

CORPORATE SOCIAL  
RESPONSIBILITY REPORT

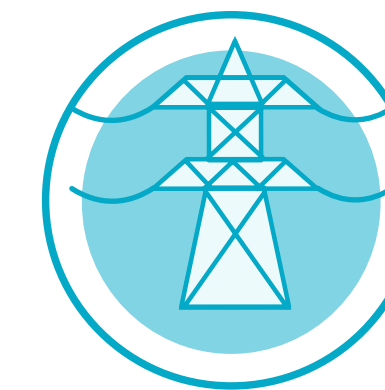
2021



tvo

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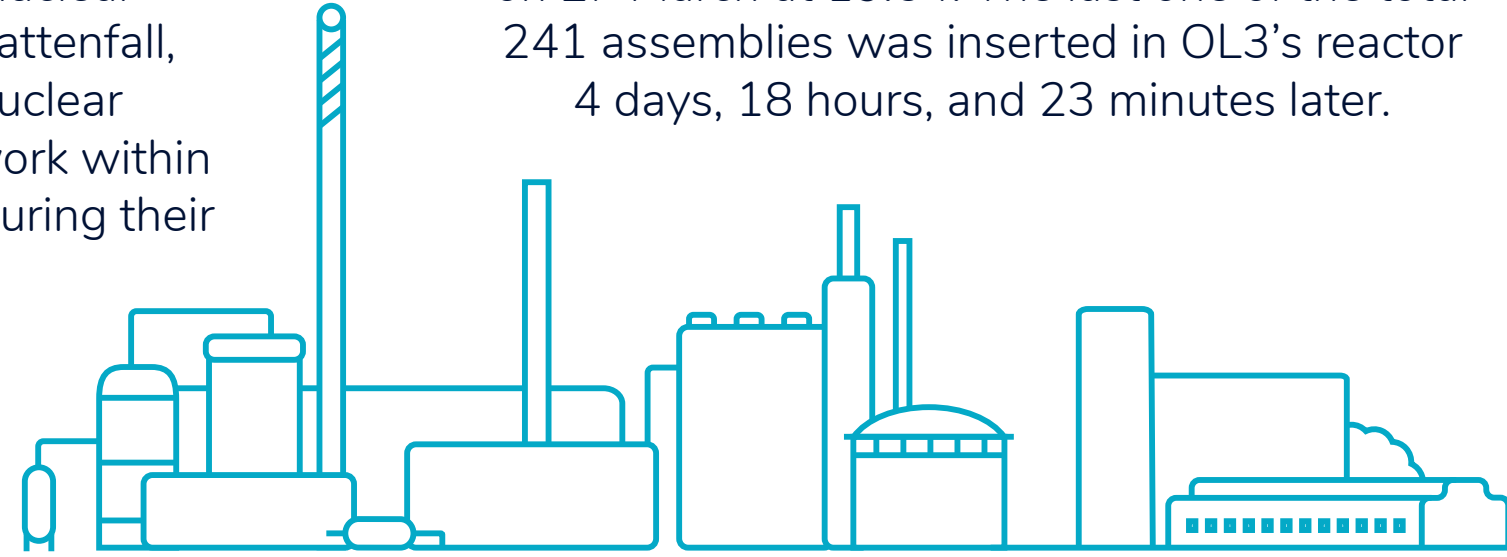


**PAGE 55:**  
A historic fuel loading  
for OL3

# TVO's year

26 February

The Nordic Nuclear Trainee Programme (NNTP) started. The goal of this programme, organised together with Nordic nuclear companies (TVO Group, Fortum, Vattenfall, and Uniper), is to provide new nuclear professionals with diverse skills to work within different roles in the nuclear sector during their careers.

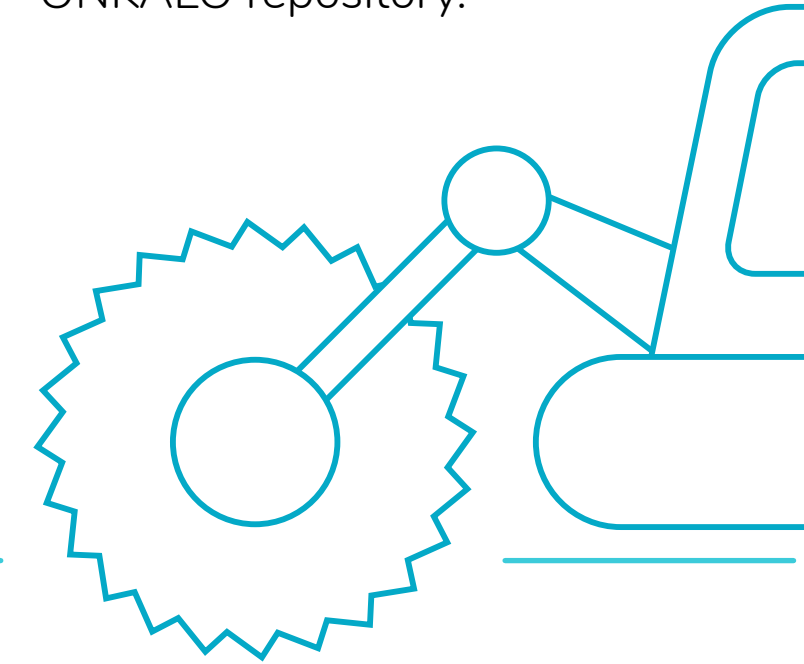


1 April

The fuel loading of the OL3 plant unit was completed. The first fuel assembly was loaded on 27 March at 19:54. The last one of the total 241 assemblies was inserted in OL3's reactor 4 days, 18 hours, and 23 minutes later.

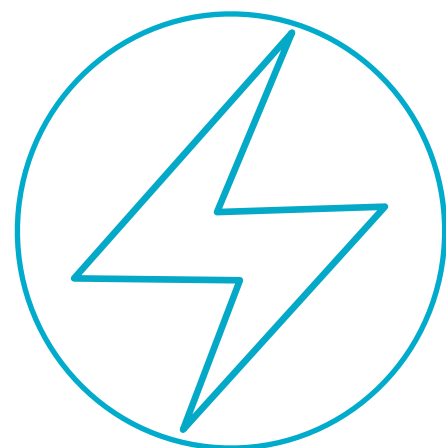
7 May

The excavation of the first deposition tunnels in the world started in Posiva's ONKALO repository.



16 June

TVO and Hitachi Energy signed a contract about delivering one of Europe's largest battery energy storage systems to Olkiluoto.



18 June

TVO's annual outages were completed. The outages lasted approximately eight weeks, and they proceeded well with all the necessary COVID-19 arrangements in place. A refuelling outage was carried out at OL1, and a maintenance outage took place at OL2.



30 December

Posiva submitted an operating licence application for the encapsulation and final disposal facility of spent nuclear fuel.



## HISTORICAL MILESTONES

were reached during 2021 in the commissioning of the Olkiluoto 3 (OL3) plant unit. After the fuel loading in April, maintenance and finalisation work as well as testing were continued. The Radiation and Nuclear Safety Authority in Finland (STUK) granted the OL3 plant unit the permission for startup on 12 December. The nuclear reaction was initiated in the plant unit's reactor for the first time on 21 December.

# 30%

of all electricity produced in Finland will soon come from the Olkiluoto island, once OL3 is in use.

# Review by the CEO 2021

**The transition in the operating environment of the energy industry continues to point strongly in a climate-friendly direction. The electricity price crisis has led to a lot of discussion, especially in the Nordic electricity market. On the EU level, the discussion has been lively around the Sustainable Finance Taxonomy. The role of nuclear power is highlighted in both the mitigation of climate change as well as stable and predictable base load power which stabilises price fluctuations on the electricity market.**

**IN 2021**, Finland's electricity consumption increased by six percent compared to the level before the COVID-19 pandemic. Concerns about climate change continue, and the Finnish Government's climate neutrality targets for 2035 ensure that there is a demand for CO<sub>2</sub>-free electricity production. Already 87 percent of the electricity produced in Finland is CO<sub>2</sub>-free, and this figure will rise to over 90 percent with Finland's greatest act for the climate, i.e., the regular electricity production of the Olkiluoto 3 plant unit.

Along with renewable energy sources, secure and stable nuclear power is seen not only as a necessary electricity production method among Finns, but even a significant solution of tackling climate change internationally. For example, in an energy attitude survey carried out by Finnish Energy, the support for nuclear energy was historically high in Finland. This positive stance has also been observable in reporting by the media and citizens' discussions on social media. In addition, a change from opposition to support has been apparent in political statements.

In Europe, the discussion on the role of nuclear power has also shifted into a positive direction in many countries. This is based on facts related to climate change mitigation. The European Commission's Joint Research Centre (JRC) carried out a study on the sustainability of nuclear power as part of the preparations for the EU's Sustainable Finance Taxonomy. According to the report, completed in March 2021, the production of nuclear power significantly promotes climate change mitigation. The report confirms that the lifecycle

greenhouse gas emissions of electricity produced with nuclear power are comparable to those of water and wind power.

The discussion on energy prices has risen strongly along with climate-friendliness, and electricity prices will continue to fluctuate considerably. Nuclear power stabilises and creates predictability on the electricity market. The EU's Sustainable Finance Taxonomy should include all climate-friendly electricity production forms from nuclear power to renewable energy sources with such criteria that the profitability of nuclear power can be secured far into the future. It is good that the discussion has gone into the direction of including nuclear power in the Taxonomy.

## Reliable green power

**THE OLKILUOTO PLANT** units are known for their world-class load factors. 14.4 TWh of climate-friendly electricity was produced in Olkiluoto in 2021, reaching a combined load factor of 92.8 percent. The production in Olkiluoto eliminated some 12 million metric tonnes of CO<sub>2</sub> emissions when compared to

producing the same volume of electricity with more carbon-intensive production methods. This roughly corresponds with emissions from all the traffic in Finland.

TVO's mission is to produce climate-friendly nuclear electricity for its shareholders safely and competitively, thus creating well-being for the whole of Finland. The work we have been doing for over 40 years continues, since the operating licenses of all our plant units are currently valid at least until 2038.

Safety and competitive ability cannot be separated from each other in our industry, and we are engaged in international cooperation to continuously improve both aspects of our operations. Our plant units have been modernised and developed throughout their lifecycle. This has allowed us to continuously improve the safety and reliability of the plant units, of which the high load factors are a concrete example.

We at TVO want to be valued trailblazers of the nuclear industry, and the management of the nuclear power lifecycle is an integral part of this aspiration. We are

also the first in the world to have a solution for the final disposal of spent nuclear fuel. Posiva's final disposal project proceeded at the end of 2021 to the submittal of the operating licence application to the Ministry of Economic Affairs and Employment. The final disposal solution of nuclear fuel acts as a game changer in Finland, when assessing the overall sustainability of the lifecycle of nuclear power. This was also noted by EU Commissioner Mairead McGuinness during her visit to Olkiluoto in autumn 2021. Posiva's project serves as a good example also internationally.

### Towards Finland's greatest act for the climate

**THE COMMISSIONING** of Olkiluoto 3 proceeded to fuel loading in March 2021. Historical moments were experienced in December, when the startup of the plant unit took place, i.e., the chain reaction started. Electricity production starts in March 2022 according to the schedule, when OL3 EPR (European Pressurised Reactor) is connected to the national grid. Regular electricity production is to start in July 2022. This also means

the fulfilment of Finland's greatest act for the climate and the increase of our production to about 30 percent of Finland's annual demand for electricity. TVO's preparedness to commission OL3 EPR has been verified for years also by independent experts. Now, activities are already carried out according to procedures of a nuclear power plant in use, putting safety before everything else.

### Responsibility is at the heart of nuclear professionalism

**BEING A NUCLEAR** professional and a trailblazer is defined by completing tasks safely and responsibly, as well as continuously improving operations, anticipating, and communicating openly. Our Group-level policies and Code of Conduct have been built on these values to support optimal work.

Responsible operations are reflected in many different ways in the TVO Group and reporting on the topic has been carried out already for 20 years. In 2021, the work on sustainability has been developed further by compiling the TVO Group's Sustainability Roadmap

until 2030. The roadmap consists of our sustainability goals according to the principle of continuous improvement. The outlook until the year 2030 enables the follow-up of developments and planning with a more long-term perspective.

At the heart of responsible actions are the people who work at TVO, whose strong nuclear professionalism produces well-being to our surrounding society. Our work community, which is participating, open, anticipating, and continuously improving operations, reflects the core values for the results of our work. Our company also invests in many ways in the development of occupational well-being with the Better Workplace programme and the Nuclear Professional Leader training programme, which aims at developing supervisors' safety management skills. The real power of our operations is achieved safely and predictably when the heart's well-being is ensured, and energy is in the hands of responsible professionals. This is how we carry out great climate acts for the surrounding society every day.

**Jarmo Tanhua**



**At the heart of responsible actions are the people who work at TVO, whose strong nuclear professionalism produces well-being to our surrounding society.**

# 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 five 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 2021. The Olkiluoto nuclear power plant generates approximately 17 percent of all the electricity consumed 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, mainte-

nance 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 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 a solid safety brand, predictable and competitive price of electricity, 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.

The TVO Group comprises subsidiaries TVO Nuclear Services Oy (TVONS) and nuclear waste management company Posiva Oy (Posiva). TVONS is a subsidiary fully owned by TVO, providing services based on TVO's expertise and covering the entire lifecycle of a nuclear power plant. Posiva is jointly owned by TVO and Fortum Power and Heat Oy (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 (PSOY) is a fully owned subsidiary of Posiva, which sells Posiva's expertise generated through 40 years of multidisciplinary research.

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 2021.

**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**

A valued pioneer of the nuclear industry. Producing 30% of Finland's electricity reliably.

**STRATEGIC CHOICES**



Safety and availability at a high level



Strategic investments

**BUSINESS FOCUSED LEADERSHIP  
– SMOOTH EVERYDAY WORK FOR OLKILUOTO CREW**

**VALUES**

- Sustainability • Proactiveness
- Transparency • Continuous improvement

# OL3 is Finland's greatest single act for the climate

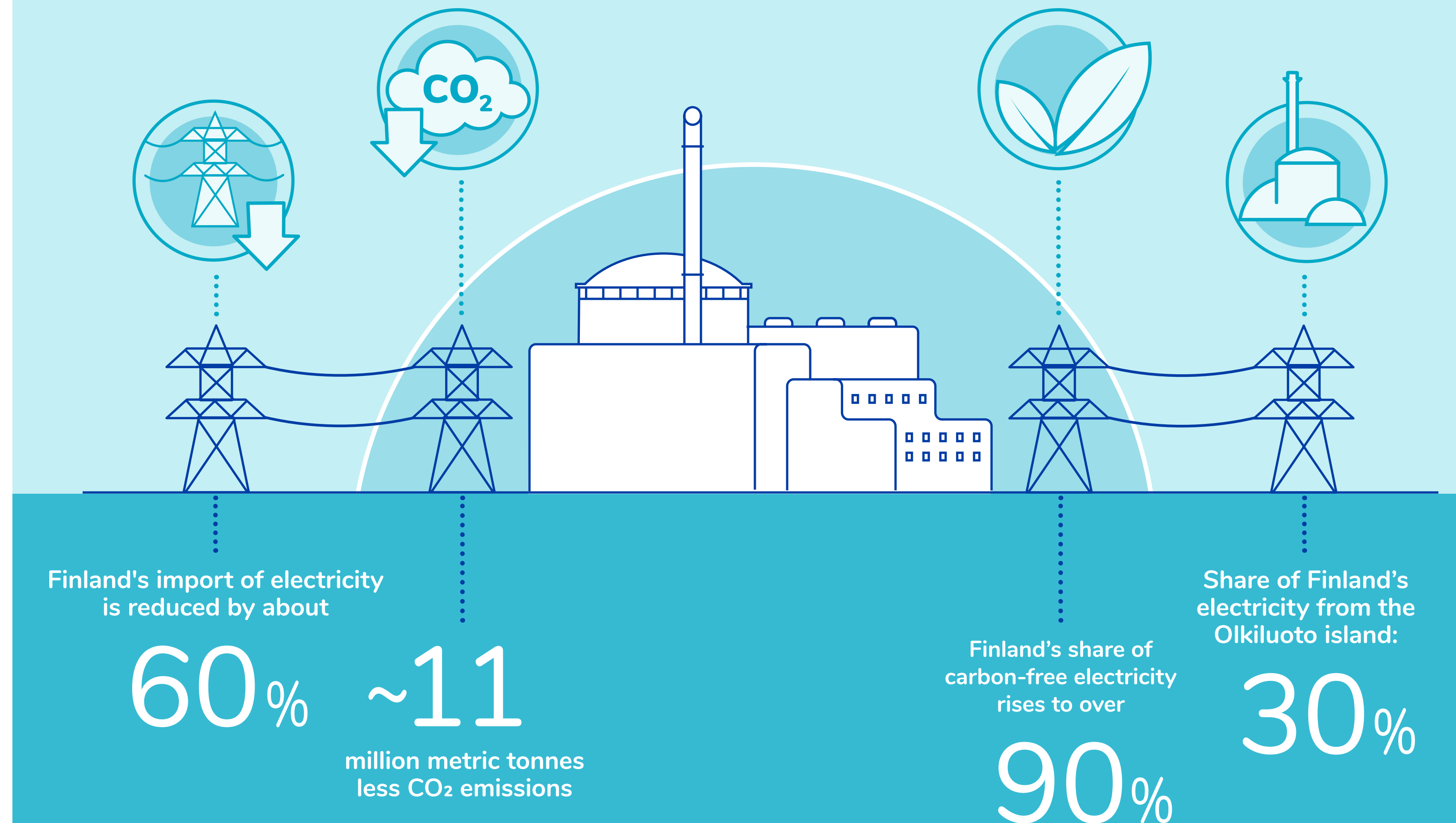
During 2021, the greatest single act for the climate in Finland was commissioned in Olkiluoto. The OL3 plant unit's fuel loading into the reactor was completed in April, and the nuclear reaction was initiated for the first time in December. With the most powerful nuclear power unit in the world, approximately 30 percent of Finland's electricity will come from one island, where the entire lifecycle of nuclear power is managed.

**AFTER CONNECTION** to the national grid in March 2022, the regular electricity production of the OL3 plant unit starts in July 2022. As a low-emission form of electricity production, nuclear power plays an important role in climate change mitigation. The regular electricity production of the OL3 plant unit enables significant leaps in advancing Finland's climate goals.

The Finnish Government Programme (2019) aims for the carbon neutrality of Finland by 2035. By replacing electricity generated with coal, the OL3 plant unit's production will reduce annual CO<sub>2</sub> emissions by approximately 11 million metric tonnes. The amount corresponds with the annual greenhouse gas emissions of traffic in Finland. Simultaneously, Finland's self-sufficiency in clean electricity grows – the share of carbon-free electricity production will rise from 87 percent to over 90 percent. The electricity production of the OL3 plant unit reduces the import of electricity by about 60 percent.

Sources: TVO, Ministry of Economic Affairs and Employment

Read more about the OL3 project from [the Report of the Board of Directors](#).





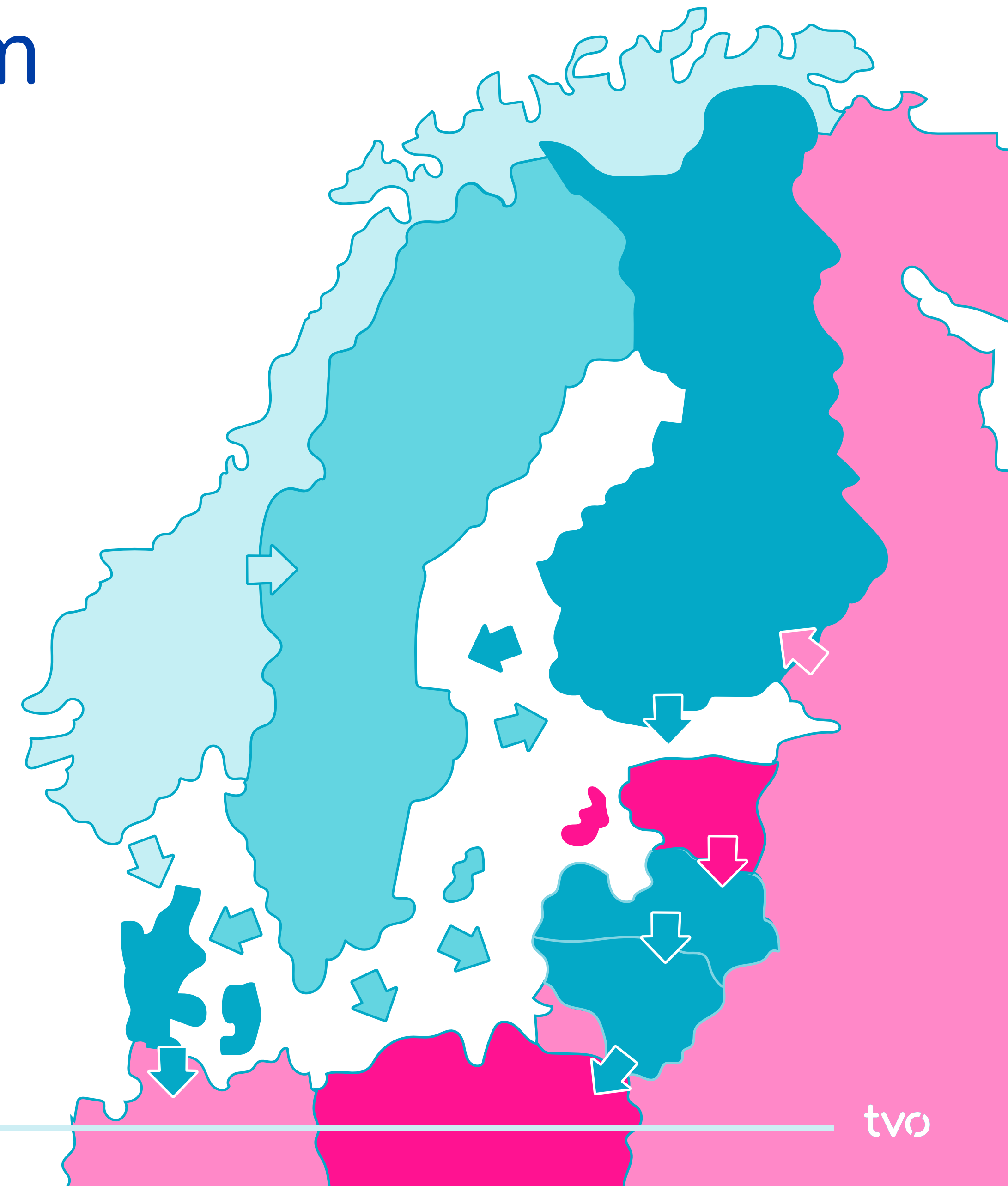
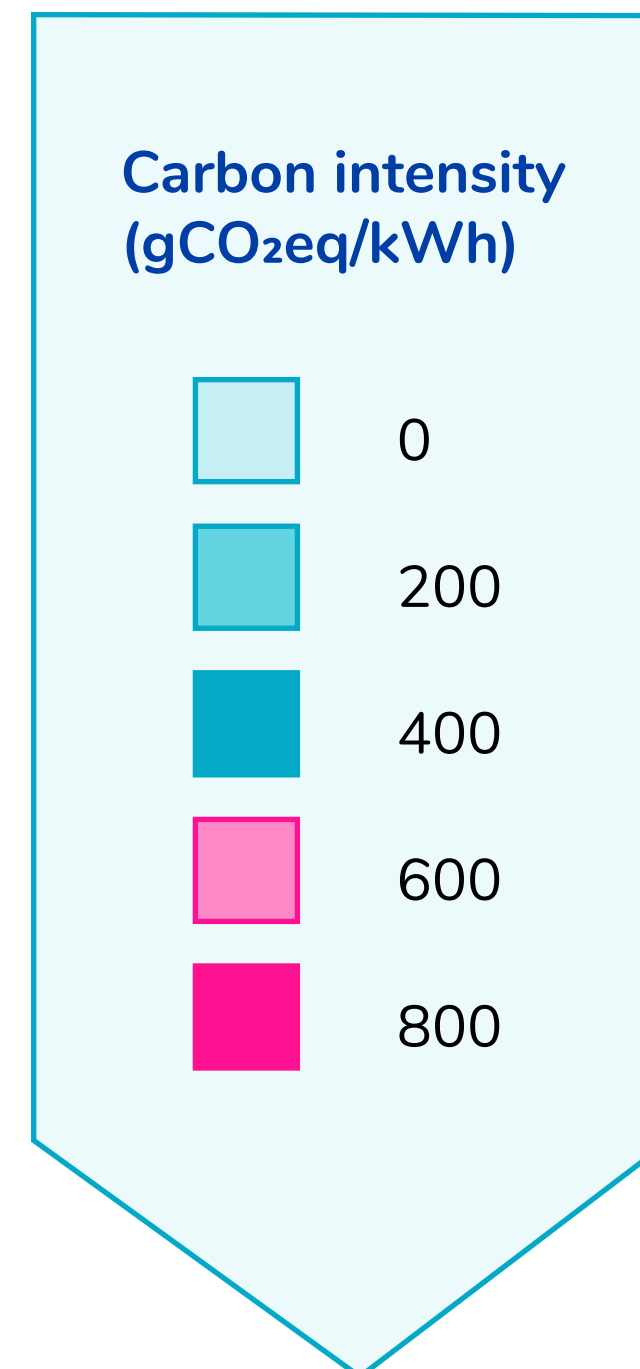
# OL3 in the Nordic power system

Finland's main grid is part of the inter-Nordic power system, which also includes the transmission grids of Sweden, Norway, and eastern Denmark. In addition, the Nordic system has transmission connections to other countries, such as Germany, Poland, Holland, Estonia, Lithuania, and Russia. Therefore, the connection of the OL3 plant unit to the national grid has even international effects.

**THE PRICE OF ELECTRICITY** is constantly followed on the electricity markets, and the purchase of electricity is determined by where the price is lowest. The recent rise in electricity prices has been partly caused by the price increase of emission allowances, which has reduced the profitability of carbon-based electricity.

