Australian Government
Geoscience Australia

Distribution and Estimates of Australia's Identified Energy Commodity Resources

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Outline

Global context

- Australia is a major global energy producer endowed with abundant high quality energy commodity resources

Australia's Energy Commodity Resources (AECR) assessment

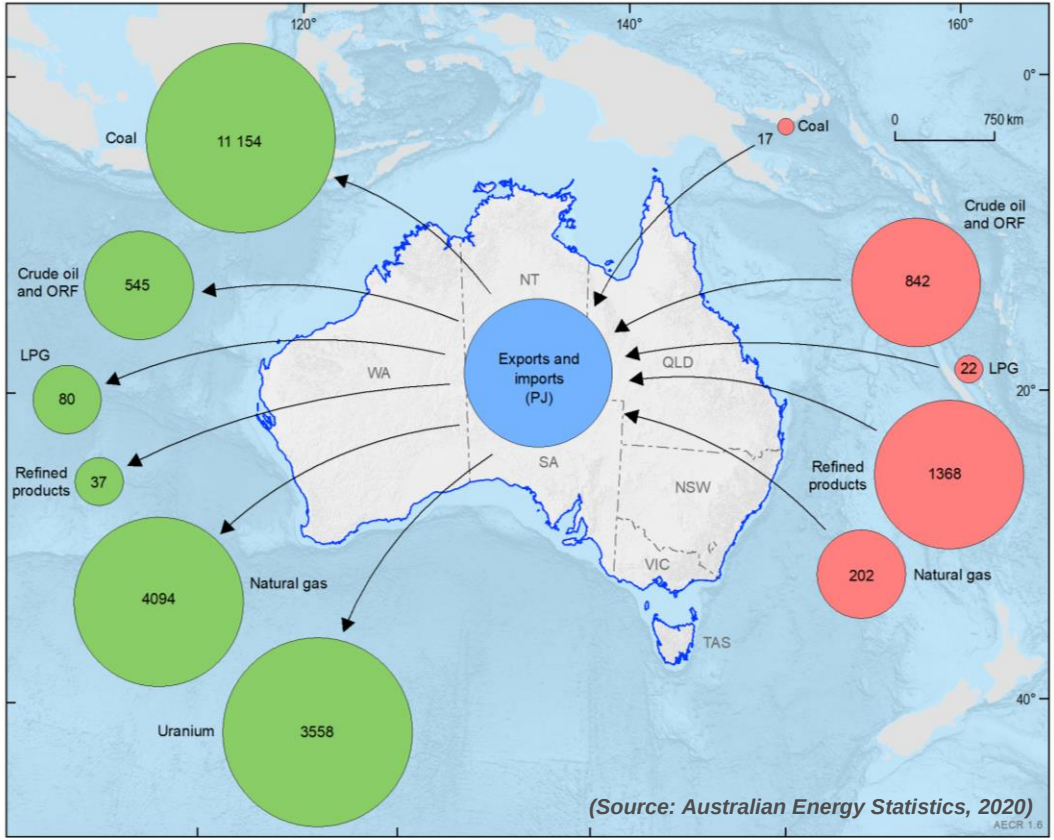
- Australia's world class gas resources are expected to last several decades and provide energy security and economic benefits to all Australians

Australia's transition to a low emissions energy future

- Australia's abundant fossil fuel resources can provide economically competitive feedstock for 'blue' hydrogen with associated carbon capture and storage of co-produced CO_2

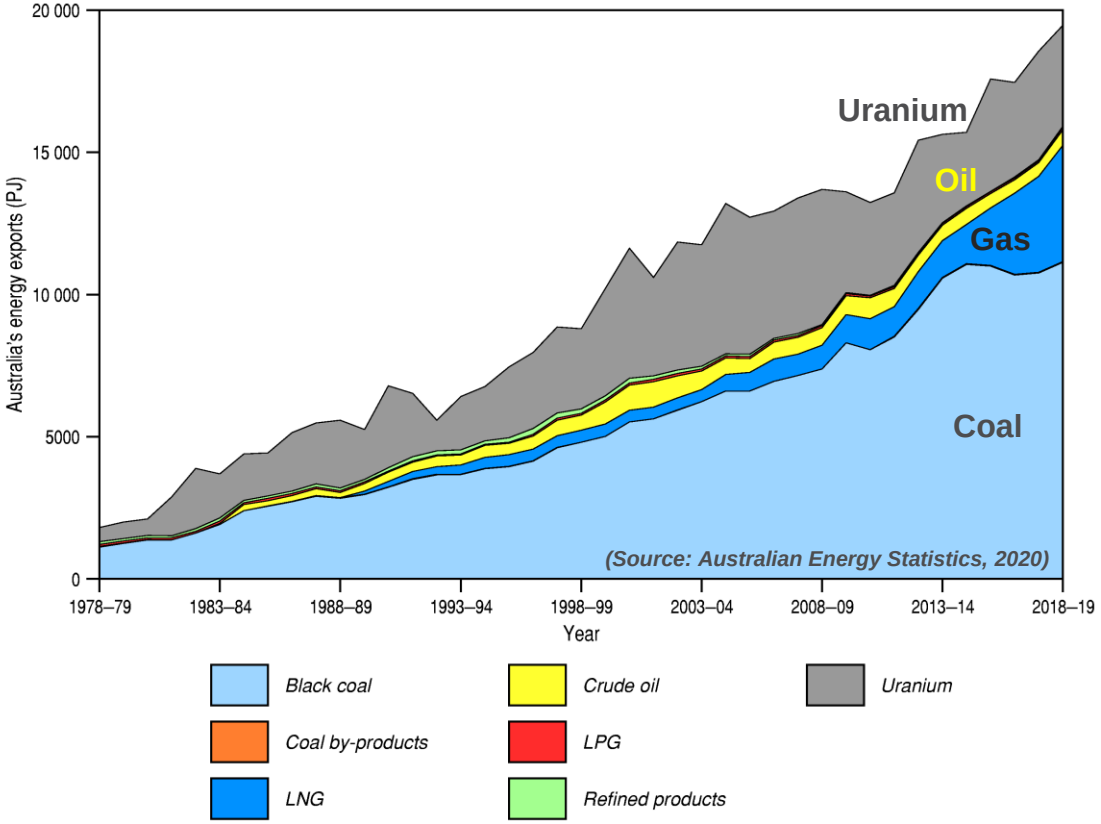
Global Context

Global Context of Australia's Energy Commodities (2019)



- Australia is a net energy exporter – about 85% of all produced energy commodities exported
- World's 4th largest energy exporter and 8th largest energy producer – provides about 6% of the world's non-renewable energy resources
- Energy exports increased in 2018-19 by 5%
- High demand for Australia's LNG exports (up 21%)

