fortum

Join the change

Loviisa power plant

Our environment 2019

Loviisa power plant – producer of clean energy

In 2019, the Loviisa power plant generated a total of 8.2 TWh (net) of carbon-free power, corresponding to more than ten per cent of the energy generation in Finland.

As a producer of clean energy, the Loviisa power plant and carbon-free nuclear power play a significant role in mitigating climate change. The greenhouse gas emissions over nuclear power's lifecycle are equivalent to those of wind, hydro and solar power.

As a result of the Loviisa nuclear power plant's electricity production, Finland emits about 6 million tonnes less carbon dioxide emissions compared to the equivalent amount of fossil fuel-based electricity.

The safety condition of the power plant remained good, and both the production and equipment availability was at a very high level.

Excellence in plant safety is an absolute prerequisite of safe and efficient operations for employees and the environment, and it is a sign of professionalism.

We strive to be a safe workplace for our employees and for the contractors and service providers who work for us. We believe that all work injuries are preventable when competence and the right attitude prevail, when potential risks are addressed and when measures are taken to safeguard against them. In 2019 we stayed within all permit limits in terms of environmental impacts.

Radiation safety

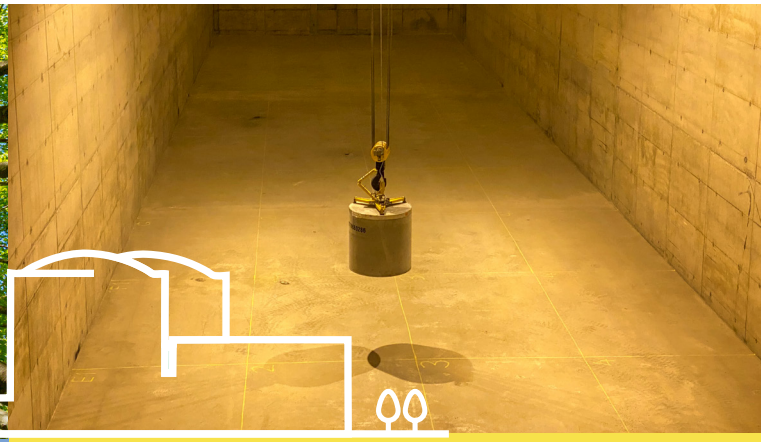
The annual collective radiation dose of the Loviisa power plant's personnel was the lowest in the plant's operating history. This shows that long-term work in radiation safety produces good results.

Emissions of radioactive effluents into the environment in 2019 were, as in previous years, significantly lower than the limits set for nuclear power plant emissions.

Based on emissions and meteorological data, the estimated radiation dose to the surrounding population was about 0.14% of the set dose limit. The radiation dose to the surrounding population from radioactive substances originating from the Loviisa power plant accounted for only a minor increase compared to the radioactive dose from other sources (like, e.g., radon and medicine).

The radiation monitoring programme carried out in the power plant surroundings occasionally detected radionuclides originating from the plant, but the concentrations detected were very small.

Responsible nuclear waste management



The environmental work of the Loviisa power plant is managed according to an ISO 14001 certified environmental management system.

Total amount of waste

1,188 t

Amount of conventional waste

95%

Conventional waste
(non-radioactive)

Waste for recovery

76%

as material 66%
or energy 10%

Waste to landfill

10%

Hazardous waste for further processing

9%

e.g. chemicals and solvents

Nuclear waste

Spent fuel

Interim storage at the power plant premises

2%

Waste for final disposal at the power plant site

Maintenance waste 1%, liquid waste 2%

3%

Final disposal to Posiva, at Eurajoki

2040's

Final disposal in the final repository

Waste management

Waste management at the Loviisa power plant is comprised of two separate areas: waste management for the non-controlled area and waste management for the controlled area. All waste generated in the controlled area is treated as radioactive. Waste generated outside the controlled area can be treated as waste from a conventional industrial plant.

The goal of conventional waste management is to prevent the production of waste and to reduce the amount of landfill waste through effective sorting. In 2019, about 1 117 tonnes of waste was transported from the power plant area. Of this, 11% was landfilled, 80% was reused as materials or energy, and 9% was treated as hazardous waste.

Waste generated in the controlled area is divided into three categories: Low-level waste (maintenance waste), intermediate-level waste (liquid waste), and high-level waste (spent fuel). Maintenance waste is either cleared as non-active and treated as conventional waste or disposed of in the final repository located at a depth of 110 metres in the power plant area. Also the final disposal of solidified liquid waste started in late 2019 when the solidified waste cavern (KJT) received an operating license.

