Uranium

Major uranium deposits (tonnes)
- Deposit: <2,967
- Operating mine:
  - 2,968–9,762
  - 9,763–17,571
  - 17,572–59,338
  - >59,339

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
- EU: 27%
- USA: 26%
- Others: 21%
- China: 15%
- Russia: 9%
- Japan: 2%

Australia's Uranium
- Ranked no 1 for uranium resources
- 3rd largest uranium producer in the world
- Exports worth $688m in 2019-20
9.1 Summary

- Uranium prices are expected to rise steadily in 2021 and 2022. The closure of Australia’s Ranger mine in early 2021 will lead to some supply pressures during the year, though large producers retain the capacity to ramp up rapidly should prices grow significantly.

- Australian production is set to decline from 2021, as the number of active uranium mines falls from three to two (see Australia section).

- Export values are expected to ease from $688 million in 2019–20 to $547 million by 2021–22 as mine output declines.

9.2 Prices

Prices are expected to rise slowly over the outlook period

Uranium prices have been volatile in recent quarters, reflecting some competing pressures (Figure 9.1). Supply cuts by major producers drove early price gains, however their impact was offset in large part by slowing global electricity demand following the outbreak of the COVID-19 pandemic. Global electricity use remains constrained, albeit with some recovery evident in recent months, especially in China.

In response to mixed price movements, uranium suppliers have shifted stances several times in 2020. Suppliers initially responded to slowing demand with substantial cuts in mine output. However, this was subsequently reversed in Canada, where the large Cigar Lake mine was restarted in the September quarter 2020 after a brief hiatus. Overall output remains down in Namibia and Kazakhstan, and a further fall in output is expected in 2021 following the final closure of the Ranger mine in Australia.

Prices are expected to increase slowly from early 2021, as global electricity use edges up. However, any rapid price growth will likely be stymied given the scale of world uranium inventories and the significant spare capacity of major producers. Production will likely be ramped up by the major producers should price rises significantly exceed current expectations.
9.3 World consumption

A recent wave of reactor completions and a slow increase in global energy demand are expected to lift global uranium consumption from 84,100 tonnes in 2020 to 85,700 tonnes in 2021. Uranium use is then expected to edge back in 2022 as the rate of reactor completions slows, though a significant longer-term pipeline of future constructions remains in prospect across Asia, Africa, and Eastern Europe (see Figures 9.3 and 9.4).

More countries are showing interest in nuclear reactors

Reactor construction schedules were largely maintained during 2020, despite the impacts of the COVID-19 pandemic. The December quarter 2020 saw several new reactors reaching their final stages of construction in China, Russia and Belarus. Countries including Egypt, Turkey, the United Arab Emirates, Bangladesh and Belarus have continued to progress towards their first reactor constructions, while Uzbekistan, Kenya, Ghana and the Philippines have announced that they are considering installing nuclear power for the first time.

China’s Fuqing nuclear plant was connected to the grid on 27 November, having achieved a sustained chain reaction on 21 October. This unit is the first of the new Hualong One reactor builds to be constructed, and is expected to start generating in December. A second unit is expected to commence commercial operation at the same site in late 2021. China’s Tianwan unit 6 also concluded cold functional testing in October, with the reactor scheduled to enter commercial operation in 2021.

In October, China’s National Nuclear Corporation completed cold functional tests at its demonstration gas-cooled reactor in Shandong province. A second reactor is now undergoing the same tests, with a further 18 units proposed for construction. China’s State Power Investment Corporation has also launched its new CAP-1400 reactor. The reactor represents an upgrade from the previous AP1000 pressurised water build, and is designed for rapid mass production and export.

The Ostrovets nuclear plant in Belarus started up its first reactor in October. The Russian-made reactor is the first of two to commence
operation, with the second reactor expected to commence in late 2021. The two reactors will be the first in Belarus, and are intended to provide the country with greater energy independence, reducing its reliance on imported gas.

Unit 2 of the Leningrad II plan in Western Russia was grid-connected in November. A final trial and inspection of the facility is now underway, with the reactor expected to start generating power in the first half of 2021.

In October, Japan’s Nuclear Regulatory Authority approved Tokyo Electric Power Company’s safety programme. This brings the restart for units 6 and 7 of the Kashiwazaki-Kariwa nuclear power plant a step closer. However, progress in reconnecting reactors in Japan remains slow, with only nine approved and one operational. There are reasonable prospects for full approval of the Kashiwazaki-Kariwa reactors and Onagawa 2 and Tokai 2 by 2022, but this would still leave 41 of Japan’s 55 reactors closed, with most of the gap filled by coal and gas power.

In the US, unit 3 of the Vogtle nuclear power plant has now concluded cold functional testing. Only one step — hot functional testing — now remains to be completed prior to fuel loading.

Development continues to step up on small modular reactors. These reactors could offer a significant potential growth path for nuclear power after 2025. The US Department of Energy has announced a cost-sharing agreement to acceleration of the first NuScale small modular reactor. Improvements to this reactor have seen expected power output increase by 25 per cent, reducing average generation costs for the reactor significantly.

