



# ASX:EEG

Oil & Gas from the McArthur - Beetaloo Basins



Alex Underwood, MD Empire Energy Group, Sydney Mining Club, October 2019

# Empire's Massive Resource



+



=

**13.0**

Tcf eq P(50) prospective resources

**12.8**

Tcf Proven reserves



=

**3.0**

Tcf Proven reserves

Shell's Prelude 475 km NE of Broome – 488m long and world's largest ship

Total East Coast production incl LNG exports - Tcf pa



=

**1.8**

# Empire Energy – Bringing the US Shale Revolution to Australia



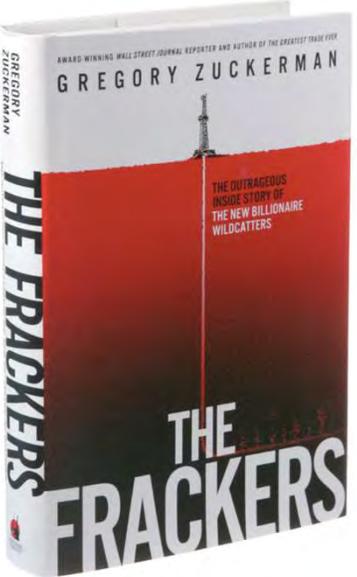
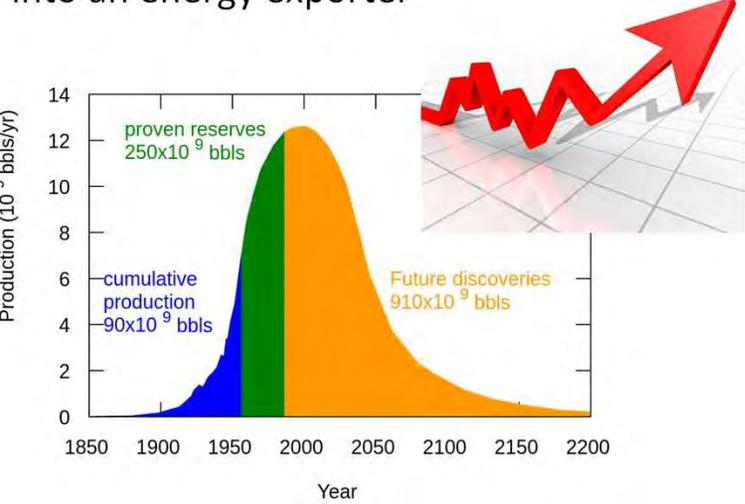
Pennsylvania USA – home of the now famous Marcellus Shale



Empire leaders Bruce McLeod (late) and Prof John Warburton



Against earlier fears of 'Peak Oil' and energy crisis, the Fracking Revolution has turned the USA into an energy exporter



Empire Energy MD Alex Underwood once banked Empire Energy at Macquarie Bank and now leads the company



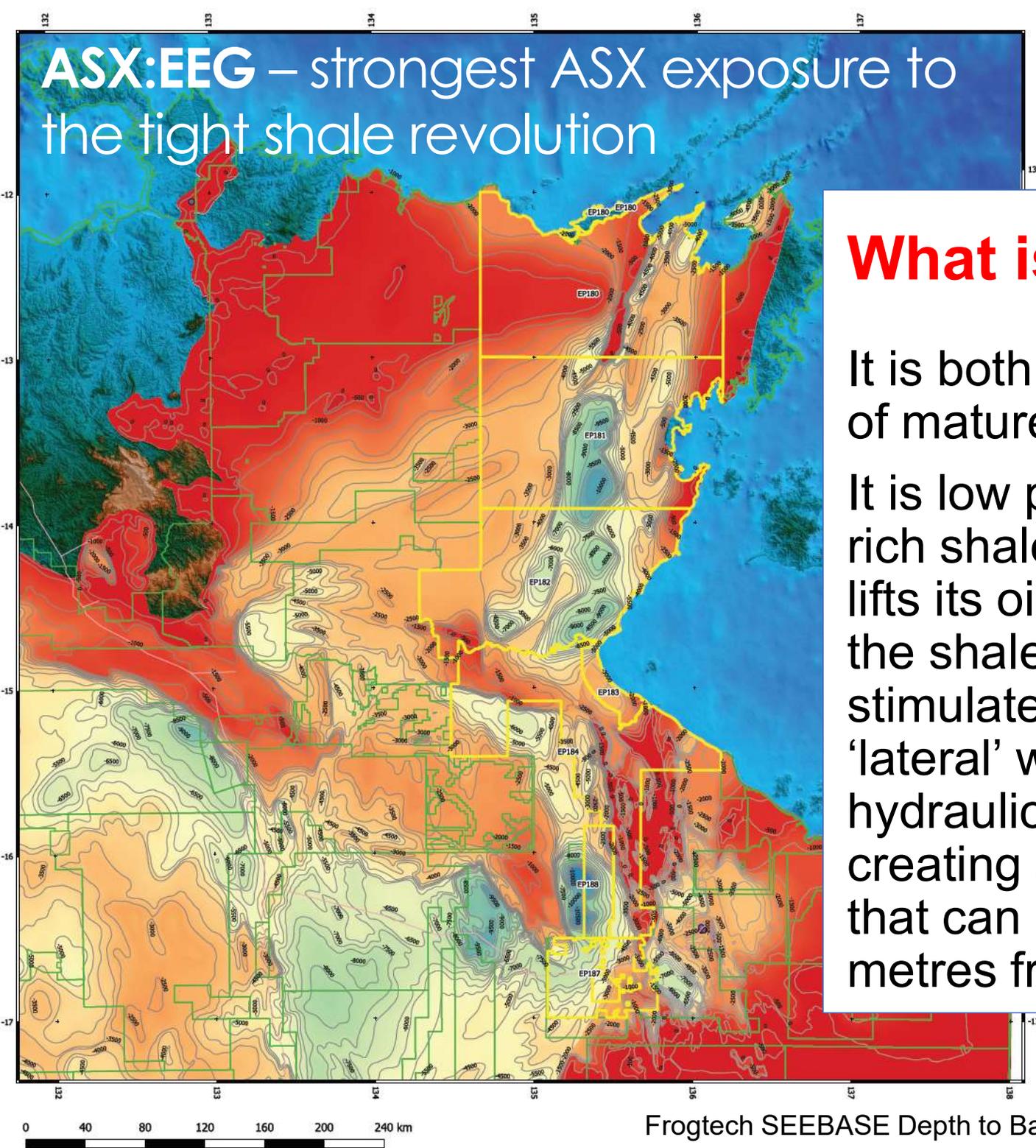
# ASX:EEG – strongest ASX exposure to the tight shale revolution



## What is tight shale?

It is both source and trap rock of mature hydrocarbons.

It is low permeability carbon rich shale that dramatically lifts its oil and gas yield when the shale strata are stimulated using horizontal or 'lateral' wells, and hydraulically fractured creating a maze of fractures that can reach hundreds of metres from the borehole.



Frogtech SEEBASE Depth to Basement Mapping

# The McArthur and Beetaloo Basins could make Australia **self-sufficient in liquid fuels**



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*



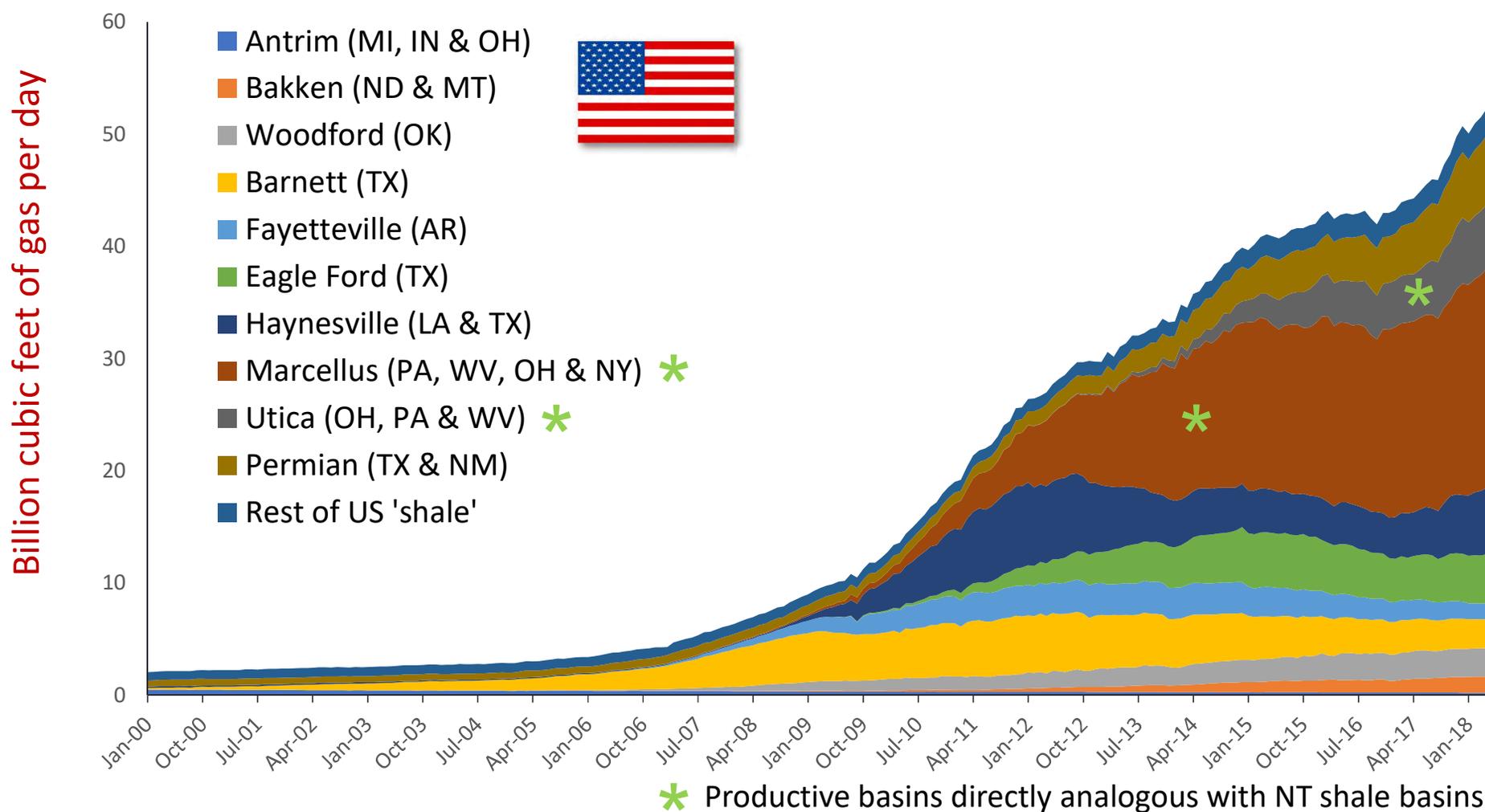
Darker shiny bands in this Barney Creek Formation core are oil-rich



