Nuclear waste policies in Finland

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Outline

Legal framework

Implementation of the Finnish project

How did Finland do it? Some observations

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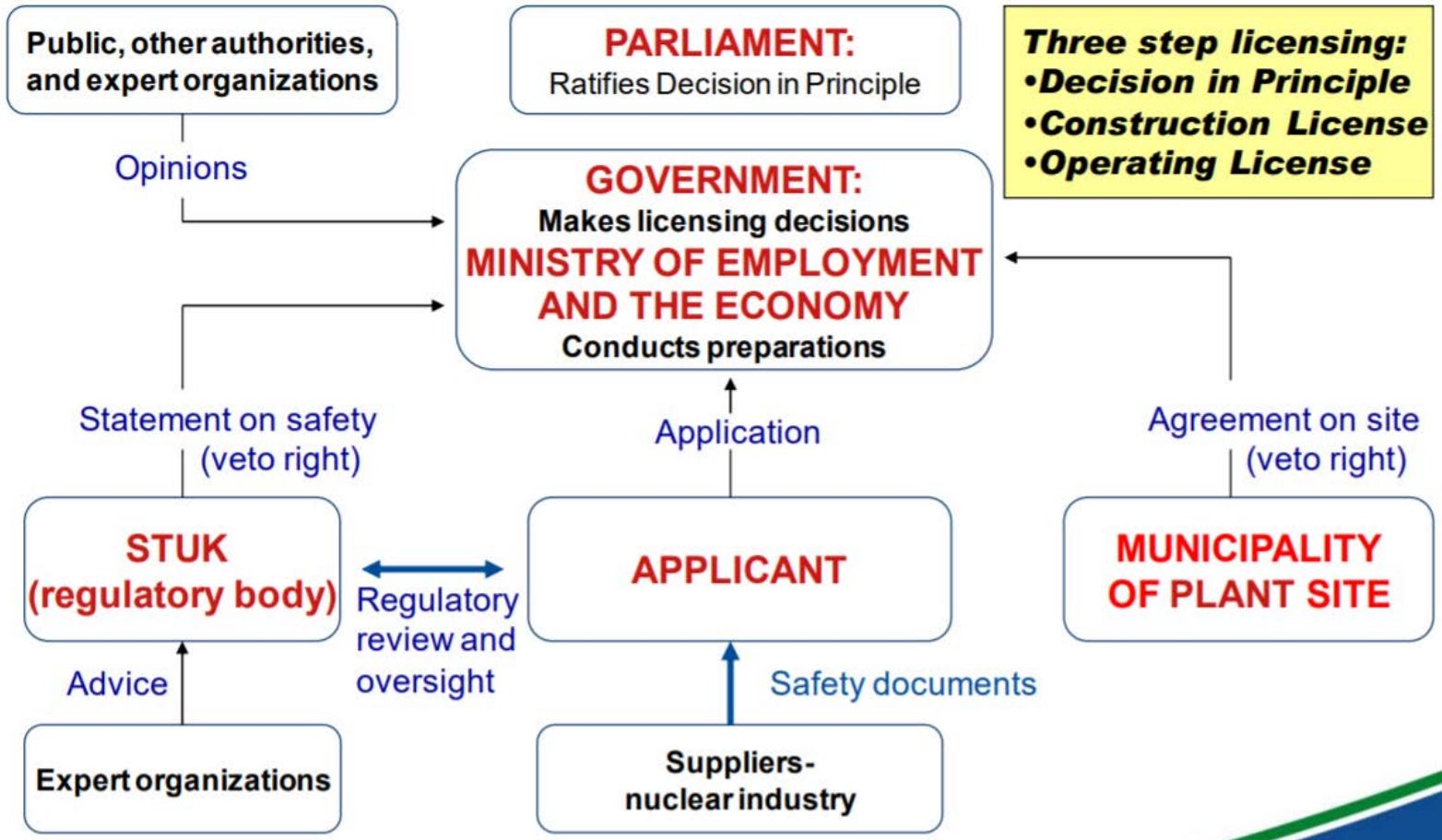
Main parties in licensing of nuclear facilities



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Posiva

Shareholders of Posiva (TVO and Fortum)

- cover all fixed and variable costs of Posiva's project
- receive capacity to store their SNF according to their shareholdings.

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	Serie A	Serie B	Total
	OL1 and OL2	OL3	
EPV Energia Oy	6.6	6.6	6.6
Fortum Oy	26.6	25.9	25.8
Kemira Oyj	1.9		0.9
Oy Mankala Ab	8.2	8.2	8.2
Pohjolan Voima Oy	56.8	60.2	58.5
	100.0	100.0	100.0

Shareholders cover all costs of TVO's electricity production and receive electricity according to their shareholdings.

