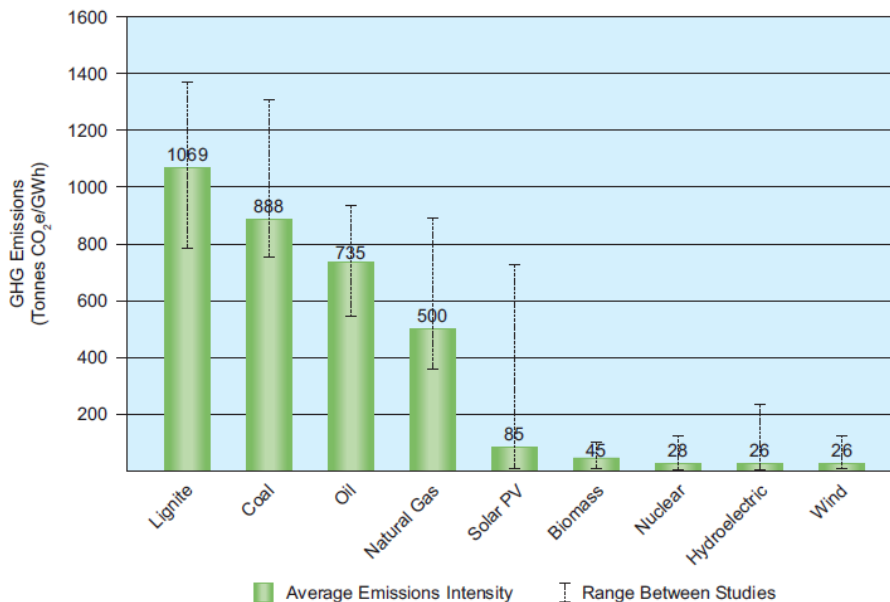


Chapter 2

The Benefits of Nuclear Power

Nuclear energy brings benefits to the national and local economy, while enhancing energy security and safeguarding the environment. This chapter explains the contributions of nuclear energy by briefly summarising country case studies by the experts who participated in the workshop. For example, nuclear had noticeably lower GHG emission compared to fossil fuels.

Figure 2-1. Lifecycle Greenhouse Gas Emission Intensity by Electricity Generation Method
(tonnes CO₂e/GWh)



tonnes CO₂e/GWh = tonnes of carbon dioxide equivalent per gigawatt-hour.

Source: World Nuclear Association (2011).

2-1. Lessons learned from experiences and cases in the United States

Public acceptance is a problem that relates not only to technological and economic issues, but also to sociological ones. Public acceptance calls for specialised knowledge, but communicating with the public using an issues-based approach, such as population problems, air pollution, and climate change, may be more effective than merely explaining the technical aspects. Global populations are increasing, and this will result in an increase in energy consumption. Fossil fuel energy use is growing in developing countries,

and the consequences of continued dependence must be considered. We should promote the use of low-carbon-emission energy. In the past, communication about nuclear power did not focus on these points, choosing to dwell instead on safety and technical issues.

Although the supply of clean (i.e. low-carbon-emission) and stable energy is important, the perfect power source that fulfils both criteria does not exist. Thermal, hydroelectric, renewable, and nuclear power generation all have their strengths and weaknesses. It is therefore necessary to create a desirable energy mix, while taking this big picture into account.

