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# Nuclear Security and HRD - Viet Nam's Effort

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## Abstract

Viet Nam is expanding its nuclear energy program for the application in various areas including industries, agriculture, healthcare, education and research. Recognizing the importance of the nineteen issues laid out in the IAEA document “*Milestones in Development of a National Infrastructure for Nuclear Power*”, Viet Nam is considering how to address these issues. This paper describes the establishment of nuclear security infrastructure in Viet Nam and how Viet Nam has addressed one of the nineteen issues, that is human resource development in nuclear energy in general and in nuclear security in particular.

## I. Introduction

Viet Nam is developing country in Southeast Asia of 93 million people. Since 1986 it has been modernizing its once centrally planned country and has achieved a gross domestic product of \$326 billion. It has a long history of the application of radiation and radioisotopes, in which a large number of radioactive sources have been used for various areas, including industries, agriculture, healthcare, education and research. Viet Nam also has more than 35 years of operation of a research reactor. Currently, we are planning to construct a new multipurpose research reactor and the first nuclear power plants in the future. To expand its nuclear energy program from a single research reactor, Viet Nam requires more than imported equipment, technology and fuel. It also requires regulatory, operational and training services, which are among the nineteen issues of the “*Milestones in Development of a National Infrastructure for Nuclear Power*” [1].

Ensuring nuclear safety and security is the top priority of the Government of Viet Nam in the peaceful use of nuclear energy. Further, Viet Nam understands that nuclear security rests entirely with the State and, although security is not a new concept, nuclear security needs a comprehensive approach. As such, an effective nuclear security regime shall be built on: adherence to all relevant international legal instruments; development of a nuclear security infrastructure, including legislation and regulations framework; implementation of nuclear security measures for nuclear and radioactive material and associated facilities and activities as well as measures for nuclear and other radioactive material out of

regulatory control. Viet Nam also recognized that human resource development (HRD) plays an important role for this regime to be effective.

The objective of this paper is to present Viet Nam's efforts in developing its human resource for its nuclear program. While the paper introduces an overview of the national nuclear security infrastructure, in which elements of the nuclear security regime are described, it also lays out efforts in the development of human resource development for nuclear program that Viet Nam has been made. In this Section, Policy on Human Resource Development, Structure of HRD Program and Education and Training Activities are discussed. Finally, the Conclusion emphasizes that Viet Nam has made every effort in developing its human resource to address the need of the expanded nuclear program.

## **II. Overview of the National Nuclear Security Infrastructure**

In the past years, Viet Nam has made every effort to enhance its nuclear security infrastructure. This includes strengthening the legal and regulatory framework for nuclear security, improving national nuclear security capability, enhancing the control of radioactive sources, strengthening detection capability to combat illicit trafficking of nuclear material and radioactive materials. Understanding the importance of international cooperation in the field of nuclear security, especially in training and education, Viet Nam actively participates in international efforts for nuclear security, including supporting multilateral instruments, collaborating with international organizations, and partnering with external stakeholders.

### **A. Adherence to International Legal Instruments**

Viet Nam has set very high standards for nuclear security and non-proliferation. The country has been a part of the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) since 1982. It signed Comprehensive Nuclear Test Ban Treaty (CTBT) in 1996 and ratified it in 2006. Viet Nam brought Safeguards Agreement into force with the IAEA in 1990, signed the Additional Protocol in 2007 and ratified it in 2012. Viet Nam is also a member of the Southeast Asia Nuclear Weapon Free Zone Treaty. In recent years, Viet Nam has been proactive in joining international treaties relating to nuclear security and nuclear safety. In 2012, Viet Nam has acceded to the IAEA Convention on Physical Protection of Nuclear Material (CPPNM) and at the same time ratified the 2005 Amendment. Relating to nuclear safety, in 2010, Viet Nam brought into force the Convention on Nuclear Safety, and in 2013 deposited its instrument of accession to the Joint Convention on the Safety of Spent Fuel Management and the Safety of Radioactive Waste Management and in September 2016 to the International Convention for the Suppression of Acts of Nuclear Terrorism (ICSANT). Furthermore, Viet Nam has participated in the Nuclear Security Summit (NSS) process since 2010 and pledged to implement commitments of the Communiqués and 2010 Workplan. Viet Nam is also a subscriber of 10 Gift Baskets, the initiatives of the participating States to implement commitments pledged at the NSS. The 10 Gift Baskets include: 1) Sustaining Action to Strengthen Global Nuclear Security, 2) Minimizing and Eliminating the Use of Highly Enriched Uranium in Civilian Applications, 3) Nuclear Security Training and Support Centers / Centers of Excellence, 4) Statement on Nuclear Detection Architectures, 5) Security of Radioactive Sources, 6) Strengthening nuclear security implementation, 7) In larger Security: A Comprehensive Approach to Nuclear Security, 8) Maritime Supply Chain Security, 9) National Legislation Implementation Kit on Nuclear Security, and 10) Nuclear Information Security.

