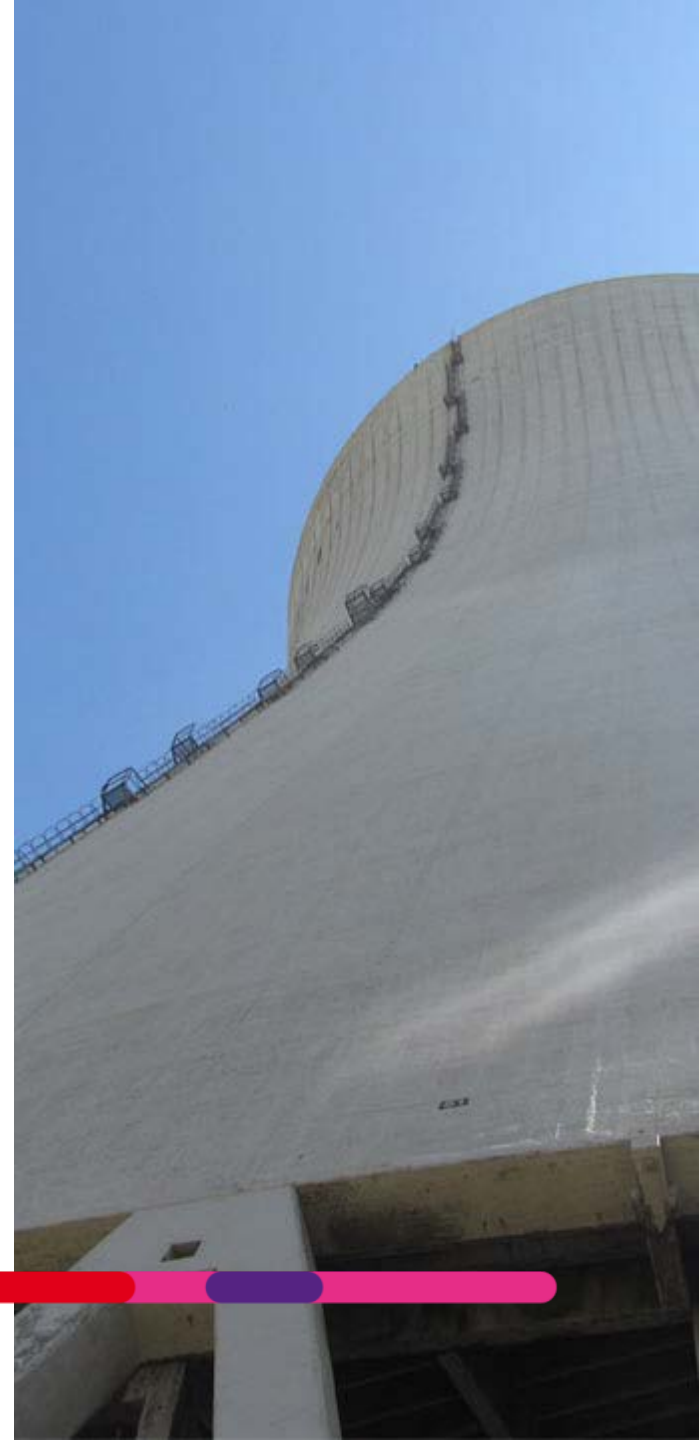

Cartography of the radiation around the reactor buildings of Doel 1 and Doel 2 in case of a severe accident



