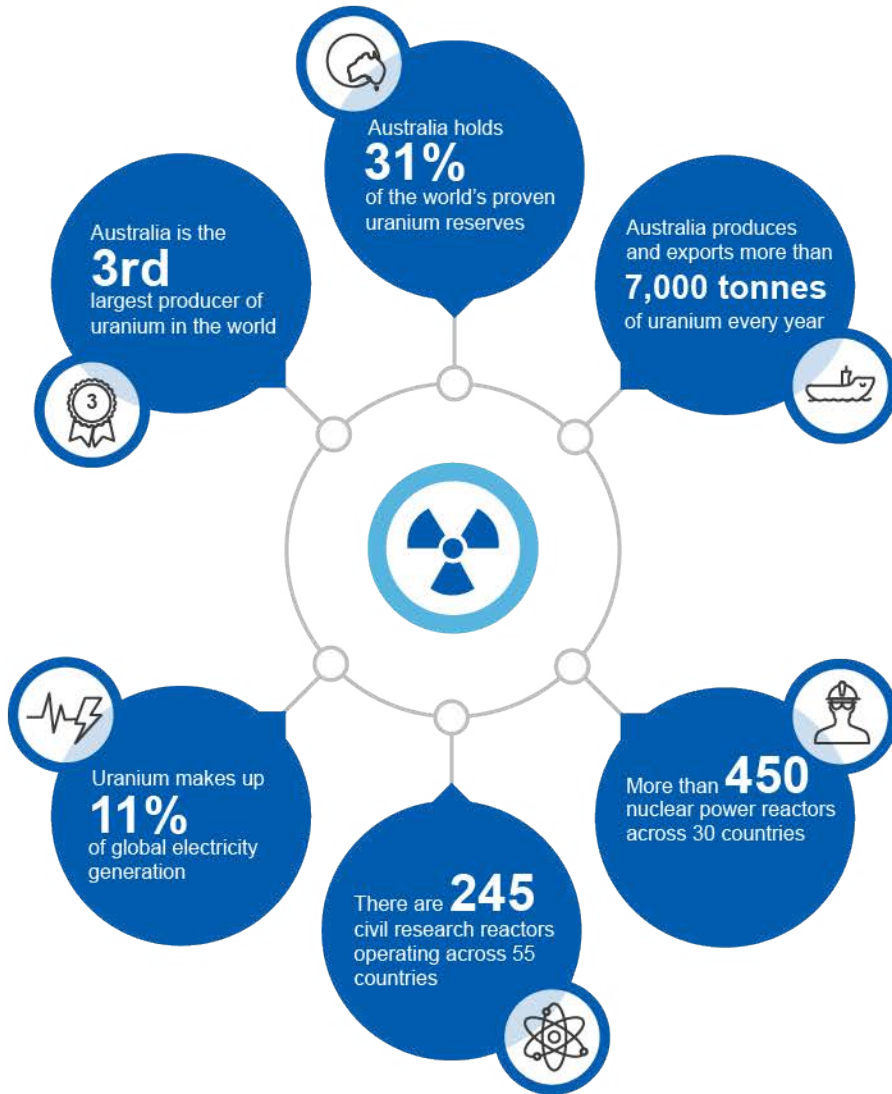


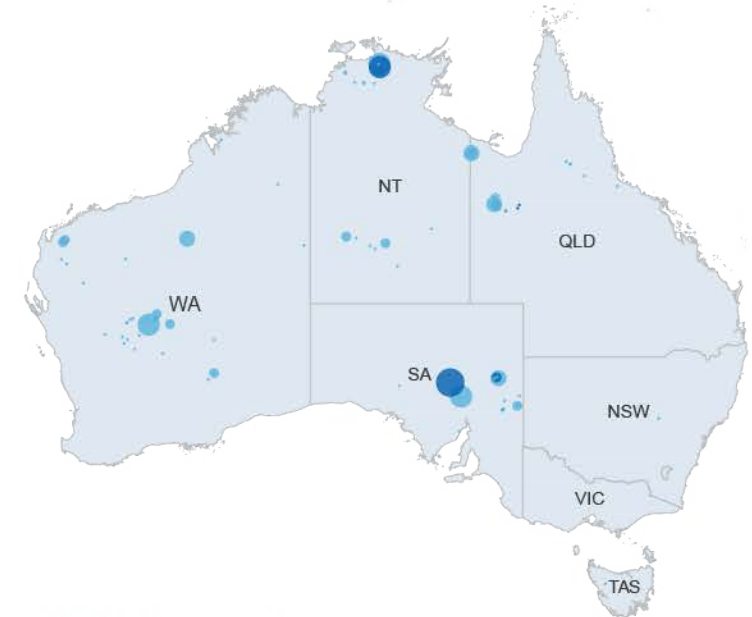
Uranium

Resources and Energy Quarterly June 2019

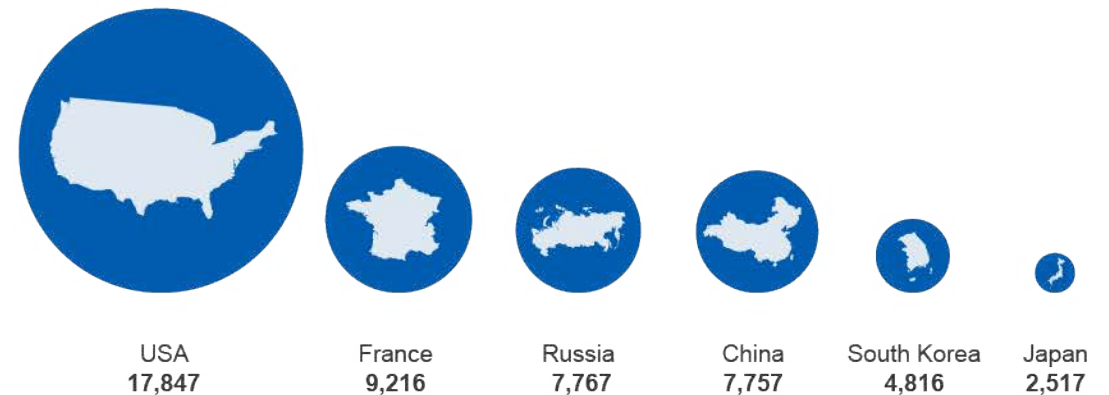


Major Australian uranium deposits (tonnes)

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



Key consumer markets (tonnes)



9.1 Summary

- Uranium spot prices have stabilised after substantial gains in late 2018. Prices remain low, but higher demand and flat or falling output is expected to push them up to above US\$37 a pound by 2021.
- Uranium production in Australia is expected to decline over the outlook period, as output winds down at the Ranger mine ahead of its scheduled closure at the start of 2021.
- Australia's uranium export earnings are expected to remain roughly steady over the outlook period, albeit with a fall in 2020 as output ceases from Ranger.

9.2 Prices

Uranium prices have stabilised, but with potential to rise further

Uranium prices have flattened out in recent months, after a strong rise in the second half of 2018. Prices bottomed out in 2017, and began to recover only after large cuts in output from producers in Kazakhstan and Canada. Kazatomprom — which dominates Kazakh output — cut production by 20 per cent, effectively reducing global supply by 8 per cent. Cameco shut down its large McArthur River mine entirely, reducing global production by a further 11 per cent.

Since these supply cuts took effect, prices have shifted to between US\$25 and US\$28 a pound. Kazatomprom has mooted further cuts in output in coming years. Supply constraints in conjunction with rising demand from new power plants in Asia and Eastern Europe should bring about a slow lift in prices (Figure 9.1), though large inventories are likely to moderate price pressures.