When more capacity producing clean electricity is connected to the grid, it replaces the expensive polluting electricity production on the electricity markets. As part of the Nordic power system, the OL3 plant unit's production therefore replaces e.g., coal, or the combustion of oil shale in Estonia. The commissioning of the OL3 plant unit not only advances Finland's climate goals, but it also increases the use of clean electricity in the entire Nordic power system. This makes the plant unit even an internationally significant act for the climate.

Sources: TVO, Fingrid, electricitymap.org (accessed 26.11.2021)



# Responsibility at TVO

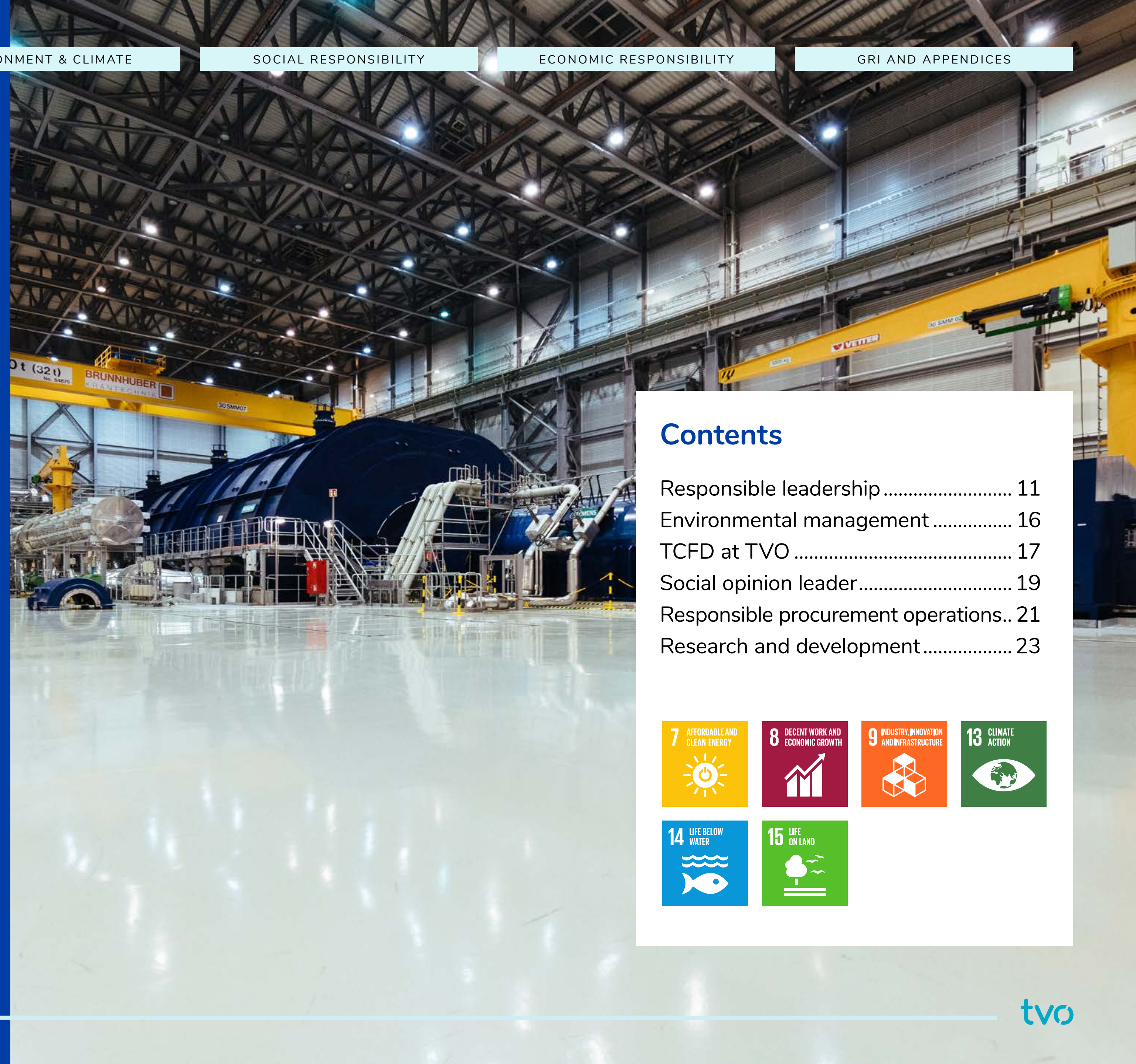
## Particle-larly responsible nuclear power

**RESPONSIBILITY IS AN INTEGRAL PART** of the TVO Group's strategy. It is observed in all the Group's operations, development, and management. During 2021, TVO has updated its sustainability goals for the entire Group. The goals are presented in the TVO Group's Sustainability Roadmap 2030 (p. 14–15).

With the energy transition, society is becoming increasingly electrified, and the need for low-emission stable power grows. The TVO Group is committed to promoting both national and international climate goals by generating climate-friendly electricity at the Olkiluoto nuclear power plant safely and reliably.

TVO's spent nuclear fuel will be packed in copper canisters and placed in the Olkiluoto bedrock at an approximate depth of 430 metres. The disposal of spent fuel is scheduled to begin in the 2020s; it will continue for approximately one hundred years. The final disposal solution plays an important role in climate change mitigation as part of the lifecycle of nuclear power.

In addition to climate change mitigation, the fundamental pillars of responsibility at the TVO Group consist of an uncompromising safety culture, the well-being of personnel and strong networks, as well as the creation of added economic value. In TVO's vision, nuclear power-generated electricity commands a competitive price and holds a strong position in the production and investment palette of TVO's electricity consumers.



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# Responsible leadership

**The cornerstones of responsible leadership and operating practices are the company's values, on which the Group-level policies and the Code of Conduct are based. TVO's objective is to operate in a responsible, transparent, proactive manner, and to continuously improve its operations.**

**THE BOARD OF DIRECTORS** approves the strategic objectives and operational guidelines of the company, such as the company values, Group-level policies, and the Code of Conduct. The TVO Group complies with valid laws, regulatory guidelines, and principles of good governance in all its operations. Regulations by STUK and requirements laid down in the nuclear power plant guides (YVL Guides) are also followed. Everybody working at the TVO Group is required to comply with legislation and regulatory guidelines and regulations, the principles of good governance, and the Group's voluntary commitments.

Managerial and supervisory personnel have the task of initiating discussions

about the Group's policies as well as the values and responsibilities on which they are based, and of controlling that laws and regulatory provisions are complied with in the activities of each responsibility area. In legal and ethical issues, employees can turn to the legal unit, the internal audit unit, or the safety unit. The internal audit unit also ensures that legislation and statutory regulations are taken into account in the organisation's activities.

The TVO Group's subcontractors are informed of the Code of Conduct by, for example, including the Code of Conduct



**TVO's values are responsibility, transparency, proactiveness, and continuous improvement.**

Read more:

[Group-level policies](#) and [Code of Conduct](#)

in contracts signed with subcontractors and partners. The Group's employees and subcontractors working in Olkiluoto must complete an online training course on the Code of Conduct. In 2021, a total of 110 people completed the Code of Conduct training.

TVO's operational system meets the requirements of the following procedures and standards, among others:

- Quality management system ISO 9001:2015, STUK YVL A.3 Management system for a nuclear facility
- Environmental management system ISO 14001:2015, EMAS Regulation 1221/2009, and Commission Regulation 2017/1505
- Energy efficiency system (ETJ+)
- Occupational health and safety management system ISO 45001:2018

## Material responsibility aspects

**THE MOST SIGNIFICANT** aspects that affect responsibility as concerns the TVO Group's stakeholders and business activities have been identified by means

of a materiality analysis. In addition to its personnel, the TVO Group's most important stakeholders include its shareholders, the authorities, investors, decision-makers, the local community, subcontractors, the media, and the general public. The reporting principles pertaining to content definition in the Global Reporting Initiative (GRI) Standards were used as the basis in the definition of the reporting content and in the materiality analysis. This Corporate Social Responsibility Report is based on a materiality analysis which was updated during the autumn 2020.

The materiality analysis surveyed aspects relevant to the Group on the basis of discussions with the management, personnel, and external stakeholders, as well as information obtained from opinion polls. Data for the materiality analysis was obtained from the most recent stakeholder survey carried out as an online survey and targeted at shareholders, decision-makers, public officials, the media, opinion leaders, experts, non-governmental organisations, and the personnel. In addition, comments and queries received from visitors were taken into account in the analysis.

After prioritisation of the material aspects, the outcome of the analysis was a materiality matrix (p. 13), which describes the view of the Group and its stakeholders on aspects of responsibility that are important to the TVO Group, the impact of responsibility, and related development areas. After prioritisation, the materiality matrix was once more subjected to an approval procedure carried out as discussions between responsibility experts and representatives of the Management Group. The Management Group separately approved the TVO Group's material responsibility aspects and the content of the Corporate Social Responsibility Report.

Based on the materiality analysis, the material aspects guiding the TVO Group's responsibility operations include:

- the production of climate-friendly electricity for society;
- an uncompromising safety culture;
- creating added economic value;
- the well-being of employees and strong networks;
- high-class nuclear and final disposal expertise.

As part of the analysis, connections were sought between the material aspects and the United Nations' Sustainable Development Goals (UN SDGs), based on which the TVO Group is committed to promoting the following goals:



There are a total of 17 UN SDGs, of which the TVO Group is committed to six goals most relevant to its operations. The goals aim at achieving a more sustainable and equal world by 2030.

The most important aspects of responsibility are dealt with in the meetings of the Board of Directors and the Committees appointed by the Board from among its members; for example, the Nuclear Safety Committee deals with matters related to the promotion of the safety culture. The Audit and

Finance Committee's responsibilities include monitoring the development of shareholder value. The work of the OL3 Committee focuses on the monitoring and promotion of the power plant project designed to ensure the supply of electricity for society and a positive impact on the climate.

The management of and the efforts taken in relation to the most significant aspects of responsibility concern the entire organisation of the TVO Group, including the Management Group, the Business Units, and the service functions. The President and CEO, with the approval of the Management Group, is responsible for the objectives and planning relating to the TVO Group's corporate responsibility. The Management Group is in charge of the implementation of the strategy, strategic projects, and strategic goals, as well as the development of new business opportunities. Furthermore, it assists the President and CEO in the planning and management of the Group's strategic operations.

In 2021, the main responsibilities of the Management Group concerning different sustainability areas were as follows:

- Social responsibility and stakeholder relations: **Jaana Isotalo**, Senior Vice President, HR, Training, Communications and Corporate Relations

- Economic responsibility: **Anja Ussa**, Senior Vice President, Finance, IT, Business Development and Assistant Services
- Environmental responsibility: **Mikko Kosonen**, Senior Vice President, Safety and Security Services
- Business ethics and compliance: **Ulla-Maija Moisio**, Senior Vice President, Legal Affairs
- Risk management: **Lauri Piekkari**, Senior Vice President, Treasury and Risk Management

The duties of the Responsibility Team, which includes members from the Management Group and experts of different areas of sustainability, include:

- making decisions on responsibility goals, policies, operating plan, and indicators;
- considering stakeholder expectations;
- monitoring the responsibility goals, actions, and indicators;
- preparing, developing, and monitoring the implementation of a corporate social responsibility policy and a related Code of Conduct;
- reporting responsibility issues to the CEO and Management Group once or twice a year.

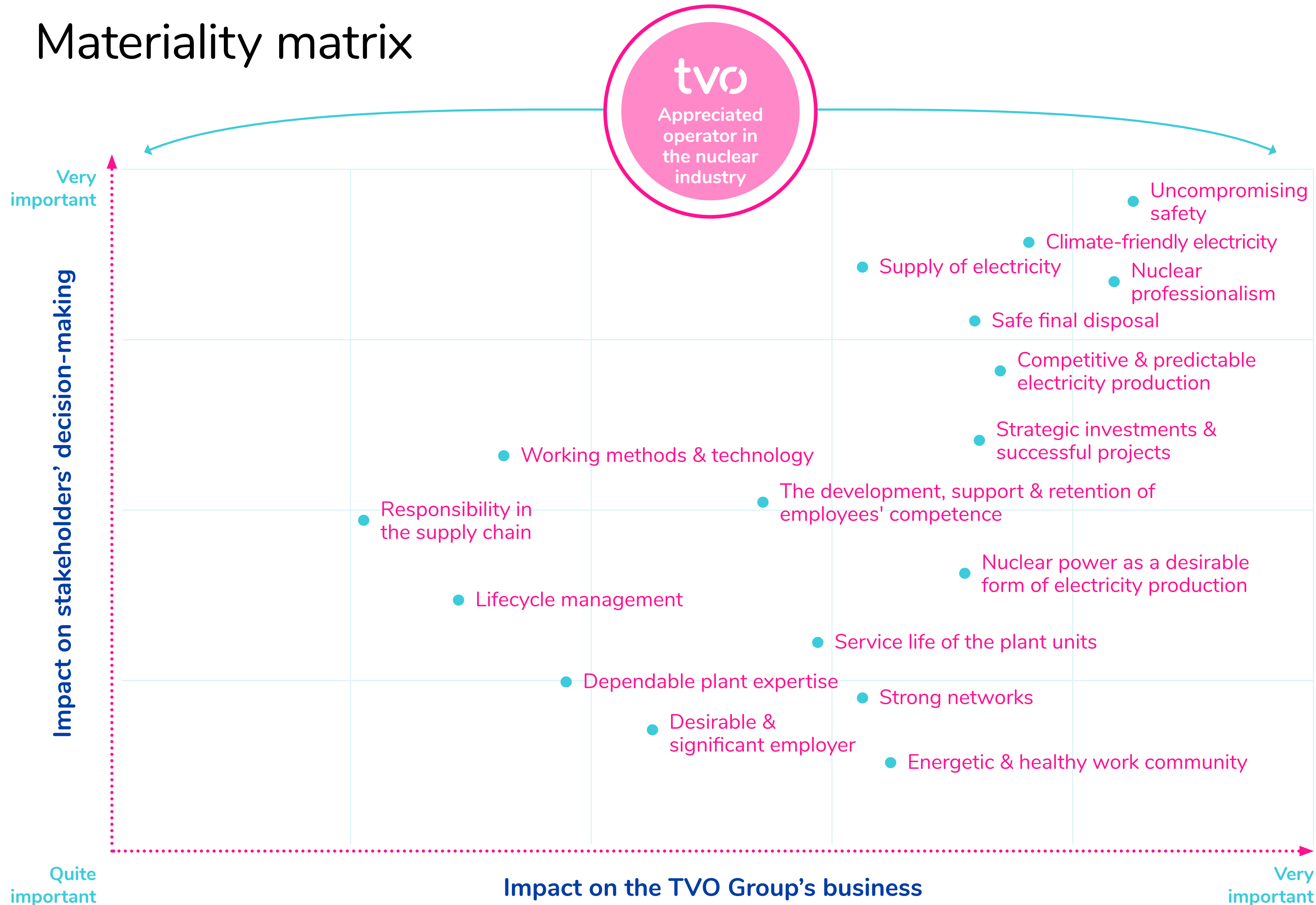
## Sustainability Roadmap 2030

**BASED ON** the material responsibility aspects and UN SDGs defined in the materiality analysis, the TVO Group's targets for developing sustainability were updated during 2021. The targets form the TVO Group's Sustainability Roadmap 2030, which is presented on pages 14–15 of this report.

The Sustainability Roadmap was developed through interviews with the Group's personnel, workshops organised in the Responsibility Team, as well as discussions with members of the Management Group. The finalised roadmap was approved in the TVO Group's Management Group.





In the roadmap, specific targets have been defined for each material responsibility aspect of the TVO Group. This way, the targets support the achievement of the different material aspects within the Group. During the process, corresponding UN SDGs were also defined for each target. With the help of the roadmap, the TVO Group aims at an even higher level of sustainable development by specifying both short and long-term goals. The outlook until the year 2030 enables the planning of sustainable development with a more long-term perspective.

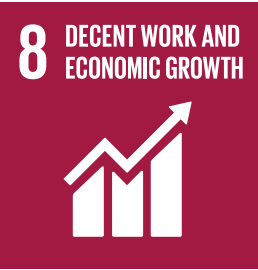
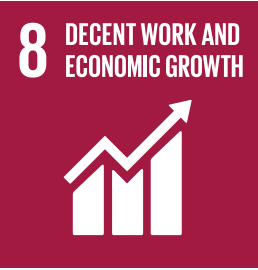
# Materiality matrix



- ▶ We produce climate-friendly electricity for society with nuclear power.
- ▶ We uphold a high-class safety culture.
- ▶ We create added economic value by promoting the competitiveness and position as a desirable production form of nuclear power.
- ▶ We look after our employees and networks.
- ▶ We are a trailblazer in the nuclear industry and final disposal.

## Sustainability Roadmap 2030

SDG	TARGET	ACTUAL RESULT 2021
   	<b>Climate-friendly electricity for society</b>	
	<b>Climate-friendly electricity production</b> <ul style="list-style-type: none"> <li>In 2022, OL3 is in commercial use, which enables the production of about 30% of Finland's electricity in Olkiluoto, as well as the avoidance of about 23 million metric tonnes of CO<sub>2</sub> emissions annually (compared with coal).</li> </ul>	<ul style="list-style-type: none"> <li>The startup of OL3's reactor took place for the first time in December 2021. Regular electricity production is to start in July 2022.</li> </ul>
	<b>Responsible nuclear waste management</b> <ul style="list-style-type: none"> <li>Posiva's final disposal activities begin according to plan in the mid-2020s.</li> <li>Final disposal is carried out on an industrial scale – about 400 tU spent fuel is disposed safely and according to cost estimates by 2030.</li> </ul>	<ul style="list-style-type: none"> <li>The construction work of Posiva's encapsulation plant and final disposal facility proceeded as planned in 2021. The operating licence application was submitted to the Finnish Government in December.</li> </ul>
	<b>Emissions</b> <ul style="list-style-type: none"> <li>The TVO Group's operations are climate neutral by 2030.</li> <li>The thermal load of cooling water does not exceed 56.9 TWh annually.</li> <li>Radioactive emissions to air and water are kept clearly below authority limits (continual).</li> <li>0 environmental accidents (in the serious / significant category) annually.</li> </ul>	<ul style="list-style-type: none"> <li>The TVO Group's Scope 1 greenhouse gas emissions were 3,897 t CO<sub>2</sub>eq. Scope 2 emissions were 68,743 t CO<sub>2</sub>eq.</li> <li>The thermal load of cooling water was 26.2 TWh.</li> <li>Radioactive emissions were clearly below authority limits.</li> <li>There were 0 environmental accidents.</li> </ul>
	<b>Biodiversity</b> <ul style="list-style-type: none"> <li>Efficient land use: share of produced electricity with respect to the surface area of built environment ca. 15,647 GWh / km<sup>2</sup> from 2023 onwards.</li> <li>At least one voluntary project promoting biodiversity carried out annually.</li> </ul>	<ul style="list-style-type: none"> <li>The amount of produced electricity with respect to the surface area of Olkiluoto's built environment was ca. 8,493 GWh / km<sup>2</sup>.</li> <li>Voluntary projects promoting biodiversity were not started in 2021, however the investigation into their start is ongoing.</li> </ul>
	<b>Circular economy</b> <ul style="list-style-type: none"> <li>Minimisation of waste volume and recycling waste as material, at least 55% annually by 2025 and 60% annually by 2030.</li> <li>0 kg of landfill waste annually.</li> </ul>	<ul style="list-style-type: none"> <li>Approximately 52% of waste was recycled as material.</li> <li>There was 0 kg of landfill waste.</li> </ul>
	<b>Energy efficiency</b> <ul style="list-style-type: none"> <li>Commitment to the goals set out in the Energy Efficiency Agreement period 2017–2025, as well as the goals of the following period. Goals are advanced by carrying out at least four location reviews and one plant measurement annually in Olkiluoto.</li> </ul>	<ul style="list-style-type: none"> <li>Four location reviews were carried out, and plant measurements were performed at both of the operating plant units after the annual outages.</li> </ul>
	<b>High-class safety culture</b>	
	<b>Safety culture</b> <ul style="list-style-type: none"> <li>No deficiencies in IAEA's safety culture levels 1 and 2 (continual).</li> </ul>	<ul style="list-style-type: none"> <li>Levels 1 and 2 were fulfilled well. On level 3, development areas were recognised in learning methods, and corrective actions have been initiated. A positive aspect was the development of procedures and safety culture at OL3, so that the plant unit's first criticality was possible.</li> </ul>
	<b>Occupational health &amp; safety</b> <ul style="list-style-type: none"> <li>No serious accidents in the TVO Group, including contractors (continual).</li> <li>The TVO Group's accident frequency (accidents per one million working hours) below 1, including contractors, by 2030.</li> </ul>	<ul style="list-style-type: none"> <li>There were three serious accidents.</li> <li>The accident frequency was 6.3 accidents per one million working hours.</li> </ul>
<b>Radiation protection</b> <ul style="list-style-type: none"> <li>Individual radiation doses incurred in Olkiluoto below half of authority limit (continual).</li> </ul>	<ul style="list-style-type: none"> <li>The highest annual individual dose was 8.1 mSv (authority limit: 20 mSv).</li> </ul>	
<b>Plant safety</b> <ul style="list-style-type: none"> <li>No events at INES 1 or higher (continual).</li> </ul>	<ul style="list-style-type: none"> <li>There were eight INES 0 events at the Olkiluoto power plant.</li> </ul>	

SDG	TARGET	ACTUAL RESULT 2021
 <p>8 DECENT WORK AND ECONOMIC GROWTH</p>	<b>Added economic value</b>	
	<b>Customer-oriented &amp; competitive activities</b> <ul style="list-style-type: none"> <li>The load factor of the Olkiluoto plant units is 90–95% as a rolling three-year average (continual).</li> <li>The rolling three-year production cost average is below 20 € / MWh in 2021. Calculating from OL3's first full production year, the rolling three-year average is below 30 € / MWh. Reported for the first time in 2026.</li> </ul>	<ul style="list-style-type: none"> <li>The rolling three-year average of the load factor was 93.7%.</li> <li>The rolling three-year average of the production cost was 16,86 € / MWh.</li> </ul>
	<b>Nuclear power as a desired production form</b> <ul style="list-style-type: none"> <li>Reputation index over 75 (excellent) in the stakeholder survey (continual).</li> </ul>	<ul style="list-style-type: none"> <li>The reputation index was 82 (excellent) in the latest stakeholder survey (2021).</li> </ul>
	<b>Funds ready for final disposal</b> <ul style="list-style-type: none"> <li>The necessary funds for final disposal are secured through payments to the Finnish State Nuclear Waste Management Fund (continual).</li> </ul>	<ul style="list-style-type: none"> <li>TVO's liability for nuclear waste management in the Finnish State Nuclear Waste Management Fund was EUR 1,816.1 million for the end of 2021.</li> </ul>
 <p>8 DECENT WORK AND ECONOMIC GROWTH</p>	<b>Well-being of employees &amp; strong networks</b>	
	<b>Occupational health</b> <ul style="list-style-type: none"> <li>Personnel survey (People Power Index) result at level AA (good) achieved by 2025.</li> <li>Sick leaves (% of working time) below 3% annually.</li> <li>Employees' pension insurance (TyEL) category below 4 (continual).</li> </ul>	<ul style="list-style-type: none"> <li>The People Power Index was at level A (satisfactory) in the 2021 personnel survey.</li> <li>TVO's sick leaves were 2.4% and Posiva's were 1.3%.</li> <li>The employees' pension insurance category was 1.</li> </ul>
	<b>High-class expertise</b> <ul style="list-style-type: none"> <li>Actualisation rate of competence surveying over 90% annually.</li> <li>Inspection rate of individual training plans over 90% annually.</li> </ul>	<ul style="list-style-type: none"> <li>The actualisation rate of competence surveying was 93.4% (recorded by 17.1.2022).</li> <li>The inspection rate of individual training plans was 89.8%</li> </ul>
	<b>Professional development</b> <ul style="list-style-type: none"> <li>Employees' changes in position over 10% annually.</li> <li>Actualisation rate of navigation discussions over 90% annually.</li> </ul>	<ul style="list-style-type: none"> <li>5.9% of permanent employees changed positions.</li> <li>92% of the Group's employees took part in at least one navigation discussion.</li> </ul>
	<b>Employer role</b> <ul style="list-style-type: none"> <li>Recruiting over 100 students for internships annually.</li> </ul>	<ul style="list-style-type: none"> <li>The TVO Group employed a total of 92 trainees during the year.</li> </ul>
	<b>Responsible supply chain</b> <ul style="list-style-type: none"> <li>All suppliers of raw uranium and its conversion services are evaluated every 3–5 years depending on the supplier.</li> </ul>	<ul style="list-style-type: none"> <li>Three fuel manufacturers' subcontractors were evaluated in 2021. No supplier evaluations expired during the year, but they are proceeding according to the target.</li> </ul>
	<b>Stakeholder cooperation</b> <ul style="list-style-type: none"> <li>The most important stakeholders feel that the TVO Group's activities can be trusted, and that the Group communicates transparently on its operations. The indicators measuring the aforementioned aspects are over 75 (excellent) in the stakeholder survey (continual).</li> </ul>	<ul style="list-style-type: none"> <li>Trust in the TVO Group's activities was at 81 (excellent) and view on communications was 72 (good) in the latest stakeholder survey (2021).</li> </ul>
	<b>Trailblazer in the nuclear industry and final disposal</b>	
<b>Research &amp; development</b> <ul style="list-style-type: none"> <li>R&amp;D operations advance the safety, business activities, and future technological solutions of the plant units and final disposal of spent fuel with the help of networks and research projects (continual).</li> </ul>	<ul style="list-style-type: none"> <li>The central R&amp;D projects and cooperation partners are described in the chapter Research and Development (p. 23-25).</li> </ul>	
<b>Reliable use of the plant units</b> <ul style="list-style-type: none"> <li>0 unplanned automatic scrams (continual).</li> <li>Annual unplanned energy unavailability factor &lt;0.4% (1.5 days / year) of total production by 2024.</li> </ul>	<ul style="list-style-type: none"> <li>There were 0 unplanned automatic scrams.</li> <li>The unplanned energy unavailability factor was 0.3%.</li> </ul>	
<b>Increasing final disposal expertise</b> <ul style="list-style-type: none"> <li>Posiva has the best knowledge and expertise in the final disposal of spent nuclear fuel, and it is the most desired international reference and valued partner (continual).</li> </ul>	<ul style="list-style-type: none"> <li>Posiva's employees received 4.1 training days per employee. Posiva Solutions' turnover increased by 11%.</li> </ul>	

# Environmental management

The TVO Group's 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. TVO's environmental management 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 is assessed based on 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.