Content

Problem statement

Solution

Example

Results and recommendations

Problem statement

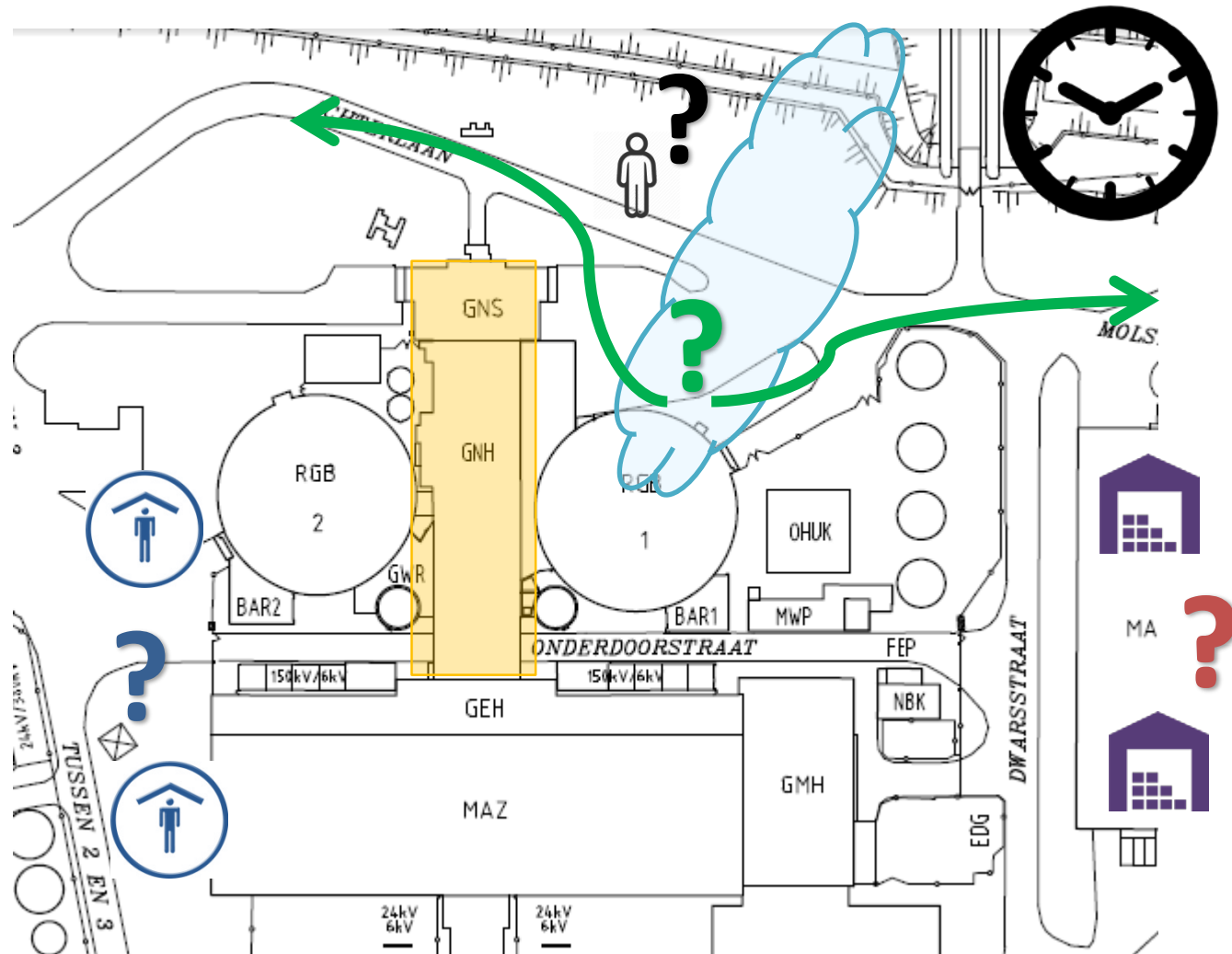
Long term operation



→ Reconsideration of severe accident management

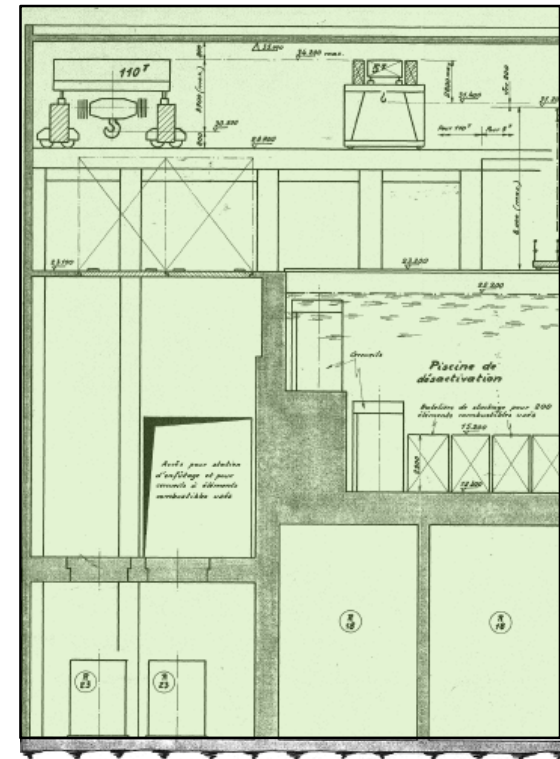
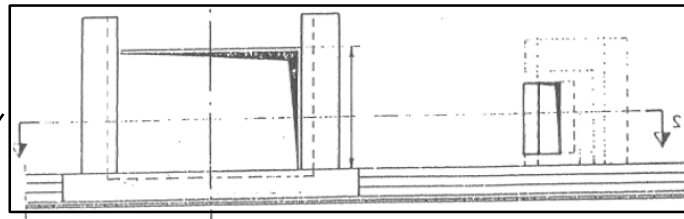
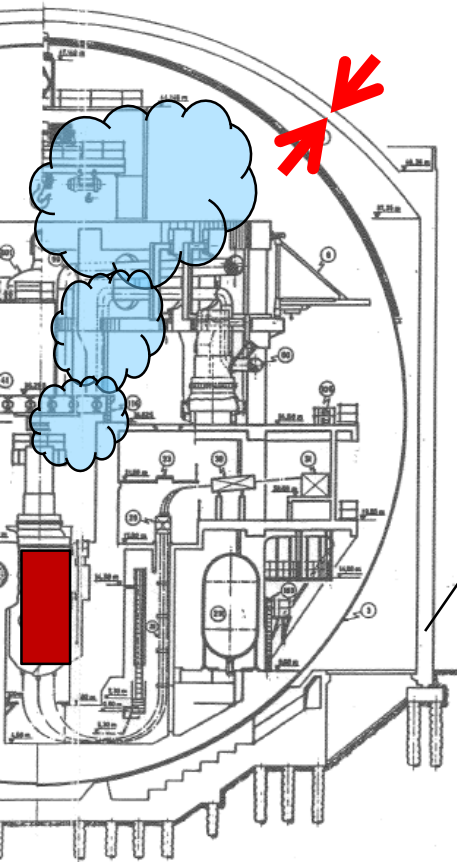
