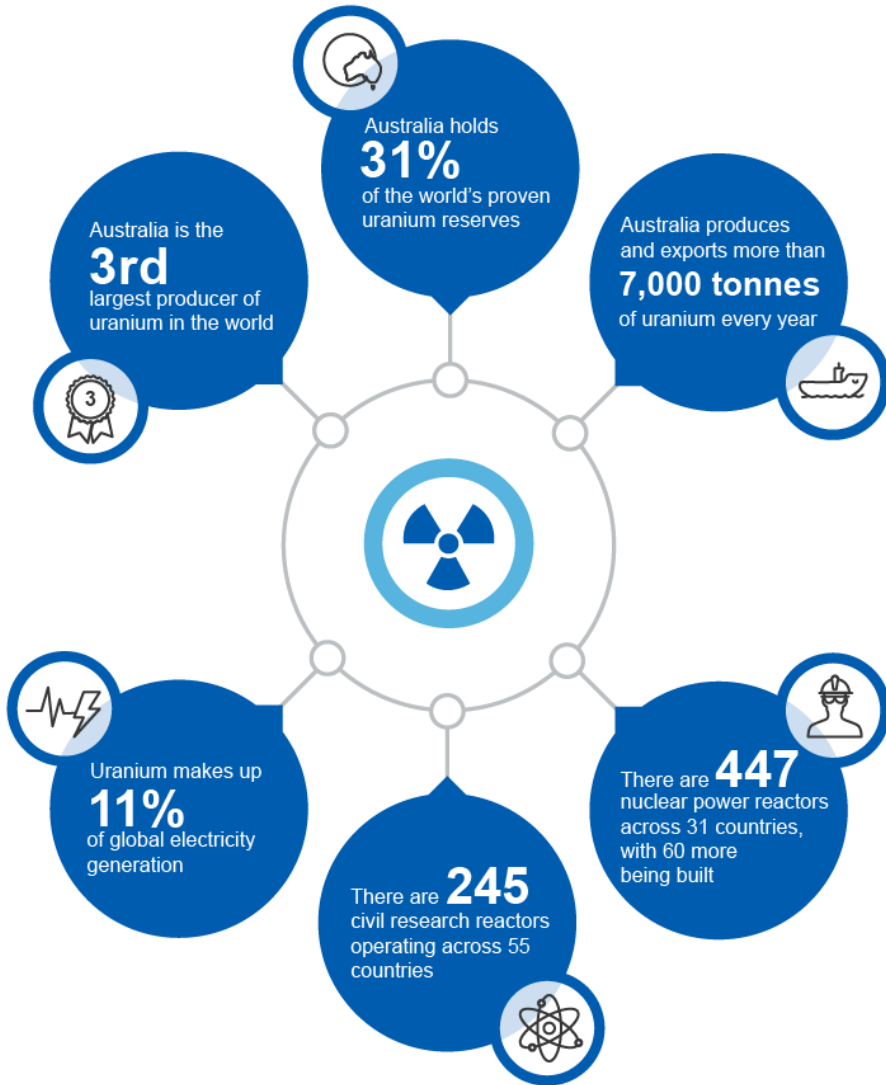


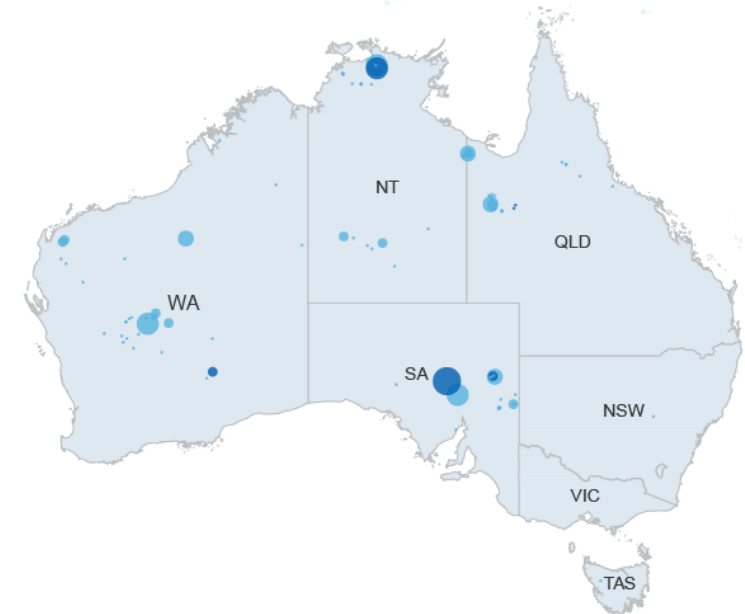
Uranium

Resources and Energy Quarterly June 2018

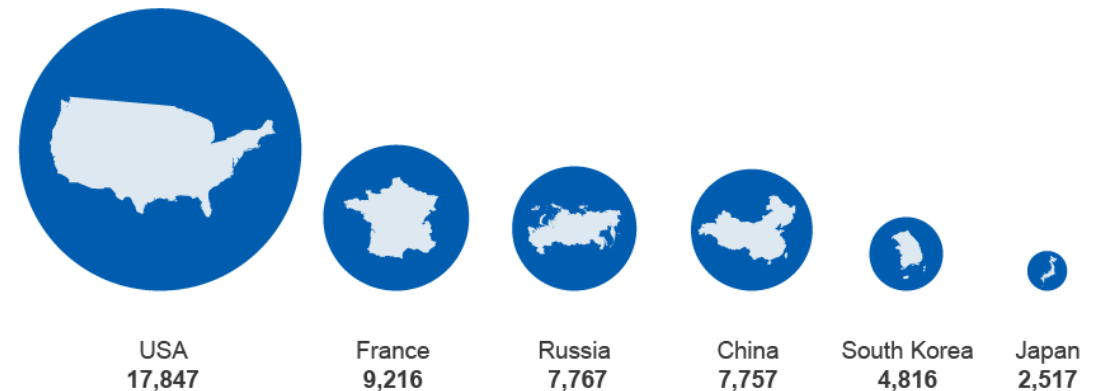


Major Australian uranium deposits (tonnes)

- <2,967
- 2,968–9,762
- 9,763–17,571
- 17,572–59,338
- >59,339
- Deposit
- Operating mine



Uranium required in 2017 (tonnes)



9.1 Summary

- Uranium spot prices have stabilised after years of declines, and are expected to start rising slowly over the outlook period, reaching US\$28 a pound by 2020.
- Australian production is expected to remain largely steady, at around 7,000 tonnes annually over the outlook period. However, some increase in output is expected at Olympic Dam following the completion of recent mine upgrades.
- Australia's uranium export earnings are forecast to increase slightly over the outlook period, reaching almost \$700 million by 2019–20. This is in line with slow growth in prices.

9.2 Prices

Prices have stabilised, and are forecast to gradually increase

