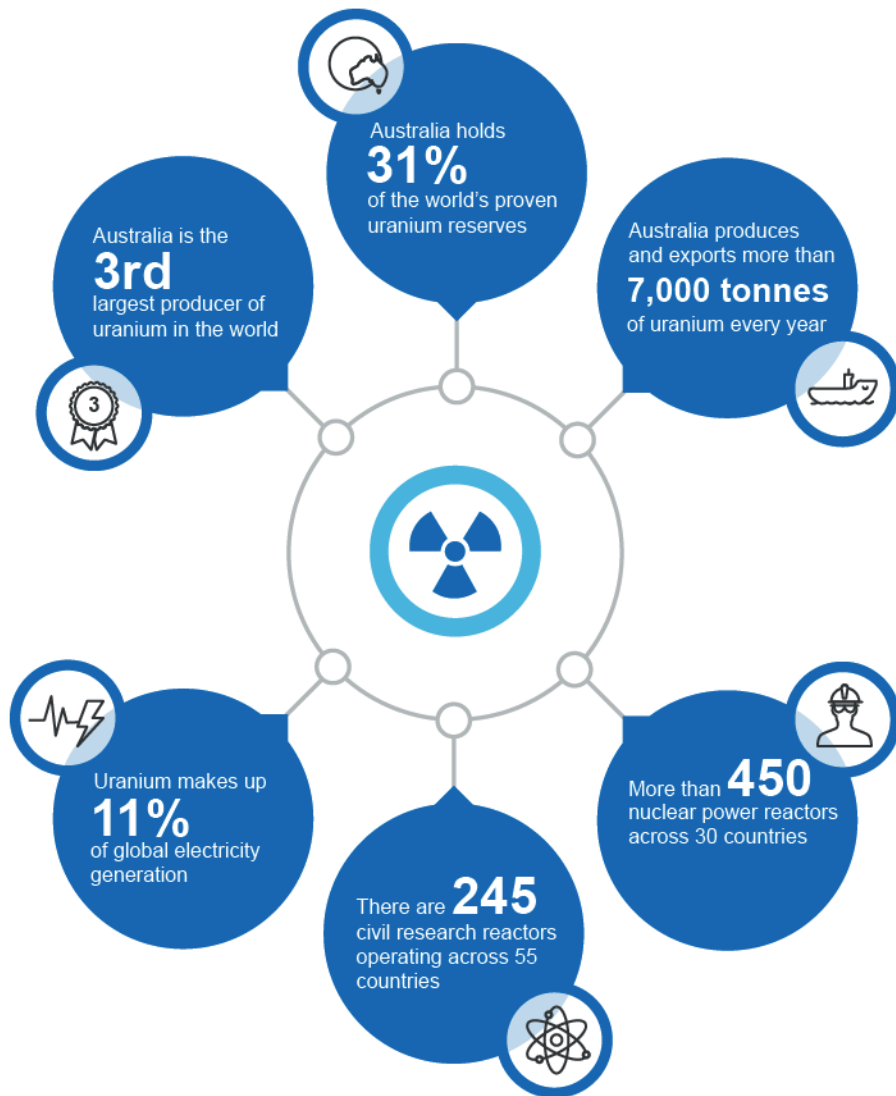


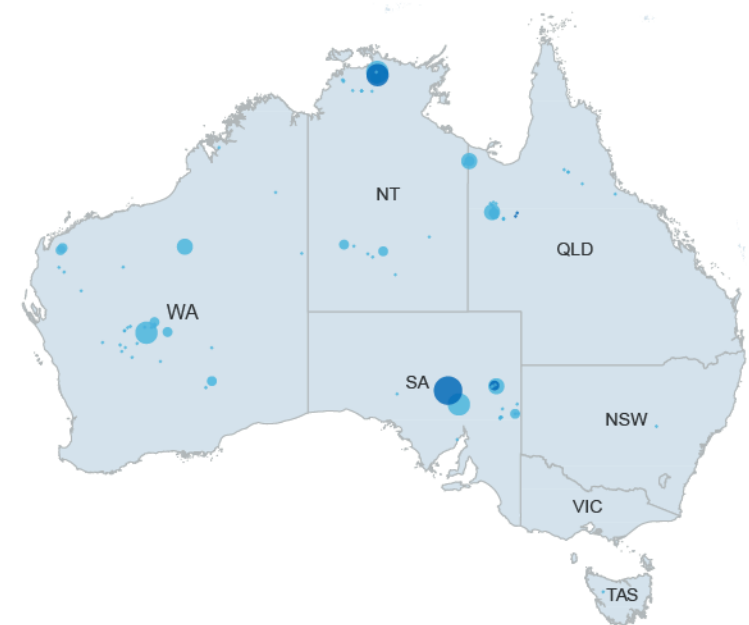
# Uranium

Resources and Energy Quarterly December 2018

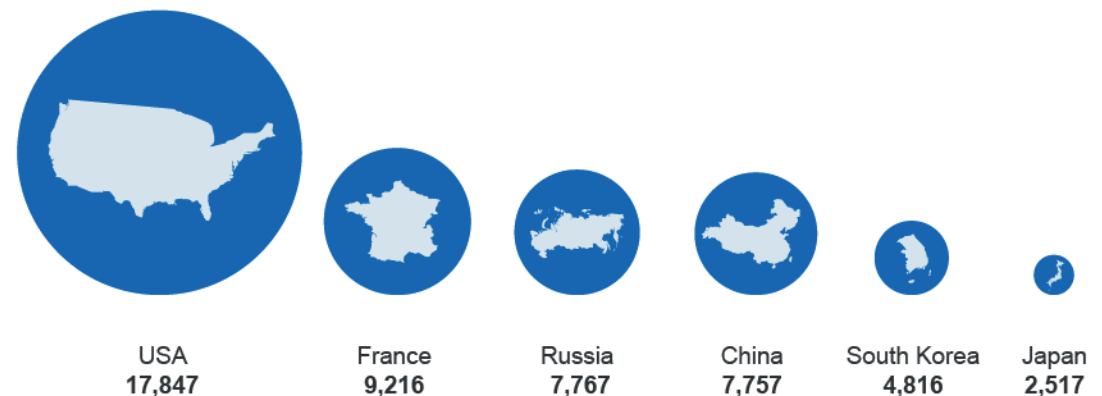


## Major Australian uranium deposits (tonnes)

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



## Key consumer markets (tonnes)



## 9.1 Summary

- Uranium spot prices appear to be on a sustained recovery, with the gains in the September quarter now appearing to be locked in. Prices are expected to build on this, rising gradually in the medium term to reach around US\$28 a pound by 2020.
- Uranium production in Australia is expected to be largely steady at around 7,000 tonnes annually over the outlook period. Rising production at Olympic Dam should offset small declines in output from the Ranger mine, which is due to close before 2021.
- Australia's uranium export earnings are expected to lift from \$650 million in 2017–18 to \$715 million by 2019–20, supported by higher prices.

## 9.2 Prices

The long-awaited recovery in prices now appears locked in

Uranium prices are recovering from a long period of historical lows. Prices lifted from US\$22.65 in the June quarter to US\$27.50 in the September quarter, with further gains evident early in the December quarter.

Prices previously hit a low of US\$18 a pound in November 2016, and entered a long period of stagnation throughout 2017 and early 2018. Around three-quarters of uranium produced has been sold at a loss over the past two years, and large inventories accumulated after the Fukushima shut-down have stopped prices from correcting. Low prices led to new supply from prospective mines in Africa and elsewhere being curtailed and postponed. The recent lift in prices is thus highly significant for producers.

Supply cuts by major producers in Canada and Kazakhstan have been the main drivers of the recent lift, and with cuts expected to persist, it is likely that prices will hold their gains in a tighter market. The scale of inventories is expected to suppress further price growth to some degree (Figure 9.1), but risks have now clearly shifted towards price spikes.