Problem statement

- Available dose-rate estimations
 - Outside: Plume
 - Inside: GNH
- **Missing key:**
 - **Doserate map in the field around reactor buildings**



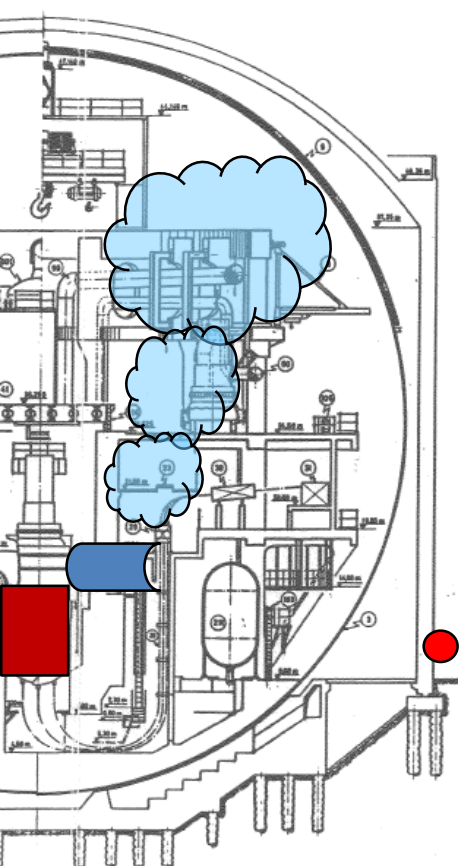
Problem statement

- Accompanying difficulties
 - Source & scenario
 - Weak spots
 - Surrounding buildings



