Enhancing R&D in Nuclear Malaysia through International Cooperation

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Abstract

Nuclear Malaysia is mandated by the Government of Malaysia, inter alia, to spearhead Research and Development (R&D) in nuclear and related technology. Technically, nuclear technology is a highly specialised subject in which expertise are thinly spread over the globe with concentration in mainly developed countries. Nuclear technology also tends to be politically sensitive and handling of radioactive materials and equipment needs high level of skills and knowledge for the safe and secured uses of this technology and needs to be regulated. Hence international cooperation and multilateral approach is of vital importance for the development and sustainability of peaceful uses of nuclear technology and to provide assurance that the interests of all parties are safeguarded and remains in check. In this context, the International Atomic Energy Agency or the IAEA, a UN agency, plays a vital role where international cooperation in nuclear technologies is centred. Malaysia also contributed a fair amount of financial resources to the IAEA as part of its international obligations to keep the Agency afloat.

This paper provides an insight into various services and facilities offered or available at the IAEA in which researchers in Nuclear Malaysia could utilize in order to expand and enhance their R&D activities in nuclear and related technologies, as mandated by the Government of Malaysia, as well as ensuring that our investments will provide good returns in terms of socio-economic benefits, both tangible and intangible.

Keywords: international cooperation, multilateral approach, IAEA, nuclear R&D

1. Introduction

The main objective of Nuclear Malaysia as mandated by the Government of Malaysia is to spearhead Research and Development (R&D) into nuclear and related technology. Technically, nuclear technology is a highly specialised subject in which expertise are thinly spread over the globe with concentration in mainly developed countries. Nuclear technology also tends to be politically sensitive since misuse and abuse of this technology could have disastrous impact, hence the need for various safety, security and safeguard regimes such as the NPT, CTBT and various international conventions and standards committee. This also entails that handling of radioactive materials and equipment needs high level of skills and knowledge for the safe and secured uses of this technology. Nuclear industries are therefore highly regulated to ensure compliance to such stringent procedures and processes. Hence international cooperation and multilateral approach is of vital importance for the development and sustainability of peaceful uses of nuclear technology and to provide assurance that the interests of all parties are safeguarded and remains in check.

IAEA is a United Nation (UN) agency which is the world's centre of cooperation in the nuclear field. It was set up as the world´s "Atoms for Peace" organization in 1957 within the United Nations family. The main objective of IAEA is promotion of nuclear science and technology for peaceful purposes (atom for peace) based on the three main pillars, or areas of work, which underpin the IAEA's mission: Safety and Security; Science and Technology; and Safeguards and Verification which forms the mandatory functions or the central roles that IAEA plays. The IAEA's mission is guided by the interests and needs of Member States, strategic plans and the vision as embodied in the IAEA Statute. The Agency works with its Member States and multiple partners worldwide to promote safe, secure and peaceful uses of nuclear technologies. IAEA provides an international platform for collaboration in various fields of nuclear technology and are effective means for multilateral co-operations, providing knowledge repository, pools of expertise and central links to all other organizations related to the use of nuclear technology for peaceful purposes.

The IAEA’s Secretariat is headquartered at the Vienna International Centre in Vienna, Austria. Operational liaison and regional offices are located in Geneva, Switzerland; New York, USA; Toronto, Canada; and Tokyo, Japan. The IAEA also runs or supports research centres and scientific laboratories in Vienna and Seibersdorf, Austria; Monaco; and Trieste, Italy. The IAEA Secretariat, the international body of staff tasked with running the Agency, is made up of a team of about 2300 multi-disciplinary professional and support staff from more than 100 countries. They come from scientific, technical, managerial, and professional disciplines.