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



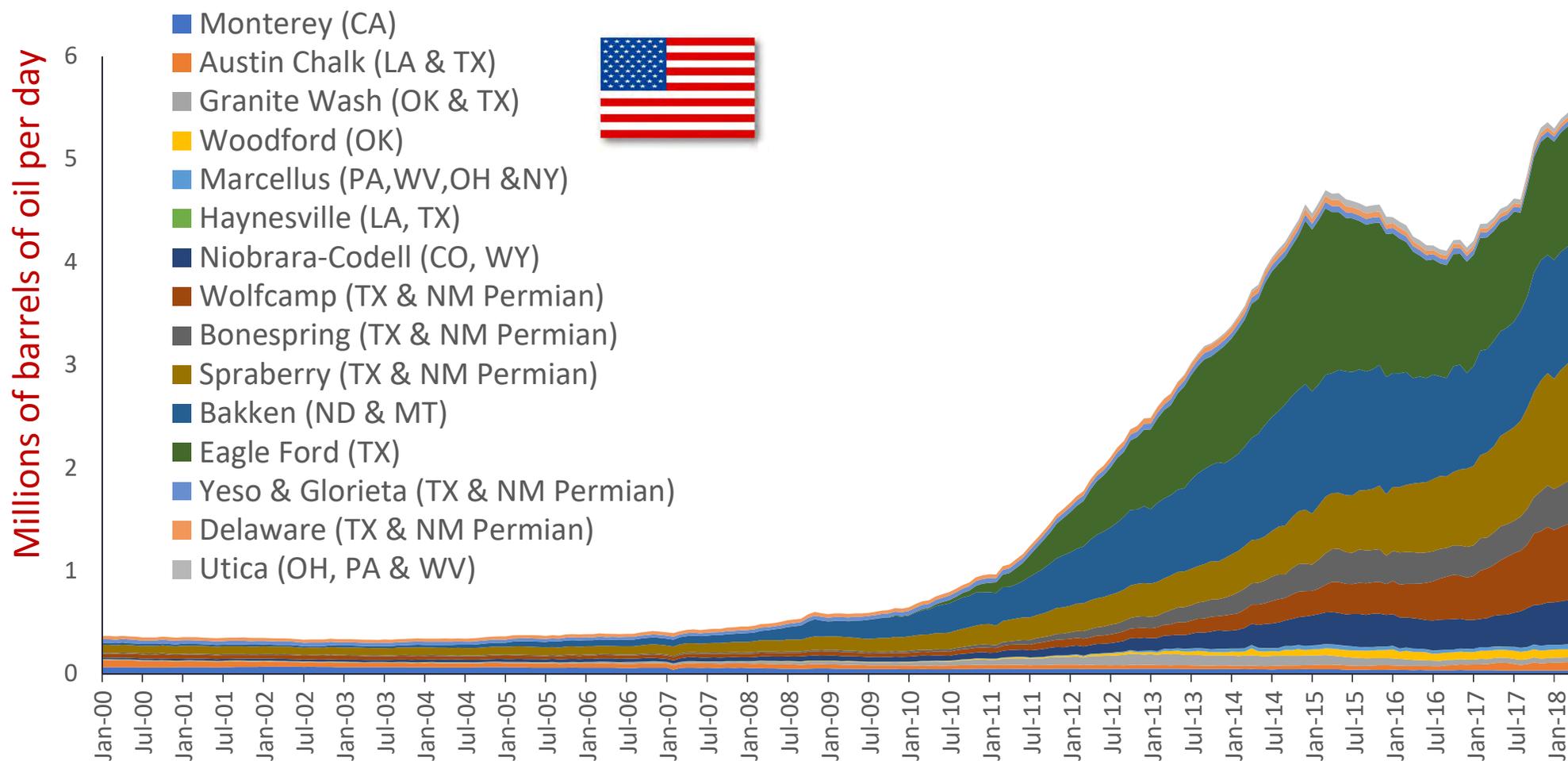
Monthly US shale gas production figures since 2000 coloured by shale formation



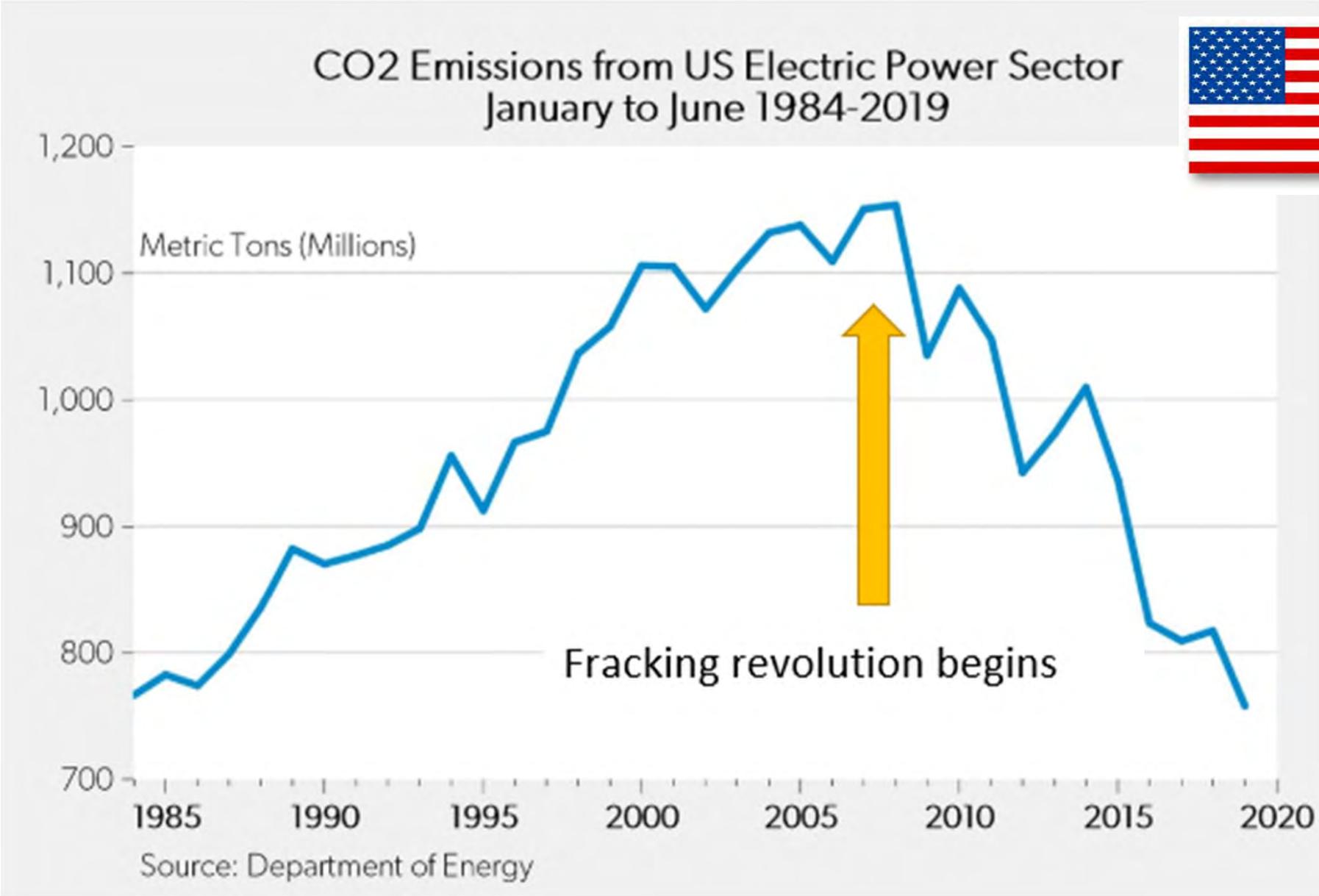
# Horizontal drilling and fracking shale gas transformed the US energy market, and its geopolitics



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

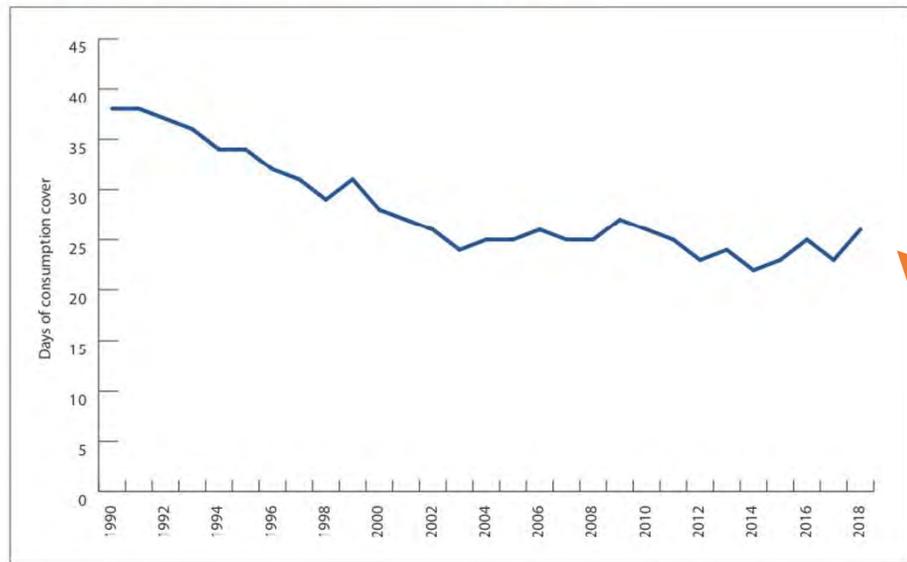


# US emissions are dramatically falling as cost-effective shale gas replaces coal for base load power



# Australia needs this resource

Figure 13: Average consumption days of refined products<sup>99</sup>, 1990–2018



Source: DoEE 2018b.

