

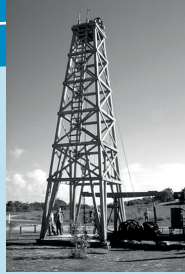
The Facts

about natural gas extraction
in South Australia



Government
of South Australia

South Australia's oil and gas industry – a history



1866
First oil exploration in SA at Alfred Flat near Salt Creek, north of the Otway Basin
First drilling for oil in Australia near Salt Creek



1941
South Australia's *Petroleum Act 1940* came into effect

1945
First oil exploration licence, OEL 1, granted to include a small part of the Cooper Basin



1959
First petroleum exploration well drilled in the Cooper Basin at Innamincka 1

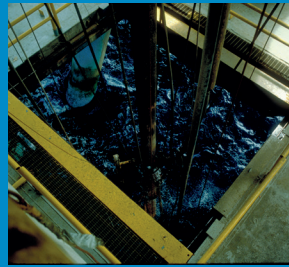


1963
Gas discovered in the Cooper Basin at Gidgealpa 2

1966
Giant natural gas field discovered at Moomba, Cooper Basin

1967
First offshore well drilled at Crayfish 1 in the Otway Basin

1968
Moomba 6 fracture stimulated (fracked)



2003
Woodside Petroleum drills Gnarlyknots 1A to 4,736 metres, most recent exploration well drilled in the Great Australian Bight



1998-2002
27 new PELs offered to new entrants in the Cooper-Eromanga basins. All licences were granted once native title agreements signed
Three new oilfields discovered by the first 6 exploration wells (Acrasia 1, Sellicks 1 and Aldinga 1)
Native title agreements signed for the 16 PELs in the Cooper-Eromanga basins

1991
Katnook Gas Plant supplies gas to customers in the Southeast



1987
Gas discovered in the onshore Otway Basin at Katnook 1



1983
First exports of crude oil and condensate from Port Bonython

1976
Supply of Cooper Basin gas begins to customers in NSW

1972
First exploration well drilled in the Great Australian Bight



1970
Crude oil discovered in the Cooper Basin at Tirrawarra 1

1969
Cooper Basin gas first supplied to customers in Adelaide



2004

690 km SEA Gas pipeline from the Victorian Otway Basin gas fields doubles gas supply capacity in South Australian gas markets

2006

Victoria Petroleum (now Senex Energy) discovers Growler 1 and Wirraway 1, opening the western flank (Cooper - Eromanga) Birkhead channel stratigraphic oil play



2007

First conjunctive Indigenous Land Use Agreement (ILUA) for oil & gas in the South Australian Cooper-Eromanga basins

2009

Cooper-Eromanga acreage release attracts 20 bids from 11 explorers for five blocks. Winning bids valued at combined \$146 million (\$101 million guaranteed)

2010

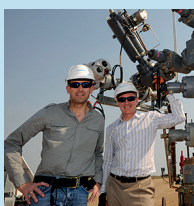
The Roundtable for Unconventional Gas Projects in South Australia formed to examine options for future gas production

Cooper - Eromanga basins acreage release attracts 11 bids from six explorers for three blocks. Winning bids worth \$154.4 million (\$49.9 million guaranteed)

2011

Beach discovers 20 million-barrel Bauer Oil Field on the western flank oil play trend

Exploration permits for Petroleum EPPs 37-40 in the Bight Basin awarded to BP Australia, later joined in partnership by Norway's Statoil



2012

October - Santos Moomba 191 supplies the first commercial gas from shale reservoirs to markets in Australia

The Roadmap for Unconventional Gas Projects in South Australia is published, Australia's first comprehensive framework for gas in unconventional reservoirs

2018 and onwards

PACE Gas grants support Haselgrove 3 discovery in Otway, enable production from Vanessa gas field and Gemba gas discovery

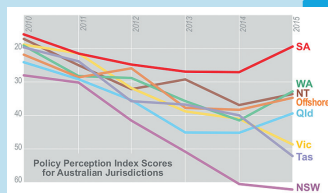
2017

March - South Australian Government launches second round (an additional \$24 million) of PACE Gas grants and GISERA Otway research partnership initiated

June - Statoil agrees to continue exploring the Great Australian Bight after taking BP's 70% interest in EPPs 39 and 40 December

