Recent trends on long-term supply of uranium resources

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It is necessary to consider the long-term supply of uranium for the stable use of nuclear energy. Information on uranium resources is periodically reported by international and national organizations of various countries. For example, the OECD/NEA (Nuclear Energy Agency, The Organization for Economic Co-operation and Development) and IAEA (International Atomic Energy Agency) jointly prepare periodic report (currently every two years) called Uranium, which is updating on world uranium resources, production and demand. This report is commonly known as the “Red Book” and its latest update is the 2020 edition, published in December 2020 (OECD/NEA-IAEA, 2020). In this paper, supply and demand of uranium are reviewed mainly based on the Red Book, and future possibility on increase in uranium resources in Canada and Australia, the principal supplying countries, is discussed.

According to Red Book 2020 edition, total identified resources recoverable (reasonably assured and inferred) in the world as of 1 January 2019 amounted to about 8 million tonnes of uranium metal(tU) in the <USD 260/kgU (<USD 100/lb U_3O_8) cost category. Annual uranium requirements were 59,200tU as of 1 January 2019, that means identified resources are sufficient for about 135 years. Annual uranium requirements by the year 2040 are projected to increase to a total of between 56,640 tU and 100,225 tU, so that the number of years that uranium can be supplied by identified resources will vary (decrease) depending on the amount required.

Additionally, the COVID-19 pandemic affected uranium supply. In Canada, operation at the Cigar Lake mine were temporally suspended, and the McClean Lake mill was ceased accordingly. In Kazakhstan, Australia, Namibia, and other countries, the production volume decreased due to the furlough of workers.

One of the topics related to uranium mining is the termination of production at mine in which Japanese companies have participated. One of those, the Ranger mine in Australia ceased production on January 8, 2021. The Ranger Mine has remaining resources, and mining of the remaining resources was initially planned. However, the mine is located in an indigenous traditional land, and since the indigenous traditional land owners did not support the creation of a new Ranger Authority, which would provide the regulatory mechanism to enable mining after 2021, it was decided to close the mine. There is the Jabiluka deposit (approx.120,000tU) near the Ranger mine, but it cannot be mined either because the indigenous people have not given their permission. In Australia, there are five uranium projects awaiting better market conditions before proceeding with development: Honeymoon deposit in South Australia, Kintyre and Yeelirrie deposits, Wiluna and Mulga Rock deposits in Western Australia. Regarding the Mulga Rock deposit (approx. 29,000tU) was once discovered by the Power Reactor and Nuclear Fuel Development Corporation (PNC) but its concession was abandoned due to high mining costs, and was later obtained by an Australian company.

In Canada, a development plan of the Wheeler River project in the Athabasca region of Saskatchewan, the largest uranium deposit in the world, is underway. This project is expected to be the first application of in-situ recovery (ISR) mining method to an unconformity-related deposit at the Phoenix deposit (approx. 26,900tU). ISR method is generally used for sandstone-type uranium deposits. Since most deposits in the Athabasca Basin are considered hard rock mines, open-pit, and underground mining with explosives or

mechanical exploitations are required to mine uranium ore. The Phoenix deposit is located just above the unconformity between impermeable hard basement rock and relatively permeable soft Athabasca sandstone that lacks impermeable layer unlike sandstone-type deposits. Therefore a “freeze wall” will be constructed around the orebody and drilled approximately 300 boreholes for chemical injection and monitoring. And rock fracturing will be conducted as used for shale oil to increase the contact area between the chemical solution and the deposit. Furthermore, Phoenix has a higher grade (19.1% U_3O_8) than sandstone deposits, and thus the uranium is directly precipitated from the chemical solution and the chemical solution is reused (a circulation system is constructed), which results in relatively low cost and low environmental impact.

Reference

OECD/NEA-IAEA, 2020, Uranium 2020: Resources, Production and Demand.

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