Australia’s 2019 Offshore Acreage Release: petroleum geology, data access and new information

Thomas Bernecker, Director - Energy Resources Advice & Promotion
• Producing hydrocarbon province (oil & gas)

• Large gas fields (eg Barossa, Caldita) await development via new pipeline

• Resource development to benefit northern Australia and adds to gas volumes needed in SE-Australia

• Underexplored targets:
  • Paleozoic (Petrel Sub-basin)
  • Triassic (eg. Calder/Malita graben)

• Agreement on maritime boundary with Timor-Leste provides certainty for future acreage releases
Petrel Sub-basin

- Existing gas production (Blacktip), further development planned (Petrel, Tern)
- Oil accumulation at Turtle/Barnett
- Shallow water exploration and development (< 100 metres)
- Paleozoic source and reservoir facies (oil and gas)
- Exploration uncertainties dominated by porosity-permeability characteristics
- Salt-tectonism
Petrel Sub-basin

![Diagram of Petrel Sub-basin]

- **Curlew 1, Gull 1**
- **LEAKY FAULT**
- **Plover Formation**
- **Salt diapir**
- **Hyland Bay Subgroup**

![Diagram of Geology Features]

- **Stage 2 syncline**
- **Salt withdrawal**
- **Fossil Head Formation and Kulshill Group**
- **Stage 1 syncline**

Australia's 2019 Offshore Petroleum Acreage Release
Southern Petrel Sub-basin

- **Reservoir facies:**
  - Marginal marine, fluvial, glacial (*Lower Permian*)
  - Open marine, shelfal (*middle Carboniferous*)
  - Small stacked accumulations (<10 MMbbl), low poro/perm

- **Source rocks:**
  - Anoxic marine mudstones (*Upper Devonian – Lower Carb.*)
  - Marine, calcareous mudstones (*Devonian*)
  - Unproven Ordovician sources?
Vulcan Sub-basin

- Proven hydrocarbon province with oil production
- New gas discovery announced in March 2019 (Orchid-1, PTTEP)
- New permit AC/P66 awarded to INPEX
- Jurassic depocentre with oil and gas-prone source rocks
- Structural plays in Triassic-Jurassic
- Stratigraphic plays in Upper Cretaceous and younger
- New multi-client seismic data commercially available
- **Ashmore Platform**  
  *(no 2019 acreage)*  
  - no exploration success  
  - uncertainty of charge  
  - transition to Vulcan Sub-basin may offer potential for stratigraphic traps

- **Vulcan Sub-basin**  
  *(Areas AC19-1 to AC19-8)*  
  - Several petroleum systems  
  - Main targets are Jurassic and Triassic  
  - Accumulations relatively small (approx. 10-50 MMbbl), but closely spaced

- **Londonderry High**  
  *(Area W19-5)*  
  - Underexplored part of Bonaparte Basin  
  - Oil and gas shows recorded  
  - Main exploration uncertainties related to geometries, lack of charge, post-charge fault movements
• Australia’s new hydrocarbon producing region

• Ichthys (INPEX-operated) designed to produce 8.9 MMt of LNG, 1.6 MMt of LPG per annum. Approx. 40 years lifespan

• Prelude (Shell-operated) expected to deliver 3.6 mio tons of LNG, 1.3 MMt of condensate, 0.4 MMt tons of LPG per annum

• Additional development planned for Crux

• Discussions about Browse LNG project (Torosa, Brecknock, Calliance) ongoing

• New acreage released on Yampi Shelf and in northern Caswell Sub-basin
Yampi Shelf (W19-6)

- 68 graticular blocks
- Underexplored part of the Browse Basin
- Dominated by shallow basement
- Cornea oil and gas accumulations demonstrate presence of stratigraphic trap potential
- Careful mapping of migration pathways required
Northern Caswell Sub-basin (W19-7, AC19-10)

- 45 and 54 graticular blocks
- Located close to large gas accumulations and recent gas discoveries
- Water depth 200 m – 1,000 m
- Access to hydrocarbon charge from mature source rocks
Browse Basin: *Petroleum Study by Geoscience Australia*

**Example:** geochemical grouping of oil and condensate families

Prominent difference between Jurassic-sourced and Cretaceous-sourced fluids and gases.
North-eastern Exmouth Plateau (W19-8)

- Under-explored part of the Northern Carnarvon Basin
- No wells drilled, limited well control provided by Whitetail-1, Wigmore-1 and Levitt-1.
- New exploration phase stimulated by recent discoveries in neighbouring Bedout Sub-basin
- Seven bids received for W18-4
- W19-8 located further outboard (water depth 1,000 to 2,000 m)
- Mostly covered by TGS’ Capreolus 3D-seismic survey
- Triassic is main target

Permit WA-541-P awarded to Santos and BP
Permit WA-542-P awarded to Equinor
Recent Success: Roebuck Basin

- New oil province on NW Shelf
- At least two operating petroleum systems identified (oil and wet gas)
- Source rocks not understood
- Sedimentary facies mapping needed to predict changes in reservoir quality
- Early Triassic (and older?) section offer new exploration opportunities
Central North West Shelf: *Regional Geological Study by Geoscience Australia*

*Example: Integration of 2D and 3D seismic data sets*

Results include:

- Improved understanding of basin development, recognition of shifting depocentres
- Interpretation of depositional facies associations and changes through the Triassic period
- Reassessment of basin boundaries
Central North West Shelf: Regional Geological Study by Geoscience Australia

Example: Palaeogeographic interpretations

Interval 2 (TR15.0-TR17.0)
Central North West Shelf: Regional Geological Study by Geoscience Australia

Example: identification of facies analogues

? Carbonate build-up

Polly 3D XL 10,500
Central North West Shelf: Regional Geological Study by Geoscience Australia