2016

November - South Australian Government's \$24 million PACE Gas Program launched to accelerate investment in South Australian gas supply projects through targeted competitive grants



2015

South Australia ranked best in the world and top in Oceania region for fiscal terms in the 2015

Fraser Institute Global Petroleum Survey

First Cooper Eromanga Basins Aboriginal Conference brings together representatives from industry and supply chain companies, and the three Aboriginal groups with Cooper Eromanga basins native title interests

2014



Petroleum Retention Licence scheme accelerates exploration valued at \$500 million, delivering the Roadmap recommendation for fit-for-purpose licences

2013

Cooper-Eromanga acreage release attracts 15 work program bids for four blocks. Winning bids total \$115 million (\$99.2 million guaranteed)

EPPs 44 and 45 in the Bight Basin granted to Chevron Australia New Ventures Pty Ltd; EPP 43 granted to Murphy Australia Oil Pty Ltd and Santos Ltd

The history of fracture stimulation in South Australia



Fracture stimulation has been used safely in South Australia since 1969, in both conventional and unconventional wells.



More than 900* wells have been fracture stimulated in the deep sandstone reservoirs of South Australia's Cooper Basin.



No fracture stimulation allowed outside the Cooper Basin without detailed assessment to inform stakeholders ahead of consultation.

45+ Years

of fracture stimulation (fracking) in South Australia

0

Negative impacts identified



Water resources



Soil



Native vegetation and fauna



Landscape and heritage



Air quality



Health and wellbeing of people and enterprise



900+

Fracture stimulated wells*



The Cooper-Eromanga basins are **Australia's leading onshore oil production basins** and generates 20.8% of Australia's oil production (2017/2018).

200 tcf gas = 200 year supply

Early indications show that the Cooper Basin could potentially produce more than **200 trillion cubic feet**. That's more than two centuries of supply if used in Australia alone.

