An insider's look at uranium production: status, prospects and challenges

By Alexander Boytsov

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Boytsov has authored and co-authored over 100 publications in Russia and internationally, including a monography on *Uranium geology, mining and economy* published in 2012.

There will be an oversupply of uranium until at least 2023, according to two recent reports. The Ux Consulting 2018 Uranium Market Outlook and the World Nuclear Association 2017 Nuclear Fuel Report present supply and demand forecasts for the nuclear fuel cycle until 2030 and 2035 respectively.

During both forecast periods, about 10% of global requirements will be provided from secondary sources. These include civilian stockpiles held by utilities and governments, recycled uranium and plutonium or re-enriched depleted uranium. The share of such sources in the overall supply of uranium will gradually decrease over time, however, leaving primary uranium without many alternatives in the long run.

Primary uranium production from existing mines will decrease by 30% by 2035 because of resource depletion and mine closures — and new mines will only compensate for the capacity of the exhausted mines. Both reports show that from 2023 to 2026 uranium demand may exceed supply. To fill the gap and ramp up to the required 30 000 tons per year by 2035, new prospective mines should start production in the next ten years. But the problem is that, according to the companies' plans, no development of these future mines has yet been confirmed. In light of this, are global uranium resources and mining capacities sufficient to meet long-term nuclear power plant requirements?

Despite a depressed market, uranium production has continued to grow steadily in the last decade, reaching 62 000 tons in 2016, which was a historical maximum for the period since 1983. (Production in 2017 was 59 000 tons.) The growth has been mostly due to a surge in production in Kazakhstan, which has increased

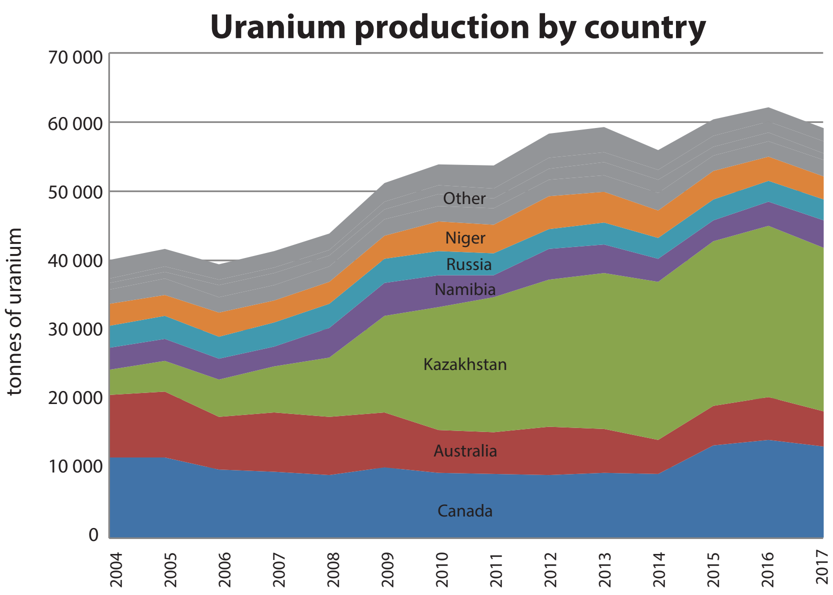

Figure 1. Uranium production by country

Source: compiled by the author, based on uranium-producing companies' public reports.

uranium production six-fold over the past ten years and has been the top producer since 2009 (see Figure 1).

In situ leaching (ISL) is the main uranium mining method in use today. Its share of the world's total production has increased from 20% in 2005 to 50% in 2016 and 2017. However, according to Ux Consulting, ISL mining capacities will start to decline after 2028 because of resource depletion, with production from low-cost ISL mines sharply declining from 2022 onwards. Uranium companies may face economic and technical challenges in developing new ISL mining projects because of higher costs and limited availability of resources.

Only 40% of the 43 currently operating mines produce uranium at a cost below the spot market price, according to Ux Consulting. And only companies with low-cost production or favourable long-term contracts are likely to survive in the current challenging uranium market.

In addition to low uranium prices, companies face constraints related to political, social and environmental factors. These constraints have hampered the development of several uranium projects in Australia, Canada, Kazakhstan, Russia and several countries in Africa. This may result in a drop in uranium production in 2018 by at least 10%.

While Kazakhstan is the world's lead producer today, it may also face all the above-mentioned challenges in the future. It plans to maintain current uranium mining capacities at a level of 25 000 tonnes per year during the next five years, but this may decrease by 40% by 2030 and by 70% by 2035 owing to resource depletion and the closing of old mines.

Enough uranium resources, but at what cost?

For sustainable, long-term production, reliable and low-cost uranium resources are key. Generally speaking, global uranium resources are more than sufficient to ensure the long-term needs of the nuclear industry. However, at the same time, many resources belong in the high-cost categories. After 2020, uranium producers may face a shortage of low-cost resources. During the last decade, total global known uranium resources increased by 21%, but resources in the low-cost category, under US $80 per kilogramme of uranium, decreased by 48% (see Figure 2).

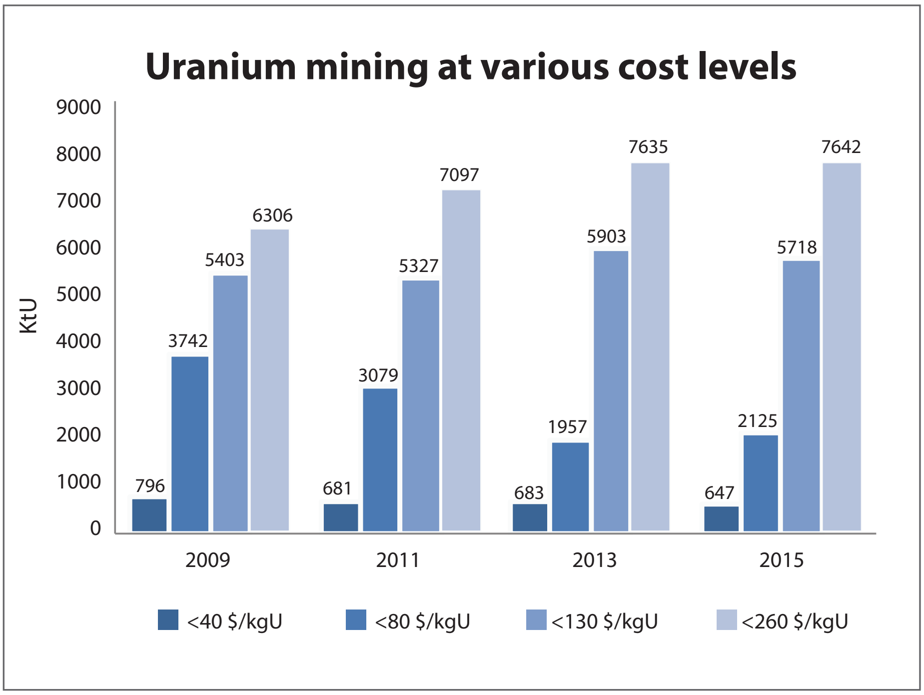

Figure 2. Evolution of uranium resources.

Source: Uranium 2016: Resources, Production and Demand, a Joint Report by the OECD Nuclear Energy Agency and the IAEA.