

ENVIRONMENTAL REPORT

2020



tvo



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TVO as a company

Teollisuuden Voima Oyj (TVO) is a non-listed public limited liability company owned by Finnish industrial and energy companies. TVO's line of business is construction and procurement of power plants and power transmission equipment, as well as production, supply, and transmission of electricity, primarily to its shareholders under the terms specified in the articles of association.

TVO OPERATES according to the cost price principle (Mankala principle). TVO is owned by six shareholders, some of which – like TVO – operate according to the cost price principle. Electricity generated by TVO serves the needs of Finnish industrial and energy companies, some of which were owned by a total of 131 Finnish municipalities in 2020. Olkiluoto nuclear power plant generates approximately 18 percent of all the electricity consumed by people in Finland.

TVO's operations are based on a strong safety culture and securing the safety of production. TVO's operational system covers production operations at the Olkiluoto nuclear power plant, maintenance and development of production capacity,

construction of additional production capacity, as well as related steering and resourcing operations. The system meets the requirements of international quality management, environmental, and health and safety standards, and it has been certified by DNV GL Business Assurance Finland Oy Ab. The general part of the operational system also acts as the licensee's quality management system approved by the Radiation and Nuclear Safety Authority (STUK).

The nuclear electricity produced in Olkiluoto plays a significant role in the economic development, electricity self-sufficiency, and general well-being of the whole of Finland. Nuclear electricity also plays an important role in the reduction of greenhouse gas emissions and the achievement of climate targets. The emissions generated by nuclear power are low: throughout the lifecycle, the greenhouse gas emissions remain at the same level as for hydropower and wind power. TVO is a major contributor to sustainable development and the mitigation of climate change.

The objectives of TVO's strategy include predictable and competitive price of electricity, a solid safety brand, and

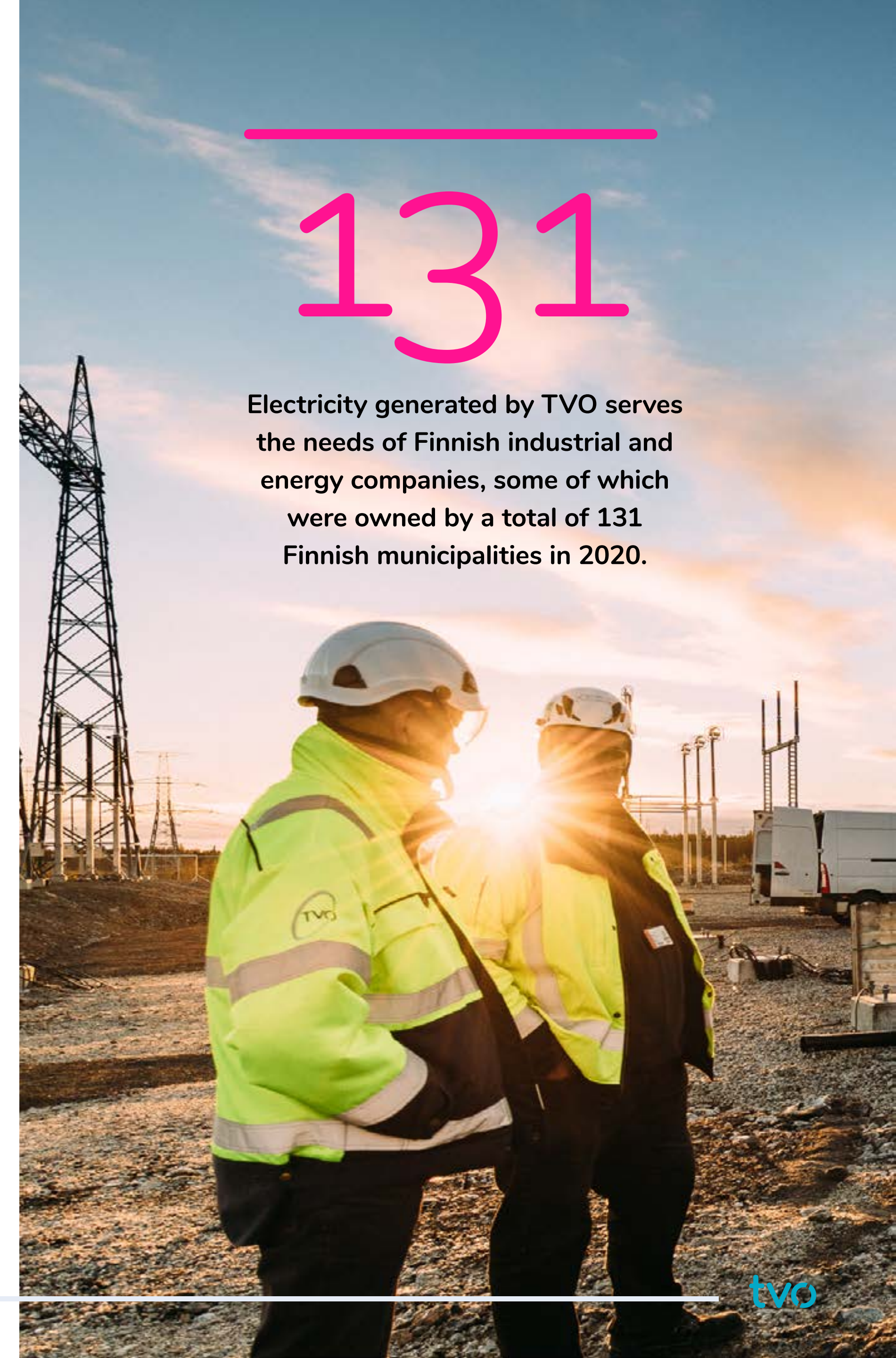
satisfied customers. The goals are to maintain a competitive average electricity production cost and to ensure that the operability of the plant units meets the company's goals. The safety culture is maintained at a high level and safety is systematically upheld and developed at all stages of the nuclear power lifecycle. As the result of changes of the operating environment, nuclear power will remain a major part of the energy selection of Finland and the entire EU as we make our way towards a carbon neutral society.

The Teollisuuden Voima Group comprises subsidiaries TVO Nuclear Services Oy (TVONS) and nuclear waste management company Posiva Oy. TVONS is a subsidiary fully owned by TVO, providing services based on TVO's expertise covering the entire lifecycle of a nuclear power plant. Posiva Oy is jointly owned by TVO and Fortum, TVO's shareholding being 60 percent. Posiva is responsible for the final disposal of spent nuclear fuel generated at the power plants of its owners TVO (Olkiluoto NPP) and Fortum (Loviisa NPP). Posiva Solutions Oy is a fully-owned subsidiary of Posiva, which sells Posiva's know-how generated through 40 years of multidisciplinary research.



131

Electricity generated by TVO serves the needs of Finnish industrial and energy companies, some of which were owned by a total of 131 Finnish municipalities in 2020.



MISSION

We produce climate-friendly electricity with nuclear power for our shareholders in a safe and competitive manner, creating quality of life for Finland.

VISION

An appreciated operator in the nuclear industry.
Approximately 30% of the electricity produced in Finland.

STRATEGIC CHOICES



Safety and availability of OL1/OL2/OL3 at a high level



Strategic investments

BUSINESS-ORIENTED MANAGEMENT

VALUES

- Responsibility • Proactiveness
- Transparency • Continuous improvement

Environment and climate

With its group-level policies, the TVO Group has committed to the principles of sustainable development, and environmental responsibility is an important part of the company's management system.

ELECTRICITY produced with nuclear power is climate friendly. TVO and Posiva carry their responsibility for the environment by identifying the environmental and energy efficiency aspects of their operations and by minimizing the related adverse impacts. Operational targets are set in accordance with the principle of continuous improvement. The impact of operations on the state of the environment has been monitored since the 1970s, and immediate corrective actions are initiated when necessary. The TVO Group takes care of the environmental competence and expertise of its personnel and others working at the Olkiluoto nuclear power plant.

The TVO Group believes that its overall responsibility for the environment at all stages of the fuel cycle is important.



Employees as well as companies and partners working in the power plant area are expected to demonstrate a responsible attitude towards environmental matters in accordance with group-level policies.

The safe use of nuclear fuel is ensured from raw material acquisition to final disposal. TVO monitors and supervises the environmental management of fuel suppliers.

TVO requires that suppliers act responsibly by ensuring and developing the living conditions in the surroundings of uranium production and processing plants, while taking local people into account. Fuel is dealt with in a responsible manner all the way from uranium mines to final disposal according to the so-called "from bedrock to bedrock" principle. The environmental responsibility of final disposal is also on financially stable ground, since nuclear power companies in Finland bear the costs of nuclear waste management, and the funds for that purpose are collected into the Finnish State Nuclear Waste Management Fund.

The aim at the Olkiluoto nuclear power plants is to prevent and reduce the already low emissions of radioactive substances. Potential exceptional events

in the plant process are predicted and preparations for the prevention of potential environmental disadvantages are made.

Energy and material efficiency is taken into account in all operations

ENERGY efficiency requirements are observed and energy efficiency is improved in all operations at Olkiluoto. The efficiency of energy consumption is monitored and continuously improved by taking energy aspects into account in project planning, the procurement of components, and the development of operating practices and procedures. Plant unit modernization projects improve the energy efficiency of the power plant process.

TVO and Posiva improve the efficiency of the use of energy and raw materials, and improve the reuse of waste. The goals are to increase the relative share of waste delivered to reuse and to decrease

the amount of radioactive waste. TVO also strives to reduce the amount of spent fuel by optimizing the use and properties of the fuel.

Sustainable utilization of the environment is taken into account in the development of the Olkiluoto area and the expansion of operations. Surrounded by four nature conservation areas, the small island of Olkiluoto currently produces around one-sixth of all the electricity used in Finland. After the commissioning of OL3, the production volume will increase to around one-third. The concentration of energy production to a small geographic area minimizes the environmental impact and allows the preservation of other areas in their natural state.

Employees as well as companies and partners working in the power plant area are expected to demonstrate a responsible attitude towards environmental matters in accordance with group-level policies.

Environmental management

Operations are managed with a certified environmental management system that complies with the international standard ISO 14001:2015, and includes an integrated energy efficiency system. The system is also EMAS registered.

THE GOAL of the management system is increasing the level and continuous improvement of environmental protection. TVO and Posiva have identified environmental and energy aspects related to their operations and assessed their significance. The significance of environmental and energy aspects are assessed on the basis of statutory and permit requirements as well as by observing the severity/utility of the impact, probability, and impacts to the stakeholder groups. Also opportunities to influence the issue affect the assessment process.

TVO has specified targets for the significant environmental and energy aspects. The targets have been confirmed by the management of the company. A team

of environmental experts from various organizational units monitors the status of the targets regularly. Other subjects discussed at the team meetings include the current status of environmental non-conformities, environmental observations, current statutory matters, and other environmental issues. The team acts as an expert, advisor, and provider of information in environmental issues.

The feasibility of the environmental management system is assessed semi-annually in conjunction with the management review. If necessary, corrective actions are specified to ensure that the goals are reached. TVO identifies all statutory and other requirements pertaining to its operations and systematically monitors the requirements for any changes. Compliance with the requirements is also assessed in conjunction with the management review. Furthermore, TVO's operations are regularly assessed both within the organization and by means of external audits.



Storage and handling of hazardous or harmful substances

Production of climate-friendly electricity

Sustainable land use

TVO has identified the significant environmental and energy aspects of its operations

Emissions in the manufacture and delivery of raw materials, products, and services

Spent nuclear fuel generated during operations

A radioactive release into the environment during a severe accident

Thermal load on the sea caused by cooling water

Proactive environmental safety

THE ASSESSMENT of environmental risks is part of TVO's comprehensive risk management process. Environmental risks have been identified and assessed, and no risks with significant impact were detected. TVO also utilizes a proactive safety observation procedure to prevent environmental damage. A total of 94 observations regarding the environment and energy efficiency were made over the course of the year. They involved matters such as the processing of waste, the management of chemicals, energy efficiency, cleanliness, and general order. TVO's initiative operations also support stakeholder group involvement in TVO's environmental management. All of the safety observations and initiatives are monitored, and all deficiencies are corrected without delay.

IN 2020, a total of 175 litres of oil leaked into the ground due to broken equipment and machines. All of the oil was recovered. In addition, minimal coolant leaks came from refrigerating machines. The environmental authorities are informed of all significant environmental non-conformances and events.

Active stakeholder cooperation

STAKEHOLDERS have a key role for a company that is engaged in environmentally responsible operations. The Olkiluoto Visitor Center normally receives some 13,000 visitors each year. The visitors are openly told about TVO's operations, and their questions are answered. This year, the visits had to be suspended due to the COVID-19 pandemic, but the first digital visits were organized at the end of 2020. The Olki-

luoto Visitor Center was closed from the end of March until the end of the year. Stakeholders also have the opportunity to submit feedback and questions to TVO via the TVO website. TVO replies to all contacts made with contact details appended. TVO received one expression of concern related to environmental issues from external sources in 2020. It was related to restarting the sea water pumps of OL3 after maintenance, which caused momentary clouding of the local seawater.



TVO's environmental management system complies with the ISO 14001:2015 standard. The system is also EMAS registered.



TCFD at TVO

Metrics and targets: TVO's most relevant metrics concerning the climate and the environment are presented in the environmental balance sheet. The targets and results of the environment and energy efficiency program 2019–2021 are reported annually in the Responsibility Report.

Risk management: The management of climate-related risks is part of the TVO Group's overall risk management, which includes both strategic and operative risks.



Governance: With its group-level policies, TVO has committed to the principles of sustainable development, and environmental responsibility is an important part of the company's management system.

Strategy: The production of climate-friendly electricity is part of the TVO Group's strategy. Investments in the production of clean electricity are included in the Group's strategic decisions.

TCFD (Task Force on Climate-related Financial Disclosures) is an international reporting recommendation, which offers companies a framework for reporting on the financial risks and opportunities related to climate-change in relation to four thematic areas: governance, strategy, risk management, and metrics and targets. TVO is reporting according to TCFD for the first time this year, and TCFD reporting will be developed further in TVO's future responsibility reports.

Climate change is one of the greatest challenges of our time, and the TVO Group is committed to supporting the achievement of both national and international climate targets. Producing climate-friendly electricity for society is one of TVO's material responsibility aspects, since nuclear power plays a significant role in the mitigation of climate change as a low-emission form of electricity production. The TVO Group's objective is to also assess climate change and environmentally responsible operations from the perspective of possible risks in accordance with the principle of continuous development.

Governance

The TVO Group's operations relating to sustainable development and environmental responsibility are addressed and developed both in the Responsibility Team and the Environmental Team, which report directly to the Management Group. Some members of the Management Group also belong to the Responsibility Team. The Management Group handles and approves the targets and policies set out in the Responsibility Team and the Environmental Team, and is in charge of their strategic implementation. The highest decision-making authority also in matters concerning sustainable development and environmental responsibility belongs to the Board of Directors and its committees.

With its group-level policies, TVO has committed to the principles of sustainable development, and environmental responsibility is an important part of the company's management system. In its group-level policies, TVO requires a responsible attitude towards environmental matters not only from its own employees but also all the companies and partners working in the power plant area.

Strategy

The production of climate-friendly electricity is part of the TVO Group's strategy. The Group is committed to supporting the achievement of the emission reduction targets set out in the Paris Agreement. TVO also participates in the Finnish Energy Efficiency Agreement for Industries, and has signed the agreement for 2017–2025.

An operating environment analysis is carried out as part of the strategy planning process, which guides the TVO Group's operations. In the operating environment analysis, the greater level of understanding on climate change related matters as well as the central role of nuclear power in achieving climate goals have been taken into account.

The TVO Group's strategic decision has been to invest in the production of clean electricity. This is reflected in the increase in the production capacity of nuclear power through the OL3 plant unit. Once the plant unit is completed, approximately 30 percent of Finland's electricity will be produced with nuclear power from Olkiluoto. In addition, TVO renounced its share in the Meri-Pori coal-fired plant in July 2020, after which 100 percent of the electricity produced by TVO is nuclear electricity.

Future strategic opportunities include small modular reactors (SMR). In a currently ongoing scheme, TVO is investigating the technical and financial possibilities of SMRs in climate-friendly electricity and heat production.

Risk management

The management of climate-related risks is part of the TVO Group's overall risk management, which includes both strategic and operative risks.

Risks which have been identified in the operating environment include different reputational risks as stakeholders are more aware of aspects relating to climate change, as well as the position of nuclear power in relation to the EU Sustainable Finance Taxonomy. The eligibility of nuclear power as a form of energy production to be included in the Sustainable Finance Taxonomy will be resolved in 2021. To ensure future business opportunities, TVO promotes the competitiveness and position as a desirable production form of nuclear power.

The TVO Group's risk management also observes learnings from other operators in the nuclear sector. For example, improvements were made to the Olkiluoto plant units after the Fukushima

nuclear accident, where the effects of earthquakes, floods, and storms are taken into account even more efficiently.

Metrics and targets

TVO's most relevant metrics concerning the climate and the environment are presented in the environmental balance sheet of this report.

In addition, an environmental and energy efficiency program has been prepared for the years 2019–2021 to ensure the achievement of the environmental targets specified in group-level policies and to improve the efficiency of the management of significant environmental and energy aspects.