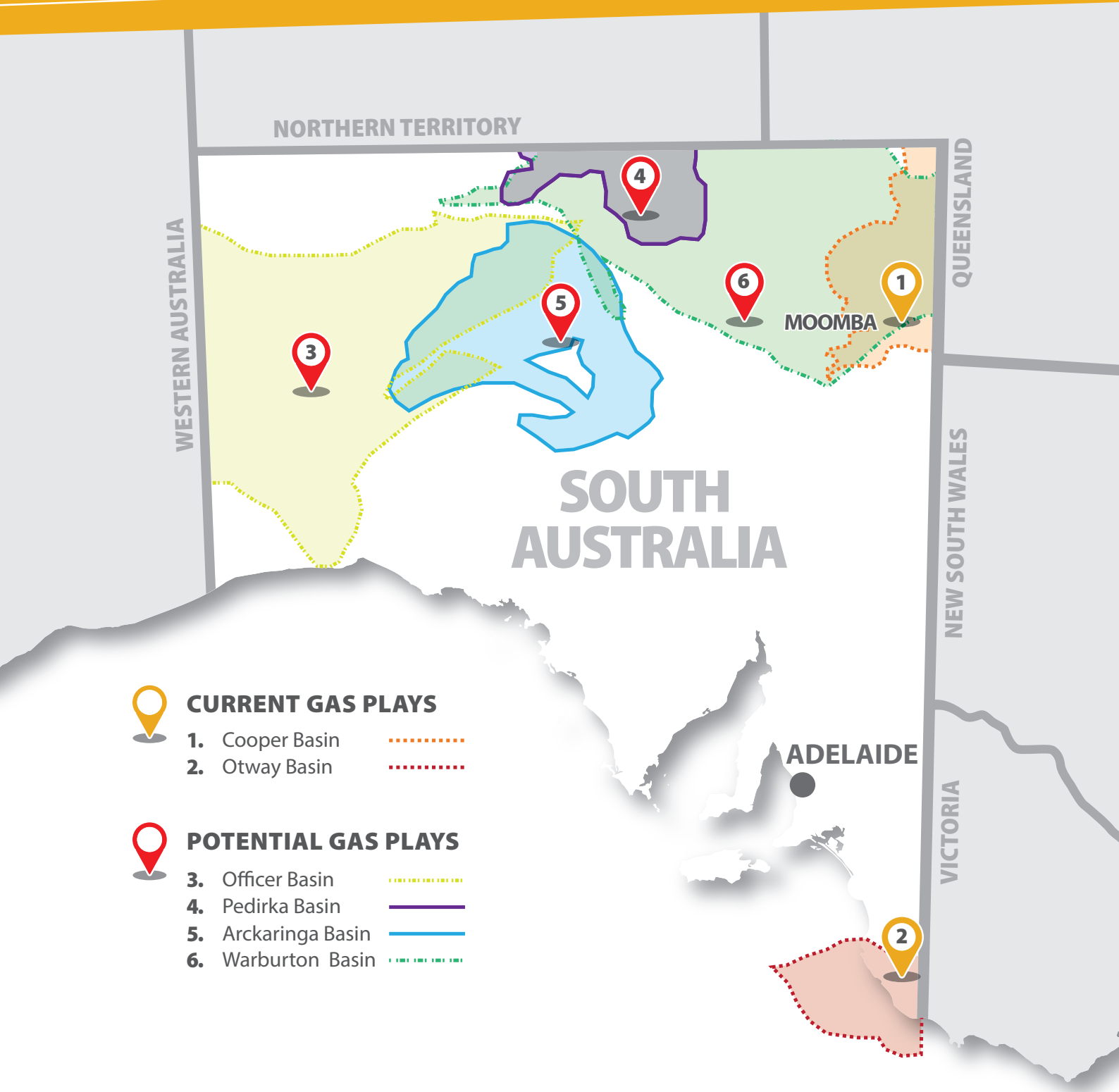


Santos's Moomba 191 well in the Cooper basin is **Australia's first commercial unconventional shale gas well**, which started flowing gas in October 2012.

\$42 Billion

The South Australian Cooper-Eromanga basins have produced more than **5 trillion cubic feet of gas** and more than **340 million barrels of petroleum liquids** since 1969 with a present sales value of **\$AUD 42 billion***.

