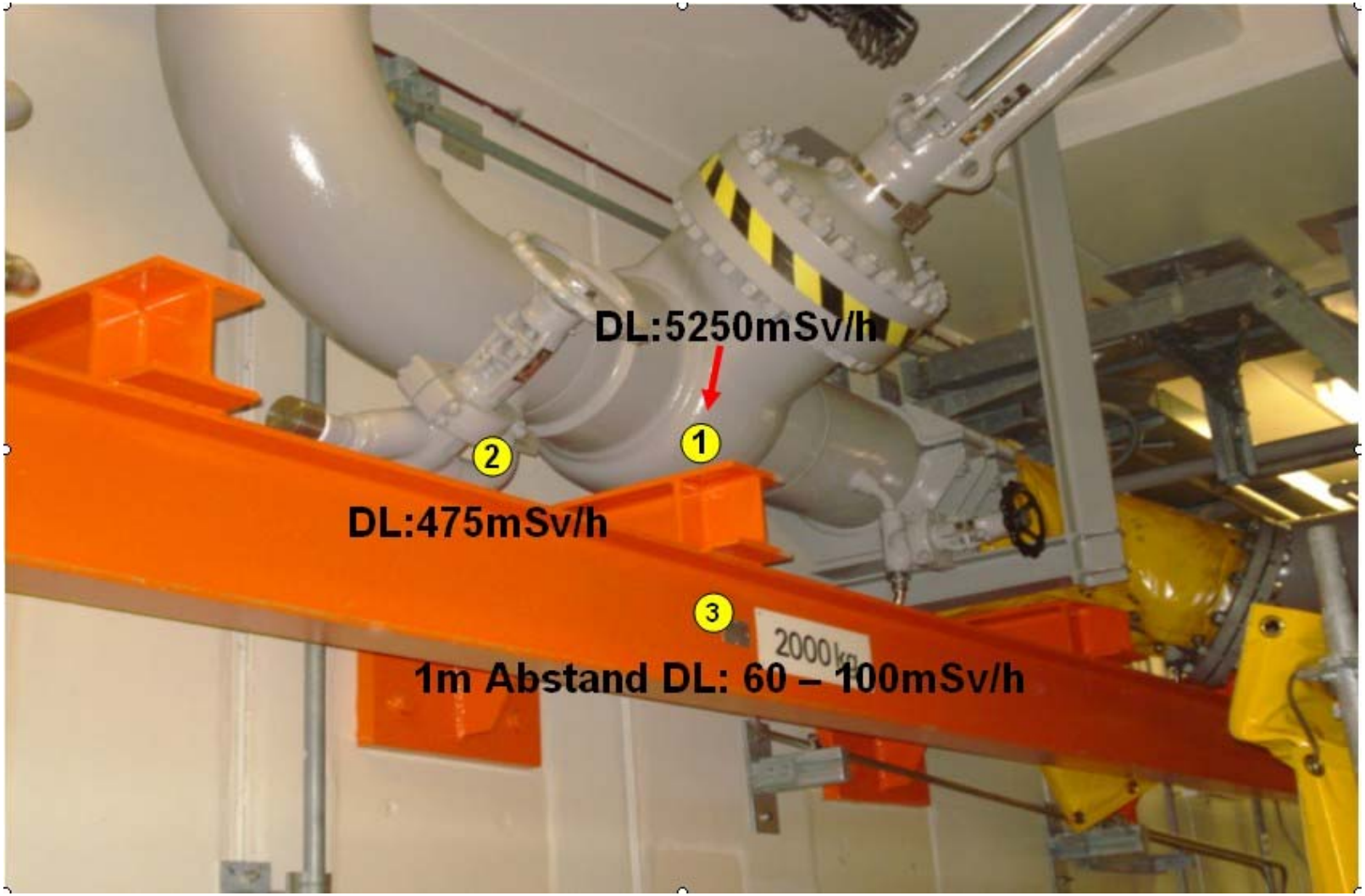
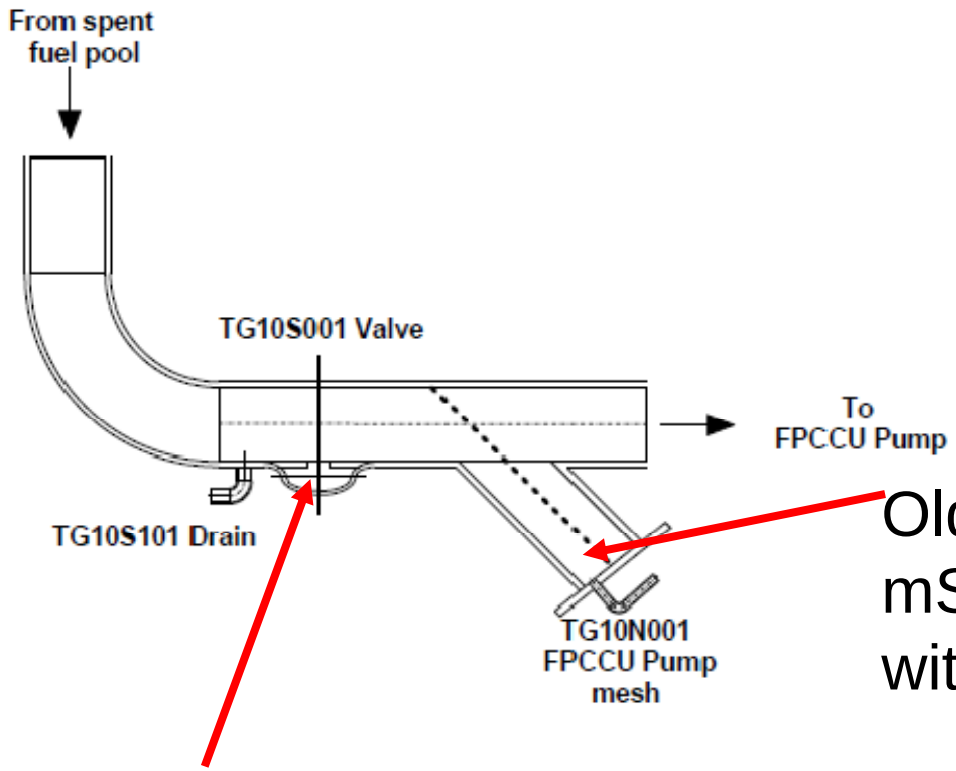
Hot Spot Experience at KKL

Andreas Ritter, KKL

Situation found during operator walkdown:



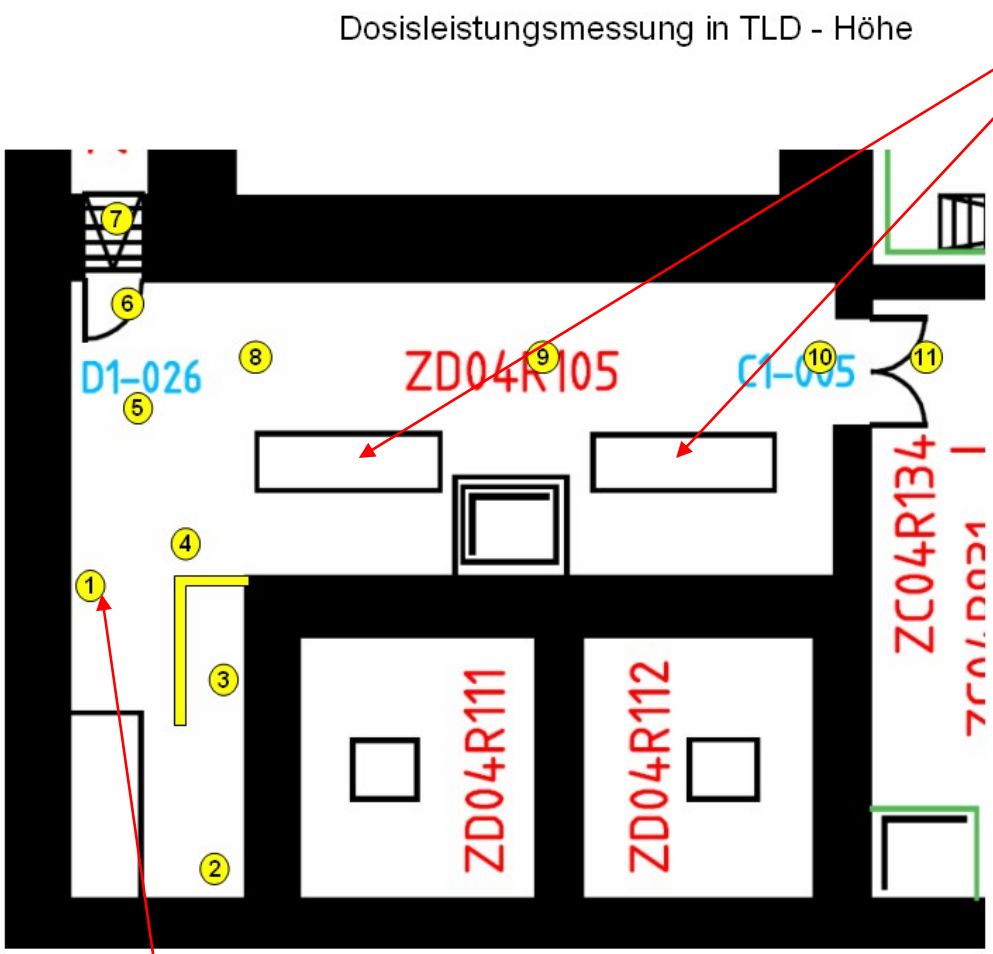
The situation found (schematic)



Old situation 20 mSv/h shielded with lead blankets

Hot Spot 5250 mSv/h (525 R/h)

Dose rates in FPCCU - pump room



Fuel Pool Cooling and Clean Up Pumps

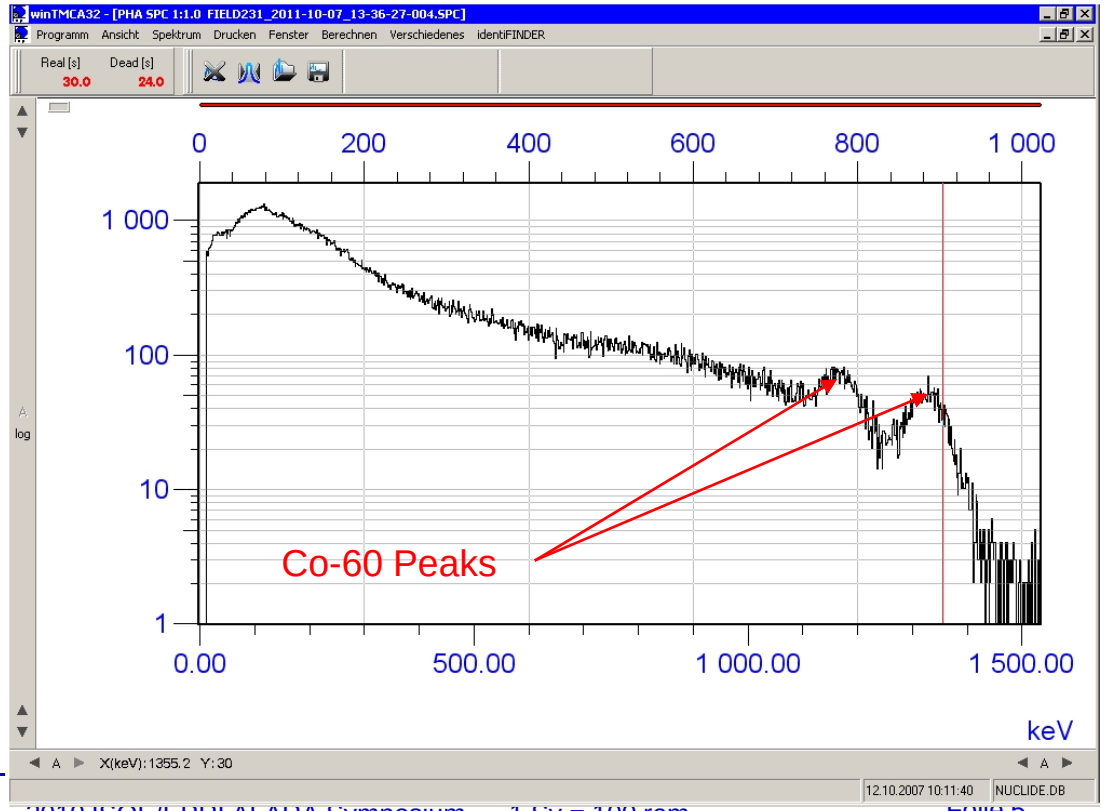
1 DL 10mSv/h
2 DL 1.0mSv/h
3 DL 4.5mSv/h
4 DL 6.7mSv/h
5 DL 0.980mSv/h
6 DL 0.450mSv/h
7 DL 0.240mSv/h
8 DL 0.850mSv/h
9 DL 0.480mSv/h
10 DL 0.220mSv/h
11 DL 0.170mSv/h

