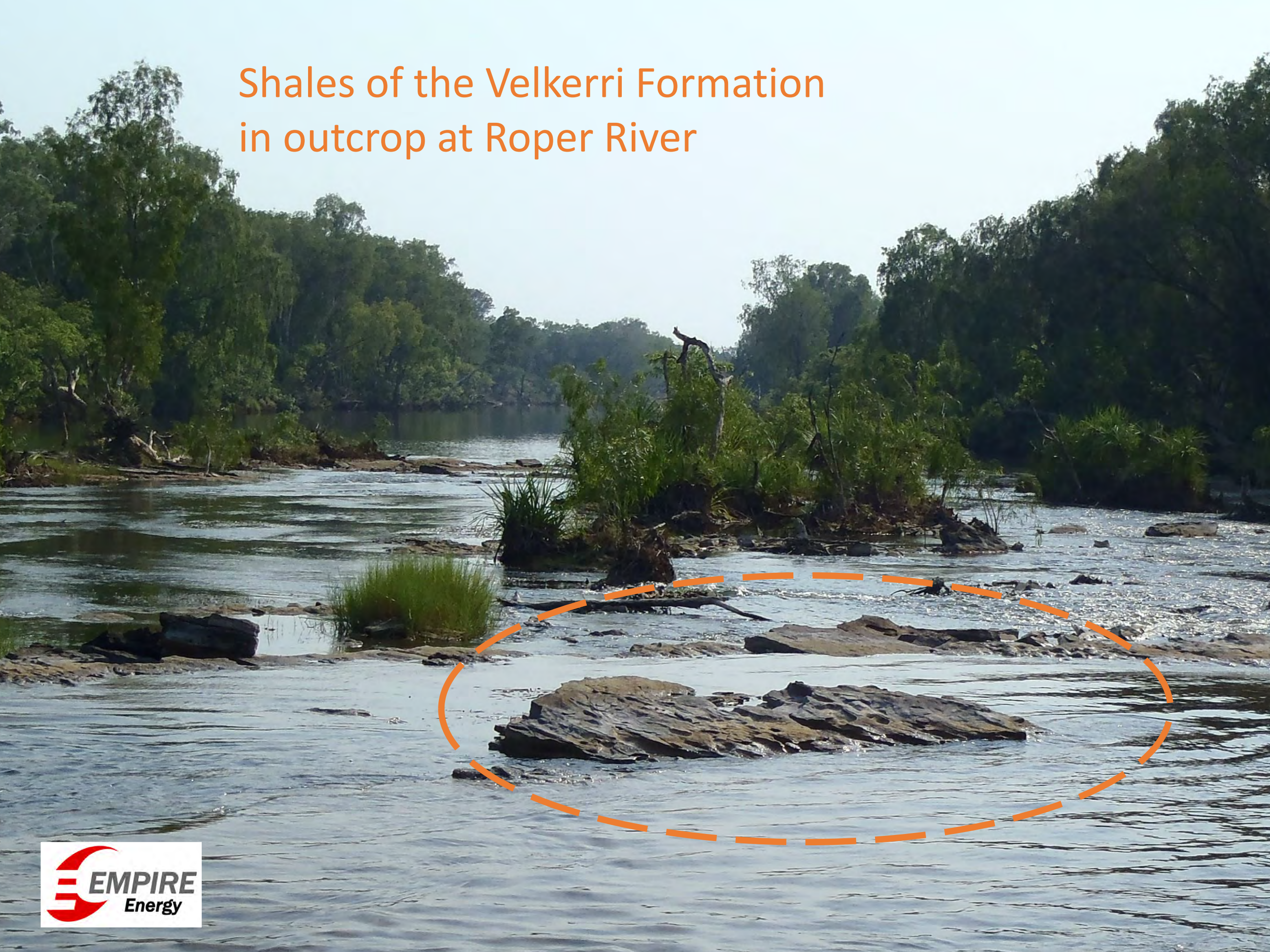
# Shales of the Velkerri Formation in outcrop at Roper River



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# McArthur Basin – Substantial Committed Investment

