MALAYSIA STRATEGY TOWARDS ESTABLISHING NATIONAL POLICY FOR E&T IN RADIATION, TRANSPORT AND WASTE SAFETY

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ABSTRACT

The usage of ionising radiation in Malaysia encompasses of diverse usage such as medical, industry, agriculture, research and others for national well-being. Education and training in Radiation, Transport and Waste Safety is a vital component to maintain sustainability and to ensure the safety of radiation workers, members of the public and the environment from radiation hazards.This paper present the initiatives taken for the establishment of the nuclear education & training strategy and policy in Malaysia. It analyzed current status of Human Resource Development (HRD) and nuclear education and training framework of Malaysia and conducting TNA (Training Need Analysis) and benchmarking exercises. The features of the current nuclear education & training in Malaysia are independent, dispersed and unintegrated within stakeholders. Linkages and cooperation systematically integrated between institutions are not visible. As a result, duplicated programs and resource allocation, and inefficiency have been identified. Therefore, this paper proposed the national nuclear education & training system model as a policy initiatives and establishment of national steeering committee to oversees that manages and centralise overall nuclear education & training.

1. Introduction

IAEA has introduces the concept of a national strategy for building competence in protection and safety in Member States in order to address educational and training needs in the field of radiation protection and the safety of radiation sources in IAEA Strategic Approach to Education and Training in Radiation, Transport and Waste Safety, 2011–2020.[1].

In line with IAEA statute and commitment as Member States, Malaysia has taken steps towards building competences and establishing strategy for education and training RTWS. The introduction of the Atomic Energy Licensing Act, followed by the establishment of the Atomic Energy Licensing Board (AELB) in 1984 were serious initiatives taken by the Malaysian Government to regulate, safeguard and monitor the ionizing radiation activities in Malaysia. In addition, AELB is to complement the functions of Malaysian Nuclear Agency (Nuclear Malaysia) that focuses on the application and promoting the peaceful uses of nuclear and related technologies for national development. Its follows with steps of participating in EDUTA mission in 2005 and 2015 and ETRES mission in 2014. Nuclear Malaysia has been running a very detailed and comprehensive annual programme for education and training in radiation protection in collaboration with AELB and other relevant institutions. A formal national strategy for building competence in radiation protection has not been formally finalised. However, some elements of this strategy are believed to be available, e.g. a well-designed annual training programme with a realistic time frame has been developed and it has been successfully implemented.[1].

The overall aim of establishing the strategy is to develop a human capital development programme required to sustain an adequate level of national capability and competency on RTWS for sustainable development and societal wellbeing.

2. Current Status of E&T in RTWS in Malaysia

Nuclear Malaysia has been providing training courses on radiological protection for more than 30 years and has extensive experience in the development of training materials. A wide range of training courses in radiological protection are currently provided by training organizations, both nationally and internationally, and significant effort has been devoted in determining appropriate levels of training, methods of training provision, course content and training infrastructure. The occupational level training courses currently vary from one-day courses for operators of straightforward equipment such as X-ray baggage inspection cabinets, to week-long courses for radiation protection supervisors in a wide range of practices. The number of participants increases each year, and in 2016 around 2845 participants from several sectors, i.e. Radiation Safety and Health (64.5%), Medical X-ray (16.5%), NDT (10.1%) and Environmental Safety and Health (8.9%) were trained [2]. Through this courses, radiation workers will able to understand and apply the concept of radiation protection at workplace. This will certainly benefit an organization with ultimate goals of continuously striving for a healthy, accident-free and environmentally sound workplace and community, while providing the technical support needed to meet the national mission. Beside Nuclear Malaysia, there is 7 other training centre accredited by regulators to conduct training in radiation protection [3].

Since 1970s, there are nuclear-related subjects being taught at local universities . Table 1 show that eight universities conduct programmes related to non-power applications of nuclear science and technology; four of them offer such programmes at postgraduate level. These are results of progress and development in the non-power sector of the application

of nuclear science and technology in the country. As can be seen, the courses are largely concentrated in the medical applications, which is consistent with the growing number of nuclear medicine centers in the country.