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fortum

- 51 % state-owned
- Listed in the Helsinki exchange

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Spent nuclear fuel in Finland

Nuclear power plant	Reactor type and capacity	Operating license in force until	Quantity of SNF by the end of 2019, tons	Total maximum quantity of SNF until decommissioning, tons
Loviisa 1 (Fortum)	Atomenergoexport VVER-440 507 MW_e	31.12.2027	690	1,096
Loviisa 2 (Fortum)	Atomenergoexport VVER-440 507 MW_e	31.12.2030		
Olkiluoto 1 (TVO)	AB Asea Atom BWR 890 MW_e	31.12.2038	1,565	2,904
Olkiluoto 2 (TVO)	AB Asea Atom BWR 890 MW_e	31.12.2038		
Olkiluoto 3 (TVO)	Areva NP EPR 1,600 MW_e	31.12.2038	-	2,500
			2,255	6,500

TVO’s schedule for final disposal of spent nuclear fuel (1982)

Period	Activity
1980–1982	Suitability study with safety analyses
1983–1985	Preparation for the preliminary site characterization
1986–1992	Preliminary site characterization in chosen site areas (5–10 sites)
1993–2000	Additional siting studies (2–3 sites)
2001–2010	Detailed studies on the chosen disposal site and pre-planning of the siting and the encapsulation plant
2011–2020	Planning and construction of the final disposal site and the encapsulation plant
2021–2050	Final disposal facility in operation
2051–2060	Closing of the final disposal site

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Site selection

1987 – TVO starts site characterisation studies in 5 areas: Kivetty, Olkiluoto, Romuvaara, Syyry, and Veitsivaara

1992 – TVO starts detailed site characterisation studies in 3 areas: Kivetty, Olkiluoto, and Romuvaara

1994 – New legislation: Obligatory EIA

1995 – TVO and Fortum establish Posiva Oy

1996 – Returning of SNF from Loviisa 1-2 to Russia stops

1997 – Posiva adds Loviisa as a possible site and starts negotiations on mutual benefits with the Eurajoki municipality

1999 – Municipality Council of of Eurajoki accepts the Vuojoki agreement on 3 May

1999 – Posiva applies for a DiP to construct a final disposal facilityfor SNF and encapsulation plant in Olkiluoto on 26 May

Vuojoki agreement

“Eurajoki local council approved the Vuojoki Agreement at 20-7 votes on May 3rd 1999. Eurajoki municipality leases to Posiva the Vuojoenlinna estate, whose empire mansion has been an old people's home, and Posiva will lend the municipality (approx. 6.9 M€) for the construction of a new old people's home. Eurajoki is obliged to pay the instalments and interest of the loan with rental income from Posiva.”

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Kojo, Matti (2009): The Strategy of Site Selection for the Spent Nuclear Fuel Repository in Finland. In M. Kojo, & T. Litmanen (Eds.), *The renewal of nuclear power in Finland,* pp. 161–191. Palgrave Macmillan

Licencing procedure

1999 – Posiva applies for a DiP to construct a final disposal facilityfor SNF and encapsulation plant in Eurajoki

2000 – Government grants a favourable DiP (SNF from Loviisa 1-2 and Olkiluoto 1-2)

2001 – Parliament ratifies the DiP

2002 – Government grants a favourable DiP on extension (SNF from Olkiluoto 3)