Datum: 08.10.2007
Visum: wpe

Hot Spot location

What is it?: Nuclide identification

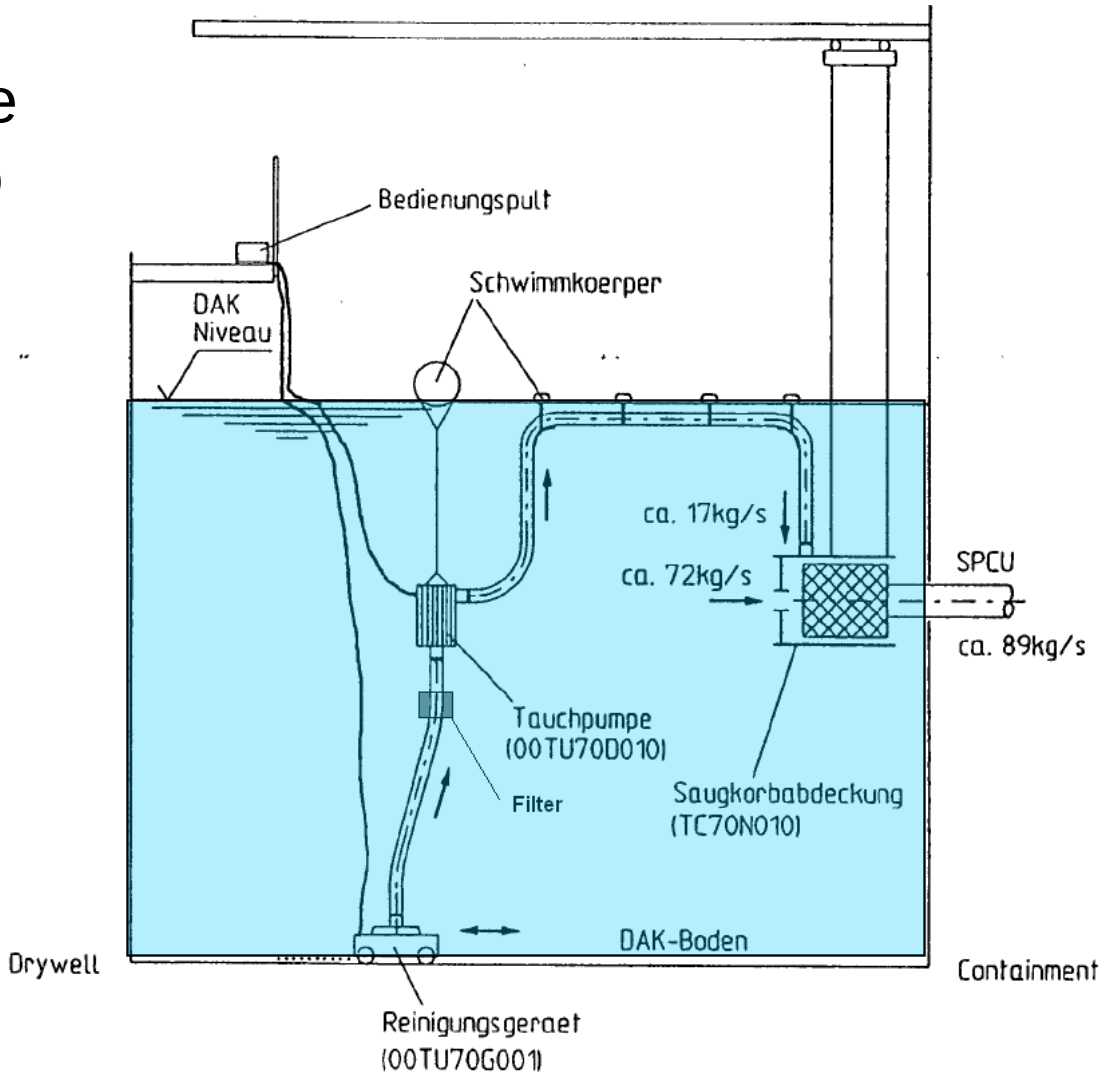
- History: Broken fuel pin in the past and 141 fuel pellets lost in spent fuel pool
- History: Control rod pins and rollers were removed in the fuel pool
- ~~Fuel?~~
- ~~Fuel cladding?~~
- Control Rod pin?
- Anything else?



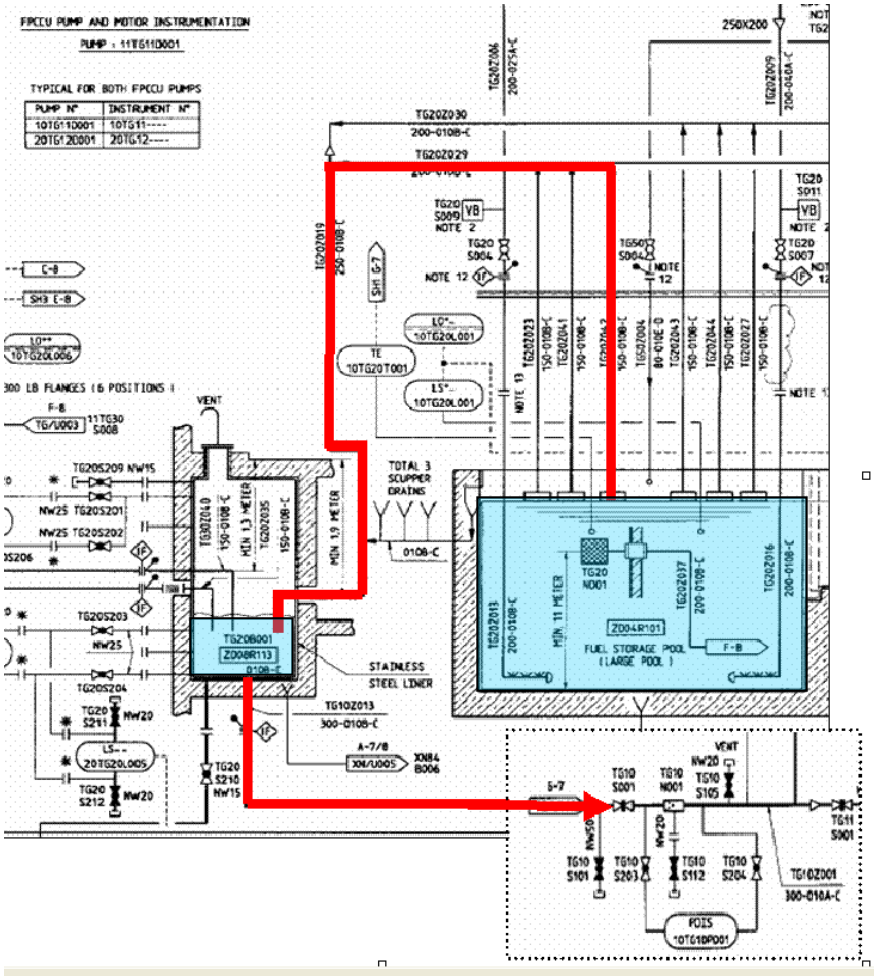
TG10S001 valve lower housing picture taken by endoscope

