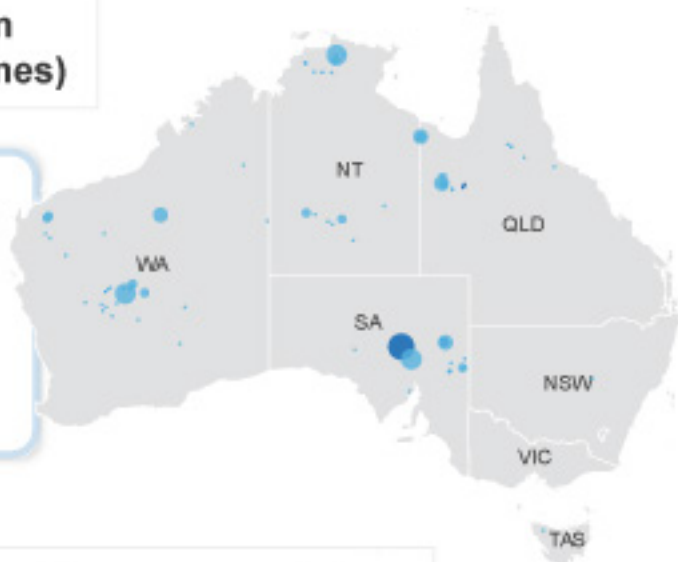
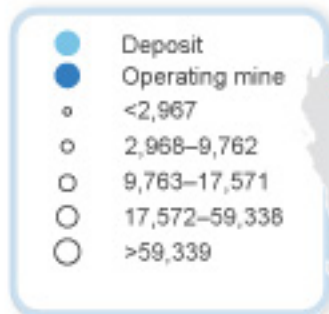


Uranium

Major uranium deposits (tonnes)



Uranium facts



Originally formed in supernovae more than **6 billion years ago**



Nuclear plants can supply electricity to **4-5 million people**



Nuclear has among the **lowest death and accident rates** of any power source

Consumer markets



27%
EU



26%
USA



21%
Others



15%
China



9%
Russia



2%
Japan

Australia's Uranium



Ranked no 1
for uranium
resources



3rd largest
uranium producer
in the world



Exports
worth more
than **\$400m**

9.1 Summary

- Uranium prices are forecast to lift from US\$36.50 a pound in 2021 to US\$47 a pound by 2027 (in real terms). A long period of low prices resulted in many uranium projects being deferred or cancelled, leading to potential uranium shortfalls during the outlook period.
- Australian production is forecast to decline from 2021, as the number of active uranium mines falls from three to two.
- Price growth is expected to see uranium export values increase from \$500 million in 2021–22 to \$729 million by 2026–27 (in real terms).

