

# He

# HELIUM

INVESTMENT OPPORTUNITIES

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*Neoproterozoic and Phanerozoic sedimentary basins of Western Australia with known and inferred distribution of salt*

## Western Australia's salt-bearing sedimentary basins provide potential seals and traps for helium resources

There has been no exploration for helium (He) in Western Australia, but several basins are prospective for co-occurring He and hydrocarbon resources

### Amadeus Basin

- Widespread early Neoproterozoic (c. 800 Ma) salt forms seal near base of basin
- Gas flows from beneath this salt returned very high (but currently uneconomic) He contents (6.2%, 9%) in two hydrocarbon exploration wells in the Northern Territory, demonstrating subsalt hydrocarbon system and high salt-seal integrity
- Subsurface geology in Western Australia is poorly understood, but salt unit is inferred to be present and likely forms a seal over shale (potential hydrocarbon source) and sandstone (potential reservoir) intervals that are thicker than in the Northern Territory

### Officer Basin

- Early Neoproterozoic (c. 800 Ma) salt widespread near base of basin; correlates with salt in Amadeus Basin
- Salt at least locally forms potential seal over shale and sandstone units, although distribution of prospective subsalt units poorly known, as few wells penetrate salt
- Gas-prone hydrocarbon source rocks inferred in lower Officer Basin in South Australia near state border, based on gas shows in exploration wells
- No He yet reported, but similarity to Amadeus Basin implies prospectivity

### Canning Basin

- Thick Ordovician–Silurian (c. 450 Ma) salt overlies hydrocarbon source rocks in southern Canning Basin, indicating potential suitability for trapping combined He and hydrocarbons



Government of **Western Australia**  
Department of **Mines, Industry Regulation and Safety**

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## Helium in hydrocarbon fields

- Helium is continuously but very slowly generated in the crust by radioactive decay of uranium and thorium (primordial He can also be sourced from the mantle)
- Helium migrates through a basin from the underlying radiogenic basement via pore fluids, to be most commonly trapped with hydrocarbons
- Most commercial He is therefore extracted as a minor byproduct during hydrocarbon production
- Helium atoms are small, light, inert and highly mobile, hence high concentrations (>1% He) require very effective seals
- Thick, stratified salt deposits in sedimentary basins provide the highest quality seals, although shale seals can trap low He concentrations
- The ideal plays for significant He resources are therefore old, long-stable basins with intact salt seals and coincident subsalt hydrocarbon systems
- The US has historically been the main He producer, most notably from salt-bearing Paleozoic basins
- Australia has produced He only since 2010, following commissioning of a plant in Darwin to separate it at low concentrations from waste gases piped from the Bayu–Undan field in the offshore Bonaparte Basin (Timor Sea)
- Australia has significant old, salt-bearing basins such as the Amadeus and Officer Basins with widespread c. 800 Ma salt, and the Canning Basin with c. 450 Ma salt, but exploration for He in Australia is in its infancy



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*Interbedded salt and dolomite in core of the Brown Formation in stratigraphic drillhole GSWA Lancer 1*

### For more information



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### Contact us

Resource Investment Information

Geological Survey and Resource Strategy Division

[minerals.investors@dmirs.wa.gov.au](mailto:minerals.investors@dmirs.wa.gov.au)

Tel: +61 8 9222 3676



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