## THE AUSTRALIAN FOR THE INFORMED AUSTRALIAN

### Securing our north critical as power in Pacific shifts

*The case for Australia building up the ADF is compelling*

**23 day reserve  
of liquid fuel  
on hand to run  
Australia**

imates," he wrote. "While wealthy, we are paying more than we can afford and ourselves more than we can neglecting basic defence. e strategy is still simply to Americans." onfirmation that the US t plans to spend about \$400 aval and air force n in the Northern Territory ent sign of our major ally's nt to Australia and to the nation, however, must be play its part, especially in warning in the US Studies

that assess industry, state and territory government, Home Affairs, intelligence and Defence capacity in the north. The ASPI report, released today, is practical and detailed as opposed to alarmist. It notes a "widened Geoff Che...

Centre report that America no longer "enjoys military primacy in the Indo-Pacific" region and "unheld... capacity to ze of power he ven r 20 years nd



DEFENCE WARNING MILITARY STRENGTH MUST BE BOOSTED IN NORTH AS U.S. 'PRIMACY' FADES  
**China threat: bolster Top End**  
 national io is a ry's warns h will rning We el

# Why does Australia need to develop its North?

- A energy-rich North is a well-defended North
- **McArthur - Beetaloo can deliver Australia liquid fuels self sufficiency**
- The North is Australia's closest interface with Asia
- **Slash emissions as in the USA**
- Offers Traditional Owners the pathway to the dignity of work and true wealth in partnership with resource companies like ours
- **Real need to develop the Northern Territory economy**
- The North is set to host an ENERGY REVOLUTION in the development of tight shale oil and gas, as transformational as it has been in the USA



# Directors of Empire Energy Group



## Alex Underwood

### Chief Executive Officer and Managing Director

- Associate Director Energy Markets Division of Macquarie Bank Limited (Sydney and Singapore)
- Director Natural Resources Division of Commonwealth Bank of Australia (Singapore)
- Financial Analyst BHP Billiton Petroleum (Perth)
- Extensive experience investing debt and equity in the upstream oil and gas sector and the identification of value creation opportunities for upstream oil and gas development / production assets

## Prof John Warburton

### Non-Executive Director

- Highly regarded petroleum geoscientist experienced in big fields
- 30 years technical & leadership experience in leading E&P companies including BP, LASMO-Eni and Oil Search
- Previously Chief of Geoscience & Exploration Excellence for Oil Search
- Non-Executive Director of Senex Energy



## Paul Espie AO

### Chairman / Non-Executive Director

- Founding principal of Pacific Road Capital, a manager of private equity funds investing in the resources sector internationally
- Former Chairman of Oxiana Ltd during the development of the Sepon copper/gold project in Laos
- Former Chairman of Cobar Mines Pty Limited after a management buyout
- Former Head of Bank of America operations in Australia, New Zealand and PNG
- Non-Executive Director of Aurelia Metals Limited



## John Gerahty

### Non-Executive Director

- Founding Director of Macquarie Bank
- Former investment banker with wide experience in commerce and business
- Former director of numerous public companies including Chairman of AFP Group PLC and MPI Mines Ltd
- Chairman of Hardie Grant Pty Limited, its major shareholder Associated Media Investments Pty Limited and AMI Advertising Media Pty Limited

# Corporate transformation, Seismic ready to roll

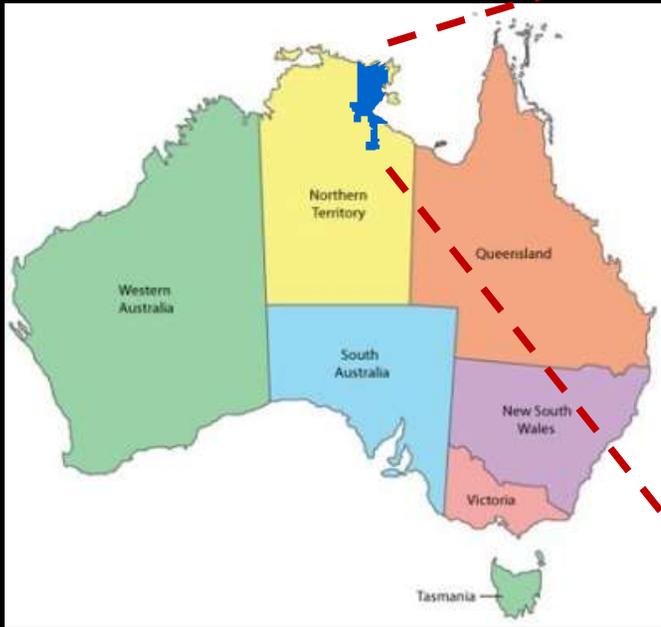
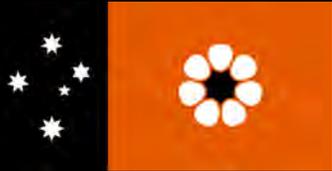
- Balance sheet repaired over 2018 – 2019 to prepare for NT exploration
- USA asset sale process commenced in late 2018 to focus on Beetaloo and McArthur
- The most active junior oiler in these new Northern Territory basins, and with the most direct ASX investment exposure
- EP187 - 231km seismic program starting NEXT WEEK
- Approval Process for drilling advancing



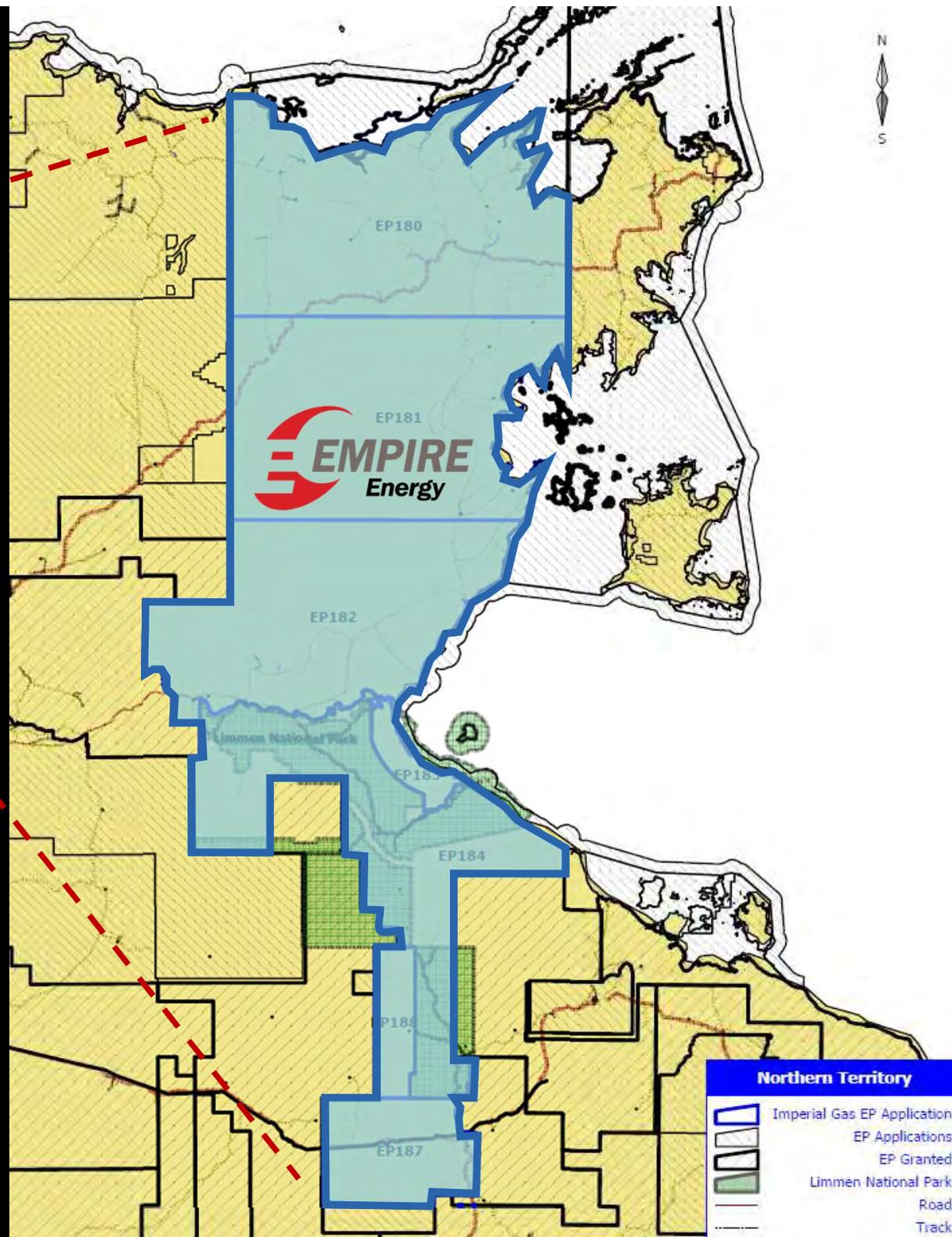
# Transforming EEG – new board, new focus, field active

- Company recapitalisation in August 2018
- Board renewal with Alex Underwood, Paul Espie, John Warburton and John Gerahty joining
- USA asset sale process reduced debt to focus the company on Beetaloo and McArthur Basins
- Sale of Kansas assets for US\$19.25 million completed reducing net debt from A\$31m to <A\$6m, with cash at bank of A\$5.5m
- Empire has retained its cash flow positive New York / Pennsylvania gas production assets

