



**Elixir Energy**

**ASX ANNOUNCEMENT**

**ASX : EXR**

17 May 2023

## **DAYDREAM-2 FUNDING UPDATE**

### **HIGHLIGHTS**

- Advanced Finding received on R&D tax credits for Daydream-2
- Government will fund 43.5% of qualifying well costs
- Detailed technical presentation on Grandis made at the APPEA Conference today

Elixir Energy Limited (“Elixir” or the “Company”) is pleased to provide a funding update on the Daydream-2 appraisal well planned for later this year (subject to rig availability) in its 100% owned Grandis Gas Project located in Queensland.

Elixir has now received an Advanced Finding from the Australian Government’s Department of Industry, Science and Resources that that activities associated with the Daydream-2 project will qualify as eligible R&D Activities for the purpose of the R&D Tax Incentive. Subject to other eligibility requirements, eligible expenditure associated with these R&D activities may be claimed as a refundable R&D offset equal to 43.5% of the expenditure on eligible R&D activities. This primarily reflects the innovative technologies developed over the last decade to enhance stimulation techniques since BG Group (now Shell) drilled in the Taroom Trough.

This Finding is sufficiently strong to support non-recourse project financing of a significant majority of the amount to be claimed. Elixir is currently evaluating providers of such finance.

Elixir is also pleased to attach a presentation on a peer reviewed technical paper titled *The Permian Gas Potential of the Taroom Trough, Queensland - New ideas to unlock a multi-TCF play*. This will be delivered later today by Elixir’s Chief Geoscientist Greg Channon at the industry leading APPEA Conference.

Elixir’s Managing Director, Mr Neil Young, said: *“Our technical team and supporting professional advisers have done a fantastic job on procuring this R&D Finding. This reflects the innovative thinking that we believe can crack the code to release the enormous gas in place known to be in the Taroom Trough. The paper delivered today at the APPEA Conference is yet another demonstration of this technical excellence.*



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*Having the Government fund nearly half of Daydream-2 is a superb outcome for Elixir shareholders – and demonstrates that the Australian Government strongly recognizes the long term criticality of new East Coast gas supplies.”*

By authority of the Board:

**Neil Young** - Managing Director

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The Permian Gas Potential of  
the Taroom Trough,  
Queensland

*New ideas to unlock a multi-TCF  
play*

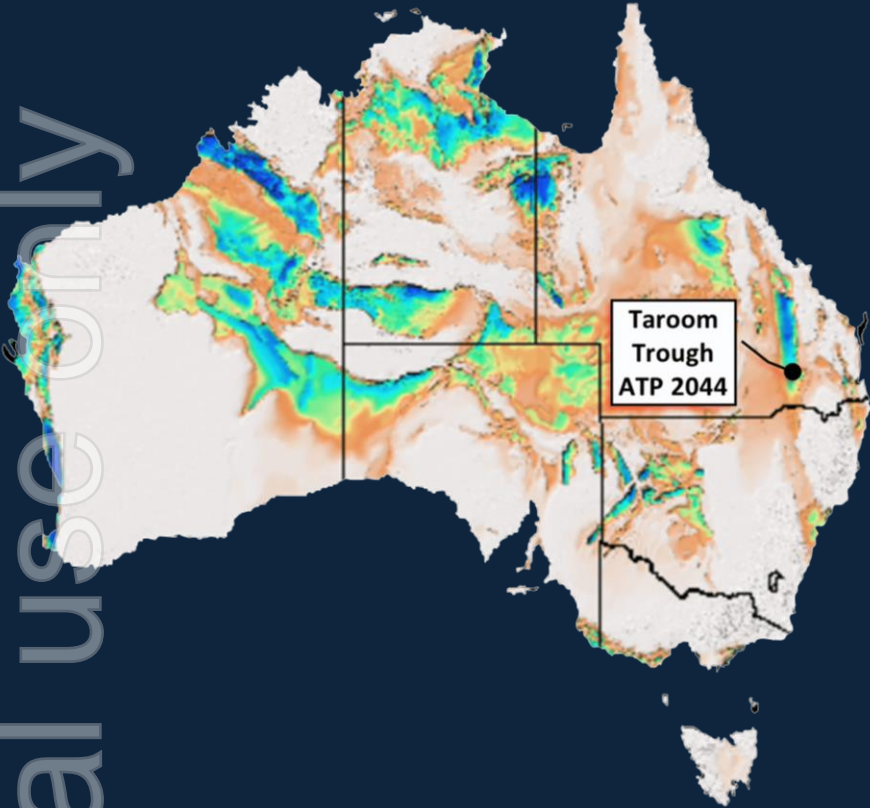
*Gareth Cooper, Greg Channon\*, Pete Bekkers  
and Neil Young*

