# Safety and Security Interface: The Implementation on the Transport of Nuclear Materials and Radioactive Sources in Indonesia

E. Yuliati[a], D. Sinaga[b],
[a,b] Nuclear Energy Regulatory Agency (BAPETEN)
Jakarta, Indonesia

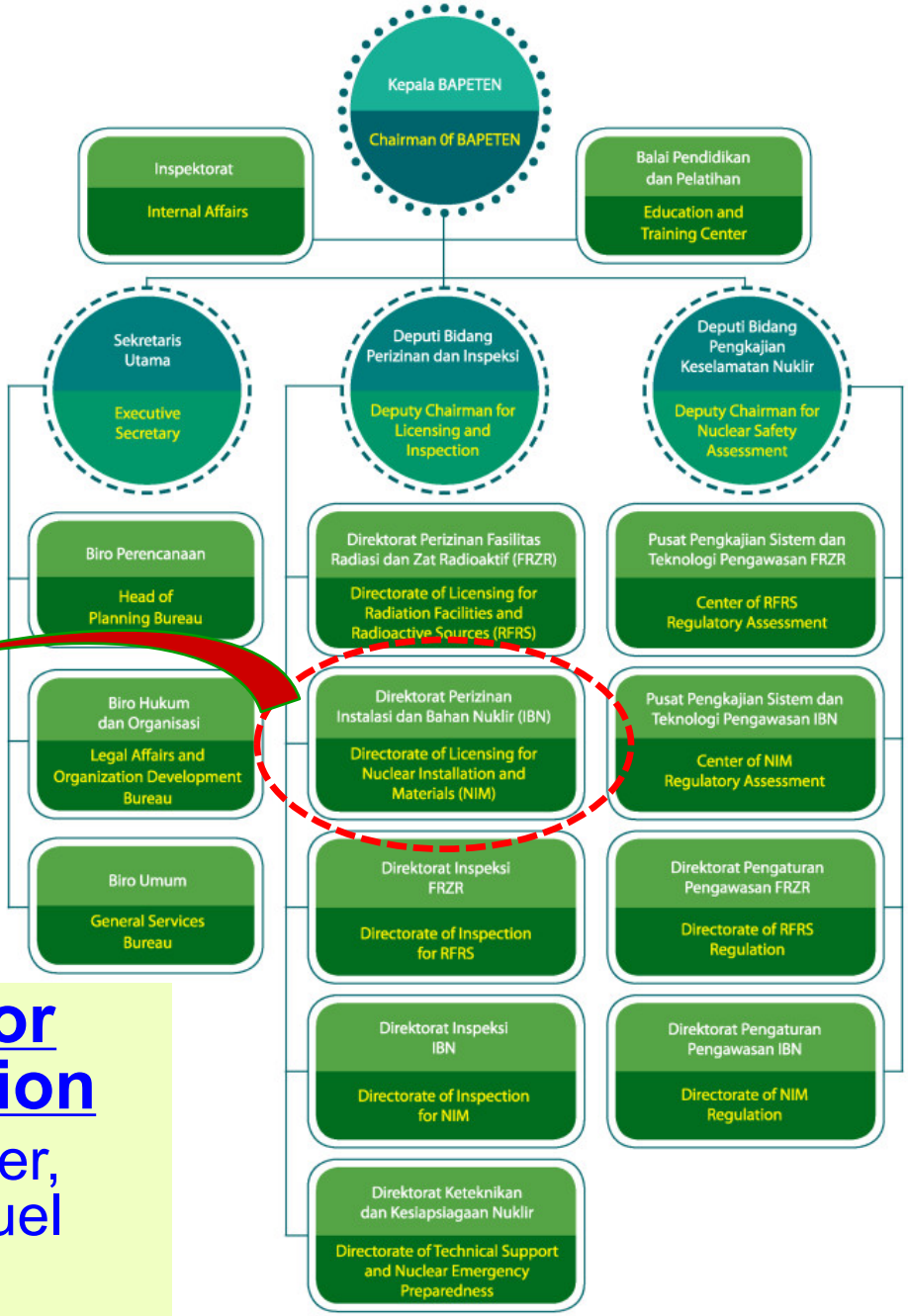
International Conference on Nuclear Security 2020
Vienna, 10 – 14 February 2020

# Outline

- Introduction
- Map of Nuclear Energy Utilization
- Regulatory Framework
- Structure of GR 58/2015
- Security Function in Transport Activity
- Safety in the Transport of Radioactive Material
- Security in the Transport of Radioactive Material
- Experiences on the Transport of Nuclear Material and Radioactive Sources
- Good Practices from Experiences
- Coordination with Other Authorities
- Marking and Labeling
- Transport Schedule Arrangement
- Route Arrangement
- Conclusion

# Introduction

- Act No. 10 year 1997 on Nuclear Energy → BAPETEN (1998)
- Main task : to conduct governmental activities in regulatory control of nuclear energy as mandated by applicable laws and regulations.