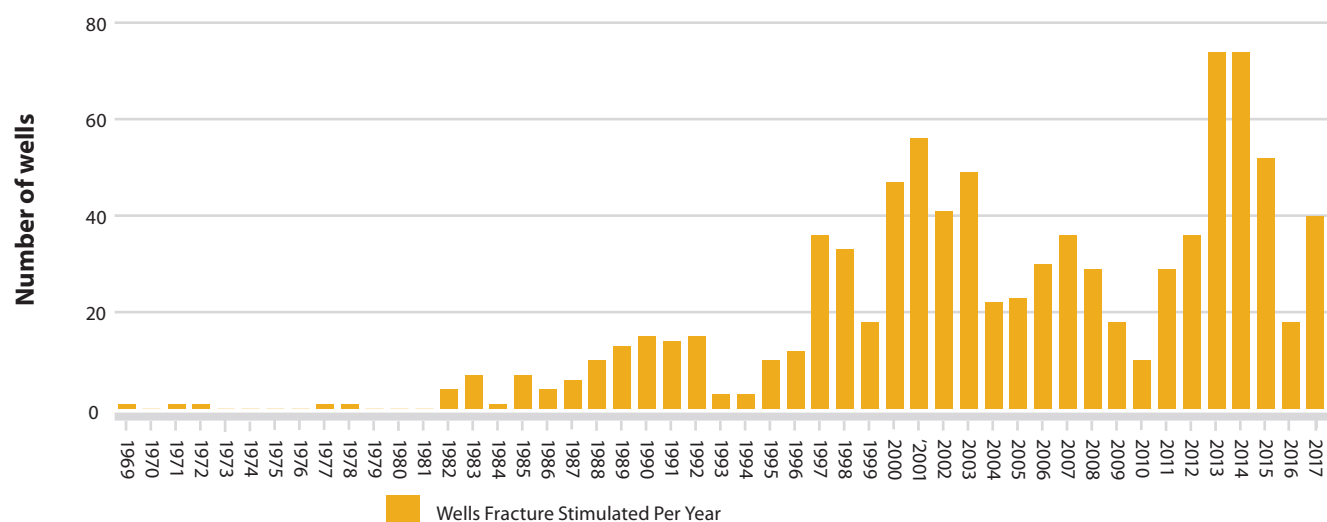
Natural gas plays in South Australia



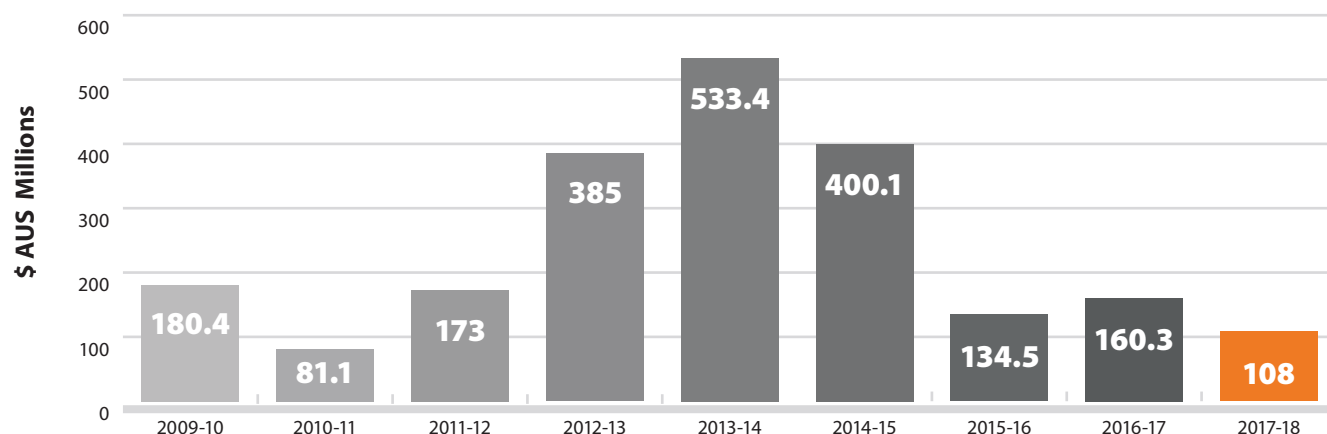
South Australia has vast, prospective natural gas reservoirs that could ensure our State's sustained well-being for decades to come.

Exploration in South Australia

SA Petroleum Wells Fracture Stimulated Per Year



Investment in oil and gas exploration



Several unconventional reservoir plays are being actively explored for gas/oil by more than 20 companies in South Australia.



PACE Gas supports diverse Cooper & Otway Basin projects targeting 217 peta-joules (PJ) of additional supply for South Australian users with upside potential of more than 1,950 PJ.

How is a licence approved?

Under the *Petroleum and Geothermal Energy Act 2000*, approval will only be granted once the community is satisfied that all risks to the environment, other land users and the precious water resources are manageable.



No petroleum operations are allowed without stringent assessment.