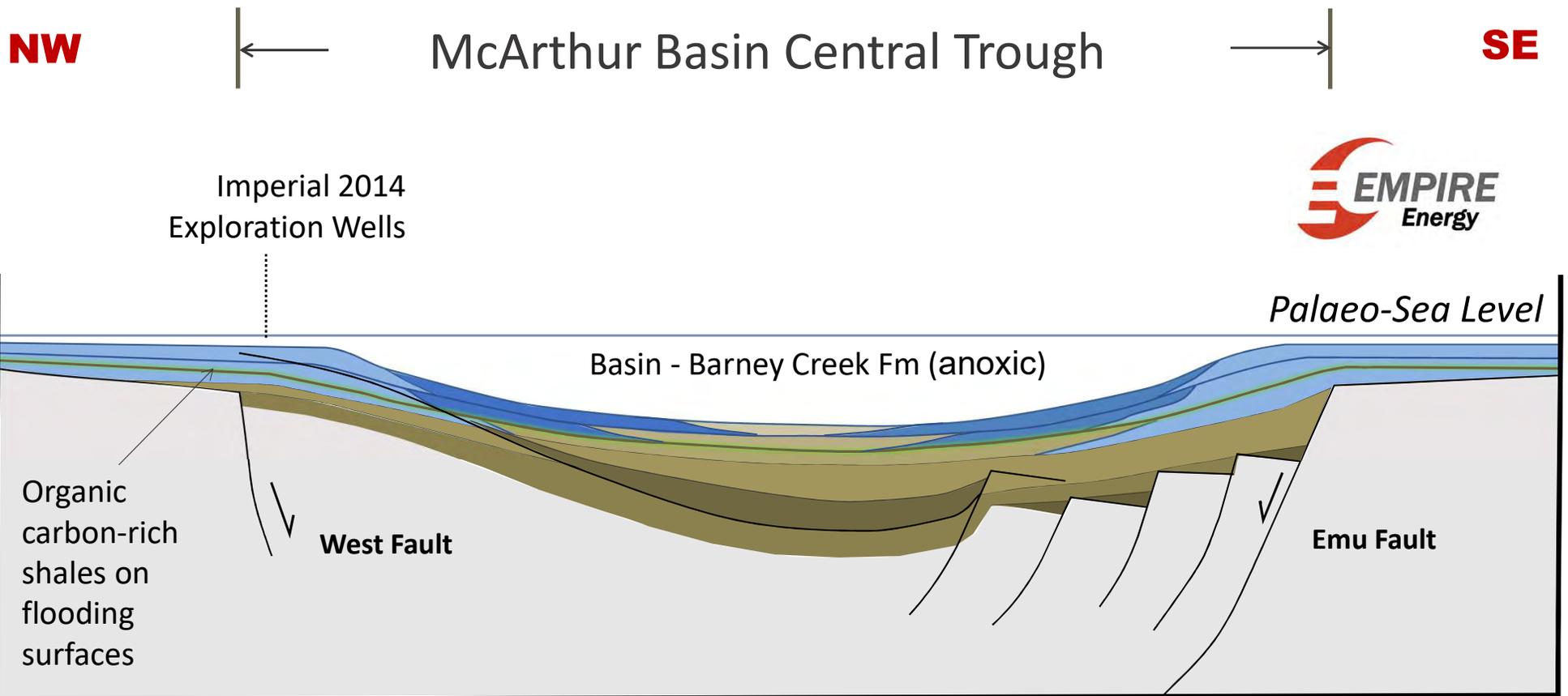
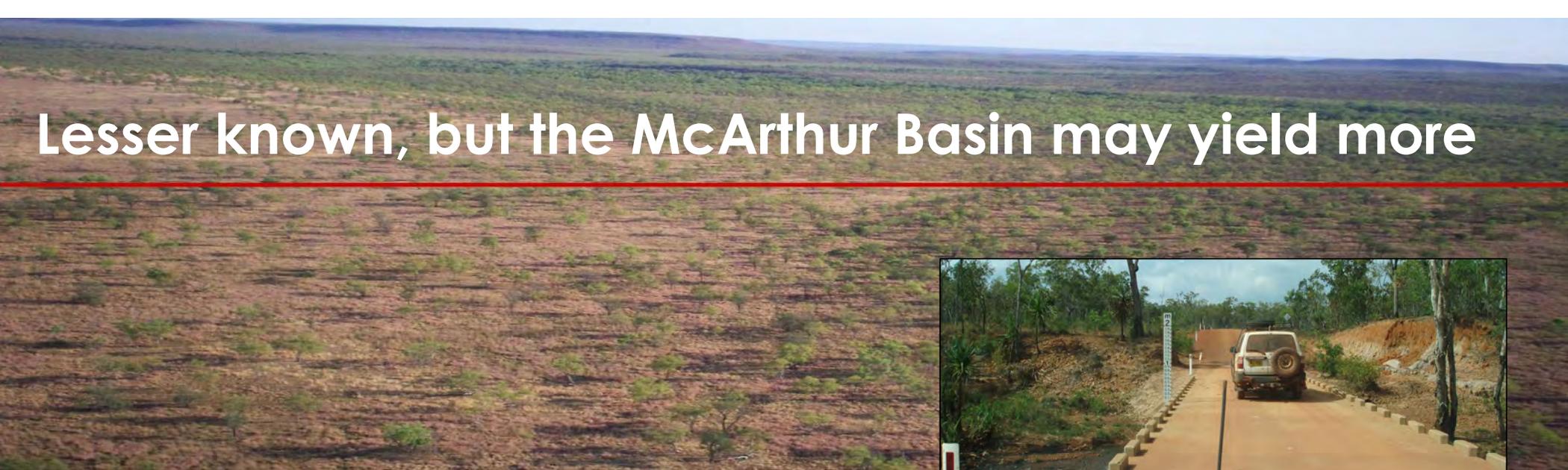




Major holdings across both McArthur and Beetaloo basins in NT's new hydrocarbon frontier



# Lesser known, but the McArthur Basin may yield more



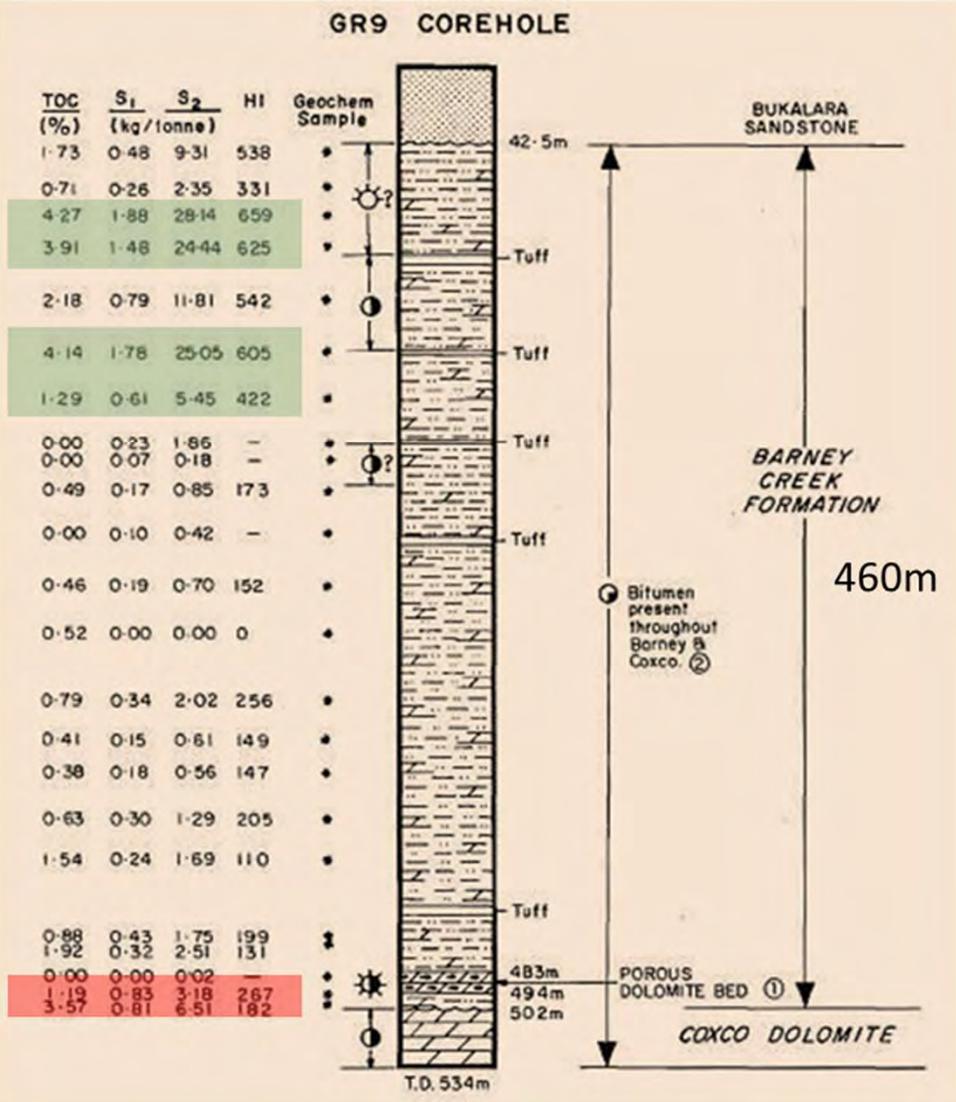
# Where the story starts...

## A Gas Strike in an April 1980 mineral drillhole

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.