Uranium spot prices appear to have stabilised following six years of decline. After bottoming out at US\$18 a pound in late 2017, prices have recovered to an average of US\$22.73 a pound in May. This levelling out comes amidst a belated slowing in inventory build and a narrowing of the supply surplus following a series of production cuts at large mines in Kazakhstan and Canada.

It is expected that prices will begin a very slow ascent from here, with supply and consumption of uranium edging closer to balance and inventories beginning to stabilise. Prices are projected to rise from US\$23.30 in 2018 to US\$26.20 in 2019 and US\$28.00 in 2020. At this level, uranium will remain a loss-making commodity for most producers, and prices are likely to adjust only slowly to changes in market conditions due to the scale of inventories accumulated over the last seven years.

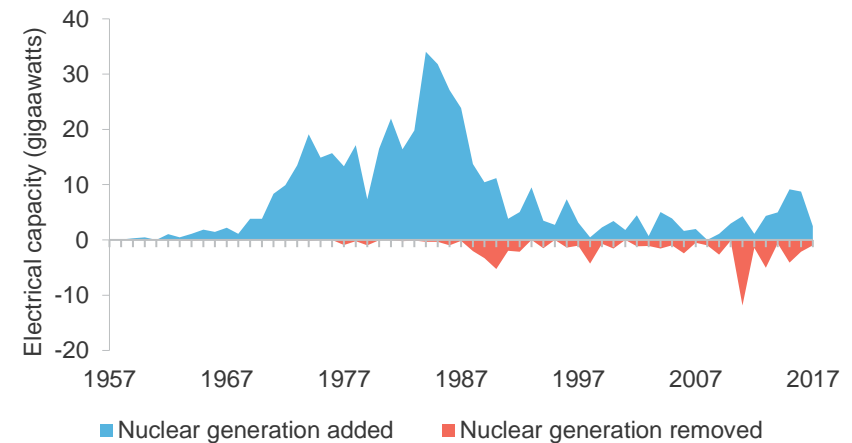
Importantly however, significant new nuclear energy capacity is now under construction around the world, and persistent low prices have led to sharp falls in the long-run development of uranium resources. This is likely to result in much greater upward price pressure over the longer term.

