



Autoriteit Nucleaire Veiligheid en
Stralingsbescherming

Regulatory Bodies Representatives Meeting – ISOE European Symposium 2024

ANVS, Patrick Arends

June 3rd 2024, Rotterdam



Participants

STUK

ASN

ETC

ONR

Belv

CSN

SSM

NRC

GRS

ANVS



Content

- > Introduction
- > Regulations on spread of contamination in NPPs
- > Limits of contamination
- > Zoning
- > Monitoring of zones
- > Additional measures
- > Transport (in RCA)
- > Inspections
- > Reporting
- > Extra presentations by ASN and BelV



Topic

- > **REGULATORY REQUIREMENTS AND GOOD PRACTICES ON CONTROL OF RADIOACTIVE CONTAMINATION SPREAD IN NPPS**
- > **Open topics:**
 - Occupational radiation protection organization in NPPs
 - Limiting and optimizing external exposure (e.g. airborne activity levels, monitoring and dosimetry, use of Respiratory Equipment, balance of risk with external exposure and conventional safety hazards).
 - SMRs: *Is the radiation protection legislation adequate to meet future challenges?*
- > **Additional possible topics:**
 - Radiation protection issues in the handling of Radioactive Waste (e.g. during cementation of resins or during separation of solid waste streams)



How is spread of radioactive material in NPPs regulated in your country? Are there any national guidelines?

- > Detailed regulation: Belgium, Spain, Finland (guides)
- > Less detailed regulation: NL, France
- > General (goal oriented) regulation: UK, Sweden

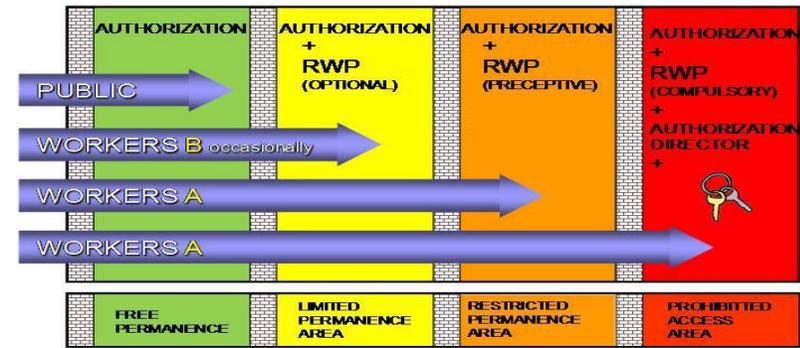
- > Remarks:
 - All countries have 'rules' to prevent spread of contamination by zoning, monitoring, use of PPE's, warning signs, minimize the amount of RA-material used
 - UK: all measures are based on risk-assessment (probably also in other countries?)
 - Rules for pregnant and breast-feeding women: all countries
 - Prohibition to eat, drink, use of cosmetics: all countries
 - Most countries seem to use radiation work permits?



Contamination limits

- > Most countries have defined the following contamination limits:
 - 0,4 Bq/cm² for β/γ -radiation emitting radioisotopes
 - 0,04 Bq/cm² for α -radiation emitting radioisotopes
 - These also apply for transport (based on IAEA SSR-6 and f.i. ADR)
- > Except for NL/Sweden/Finland:
 - 4 Bq/cm² for β/γ -radiation emitting radioisotopes
 - 0,4 Bq/cm² for α -radiation emitting radioisotopes
 - For transport 10 times lower

