Long-term operation of Loviisa NPP

Elina Brunner, Director Engineering and investments, Loviisa NPP / 22.1.2025

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Fortum - We are a strong Nordic nuclear operator

Key figures 2023

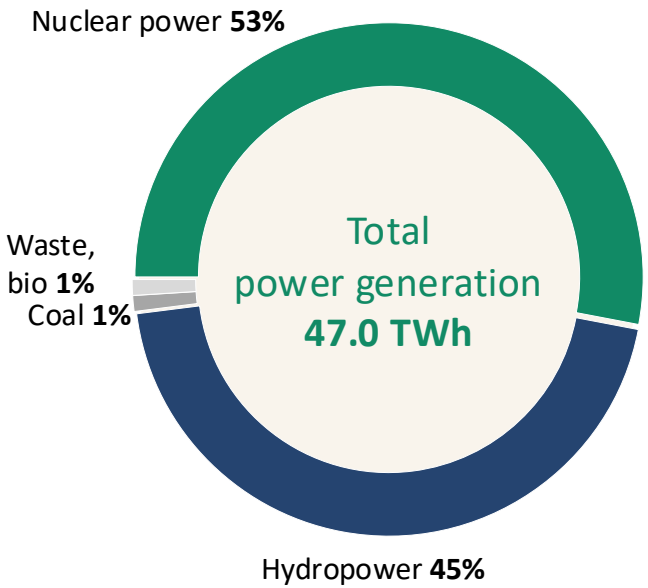
Nuclear generation	**24.8 TWh**
Total nuclear capacity	**3.2 GW**
Share of Fortum's total power generation	**53%**
Nuclear professionals	**~750**

We have 40+ years' track record of safe nuclear operations and we are forerunners in responsible waste management

- Fully-owned nuclear power plant in Loviisa, Finland
- Co-owned nuclear power plants in Finland and Sweden
- Nuclear services provider with innovative products and services
- New Nuclear Feasibility Study in Finland and Sweden
- In-house engineering and project competences

Expertise from new build to decommissioning and final disposal of nuclear waste

Fortum's power generation in 2023



Unit	Mwe (net)	Fortum Share %
Loviisa 1	507	100
Loviisa 2	507	100
Olkiluoto 1	890	26.6
Olkiluoto 2	890	26.6
Olkiluoto 3	1600	25
Forsmark 1	988	23.4
Forsmark 2	1120	23.4
Forsmark 3	1172	20.1
Oskarshamn 3	1400	43.4
Oskarshamn 1	decom	43.4
Oskarshamn 2	decom	43.4

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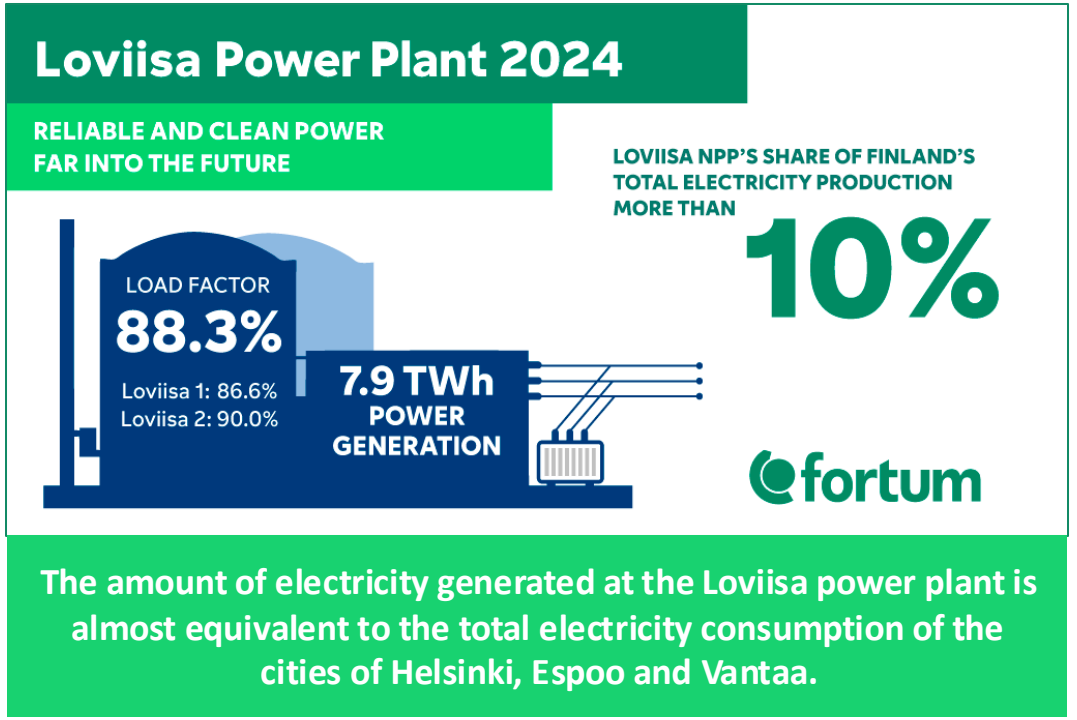
Reliable and clean power far into the future

