Nuclear

Nuclear Industry and Transport

Direct impact

Indirect impact

Safe and secure nuclear transport

The transport of radioactive materials has a long history spanning several decades, with transports regularly taking place by road, rail, air, river, and sea. A stringent regulatory regime has been developed at both international and national levels. These all ensure that the safety and security of radioactive material is robustly assured when being transported.

The basic concept is that safety is vested principally in the package containing nuclear materials. The package must provide shielding to protect workers, the public and the environment against the effects of radiation, to prevent an unwanted chain reaction, to prevent damage caused by heat and to provide protection against dispersion of the contents.

A graded approach is applied when determining transport security requirements, where measures are employed as deemed appropriate. These range from the design of the package and vehicle used as well as security forces, access control, employee screening, satellite tracking and coordination with local and national security authorities.

To ensure security, transportation preparedness programs have been developed to assist state, tribal, and local responders with essential emergency services. Funds provided to these groups support continued training and have allowed for communication centers, telemetric monitoring technology, and other critical infrastructure to be built in communities that fall within radioactive material transportation routes.

Shipping this material has also encouraged innovation. Ongoing projects with the U.S. Department of Energy and the U.S. Navy are designing and testing new casks, buffers, and escort railcars for future large-scale transport. The railcars will use the most advanced designs and technologies available. Internatonally, shipping casks have been designed and constructed to safely transport radioactive material.

Sustainable development aspect

Given the significant current challenges of climate change and decarbonisation of a number of sectors and sub-sectors, in industry, transport, and heating, nuclear power is well suited to serve as a decarbonising agent in the energy transition. With transportation of radioactive material being an integral part of the nuclear industry, the nuclear industry could play a role in transportation decarbonisation.

Transport safety and security is not only a vital component during all stages of the nuclear fuel cycle, but it also has a direct and indirect impact on all 17 Sustainable Development Goals. As a result of the increased use of radioactive materials in various industries, medicine, and agriculture, the transport sector has become a key priority for decarbonisation, offering further protection of the environment,ensuring clean air, water, soil and boosting agricultural production.

Decarbonisation of the transport industry

Transport is a vital part of our lives, allowing us to travel across continents and cultures for leisure and facilitating the delivery of a variety of goods and services. Most of the transport today is based on fossil fuels with a high degree of electrification in public transport systems and a slow increase, though still marginal, of such electrification in private transport. The transport sector overall is responsible for about 25% of the world's total energy-related GHG emissions.

Achieving a more sustainable transport future requires some combination of the following: reducing the transport needs overall, modal shifting towards lower-carbon transport systems, lowering the energy intensity and reducing the carbon intensity of the fuels used. Nuclear can provide a more sustainable solution for transport in three domains:

- Enabling increased electrification in public and private transport by providing low-carbon electricity;
- Fueling freight transport as a propulsion energy source as has been practiced in some nuclear-powered freight vessels and ensuring a highly performing service in the military domain;
- Providing a prime low-carbon energy source for hydrogen production, as hydrogen is potentially a very effective and high-performing energy carrier for low-carbon heavy-freight transport.

In addition, nuclear-produced hydrogen has been rightly identified as a vital tool in the necessary decarbonisation of transportation sub-sectors that would otherwise prove difficult and expensive to decarbonise via electrification. It can be employed in new and novel applications as a means to replace current fossil fuel use and deliver wider decarbonisation (as well as fuel diversification).

In industrial and transport applications, hydrogen can be used in the production of liquid transport fuels to replace oil. The greater deployment of hydrogen fuel cell electric vehicles (FCEVs), in tandem with the deployment of hydrogen refuelling stations (HRSs) are one means of decarbonising the transport modes requiring longer distances and faster refuelling times, such as trains, heavy-duty trucks and long-distance coaches.

Nuclear-produced hydrogen may also play a role in the decarbonisation of the aviation and shipping subsectors, which together account for roughly 5% of total global emissions. This remains a long-term possibility as several technical and commercial obstacles must first be overcome. Using ammonia made from zero-carbon hydrogen in shipping is a potentially promising option.

Viewpoint

Radioactive Material Transport

For over 50 years, consignments of radioactive material have been transported throughout the world. It is estimated that each year about 20 million transports take place, with a safety record that has ensured that there has never been a transport incident involving nuclear materials that has caused significant radiological damage to people or the environment.

Consignments are carried by road, rail, air, sea, and inland waterways. These have included fuel cycle material as well as radioactive material for other uses such as cobalt sources for medical use. It is likely that the number of these shipments will grow as the world tackles global challenges such as increasing access to essential medical services and combating energy poverty.

With the increased focus on nuclear science and technology, the necessary transport of radioactive material will bring new opportunities for the transport industry, building on the knowledge and capability that has been developed over the decades.

It is also exciting to follow the developments in nuclear technology that will enable the transport industry to become cleaner and greener. For many years transport has supported the nuclear industry through the safe and reliable delivery of its cargo. Now, as we embrace the United Nations Sustainable Development Goals, the nuclear industry can play an ever-increasing role in the energy mix that will support the transport industry with cleaner, greener fuel options such as electric vehicles and fuel cell technology.

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