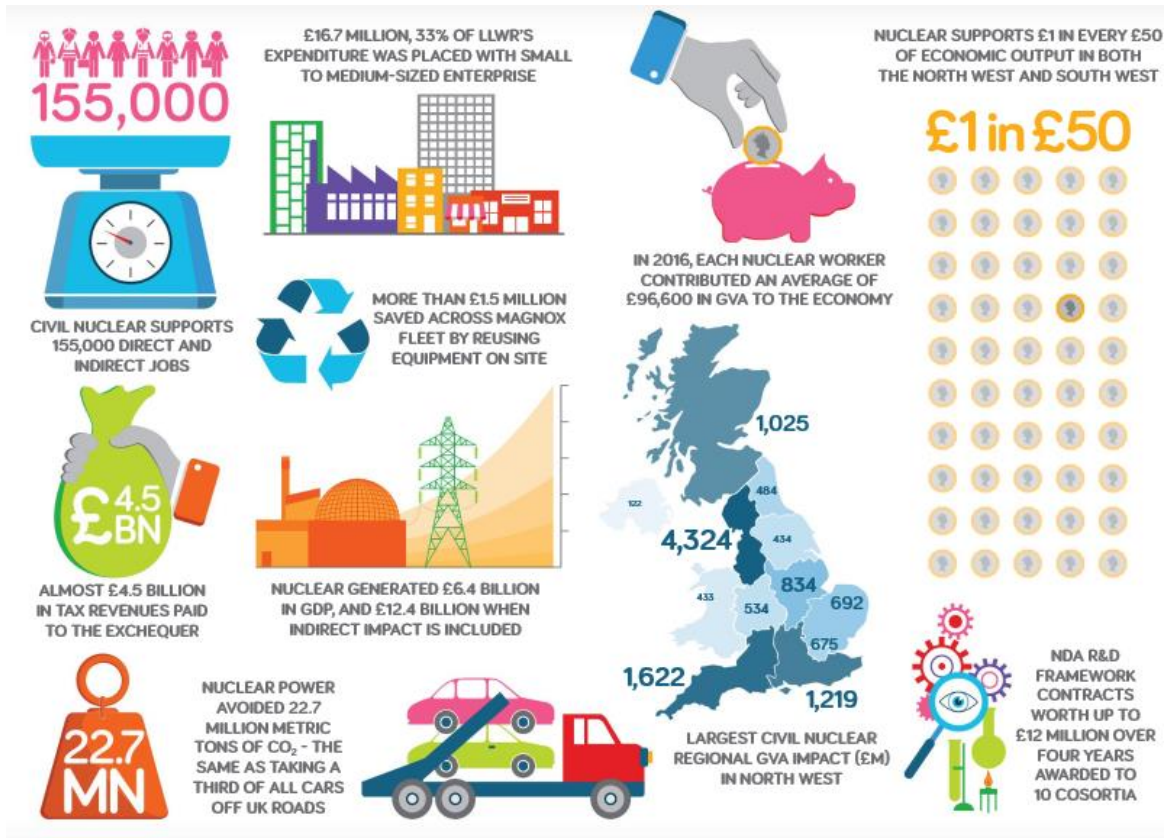
A harmonious relationship with the local community is vital to the construction of power plants and the installation of transmission networks. In the US, where consumers can choose to buy renewable energy, and it may also be a good idea to offer the option of nuclear power as a low-carbon energy source. Although individuals have a degree of choice as to their preferred power source, they have no choice when it comes to the risks of potential exposure. Therefore, building harmonious relationships while respecting the choice of individuals is an immense challenge.

2-2. Lessons learned from experiences and cases in the United Kingdom

Oxford Economics estimated the economic value of nuclear power in the UK (NIA, 2017) (Figure 2-2). The report revealed the following facts.

- The UK's civil nuclear sector contributed £6.4 billion to the UK economy in 2016.
- This economic impact increases to £12.4 billion and 155,000 jobs when the sector's expenses on associated goods and services in the supply chain and the wages paid to employees are taken into account.
- Nuclear operations provide a saving of 22.7 metric tonnes of carbon dioxide – the equivalent of removing one-third of UK's cars from the roads.
- There was a 4.5 terawatt-hour increase in output from nuclear stations, meaning nuclear remained the largest single low-carbon source of electricity in the UK.
- Nuclear produced enough electricity to power 16.3 million homes.
- Constructions began on the first new nuclear power station in a generation at Hinkley Point C.
- Significant contracts in the UK and overseas were awarded to UK supply chain companies.
- Cost savings were made across all decommissioning projects, including more than £200 million at Sellafield.

Figure 2-2: Nuclear Contribution to United Kingdom Economy, 2016



Source: Nuclear Industry Association (2017), *Nuclear Activity Report 2016*.

Nuclear power is an important UK industry. Building a harmonious and co-operative relationship with local industries and local governments based on the country's industry policies is therefore of great importance. The Government of the United Kingdom has stressed the importance of nuclear power to the domestic industry, and therefore the industrial sector, the national government, and local governments are cooperating to realise policies established by the national government. A cross-cutting relationship needs to be established between industries, the education sector, and the government.

