Presentation Outline

- Petroleum exploration spend, \textit{trends and observations}
- Area under petroleum title, \textit{trends and observations}
- Federal Offshore Release Round bids and awards, \textit{analysis and observations}
- Summary of exploration acreage releases and permits awarded
- Summary of exploration transactions & farmins
- Summary of exploration & appraisal activity – wells and surveys
- Key exploration and appraisal well summaries
- Summary, key take-aways & acknowledgements
Petroleum exploration spend in total rose 8.3% (A$24.2 million) to A$314.1 million

Onshore exploration spend rose 6% (A$11.4 million) to A$201.3 million

Offshore exploration spend rose 12.7% (A$12.7 million) to A$112.7 million

Onshore exploration spend has been greater than offshore spend since late-2019

For comparison, minerals exploration spend for 2021 was A$921.5 million

Source: Australian Bureau of Statistics, Mineral and Petroleum Exploration, Australia December 2021
The only things going up are production licenses and retention licenses.

Area under production licenses has grown 18% over 6-years, on average 3-4% per annum.

Area under retention lease has grown 63% over 6-years, on average 9% per annum.

Area under exploration license has decreased 43% over 6-years:
- -35% onshore, on average -7% per annum
- -57% offshore, on average -13% per annum

Offshore exploration licenses represented 35-38% of the total (2015-2018) declining ever since to 27% in 2021.

Source: GPInfo
Federal Offshore Release Round Bids & Awards

In 2021:
- 8 Federal offshore exploration licenses awarded
- No firm wells in guaranteed work program
- 1,362 km$^2$ of 3D
- A$60.2 million in total firm expenditure
- 2 awards in Gippsland, 2 awards in Bonaparte, 3 awards in Carnarvon and 1 in the Vulcan
- 6 awards from 2019 release round (bids closed March 2020)
- 2 awards from 2020 release round (bids closed June 2021)

In 2022 so far:
- 3 awards
- 2 firm exploration wells
- 1,000 km$^2$ firm 3D

Acknowledgements: Analysis courtesy of C. Gumley
Exploration Acreage Releases 2021

Federal Offshore Release Round
- 21 release areas
- Opened June 2021, Closed 3 March 2022
- (10 bids)

Federal Offshore GHG Storage Release Round
- 5 release areas
- Opened 6 Dec 2021, Closed 10 March 2022
- (9 bids)

Northern Territory Release Round
- 2 release areas – Georgina Basin
- Opened 16 June 2021, Closed 16 Nov 2021

Queensland Release Round
- 8 release areas
- Opened 24 Nov 2021, Closed 4 March 2022

Queensland GHG Storage Release Round
- 4 release areas
- Opened 24 Nov 2021, Closed 7 March 2022

Open tender process (last formal round 2019)

Last round 2020
Offshore GHG Storage Release Round 2021

- First time offering of GHG Storage release areas under the OPGGSA (2006)
- 5 release areas
- Round opened 6 December 2021 (bids were due 10 March 2022)
- 9 bids (retrieved from NEATS)
- No awards as yet
Exploration Permits Granted 2021

- **8 Federal offshore exploration licenses awarded in 2021**
- **3 offshore in WA state waters**
- **6 onshore WA permits**
- **3 onshore WA SPA’s**
- **4 onshore Queensland**
- **3 onshore SA**
Exploration Deals 2021

**Talon Energy** acquire 100% equity from Macallum
Value US$0.5 million

**Triangle Energy** acquire 50% of L7 and 86.94% of EP 437 from Key Petroleum
Value US$0.5 million

**Tamaska** acquire 20% of Skye Napoleon
Value US$0.7 million

**Triangle Energy** acquire 50% of L7 and 86.94% of EP 437 from Key Petroleum
Value US$0.5 million

**Cerberus Permits**
Bounty Oil & Gas farmin to 50% of 3-wells
Value US$15 million

**EP 437 & L7**
Triangle Energy acquire 50% of L7 and 86.94% of EP 437 from Key Petroleum
Value US$0.5 million

**WA-519-P Sasanof Prospect**
Global Oil & Gas and Prominence Energy farmin 2:1 promote

**EP 494 & SPA 81**
Talon Energy acquire 100% equity from Macallum
Value US$0.5 million

**EOG** acquire 100% of Beehive Prospect from Melbana
Value US$7.5 million

**Beetaloo Basin**
Empire acquire additional 17.5% in permits from EMG
Value US$8.7 million

**Beetaloo Basin**
Empire acquire Pangaea interests
Value US$28.4 million

In addition, over US$1.6 billion raised on equities market by ASX listed O&G companies, double that of 2020, 2 ½ times that of 2019.

