

Reduction of personal contamination by keeping score

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Outline

- Information on Forsmark NPP
- How do we deal with external personal contamination?
- Keeping score of the alarms
- How does it work?
- Results & benefits
- Conclusion



Forsmark NPP, 3 BWR reactors



Forsmark 1

Generator output net 978 MWe

Critical reactor

23 April 1980

Commercial operation

10 December 1980

Forsmark 2

Generator output net 990 MWe

Critical reactor

16 November 1980

Commercial operation

7 July 1981

Forsmark 3

Generator output net 1,190 MWe

Critical reactor

28 October 1984

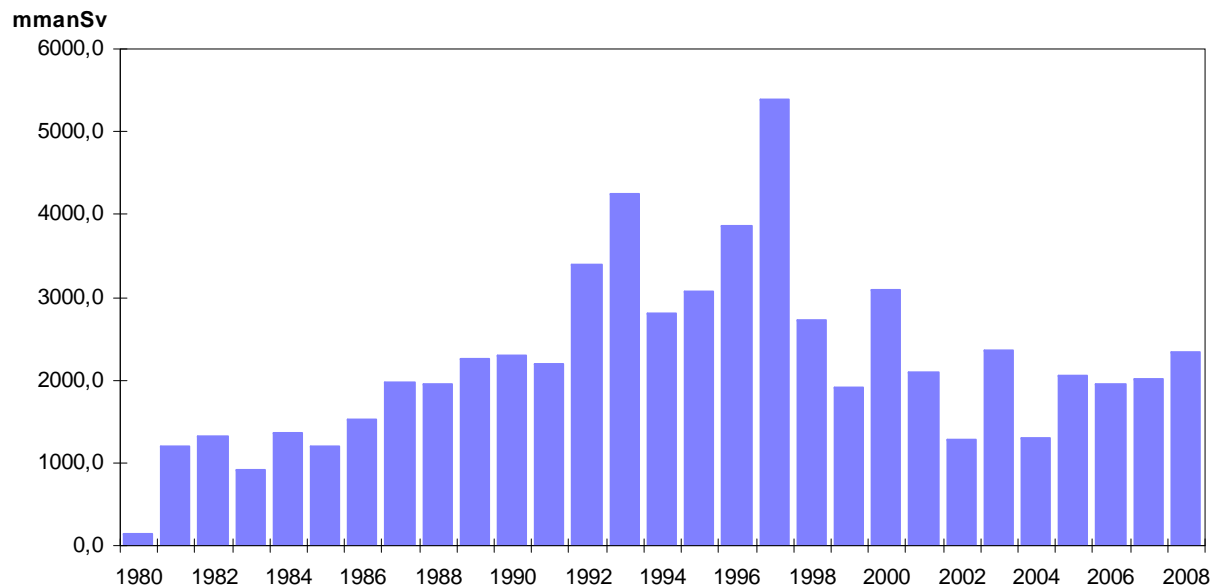
Commercial operation

21 August 1985

Staff at Forsmark NPP

- Employees 1038 persons
- Full time consultants 550 persons
- Extra staff during outage up to 1500 persons