Global Context of Australia's Energy Commodities (2019)



Coal:

- Largest metallurgical coal exporter;
- 2nd largest thermal coal exporter;
- 5th largest black coal producer

Uranium:

- World's largest EDR;
- 3rd largest uranium producer

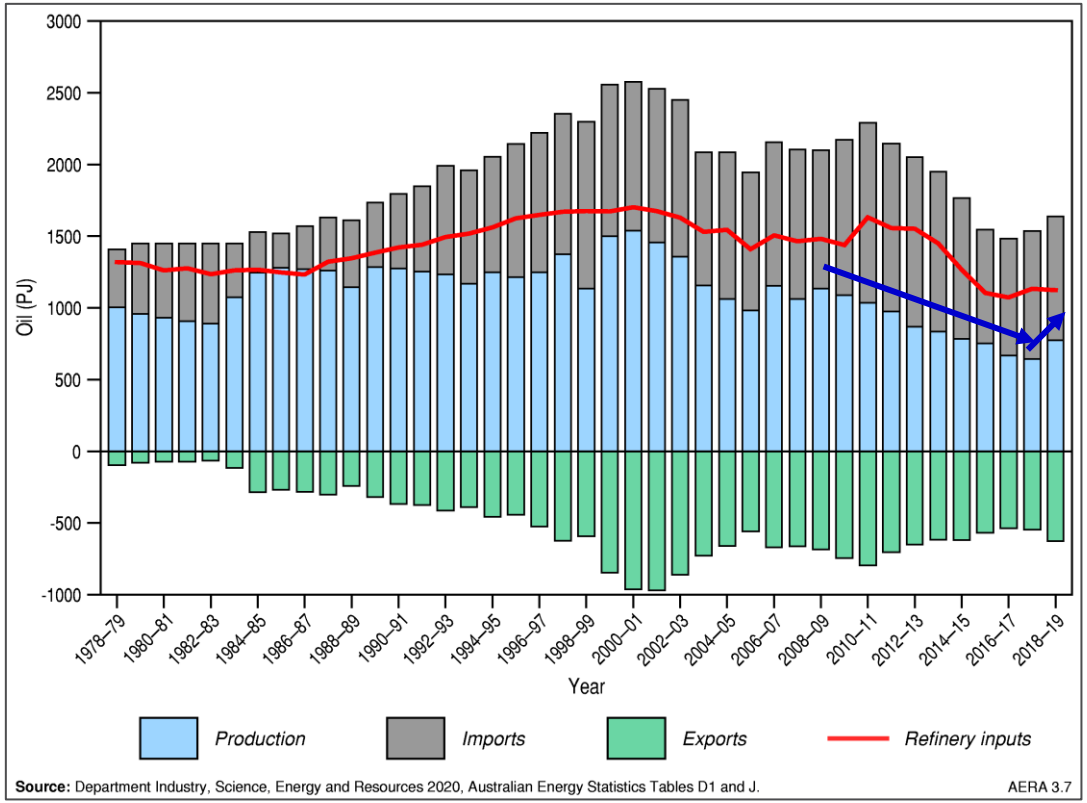
Gas:

- World's largest LNG exporter;
- 7th largest natural gas producer

Oil:

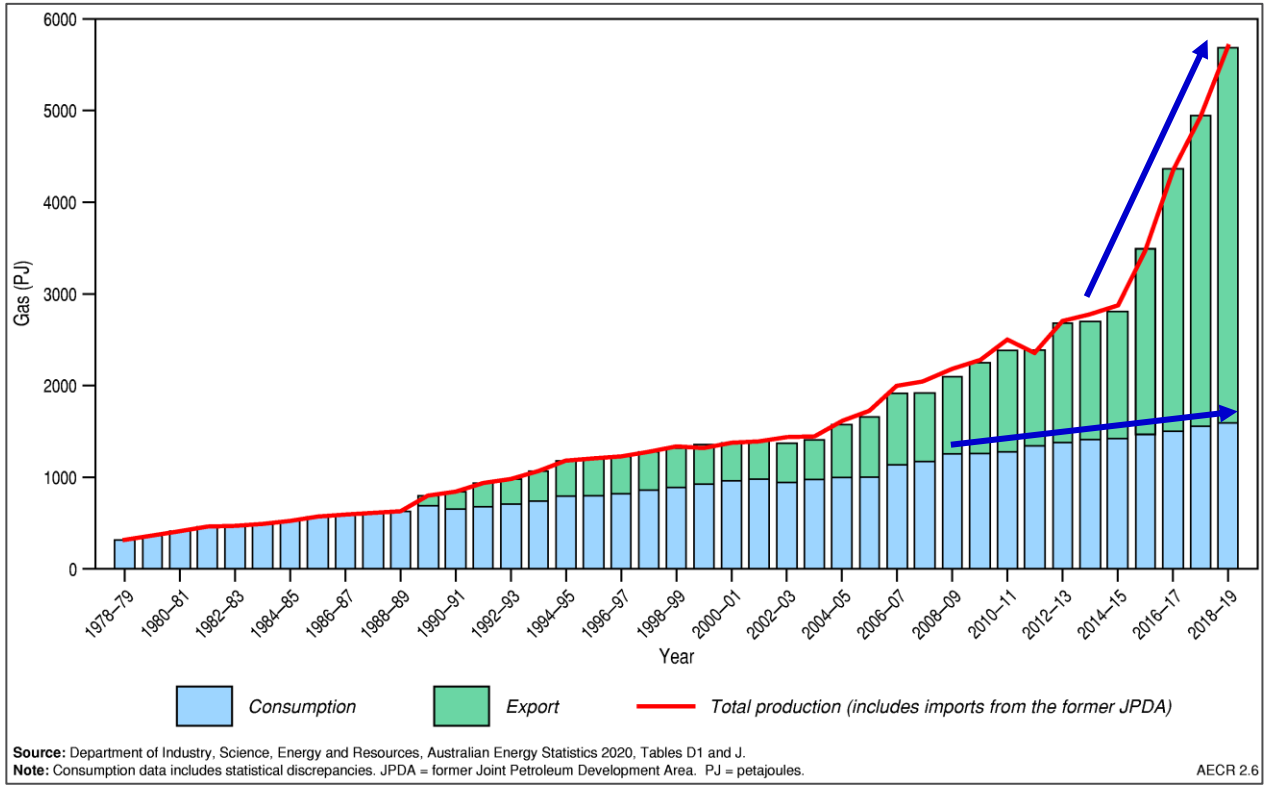
- Small by global standards (net importer)