Numerous farm-out deals have been carried out resulting in capital commitments of hundreds of millions of dollars by major oil and gas companies[1]

| Year | Vendor | Investor | WI | Basin | Cash Upfront | Carried expenditure | Acres (mm) |
|---|---|---|---|---|---|---|---|
| 2011 | Falcon Oil & Gas | HESS | 62.5% | Beetaloo | A$27m | A$162m | 6.2 |
| 2013 | Tamboran | Santos | 75.0% | Beetaloo / McArthur | N / d | N / d | 6.4 |
| 2014 | Falcon Oil & Gas | origin / sasol | 70.0% | Beetaloo | A$20m | A$185m | 4.6 |
| 2015[2] | Empire energy | American Energy Partners | 80.0% | Beetaloo / McArthur | A$20m | A$80m + A$133m | 14.5 |
| 2015[2] | armour energy | American Energy Partners | 75.0% | McArthur / Nicholson | A$31m | A$173m + A$133m | 31.3 |

- Large JV deals have been carried out across the basin
- Major global oil companies recognize that the Beetaloo / McArthur Basin shales have world scale potential
- The lifting of the fracking moratorium and recommencement of appraisal drilling activities pave the way for a resumption of Empire Energy's corporate activity
- Empire is one of the only tenement holders in the basin with 100% equity and enormous acreage footprint
- With US asset sales advancing, Empire Energy will become a pure NT hydrocarbon play and its shares will offer the single best stock market exposure to the potential of the McArthur / Beetaloo Basins

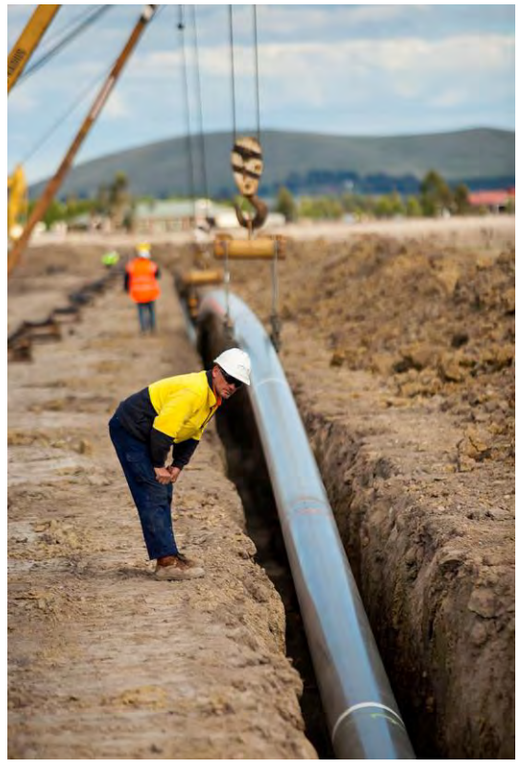
*1: Company filings / press releases*
*2. Transactions did not proceed due to passing of founder of AEP*

# **NEGI** link opened the supply route to East Australia

Massive buildout of East Coast LNG has created substantial domestic gas shortfall