Targets and results of the environment and energy efficiency program are reported annually. The set targets are based on the production of stable and environmentally friendly electricity for society and minimization of adverse environmental impacts of the operations at all stages of the electricity production chain.

Read more on TCFD:
<https://www.fsb-tcf.org/>



Environment and energy efficiency program 2019-2021

An environmental and energy efficiency program has been prepared for the years 2019–2021 to ensure the achievement of the environmental targets specified in group-level policies and to improve the efficiency of the management of significant environmental and energy aspects.

THE SET targets are based on the production of stable and environmentally friendly electricity for society and the minimization of adverse environmental impacts of the operations at all stages of the electricity production chain. Procedures, responsibilities, and schedules are set to ensure that the targets are met. To ensure continuous improvement, the achievement of the targets is regularly monitored.

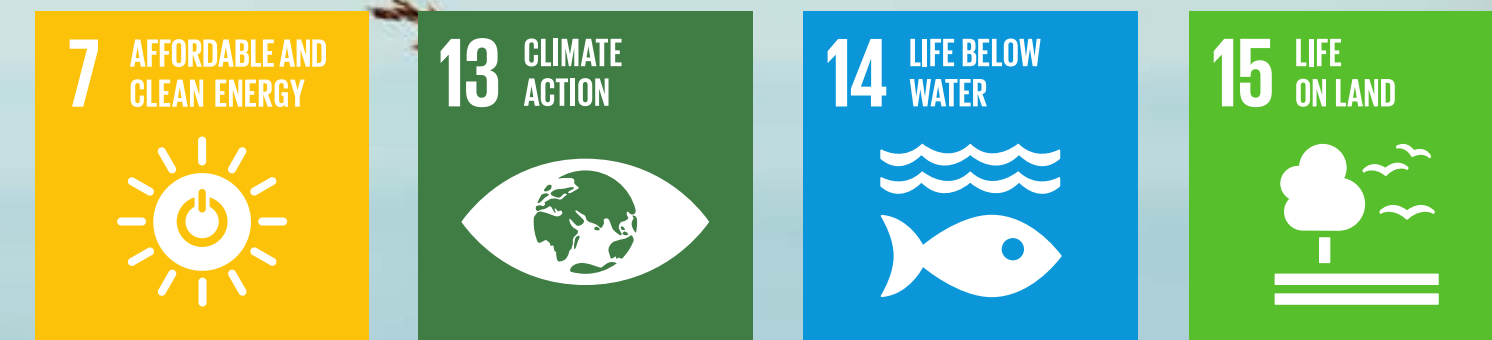
In 2020, the focus of target setting was on the development of environmental risk management, the improvement of

energy efficiency, and the implementation of a chemical management system (TLTA) at the OL3 plant unit. Long-term efforts on the management of radioactive emissions and the thermal load of the cooling water were also continued.

In 2020, the operations at the Olkiluoto nuclear power plant and Posiva's final disposal facility construction site complied with legislation, environmental permits, and the environmental management system.



The TVO Group is also committed to the promotion of climate-related UN Sustainable Development Goals.



Targets and results of the environment and energy efficiency program

Development of the environment and energy efficiency program

- **Development of environmental risk management:** Implementation of HSE risk assessments according to plan. **Actual result:** 80 % of risk assessments of the premises were carried out. The precautionary environmental risk management plan was updated in respect of preparation for pandemics and the management plan for extinction water.
- **Increasing awareness of environmental matters and energy efficiency:** Paying more attention to environmental matters and energy efficiency in projects and modifications, and renewing environmental training. **Actual result:** In the beginning of the year, the environmental safety expectations and managers' supervision responsibilities were reviewed in the management groups of different departments. The incorporation of environmental and energy efficiency aspects to templates in projects and modifications has enhanced their recognition.

Management of environmental load

- **Zero environmental accidents:** There are no serious or significant environmental accidents, there are at least 90 proactive environmental observations. **Actual result:** The environmental accident target was reached. There were 94 proactive environmental observations, the majority of which were related to the management of municipal waste.

- **Production of climate-friendly electricity:** Production goal for 2020: 14,870 GWh. **Actual result:** The OL1 and OL2 plant units produced electricity amounting to 14,587 GWh, which means the production goal was not reached. This was partially impacted by the disturbance at OL2 in December, which caused an interruption of nine days in the plant unit's electricity production.
- **Management of cooling water heat load:** No excesses of the environmental permit target values. **Actual result:** The cooling water temperature remained below the target values specified in the environmental permit. Extended voluntary monitoring of seawater temperature was continued in the sea areas near Olkiluoto, and measurements were carried out to obtain more information about the spreading of cooling water into the sea area.
- **Management of environmental issues at OL3:** Harmonizing and updating the environmental systems of TVO and the plant supplier. **Actual result:** A management system based on TVO's general operational system has been specified for OL3 in cooperation with the plant supplier (CFS). Preparations were made for the commissioning of the plant unit by reviewing instructions.
- **Optimal and controlled environmental load from the use of chemicals:** Inspection and maintenance of pools preventing chemical contamination and oil trap wells in accordance with the preventive maintenance program (100 %). **Actual result:** Condition surveys for all structures and components used in the storage, handling, and leak detection of chemicals have been includ-

ed in the scope of the preventive maintenance program, and all inspections and maintenance actions were carried out according to plan. Two action proposals were recorded concerning oil traps.

Improvement of material and energy efficiency and sustainable land use

- **Total energy saving target for the agreement period 2017–2025:** 150 GWh. **Actual result:** An additional savings target of 1 GWh has been set for 2020-2021. Energy efficiency measures carried out in 2020 were the air conditioning renovations of the generator warehouse and the VLJ repository, as well as the HVAC renovation of the OL2 lobby. In addition, more energy meters were installed in the buildings of the area, and the analysis of measurement results was developed during the year. Small teams were taken into use in the energy efficiency group in order to develop the analysis of site inspections, modernizations, plant measurements, and consumption information.
- **Development of circular economy:** Reduction of waste volume and recycling of waste as material (a minimum of 35 % of the overall waste volume, excluding sludge). **Actual result:** 24 % of the site area waste was utilized, which means the target was not reached. The separate collection of plastic waste was started e.g. in the logistics terminal and storage spaces. During the renovation of the central office which started at the end of the year, the target for

minimizing the waste volume was not completely achieved e.g. due to the COVID-19 pandemic.

- **Land use planning:** The concentration of energy production to a small geographic area minimizes the environmental impact and allows the preservation of other areas in their natural state. **Actual result:** A steering group for infrastructure and land use adapts infrastructure designed and implemented in the area to the natural environment, paying particular attention to natural sites and nature conservation areas.

Suppliers' environmental responsibility

- **Environmental and energy efficiency in procurement:** Energy efficiency assessment questions will be added to the supplier evaluation procedure. **Actual result:** The TVO Group's procurement terms have been updated. TVO procures products that are durable and have a long lifespan, and takes into account opportunities to recycle or potentially reuse the products at the end of their service lives.
- **Development of supplier monitoring in Olkiluoto:** Evaluating the partners' management of environmental issues and energy efficiency measures. **Actual result:** A cooperation and safety forum for contractors working in Olkiluoto was started in the beginning of the year. The objective of the forum is to review current HSE matters, as well as to exchange best practices with different operators. Due to the COVID-19 pandemic, the forum was continued remotely during the autumn.

Isolation of radioactivity originating at the power plant from the organic environment

- **Ensuring the purity of the process:** Implementing the TLTA (safety-classified supplies) system at OL3. **Actual result:** TLTA was introduced at OL3.
- **Keeping radioactive emissions into air and water clearly below the limits set by the authorities:** ALARA program targets. **Actual result:** Radioactive emissions into the air and water remained clearly below the limits set by the authorities. The targets of TVO's own ALARA program were partially reached for air and water emissions.
- **Management of nuclear safety risks** **Actual result:** Risks are actively identified, and measured for their probability and consequences by means of up-to-date Probabilistic Risk Assessment (PRA). The identified risks are mitigated applying the Safety As High As Reasonably Achievable (SAHARA) principle. Following the Fukushima accident, TVO has further developed the capabilities of the plant units to withstand extreme natural phenomena and simultaneous loss of power supply. Plant modifications related to these capabilities have significantly reduced the nuclear safety risk.

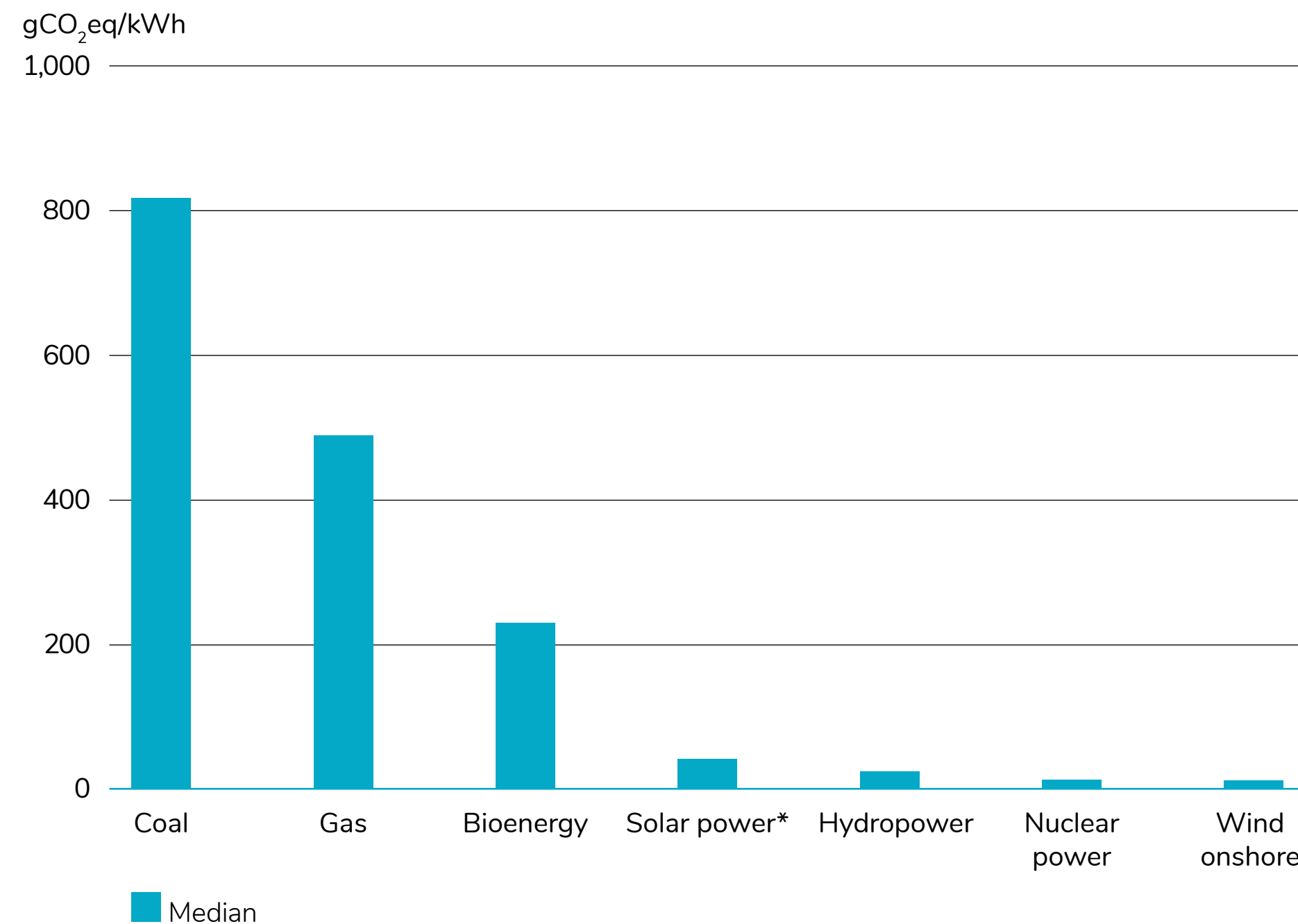
Climate-friendly electricity

The role of low-carbon energy, such as renewable energy and nuclear power, is crucial in the mitigation of climate change.

ACCORDING to the most recent Sustainable Development Scenario by the International Energy Agency (IEA), which aims to limit the planet's rising temperature, nuclear power production should increase by 55 percent by 2040. Nuclear power will remain a major part of the energy selection of Finland and the entire EU as we make our way towards a carbon neutral society. In 2020, the share of nuclear power was about 34 percent of all the electricity produced in Finland.

During its entire lifecycle, nuclear electricity is as environmentally friendly an electricity production method in terms of greenhouse gas emissions as wind power, hydropower, and solar power. The use of bioenergy will not add to the amount of carbon dioxide in the atmosphere either. The nuclear power annually produced in Finland helps prevent approximately 20 million metric tons of CO₂ emissions.

Average lifecycle greenhouse gas emissions of electricity production



*Solar panels

Source: IPCC Fifth assessment report (Working group III Report "Climate Change 2014: Mitigation of Climate Change")



-20
million metric tons CO₂

The nuclear power produced annually in Finland helps prevent approximately 20 million metric tons of CO₂ emissions.

The environmental impacts of nuclear power

The emissions generated by nuclear power are low: throughout the lifecycle, the emissions remain at the same level as for renewable sources of energy. The long service lives and small land areas required by nuclear power plants make them even more environmentally friendly.

NUCLEAR power causes some negative environmental effects as well, such as slight warming of the surrounding sea areas, minor emissions into the air, water, and soil, as well as nuclear waste consisting of spent nuclear fuel.

The final disposal of nuclear waste is a key question in the use of nuclear power. The TVO Group has come up with a unique solution for the final disposal of nuclear waste known all around the world, ONKALO®.

14,59 TWh

TVO's electricity production in 2020 covered 18 % of Finland's electricity demand.

30%

of all electricity produced in Finland will soon be generated on the island of Olkiluoto.

170 ha

The centralization of Olkiluoto's built environment to a small surface area minimizes the environmental impact and makes it possible to preserve other areas in their natural state.

430 m

The safe final disposal of spent nuclear fuel in ONKALO, in the depth of approximately 430 m, enables the production of sustainable nuclear electricity.

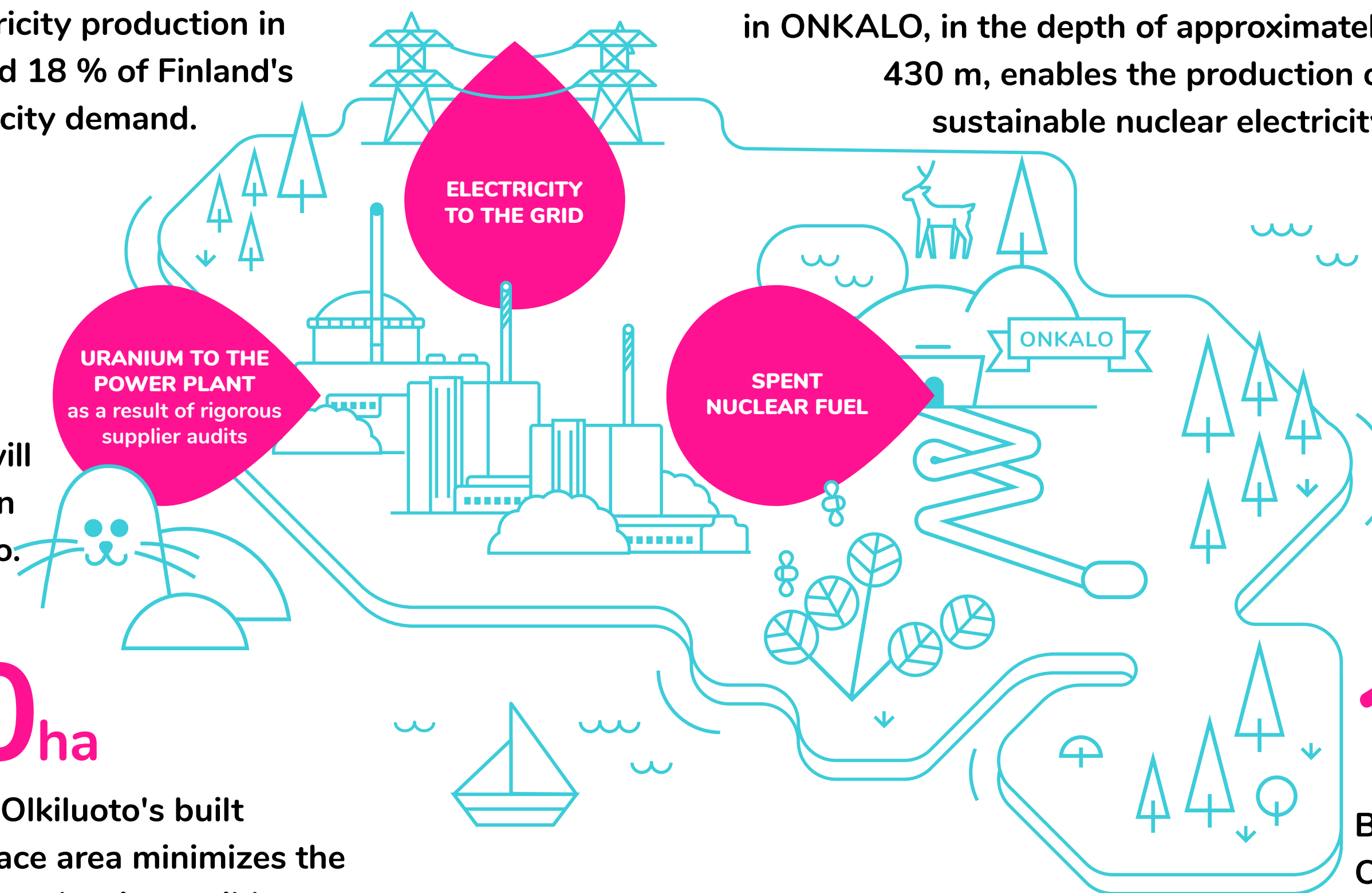
Nuclear power enables major emission reductions

Nuclear power production can significantly reduce annual carbon dioxide emissions. If all fossil fuels were replaced with nuclear power, a reduction of 700 million metric tons of CO₂ emissions would be possible in Europe, from which Finland's reduction would account for 20 million tons of CO₂.