Targets have been specified for the significant environmental and energy aspects in the Environment and Energy Efficiency

Programme. The targets have been confirmed by the Management Group. A team of environmental experts from various organisational 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. The TVO Group 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, operations are regularly assessed both within the organisation and by means of external audits.





# TCFD at TVO

**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 connected with climate change in relation to four thematic areas: governance, strategy, risk management, and metrics and targets. TVO has reported in accordance with TCFD since 2020.**

**THE PRODUCTION** of climate-friendly electricity for society is one of the TVO Group'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 in matters concerning sustainable development and environmental responsibility belongs to the company's 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 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 TVO GROUP'S MISSION** is to create quality of life for Finland by producing climate-friendly electricity with nuclear power for shareholders in a safe and competitive manner. Consequently, the production of climate-friendly electricity is an integral part of the TVO Group's strategy. An operating environment analysis is carried out as part of the strategy planning process, in which the central role of nuclear power in achieving climate goals has been recognised.

### SDG

### TARGET



#### Climate-friendly electricity production

- In 2022, OL3 is in commercial use, which enables the production of about 30% of Finland's electricity in Olkiluoto, as well as the avoidance of about 23 million metric tonnes of CO<sub>2</sub> emissions annually (compared with coal).

#### Emissions

- The TVO Group's operations are climate neutral by 2030.

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. With the regular electricity production of the plant unit, 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 electricity produced by TVO has been nuclear power.

More detailed strategic targets for the next decade in relation to the climate and environment are specified in the TVO Group's Sustainability Roadmap 2030. With the targets, the TVO Group aims at supporting broader climate goals, such as the Paris Agreement. The most significant target in the roadmap as concerns climate change mitigation is the commercial use of the OL3 plant unit by 2022, which enables the annual reduction of approximately 11 million metric tonnes of CO<sub>2</sub> emissions. In addition, the TVO Group aims to keep emissions from its own operations as low as possible and is committed to promoting climate neutrality.

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. TVO's R&D activities aim at advancing future technological solutions, which can also function as ways to mitigate climate change.

## Risk Management

**THE MANAGEMENT** of climate risks is part of the TVO Group's overall risk management, which includes both strategic and operative risks. Risk management, and therefore also the management of climate risks, forms a part of the Group's strategic work. TVO's Board of Directors monitors the companies' risk management and confirms the policies which are to be complied with. The Group's CEOs oversee the risk management for their own company, and the members of the Management Group in turn are responsible for the risk management of their own responsibility area. The purpose of the risk management unit is to ensure that procedures and methods are consistent. Environmental effects and environmental safety are assessed in conjunction with each task. The overall risk management thereby covers the

entire organisation from a managerial to an operative level, where each person carries responsibility for the identified risks.

Risks which have been identified in the operating environment include different reputational risks as stakeholders are increasingly 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 in the Sustainable Finance Taxonomy will be resolved in 2022. To ensure future business opportunities, TVO promotes the competitiveness and position as a desirable production form of nuclear power.

Plant modifications are carried out at the TVO Group, which improve the plants' safety, operability, and efficiency. The aim with these measures is to follow the Group companies' values, strategic goals, and to develop the climate-friendliness of the plants.

Probabilistic Risk Assessments (PRA) are carried out as part of risk management. PRA is based on STUK's nuclear power plant guides (YVL Guides). According to PRA, TVO analyses the following: the plant's internal failures, disturbances and

human errors, loss of off-site power supply, fires, flooding, hoisting of heavy loads, abnormal weather conditions, seismic events and other environmental factors, as well as external factors caused by human activities. STUK oversees the licensee's risk management and the actualisation of PRA.

The TVO Group 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 extreme weather and climate phenomena, such as floods or storms, are taken into account even more efficiently.

## Metrics and Targets

**METRICS** and targets for climate-friendly electricity production and the climate neutrality of operations are specified in the TVO Group's Sustainability Roadmap 2030. The progress of achieving climate neutrality is monitored through the TVO Group's Scope 1 and 2 greenhouse gas emissions, which have been calculated according to the Greenhouse Gas Protocol (GHG Protocol). In addition, significant metrics concerning the climate and the environment are presented in the Environmental Balance Sheet of this report (p. 37).

The Environment and Energy Efficiency Programme 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 Programme are reported annually in the Environmental Report. The set targets are based on the production of stable and environmentally friendly electricity for society and minimisation of adverse environmental impacts of the operations at all stages of the electricity production chain.

## Greenhouse gas emissions

GHG emissions, t CO <sub>2</sub> eq	2021
Scope 1	3,897
Scope 2	68,743

Read more about TCFD:  
[www.fsb-tcfid.org](http://www.fsb-tcfid.org)

Read more about Greenhouse Gas Protocol reporting:  
[www.ghgprotocol.org](http://www.ghgprotocol.org)

# Social opinion leader

**The TVO Group cooperates with political decision-makers and the Government to develop and execute energy legislation and guidelines. The Group's interaction with all stakeholders is always guided by strict ethical principles.**

## Local communities

### Active stakeholder cooperation

Stakeholders play a key role for a company that is engaged in sustainable operations. The most important local stakeholders identified by the TVO Group are local residents, councilmembers of nearby municipalities, the chamber of commerce, local schools, and other local opinion leaders.

The inclusion of local communities in decisions relating to nuclear power and

final disposal activities is extensive and continues throughout the entire lifecycle of operations. The TVO Group organises regular interaction through various forums, such as the Municipal Cooperation Committee. The Municipal Cooperation Committee was established in the 1970s upon the initiative of TVO. The committee is a forum for interaction and exchange of information, providing local municipal decision-makers with first-hand information. In addition to representatives of TVO and Posiva, the Committee includes representatives appointed by the municipalities and towns of Eurajoki, Rauma, Nakkila, Eura, and Pori. TVO also maintains close interaction with Eurajoki in the municipality's own cooperation team. In addition, TVO participates in the operations of the Vuojoki Foundation and Vuojoki Cooperation Group.

TVO normally engages in free-form interaction with the residents of the neighbouring areas at open coffee and chat events and the SuomiAreena public debate forum, where discussion about the company and nuclear power is lively. Live events had to be postponed during 2021 due to the COVID-19 pandemic. However, virtual events were still participated in. TVO publishes Uutisia Olkiluodosta (News from Olkiluoto) magazine for people living in the immediate region and communicates diversely through digital channels. 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 2021.

The Olkiluoto Visitor Centre normally receives some 13,000-15,000 visitors each year. The visitors are openly told about the TVO Group's operations, and their questions are answered. In 2021, the visits were carried out remotely as Digital Visits due to the COVID-19 pandemic. The traditional close cooperation with schools was continued during 2021 through digital

school visits. For example, the traditional Energy Day organised for ninth grade students from Eurajoki upper secondary school was carried out remotely. The children's science and technology camps were postponed to a time when they can be organised safely.

### Impacts on the local community and surrounding environment

The TVO Group's strongest positive impact on the immediate community is related to economic well-being and activity in the area, achieved through employment. The local community's attitude towards investments by the TVO Group, such as the OL3 project and the ONKALO project of Posiva, is positive. The real estate taxes paid by TVO and Posiva have a significant economic impact on the municipality of Eurajoki, and the neighbouring municipalities in the region also benefit from the taxes paid by TVO Group employees. The TVO Group and the OL3 construction site are important sources of employment and economic prosperity in the region, both directly and indirectly. Product and service purchases also provide employment and income to local people. TVO's most significant

measurable negative effect on the region is an increase in the temperature of the sea in the vicinity of the power plant. The increase in the temperature of seawater is regularly monitored and measured, together with the impact of the increased temperature on the seabed.

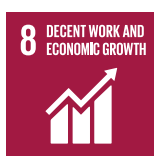
### Memberships in nuclear industry organisations

The TVO Group is an active participant in both the national and international nuclear power community, as well as in various organisations and communities of the nuclear energy sector.

TVO's most significant international memberships are those in FORATOM, the trade association for the nuclear energy industry in Europe, and the World Association of Nuclear Operators (WANO) which focuses on the development of nuclear safety. TVO also complies with the recommendations and requirements of the International Atomic Energy Agency (IAEA).

SDG

TARGET



#### Stakeholder cooperation

- The most important stakeholders feel that the TVO Group's activities can be trusted, and that the Group communicates transparently on its operations. The indicators measuring the aforementioned aspects are over 75 (excellent) in the stakeholder survey (continual).

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## Visits

**THE OLKILUOTO** Visitor Centre stayed closed from visitors the whole year due to the COVID-19 pandemic. Digital Visits, which were started at the end of 2020, got such a good reception from audiences, that the concept was decided to be included in activities even after the pandemic. During 2021, a total of 3,859 participants from all over Finland, and even some from abroad, got to know Olkiluoto through Digital Visits.

## Sponsorship activities

**TVO SUPPORTS** sports, cultural endeavours, and activities for the public good. TVO's sponsorship principles are built on the company's values, and the supported activities must be in line with the TVO Group's strategy and operating principles. When selecting partners and sponsorships, the emphasis is on offering opportunities for recreational activities to children and young people in the local area. TVO mainly supports activities that reach large numbers of people and are open to everyone.

The most important sponsorship recipients in 2021 were:

- Rauman Lukko (ice hockey; representative team and juniors)
- Pallo-liriot (football; representative team, girls' football, juniors, and supervised exercise for children)
- Fera Association (Finnish baseball; Fera women's representative team and junior girls' teams)
- Rauma Golf
- Eurajoen Veikot (various sports)
- TVO supports the local community by sponsoring sports, cultural endeavours, and associations in the immediate vicinity of the power plant.

In addition to sponsorships, TVO makes annual donations to organisations, communities, and student groups who work for the public good. In 2021, donation recipients included a mental health centre in Rauma; Kriisikeskus Ankkurpaikk'.

Decisions concerning sponsorships and donations are made by TVO's HR Competence Centre together with the management of the company. In line with the sponsorship principles, TVO does not sponsor any activities that do not comply with the TVO values, ethical code, or principles of social responsibility, or any political or religious organisations or projects.



# Responsible procurement operations

**High-quality procurement ensures safe, competitive and reliable production and the long-term operation of the plant units.**

**THE TVO GROUP** and the OL3 construction site are major employers and providers of financial well-being in Finland and the Satakunta region, both directly and indirectly. Purchases of products and services provide work and employment in the entire country. Furthermore, TVO and Posiva pay real estate tax to the municipality of Eurajoki.

When selecting suppliers, particular attention is paid to the continuity of the suppliers' operations, delivery reliability, quality, management of the environment and occupational health and safety

as well as competitiveness, while also valuing domestic and local suppliers. Suppliers are evaluated, delivery quality is monitored, and immediate corrective measures are taken when necessary.

The TVO Group only purchases products and services from evaluated and approved suppliers. The Group utilises a supplier classification that is performed for all suppliers. Suppliers are classified on the basis of how significant their operations are for the Group's safety and the potential risks inherent to its production operations. The purchased products and services must meet the TVO Group's requirements concerning safety, quality and the environment. Furthermore, the TVO Group requires that contracting parties use operating methods that comply with the TVO

Group's Code of Conduct and policies. Orders can be placed with evaluated and approved suppliers only.

## Audits – a quality assurance method

**THE TVO GROUP'S** suppliers generally apply a level of requirements in accordance with the ISO 9001 quality management system, ISO 14001 environmental management system, and the ISO 45001 occupational health and safety system. Auditing is one of the quality assurance methods used. The audits may be performed by the TVO Group itself or a third party. The TVO Group has the right to audit the management systems for quality, safety, information security, and the environment, as well as the operations of its contractual partners and subcontractors to the extent it considers necessary. Contractual partners are obligated to ensure that the above-mentioned right is included in all contracts between the contractual partner and its subcontractors in the entire supply chain. STUK may participate in the audits to validate the operations of the TVO Group and its subcontractors.

## Procurement of uranium

**TVO HAS HIGH-LEVEL** in-house expertise regarding all the stages of the fuel procurement process. TVO procures its fuel mainly through a decentralised supply chain, entering into negotiations and making procurement contracts with each separate supplier at the various stages of the fuel production chain. There are several suppliers for each stage in the chain, and the procurement operations are regularly subjected to competitive bidding.

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**The TVO Group requires that contracting parties use operating methods that comply with the TVO Group's Code of Conduct and policies. Partners must uphold a high level of safety culture and responsible practices in their own operations.**

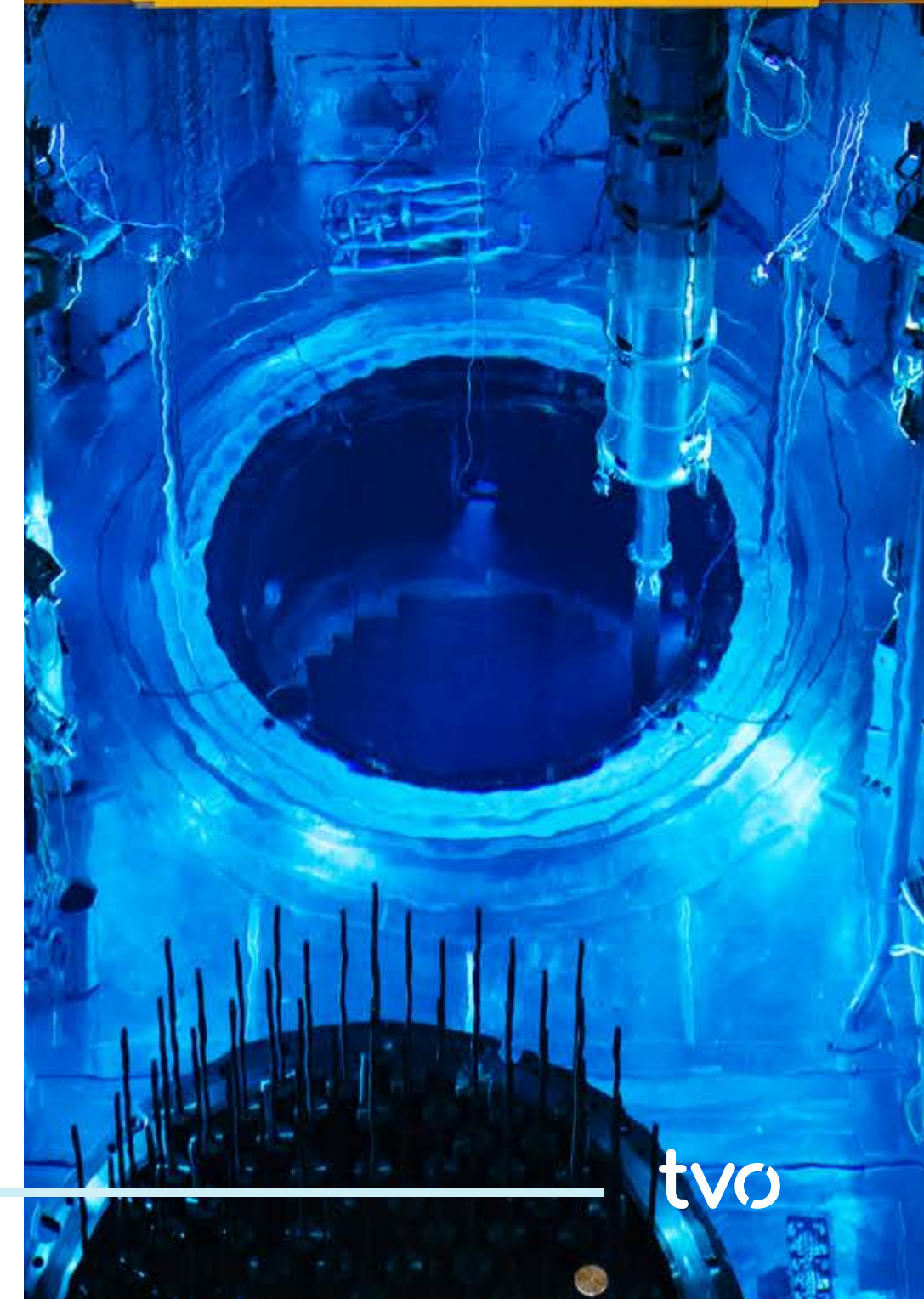
SDG

TARGET

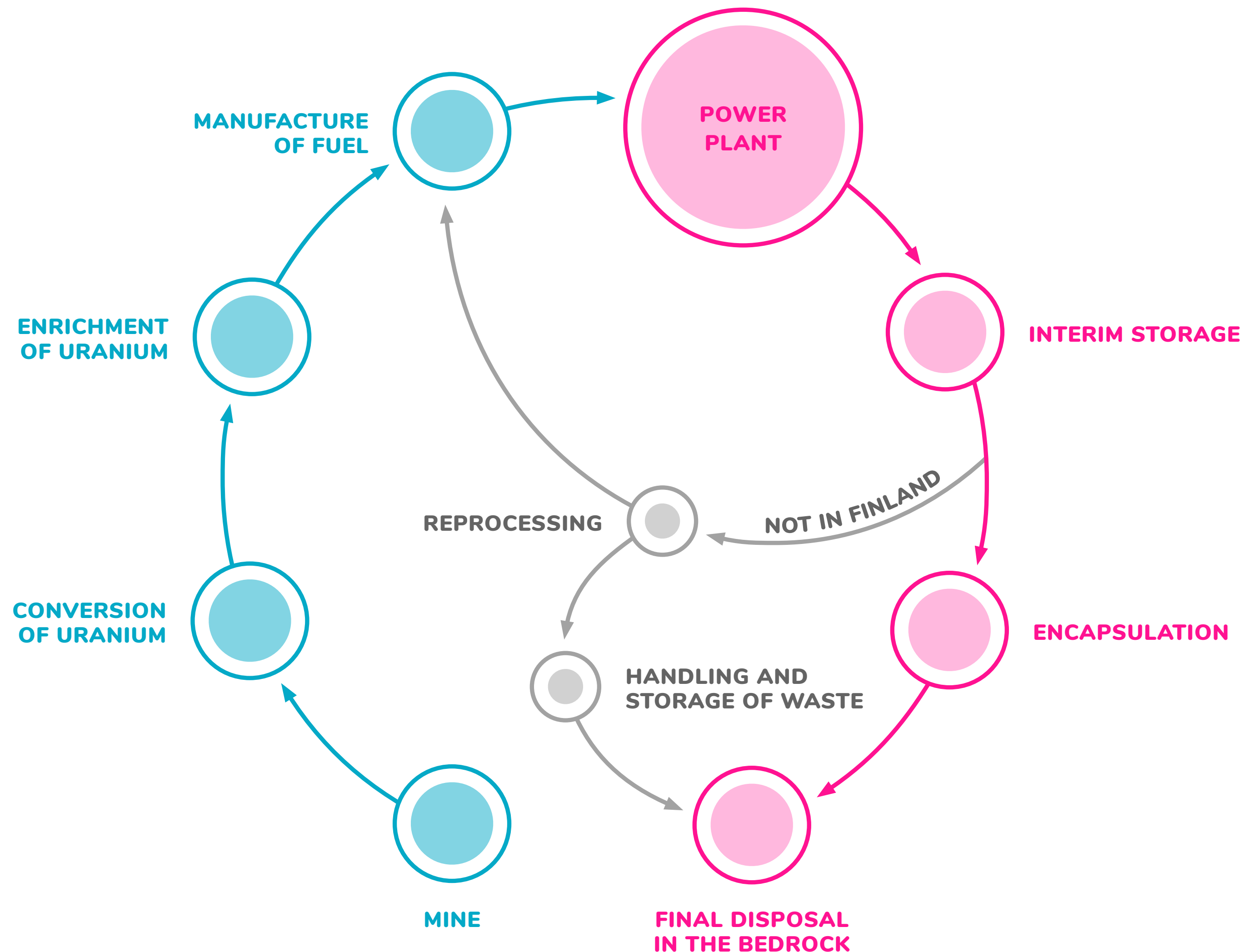


### Responsible supply chain

- All suppliers of raw uranium and its conversion services are evaluated every 3–5 years depending on the supplier.



# Circulation of Uranium



Furthermore, the composition of the fuel and the manner in which it is used are designed by TVO itself. The policy chosen by TVO clearly strengthens the company's position as Finland's leading supplier of nuclear power. Procurement operations are based on long-term contracts with leading suppliers. These companies have mining operations in many countries. If required, TVO also purchases additional batches and services from the market, the development of which is followed actively. Most of the uranium procured by TVO comes from Kazakhstan, Canada, and Australia. The fuel elements ordered by the company are constructed and assembled in Germany, Spain, or Sweden.

## TVO subjects fuel suppliers to strict evaluation

**TVO EMPLOYS** a supplier evaluation process and only procures uranium and nuclear fuel refining services from suppliers who have passed the evaluation. A systematic evaluation process precedes the closure of each supply contract. In addition to the requirements set for the products, the process also considers the reliability and responsibility of the supplier.



**The purpose of supplier evaluation is to ensure that suppliers pay appropriate attention to environmental issues, the well-being of personnel, and quality management.**

TVO's supplier evaluation also includes active monitoring and evaluations at fixed intervals. Remote monitoring in Finland and visits to production sites both provide TVO with an opportunity to examine the suppliers' practices and, when necessary, to intervene in their practices. The purpose of supplier evaluation is to ensure that suppliers pay appropriate attention to environmental issues, the well-being of personnel, and quality management. Special issues concerning mines are also considered, such as the impact of the mining operations on local people.

# Research and development

A key target of TVO's research and development (R&D) activities is to ensure the viability of the current business functions and to create new business opportunities for the TVO Group. The vision for R&D is to be a bold innovator and developer that enables the TVO Group to remain a pioneer within the nuclear energy industry.

**MODERNISATIONS** and modifications carried out at the plant units, as well as the monitoring and use of new technology, create new research needs. Storage, handling, and final disposal of waste comprise another important research area.

The total R&D expenses in 2021 were EUR 18.2 million, of which most were used for R&D related to nuclear waste management. TVO is the largest contrib-

utor to the financing of Finnish national public research programmes on nuclear power plant safety (SAFIR2022) and nuclear waste management (KYT2022). In 2021, TVO paid a total of EUR 5.1 million in research fund related contributions to the Finnish State Nuclear Waste Management Fund.

## Important nuclear sector researcher and developer

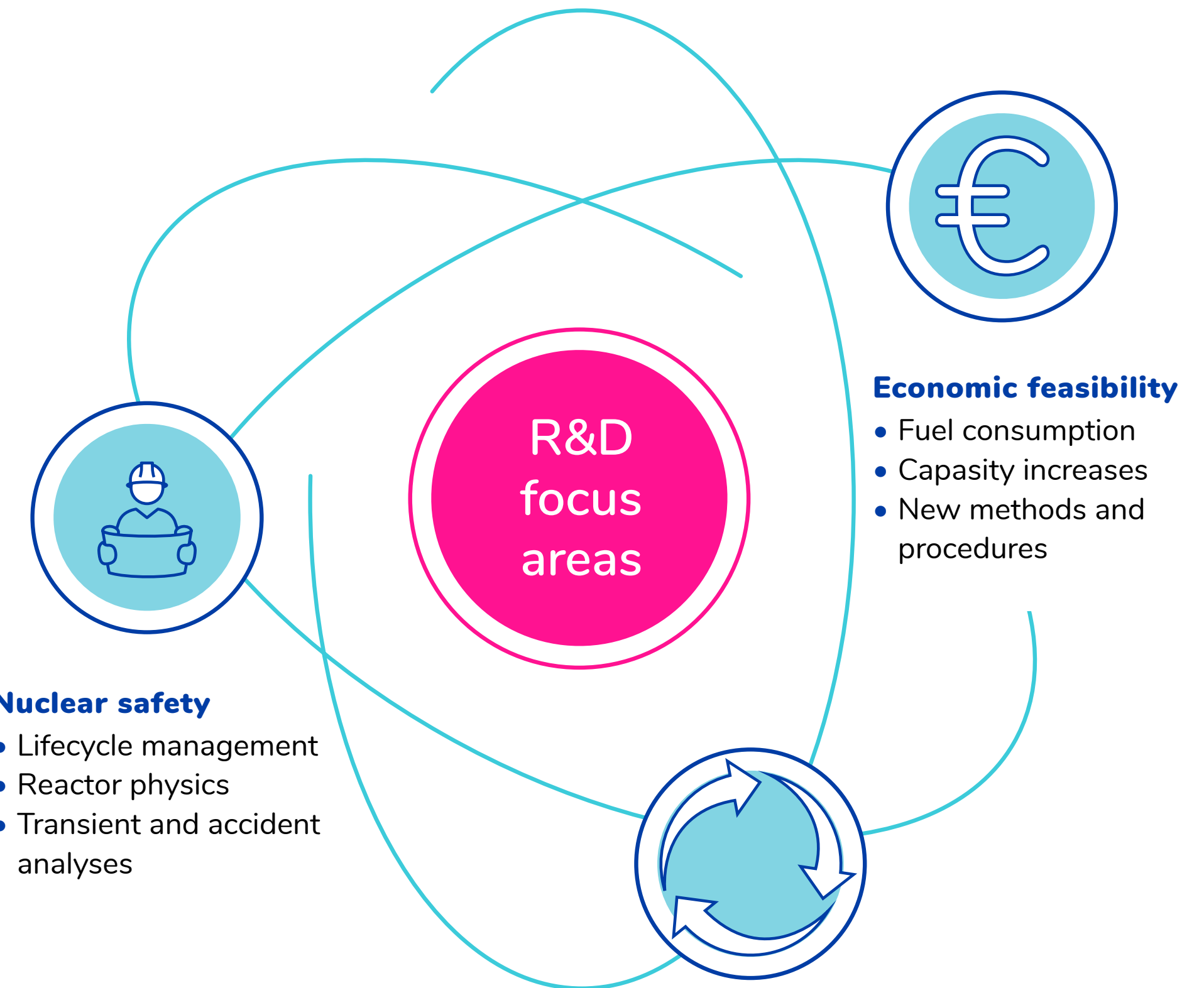
**OVER THE PAST** few years, general developments in the industry and TVO's plant projects have significantly altered the needs for research and development within the nuclear energy industry. Expanding production and extending the operating life of the plant units are changing the goals of plant technology research and research into nuclear waste management.

