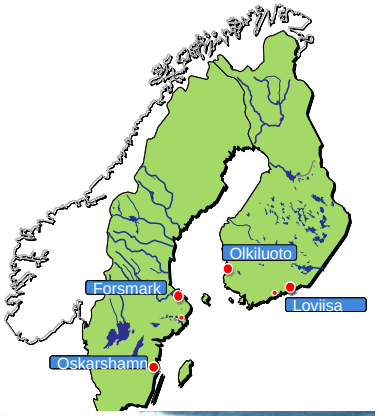
35 YEARS OF SUCCESSFUL OPERATION – LOVIISA NPP

Fortum

Overview of Fortum’s nuclear fleet



Loviisa

Two units
2 × 498 MW = 996 MW

Olkiluoto

Two units, one under construction

880 + 860 MW = 1740 MW
Under construction 1600 MW

Fortum’s share: 27 % (463 MW)

Oskarshamn

Three units
473 + 638 + 1400 = 2511 MW

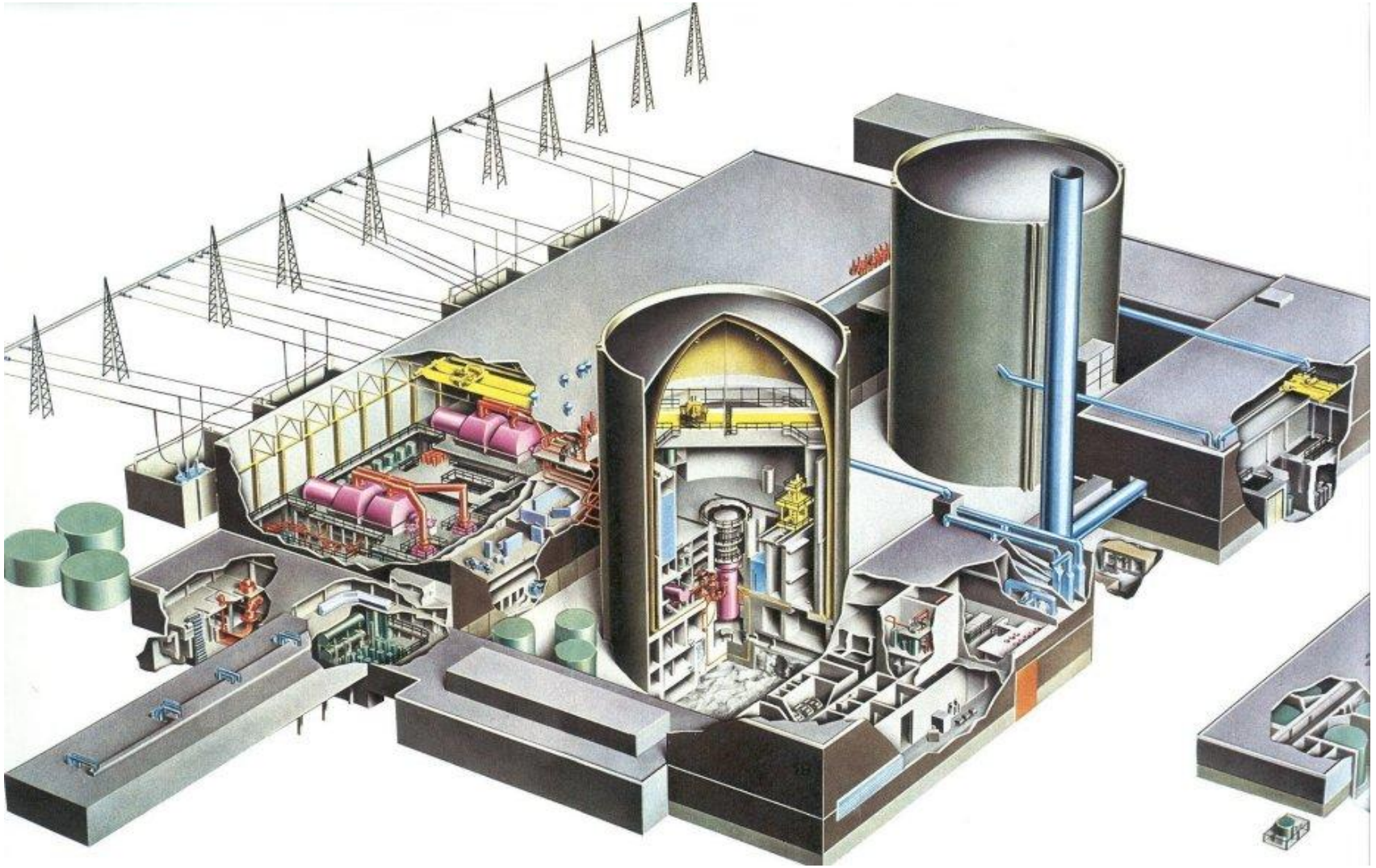
Fortum’s share: 43 % (1089 MW)