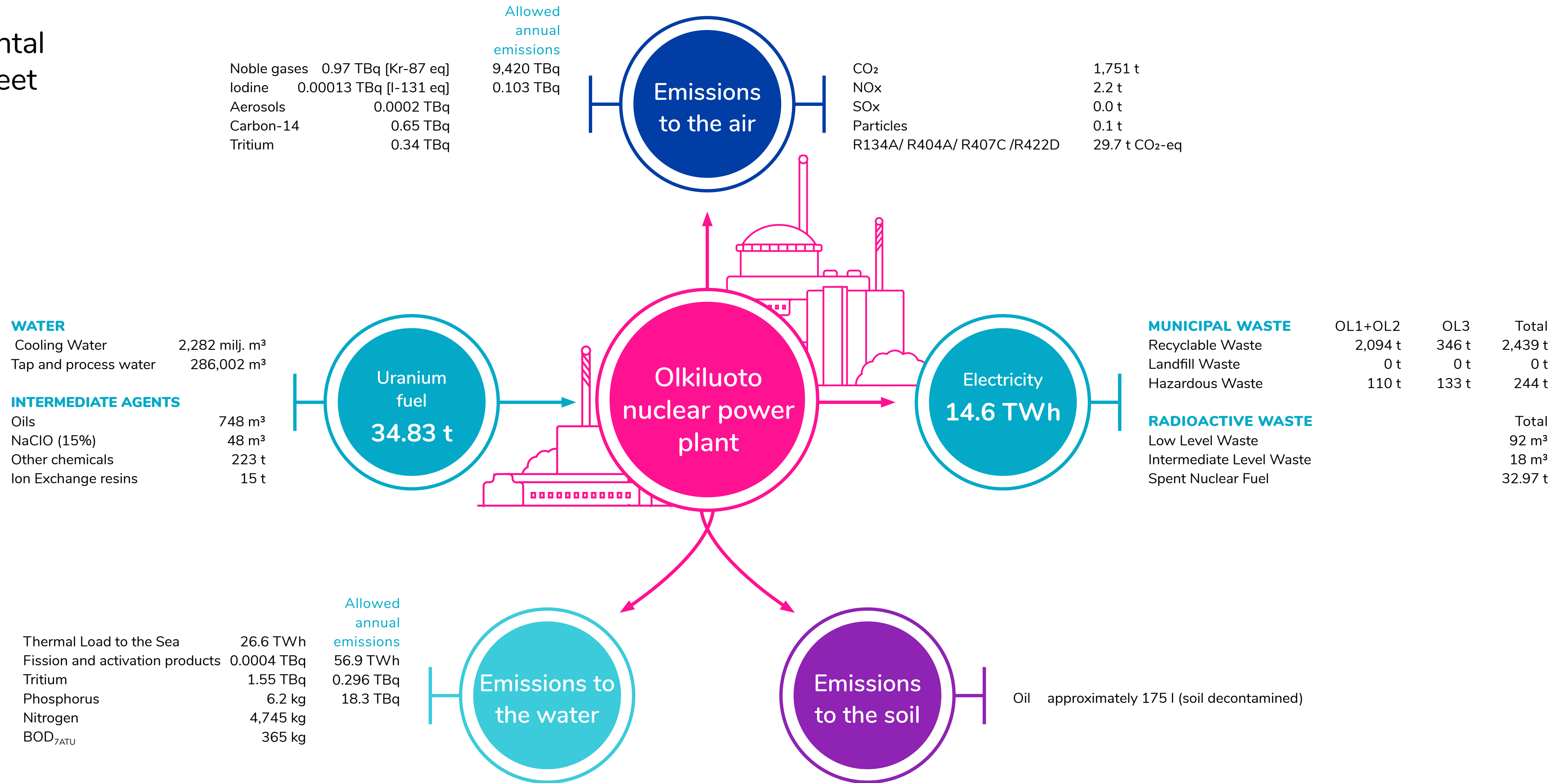
During its production history, the Olkiluoto nuclear power plant has produced 525 TWh of electricity. This production volume prevented CO₂ emissions of circa 430 million tons, which corresponds to all the greenhouse gas emissions in Finland during a period of approximately eight years in a scenario where nuclear power was replaced with condensing coal power, the specific emissions of which amount to 820 g/kWh.

12 million tons

By producing electricity at the Olkiluoto nuclear power plant, Finland avoids 12 million tons of carbon dioxide emissions annually.



Environmental balance sheet



Cooling water

The warming of the seawater due to the thermal load from the cooling water is the most important environmental impact of the Olkiluoto nuclear power plant. The total volume of seawater used for the cooling of the OL1 and OL2 plant units is approximately 76 m³/ sec.

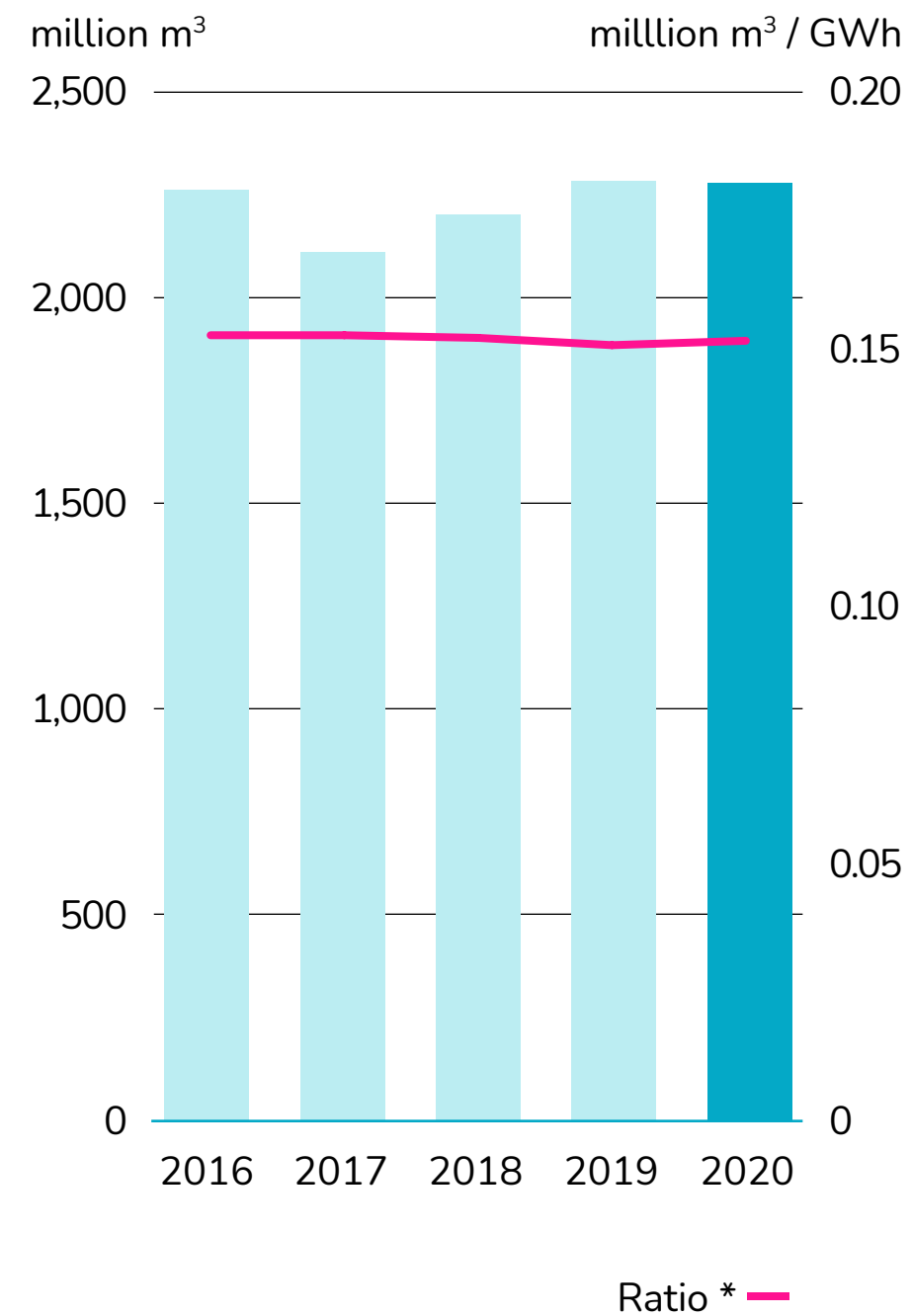
IN 2020 2,282 million cubic meters of seawater was used for cooling, and the resulting thermal load on the sea was 26.6 TWh. Seawater temperature is monitored as required by the environmental permit. One of the environmental permit conditions is that the seawater temperature does not exceed the target value of 30°C when measured as a weekly average at a distance of 500 meters from the cooling water discharge channel. Limit values have also been specified for the amount of cooling water (max. 4,415 million m³) and the thermal load (max. 56.9 TWh) in the environmental permit. None of the permit limits were exceeded in 2020.

As the cooling water passes through a plant unit, its temperature increases

by approximately 10°C, after which it mixes with seawater. The cooling water does not come into direct contact with the power plant's circulating water. Throughout the operation of the power plant, TVO has monitored the impact from cooling water and conducted related surveys. The cooling water accumulates in an extensive sea area in the surface layer, from where part of the heat transfers into the air. Depending on the weather conditions, an increase in temperature can be observed at an approximate distance of 3–5 kilometers from the cooling water discharge location.

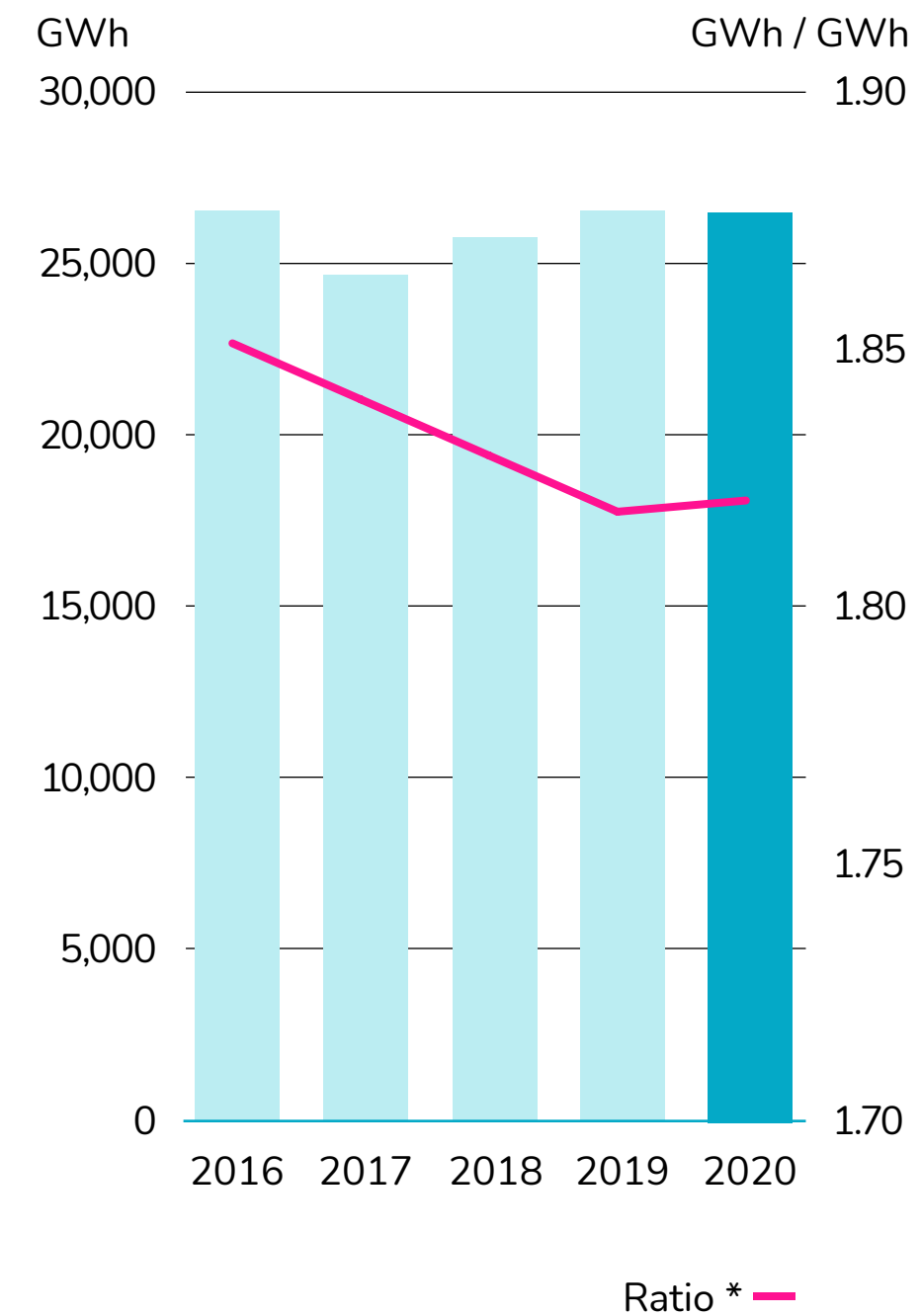
The cooling water also causes changes in the ice conditions, as the cooling water discharge area remains unfrozen throughout the winter. The size of the unfrozen and weak ice area varies depending on the winter weather, being at a maximum of around 7 km². TVO issues warnings about the unfrozen area to the local residents in newspapers and with ice warning signs. The warm cooling water extends the growth period in the unfrozen sea area and increases

Water usage Cooling water



* The ratio is given per GWh of electricity produced.

Emissions Thermal load on the sea



* The ratio is given per GWh of electricity produced.

its overall biological production. Other biological effects caused by the cooling water are minor.



TVO monitors seawater temperature as required by the environmental permit. None of the permit limits were exceeded in 2020.

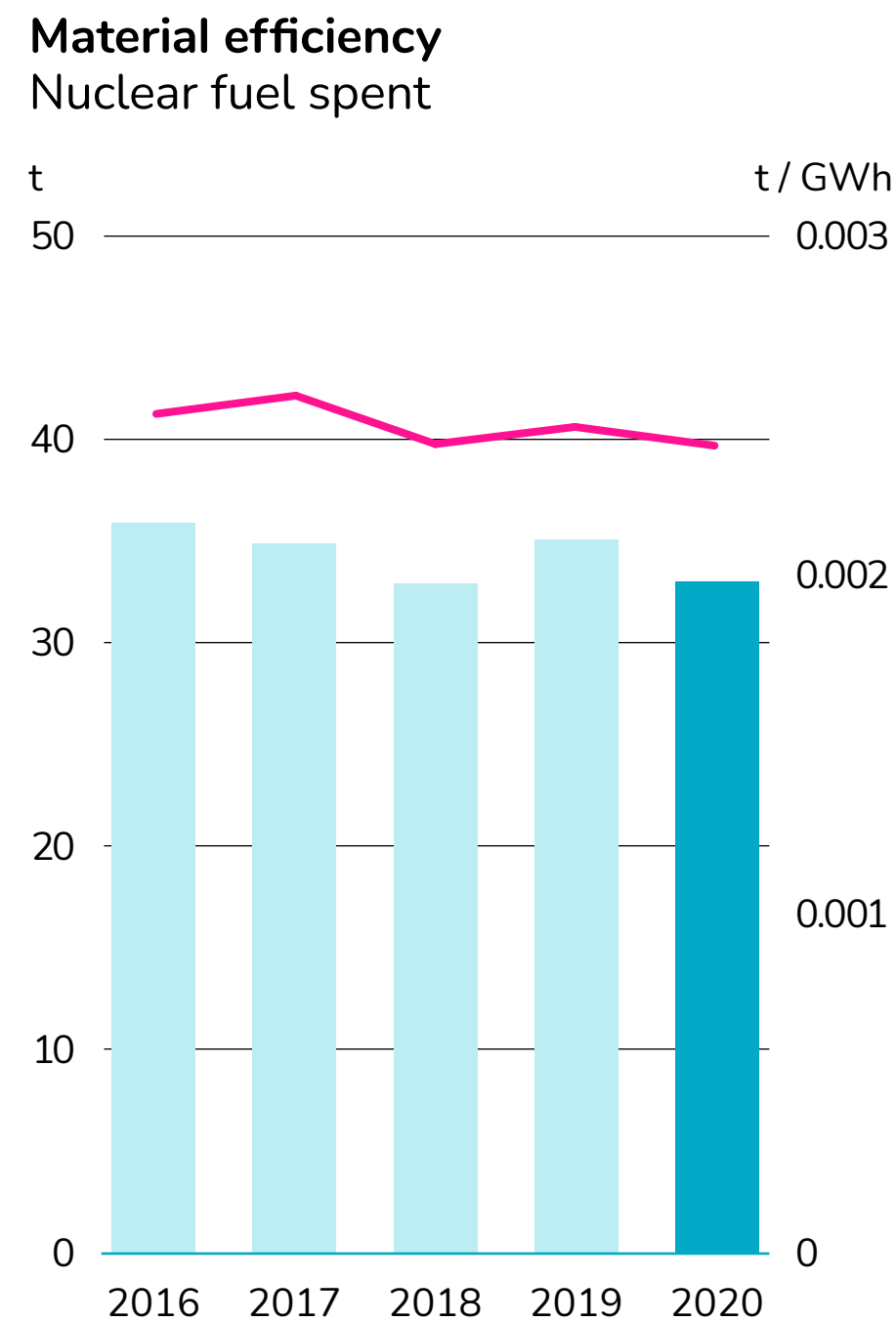
Raw materials and material efficiency

TVO ensures the safe use of the uranium used as nuclear fuel at all stages of the electricity production chain from responsible procurement to safe final disposal. The OL1 and OL2 plant units require an annual total of approximately 40 metric tons of low-enriched uranium for fuel.