The Canadian government has announced an investment of US$15 million to accelerate Terrestrial Energy’s Integral Molten Salt reactor plant. This plant will be able to mass produce pre-built reactors for easy shipment, and forms part of the country’s strategy to achieve net zero carbon emissions by 2050.

9.4 World production
Large suppliers have reduced output in the wake of COVID-19

World uranium production has long been checked by large stocks of surplus supply and inventories. However, the impact of COVID-19 does not appear to have resulted in significant disruption to uranium supply. A recent survey conducted by UxC suggests that most utilities and uranium suppliers are operating relatively unhindered, with initial mine production issues passing rapidly. Most production plans are expected to proceed without interruption into 2021.

Development of new uranium mines has been slow in recent years, due to persistently low prices. However, recent price growth has led to some small increases in exploration and development. In September 2020, the Ceará state government in Brazil announced the signing of a Memorandum of Understanding with the Santa Quitéria Consortium. The memorandum provides a basis for the development of a large mineral deposit in the country’s north, which includes the construction a combined uranium and phosphate extraction facility to refine the output. The deposit is expected to produce around 79,000 tonnes of Triuranium octoxide (U3O8), in addition to phosphate and other minerals.

In November, the UK Atomic Energy Authority’s Mega Amp Spherical Tokamak (MAST) Upgrade achieved first plasma. The MAST upgrade is a forerunner for one of the world’s first prototype nuclear fusion plants. The MAST upgrade will also provide data and support for Iter — the world’s largest fusion experiment — which seeks to develop industrial-scale fusion power. Fusion power on this scale would enable the construction of large scale nuclear plants that do not require uranium. However, development of fusion technology has thus far been slow.

Overall, uranium supply is expected to edge down from 84,600 tonnes in 2020 to 84,200 tonnes in 2021. A fall to 80,600 tonnes is expected in 2022, as utility sales and supplies from stockpiles are reduced. This would keep global output somewhat below its recent average for the next two years (see Figure 9.5). Further out, supply is expected to grow again, as
the impact of the COVID-19 pandemic recedes and reactor constructions start to accelerate in the early 2020s.

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

![Graph showing world uranium production and secondary supply](source)

9.5 Australia

Production and exports are set to decline from 2021

Growth in Australian output is likely to be stymied in the short term, following the shelving of plans to expand the Olympic Dam copper, gold and uranium mine. Studies conducted by BHP concluded that copper resources, which were the primary target for the expansion, were ‘more structurally complex’ and ‘less continuous’ than previously thought. The company will instead focus on improving its site infrastructure, to remove bottlenecks and increase its ability to extract from existing deposits.

Mining at the ERA’s Ranger site has now effectively concluded, with the company obliged by its lease to halt all mining at the site by January 8 2021. On October 6, the company released an update to its closure plan, and announced that 13 million tonnes of material had been shifted to fill in the mine pit in readiness for revegetation of the site. The planting of seedlings commenced in 2019, and full revegetation is scheduled for completion by 2026. Mining works at the site have been halted, with recent output limited to shipments from stockpiles and tailings. The closure of this mine will leave two Australia with two operating uranium mines, resulting in falling production and exports after 2020 (see Figure 9.6).

Export volumes are expected to ease from 7,195 tonnes in 2019–20 to 5,800 tonnes by 2021–22. Export values are expected to fall from $688 million in 2019–20 to $547 million in 2020–21 and 2021–22, with slow price growth only partly offsetting falling volumes.

**Figure 9.6: Australia’s uranium exports**

![Graph showing Australia’s uranium exports](source)

Exploration remains low due to ongoing weak prices

Only $1.8 million was invested in uranium exploration in the September quarter. This is above the historical low of $1.1 million in the June quarter, but well below the peaks recorded in 2010.

Revisions to the outlook

The export earnings forecast for 2020–21 was revised down by $74 million in the December *Resources and Energy Quarterly*, with the 2021–22 forecast revised down in similar proportion. This reflects a weaker price outlook over the next two years.
### Table 9.1 Uranium outlook

<table>
<thead>
<tr>
<th>World</th>
<th>Unit</th>
<th>2019</th>
<th>2020*</th>
<th>2021f</th>
<th>2022f</th>
<th>2020e</th>
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<td>US$/lb</td>
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<td>33.3</td>
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<tr>
<td>– real&lt;sup&gt;d&lt;/sup&gt;</td>
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Notes: <sup>b</sup> Includes Niger, Namibia, South Africa, Malawi and Zambia; <sup>c</sup> In 2020 US dollars; <sup>d</sup> in 2020–21 Australian dollars; <sup>e</sup> estimate; <sup>f</sup> forecast. Source: Department of Industry, Science, Energy and Resources (2020); Cameco Corporation (2020); Ux Consulting (2020) Uranium Market Outlook.