Forsmark

Three units
978 + 990 + 1170 = 3138 MW

Fortum’s share: 22 % (696 MW)

Loviisa 1 and Loviisa 2



Fortum Power Division – Loviisa Nuclear Power Plant

Loviisa NPP includes two PWR units
VVER-440, 2 x 496 MWe (net)

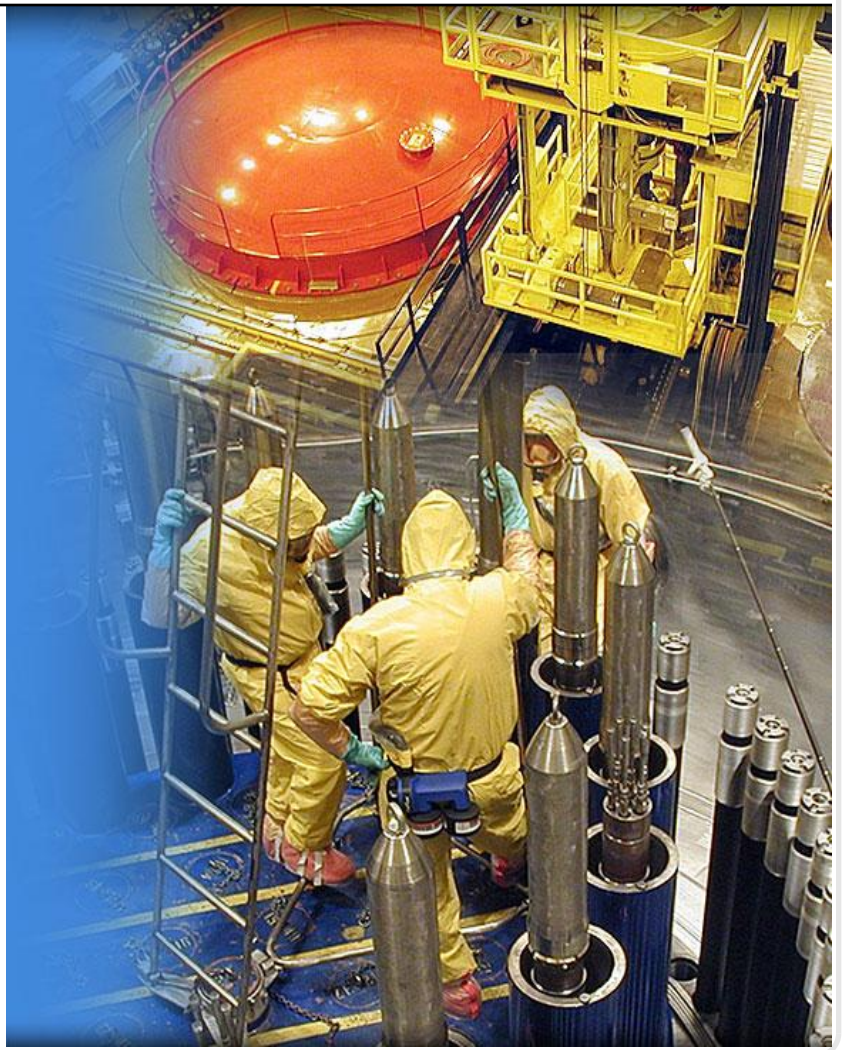
Loviisa 1 started operation in 1977
and Loviisa 2 in 1980