*\*presenter*

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# Regional Location

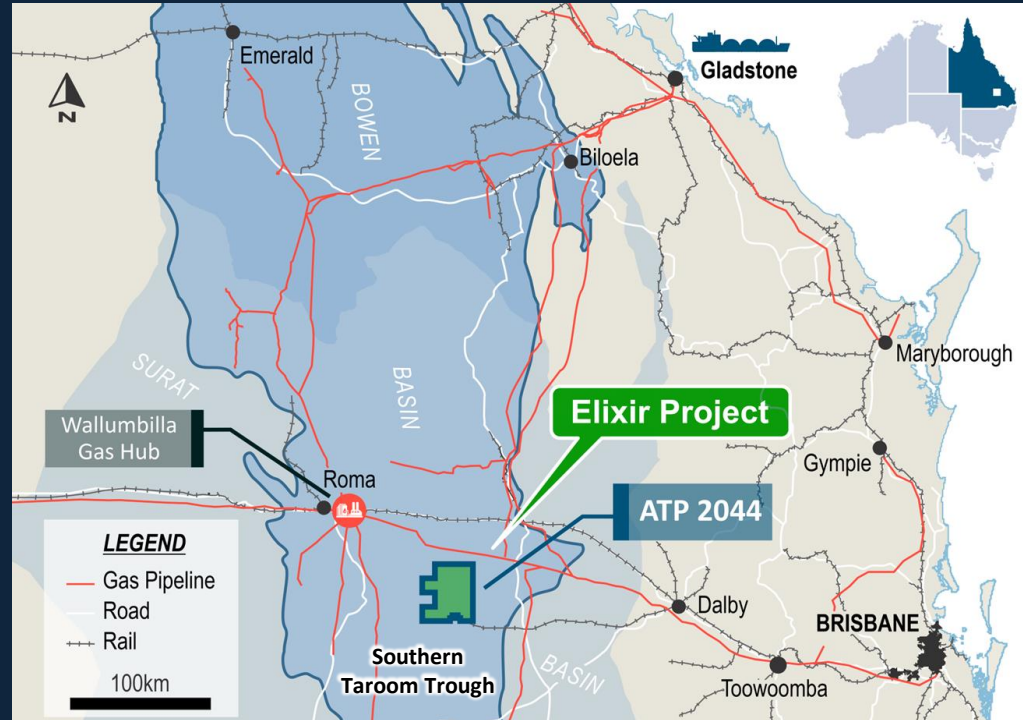


- One of the few remaining places onshore Australia where a substantial gas resource could exist
- Permian coals have sourced oil and gas fields on the flanks, but considerable gas volumes may remain trapped within the depocentre
- The unique geology of the Taroom Trough means this basin may succeed where others (e.g. Nappamerri Trough – Cooper Basin) have failed
- Stress modelling by Elixir has recognised the importance of stress partitioning and stress anisotropy in this area resulting in the derivation of an optimal fracture stimulation program



# Location and Key Points

- Synclinal depression in the southern Bowen Basin
- Large resource known to exist with major and smaller operators now active
- QGC (now Shell) flowed gas and condensate to surface from adjacent wells targeting the same play
- East Australian and international gas markets access via Gladstone
- Not subject to any form of domestic gas reservation



- Elixir owns 100% of ATP 2044 and will drill the Daydream-2 appraisal well in late 2023/24

# Stratigraphy of Southern Taroom Trough

# Surat/Bowen Stratigraphy

BASIN	PERIOD	PALY ZONE	STRATIGRAPHY	LITH.	EVENT	FACIES					
Surat Basin	CRET.	EARLY	PK5	Wallumbilla Formation	Orange	Tasman Rift	Uplift 90Ma				
			PK4								
			PK3								
			PK2								
			PK1								
	JURASSIC	LATE	PJ6	Gubberamunda Sandstone	Orange	Thermal Sag 3	Lower Deltaic				
			PJ5	Westbourne Formation	Orange						
			PJ3	Walloon Subgroup	Black, Yellow, Brown			Thermal Sag 2			
				Jundah Coal Measures	Black						
				Tangalooma Sst/Proud Sst	Black						
	PJ4	Eurombah Formation	Black								
	JURASSIC	EARLY	PJ3	Hutton Sandstone	Orange	Thermal Sag 1	Fluvial				
			PJ2	Evergreen	Orange						
				Upper Evergreen Member	Orange						
			PJ1	Bonville Sandstone	Yellow						
Formation			Lower Evergreen Member	Orange							
Basal Evergreen Sst/Precipe Sst	Orange										
Bowen Basin	TRIASSIC	MIDDLE	PT5	Moolayember Formation	Yellow	Hunter-Bowen Compression	Uplift				
			PT4								
			PT3					Moolayember Shale Mbr	Black		
								Basal Moolayember Sandstone	Orange		
								Snake Creek Mudstone	Black		
	TRIASSIC	EARLY	PT2	Rewan Formation	Orange	Foreland Loading	Red Beds				
								PT1	Basal Rewan Sandstone	Orange	
									Blackwater Group	Kianga Formation	Black
										Black Alley Shale	Black
										Winathoola Coal Mbr	Black
PERMIAN	LATE	PP5	Back Creek Group	Black, Yellow, Orange	Compression	Deltic					
							PP4	Burunga Formation	Black		
								Timowan Formation	Black		
								Wallabella Coal Mbr	Black		
								Muggleton Formation	Black		
PERMIAN	EARLY	PP3	Buffel Fm.	Orange	Extension	Volcano-clastic					
							PP2	Reid Dome Beds	Black		
							PP1	Combango Volc.	Black		
							Camboon Volc.	Black			
							Timburly Hills Formation	Grey			