Thanks to efficient sorting and packaging, the amount of maintenance waste for final disposal in 2019 accounted for a small share. Liquid waste is purified and released into the sea or stored and solidified in concrete and then disposed of in the final repository. Spent fuel is stored to await final disposal in Eurajoki.

Final disposal of liquid radioactive waste started in 2019 – Waste is solidified at Loviisa's own solidification plant

The radioactive liquid waste generated during the operation and decommissioning of the Loviisa power plant is be solidified at the Loviisa solidification plant. This waste primarily consists of ion exchange resins used in the purification of process water as well as bottom sludge from evaporator concentrate tanks. The solidification process is highly automated and the process is controlled from a control room at the solidification plant.

A significant milestone in the handling of the Loviisa power plant's liquid radioactive waste was reached in December 2019 when the final disposal of the waste got under way after years of persistent work.

Final disposal of the intermediate-level radioactive solidified liquid waste could commence in the solidified waste cavern once the Radiation and Nuclear Safety Authority (STUK) gave its favourable decision in November.

Commissioning the solidified waste cavern is a significant step forward in the responsible handling of radioactive waste at the Loviisa power plant.

Radioactive liquid waste is dosed at the solidification plant into a concrete final disposal container where the waste is bound using cement and blast furnace slag into a solid concrete matrix. The ensuing waste package is then sealed with a concrete lid and transported to intermediate storage for 28 days. After intermediate storage, the waste packages are deposited in the power plant waste final repository, which has been built in the bedrock at a depth of about 110 meters in power plant area.

Cooling water

The power plant's most significant environmental impact is the thermal load on the sea caused by the cooling water, which heats up by about 10 degrees as it passes through the plant. In practice, two-thirds of the thermal energy produced by the reactor ends up in the sea with the cooling water. According to temperature measurements, the discharged water raises the temperature of the sea water during the growing season by about 1-2.5 degrees within a 1-2 kilometre range from the discharge point.

The cooling water discharge area remains unfrozen throughout the winter. The size of the open water and thin ice area depends on winter temperatures. In 2019, the power plant used a total of about 1,389 million m^3 of sea water for cooling, and the thermal load on the sea totalled 57,005 terajoules.

In accordance with the environmental permit, the amount of cooling water released into the sea should not exceed 1,800 million m^3 per year or 56 m^3/s. The cooling water's thermal load on the sea may not exceed 60,000 terajoules annually. The limits set by the permit were not exceeded in 2019.

Service water

The process and domestic water required by the power plant is sourced from Lake Lappominjärvi, which is located about 5 kilometres north of the power plant.

The water is purified before use at the water plant, and the water used as process water is additionally treated at the demineralisation plant.

The total volume of water withdrawn from Lake Lappominjärvi in 2019 was about 135,700 m³.

According to the service water withdrawal permit, the power plant can withdraw up to 180 m³/h of water from the lake for a short period of time and a maximum of 150 m³/h per quarter.

Key figures

IN 2019, LOVIISA NUCLEAR POWER PLANT GENERATED

8.2 TWh ELECTRICITY
without carbon dioxide emissions

The amount of electricity generated at the Loviisa power plant is almost equivalent to the total electricity consumption of the cities Helsinki, Espoo and Vantaa.

Load factor

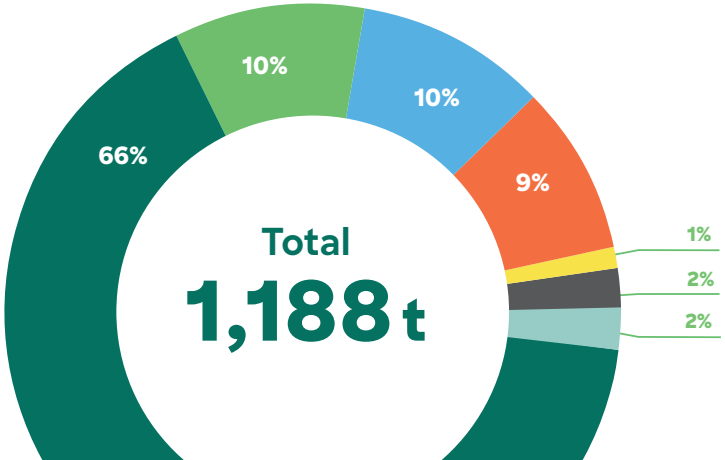
92.4%

Loviisa 1 **93.0%**

Loviisa 2 **91.8%**

LOVIISA NUCLEAR POWER PLANT'S SHARE OF FINLAND'S TOTAL ELECTRICITY PRODUCTION IS OVER **10%**

Total amount of waste handled at the Loviisa power plant in 2019



- as material
- as energy

Waste to recycling **76%**

- **Waste to landfill**
- **Hazardous waste**
- **Radioactive maintenance waste** (to final repository)
- **Radioactive liquid waste for solidification**
- **Spent fuel**

Occupational safety

OCCUPATIONAL INCIDENTS

Loviisa power plant, own personnel

2019 **2** | 2018 **0**

Loviisa power plant, external personnel

2019 **1** | 2018 **4**

OBSERVATION REPORTS (NO.)