The principle of spent fuel pool cleaning

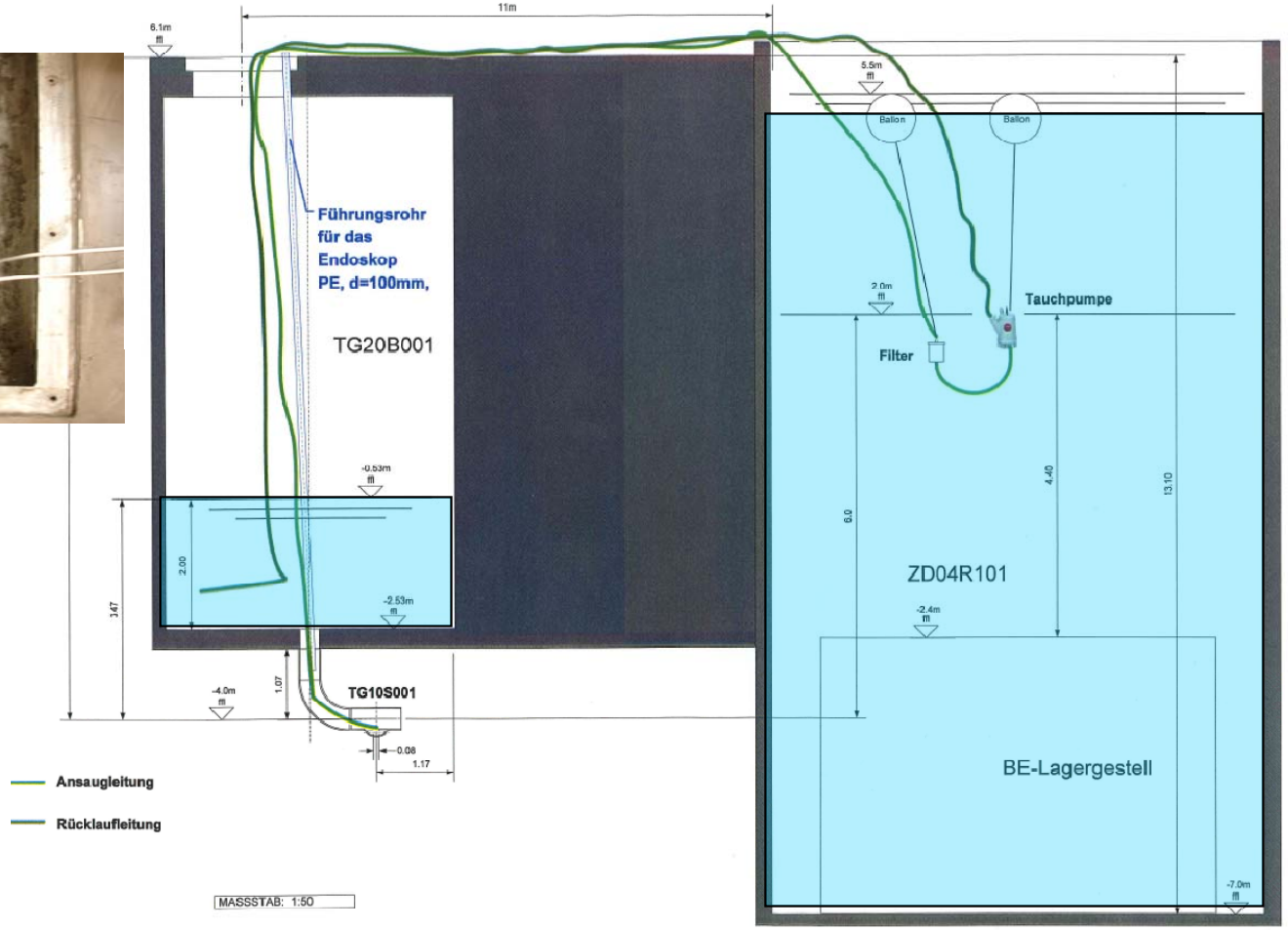
- Move the dirt from the spent fuel pool floor to the radwaste
- No submerged filter disposal



