

Ebb and flow: the economics of uranium mining

By Miklos Gaspar and Noah Mayhew

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— Brett Moldovan, uranium production specialist, IAEA

Mining uranium is just like mining any other base metal, many industry executives say: exploration, licensing, excavation and then shutting down the mine at the end of its useful life. But when you consider radiation protection, long-term management of radioactive waste and the lack of public support surrounding uranium mining in some countries, it is clear that the industry’s challenges are more complicated than in the case of other metals. Its economics has been complicated, too, with prices in the last decade or so showing the greatest volatility in history — with a peak of US \$300/kilogramme in 2007 and a trough of US \$41/kilogramme in 2016 (see chart).

“Over the past few years a surplus of inventory of uranium ore concentrate has developed, leading to lower prices. This is a result of a combination of increased production and reduced demand,” said Brett Moldovan, uranium production specialist at the IAEA. “Operating many of the mines under the current price for uranium is a challenge economically.”

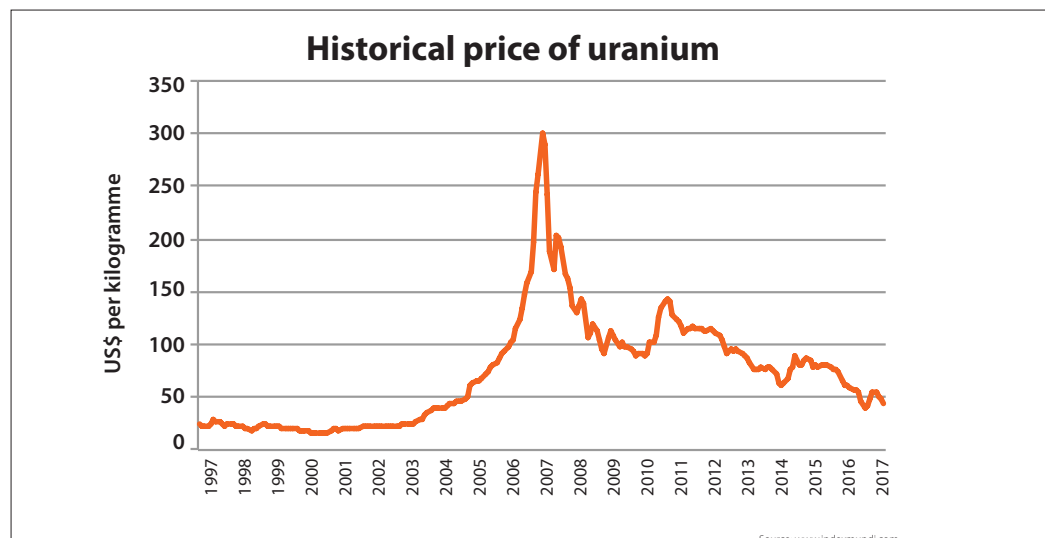
With prices hovering at around US \$49/kilogramme today, many of the world’s largest uranium mines are in care-and-maintenance mode. “They will be economical to re-start when the uranium spot price is above the cost of production and when price forecasts show that this price will remain stable or increase. The required uranium price

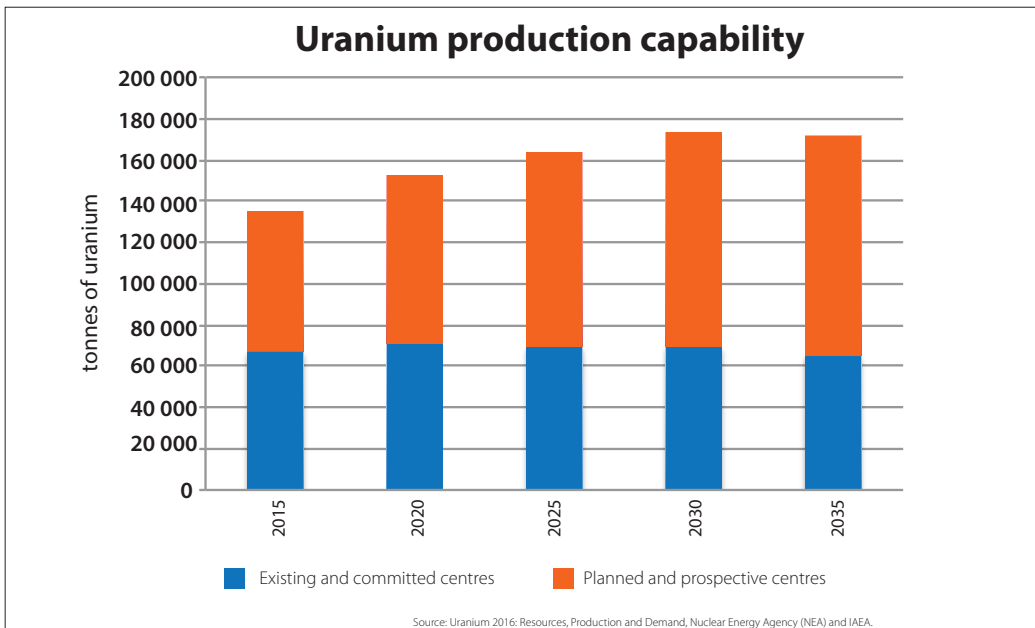
for restart is different for each mine as their operating costs vary,” Moldovan said. “Peaks in the price of uranium are often short-lived, while valleys can last for decades.”