The Agency is led by a Director General (currently Mr Yukiya Amano from Japan) and six Deputy Director Generals who head the major departments as follows:

i. Department of Management (DDG-MT)
   Responsible for general management, financial services and support, legal and various support services such as ICT, logistics etc
ii. Department of Nuclear Science and Application (DDG-NA)
   Responsible for promoting and providing technical services and support for all non-power applications i.e. application of nuclear technology in agriculture, industry, human health and environment
iii. Department of Nuclear Energy (DDG-NE)
   Responsible for the promotional, technical support and services and technology development for all nuclear power applications (NPP) i.e. for electricity and non-electric applications,

energy systems planning and development, collection, storage, preservation and dissemination of nuclear knowledge through nuclear knowledge management (NKM) programme

iv. Department of Nuclear Safety and Security (DDG-NSNS)
Responsibilities include technical and to certain extent management support and services for all issues related to nuclear safety and security; central roles for emergency preparedness and mitigation of nuclear incident, accident and emergencies; technical support and services for regulatory control and regulatory bodies

v. Department of Safeguard (DDG-SG)
Responsible for technical support and managing all issues related to nuclear safeguard

vi. Department of Technical Cooperation (DDG-TC)
Responsible for the management and programming of Technical Cooperation Programme (TCP) i.e. transfer of nuclear technology to selected member states based on needs and status of member states

2. IAEA's Technical Cooperation Programme

The IAEA's Technical Co-operation Programme (TCP) is an effective mechanism to transfer nuclear knowledge to Member States especially to developing economies. Under TCP, various mechanisms are used to realise the goals of transferring nuclear knowledge and expertise and capacity building to member states, such as implementation of the Technical Cooperation (TC) projects at the national, regional and interregional level, technical meetings (TM), training courses and other events jointly organised by TC or funded by TCF and finally through expert services and peer reviews provided by the agency.

2.1. TC projects – national, regional and interregional

National TC projects are programmed, managed and executed jointly between the secretariat (Programme Management Officers, PMO from TC Department and Technical Officers, TO from other technical departments such as Nuclear Science and Applications and Nuclear Energy) and national project counterparts from member states. Most national TC projects are geared towards knowledge transfer and capacity building within member states, according to needs and are funded through the TCF (Technical Cooperation Fund). Regional and interregional TC projects are also funded by TCF and programmed and managed by the secretariat and executed in conjunction with participating member states and usually covers areas that are of common interest to a region or to most of member states. TC projects are therefore very important for Malaysia in its quest to develop its nuclear technology as these provides effective mechanisms for developing our capacities and capabilities in the nuclear field, tapping into the vast knowledge and expertise available via the IAEA and are therefore of strategic importance for Malaysia to be active in these areas.

Another category of regional projects are those executed under formal regional agreements such as the RCA (Regional Cooperative Agreement for the Asia Pacific region) in which Malaysia are a party to. In such cases the participation to these projects are limited only to those signatories to the agreement and Malaysia is active in projects executed under the RCA and these projects play important role in our nuclear technology development as it provides multilateralism as well as regional flavours to the project, RCA also had its own mechanism for programming, managing and executing its projects in conjunction with the secretariat and it is vital for Malaysia to take part in such activities in order to protect our national interests.

2.2. TM and CS meetings and events jointly organised by TC or funded by TCF

TC regularly conducts joint events with other technical departments such as technical meetings (TM), workshops, trainings etc., usually under the aegis of a regional or interregional project. These are normally funded under TCF and hence all TC recipient member states, in which Malaysia is part of, are eligible to be funded under this scheme. Due to limitation in our ability to fund our participants to such events, it is therefore important for us to take part in such events under the sponsorship of the TCF and these events are important mechanism for knowledge sharing, technology transfer and capacity building for developing member states.

2.3. Expert services

The agency also provide expert services, peer reviews and consultancies to member states which could be funded by TCF either in full or partially, depending on budget availability. These are usually done on request by member states according to needs and accessed by the secretariat accordingly. Hence it is of importance that we keep a good repo with the secretariat and TC Department in order for Malaysia to take full advantage of these services.