Transport path of Hot Spot



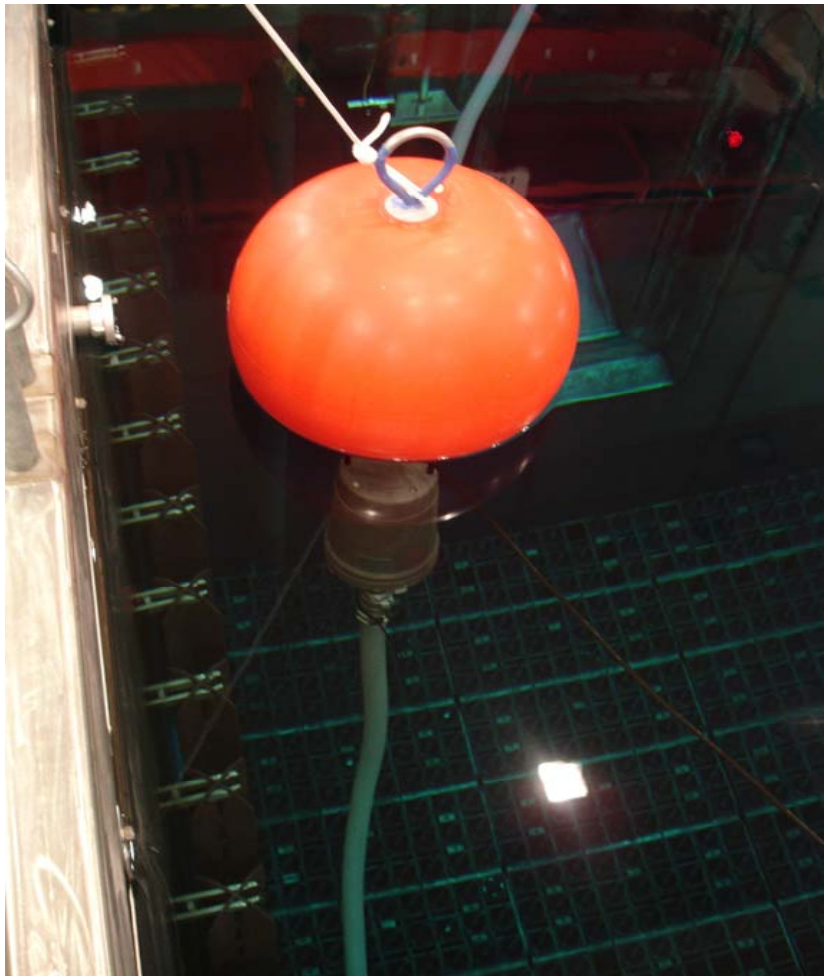
Hot Spot #1 removal line up



Mock - up

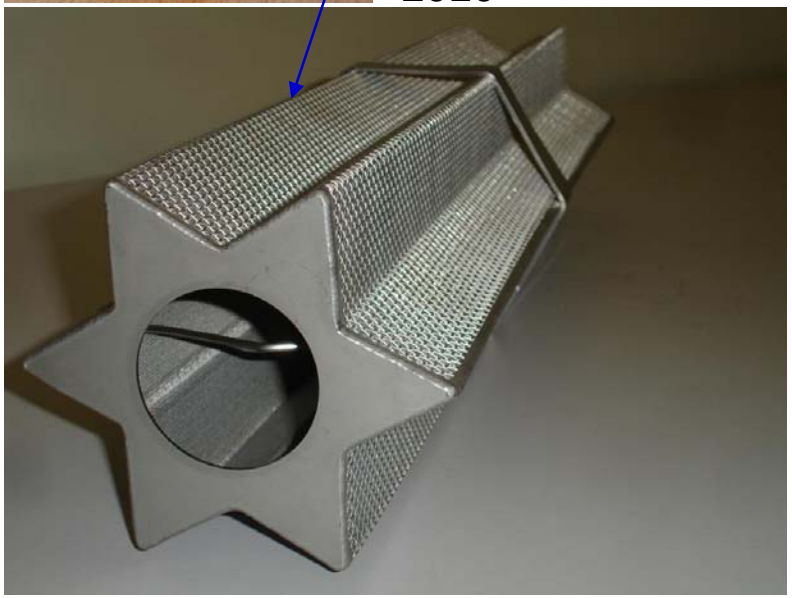
Video: Hot-Spot vacuuming sequence TG10S001

Where did the Hot Spot go?



Commercial filter cartridge: clogging

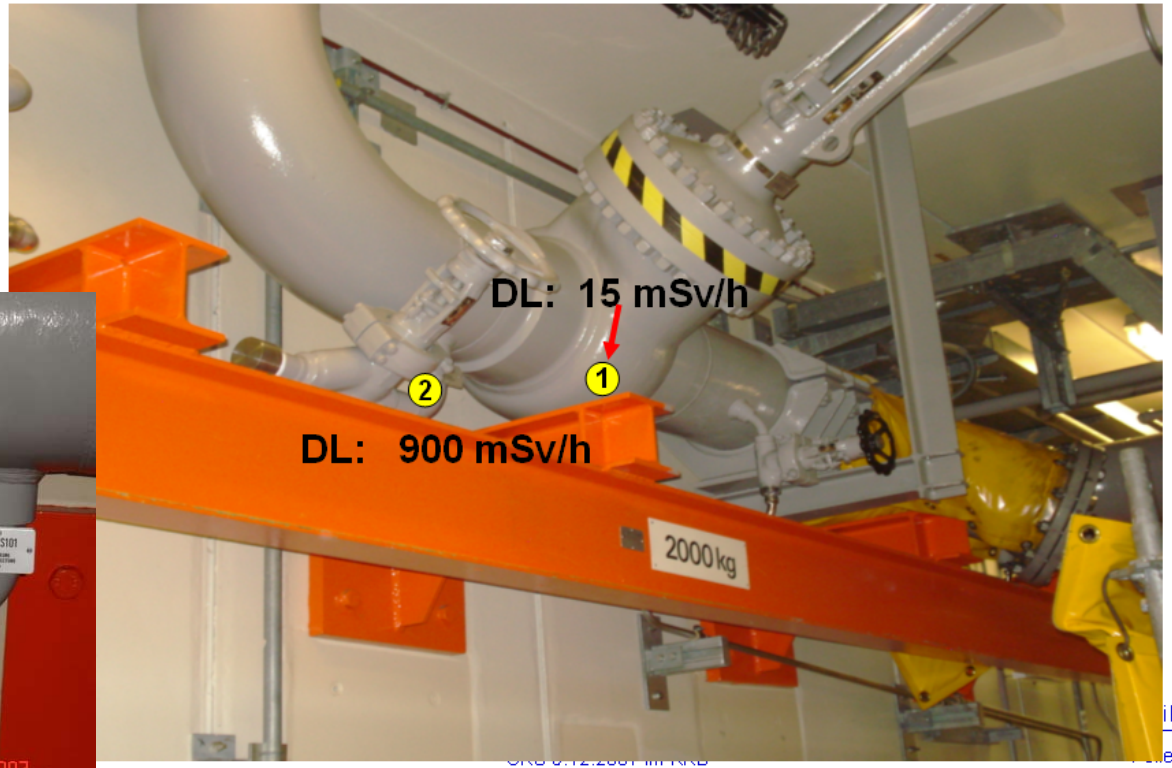
Customized „star-filter“: wider mesh, 800 mSv/h, disposal during Control Rod disposal campaign 2010



Situation after Hot Spot #1 removal

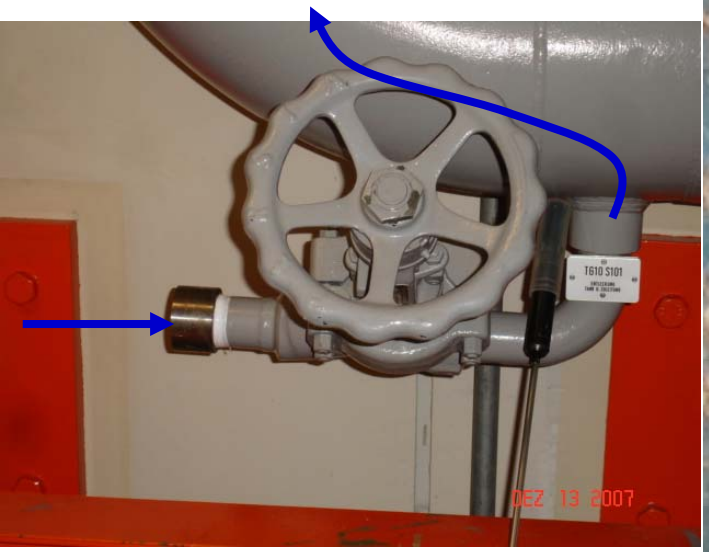
Hot - Spot am Ventil TG10S00 ZD04R105 Nach dem Entfernen des Hot - Spots