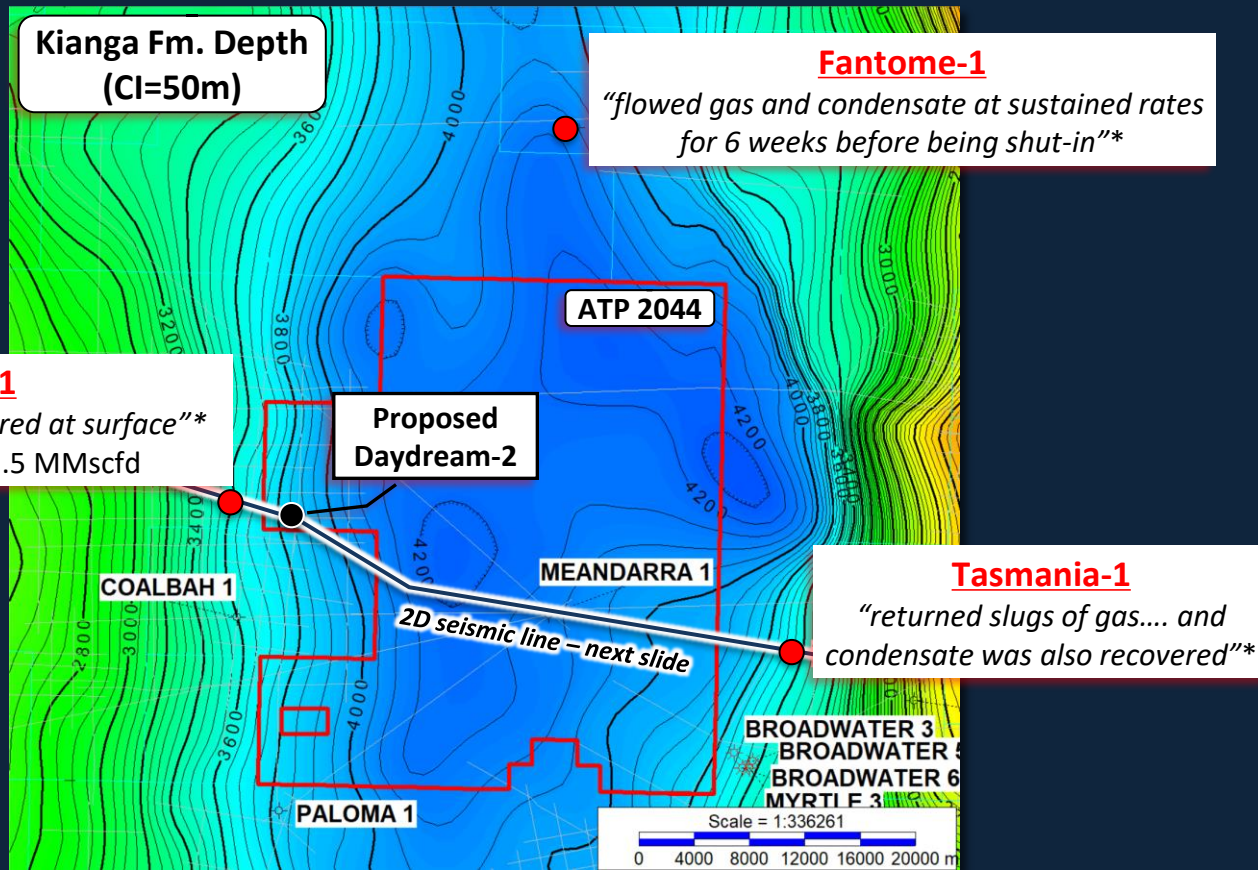
Surat Basin contains key CSG reservoirs

Kianga Fm.

Bowen Basin contains Permo-Triassic low-permeability gas/condensate sandstone and coal reservoirs  
Primary target in ATP 2044

Back Creek Gp.