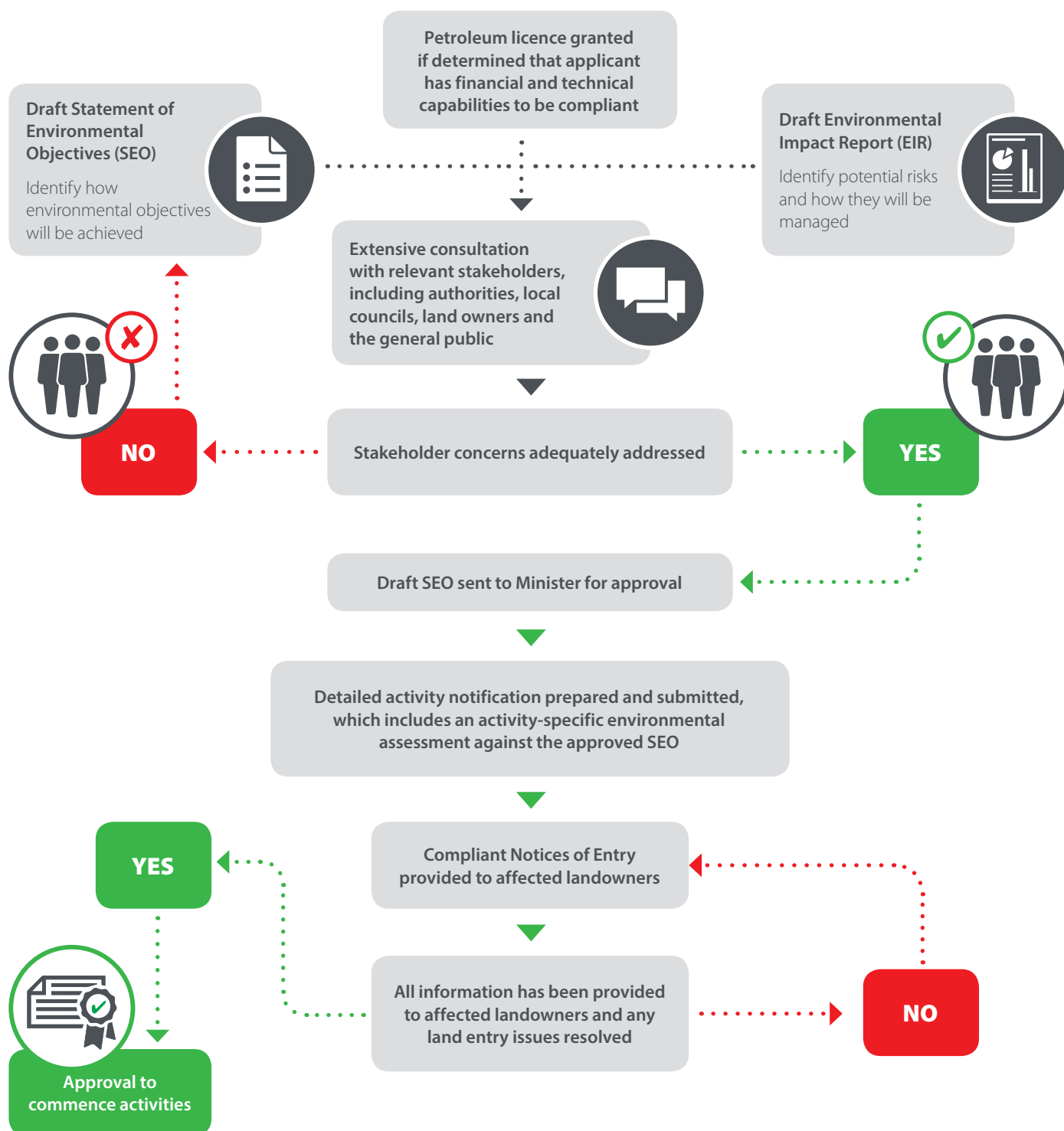
Operators must give timely notice of entry to affected landholders.