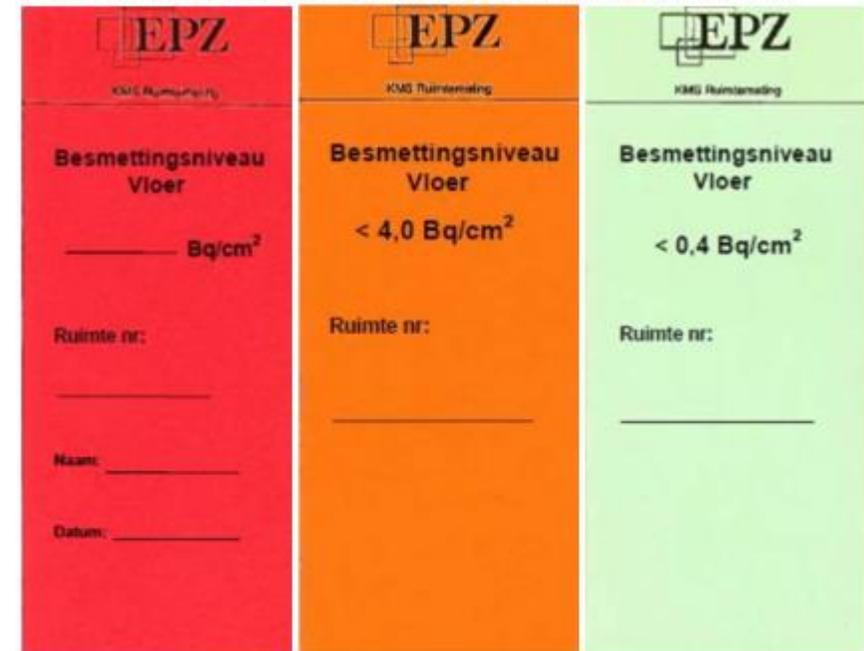
Note: NL: in NPP the lower values are used



Zoning

- All countries use the concept of Controlled and Supervised areas with requirements to clearly delineate these controlled zones (preferably by hard barriers) and to restrict access (often: badge authority and administrative measure)
- Access control based on dosimetry, medical fitness, security check
- A lot of NPPs use additional zoning based on dose rate level, air contamination and surface contamination (in Spain this is a common practice in all NPPs).
SE: blue-yellow-red
UK: Contamination: C1, C2, C3, Radiation: R1, R2, R3
- SE and FIN: have this regulated
- Access to zones with higher contamination is restricted and even prohibited
- Belgium uses a KPI of 95% for rooms.

Informatiekaartjes van het besmettingsniveau bij toegang ruimte:



Rode kaart	Oranje kaart	Groene kaart
Groter dan 4 Bq/cm ²	Tussen 0,4 en 4 Bq/cm ²	Kleiner dan 0,4 Bq/cm ²
Maximaal 40 Bq/cm ² toegestaan		
Continue begeleiding door KMS	Werken met toestemming KMS	Vrij toegankelijk



Zoning - ventilation

- > In most countries there are NO legal requirements for ventilation rates in different zones.
- > However, the construction should be based on applicable norms:
 - [ISO 26802:2010](#) NPPs
 - [ISO 17873](#) nuclear facilities – non-NPP
 - [ISO-20553](#) Radiation protection – Monitoring of workers occupationally exposed to a risk of internal contamination with radioactive material
 - ASME-codes (Belgium):
 - o [ASME AG-1 Code on nuclear air and gas treatment](#)
 - o [ASME N509 NPP Air -cleaning Units and components](#)
 - o [ASME N510 Testing of Nuclear Air Treatment Systems](#)
 - o [ASME N511 In service testing of nuclear air treatment, heating, ventilating and Air -conditioning systems](#)

EN-codes

- o [EN 1822 High efficiency air filters](#)
- o [EN 14175 Fume cupboards](#)



Zones with higher contamination risk

- › Generally, in most countries measures like step-over benches, additional clothing requirements, apply



Monitoring of Zones

- › In all countries it is required/practice to perform contamination monitoring
 - in controlled zones, supervised zones and sometimes onsite (BE, NL, more countries).
 - of people, tools, materials, leaving zones with a higher risk of contamination
 - in NPPs, at the exit of RCAs almost always it is required to use Whole Body Contamination monitor with exit door to prevent shortcuts (NL: 2 WBCM, one to check overall, one to check underwear). Hard barriers with monitors are not legally required.
 - The use of HF-monitors at specific areas (workshops, areas with higher contamination risk) is not legally required, but common practice.
- › How is the use of HF-monitors controlled?? (Spain: responsibility of workers)



Additional measures (PPE)

- > In all countries there are no legal requirements, other than the general requirements to prevent contamination and spread of contamination and of-course ALARA/ALARP
- > Based on Labor/Work regulations – Risk Analysis (SE, FR, UK)
- > Common use of overall, (safety)shoes/shoe covers, safety glasses, cotton gloves
- > But:
 - Belgium, based on lower contamination risk, less clothing requirements
 - France: Everest concept
- > **Belgium Good Practice: part of the staff is trained to assist workers in the proper use of protective clothing and equipment: qualified protective equipment dressers.**



Additional Measures (LEV and respiratory protect.)

