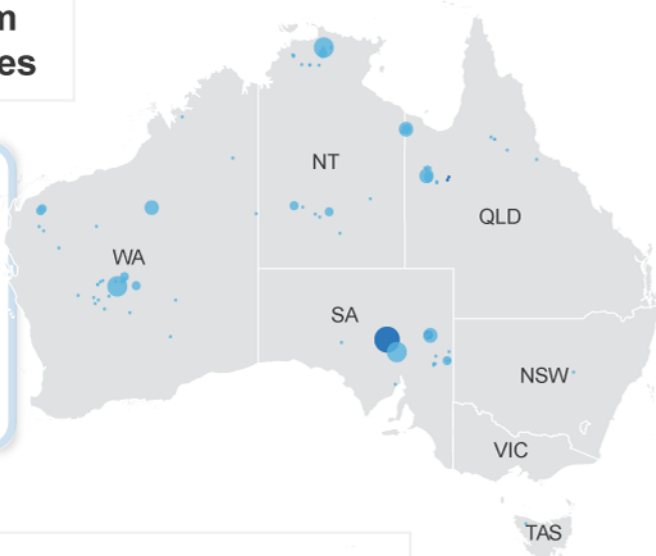
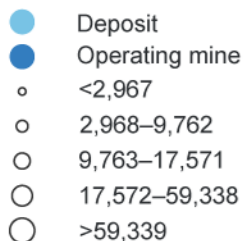
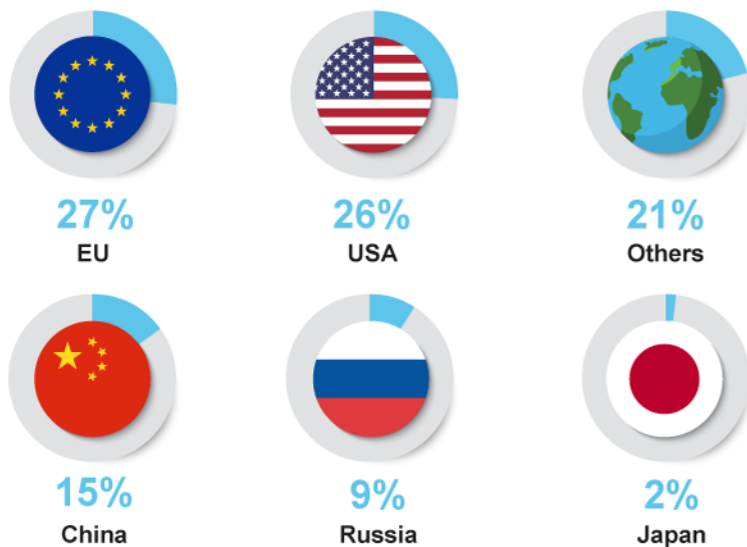


Uranium

Major uranium deposits, tonnes



Consumer markets



Uranium facts



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



Nuclear plants can supply electricity to **4-5 million people on only 2km² land**

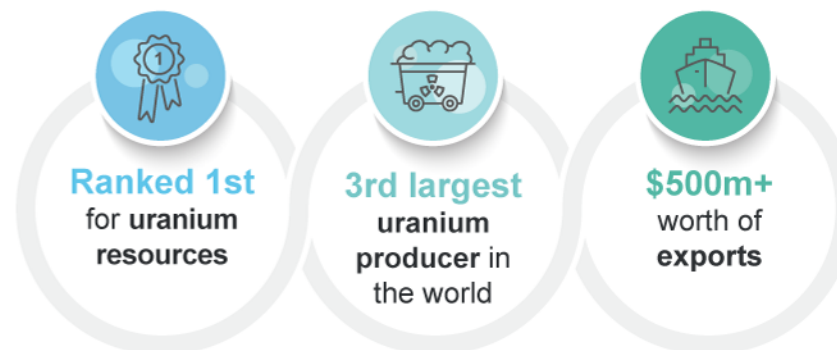


Uranium powers around **450 nuclear plants**, with **50 more under construction**



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

Australia's Uranium



9.1 Summary

- Uranium prices are forecast to lift from US\$53 a pound in 2022 to US\$61 a pound by 2024. Uranium shortfalls are becoming a prospect, following years of low prices and underinvestment.
- Australian exports are forecast to decline to 4,700 tonnes in 2021–22, following the closure of the Ranger mine. This is expected to rise to around 5,500 tonnes by 2023–24 (see [Australia section](#)).
- Price growth is expected to increase uranium export values from \$511 million in 2021–22 to \$815 million by 2023–24.