- Loviisa power plant has two VVER pressurised water reactors, with capacities of 507 MW net
- Loviisa power plant produces more than 10% of Finland's total electricity production
- Loviisa 1 was commissioned in 1977 and Loviisa 2 in 1980
  - Old operating licenses were coming to end 2027 and 2030
  - New operating licence for both units is valid until the end of 2050



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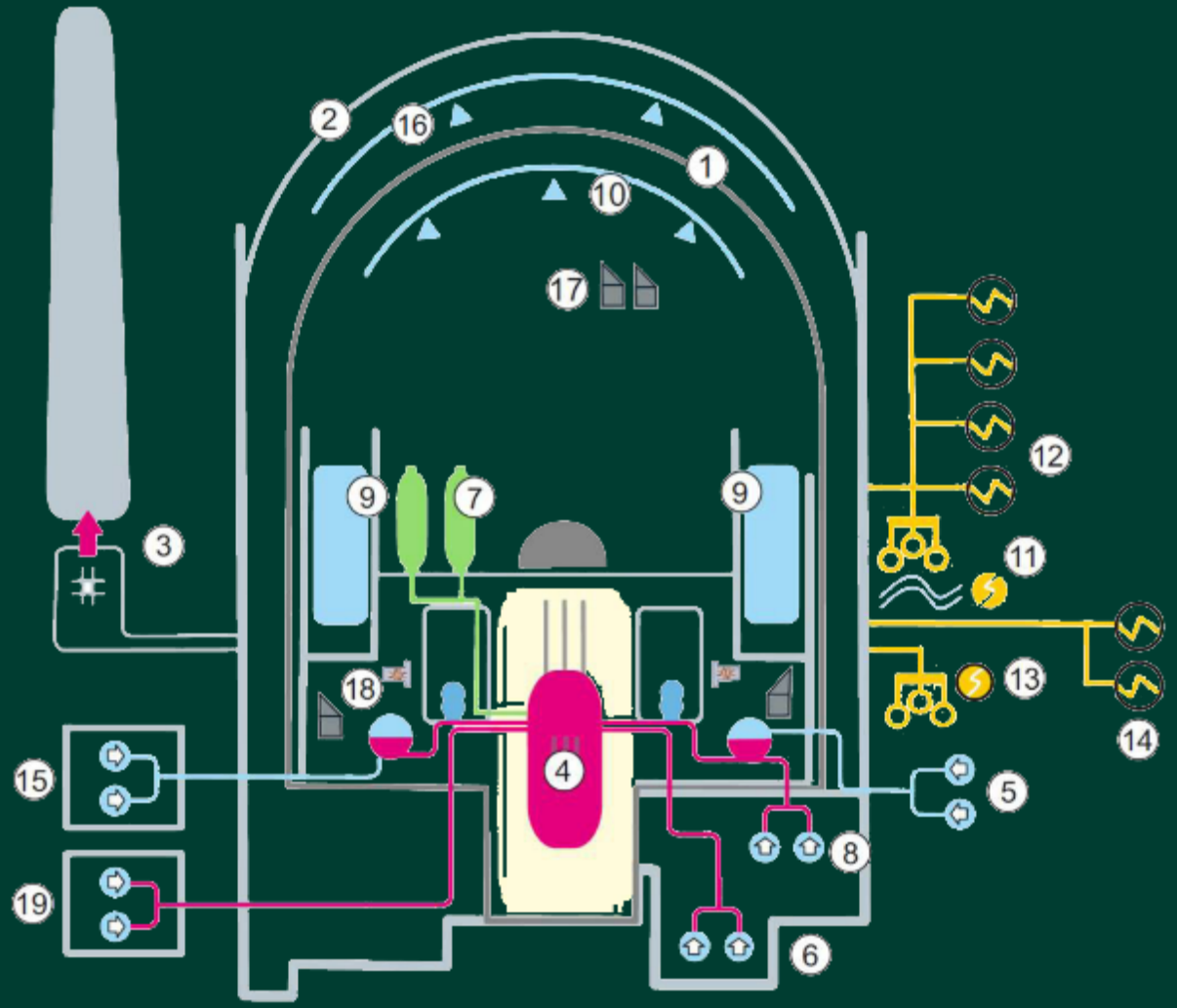
Safety systems at Loviisa power plant