- > In most countries there are No specific legal requirements; practice is based on internal rules of NPPs. (Independent) Respiratory protection is commonly used in cases with increased risk of internal contamination.
- > Local Exhaust Ventilation or tents are used in:
 - Penetration into highly contaminated areas (heat exchangers, covers, pressurizers, steam generators etc.).
 - Work with a high risk of resuspending contamination (cutting, grinding, brushing, etc.) on contaminated parts.
 - Decontamination work.
 - Criteria:
 - Type of contaminant (alpha-emitter or not) and results of surface-activity measurements
 - If available measurements, criterion based on a multiple of the derived air concentration limit
 - Work environment (confined space)
 - Proximity between LEV suction hose and circuit opening for dynamic confinement



Transport in RCA

- > Question in questionnaire was not clear enough. Purpose was to ask about transport trolleys in RCA.
- > Do you tape the wheels or not?
- > Generally spreading of contamination from NPPs must be avoided
- > Dutch NPP: no specific requirements for transport cars in RCA: wheels used to be taped; had changed last year not to tape them anymore.
- > Transport on site: in most countries/sites based on ADR regulation
- > Regular inspections of site (roads): Belgium and NL (Others as well)





Regulatory Inspections on contamination control

- > No differences in regulatory requirements between normal operation and maintenance: Belgium, Finland, France, Spain, UK, NL
- > During maintenance outage:
 - Higher presence from RP inspectors and/or site/resident inspectors: Belgium; Finland, NL, France, UK (risk informed)
 - Scope is on local controlled areas and on the control and detection of personnel contamination
- > Belgium: Licensees requirement for personnel contaminations at the exit of the unit: 0,7% (NL: KPI for RCA)
- > Sweden: work package with dose above 100 person.mSv: dose prognoses
- > NL: Dose above 5 person.mSv: ALARA-report is required (internal NPP rule). Maintenance outage: dose prognosis is required by ANVS. ONR: Restriction of Exposure Report (ALARP).
- > NL and Sweden: Dose evaluation report after maintenance outage, within 3 months (SE: > 100 person.mSv)
- > Spain: Inspections are done according to Inspection Plan and two resident inspectors are at site whole year round.



Reporting

- All countries have reporting thresholds based on:
 - Spread of contamination inside controlled areas and hotspots
 - Spread of contamination outside RCA
 - Spread of contamination out of site (also on objects, tools, vehicles etc)
 - Internal contaminated (threshold based on dose, risk analysis): **are there any requirements for assessing the internal committed dose (sampling, models etc)?**
- UK and SE provided us with the type of information to be reported (discussed this topic in Tours)
- **In all countries, except Spain, these kind of events keep happening!!**
WHY??

ISOE-SYMPOSIUM IN ROTTERDAM, 2024

REGULATORY BODY MEETING – 3 JUNE 2024

SIGNIFICANT EVENT RELATED TO RADIATION PROTECTION OF WORKERS
IN NUCLEAR POWER PLANTS

EXTERNAL CONTAMINATION OF A WORKER IN THE CATTENOM NPP, 2023



Presentation by ASN on event Cattenom – Unit 3

- › Contamination was detected during the check carried out on leaving the controlled area (radioactive particle of Co 60 ~400 KBq located in the neck of a insulation worker)
- › This lead a skin dose of more than 500 mSv.
- › Rated at INES-level 2