More than 180 nuclear-power-related organisations exist in the UK. Wales has successful experience in the stable operation of existing power plants, and residents are not anxious about the construction of new plants. Furthermore, the construction of new plants brings greater employment and business opportunities. Sites with existing nuclear power facilities are often selected for the construction of new nuclear power plants.

Safety and related costs, the impact on the local community, and the proportion of employment procured locally are some of the important factors to consider. It is vital to ensure that primary

contractors and operators are present at the plant's location, demonstrate support for the local community, and contribute to improvements in site safety.

2-3. Lessons learned from experiences and cases in Finland

For many years, those opposed to nuclear power have maintained that nuclear power is dangerous and causes problems in terms of the disposal of radioactive waste, and that investment should be made in renewable energy instead. However, various data and analysis counter these views. For example, data on the number of fatalities per unit of energy produced show that nuclear power fatalities are overwhelmingly low compared with other energy sources (World Nuclear News, 2010). Furthermore, while there are concerns about the health effects of radiation, it is not necessarily true that nuclear power poses a more serious health hazard than other hazards such as air pollution. The merits of nuclear power, such as its ability to supply a far higher volume of electricity than renewable energy for the same facility capacity, need to be explained in terms that are easy to understand.

2-4. Lessons learned from experiences and cases in India

The first nuclear power plant in India was built in 1963, and there are now 22 nuclear reactors and 7 nuclear power plants in the country. Furthermore, agreements have been concluded to construct 10 new 700-megawatt power plants.

There are three key reasons why nuclear power generation is important in India. First, it provides a stable supply of energy over the long-term. Second, it is perceived as an important baseload for coping with strong power demand. Third, it fulfils an important role in coping with long-term energy demand.

India faces challenges in fostering public acceptance, selecting sites and acquiring land, coping with fuel depletion, fostering responsibility in the private sector towards the Nuclear Damage Law, and ensuring safety. Despite such challenges, nuclear power is perceived to be of great importance to India's future.

Governance by the Central Electricity Regulatory Commission is key to ensuring safety, and citizens understand that the nuclear power plants are managed appropriately through such regulations. For this reason, they have continued to accept nuclear power plants of the same model as the one used at Fukushima, even after the nuclear accident. The government has imported power plants from Russia and is currently constructing the Kudankulam nuclear power plant. Although this was initially opposed by the local community, the government emphasised the need for energy, and eventually succeeded in commencing construction.

2-5. Lessons learned from experiences and cases in Thailand

Although there are no nuclear power plants in Thailand, debates about projects to construct nuclear power plants have been ongoing since the 1960s. However, after it was discovered that Thailand possessed rich natural gas resources, the debate subsided somewhat. Last year, however, the Government of Thailand conducted a survey on the safe use of nuclear power. In plans formulated based on the survey, public acceptance is positioned as one of the important elements. A survey conducted for every region in the country on the acceptance of nuclear power plants showed that there was a degree of acceptance mainly in the northern part of Thailand. Thailand must prepare itself for a possible shortage of its natural gas supply. To this end, it should consider the introduction of nuclear power as an alternative means of energy production.

2-6. Lessons learned from experiences and cases in Japan

Efforts to attract nuclear fuel cycle facilities (to process spent fuel) were initiated in Rokkasho village in 1980. A cold wind known as the 'Yamase' blows through this region, resulting in low agricultural productivity. Hence, about 4,000 of its population of 12,000 had left the village to work elsewhere. Although there was some opposition amongst the residents during the initial efforts to attract nuclear facilities, the nuclear fuel cycle project contributed to economic growth, employment, and the development of education infrastructure. Today, the residents do not have to move to other regions for work and there is a high level of acceptance of nuclear power in the village. As all energy sources have their strengths and weaknesses, there is a clear need for nuclear power as a component of the energy mix. However, it is natural to want operators to continuously improve safety and to interact and work closely with residents on aspects that impact their lives.

The spread of education activities is one of the benefits of nuclear power. In Rokkasho village, examples of the contributions to the village include initiatives for short-term homestays overseas for elementary and junior high school students to promote international understanding, and a fund to help its children continue their studies at university level. The Rokkasho branch of Tohoku University is also located in the village, and residents can study subjects such as quantum engineering at this institution.