Coxco Dolomite

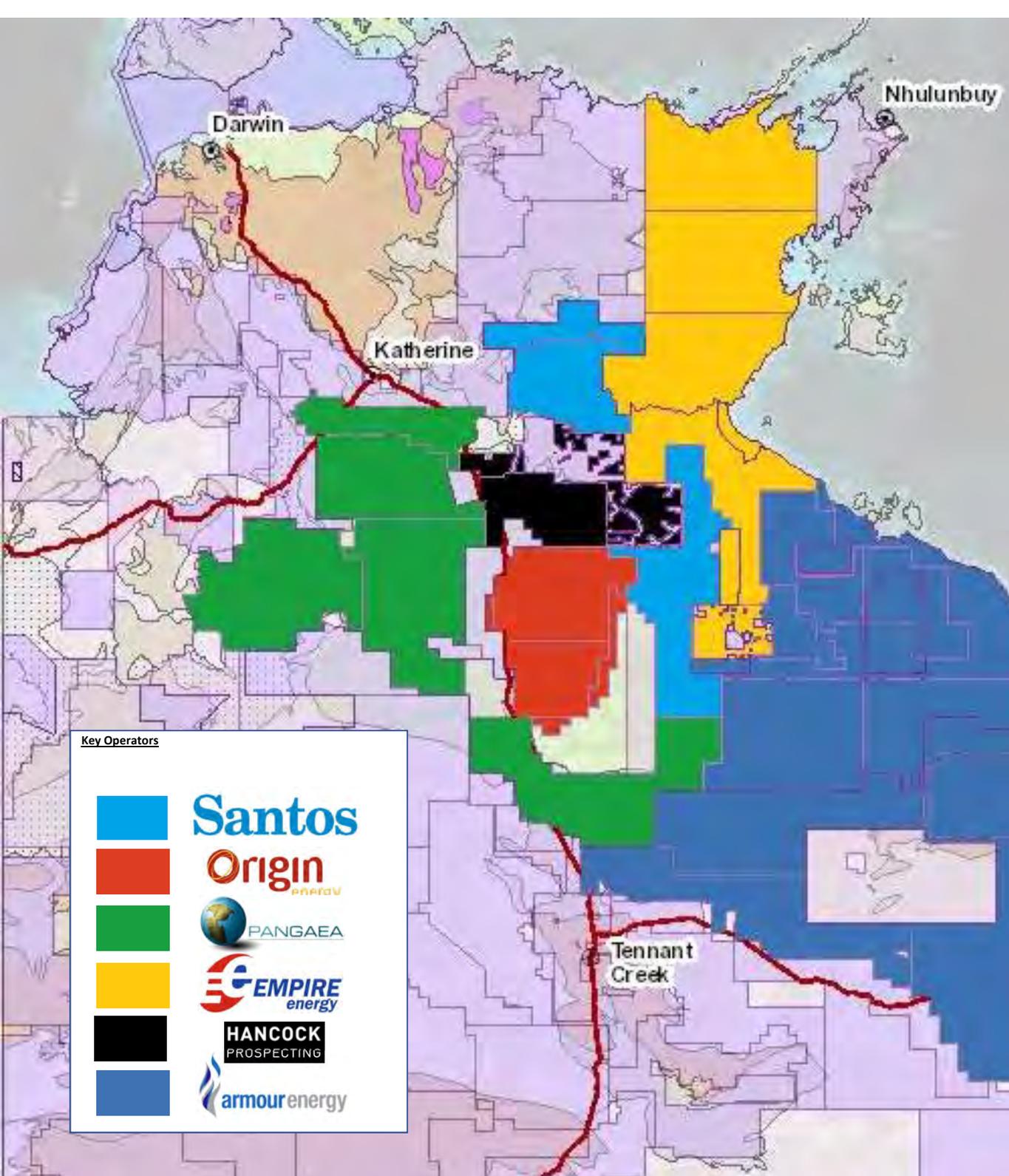
Carbonaceous black, silty- shale with bitumen

# Amoco Minerals' GRNT-09 mineral drillhole ignited unexpectedly



Amoco Minerals ASX announcement 11<sup>th</sup> October 2010

- Beneath a 6 metre flame it flowed at a phenomenal 140psi for 6 months at ~ 6 mmcfpd, for ~2 Bcf/yr
- Over 30 hydrocarbon wells have been drilled since
- Now over \$800m is committed to exploring this new hydrocarbon province



## 2019 the watershed moment – drilling ramping up

- Numerous large independent oil and gas companies hold substantial acreage positions in the Greater McArthur Basin
- Origin drilling 2 fracked horizontal wells in 2019 / 20 testing Velkerri Shale and Kyalla Formation
- Santos to drill 2 fracked horizontal wells in 2020 testing Velkerri Shale
- Hancock Prospecting has indicated it may invest A\$150m - A\$200m in exploration

# Amungee compared with the breakout well in the US

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



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



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.<sup>36</sup> Steinsberger, in an interview with The Atlantic, said,

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*“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!”*<sup>37</sup>

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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.<sup>38</sup> Steinsberger had finally figured out how to get shale rock formations to give up their natural gas and do so in an economical way.



# Strongest exposure to the McArthur Basin



Total 33,867 km<sup>2</sup> (8.4mm acres) of identified shale for Independent Prospective Resource identification

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

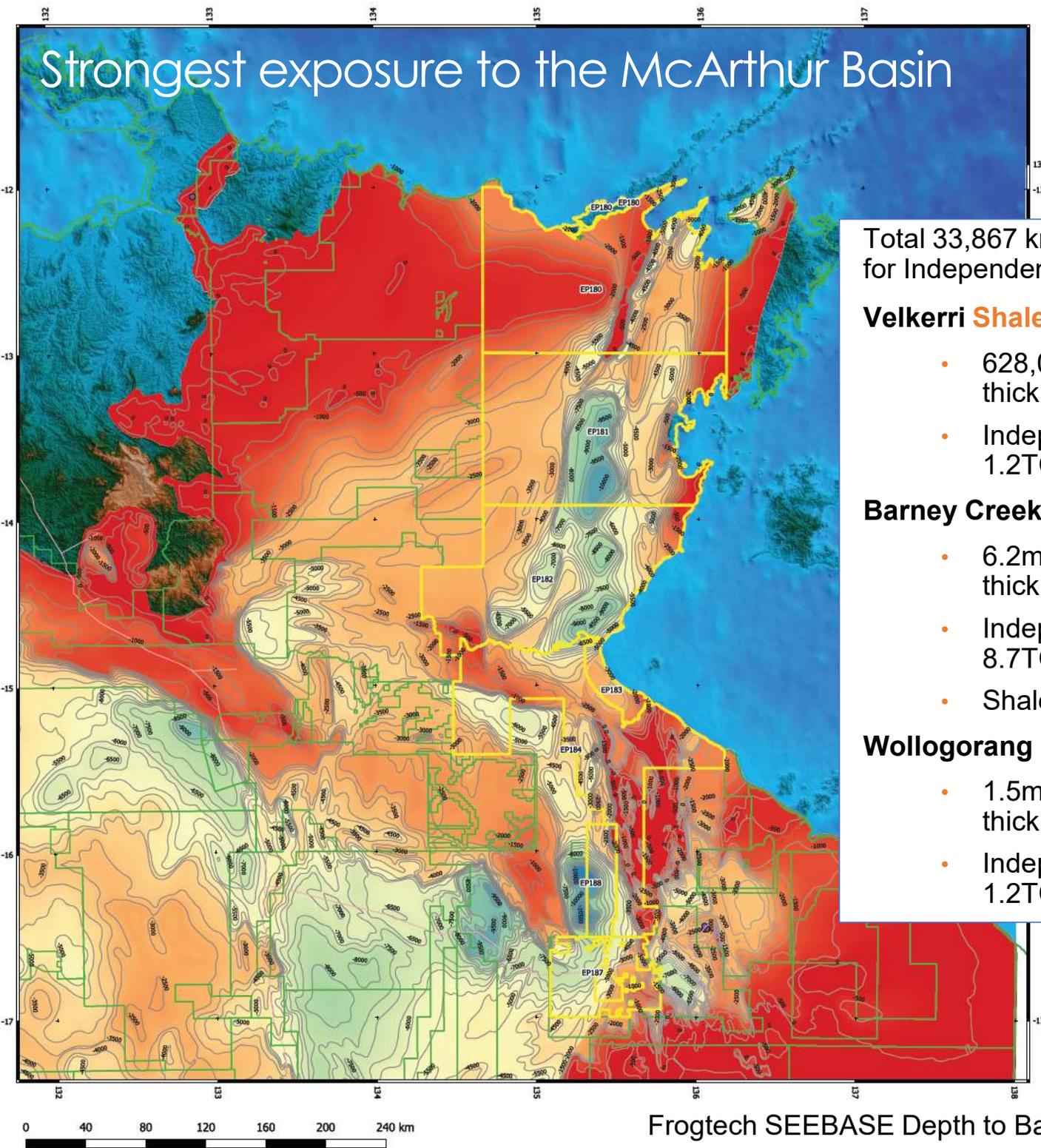
- 628,000 acres (>2,500km<sup>2</sup>), up to 600m thick
- Independent Prospective Resource (P50) 1.2TCF gas + 24 mmbbls oil / condensate

## Barney Creek Shale (McArthur Basin)

- 6.2mm acres (>25,000km<sup>2</sup>), 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 (>6,000km<sup>2</sup>), up to 100m thick
- Independent Prospective Resource (P50) 1.2TCF gas + 24 mmbbls oil / condensate



Frogtech SEEBASE Depth to Basement Mapping

# McArthur Basin, a Vast & Proven Petroleum System



Shales of the Barney Creek at Glencore's McArthur River lead-zinc-silver mine host syngenetic hydrocarbons and base metals