Datum: 29.11.07 Visum: Stritt Oliver



Hot Spot #2 inside drain line TG10S101

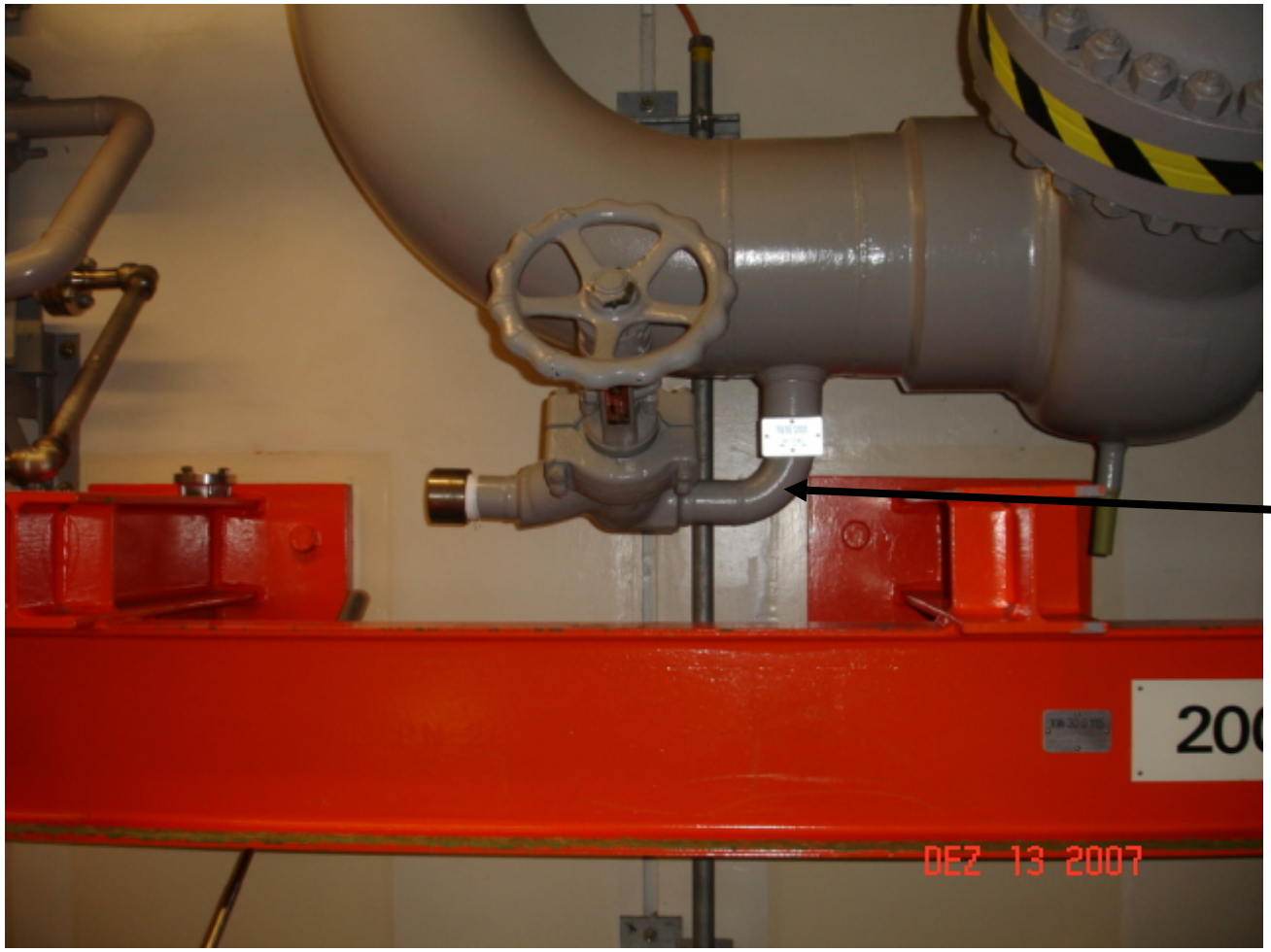
Vacuum
hose to filter



Clean water injection
for backwash,
including check-valve

Video: Hot-Spot vacuuming sequence drain line TG10S101

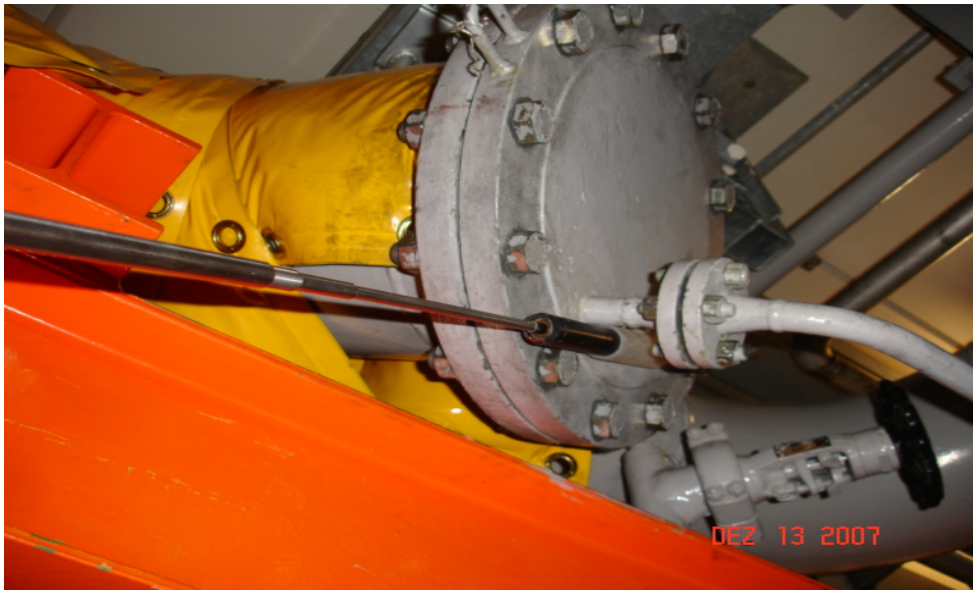
Situation after Hot Spot #2 removal



6 mSv/h

Situation before and after RFO24