TVO uses a diversified nuclear fuel procurement chain, meaning that separate contracts are concluded for the different procurement stages, usually with several suppliers for each stage. Procurement operations are based on long-term contracts with leading suppliers. Uranium is only acquired from suppliers who meet the strict requirements specified by TVO.

Material efficiency through recycling

THE TVO Group procures products that are durable and have a long lifespan, and takes into account opportunities for their recycling and potential reuse at the end of their service lives. The procurement



* The ratio is given per GWh of electricity produced.

operations ensure safe, competitive, and reliable production and long-term operation of the plant units.

All purchased products and services must meet the TVO Group's quality, occupational health and safety, and environmental requirements. The availability of products and services necessary for the company's operations is ensured through long-term contracts based on mutual trust and partnership.

Intermediate agents in production

CHEMICALS are extensively stored and processed by TVO. The Olkiluoto nuclear power plant is a safety report establishment. The intermediate agents include the fuel of the emergency diesel genera-

tors, the reserve power boiler plant, and vehicles (oils) and sodium hypochlorite (NaClO) used for hydroid control in the seawater systems. The ion-exchange resin used to clean the circulating water as well as solvents, bitumen, and nitrogen used at the plant (other chemicals) are among the reported additives. Consumption of oil increased due to the commissioning tests of the emergency diesel engines that help ensure the safety.

Reducing consumption of water

IN ADDITION to the seawater used as cooling water, the Olkiluoto power plant makes use of fresh water, which is used as tap water and circulating water. The circulating water that boils in the reactor

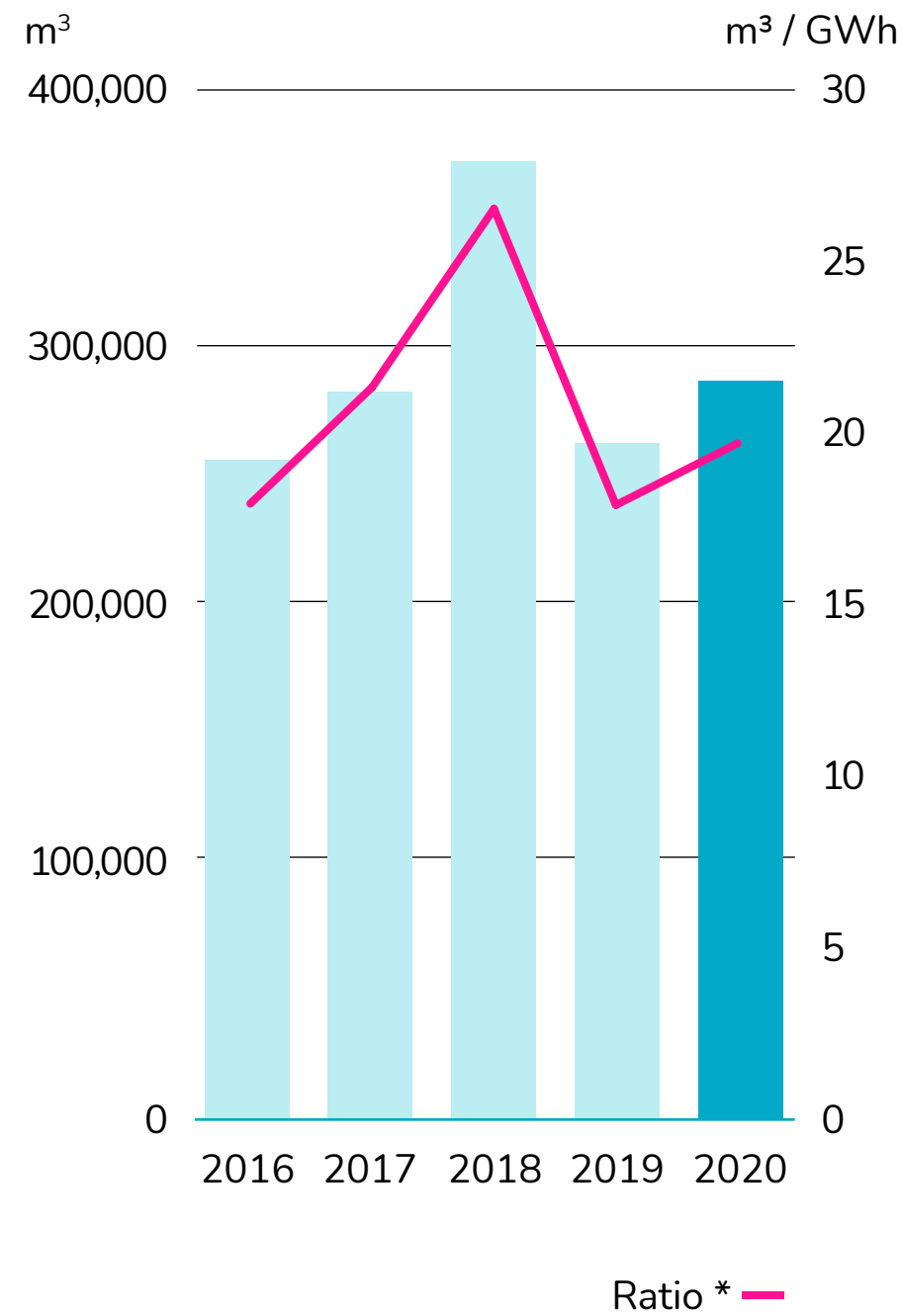
Intermediate agents	2020	2019	2018	2017	2016
Oils (m ³)	748	732	657	258	255
NaClO (15%) (m ³)	48	39	45	40	41
Other chemicals (t)	223	118	137	176	235
Ion exchange resins (t)	15	15	15	17	18



The procurement operations ensure safe, competitive, and reliable production and long-term operation of the plant units.

must not contain any salts, impurities, or particles that could damage the reactor internals. Olkiluoto has all the necessary plants for water treatment: a water treatment plant, a demineralization plant, a laboratory, and a wastewater treatment plant. The tap and circulating water are treated at TVO's own water treatment plant. Ion exchange and reverse osmosis methods are used to purify the water used in the power plant process. Circulating water is continuously recycled and purified. During annual outages, the fuel pool water is stored in storage pools to wait for reuse. The recycling of water reduces TVO's need for clean circulating water and the amount of circulating wastewater discharged from the plant by approximately 30,000 m³ each year. During the reporting year, 286,002 m³ of fresh water was taken from the Eurajoki river.

Water usage
Untreated water

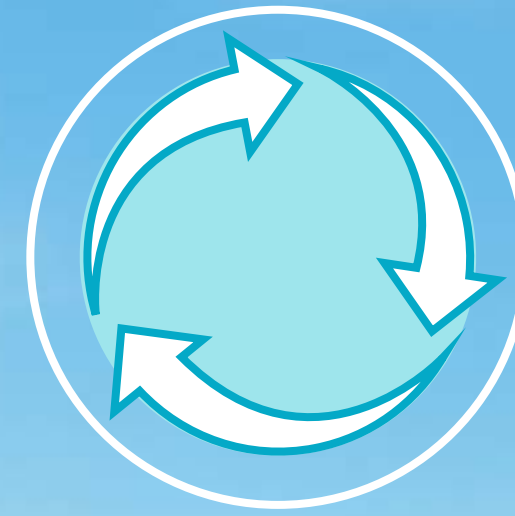


* The ratio is given per GWh of electricity produced.

	2020	2019	2018	2017	2016
Raw water treatment					
Amount of water (m ³) ¹⁾	286,002	262,891	372,295	284,874	256,237
Water treatment chemicals (t) ²⁾	54	73	117	83	70

¹⁾ Amount of water pumped from River Eurajoki to Korvensuo.

²⁾ Chemicals used in water processing (H₂SO₄, NaClO (10%), NaOH, sedimentation chemicals)



30 000 m³

the avoided need of clean circulating water annually due to the recycling of water.



Production and energy efficiency

In 2020, the combined power output of the Olkiluoto plant units, OL1 and OL2, was 14,587 GWh. The combined load factor of the plant units was 93.8 percent. TVO produces approximately 18 percent of all the electricity consumed in Finland.

THE PLANT UNITS operated safely and reliably. The net output of OL1 was 7,310 GWh. OL1's load factor was

93.7 percent. The net output of OL2 was 7,277 GWh and the load factor was 93.3 percent. Nuclear power is used as stable base load power which supports stable electricity production to supplement the variable production of hydro-power, wind power, and solar power. With its climate-friendly electricity production, TVO promotes the achievement of emission reduction targets set in the Paris Agreement.

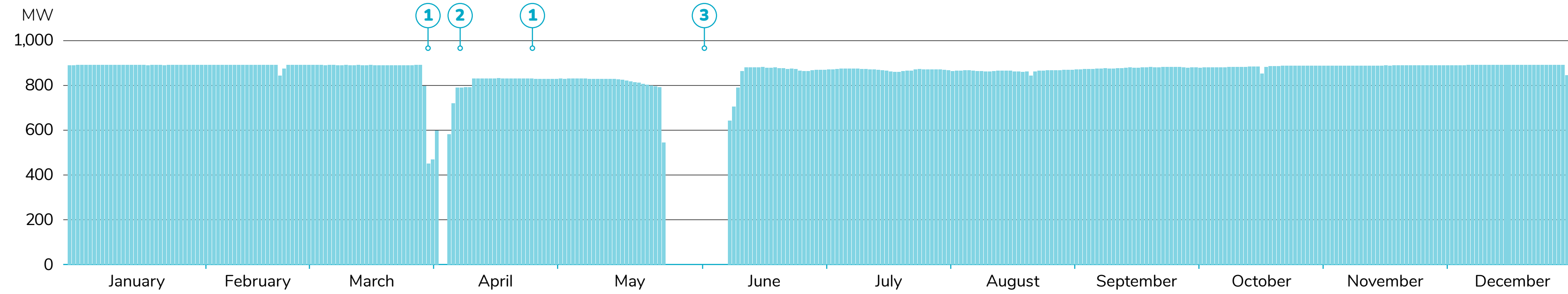
OL1	2020	2019	2018	2017	2016
Net production (GWh)	7,310	7,542	6,755	7,158	7,048
The plant units' own electricity consumption (GWh)	259	268	246	264	258
Capacity factor (%)	93.7	96.9	87.8	93.1	91.4
Efficiency (net) (%)	35.5	35.5	35.3	35.1	35.0

OL2	2020	2019	2018	2017	2016
Net production (GWh)	7,277	7,209	7,334	6,256	7,301
The plant units' own electricity consumption (GWh)	262	258	264	226	265
Capacity factor (%)	93.3	92.7	94.3	81.3	94.6
Efficiency (net) (%)	35.4	35.5	35.4	35.4	35.1



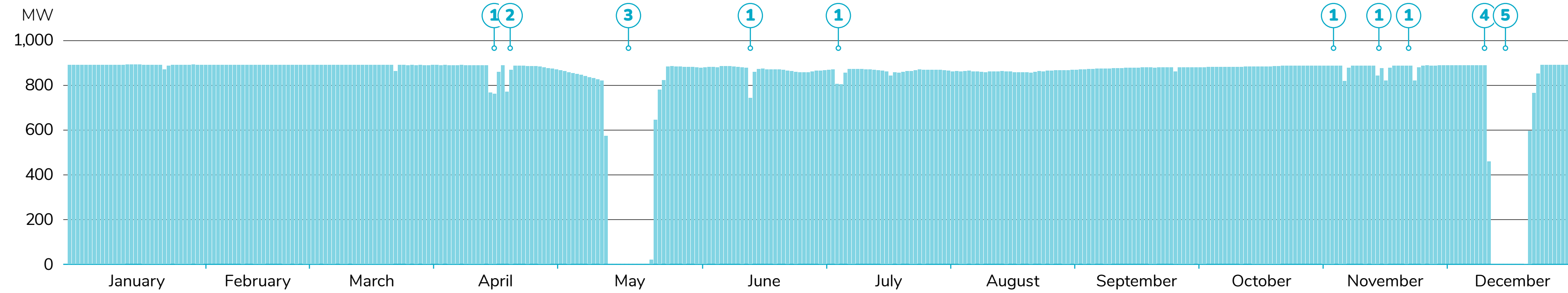
Each year, the nuclear power produced at Olkiluoto helps prevent carbon dioxide emissions of over 12 million metric tons in Finland when compared to producing the same amount of electricity using fossil fuels.

OL1 Production
Average output MW



- 1. Restriction due to fuel
- 2. Repair of the main steam valve
- 3. Annual outage

OL2 Production
Average output MW



- 1. Low electricity demand
- 2. Partial scram due to a failure in temperature measurement
- 3. Annual outage
- 4. Reactor scram due to high activity levels in the main steam lines
- 5. Cold shutdown state due to inspection and repair work



20 GWh

district heating from the plant units to buildings in Olkiluoto. In 2020, more energy meters were added to the buildings of the area, and the analysis of measurements was developed.

Improving energy efficiency

FOR several years, TVO has participated in the voluntary Finnish Energy Efficiency Agreement for Industries. TVO signed the agreement for the first time in 1998. In accordance with the agreement, efforts have been focused on the continuous improvement of energy efficiency at the plant units and in the Olkiluoto area.

TVO has also signed the Energy Efficiency Agreement for 2017–2025. During this period, the associated Action Plan for Energy Production aims to implement actions designed to make the use of energy more efficient, as well as to improve the efficiency of primary energy use and the total efficiency of energy production. TVO's total energy savings target for 2017–2025 is 150 GWh, which equals to the average annual consumption of some 7,500 single family homes heated with electricity. This target was already reached in 2019, so an additional savings target of 1 GWh has been set for 2020–2021.

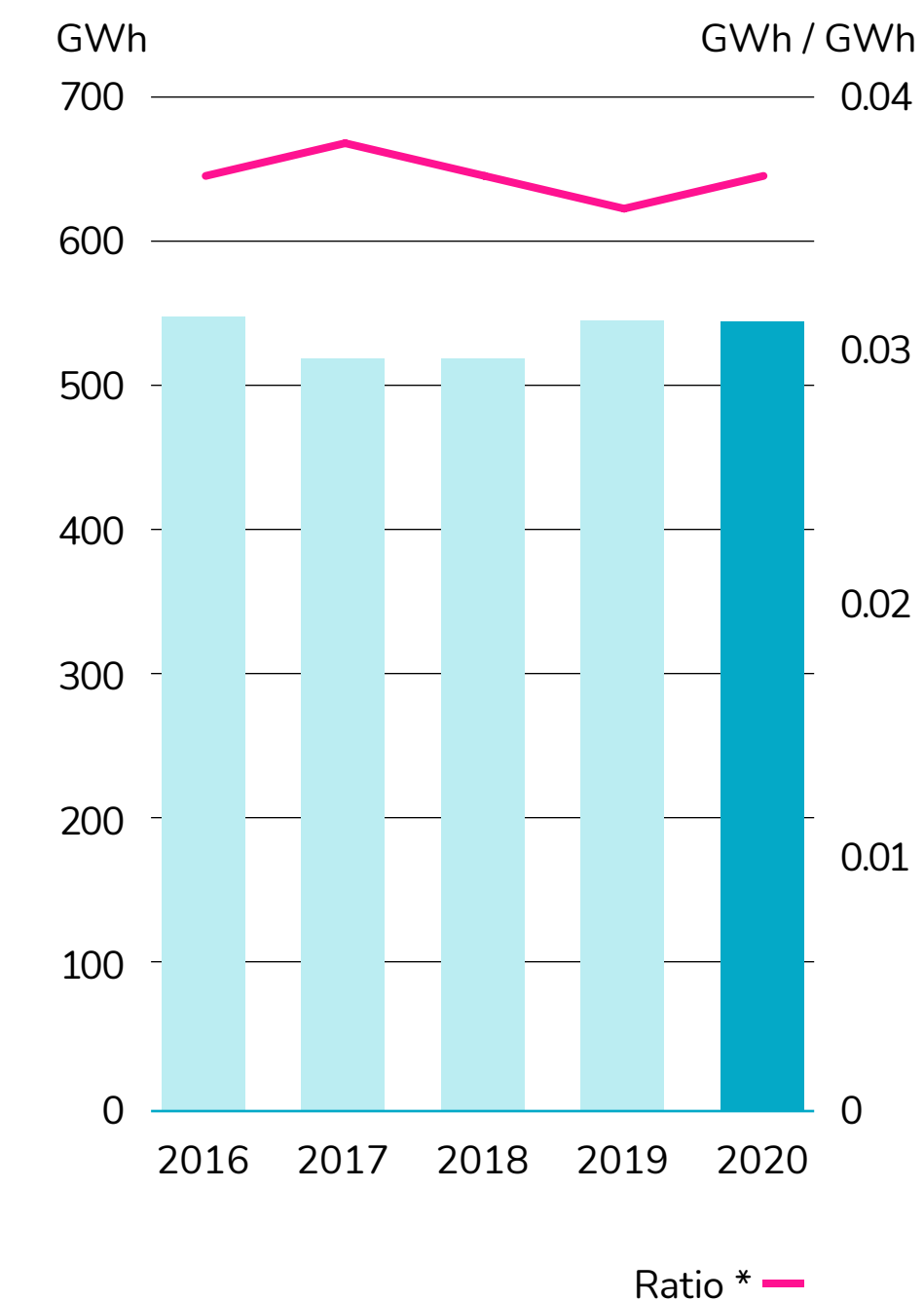
Energy efficiency measures carried out in 2020 were the air conditioning renovations of the generator warehouse and the VLJ repository, as well as the HVAC renovation of the OL2 lobby. The reno-



vation work at the generator warehouse was completed during 2020, and the other renovations will continue during 2021. Furthermore, more energy meters were installed in the buildings of the area, and the analysis of measurement results was developed during the year. Measurements and energy analyses were performed in both of the existing plant units after the annual outages.