Jemena's **Northern Gas Pipeline** has connected NT to the East Coast

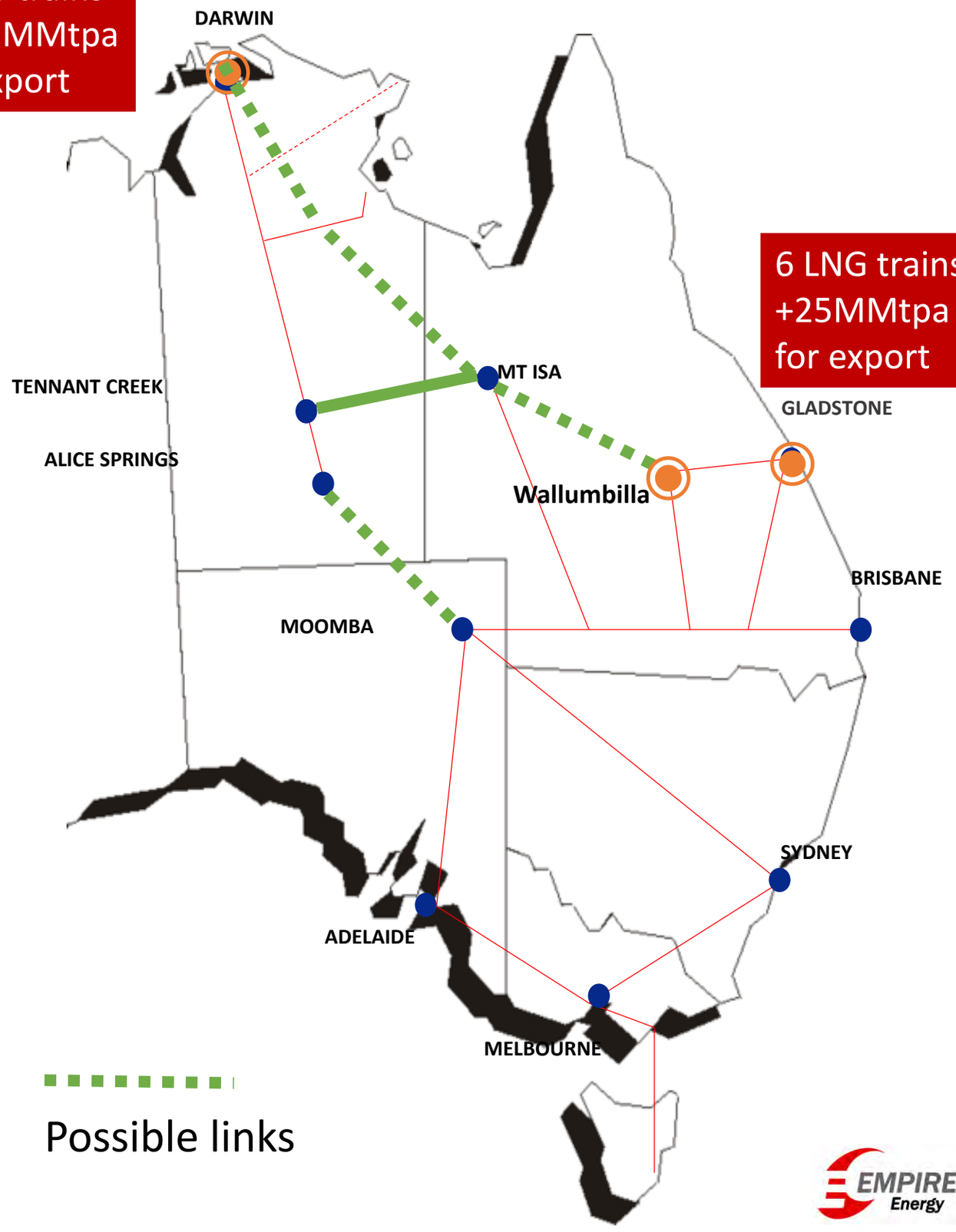
The Northern Territory & Federal Governments now working to facilitate the development of the **North East Gas Interconnector** to meet Eastern Australia energy demand



Jemena
bringing energy to life

3 LNG trains
+11.5MMtpa
for export

6 LNG trains
+25MMtpa
for export




Possible links

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# Infrastructure for Domestic and Export markets

- Current LNG plants operate below capacity and further, expansions could double installed capacity
- Australia is strategically located to fulfil rapidly increasing Asian demand with low sovereign risk
- There is already a pipeline corridor directly through Empire's EP187 tenement allowing for near-term commercialisation, and a larger pipeline can be added alongside existing
- A 1.0 Bcf /day pipeline to Darwin would cost ~$1.5bn, and could be expanded to 2-3 Bcf /day with compression. This cost could be borne by pipeline operators upon reserve certification by Santos / Origin / Pangaea / Empire

---

- Jemena has publicly stated that following lifting of the NT Fracking Moratorium it will increase its $800m investment in the Northern Gas Pipeline by up to $4bn to increase installed capacity from 90 Pj / day to 700 Pj / day

**Domestic**

- "Santos is focused on further exploring and appraising the McArthur Basin in the NT, a multi-TCF prospective resource position analogous to US shale plays. Santos' focus for this region is to support Darwin LNG backfill, expand our acreage footprint and explore and appraise the McArthur Basin."