The demand for uranium is mainly determined by nuclear power. There are currently 451 power plants in operation in the world and 59 are under construction, while five were permanently shut down in 2017 and four the year before. The International Energy Agency (IEA) predicts world energy consumption to increase by 18% by 2030 and by 39% by 2050, and the question is what role nuclear power will play in meeting this growing demand.

The IAEA low estimate predicts global energy generated with nuclear power will gradually decline through 2040, to then return to today’s levels by 2050. This scenario is specifically designed to create a conservative estimate. The high estimate predicts an increase in nuclear electrical generation capacity from 2016 levels by 42% by 2030 and 123% by 2050. It assumes that current rates of economic growth will continue, along with a growing interest in nuclear power, particularly in East Asia.

Although uranium makes up only 5–10% of the price of electricity generated using nuclear power, it is nonetheless crucial for the long-term sustainability of the industry. According to the latest edition of





Uranium 2016: Resources, Production and Demand — a world reference on uranium jointly prepared by the Nuclear Energy Agency (NEA) and the IAEA — primary global supply is assured until at least 2035 in the low nuclear growth estimate. Known identified resources at the current rate of demand are sufficient for approximately 118 years and even longer if undiscovered resources are included (see chart).

Investing in a uranium mine

Opening a uranium mine requires significant capital investment and is a long process that often involves 10 to 15 years of lag time before the mine begins operation. The cost of the equipment for mining and milling uranium into uranium ore concentrate, which generally takes place on site, is over US \$100 million and can even reach into the billions. Thus, private companies and state entities alike must carefully consider long-term economics before opening a mine. Many countries that are new to uranium mining, such as Botswana and Tanzania, have used the IAEA's expertise and assistance to create the necessary infrastructure and the legal, environmental and regulatory framework to open mines. The mines are at an advanced stage of exploration, waiting for a more favourable economic environment.

Most contracts in the uranium business are long term, including price ceilings to protect customers and price floors to protect mines. Although spot prices affect the overall market price, this change happens more slowly. Depending on current market price and the level of a country's nuclear power programme,

it can sometimes be more profitable to simply trade uranium than to mine it domestically.

There are countries such as China and India that operate mines mainly to ensure security of domestic supply, with economics being an important but secondary consideration. Most uranium in the world these days is nonetheless mined commercially. Countries like Australia, Kazakhstan and Namibia operate mines for exporting uranium, while others like Canada use the uranium both domestically and for export.

So, what does the crystal ball say? That demand for uranium is forecast to increase in the long run and that prices should increase along with it. But when and by how much is hard to predict, particularly in the light of hesitation by the public in many countries to invest in nuclear power.

“Previous fixes by the industry, through for example strengthening corporate social responsibility or other similar stakeholder engagement efforts, have become less effective given the degree of public scepticism about mineral industries in general,” said Hussein Allaboun, Manager of the Jordanian Uranium Mining Company.

Jordan is one of many countries exploring the prospect of uranium production. It has done feasibility studies and constructed a pilot plant to gather the necessary industrial and engineering data. “The project is envisaged as a constituent in a clustered national nuclear energy transformation programme triggered by the country's keen need for a secure source of energy,” Allaboun said.