Source: GlobalData
Surveys Acquired in 2021

- Offshore 3D surveys = 3
- Onshore 3D surveys = 1
- Onshore 2D surveys = 6 (1,460 km)
- Other (EM, Geochem, Gravity) = 4
Exploration and Appraisal Wells Drilled 2021

Exploration wells (n= 29)
- Unconventional non-discovery 10%
- Offshore non-discovery 7%
- Offshore discovery 4%
- Onshore discovery 24%
- Onshore non-discovery 41%

- Offshore exploration wells = 3
- Offshore discoveries = 1
- Onshore exploration wells = 26
- Onshore conventional discoveries = 7
- Onshore unconventional discoveries = 4

Onshore Conventional Discoveries
- Odin-1
- Rosebay-1
- Lowry South-1
- Liger-1
- Chimera-1
- Lockyer Deep-1
- Rafael-1

Onshore Unconventional Discoveries
- Tanumbirini-2H & 3H
- Rougemont-1 & 2

Exploration and Appraisal Wells Drilled 2021

Exploration wells (29)
- Appraisal wells (31)

Legend
- 2021 Appraisal Well
- 2021 Exploration Well
- Production Licence
- Retention Lease
- Location Declaration
- Petroleum Gazette
- Special Prospecting Authority
- Exploration Permit
- Under Application
- Sequestration Gazettal

Onshore Conventional Discoveries
- Odin-1
- Rosebay-1
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- Liger-1
- Chimera-1
- Lockyer Deep-1
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Onshore Unconventional Discoveries
- Tanumbirini-2H & 3H
- Rougemont-1 & 2

Exploration wells (29)
Artisan-1 drilled February – March (VIC/P43) in 71 m water depth by Beach Energy

- Amplitude supported
- 69.5 m gross gas column in Upper Waarre Formation (90% NTG)
- 20.9 m gross gas column in Flaxman Formation (22% NTG)
- TD of 2,205 m
- EUR 11 MMboe gross (66 BCF)

Source: Beach Energy ASX releases and corporate presentations
Drilled May – June 2021 in TP/25 by Sapura-OMV and Finder Energy
Tested Brigadier – Mungaroo Formation in a downthrown fault-dependent structural closure in the Long Island fault zone
Intersected good to very good quality Mungaroo Formation reservoir sands with residual hydrocarbon shows
Well failure attributed to breach of fault-seal

Source: Sapura-OMV and Finder Energy
Currajong-1 & Raphael-1

- Currajong-1 intersected interpreted oil saturations in vugular porosity at Top Ungani Dolomite and within the lower Dolomite
- 4 zones tested, all zones water bearing
- Up to 6% natural hydrogen gas detected

- Currajong-1 drilled July – August (EP 391) and Raphael-1 drilled August – December (EP 428)
- Buru Energy Operator, Origin farmin wells
- Ungani Dolomite equivalent targets

Source: Buru Energy ASX releases and corporate presentations
Currajong-1 & Raphael-1

- Currajong-1 drilled July – August (EP 391) and Raphael-1 drilled August – December (EP 428)
- Buru Energy Operator, Origin farmin wells
- Ungani Dolomite equivalent targets

- Raphael-1 intersected an interpreted 165 metre gas column (3,785 – 3,950 mMD) in Ungani Dolomite
- Gas down to evaluated
- Over-pressured interval
- Tested at rates up to 7.6 MMcf/d
- CGR of 40 bbl/MMcf
- Additional gas zones interpreted in Upper Laurel Dolomite and Anderson Formation
Perth Basin Drilling 2021: Lockyer Deep-1