INSTITUTES	LEVEL OF STUDY	PROGRAMME
UKM	Undergraduate	Bachelor in Nuclear Science
	Postgraduate	Diagnostic Imaging and Radiotherapy Master of Medicine (Radiology) Master of Science (Radiation Safety)
	Postgraduate	Master of Science (Safety, Security and Safeguard)*
UM	Undergraduate	Bachelor of Biomedical Technology (Nuclear Medicine)
	Postgraduate	Master in Medical Physics (coursework)
USM	Undergraduate	Bachelor of Applied Science in Medical Physic Bachelor in Medical Radiation
	Postgraduate	Master of Science in Medical Physic (coursework) Master of Medicine (Radiology)
UPM	Undergraduate	Bachelor in Applied Radiation (research subject in Radiation Synthesis and Medical Physics)
UTM	Undergraduate	Bachelor in Health Physics Bachelor in Nuclear and Energy Engineering
UiTM	Undergraduate	Bachelor in Basic Nuclear Technology and Application of Radioisotope and Radiation (major subject in 3th year)
UNITEN	Undergraduate	Bachelor in Mechanical Engineering with elective courses (i) Introduction to Nuclear Engineering, (ii) Radiation Detection and Nuclear Instrumentation, (iii) Introduction to Reactor Physics, (iv) Reactor Thermal-hydraulics, (v) Radiation Safety and Nuclear Waste Management, and (vi) Nuclear Policy, Security and Safeguard
UNIMAS	Postgraduate	Condition Monitoring and Non-Destructive Testing (PhD)

Table 1: University Offering Nuclear Related Courses

Since 1980s, nuclear education outreach for secondary schools was successfully implemented in Malaysia. The programme is well collaborated between Malaysian Nuclear Agency (Nuclear Malaysia), Ministry of Education (MOE) and Ministry of Science, Technology and Innovation (MOSTI). The nuclear education outreach are known as Nuclear Science and Technology (NST) Talk and Exhibition for Secondary Schools, Nuclear Camp *Veni Vidi Vici* and Scientist Icon Roadshow and IAEA Technical Cooperation Program in Compendium of NST for Secondary Schools Pilot Programme [4]. By participating in this programme, Malaysia has enriched the new method in outreach activities so that the students become more engaging with science. Besides all the programmes mentioned, Nuclear Malaysia has also organised few

programmes which indirectly promoting NST to students; nuclear facilities visit, public exhibitions and nuclear talk.

2.1 Policy Framework

The legal and regulatory framework for atomic energy in Malaysia is provided through the Act 304, which provides for the regulation and control of atomic energy, for the establishment of standards on liability for nuclear damage and for matters connected therewith or related thereto. The regulatory body, Atomic Energy Licensing Board (AELB) within the Ministry of Science, Technology and Innovation (MOSTI), is responsible for regulation in the area of radiation and nuclear safety, nuclear security, safeguards and liability except for medical applications which are regulated by the Ministry of Health on behalf of AELB.

Requirements and provisions are established calling for all persons associated with work with ionizing radiation to be suitably trained and qualified. Sub-Regulations 15(8), of the Atomic Energy Licensing (Basic Safety Radiation Protection) Regulations 2010 require that *"the licensee or the employer to provide appropriate training, retraining and facilities for updating the skills and knowledge of their workers"*.[5] The regulatory body has established guidance specifying which persons should have particular qualifications and the process to be employed for the recognition of such qualifications. Such requirements and guidance are enforced by the regulatory body.

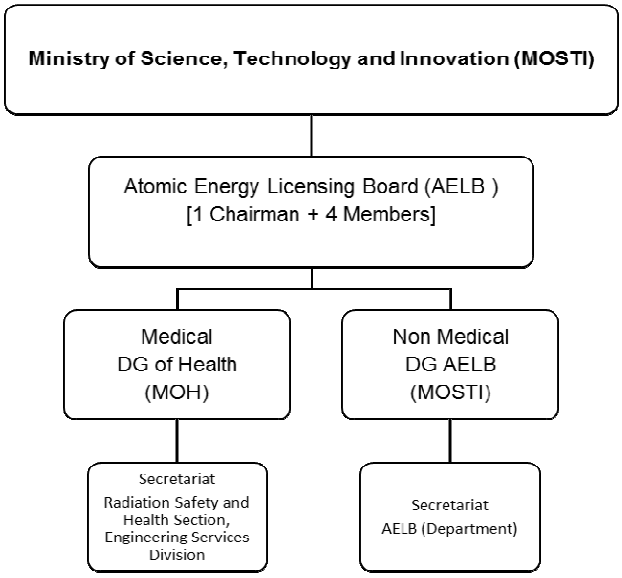

Fig 1: Regulatory Function

2.2 Nuclear Infrastructure and Stakeholders

For a successful education and training strategy, all relevant stakeholders must be identified and involved. Stakeholders' identified are regulatory body, research agency, utilities, education institution i.e. universities and training center, certification body and scientific/professional organization and government. However, needs of leading organization to spearhead and coordinate the strategy is very importance.