TVO and Posiva carry out activities related to energy efficiency as part of their normal operations. For TVO, the highest potential for savings involves the improvement of the efficiency of the electricity production process; this has been implemented in the long term by means of plant modernization projects throughout the operational history of the company. Another area of improvement

Energy efficiency TVO's electricity consumption



* The ratio is given per GWh of electricity produced.

is the reduction of own energy consumption at the company's site in Olkiluoto.

The energy efficiency system EES+ has been integrated into the TVO Group's environmental management system. It is used to improve energy efficiency in compliance with the principle of continuous improvement in all of the Group's functions.

Emissions to the air

With regard to the management of radioactive substances, TVO always strives to keep any emissions well below both the emission limits set by the authorities and TVO's own target limits, which are more stringent than the official limits. With the electricity production at the Olkiluoto nuclear power plant, approximately 12 million tons of CO₂ emissions are avoided each year, compared with the same amount being produced by fossil fuels.

Radioactive releases into the air

NOBLE GAS emissions into the air amounted to 0.01 percent and iodine emissions into the air amounted to 0.12 percent of the allowed limit value specified by the authorities. In March 2020, the collectors used for the determination of H-3 and C-14 emissions to the air used at both operating plant units were renewed.

The theoretical radiation dose caused to neighboring residents in Olkiluoto is estimated to remain clearly below the threshold value. In 2019, the radiation dose was 0.21 µSv (threshold value: 100 µSv).

Carbon dioxide emission

TVO TAKES part in Finland's fight against climate change by producing low-emission electricity. The Olkiluoto nuclear power plant is included in the European Union emissions trading scheme that aims at monitoring greenhouse gas emissions and achieving CO₂ reduction goals. Posiva also plays an important role in the mitigation of climate change since the final disposal solution is a part of the lifecycle of nuclear power.

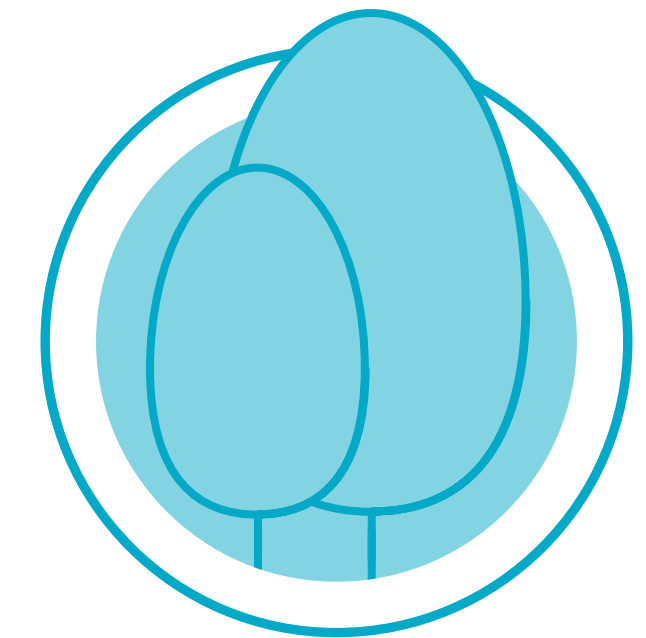
THE POWER plant's actual CO₂ emissions are generated by the releases of the reserve boilers and the emergency diesel generators. The emergency diesel generators would ensure power supply of the plant in a possible but unlikely loss-of-power situation. In order to

Radioactive emissions to the air	2020	2019	2018	2017	2016
Noble gas TBq (Kr-87 equivalent)	0.97	1.76	0.91	3.43	9.69
% of allowed amount	0.01	0.02	0.01	0.04	0.1
Iodine TBq (I-131 equivalent)	0.00013	0.0008	0.0005	0.0009	0.0016
% of allowed amount	0.12	0.74	0.48	0.84	1.50
Aerosols TBq	0.0002	0.0001	0.0006	0.025	0.24
Tritium TBq	0.34	0.82	1.32	1.07	2.65
Carbon-14 TBq	0.65	0.64	0.93	1.02	1.23 ¹⁾

Verified CO ₂ emissions of the Olkiluoto power plant	2020	2019	2018	2017	2016
CO ₂ emissions total (t)	1,751	1,388	1,505	717	737
OL1/OL2 back-up heating boilers (8 MW + 12 MW)	268	17	1	22	95
OL1/OL2 emergency diesels (8 x 1,8 MW + 1 x 2.5 MW)	594	446	380	355	491
OL3 emergency diesels (4 x 6,4 MW, 2 x 2,5 MW, 1 x 1,3 MW)	888	925	1,124	340	152

ensure safety, the emergency diesel generators are regularly tested in compliance with the technical specifications, which means that their emissions cannot be lowered. The replacement of the emergency diesel generators at OL1 and OL2 during the next few years will

reduce particulate emissions to the air. A milestone was reached in the biggest modernization project of TVO's history during the summer, when the ninth emergency diesel generator was taken into use. This unit which is separate from OL1 and OL2, enables the gradual replacement of the original diesels.



TVO's radioactive emissions to the air are less than one percent of the limits specified by the authorities.

Emissions to water and soil

The emissions of radioactive fission and activation products into water amounted to 0.15 percent and tritium emissions to 8.5 percent of the annual limit value specified by the authorities.

Sanitary wastewater is treated at the Olkiluoto wastewater treatment plant before it is discharged into the sea. In 2020, the amount of treated sanitary wastewater was 90,304 m³. The phosphorus load discharged into the sea was 6.2 kg, the nitrogen load was 4,745 kg, and the biological oxygen demand (BOD_{7ATU}) was 365 kg. The treatment of sanitary wastewater is based on the permit regulations specified for the purification efficiency and loads discharged into water bodies, as well as regulatory requirements. Emissions from the sanitary wastewater treatment plant were a fraction of the nutrient load of the Eurajoki river running to the north of Olkiluoto. Water quality measurements are taken by a third party.

Emissions to the soil

OVER THE COURSE of the year, a total of approximately 175 litres of oil ended up in the soil due to failures of working machines and equipment. All oil was recovered, and the used spill control materials were delivered to appropriate further processing.

Radioactive emissions to water	2020	2019	2018	2017	2016
Fission and activation products TBq	0.0004	0.0001	0.0001	0.0003	0.0002
% of allowed amount	0.15	0.04	0.04	0.09	0.05
Tritium TBq	1.55	1.59	1.62	2.46	2.32
% of allowed amount	8.5	8.7	8.9	13.5	12.7

Wastewater treatment	2020	2019	2018	2017	2016
Amount of water (m³)	90,304	83,545	89,558	97,207	88,606
Concentration (mg/l)¹⁾					
BOD _{7ATU}	4	6,6	10	8,0	13
Phosphorus	0.07	0.37	0.12	0.12	0.24
Treatment efficiency average (%)¹⁾					
BOD _{7ATU}	98	97	96	96	94
Phosphorus	99	96	99	98	98
Load on sea area (kg)					
Phosphorus	6.2	31	11	12	21
Nitrogen	4,745	2,993	4,380	5,840	4,380
BOD _{7ATU}	365	548	913	767	1,132
Water treatment chemicals (t)²⁾	29	32	35	39	34

¹⁾ The permit regulation for the sanitary wastewater: The maximum BOD_{7ATU} value of wastewater discharged into the seas is 13 mg O₂/l and the maximum phosphorus concentration is 0.52 mg P/l. The minimum treating efficiency for the BOD_{7ATU} value and phosphorus is 95 %. All values are calculated as annual averages. ²⁾ Chemicals used for the treatment of sanitary wastewater.

Waste

The TVO Group is committed to reducing the amount of waste and to promoting its utilization. Radioactive waste is isolated from the organic environment until its radioactivity has decreased to a harmless level. The TVO Group disposes of the radioactive waste it generates in a responsible manner.

Radioactive waste

THE WASTE produced at the power plant is classified, based on radioactivity, into waste exempted from control, low and intermediate level operational waste, high-level waste (spent fuel), and decommissioning waste.

Waste exempted from control contains such a small amount of radioactive substances that the waste can be reused or delivered to the Olkiluoto landfill for final disposal. The waste is produced during the operation and maintenance of the power plant. In 2020, the amount of maintenance waste exempted from control was 0 tons. Approximately 18 tons of metal was also cleared for recycling.



Radioactive waste	2020	2019	2018	2017	2016
Low-level (m ³) ¹⁾	92	150	92	47	86
Intermediate level (m ³) ¹⁾	18	7	53	51	9
Operating waste cleared after monitoring (t)	0	0	44	40	96

¹⁾ Operating waste cleared after monitoring (t)

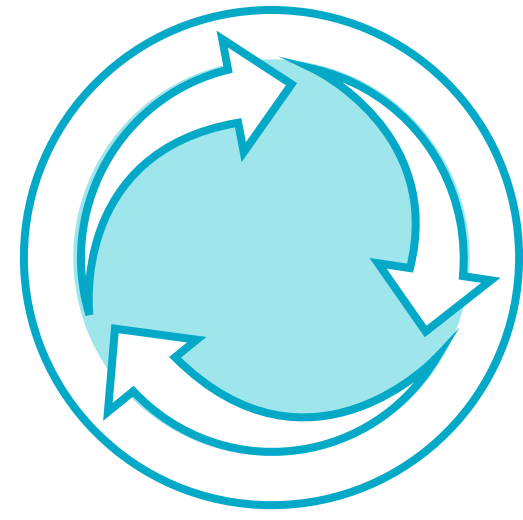
Amount of spent fuel in the OL1 and OL2 storage polls and interim storage, cumulative	2020	2019	2018	2017	2016
Number of assemblies (pcs)	9,524	9,328	9,122	8,922	8,720
Assemblies (t)	1,597.47	1,564.9	1,531.2	1,498.5	1,465.2

Protective gear used in operating and maintaining the power plant, components removed from the process, and insulating materials are low-level waste. Such waste is tightly packaged and placed in the repository for operational waste (VLJ repository) located at an approximate depth of 100 meters in the plant area.

The ion exchange resins used for the treatment of the process water at the power plant are classified as intermediate level waste which is incorporated in bitumen and embedded in the

operating waste repository. In 2020, intermediate level waste amounting to 18 m³ and low level waste amounting to 92 m³ was placed in the VLJ repository. In spring 2020, TVO initiated an environmental impact assessment for building a near-surface final disposal facility for very low-level nuclear waste in Olkiluoto.

The total amount of high-level radioactive waste (spent fuel) generated during the year under review was 32.97 t. It is kept in an interim storage in Olkiluoto until it can be embedded in the bedrock



91%

Share of waste recycled as material or energy of the total waste volume.

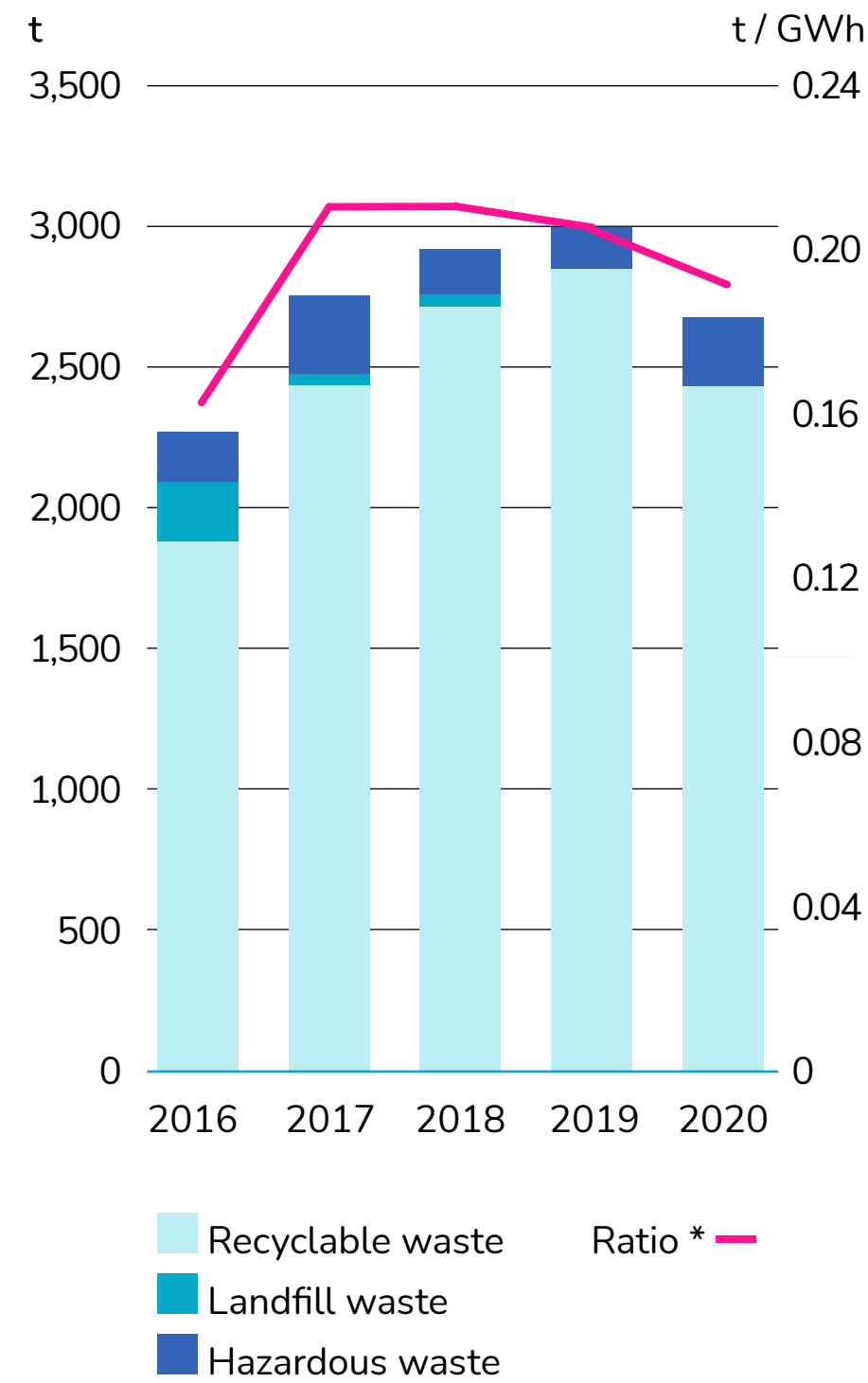
Decommissioning waste is waste produced in connection with the demolition of the power plants at the end of the operating life. The final disposal of decommissioning waste will also take place in Olkiluoto.

Municipal waste

THE OPERATION of the power plant also generates municipal waste. The TVO Group is committed to the reduction of the amount of waste and to the improvement of the reuse of waste. This is a requirement for everybody working at Olkiluoto. All waste generated at Olkiluoto is sorted and processed. The sorted waste is recycled as materials whenever possible, or reused as energy. Only waste that cannot be reused in any manner is taken to the landfill. In 2020, there was no such waste. All hazardous waste is collected in the hazardous waste storage to be sent to an appropriate waste treatment plant.

In 2020, the total amount of waste was 2,683 metric tons. Waste suitable for

Waste Municipal waste



* The ratio is given per GWh of electricity produced.

recycling or reuse as energy amounted to 91 percent of the total amount of waste and the shares of hazardous waste was 9 percent. Most of the hazardous waste was batteries and WEEE (waste electrical and electronic equipment) waste.

