ROUTES SUBTASK 4.2 WORKSHOP SHARING EXPERIENCE ON WASTE MANAGEMENT WITH / WITHOUT WAC

Development of WAC for Central Interim Storage Facility for small producers

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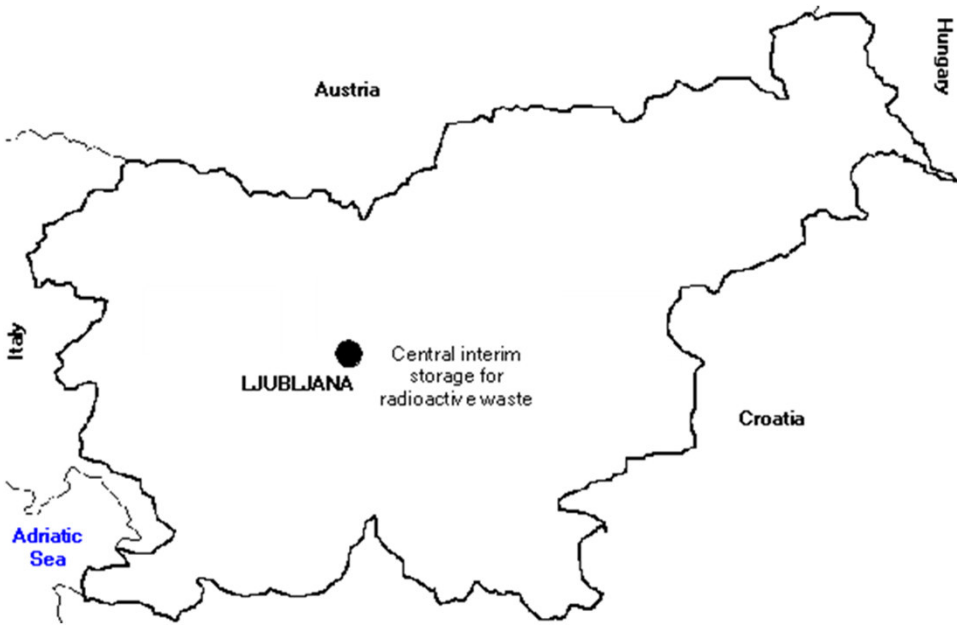
CENTRAL INTERIM STORAGE FACILITY (CISF) IN BRINJE

- construction started in 1984 as part of Reactor centre at Josef Stefan Institute, where also TRIGA Research Reactor is in operation (from 60-ies)
- operational since 1986, first operator Josef Stefan Institute
- Central storage for LILW from medical, industrial and research applications
- in 1999, responsibility for managing and operation transferred from the JSI to the Agency for Radwaste Management (ARAO - WMO)
- nuclear facility according to legislation
- main safety problems: obsolete installations and facility, poor data on inventory, lack of procedures, no safety analysis report, no nuclear license



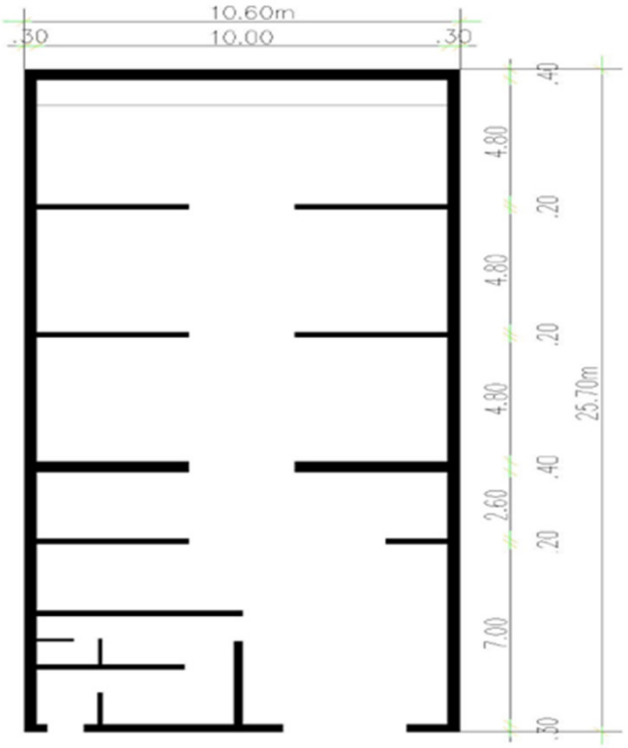
SITUATION IN CISF BRINJE, 1999

INVENTORY IN CISF

Waste type	*August 1999 (number)*	End of 2001 (number)	Main radionuclides	Estimated activity (GBq)
Drums	177	254	Co-60, Cs-137, Ra-226, Eu-152	3 – 20
Special bulky items	140	141	Co-60	2900
Disused sealed sources	344	347	Co-60, Cs-137, Kr-85, Sr-90	560
*Undefined sources	34	34	-	-
Total	**695**	**776**	**-**	**~3500**

BOUNDARY CONDITIONS FOR CISF

- in 1999 government adopted decree that CISF shall accept all produced waste from small producers without exceptions
- nuclear legislation in 1999 existed but no details, also on WAC → everything in agreement with NRA
- no treatment and conditioning capacities in the storage, no conditions for characterization and measurements of the waste (inventory in all compartments), no space for proper decontamination
- out-of-date systems in the storage: old ventilation (radon!), old electric system (fire risk), no water and sewage
- poor documentation on waste inventory (historical waste, no WAC), low utilization of the storage
- insufficient room for the staff, improvised entrance to the controlled area