# Recorded Gas/Condensate Flows

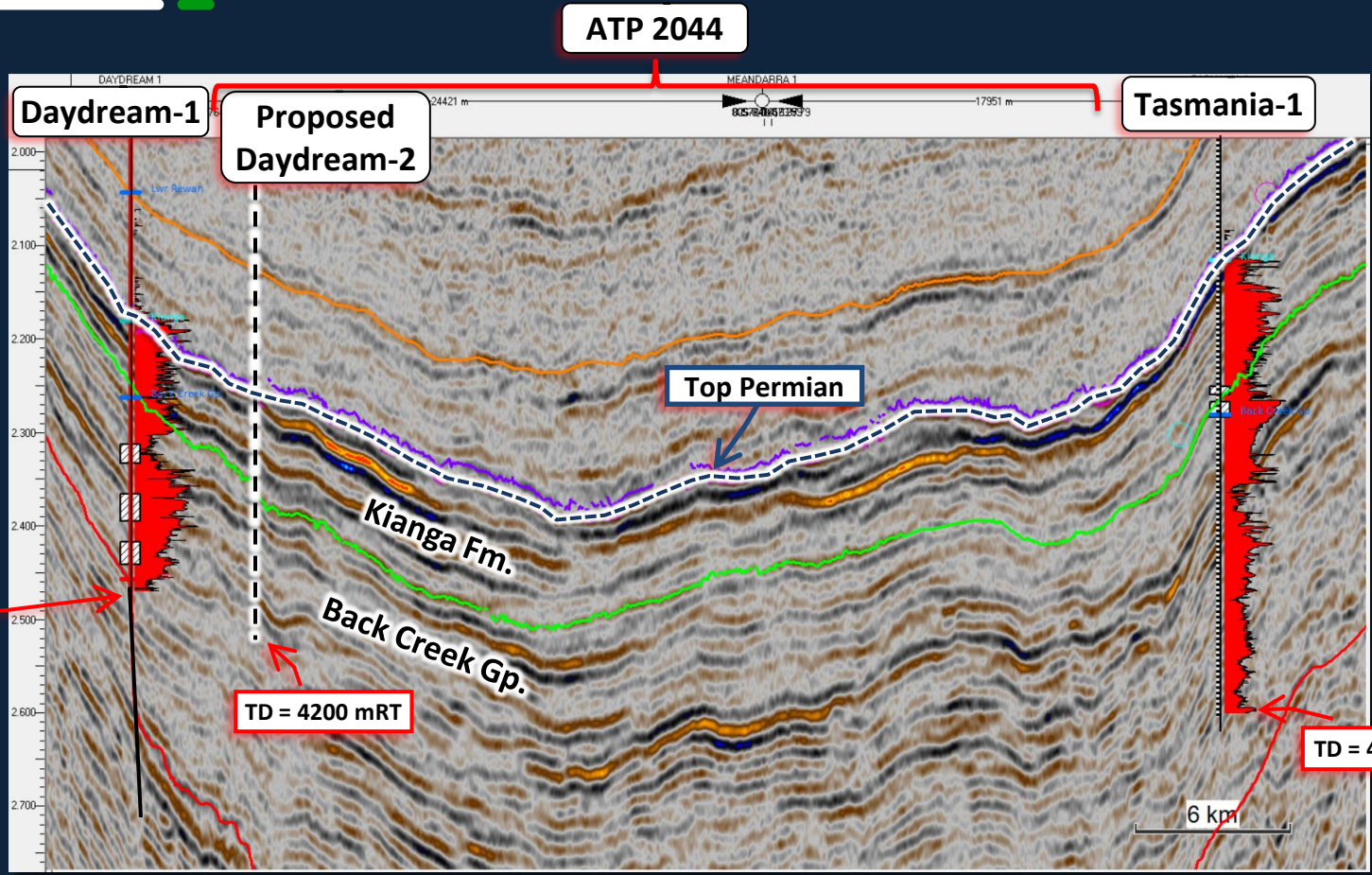


\*ATP 645, BOWEN BASIN, QUEENSLAND  
Geology & Geophysical Studies  
Report, 2016, Section 4.2, QGC (Shell)

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# Total Gas Increase Upon Drilling the Permian



Internal use only

TD = 4140 mRT

TD = 4200 mRT

TD = 4623 mRT

ATP 2044

Daydream-1

Proposed Daydream-2

Tasmania-1

Top Permian

Kianga Fm.

Back Creek Gp.