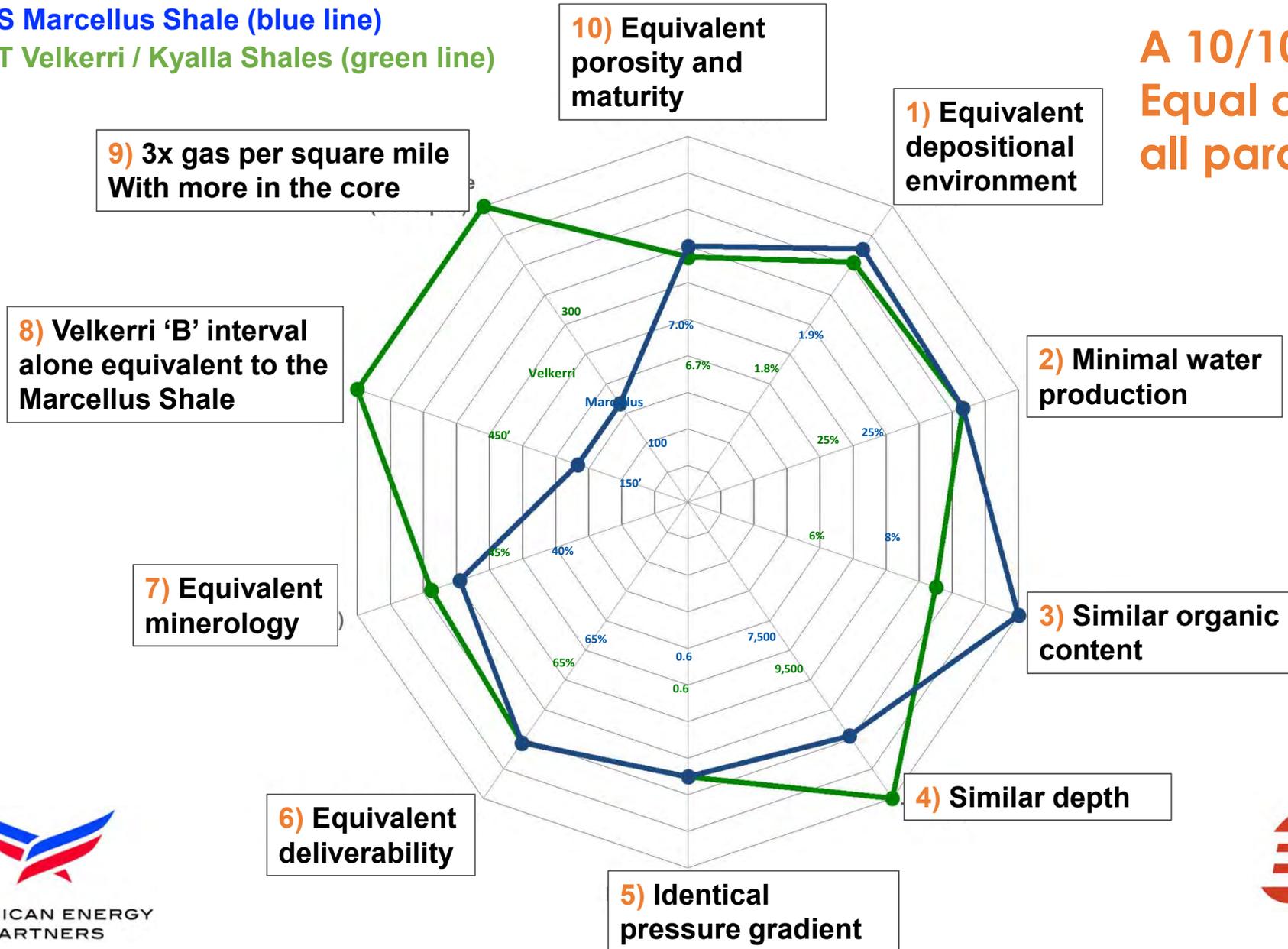


# Clear USA shale analog with **Velkerri / Kyalla Shales** with original gas in place equal to three stacked **Marcellus Shale** plays

US Marcellus Shale (blue line)

NT Velkerri / Kyalla Shales (green line)

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



AMERICAN ENERGY PARTNERS

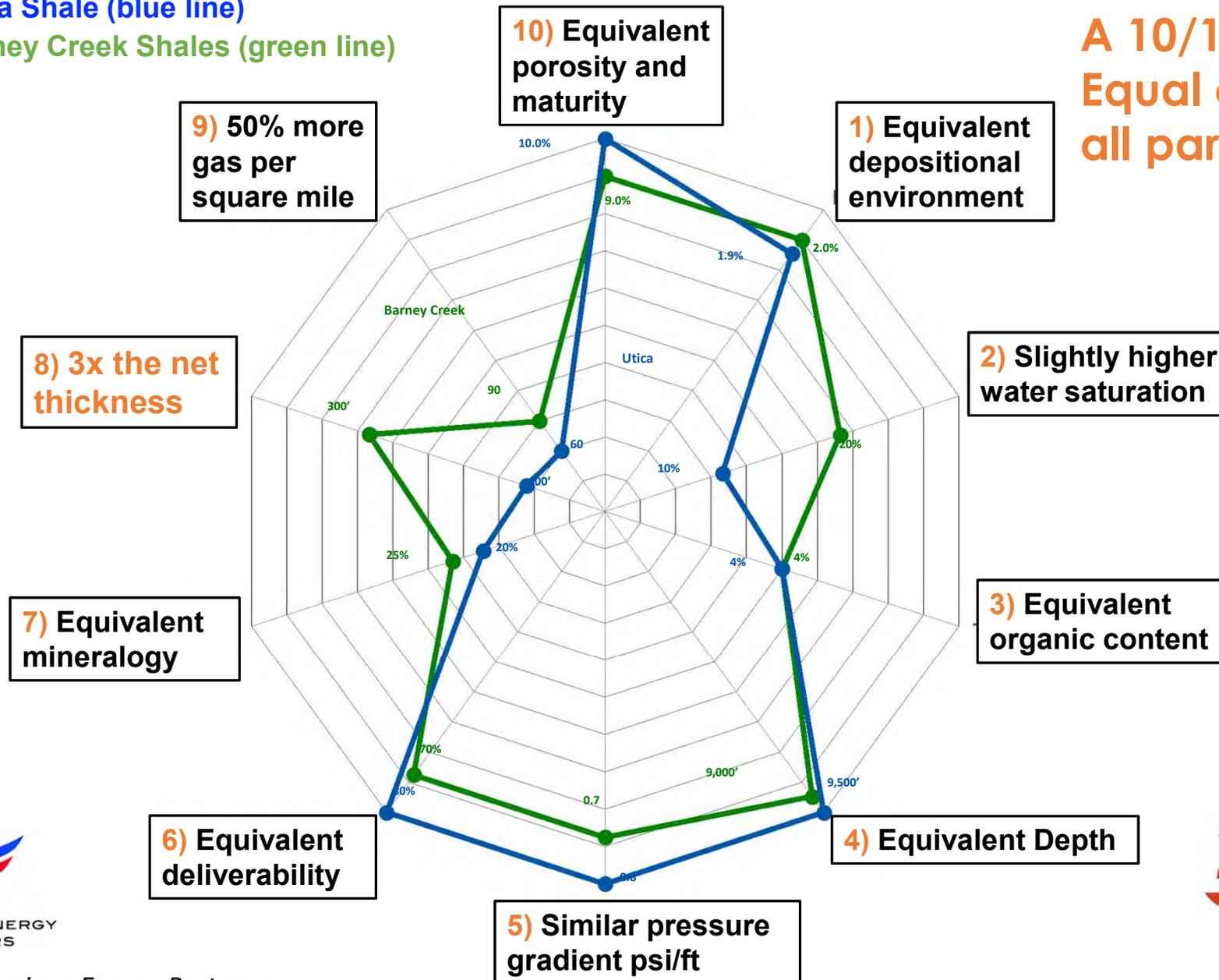


# Clear USA shale analog of **Utica Shale** identified in the NT's **Barney Creek Shale** - with 50% more gas equivalent

US Utica Shale (blue line)

NT Barney Creek Shales (green line)