Safety Systems:

1. Containment
2. Reactor building
3. Filters for ventilation exhaust
4. Reactor and control rods
5. Emergency feedwater system
6. Low-pressure safety injection system
7. Pressurised hydro accumulators
8. High-pressure safety injection system
9. Ice condenser
10. Containment spray system
11. Power supply from hydro power station
12. Emergency diesel generators
13. Diesel generators plant
14. Severe accident diesel generators
15. Auxiliary emergency feedwater pumps
16. Containment external spray system
17. Hydrogen removal (passive autocatalytic recombiners)
18. Hydrogen removal (igniters)
19. Boron supply system

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New operating licenses granted

In February 2023, the Finnish Government granted a new operating license for Fortum's fully-owned Loviisa NPP until 2050 and in March 2023 for the LILW final repository until 2090.

Reliable backbone of the energy transition	• New operating licence until 2050 offers up to 177 TWh of additional CO_2-free power
Competitive economics	• Very reasonable addition of nuclear supply with limited capital expenditure of estimated approx. EUR 1 bn. • Investments will be evenly distributed over the extended lifetime.
Solution for waste	• Finland is a forerunner in nuclear waste management and has a solution for final disposal. • Fortum offers solutions and services for customers.
Public backing	• Fortum is the local reliable operator for decades. • Nuclear acceptance both nationally and locally high.

The new operating licence has gained a lot of interest nationally and around the world

Energy

Fortum gets Loviisa nuclear plant permit extension

The reactor will now run until 2050.

The Fortum nuclear plant

YLE NEWS

16.2.2023 17:53 • Update

The government ha
until 2050. The plan
and 2030.

ENERGY WATCH

Finland extends lifecycle of nuclear power plant by 20 years

The Finnish government has issued a new operating license for Fortum's Loviisa nuclear power plant, which is now allowed to remain online until 2050.

ARD

Fortum granted licence extension for Loviisa

16 February 2023

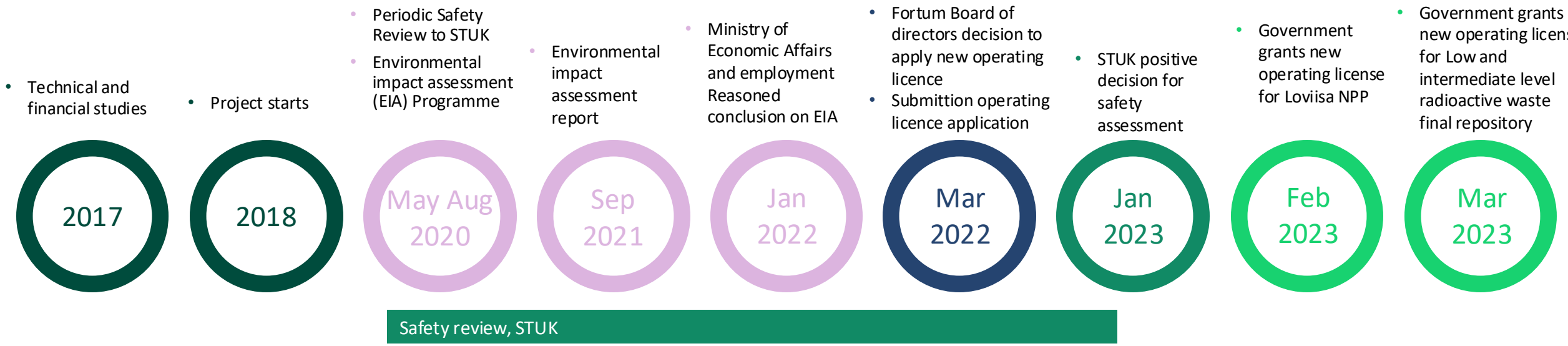
Share

The Finnish government has granted Fortum an extension to the operating licence for the two-unit Loviisa nuclear power plant, allowing the plant to continue generating power until the end of 2050.