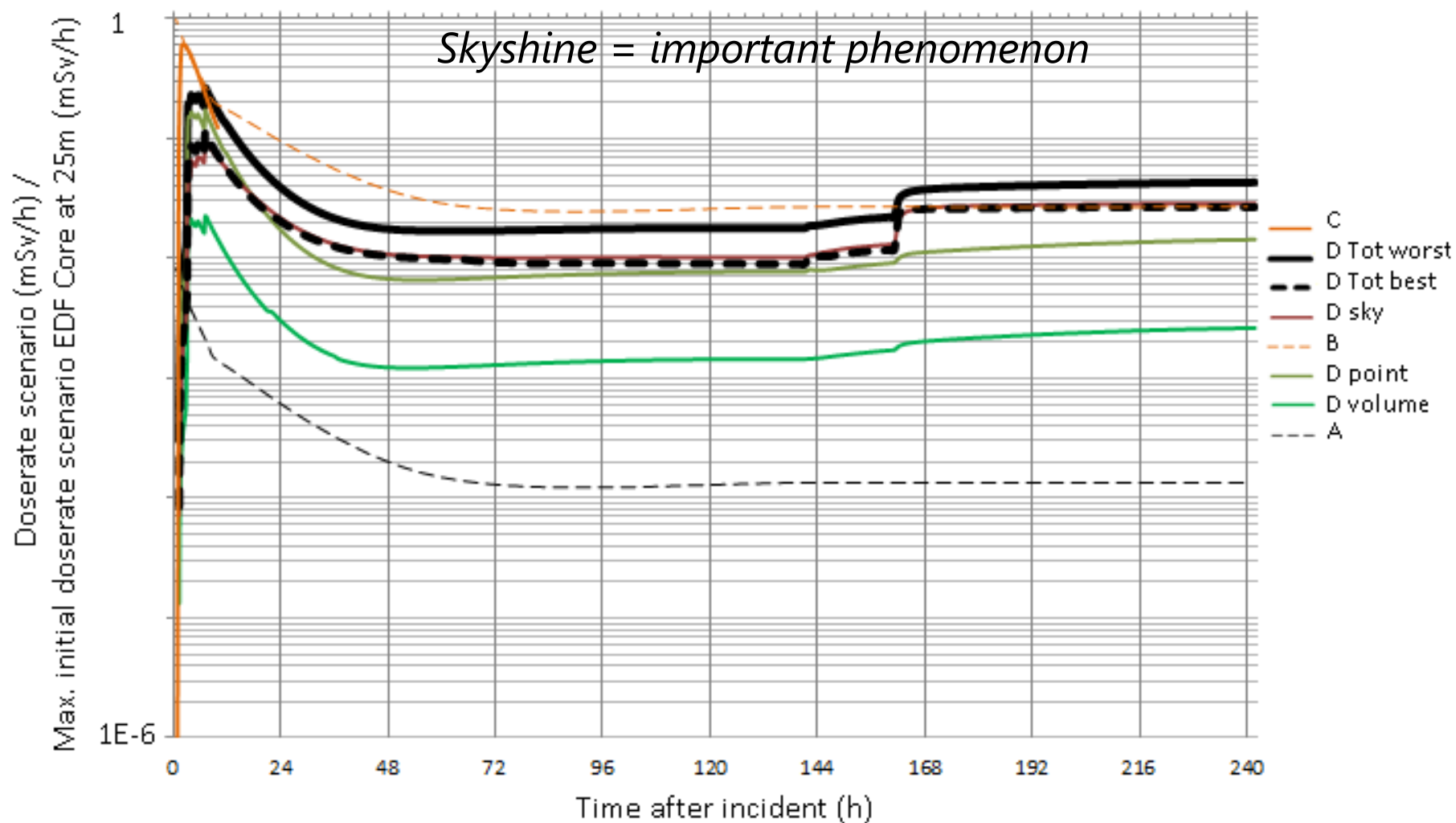
Solution

- Source and scenario:
 - Most plausible origin: LOCA, LOOP (operation + shut down)
 - *Doserate due to core = Negligible*
 - 4 scenarios