Historical Trends in Australia's Oil Production



- Oil production in decline since 2009
- Production increased by 18% in 2018-19 (Greater Enfield crude oil, Ichthys & Prelude condensate)
- 80% of oil produced is exported (AU $9 billion export earnings)
- Only 12% of refinery feedstock domestically produced (sourced from eastern Australian basins)

Historical Trends in Australia's Gas Production

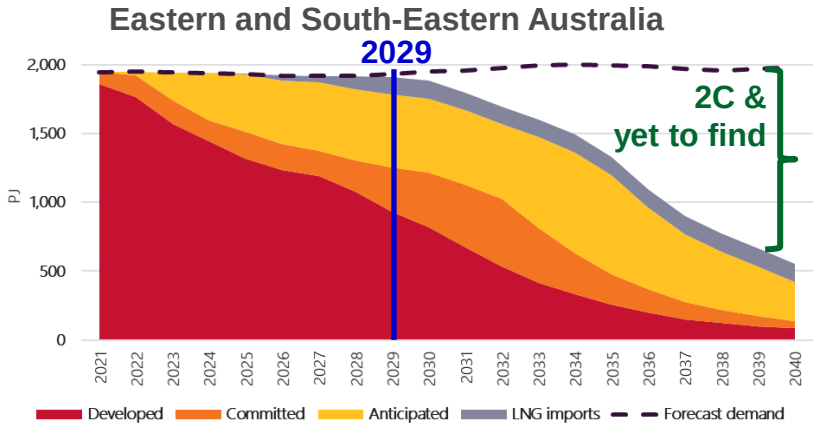


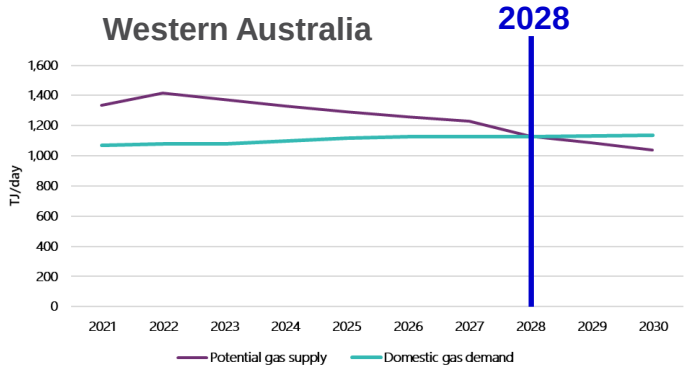
Source: Department of Industry, Science, Energy and Resources, Australian Energy Statistics 2020, Tables D1 and J.
Note: Consumption data includes statistical discrepancies. JPDA = former Joint Petroleum Development Area. PJ = petajoules.

AECR 2.6

- Average 11.5% growth in production over the past decade to feed LNG exports
- 16% growth in production during 2018-19
- Comparatively slower growth in domestic gas consumption (ave 2.7% over 10 years)
- 75% of gas produced used for LNG exports (AU $50 billion export earnings)

Australia's Gas Security – AEMO 2021 Forecast





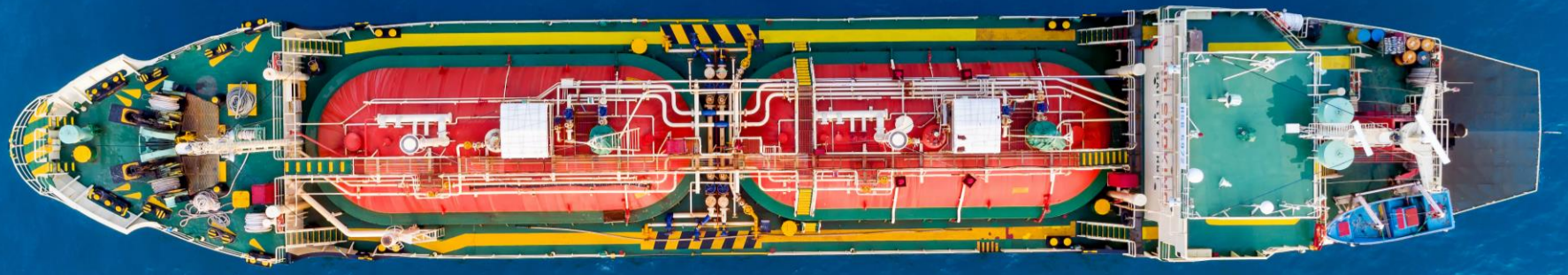
Eastern and South Eastern – 2021 GSOO

- Sufficient gas supply to meet forecast demand (LNG & domestic) until at least 2029 provided that all committed and anticipated projects are developed and LNG imports to the Port Kembla Gas Terminal commence by mid 2023.

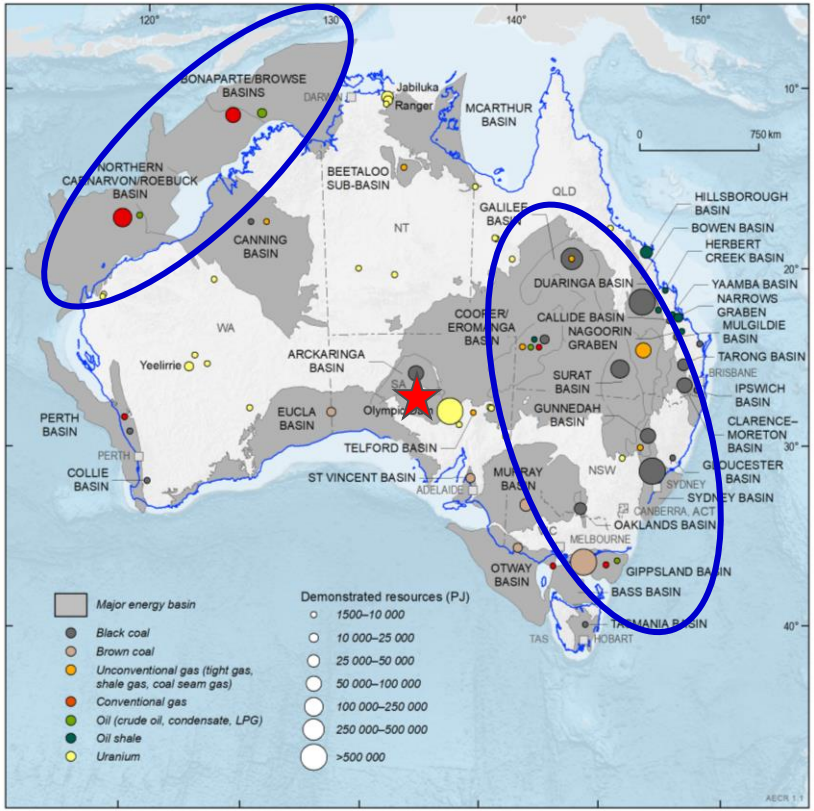
Western Australia – 2020 GSOO

- Forecast shortfall in gas supply after 2028 unless gas production from gas fields supplying existing LNG projects are backfilled by stranded contingent resources on the North West Shelf.