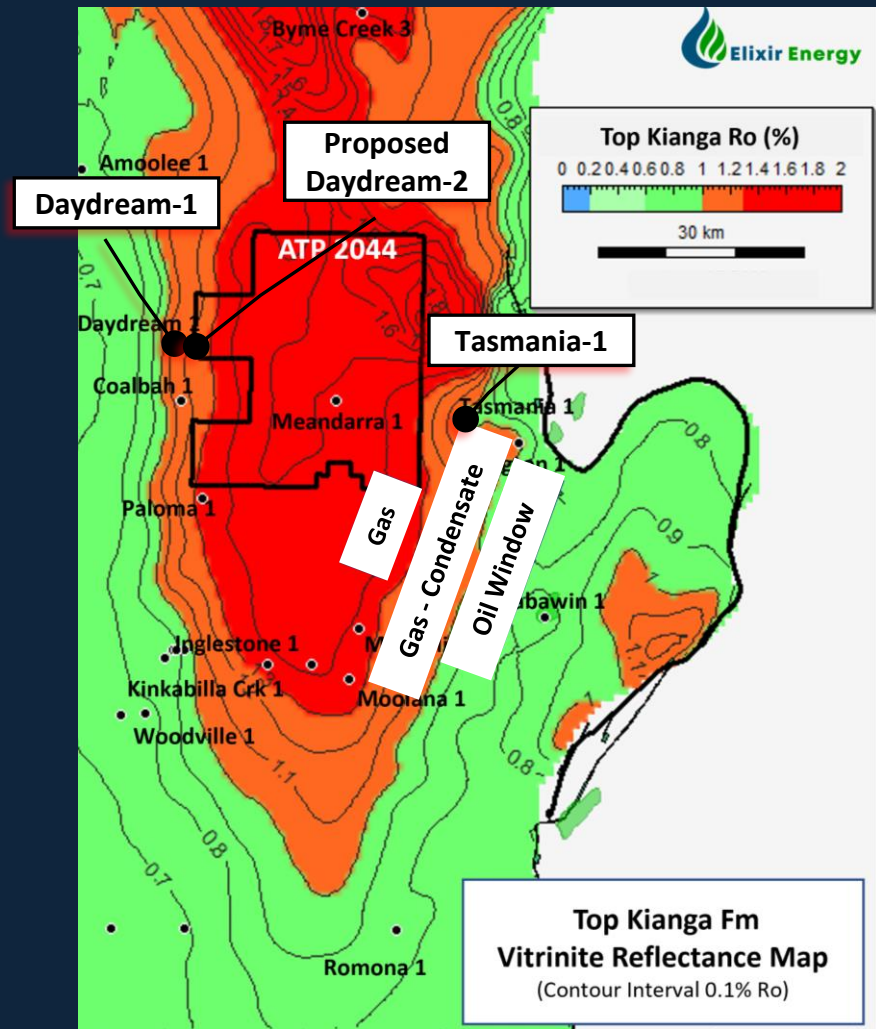
Perforations

6 km



# Source/Maturity

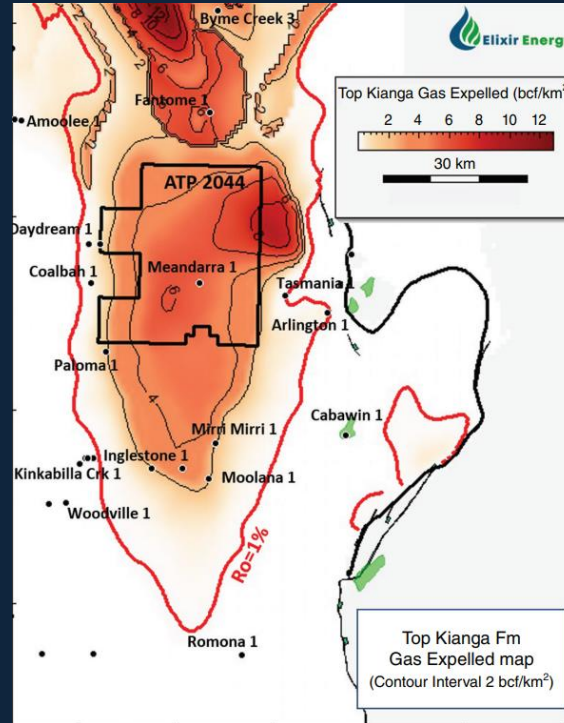
- Upper Permian Kianga Fm. and the Middle Triassic Snake Creek Mudstone contain oil and gas-prone type II/III to type III kerogen that lies within the gas and gas condensate generation window over much of the ATP 2044 area
- Additional high TOC shales are observed throughout the Early to Late Permian succession which also contribute significantly to the source potential
- Typical of Tight Gas Sand and Basin Centred Gas Plays, the reservoir and source intervals are interbedded or adjacent to each other