### **B. National Legislative and Regulatory Framework**

Viet Nam approved its legal and regulatory framework for its nuclear energy sector in 2008 with the Atomic Energy Law [2]. As part of the Atomic Energy Law, it formally banned the development of

nuclear weapons and all forms of nuclear proliferation. The law has established the Vietnam Agency for Radiation and Nuclear Safety (VARANS) under the Ministry of Science and Technology (MOST) as the nuclear regulatory body responsible for nuclear safety, security, and non-proliferation.

Further, during the past few years, a number of regulations on nuclear security were issued by the Prime Minister and MOST, including regulations on security of radioactive sources, security of nuclear material and nuclear facilities, recovery and handling of orphan sources, prevention of illicit trafficking of nuclear and radioactive material, taking into consideration the IAEA recommendation of Nuclear Security Series.

### **C. Prevention Measures**

Viet Nam has established a national registry using the Viet Nam's customized Regulatory Authority Information System (RAIS) provided by the IAEA of all radioactive sources and administrative details of all licensees of radioactive materials. Viet Nam supports and implements in good faith the IAEA's Code of Conduct on the Safety and Security of Radioactive Sources and the Supplementary Guidance on Export and Import of Radioactive Sources. Within the framework of the Global Threat Reduction Initiative program, and with the support from the United States, Viet Nam upgraded physical protection systems for 24 radiation facilities with category 1 sources of radioactivity greater than 1000 Ci. The key challenge in upgrading these systems was the coordination between the on-site guards and the response force outside the facilities in case of nuclear security events since no mechanism for this coordination was in place at the time of the installation of the systems. In order to address this issue, Memorandums of Understanding (MOU) were signed between the two forces.

Physical protection for the research reactor in Da Lat was also upgraded through the cooperation with the US DOE Sandia National Laboratory during the period of 2008-2009, and in 2014. The upgrade was carried out based on the threat assessment between the facilities and various competent authorities. As the facility is, by regulations, an installation important to the national security, the facility already has been provided with off-site response force. In order to ensure effective response, workshops were organized by the regulatory body to support the facility to develop its contingency plan, and regular exercises have been conducted.

Furthermore, on February 26, 2014, Viet Nam, the Republic of Korea (ROK) and the IAEA signed the "Letter of Intent" to implement a Pilot Project for Radioactive Source Location Tracking System (RADLOT) in Viet Nam, contributing to the security of radioactive sources used for Non-Destructive Testing (NDT). This is also to fulfill the commitment made by Viet Nam's Prime Minister and ROK President at the Nuclear Security Summit in Seoul in 2012. It is expected that equipment installation will be completed in 2017. Furthermore, Viet Nam is also developing its indigenous tracking system for mobile radioactive sources used in radiography. It is planned that the system will be in operation by the end of 2016.

In order to assess threats in a systematic manner, Viet Nam has established a Task Group on Design Basis Threat (DBT) development based on methodology recommended by the IAEA. The Task Group is led by the Ministry of Public Security and information is being collected. To assist the regulatory body in verification, evaluation and inspection of physical protection systems of nuclear facilities with focus on nuclear power plants, an IAEA Expert Mission was conducted in March 2014 in Ha Noi. The Mission was not only for the exchange of expertise, but also for developing an Action Plan for further cooperation. The Action Plan was approved by both VARANS and the IAEA Nuclear Security Division.

