Examination on geological potential for long-term supply of uranium resources

*Eiji Sasao[1]

1.Tono Geoscience Center, Japan Atomic Energy Agency

Introduction

According to “Long-term Energy Supply and Demand Outlook” released on July 2015, the dependence on the nuclear power plants is planned to be 20 to 22% of the electric power supply in FY2030. Because uranium is limited resource, it is necessary to consider the long-term supply.

Information on uranium resources is periodically reported by international and national organizations. For example, OECD/NEA and IAEA have jointly prepared periodic updates on world uranium resources, production and demand. These updates have been published in what is commonly known as the “Red Book” (OECD/NEA-IAEA, 2014). In this presentation, supply and demand of uranium are reviewed based mainly on the Red Book, and then future possibility on increase in uranium resources in Canada and Australia, the principal supplying countries, is discussed.

Resource and Demand

According to Red Book 2014 edition, total identified resources (reasonably assured and inferred) as of 1 January 2013 amount to about 7.6 million tonnes U in the less than USD 260/kgU (USD 100/lb U_3O_8) cost category. Annual uranium requirements was 61,600tU in 2012. Identified resources are sufficient for over 120 years based on the 2012 requirement. Annual uranium requirements by 2035 are projected to rise to between 72,205tU and 122,110tU, so that relation between supply and demand could be changed in future.

Uranium deposit type

OECD/NEA-IAEA (2014) classifies uranium deposit types into following 15 categories, which are arranged according to their approximate economic significance;

1. Sandstone deposits
2. Proterozoic unconformity deposits
3. Polymetallic Fe-oxide breccia complex deposits
4. Paleo-quartz-pebble conglomerate deposits
5. Granite-related
6. Metamorphite
7. Intrusive deposits
8. Volcanic-related deposits
9. Metasomatic deposits
10. Surficial deposits
11. Carbonate deposits
12. Collapse breccia-type deposits
13. Phosphate deposits
14. Lignite and coal
15. Black shale

Potentiality of increase in uranium resources

Canada produced 8,998tU in 2012. All amounts of uranium were mined from the Proterozoic unconformity deposits. The Proterozoic unconformity deposits are generally large scale and are characterized by their high ore grades. For example, present principal uranium mines (Cigar Lake and McArthur River deposits) contain more than 100,000tU with the ore grade of more than approximately 15%U_3O_8. The plane extension is 1,700m long and 30m wide in the McArthur River deposit, and 1,950m long and 20 to 100m wide in the Cigar Lake deposit. The deposits locate in the

depth of more than 400m below surface.
Many uranium deposits have been discovered by extensive exploration activities since 1960s. However, many target areas remain to be unexplored, because the distribution of uranium deposits is so narrow and because drilling is only method to detect the deposits in deep underground. After the discovery of the McArthur River deposit in 1989, excellent deposits have been discovered such as the Millennium deposit in 2000 and the Phoenix deposit in 2008. New findings of uranium occurrences are continuously reported (e.g. Government of Saskatchewan, 2015). Taking these points into consideration, the discovery of new deposits and the increase in resources may be quite possible.
Australia produced 7,009tU in 2012. Uranium was mined from the Proterozoic unconformity, polymetallic Fe-oxide breccia complex and sandstone deposits. Development of the previously discovered deposits would be proceeded. Discovery of new deposits is quite possible by progress of exploration, because Australia has much unexplored land.
Reference
Government of Saskatchewan, 2015, Saskatchewan Exploration and Development Highlights 2015.
OECD/NEA-IAEA, 2014, Uranium 2014: Resources, Production and Demand.

Keywords: Uranium Resource