2002 – Parliament ratifies the DiP on extension

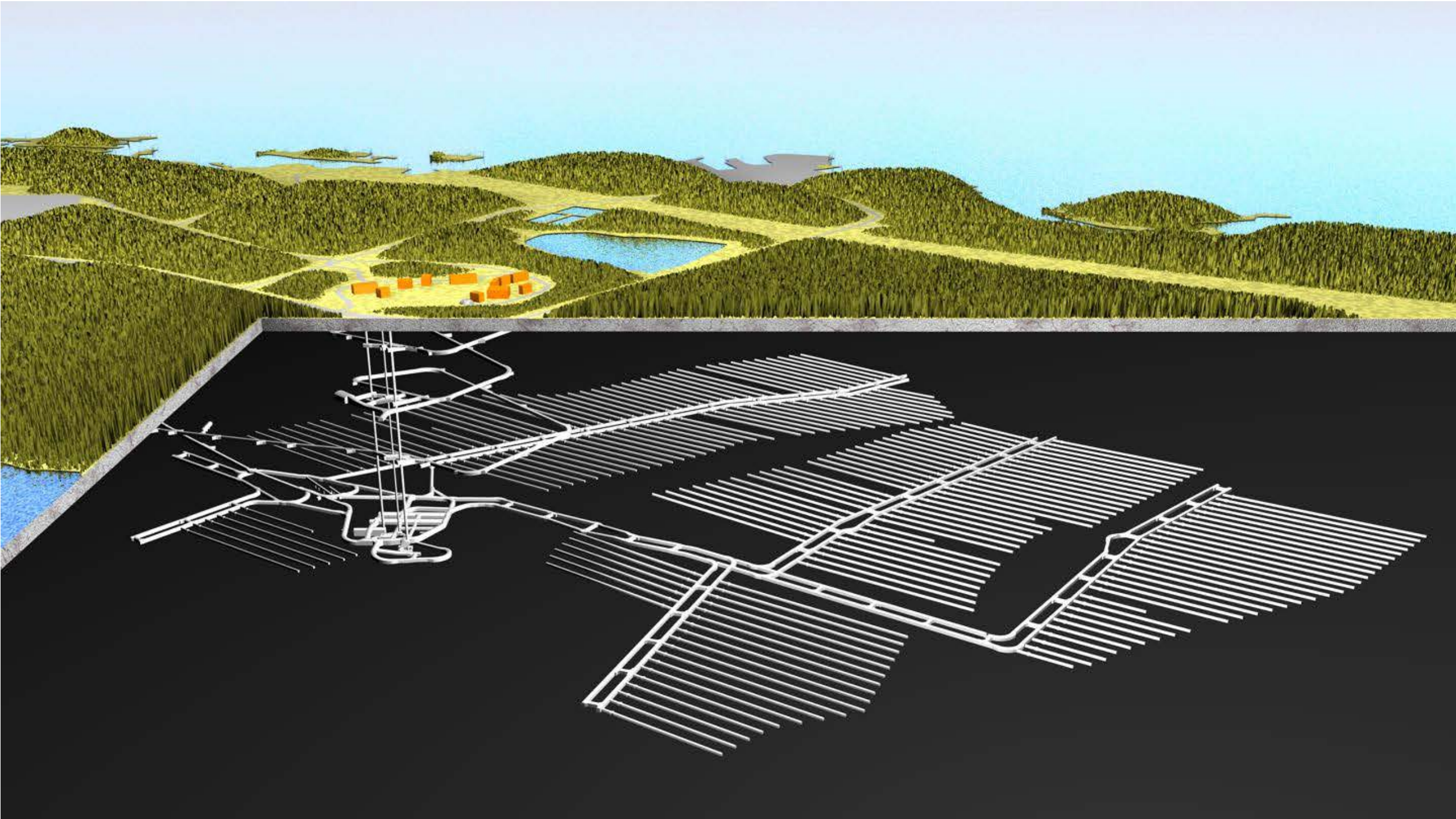
2004 – The name ONKALO introduced for the project

2012 – Application to the government for a construction licence

2015 – Government grants the construction licence

2016 – Posiva estabishes a subsidiary, Posiva Solutions

2021 – Application to the government for a operating licence



How Finland did it? Some observations (1)

- Nuclear waste management has not been a big topic of public discussion in Finland when compared to new nuclear power plants
- Public participation in decision-making on Posiva's project was not very active
- Citizen activism has mostly taken place in the municipalities of possible SNF repository sites
- Ratification of the DiP on Posiva's project in 2002 practically ended activism in nuclear waste management

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How Finland did it? Some observations (2)

- Cooperation between (nuclear) energy companies (Fortum and TVO → a joint company **Posiva Oy**
- **Pro-nuclear** directors in **Energy Department** of the Ministry of Economic Affairs and Employment and the Radiation and Nuclear Safety Authority **STUK**)
- High trust in technology and experts among the citizens — and members of the parliament

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How Finland did it? Some observations (3)

- DiP applications for Posiva’s final disposal site and TVO’s Olkiluoto 3 were together at the political agenda
- In the site selection, local acceptability became more important than e.g. geological factors in the site selection process

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How Finland did it? Some problems still remain

- Corrosion of the copper capsules
- Decommissioning of ONKALO

Nuclear Energy Act 990/1987, Section 34

Responsibility for nuclear waste after its disposal

When the license holder’s waste management obligation has ceased by virtue of section 32, subsection 1, paragraph 3, the ownership right to the nuclear waste is transferred to the State, which shall be responsible thereafter for the nuclear waste.