TG10S001
5 mSv/h / 520 mSv/h

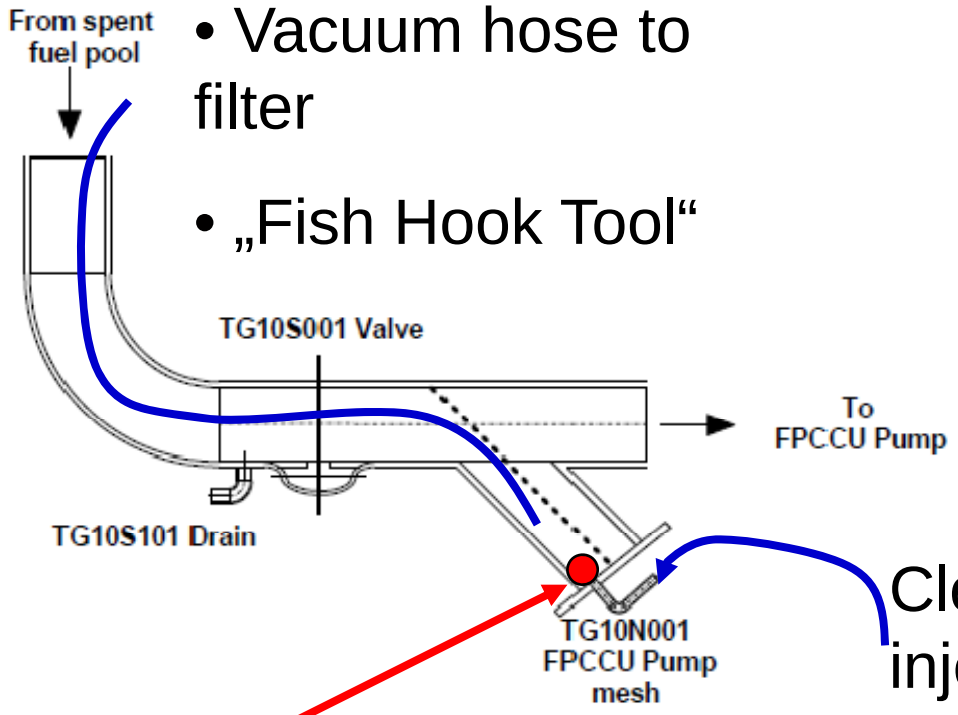


Drain line of FPCCU pump protection mesh

620 mSv/h / 4‘500 mSv/h

During RFO-24 fuel inspection fuel cladding needed to be brushed. Removed CRUD was pumped into FPCCU suction line. Good idea????

Hot Spot #3



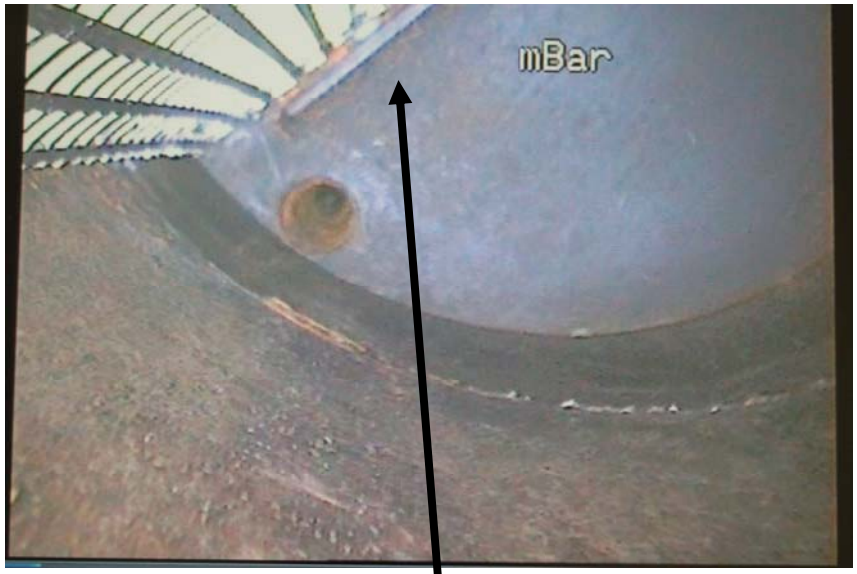
- Vacuum hose to filter
- „Fish Hook Tool“