**Export**

EMPIRE Energy

# And equally access to growing export markets

| Plant | Status | Operator | Capacity Bcf/day |
|---|---|---|---|
| Ichthys Darwin | Online | INPEX | 1.2 |
| Darwin LNG | Online | ConocoPhillips | 0.5 |
| QCLNG Gladstone | Online | Shell | 1.2 |
| GLNG Gladstone | Online | Santos | 1.1 |
| APLNG Gladstone | Online | Australia Pacific LNG | 1.3 |
| **Total production from 9 trains** | | | **5.3** |

**Expansion Potential to a Total of 18 trains for 10.8 Bcf / day**

EMPIRE Energy

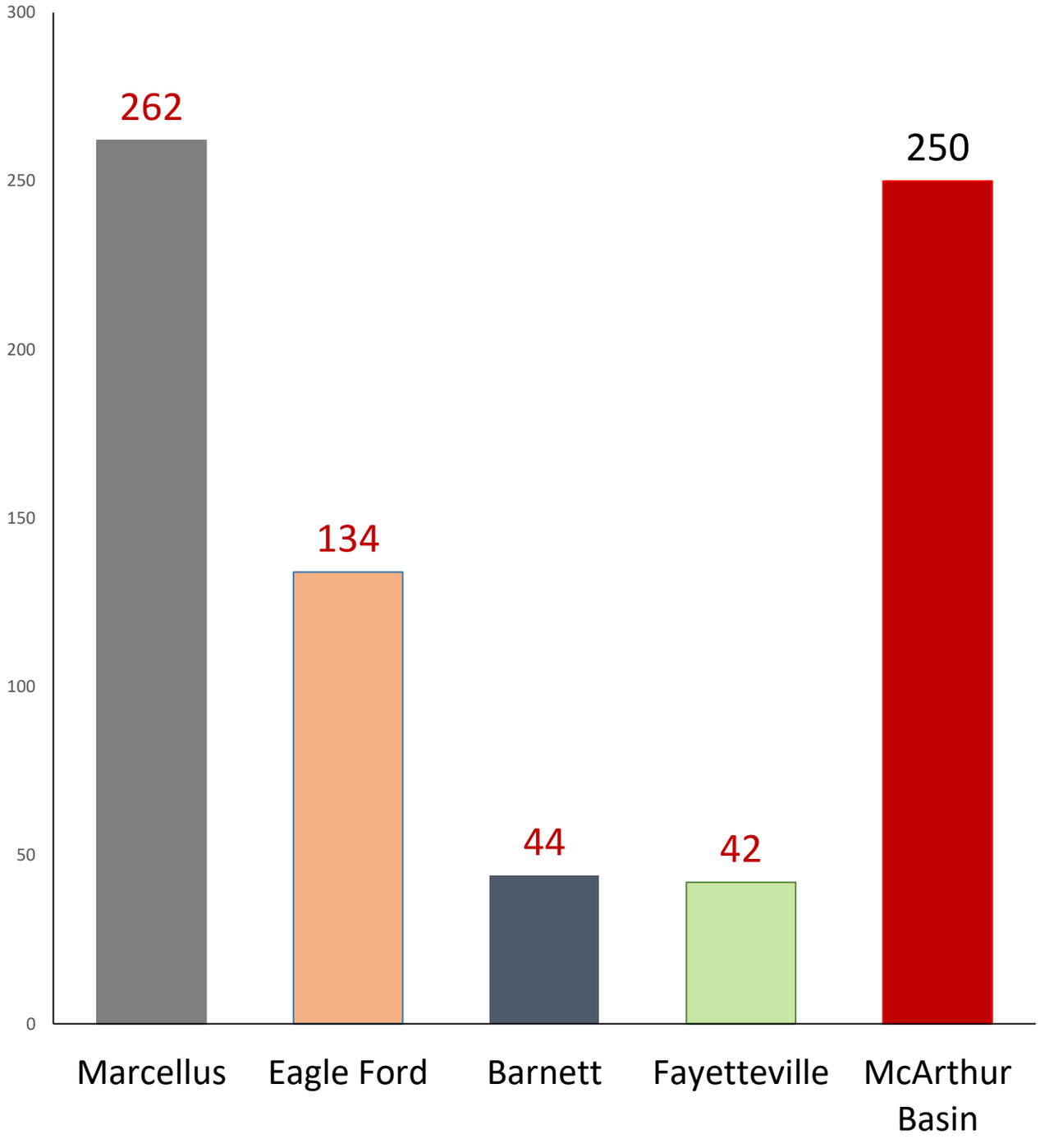
# Empire's independently certified NT Prospective Resource Estimate

