

## Assessment on Regulatory Framework for Safety of Radioactive Waste Management as Preparation for Future NPP in Indonesia; a Comparison Study with South Korea

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### 1. Introduction

Indonesia is an archipelago country consisting of more than 18,000 islands with five main big islands; Java; the smallest among the five, with the most population which is more than 58% of the total 237 million people as national population living in it; Sumatera, Borneo/Kalimantan, Sulawesi and Irian which share half of its island to Papua New Guinea. Challenges in monitoring and controlling nuclear-related facilities in such widely spread geographical location is definitely high. Requirements of strong regulation and consistent law enforcement along with qualified human resources to perform their duties need to be satisfied in order to be able to cover the whole region with excellent strategic planning of actions.

Apart from the three research reactors, radioactive and/or nuclear facilities exist in industrial sites in Indonesia for various purposes. There are several types of nuclear energy utilization for industrial purposes. Irradiator is one type utilizing ionizing radiation generation or sealed encapsulated radioactive source commonly used for enhancing rubber flexibility without decreasing its quality level. Other application of nuclear energy utilization in industry is gauging implemented in beverage and cigarettes industries for measurement process by using radioactive source like Cs-137, Co-60 and Am-241Be to control maximum level of liquid in glass bottles and to check even distribution of tobacco in cigarettes. Nuclear energy utilization in Non Destructive Testing (NDT) application can be found in facilities like radiography for open facilities (usually for remote location with mobile equipment of NDT) and for closed facilities usually performed for piping inspection particularly in piping connection for structure and material inspection.

In oilfield service industry, we have oil well logging utilizing nuclear energy for formation evaluation process by having porosity and density measurements. Nuclear well logging is intended to get wellbore information regarding natural radioactive sources downhole in oil and gas exploration and exploitation. Tracer is another type of nuclear energy utilization in industrial facilities. Tracer is operated by utilizing radioactive source attached to the system to follow the behavior pathway of one or more components of the particular system. It is used to detect easily and clearly on low concentration radioactive level of the system, as well as to detect and take samples without destroying the active system.

Number of total radioactive and/or nuclear facilities for industrial purposes in Indonesia tends to be increasing as the implementation is getting wider. One of the nuclear authorities in Indonesia is the Nuclear Regulatory Agency (BAPETEN) which on behalf of the government grants the licenses to the respective facilities and monitors the regulation implementation on the facilities to ensure the safety, security and safeguard for the purpose providing protection to the people, property and environment.

Considering the wide use of nuclear energy application and implementation in industrial purposes facilities, qualified human resources for controlling the law enforcement to ensure the proper standards of safety and security including the management of the waste generated by various nuclear energy utilization.

Wide progressive demands of electricity for the future give challenges to the government to meet the projected needs of energy to be fulfilled. One of the options which can be considered reasonable in answering such problem to provide the high request of energy is by building nuclear power plant.

Understanding the much wider use of nuclear energy implementation within the country, nuclear and radioactive waste facilities need to be developed in meeting the capacity required for prospective requirements.

### 2. Methods and Results

#### 2.1. Review on Regulatory Framework for Radioactive Waste Management in Indonesia

Regulatory framework in Indonesia related to nuclear energy covers the Constitution 1945 depicted in Nuclear Energy Act No. 10 year of 1997 covering most legal aspects of nuclear energy and/or radioactive materials has been carried out by several more definite aspects of regulation in forms of government regulations. Due to the nature of mobility activities in several facilities which involve radioactive material transportation, special regulation is also applied as stated in Government Regulation No. 26/2002 about Safety on Transportation of Radioactive Materials. Regulatory framework in Indonesia prepared and established by BAPETEN has specified to the details of each type of nuclear energy and/or radioactive material utilization including the radioactive waste facilities safety requirements as guidance in BAPETEN Chairman Decrees.

Indonesia is a signatory to the Joint Convention of the Safety of Spent Fuel Management and on The Safety of Radioactive Waste Management, the Convention on Nuclear Safety, and the Convention on the Physical Protection of Nuclear Material. Most of all those conventions have been ratified and adapted or adopted by national regulations concerning nuclear energy implementation for nuclear installation and radioactive sources facilities in research reactors as well as medical and industrial fields.

## 2.2. Review on Regulation for Radioactive Waste Management in Indonesia

Government Regulation No. 27/2002 on Radioactive Waste Management regulates the general requirements of safety for radioactive waste management. Based on the definition stated within the general specification, radioactive waste includes all radioactive materials and/or any equipment contaminated by the radioactive materials which eventually turn into radioactive due to the operating of nuclear installation or any other installation using ionizing radiation which are not to be utilized in the future. In order to make it easier on regulating of managing radioactive waste since the generating period, grouping of radioactive waste is categorized as the following: low radioactive waste, intermediate radioactive waste and high radioactive waste. The grouping of radioactive waste itself is basically based on the quantity or amount of the waste and the quality as in the level of radioactivity of the waste. Some of the radioactive waste can be excluded from the safety requirement to be released to the environment as long as they meet the standards of clearance level that they do not exceed the maximum concentration activity, contamination level and the total activity as regulated within the national law.

A broad range of activities can be the source of radioactive waste generation including those involving a wide variety of radioactive materials associated with operation of nuclear facilities, the utilization of sealed radioactive sources in industry along with the use of human made radionuclides in hospitals and laboratories as well as the decommissioning of such facilities. Characteristics of the waste in term of physical, chemical and radiological term can differ based on their specification.

Radioactive waste stated within the regulation are those generated by the licensees during operating the nuclear energy facilities or installations. Facilities of radioactive management can be initiated by operators as state owned company, cooperation or private company. By regulation all of those radioactive waste management facilities should have license from the regulatory body prior to their first operation and even prior to their construction period up to the post decommissioning of the facilities. Activities included in the radioactive waste management facilities cover collecting, grouping, processing, transporting, storage and disposal.

## 2.3. Review on Regulatory Framework for Radioactive Waste Management in South Korea

The newly established Nuclear Safety and Security Commission (NSSC) in South Korea has definitely set up a high standard for nuclear regulatory agency's independence. It is expected to be a significant role model for any other countries regulatory agency. Regulatory framework in term of nuclear energy application and implementation particularly for radioactive and nuclear waste management can be an important reference for the international nuclear society.

The fact that South Korea has been regulated by a bilateral agreement with the US not to process any nuclear waste has encouraged the practitioners in radioactive and nuclear waste management to find the most suitable solution in dealing with these particular matters. Advance research institutes available within the country and full support of government along with private nuclear facilities have set up a strong basic for good examples of regulation implementation for international nuclear community.

## 3. Conclusion

Current conditions for radioactive waste management in facilities dealing for the particular matter in Indonesia need improvement and development. It is due to the fact that future demands for standardized radioactive waste facilities are highly required. International standards and requirements are progressively developed of which all country members are expected to keep up with the pace of rapid changes.

National regulation which becomes as one of the references for such facilities must have the capability in adapting and adopting the international most recent recommendations.

## References

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