Australia's Energy Commodity Resources 2021

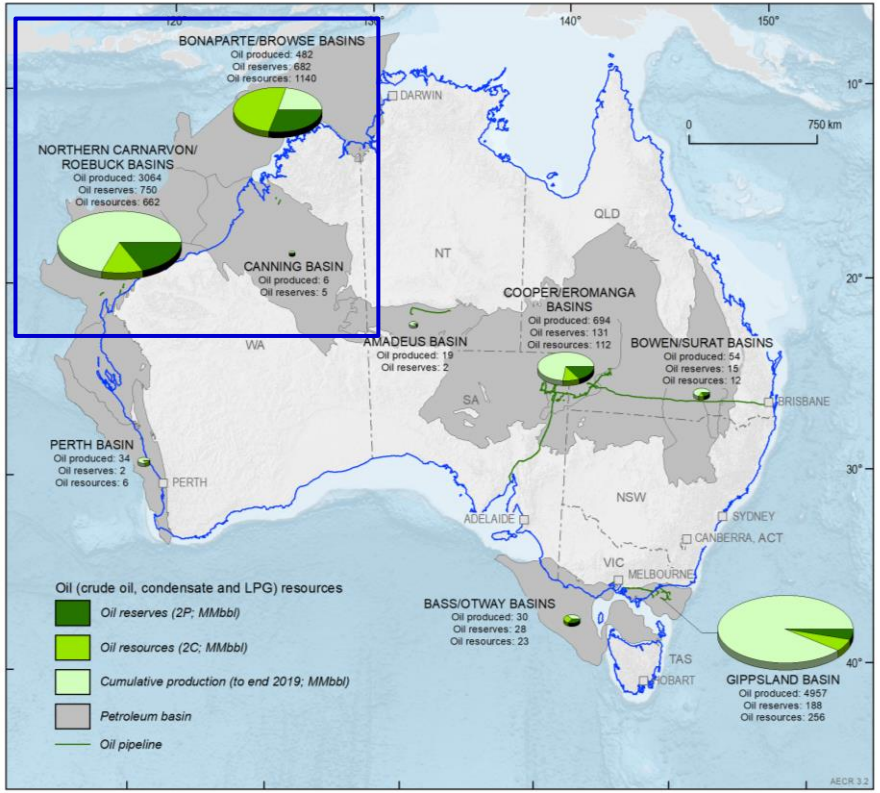


Australia's Energy Commodity Resources (2019)



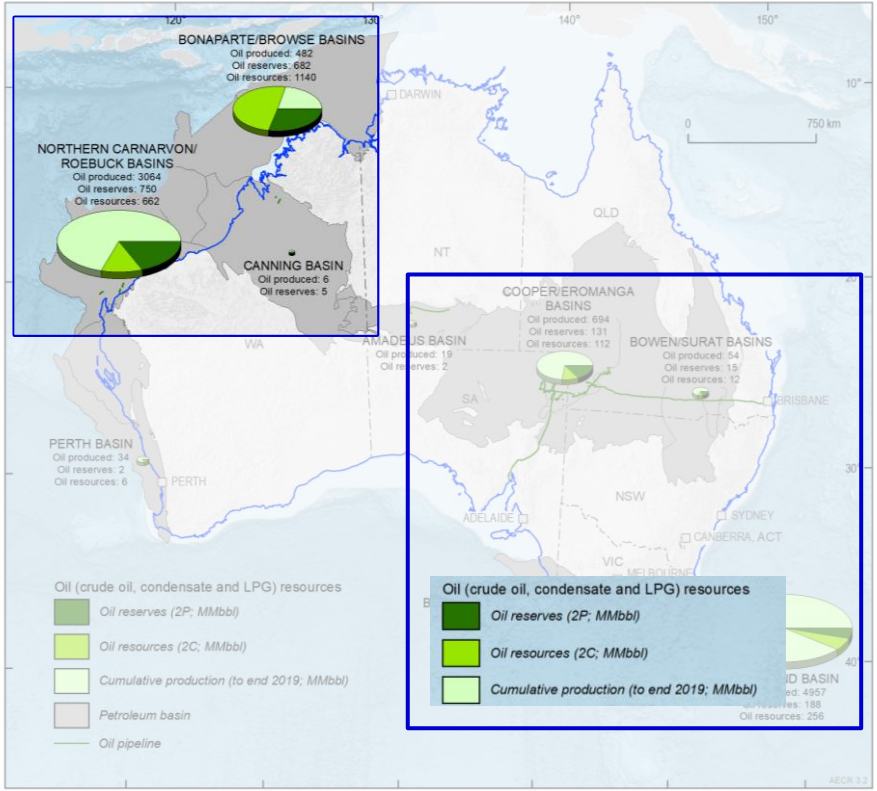
- AECR provides a pre-COVID baseline for production and remaining resources of gas, oil, coal and uranium in 2019
- Basin-scale production and remaining resources data (reserves/economic demonstrated resources + contingent/sub-economic resources)
- Data sourced from open file reports aggregated with de-identified confidential data
- Synopsis of the distribution and scale of Australia's energy commodity resources

Australia's Remaining Oil Resources (2019)



- Australia's oil resources (crude, condensate & LPG) are depleting faster than they are being replenished (5% decline in 2019)
- **Remaining oil resources in 2019:**
  - 2P reserves = 1,803 MMbbl
  - 2C resources = 2,210 MMbbl
  - Resource life = 30 years
- Condensate represents about 70% of our remaining oil resources
- 80% of remaining oil resources located in basins on the North West Shelf

Australia's Remaining Oil Resources (2019)