| Formation | Permits | Geological factor discount | Area m acres | Units | P90 | P50 | PV10 |
|---|---|---|---|---|---|---|---|
| Barney Creek | EP 184, EPA180, 181, 182, 183, 188 | 50-90% | 3,559 | Bcf | 3,304 | 8,699 | 20,172 |
| | | 50-90% | | MMBO | 66 | 174 | 403 |
| Velkerri | EP184, 187, EPA 188 | 50% | 315 | Bcf | 383 | 1,192 | 3,086 |
| | | 50% | | MMBO | 8 | 24 | 62 |
| Wollogorang | EP 184, 187, EPA 188 | 90% | 1,384 | Bcf | 524 | 1,185 | 2,371 |
| | | 90% | | MMBO | 10 | 24 | 47 |
| **Total** | | | | **MMBOe** | **851** | **2,238** | **5,183** |

**Prospective Resource – P50 13,000 Pj equivalent**

*Conversion Factor: 5.485 Mcf : 1 Bbl*
*Northern Territory Resources by: Muir & Associates P/L and Fluid Energy Consultants*

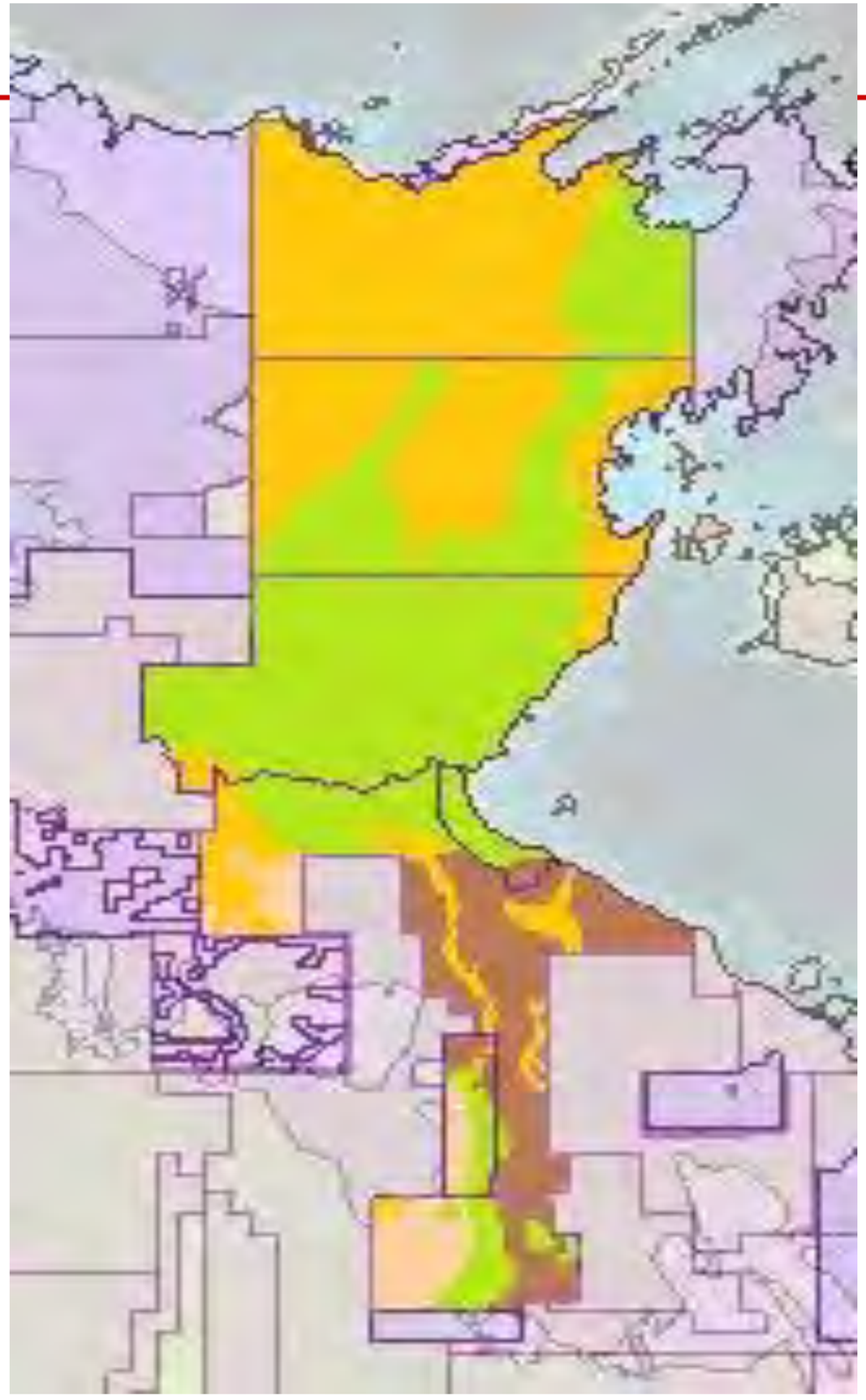
# Un-risked Prospective/Technically Recoverable Resource