Municipal and hazardous waste OL1 and OL2 (metric tons)	2020	2019	2018	2017	2016
Mixed waste to energy ¹⁾	120	64	59	65	103
Landfill waste to TVO's landfill	0	0	44	41	45
Paper and cardboard	95	48	49	50	74
Energywaste	112	113	102	132	114
Biowaste	48	35	57	50	64
Wood	115	111	108	99	67
Metal	86	201	208	107	77
Glass	5	4	5	5	5
Plastic	4	2	-	-	-
Cable refuse	16	8	23	8	7
Crushed brick and concrete	8	5	3	0	0
Screening	38	25	36	79	61
Hazardous waste	103	104	53	62	64
Sludge ²⁾	1,425	990	1,038	933	807

¹⁾ Since 2017, mixed waste has been taken to a waste-to-energy plant where it is used to produce district heating and electricity. ²⁾ Sludge from the wastewater treatment plant, sand water & shellfish water mixture (solid matter 8-10%).

Municipal and hazardous waste OL3 (metric tons)	2020	2019	2018	2017	2016
Mixed waste to energy ¹⁾	56	62	173	168	118
Landfill waste to TVO's landfill	0	0	0	0	44
Paper and cardboard	16	21	26	31	43
Energywaste	93	81	128	140	138
Biowaste	38	31	43	53	35
Wood	106	296	168	214	188
Metal	33	754	43	275	138
Cable refuse	4	3	22	32	65
Crushed brick and concrete	0	0	436	0	20
Cable reels	0	6	0	5	2
Hazardous waste	133	47	112	221	114

¹⁾ Since 2017, mixed waste has been taken to a waste-to-energy plant where it is used to produce district heating and electricity.

Environmental research and biodiversity

Environmental research has been conducted on the Olkiluoto island since the 1970s, years before electricity production was launched. The early baseline studies created a basis for the environmental monitoring programs aimed at facilitating environmental radiation monitoring and determination of the impact on waters.

ENVIRONMENTAL safety at the Olkiluoto nuclear power plant is continuously monitored with many different methods and through the cooperation of several parties. Around 300 samples are taken from the environment of Olkiluoto each year to be analyzed in compliance with an environmental radiation monitoring program approved by the Radiation and Nuclear Safety Authority (STUK). There are also several radioactivity monitors in the immediate vicinity of the plant. They continuously measure radiation and are connected to STUK's automatic network for monitoring external radiation.

Over 100 water samples are taken from the sea surrounding Olkiluoto each year. These samples are subjected to about 1,500 different water quality analyses.

Furthermore, the condition of fish stocks is monitored by, for instance, fishing for record-keeping purposes and surveys among professional and recreational fishermen. Test fishing takes place every four years in the areas surrounding Olkiluoto in accordance with the environmental monitoring plan. The state of aquatic plants is monitored by means of transect line diving every six years.

All the Olkiluoto power plant projects have undergone extensive environmental impact assessments. The final disposal of spent nuclear fuel has been studied since the 1980s, and it has also been evaluated through environmental impact assessments.

Centralized production protects biodiversity

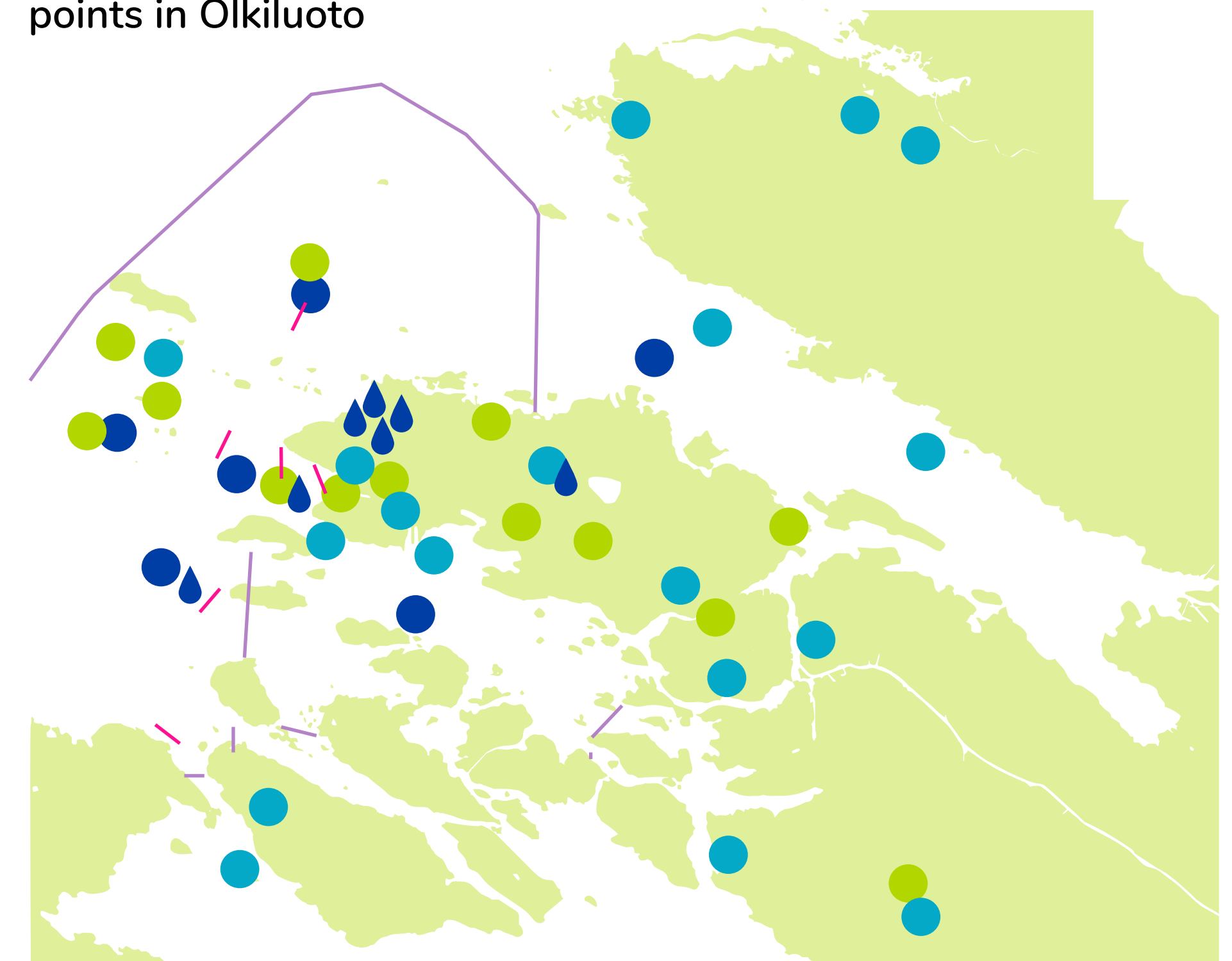
SURROUNDED by four nature conservation areas, the small island of Olkiluoto produces around one-sixth of all the electricity used in Finland. After the commissioning of OL3, the production volume will increase to around one-third. The concentration of energy production in a small geographic area minimizes the environmental impact and allows

the preservation of other areas in their natural state. Climate change also has a major impact on biodiversity. By producing clean and climate-friendly nuclear power-generated electricity, the TVO Group makes a significant contribution to the mitigation of climate change and promotion of sustainable development. The island of Olkiluoto is one of the most researched areas in Finland, and its diverse nature is charted in detail.

The total surface area of the Olkiluoto island is 900 hectares, of which areas constructed for nuclear power and final disposal amount to approximately 170 hectares. The total volume of non-water-permeable areas is 42 hectares. TVO does not own any nature-oriented areas.

TVO and Posiva strive to improve biodiversity in relation to their operations, and cooperate on different schemes with stakeholders. For example, a webinar on migratory fish was supported in 2020, which was organised by the local association for water conservation. The impact of the power plant's cooling water is compensated with an EUR 11,000 annual fishing industry payment.

Environmental measuring points in Olkiluoto



- Radiation, water
- Radiation, air
- Radiation, plants, vegetation, organisms and soil
- Water quality
- Water plants
- Exploratory fishing

Cooperation with authorities

The operation of a nuclear power plant is subject to a license and permits, and it is governed by the authorities. The Radiation and Nuclear Safety Authority (STUK) supervises nuclear and radiation safety in Finland.

THE COMPETENT environmental permit authority is the Southern Finland Regional State Administrative Agency, and the supervising authority is the Southwest Finland Centre for Economic Development, Transport and the Environment. Other authorities involved in the management of environmental issues include the environmental department of the municipality of Eurajoki and the Ministry of Economic Affairs and Employment, which acts as TVO's liaison authority in EIA procedures.

Radiation monitoring samples taken from the Olkiluoto environment are submitted to STUK for analysis. TVO annually prepares a report on the waste and emissions caused by its operations and submits the report to several regional and national authorities. TVO

annually reports its environmental investments and environmental protection activity expenses to Statistics Finland.

After verification, the annual carbon dioxide emissions of the emergency diesel generators and reserve boilers are reported to the Energy Authority. Energy savings are reported to Motiva. The Finnish Safety and Chemicals Agency (Tukes) acts as the supervising authority for the industrial processing and storage of hazardous chemicals.

Ten special events in 2020

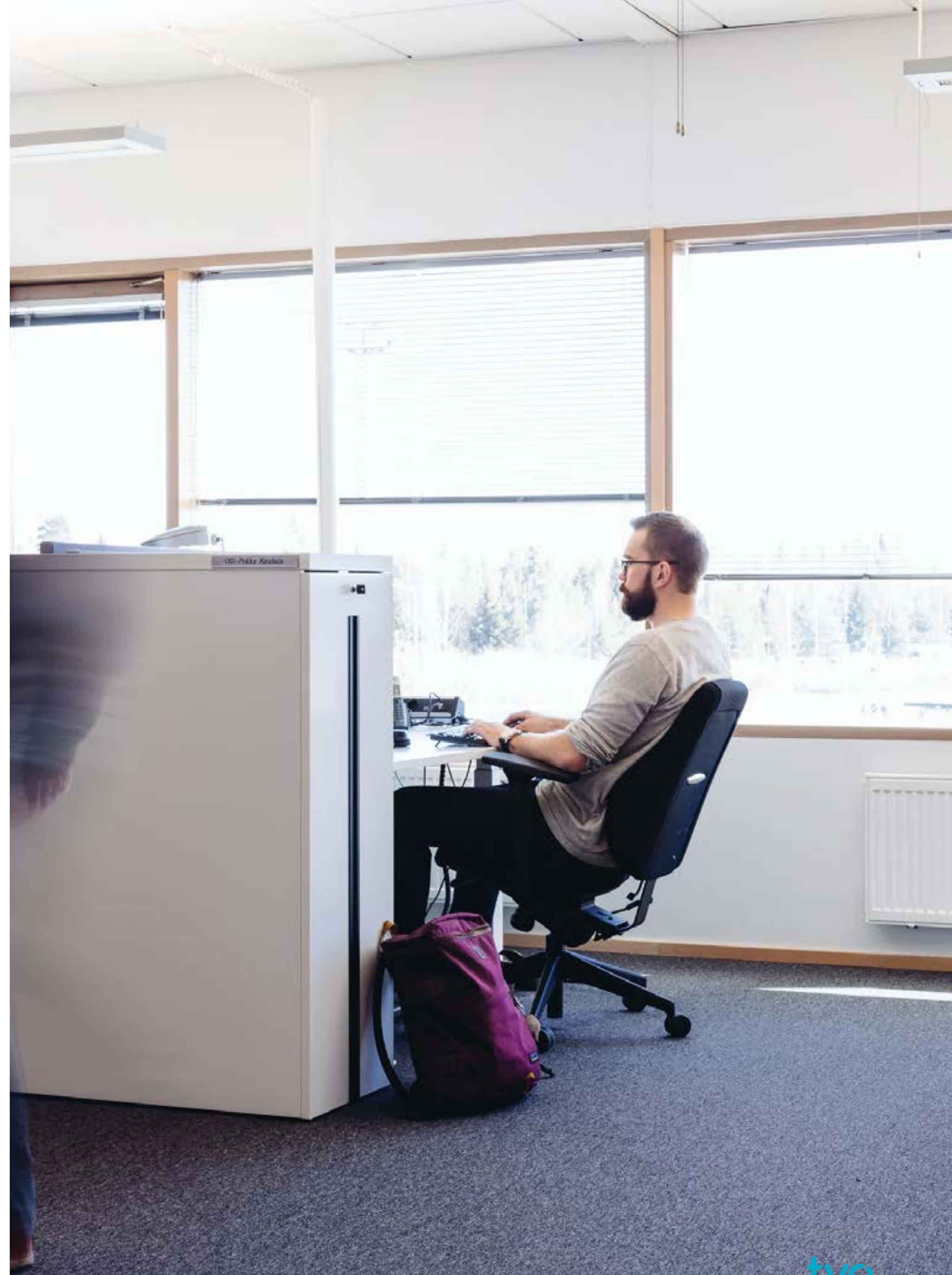
THE OLKILUOTO nuclear power plant units, OL1 and OL2, operated safely throughout the year. TVO classifies events affecting nuclear safety in accordance with the international INES scale (0–7). In 2020, nine events rated as INES category 0 events (no nuclear or radiation safety significance) and one event rated as INES category 1 (anomaly, exceptional incident with safety effects) took place at the Olkiluoto plant. TVO

investigates all events that could have an impact on nuclear safety and determines corrective actions. TVO publishes information on every event with public interest in the News section of its website.

There was a disturbance at OL2 in December, when the plant unit was suddenly disconnected from the grid, and a site area emergency was declared at the plant unit. The disturbance quickly proved to be less serious than a site area emergency, and the plant unit was driven down into a cold shutdown state.

The situation was caused due to hot water moving into the filters of the reactor water clean-up system, which is when the activity levels (radiation levels) of the steam moving through the main steam lines momentarily rose to about 3 to 4 times higher compared with the normal activity level.

Immediate actions to prevent similar occurrences have been completed, and the disturbance caused an interruption of nine days in OL2's electricity production.



The disturbance did not cause harm to people or the environment. STUK rated the event in the INES category 0, which means it did not have nuclear or radiation safety significance.

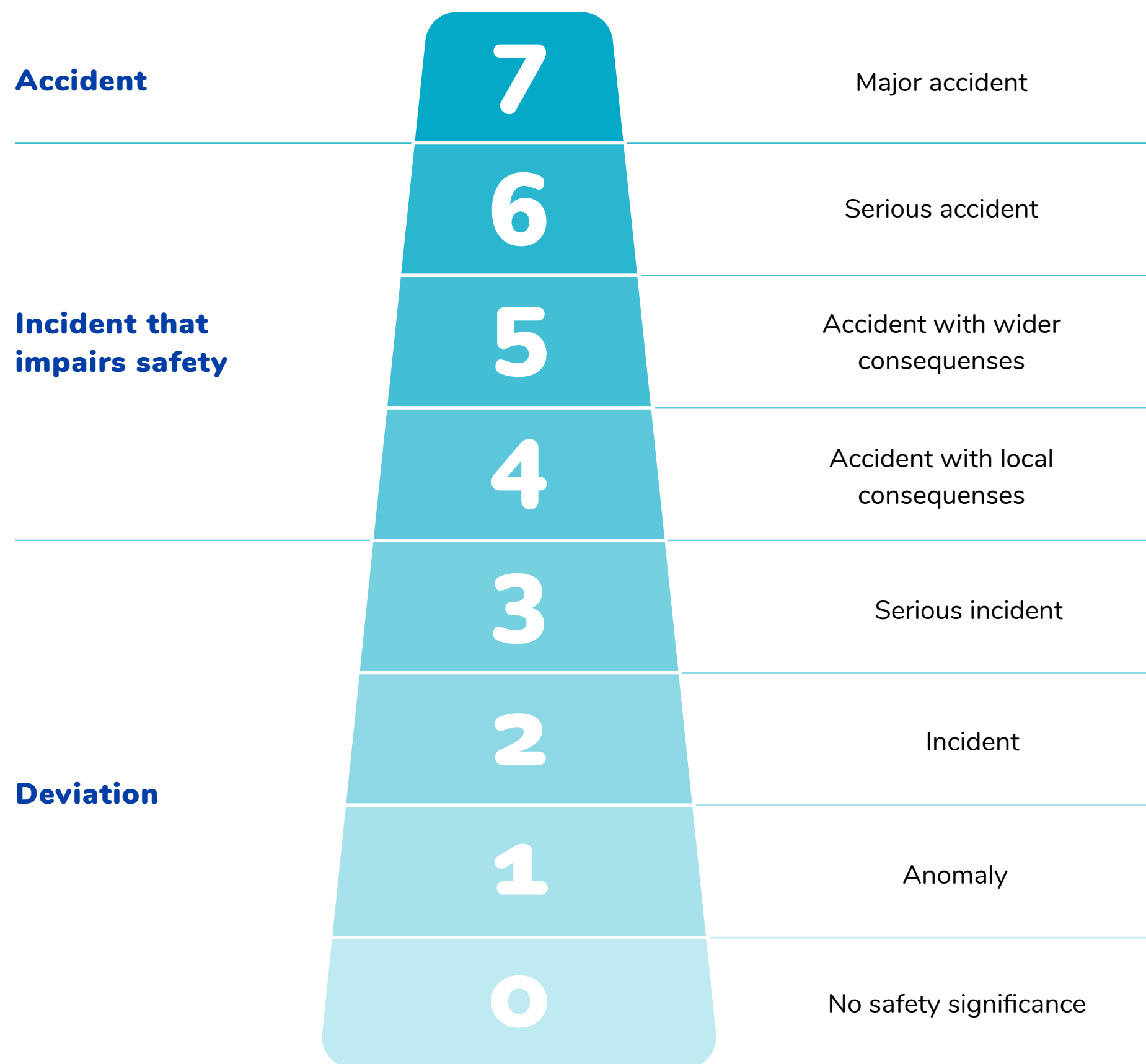
TVO also follows events at other nuclear power plants around the world. Operations are continuously developed based on the observations made.