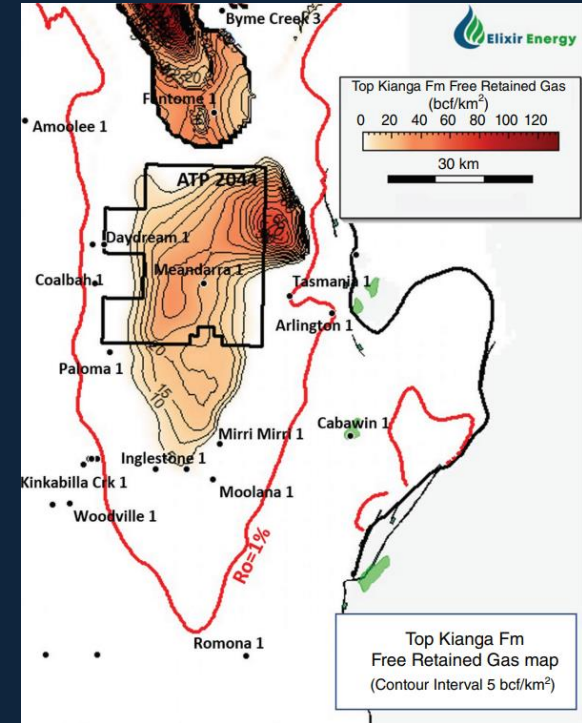
# Expelled vs Retained Gas

- 73 m net coal thickness in the Upper Permian succession modelled
- Retained free gas within the contour  $R_o > 1.0\%$  defines the extent of the Fractured Thermally Mature Coal (FTMC) play with a mean GIP of 14.9 Tcf
- Independent 2C of 395 Bcf within ATP 2044 only

## Expelled Gas



## Retained Free Gas

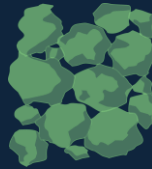


# Fractured Thermally Mature Coals, Tight Gas Sands & Basin-Centered Gas Plays



## FTMC

- Can contain significant free gas in fractures and cleats
- High gas readings in all wells nearby
- Coals are the mature source rock, self-sourcing ( $R_o > 1\%$ )
- MEM shows coals are normally stressed - obvious target for frac stimulation
- Free gas (not adsorbed)



## TGS

- Sandstone  $< 7\%$  porosity that trap gas via stratigraphic or unknown mechanisms
- Corresponding low permeability means fracking essential
- Conventional play utilising unconventional completion



## BCG

- Regionally pervasive unconventional gas resources that requires stimulation for commercial production
- Generally abnormally pressured
- Trap requires a “permeability gaol”
- Regionally extensive
- Perms  $< 0.2\text{mD}$  and low porosity
- Imperative to stimulate as many reservoirs as possible to attain commercial rates of gas production

*Unable to differentiate between TGS play and BCG play*



# The Key may lie in the Stress Regime

1.

Current day strike slip

2.

Coals can absorb stress and remain in a normal stress regime

3.

Any fracture growth will naturally propagate to lower stressed coals

4.

Modelling show frac's migrating out of sandstones into coals

5.

Target coals as well as sandstones

6.

Coals require specialised fracture treatment



# Mechanical Earth Model (MEM)

MEM = 1D representation of down-hole stress

Elastic rock properties and stress anisotropy critical for coal fracture growth

Importance of the role of stress partitioning and stress anisotropy in the Bowen Basin now recognised

The stress profile will

- Govern how fractures grow and are contained
- Determine the length and conductivity of those fractures in relation to the pump and treatment schedule

Dipole sonic and density data utilized from Daydream-1 and Tasmania-1 and were calibrated for leak-off test data and closure pressures from stimulation treatments and DFITs

