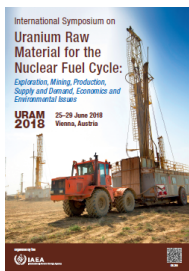


International Symposium on Uranium Raw Material for the Nuclear Fuel Cycle: Exploration, Mining, Production, Supply and Demand, Economics and Environmental Issues (URAM-2018)



Contribution ID: 94

Type: ORAL

CANADA'S URANIUM MINING INDUSTRY: 75 YEARS OF PRODUCTION AND FUTURE PROSPECTS

Monday, 25 June 2018 15:00 (20 minutes)

HISTORICAL BACKGROUND

Pitchblende ore was mined at the Port Radium mine in the Northwest Territories from 1932 to 1940 to extract radium for medical use [1]. However, Canadian uranium production did not begin until 1942, when, at the request of the Government of Canada, the Port Radium mine was re-opened to supply uranium for the Manhattan Project [2]. With the onset of the Cold War, military demand for uranium soared, creating a uranium exploration boom in which thousands of uranium occurrences were discovered throughout Canada [1]. Canada's second uranium mine opened in northern Saskatchewan in 1953, and by the late 1950s, there were 20 uranium production centres in Ontario, Saskatchewan and the Northwest Territories [1,3]. Annual production peaked in 1959 at 12 200 tonnes of uranium (tU), but declined rapidly as U.S. and U.K. military demand had been met and contracts were not extended. Only 8 mines remained in operation in 1961 [1], and by 1966, production had fallen to less than 3 000 tU with only 4 mines remaining in production [4]. In 1965, Canada made a policy decision that all future uranium sales would be for peaceful purposes only, and while the development of nuclear power was expanding, it was not until the 1970s that uranium demand had risen substantially and exploration and development activity increased [5]. By the late 1970s, new uranium mines were being developed in Ontario and Saskatchewan. Annual uranium production grew through the 1980s, with the focus of production shifting to the high-grade uranium deposits of the Athabasca Basin of northern Saskatchewan [6]. Uranium mining in Ontario ceased in 1996, leaving Saskatchewan as the sole producer of uranium in Canada.

URANIUM PRODUCTION

Canada is currently the world's second largest producer and exporter of uranium, with 22% of world production in 2016 [7]. More than 85% of uranium production is exported, making it Canada's largest clean energy export. Canadian uranium exported for use in nuclear power helps combat climate change by avoiding some 600 million tonnes of CO₂ equivalent emissions annually. In addition to being a reliable supplier of uranium, Canada has also long been recognized as a responsible producer of uranium due to policies and practices that ensure protection of the environment, corporate social responsibility and nuclear-non-proliferation.

The McArthur River Mine and the Cigar Lake Mine are the world's largest and second largest uranium mines, respectively, in terms of annual production [7]. These mines have ore grades of up to 20% uranium, one-hundred times higher than the world average. Canada's annual uranium production has risen substantially since the start-up of the Cigar Lake mine in 2014, increasing by 42% in 2015 and increasing a further 5% in 2016 to reach a record annual production level of 14,039 tU [7].

Low demand and low prices has resulted in a 8% decrease in Canada's uranium production for 2017. Due to continued depressed market conditions, 2018 production is expected to decrease a further 40% as production at the McArthur River mine and Key Lake mill are suspended for ten months. This action will reduce operating costs, while uranium concentrates will continue to be supplied to customers from the excess inventory that is currently stored at the Key Lake mill [8].

While only the Cigar Lake mine and McClean Lake mill are currently in production, both the Cigar Lake mine and the McArthur River mine have extremely high-grade uranium deposits with low production costs. As a result,

the Canadian uranium industry is able to remain viable in a low uranium price market and could quickly ramp-up production to meet an increase in demand. In addition, the Rabbit Lake mine and mill, which has been in care in maintenance since mid-2016 due to low uranium prices, could be brought back into production should uranium prices increase substantially.