Strategic plant lifetime target 50 years

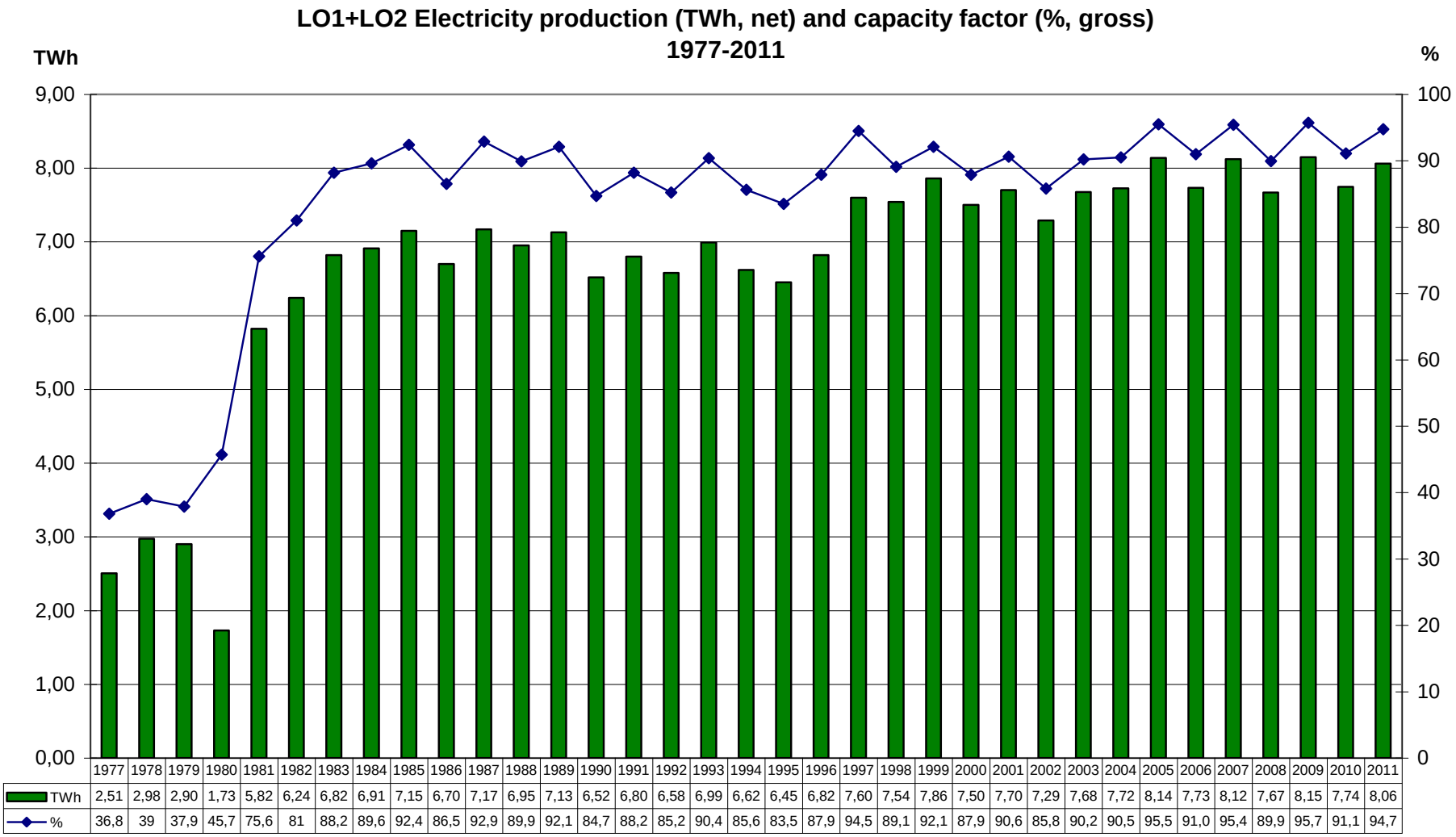
- Gross load factors 2011: LO1 94,7 %
  LO2 94,8 %

Annual production 8,06 TWh (net)