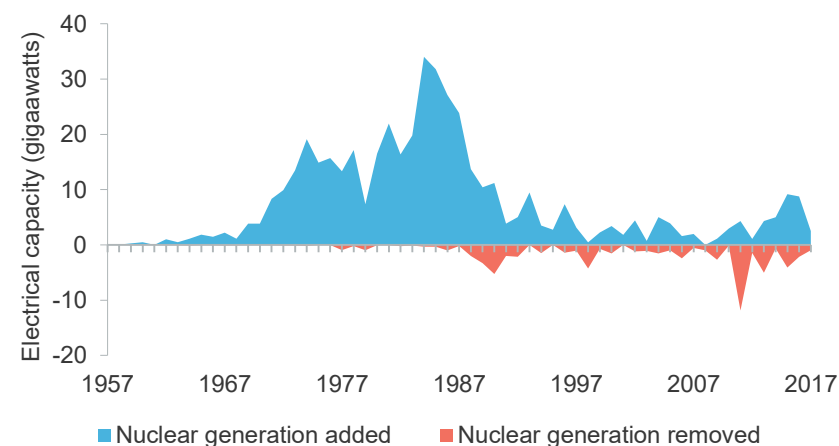
The longer-term effects of falling mine commencements and lower exploration on the uranium market have not yet become apparent.

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); Department of Industry, Innovation and Science (2018)

### 9.3 World consumption

#### Nuclear power growth continues across Asia

Several recent developments have boosted uranium demand in Asia. In China, a string of new reactors have been connected to the grid over the past few months. Unit 4 of the Tianwan nuclear plant was grid-connected in early October, which resulted in global nuclear generation rising above 400 GWe for the first time. Unit 1 of the Haiyang nuclear power plant also moved closer to connection, following a successful completion of 168 hours of continuous generation. This follows the connection of unit 2 of the Sanmen nuclear plant in the September quarter.

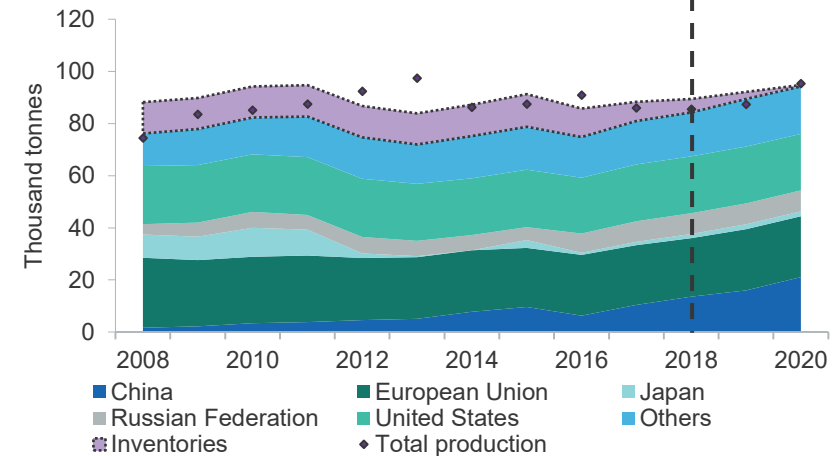
In Taiwan, the government held a referendum on its policy to phase out nuclear energy by 2025. The referendum produced a decisive result, with 59 per cent voting against the proposal, and in favour of retaining nuclear power into the future. Taiwan suffered a five-hour blackout in 2017 after an earlier reactor closure, and nuclear power remains by far the country's cheapest energy source, generating power at around one-fifth of the cost of LNG and one-third the cost of wind energy.

Japan's Nuclear Regulation Authority has approved the restart of unit 2 of the Tokai nuclear plant. An injunction on the re-connection of unit 3 of the Ikata power plant was rejected on October by the Hiroshima district court, clearing the way for another reactor to restart. Nine reactors have thus far been given approval to re-connect, with 18 in the process of approval. Since 2011, 15 older and smaller reactors have been confirmed for decommissioning.

Russian energy company Rosenergoatom announced in October that unit 1 of its Leningrad Phase II nuclear power plant is ready to connect, following the completion of its final testing. Unit 4 of the Rostov nuclear power plant also entered commercial operation in the December quarter.