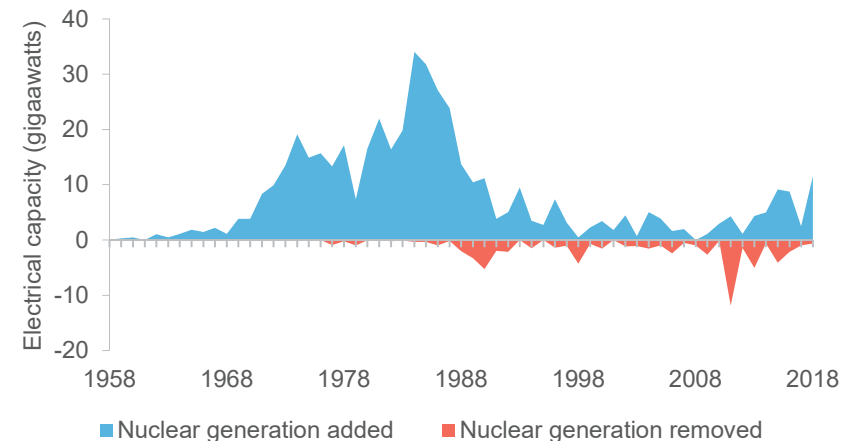
Price pressures may become much greater in the future. A number of mines, including several large projects in Africa, were postponed during the period of depressed prices. Rising demand (Figure 9.2) and a deferral of new supply could lead to a supply crunch by the mid-2020s. The longer-term outlook and history for uranium is examined in more detail in this edition's *uranium special topic*.

Figure 9.1: Uranium price outlook



Source: Cameco Corporation (2019) Uranium Spot Price; Ux Consulting (2019) Uranium Market Outlook

Figure 9.2: World nuclear power generation



Source: International Energy Agency (2019); World Nuclear Association (2019); Department of Industry, Innovation and Science (2019)

9.3 World consumption

Nuclear power growth continues across Asia

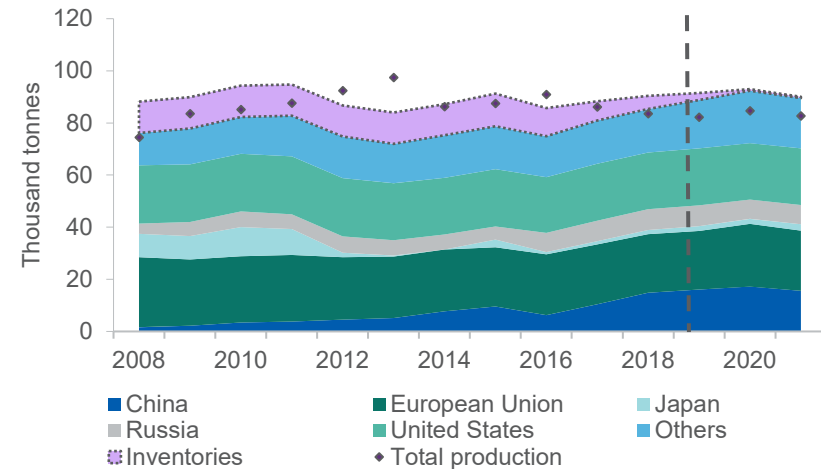
Chinese nuclear deployments have recently slowed significantly, with five reactors expected to be constructed in China in 2019 — around half the number connected in 2018. These include unit 5 of the Fuqing nuclear power plant, which began undergoing hydrostatic tests in April, bringing the unit into its commissioning phase 50 days ahead of schedule. Reactor construction processes in China have become increasingly efficient, with construction times for Fuqing 5, Hongyanhe 5 and Fangchenggang 3 all averaging around four years.

Construction milestones have also been reached in other countries. In South Korea, unit 4 of the Shin Kori power plant was grid-connected in late April 2019. Russia’s twin KLT-40 reactor system — the first floating reactor capable of connecting to external sources — passed final tests and is set to be granted an operating licence in July. The system contains twin reactors and will be capable of ocean travel, making it able to connect to power grids around the country.

The Russian government also granted final regulatory approval to unit 2 of the Novovoronezh II nuclear power plant in April, enabling it to start supplying electricity in May. The United Arab Emirates recently connected its first reactor, beginning a construction wave expected to produce 6GWh of nuclear power over 10 years. Finland recently granted its first licence for a new nuclear power plant since 1979. The reactor at Olkiluoto will be among the largest reactors ever built, supplying 1600 Megawatts electric, or around 15 per cent of the country’s total electricity supply.