Figure 9.1: Uranium prices, monthly



Source: Cameco Corporation (2018) Uranium Spot Price; Ux Consulting (2018) Uranium Market Outlook

Figure 9.2: World nuclear power generation



Source: International Energy Agency (2018); World Nuclear Association (2018); DIIS estimates

9.3 World consumption

Nuclear power growth is moderate — but a new region is showing interest

Uranium use is projected to grow from 85,000 tonnes in 2018 to 94,300 tonnes by 2020. This will be driven in large part by China, which completed its Sanmen nuclear plant in the June quarter and has several other reactors within months of completion. Approvals for future plant constructions in China are also picking up following a slackening in 2017.

Demand is also rising in Japan, which re-connected unit 4 of its Ohi nuclear plant in May, and its Genkai 4 unit in June. South Korea, which currently has almost half of its nuclear fleet offline for maintenance, is expected to increase its demand in 2019. Russia has also completed its floating Akademik Lomonosov plant, which is capable of providing mobile power generation and desalination to virtually any coastal location.

New markets also appear to be emerging for nuclear power in the Middle East. Russia's State Atomic Energy Corporation has recently signed a contract to construct four 1200 MW reactors in Egypt. This follows an earlier announcement of four 1400 MW units to be constructed in the United Arab Emirates by South Korean companies. Turkey has announced plans to build a huge 4800 MW nuclear project. It is likely that 11,000 MW of new nuclear capacity will be constructed in the Middle East by 2030.

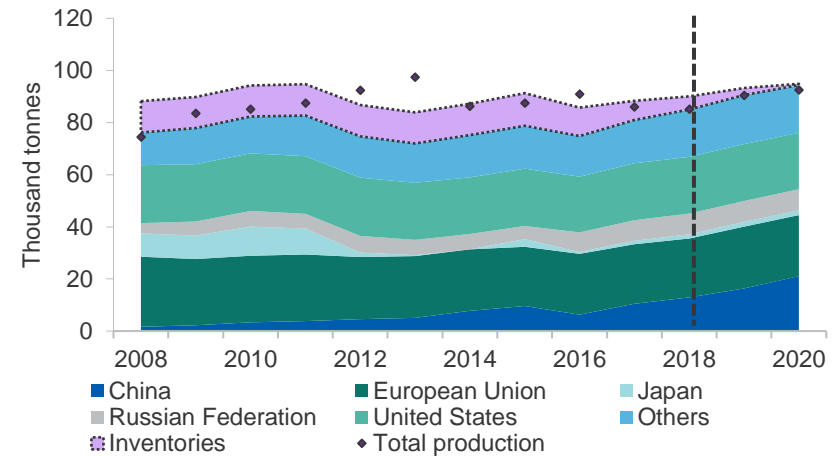
In the US, Terrestrial Energy USA and Energy Northwest have signed a memorandum of understanding on constructing the world's first Integral Molten Salt Reactor (IMSR). IMSRs use a liquid fuel mix which is incapable of melting down. The elimination of meltdown risk removes the need for the expensive reactor shields and cooling facilities used in traditional reactors. IMSRs could be commercialised by the 2020s.

