# SAFETY AND SECURITY INTERFACE: THE IMPLEMENTATION ON THE TRANSPORT OF NUCLEAR MATERIALS AND RADIOACTIVE SOURCES IN INDONESIA

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**Abstract**

Indonesia is archipelago country with large area. The large use of radioactive materials in all over Indonesia needs serious attention on the safety and the security of the transport of these materials. Nuclear Energy Act No. 10 year 1997 article 27 mentions that the transport shall regard the safety of workers and public as well as the protection to environment. Particularly, government has issued Government Regulation (GR) No. 58 year 2015 on Radiation Safety and Security on the Transport of Radioactive Materials. In fact, there is interface between safety and security that needs adjustment in implementation of this regulation. The adjustment is based on potential threat that might arise. Therefore, there is a coordination of many institution involved before and during the transport. Indonesia has experiences in the transport of nuclear materials and radioactive sources. There are some cases of transport such as repatriation of spent fuel of research reactor, transport of imported nuclear material for research reactor fuel fabrication, and transport of radioactive sources from hospital to radioactive waste management facility. From those cases, it can be drawn lesson learnt on how to balance safety and security aspect in the transport of nuclear materials or radioactive sources.

**Key Words**: safety, security, interface, transport, radioactive source, nuclear material.

## INTRODUCTION

Safety and security are two important aspects should be implemented in the use of nuclear energy in Indonesia. Considering the importance, BAPETEN as regulatory body always keep updating its regulations to support the implementation of those aspects as well as the interface. GR No. 33 Year 2007 on the Safety of Ionizing Radiation and the Security of Radioactive Sources and GR No. 54 Year 2012 on the Safety and the Security of Nuclear Installation are two important regulation as bases for safety and security. On the transport, BAPETEN has issued GR No. 58 Year 2015 on Radiation Safety and the Security on the Transport of Radioactive Materials. This government regulation on the transport will be discussed more without neglecting previously mentioned regulation as well as consider related derived regulations. The appropriate strategy in implementing regulations should be taken into account so that the safety and the security are not compromising one to another. Regarding to the regulation implementation in the case of interface between safety and security, Indonesia has several experiences in the transport of nuclear material as well as radioactive source that can be taken as lesson learnt for the next transport activity.

## REGULATION

The transport of radioactive sources and nuclear materials are regulated comprehensively by GR No. 58 Year 2015 on Radiation Safety and the Security on the Transport of Radioactive Materials. This government regulation consist of 10 chapters and 110 articles and are intended to regulate the transport of Low Specific Activity Material (I, II, III), Special Form Radioactive Material, Surface Contaminated Object (I, II), Low Dispersible Radioactive Material, Fissile Material, and Uranium Hexafluoride (UF6). The structure of this government regulation is as follows.

TABLE 1. THE STRUCTURE OF GR NO. 58 YEAR 2015

|  |  |  |
| --- | --- | --- |
| **Chapter** | **Content** | |
| Chapter I General Clause | Definition and Scope | |
| Chapter II  Types of Radioactive Material | Low Specific Activity Material (I, II, III), Special Form Radioactive Material, Surface Contaminated Object (I, II), Low Dispersible Radioactive Material, Fissile Material, Uranium Hexafluoride (UF6) | |
| Chapter III  Safety in the Transport of Radioactive Material | Radioactive Material in Transport | Classification of Material: Low Specific Activity Material(LSA-I, LSA-II, LSA-III), Surface Contaminated Object (SCO-I, SCO-II), Special Form Radioactive Material, Low Dispersible radioactive Material, Fissile Material, Uranium Hexafluoride. |
| Requirements for Packagings and Packages | Classification of Packages, Categorization of packages, overpacs, and freight containers, Marking, labelling, and placarding, Determination of TI and CSI, Limits on TI, CSI, and radiation levels for packages and overacks. |
| Radiation Protection Program | Content of RPP, Dose assessment |
| Requirements for placement of packagings during transport and storage in transit | Consideration of transport modes, type of vehicles, radiation level, TI, and CSI. |
| Chapter IV  Security in the Transport of Radioactive Material | Special Form Radioactive Material, Low Dispersible Radioactive Material | Categorization of radioactive sources, classification of security level, security plan |
| Fissile Material, Uranium Hexafluoride (UF6) | Classification of nuclear material, physical protection plan |
| Chapter V  Management of Safety and Security in the Transport of Radioactive Material | Responsibility of consignor, consignee, and carrier.  Management System |  |
| Chapter VI  The System of Emergency Preparedness and Response |  |  |
| Chapter VII  Administration Requirement | Approval, notification, and validation |  |
| Chapter VIII  Administrative Sanction |  |  |
| Chapter IX Transition Clause |  |  |
| Chapter X Closing Clause |  |  |