The purpose of R&D activities is to use research to produce information supporting the safe operation and decommissioning of the Olkiluoto plant units. The aim is also to remain agile, testing new ideas and offering opportunities for the TVO Group to experiment with various new things.

Actions are guided by the following objectives:

- **Economy:** Ensuring an operating life of 60 years for the plant units, possible operating life extension and the utilisation of higher fuel burn-up values.
- **Safety:** The construction of new reactors and the modernisation of existing ones, while meeting all safety requirements and adding to the passive features of the safety systems.
- **Sustainable development:** Developing the final disposal concept for nuclear waste, acquiring the necessary approvals, and placing operating waste safely in final disposal.

The actions aim at securing the functional prerequisites in the longer term by supporting the company's financial goals and the safe operation of the plant units.



### Nuclear safety

- Lifecycle management
- Reactor physics
- Transient and accident analyses

### Economic feasibility

- Fuel consumption
- Capacity increases
- New methods and procedures

### Sustainable development

- Waste management
- New concepts (Small Modular Reactors, SMR)
- Fuel development
- Resources

## SDG TARGET



### Research & development

- R&D operations advance the safety, business activities, and future technological solutions of the plant units and final disposal of spent fuel with the help of networks and research projects (continual).

In 2021, TVO engaged in the following research projects, among others:

#### **SMR2029 and hydrogen survey**

The aim of the Small Modular Reactor 2029 (SMR2029) project is to support TVO's long-term strategic planning and to produce information on small modular reactors (SMR) in order to support planning and decision-making. A key target of the project is to increase knowledge and understanding concerning the opportunities and challenges of SMR plants from TVO's point of view.

The key design basis for SMR plants is the modular structure of the main components and standardised serial production. The aim is to develop legislation and authority processing in order to make it correspond to the requirements of SMR plants as regards safety and feasibility. Matters related to legislation and authority processing include topics such as nuclear material safeguards, security arrangements, plant operation, continuous supervision, and final disposal. The practices and agreements related to these are being developed by the authorities in international cooperation, as well as where national legislation is concerned.

In 2021, the R&D project involving small modular nuclear reactors that was launched at TVO in 2020 was continued. The objective of the project is to investigate the use of SMRs in electricity and heat production, as well as the feasibility and profitability of different technical alternatives in Finnish circumstances and as part of the Finnish energy system. The project is carried out as part of the broader EcoSMR project funded by Business Finland and coordinated by VTT Technical Research Centre of Finland.

A lot has happened within the energy sector during the course of the SMR2029 project. TVO is preparing for a paradigm shift in the field of energy and surveying new areas of business that could offer added value for TVO's owners. Interest in SMR plants has remained high, and hydrogen has clearly emerged as a trend alongside them. At the moment, several notable actors are considering that hydrogen economy is a key part of a new energy system as we shift away from fossil fuels.

Hydrogen provides TVO with several opportunities to provide new added value for its owners, utilising its extensive competence in the nuclear energy

industry. This is related to utilising current production capacity, constructing new capacity, and seizing new business opportunities.

#### **TAKU**

One of TVO's strategic choices is to shift to needs-based maintenance (TAKU) in 2024. The aim of the TAKU project is to find new tools and courses of action for needs-based maintenance, to utilise existing tools better, and to develop them.

#### **Electrical and I&C research**

Research in I&C technology focuses on solutions required for the maintenance of the I&C systems at the OL1 and OL2 plant units and the solutions required for the commissioning of OL3. Primary research areas include the ageing of electronics, the commissioning of digital I&C technology, and the enabling of digitalisation to support proactive maintenance.

#### **Fuel research**

Fuel research is TVO's most important area of international research cooperation; its objectives include safe reactor operation, good fuel economy and safe final disposal. Fuel research requires special expertise, available testing reactors, and hot cell studies, which are best obtained





by means of international cooperation and by utilising international readiness for research. Research further specifies and validates the safe use of fuel and accident safety margins at higher burn-up. The behaviour of fuel in storage and after final disposal is another important field of study. TVO also participates in the international OECD-NEA Studsvik Cladding Integrity Project (SCIP IV) to investigate the behaviour of fuel rods during various reactor transients, as well as phenomena and solutions related to the handling and storage of spent nuclear fuel.

### Nuclear waste research

The handling and final disposal of operating waste and the long-term safety of the operating waste repository (VLJ repository) are an important area of research and development for TVO. The long-term safety of the VLJ repository is assessed by means of safety analyses; as

regards bedrock, this requires information regarding the geology of the nearby rock, hydrogeology and groundwater chemistry. Furthermore, various material tests and material sample studies, such as a gas generation test, disassembly waste metal studies and concrete dilution studies, are under way in the VLJ repository.

### 3D printing

A 3D printing project is under way at TVO, the aim of which is to gain access to a new method of manufacturing components for the nuclear energy industry. The digitalisation of spare parts is a major step towards more sustainable business and a smaller carbon footprint. It also generates cost savings while improving the availability of spare parts and making them quicker to acquire. In 2021, a valve with a 3D printed body was tested at the Olkiluoto nuclear power plant in cooperation with Fortum.



## Cooperation and networking

**AS REGARDS R&D** activities, TVO widely utilises both domestic and international networks. In Finland, the most important partners are the other nuclear power companies Fortum and Fennovoima, and the research institutions VTT Technical Research Centre of Finland, Lappeenranta-Lahti University of Technology (LUT), University of Helsinki, Aalto University, and Tampere University. In the field of international cooperation, TVO is active in R&D efforts on the Nordic level, with other European partners and on a wider international scale. At the Nordic level, the cooperation mostly takes place through the Energiforsk research programme, and by participating in the funding of NKS and NPSAG research. At the European level, cooperation has been arranged through the SNETP (Sustainable Nuclear Energy Technology Platform), NUGENIA, and Euratom's research projects.

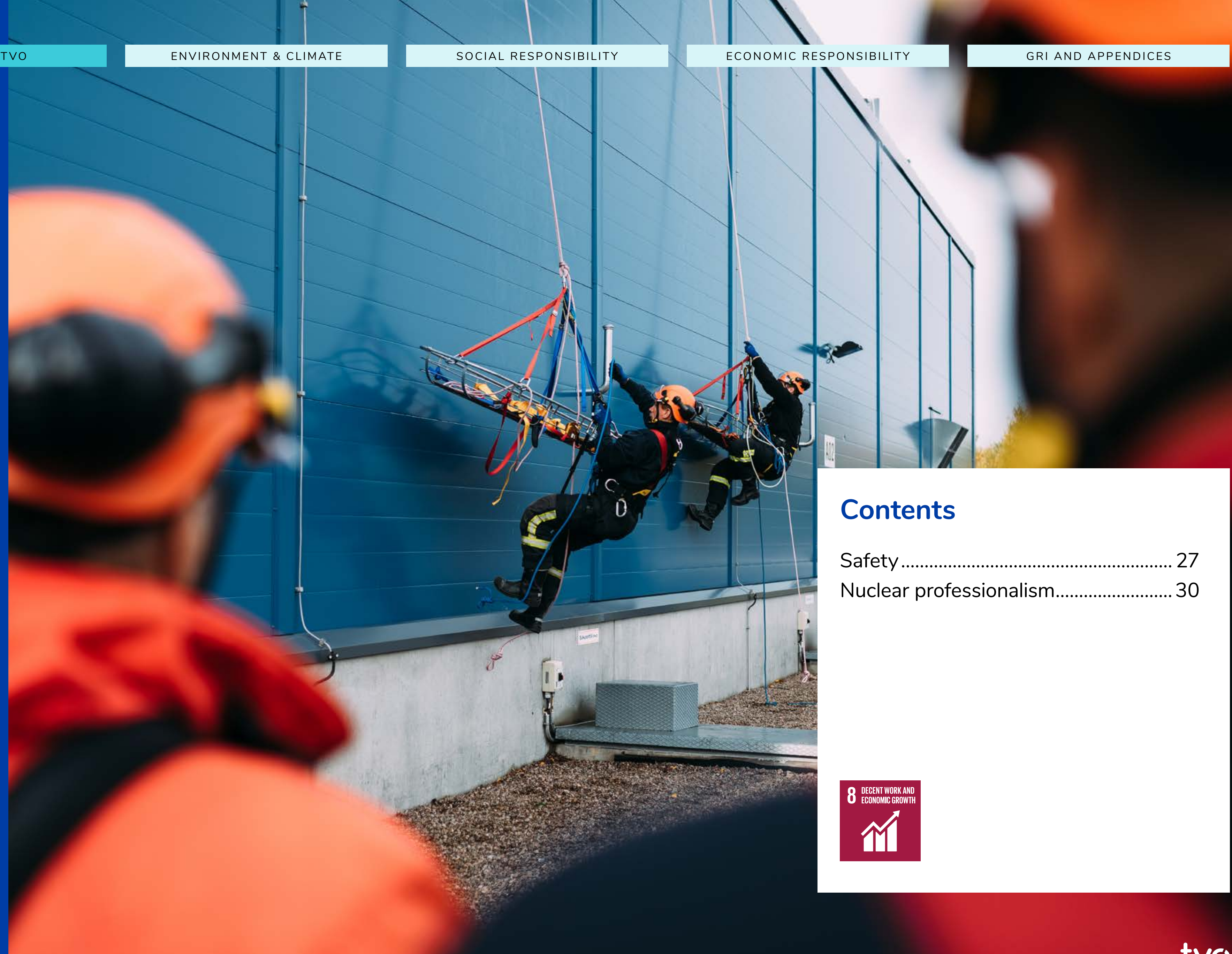
# Safety at TVO

## Particle-larly versatile safety thinking

**AT THE TVO GROUP**, safety aspects are at the core of all operations and they are developed in accordance with the principle of continuous improvement.

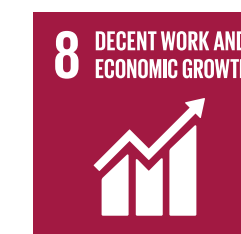
A high level of safety culture is the cornerstone of good and safe production. Strong commitment, responsibility, maintaining competence, and the continuous development of activities are prerequisites for the operation and maintenance of the plant units.

TVO has a safety culture programme that aims to achieve the IAEA's highest safety culture level, i.e. to create a learning organisation.



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# Safety

The safe operation of the Olkiluoto nuclear power plant is based on competent and responsible personnel, high-quality plant technology, the principle of continuous improvement, and independent internal and external supervision. TVO's activity management system meets the requirements for quality, the environment, and occupational health and safety. In order to ensure safe operations, TVO systematically assesses the level of its safety and safety culture, and all of the employees are committed to a strong safety culture.

**TVO REGULARLY** assesses the state of overall safety in terms of production, nuclear safety, security and service life

management as well as leadership, the organisation, and personnel. The level of safety is good.

The state of the safety culture is regularly assessed according to the IAEA's procedure. TVO's safety culture is estimated to be at a level where the strategic importance of safety has been recognised and proactive practices are employed. TVO aims to reach the highest possible level of safety culture. TVO has continued to employ various measures to maintain and develop the safety culture.

TVO regularly assesses and develops the operation of its plant units with the help of internationally used safety indicators. The sustainability goals

related to safety and safety culture are described in more detail in the TVO Group's Sustainability Roadmap 2030 (p. 14-15).

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 2021, eight events rated as INES level 0 (no nuclear or radiation safety significance) took place at the Olkiluoto plant. TVO analyses and investigates all events that may have affected nuclear safety and defines the corrective actions for their causes. TVO publishes news on any significant events that may be of public interest on its website.



The onion graph indicates the currently used oversight model. The oversight model consists of the organisation's self-monitoring, independent monitoring within the company, peer reviews, and regulatory oversight.

**SDG TARGET**



**Safety culture**

- No deficiencies in IAEA's safety culture levels 1 and 2 (continual).

**Plant safety**

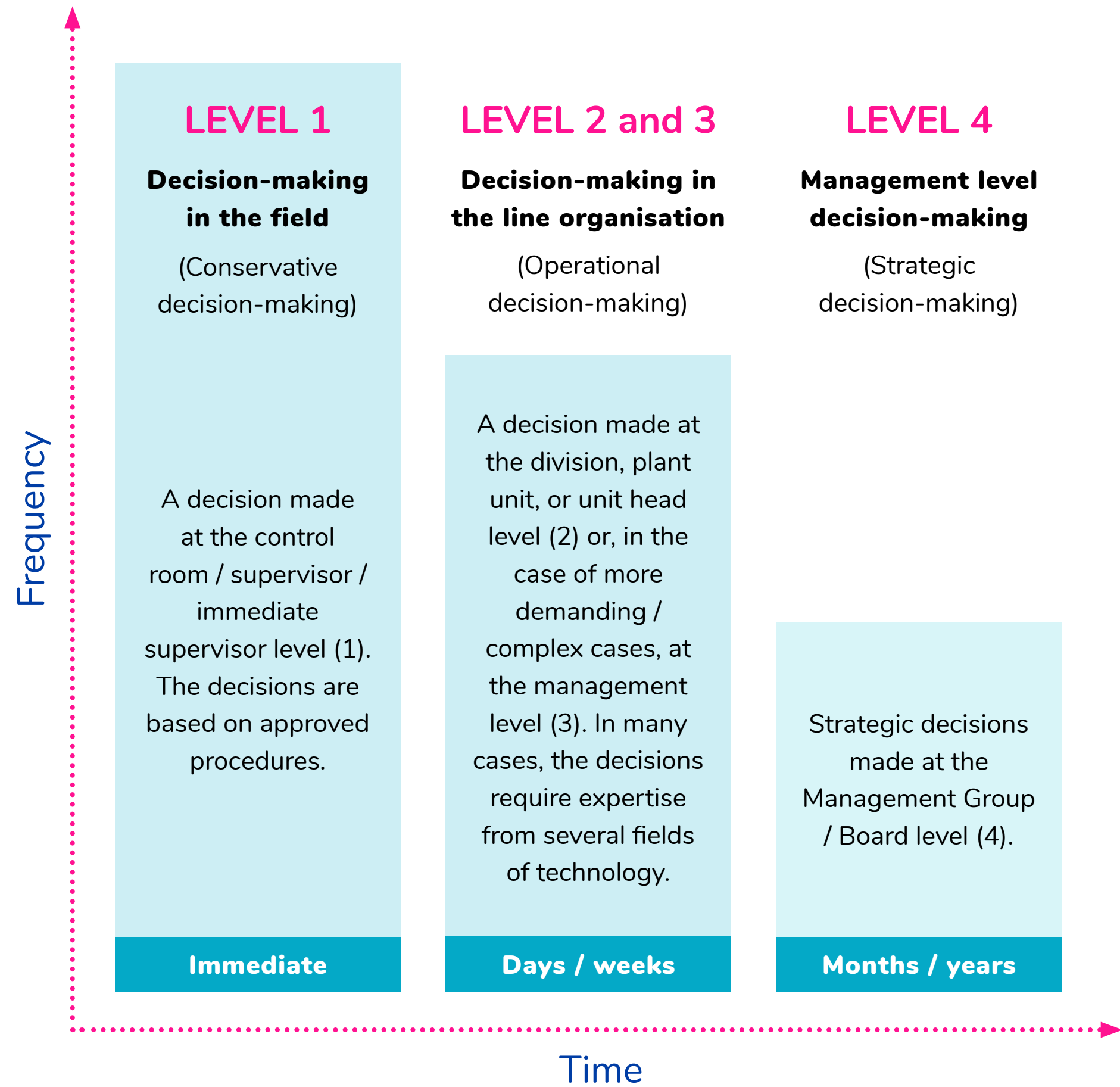
- No events at INES 1 or higher (continual).

**Read more**

about the INES-scale:

[Click here >>](#)

# Operating line's decision making process



## Plant modifications to further improve safety

**THE OL1 AND OL2** plant units are continuously maintained in good condition in terms of production and functionality through alternating refuelling and maintenance outages at the plant units.

The 2021 annual outages of the Olkiluoto nuclear power plant were started with a refuelling outage at the OL1 plant unit on 25 April. The refuelling outage was completed on 11 May. The annual outage for OL1 consisted of refuelling and several other tasks, some of which were postponed from the annual outages of 2020 due to the COVID-19 pandemic. The work included main transformer replacement and a pressure test of the reactor's primary circuit.

The annual outage for OL2 was a maintenance outage that started on 16 May and ended on 18 June. In addition to refuelling, major work during the service outage included pump and piping replacements in the shut-down cooling system, replacement of containment electrical penetration

modules, sea water channel repair, feed water system recirculation line modification, containment leak-tightness test, and inspection and vacuum cleaning of the reactor pressure vessel bottom. Numerous special procedures and arrangements were put in place during the annual outages to protect peoples' health in Olkiluoto and prevent the possible spread of COVID-19, as well as to ensure safe and high-quality annual outages.

The annual outages were carried out successfully despite special arrangements due to COVID-19.

Six lost time industrial accidents occurred during the annual outages.

In addition to TVO's own personnel, some 800 external resources participated in the refuelling outage, while approximately 1,000 external people worked in the maintenance outage. Approximately one hundred specialists arrived from abroad for the annual outages.



**The annual outages were carried out successfully despite special arrangements due to COVID-19.**

## 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 utilises a proactive safety observation procedure to prevent environmental damage. A total of 132 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 2021, a total of 55 litres of oil was released into the soil as a result of the breakage of working machines and equipment. All of the oil was successfully recovered. There were also minor refrigerant leaks from the cooling devices. The environmental authorities are informed of all significant environmental deviations and events.

### Preparation for crises and exceptional situations

Laws, decrees, and regulations provide the framework for TVO's fire brigade operations as well as emergency preparedness and security arrangements. The authority guidelines set the minimum requirements for activities, and TVO carries out its emergency preparedness activities in line with its own action plans.

Olkiluoto has an emergency preparedness organisation that ensures operations are in compliance with the statutory emergency preparedness plan. The emergency preparedness organisation has been formed starting from the normal line organisation. In total, the TVO Group's emergency preparedness organisation includes 250 people in nearly 30 roles.

Several exercises were organised for the emergency preparedness organisation in Olkiluoto during 2021 despite the COVID-19 pandemic, including emergency preparedness exercises, joint exercises with the fire brigade, and joint exercises with the security organisation. Activities were developed and broadened also regarding emergency preparedness thinking during the year, since normal courses of action were not completely possible due to the pandemic restrictions.

The plant disturbance in 2020 was also used as a learning opportunity during the past year, and activities have been extensively developed throughout the organisation.

Emergency exercises are arranged regularly each year, and their scope and duration vary according to the goals of the exercise. The aim of exercises, among other things, is to test the functionality and coverage of the instructions and to reinforce cooperation between the different actors. The key cooperation partners for the emergency exercises are STUK, the police, and the rescue department.

Preparing for emergencies is recorded in the company's guidelines, and these guidelines are also used to create the plans for action, training and exercises relating to emergency preparedness, fire safety, environmental safety, and security arrangements. Emergency preparedness is seen as an interesting and important part of nuclear professionalism. Guidelines are regularly reviewed and updated. Instructions have been created for crisis communication, and their functionality is also tested during the emergency exercises. Corporate Communications is responsible for crisis communication.

## CASE

### OLKI21 emergency preparedness exercise

**EACH YEAR**, exercises are arranged in Olkiluoto to prepare for various emergency preparedness events. In the OLKI21 emergency preparedness exercise held on Wednesday, 8 December 2021, an emergency preparedness event occurring at the OL3 plant unit was being rehearsed.

In addition to the entire emergency preparedness organisation of the TVO Group, STUK and Satakunta Rescue Department took part in the exercise. The aim of the exercise was to rehearse launching emergency preparedness activities, forming an understanding of the situation, and distributing information during the

event by means of announcements made in the Olkiluoto area and the Hopealuoti SMS system.

– The activities for several emergency preparedness roles have been developed as a result of the plant disturbance in December 2020, and the OLKI21 exercise allowed us to test these areas for development, says Corporate Safety Expert **Anni Lähdeoja** who is responsible for the operations of the emergency preparedness organisation.

An exercise report is always drawn up for each emergency preparedness exercise that allows for defining the actions to be taken in order to develop the operations of the emergency preparedness organisation on the basis of the feedback from the exercise.

# Nuclear professionalism

All of the TVO Group's employees, suppliers, and subcontractors are committed to an uncompromising safety culture. Accordingly, all factors affecting the nuclear power plant's safety receive the attention warranted by their significance and are given priority in decision-making. The principle of continuous improvement and the safety culture are inherent features of all day-to-day work.

**IN PRACTICAL WORK**, safety culture means operating in accordance with the principles of nuclear professionalism. Nuclear professionalism means following common policies and guidelines, understanding the safety significance of the work, observing, reporting, and boldly influencing as well as learning from new experiences, with the understanding that results come from good collaboration. The most important aspect of nuclear professionalism is having a responsible attitude.

The development of management principles and working policies in a nuclear power plant has been carried out through defining the expectations for a nuclear professional and taking action in order to reinforce these expectations. The expectations for a nuclear professional are part of TVO's activity management system. TVO also has in place a safety culture programme that aims to achieve the IAEA's highest safety culture level, i.e. to create a learning organisation.

In 2021, nuclear professionalism was further reinforced by starting the Nuclear Professional Leader training programme for supervisors and by setting up a nuclear professionalism group that is tasked with the further development of nuclear professionalism and assessing how human factors can be observed more efficiently in operations.

## Nuclear professionalism



# Climate impact and environmental responsibility

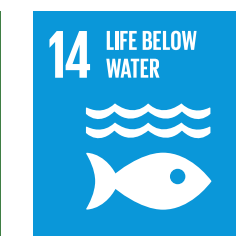
## Towards a particle-larly cleaner world

**ONE OF THE KEY ASPECTS** of responsibility for the TVO Group is the production of climate-friendly electricity. The production of nuclear power generates low carbon dioxide emissions; emissions remain on the same level as for hydropower and wind power during the entire lifecycle. Each year, approximately 12 million tonnes of carbon dioxide emissions are avoided with the electricity production from the Olkiluoto nuclear power plant, when nuclear power is assumed to replace electricity produced by coal. With the production of the OL3 plant unit, this figure will go up to approximately 23 million tonnes.

Through its actions, the TVO Group is committed to advancing both national and international climate goals. The Finnish Government Programme (2019) aims for Finland to be carbon neutral by 2035. The EU's target is to reduce greenhouse gas emissions by at least 55 percent by 2030 (compared to 1990 levels), so that the EU's target for carbon neutrality by 2050 can be reached. As a low-emission form of electricity production, nuclear power has a significant role in achieving these goals.

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# 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 of nuclear power plants and their small land use requirements 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 releases into the air, water, and soil, as well as nuclear waste consisting of spent nuclear fuel.

In particular, the final disposal of nuclear waste is a key question in the use of nuclear power. The TVO Group has a unique solution for the final disposal of nuclear waste that is even known all around the world: ONKALO.

**Nuclear power enables major reductions in emissions**

Nuclear power plays an important role in climate change mitigation. With

**14.44 TWh**

TVO's electricity production in 2021 covered 17% of Finland's electricity demand.

**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.

**30%**

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

URANIUM TO THE POWER PLANT as a result of rigorous supplier evaluations

ELECTRICITY TO THE GRID

SPENT NUCLEAR FUEL to ONKALO

**170 ha**

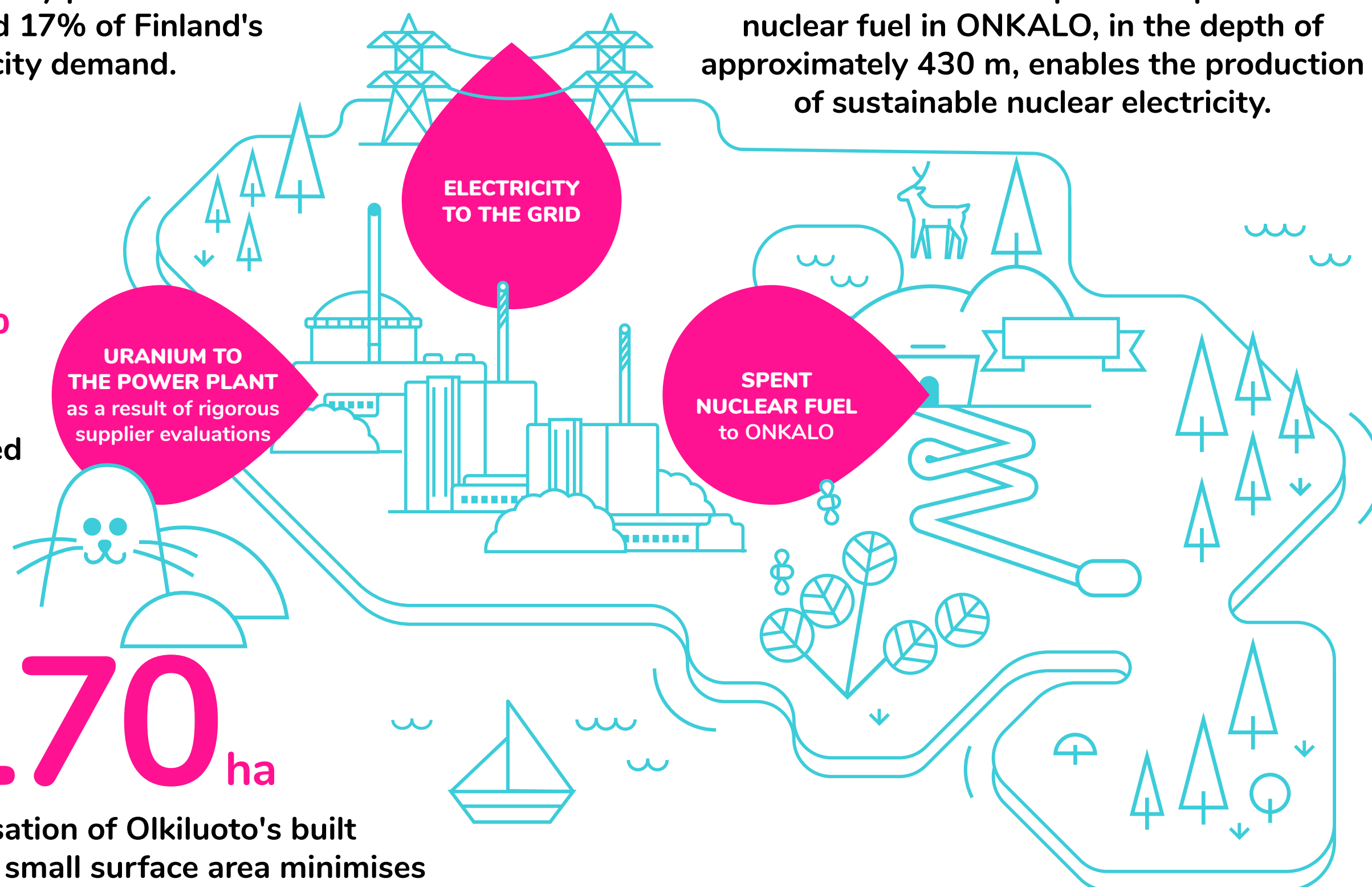
The centralisation of Olkiluoto's built environment to a small surface area minimises the environmental impact and makes it possible to preserve other areas in their natural state.

the current nuclear power production in Europe, approximately 700 million tonnes of CO<sub>2</sub> emissions are avoided annually, of which Finland's share accounts for 20 million tonnes of CO<sub>2</sub> emissions.