Loviisa units 1 and 2 (Image: Fortum)

The Loviisa plant - comprising two VVER-440 type pressurised water reactors - was the first nuclear power plant in Finland and currently provides more than 10% of the country's electricity. Loviisa unit 1 began commercial operation in 1977, with unit 2 following in 1981. The operating licences for the units were renewed in 1998 and 2007, respectively.

Loviisa NPP Operating Licence project



Environmental Impact Assessment programme and report documents in Finnish, Swedish, English,
summaries also in Estonian, Latvian, Lithuanian, Norwegian, Polish, German, Danish, Russian

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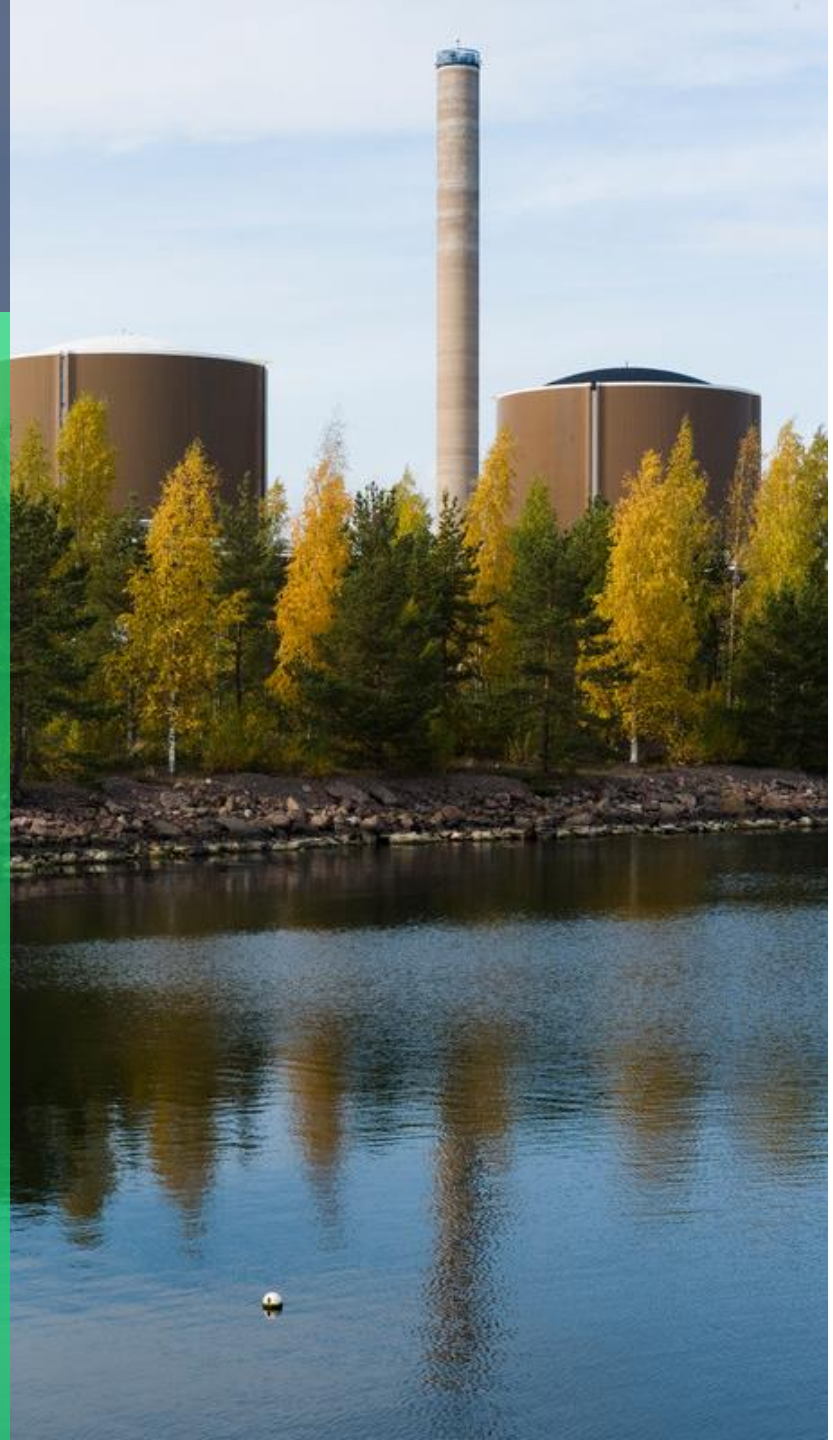