For the purpose of security during the transport, requirements should be fulfilled by consignor, consignee, as well as the transporter as listed in Table 2.

TABLE 2. SECURITY FUNCTIONS IN TRANSPORT ACTIVITY

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Basic Security Level | Enhanced Security Level | Enhanced Security Level with Additional Measures | Physical Protection Measures |
| Catagorization of RA Sources/Nuclear Materials | Cat. 3 Source | Cat. 2 Source | Cat.1 Source | Cat. I, II, III, and IV NM |
| **Prevention Function** |  |  |  |  |
| Early notification to consignee | √ | √ | √ | √ |
| Early notification to BAPETEN | - | √ | √ | √ |
| Identification of personnel of transport company | √ | √ | √ | √ |
| Choice of transportation mode | √ | √ | √ | √ |
| Determination of route | - | √ | √ | √ |
| Determination of the area for transit or parking | √ | √ | √ | √ |
| **Detection Function** |  |  |  |  |
| Checking the vehicles | √ | √ | √ | √ |
| Using secure communication system | - | √ | √ | √ |
| Using tracking system | - | √ | √ | √ |
| **Delay Function** |  |  |  |  |
| Using key and seal | √ | √ | √ | √ |
| Process of handing over sources/nuclear materials | - | √ | √ | √ |
| **Respond Function** |  |  |  |  |
| Security and transport emergency response plan | √ | √ | √ | √ |
| Reporting in routine and emergency condition | √ | √ | √ | √ |
| Determination of radioactive source security officer | - | √ | √ | √ |
| Coordination with police or military force | - | - | √ | √ |

## EXPERIENCES IN SAFETY-SECURITY INTERFACE

In relation to GR 58 Year 2015, Indonesia has experiences in implementation of this regulation in several activities in transporting radioactive materials. Until now, there is no record of accident or incident that compromise the safety or security of radioactive materials during the transport. However, there was adjustment to accommodate the interface between safety and security. Below are some experiences in the transport of radioactive materials in Indonesia.

### Repatriation of Spent Fuel

In 2009, Indonesia returned US origin spent fuels from interim spent fuel storage facility in Serpong to Savanah River Site, USA. This repatriation activity was intended to transport 42 units consisting of 34 standard fuel of silicide and oxide and 8 control elements of silicide and oxide. It took about 9 weeks to transport the spent fuels, starting on July 29, 2009 until arriving in Savanah River site on September 26, 2009. The transport was using land as well as sea transportation modes. Considered as an important experience, this activity was involving several parties such as BATAN, US-DOE, PRO2SERVE, Areva Transnuclear Inc., PT. SpeedMark Indonesia, BAPETEN, Police, Navy, National Intelligence Agency, National Seaport Company PT. Pelindo II, and Custom, and BATAN was a leader in the activity. There were two teams involved, first was transport team consist of 59 persons from BATAN and related organization, second was police team involving 350 personnel. The repatriation activity was conducted successfully as those involved organizations were successfully cooperated and fully carried out their responsibilities.

