

Radiological characterization of V1 NPP technological systems and buildings - contamination

Workshop on Radiological Characterisation for
Decommissioning,
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V1 NPP at Jaslovske Bohunice Site

V1 NPP decommissioning:

- 2 WWER type reactor 440/230 units
- Operation: **Unit 1 in 1978 – 2006, Unit 2 in 1980 - 2008,**
- Since 2001 D&D preparation supported by Bohunice International Decommissioning Support Fund (**BIDSF**)
- Present status: **units finally shutdown, under decommissioning license, fuel is removal**
- The beginning of practical dismantling planned in 2012



BIDSF Project B6.4

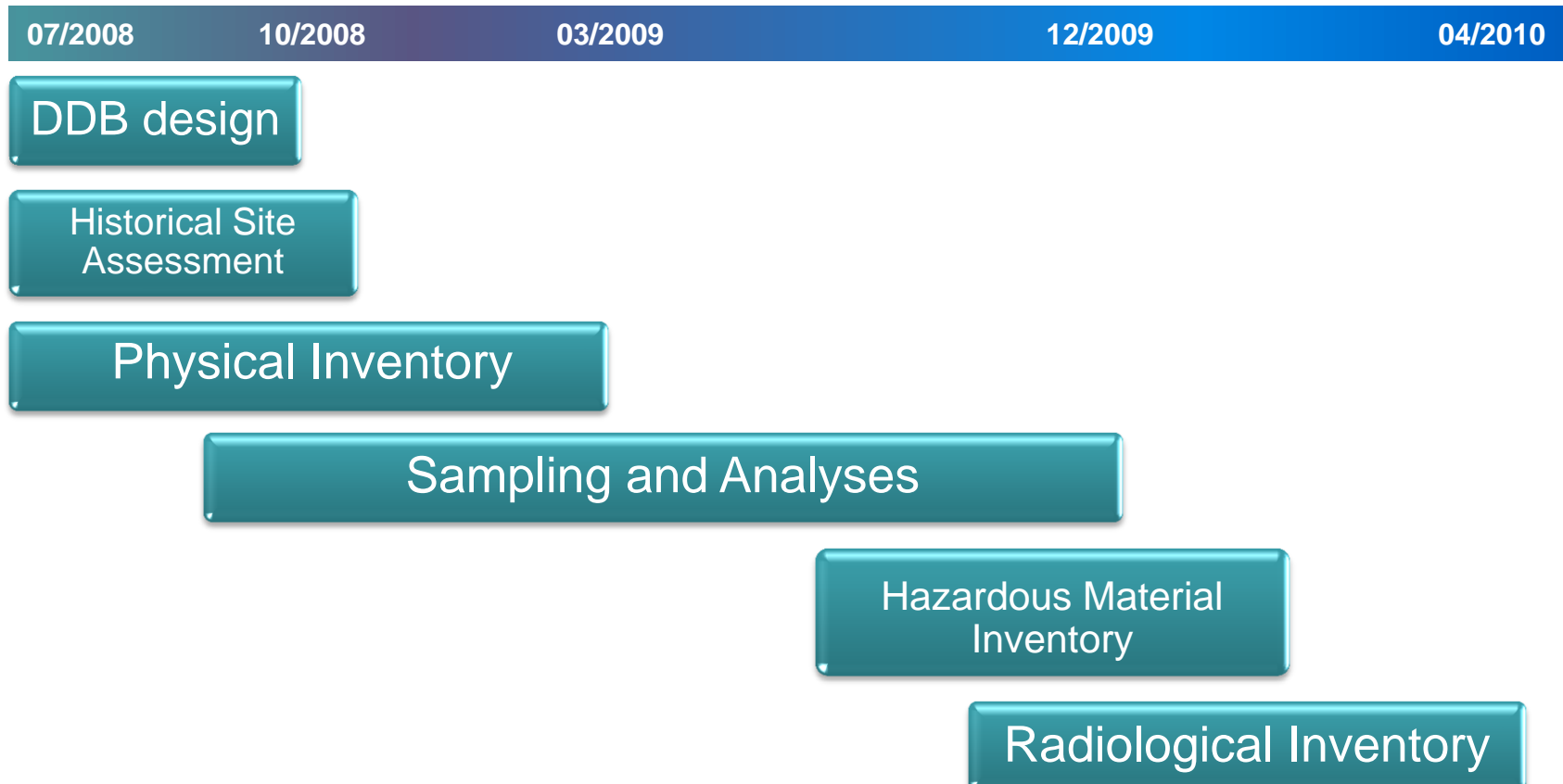
“Decommissioning Database”



