



Federal Ministry for the  
Environment, Nature Conservation,  
Building and Nuclear Safety

# Methods to Calculate the Radiological Consequences of Sabotage

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# Calculating radiological consequences: a response measure?



- Session title: Response to (nuclear) Security Events
- Sabotage is a main possible threat
- Releases of radioactive substances are a consequence of sabotage
- Response measures have to include measures to mitigate and minimize the consequences

## Therefore:

- Procedures to calculate radiological consequences should be in place
  - As a prevention measure
  - As a response measure

# Agenda



- A look at the Nuclear Security Series
- German approaches
- Nuclear facilities:  
Guideline to calculate radiological consequences
- Transports of nuclear material:  
draft new guideline including procedures to  
calculate radiological consequences

# Nuclear Security Series (1)



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## Nuclear material

... the State should  
establish its threshold(s)  
of unacceptable  
consequences ...

5.44-5.58:  
response measures

## Other radioactive material

unacceptable radio-  
logical consequences:  
A level of radiological  
consequences,  
established by the State  
...

4.15: sabotage

## Material out of regulatory control

For nuclear security  
events .... emergency  
response activities ... to  
mitigate and minimize  
the radiological  
consequences

6.17-6.18 national  
response plan

# Nuclear Security Series (2)



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**Nuclear material**

Contingency plan

Emergency plan

**Other radioactive  
material**

National response  
plan

**Material out of  
regulatory control**

National response  
plan

# German approach (1)



## Nuclear material:

- Definition of the threshold for unacceptable radiological consequences
- Guideline for calculating **potential** radiological consequences (2014)

Objective: unacceptable radiological consequences in the aftermath of a DBT-scenario should be avoided

# German approach (2)



## Other radioactive material:

- Categorization covers potential radiological consequences
- Software to calculate the release of radioactive material after an event (e.g. LASAIR)

## Material out of regulatory control:

- No threshold or categorization possible
- Software to calculate the release of radioactive material after an event (e.g. LASAIR)

# Threshold value (nuclear material)



## Basis: German recommendations for civil protection in the neighbourhood of nuclear facilities

- Threshold value for evacuation
- 100 mSv effective dose
- 7 days exposure and committed effective dose as a result of inhalation



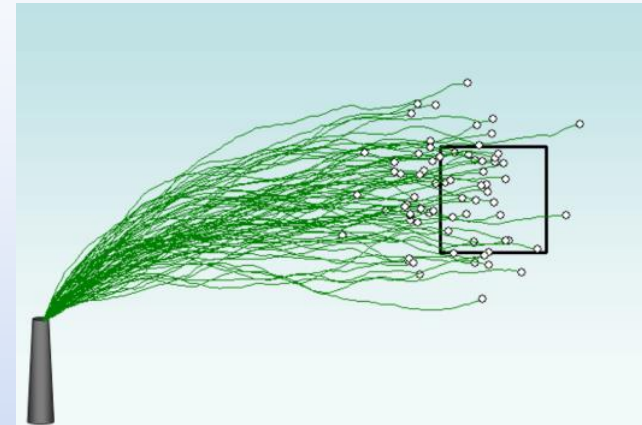


# Guideline to calculate radiological consequences



## Essentials of the guideline

- Only DBT-Scenarios
- Nuclear facilities only
- Typical: short release at ground level
- Lagrangian-model
- Complete age range
- Model points: all residential area and activity areas in the surrounding of the facility
- Probabilistic or deterministic calculation



# Draft guideline for transports of nuclear material



## Essentials of method to calculate unacceptable radiological consequences

- Typical: short release at ground level
- Only DBT-Scenarios and transportation by rail or by road
- Lagrangian-model
- Threshold level 100 mSv
- Only adults and only committed effective dose as a result of inhalation
- Model points: 15 m or more beside the transport vehicle

# Conclusion



- **Threshold(s)** of unacceptable radiological consequences should be established (except MORC)
- **Quick calculation** of releases of radionuclides and the resulting radiological consequences in the aftermath of nuclear security events should be part of response plans
- **Protection measures** of nuclear facilities should be able to avoid any unacceptable radiological consequences after DBT-scenarios

# Contact



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**Muchos gracias and thank you for your attention ...**