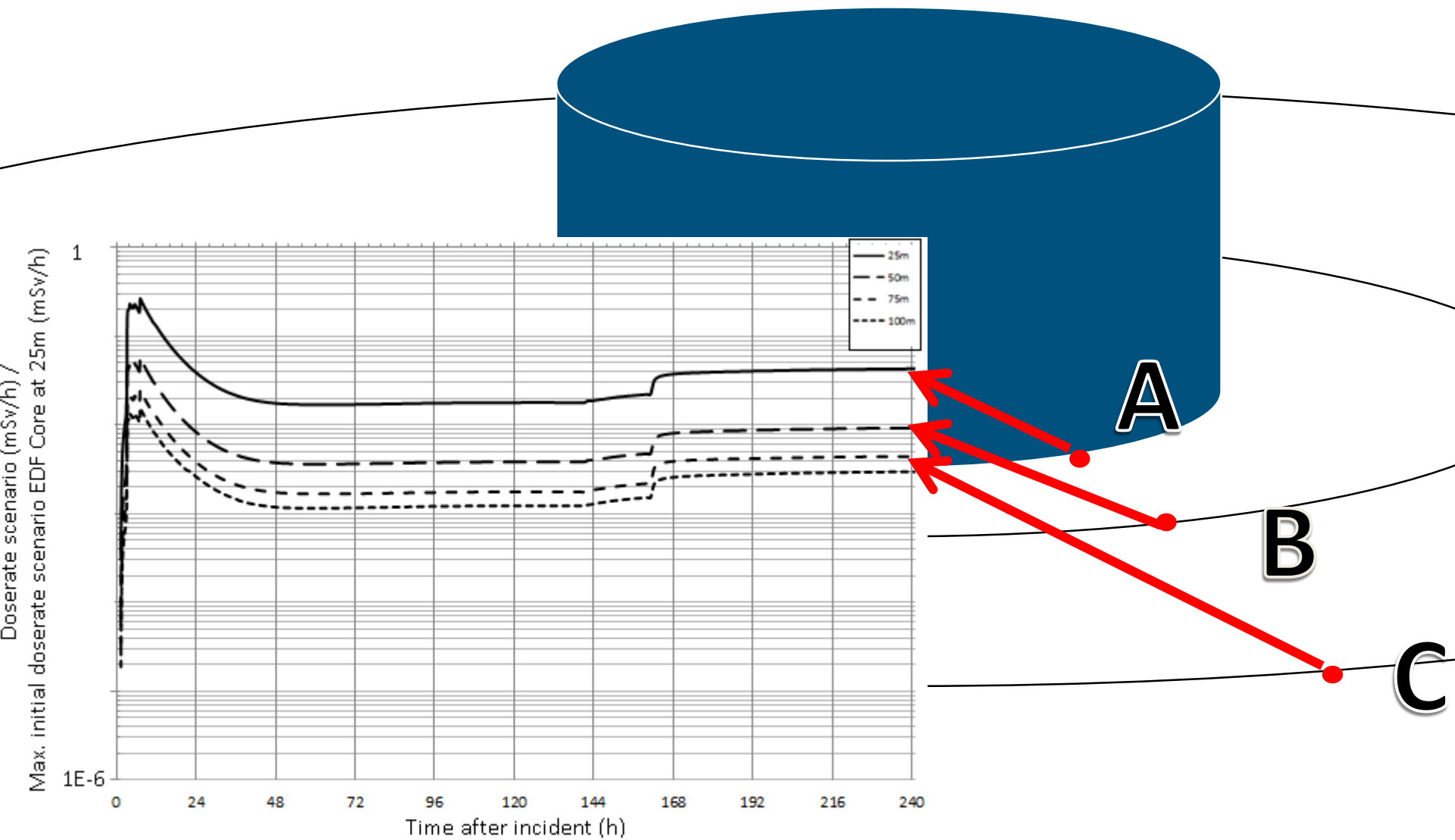


Scenario	A	B	C	D
Name	EDF Best Case	EDF Worst Case	NUREG 1465	Reference
Event	Cladding damage	Core damage	'Typical' accident	SBO + LOCA
Method	Point	Point	Point	Point Volume Skyshine