Own personnel 504 and 80 permanent contractors

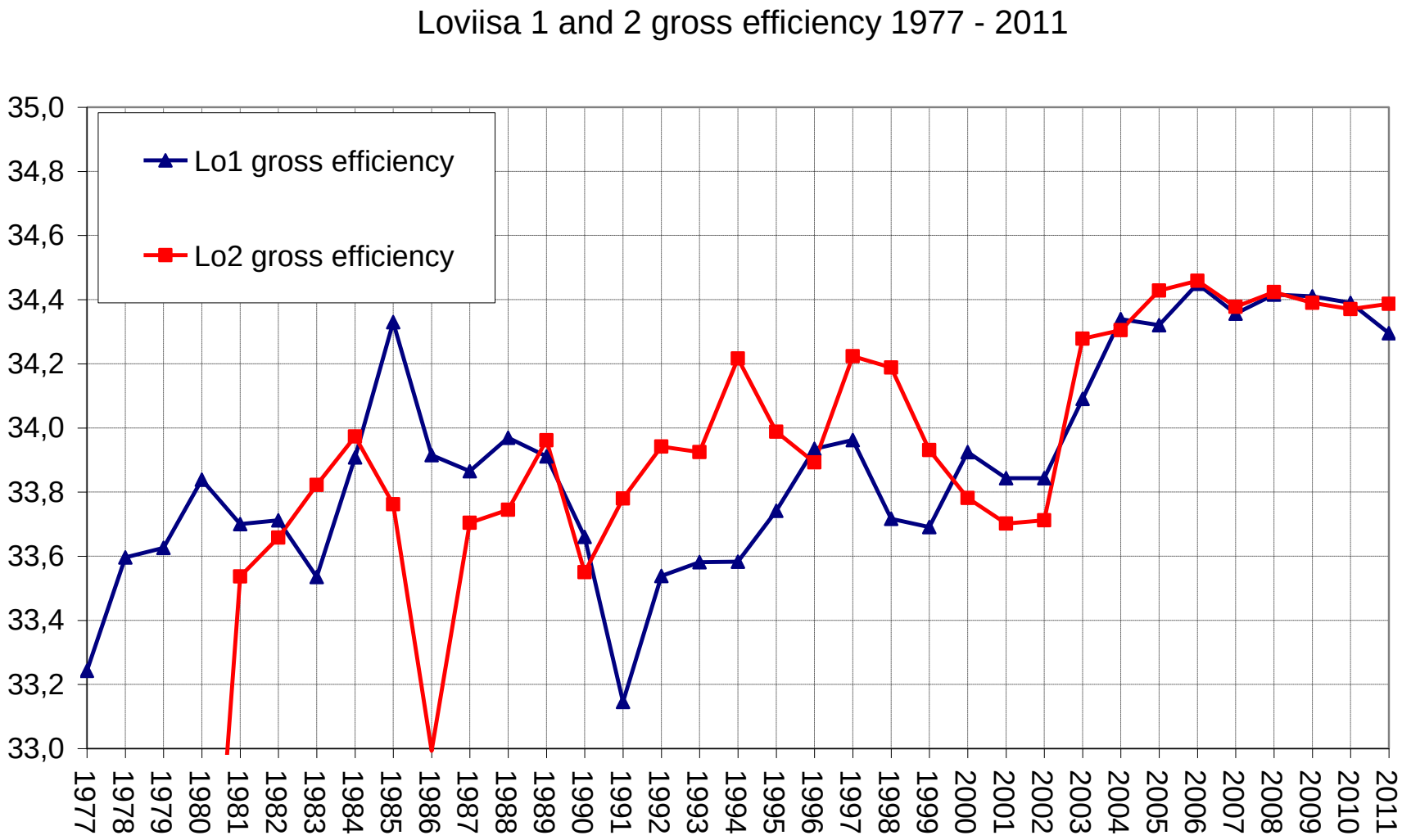


Production – Annually 1977 - 2011

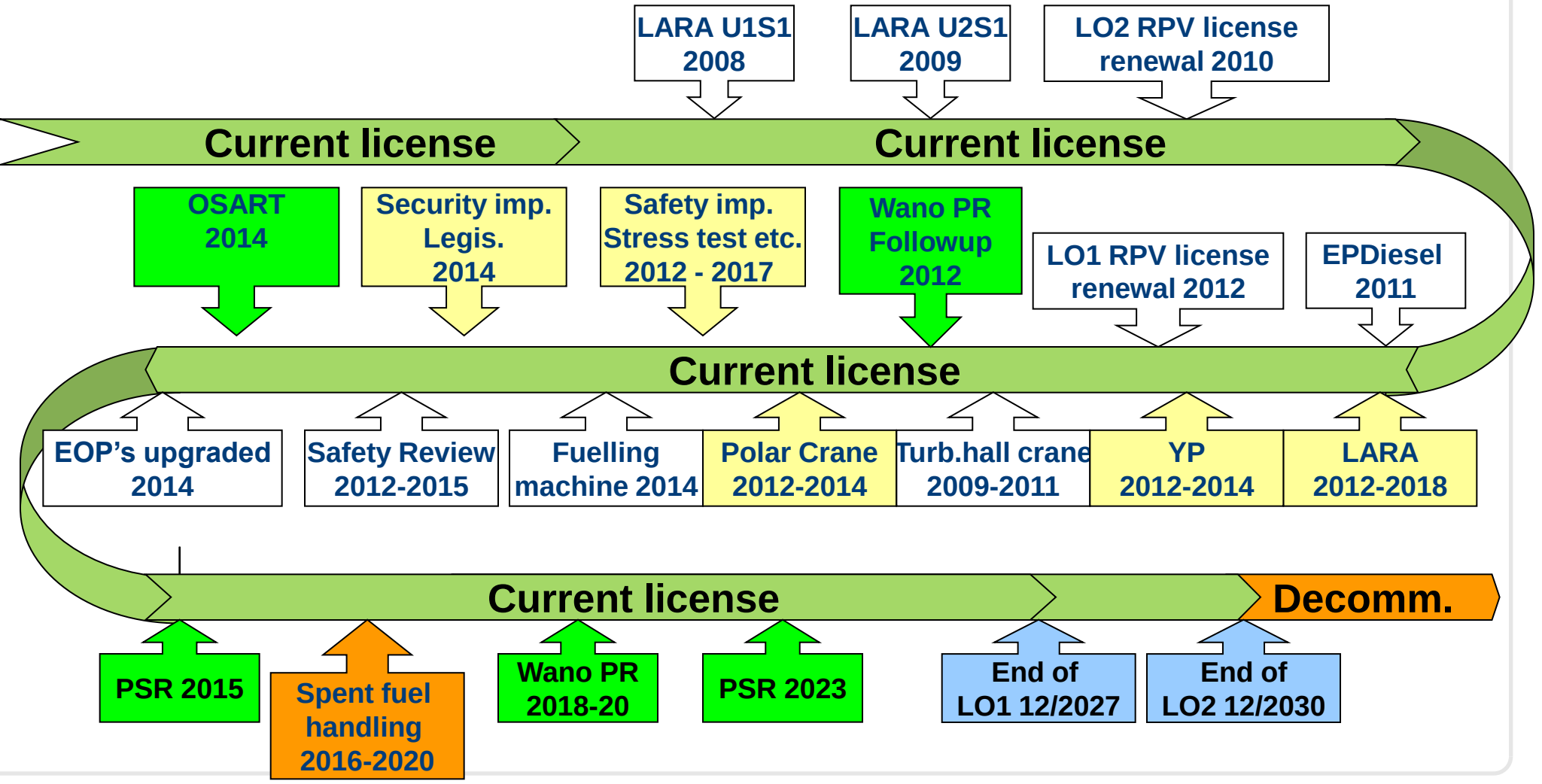


	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
TWh	2,51	2,98	2,90	1,73	5,82	6,24	6,82	6,91	7,15	6,70	7,17	6,95	7,13	6,52	6,80	6,58	6,99	6,62	6,45	6,82	7,60	7,54	7,86	7,50	7,70	7,29	7,68	7,72	8,14	7,73	8,12	7,67	8,15	7,74	8,06