Total annual collective dose at Forsmark



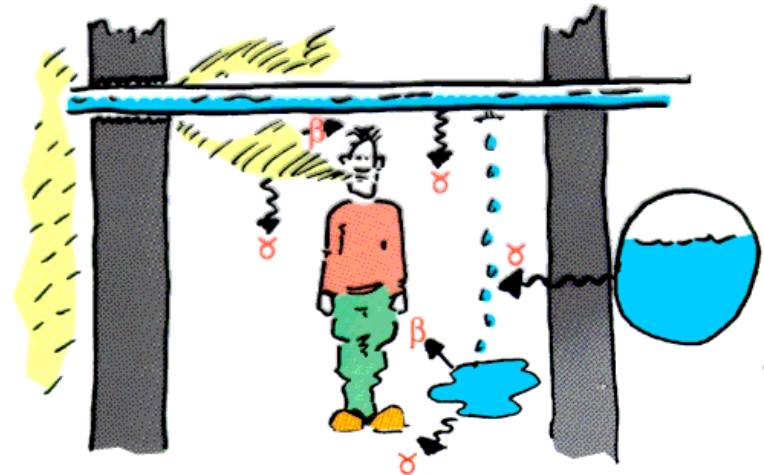
Importance of keeping contamination low

- We monitor all air and water discharge from the NPP
- We control all material and equipment with scintillation detectors and wipe tests, prior to release from RCA/CCA
- One other possible release point for contamination is through staff that leaves the RCA/CCA – which we also monitor
 - We have approximately 200 000 exits through personal contamination monitors per year, adding all 3 units

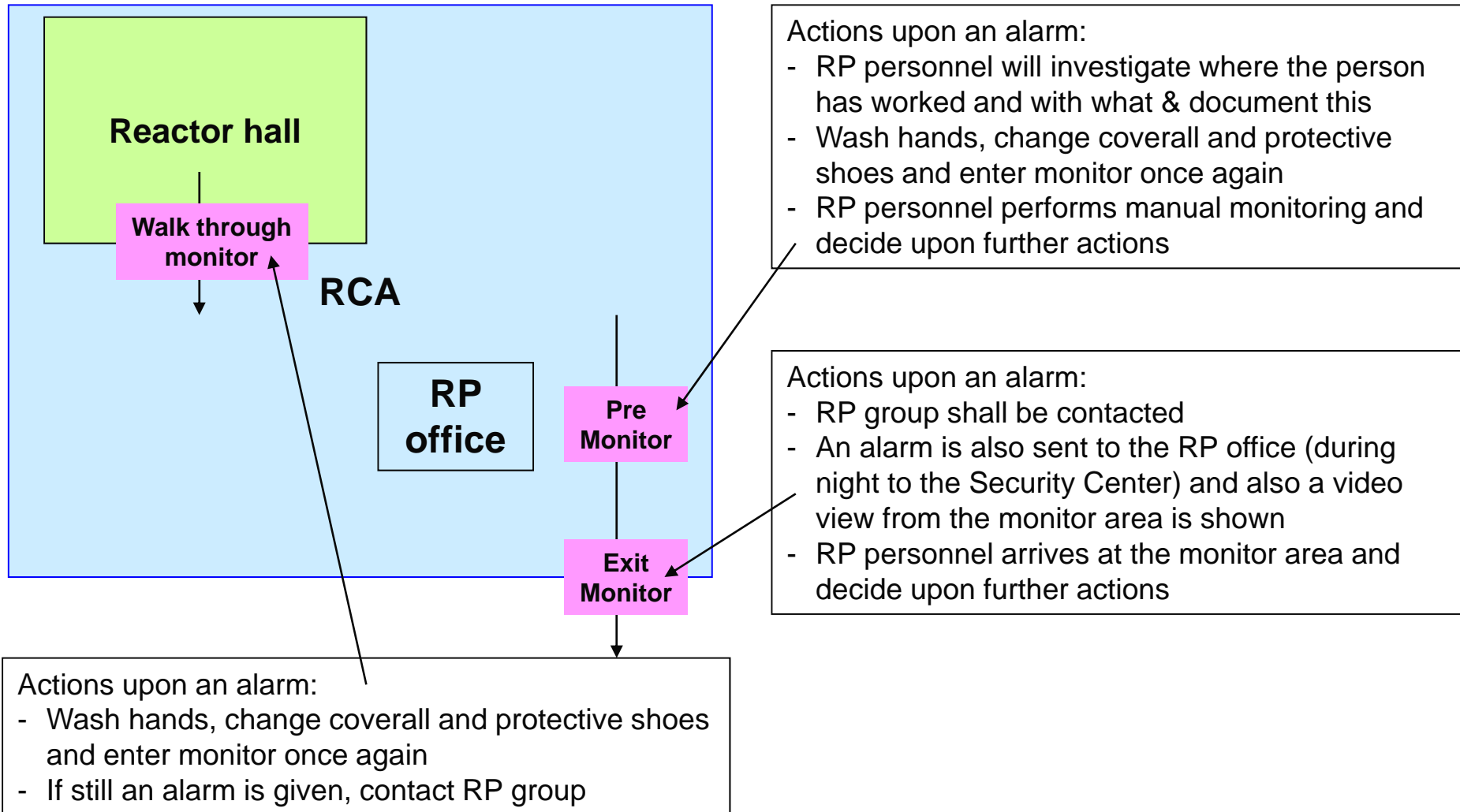


Importance of keeping contamination low

- By reducing personal external contaminations we can also help minimize internal contaminations
- The reduction of external contaminations also reduces doses, especially if contaminations are reduced by cleaner workplaces and improved workmanship



Monitoring of external contamination



Reducing personal contamination by keeping score

By keeping score of how, where, and when a person is contaminated we have reduced the number of alarms in the exit monitoring from around 2 % to 0.5 %

We are made aware of:

- places that are contaminated
- If extra protective equipment is needed
- Workers that do not, voluntarily or involuntarily, follow safety instructions
- If safety instructions are incomplete or incompletely communicated



Example of log-sheet

					Pre				Exit			Workplace										Signature				Comment
Date	Time	Dos no.	Room	System	Coverall	Shoes	Hands	Other	Face	Hands	Feet	Other	Reactor hall	ÖRI	NRI	reactor built	Turbine	Verk/Dek.	Waste dep.	other	Same person	Same system	Same room			
09-08-05	04:50	1777X				x											x				1	0	0	6CD	Turbine containment	
09-08-05	08:55	1824X	ÖRI			x								x							1	0	3	4ML		
09-08-05	08:45	1784X			x										x						2	0	0	4ML	main circulation pumps	
09-08-05	09:20	1973X	A4.87		x									x							1	0	1	4ML	coverall, right sleeve	
09-08-05	10:00	1812X	NRI		x										x						1	0	2	8CH		
09-08-05	11:00	1886X	D4.25		x												x				2	0	1	8CH	coverall, front	
09-08-05	11:36	1849X	ÖRI		x									x							1	0	3	8CH		
09-08-05	12:30	1773X	B-byggnad									x				x					1	0	1	4ML	side of the body	
09-08-05	13:40	1859X			x									x							2	0	0	8CH		
09-08-05	14:25	1822X	D5.27		x												x				1	0	2	4IQ		
09-08-05	14:25	1886X	D5.27		x												x				2	0	2	4IQ		
09-08-05	00:00	1832X			x										x						1	0	0	6qs		
09-08-05	15:40	1941X			x		x											x			1	0	0	6qs		
09-08-05	15:40	1834X			x		x											x			1	0	0	6qs		
09-08-05	15:50	1784X			x										x						2	0	0	6qs	Pump station	
09-08-05	16:00	1831X								x				x							1	0	0	rfl		
09-08-05	16:15	1839X										x									1	0	0	6qs	shoulders, Pump station	
09-08-05	17:00	1798X				x											x				1	0	0	6qs		
09-08-05	19:45	1741X	Dekonten		x													x			1	0	1	4QG	coverall, sleeve	
09-08-05	21:15	1859X			x									x							2	0	0	4RN		
09-08-05	23:05	1887X	ÖRI		x									x							1	0	3	6CD		
09-08-05	23:55	1827X	NRI				x								x						1	0	2	6CD		
																					0	0	0			

ORI = upper containment

NRI = lower containment

Follow-up of contaminated persons

- If any person is contaminated more than twice in one day, follow-up is done regarding the causes
- First it is checked if the RP staff have performed their duties
 - information,
 - job-planning,
 - contamination checks and
 - supply of protective gear
- If all these duties are found to have been performed satisfactory the management of the contaminated person is notified



Follow-up of contaminated persons

- A formal notice is given to the work management
- The RP staff indicate on the notice if, in their opinion the person has failed to follow instructions, voluntarily or involuntarily, or lacks the knowledge on how to behave in the RCA/CCA



- It is the work management's obligation to take action, if needed

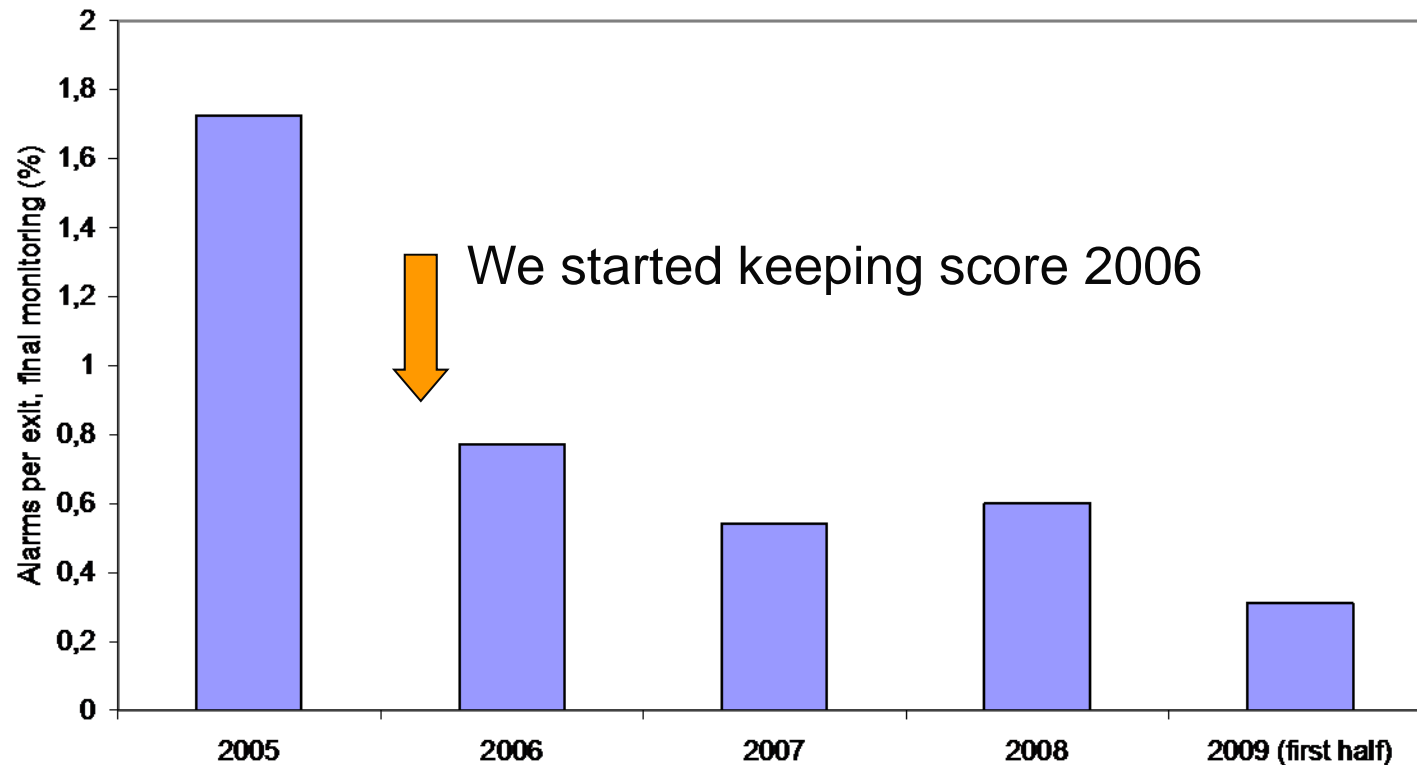
Follow-up on contaminated locations

- Follow-up is also done if any specific workplace results in contamination more than twice in one day
- The RP-technician responsible for that location is notified and extra cleaning performed
- This procedure is a great help making sure that locations where contamination is spread are kept as clean as possible