9.4 World production

Mine output has contracted in response to excessive supply

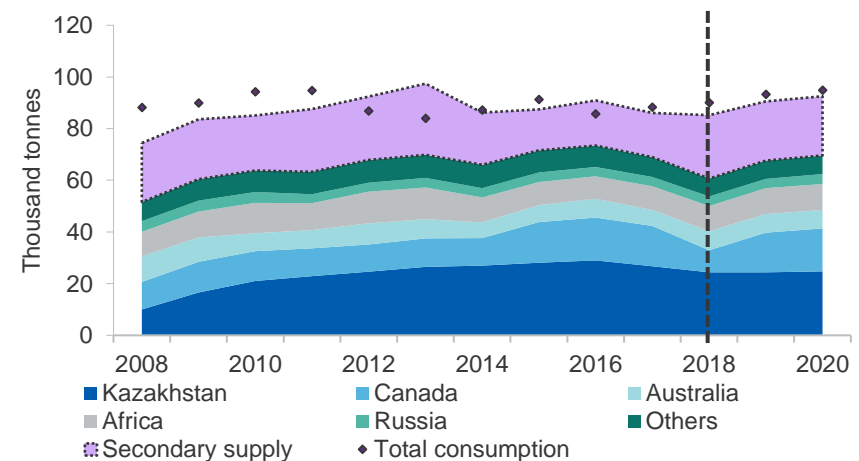
Mine production is expected to rebound slightly, following significant cuts in output from large mines in Canada, Niger, and Kazakhstan. These cuts reduced overall world production sharply to 60,600 tonnes in 2018.

Figure 9.3: World uranium consumption and inventory build



Source: International Energy Agency (2018); World Nuclear Association (2018); Ux Consulting (2018)

Figure 9.4: World uranium production and secondary supply



Source: Ux Consulting (2018) Uranium Market Outlook; World Nuclear Association (2018)

Some of these cuts are scheduled to wind back over the outlook period, leading to a rise in mine production to 69,700 tonnes by 2020. Supply is also expected to be supported by higher secondary output (which encompasses material entering the market from sources other than mines). This added secondary output includes higher inventory run-down by large utilities and sales from the United States Enrichment Corporation.

Although supply is likely to grow moderately over time, it is expected that overall output and demand will move much nearer to parity over the next two years. However, this is unlikely to produce any dramatic effect on prices given the scale of inventories accumulated since Fukushima.

A potential risk does exist with regard to long-term uranium supply. The sustained stretch of low uranium prices has led to significant reductions in the investment pipeline across many African countries and among traditional producers. This has greatly reduced the potential scale of future supply. Uranium markets have a tendency to adjust slowly to changes due to the quantity of safeguards and regulations applying at all steps of their supply chains. The current lack of investment in new supply could thus result in a sustained supply crunch in the future, which may take significant time to address. Nuclear technology has improved significantly in recent years, making it more attractive to countries seeking low-carbon, dispatchable energy.

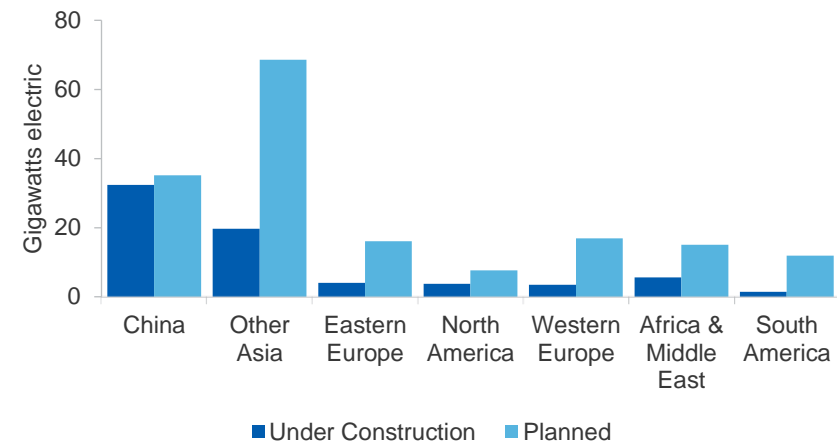
9.5 Australia

Australia's uranium exploration continues to fall away

Only \$1.9 million was spent on uranium exploration in the March quarter 2018: a drop from an already-low level of \$2.9 million spent in the December quarter. Uranium exploration is now largely confined to South Australia, tailing off in all other states.