Solution



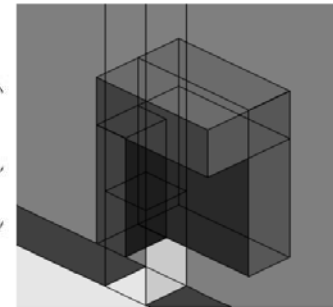
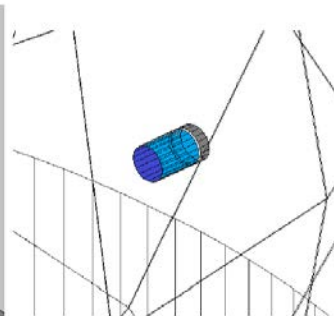
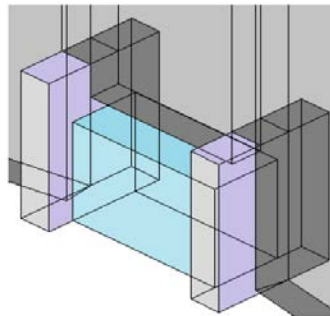
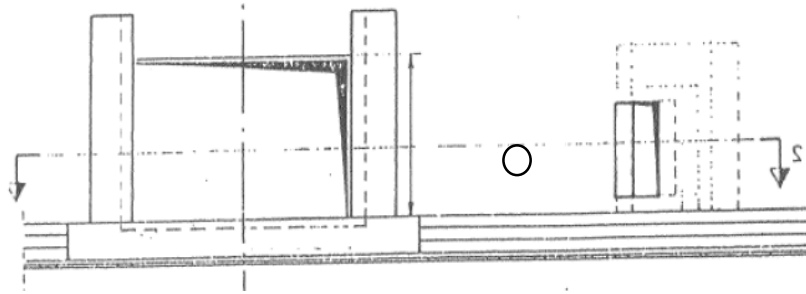
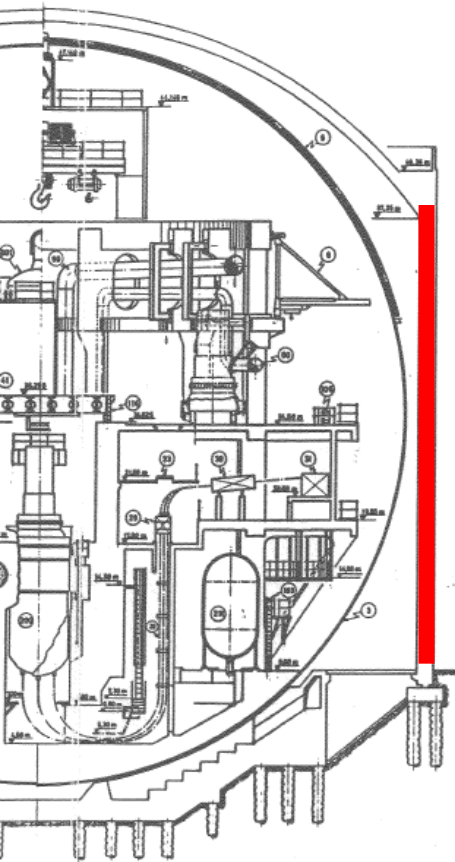
Solution