Over the course of its entire history, the Olkiluoto nuclear power plant has generated 539 TWh of electricity. This production volume has prevented greenhouse gas emissions of more than 442 million tonnes, 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 tonnes**

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





# Supply of electricity in Finland and its climate impact

The volume of electricity production from Olkiluoto will be nearly doubled when the OL3 plant unit starts production. This means that the low-emission nuclear electricity produced in Olkiluoto will play a significant role in the economic development, electricity self-sufficiency, and general well-being of all of Finland for decades to come.

**FINNISH PEOPLE** are highly concerned about climate change and the majority consider climate change mitigation to be extremely important. Nuclear power is seen to play a major role in the common fight against climate change, and an increasing number of respondents to TVO's latest stakeholder survey believe that it is very difficult for Finland to reduce greenhouse gas emissions into the atmosphere without the construction of new nuclear power plants. Nuclear power plays a key role in achieving climate goals, and the number of people who are in favour of nuclear power due to environmental reasons is increasing.

In 2021, the International Energy Agency (IEA) published its new Net Zero 2050 scenario. The aim of the scenario is to

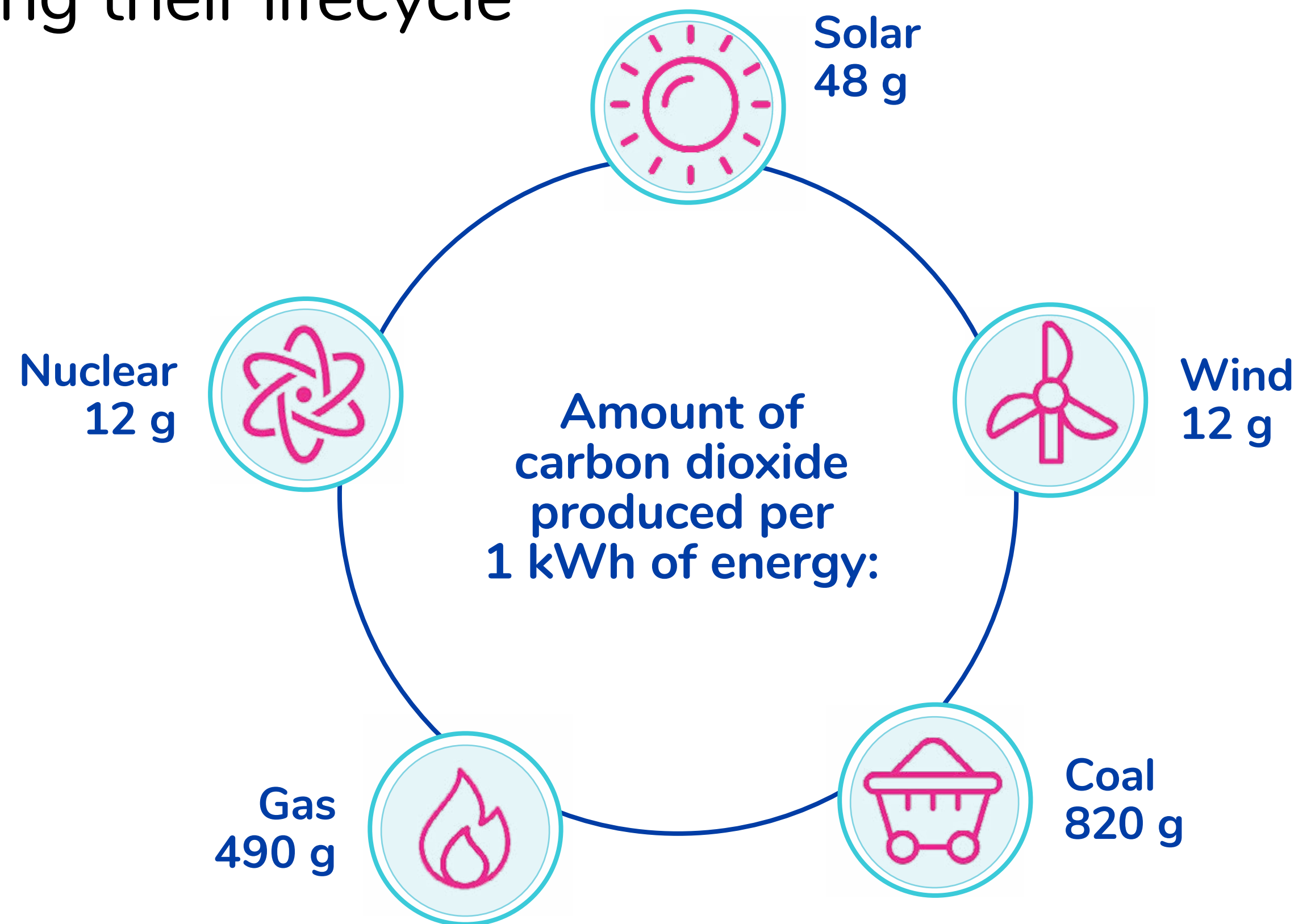
demonstrate the necessary actions to limit global warming to 1.5 degrees Celsius. IEA predicts that meeting the target would require the doubling of existing nuclear capacity by 2050. Nuclear power will remain a major part of the energy mix of Finland and the entire EU as we make our way towards a carbon neutral society. In 2021, the share of nuclear power was about 33 percent of all the electricity produced in Finland.

In terms of greenhouse gas emissions, nuclear electricity is as environmentally friendly an electricity production method as wind power, hydropower, and solar power during its entire lifecycle. The use of bioenergy also does not add to the amount of carbon dioxide in the atmosphere. The electricity generated by nuclear power each year in Finland helps prevent approximately 20 million tonnes of CO<sub>2</sub> emissions.



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

## CO<sub>2</sub> emissions of different production modes during their lifecycle



# Responsibility for the 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.**

**TVO AND POSIVA** carry their responsibility for the environment by identifying the environmental and energy efficiency aspects of their operations and by minimising the related adverse impacts. Operational objectives are specified in compliance with the principle of continuous improvement. Environmental research has been conducted on the Olkiluoto island since the 1970s, years before electricity production was started. The early baseline studies created a basis for the environmental monitoring programmes aimed at facilitating environmental radiation monitoring and determination of the impact on waters. The TVO Group ensures that the personnel and other persons working at the Olkiluoto site have competence and expertise in matters related to the environment.

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The TVO Group ensures that the personnel and other persons working at the Olkiluoto site have competence and expertise in matters related to the environment.

The TVO Group acknowledges the importance of its overall responsibility for the environment during all the phases of the fuel cycle. The safe use of nuclear fuel is ensured from raw material procurement to final disposal. The company monitors and supervises the management of environmental issues implemented by the fuel suppliers. TVO requires that the suppliers 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 is dealt with in a responsible manner all the way from uranium mines to final disposal, according to the principle of “from bedrock to bedrock”. 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 plant is to prevent and further reduce the already low releases 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.

## 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. Plant unit modernisation projects are implemented to improve the energy efficiency of the power plant process.

TVO participates in the Energy Efficiency Agreement and complies with the associated Action Plan for Energy Production that describes the implementation of actions designed to make the use of energy more efficient and to improve the efficiency of primary energy use as well as the total efficiency of energy production.

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 optimising the use and properties of the fuel.

Sustainable utilisation 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. Once OL3 is completed, the production volume will increase to around one-third. The concentration of energy production in a small geographic area minimises 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 the Group-level policies.

# Environment and energy efficiency programme

The Environment and Energy Efficiency Programme has been prepared to ensure the achievement of the environmental targets specified in the Group-level policies and to improve the efficiency of the management of significant aspects related to the environment and energy.

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

In 2021, 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 releases and the thermal load of the cooling water were also continued at the power plant.

In 2021, the operations at the Olkiluoto nuclear power plant and Posiva's spent nuclear fuel disposal facility worksite complied with legislation, environmental permits, and the environmental management and energy efficiency system.

The targets and results of the Environment and Energy Efficiency Programme are presented in the [Environmental Report](#).

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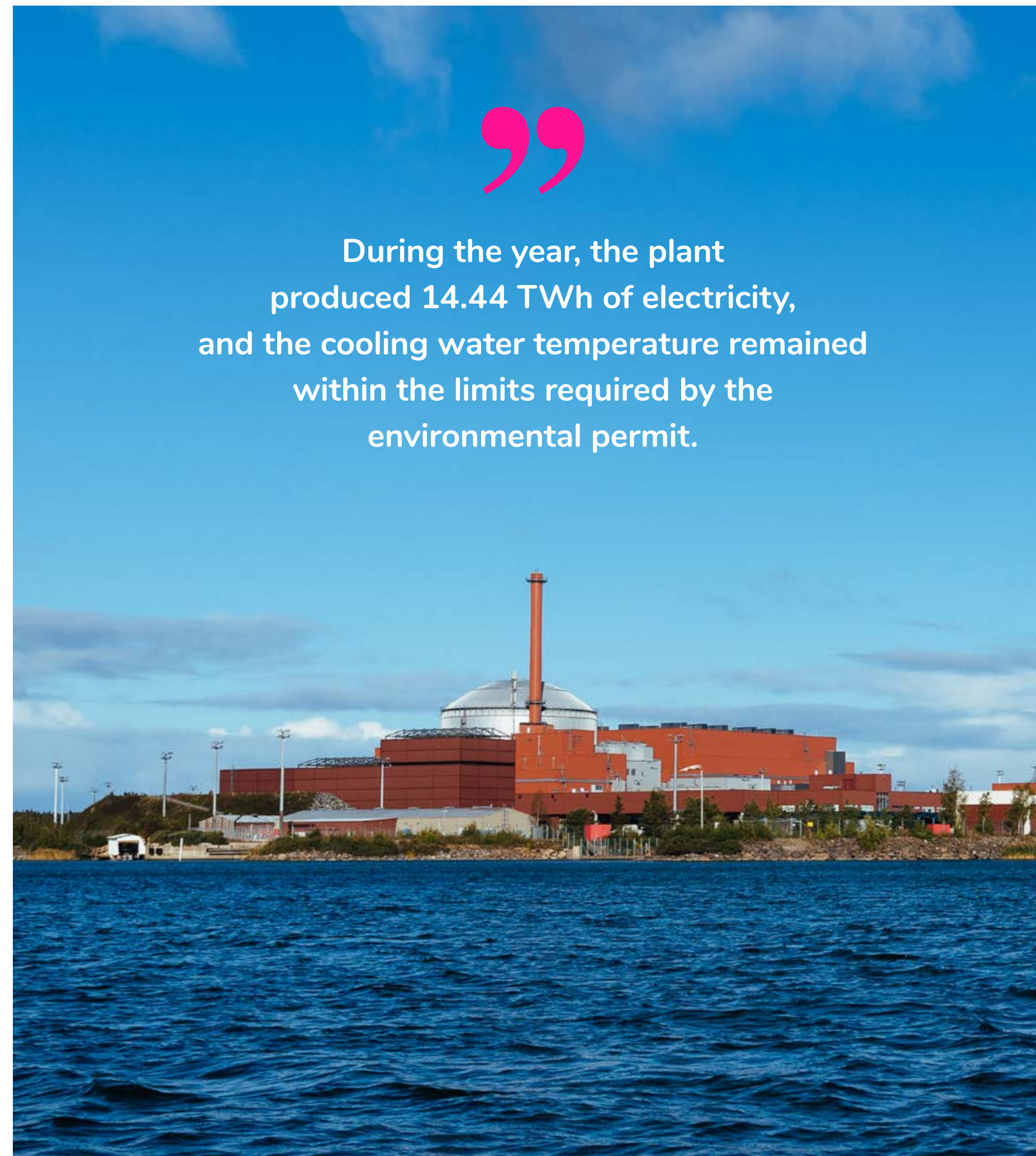
The TVO Group is committed to the promotion of the following climate-related UN Sustainable Development Goals:



# Follow-up of environmental impacts

Under normal conditions, the environmental impacts from nuclear electricity production do not pose any harm to people or the environment. The impact of the Olkiluoto nuclear power plant's operations on land, sea, and air is continuously monitored. Based on the monitoring results, the operations only cause minor environmental load.

**THE MOST SIGNIFICANT** environmental aspect of the Olkiluoto nuclear power plant is the production of climate-friendly electricity, and the most significant impact is the local warming of the seawater near the plant. During the year, the plant produced 14.44 TWh of electricity, and the plant units' cooling water temperature remained within the limits required by the environmental permit. Radioactive releases into the air and water from the nuclear power plant were extremely low. Commissioning tests carried out at OL3 created temporary environmental effects, such as CO<sub>2</sub> emissions due to the commissioning of emergency diesel generators.



”

During the year, the plant produced 14.44 TWh of electricity, and the cooling water temperature remained within the limits required by the environmental permit.

## CASE

### Joint Research Centre of the European Commission: Nuclear power can receive a green status

**THE PREPARATION** of the EU Taxonomy has continued within the European Commission during 2021. It is a classification system which may be used in the future to assess which economic activities are considered sustainable investments within the EU from an environmental point of view.

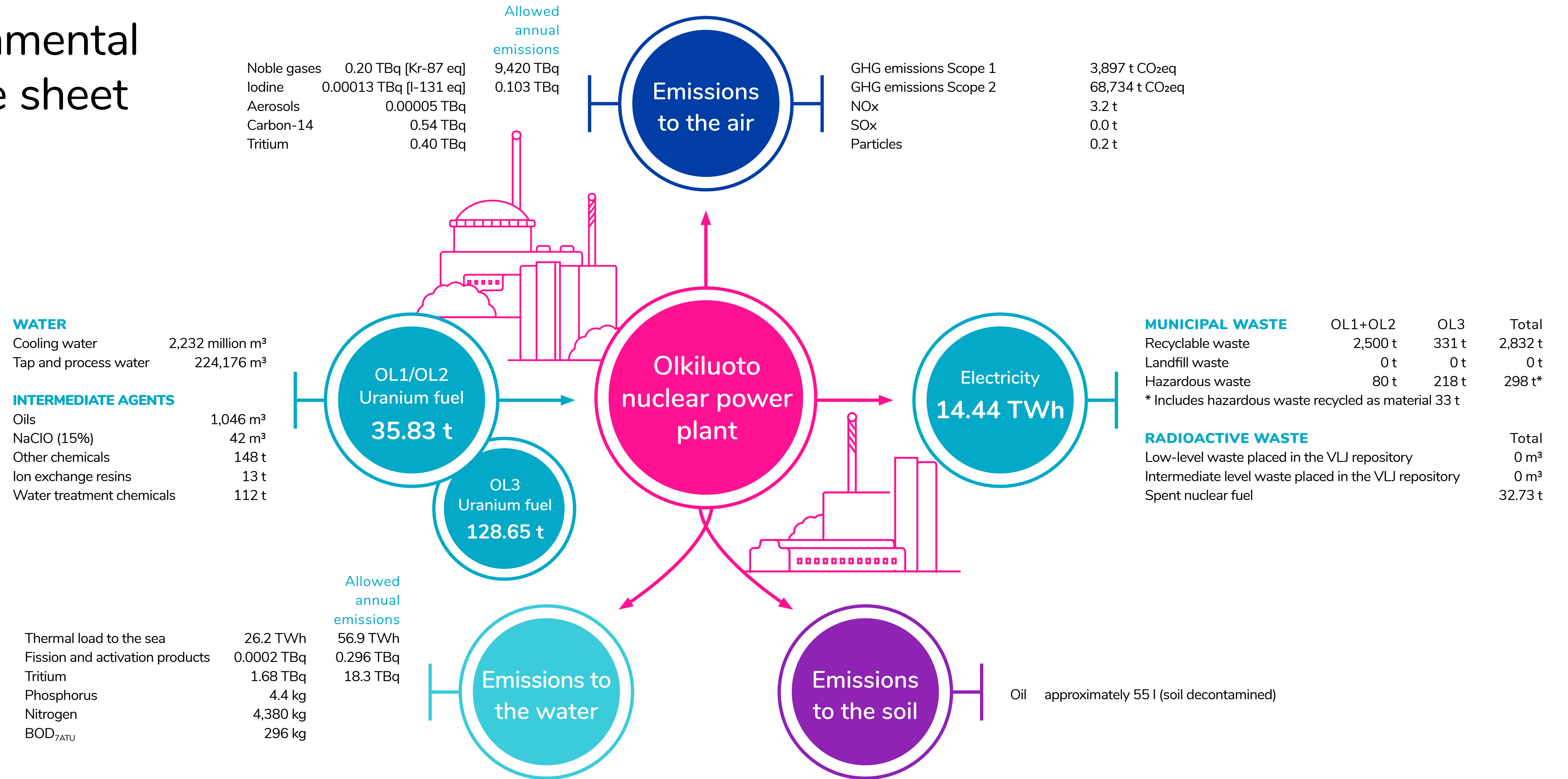
The Commission's Joint Research Centre (JRC) completed its report on the eligibility of nuclear power in March 2021. The report does not present scientific evidence for excluding nuclear power from the Taxonomy – the report says that nuclear power does no more harm to human health or the environment than forms of electricity generation that are already included in the Taxonomy. The report further confirms that the lifecycle emissions of electricity generated by nuclear power are comparable to those of hydropower and wind power.

– It comes as good and expected news that a scientific, independent report proves that nuclear power is a sustainable way of generating electricity, says **Lauri Piekkari**, TVO's Senior Vice President of Treasury, regarding the JRC's results.

The report also states, based on completed scientific analyses, that appropriately implemented and monitored storage or final disposal of spent nuclear fuel will not cause significant harm to human health or the environment. The required technical solutions for the final disposal of spent nuclear fuel already exist. The solutions may be utilised when political and public opinions are favourable. The world's first geological final disposal site, Posiva's ONKALO, will open in Finland during the 2020s.

You can study the JRC's results on [TVO's website](#)

# 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 m<sup>3</sup>/sec.**

**IN 2021**, 2,232 million cubic metres of seawater was used for cooling, and the resulting thermal load on the sea was 26.2 TWh. Seawater temperature is monitored as required by the environmental permit. One of the permit conditions is that the seawater temperature must not exceed the target value of 30°C when measured as a weekly rolling average at a distance of 500 metres from the cooling water

discharge channel. Limit values have also been specified for the amount of cooling water (max. 4,415 million m<sup>3</sup>) and the thermal load (max. 56.9 TWh) in the environmental permit. None of the permit limits were exceeded in 2021.

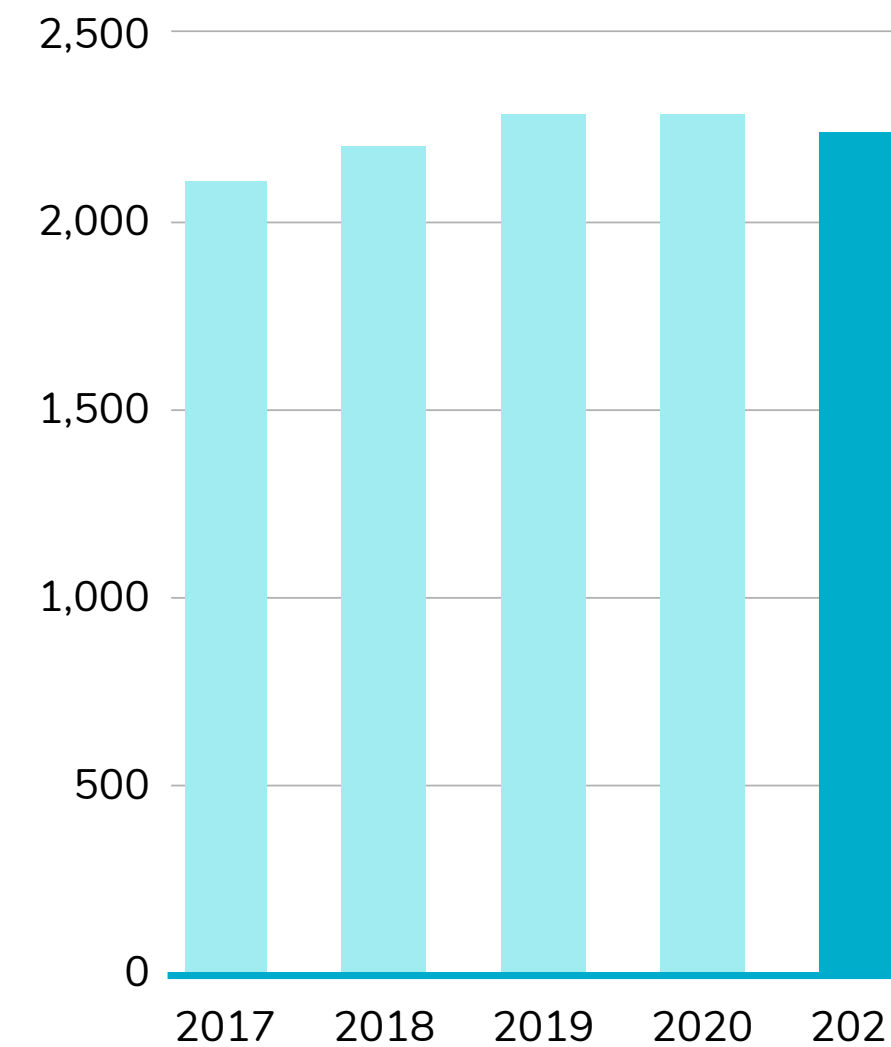
As the cooling water passes through a plant unit, its temperature increases by approximately 10°C, after which it mixes with seawater. The cooling water does not come into direct contact with the power plant's process water. Throughout the operation of the power plant, TVO has monitored the impact from 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 kilometres 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. Warnings about the unfrozen area are issued 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 its overall biological production. Other biological effects caused by the cooling water are minor.

## Water usage Cooling water

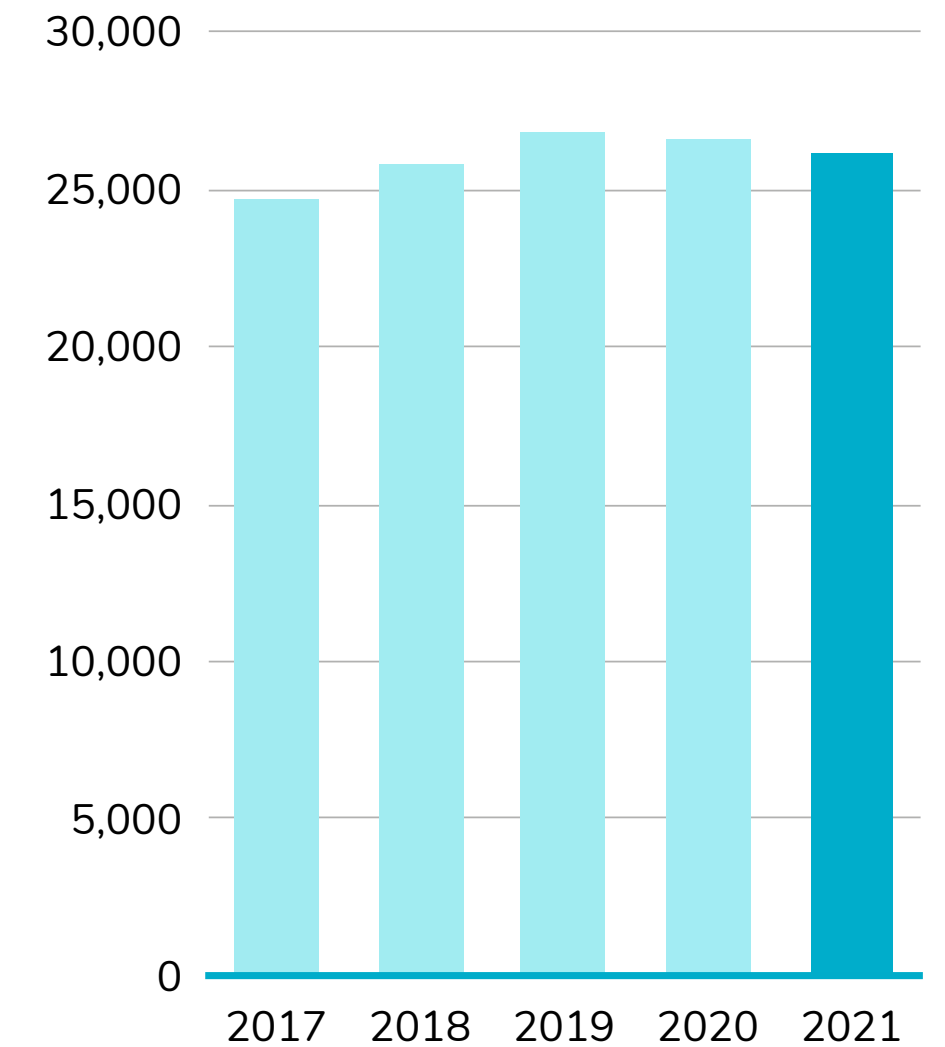
million m<sup>3</sup>




## Emissions

Thermal load on the sea

GWh



SDG
TARGET



14  
LIFE BELOW  
WATER

**Emissions**

- The thermal load of cooling water does not exceed 56.9 TWh annually.