3. Nuclear applications: power and non-power

Use of nuclear and radiation technology had made important contributions to some niche areas in agriculture, human health, industry and the environment and Malaysia through its nuclear R&D institute, namely Malaysian Nuclear Agency or Nuclear Malaysia, had been actively promoting the use of radiation sciences in enhancing products and services in those areas. In due course, Malaysia had developed a number of services and irradiation facilities for use in those areas, inter alia the Triga Mark II research reactor, Cobalt-60 gamma irradiator and electron beam machine (EBM), as well as various specialised analytical and support laboratories fitted for the intended purposes. Malaysia had also developed expertise and human resources to support all these activities. Further, Malaysia is also preparing itself for the eventual introduction of Nuclear Power as one of its electricity generation mix.

In order to sustain and further develop these programmes, again the issue of knowledge acquisition and capacity building is of paramount importance. Hence support and good cooperation from the agency in these areas are vital as Malaysia seeks to further develop its capabilities and human capacities in those areas, taking into account that many national incumbents in these areas are near their retirement age and there is huge gap between them and the new recruits. Malaysia seeks to gain from the agency through its programmes which are funded by the IAEA's regular budget, such as Technical Meetings (TM), Consultancy Meetings (CS), conferences, workshops, trainings etc. In many occasion these events are also co-funded by TC through TCF. These events provide effective avenues for exchange of information, knowledge transfer and multilateral networking among scientists and researchers.

As Malaysia is categorised under TC recipient states, Malaysian are eligible to be funded by the agency to attend such events but limitations are usually applied for participation per member states so as to provide a fair distribution of participants across all member states. Hence whenever necessary and if participation is of critical importance, Malaysia should also be ready to contribute to fund our participants for those events. Nuclear non-power applications is under the jurisdiction of the Department of Nuclear Science and Applications, headed by DDG-NA whilst nuclear power applications are handled by the Department of Nuclear Energy headed by DDG-NE

3.1. Coordinated Research Activities

IAEA is also conducting international or multilateral approach to nuclear research in selected topics under the Coordinated Research Activities (CRA) which are managed by the Department of Nuclear Sciences

and Applications or NA. These activities are based on Article III of the IAEA's statute which mandated the IAEA to encourage and assist research on and development and practical application of atomic energy and its applications for peaceful purposes throughout the world and foster the exchange of scientific and technical information and exchange of scientists for peaceful uses of atomic energy. CRAs have thus been designed to contribute to the fulfilment of this mandate by stimulating and coordinating the undertaking of research by institutes in IAEA member states in selected nuclear fields. It therefore create fertile ground for bringing together scientists from developing and developed countries to meet, focus on well-defined areas of research and exchange of knowledge, experience and ideas for their mutual benefits. Most of the Coordinated Research Activities are carried out under its Coordinated Research Projects (CRPs), which bring together an average of 15 scientific institutes from developing and developed countries to concentrate on problems of common interest.

Hence the objectives of CRP is to provide a platform whereby scientists from developed countries can be in direct contact with researchers in the respective fields and encourage the acquisition and promote the dissemination of knowledge and new technologies. CRP's research priorities are given to problems of significant regional and global concerns that has high potential for results transfer and cannot be produced at optimal level by individual member states. There are several mechanisms by which CRPs, are implemented, namely through research contracts or agreement. Contracts are awarded for 1 year and renewable for up to 3-5 years depending on the lifetime of the projects. Under such arrangement, scientists from interested member states work together under one project, probably looking at different angles or problems and will meet regularly to exchange ideas and information as well as report on progress thus far. Research Agreements are awarded for the whole foreseen of the CRP, whereby a specific member state are given a project or problems to be conducted at their premises funded by the IAEA, which monitors the progress and publish reports and any research results or outputs.