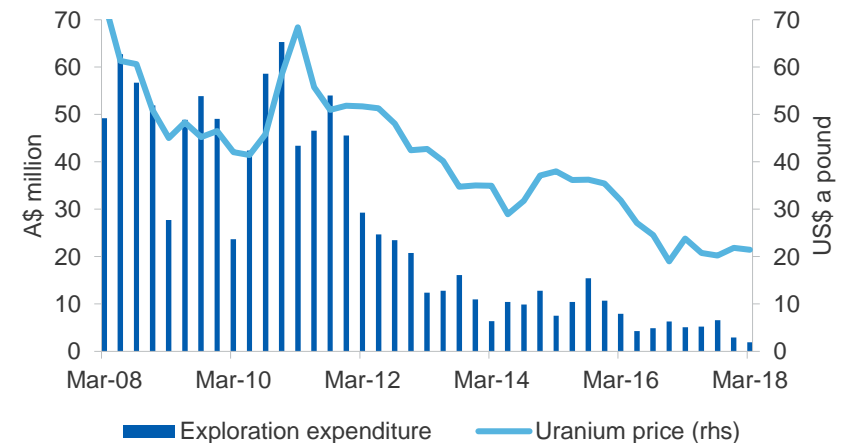
Considerable uranium deposits remained untapped across Western Australia and the Northern Territory, but any significant pickup in exploration activity will depend on a sustained rise in the uranium price.

Figure 9.5: New nuclear capacity



Source: International Energy Agency (2018); World Nuclear Association (2018); DIIS estimates

Figure 9.6: Australia's uranium exploration expenditure



Source: ABS (2018) Mineral and Petroleum Exploration, cat. No. 8412.0; Cameco Corporation (2018) Uranium Spot Price

Production is expected to remain largely steady over the next two years

Australian production is expected to lift from 6,631 tonnes in 2017–18 to 7,140 tonnes in 2018–19 and 7,240 tonnes in 2019–20. This reflects a return to normal production at Olympic Dam, which had reduced output in 2017 as a result of long-planned mine upgrades. Production at the mine has now returned to its pre-upgrade level, and is expected to rise further.

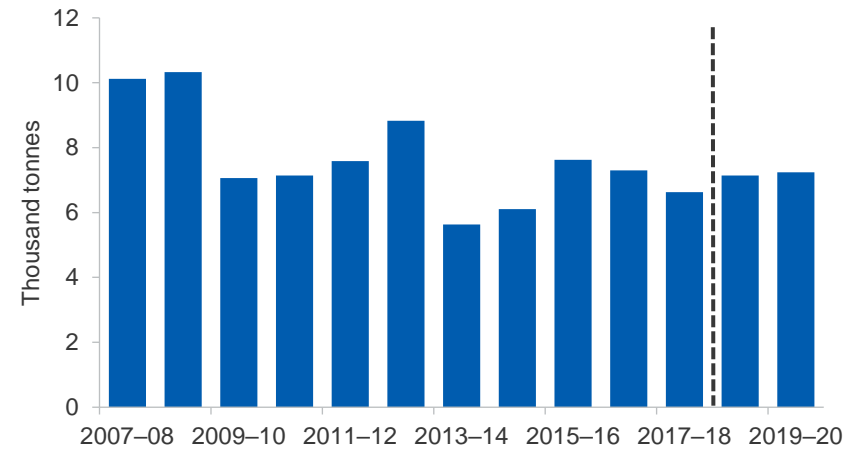
Low prices have otherwise created minimal incentive for new mines or upgrades, and none are expected over the outlook period. However, Vimy Resources Limited has recently released the first Mineral Resource estimate for its newly acquired Angularli deposit. This Northern Territory deposit is expected to hold around 26 million pounds of U3O8 at a cut-off grade of 0.15 per cent. At current price levels, the mine is not considered to be economical, but a higher price outlook will improve its potential considerably in the future.

Conditions for exporters remain difficult, but Australia is still well placed

Export values are expected to change minimally over the outlook, rising from \$642 million in 2017–18 to \$651 million in 2018–19 and \$693 million in 2019–20. In volume terms, exports are expected to edge back from 7,661 tonnes in 2017–18 to 7,240 tonnes by 2019–20. The export result for 2017–18 was inflated by the timing of shipments, and a small correction is thus expected. It is generally assumed that exports will stay in the same stable trajectory as production, as Australia exports virtually all mined output and has only negligible domestic use. Nuclear power generation in Australia is confined to a single 20MW reactor at Lucas Heights, which makes medical isotopes.

