

Advancements of Nuclear Energy for a Sustainable Future

Baozhu Zhang*

Department of Genetics, University of Sydney, Sydney, Australia

DESCRIPTION

One of the most significant advantages of nuclear energy is its low carbon footprint. It is defined by the need to reduce greenhouse gas emissions, nuclear power stands out as a virtually emissions-free energy source. Unlike fossil fuels, which release large amounts of carbon dioxide into the atmosphere, nuclear reactors generate electricity without producing such emissions during their functioning. While renewable energy sources are main components of a clean energy transition, they have their limitations. Solar and wind power are intermittent, dependent on weather conditions, and require energy storage solutions for consistent availability. Nuclear energy provides a stable and continuous source of electricity, capable of meeting baseload power demands.

Safety concerns and misconceptions

When discussing nuclear energy, safety is often a primary concern. The legacy of high-profile nuclear accidents, such as Chernobyl and Fukushima has created a perception that nuclear power is harmful. However, it is important that these catastrophic events were the result of unique circumstances and inadequate safety protocols.

Modern nuclear reactors have made significant advancements in safety. Passive safety systems, advanced engineering, and regulatory oversight contribute to minimizing the risk of accidents. Moreover, the nuclear industry continues to invest in research and development and focusing to make reactors even safer and more efficient. This includes the development of next-generation reactors like molten salt reactors and fast breeder reactors that utilize new fuel cycles by improving the safety and reducing nuclear waste.

The volume of waste generated by the nuclear industry is relatively small compared to the vast amounts of waste produced by other industries by including fossil fuels. Furthermore, there are established practices for the safe storage and disposal of nuclear waste, such as deep geological repositories, which are already in use in several countries. Innovations in waste management techniques, such as reprocessing and recycling are

also being explored to reduce the long-term impact of nuclear waste.

Economic viability and energy independence

In addition to its environmental benefits, nuclear energy can contribute significantly to economic growth and energy independence. The construction and operation of nuclear power plants create jobs and stimulate local economies. These facilities often require highly skilled workers, leading to the development of specialized workforce clusters that can drive economic development in regions with nuclear facilities.

Moreover, nuclear energy reduces a country dependence on energy imports, which can be a critical national security concern. By changing their energy mix with nuclear power, countries can increase their energy security and reduce their exposure to geopolitical tensions related to oil and gas.

Innovations in nuclear energy

The future of nuclear energy is not confined to existing technologies and plants. One area of innovation is Small Modular Reactors (SMRs). These compact reactors are designed to be more flexible, cost-effective and scalable than traditional large-scale nuclear plants. SMRs can be deployed in a variety of settings, including remote locations and regions with limited grid infrastructure. Their modular design allows for streamlined construction, reducing the capital cost barrier that often hinders the development of larger nuclear facilities.

Molten Salt Reactors (MSRs) represent another innovative approach to nuclear power. These reactors use liquid fuel and operate at higher temperatures by offering improved safety features and greater fuel efficiency. MSRs have the potential to significantly reduce nuclear waste production and are well-suited for a variety of applications, including electricity generation and process heat for industrial applications.

Furthermore, fast breeder reactors have the capacity to recycle nuclear waste, converting it into usable fuel. This technology has the potential to extend the fuel supply and further reduce nuclear waste volumes.

Correspondence to: Baozhu Zhang, Department of Genetics, University of Sydney, Sydney, Australia, E-mail: xind@ezweb.ne.jp

Received: 10-Aug-2023, Manuscript No. JFRA-23-27517; **Editor assigned:** 14-Aug-2023, PreQC No. JFRA-23-27517 (PQ); **Reviewed:** 28-Aug-2023, QC No. JFRA-23-27517; **Revised:** 04-Sep-2023, Manuscript No. JFRA-23-27517(R); **Published:** 11-Sep-2023, DOI: 10.35248/20904541.23.13.316

Citation: Zhang B (2023) Advancements of Nuclear Energy for a Sustainable Future. J Fundam Renewable Energy Appl. 13:316.

Copyright: © 2023 Zhang B. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.