McArthur Basin potential rivals the Resource Potential of the US Marcellus Shale

**"Prospective Resource"** is the estimated quantities of petroleum that may potentially be recovered by the application of a future development project(s) relate to undiscovered accumulations. These estimates have both an associated risk of discovery and a risk of development. Further exploration appraisal and evaluation is required to determine the existence of a significant quantity of potentially moveable hydrocarbons.

# Empire's primary Shale Targets



Total 33,867 km$^2$ (8.4mm acres) of identified shale for Independent Prospective Resource identification

## Velkerri Shale / Kyalla (Beetaloo sub-Basin)

- 628,000 acres (>2,500km2), up to 600m thick
- Independent Prospective Resource (P50) 1.2TCF gas + 24 mmbbls oil / condensate

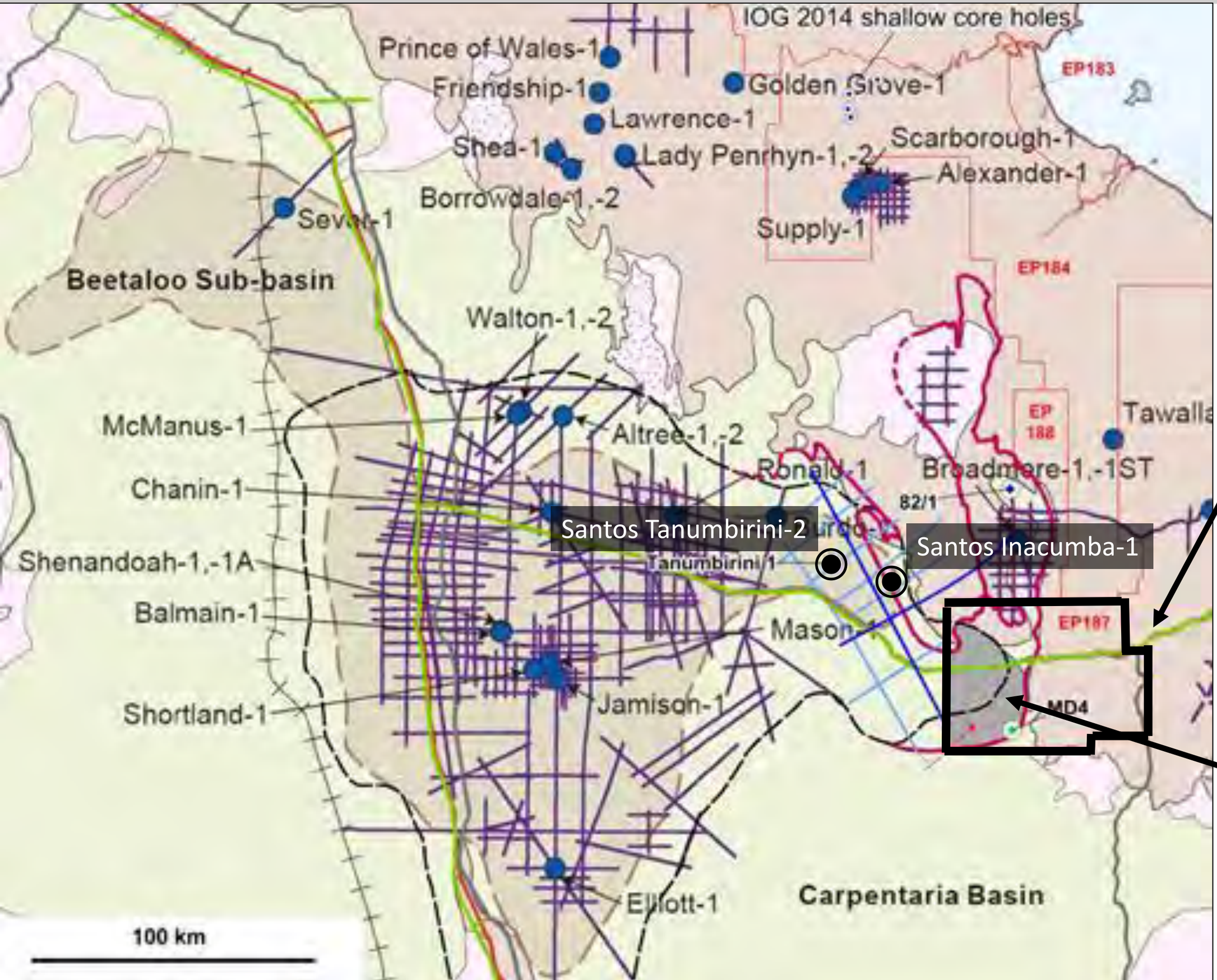
## Barney Creek Formation (McArthur Basin)