Solution

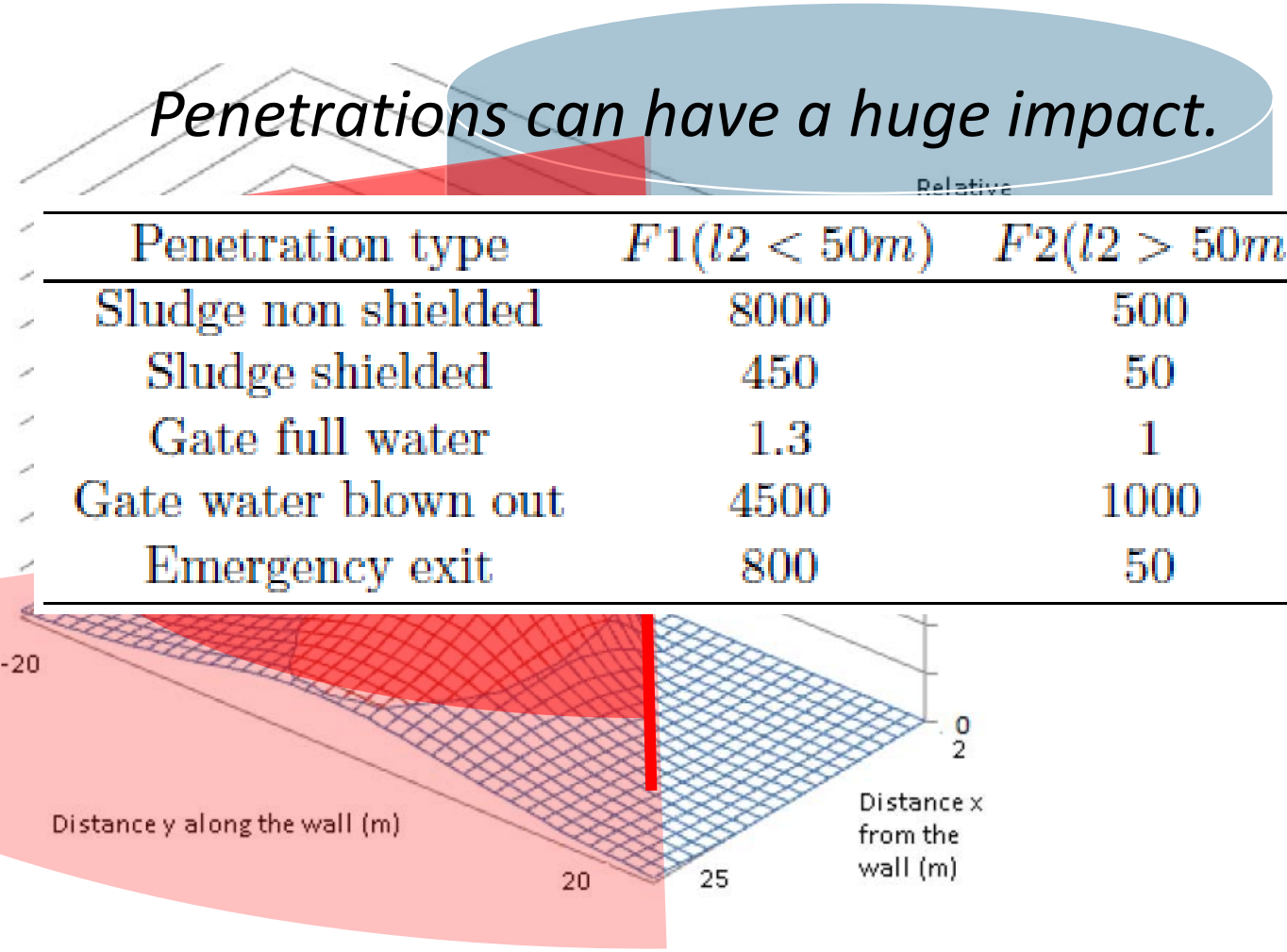
– Penetrations:

Material gate, sludge lancing, emergency



Solution

Penetrations can have a huge impact.