# Key Metric Comparison

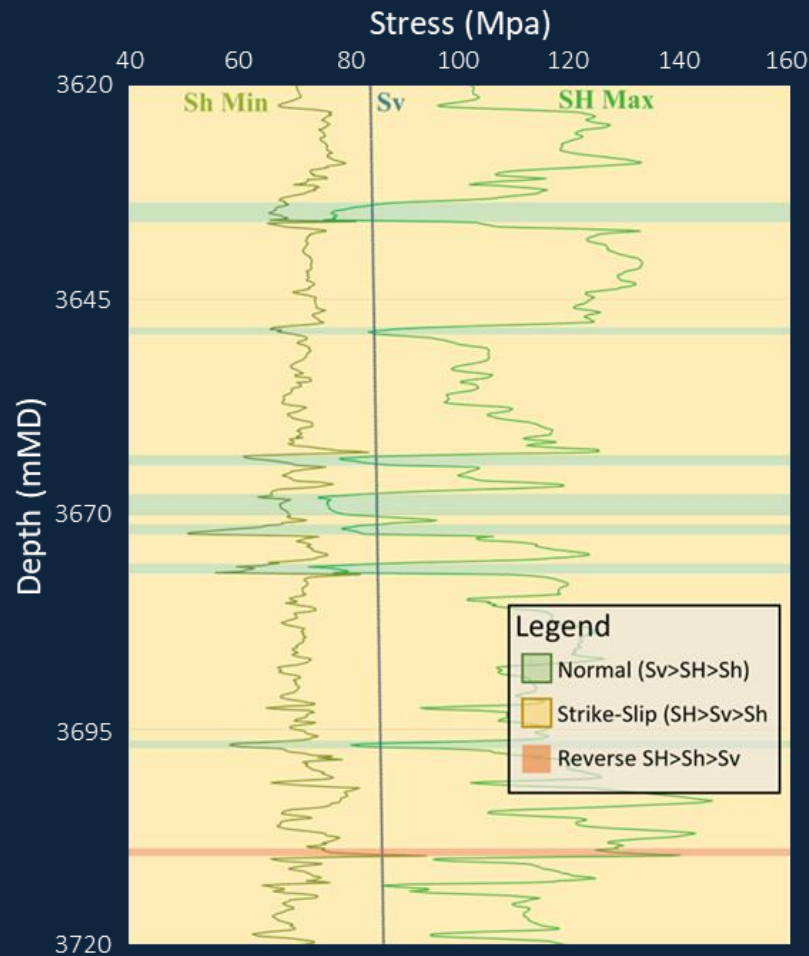
Key Metric	ATP 2044 (2023)	QGC (2012)	Cooper Basin (2010-2015)
Play Type	FTMC/TGS/BCG	TGS	BCG
Depth to target	4300m	4650m (max)	3600-4000m
Heat flow (average)	75 mW/m <sup>2</sup>	75 mW/m <sup>2</sup>	130-190 mW/m <sup>2</sup>
Max temperature at target depth	127 C	140 C	215-246 C
Stress regime of target	Normal/Strike-slip	Strike-slip	Reverse
Frac gradient (Shmin)	0.65-0.80 psi/ft	0.80-0.90 psi/ft	1.1-1.60 psi/ft
Overpressure	0.51-0.66 psi/ft	0.66-0.83 psi/ft	0.73 psi/ft
CO <sub>2</sub>	<5%	<5%	~30%
Source/reservoir maturity Ro%	1.0-1.4 Ro%	1.0-1.5 Ro%	2.7-6.4 Ro%
Source/reservoir window	Gas-condensate	Gas	Late Gas-Thermally exhausted
Permeability	<0.2 mD	<0.2 mD	0.1 mD
Porosity	5-7 %	5-7 %	4-6 %
Frac optimisation - frac fluids	10-20 pound Guar + XL Gel	35 pound borate	35 pound borate
Frac optimisation - viscosity inhibitor	Yes	No	No
Frac optimisation - phasing	60 deg	180 deg	60 deg
Frac optimisation - main mesh size	30/50	20/40 & 40/70	20/40 & 30/50
Frac optimisation - step-down test optimisation	Yes	No	No



# MEM Findings

- Stress in the deep Permian succession changes vertically throughout the bore with lithology, although the overall far-field stress regime is strike-slip
- Both sandstones and coals are in suitable stress states to accommodate the growth of vertical fractures on stimulation; however, as coal is less stressed - preferential target for vertical fracture propagation
- Perforations targeting adjacent sandstones need to have sufficient stand-off to prevent the diversion of fractures toward the lower-stress coals

## Daydream 1 Depth v Stress

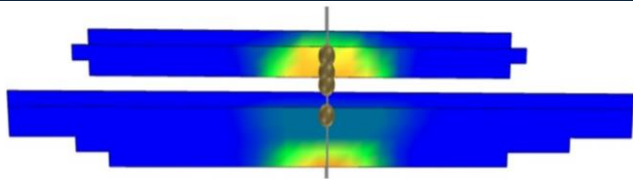


# Using the results to build simulation models

- Numerical simulation models built with multiple iterations in Gohfer and ResFrac software
- Marked improvements using new stress profiles, pump and treatment schedules observed

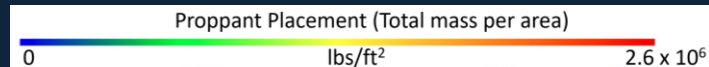
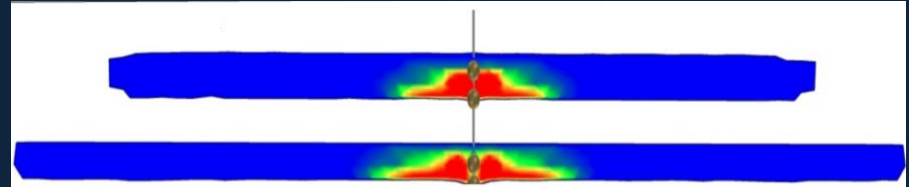
## Stimulation MODEL A – previous operators

- Initially used a generic MEM where the contrast in Poisson's ratio between coal and sandstone is similar to that observed in USA basins, resulting in high stresses in the coal
- Perforations were placed solely to target tight gas sandstones (TGS) in the Kianga Formation