There is also some opportunity for doing Doctoral CRP whereby students from developing countries are paired with professors in developed country research institutions, the research contracts fund the student towards his/her PhD for a period of 3 years. These are somewhat limited but there is the possibilities which will greatly boost the capacity of member states especially for developing economies. Though TC projects and CRPs are conducted simultaneously, synergy do exists between them and often times CRPs led to TC projects and vice versa and could benefit from each other funding mechanisms. Malaysia could certainly benefits from these activities by joining any of the Coordinated Research Projects (CRPs) conducted under these activities which are of interest to us. Our scientists and engineers need to be made aware of the programmes and be encouraged to join.

3.2. International Project on Innovative Reactors and Fuel Cycles (INPRO)

In order to create sustainable energy systems throughout member states, IAEA had launched an International Project on Innovative Reactors and Fuel Cycles or INPRO, which seeks to conduct research, development and innovation into new and future proof energy systems, including nuclear power reactors, fuel technology and materials i.e. the complete chain of nuclear fuel cycles. Regardless of whether Malaysia will embark on a Nuclear Power Programme (NPP) or not, it is of strategic importance that Malaysia take active part in this project as this provides multilateral approach and international networking towards developing innovative nuclear energy systems and any member state, Malaysia included, stands to gain from such interactions which will results in the exchange of valuable information and transfer of knowledge between member states. Besides, multilateral approach to fuel cycles will be less politically sensitive and proliferation proof and hence member states can focus more on the technicalities rather than spending time and energy on managing the politicisation of the issues.

It will be more pertinent for Malaysia to actively participate in this project if it goes ahead with the planned NPP. Malaysia has been accepted as a member of this project since 2011 through its commitment to conduct technical works towards development of Thorium as a viable fuel of the future under the SYNERGY umbrella project, but so far participation has been limited to attendance in meetings and international networking. It has yet to start its research and development works and hence to contribute more substantively to this project.

4. References, standards, guidelines, guidance documents, websites etc

Through engagement with member states and various professional players in the nuclear industry, IAEA has produced a large collection of reference materials, reports, standards, databases, guidelines and guidance documents that are easily accessible to Member States, either electronically or by conventional means. It also has extensive library services and document management systems and knowledge portals such as the International Nuclear Information System (INIS). Hence Malaysia would stand to gain from access to these vast amounts of information and knowledge repository in order to pursue its capacity and capability building and be an active member in all those related activities such as INIS and Nuclear Knowledge Management (NKM) programme.

All these materials and facilities are accessible through the IAEA's website, http://www.iaea.org, though some sub-sites are classified and accessible to certain members only but even in the completely public domain, IAEA's website has a lot to offer to the general public, specifically to the scientific and nuclear research communities. The IAEA's website is a portal to all nuclear materials, online databases and a host of information and knowledge tools for anybody interested to pursue nuclear knowledge acquisition.

5. Discussions and conclusions

IAEA plays a central role in the collection, collaboration and dissemination of nuclear knowledge as it serves as a meeting point for international players in this field and hence its activities produces valuable inputs to nuclear research institutes such as Nuclear Malaysia, in which education and training, capacity and capability buildings still play major roles, whereby IAEA services is of great assistance.

There are also a great number of things that Malaysia can learn from IAEA such as the way the organizations and its resources are being managed and the ways by which the projects are being handled under the constraints of multilateralism which cuts across various political, cultural and social ideologies. For example, some useful concepts in managing TC projects such as the concept of bigger and better projects, umbrella or thematic projects, the use of Logical Framework Matrix/Approach (LFM/LFA) for quality project design, management and monitoring and the outcome-based or results-based management (RBM) approach are all useful methodologies that we can adapt in order to conduct our R&D activities more effectively.

Finally, it is important for Malaysia to maintain its visibility in international organizations such as the IAEA and gain international recognition, as such active participations will enhance our international standings and in turn will bring direct and indirect socio-economics benefits, in our quest to further develop our nuclear science and technology. Nuclear Malaysia as an R&D organization stands to benefit from the vast amount of knowledge and information at the disposal of IAEA through various networking mechanism available to member states as described in this paper.