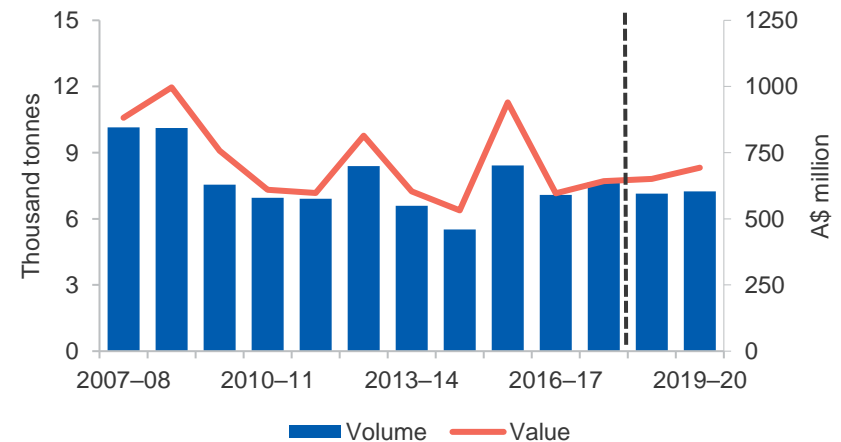
Exporters are expected to face tough conditions over the outlook period, due to weak prices and the expiration of some legacy contracts. However, conditions are expected to improve gradually as prices begin a slow rise from the historical lows of late 2017. Australia's largest uranium mine (Olympic Dam) is among the most efficient uranium operations in the world, making Australia relatively well placed to ride out difficult conditions.

Figure 9.7: Australia's uranium production



Source: BHP (2018); Operational Review, DIIS (2018); Energy Resources of Australia (2018); ASX Announcements — Operations Review; company media announcements (2018)

Figure 9.8: Australia's uranium exports



Source: Department of Industry, Innovation and Science (2018)

Table 9.1 Uranium outlook

World	Unit	2017	2018 ^s	2019 ^f	2020 ^f	Annual percentage change		
						2018 ^s	2019 ^f	2020 ^f
Production	kt	69.0	60.6	67.6	69.7	-12.2	11.5	3.0
Africa ^b	kt	9.1	9.8	10.0	10.0	7.6	1.6	0.5
Canada	kt	15.6	8.6	15.4	16.7	-44.8	78.9	8.0
Kazakhstan	kt	26.7	24.3	24.3	24.7	-8.8	0.0	1.5
Russia	kt	3.6	3.7	3.7	3.8	2.3	0.0	3.1
Consumption	kt	80.9	85.0	90.5	94.3	5.0	6.5	4.2
China	kt	10.4	12.9	16.3	21.1	24.0	26.3	29.1
European Union 28	kt	22.9	22.6	23.7	23.4	-1.5	4.9	-1.2
Japan	kt	1.3	1.6	1.9	1.9	25.0	18.8	0.0
Russia	kt	7.9	8.0	8.0	8.1	1.0	0.1	0.8
United States	kt	21.8	21.8	21.8	21.7	0.0	0.0	-0.7
Spot price	US\$/lb	21.7	23.2	26.2	28.0	7.3	12.9	6.9
real ^c	US\$/lb	22.2	23.2	25.7	26.9	4.8	10.5	4.9
Australia	Unit	2016–17	2017–18 ^s	2018–19 ^f	2019–20 ^f	2017–18 ^s	2018–19 ^f	2019–20 ^f
Mine production	t	7,295	6,631	7,140	7,240	-9.1	7.7	1.4
Export volume	t	7,081	7,661	7,140	7,240	8.2	-6.8	1.4
– nominal value	A\$m	596	642	651	693	7.7	1.5	6.4
– real value ^d	A\$m	608	642	636	662	5.6	-0.8	4.0
Average price	A\$/kg	84.2	83.8	91.2	95.8	-0.5	8.9	5.0
– real ^d	A\$/kg	85.8	83.8	89.1	91.4	-2.4	6.4	2.6

Notes: **b** Includes Niger, Namibia, South Africa, Malawi and Zambia; **c** In 2018 US dollars; **d** in 2017–18 Australian dollars; **f** forecast; **s** Estimate
Source: Australian Department of Industry, Innovation and Science (2018); Cameco Corporation (2018); Ux Consulting (2018) Uranium Market Outlook