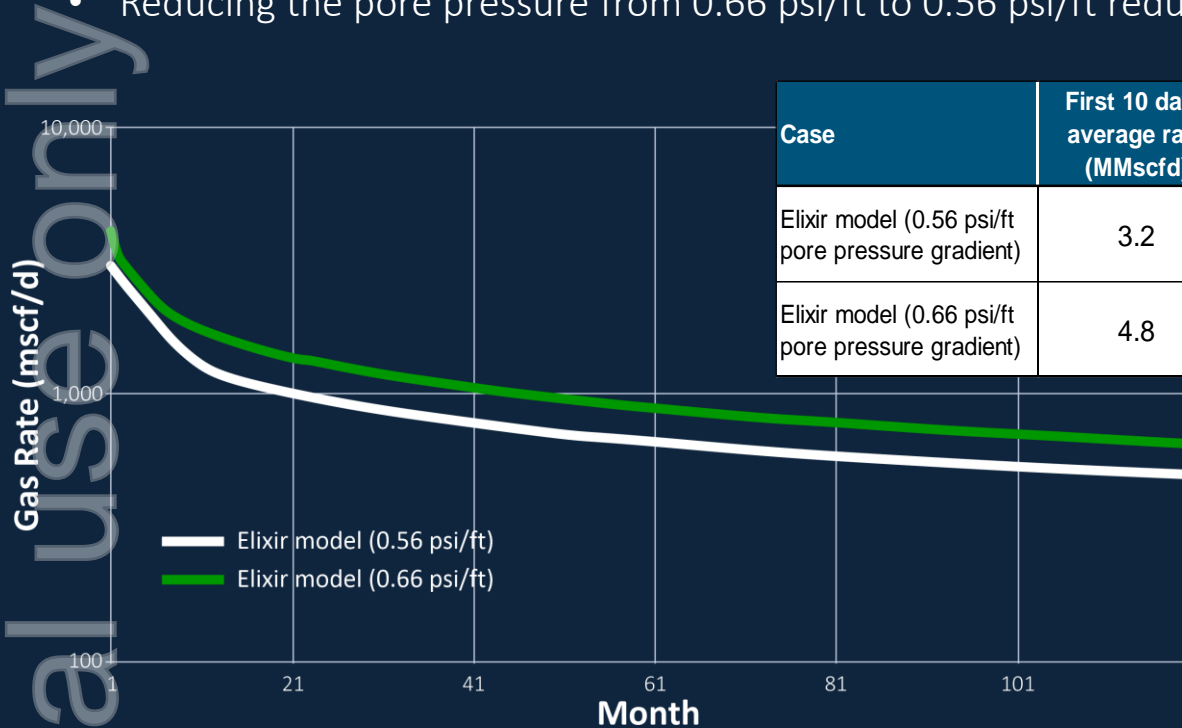
## Stimulation MODEL B – Elixir MEM utilized

- Imported the new MEM where coals are low stress and perforations were placed to allow some stand-off from these coals so that growth within TGS targets could be maximised
- Both fracture length and fracture conductivity were greatly improved



# Preliminary Modelled Production Profile (vertical well – 4 stages)

- IP30 modelled to flow 3 – 4 MMscfd
- A realistic range of pore pressures (0.56 – 0.66 psi/ft) has been used
- Reducing the pore pressure from 0.66 psi/ft to 0.56 psi/ft reduces long-term recovery by 33%



Case	First 10 days average rate (MMscfd)	First 30 days average rate (MMscfd)	3.3 years cumulative (Bcf)	20 years cumulative (Bcf)
Elixir model (0.56 psi/ft pore pressure gradient)	3.2	3.1	1.5	4.5
Elixir model (0.66 psi/ft pore pressure gradient)	4.8	4.1	2.0	6.7



# Conclusions



Elixir has identified a large and compelling gas/condensate resource in the Southern Taroom Trough



Upon obtaining ATP 2044, ERC Equipoise certified a Contingent Resource (2C = 395 Bcf) within the sandstone reservoirs only



Operators in adjacent blocks are actively drilling the same play



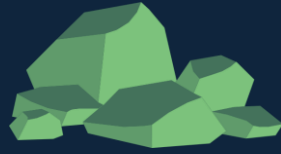
Detailed inhouse analysis and modelling has identified pitfalls and areas for improvement:

- MEM
- Different location
- Different frac design
- Different zones
- Different lithologies – both sandstones AND coals

# Conclusions (cont'd)



Elixir's proprietary Mechanical Earth Model (MEM) and Reservoir/Frac Model suggest potential to improve the flowrates significantly



Focus on coals and sandstones of the Kiang Formation and Back Creek Group



The presence of gas in surrounding wells (both on logs and multiple flows of gas/condensate to surface) proves the discovery of an extensive resource



Elixir will drill an appraisal well (Daydream-2) in 2023/24, subject to rig availability

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