9.2 World consumption

More countries are showing interest in nuclear reactors

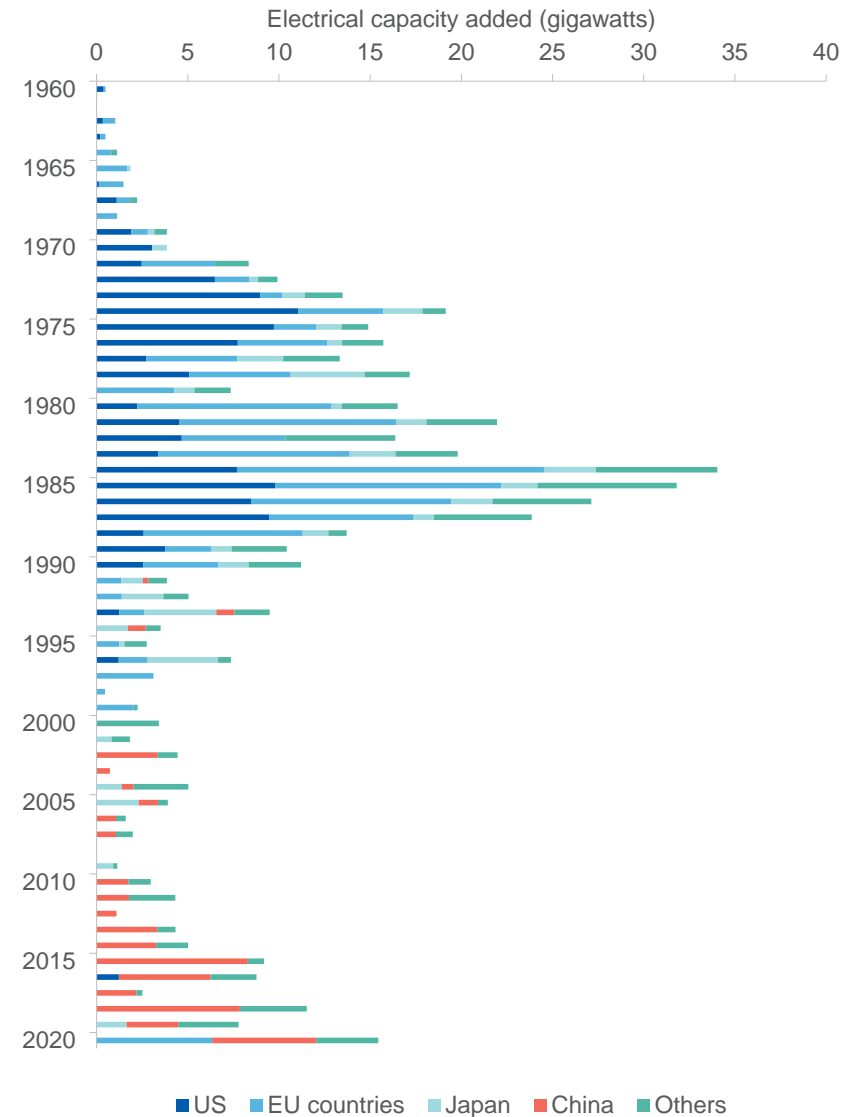
Nuclear power development is being taken up by a broader array of countries (Figure 9.1 and 9.2), with several building nuclear power for the first time, or pivoting back to it.

Among the latter countries is France, where the Government has announced that six new nuclear reactors will be constructed, with a further eight under consideration. The French Government has also announced that it will seek to progress development of small modular reactor technology for domestic use. France generates the bulk of its electricity from nuclear power, but had slowed construction in recent years.

Uptake is also growing in other parts of Europe. A small modular reactor has been scheduled for deployment in Poland from 2029, with NuScale Power and Polish company KGHM signing a work agreement. In Belarus, fuel loading has begun at the Ostrovets plant's second reactor. Finland's Olkiluoto unit 3 has started supplying electricity to the national grid, with the plant expected to produce around 14% of Finland's electricity needs.

The Slovenian Government has announced that it will close all coal-fired power plants by 2033, and will construct a nuclear plant at Krško as a replacement. Seeking to build on current momentum for coal replacement, Bryden Wood – a UK company – has announced that it is developing a new digital platform intended to enable easier replacement of coal-fired boilers with modular nuclear reactors.

Figure 9.1: Growth in world nuclear power generation



Source: International Energy Agency (2021); World Nuclear Association (2021); Department of Industry, Science, Energy and Resources (2021)

China continues to progress with numerous reactors. Unit 6 of the Fuqing nuclear plant entered commercial operation in early 2022, following a similar connection of Fuqing 5 in 2021. Concrete has been poured at unit 2 of the San'ao nuclear power plant. The first of six units at the Taipingling nuclear power plant passed a key milestone, with installation completed on the safety dome.

Several reactors reached scheduled closure in late 2021. Russia's Kursk 1 reactor shut down after 45 years of use. Reactor 4 of Scotland's Hunterston B nuclear plant closed at the end of 2021. In Germany, the Brokdorf, Grohnde and Gundremmingen C reactors all closed, in line with the country's nuclear phase-out policy. The last three active German reactors are scheduled to close by the end of 2022, but this could be reconsidered in the wake of the Russian invasion of Ukraine and a growing push to avoid heightened dependency on imported Russian gas.

Reactor connections are expected to largely offset closures over the outlook period. On balance, uranium consumption is expected to remain largely steady at around 90,000 tonnes annually, with growth picking up from the late 2020s.