Project purpose: Physical and radiological inventory database development to support V1 NPP decommissioning

Performed by: EWN GmbH, STM Power and AMEC Nuclear Slovakia

Project B6.4 tasks and time schedule:



Scope of Inventory



- Nearly 100 civil objects
(controlled area, out of controlled area)
- 175 technological systems
- Over 40 parameters for each DDB item - identification, physical and radiological properties

1. Methodology based on manual MARSSIM¹

- Consideration of HSA and Scoping Survey results
- Definition of Survey units, preliminary categorization of DDB items
- Monitoring plan for individual Survey units – number of measurements, sampling plan
- Selection of the most effective measurement and analysis types

2. ALARA, H&S and QA plan

- ALARA and H&S principles consideration for monitoring and sampling implementation
- QA criteria for measurement and statistical processing of data

1 - Multi-Agency Radiation Survey&Site Investigation Manual

1. Contamination spread boundaries
2. Categorization of database items
3. List of radionuclides, radionuclide vectors
 - Free release purposes (all identified artificial gamma emitters, alpha and beta emitters typical for WWER reactors)
 - Waste disposal purposes (defined group of long-lived nuclides required by Slovak RAW repository)
4. Determination of radiological parameters
 - ALARA purposes (dose rate, external surface contamination)
 - Waste management (internal surface contamination, mass activity, radionuclide vectors)



Small local contaminated areas outside the NPP controlled area:

- Leakage of boric acid tank and spent fuel storage pool (underground water)
- Leakage of other technology
- Treatment station of liquid industrial waste
- Temporary storage of contaminated equipment

Radiological parameters assigned to impacted components and civil structures:

- Dose rates in contact and at distance 1 m
- External and internal surface contamination
- Volume/mass contamination

Radiological parameters assigned to rooms in controlled area:

- Average and maximum dose rate
- Average surface contamination of floor and walls
- Identification of „hot spots“

Radiological survey in buildings outside the controlled area:

- > 300 direct measurements of dose rate
- > 680 direct measurements of walls and floors surface contamination (also 550 measurements of equipment external surface contamination)
- > 40 smears, scrapes and sludge samples
- 20 on-site gamma spectrometry measurements
- 8 drilled concrete samples
- 100 surface soil samples

Radiological survey in buildings inside the controlled area:

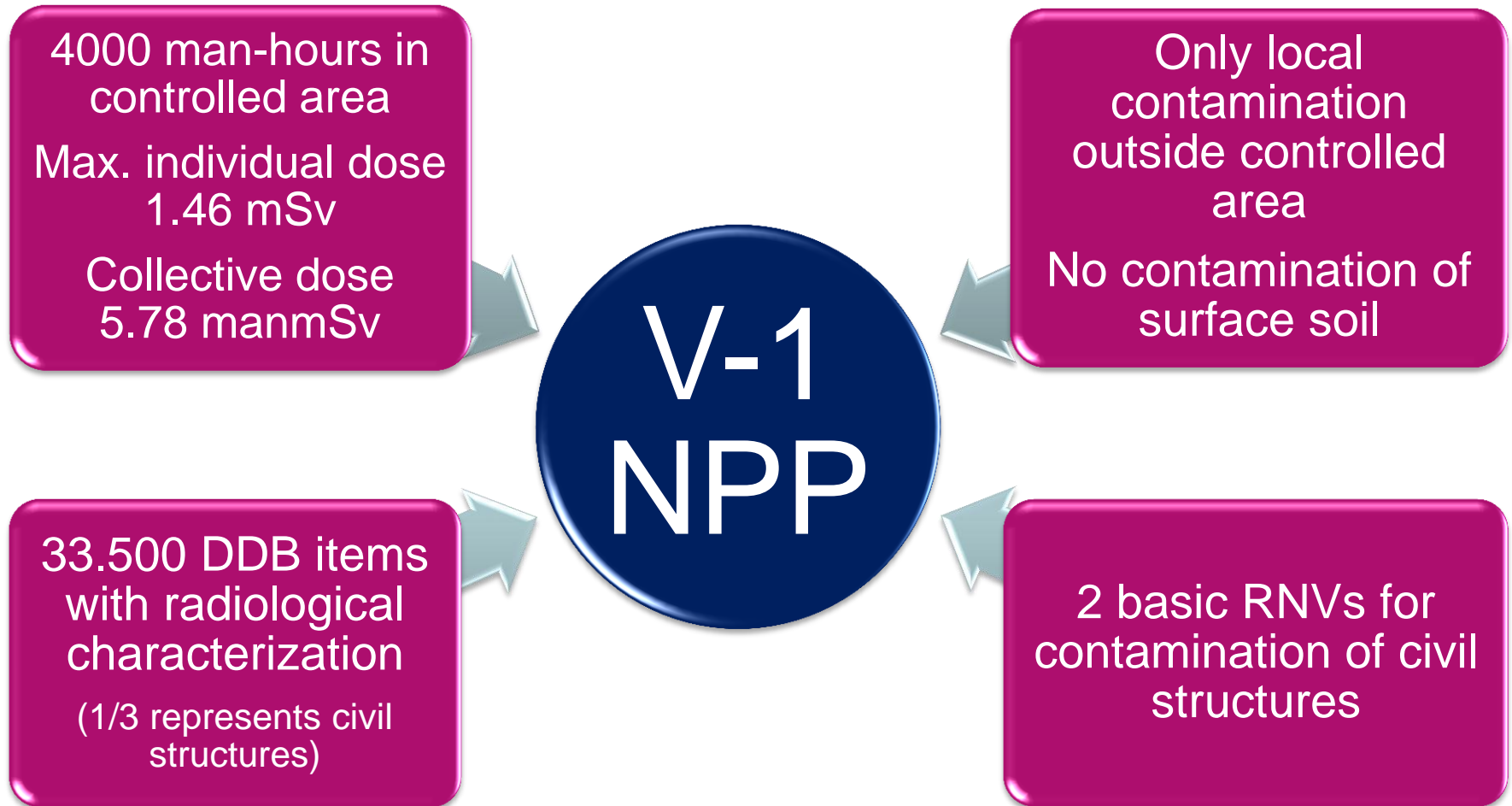
- > 3400 direct measurements of dose rate
- > 1450 direct measurements of surface contamination (mainly walls and floors)
- 1200 samples (external smears from walls, floors and equipment)
- 15 drilling cores (mass activity)



- **Every sample:**
 - Total alpha, beta and gamma activity

- **Selected samples:**
 - Gamma spectrometry
 - Determination of hard-to-detect radionuclides (alpha and beta spectrometry)