The issues that were the most important to study/ lessons learned

- Feasibility study from technical and safety perspective needed
- But also financial feasibility study and public and political acceptance are a must
- If plant lifetime management, equipment reliability and maintenance processes are well established already (=knowledge/understanding of the condition of your plant, systems and equipment), it is possible to make a good assessment of the feasibility from different aspects with moderate costs. If you don´t have these, making good assessment it is extremely difficult.
- Own understanding of plant, requirement level and history required. Not to trust only on external view
- Huge effort. To consider whether to do it with small or large team. Smaller team – higher probability to miss some technical point of view. Bigger team – harder to summarize and find common consensus
- Financial feasibility: sensitivity analysis (base, low, high scenarious) and risk analysis
- Higher requirement level needs to be considered (also ”softer” issues: quality and organizational requirements)
- In Loviisa NPP an organizational change in summer 2023 related especially to investment and project management in order to manage the investment required for the life-time extension
- If there is decision to continue operation, issues identified as critical should be investigated further to mitigate risks and uncertainties

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Loviisa long-term operation Program (LTOP) is strategic growth objective for Fortum

Program objectives ensure the feasibility of implementation

Sub-programs to further detail the objectives

- Technical feasibility
- Financial feasibility
- Feasibility from safety perspective
- Public and political acceptance

Program objectives

- Stable, reliable and predictable operation until 2050
- Safety, security and sustainability improvements
- Secondary circuit modernizations to increase production
- Management of productivity over remaining lifetime
- Investments in set frame (schedule, cost and quality)
- Securing competence and capabilities for operations until 2050

Program obejctives fullfilmment tp be ensured through more in detailed planning of portfolios

Strategy cornerstones / boundary conditions

- Profitability
- **Safe** — On par with best available technologies in terms of health impact on people and the environment
- Societal acceptance
- **CO2-free** — Lowest emissions per GWh over plant lifecycle for any major technology
- Market environment
- **Stable & predictable** — Dispatchable power on demand
- Competence

Solid basis of our nuclear operations

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Loviisa Long-term operation program aimed at implementing the needed investments

9 portfolios

~200 single projects

All actions aim to improve nuclear safety

- Safety classified Mechanical Components and Readiness for Repairs
- Turbine Island modernization
- Buildings, Structures and Infra
- I&C modernization
- Emergency Diesel Generators and Electrical equipment modernization
- Ventilation and Air conditioning systems Modernization
- Safety Improvements
- Nuclear fuel and waste
- Security

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What inputs trigger the renewal of system, structure or component

- Technological obsolescence and lack of spare parts in stock
- End of qualification
- Reduced performance in system health
- High maintenance and/or operation costs
- Physical aging
- Authority requirements
- Improving nuclear or personal safety
- Geopolitical situation
- Internal and external operation experiences
- Functional failure

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Status of Loviisa Main Components

No significant actions foreseen

Investments prepared for long term ooeration

Containments and reactor buildings

No lifetime limiting degradation mechanisms identified.

Moisture separator reheaters

Replaced 2015-2017.

Turbines

HP turbines replaced 2016-2018.
Replacement/modernization of LP turbines foreseen
Potential for extra production