URANIUM RESOURCES

Canada has 9% of the world's low-cost uranium resources (< US\$130/KgU) and has the world's highest-grade uranium deposits, ensuring that Canada will continue to be a major supplier of uranium well into the future [9]. Canada's low-cost uranium resources have risen by 60% since 2009 due to increased exploration efforts. When uranium demand and prices increase, two advanced uranium projects in Saskatchewan, which have been put on hold due to low prices, could enter production and provide additional feed for the existing mills. Ore from the proposed Millennium mine would be processed at the Key Lake mill, while ore from the proposed Midwest mine would provide additional feed for the McClean Lake mill [9]. There are also additional undeveloped uranium deposits at McClean Lake that could be brought into production.

The Athabasca Basin continues to be highly-prospective for discovering new deposits and several large high-grade uranium deposits have been identified that could be developed into mines in the future. Recent large discoveries in the eastern Athabasca Basin include the Roughrider deposit (Rio Tinto), the Phoenix and Griffon deposits (Denison Mines), and the Fox Lake deposit (Cameco) [9]. In the western Athabasca Basin, the Triple-R deposit (Fission Uranium) and the Arrow Deposit (Nex-Gen Energy) are currently the two largest undeveloped uranium deposits in Canada [9]. Through continued exploration, Canada's uranium resources are expected to increase further.

PUBLIC ACCEPTANCE

The success of Canada's uranium industry is not only the result of having a good resource base and the use of modern and sustainable mining methods, but also the result having an appropriate policy and regulatory regime which fosters a high degree of public acceptance. These policies and regulations address public concerns on health, safety and the environment, as well as nuclear non-proliferation and foreign ownership. The industry itself has adopted best practices through which it has earned a high degree of public support, especially among local Indigenous communities with which they have developed partnerships that provide much-needed local employment and business opportunities.

SUMMARY

This presentation will briefly outline Canada's 75-year history in uranium mining as well as examine Canada's current uranium production and the policy and regulatory regime that governs the Canadian uranium industry. Future prospects for uranium mining in Canada will be discussed, as well as the importance of developing community support.

REFERENCES

- [1] J.W. Griffith, *The Uranium Industry –Its History, Technology and Prospects*, Mineral Report 12, Mineral Resources Division, Department of Energy, Mines and Resources, Ottawa, Ontario Canada, 1967, 335p.
- [2] R. Bothwell, *Eldorado, Canada's National Uranium Company*, University of Toronto Press, Toronto, Ontario, Canada, 1984, 515p.
- [3] O.J.C. Runnalls, *Ontario's Uranium Mining Industry –Past, Present and Future*, Mineral Ontario Mineral Policy Background Paper No. 13, Ontario Ministry of Natural Resources, Toronto, Ontario Canada, 1981, 182p.
- [4] R. Bothwell, *Eldorado, Canada's National Uranium Company*, University of Toronto Press, Toronto, Ontario, Canada, 1984, 515p.
- [5] D.A. Cranstone and R.T. Whillans, *An analysis of uranium discovery in Canada. 1930-1983*, Uranium Resources and Geology of North America, Technical Document 500, International Atomic Energy Agency, Vienna, Austria, 1989, pp. 29-48
- [6] Nuclear Energy Agency, *Forty Years of Uranium Resources, Production and Demand in Perspective*, Organisation for Economic Co-operation and Development, Paris, France, 2006, 276p.
- [7] World Nuclear Association, *World Uranium Production* (updated July 2017), <http://www.world-nuclear.org/information-library/nuclear-fuel-cycle/mining-of-uranium/world-uranium-mining-production.aspx>
- [8] Cameco Corporation, *Cameco to Suspend Production from McArthur River and Key Lake Operations and Reduce its Dividend*, November 8, 2017, News Release.
- [9] Nuclear Energy Agency, *Uranium 2016: Resources, Production and Demand*. Organisation for Economic Co-operation and Development, Paris. 2016.

Country or International Organization

Canada

Primary author: Dr CALVERT, Tom (Natural Resources Canada)

Presenter: Dr CALVERT, Tom (Natural Resources Canada)

Session Classification: Uranium Markets

Track Classification: Track 2. Uranium markets