18
Years

14,000
notices of entry
issued for operations

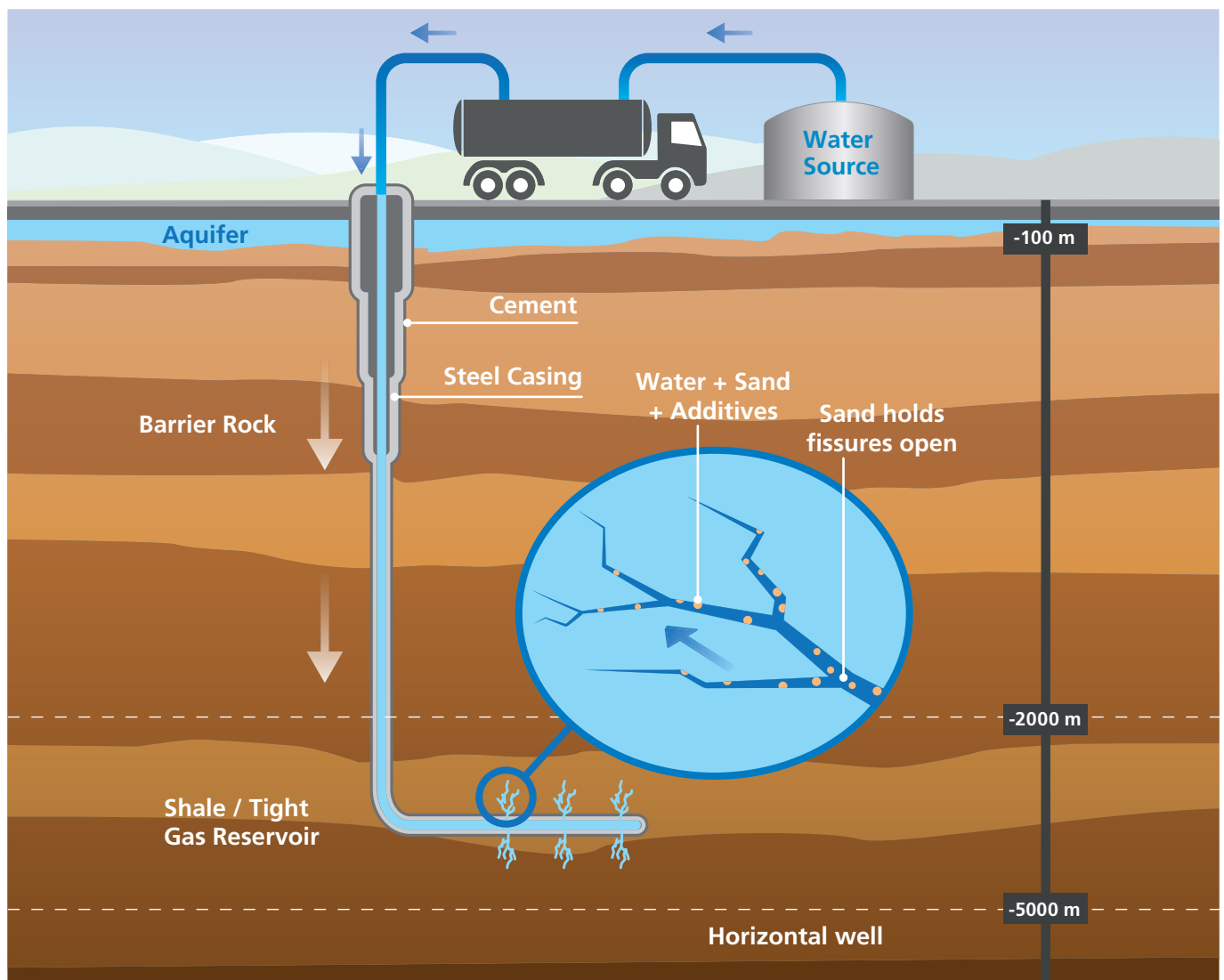
Fewer than
0.05%
legal objections
from people or
enterprises

The approval process



How is natural gas extracted?

Fracture stimulation in South Australia



The hole drilled in the ground is equal to the width of a standard A4 page.

Deep gas targets Vs Shallow coal seams

Cooper Basin in SA and Qld	Vs	Surat-Bowen basins, Qld
Shales, siltstones, tight sandstones and deep coals		Shallow coal seams
Deep gas targets 2,000 to 5,000m		Gas at less than 1,000m
Remote and separated from potable water resources		Close proximity to potable water resources
Modest surface footprint as wells are drilled from pads with a single road and flow-line into multiple wells		Can be an expansive surface foot-print
Fewer wells required than for shallow coal seam gas		Associated with thousands of wells
Land access enabled with risks well managed		Land access enabled with risks well managed



Fracture fluids are sometimes needed (using a mix of water, sand and additives) to improve movement within the pipes, stop the growth of bacteria, clean the well and remove oxygen to prevent corrosion.



Operators monitor the containment of wells using high-tech monitoring tools during the fracture stimulation process and ongoing integrity testing.



Casing and cement are pressure tested for leak-tightness before wells are put to use.



Recognised industry best practice for facility integrity and safety must be adhered to in well design, construction, maintenance, and monitoring to minimise cross-flow from petroleum-bearing reservoirs including between the stimulated reservoir into water-bearing aquifers.

Is fracture stimulation safe?



There is *no evidence to date* that fracture stimulation in Australia has led to any serious environmental contamination or harm.



Since 1969, fracture stimulation in South Australia has been proved to be safe and without harm to social, natural or economic environments.