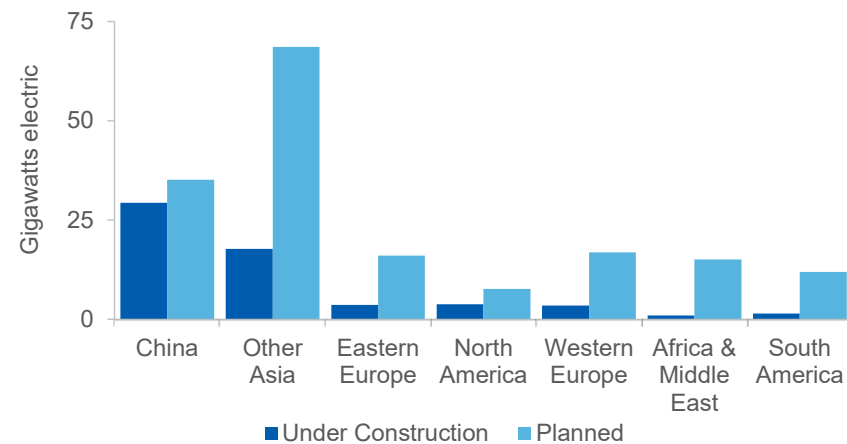
Other countries have begun to move towards commencement of nuclear constructions. Uzbekistan recently begun a site selection process for its first nuclear plant. In Egypt, the Nuclear Power Plants Authority has been granted approval to construct four units at its El Dabaa site. Brazil has released an energy plan which outlines goals out to 2050: the plan requires consideration of nuclear plants, including modular Generation IV reactor technology. The Brazilian government has also confirmed its commitment to progressing construction of the large Angra 3 project.

Figure 9.3: World uranium consumption and inventory build (U3O8)



Source: International Energy Agency (2019); World Nuclear Association (2019); Ux Consulting (2019)

Figure 9.4: New nuclear capacity



Source: International Energy Agency (2019); World Nuclear Association (2019); Department of Industry, Innovation and Science (2019)

Development of small modular reactors passed a milestone in April, with the first licence application for a small modular reactor submitted to the Canadian Nuclear Safety Commission. The application was lodged by Global First Power and includes a proposal for a reactor construction plant in Ontario. This plant would be capable of producing pre-assembled reactors on a production line for shipment around the world.

The US Senate has sought to support this technology through its recently introduced Nuclear Energy Leadership Act. This would authorise long-term power purchase agreements for nuclear energy, and establishes a pilot program to enable them. It also sets goals and a strategic plan for advanced reactor research and development, provides for additional nuclear research in universities, and updates regulations to better support emerging technology. The progression of this technology creates significant long-term potential for further growth in uranium demand.

Other countries have revisited earlier plans to reduce nuclear generation in their grids. A draft bill presented to the French Council of Ministers seeks to delay France's scale-down of nuclear power. France previously proposed a reduction of nuclear power from 50 per cent of electricity generation to 35 per cent by 2025: the new bill would defer this goal to 2035. The phase-out of nuclear power would have required the injection of significant Russian gas into the French power grid, reducing French energy independence and adding significantly to carbon emissions. The new bill would change the current carbon pathway — for a 75 per cent cut in greenhouse gas emissions from 1990 levels by 2050 — to one which leaves France fully carbon neutral by 2050.

Japan re-opened five reactors in 2018 (Genkai 3 and 4, Ohi 3 and 4, and Ikata 3), bringing its total operating units to nine. However, nuclear power in Japan continues to face challenges, with Japan's nuclear regulation authority recently announcing that operations would be halted at reactors which miss deadlines on installing new counterterrorism measures. At the time of writing at least five reactors are lagging in their schedules.

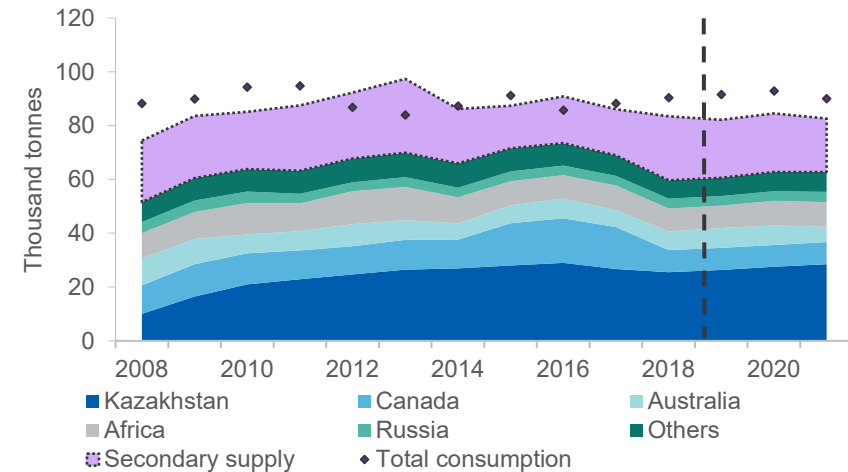
Overall reactor requirements are expected to grow steadily over time (Figure 9.3), rising from 85,300 tonnes in 2018 to 89,500 tonnes by 2021.