9.3 World production

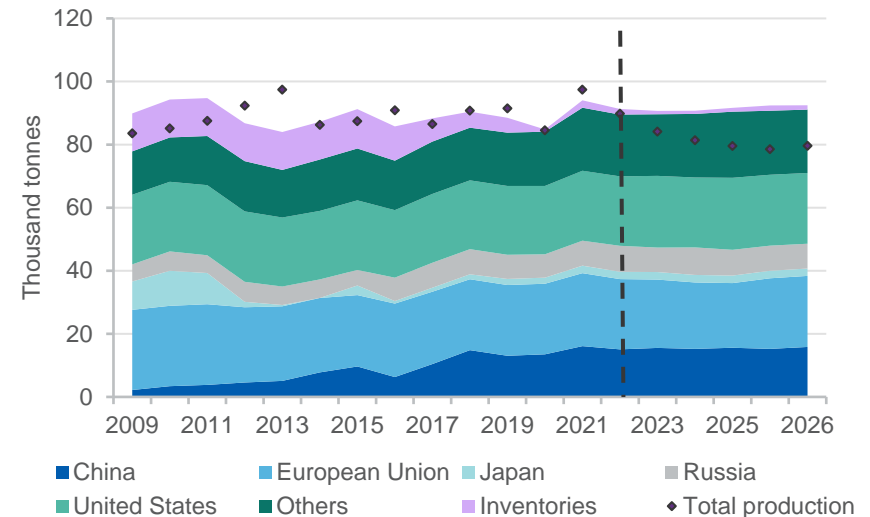
Large suppliers are shifting back to full production

In Canada, Cameco has announced that production will re-commence at its McArthur River mine, which has been idle for more than three years. The mine is one of the world's largest, but the company has announced that supply will be kept constrained for the time being.

Prospects for use of the extensive Khokhlovskoye uranium deposit in Russia have picked up, following a decision by the Russian Government to classify the area as 'industrial land'.

Ukraine's Government has announced a program to make Ukraine fully self-sufficient in uranium by 2027. This program will aim to expand domestic uranium mining to support nuclear energy, which provides more than half of Ukraine's electricity generation. However, major uncertainties remain on the program's progress following Russia's invasion of Ukraine.

Figure 9.2: World uranium consumption and inventory build (U3O8)



Source: International Energy Agency (2022); World Nuclear Association (2022); Ux Consulting (2022)

9.4 Prices

Prices are expected to rise steadily, and potentially rapidly

Uranium prices have lifted in recent months, supported by greater investor interest in the uranium spot market. Kazakhstan, which is the world's largest supplier of uranium, also faced significant public protests in early 2022, and the possibility of further protests presents a possible supply and price risk.

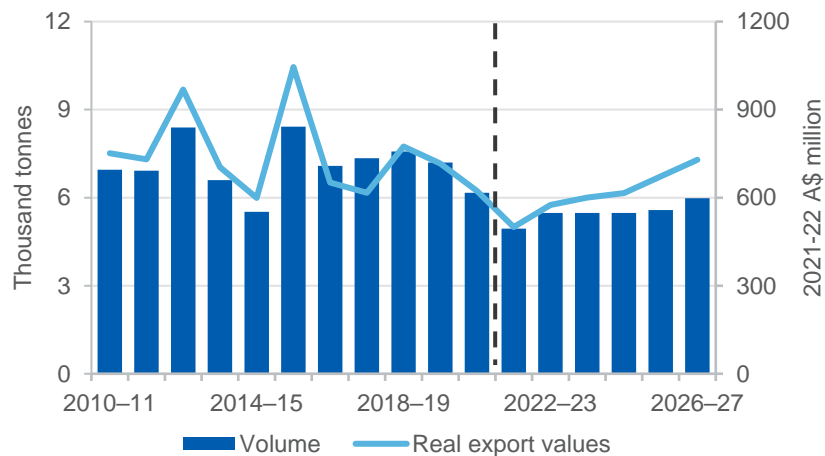
Price gains are also expected to be driven by long-term factors (Figure 9.3). After years of deferrals of uranium projects, there is a growing prospect that supply shortfalls could emerge as existing mines gradually deplete during the second half of the outlook period. Uranium mines typically take a long time to obtain approvals, potentially drawing out supply shortages over the longer term and creating a baseline for structurally higher prices in the late 2020s. The shortfall could lead to prices spiking significantly above forecast levels, though global reserves remain high among most major importers.