Reduction of alarms in the exit monitors

Alarms per exit, mean for all Forsmark units



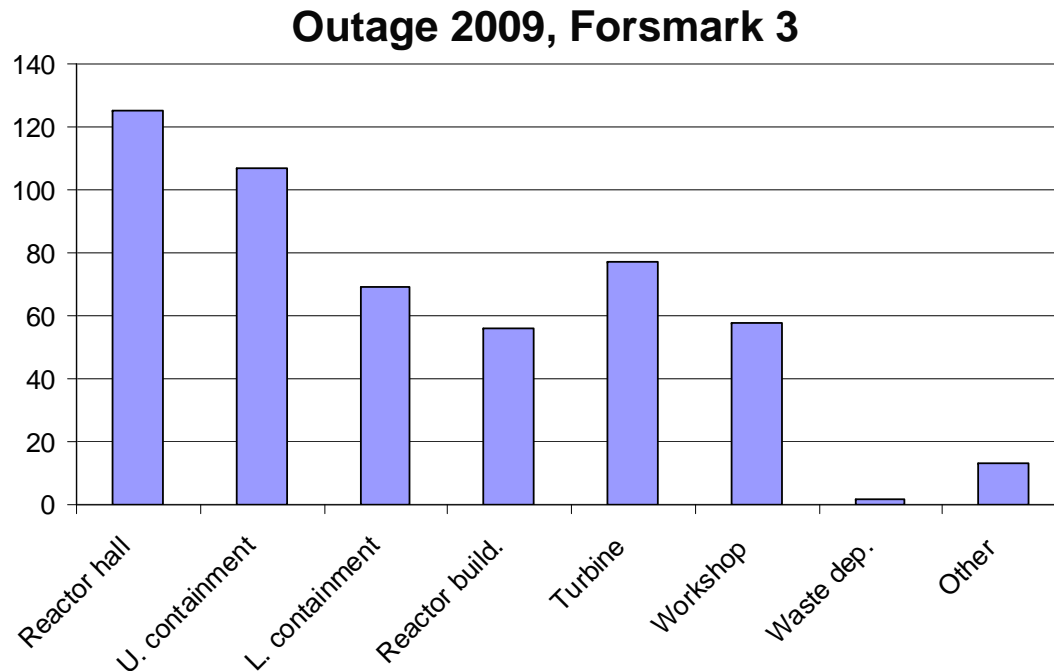
Alara Goals

- To highlight our efforts on reducing the number of contaminated persons, we have added the goal of reduced alarms in the exit monitoring to our ALARA programme
- We have managed to reach these goals every year, even if the goals have been set higher and higher

	F1	F2	F3	Alara goal
2005	1,76	1,28	1,80	n.a
2006	0,75	0,71	0,91	2
2007	0,46	0,35	0,68	2
2008	0,38	0,32	1,03	1
2009 (first half)	0,21	0,13	0,57	0,5

Where do contamination come from?

Since we introduced mandatory contamination monitoring upon exiting the reactor hall, contaminations from the hall is no longer the vast majority. Instead there is now an even spread depending upon where the work is done.



Conclusion – Gains

- We have managed to reduce the number of alarms in the exit monitors simply by keeping score;
- We are made aware of inadequate workmanship
- We can react faster on contamination spread in areas or in connection with specific jobs – countermeasures regarding cleaning and protective equipment can be performed
- Data serves as a great help in the pre-job planning – safety instructions becomes more adequate for the job planned



Conclusion – Gains

- We have obtained a cleaner workplace – contaminated locations have been made more visible
- We have improved the workmanship of the staff – they get more confidence in that we care for their safety and work environment
- The RP-staff gets a push to do their job correctly, increasing their knowledge on how and where contaminations usually occur



This will in the long end reduce doses throughout the plant, making it a safer place



Thank you for your attention!