The establishment of a national nuclear research institute in 1972, now known as the Malaysian Nuclear Agency, catalyzed the development of nuclear science and technology in Malaysia. The institute was set-up as a research and training facility to develop the manpower and technical capability for the introduction of nuclear power program in Malaysia. A 1 megawatt thermal nuclear research reactor was built and commissioned in 1984. However the discovery of oil fields and subsequent development of petroleum industry in Malaysia in the middle of 1980s set the program back. The diversity of nuclear science and technology enables the institute to instead focus in its non-power applications. Currently, Nuclear Malaysia has a total of 815 personnel, of which 313 are researchers having tertiary degrees. The figure comprises of 64 with PhD and 90 with Master Degree (MSc) representing 21% and 27% respectively. The remaining 159 personnel with bachelor's degree (BSc) qualification are mainly the newly recruited personnel [6]. Hence, Nuclear Malaysia involvement in setting up the E&T landscape in Malaysia are undeniable.

The administrative infrastructure for further growth of the technology in Malaysia was completed with the setting-up of the Atomic Energy Licensing Board (AELB) in 1985. The board is the regulatory agency that implements the Atomic Energy Licensing Act which was enacted in late 1984.

For nuclear safety training, stakeholders identified includes Malaysia Nuclear Power Corporation (MNPC) and Tenaga Nasional Berhad (TNB). On January 2011, (MNPC) in its capacity as the country's Nuclear Energy Program Implementing Organization (NEPIO) was established to spearhead Malaysia's nuclear power program. The government is studying the possibility of deploying nuclear energy to meet future demand and diversify the energy mix for Peninsular Malaysia

TNB is the largest electricity utility in Malaysia with RM117.1 billion in assets and capital expenditure of RM10.8 billion in power plants and system improvements [6]. Its core businesses are generation, transmission and distribution of electricity throughout Peninsular Malaysia, the state of Sabah and the Federal Territory of Labuan. TNB owns and operates a total 10,818 MW of installed capacity comprising of thermal generation facilities and major hydro-generation schemes in Peninsular Malaysia. Other TNB businesses include operation and maintenance services, manufacturing of electrical equipment such as switchgears, transformers and cables, and higher education and research services. TNB employs approximately 36,000 staff group-wide to serve an estimated 8.9 million customers nationwide [7]. TNB also owns its education and training infrastructures which is ILSAS and UNITEN.

3. Strategy Initiatives for Building Competence in RTWS

3.1 Dissemination of Information

The first action taken by Malaysia Nuclear Agency is to conduct Special Meeting & Briefing on the Establishment of Steering Committee for the Preparation of National Strategy on Education and Training in Radiation, Waste and Transport Safety. This meeting was conduct in 2013 at Nuclear Malaysia with targets to disseminate information to stakeholders, gained support and established linkage.

Stakeholders invited were Atomic Energy Licensing Board Ministry of Health, Ministry Of Education, USM and UKM. Mr John S. Wheatley, Head, Technical Assistance and Information Management Unit, IAEA Division of Radiation, Transport & Waste Safety was invited to conduct the briefing.

However, the commitment from the stakeholders to the next steps was very slow due to issue of responsible lead agency, source of mandate and availability of current committee for RPO certification (JKPPPS).

3.2 Commitment and Support from Stakeholders

In 2015, IAEA has conducted Regional Workshop addressing on Establishing National Policy in Education and Training at Kuala Lumpur Malaysia. This workshop has trigger the importance of needs assessment and national strategy by sharing other countries experience. Therefore Nuclear Malaysia has taken the initiatives to lead the interim committee and conduct national workshop.

The workshop has been conducted on 19-21 October 2015 with attendance of several key person from regulatory body, certification body and public university. Participants conduct needs assessments about the capacity, skills and responsibilities of regulators and radiation workers in RTWS. Acquisition of information on facilities and activities related to RTWS was available from regulatory body database. Analysis on education and training requirements specified in the legal and regulatory framework and defining the skills and levels of education and training required for RTWS stake holders was carried during the workshop. Information necessary for the analysis of training needs including feedback on implementation is described in the Safety Guide on Building Competence in Radiation Protection and the Safe Use of Radiation Sources (RS.G-1.4) para [4.11]. However, without information sharing within stakeholders, the task will be not accomplished as the data is confidential and only can be access by subjected officer.

From the TNA results, there has been a significant increase in the industrial applications of radiation sources in Malaysia. In 2015 there were about 4444 workplaces involved with ionizing radiation from 3 categories of job activities, namely medical, industrial and non-destructive testing, NDT. As results, the number of workers in this field is steadily increasing, with around 18,820 radiation workers in 2008 and 21,113 in 2015. Approximately 40.9% of the total workers are from the industrial, 52% from medical and 7.1% from NDT sectors. Below is the latest data of number of radiation facilities and radiation workers in Malaysia.