4500 mSv/h

Clean water injection for backwash, including check-valve

Video: Hot-Spot vacuuming sequence TG10N100 pump protection mesh

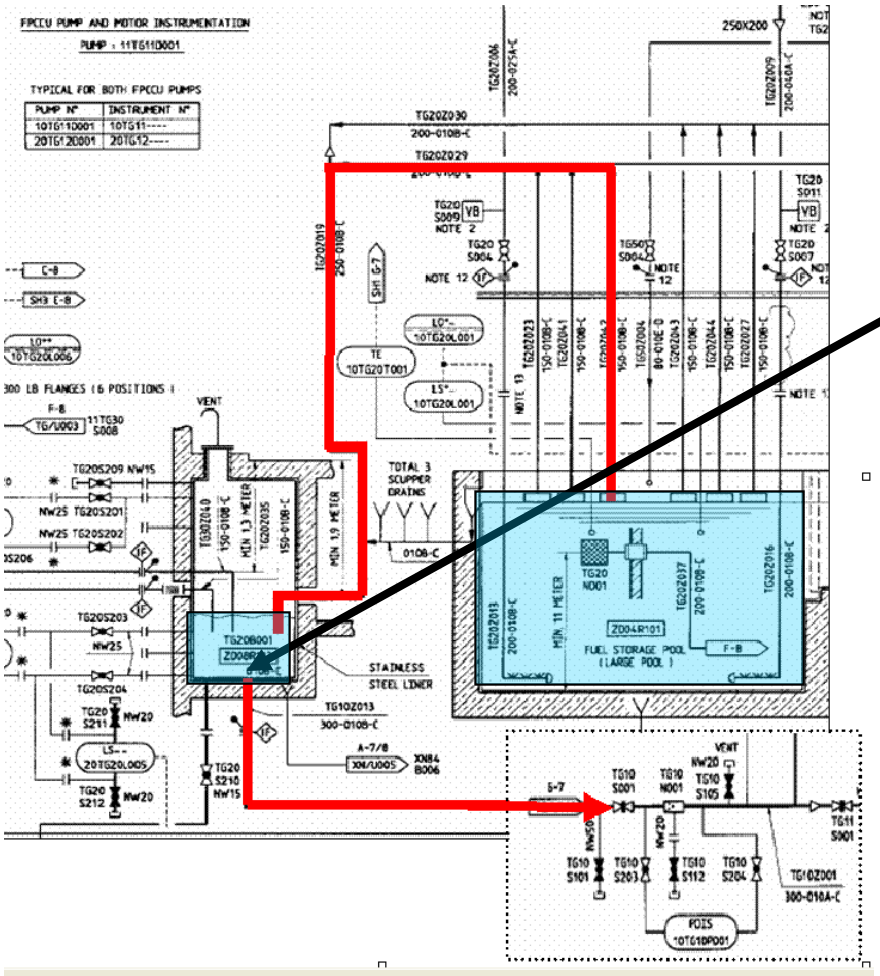
Pump mesh before and after cleaning



Remaining Hot Particle #4
1200 mSv/h

Removed foreign material

Installation of collar

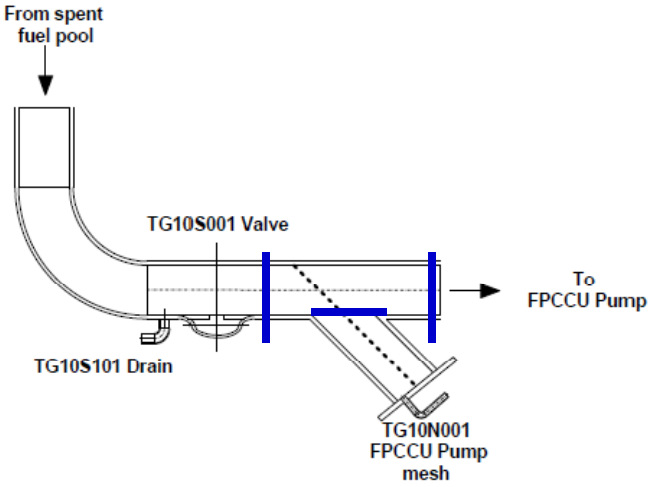


collar prevents heavy particles from being washed into suction line

Installation of additional Area Radiation Monitors

- Continuous survey of dose rate situation and warning

Remaining challenges: Hot Spot in filter housing TG10N001

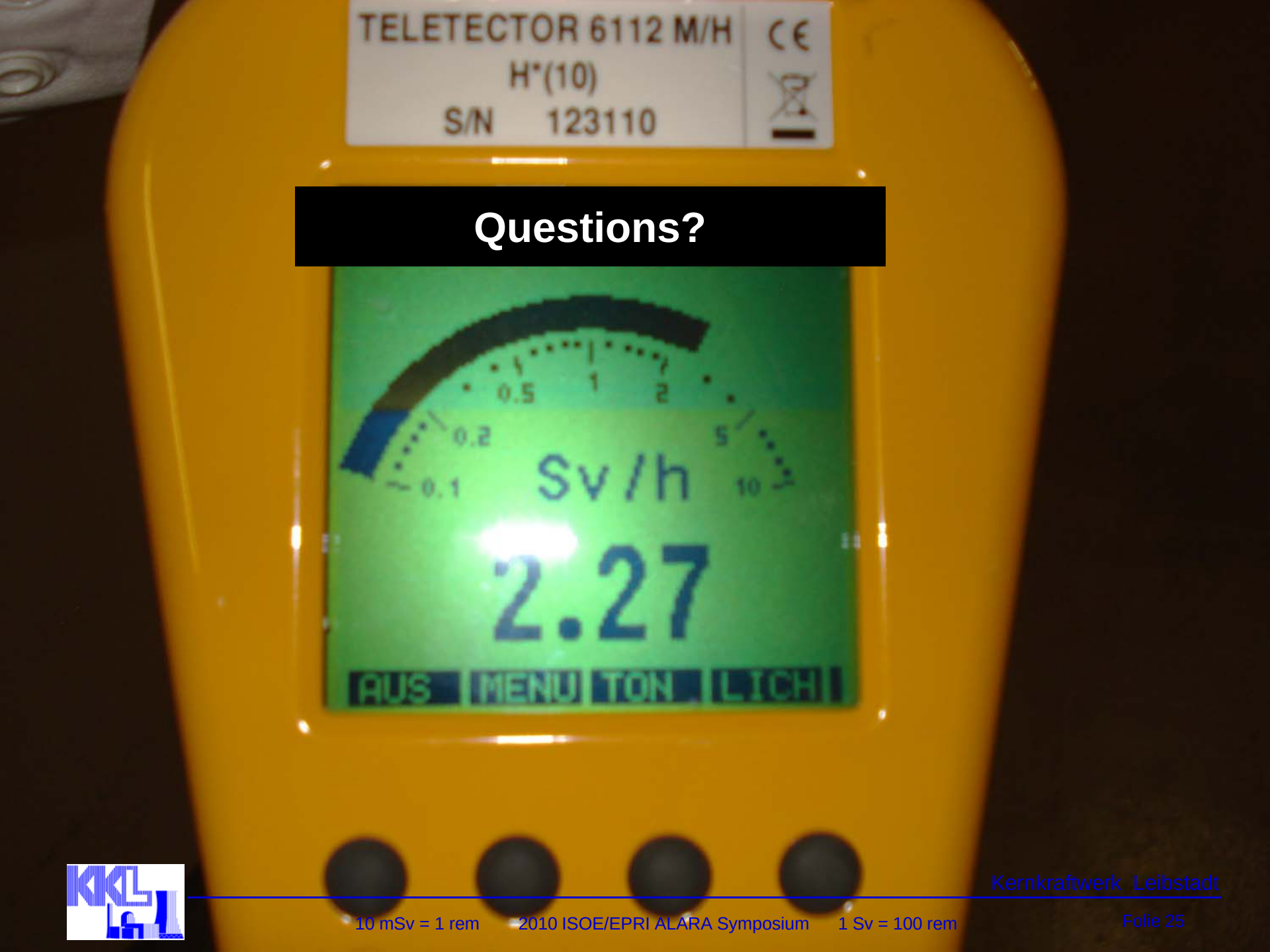


- Option 1
- Remove TG10N001 internals including Hot Spot #4 and install blind part to prevent new Hot Spot build up.
- Install pump protection mesh elsewhere
- Residual heat removal from spent fuel pool during installation?

- Option 2
- Remove entire TG10N001 including Hot Spot #4 and install straight piece of piping
- Install pump protection mesh elsewhere
- Residual heat removal from spent fuel pool during installation?

Conclusions

- **If radioactivity is located in a safe place: Leave it there**
- **If radioactivity has to be moved: Follow the path to the final destination (= geological repository)**
- **Have your surveys/instruments in place**
- **Have your RP - technicians ready to handle high dose rates**
- **Have your Foreign Materials Exclusion controls in place**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Questions?
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