Permits govern the activities

IN ADDITION to legislation pertaining to nuclear energy and radiation safety, the operation is also regulated by requirements laid down in environmental laws. Operating the Olkiluoto power plant is subject to a permit according to the Environmental Protection Act, and cooling water intake is subject to a permit according to the Water Act. The permits decisions are valid until further notice.

Environmental and water permit decisions cover power plant operations and its emergency power generation systems. The permit conditions control the nuclear power plant's cooling

INES-scale



water volume and the amount of heat contained in it, wastewater treatment efficiency, the processing of waste, operations in transient and abnormal conditions, as well as monitoring and reporting. In addition, there are separate environmental permits for supporting operations of the Olkiluoto nuclear power plant, such as the landfill and the crushed stone storage area.

Licenses according to the Chemicals Act have been granted for the handling and storage of hazardous chemicals. The reserve boilers of the Olkiluoto nuclear power plant, as well as the emergency diesel generators of OL1, OL2, and OL3 (a total of 16 generators), are included within the scope of the emissions trading system. In compliance with the Finnish Emissions Trading Act, TVO submits an annual verified emissions report and a verifier's statement to the emissions trading authority.

During the year under review, TVO initiated an environmental impact assessment for building a near-surface final disposal facility for very low-level

nuclear waste in Olkiluoto. In addition, the Olkiluoto water management security project for securing the supply of raw water and building a transfer sewer for wastewater progressed to the construction engineering stage in autumn 2020.

Compliance with environmental legislation

THE TVO Group continuously monitors statutory regulations and other requirements pertaining to its operations. People in charge of different parts of the operations are in charge of ensuring that the organizations receive sufficient up-to-date information about statutory regulations and their impact on the TVO Group's operations. Compliance with the regulations and requirements is regularly assessed in internal and external audits as well as management reviews. In 2020, the operations complied with environmental legislation, licenses, and permits.

Nuclear waste management

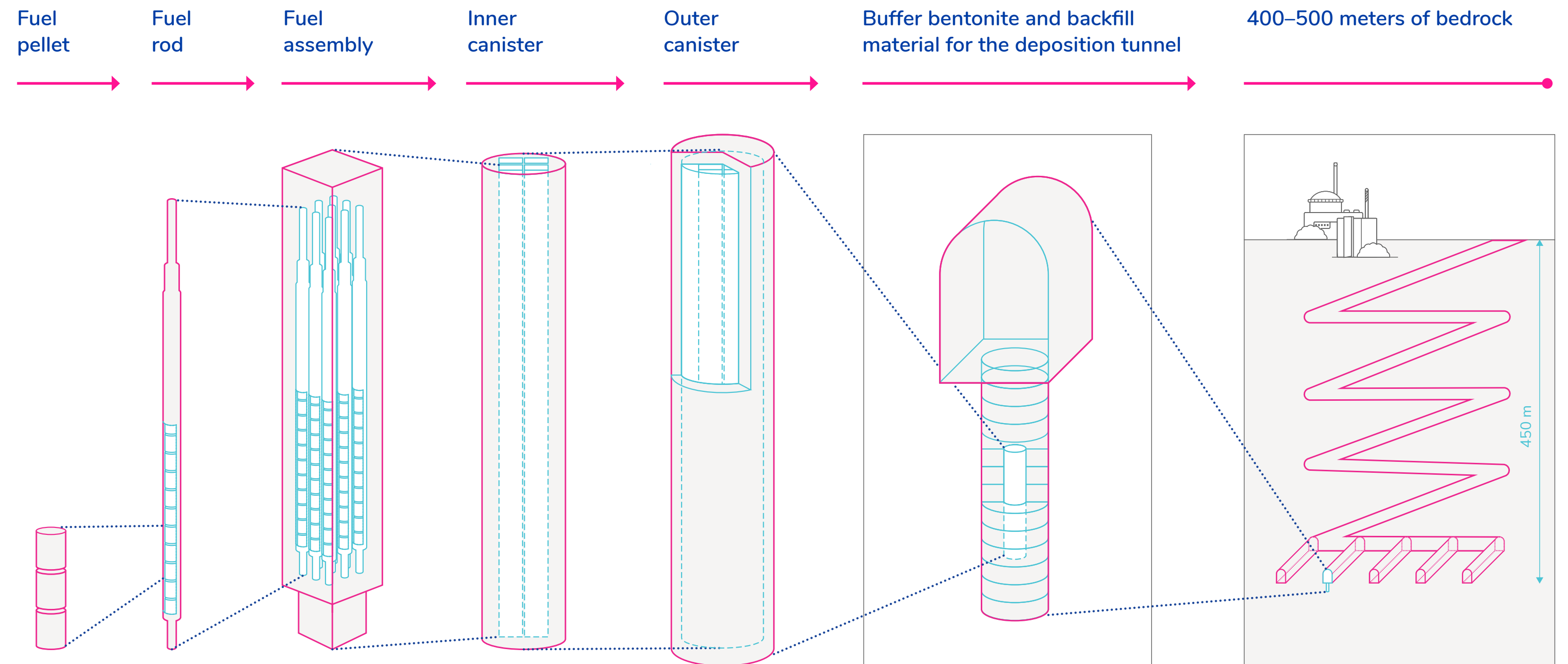
The types of nuclear waste generated at a nuclear power plant include waste exempt from control, low and intermediate level operating waste, and high-level spent fuel. Posiva Oy is responsible for the final disposal of spent nuclear fuel generated at the power plants of its owners, TVO (Olkiluoto NPP) and Fortum (Loviisa NPP).

COMPARED to the volume of produced energy, however, the amount of waste and its space requirements are low. The principle of nuclear waste management is to isolate the waste from organic nature until the radioactivity of the waste has decreased to an insignificant level.

The responsibility for nuclear waste management lies with the nuclear power companies. They must carry out the necessary nuclear waste management measures for their own waste at their own cost. According to the Finnish Nuclear Energy Act, nuclear waste generated in Finland must be treated, stored, and finally disposed of in Finland and the import of nuclear waste into Finland is prohibited.

Only safe final disposal is possible

Multi-barrier principle of final disposal:
Several release barriers backing up each other ensure long-term safety.



Spent nuclear fuel from the nuclear power plants of Teollisuuden Voima and Fortum will be packed in copper canisters and embedded in Olkiluoto bedrock at a depth of approximately 430 meters.

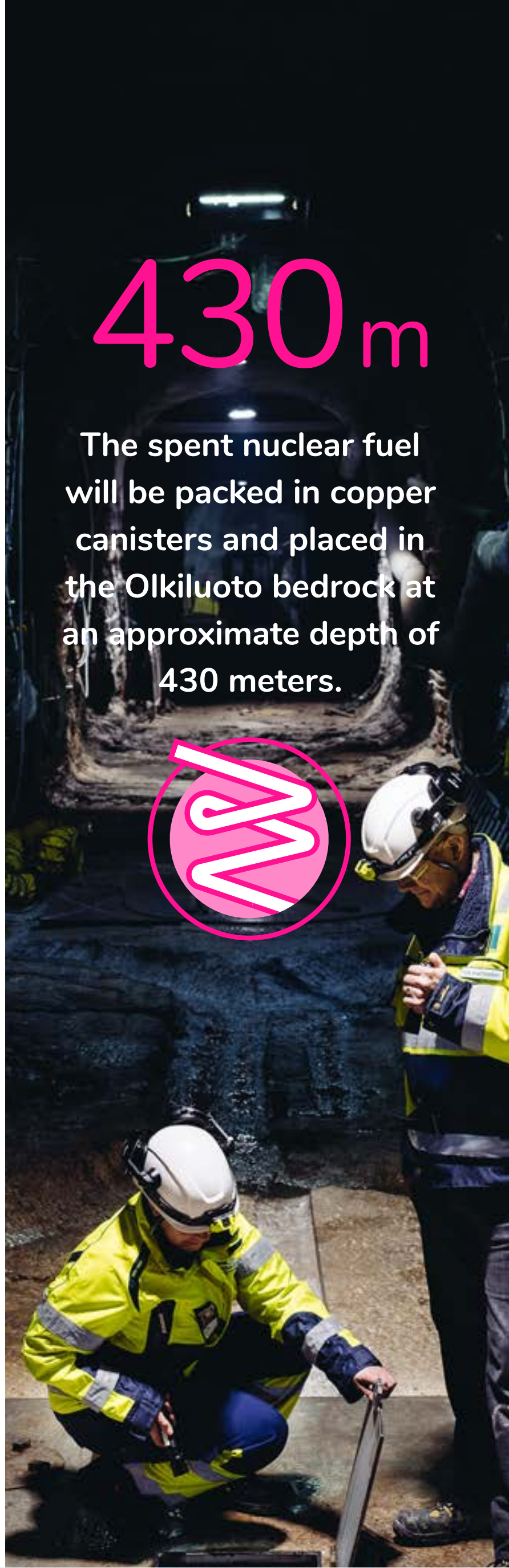
Posiva manages the research into the final disposal of spent nuclear fuel, construction and operation of final disposal facilities, and eventual closing up of the facilities on behalf of its owner companies.

Posiva and its final disposal solution, ONKALO, are internationally renowned in the nuclear industry. Posiva's subsidiary Posiva Solutions Oy sells this expertise which has been generated through

40 years of multidisciplinary research. Posiva Solutions provides tailored expert services for final disposal and ready-made solution and service models for nuclear waste management companies together with a broad network.

The final disposal of spent nuclear fuel is based on the use of multiple release barriers, which ensure that the nuclear waste cannot be released into organic nature or become accessible to humans. A deficiency of a single barrier or a predictable geological or other change will not endanger the performance of the insulation. The release barriers include the physical state of the fuel, the disposal canister, the bentonite buffer, the backfilling of the tunnels and the surrounding rock.

The key to the final disposal of spent fuel is the long-term safety of the solution, which is assessed and demonstrated with a safety case. According to the international definition, a safety case refers to all technological and scientific materials, analyses, observations, trials, tests and other proof used to justify the reliability of the assessments made of the long-term safety of final disposal. Plenty of time has been reserved for the preparation and practical execution of final disposal, and safety is evaluated at many stages. The disposal of spent fuel is scheduled to begin in the 2020s, and it will continue for approximately a hundred years.



430m
The spent nuclear fuel will be packed in copper canisters and placed in the Olkiluoto bedrock at an approximate depth of 430 meters.

In 2019, Posiva started the EKA project, which aims at initiating final disposal operations in the 2020s. The project involves constructing an above-ground encapsulation plant and installing the systems for final disposal in the underground ONKALO facility, obtaining the requisite licenses for the final disposal concept, the facility and its systems, and preparing the supply chains needed for production, before starting the actual final disposal of spent nuclear fuel. The EKA project has a strong impact on vitality - the cost estimate of the large-scale construction project is approximately EUR 500 million, and its employment impact is approximately 2,500 person years. The project will employ a maximum of some 500 people.

Finland is the only country so far to progress to the implementation phase of final disposal, which makes the EKA project internationally significant. Posiva plays an important role in the mitigation of climate change as part of the lifecycle of nuclear power. Many countries using nuclear power have final disposal repositories for low- and intermediate-level waste, but the final disposal of high-level spent fuel has not yet been started anywhere.

Read more about Posiva:
<https://www.posiva.fi/index.html>

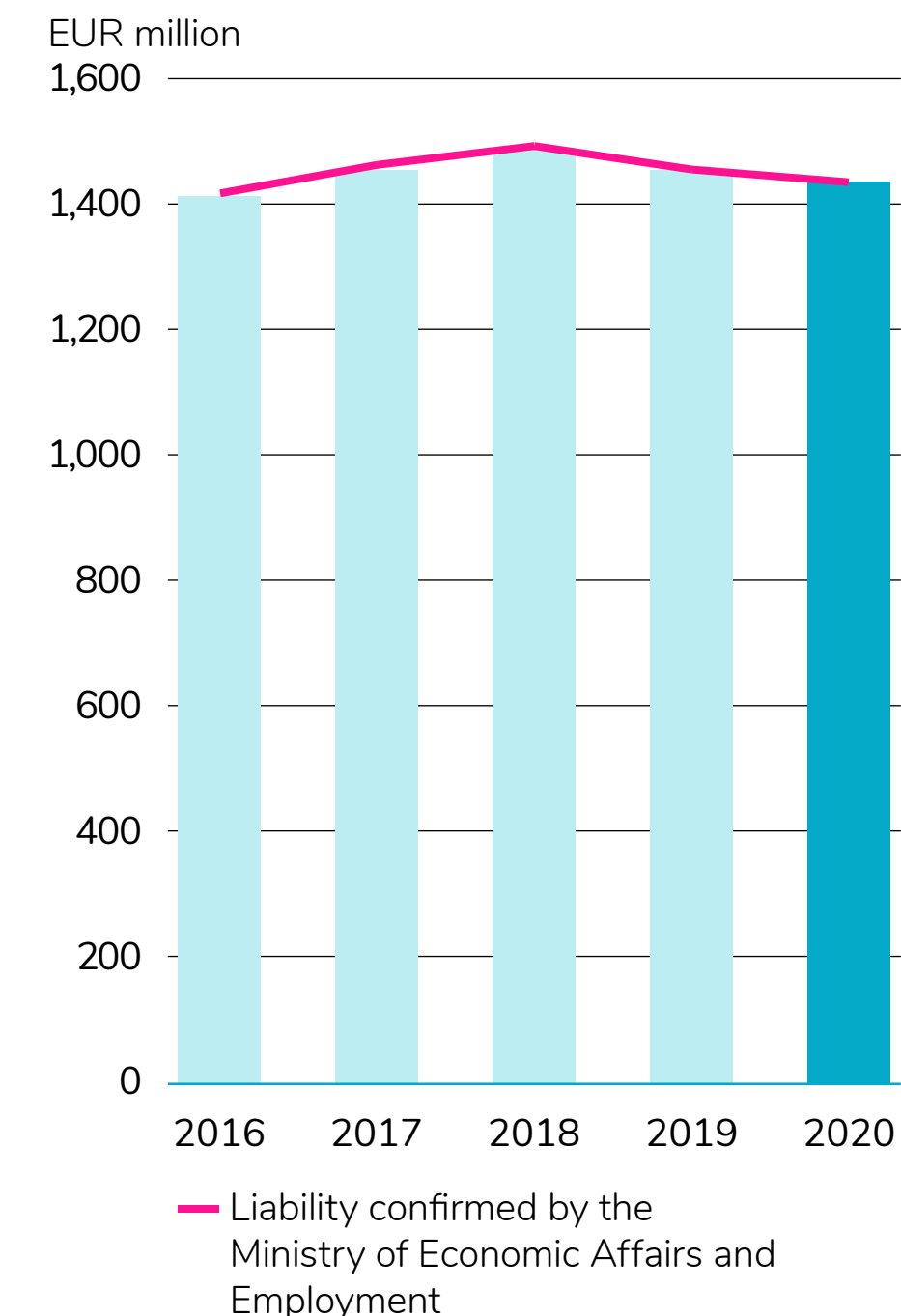
Advance collection of waste management funds

THE COSTS of nuclear waste management and final disposal of spent fuel are collected in the price of nuclear electricity from shareholders into a fund for future use.

In Finland, nuclear power companies bear the costs of nuclear waste management, and the funds for that purpose are collected into the Finnish State Nuclear Waste Management Fund. Each year, the Ministry of Economic Affairs and Employment determines the share of each nuclear power company in the Fund as well as the waste management fee to be paid to the Fund. The liability share of the nuclear power companies in the Fund is decreased by the investments they make in final disposal.

The annual fee payable to the Fund is determined on the basis of the difference between the amount of accumulated nuclear waste for final disposal and the measures implemented for nuclear waste management. The fee is also increased or decreased on the basis of how well the Fund succeeds in its investments: if the interest income is higher than expected, the liability share

TVO's fund target share in the Finnish state nuclear waste management



in the Fund is correspondingly reduced. The objective is to accumulate enough assets in the Fund for the final disposal of accumulated nuclear waste.

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EMAS statement

TVO's environmental report is based on the requirements laid down in the EMAS Regulation and serves as a verified environmental statement of the operation of the Company.

THE ENVIRONMENTAL REPORT for 2020 provides a comprehensive presentation of the environmental impact of TVO's operation, the Company's objectives with respect to environmental protection, and their achievement, as well as the key environmental indicators.

DNV GL Business Assurance Finland Oy Ab has in the capacity of an accredited, independent and objective party verified the information presented in the environmental report on the 12th of February 2021.

TVO publishes the environmental report in Finnish and English.

The information to be reported for 2021 will be published in the spring of 2022.