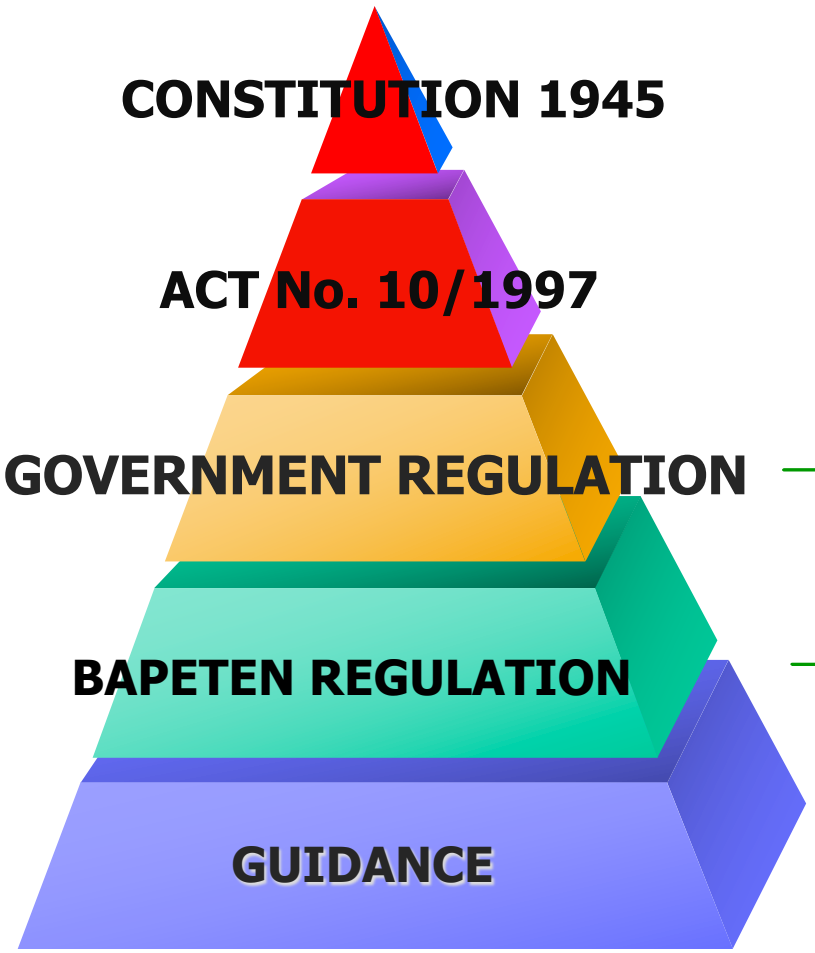



## Subdirectorate of Licensing for Non Nuclear Reactor Installation

Licensing of waste management center, fuel production facility for RR, spent fuel storage facility, installation for fuel experiment, radioisotop production facilities, TENORM storage.

# Map of nuclear energy utilization in Indonesia

# Regulatory Framework




- GR No. 33/2007 on the Safety of Ionizing Radiation and the Security of Radioactive Sources
- GR No. 54/2012 on the Safety and the Security of Nuclear Installation
- GR 58/2015 on Radiation Safety and the Security on the Transport of Radioactive Materials
- BR No. 6 Year 2015 on the Security of Radioactive Sources
- BR No. 1 Year 2009 on the Physical Protection System Requirement of Nuclear Installation and Materials

# Structure of GR 58/2015

| 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 ($UF_6$) | |
| **Chapter III. Safety in the Transport of Radioactive Material** | | |
| | Radioactive Material in Transport | |
| | Requirement for Packagings and Packages | |
| | Radiation Protection and Safety Program | |
| | Requirement for placement of packagings during transport and storage in transit | |
| **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 ($UF_6$) | 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** |

# Radioactive Material in Transport

- 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 ($UF_6$)

