Fuel Inspection Hot Cell at Ignalina B1 ISFSF – Lessons Learned

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1. Objective
2. Basis
3. Optimization possibilities
   a) Ease of access
   b) Location of wall penetrations
   c) Shielding
4. Summary
Fuel Inspection Hot Cell (FIHC) at B1 ISFSF, Ignalina NPP, Lithuania

B1 Project: Interim Spent Fuel Storage Facility (ISFSF) (Dry Storage)
2 Basis

Requirements for Interim Spent Fuel Storage Facility (ISFSF):

- Capacity of **201 (+1) CONSTOR® RBMK1500/M2 casks** (planned 190)
- Storage period: **50 years (+20 years)**

Fuel Inspection Hot Cell (FIHC)

- Purpose of the Hot Cell is to reload a cask in case the CONSTOR® RBMK1500/M2 casks may leak by removal of all fuel bundles (≤ 182) of one Cask into intermediate storage wells
- Expected frequency of usage: **0 to once** in storage period, because FIHC is used in emergency case only
2 Basis

Overview of FIHC

Concrete walls

CONSTOR RBMK 1500/M2

Storage wells

Shielded Hatch

Fuel Bundle
Concrete walls

CONSTOR RBMK 1500/M2

Storage wells

Shielded Hatch

Fuel Bundle

Accessible area inside of FIHC

cut for next slide

cut for slide afterwards
2 Basis  Overview of FIHC

Concrete walls

CONSTOR RBMK 1500/M2

Storage wells

Shielded Hatch

Shielded Windows

cut at height of shielded windows
2 Basis Overview of FIHC

Cut at access to Cask Transfer Bogey Area
3 Optimisation possibilities
a) Ease of access - “as is” design

Designed access pathway shown red:

- enter room
- construct a platform
- Enter using ladders
Design priority: tightness of FIHC inside

For rare usage (once in 50 years) priority:
ease of access (maintenance)

Red circle: possible location for additional labyrinthic access

3 Optimisation possibilities

a) Ease of access - possible solution
3 Optimisation possibilities
b) Penetrations

Ventilation duct

Cut
Cable toggle boxes

Cut
3 Optimisation possibilities

b) Penetrations

Ventilation duct

Cable toggle boxes
Optimal locations:
Ventilation duct:
other wall and higher position
Cable toggle boxes:
one level upwards
3 Optimisation possibilities
c) Shielding

Shielding survey:

Container for Test Source:
- 20 cm height
- 3 cm diameter
- 130 TBq Co-60
(to detect 10 µSv/h outside of shielding)

Comparison Fuel Bundle:
- 360 cm height
- 7 TBq Co-60 equiv.
Shielding survey:

Solution:

• Shielding frames in building joint

(not required in this case due to low dose rate resulting)
3 Optimisation possibilities

c) Shielding

Shielding Survey:
Dose rate significantly above expected value detected:
~2 mSv/h

Comparison to FB activity
~140 µSv/h
(but FB has 3.2 m length)
3 Optimisation possibilities

c) Shielding

Actions:

- Primary drilling
Optimisation possibilities

3 Optimisation possibilities

c) Shielding

Actions:

• Primary drilling

• Disturbance detection
3 Optimisation possibilities

c) Shielding

Actions:

• Primary drilling
• Disturbance detection

Analysis:

• Metal spacers,
• Depth 60 to 70 cm
3 Optimisation possibilities

 c) Shielding

Location of disturbance in the wall
3 Optimisation possibilities

c) Shielding

Actions:
• Primary drilling
• Disturbance detection

Analysis:
• Metal spacers,
• Depth 60 to 70 cm
• Repair (filled with grout)

Result: <15 µSv/h
(<=0.1 µSv/h with FB)
4 Summary

Lessons learned:

• Ease of access:
  personal safety can be enhanced by labyrinth access

• Location of penetrations (cables & ventilation):
  away from operator level
  Shielding aspects
  Frequency of personnel access of mayor importance

• Shielding design & supervision
  Measurement mandatory, especially at known “disturbances”
  Close supervision during construction required
Thank you for your attention!

Questions?