The Olkiluoto power plant has been EMAS (Eco-Management and Audit Scheme) registered with the code FI-000039 (NACE code 35)

REQUIREMENT	REPORT PAGE
A clear and unambiguous description of the organization registering under EMAS and a summary of its activities, products, and services, and its relationship to any parent organizations as appropriate.	TVO as a company
The environmental policy and a brief description of the environmental management system of the organization.	Group-level policies Environmental management
A description of all the significant direct and indirect environmental aspects which result in significant environmental impacts of the organization and an explanation of the nature of the impacts as related to these aspects.	Environment and climate Environmental impacts – low-emission electricity production Environmental balance sheet Environmental management
A description of the environmental objectives and targets in relation to the significant environmental aspects and impacts.	Environmental management Environmental program 2019-2021
A summary of the data available on the performance of the organization against its environmental objectives and targets with respect to its significant environmental impacts. Reporting shall be on the core indicators and on other relevant existing environmental performance indicators.	Environmental management Environmental program 2019-2021 Climate friendly electricity Environmental impacts – low-emission electricity production Cooling water Raw materials and material efficiency Production and energy efficiency Emissions to air Emissions to water and soil Waste Environmental research and biodiversity Nuclear waste management
Other factors regarding environmental performance including performance against legal provisions with respect to their significant environmental impacts.	Environmental management Cooperation with authorities Cooling water Emissions to air Emissions to water and soil Waste Environmental research and biodiversity Nuclear waste management
A reference to the applicable legal requirements related to the environment.	Cooperation with authorities
The name and accreditation number of the environmental verifier and the date of validation.	Verification report of the environmental report

Verification report of the environmental report

Confirmation Of Compliance

DNV GL Business Assurance Finland Oy Ab has, as an accredited certifier (FI-V-0002), reviewed the environmental management system at Teollisuuden Voima Oyj's Olkiluoto power plant.

Based on this review, DNV GL Business Assurance Finland Oy Ab states that the environmental system with the programs and audit procedures as well the updated environmental statement including the indicators fulfill the requirements of Regulation (EC) No. 1221/2009 as well as Commission regulation (EC) 2017/1505.

Scope and methodology of verification

The Environmental Statement 2020 (called Environmental Report 2020) was verified at the Olkiluoto location of Teollisuuden Voima Oyj at the 8th of February 2021. The verification was performed with the ISO 14001:2015 periodical audit by processing the

requirements for both systems, and compliance with them.

The scope of the report and the accuracy of the information contained therein were verified by means of a written report and practical inspections. Key personnel at the plant were interviewed, and the information contained in the report was compared with information found in reviewed source material.

The Environmental Statement 2020 has the same structure as the Environmental Report 2019. The content and environmental indicators can easily be compared year by year. The statement provides a clear and accurate image of Teollisuuden Voima Oyj's operations and their impact on the environment. The environmental system is implemented by setting goals. The implementation and effectiveness of the system is monitored by the environment team and management reviews. The Environmental Report 2020 with environmental indicators, which describe the impact of the system, meet the EMAS 1221/2009

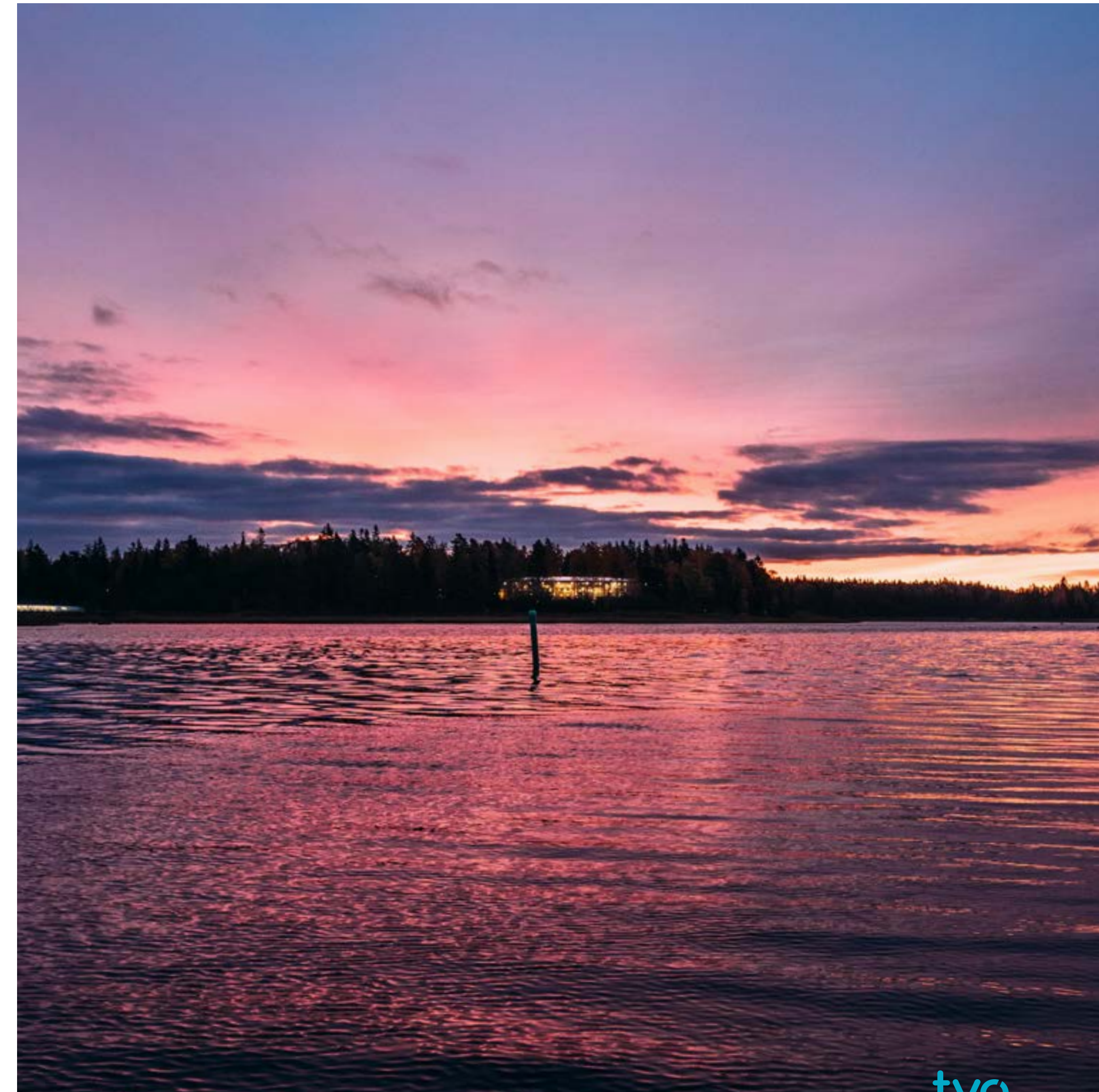
requirements for updated environmental statement as well as the requirements of EU 2017/1505 for annexes I-III and requirements of EU 2018/2026 for the annex IV.

The dedicated level of Teollisuuden Voima Oyj's commitment to a high standard of safety, quality and environmental protection, and continuous improvement is shown in the Environmental Report 2020.

Espoo, the 12th of February 2021

DNV GL Business Assurance Finland Oy Ab
EMAS-accredited verifier
FI-V-0002

Esa Notkonen
Lead Auditor, Verifier



Group-level policies

THE GROUP-LEVEL policies have been approved in the meeting of TVO Group's Management Board on October 14th 2019.

Safety culture

TVO GROUP and its entire personnel are committed to a high standard of safety culture.

Safety culture is comprised of organisational practices and individuals' attitudes. Thanks to the safety culture, all factors that affect the nuclear power plant's safety will receive attention in proportion with their significance and are given priority in decision making.

Group-level policies

TVO GROUP and its personnel comply in their actions with the policies defined by the Group.

Applicable laws, decrees, and official regulations as well as international agreements are strictly followed. TVO Group sets objectives for its operations,

which are stricter than those set out in the applicable laws.

Issues are dealt with transparently within the Group. Reporting of development needs, detected shortcomings, nonconformances and errors is encouraged.

TVO Group requires its partners and their personnel working at Olkiluoto to be committed to the high safety culture and high-quality operating methods. This means that the companies and personnel in a direct or indirect contractual relationship engage in responsible operations according to TVO Group environmental, nuclear safety and quality policy, and information security principles.

Policy on nuclear safety and quality

The nuclear safety and quality policy includes nuclear safety, radiation protection, nuclear material supervision and quality.

Nuclear safety

TVO Group is committed to maintaining operating conditions where efficient procedures can be implemented by taking safety, quality, and costs into account. This ensures the capacity to also produce competitive electricity in a safe and reliable manner over the long term.

TVO Group's operations shall not cause any damage to people, the environment or property.

Radiation protection

In all their radiation protection activities, TVO Group and its personnel are committed to following the ALARA (As Low As Reasonably Achievable) principle. According to the principle, individual and collective radiation doses are kept as low as possible by practical measures.

Restricting the amount of doses and keeping the amount of radioactive emissions as low as possible are already accounted for when designing the structures and functions. All employees

shall observe matters affecting radiation protection in their work.

In addition to authority guidelines, the development of radiation protection operations also takes international recommendations into account.

Nuclear safeguards

TVO Group takes good care of nuclear material and ensures that it does not get into the hands of unauthorized persons.

Quality

Work practices of a high standard are followed within TVO Group, which creates a basis for safe and economically efficient operation.

The professionals in nuclear industry who work at TVO Group are expected to show unfaltering compliance with procedures and verified execution of their own work. On the level of individual employees, this refers to a prudent approach to work, i.e., compliance with the STAR principle (Stop, Think, Act, Review) The personnel shall be aware of the safety significance of their work

and utilise methods developed for the management of human errors which are employed in the Group.

Risk management is implemented on a regular and consistent manner. Any risks affecting operation, and in particular safety, are identified already at the operational planning phase.

We consider our internal and external customers equally important. We perform all work tasks appropriately, according to schedule, and with high quality.

TVO Group develops co-operation with its suppliers so that the safety, availability, and environmental friendliness of the plant units remain at a high international level.

Corporate social responsibility policy

The corporate social responsibility policy covers the environment, energy efficiency, procurement, personnel, occupational health and safety, and communication.

Environment and energy efficiency

TVO Group operates in accordance with the principle of sustainable development and produces environmentally friendly nuclear electricity. The Group recognises the environmental and energy aspects of its operation and minimises the related adverse impacts at all phases of electricity production. Operational objectives are specified in compliance with the principle of continual improvement. TVO Group monitors the impact that its operations have on the state of the environment, and when necessary, launches immediate corrective actions. TVO Group ensures that the personnel and other persons working at the Olkiluoto nuclear facilities have competence and expertise in matters related to the environment and energy efficiency.

The objective of TVO Group is to prevent and further reduce the already low emissions of radioactive substances. Abnormal events in the plant process are anticipated and preparedness for the prevention of environmental damage caused by them has been established.

TVO Group acknowledges the importance of its overall responsibility for all the phases of the fuel cycle. The Group monitors and supervises the manage-

ment of environmental issues implemented by the fuel suppliers. TVO Group requires the suppliers to assume responsibility for the securing and development of living conditions in the surroundings of uranium production and processing plants, taking indigenous peoples into consideration. Fuel management extends from the uranium mines all the way to final disposal according to the “from bedrock to bedrock” principle.

TVO Group is committed to improving the efficiency of energy production. The Group monitors its own energy consumption and improves its efficiency by taking energy aspects into account in the operations. Plant unit modernisation projects are implemented to improve the energy efficiency of the power plant process. Opportunities for improvement of energy efficiency are considered in investments, modifications and procurement. The level and performance of energy efficiency are also reported on in the annual environmental report. TVO Group minimises the amount of waste through the improvement of the use of raw materials and the reuse of waste. The goal is to increase the relative share of waste delivered for reuse and to decrease the amount of radioactive waste. TVO Group also takes efforts to reduce the amount of spent fuel through optimisation of the use and properties of fuel.

Sustainable utilisation of the environment is taken into account in the development of the Olkiluoto area and expansion of operations. The design and construction of any new nuclear power plant units aims to minimise harm and disruption to the environment.

Procurement

TVO Group employs procurement activities of a high standard to ensure safe, competitive and reliable production as well as the long service life of the plant units.

The products and services purchased by the Group are required to meet the requirements for safety, quality and the environment which the Group has specified. The availability of requisite products and services is ensured by means of long-term agreements based on mutual trust and partnership.

Factors particularly emphasised by TVO Group in the selection of suppliers include the continuity of the supplier’s operation, security of supply, management of quality and environmental aspects, as well as competitiveness, with domestic and local suppliers given priority. Supplier assessments are based on the safety significance of the products

and services to be ordered. The quality of deliveries is monitored and when necessary, corrective actions are taken without delay.

TVO Group conducts its relations with the supplier chain and business partners in a responsible and ethical manner. TVO Group expects its partners to uphold a high level of safety culture and responsible practices in their own operations.

Personnel

The objective of TVO Group is to ensure that the whole personnel is motivated, carry out their tasks in a responsible manner and commit to observing the agreed practices and procedures.

TVO Group makes sure that the human resources of the Group are competent and adequate to guarantee the achievement of the objectives specified for the Group.

TVO Group offers the employees opportunities for self-development in their work and profession and for the improvement of their competence by taking advantage, according to their own individual needs, of the training programmes provided by the Group. TVO Group offers competitive rewards

and encourages employees to work profitably, to meet their goals, and to work to a high standard every day. TVO Group provides its personnel with opportunities for the maintenance of their work ability. The principles of the HR policy are implemented through good cooperation with the personnel. The objective of TVO Group is to ensure the equality and well-being of the work community where no discrimination is approved and which promotes the implementation of equality.

Health and safety

The goal of health and safety activities in TVO Group is to promote health and occupational safety by a proactive approach.

A good atmosphere is maintained in the work community within the Group, ensuring good working conditions as well as equality of treatment. We do not approve of any form of harassment or bullying in the workplace.

The goal of every employee in terms of occupational safety is to look after the safety of oneself and others. When making decisions related to occupational safety, TVO Group is committed to consultation and participation of workers, and their possible representatives.

Communication

TVO Group increases mutual trust by supporting open and responsible interaction with all of its stakeholders in the local region, the Finnish society and the international cooperation network of the nuclear industry.

The Group promotes public knowledge about and acceptance of nuclear power by participating in social debate and communicating transparently about operations and events at the Olkiluoto nuclear facilities.

TVO Group uses internal communication to support an interactive work community culture and ensures that the personnel understand the goals and policies of the Group and are aware of the Group's financial and production situation. TVO Group's contact with stakeholders is based on high ethical principles and thus reinforces confidence in the operation of both the Group and the stakeholders, posing no threat to the reputation or objectivity of either.

Sponsorship of culture, sports, research and non-profit activities is part of the corporate social responsibility of TVO Group. Factors considered in the selection of cooperation partners and sponsorship

recipients include reputation, values and compatibility with the strategic objectives and principles of the Group. Finnish origin, a ground-breaking role, reliability, and interaction are some of the key selection criteria.

Production policy

The production policy covers the operation and maintenance of the plant, and the expansion of the production capacity.

Operation and maintenance

The objective of the operation and maintenance activities implemented by TVO Group is to ensure uninterrupted, predictable and competitive electricity production. Nuclear and operating safety are always given priority.

Plant safety and reliability are developed systematically. Modification and renovation projects are implemented at the plant in accordance with pre-approved plans to ensure an as long service life as possible for the plant.

Systematic test and inspection activities of an appropriate scope are carried out to verify the safe and reliable operation of the plant.

Plant maintenance operations are implemented in a well-planned manner,

predicting potential disruption situations, and preparing for the measures the situations require.

Expansion of production capacity

TVO Group follows development in nuclear power technology and participates in international cooperation both with power plant suppliers and with nuclear power companies.

The electrical output of the existing plant units in Olkiluoto will be increased where possible by taking advantage of the latest available technology.

The best economically feasible technology that minimises environmental impacts over the entire life cycle of the plant unit is applied in the design and implementation of Olkiluoto 3.

Corporate security policy

The corporate security policy covers the safety of production and operation, personnel safety and facility security, rescue and emergency preparedness, and information security.

Safety of production and operation, personnel safety, and facility security

Procedures related to safety and security are implemented in a systematic, proactive and comprehensive manner. The procedures are designed to guarantee the safe operation of the plant, as well as the physical integrity of the personnel and others working at the plant.

Rescue and emergency preparedness

TVO Group maintains and develops preparedness for special conditions. Exercises in rescue and emergency operations are arranged systematically and regularly.

TVO Group maintains at all times its awareness of risks related to the company, the personnel and the operating environment.

Information security

Information security procedures are in TVO Group designed according to the significance and risk of each function. The objective is to secure nuclear safety, financial interests and the privacy protection of the personnel, to verify the availability of correct and reliable information,

and to avoid any damage resulting from information processing.

TVO Group's information security procedures cover the availability, authenticity, and confidentiality of information, as well as procedures for the management of access rights.

Group employees are granted access rights to the Group's information and information systems as required for the performance of their work tasks. Disclosure of information to third parties is only allowed when this is in the interest of the Group. Information disclosed by other parties is in TVO Group processed using at least the information security procedures used or required by the disclosing party.