- Lockyer Deep-1 drilled over July – November in EP 368 by Energy Resources and Norwest Energy
- 34 m gross gas interval with 20.2 m net pay in Kingia Sandstone
- 16% average porosity and estimated average permeability of 500 mD
- Reservoir pressure indicating potential long gas column
- Tested at rates up to 117 MMscf/d (sustained flow rate 102 MMscf/d)

Source: Energy Resources
West Erregulla-4 drilled over January – April, West Erregulla-5 over May – July

Appraisal drilling following West Erregulla-2 discovery of gas in the Kingia and High Cliff Sandstones (2019). West Erregulla-3 suspended in January 2021 before reaching objective.

- West Erregulla-4 tested at rates up to 35 MMscf/d
- West Erregulla-5 tested at rates up to 13.1 MMscf/d
Perth Basin Drilling 2021: Walyering-5

- Appraisal of Walyering gas field following 3D acquisition (2019)
- 4 gas zones in Jurassic Cattamarra Coal Measures A, B, C & D-sands. 51m net gas pay
- A-sand primary reservoir with 17.3% average porosity
Odin-1, Vali-2 & 3

- Gas in Patchawarra Formation, shows in Lower Nappamerri Group, Toolachee Formation, Epsilon Formation and Tirrawarra Sandstone
- Gross 2P reserves of 92 Bcf
- Odin-1 drilled over May – June in PRL 211. 40% gPOS pre-drill.
- 172 m of net gas pay in Toolachee Formation, Epsilon Formation and Patchawarra Formation. Tested at rates up to 6.5 MMscf/d
- Gross 2C of 36.4 Bcf

Source: Vintage Energy
Tanumbirini 2H & 3H

- Tanumbirini-2H drilled over May – August
  - TD of 4,598 mMD
- Tanumbirini-3H drilled over August – November
  - TD of 4,857 mMD
- Velkerri ‘B’ Shale objective
- Horizontal sections over 1,000 m each
- Wells fracture stimulated and flowed gas to surface (2 MMscf/d)
- Peak rates reported up to 10 MMscf/d

Source: Tamboran Resources
Carpentaria-2 & 2H drilled over November – December in EP 187 by Empire Energy
- Step-out exploration/appraisal of Carpentaria-1 (2020)
- 11 km to the north and down-dip
- Carpentaria-2 drilled to a TD of 1,835 mMD
- 192 metres net Velkerri Formation shale gas pay in Carpentaria-2

Carpentaria-2H drilled to a TD of 3,150 mMD
- 1,345 metre horizontal in Velkerri B shale,
- Fracture stimulation and production test in 2022
In Summary

- Petroleum exploration spend increased and is trending upwards. Onshore exploration spend has exceeded offshore since 2019. Petroleum exploration spend lags behind mineral exploration spend, and the gap is growing.
- Total area under petroleum exploration title is decreasing.
- 8 Federal offshore exploration permits were awarded in 2021, with no firm exploration wells. However, spend and seismic commitment is trending upwards.
- 9 exploration permits and 3 SPA’s were awarded in WA, 4 exploration permits were awarded in QLD and 3 were awarded in SA.
- 21 areas release in the annual Federal offshore petroleum exploration acreage release round and 5 GHG areas released.
- Exploration acreage releases in WA, NT and QLD with acreage open for application in SA.
- 1 offshore and 7 onshore conventional petroleum discoveries.
- 29 exploration (3 offshore) and 31 appraisal (1 offshore) wells drilled.

Key take-aways

- Petroleum exploration titles and bids/awards are decreasing.
- However, recent Federal offshore release round bids contained an increase in exploration commitments and firm wells.
- Petroleum exploration is very much focussed on the onshore basins.
- Petroleum exploration spend is 1/3 of minerals exploration.
- Onshore Perth Basin continues its renaissance with Lockyer Deep gas discovery, West Erregulla and Walyering appraisal.
- The Cooper – Eromanga continues to yield exploration discoveries.
- The Beetaloo Basin is the focus for unconventional exploration.
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In 2021

- 21 offshore release areas (petroleum)
- 5 offshore release areas (GHG storage)