9.2 World consumption

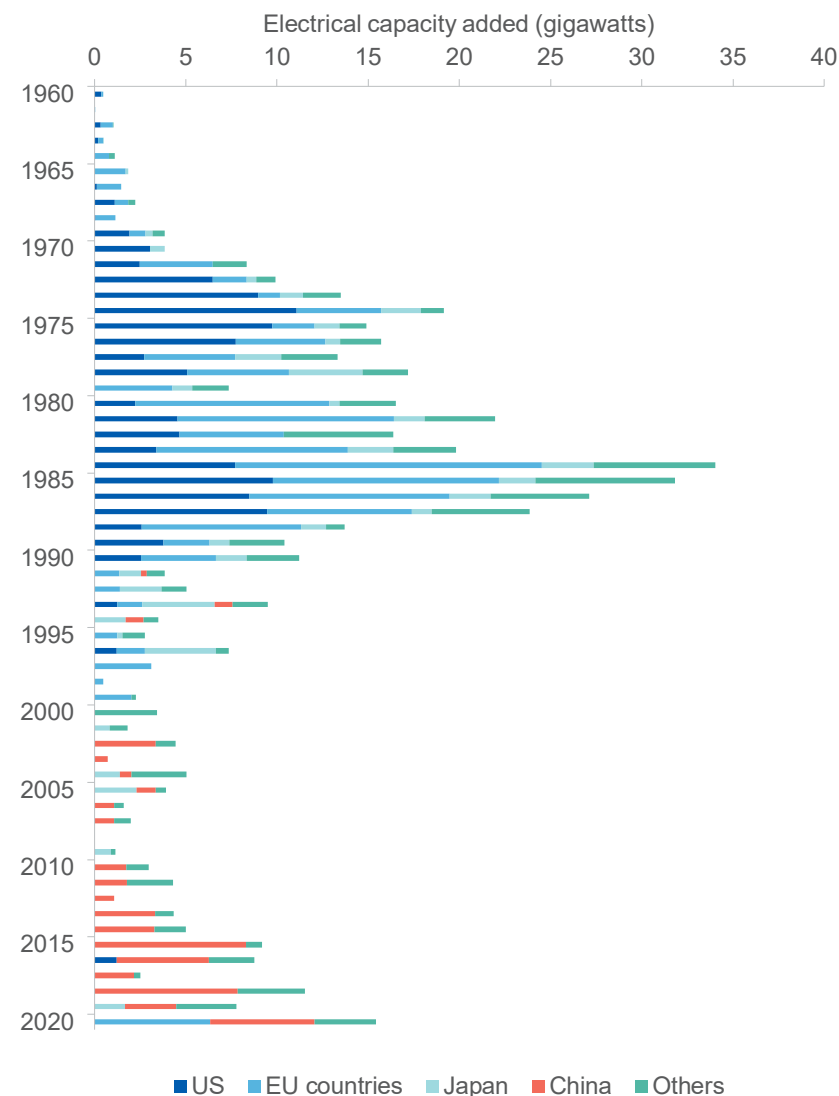
Market conditions have shifted as supply becomes tighter

Uranium markets are entering a new phase. Uranium prices have been relatively low since 2011, when radioactive material leaked from Japan's Fukushima plant. The Japanese nuclear industry was closed down after the incident, and other countries (notably Germany) followed with proposals to delay or withdraw from nuclear power. This contributed to a lull in nuclear development after 2011 (Figure 9.1). As prices fell and inventories built, mine projects were cancelled or placed in hiatus.

However, the market has recently shifted, with demand increasing rapidly relative to supply. Japan has restarted nine of its reactors, with a tenth (unit 2 at Chugoku Electric Power Company's Shimane nuclear power plant) now also approved for imminent restart. Other countries have accelerated their investment in nuclear power. Uranium inventories have declined, and paused mining projects in Africa, Australia and Kazakhstan are being revisited. Price rises that previously appeared tentative now appear to be solid. The twin demands of lower carbon emissions and reduced dependency on Russian gas may support further nuclear take-up.