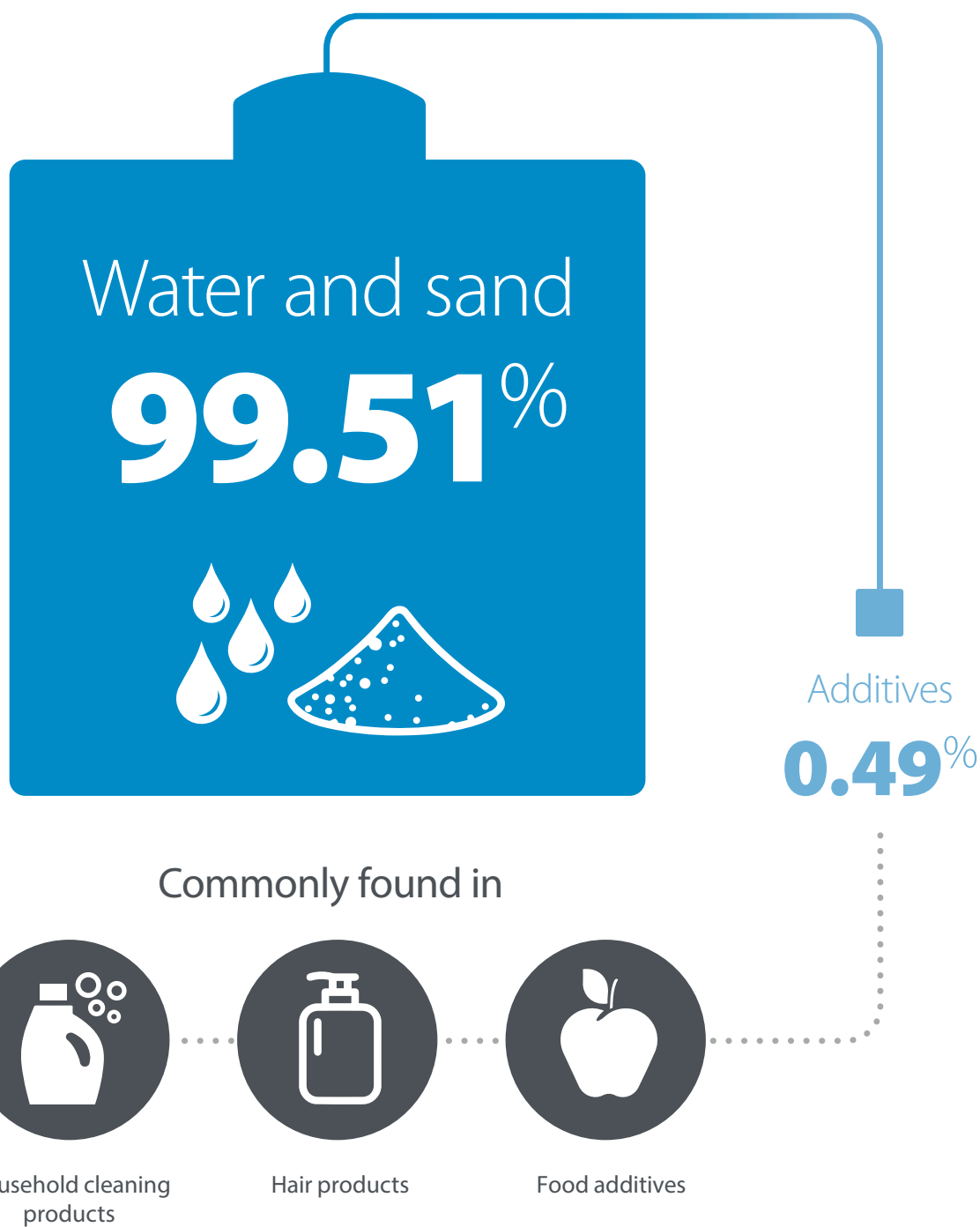


SA Parliamentary Inquiry found the specific process of hydraulic fracturing in deep shale, properly managed and regulated, is unlikely to pose significant risks to groundwater.



Most Australian jurisdictions including the Commonwealth have investigated onshore gas and hydraulic fracturing such as South Australia's Parliament's Natural Resources Committee.

What is in fracture fluids?





The State Government and the Commonwealth Scientific and Industrial Research Organisation (CSIRO), through the Gas Industry Social and Environment Research Alliance (GISERA), are partnering to undertake social and environmental research on the potential impacts and opportunities of onshore gas development on the environment and communities in the onshore Otway Basin in South Australia's South East.

<https://gisera.csiro.au/>



Government of South Australia
Department for Energy and Mining





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