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| **1:1 (2024 ) 3-9**  Global Energy |

Natural Geological Resources Used in Nuclear Energy Production: A Mining Perspective

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| A R T I C L E I N F O | A B S T R A C T | |
| *Article history:*  Received 21 November 23  Revised 11 March 2024  Accepted 13 December 2024  Available online 18 December 2024  *Presented in International Energy Summit 2024* | | A nuclear reactor requires components like enriched uranium or thorium that come from natural geological sources (rock, mineral) in order to generate energy. Nuclear reactors run on uranium, a radioactive actinide metal. Uraninite, carnotite, or thorite minerals are used to make uranium, which is found in deposits in Africa (Congo), Canada, and the United States (Colorado and Utah). In-situ leaching combined with uranium mining is known to supply 57% of global production, while traditional underground or open pit mining accounts for 43%. The principle behind ores in the traditional mining industry is to grind the ore to a single grain size before using a chemical leaching process to extract uranium. The natural "yellowcake" of uranium, which is currently marketed as U3O8, is ground into a dry powder. The top three producers of uranium are Canada, Kazakhstan, and Australia. Nuclear power plants use the uranium that is taken from the earth. In addition to being an essential strategic resource for national growth, uranium is a major supplier of raw materials for energy globally. In the upcoming years, nations are strongly searching for new energy sources and a shift to green energy as part of the "carbon footprint" targets and agreed practices. Growing geopolitical risks and economic worries appear to have raised awareness of the need for nuclear energy, and eventually its usage as a backup energy source.  2024 Batman University. All rights reserved |
| *Key words:* Economic mineralEnergyNuclear ReactorUraniumYellow cake \* Corresponding author.  E-mail address: sema.tetiker@batman.edu.tr | |

1. **Introduction**

Utilizing nuclear reactions to generate electricity is known as nuclear power. Nuclear fission, nuclear decay, and nuclear fusion reactions can all produce nuclear electricity. Currently, nuclear power plants use nuclear fission of uranium and plutonium to generate the great bulk of nuclear-powered electricity. Elements like enriched uranium (U) or thorium (Th), which are present in natural geological resources (rock, mineral), are required in nuclear reactors to generate energy. Nuclear power plants use uranium, a radioactive actinide metal, as fuel. The most significant uranium ore mineral in nature is uraninite, also known as pitchblende, which is an oxide of uranium. Understanding the natural geological origins of the uranium ore used to create uranium is a crucial precondition for the long-term usage of nuclear energy. In addition to its widespread use as fuel in nuclear power plants, uranium is a naturally occurring geological resource that is highly sought after. Cold War ideas in the energy sector, rising geopolitical risks, nuclear reactor building, and energy production activities with enormous potential for countries are all on the rise today. The main purpose of this study is to provide a general perspective in terms of uranium geology, data characteristics and uranium mining within the scope of the increasing nuclear energy potential.

**Acknowledgement**

*This paper was previously published as a conference paper in “Batman Energy Summit (BES2023), Nowember 2023”.*

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