In relation to safety-security interface in this activity, the transport schedule was carefully considered. It was arranged to be transport at night, starting at 23:00, with simulated assumptions that the traffic would have not been so heavy, there would have not been any possibility of flat tire or changing of vehicle, or security threat of terrorist. The scenario of escorting and route arrangement were also prepared carefully in transporting the spent fuels that travelled 160 km from interim storage in Serpong to Ciwandan-Cilegon seaport. The simulation of repatriation was conducted on July 27, 2009 to ensure that every organizations involved understood their responsibilities. The fuels were travelled at average speed 40 km/hours and arrived at seaport at 03:00. This activity was successfully conducted in accordance with the transport plan.

### Transport of Radioactive Source

In March 2016, there was the transport of Co-60 of therapy unit from Cipto Mangunkusumo Hospital in Central Jakarta to Radioactive Waste management Center BATAN in Serpong. The distance between two facilities is about 40 km. The transport was involving CM Hospital, RWM Center BATAN, BAPETEN, PT. Besindo as transporter, and Police. The activity was started by coordination meeting on February 29, 2016 to finalize the plan and to ensure that each organization understand its roles and responsibility. The next day, there was the Co-60 dismantling from therapy unit that starting at 11:15 and finished at about midnight. On March 2, the transport of Co-60 source from the hospital was started based on transport scenario as follows:

1. Arrangement of vehicles formation (Police vehicle as leader, then followed by transport truck, vehicle of RWM Center and hospital team, vehicle of Besindo team, and vehicle of BAPETEN Inspectors)
2. Transport route (Hospital in Salemba, Jln. Pramuka, Rawamangun toll road, Tanjung Priok toll road, Cawang toll road, JORR TB Simatupang, Serpong toll road, exit toll road in Rawa Buntu, Technopark, Muncul, Puspiptek Serpong, RWM Center)
3. The schedule (the truck was leaving at 03:15 and arriving at 04:30)

Different from the repatriation of spent fuels, this activity involved fewer personnel. Considering that, marking and labelling was also considered so that, for example, it was expected not to attract terrorist attention without neglecting the safety of transport.

|  |  |
| --- | --- |
| age14image3831776 |  |
| *FIG. 1. Labelling on the transport truck* | *FIG. 2. Label on container and position of container in the truck* |

### Transport of Nuclear Material

In April 2018, there was other experience in transporting nuclear material. PT. INUKI imported LEU from Y-12 as uranium producer, and was using ALARA Logistic as transporter. PT. INUKI as an importer was taking full responsibility in this transport activity. Nevertheless, this activity was also supported by various organization such as BAPETEN, BATAN, and Police. The transport of LEU was planned and prepared very well to ensure the LEU transported safely and securely from Jakarta International Airport to Research Reactor Fuel Fabrication Facility in Serpong. Before the LEU arrived in April 15, PT. INUKI held several meetings for coordination. In April 10, there was a meeting to prepare escorting formation, transport route and timeline. The formation of vehicles to transport LEU from airport to Serpong was as follow:

1. Police vehicle (armed police team)
2. Van 1 for LEU (Radiation Protection Officer, BATAN security team, driver)
3. Response team vehicle (Safety officer, BATAN security team, armed police team)
4. Van 2 for toolkit (Safety officer, BATAN security team, driver)
5. Logistic vehicle

In this case the transport was conducted during day time, as the LEU arrived at the airport about late at night in April 14, so that the transport was conducted the next day. Transport route and timeline was arranged as listed in Table. 3.