## **D. Detection Measures**

Viet Nam is participating in the Joint IAEA-EU Project, through which Radiation Portal Monitors (RPMs) were installed and has been in operation at Noi Bai International Airport since April 2013. Through this project, an Integrated Nuclear Security Network (INSN) has been established, connecting the Local Alarm Station (LAS) at Noi Bai Airport to the National Data Analysis Centre (NDAC) at Customs Headquarters and the Alarm Support Centre (ASC) located at VARANS's Technical Support Centre for Radiation Protection and Emergency Response. The biggest challenge in this is the cooperation with the Customs. Before the Customs were involved in these activities, their knowledge and understanding of their role in detection of illicit trafficking was limited. This has been improved significantly since the cooperation with the IAEA. As such, they have been requesting further support in provision of RPMs at other international airports. They also have a better understanding of the importance of the coordination with relevant agencies in this endeavor, especially the nuclear regulatory body for technical support, and the need for Standard of Operation Procedure to be in place. Hence, the SOP has been developed and revised so as to address both airports and seaports. Furthermore, the nuclear regulatory body and the Customs have established a formal coordination mechanism in detection, and response to detection alarms in particular, and illicit trafficking in general. The Project is currently expanding to cover other international airports.

By participating in the Megaport Initiative, Viet Nam also contributes to international efforts in combating illicit trafficking of nuclear and radioactive materials. Since early 2014, RPMs installed in Cai Mep Seaport are already in operation. It is expected that RPMs will be also installed in other seaports under this Initiative.

## **E. Response**

On August 31, 2010, the Prime Minister issued Decision No. 1636/QĐ-TTg on approval of the Master Plan for a radiological environment monitoring and warning network [3]. The objective of this Master Plan is to establish a national network to promptly detect abnormal radiation within the territory of Vietnam, to actively assist in responses to radiological and nuclear incidents, to provide radiological data to support the state management on nuclear energy, and radiation and nuclear safety. Under this Master Plan, several Monitoring Stations will be established at Provinces.

At present, with the support from VARANS, a number of Provincial Emergency Plans have been developed. Exercises on emergency response were conducted in Hanoi, Quang Ninh, Lang Son, Da Nang, Thai Nguyen, etc. A number of lessons have been learnt from these exercises. Provisional training in advance for personnel participating in the exercises is considered to be valuable for the effectiveness of the response activities. Scenarios for the exercises should be realistic so that the participation of the personnel would be more efficient.

In addition, in 2012, the IAEA Emergency Preparedness and Review Services (EPREV) were conducted in Vietnam to assess the radiation emergency preparedness and response capabilities of Vietnam and provide recommendations for continued improvement. Currently, guidance on National System for Nuclear Emergency Preparedness is being drafted, which is expected to be a national platform for preparing and responding nuclear emergency situation, and coordinating all organizations engaged.

## **III. Human Resource Development for Nuclear Program**

The IAEA document “*Milestones in Development of a National Infrastructure for Nuclear Power*” emphasizes that significant education and training are needed to build up national capabilities and, during that process, national personnel shall gain practical experience. Viet Nam has received the Integrated

Nuclear Infrastructure Review Mission (INIR) from the IAEA in 2012, and its follow-up Mission in 2014. It was commented from these Missions that Viet Nam in Phase 2, whereas preparatory work for the contracting and construction of a nuclear power plant after a policy decision has been taken [1].

## **A. Policy on Human Resource Development**

The Government of Viet Nam recognizes that the establishment of an adequate infrastructure supporting HRD (nuclear engineering faculties, research groups and technical support centers) is indispensable for Viet Nam. Education and training abroad is essential for the next several years. Aging within the workforce is also an issue, which could lead to the risk of loss of nuclear knowledge if no measures are taken.

The Atomic Energy Law specifies the leading role of the Government in human resource development. In addition, the law stipulates the responsibility of the nuclear power plant (NPP) operator (EVN) for ensuring adequate manpower. Decree No. 07/2010/ND-CP [4] also specifies measures to attract and sustain people to work for the nuclear energy field, including providing favorable conditions for those workers.

Viet Nam envisions that an HRD program should provide both short-term and long-term education and training for manpower from various organizations such as regulatory body, lecturers at universities, and scientists for R&D activities.