NO	TYPE OF CERTIFICATION	TOTAL
1	Radiation Protection Officer	1043
2	Supervisor	635
3	Workers	16335
4	Trainee	465
5	Radiation Protection Consultant	511
6	Qualified Expert	10
	TOTAL	**21,113**

Table 2. No. of Radiation Workers in Malaysia

PRACTICES USING RADIATION SOURCES	NUMBER OF FACILITIES		
	EXISTING	FORESEEN (< 5YRS)	TOTAL
Industrial Radiography	83	15	98
Irradiating Facilities including Research Reactor	5	1	6
Gauging	778	60	838
R&D	46	5	51
Mineral	23	5	28
Nuclear Medicine	30	8	38
Radiotherapy	34	9	43
Dental	1598	400	1998
Radiology	1851	463	2314
Veterinary	82	21	103
Laboratory	2	1	3
TOTAL	**4444**	**988**	**5520**

Table 3. License Radiation Application in Malaysia

Source: AELB Database until October 2015

3.3 Policy Suggestion

Draft of the policy/strategy has been prepared during the National Workshop on 19-21 October 2015. Strengthening collaborations among the stakeholders and establishing working committee to support the steering committee were taken to formalise the national strategy. Commitment and support from relevant authorities to establish the policy/strategy to formalize/endorse the related documents were needed. Members of the WG including all stakeholders i.e Atomic Energy Licensing Board (AELB), Ministry of Health, Department of Skill, USM and Nuclear Malaysia. The visions of the policy are transforming education and training in radiation, transport and waste safety (RTWS) for national well-being and sustainable development. The strategies includes Development of a National RTWS Education and Training Programme, Continuous Training Programme, Development of a National RTWS Competency and Certification Scheme and Development of Educational Institution. The policy also suggested for establishing a network of training provider for coordinated and integrated nuclear education and training programme. The policy still under review before submitting to the relevant authorities for endorsement.

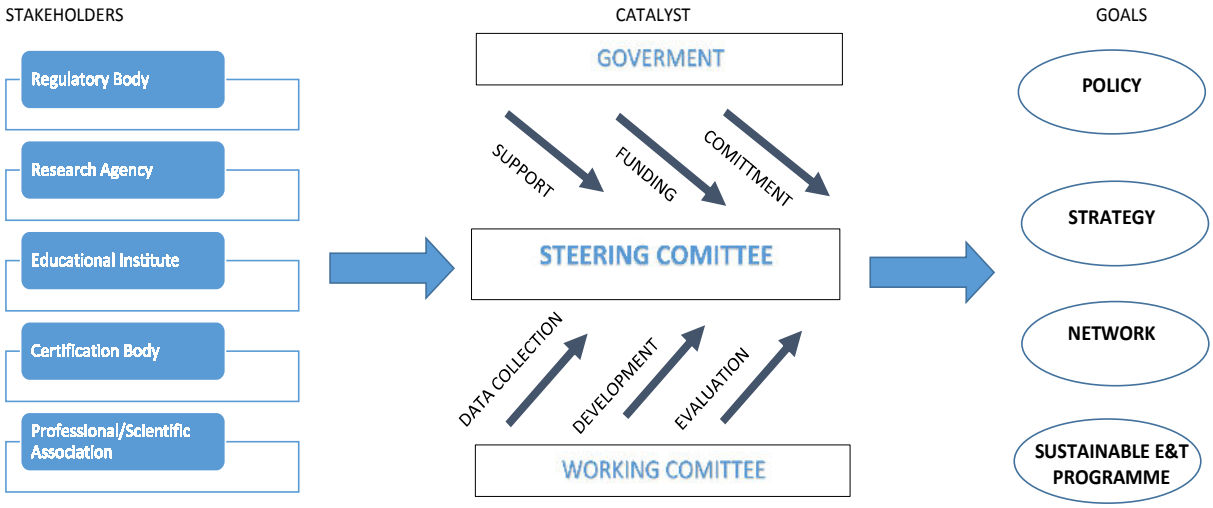

Figure 2: Strategy Model for Establishing National Policy

4. Conclusion

Comprehensive and integrated planning and implementation to develop national strategy on E&T in RTWS shall involve all relevant stakeholders within the HRD framework of Malaysia (industry, educational institutions, etc.). Cooperative partnership and collaborative efforts can assist in strengthening the national E&T programme on RTWS and must be expanded beyond borders to enable sharing of expertise and experiences for a better and balanced global development. The needs of formalized E&T policy/strategy deem fits to Malaysia E&T objectives for sustainable societal well-being.

Having discussed about the status of nuclear education and training in Malaysia, it is concluded that Nuclear education and training in Malaysia has contributed importantly to the country's self-reliance on nuclear technology for peaceful use; it is expected to take a more innovative role to meet the need of attracting young scientists to the nuclear field, preserving nuclear knowledge as well as advanced nuclear energy technology development. The community of nuclear education and training in Malaysia is making an extensive efforts to strengthen its capability at national level including established linkage, networking and sharing information and resources.

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