%	36,8	39	37,9	45,7	75,6	81	88,2	89,6	92,4	86,5	92,9	89,9	92,1	84,7	88,2	85,2	90,4	85,6	83,5	87,9	94,5	89,1	92,1	87,9	90,6	85,8	90,2	90,5	95,5	91,0	95,4	89,9	95,7	91,1	94,7

Production - Efficiency



Selected actions to support the current operating license and optimized decommissioning



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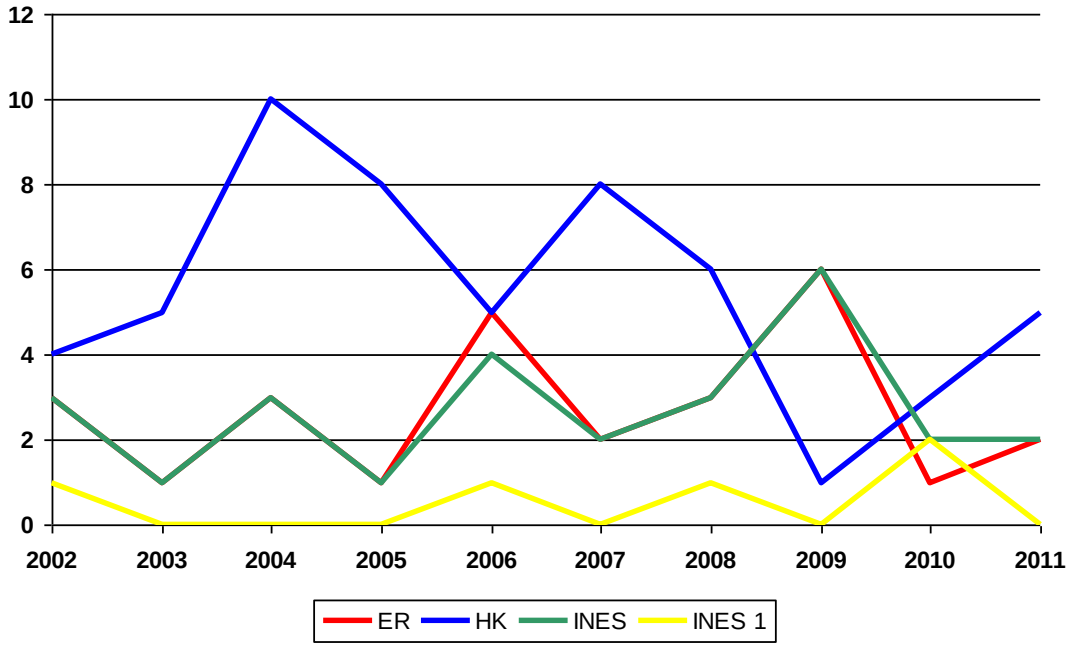
Safety, EHS & HR- Operational Incidents