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



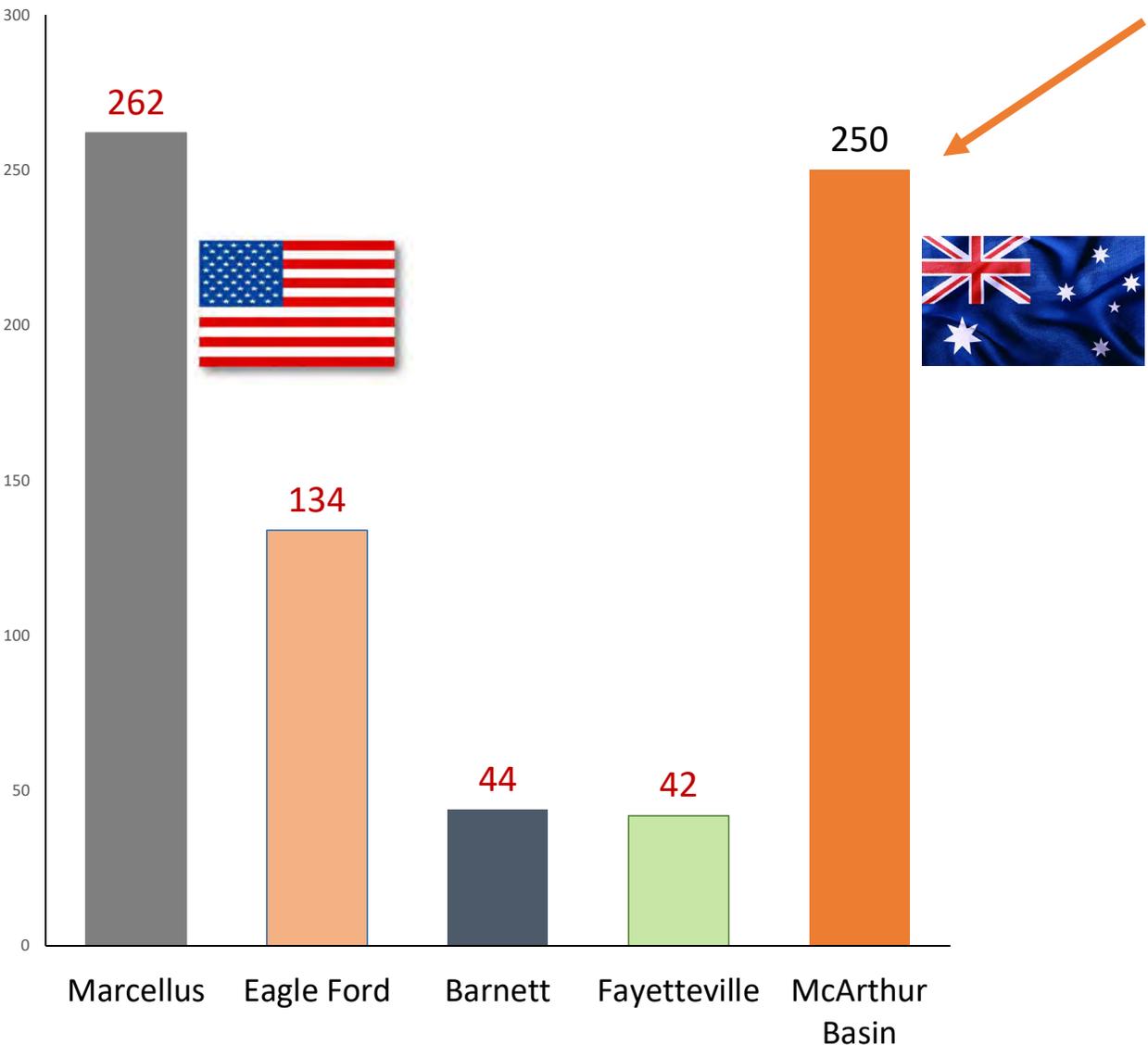
AMERICAN ENERGY PARTNERS

Source: American Energy Partners



# McArthur Basin resources rival the prolific US Marcellus Shale

Trillion Cubic Feet (Tcf) unit comparison

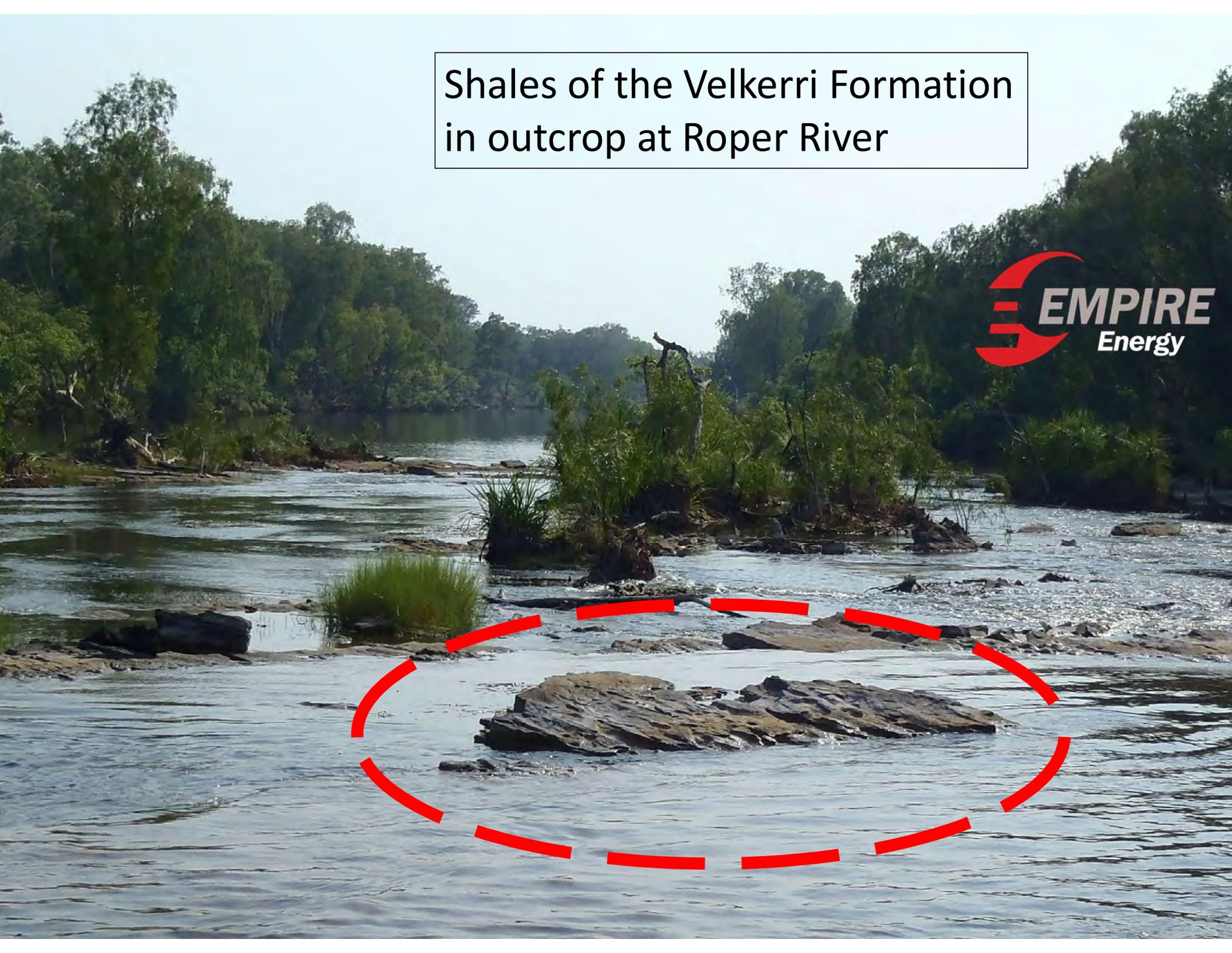


McArthur Basin alone rivals the Resource Potential of the USA's Marcellus Shale

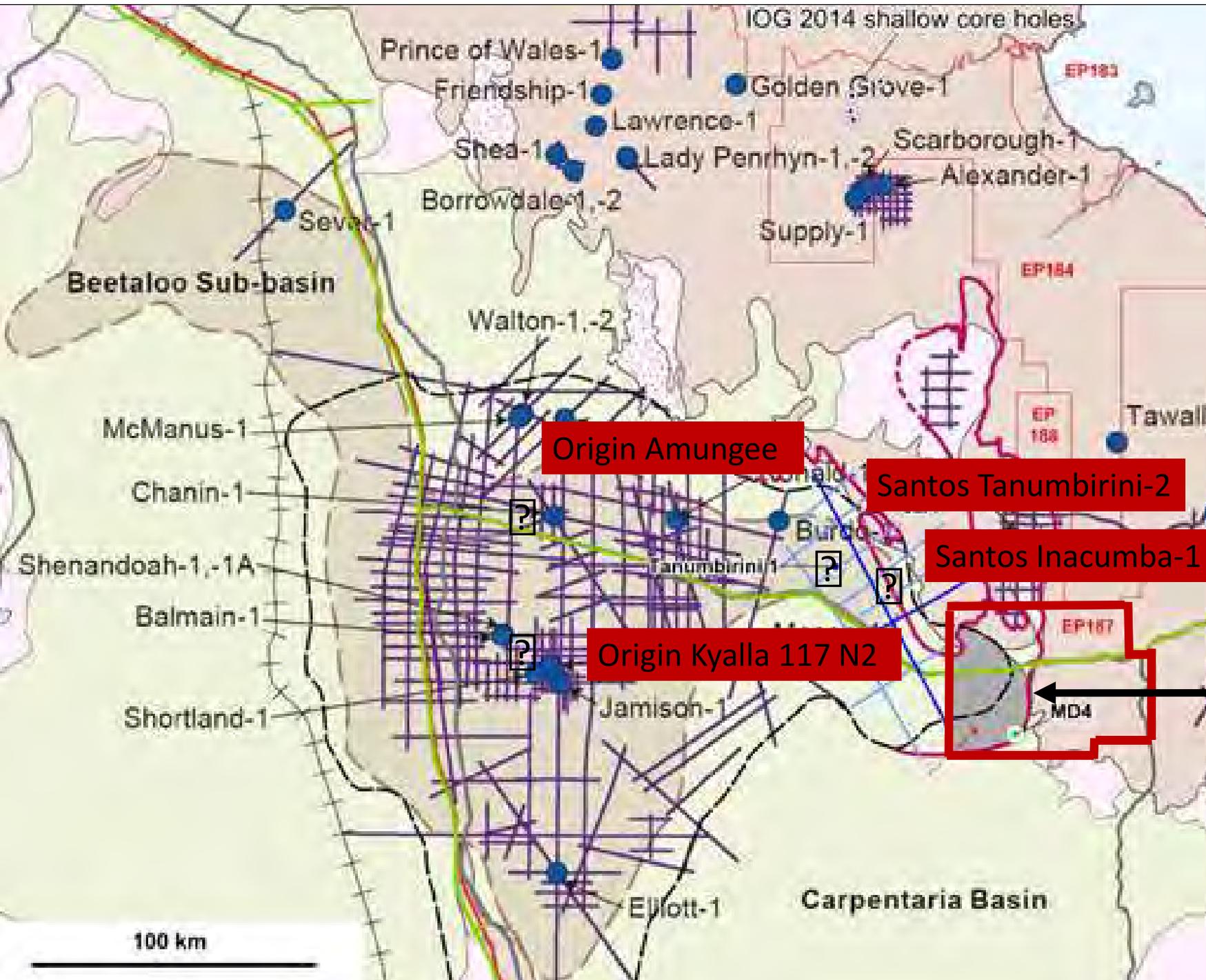
“Prospective Resource” is the estimated quantities of petroleum that may potentially be recovered by the application of a future development project(s) relate to undiscovered accumulations. These estimates have both an associated risk of discovery and a risk of development. Further exploration appraisal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