2019 **1,009** | 2018 **1,052**

The power plant uses an observation report procedure to collect information for use at the power plant and for safety-related statistics. Observation reports are also made for “near miss” incidents and possibly hazardous incidents.

Personnel

Own personnel

520

Temporary employees **16**

Men **84%**

Women **16%**

External personnel

Fortum’s technical support in Espoo, ca. **170**

Permanent contractors, ca. **100**

Summer workers **78**

During annual outages, ca. **800**

Emissions into air

	2019	2018	Permitted annual emissions
Noble gases, TBq (Kr-87 equivalent)	5.0	4.7	14,000
Iodine, TBq (I-131 equivalent)	0.0000006	0.000004	0.22

Emissions into water

	2019	2018	Permitted annual emissions
Cooling water, million m³	1,380	1,304	1,800
Thermal load into the sea, TJ	57,005	54,916	60,000
Tritium, TBq	14.5	15.2	150
Other radioactive nuclides, TBq	0.0008	0,000159	0.89

Annual load caused by domestic water

	2019	2018
Biological oxygen demand, kg	65.6	91
Chemical oxygen demand, kg	463.6	300
Phosphorus, kg	4.2	4.5
Nitrogen, kg	904.6	1,018
Solids, kg	308	242
Domestic wastewater volumeme, m³	22,642	17,658

Annual load caused by process wastewater

	2019	2018
Phosphorus, kg	3.0	2.8
Nitrogen, kg	411	188
Solids, kg	90	0.07
Process wastewater volume, m³	234,537	164,206

Wastewater

The domestic wastewater generated is treated at the power plant area's biological-chemical wastewater treatment plant, to which about 22,642 m^3 of wastewater was piped in 2019.

In accordance with the environmental permit, domestic wastewater must be treated so that the biological oxygen demand (BOD7ATU) of wastewater discharged into the sea does not exceed 15 mg/l and the total phosphorus concentration does not exceed 0.7 mg/l, calculated as annual averages. The efficiency of the treatment process must be at least 90% for both variables.

According to the monitoring results, the treatment plant reached results compliant with the conditions of the permit: the biological oxygen demand of treated wastewater in 2019 was 2.53 mg/l on average and total phosphorus concentration 0.18 mg/l. The load caused by domestic wastewater in 2019 was 4.0 kg of phosphorus, 905 kg of nitrogen and 308 kg of solids. The environmental permit of the power plant does not set any limits for the process wastewater load. However, the nutrient load caused by the process wastewater is monitored through samples taken in accordance with the monitoring programme.

The load caused by process wastewater in 2019 was 3.0 kg of phosphorus, 411 kg of nitrogen and 90 kg of solids. In 2019, the power plant's share of the total load in the Hästholmen sea area was about 1% phosphorus and about 6% nitrogen.

Environmental incidents

No permit limits were exceeded at the Loviisa power plant in 2019 nor were there any breaches of permit conditions.

A total of two chemical and oil leaks were reported. The first incident was related to a lye leak at the water plant where an operating error occurred when the water plant's lye tank was being filled. As a result, about 50 litres of 50% lye leaked onto the asphalt. The plant's fire brigade was quickly at the site and used an absorbent to recover the chemical that spilled.

The second incident was related to a hydraulic oil leak at a construction site; about 2-3 litres of oil leaked from an excavator into the excavation pit. In this case, too, the fire brigade was called to the site and used an absorbent to recover the oil that had leaked.

All the leaks were less than 100 litres/kg in volume.

The most important task of our nuclear power operations is to produce electricity safely, reliably and competitively, in the short term and long term, while complying with the principles of nuclear and radiation safety, waste management safety, and nuclear material control.

Our operations are based on a high-level safety culture and quality and on continuous improvement.

Our own world-class expertise is a prerequisite for safety and competitiveness. Our Nuclear Services business is built upon this strong competence base, and our customers are in the centre of the solutions we provide.

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