- 6.2mm acres (>25,000km2), up to 900m thick
- Independent Prospective Resource (P50) 8.7TCF gas + 174 mmbbls oil / condensate
- Shales up to 3km thick

## Wollogorang Formation (McArthur Basin)

- 1.5mm acres (>6,000km2), up to 100m thick
- Independent Prospective Resource (P50) 1.2TCF gas + 24 mmbbls oil / condensate

# Beetaloo Sub Basin – Empire's 1-3tcf Target




Existing all weather road and gas pipeline

Empire's Velkerri target in EP187

# Beetaloo Sub Basin – Empire's 1-3tcf[1] Target

## Empire's 1 - 3 TCF target on trend with major Origin discovery and Santos work programs

- Empire ~2,543km$^2$ (630,000 acres) in eastern Beetaloo sub-basin
- Amungee NW-1H – TD 2,500m Beetaloo well flowed gas from the Velkerri Shale
- Tanumbirini-1 well encountered Velkerri shale from 2,400m to >3,800m
- Santos to undertake major fracked horizontal development program in adjacent block in 2019

- Empire EP187 Work Program
- Velkerri Shale in EP187 will be Empire's initial exploration, appraisal and development target
- 231 line km 2D seismic will delineate the shape of the basin and identify drilling targets
- Initial drilling program to comprise a core well to confirm hydrocarbon content and rock characteristics
- Thereafter, fracked horizontal production wells will be drilled and put into production
- EP 187 is located on an existing sealed road and gas pipeline which reduces drilling costs and allows for near term commercialisation

