

Overview

SDG9: Industry, Innovation and Infrastructure

Sustainable Industrialization

Nuclear energy systems and, in general, any application of nuclear science and technology, demand a multidisciplinary skill set for high-performing development and industrial deployment of market-competitive solutions. The long time frames required to develop from early ideas through technology qualification and finally industrialisation demand an integrated approach involving many stakeholders. The inclusion of universities, R&D laboratories, small and medium sized enterprises as well as a variety of industrial companies on the international scene are required to make such nuclear development and deployment a success. In addition, high-quality standards require inclusive partnerships with various stakeholders based on a high degree of mutual trust and quality of technical and economic performance.

The nuclear industry already provides great examples of inclusive long-term partnerships with various partners including the development of skills and capabilities as part of newbuild programs. It is gearing towards even higher-performing industrialisation schemes for the newbuilds in the coming decades by integrating innovative industrialisation processes supporting the current reactor fleet as well as the newbuilds and advanced technologies for tomorrow.

The nuclear supply chain for reactor commissioning, operation and maintenance and its nuclear fuel cycle entails among the lowest environmental impact of all decarbonised energy technologies. The high technology character of this supply chain yields sustainable high-paying jobs and technological excellence with important and broad economic benefits.

Fostering Sustainable Nuclear Innovation

Today's global economy is developing the world's natural resources and generating waste streams at an unsustainable rate. A redesign of unsustainable business practices is needed in order to preserve the world's natural resources and the health of future generations. The environmental performance of the commercial nuclear power industry is better than many other energy options, but it also must improve, and sustainable innovations like advanced nuclear reactor technology are needed to address global sustainability goals.

In comparison to conventional nuclear reactors, advanced nuclear construction uses significantly less cement and steel, two emission-intensive materials. While nuclear power plants produce carbon-free electricity during operation, the production of the cement and steel used in their construction releases some carbon emissions. Scientists and engineers have streamlined advanced reactor designs for simplified construction. Reactors like TerraPower's Sodium technology or Westinghouse's SMR will reduce the amount of nuclear-grade concrete by 75-80% when compared to traditional large-scale reactors. Also, most advanced reactor designs will operate at low pressures, eliminating the need for costly steel pressure vessels.

Advanced nuclear reactors are also more energy efficient. Next-generation designs will be able to achieve higher operating temperatures and thereby provide more efficient use of nuclear fuel and generate less waste. These designs will also be able use their excess heat for industrial processes like steel and cement production, water desalination, or hydrogen production, further reducing greenhouse gas emissions and the 40% of energy that is typically wasted in power production.



Sustainable and Resilient Infrastructure

The nuclear industry relies on a multimodal international transport network for the safe, secure and reliable movement of nuclear material between facilities. To ensure that shipments face minimal delays, this network must remain open and free from barriers. Internationally agreed regulations, such as those governing packaging and labelling, ensure that smooth transitions occur at all interfaces within regions and at international borders. The harmonisation of model regulations is also important for material that is transiting between the different regulations that govern road, rail, air, sea and inland waterway transport.

Industry representation at intergovernmental organisations, such as the International Atomic Energy Agency (IAEA), is crucial in ensuring that the industry viewpoint and technical expertise are available to policy makers when drafting legislation. This representation is achieved through non-governmental organisations such as the World Nuclear Transport Institute (WNTI).

Investment in the workforce ensures that qualified and properly trained personnel are available throughout the fuel cycle chain, thus protecting the routes used and ensuring that nuclear power stations receive the fuel that they need.

Investment in engineering, infrastructure and technology ensure that properly fit-for-purpose equipment and systems are available. Specially constructed flasks¹ are used to contain nuclear material during transport and storage, and these flasks are designed to facilitate ease of handling. In many instances, purpose-built transport vehicles are used for land transport, and purpose-built ships are used for maritime transports of the most radioactive materials.

¹ in the US they are called casks

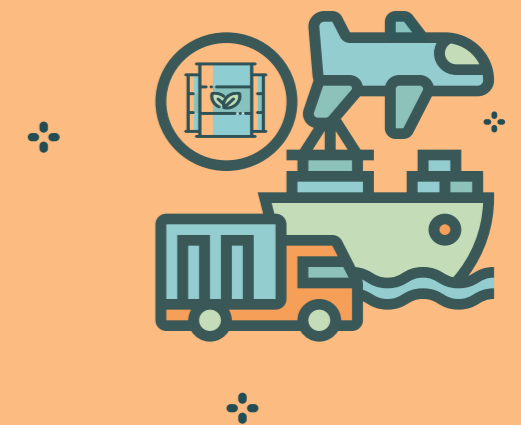
Nuclear as a driver of sustainability

Innovation has defined the success of nuclear energy industry in the past and remains essential for the sustainable future. Development of innovative nuclear technologies has shaped national and international efforts to define climate goals consistent with overall sustainable development goals.

Considering the world energy demand and sustainability-related constraints (economic, environmental, and social), nuclear energy represents an ideal option to meet the projected increase in global future energy needs in a sustainable manner and replace ageing infrastructure based on fossil fuels.

According to the OECD Nuclear Energy Agency, innovation in nuclear technologies requires a proper coordination of many policy areas including energy, science and technology development, environmental, industrial, safety and regulatory.

Therefore, investments in new nuclear are a driving force behind achieving UN Sustainable Development Goal 9 on building resilient infrastructure, promoting inclusive and sustainable industrialization, and fostering innovation.



www.newnuclearwatchinstitute.org/yestonuclear