2010

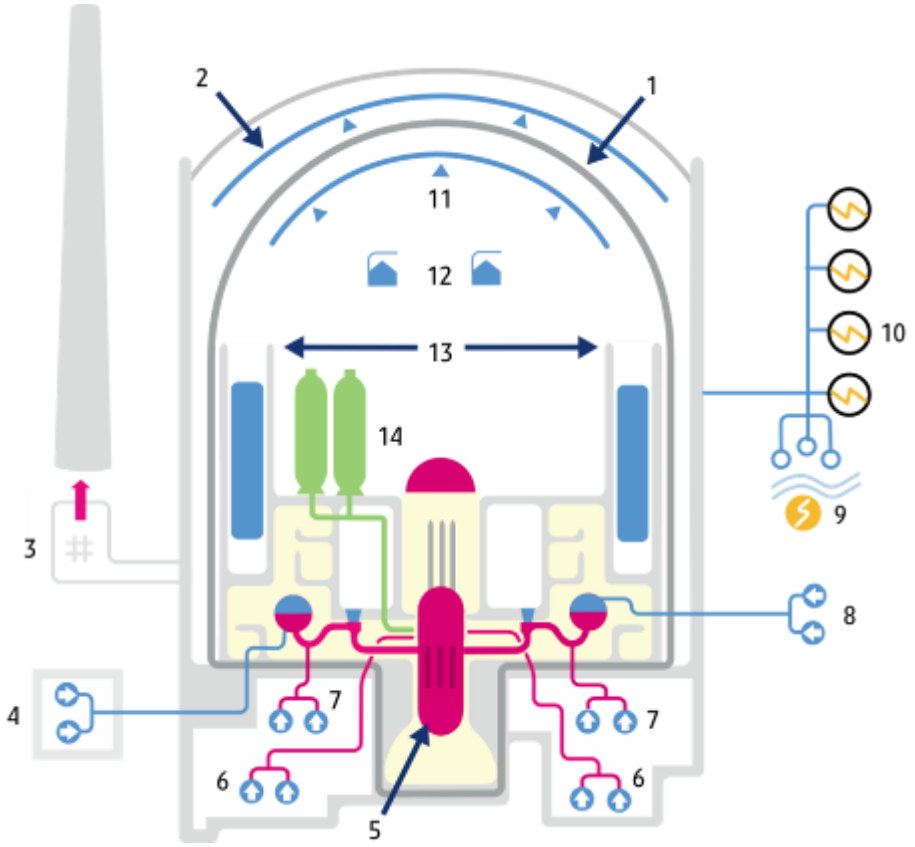
- **2 INES > 0**
- **0 INES = 0**
- **1 Special reports (ER)**
- **3 Operational disturbance report (HK)**

2011 (7.11.2011)

- **0 INES > 0**
- **2 INES = 0**
- **2 Special reports (ER)**
- **5 Operational disturbance report (HK)**

Most important safety systems at Loviisa NPP

1. Steel containment
2. Containment's external spray system
3. Air filters
4. Reserve emergency feed water pumping station
5. Reactor pressure vessel
6. Low-pressure safety injection pumps
7. High-pressure safety injection pumps
8. Emergency feed water pumps
9. Electric connection from hydro power plant + gas turbine
10. Emergency power diesel generators
11. Containment spray
12. Hydrogen recombiners and igniters
13. Ice condensers
14. Hydro accumulators



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Severe Accident Management (SAM)