# Empire's US Reserves and Resources in Kansas, NY State & Pennsylvania – currently advancing sales process

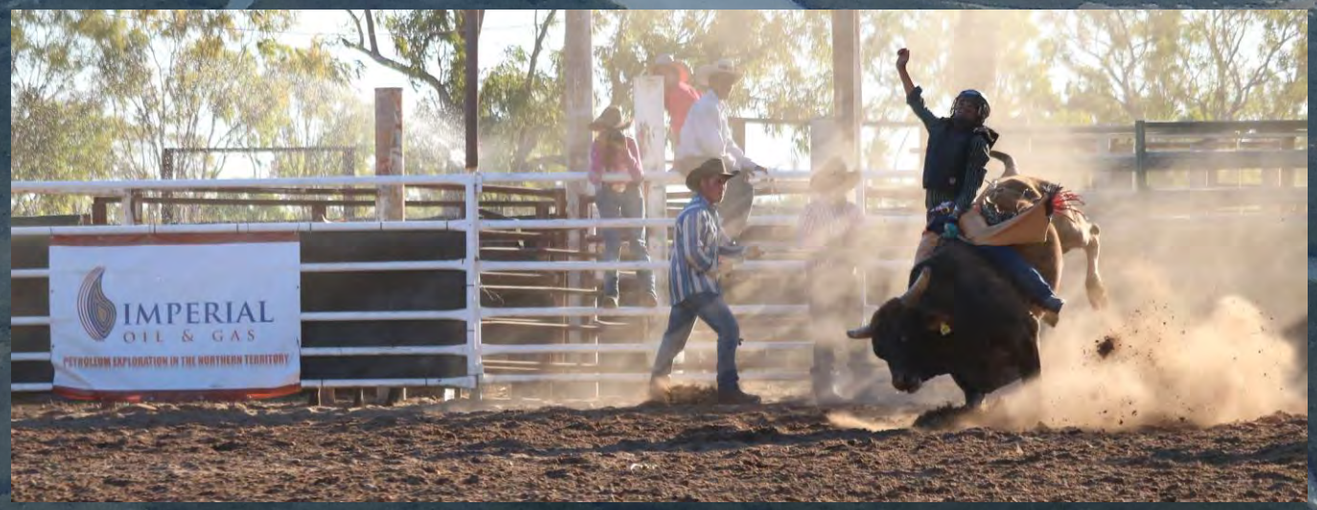
## As at December 31, 2018

| Reserves (NYMEX STRIP - DEC 31, 2017) | Gross Wells | Oil (Mbbls) | Gas (MMcf) | MBoe | Capex US$M | PV0 US$M | PV10 US$M |
|---|---|---|---|---|---|---|---|
| Region (Reserves) - USA | | | | | | | |
| Proved Developed Producing | 2,211 | 1,612 | 26,787 | 6,077 | 0 | 62,697 | 31,919 |
| Proved Developed Non-producing | 21 | 503 | 0 | 503 | 1,546 | 10,858 | 5,361 |
| Proved Behind Pipe | 6 | 148 | 39 | 155 | 532 | 4,988 | 1,472 |
| Proved Undeveloped | 80 | 1,027 | 3,396 | 1,593 | 14,542 | 27,755 | 7,480 |
| **Total 1P** | **2,318** | **3,290** | **30,222** | **8,327** | **16,620** | **106,298** | **46,232** |
| Probable | 83 | 1,248 | 12,654 | 3,357 | 19,776 | 47,087 | 13,519 |
| **Total 2P** | **2,401** | **4,538** | **42,876** | **11,684** | **36,396** | **153,385** | **59,751** |
| Possible | 208 | 1,749 | 3,772 | 2,378 | 24,589 | 54,735 | 10,284 |
| Possible - NY Shale | | 90,740 | 12,460 | 92,817 | | | |
| Total 3P | 2,609 | 97,027 | 59,108 | 106,878 | 60,985 | 208,120 | 70,035 |
| **Prospective Resource New York Shale P(50)[(1)]** | | **203,500** | **1,221,000** | **407,000** | | 0 | 0 |
| **Total Reserves & Resources** | | **300,527** | **1,280,108** | **513,878** | | | |

*US Reserves by: Graves & Co Consulting & Pinnacle Energy Services, LLC*

*[(1)] Prospective Resource P(50) - unrisked, is the estimated quantities of petroleum that may potentially be recovered by the application of future development project(s) relate to undiscovered accumulations. These estimates have both an associated risk of discovery and a risk of development. Further exploration appraisal and evaluation is required to determine the existence of a significant quantity of potentially moveable hydrocarbons*

Empire’s vision is to safely develop the NT’s petroleum resources and to preserve cultural, heritage, customs & natural environment




Empire's vision is to safely develop the NT's petroleum resources and to preserve cultural, heritage, customs & natural environment

# Corporate, technical and regulatory stars align

- Empire has substantially reduced debt, increased cash balance and renewed the Board of Directors
- Strategy is to focus on the substantial value creation potential of its Northern Territory assets
- The Middle Velkerri Shale of the Beetaloo Basin is a world class resource with over 500 TCF gas in place
- Northern Territory Government is open for business
- Major industry appraisal drilling is expected to start in the coming months
- Beetaloo Basin operators are likely to commence flow testing of appraisal wells later in 2019
- Empire is the only ASX listed junior with Beetaloo Basin and McArthur Basin tenements

ASX:EEG

With US asset sales advancing, Empire Energy is becoming an NT-focused hydrocarbon play and its shares will offer the single best stock market exposure to the potential of the exciting future of the McArthur and Beetaloo Basins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