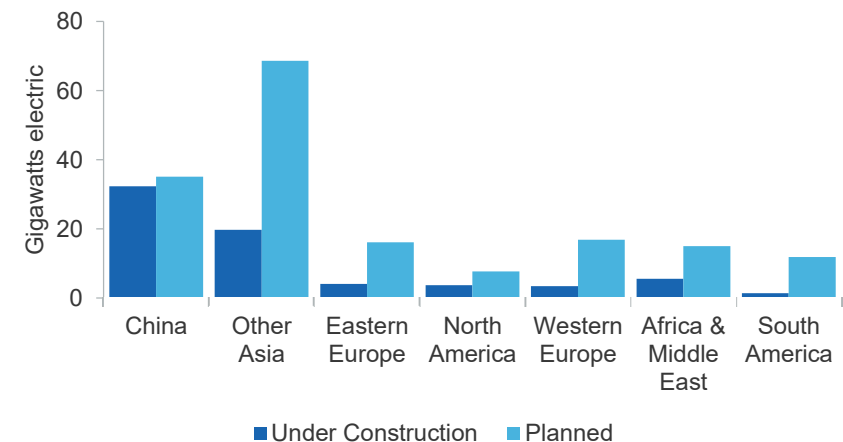
In the US, the Vogtle 3 and 4 reactor constructions have been cleared to proceed, with all four co-owners voting to continue construction. The first coolant pumps were also put in place during the December quarter, marking a major milestone in a much-delayed project.

**Figure 9.3: World uranium consumption and inventory build**



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

**Figure 9.4: New nuclear capacity**



Source: International Energy Agency (2018); World Nuclear Association (2018); Department of Industry, Innovation and Science (2018)

The use of reactors in producing medical isotopes is set to increase, with Bruce Power in Canada now generating medical-grade cobalt in all four of its Bruce B units. These units are expected to be capable of operating as medical suppliers until 2064. Canadian Nuclear Laboratories are also shifting towards commercial production of a rare medical radioisotope called actinium 225, which has high potential in cancer treatments.

Nuclear power generation has recorded solid growth in 2018, with nine substantial new reactors commencing operation, and promising new medical uses of nuclear energy emerging. Further reactor connections in China and India could still occur before the end of the year. Uranium consumption is accordingly expected to rise from 80,900 tonnes in 2017 to 84,300 tonnes in 2018. The scale of construction across Asia is forecast to add a further 10,000 tonnes to uranium demand by 2020 (Figure 9.3).

## 9.4 World production

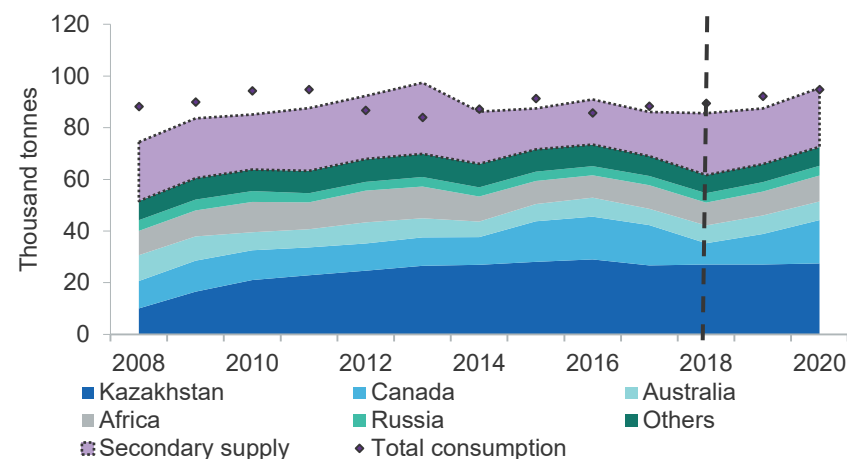
### Conditions for uranium producers are belatedly improving

Since 2011, uranium supply has been largely stable or rising, while demand has consistently fallen short of expectations. This has led to significant downward price pressure and persistent growth in inventories.

Large supply cuts over 2018 have belatedly turned this around. A succession of production pauses in Canada, Niger, and Kazakhstan has resulted in a large reduction in global supply, from 69,000 tonnes in 2017 to 61,700 tonnes in 2018 (see Figure 9.4). Excessive enrichment capacity, which has added to growth in secondary (recycled) supplies, has partly offset this, but overall supply is nonetheless expected to be in some shortfall over the outlook period.