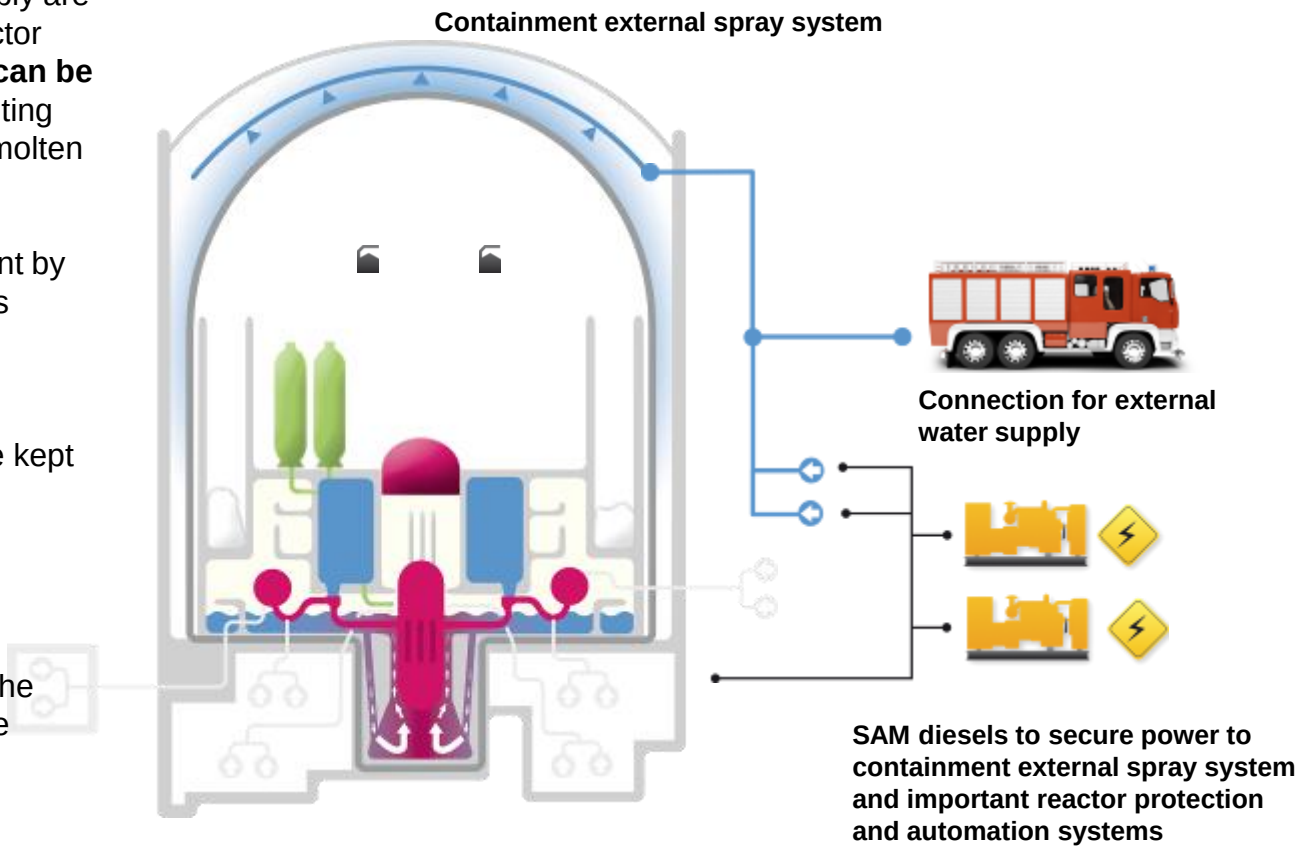
If all cooling systems and power supply are lost, the fuel starts to melt in the reactor core. The **reactor pressure vessel can be cooled from outside** with water melting from ice condensers, thus retaining molten core inside the vessel.

Heat is removed from the containment by **outside spray cooling** (autonomous system).

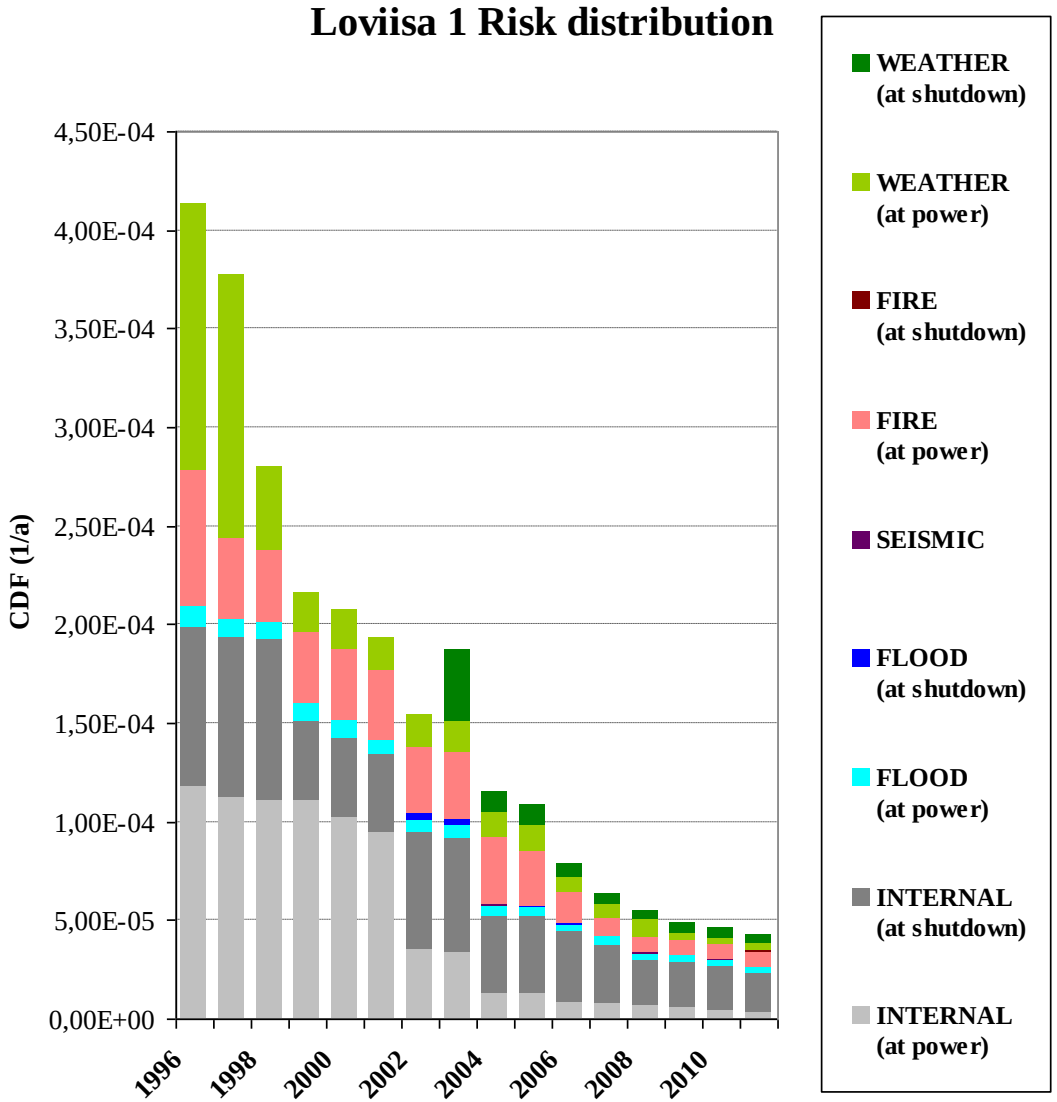
With these arrangements the reactor pressure vessel and containment are kept intact.