PERFORMED ACTIVITIES

- **urgent maintenance and refurbishment works**
  - hydroisolation renewal,
  - construction of auxiliary building for staff and equimpent (forklift)
  - conditioning of the radium applicators (mobile unit from Seibersdorf via IAEA TC)
- **improvements in storage utilization:**
  - WAC, procedures and instructions
  - tariff system - decree
  - SAR for present situation, EIA report, licensing
- **more complex reconstruction and modernisation of the storage:**
  - electric installations,
  - water supply and sewage system,
  - ventilation system,
  - fire protection,
  - remediation of minor defects.
- **Characterisation, repacking and rearrangement of the waste (smoke detectors, spent sealed sources bellow clearance levels and pure beta emmiters)**

WAC DEVELOPMENT

- T&C facilities has been hired in the JSI area with hot cells – includes different opportunities for measurements, characterization and repackaging.
- WAC developed to support public service provided ARAO to be able to take over all waste from small producers and to prepare for transport, and to assure RW producers to assess the acceptability of their waste according to the criteria.
- If WAC are not fulfilled, hot cells serves as place to prepare RW for storage:
  - Additional measurements, if not all data available,
  - Repackaging, if needed and control,
  - Procedure with liquids and mixed waste (double packaging),
  - Procedure with explosive and flammable waste.
- Introduction of categorization and tariff system:
  - Solid waste – T 1 to T4 (all solid, compatible or not, combustible or not)
  - Bulky items – package of special dimensions
  - Spent sealed sources – ZV0 (smoke detectors), ZV1 - ZV4 (based on activity)
  - Other waste: L - liquids, IM - mixed (RW with other risky characteristics)

WAC 1

Acceptance criterion	CSRAO – Brinje
1) Radionuclide content and specific activity	• Recording main radionuclide in package • $A_{sp}(\alpha$, package) ≤ 4,000 Bq/g (short lived waste) • $A_{sp}(\alpha$, package) > 4,000 Bq/g (long lived waste) • $A_{sp}(\alpha$, CSRAO) ≤ 400 Bq/g
2) Surface dose rate and dose rate at reference distances	• ≤ 2 mSv/h on package surface • Dose rate at reference distances is not acceptance criterion for storage • Periodical dose field measurements
3) Surface contamination	• ≤ 40 Bq/100 cm^2 for α emitters • ≤ 400 Bq/100 cm^2 for β/γ emitters
4) Radiation degradation	N/A
5) Leachability	N/A
6) Free liquid content	• ≤ 1% of package volume, otherwise waste to be treated (drying, addition of absorbents)
7) Corrosivity	• Recording and inspection • Forms with pH value less < 5 or > 9 are neutralized (drying, addition of absorbents)
8) Corrosion resistance	• External containers of corrosion-free material
9) Presence of chelating and complexing agents	• Recording and inspection • ≤ 1% of package volume
10) Toxic constituents	• Records according to the list of toxic and other hazardous materials • Infective waste is placed in special packaging • Infective waste is treated (sterilization, incineration)
11) Gas generation and content	• Recording (H_2, CH_4, VOC) and inspection • Spent sealed sources containing radionuclides H-3, Kr-85 and Ra-226 in gaseous form shall be placed in special container. Lid to be placed tightly and welded • Forms containing Ra-226 shall be well conditioned • Explosive gas accumulation reduced to minimum

WAC 2

Acceptance criterion	CSRAO - Brinje
12) Explosivity	• Storage of explosive materials not permitted
13) Chemical stability	N/A
14) Strength	• Packaging method to comply with waste type and properties • Maximum possible package homogeneity • Packages shall be resistant to deformations • Packages shall be tightly closed
15) Ignitability	• Storage of waste containing highly flammable (< 21 °C) and flammable materials (from 21 to 55 °C) not permitted
16) Flammability	• Recording and inspection • PVC < 10% of package volume
17) Organic content	• Recording (waste biological contamination)
18) Package identification method	• Packages marked with radiation symbol and label • Identification label according to Regulation JV7 • Packages containing hazardous materials identified acc. to the Regulation on Sorting, Packaging and Identification of Hazardous Materials • Packages with infective waste identified with international symbol
19) Container types and packaging methods	• Waste placed in inside and outside packaging • List of inside and outside packaging given • Infective waste is packaged separately • Untreated waste mass in standard 208-liter metal container is maximum 250 kg • Untreated waste mass in 320-liter metal container is maximum 350 kg • When these containers are used for packaging of spent sealed sources, package mass could be higher • Periodical visual inspection of package integrity

CONSLUCIONS

- WAC developed in first version in short time (2001) after responsibility was assign, following international practice and without detailed requirements driven by national needs of small producers.
- Only in 2007 regulation JV 7 adopted with detailed WAC prescription.
- WAC evolved true years to follow the operational experiences and international practice in iterations.
- First version did not concern the WAC for disposal as there were non.
- From 2008 preliminary WAC disposal for LILW repository developed - most of CISF inventory will be disposed in near surface (silo) repository (based on PA/SA calculations).