Production pauses at Cameco's huge McArthur River and Key Lake mines in Canada have been extended, meaning the largest uranium mine in the world effectively produced no output through 2018. In the longer term, rising demand (see Figure 9.5) plus project postponements in Africa and other regions are likely to increase price pressure and could lead to a supply crunch beyond the outlook period.

**Figure 9.5: World uranium production and secondary supply**



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

## 9.5 Australia

### Australia's uranium exploration has virtually dried up

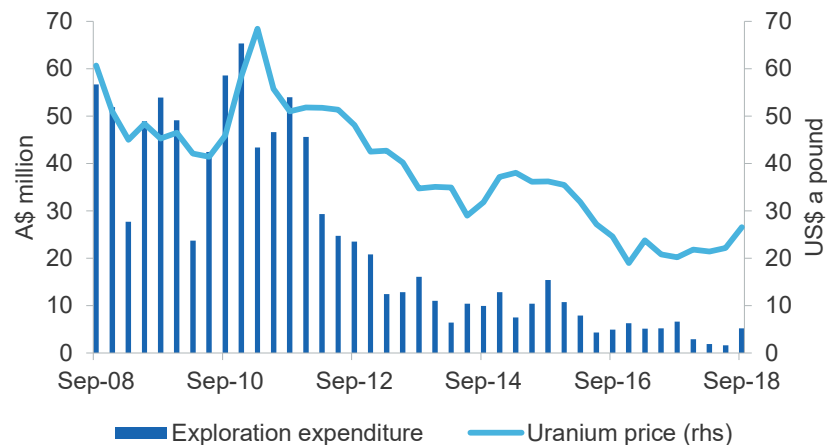
As Figure 9.6 shows, expenditure on uranium exploration has lifted from a low of \$1.6 million in the June quarter 2018, to \$5.2 million in the September quarter. This is still a relatively low level, but suggests recent price gains are expected by most producers to be retained, especially in an environment of potential long-term supply shortages.

Exploration remains largely confined to sites in the Northern Territory, Queensland, and South Australia.

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

As Figure 9.7 shows, Australian production is expected to lift from 6,654 tonnes in 2017–18 to 6,743 tonnes in 2018–19 and 7,240 tonnes in 2019–20.

**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

ERA's Ranger project — Australia's second largest uranium mine — is set to cease operations by January 2021, in line with long-planned project timeframes. Work on the closure feasibility study is almost complete, and is now expected to conclude before the end of 2018. ERA's Mine Closure Plan foresees revegetation of the site by 2024 and full rehabilitation by 2026. This will lead to a substantial fall in Australia's uranium exports from the early 2020s.

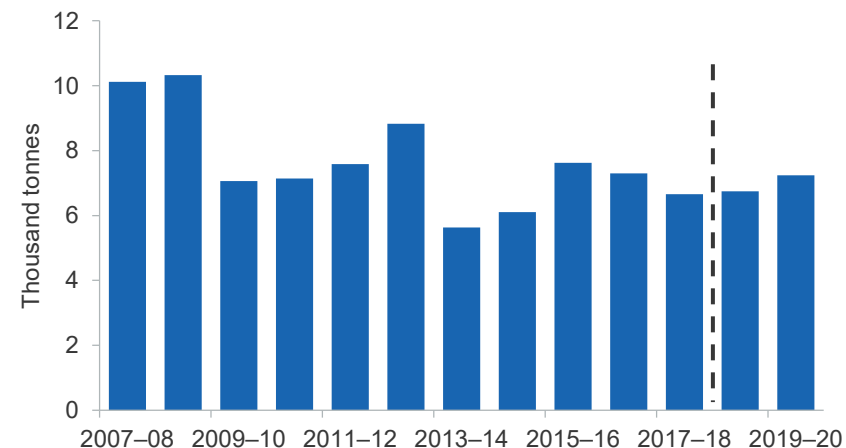
#### Conditions for exporters remain difficult, but Australia is still well placed

Price growth is expected to support rising export values in coming years, with earnings forecast to lift from \$650 million in 2017–18 to \$715 million by 2019–20 (Figure 9.8). Export volumes are expected to edge back from 8,118 tonnes in 2017–18 (a result inflated by the timing of shipments) to 6,743 tonnes by 2019–20.