Generators, Switchgears,

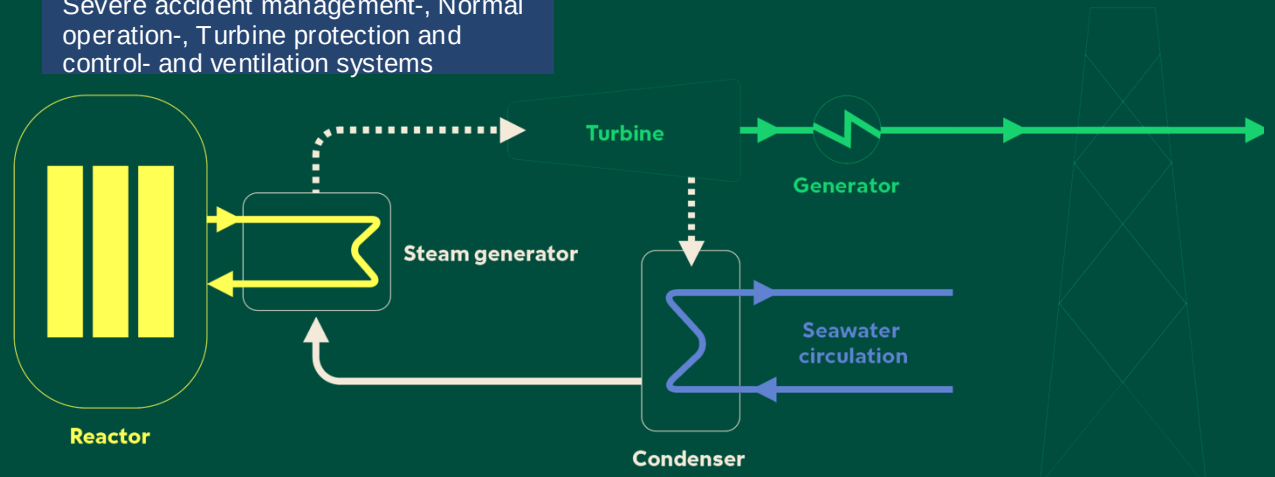
Rotors replaced 2012-16
Four stators have been replaced 2018–2020
6 kV breakers 2008-2013
0,4 kV breakers 2016

Reactor pressure vessels

Analyses ongoing.
Reactor pressure vessel irradiation embrittlement is assessed as manageable.

Automation

Replacement of plant protection-, Severe accident management-, Normal operation-, Turbine protection and control- and ventilation systems



Emergency diesels

Ensuring strategic spare parts

Emergency core cooling systems

No actions identified.

Main transformers

Replaced 2014-16.

Primary coolant pumps, loops and pressurizers

No lifetime limiting degradation mechanisms identified.

Steam generators

Degradation of tubes is currently manageable (lifetime limiting phenomenon).

Preheaters

Replacements foreseen.

Potential for extra production

Seawater pumps

Replacement foreseen.

Potential for extra production

Condensers, and Feedwater pumps

Potential for extra production.

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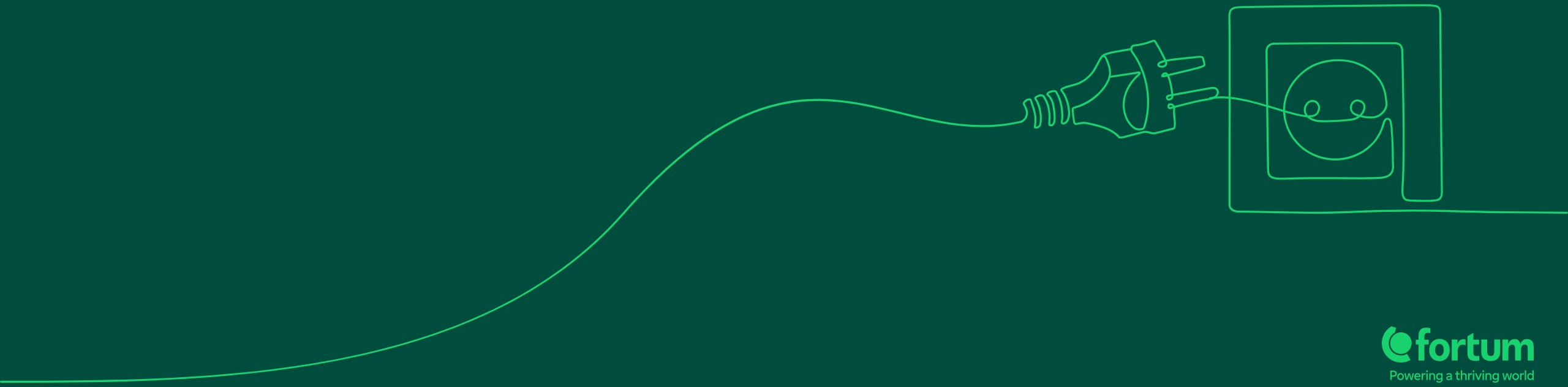
Thank you!



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