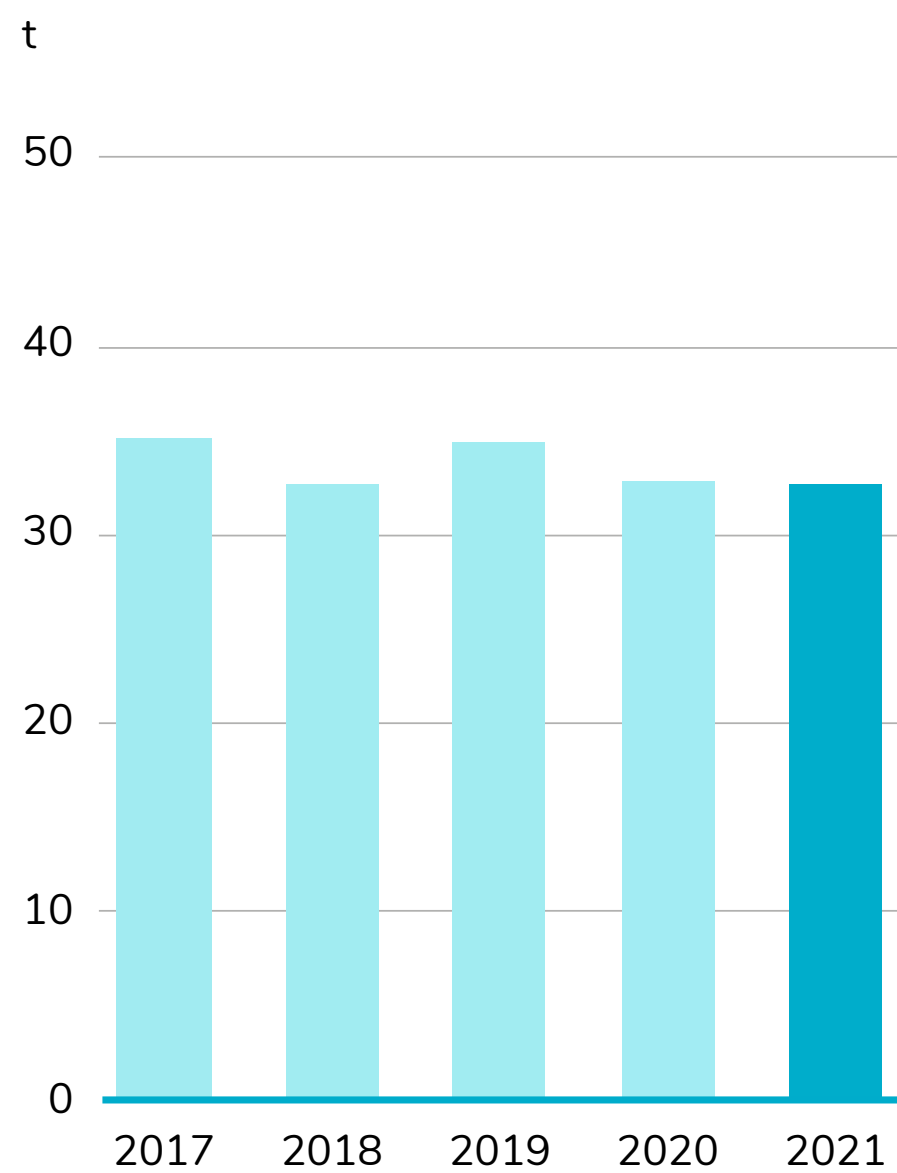
# Raw materials and material efficiency

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. TVO's OL1 and OL2 plant units require an annual total of approximately 40 tonnes 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

Nuclear fuel spent



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

The purchased products and services must meet the TVO Group's requirements concerning quality, industrial safety, and the environment. The availability of products and services necessary for the Group's operations is ensured by means of long-term agreements 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 (oil) of the emergency diesel generators, the reserve power boiler plant and vehicles, and the sodium hypochlorite (NaClO) used for hydroid control in the seawater systems. The ion exchange resin used to clean the process water as well as solvents, bitumen, and nitrogen used at the plant (other chemicals) are among the intermediate agents to be reported. Consumption of oil increased due to the commissioning tests of the emergency diesel generators that help to ensure safety.



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.

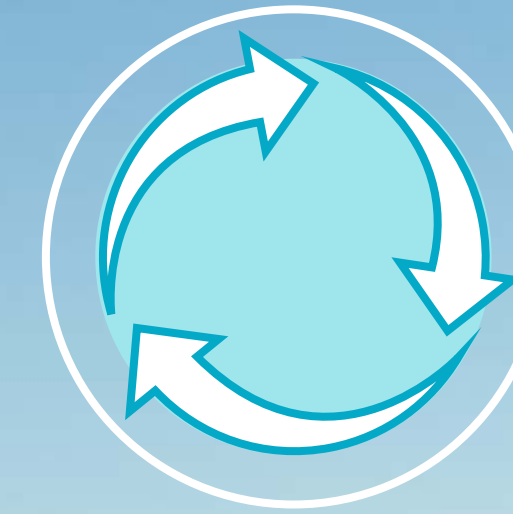
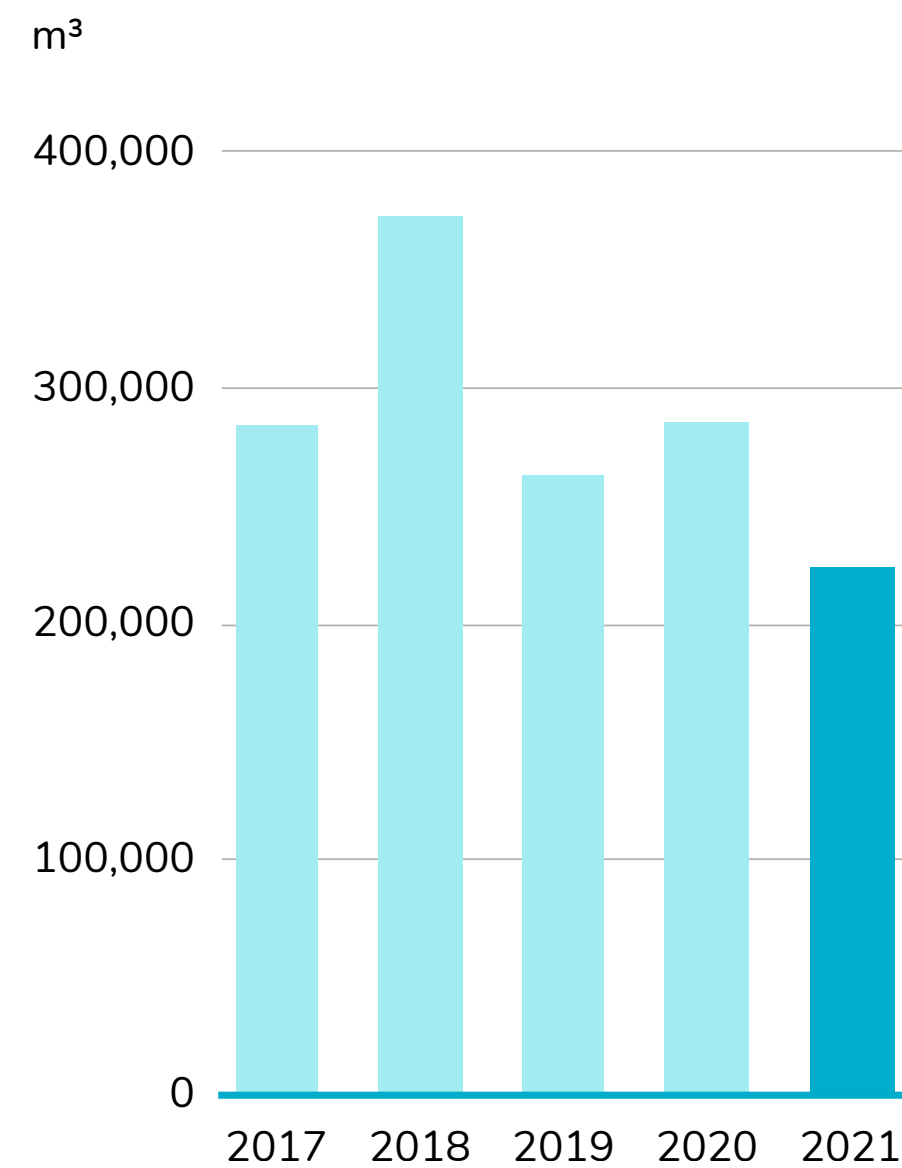
Intermediate agents	2021	2020	2019	2018	2017
Oils (m <sup>3</sup> )	1,046	748	732	657	258
NaClO (15%) (m <sup>3</sup> )	42	48	39	45	40
Other chemicals (t)	148	223	118	137	176
Ion exchange resins (t)	13	15	15	15	17
Water treatment chemicals (t)	112	83	104	153	122

## 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 process water. The process water that boils in the reactor 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 demineralisation plant, a laboratory, and a wastewater treatment plant. The tap water and process water are treated at TVO's own water treatment plant. Ion exchange and reverse osmosis methods are used to purify all the water used at Olkiluoto. Process water is continuously recirculated and purified.

During annual outages, the fuel pool water is stored in storage pools and later reused. The recirculation of water reduces TVO's need for clean process water and the amount of process wastewater discharged from the plant by approximately 30,000 m<sup>3</sup> each year. During the reporting year, 224,176 m<sup>3</sup> of fresh water was taken from the Eurajoki river for use at the power plant.

**Water usage**  
Untreated water



# 30,000 m<sup>3</sup>

The avoided need of clean process water annually due to water recirculation.



# Production and energy efficiency

In 2021, the combined electricity production of the Olkiluoto plant units, OL1 and OL2, was 14,438 GWh. The combined load factor of the plant units was 92.8 percent. TVO produced approximately 17 percent of all the electricity consumed in Finland.

**THE PLANT UNITS** operated safely. OL1 generated 7,404 GWh of electricity. The load factor for OL1 was 95.1 percent. The net generation for OL2 was 7,033 GWh and the load factor was 90.4 percent.

Preparing the OL3 plant unit for production proceeded to nuclear commissioning in 2021. Fuel loading was completed

OL1	2021	2020	2019	2018	2017
Net production (GWh)	7,404	7,310	7,542	6,755	7,158
The plant units' own electricity consumption (GWh)	262	259	268	246	264
Capacity factor (%)	95.1	93.7	96.9	87.8	93.1
Efficiency (net) (%)	35.6	35.5	35.5	35.3	35.1

OL2	2021	2020	2019	2018	2017
Net production (GWh)	7,033	7,277	7,209	7,334	6,256
The plant units' own electricity consumption (GWh)	252	262	258	264	226
Capacity factor (%)	90.4	93.3	92.7	94.3	81.3
Efficiency (net) (%)	35.5	35.4	35.5	35.4	35.4

in April, and the startup of the reactor took place for the first time in December. Electricity production is to start in March

2022, once the plant unit is connected to the national grid. Regular electricity production starts in July 2022.

## CASE

### One of the largest battery energy storage systems in Europe is being constructed at Olkiluoto

**IN 2021**, Hitachi Energy (previously Hitachi ABB Power Grids) and TVO signed a contract on the delivery of one of Europe's largest battery energy storage systems (BESS) to Olkiluoto.

For its part, the 90-megawatt BESS will support the entire energy system in case of a possible production disturbance at the OL3 plant unit, thereby reducing the effects of power changes on the national grid. This turnkey solution acts as a quick power reserve.

– The national significance of TVO's electricity production will increase with the OL3 plant unit, which will soon be completed. Investing in a battery energy storage system will, for its part, secure disturbance-free power supply in Finland. In case of a possible operational occurrence at the nuclear power plant, the BESS will act as reserve power until substitute production has been ramped up. This allows us to secure the operability of the national grid even in situations where a large amount of generating capacity is lost, says **Sami Jakonen**, Senior Vice President of Engineering at TVO.

The BESS will be commissioned during 2022.

Read more on [TVO's website](#)

## SDG TARGET



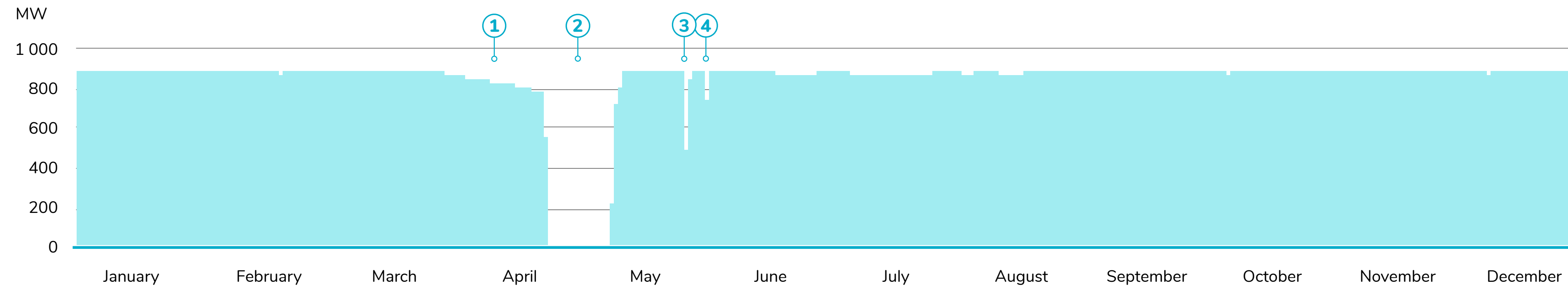
### Reliable use of the plant units

- 0 unplanned automatic scrams (continual).
- Annual unplanned energy unavailability factor <0.4% (1.5 days / year) of total production by 2024.

### Energy efficiency

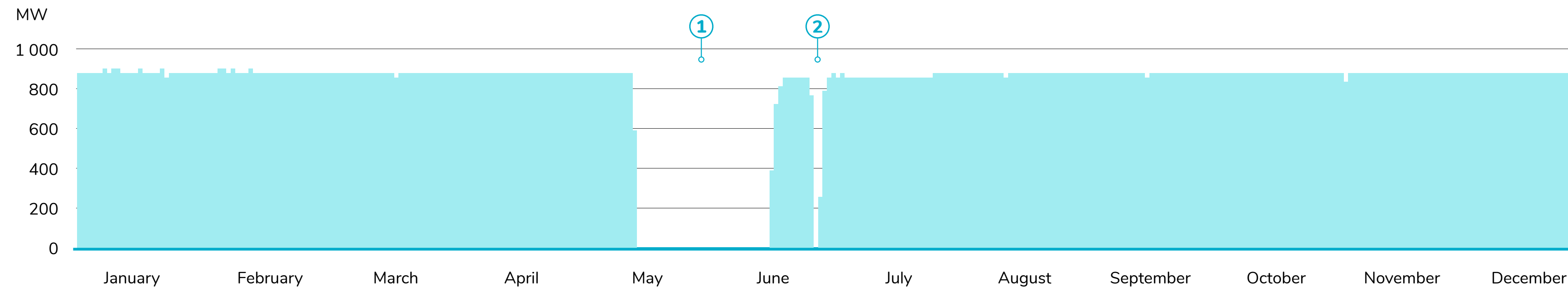
- Commitment to the goals set out in the Energy Efficiency Agreement period 2017–2025, as well as the goals of the following period. Goals are advanced by carrying out at least four location reviews and one plant measurement annually in Olkiluoto.

**OL1 Production**  
Average output



- 1. Coast-down
- 2. Annual refuelling outage
- 3. Inspection of main condenser
- 4. Repair of valve in turbine side

**OL2 Production**  
Average output



- 1. Annual maintenance outage
- 2. Repair of valve in reactor side

## Improving energy efficiency

**FOR SEVERAL YEARS**, the TVO Group 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.



# 34 GWh

district heating from the plant units to buildings in Olkiluoto.

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 energy savings target for the 2017–2025 agreement period is a total of 150 GWh, which corresponds to the average annual consumption of about 7,500 single-family homes with electric heating. The target was already achieved in 2019, so an annual savings target of 1 GWh has been set for 2020–2021.

Energy efficiency measures carried out in 2021 included the renovation of the ventilation in the OL2 entrance building and the HVAC renovation of the operating waste repository (VLJ repository). The modification in the VLJ repository was completed in 2021 and the ventilation work in the OL2 entrance building continues in 2022. During the year, energy reviews were also performed at the Olkiluoto visitor centre and the main gate, for example. A minimum of four location reviews are performed each year, and they are used as the basis for selecting the modifications to be performed. Plant measurements were performed at both of the operating plant units after the annual outages.



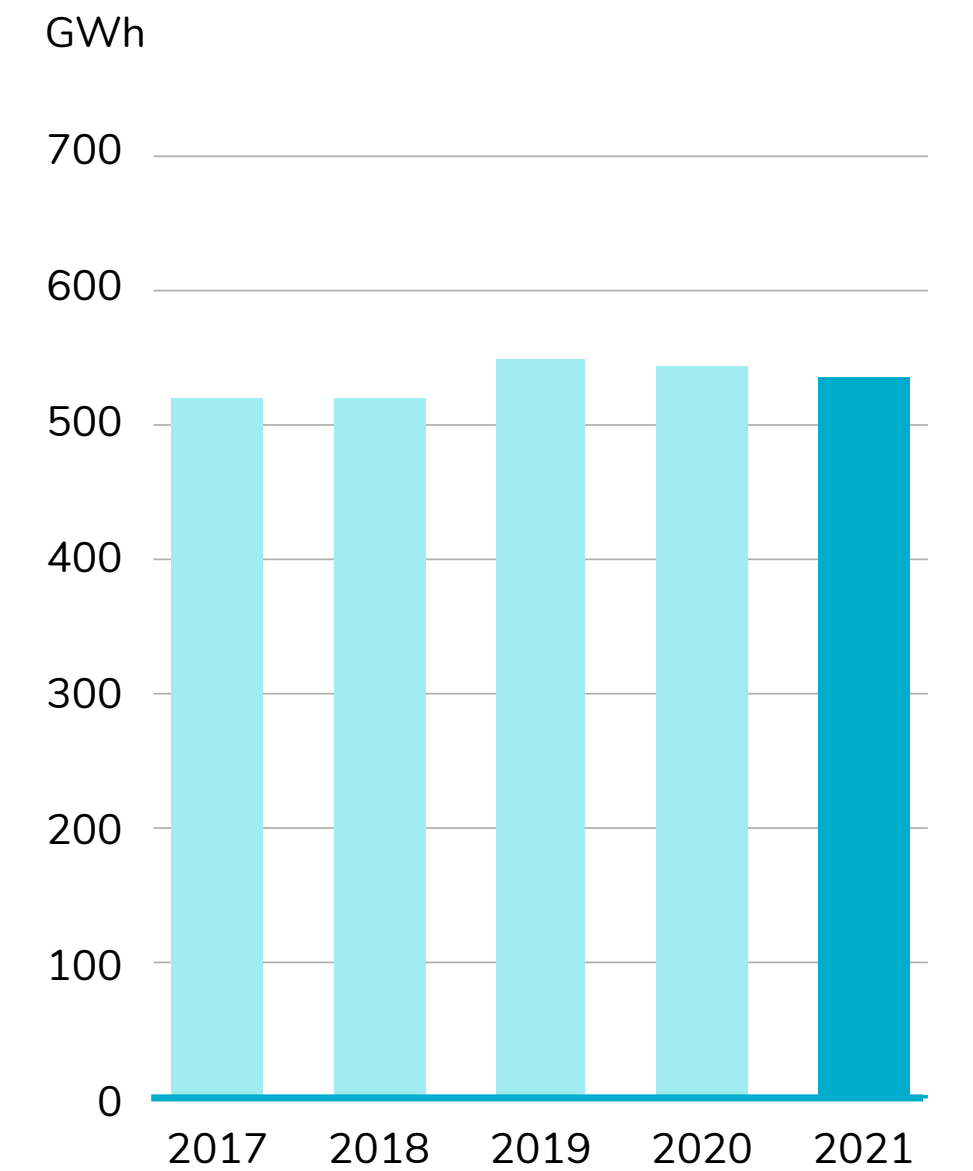
TVO and Posiva carry out activities related to energy efficiency as part of their normal operations. For TVO, the highest potential for savings involves the improvement of the efficiency of the electricity production process; this has been implemented in the long term by means of modernisation projects at the plant throughout the operational history. Another area for improvement is the reduction of in-house energy consumption at the site in Olkiluoto. The

TVO Group's environmental management system incorporates the energy efficiency system ETJ+ that is used to continuously improve energy efficiency across all functions.

The electricity used in Olkiluoto consists of electricity produced in-house and electricity purchased from the power market. The operating plant units, OL1 and OL2, use electricity generated in their own production. Currently, elec-

## Energy efficiency

TVO's in-house electricity consumption



tricity is purchased from the power market for the Olkiluoto outdoor areas, Posiva, and the OL3 plant unit. The distribution of production methods in the electricity purchased from the power market is calculated according to the residual distribution from the Energy Authority. In 2020, the percentages were as follows: nuclear power 51.54, fossil-based energy sources and peat 40.58, and renewable energy sources 7.88.

# Releases into the air

With regard to the management of releases of radioactive substances, TVO always strives to keep any releases well below both the 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 tonnes of CO<sub>2</sub> emissions into the atmosphere 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 0.002 percent and iodine emissions into the air amounted to 0.13 percent of the allowed limit value specified by the authorities.

The theoretical radiation dose caused to neighbouring residents in Olkiluoto is estimated to remain clearly below the threshold value. In 2020, the radiation dose was 0.24 µSv (threshold value: 100 µSv).

## Greenhouse gases and other releases into the air

**TVO TAKES PART** in Finland's fight against climate change by producing low-emission base load electricity. The Olkiluoto nuclear power plant is included in the European Union's emissions trading scheme that aims at monitoring greenhouse gas emissions and achieving the CO<sub>2</sub> 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.

Radioactive emissions to the air	2021	2020	2019	2018	2017
Noble gas TBq (Kr-87 equivalent)	0.20	0.97	1.76	0.91	3.43
% of allowed amount	0.002	0.01	0.02	0.01	0.04
Iodine TBq (I-131)	0.00013	0.00012	0.0008	0.0005	0.0009
% of allowed amount	0.13	0.12	0.74	0.48	0.85
Aerosols TBq	0.00005	0.0002	0.0006	0.0006	0.025
Tritium TBq	0.40	0.34	0.82	1.32	1.07
Carbon-14 TBq	0.54	0.65	0.64	0.93	1.02

Emissions to the air (t)	2021	2020	2019	2018	2017
GHG emissions Scope 1 (CO <sub>2</sub> eq)	3,897	3,254	-	-	-
CO <sub>2</sub> emissions included in emissions trading scheme	2,436	1,751	1,388	1,505	717
GHG emissions Scope 2 (CO <sub>2</sub> eq)	68,743	29,677	-	-	-
NO <sub>x</sub>	3.2	2.2	2.2	1.8	1.0
SO <sub>x</sub>	0.0	0.0	0.0	0.0	0.0
Particles	0.2	0.1	0.2	0.1	0.1

The power plant's actual CO<sub>2</sub> emissions are generated by the releases of the reserve boilers and the emergency diesel generators. The purpose of the emergency diesel generators is to automatically ensure the power supply of the plant in a possible but unlikely loss-of-power situation. In order to 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 will reduce particulate emissions to the atmosphere. This largest modernisation project in history reached a milestone in summer 2020, when the ninth emergency diesel generator was deployed. This unit,

separate from OL1 and OL2, will enable the replacement of the original generators one by one, the first of which was deployed in summer 2021 and another will be completed in spring 2022.

During the reporting period, the TVO Group started the calculation of greenhouse gas emissions in accordance with the Greenhouse Gas Protocol (GHG Protocol). Scope 1 includes direct emissions from the company's operations, and it takes into account the emissions from the emergency diesel generators, reserve boilers, vehicles, working machines and equipment, as well as refrigerant leaks. Scope 2 accounts for indirect emissions generated by the company's energy consumption. The majority of Scope 2 emissions are from electricity purchased to OL3.

Going forward, the emergency diesel generators and reserve boilers will switch to a fuel that contains a biocomponent, which makes them more climate-friendly. This transition is included in the goals of the Environment and Energy Efficiency Programme for 2022–2024.

SDG
TARGET



**Emissions**

- Radioactive emissions to the air are kept clearly below authority limits (continual).

# Releases into water and soil

The releases of radioactive fission and activation products into water amounted to 0.06 percent and tritium emissions to 9.2 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 2021, the amount of treated sanitary wastewater was 180,412 m<sup>3</sup>. The phosphorus load discharged into the seawater was 4.4 kg, the nitrogen load was 4,380 kg and the biological oxygen demand (BOD<sub>7ATU</sub>) was 296 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.

TVO has started a project where, going forward, wastewater from Olkiluoto will be routed for processing at the Maanpää wastewater treatment plant in Rauma via a transfer sewer system that runs from Eurajoki to Rauma. Processing wastewater in a larger unit allows for its more efficient purification and reduces the load caused on the water systems. The total value of the project is approximately EUR 5.9 million. The goal for the period 2022–2024 of the Environment and Energy Efficiency Programme is for the project to be completed by summer 2023.