The Russian invasion of Ukraine threatens to push up prices further. Russia supplies almost 15% of global uranium concentrates in addition to its enrichment facilities, and its exports have potential to be disrupted by sanctions and by cancellations of cargo insurance. A substantial supply effect is not yet evident, but the added risk may be pushing prices up.

Figure 9.1: Growth in world nuclear power generation



Source: International Energy Agency (2022); World Nuclear Association (2022); Department of Industry, Science and Resources (2022)

Uranium miners retain some unused capacity, which could be brought into markets relatively easily. However, it is not yet clear that this will be sufficient to meet demand over the next few years. Falling inventories have made uranium markets more vulnerable to supply shocks. Lack of investment over the past 10 years has affected all stages of the supply chain, from extraction to shipping, conversion, and enrichment. A larger share of the spot market is now being acquired by speculators, adding to potential price pressures faced by power plants. Demand is expected to continue to outstrip supply over the outlook period (Figure 9.2).

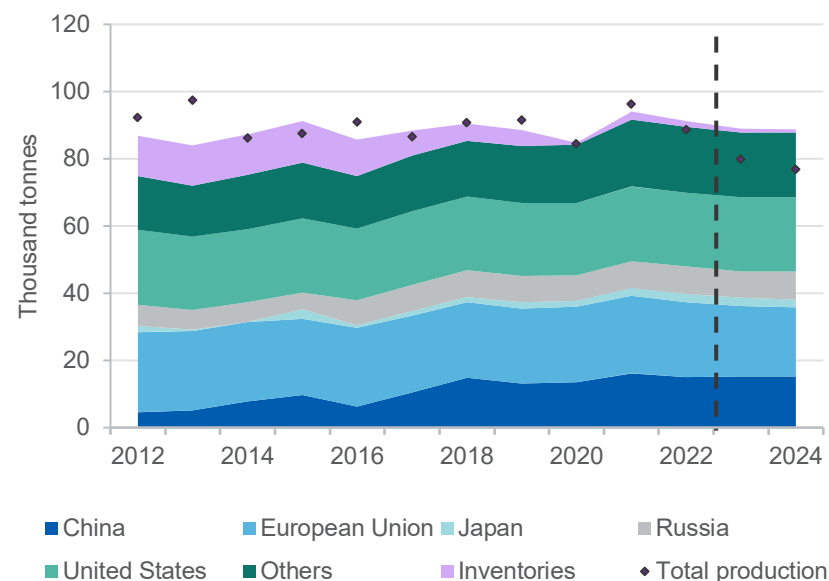
In China, Unit 6 of the Hongyanhe nuclear power plant has begun supplying power to the grid. The State Council has also approved the construction of six new reactors, with power stations at Sanmen, Haiyang and Lufeng each to gain two reactors.

The UK has released a new Energy Security Strategy, which calls for the construction of eight new reactors, supported by small modular reactors and totalling 24 GWe of capacity. If undertaken, construction on this scale could attain significant economies of scale, potentially building domestic construction capacity and reducing construction costs.

India is also seeking to develop economies of scale in its reactor development, announcing plans to start constructing reactors in fleet mode from 2024. Ten reactors are expected to be constructed under this process, all using an identical 700 MWe PHWR domestically developed design. The use of fleet mode and identical designs is intended to foster greater efficiency and economies of scale.

The newly elected South Korean government has dumped the previous government's nuclear phase-out policy. The new government has announced that 'reasonable' use of nuclear power will continue, citing its importance to net-zero targets. A recent poll suggests 72% of respondents support the ongoing use of nuclear power. South Korea has 24 nuclear reactors, and could also now resume construction of Shin-Hanul units 3 and 4. South Korean companies continue to progress a large reactor construction pipeline in the United Arab Emirates, where two plants have been grid connected, and a third (Barakah 3) is undergoing fuel loading.

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



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

9.3 World production

Large suppliers are restoring production, but slowly

In Canada, Cameco has announced that its production plans will remain unaltered, despite the recent tightening in the uranium market. The company has noted that 'Cameco does not intend to change its production plans despite the current geopolitical uncertainty ... we will not front-run demand with supply'.