# Safety in the Transport of Radioactive Material (cont.)

## Requirement for Packagings and Packages

- The use of package (IP-I, IP-II, IP-III, type A, B(U), B(M), C)
- Determination of package category (I-White, II-Yellow, III-Yellow)
- Marking (identity of consignor/consignee, UN number, package type, mass info, identification code, design serial number, radiation sign)
- Labeling (radiation sign, 'RADIOACTIVE', package category, content, radionuclide activity, Transport Index, class 7 for dangerous material)
- Placarding for container/tank (radiation sign, 'RADIOACTIVE', class 7 for dangerous material, UN number)
- Determintation of Criticalily Safety Index for fissile material / UF6 transport
- Package checking for custom purpose

# Safety in the Transport of Radioactive Material (cont.)

## Radiation Protection and Safety Program

- Scope
- Responsibility of consignee, consignor, carrier
- Dose assessment result
- Personal and Occupational dose monitoring
- Radiation exposure and surface contamination measurement, Transport Index or Criticality Safety Index
- Package arrangement and other protection measures
- Procedures of loading, placement, transporting, handling, and unloading
- Emergency preparednes procedure
- Trainings
- Management system in transport

# Safety in the Transport of Radioactive Material (cont.)

## Placement of package during transport

- Tranportation mode(air, land, sea)
- Vehicle type
- Radiation exposure on the vehicle surface
- Transport index
- Criticality safety index

## Placement of package during transit

- Not easily reached by public
- Transport index, Criticality safety index

# Security in the Transport of Radioactive Material

## Special form radioactive material & low dispersible radioactive material

- Determination of radioactive source category
- Determination of security level
- Transport index
- Security Plan

## Fissile material, uranium hexafluoride ($UF_6$)

- Classification of nuclear material,
- Physical Protection Plan

# Security Function 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 on the Transport of Nuclear Material and Radioactive Sources

- Repatriation of spent fuel to Savanah River Site from Radioactive Waste Management Center in Serpong through Ciwandan-Cilegon seaport,160 km (July 2009)
- Transport of Co-60 of teletherapy unit from Cipto Mangunkusumo Hospital in Central Jakarta to Radioactive Waste Management Center in Serpong, 40 km (March 2016)
- Transport of LEU from Jakarta International Airport to RR Fuel Fabrication Facility in Serpong, 50 km (April 2018)

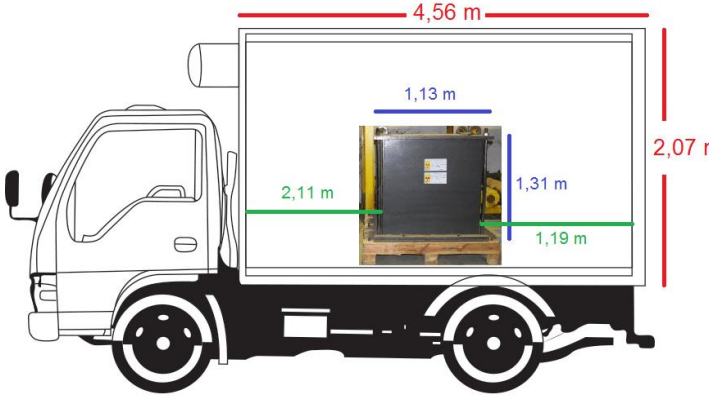
# Good Practices from Experiences

- Coordination with other organizations
- Marking and labeling
- Transport schedule arrangement
- Route arrangement

# Coordination with Other Authorities

- Authorities involved: BATAN, BAPETEN, US-DOE, Shipping/Transport Company, Police, Navy, Intelligence Agency, National Seaport Company, Custom.
- Coordination to explain transport plan as well as its safety & security aspect.
- Conduct simulation that include simulated problems during transport (vehicle problem, terorist attack).

# Marking and Labeling




# Transport Schedule Arragement

- Time of transport is carefully arranged so that not contribute unnecessary exposure to public (at night, or before dawn).
- Case transport from hospital to RWM Center was conducted at 03:15 – 04:30, with truck speed 40 km/hour.
- Case Repatriation was conducted at 23:00 – 03:00, with truck speed 40 km/hour.



# Route Arrangement

- Route is carefully arranged so that not contribute unnecessary exposure to public.
- Conduct simulation before transport.

| Time | Activity |
|---|---|
| 09:45 | Formation Team leaving |
| 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

- Regulations are sufficient.
- Implementation of regulation should result safety & security not compromise one another.
- Coordination is important so that authorities involved understand their responsibilities.
- Each case is different that need different approach for safety and security.

# Thank YOU


y.evin@bapeten.go.id
**Nuclear Energy Regulatory Agency (BAPETEN)**
**Jl. Gajah Mada No. 8 Jakarta – 10120**
**INDONESIA**