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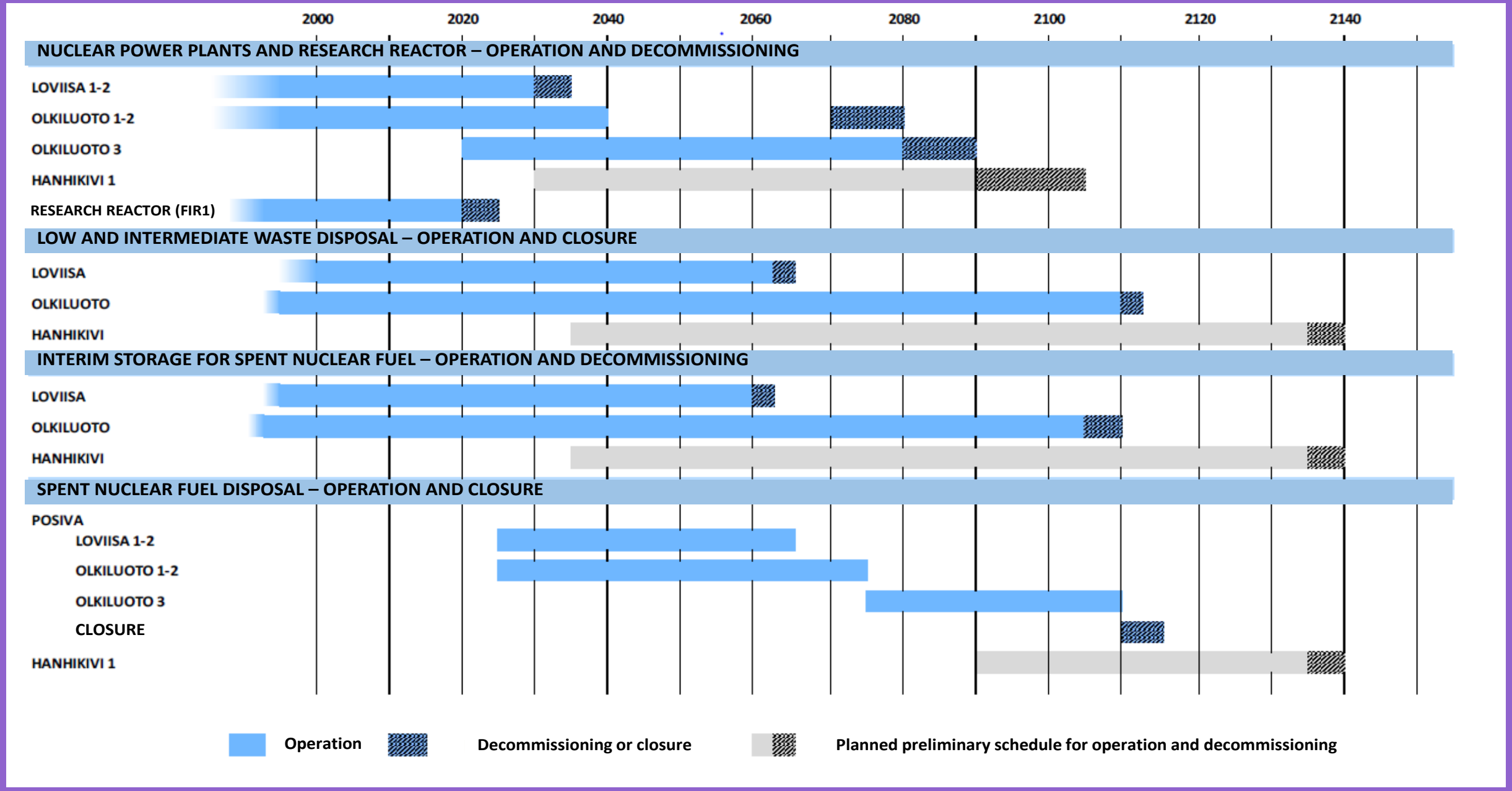
2000
2020
2040
2060
2080
2100
2120
2140
NUCLEAR POWER PLANTS AND RESEARCH REACTOR – OPERATION AND DECOMMISSIONING
LOVIISA 1-2
OLKILUOTO 1-2
OLKILUOTO 3
HANHIKIVI 1
RESEARCH REACTOR (FIR1)
LOW AND INTERMEDIATE WASTE DISPOSAL – OPERATION AND CLOSURE
LOVIISA
OLKILUOTO
HANHIKIVI
INTERIM STORAGE FOR SPENT NUCLEAR FUEL – OPERATION AND DECOMMISSIONING
LOVIISA
OLKILUOTO
HANHIKIVI
SPENT NUCLEAR FUEL DISPOSAL – OPERATION AND CLOSURE
POSIVA
LOVIISA 1-2
OLKILUOTO 1-2
OLKILUOTO 3
CLOSURE
HANHIKIVI 1
Operation
Decommissioning or closure
Planned preliminary schedule for operation and decommissioning

More information in a forthcoming Springer book:

Jarmo Vehmas, Aleksis Rentto, Jyrki Luukkanen, Burkhard Auffermann & Jari Kaivo-oja: The Finnish solution to final disposal of spent nuclear fuel.

In M. Arentsen, D. Snijders & R. van Est (eds.), The Future of Radioactive Waste – Governance Lessons from Europe