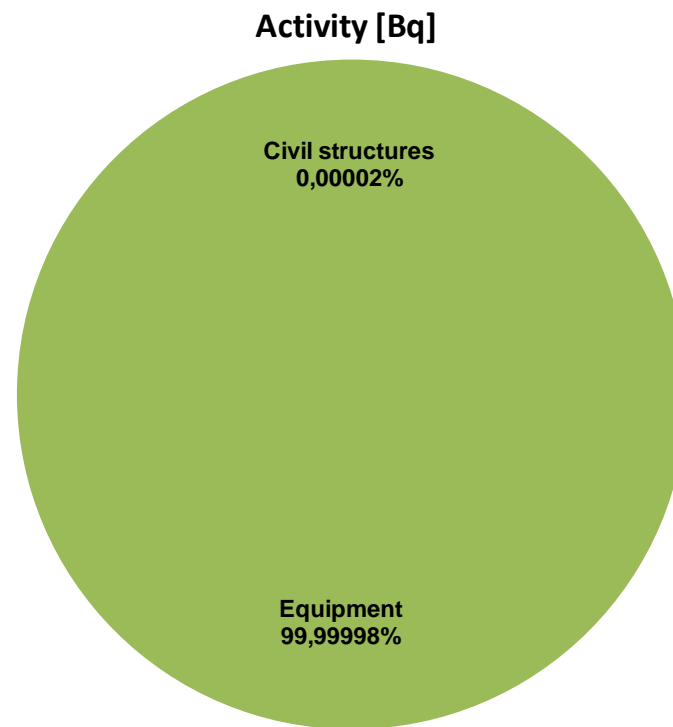
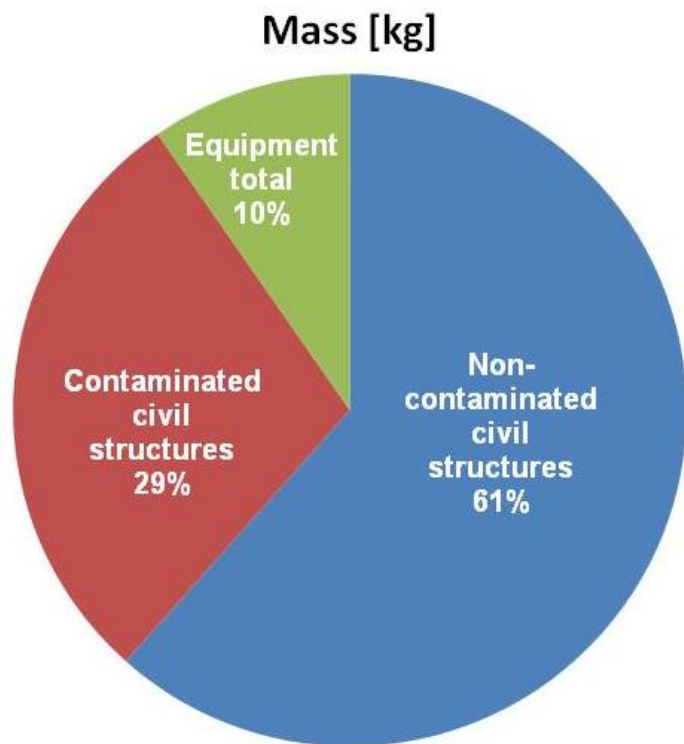
Radiological inventory results



Final list of RNV for contamination:

RNV code	RNV description
RNV1	Outer surface contamination, Unit 1 Inner surface of primary circuit technological equipment , Unit 1
RNV2	Outer surface contamination, Unit 2 Inner surface of primary circuit technological equipment , Unit 2
RNV3	Spent fuel cooling pond Unit 1
RNV4	Spent fuel cooling pond Unit 2
RNV5	Inner surface of air-conditioning system
RNV6	Inner surface of technological equipment in contact with concentrates
RNV7	Inner surface of technological equipment in contact with resins
RNV8	Civil structures volume contamination

Radiological inventory results



	Non-contaminated civil structures	Contaminated civil structures	Civil structures total	Equipment	V1 NPP total
Mass [kg]	4,921E+08	2,297E+08	7,218E+08	7,730E+07	7,991E+08
Activity [Bq]	-	4,422E+10	4,422E+10	2,617E+17	2,617E+17

Radiological inventory results

Percentage contribution of radionuclides to the V-1 NPP civil structures contamination:

