



Strål
säkerhets
myndigheten

Swedish Radiation Safety Authority

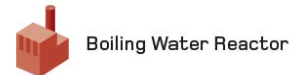
What Swedish regulators learned from the US event and how applied to Swedish facilities

Angelica Öhrn
2017-06-13



- ➔ Ten reactors in operation
- ➔ Two closed down reactors
- ➔ Central interim storage facility for spent fuel (Clab)
- ➔ Final repository for short-lived LIL waste (SFR)
- ➔ Fuel factory (WSE)
- ➔ Research reactors under decommissioning (Svafo)
- ➔ Waste treatment facilities (Studsvik, Cyclife)
- ➔ Closed down uranium extraction facility (Ranstad)

Nuclear Facilities in Sweden

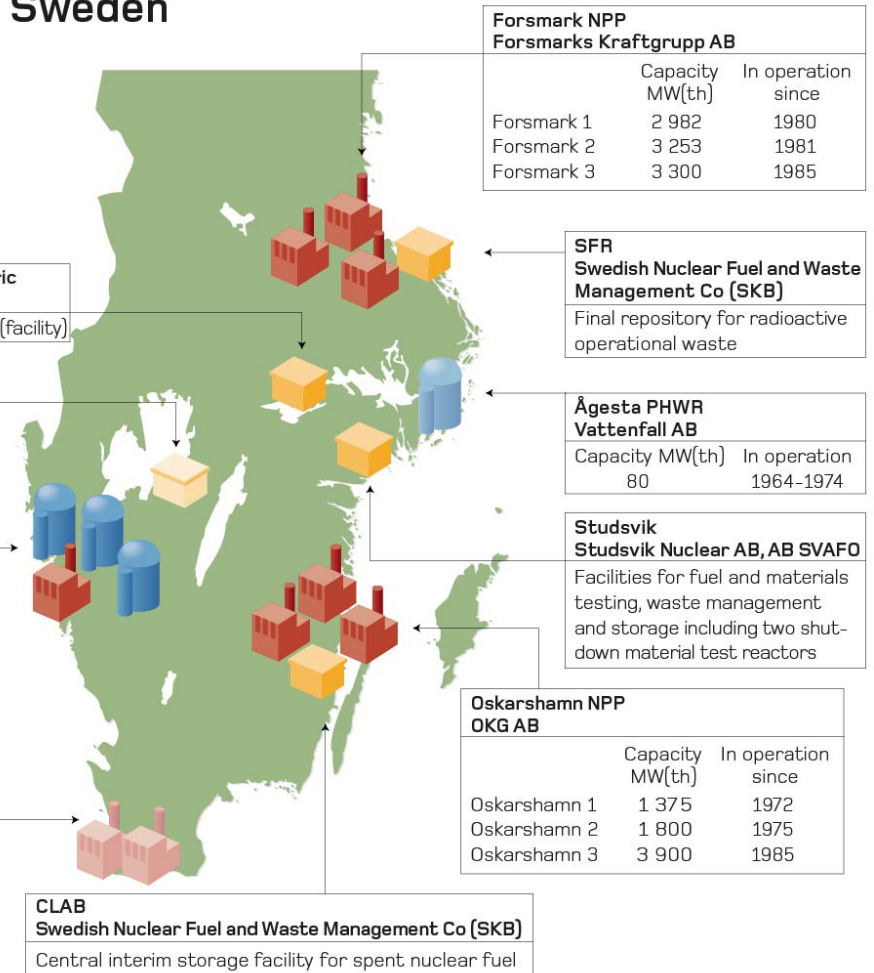


Westinghouse Electric Sweden AB
Fuel fabrication plant (facility)

Ranstad Ranstad Industricentrum AB
Former Uranium mining and milling facility

Ringhals NPP Ringhals AB		
	Capacity MW(th)	In operation since
Ringhals 1	2 540	1976
Ringhals 2	2 660	1975
Ringhals 3	3 144	1981
Ringhals 4	2 783	1983

Barsebäck NPP Barsebäck Kraft AB		
	Capacity MW(th)	In operation
Barsebäck 1	1 800	1975–1999
Barsebäck 2	1 800	1977–2005





Findings at the Westinghouse Fuel Fabrication Plant

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Findings (1/5)

- Westinghouse Sweden (WSE) learned from the event from WEC.
- Investigated their wet scrubber systems and other "wet systems".
- The "wet systems" had either geometries that were safe from a criticality point of view, contained neutron absorbers or had moderation control
- It was concluded that there was no such scrubber as the one in the U.S.



Findings (2/5)

- ➔ Next step was to investigate the dry systems, for example the ventilations systems.
- ➔ There are instructions for cleaning the ventilations systems regularly (according to the Safety analysis).
- ➔ These instructions had not been followed for years.
- ➔ The responsibility to follow up these instructions was unclear.



Findings (3/5)

- ➔ The production was stopped (Friday). The regulatory body was informed (Saturday) that WSE could not verify when these systems had been cleaned, at which intervals and also that WSE did not know how much uranium there could be inside the system.
- ➔ The regulatory body decided to perform an unannounced inspection at WSE.



Findings (4/5)

- When the systems were opened, approx 1,5 kg of uranium was found at three different positions (Sunday).
- An unannounced inspection was carried out on Tuesday.



Findings (5/5)

- ➔ Three weeks later, WSE informed the regulatory body that another 30 kg of uranium was found in the central vacuum cleaner system.
- ➔ This happened in 2009 as well (60 + 60 kg). The system was rebuilt, but the construction basis was not followed, which allowed for the event in 2016 to occur).
- ➔ In 2012, 129 kg of uranium was found inside the ventilation systems (central vacuum cleaner).
- ➔ **WSE had not learned from their own events.**



Corrective actions at WSE

- An extensive programme of corrective actions. (for example: review of the systems, safety culture, reporting and monitoring of maintenance, review of instructions)
- WSE has developed a method for measuring the amount of uranium inside the ventilation systems.



The regulatory body

- ➔ An unannounced inspection as an immediate response.
- ➔ Intensified supervision of WSE, which includes monitoring of their corrective actions programme.



What about the rest of the Swedish regulators of FCFs?

- The scrubber event does not apply for the rest of the Swedish regulators of FCFs, from a criticality point of view.
- Contamination of closed systems can occur (will be an issue when decommissioning).



Thank you for your attention.