Figure 9.3: Uranium price outlook



Source: Cameco Corporation (2022) Uranium Spot Price; Ux Consulting (2022) Uranium Market Outlook

Figure 9.4: Australia's uranium exports



Source: Department of Industry, Science, Energy and Resources (2022)

9.5 Australia

Production and exports are set to decline in the short term

Production at Olympic Dam fell in the December 2021 quarter, due to disruptions caused by maintenance. This maintenance was completed in January 2022, and solid production is expected through the rest of the year.

Prospects for additional output in Australia over the longer term are mixed. Of the four potential mines granted permits in Western Australia, three have now seen their permits lapse, due to a failure to pass key milestones for 'substantial commencement' of the projects. The remaining deposit — Vimy's Mulga Rock — has achieved sufficient progress to continue, with Vimy forecasting production from 2025. Cameco has announced that it remains committed to its proposed mine in Yeelirrie, and has requested an extension to Western Australia Government approval processes.

Re-opening of the Honeymoon mine in South Australia also remains in prospect, though mine owners are currently building inventory from spot markets in lieu of opening up new deposits.

Overall mining exploration fell to \$3 million in the December quarter 2021, continuing a trend of low exploration spending in recent years. Growth in uranium exploration is expected if uranium prices continue to rise.

Uranium export earnings are expected to grow from \$500 million in 2021-22 to \$729 million in 2026-27 (in real terms). Higher prices are expected to build on output growth (including from the Mulga Rock deposit) towards the end of the outlook period (Figure 9.4).

Revisions to the outlook

Export earnings forecasts for 2021–22 and 2022–23 have been revised up by around \$50 million (nominal terms) in line with a stronger price forecast. The export earnings forecast for 2025–26 is unchanged from the March 2021 *Resources and Energy Quarterly*.

Table 9.1 Uranium outlook

World	Unit	2021	2022 ^f	2023 ^f	2024 ^z	2025 ^z	2026 ^z	2027 ^z	CAGR ^r
Production	kt	55.0	59.3	61.2	63.5	63.9	65.2	66.9	3.3
Africa ^b	kt	9.1	8.9	10.0	10.5	10.1	9.4	9.0	0.0
Canada	kt	5.4	8.2	8.6	8.6	8.6	10.5	11.4	13.2
Kazakhstan	kt	26.6	26.6	26.6	28.3	28.6	28.3	29.4	1.7
Russia	kt	3.3	3.3	3.7	3.9	4.1	4.2	4.2	4.1
Consumption	kt	91.7	89.5	89.6	89.7	90.4	90.8	91.1	-0.1
China	kt	16.1	15.1	15.5	15.2	15.6	15.2	15.8	-0.3
European Union 28	kt	23.1	22.3	21.7	21.1	20.5	22.4	22.5	-0.4
Japan	kt	2.4	2.4	2.4	2.4	2.4	2.4	2.4	0.0
Russia	kt	7.9	8.2	7.8	8.7	8.1	8.0	7.8	-0.2
United States	kt	22.2	22.0	22.7	22.2	22.8	22.5	22.5	0.2
Spot price	US\$/lb	35.3	43.5	44.7	45.6	48.8	52.2	52.9	7.0
real ^c	US\$/lb	36.5	43.5	43.5	43.3	45.2	47.3	46.7	4.2
Australia	Unit	2020–21	2021–22 ^f	2022–23 ^f	2023–24 ^z	2024–25 ^z	2025–26 ^z	2026–27 ^z	CAGR ^r
Mine production	t	6,213	4,258	5,480	5,480	5,480	5,580	5,980	-0.6
Export volume	t	6,166	4,944	5,480	5,480	5,480	5,580	5,980	-0.5
– nominal value	A\$m	606	500	588	627	659	737	818	5.8
– real value ^d	A\$m	622	500	575	600	615	672	729	3.4
Average price	A\$/kg	94.4	101.1	107.3	114.5	120.2	132.1	136.9	6.4
– real ^d	A\$/kg	96.9	101.1	105.0	109.5	112.3	120.5	121.9	3.9

Notes: **b** Includes Niger, Namibia, South Africa, Malawi and Zambia; **c** In 2022 US dollars; **d** in 2021–22 Australian dollars; **s** estimate; **f** forecast; **r** Compound annual growth rate; **z** Projection
Source: Department of Industry, Science, Energy and Resources (2022); Cameco Corporation (2022); Ux Consulting (2022) Uranium Market Outlook