

Nuclear Science and Technology in Malaysia

Nuclear science and technology has been playing an important role in the overall development of science and technology, and socio-economy throughout the world. In general the application of nuclear science and technology consists of two major sectors, namely power generation and non-power applications

In many developed nations, the immediate spin-off of research and development in nuclear power production is the non-power applications of the technology in various fields such as food and agriculture, water resources, medicine, industry and archaeology. Malaysia is an example of a developing nation benefiting the outcome of this technology. Private sectors as well as state-owned companies are typical beneficiaries of the technology in the country.

The Malaysian Institute for Nuclear Technology Research (MINT) as the sole nuclear research institute in the country plays a supportive role to promote wider application of the technology in the various sectors through aggressive research and development activities. The main objective of the nuclear research organisation is to improve socio-economy of the country from application of nuclear science and technology. This can be achieved through production of new products, processes, and as first beneficiary of technology transfer. In addition. MINT also plays an active role to ascertain safe use of the technology nationwide.

Having the advantage of cutting across many subject boundaries, nuclear technology can be utilised in various economic sectors in Malaysia. The results of R&D in nuclear technology show the significant contribution to the economic prosperity and quality of life. Among others are:

- *Agriculture.* Increase the yield of commodities through mutation breeding, nutritional intake and soil-plant relationship studies.

- ❑ *Medicine.* Provide quality healthcare through introduction of nuclear medicine for diagnostic and therapeutic purpose, and quality assurance of radiation equipment.
- ❑ *Industry/Manufacturing.* Improve productivity and quality of products, and identification of engineering faults.
- ❑ *Hydrology.* Identification of potential water resources and sedimentation rate through isotopic tracer techniques.
- ❑ *Environment.* Improve healthy environment through quality monitoring protocol and enhance waste treatment strategies especially radioactive waste.

Realising the true potential of R&D in nuclear technology, MINT, as a frontier in this sector, has taken great efforts and measures to carry out R&D activities in these fields, either at organisational level or through collaborative research be it with public research institutes or private sector companies. In promoting the collaborative R&D, the Government has also provided matching grants for companies in selected sectors to undertake R&D projects for the purpose of rental facilities, salary and R&D costs. In encouraging the technology transfer and improve the capability of bumiputera technopreneurs, the procurement policy for contract will be awarded on long term basis to enable bumiputera technopreneurs to undertake R&D projects.

Nuclear Power Programme

Currently, the main source of energy supply of the world is oil and gas. Understandably, every nation is dependent on the OPEC and oil cost is fluctuating and continuously rising since world oil crisis in early 1970's. Malaysia has embarked on a vigorous programme to diversify its energy supply and utilisation patterns. The national 5 fuel-policy is based on the utilisation of oil, hydropower, coal, natural gas and renewable energy resources. Although nuclear power does not feature in this strategy but in the long-term energy development, the nuclear power option cannot be ignored. These are due to technical, financial and environmental reasons as follows:

- *Economic reasons.* Study in the USA shows operating cost per kilowatt/hour (kW/hr) currently favours nuclear. The comparison is as follows:

Nuclear	USD 0.18/kw/hr
Coal	USD 0.21/kw/hr
Natural Gas	USD 0.35/kw/hr

At the current high price of fossil fuels, nuclear energy looks attractive and merits a second look.

- *Prospects and limitations of alternative energy sources.* Resources such as gas and petroleum may dry out in the next 20 to 30 years. The nuclear power production reduced dependency on oil and gas that can be channelled elsewhere to boost petroleum related industries such as production of inclined demand for polymeric materials.
- *Supply and demand of energy.* Inclined population growth and the need for industrialisation for creating wealth require ample supply energy and electricity.
- *Growing environmental concern.* Nuclear power is environmental friendly as it unleashed power without combustion thus free of pollutants gas emission, particularly the green house gases.
- *Development.* Long lead time for installation of nuclear power station, i.e., it normally takes between 10 and 15 years prior to electricity generation.
- *Sustainability and renewability.* Except hydropower generation, the rest of power generation resources are not meeting this requirement.

Realising the need for early and adequate preparations of nuclear power programme, a series of studies had been carried out to systematically examine the possible role of nuclear power in Malaysia and to evaluate the national state-of-preparedness for a possible introduction of such programme. The purpose of these studies is basically to establish and gather sufficient information to enable well-founded decisions to be made at the appropriate time with regard to the possible utilisation of nuclear power in Malaysia. Those areas of interest include regulatory frameworks, siting, human capital, financial sources, and managements of waste, environmental impact assessment, public acceptance and grid integration.

Summary

The notable applications of Nuclear Science and Technology, where Nuclear Research Institute and other related organisations in Malaysia involved are in the areas of agriculture, medical, industrial and environmental applications. The R&D in nuclear science and technology is commendably active, whereby the NST researchers not only play leading role in R&D to innovatively produce national and international marketable new products, processes and specialised services, but also providing infrastructure to other users from various institutions in the country.

The Nuclear Research Institute and the related organisation in Malaysia currently strategise a plan to improve R&D toward more focused in the activity and fulfilled the requirement of stakeholders and business communities. This may be optimised through close cooperation with local Research Institutes, business communities and researchers from institutes of higher learning. In the area of nuclear power applications, there are a lot of rooms for improvement. In light of the current escalation of inclined oil price, it is wise for a revisit on the feasibility of using nuclear technology for power production complementing the current 5-fuel policy of the government.