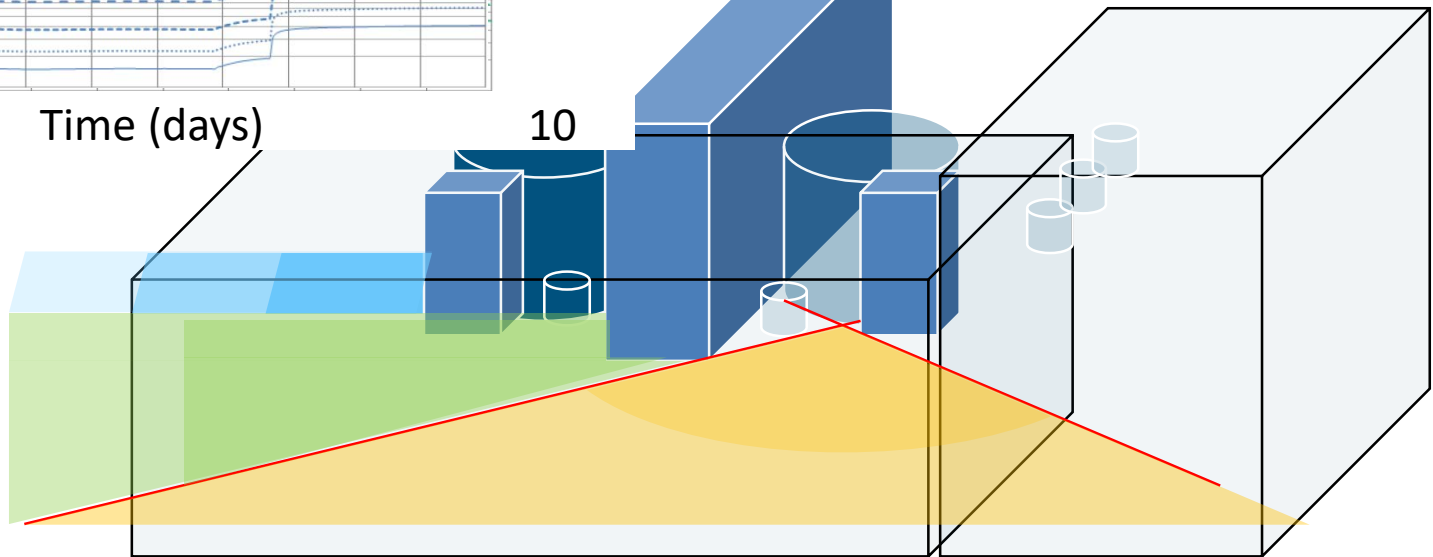
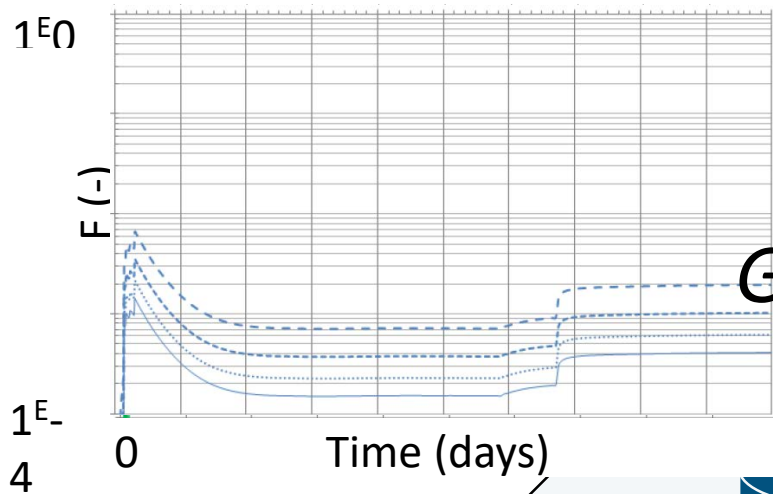
Penetration type	$F1(l2 < 50m)$	$F2(l2 > 50m)$
Sludge non shielded	8000	500
Sludge shielded	450	50
Gate full water	1.3	1
Gate water blown out	4500	1000
Emergency exit	800	50

Solution

- Buildings:

- GNH +GNS, RGB, BAR
- MAZ, GEH, other objects

GNH = most important shielding



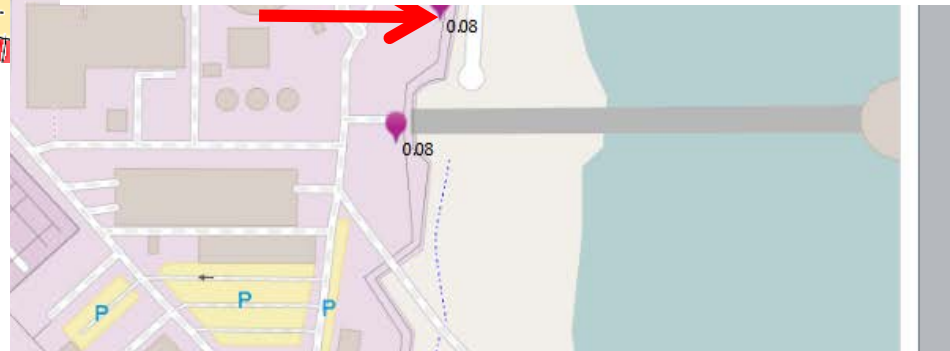
$f_1 = 1 \cdot 10^{-3}$ $f_2 = 7 \cdot 10^{-4}$ $P = 50$

Penetration type	F1 ($l_2 < 50m$)	F2 ($l_2 > 50m$)
Sludge non shielded	8000	500
Sludge shielded	450	50

$D_2 = D_1 \times f_2 / f_1 \times P$

$=$

$0,7 \text{ mSv/h}$



- Main results
 - Establishment of the cartographic tool
 - Doserate due to core = negligible
 - Skyshine = important phenomenon
 - Penetrations can have huge impact

Recommendations:

- Remote repair of material gate
- Additional shielding emergency exit
- Escape routes
- Sheltering locations
- Storage locations

Questions