9.4 World production

Conditions for uranium producers are belatedly improving

Uranium production continues to face constraints (Figure 9.5). Kazatomprom — the world's largest uranium supplier — is expected to continue progressing its plan to reduce output by 20 per cent by 2020.

Figure 9.5: World uranium production and secondary supply (U3O8)



Source: Ux Consulting (2019) Uranium Market Outlook; World Nuclear Association (2019)

Uranium production in the US fell by more than 80 per cent between the last quarter of 2018 and the first quarter of 2019 — among the sharpest cuts on record. However, some prospects are emerging for a recovery in US output, with Energy Fuels' two Utah mines being refurbished and prepared for commercial production. Further progress will likely depend on the company's success in negotiating uranium sales contacts.

Uranium output from Iran is rising in the wake of the cancellation of the Iran nuclear deal, which previously restricted uranium production in the country.

In aggregate, global mine production is expected to edge up from 59,700 tonnes of U3O8 in 2018, to 62,700 tonnes by 2021.

9.5 Australia

Low prices have sharply reduced uranium exploration

Only \$2.3 million was invested in uranium exploration in Australia in the March quarter. This is down from \$3.6 million in the December quarter. Over the year to date, \$11 million has been spent: virtually unchanged from the same period a year ago, but well below the 10-year average.

The closure of Ranger will drive a decline in production by 2021

The Ranger uranium mine, operated by Energy Resources Australia, remains on schedule to close in January 2021, as required by its lease conditions. Closure of this mine will reduce Australian output significantly.

Cameco Australia's Yeelirrie uranium mine in Western Australia was granted environmental approval in April by the Commonwealth Department of Environment and Energy. This follows a provisional approval from the Western Australian state government; at the time of writing final approval from the state government remains pending.

The Yeelirrie mine sits on one of Australia's biggest uranium deposits, and would be capable of producing around 3,850 tonnes of U₃O₈ each year for around fifteen years. The mine will be 9 kilometres long, 1.5 kilometres wide and 10 metres deep. Approval follows a two-year environmental assessment process, with the company required to take measures to reduce potential impact on stygofauna (creatures which dwell in groundwater) unique to the site. The mine will take around five years to start producing, and the company has advised that any commencement to the next stage would depend on 'market conditions'.

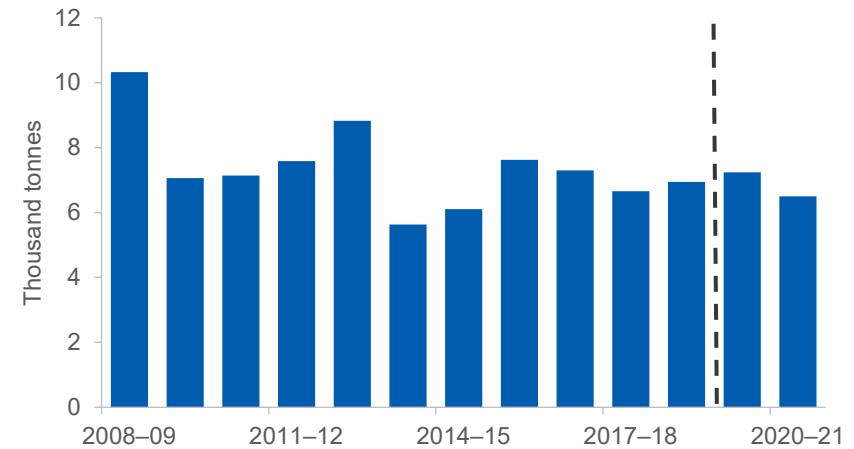
Conditions for exporters remain difficult, but price growth should help

Following the trajectory of production, export volumes are expected to decline from 2019–20. Price growth is expected to slightly offset this fall over the outlook period (Figures 9.6 and 9.7).