# Shales of the Velkerri Formation in outcrop at Roper River



# The Beetaloo and Empire's 1-3 Tcf early production target



All weather road and gas pipeline



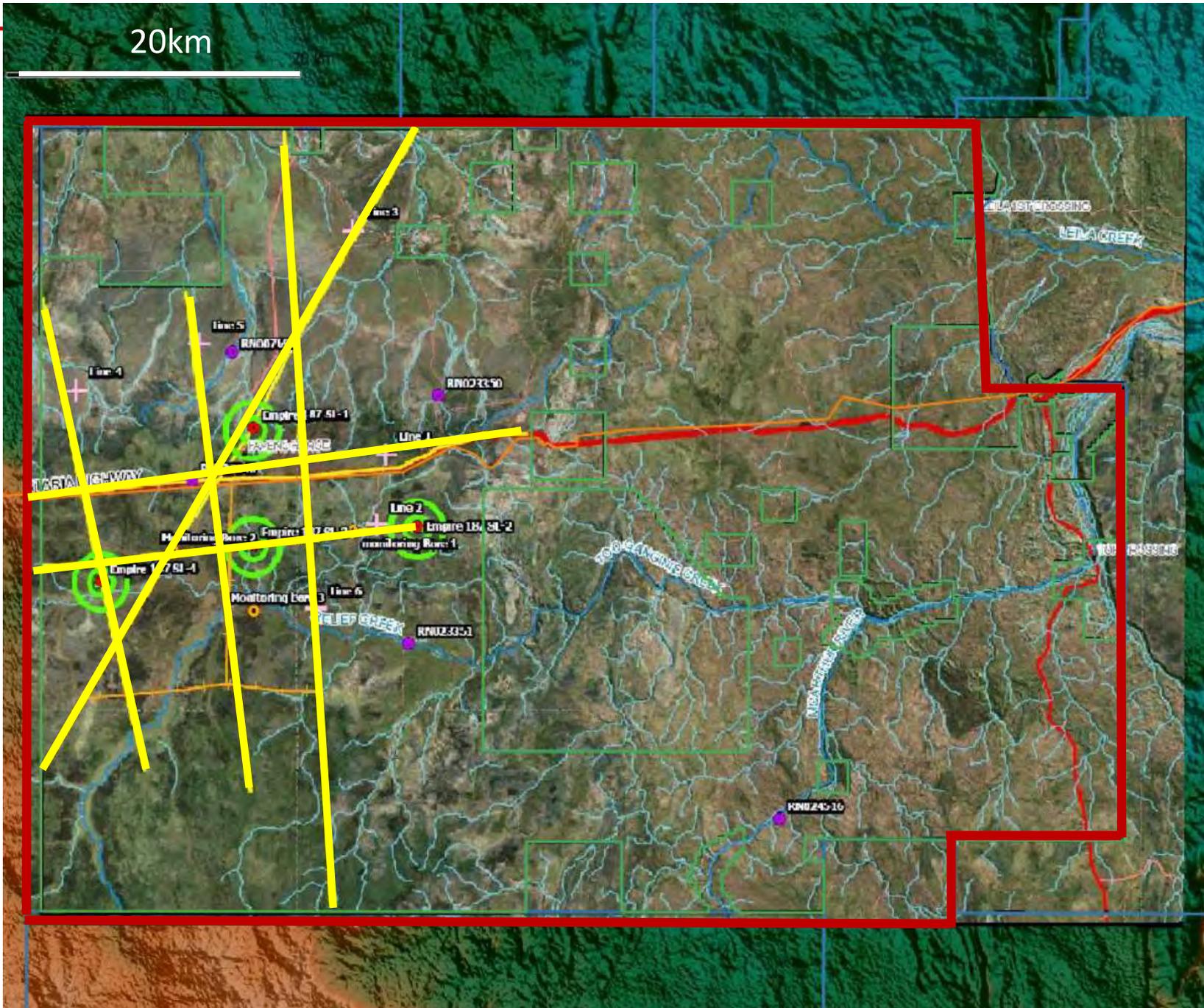
Empire's EP187 Velkerri target

# EP187 is contiguous with the Origin and Santos discoveries

- Empire ~2,543km<sup>2</sup> (630,000 acres) in eastern Beetaloo sub-basin
- **Adjacent Tanumbirini-1 well confirmed thick Velkerri shale from 2,400m to 3,800m**
- Santos fracked horizontal development program in adjacent block in 2020
- **Velkerri Shale in EP187 is Empire's first priority exploration, appraisal and development target**
- Empire will acquire 231 line km 2D seismic to delineate the shape of the basin, establish continuity with other drilling and pinpoint Empire sweet spots
- **First Empire well in 2020**
- Thereafter, fracked horizontal production wells along pipeline/road route will be drilled and put into production



# EP187 2019 Seismic Program starting next week

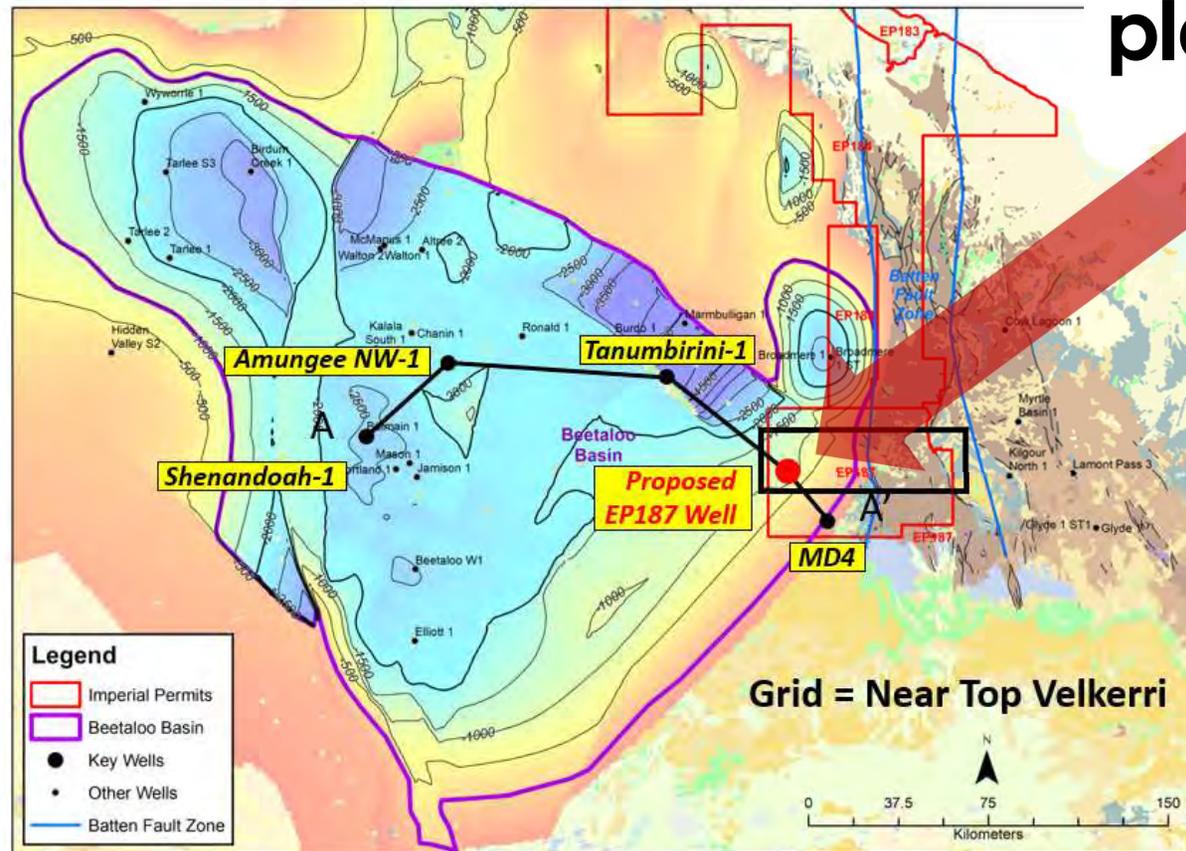
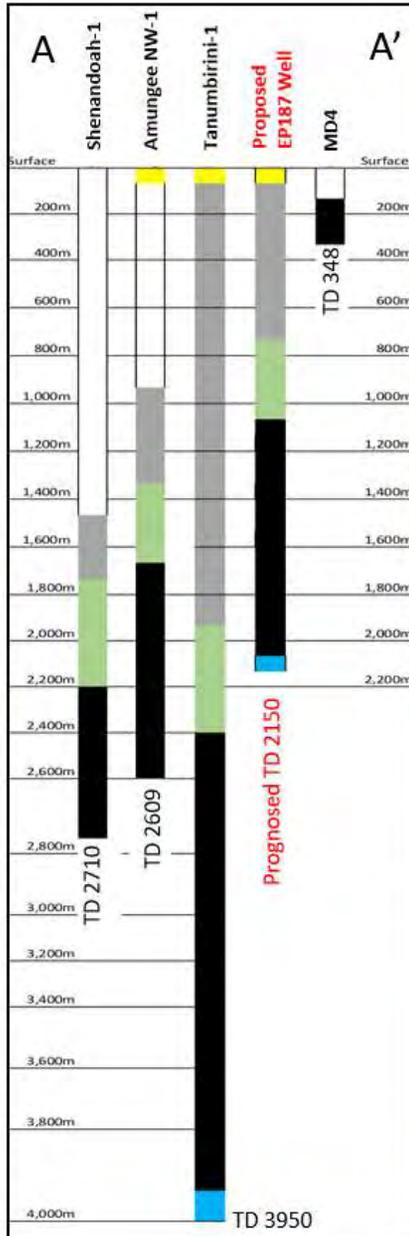


All weather road and gas pipeline



# Empire's EP187 Initial Drilling Target

2020 well in planning



Simplified Geology

# Corporate Snapshot



## Pro-Forma Capital Structure

Shares on issue	231m
Share price	A\$0.225
<b>Market cap</b>	<b>A\$52m</b>
Net debt	A\$6m
Enterprise value	A\$58m
Cash at bank	A\$5.5m

## ASX Share Price



## Corporate Structure



## Top Shareholders

Macquarie Bank Limited	14.7%
Global Energy and Resources Development Limited	10.7%
Liangrove Media Pty Limited	5.3%
Elphinstone Holdings Pty Limited	3.0%
<b>Board &amp; Management</b>	<b>7.0% ↑</b>

# ASX:EEG

With US asset sales under way, Empire Energy will become a pure Northern Territory hydrocarbon play offering the most direct market exposure to the exciting future of both the McArthur and Beetaloo Basins



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Chief Executive Officer  
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# Empire's independently certified NT Prospective Resource Estimate – on Empire acreage alone

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
<b>Total</b>				<b>MMBOe</b>	<b>851</b>	<b>2,238</b>	<b>5,183</b>

**Empire's P(50) resource is 13 Tcf eq**

Conversion Factor: 5.485 Mcf : 1 Bbl

Northern Territory Resources by: Muir & Associates P/L and Fluid Energy Consultants

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