

National Nuclear Development Policy and Nuclear Engineering Education and R&D at University Teknologi Malaysia

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1. Introduction

The need to create a Nuclear Engineering Program at Higher Education Institutions in Malaysia was based on the intention to use nuclear energy as a source of national electricity generation, particularly in Peninsular Malaysia in the post-2020 period. This was contained in several Cabinet Meeting decisions, including The National Nuclear Policy (NNP) approved in 2010, and the country's Economic Transformation Program (ETP) which is one of the pillars of the New Economic Model (NEM) with the objective of making Malaysia a high-income nation by 2020.

2. National Nuclear Policy

The vision of the NNP is to develop peaceful, safe & secure utilization of nuclear energy & technology for national well-being & sustainable development and the mission is to enhance national capability & competency for peaceful, safe & secure utilization of nuclear energy & technology for sustainable development & national well-being through technological innovation & appropriate legal & regulatory framework towards eventual technological self-reliance. Implementation of this Policy will be guided by two Policy Objectives, the first of which is specifically for use for the energy sector, and the second for various uses for the non-energy sector, particularly for industrial use, health care, agriculture, and environmental and resource management.

The focus area for implementing this Policy is contained in the 10 Thrusts one of which is Human capital development and verification of efficiency for safe use of nuclear energy and technology for public purposes (Thrust 8). Five strategies are identified to realize the objective of Thrust 8. They are: Developing national science and technology education programs; Developing a continuous nuclear education program; Developing national nuclear efficiency and certification scheme; Maintain trained human capital in nuclear and Develop a nuclear education institution.

The Under the ETP, two of the first nuclear power plants in Malaysia are targeted to start operating and generating electricity in 2021 and 2022 [1]. However, the date has since been postponed to 2030[2] after the accident at Fukushima Daiichi. Despite this postponement, a number of initial steps have been taken

to support the development of the nation's nuclear power program, including education. Universiti Teknologi Malaysia (UTM) took a proactive step by taking the first batch of Bachelor of Engineering (Nuclear) students in September 2012.

The 10th Malaysia Plan (10MP) has also stated that initial project preparation such as feasibility studies, human capital development and public awareness campaigns will be implemented, in the context of nuclear energy development as an option for electricity generation in Peninsular Malaysia which will be considered to ensure reliable and effective supply cost [3].

3. Nuclear Education

Prior to the Nuclear Engineering program in UTM, there have been several programs in the field of nuclear science in Malaysia already. Universiti Kebangsaan Malaysia (UKM) runs nuclear science program, Universiti Sains Malaysia runs Medical Physics program and UTM runs Health Physics program. Several other universities offer nuclear related courses as elective courses.

3.1 Nuclear Engineering Program in UTM

Universiti Teknologi Malaysia developed the curriculum for the Bachelor of Engineering (Nuclear) program with reference to the guidelines issued by the IAEA[4]. The formulation of the curriculum also took into account the views of various stakeholders and benchmarked against top universities running similar programs around the world.

The curriculum has also to fulfill the requirements of the Program Standards: Engineering and Engineering Technology by the Malaysian Qualifications Agency (MQA - Malaysian Qualifications Agency), the Engineering Accreditation Council (EAC) and the Ministry of Higher Education (MOE). It has just received total accreditation of four years.

The curriculum of a nuclear engineering undergraduate program comprises university core / compulsory courses, basic science and engineering courses, core courses of programs covering core faculties and nucleus of nuclear engineering, as well as program elective courses, with a graduating credit hours of 135. The curriculum of a nuclear education program should be regularly reviewed by specialists in the field,

whether from within and outside the country, including from industries related to nuclear activities, to overcome the risks of non-compliance with qualifications of graduates with market requirements. If the nuclear power program is delayed, the nuclear engineering graduates will still have the opportunity to work in various other areas of engineering, such as materials, software development, and non-nuclear energy industries. In other words, job opportunities for nuclear engineering graduates are not focused on nuclear engineering alone.

Table 1. Nuclear Engineering Students Enrolment

Student	Session					
	2012/ 2013	2013/ 2014	2014/ 2015	2015/ 2016	2016/ 2017	2017/ 2018
Year 1	32	30	23	15	29	30
Year 2	-	31	30	23	15	29
Year 3	-	-	31	30	23	15
Year 4	-	-	-	31	30	23
Total	32	63	84	99	97	97

Since the first intake of students in 2012, there have been five more batches as summarized in Table 1. Two batches of students have graduated. Most of them are opting to further their studies, and not necessarily in nuclear field. A number of them are working in various sectors of the industry and other are undergoing training in Non-Destructive Testing and Radiation Protection.

3.2 Nuclear Research and Development in UTM

The country's involvement in nuclear activities has begun since the 1970s. The country has many nuclear scientists working in institutes of higher learning (IHE), government agencies, and private organizations. Among the areas of research are Radiological protection, Radiation Dosimetry, Nuclear Physics Theory, Neutron Activation Analysis, Medical imaging, Simulation Study in Reactor Physics, Environmental Radioactivity and Selection of Reactor Sites and Emergency Plan. However, there are only four academic staff (two in UTM) who have nuclear engineering background in IHE. UTM application to offer postgraduate academic programs has not been approved yet. As such, R & D activities are not as active as it should be and most are in collaboration with Malaysian Nuclear Agency (MNA).

3.3 Challenges

Even though the academic program has received accreditation from EAC, it is not a full one. Their major requirements for the program to have at least eight nuclear engineers and three must be qualified as professional engineers have yet to be met. Other challenges are how to have enough laboratories and to equip them up in order teaching and research activities

can be carried out. It is desirable to have the teaching staff to be expert in as many nuclear fields as possible.

To ensure the marketability of nuclear engineering graduates, they must have a level of knowledge and soft skills that are comparable to foreign graduates. To achieve this, the curriculum and training levels are in line with the curriculum and training levels available at world-renowned universities. This situation can be achieved through close collaboration between them.

4. Conclusions

Depleting oil and gas reserves give very clear signal that Malaysia needs energy from other sources. This is further exacerbated by the increasing demand for electricity from the industry and domestic users, and rising oil, gas, and coal prices. Nuclear energy is the only best option despite the many worries about safety of NPP and radioactive waste. The first two nuclear power plants in Malaysia are targeted to start operating and generating electricity in 2030. In order to prepare for human resource requirements, UTM started to offer the first Nuclear Engineering academic program in 2012. Despite many challenges the program is still running strong, with the help of many parties from within and outside of the country. To date, more than 60 students have graduated and around 100 are still pursuing their studies in UTM.

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