#### Revisions to the outlook

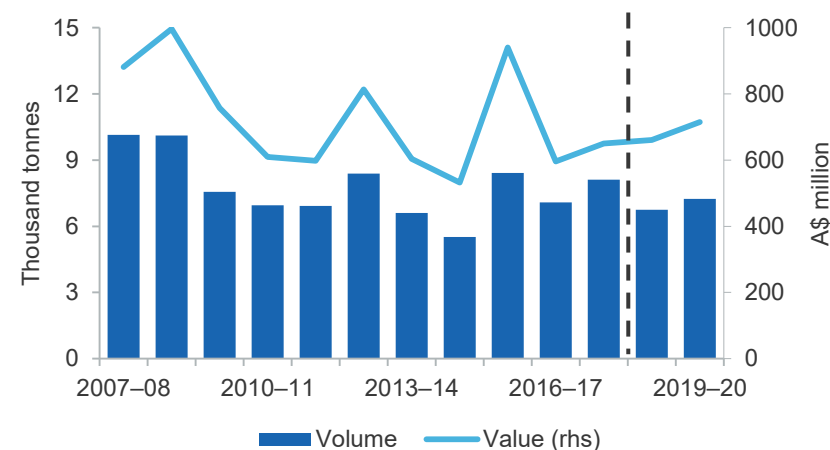
Australia's forecast uranium export earnings for 2018–19 remain largely unchanged from the September *Resources and Energy Quarterly*.

**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 <sup>s</sup>	2019 <sup>f</sup>	2020 <sup>f</sup>	Annual percentage change		
						2018 <sup>s</sup>	2019 <sup>f</sup>	2020 <sup>f</sup>
Production	kt	69.0	61.7	65.9	72.5	-10.6	6.8	10.0
Africa <sup>b</sup>	kt	9.1	8.8	9.2	10.0	-3.4	4.8	8.6
Canada	kt	15.6	8.2	11.8	16.8	-47.2	43.3	42.3
Kazakhstan	kt	26.7	27.0	27.0	27.5	1.3	0.0	1.5
Russia	kt	3.6	3.7	3.7	3.8	2.3	0.0	3.1
Consumption	kt	80.9	84.3	89.4	94.3	4.2	6.1	5.4
China	kt	10.4	13.6	16.0	21.1	30.4	17.7	31.9
European Union 28	kt	22.9	22.5	23.5	23.3	-2.1	4.6	-0.6
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	24.1	26.2	28.0	11.4	8.7	6.9
real <sup>c</sup>	US\$/lb	22.2	24.1	25.6	27.1	8.7	6.3	5.7
Australia	Unit	2016–17	2017–18 <sup>s</sup>	2018–19 <sup>f</sup>	2019–20 <sup>f</sup>	2017–18 <sup>s</sup>	2018–19 <sup>f</sup>	2019–20 <sup>f</sup>
Mine production	t	7,295	6,654	6,743	7,240	-8.8	1.3	7.4
Export volume	t	7,081	8,118	6,743	7,240	14.6	-16.9	7.4
– nominal value	A\$m	596	650	661	715	9.0	1.8	8.1
– real value <sup>d</sup>	A\$m	621	665	661	698	7.0	-0.5	5.6
Average price	A\$/kg	84.2	80.0	98.0	98.7	-4.9	22.5	0.7
– real <sup>d</sup>	A\$/kg	87.8	81.9	98.0	96.4	-6.7	19.7	-1.7

Notes: <sup>b</sup> Includes Niger, Namibia, South Africa, Malawi and Zambia; <sup>c</sup> In 2018 US dollars; <sup>d</sup> in 2018–19 Australian dollars; <sup>f</sup> forecast; <sup>s</sup> Estimate

Source: Australian Department of Industry, Innovation and Science (2018); Cameco Corporation (2018); Ux Consulting (2018) Uranium Market Outlook