It also recognized that it needs strong support from countries with mature nuclear infrastructure in developing human resources relating to nuclear safety and security. This support can be done through workshops and long-term training programs to meet human resource demand. Further, Viet Nam understood that a closer coordination between the “suppliers” of human resources (Ministry of Education and Training (MOET), Universities, Training Centers) and their “customers” (Vietnam Electricity - EVN, VARANS, Vietnam Atomic Energy Agency - VAEA, Vietnam Atomic Energy Institute - VINATOM) is needed to ensure the supply matches the demand in a timely manner.

## **B. Structure of HRD Program**

Viet Nam is preparing for construction of its first nuclear power plant to be in operation by 2028. The plan is that Ninh Thuan 1 NPP will be in operation first, and then followed by Ninh Thuan 2 NNP after one or two years. As such, Viet Nam recognizes that capacity building and human resource training for nuclear energy are the greatest challenges. These challenges may include: the coordination among stakeholders involved in the HRD program, including the regulatory body and the operator; the long term availability of qualified human resources; the need for policy/ measures/ incentives to attract people to work for nuclear sector and to maintain the workforce; the need for training and teaching skills through involvement in R&D activities and industrial operation; and high cost investment needed for a long term HRD program.

In order to address these issues, by Decision No 1558/QĐ-TTg on August 18, 2010 [5], the Prime Minister approved the project “Training and Human resource development (HRD) for nuclear energy” with the budget of approximately 150 million USD. Under this Project, in cooperation with relevant Ministries, the Ministry of Education and Training is responsible for implementation of undergraduate and graduate programs in various nuclear disciplines. The Ministry of Science and Technology is responsible for implementation of domestic and overseas training for personnel of the regulatory body, technical support centers and R&D institutes and EVN has the responsibility to implement domestic and overseas training for its staff. In order to effectively implement the Project, a National Steering Committee on training

human resources in the field of atomic energy led by Deputy Prime Minister was established by Decision No. 940/QĐ-TTg dated 17/6/2011 [6].

In addition, five Universities including Hanoi University of Science and Technology, Hanoi National University of Natural Science, Ho Chi Minh University of Natural Science, Dalat University, Electricity Power University have been assigned to provide education and training in nuclear disciplines. Also, a training center was established at VINATOM in April 2011.

Furthermore, in order to address the need in human resource development in nuclear security, Viet Nam is participating in the International Network of Nuclear Security Support Centers (NSSC) in planning to establish a Technical Support Centre for Nuclear Security and Safeguards. It is envisioned that this Center would serve multiple purposes: 1) providing technical support for regulatory activities relating to nuclear security; 2) providing training for the regulatory body's staff, and other relevant agencies such as the Customs, Ministry of Public Security and facilities in nuclear security in general and detection and response as well as equipment maintenance in particular; 3) as safeguards laboratory (some equipment used for security can also be used for safeguards purposes). This Center will, at first, serve the national needs, then the region, since Viet Nam has experience in the security of radioactive sources.

### **C. Education and Training Activities**

In 2012, MOST conducted a survey on the current status and further need for human resource development in the field of nuclear energy. The survey focused on collecting information relating to existing personnel with undergraduate and postgraduate degrees of each related organization (VARANS, VAEA, VINATOM, EVN) and analyzed the collected data to forecast manpower needs as well as training needs for each of those organizations.

The results of the survey showed that there is the need for long-term education and training, as well as short-term training. While the long-term education and training can be done at the universities in the country, and also through dispatching personnel abroad for PhD, Master degrees in nuclear advanced countries such as Russia, Japan, Sweden, France, USA and ROK, the short-term training can take advantage of regional and international training courses provided by the IAEA and other countries.

Under the Project "Training and Human resource development (HRD) for nuclear energy", EVN has already developed its "Training and HRD Project" which has been reviewed by an IAEA Expert mission and suggestions for further improvements and then approved by the Prime Minister's Decision No. 584/QĐ-TTg dated 11/4/2013 [7]. VARANS is developing an internal training course and recognizes the need for specific on the job training with experienced regulators. However, it should be noted that these activities mainly focus on nuclear safety.