Radioactive emissions to water	2021	2020	2019	2018	2017
Fission and activation products TBq	0.0002	0.0004	0.0001	0.0001	0.0003
% of allowed amount	0.06	0.15	0.04	0.04	0.09
Tritium TBq	1.68	1.55	1.59	1.62	2.46
% of allowed amount	9.2	8.5	8.7	8.9	13.5

Wastewater treatment	2021	2020	2019	2018	2017
<b>Amount of water (m<sup>3</sup>)</b>	89,957	90,304	83,545	89,558	97,207
<b>Concentration (mg/l)<sup>1)</sup></b>					
BOD <sub>7ATU</sub>	3.3	4	6,6	10	8,0
Phosphorus	0.05	0.07	0.37	0.12	0.12
<b>Treatment efficiency average (%)<sup>1)</sup></b>					
BOD <sub>7ATU</sub>	99	98	97	96	96
Phosphorus	100	99	96	99	98
<b>Load on the sea area (kg)</b>					
Phosphorus	4.4	6.2	31	11	12
Nitrogen	4,380	4,745	2,993	4,380	5,840
BOD <sub>7ATU</sub>	296	365	548	913	767
<b>Water treatment chemicals (t)</b>	26	29	32	35	39

<sup>1)</sup> The permit regulation for the sanitary wastewater: The maximum BOD<sub>7ATU</sub> value of wastewater discharged into the seas is 13 mg O<sub>2</sub>/l and the maximum phosphorus concentration is 0.52 mg P/l. The minimum treating efficiency for the BOD<sub>7ATU</sub> value and phosphorus is 95%. All values are calculated as annual averages.

## Releases into the soil

**OVER THE COURSE** of the year, a total of approximately 55 litres of oil ended up in the soil due to failures of working

machines and equipment. All of the oil was recovered. There were also minor refrigerant leaks from the cooling devices.

### SDG TARGET



#### Emissions

- Radioactive emissions to the water are kept clearly below authority limits (continual).
- 0 environmental accidents (in the serious / significant category) annually.

# Waste

The TVO Group is committed to reducing the amount of waste and promoting its utilisation. 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.

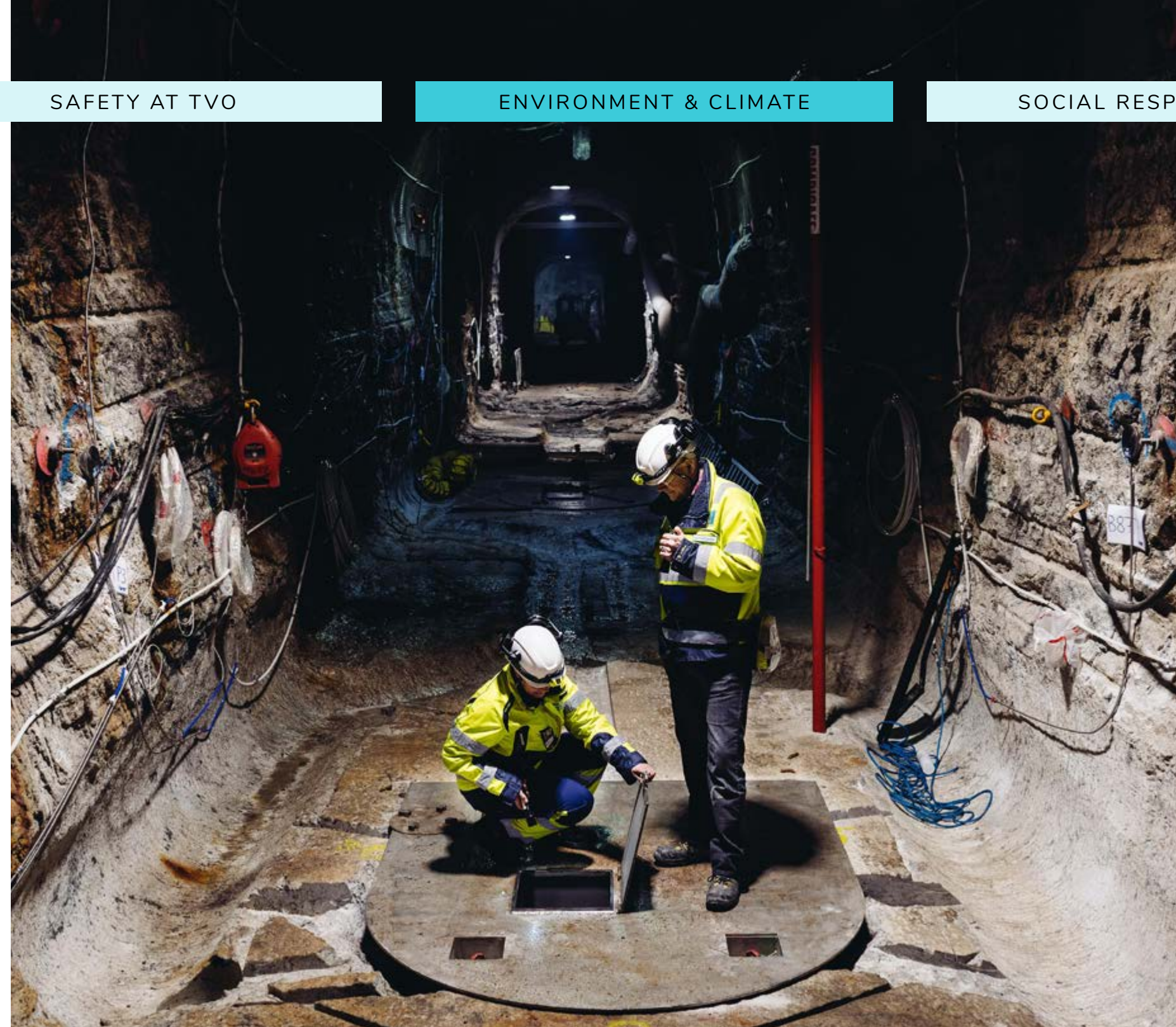
## Radioactive waste

**THE WASTE** produced at the power plant is classified, based on their radioactivity, into waste exempted from control, low and intermediate level operating waste, high-level 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 2021, no maintenance waste was exempted from control. Approximately 33 tonnes of metal was cleared for recycling.

Protective equipment 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 operating waste repository (VLJ repository) located at an approximate depth of 100 metres in the plant area. TVO is planning to construct a disposal repository for very low-level waste (HMAJ) at Olkiluoto. It will reduce the amount of low-level waste placed in the VLJ repository.



Radioactive waste	2021	2020	2019	2018	2017
Low-level (m <sup>3</sup> ) <sup>1)</sup>	0	92	150	92	47
Intermediate level (m <sup>3</sup> ) <sup>1)</sup>	0	18	7	53	51
Operating waste cleared after monitoring (t)	0	0	0	44	40

<sup>1)</sup> Operating waste placed in the VLJ repository during the year.

Amount of spent fuel in the OL1 and OL2 storage polls and interim storage, cumulative	2021	2020	2019	2018	2017
Number of assemblies (pcs)	9,724	9,524	9,328	9,122	8,922
Assemblies (t)	1,629.6	1,597.5	1,564.9	1,531.2	1,498.5

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 placed in the VLJ repository. In 2021, no intermediate or low level waste was placed in the VLJ repository because of the HVAC renovations taking place at the repository.

TVO uses an operating waste management manual that contains procedures and instructions for the handling, storage, and final disposal of radioactive waste. The employees working with operating waste management receive training on the subject on the basis of separate training requirements and induction programmes.

The total amount of high-level radioactive waste (spent fuel) generated during the reporting year was 32.73 t. It is kept in an interim storage at Olkiluoto until it can be placed in final disposal in the Olkiluoto bedrock. The final disposal will start in the 2020s. Posiva is the first company in the world to commission a safe final disposal solution for spent nuclear fuel. In order to construct the final disposal repositories, approximately 500,000 solid cubic metres of Olkiluoto bedrock has been excavated by 2021. The majority of blasted stone has been utilised for construction on the Olkiluoto island and in the local area. The objective in all the preparations for final disposal, such as method research and the construction of facilities, is to minimise the impacts on the surrounding nature.

SDG

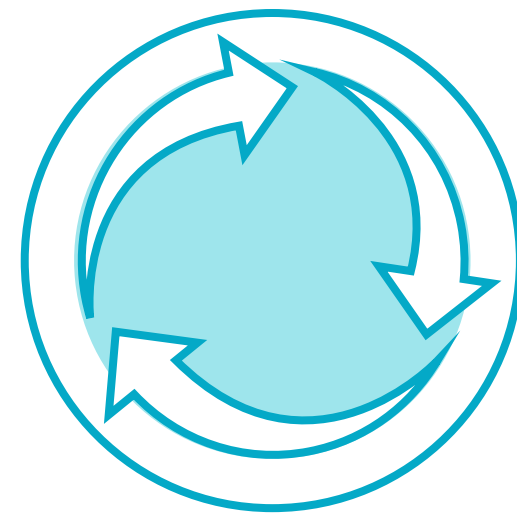
TARGET



**Circular economy**

- Minimisation of waste volume and recycling of waste as material, at least 55% annually by 2025 and 60% annually by 2030.
- 0 kg of landfill waste annually.

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



91%

The share of waste reused for materials and energy of the total amount of waste.

### Municipal waste

**THE OPERATION** of the power plant also generates municipal waste and hazardous 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. The goal is to route any usable products for reuse, and donations to charity are also made. The generation of waste is considered already at the procurement stage, with the aim to reduce the volume of waste generated. The TVO Group focuses on procuring 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.

All waste generated in 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 2021, there was no such

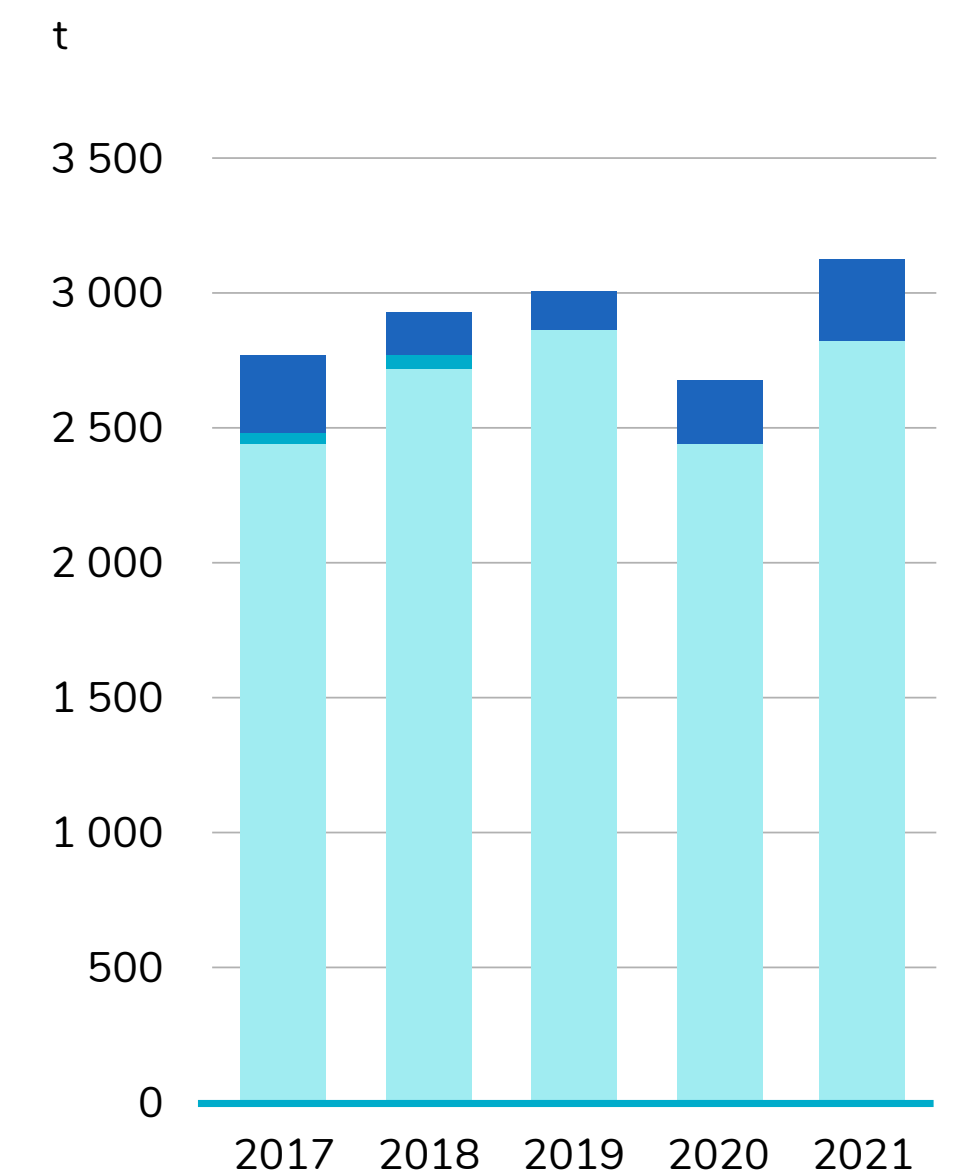
waste. The optimal use of chemicals is one of the ways aiming at reducing the amount of hazardous waste. All hazardous waste is collected in the hazardous waste storage to be sent to an appropriate waste treatment plant.

Municipal and hazardous waste OL1, OL2 and OL3 (t)	2021	2020	2019	2018	2017
Mixed waste to energy	209	176	126	232	233
Landfill waste to TVO's landfill	0	0	0	44	41
Paper and cardboard	73	111	69	75	81
Energy waste	203	205	194	230	272
Biowaste	98	86	66	100	102
Wood	180	220	407	276	313
Metal	172	119	955	251	383
Glass	4	5	4	5	5
Plastic	3	4	2	-	-
Cable refuse	9	20	11	45	0
Crushed brick and concrete	210	8	5	439	0
Screening	11	38	25	36	79
Hazardous waste	298 <sup>1)</sup>	243	151	165	283
Sludge <sup>2)</sup>	1,627	1,425	990	1,038	993

<sup>1)</sup> Includes hazardous waste recycled as material 33 t.

<sup>2)</sup> Sludge from the wastewater treatment plant, sand water and shellfish water mixture (solid matter 8-10%).

### Waste Municipal waste



Recyclable waste  
Landfill waste  
Hazardous waste

In 2021, the total volume of waste was 3,096 tonnes. Waste suitable for recycling as materials or reuse as energy amounted to 91 percent of the total amount of waste and the share of hazardous waste was 9 percent. Most

of the hazardous waste was batteries and WEEE (waste electrical and electronic equipment), as well as oil-water mixtures, glycol, and asbestos.

# Environmental research and biodiversity

**The island of Olkiluoto is one of the most researched areas in Finland, and its diverse nature is charted in detail. Environmental research has been conducted on the island since the 1970s, years before electricity production was started. The early baseline studies created a basis for the environmental monitoring programmes aimed at facilitating environmental radiation monitoring and determination of the impact on waters.**

**ENVIRONMENTAL RADIATION** 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 analysed in compliance with an environmental radi-

ation monitoring programme approved by 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 in the sea area 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 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. In the spring of 2021, TVO published the environmental impact assessment (EIA) for the construction of a near-surface final disposal facility for very low-level waste in Olkiluoto.

## Centralising production secures biodiversity

**CLIMATE CHANGE** also has a major impact on biodiversity. As a producer of climate-friendly electricity, TVO safeguards and maintains the diversity of nature. About 21 percent of all electricity produced in Finland and about 17 percent of all electricity consumed in Finland is generated on the small island of Olkiluoto, surrounded by four nature conservation areas. The concentration of energy production in a small geographic area minimises the environmental impact and allows the preservation of other areas in their natural state.

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 conservation-oriented areas.

## Promoting biodiversity

**A BIODIVERSITY STUDY** is completed on the island of Olkiluoto every ten years. The last comprehensive study was performed in 2013. A nature investigation was carried out in the island's western part in 2020. The results indicate that the biotopes occurring at Olkiluoto are mostly barren, with few species, but the four nature conservation areas surrounding the power plant area add to biodiversity. In places, the bird population on the island of Olkiluoto and its surrounding areas is diverse and plentiful, and the constructed areas offer nesting opportunities from some notable bird species. Energy production has had no significant impact on the nature of Olkiluoto, which for the most part is barren and poor in species.

Biodiversity is promoted as part of the Environment and Energy Efficiency Programme, which includes, for instance,

the principle of aligning the needs of the natural environment and any infrastructure being planned and placed in the area during land use planning, with special emphasis on locations relevant in terms of nature and nature conservation areas. The TVO Group's Sustainability Roadmap also includes goals concerning biodiversity, in relation to efficient land use and projects promoting biodiversity.

TVO and Posiva aim to improve biodiversity in connection with their operations and cooperate with stakeholders within different projects. The impacts of the power plant's cooling water are mitigated with an annual fishery fee of EUR 11,000.

Biodiversity is also considered when planning decommissioning. The Centre for Economic Development, Transport and the Environment and the municipality of Eurajoki monitor the environmental permits, according to which detailed landscaping plans are required for the decommissioning of the power plant or a specific area. The plan for the landscaping takes into account restoring the area to its natural state and other goals regarding biodiversity, and they are approved by the authorities.

## SDG

## TARGET



### Biodiversity

- Efficient land use: share of produced electricity with respect to the surface area of built environment ca. 15 647 GWh / km<sup>2</sup> from 2023 onwards.
- At least one voluntary project promoting biodiversity carried out annually.



# Cooperation with authorities

**The operation of a nuclear power plant is subject to licences and permits, and it is governed by the authorities. The authority supervising nuclear and radiation safety is the Radiation and Nuclear Safety Authority in Finland, STUK.**

**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 matters 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

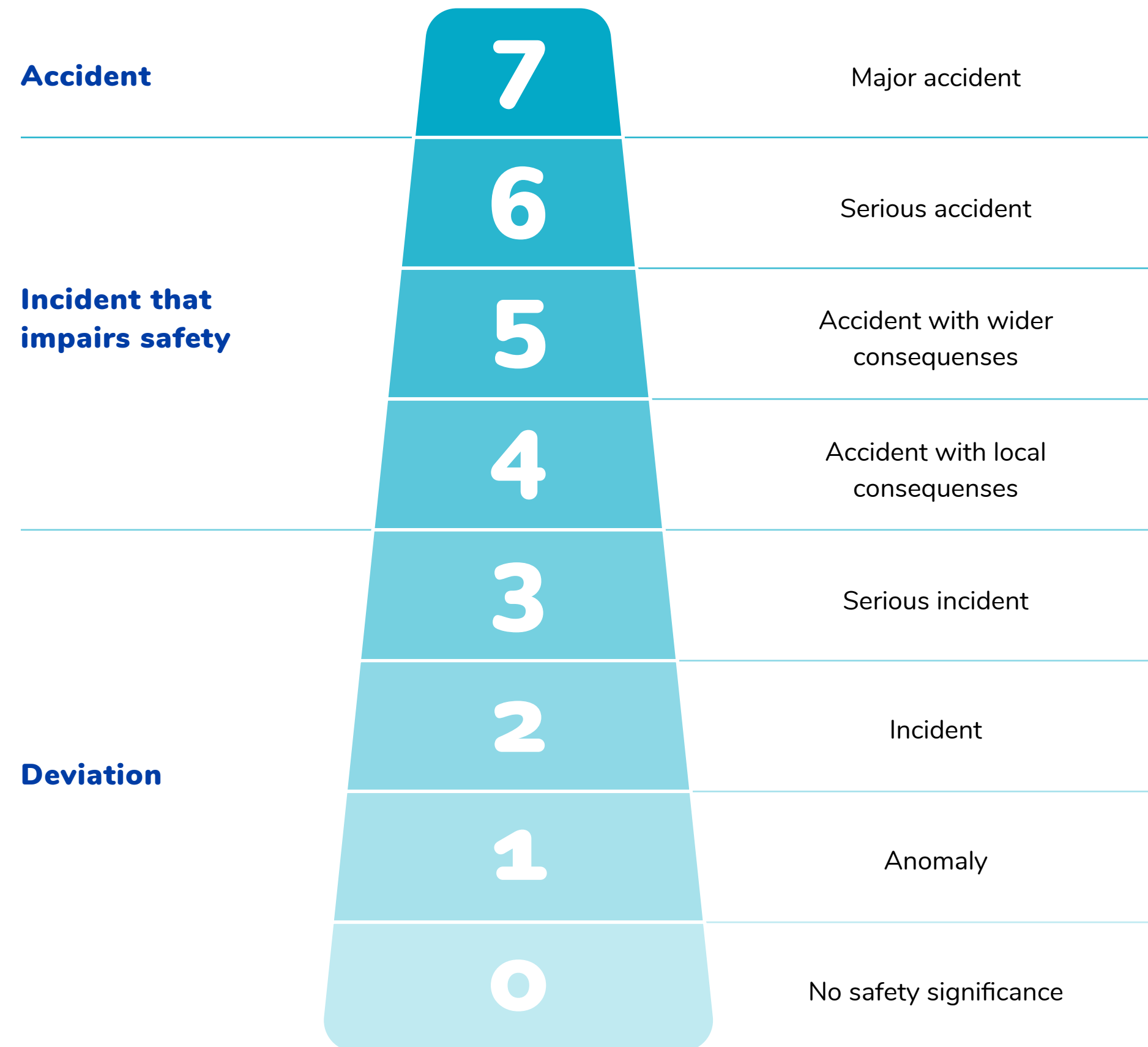
submits the report to several regional and national authorities. TVO annually reports its environmental investments and environmental protection activity expenses to Statistics Finland. After verification, the annual carbon dioxide emissions of the emergency diesel generators and reserve boilers are reported to the Energy Authority. Energy saving measures 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.

## There were eight special events in 2021

**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 2021, eight events rated as INES level 0 (no nuclear or radiation safety significance) took place at the Olkiluoto nuclear power plant. TVO



## INES-scale



analyses and investigates all events that may have affected nuclear safety and defines the corrective actions for their causes. TVO publishes news on any significant events that may be of public interest on its website.

TVO also follows events at other nuclear power plants around the world. Activities of the Olkiluoto nuclear power plant are constantly developed on the basis of any observations made.

### Permits govern the activities

**IN ADDITION** to legislation pertaining to nuclear energy and radiation safety, operations are also regulated by requirements laid down in environmental legislation. Operating the Olkiluoto nuclear 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 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 water volume and the amount of heat contained in it, wastewater treatment efficiency, the processing of waste, operations in the event of operational occurrences and emergencies, as well as monitoring and reporting. In addition, there are separate environmental permits for the supporting operations of the Olkiluoto nuclear power plant, such as the landfill and the quarry material storage area. During the year, the permit regulations concerning hydroid prevention were updated and the Olkiluoto spoil deposit was granted a new environmental permit.

Licences 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. During the reporting year, the power plant received an emissions permit for the period of 2021–2030. 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. TVO is planning to construct a disposal repository for very low-level waste (HMAJ) in Olkiluoto. The EIA report concerning the plan was completed in 2021. In addition, the Olkiluoto water management project for securing the supply of raw water and building a transfer sewer for wastewater progressed from design to the construction stage.

### Compliance with environmental legislation

**THE TVO GROUP** continuously monitors statutory regulations and other requirements pertaining to its operations. People in charge of different areas are responsible for ensuring that the organisations receive sufficient up-to-date information about statutory requirements and their impact on the TVO Group's operations. Compliance with the requirements is regularly assessed in internal and external audits as well as in management reviews. In 2021, the TVO Group's operations complied with environmental legislation, licences, and permits.

# Final disposal of spent nuclear fuel

The types of nuclear waste generated at a nuclear power plant include waste exempted from control, low and intermediate level operating waste, and high-level spent nuclear fuel. 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).

**COMPARED** to the amount of produced energy, the volume 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 and cover their costs. According to the Finnish Nuclear Energy Act, nuclear waste generated in Finland must be treated, stored and placed in final disposal in Finland, and the import of nuclear waste into Finland is prohibited.

Spent nuclear fuel from the nuclear power plants of TVO and Fortum will be packed in copper canisters and placed in final disposal in Olkiluoto bedrock at a depth of approximately 430 metres. Posiva manages the research into the final disposal of spent nuclear fuel, the construction and operation of disposal

facility and the eventual closure of the facility on behalf of its owner companies.

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 operating licence for the final disposal concept, the facility complex 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 work-years. The project will employ a maximum of approximately 500 people.

The work in the EKA project progressed according to schedule during 2021 despite COVID-19 restrictions. In May, the excavation of the five first deposition tunnels, accessed through the central tunnels, was started in ONKALO at a depth of approximately 430 metres. In December, the roof wetting ceremony for



the encapsulation plant was celebrated. A significant event in the preparation of the project in 2021 was the submittal of the operating licence application to the Finnish Government in December.

Finland is the only country to proceed to the implementation of final disposal, which makes the EKA project unique on a worldwide scale. Therefore, Posiva also plays an important role in the mitigation of climate change as part of the lifecycle of nuclear power. Several countries employing nuclear energy have disposal facilities for low and intermediate level waste, but the final disposal of high-level spent nuclear fuel has not been started anywhere in the world.

Posiva's subsidiary PSOY sells this expertise, which has been generated through 40 years of multidisciplinary research. PSOY provides tailored expert services for final disposal and ready-made solution and service models for nuclear waste management companies together with a broad network.

Final disposal is based on employing multiple release barriers. Release barriers ensure that the nuclear waste cannot be

SDG	TARGET
<p>7 AFFORDABLE AND CLEAN ENERGY</p>	<p><b>Responsible nuclear waste management</b></p> <ul style="list-style-type: none"> <li>• Posiva's final disposal activities begin according to plan in the mid-2020s.</li> <li>• Final disposal is carried out on an industrial scale – about 400 tU spent fuel is disposed safely and according to cost estimates by 2030.</li> </ul>
<p>9 INDUSTRY, INNOVATION AND INFRASTRUCTURE</p>	<p><b>Increasing final disposal expertise</b></p> <ul style="list-style-type: none"> <li>• Posiva has the best knowledge and expertise in the final disposal of spent nuclear fuel, and it is the most desired international reference and valued partner (continual).</li> </ul>

released into organic nature or become accessible to humans. A deficiency of a single barrier or a predictable geological or other change will not jeopardise the performance of the isolation. The release barriers include the physical state of the fuel, the final disposal canister, the bentonite buffer, the backfilling of the tunnels, and the surrounding rock.