Example: identification of facies analogues

? Carbonate build-up

Base Triassic (TR10.0) surface

Exhumed reef complex, Devonian, Canning Basin
Eastern Exmouth Plateau

**W19-10, 11, 12 & 14**
- Straddling the border to the Beagle Sub-basin
- Possible access to liquid petroleum system
- Untapped deeper Triassic targets

**W19-19**
- Access to gas producing Rankin Platform
- Northern part of block only lightly explored

**W19-27 to W19-38**
- Single graticular blocks from recent relinquishments
- Good 3D seismic coverage over southern part of block
- Deep water opportunities in northern part
Western Exmouth Plateau

W19-28
- Deep water frontier (>2,000 m)
- Possible extent of Triassic carbonate play

W19-42 to W19-46
- Cretaceous play
- Western region of “traditional” Mungaroo play
- Southern area may have access to Lower Triassic targets
- Limited well control
Dampier Sub-basin

• Straddling boundary between Lambert Shelf and Dampier Sub-basin
• Shallow basement in the eastern section offers stratigraphic plays

W19-9

W19-13 and W19-15 to W19-18

• Centre of prolific Dampier Sub-basin
• Oil and gas petroleum systems
• Fully covered by modern 3D seismic
• Existing and expanding infrastructure
Barrow Sub-basin

W19-20 to W19-23

- Oil and gas petroleum systems
- Shallow water
- Fully covered by modern 3D seismic
- Existing and expanding infrastructure
Exmouth Sub-basin

W19-25 and W19-26

- Oil and gas petroleum systems
- Mainly shallow water
- Areas located outside commercial oil and gas accumulations, offering untapped potential
- Triassic and Jurassic plays characterised by “textbook-style” horst structures
Otway Basin

V19-1
- Offshore extension of Portland Trough
- Shallow water
- Waarre Fm. Play unsuccessfully tested by Champion-1
- Early Cretaceous (Pretty Hill Fm.) untested

V19-2
- Eastern flank of Shipwreck Trough
- Shallow basement in eastern part of block reliant on updip migration
- Southern part of block offers access to Waarre play with Geographe/Thylacine affinity.

Important aspect:
Even small newly discovered accumulations can be developed and monetised quickly, supplying gas to the SE-Australian expanding gas market.

La Bella gas field awarded to Lattice Energy (2018 cash bid auction)

No bids

New gas discovery: Annie-1, Cooper Energy

Much of the Otway shelf and the deep water region remain underexplored
Gippsland Basin

Permit VIC/P75 awarded to Cooper Energy

Permit VIC/P74 awarded to 3D Oil

V18-5

- Located on eastern Central Deep in shallow water
- Top-Latrobe Group targets

V19-3

- Straddling boundary between Northern Terrace and Northern Platform
- Main (only) play is Latrobe Group pinch-out

V19-4

- Located on eastern Central Deep in shallow water
- Top-Latrobe Group targets

V18-4
Gippsland Basin

V19-5
- Extending across Northern Platform and Terrace to Central Deep
- Deeper Latrobe Group plays (Golden Beach, Emperor; Turonian-Maastrichtian) are main targets

V19-6 and V19-7
- Deep water frontier
- Testing deep Latrobe Group targets
- Understanding lacustrine facies (Kipper Shale)
- Evaluation of marine source rocks
Late Campanian Palaeogeography Golden Beach SGp (T. lilliei)

Bernecker & Partridge, 2001
Latrobe Gp Oil–Source Correlations Biomarkers

- Angler/Blackback oils – Chimaera SR
- Central Deep oils
  - Oxic, fluvio-deltaic
  - Land-plant > lacustrine
- Anemone oil – Anemone SR
- Mostly Anemone SRs
  - Sub-oxic
  - Mixed marine/terrestrial
- Mostly Volador SRs
  - Mixed terrestrial/lacustrine
  - Strongly oxic
  - No oil correlation

22 SRs, 11 oils, one Fl oil & 21 source variables

After Edwards et al, 2015
Further Information
Source Rocks and Fluids portal:
delivering petroleum geochemical data online
Further Information


Acreage Release process

How to obtain acreage, bidding process

Release area maps ("QuickLooks")

Block listings and diagrams

How to nominate areas for future release
Further Information


- Nominations for the 2020 acreage release can be registered now.
- Nominations are treated as 'Commercial-in-Confidence'.
- While expressing interest does not guarantee inclusion in the release, all nominations will be considered.
- The closing date for nominations for the 2020 release is yet to be confirmed.
National Offshore Petroleum Information Management System (NOPIMS)

Welcome to NOPIMS

Geoscience Australia has developed the National Offshore Petroleum Information Management System (NOPIMS) as an online data discovery and delivery system for all Australian offshore petroleum wells and survey information.

Data Access

2019 Offshore Petroleum Exploration Acreage Release
01/08/2019

New direct access to all NOPIMS digital assets via 11 API, 2 WFS and 8 standalone tables
Further Information

www.ga.gov.au/petroleum

- Regional geological overviews
- Exploration histories
- Latest results from GA-petroleum studies
- Marine Environment information
- Maps, diagrams, figures

Note:
Currently only those basins described which offer 2019 acreage.
Content will be expanded as part of an ongoing project.
NEW PROCESS (2019 onwards): condensed timeline

Dec/Jan (Year 1)
Nominations for next release close

April/May (Year 1)
Consultation process completed

March/April (Year 2)
Work program bidding closes

June/July (Year 2)
Bid assessments completed

Oct/Nov (Year 2)
Permit awarded

Nominations accepted
18 - 20 months

Consultation period
4 months

Bidding period
7-9 months

Bid assessments
3-4 months

Permit offer and award
1-2 months

Formal acreage release - July

Nominations
12 months

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