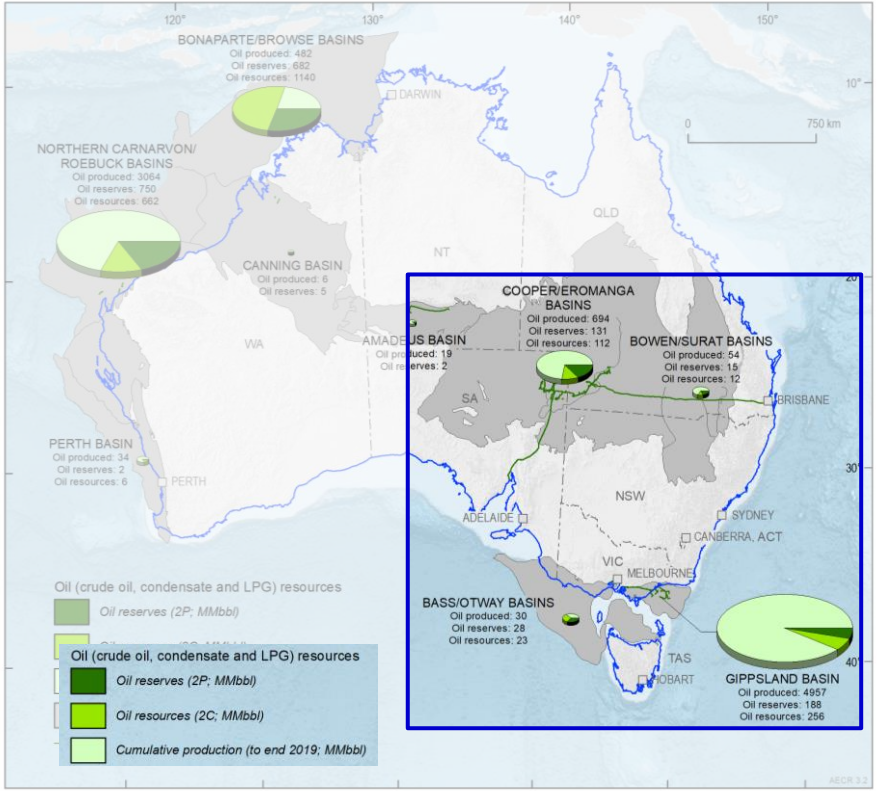
Nth Carnarvon/Roebuck:

- 70% of initial in place resource produced
- Contains ~half of Australia's remaining crude oil resource (493 MMbbl) & 34% of remaining condensate resources (919 MMbbl)

Browse/Bonaparte:

- 20% of initial in place resource produced
- Substantial condensate resource (1630 MMbbl) = 60% Australia's remaining condensate
- 62% of remaining resources are 2C

Australia's Remaining Oil Resources (2019)



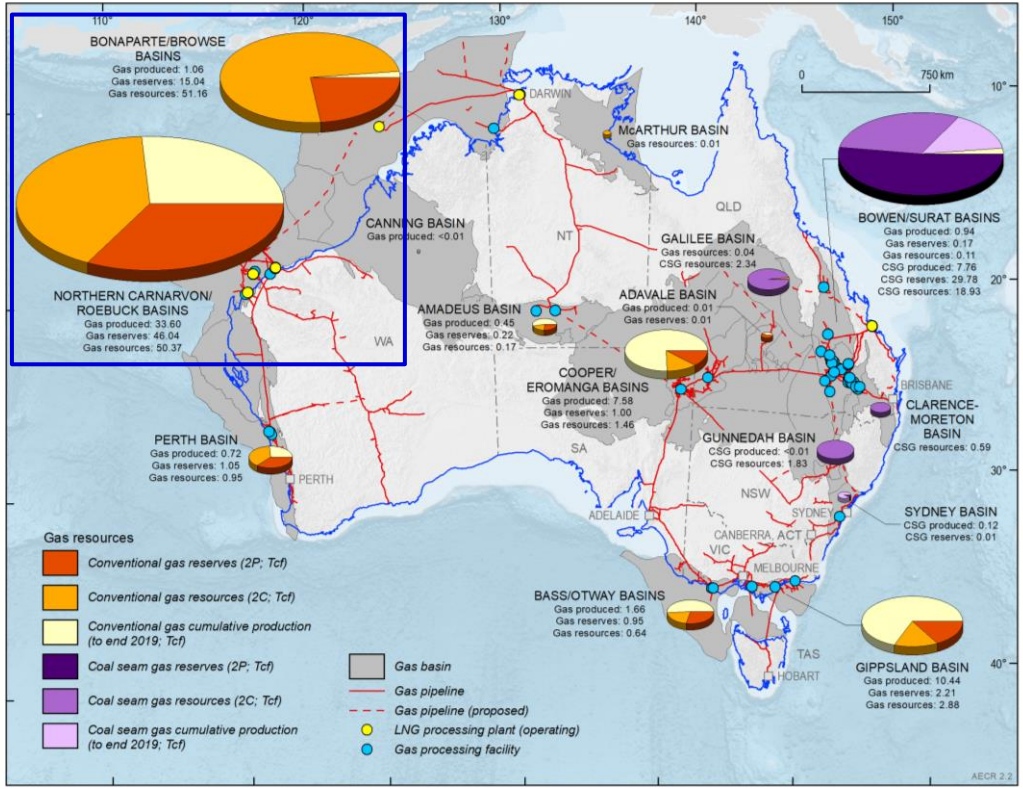
Gippsland:

- Produced over 50% of all Australian crude oil resources
- 92% of initial in place resource produced

Cooper/Eromanga Basin:

- 75% of initial in place resource produced
- Contains most of Australia's remaining onshore oil resources

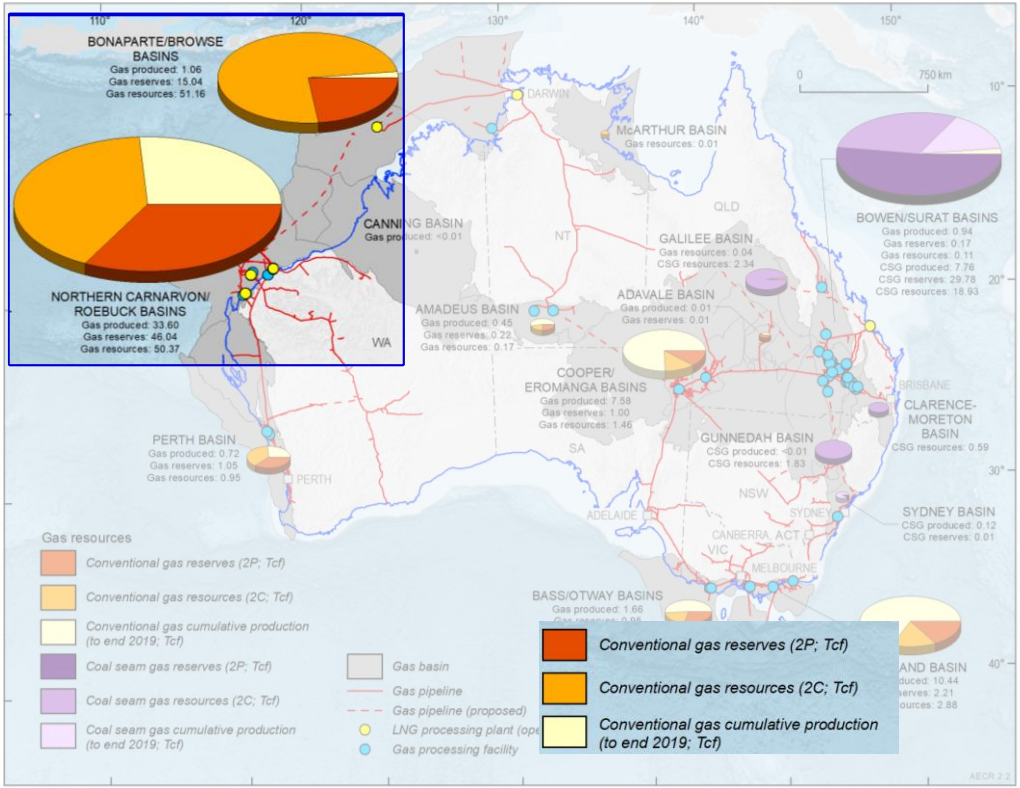
Australia's Identified Gas Resources (2019)