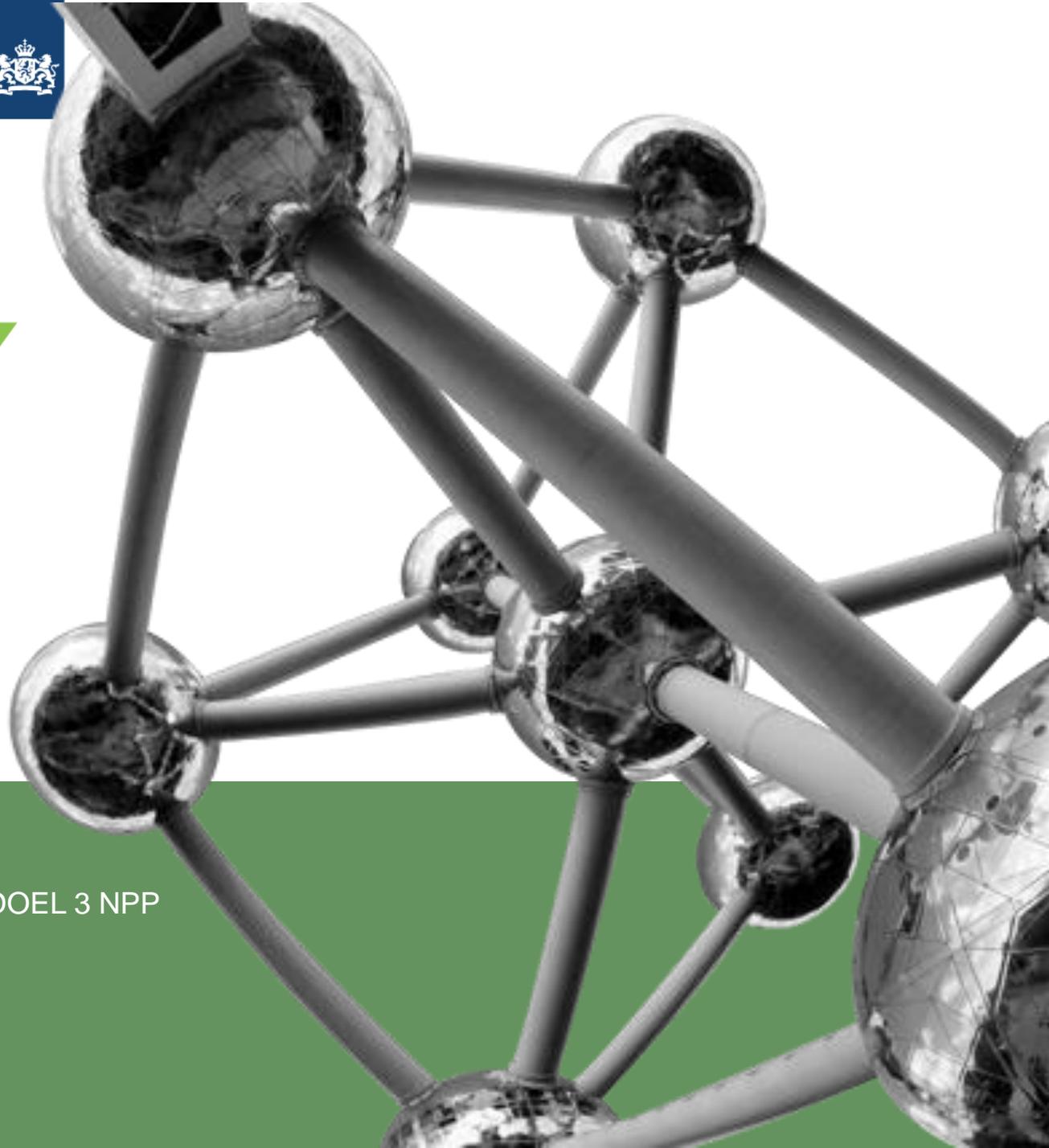


BEL ✓

Belgian TSO

FULL SYSTEM DECONTAMINATION OF THE PRIMARY CIRCUIT AT DOEL 3 NPP
SAFETY ASSESSMENT BY THE REGULATORY BODY

Etienne Minne, Lionel Bastiaens, Valéry Detilleux



Main results - Conclusion

- > Objectives fulfilled:
 - No safety or radiation protection issues during the FSD (80 man.mSv < 110 man.mSv)
 - Mean Decontamination Factor > 100 (10 expected)
 - Mass of metal in FSD scope with radiological content ≤ 50 Bq/g: 92 %
(> expected 75%)
 - Volume of generated waste < (conservative) initial assumptions.
 - > Detailed results and characterization of generated waste are being assessed by the licensee.
 - > Message for RB : Applied approval process allowed constructive and timely exchanges between all involved parties.
- Strategic project implemented in a safe and concerted way, contributing to sustainable development.





Presentation by BelV on FSD/CSD at Doel 3

> Very good results:



Thanks for your attention!

Any questions?