Revisions to the outlook

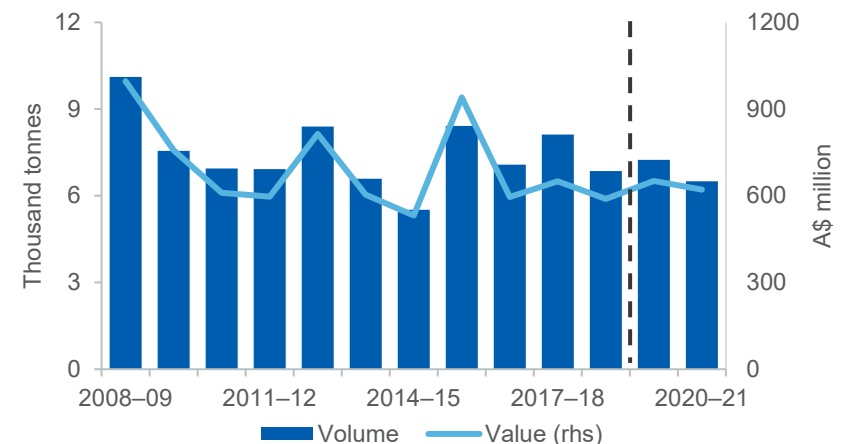
Australia's forecast uranium export earnings for 2018–19 and 2019–20 remain largely unchanged from the previous forecast.

Figure 9.6: Australia's uranium production



Source: BHP (2018); Operational Review, Department of Industry, Innovation and Science (2019); Energy Resources of Australia (2018); ASX Announcements — Operations Review; company media announcements (2019)

Figure 9.7: Australia's uranium exports



Source: Department of Industry, Innovation and Science (2019)

Table 9.1 Uranium outlook

World	Unit	2018	2019 ^f	2020 ^f	2021 ^f	Annual percentage change		
						2019 ^f	2020 ^f	2021 ^f
Production	kt	59.7	60.6	62.8	62.7	1.6	3.6	-0.1
Africa ^b	kt	8.6	8.3	9.1	9.1	-3.2	9.5	0.0
Canada	kt	8.2	8.2	8.2	8.2	-0.8	0.0	0.0
Kazakhstan	kt	25.5	26.4	27.5	28.5	3.7	4.3	3.6
Russia	kt	3.7	3.7	3.7	3.8	0.0	0.0	3.1
Consumption	kt	85.3	88.8	92.4	89.5	4.1	4.0	-3.1
China	kt	14.8	16.1	17.2	15.6	8.5	7.1	-9.6
European Union 28	kt	22.5	22.5	24.1	23.1	0.0	7.2	-3.9
Japan	kt	1.6	1.9	1.9	2.4	18.8	0.0	26.0
Russia	kt	8.0	8.0	7.4	7.4	-0.3	-6.7	-0.4
United States	kt	21.8	21.8	21.7	21.8	0.0	-0.7	0.6
Spot price	US\$/lb	24.1	27.5	33.8	37.5	13.8	23.1	11.1
real ^c	US\$/lb	24.7	27.5	33.0	35.9	11.3	20.3	8.7
Australia	Unit	2017–18	2018–19 ^s	2019–20 ^f	2020–21 ^f	2018–19 ^s	2019–20 ^f	2020–21 ^f
Mine production	t	6,654	6,943	7,240	6,500	4.3	4.3	-10.2
Export volume	t	8,118	6,857	7,240	6,500	-15.5	5.6	-10.2
– nominal value	A\$m	650	589	651	621	-9.4	10.6	-4.6
– real value ^d	A\$m	663	589	636	592	-11.2	8.0	-6.9
Average price	A\$/kg	80.0	85.9	89.9	95.6	7.3	4.7	6.3
– real ^d	A\$/kg	81.6	85.9	87.8	91.1	5.2	2.3	3.7

Notes: **b** Includes Niger, Namibia, South Africa, Malawi and Zambia; **c** In 2019 US dollars; **d** in 2018–19 Australian dollars; **f** forecast; **s** estimate.

Source: Australian Department of Industry, Innovation and Science (2019); Cameco Corporation (2019); Ux Consulting (2019) Uranium Market Outlook