Conventional gas resources:

- 2P reserves = 67 Tcf
- 2C resources = 108 Tcf
- resource life = 42 years
- 93% located on North West Shelf

Australia's Identified Conventional Gas Resources (2019)



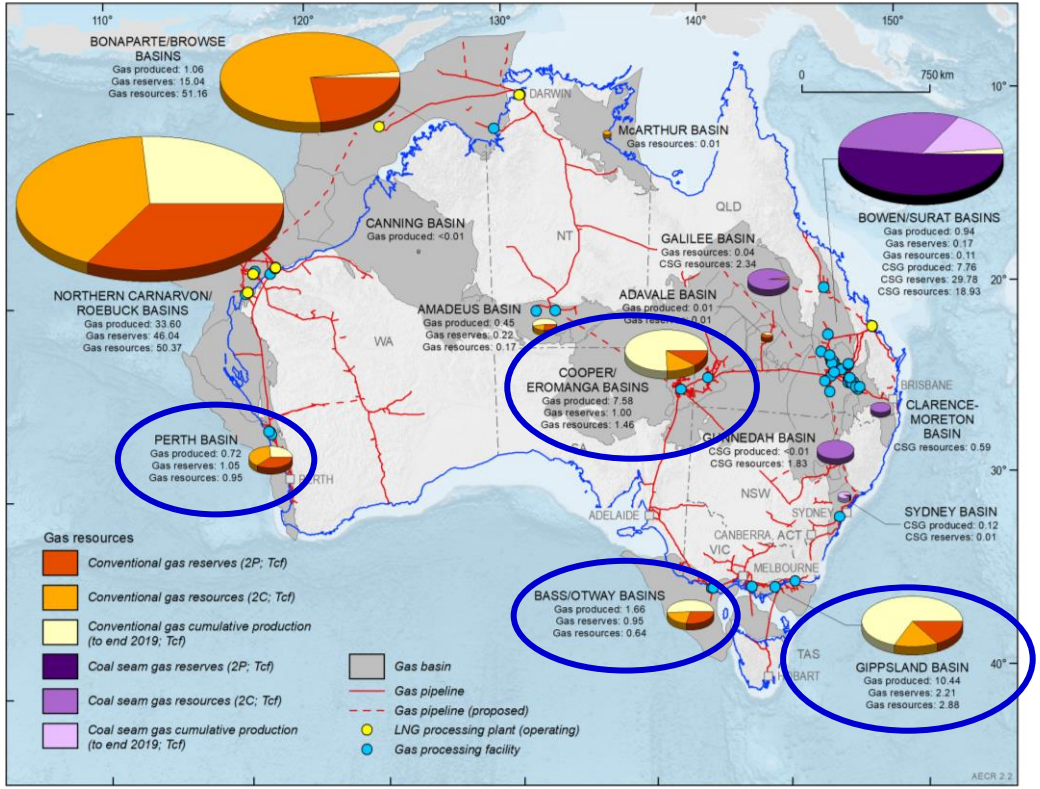
Nth Carnarvon/Roebuck:

- Contains over half of Australia's remaining conventional gas resources (96 Tcf) – significant reserves (46 Tcf)
- 25% of initial in place resource produced

Browse/Bonaparte:

- Only 2% of initial in place resource produced
- Contains over one third of Australia's remaining conventional gas (66 Tcf)
- 77% of remaining resources are 2C

Australia's Identified Conventional Gas Resources (2019)



Perth Basin:

- Total remaining resources = 2 Tcf

Bass/Otway Basins:

- Total remaining resources = 1.6 Tcf

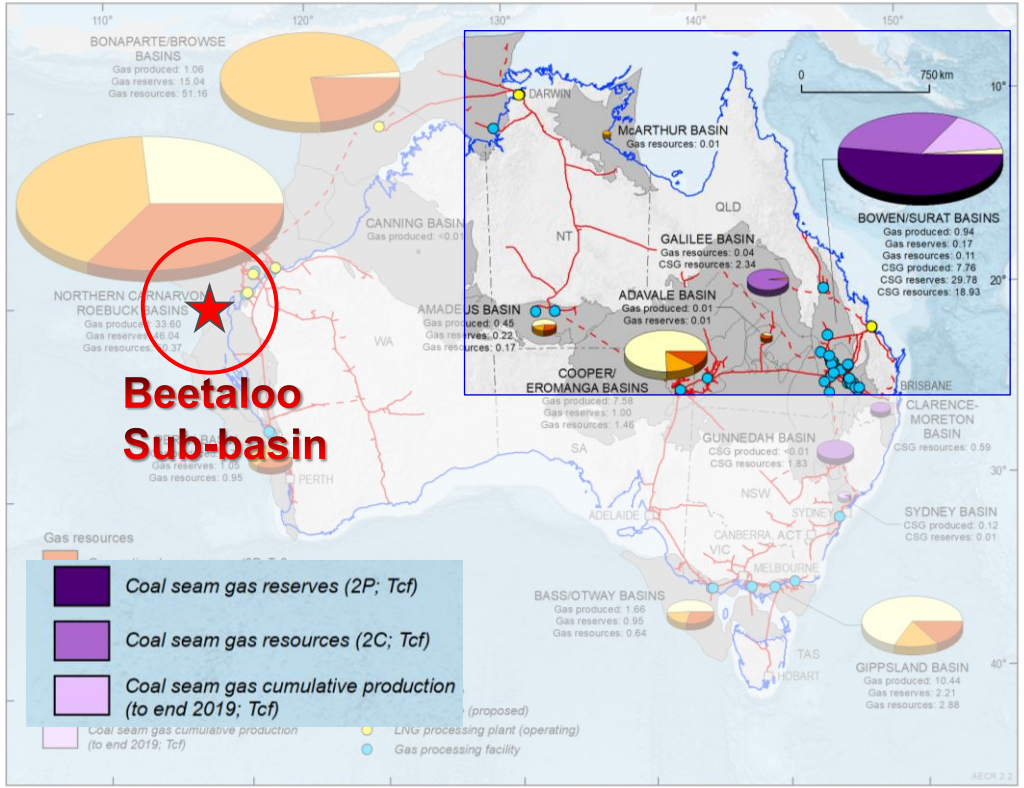
Gippsland Basin:

- 68% initial in place resources produced
- Total remaining resources = 5 Tcf

Cooper/Eromanga Basin:

- 75% initial in place resources produced
- Total remaining resources = 2.5 Tcf

Australia's Identified Unconventional Gas Resources (2019)



Coal seam gas resources:

- 2P reserves = 30 Tcf
- 2C resources = 24 Tcf
- resource life = 36 years
- 91% located in Bowen/Surat – 14% initial in place resources produced

Other unconventional gas resources:

- No identified reserves or production
- 2C contingent resource totaled 13 Tcf
- 60% of 2C resources located in the Beetaloo Sub-basin

Australia's transition to a low emissions energy future

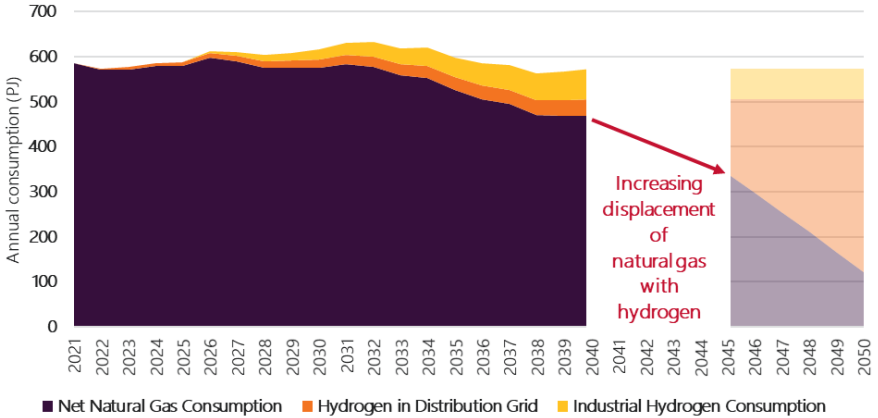
Enabling Clean Energy Technologies – Hydrogen

Forecasts costs for hydrogen production

	Cost 2018 est. US$/kg (CSIRO)	Cost 2020 est. US$/kg (BNEF)	Cost 2030 est. US$/kg (BNEF)	Cost 2050 est. US$/kg (BNEF)
Natural gas + CCS	1.61 – 1.96	1.34 - 2.91		1.25 - 2.82
Coal + CCS	1.82 – 2.17	2.51 - 3.30		2.22 - 3.05
Renewable H_2	3.36 – 5.18	2.53 – 4.57	1.14 - 2.71	0.73 - 1.64