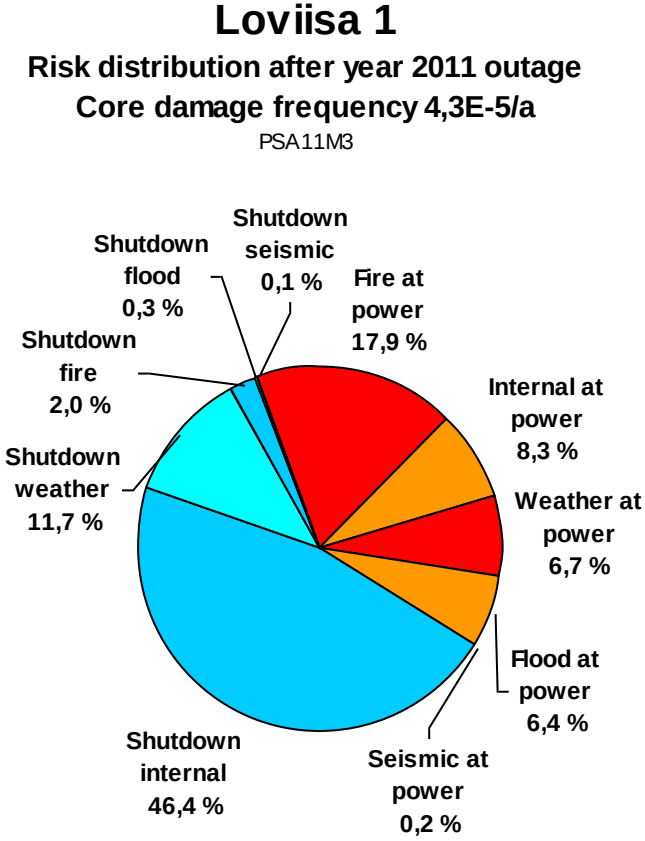
Dedicated, radiation protected **SAM control room** has been constructed.

To **prevent hydrogen explosions**, the containment is equipped with passive recombiners and igniters.



Improvement in plant safety





The results of the stress tests and future actions

- Design Criteria's are right
- Finnish requirements and guidelines are more stringent than in other countries or in relevant IAEA standards
- Continuous improvement of safety has been done in a systematic way on the Finnish plants
- Planned actions are right
- No need for immediate actions
- STUK has required plans for planned actions, and will present specific requirements to the Finnish plants during summer 2012
- Safety improvements can be made in the frame of annual investment programs, and do not affect availability

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Safety improvements to be further evaluated in Loviisa based on “stress tests”

- Containment heat removal without sea water systems
- Study of need to increase fuel for emergency power at site
- Decay heat removal from SFP to UHS in extreme events
- Alternative means of decay heat removal from in-containment fuel pools
- Measures to increase margins in case of flooding will be evaluated
- Battery capacity
- Multi units severe accidents; emergency preparedness

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