TABLE 3. TRANSPORT ROUTE AND TIME LINE

|  |  |
| --- | --- |
| Time | Activity |
| 09:45 | Formation Team leaving Serpong |
| 10:30 | Formation entering cargo terminal |
| 13:06 | LEU removed from the cargo, checking for 1 palet, 1 tool box |
| 13:10 | Leaving airport area, traveling to Serpong, speed 30 km/hour via toll road |
| 13:23 | Formation passing through Kayu Besar toll road, speed 50 km/hour, exposure 0.018 μSv/hour |
| 13:34 | Formation passing through Karang Tengah toll road, speed 50 km/hour, exposure 0.028 μSv/hour |
| 13:40 | Formation leaving Kunciran Alam Sutera toll road, speed 30 km/hour, exposure 0.019 μSv/hour |
| 13:57 | Formation passing through BSD, speed 40 km/hour, exposure 0.019 μSv/hour |
| 14:01 | Formation passing German Center, speed 40 km/hour, exposure 0.020 μSv/hour |
| 14:07 | Formation passing Rawa Buntu, speed 40 km/hour, exposure 0.018 μSv/hour |
| 14:13 | Formation entering Techno Park, speed 40 km/hour, exposure 0.018 μSv/hour |
| 14:15 | Formation passing Kademangan, speed 40 km/hour, exposure 0.018 μSv/hour |
| 14:17 | Formation passing through Muncul intersection, speed 35 km/hour, exposure 0.016 μSv/hour |
| 14:18 | Formation entering Puspitek, speed 10 km/hour, exposure 0.016 μSv/hour |

## CONCLUSION

In the implementation of safety and security during transport of radioactive materials, Indonesia has developed GR No. 58 Year 2015 on Radiation Safety and the Security on the Transport of Radioactive Materials. This regulation is sufficient as a guidance. From experiences, the implementation of GR No. 58 has been running very well so that there is no record of accident or incident that threat safety and security. However, the implementation needs adjustment or approach to accommodate the interface between safety and security in order not to compromise one to another. Different approach can be learned from transport cases above. Moreover, some factors can be taken as lesson learnt for next transport activity as follow:

1. Coordination with other organizations

With so many organization involved, good coordination is very important among those organizations. In these cases, the transport plan has been prepared very well and it was understood by everyone. Transport simulation was conducted to ensure that everyone followed the plan and understood their roles and responsibility in safety and security during the transport of radioactive materials.

1. Marking and labelling

Marking and labelling is a requirement to safety. In some transport cases, marking and labelling was not applied due to security purpose, but sufficient number of police guards were assigned to keep the safety. In other case, marking and labelling was still applied but it was carefully considered to make the marking and labelling that not-too-appealing to terrorist or theft.

1. Transport schedule arrangement

On those three cases, the schedules were planned carefully. Considering the safety, transport time was arranged at night or dawn when the traffic was not too heavy to prevent unnecessary exposure to public. In addition, police and security team was still assigned to enforce the security. In the case when night or dawn transport was not possible to be implemented, combination of police guard escort and route arrangement was carefully prepared to ensure the safety as well as the security of radioactive materials.

1. Route arrangement

Route arrangement was carefully planned so as public did not receive unnecessary exposure. The transport route was carefully considered that it secured from the threat. Police and security team was always involved to secure the route.

Nevertheless, each transport case is subject to different approach to accommodate the interface between safety and security. The approach depends on many factors such as the threat, the number of organizations or personnel involved in the transport activity. However, with proper planning and preparation, the transport of radioactive materials will run safely and securely.

References

1. Government Regulation No. 58 Year 2015 on Radiation Safety and the Security on the Transport of Radioactive Material, Nuclear Energy Regulatory Energy, Indonesia, 2015.
2. Report of LEU Transport, Report No. INI-141-E02-037 Rev.0, PT. INUKI, Indonesia, 2018.
3. Executive Report of The Transport of Radioactive Source Inspection, Nuclear Energy Regulatory Energy, Indonesia, 2016.
4. Sulistyani, Diah., Purwantara., The Transport of US Origin Spent Fuel on The Repatriation Activity to USA, Proceeding of The VIII Waste Management Technology National Seminar, National Nuclear Agency, Indonesia, 2009.