In addition, Viet Nam also entered the cooperation with the nuclear power plant vendors: Russia and Japan and other nuclear advanced countries such as US, EC, France, ROK and Hungary. Under these cooperation, students were dispatched for undergraduate training and specialists for specific technical training courses. For example, in 2016, 70 students are to be sent to Russia and another 10 students to Japan for undergraduate programs; 15 core members for Ninh Thuan 2 Nuclear Power Plant were trained in Japan for 2 years (2012-2014), and another 9 core members were trained in 2014-2016. Numerous students also participated in postgraduate programs or training courses in KINS, KAIST, KAREI and KINAC of the Republic of Korea.

Furthermore, Viet Nam has collaborated with the International Atomic Energy Agency (IAEA) in the form of the so-called Integrated Security Support Program (INSSP). In 2011, together with experts from the IAEA, Viet Nam's representatives from various ministries have developed the INSSP, which was later

approved by both sides in 2012, and updated in 2014. Under this INSSP, various training activities have been carried out. In cooperation with the IAEA and other international partners such as the United States, Japan and the Republic of Korea, numerous workshops were organized on different topics including development of DBT, nuclear security legal and regulatory framework, security plan, physical protection system and contingency plan. In addition, national workshops for frontline officers and Mobile Expert Support Team (MEST), and coordination meetings for border monitoring were also conducted to ensure the sustainability of the detection system and effective response to detection alarms.

The implementation of the policy for HRD as well as HRD Program has been providing numbers of cadres for the nuclear energy sector. However, the implementation of the Decision No. 1558/QĐ-TTg on August 18, 2010 by the Prime Minister [5] has been slow. This is due to the fact that the program involves various agencies, such as MOET, MOST, VARANS, VAEA, VINATOM and EVN. Hence, it is important that coordination among these agencies is in place. Furthermore, as the program partly depends on the availability of received countries in term of time and lecturers, it is often difficult to make arrangement for intensive training abroad. Language barriers are also challenges that need to be addressed.

## **IV. Conclusion**

In ensuring a safe, secure, and peaceful use of their nuclear program, Viet Nam has been making every effort to strengthen its infrastructure for nuclear security. As Viet Nam is expanding its nuclear energy program, they have faced many challenges in the development of manpower in this field. Hence, Viet Nam has established the infrastructure to support its HRD program. This infrastructure consists of the policy, a legal framework, and a technical infrastructure, including nuclear engineering faculties, research groups and technical support centers. While the policy and the legal framework provide the legal basis for implementing the HRD program, the technical infrastructure is for the effective implementation of the program. Collaboration with other countries is also a measure for Viet Nam to address the capacity building in the field nuclear energy in general and nuclear security in particular.

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## **VI. Authors' Bio and Contact Information**

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Nguyen Nu Hoai Vi has been working in the nuclear sector for over 30 years. During the period from 1982 to 2006, she had been working for the Institute of Technology for Rare and Radioactive Elements, which is under the Vietnam Atomic Energy Institute (VINATOM), as researcher. In 2006, she was seconded to the Vietnam Agency for Radiation and Nuclear Safety (VARANS). Since 2006 to March 2016 she has worked as the Director of the Division of Nuclear Security and Safeguards. Since April 2016, she has been assigned to be the Assistant to the Director General of VARANS. Nguyen Nu Hoai Vi is chemist by training. She graduated from Ha Noi University in 1981. She holds a Master of Science in Chemistry from the University of Newcastle, Australia and a PhD degree in Chemical Engineering from the University of New South Wales, Australia.

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Vuong Huu Tan has been working in the nuclear sector for 37 years. Since 1979 to 1996, he worked for the Institute of Nuclear Research as researcher. In 1998, he was promoted to be the Deputy Director of the Institute of Nuclear Research and Vice-Chairman of the Vietnam Atomic Energy Institute (VINATOM). Since 2001 to April 2012 he served as the Chairman of VINATOM. In May 2012 he was seconded to the Vietnam Agency for Radiation and Nuclear Safety (VARANS). He served at VARANS as the Director General until November 2016. Vuong Huu Tan graduated from Ha Noi University of Technology as nuclear physics engineer. He holds PhD degree in nuclear physics from National University of Kiev, Ukraine. He was also a lecture at Da Lat University for several years.

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