The company is holding to its schedule in restarting production at the McArthur River mine in 2024. The mine has been in care and maintenance since 2018, when prices were at a near-record low. Output at Cigar Lake continues at a reduced rate, but with the potential to rise if prices increase further.

9.4 Prices

Prices are expected to rise steadily, and potentially rapidly

Uranium prices are lifting, and the rise is expected to sustain over time. Structural changes in uranium markets have reversed the conditions of the last 11 years, with years of deferrals of uranium projects closing the window on numerous potential avenues of supply. Uranium mines typically take a long time to obtain approvals, potentially drawing out any supply shortages over the longer term, and creating a baseline for structurally higher prices over the rest of the 2020s (Figure 9.3).

9.5 Australia

Higher prices should boost export earnings despite a recent fall in volumes

Production at Olympic Dam has recovered, following the completion of most maintenance at the site. Output is expected to lift in 2022 and sustain through the outlook period (Figure 9.4).

Two domestic uranium miners — Vimy Resources and Deep Yellow — have agreed to a merger, under which Deep Yellow acquires all of Vimy's shares. The combined entity will own the emerging Mulga Rock project in Western Australia, as well as the Tumas mine in Namibia. The sharing of capital may allow for more rapid development of the Mulga Rock deposit.

Boss Energy has approved its final investment decision, and released a plan for rebuilding the Honeymoon mine. The mine has been in care and maintenance for nine years. The company has announced that \$113 million will be used to refurbish the mine, with first output expected in late 2023. The mine is expected to ramp up to full production (2.45 million pounds per annum) by 2027.

Extra production and higher prices are expected to lift Australia's uranium export earnings from \$511 million in 2021–22 to \$815 million by 2023–24 (Table 1).

Revisions to the outlook

Export earnings forecasts for 2021–22 and 2022–23 have been revised up by around \$180 million (nominal terms) reflecting a stronger price forecast.

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 and Resources (2022)

Table 9.1 Uranium outlook

World	Unit	2021	2022 ^s	2023 ^f	2024 ^f	Annual percentage change		
						2022 ^s	2023 ^f	2024 ^f
Production	kt	54.2	56.9	59.3	61.6	5.0	4.2	4.0
Africa ^b	kt	9.3	9.2	10.1	10.5	-0.5	9.6	3.8
Canada	kt	5.5	6.8	7.1	6.4	23.0	5.0	-10.0
Kazakhstan	kt	25.8	25.9	26.1	28.3	0.6	0.5	8.6
Russia	kt	3.3	3.3	3.7	3.9	0.0	12.2	3.6
Consumption	kt	91.7	89.5	87.9	87.7	-2.4	-1.8	-0.2
China	kt	16.1	15.1	15.1	15.2	-6.3	0.4	0.6
European Union 27	kt	23.1	22.3	21.1	20.6	-3.8	-5.3	-2.4
Japan	kt	2.4	2.4	2.4	2.4	0.0	0.0	0.0
Russia	kt	7.9	8.2	7.8	8.2	3.2	-5.0	5.7
United States	kt	22.2	22.0	22.2	22.2	-0.6	0.7	0.0
Spot price	US\$/lb	35.3	52.9	59.7	61.4	50.0	12.8	2.9
real ^c	US\$/lb	38.0	52.9	58.0	58.4	39.2	9.6	0.6
Australia	Unit	2020–21	2021–22 ^{fs}	2022–23 ^f	2023–24 ^f	2021–22 ^s	2022–23 ^f	2023–24 ^f
Mine production	t	6,213	4,019	5,480	5,495	-35.3	36.4	0.3
Export volume	t	6,166	4,705	5,480	5,495	-23.7	16.5	0.3
– nominal value	A\$m	606	511	743	815	-15.7	45.5	9.7
– real value ^d	A\$m	633	511	710	754	-19.2	39.0	6.2
Average price	A\$/kg	98.3	109.3	135.6	148.3	11.2	24.1	9.3
– real ^d	A\$/kg	102.5	109.3	129.3	136.5	6.6	18.3	5.6

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
Source: Department of Industry, Science and Resources (2022); Cameco Corporation (2022); Ux Consulting (2022) Uranium Market Outlook