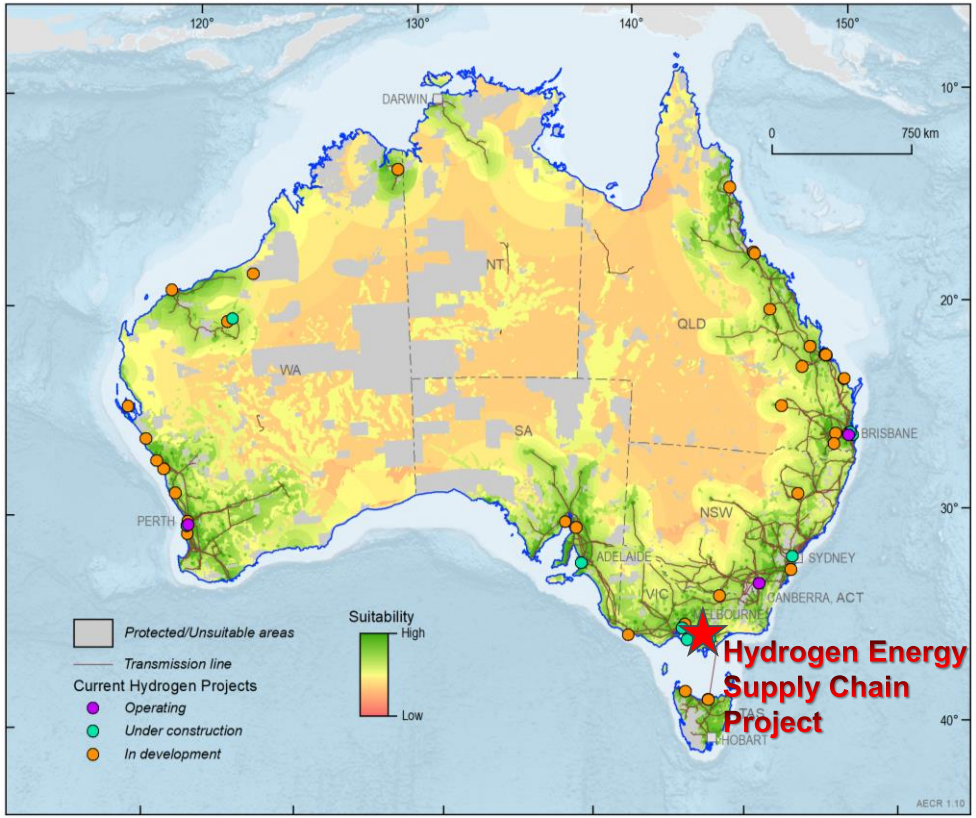
$2/kg

AEMO assumed hydrogen impact on domestic gas consumption



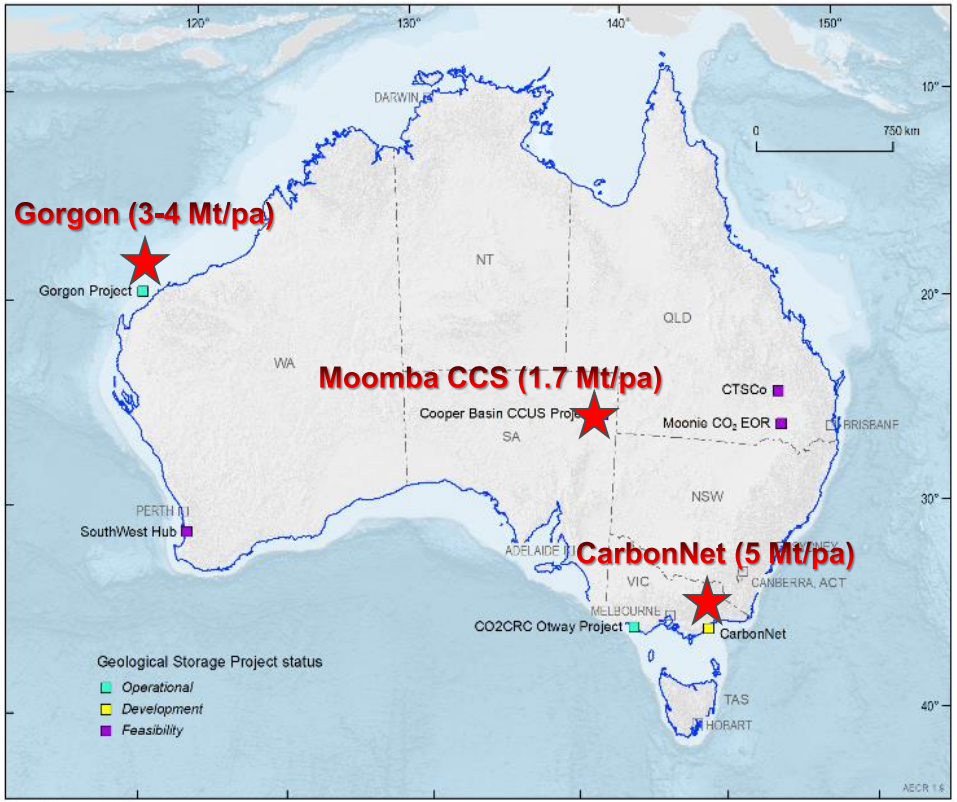
- Hydrogen produced from either renewable energy sources (green hydrogen) or fossil fuels with associated carbon capture & storage of CO_2 (blue hydrogen) is a key component of Australia's energy future
- The AEMO GSOO now considers the potential impacts on natural gas demand as green hydrogen is introduced into the energy market – likely to be significant decline in gas demand post-2040

Australia's Hydrogen Potential



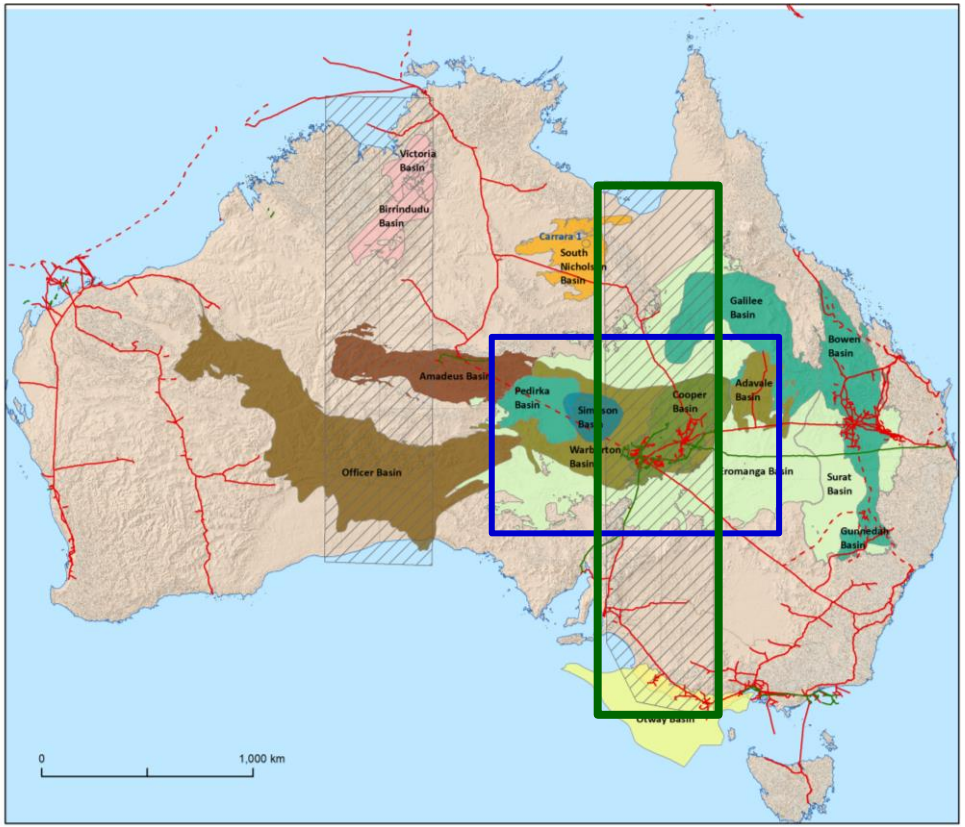
- Australia is well placed to be a major hydrogen producer with extensive potential renewable energy sources, abundant identified gas and coal resources, and many potential geological storage sites
- The Hydrogen Energy Supply Chain Project in the La Trobe Valley is demonstrating the feasibility of producing hydrogen from brown coal resources in the Gippsland Basin with CCS of CO_2 by-products in suitable geological storage sites (1st hydrogen production occurred in early 2021)

Enabling Technologies – Carbon Capture and Storage



- Australia contains a range of potential geological storage sites that enable long-term storage of CO_2 produced during extraction of oil and gas resources, or as by-products from blue hydrogen production
- Two currently operating projects and five others at various stages of assessment
- Large-scale projects include Gorgon CCS, Moomba CCS and CarbonNet

Australia's Future Energy Resources (AFER) Project



- Geoscience Australia's AFER Project has commenced an investigation of Australia's Yet To Find future energy resources as part of the Exploring for the Future Program
- Initial focus area in central Australia
- Components of the AFER study include:
  - basin inventories for under explored onshore energy basins;
  - play-based assessments of yet to find (prospective) conventional and unconventional hydrocarbons;
  - evaluating potential new oil resources and basin-scale Enhanced Oil Recovery CCS opportunities associated with residual oil zones.
  - understanding hydrogen storage resources.

Summary

- Australia is endowed with an abundant and diverse energy resource commodity base which has enabled us to be a globally significant, net energy producer
- AECR shows that Australia's total identified gas reserves and resources are sufficient at 2019 production rates to last over 40 years provided that the barriers to development of contingent resources are mitigated
- Blue hydrogen produced from Australia's abundant natural gas and coal resources with geological storage of co-produced CO_2 will help Australia develop its clean energy future and meet the growing global demand for low emissions fuels
- Geoscience Australia's Exploring for the Future Program is helping Australia reach this clean energy future through it's its investigation of Yet To Find energy resources under its AFER Project

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The National Offshore Petroleum Titles Administrator (NOPTA) is also acknowledged for providing basin aggregated offshore oil and gas resources and production data for year-end 2019.

For more on this topic

- Visit our team at the Australian Government booth, #34
- Read the AECR publication: Geoscience Australia (2021). Australia's energy commodity resources, 2021 edition.