The long-term safety of the solution is paramount in the final disposal of spent nuclear fuel. It is evaluated and demonstrated with the safety case. According to the international definition, a safety case refers to all of the technoscientific documentation, analyses, observations, examinations, tests, and other evidence for justifying the reliability of the assessments made on 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 final disposal of spent nuclear fuel will continue for approximately one hundred years.

According to legislation, a party with a nuclear waste management obligation must present to the Ministry of Economic Affairs and Employment at regular intervals a plan on how they intend to carry out the measures pertaining to nuclear waste management and their preparation. At the end of September, Posiva's owners submitted nuclear waste

management plans for 2022–2024 to the Ministry, as well as the nuclear waste management programme YJH-2021, which describes preliminary plans for 2025–2027. The nuclear waste management programme contains plans for the processing, storage and final disposal of spent fuel and the decommissioning of the plant units, for example.

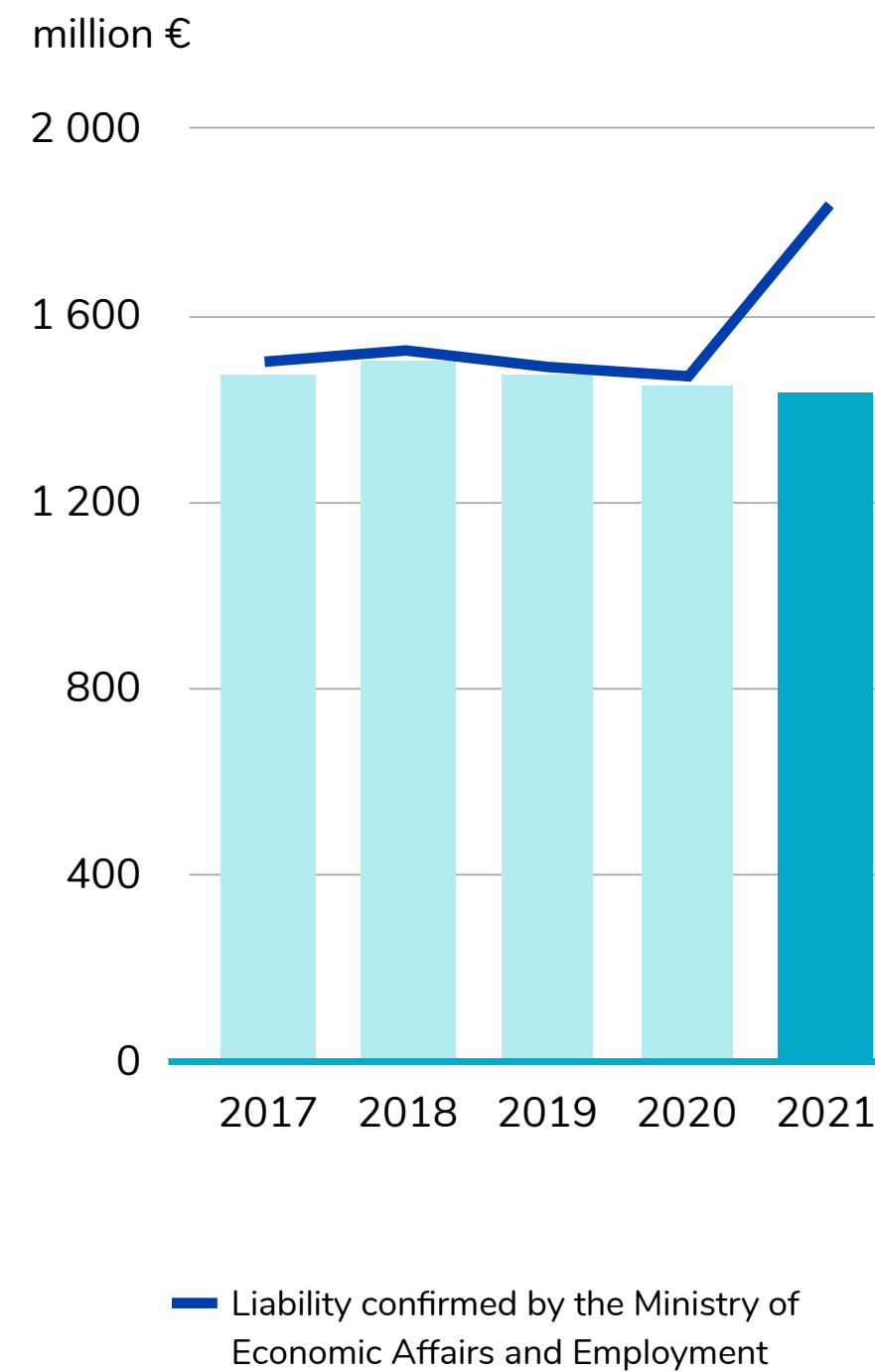
For more information on Posiva, please visit [www.posiva.fi/en/](http://www.posiva.fi/en/)

### 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 increase in 2021 of the liability confirmed by the Ministry of Economic Affairs and Employment is due

### TVO's fund target in the Finnish State Nuclear Waste Management Fund



to the fuel loading of OL3, which began the plant unit's nuclear waste management obligation.

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

### CASE

## Excavation of the world's first deposition tunnels started inside Posiva's ONKALO

**POSIVA STARTED** the excavation of the first five deposition tunnels in ONKALO in May 2021. Starting the excavation was a major milestone for Posiva, as it was preceded by years of research and development in rock construction. STUK determined that the prerequisites for starting excavation have been met.

– This moment is the crystallisation of long-term research and development in rock construction that has resulted in nuclear facility construction methods suitable for the Finnish bedrock. The development of the methods started already with the construction of ONKALO in 2004, Posiva's Construction Manager **Juha Riihimäki** said as the excavation started.

The excavation of the first five tunnels is part of the EKA project, worth approximately EUR 500 million. The EKA project boldly signifies that Posiva is the first company in the world to implement geological final disposal of spent nuclear fuel.

The encapsulation of spent nuclear fuel and the placement of the canisters inside the deposition holes will begin once the Finnish Government has granted an operating licence for the disposal facility.

– The current estimate is that final disposal activities will begin in the mid-2020s, says Program Manager **Kimmo Kemppainen** from Posiva.

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

# Social responsibility at TVO

## Particle-larly great jobs

**THE TVO GROUP IS A HUB** of Finnish nuclear power expertise. The company's top-quality results are produced by skilled, professional, and experienced employees. The nuclear energy industry employs approximately 4,000 people in Finland, of which approximately 1,000 work for the TVO Group. 70 new employees were hired by the company during 2021. In addition, TVO employed a total of 84 summer trainees.

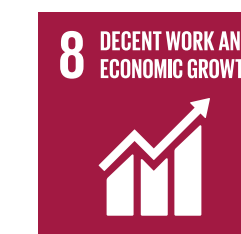
The TVO Group offers its personnel varied duties and opportunities for professional development. The personnel receive comprehensive training throughout their careers. A high level of competence is achieved by means of training requirements targeting various functions, job rotation, induction, and occupational instruction. In 2021, the personnel received a total of 10,608 days of training, on average 10.8 days per each employee at TVO.

The TVO Group is aware of its future need of new energy industry experts, and aims to do its part in developing competence in the field. The Group is involved in varied and responsible cooperation with educational establishments and student communities, for example.

The Group aims to guarantee good, safe working conditions for everyone. In accordance with its Code of Conduct, the TVO Group will not tolerate discrimination or harassment based on age, gender, ethnic background, religion, life philosophy, opinion, or other personal characteristic.

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# Good working community

**The objective of the TVO Group is to have an equal, healthy working environment that tolerates no discrimination and promotes the implementation of equality in practice.**

**THE TVO GROUP'S** Code of Conduct and policies define the principles of the human resources policy. A prerequisite for the TVO Group's operations is that all of its employees remain motivated, carry out their duties in a responsible manner, and commit to the agreed processes.

The TVO Group offers its personnel varied duties and opportunities for professional development. The Group offers competitive rewards and encourages employees to work profitably, to meet their goals, and to work to a high standard every day. The competence and expertise of the Group's employees

are based on systematic development of professional competence and long employment relationships.

In 2021, the TVO Group continued its activities to develop the work community culture and reinforce the safety culture. The Group carries out a personnel survey approximately every 18 months. The results of the survey, performed by Eezy Spirit Oy, were received in November 2021. The next survey will take place in 2023.

## 70 new employees joined the Olkiluoto team to do a Particle-larly Great Job

**A TOTAL OF 70** new employees were hired during 2021. At the end of 2021, TVO employed 982 people. The average number of employees during the year was 1,002. Most of TVO's employees work in

Olkiluoto, with some 20 people working in Helsinki. The average age of TVO's employees was 43.2 years in 2021.

At the end of 2021, 22.2 percent of TVO's permanent employees were female. The Board of Directors had ten members, one of them female. The Management Group had thirteen members, four of them female. The Management Group includes three personnel representatives. A total of 61 permanent employees left the company, five of them due to retirement. Six percent of TVO's permanent employees took parental leave during the year.

TVO employed 84 summer trainees in 2021. As in previous years, TVO participated in the Responsible Summer Job campaign, which aims to develop the quality of summer jobs and the readiness of youth between the ages of 16 and 25 to begin their working careers. TVO also continued its cooperation with educational institutions in the adjacent area. TVO participated in recruitment events arranged by institutes of higher education, which were mostly virtual due to the COVID-19 pandemic.

The personnel numbers for the Group are summarised in the chapter Social responsibility indicators (p. 69).

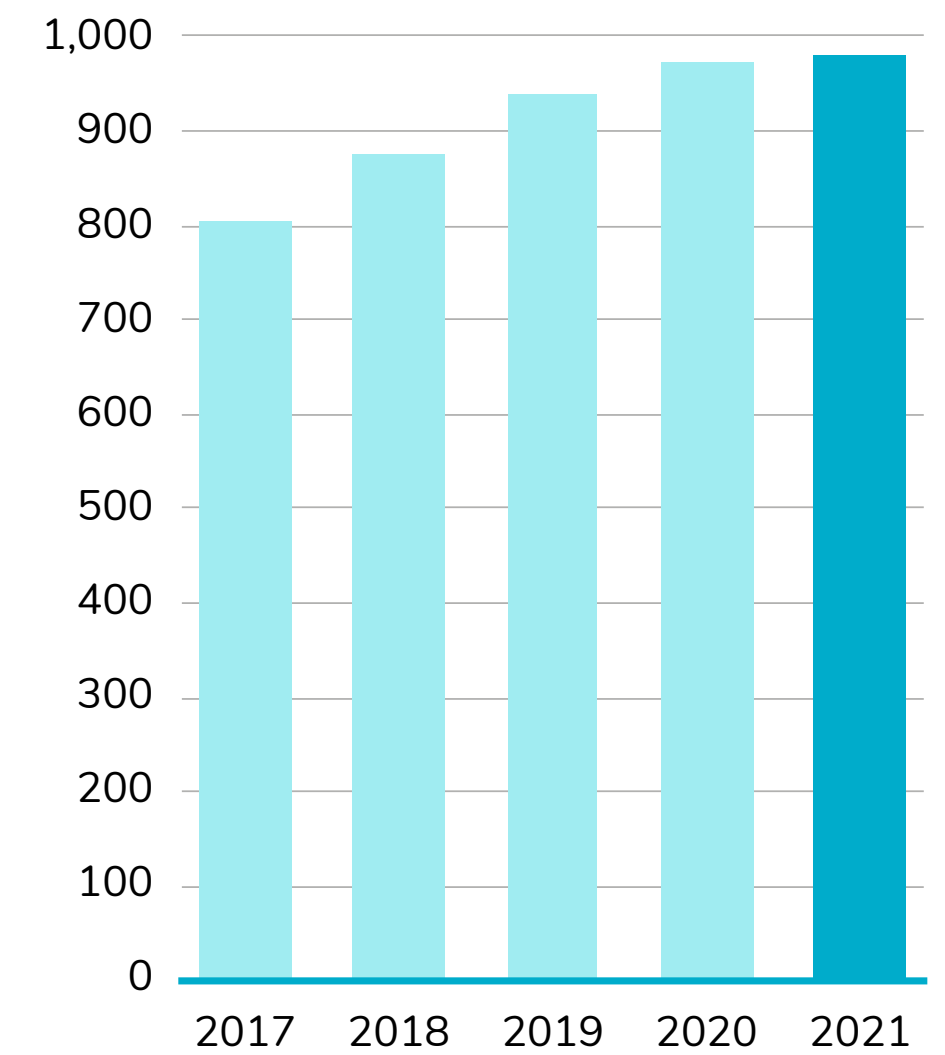
## Large projects provided employment for thousands of people in Olkiluoto

**OLKILUOTO 3 IS A LARGE** international project, and the plant supplier's average workforce at the OL3 construction site was 1,500 in 2021. A high level of safety culture is required from all parties working at the construction site. The occupational health and safety of the employees working at the site remained at a good level.

The annual outages of the OL1 and OL2 plant units employ over 150 subcontractor companies from Finland and abroad. A total of 939 external workers participated in the annual outages in 2021, 759 of them Finnish. In addition to companies from Finland, subcontractors from 22 other countries participated in the effort. To ensure safe annual outages during the COVID-19 pandemic, TVO engaged in extensive cooperation with various authorities such as the Satakunta

## TVO's personnel

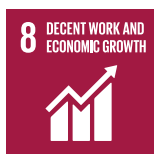
Personnel



Hospital District and doctors of infectious diseases in the adjacent towns and municipalities. Safety measures were carried out in compliance with the general policies of the Finnish Government and the recommendations of the Finnish Institute for Health and Welfare (THL).

SDG

TARGET



**Employer role**

- Recruiting over 100 students for internships annually.

## The impact of the COVID-19 pandemic on work arrangements in the TVO Group

**DURING THE YEAR**, the TVO Group continued to prepare for potential COVID-19 contagions and executed various measures to prevent the spread of the virus on the Olkiluoto island. The extensive measures included reducing travel, remote working whenever possible, restricting visitors' access to the TVO Group's facilities, cancelling events, and moving training to digital environments. Access restrictions were introduced in the area to redistribute encounters to different areas and to reduce physical contacts. The staff canteens as well as cleaning operations at all sites underwent major changes, and COVID-19 home tests were put to use provided by the employer. The effectiveness of the measures was deemed successful, since COVID-19 transmission chains were avoided in Olkiluoto.

The TVO Group continuously assesses the epidemic situation. The Group's own instructions and recommendations follow the general policies and decisions of the Finnish Institute for Health and Welfare (THL) and the Finnish Government.

### Fair workplace

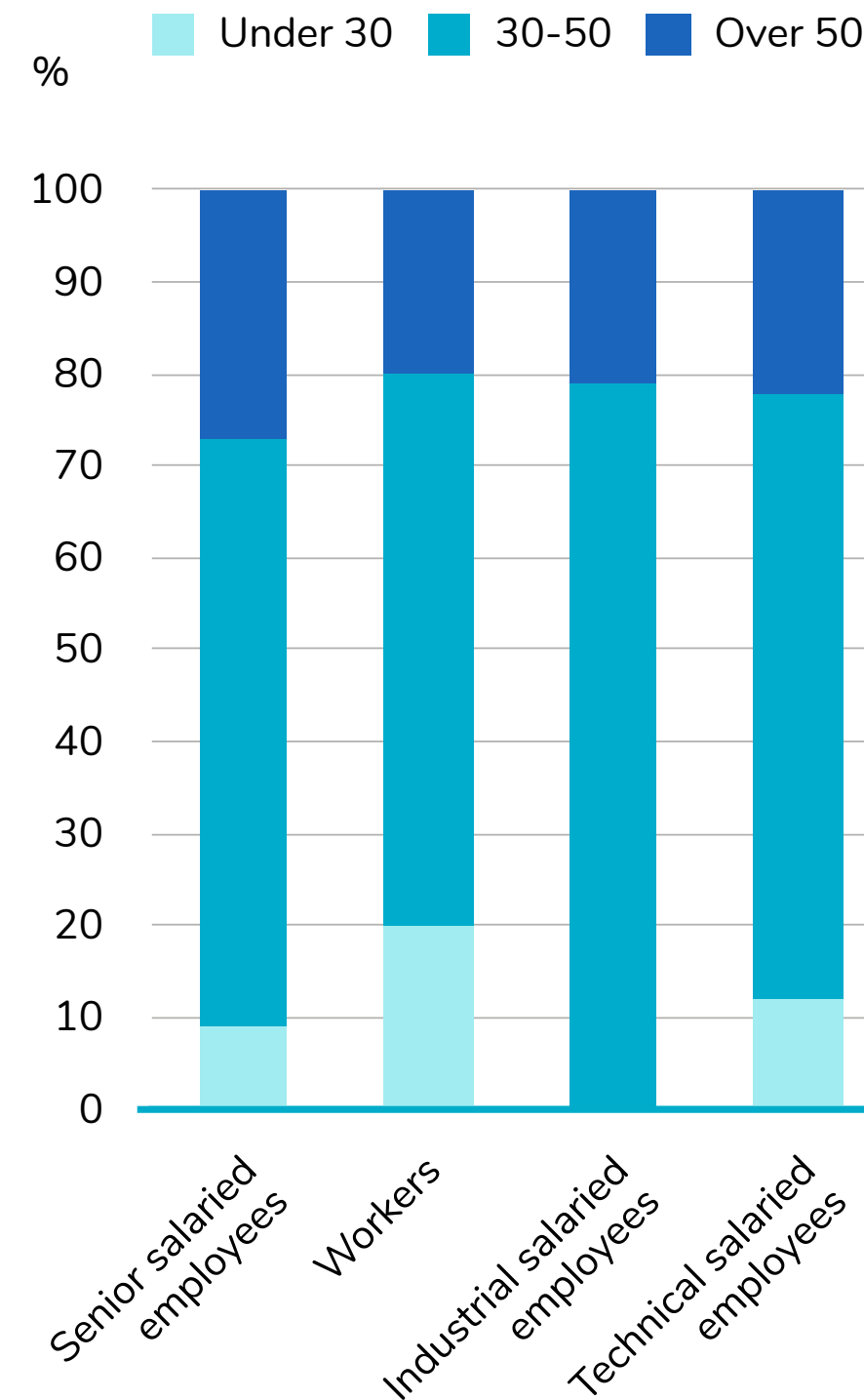
**THE TVO GROUP** complies with the applicable collective labour agreements

for the energy sector in all its operations. The current agreements are valid until early 2022. All of the employees fall under the scope of the collective agreements. The TVO Group has freedom of association. The energy sector's agreed salary systems for technical and industrial officials and employees are based on the job requirement categories and support the implementation of an equal salary policy. As a rule, the various employment benefits apply to the entire personnel, excluding very short employment relationships.

The TVO Group is committed to promoting equality and preventing discrimination in all of its activities. The TVO Group employs an equality plan that discusses equality and separately presents those courses of action that the TVO Group uses to ensure the prevention of all forms of discrimination within its processes and, on the other hand, promotes the equal treatment of personnel.

The equality status of the workplace is evaluated continuously. The purpose of the evaluation is to keep up to date on how equal the working community within the TVO Group is considered to be, and which areas for improvement could possibly be found in relation to equality. The evaluation is performed by utilising the personnel reports and key performance indicators that are also created

### TVO's personnel by age group



for other needs (e.g. personnel survey, safety culture questionnaire, Corporate Social Responsibility Report / social responsibility, Code of Conduct) and the matter is discussed during the employer / employee cooperation meetings.

### CASE

## Fuel loading for OL3, a historic event in many ways, completed successfully

**THE EAGERLY ANTICIPATED** fuel loading work for OL3 was started on Saturday, 27 March 2021. The work was complete in less than five days. A total of approximately 50 nuclear professionals from TVO and the plant supplier took part in the carefully rehearsed fuel loading work.

The first fuel assembly was loaded on Saturday, 27 March at 19:54. The last of the 241 total assemblies was taken into the OL3 reactor 4 days, 18 hours, and 23 minutes later. The work only required a final inspection to be complete.

Naturally, the fuel loading itself was historic in Olkiluoto and in all of Europe, but there was a special sense of occasion in the placing of the first assembly. The honour was given to **Klaus Frisk**, whose father had done the same task 41 years, 5 months, and 26 days earlier. **Kalevi Frisk**, Klaus's father, had previously completed the same task in the reactor hall of the OL2 plant unit. Strong nuclear professionalism, from generation to generation!

Read more on TVO's website [TVO's website](#)

The themes of equality as well as the principles of leadership and working are discussed in the joint meetings of the Group's management and personnel representatives (employer / employee cooperation meetings, employment

negotiations, the Group's Management Group). Furthermore, their implementation is tracked in connection with the personnel surveys, for example. Any identified deficiencies and areas for improvement are rectified without delay.

# Occupational well-being

**The Better Workplace programme develops the TVO Group's management and operating culture.**

**THE GOALS** of the Better Workplace programme include boosting the operations and ensuring good operational preconditions by developing issues pertaining to the employees' own work, their immediate work community, and the entire Group.

The 2021 themes of Better Workplace were:

- "You, me, us – nuclear professionals", including better and broader communication and processing of the Group's shared issues, experience of shared ownership of the Group's projects, and emphasis on taking responsibility for your own actions, focusing on finding solutions, and intervening in problems if necessary.

- Work inspired by results, which aimed at clear decision-making and improving cooperation. The focus was on providing feedback on achieved results and coaching as a part of working together. The modern work environment, developing ways of working, and goal-oriented management of the continued ability to work were also emphasised.

In 2021, Better Workplace continued with measures that focused on themes selected on the basis of the 2020 personnel survey results. Implementation of suggestions for improvements that were received from the field also continued. Goals included promoting the concrete development actions, streamlining practices, and communicating about these. Development of the themes selected on the basis of the 2021 personnel survey and the feedback received from the field will also continue in the Better Workplace group in 2022.

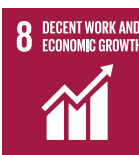
**Occupational well-being is created together**

**KEY ACTIONS** related to the maintenance and development of occupational well-being in 2021 involved promoting new ways of working, enabling safe work during the COVID-19 pandemic, and activities organised together with occupational healthcare services. During the course of the year, various webinars were arranged for supervisors and the entire personnel concerning changes in the working life, time management, and self-leadership.

Close cooperation with occupational healthcare services has continued. The Group uses an early intervention model and models for substitutive and lighter work. In 2021, supervisors were encouraged to intervene early in problems, in accordance with the Group's model. Occupational healthcare services focus especially on proactive management and maintenance of working capacity and risk-based working capacity analyses. During the year, low threshold online mental health services were also introduced for the personnel.

SDG

TARGET

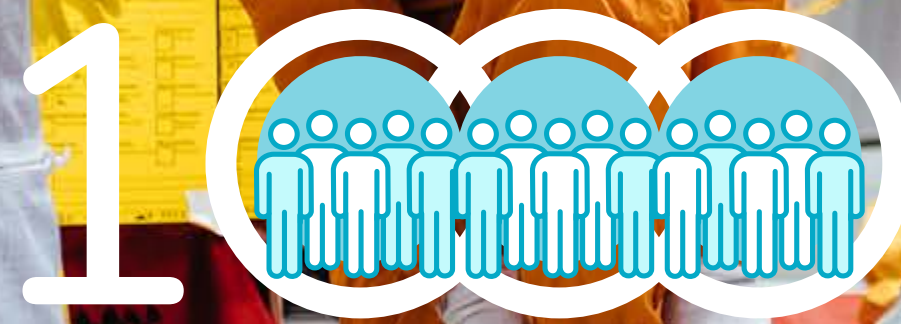


## Occupational health

- Personnel survey (People Power Index) result at level AA (good) achieved by 2025.
- Sick leaves (% of working time) below 3% annually.
- Employees' pension insurance (TyEL) category below 4 (continual).







The nuclear industry employs about 4,000 people in Finland, of whom approximately 1,000 work for the TVO Group.

An investigation related to the psychosocial stress of TVO's and Posiva's supervisors was carried out from August to September 2021. 135 supervisors took part in the investigation, and the analysis of the results was carried out by occupational health psychologists at the TVO Group's occupational health care provider, Terveystalo. The objective was to gain an overall picture of the supervisors' coping at work. The necessary means and procedures for promoting and supporting the supervisors' coping at work will be planned based on the results.

Well-being at work is also promoted by the comprehensive occupational healthcare services available to all of the Group's employees, and the supplementary insurance coverage. In addition to the full-time group accident insurance, the personnel have travel insurance and medical expense insurance. The employees' ability to reconcile work and leisure is supported by using flexitime and a sabbatical leave system. A working time account system is used to provide additional support for managing the balance of work and rest periods. Flexiwork as defined in the new Finnish Working Time Act, valid since the beginning of 2020, has been adopted for piloting. The working time account system and the flexiwork pilot cover senior officials who are included in the scope of the total compensation system.

Employees of the TVO Group have the Smartum sports and culture balance with the massage service option available to them, used by the employer to support the employees voluntarily maintaining their own working capacity. Only a few communal events promoting occupational well-being could be arranged towards the end of the year due to the COVID-19 pandemic. Maintaining and promoting the community spirit by means of virtual activities has been encouraged. The employees have access to several holiday locations, with some restrictions during the pandemic.

### Navigation discussions provide a direction for working

**THE EMPLOYEES'** performance, workload, and coping at work are monitored through navigation discussions with their immediate supervisor, arranged three times a year. The focus in management and supervisory work has been shifted from the monitoring of working hours towards the management of performance. This process allows for more flexible ways of working, such as telecommuting, for all employees whose job description allows it. During the navigation discussions, all employees can discuss their development proposals involving the operations of the company, their immediate work community, or their own work with their supervisor, as well as discuss aspects relating to salary.

# Competence development

**The safe operation of the nuclear power plant is ensured by means of developed and versatile competence management.**

**COMPETENCE MANAGEMENT** at the TVO Group aims at ensuring and maintaining the professional competence and skills required in the nuclear industry for both the Group’s own personnel and for the external workforce. An individual training plan has been prepared for each employee of TVO. The plan is used to track the completion of the training required to reach full qualifications, and to plan any further training that is needed.

High quality, long-term planning and a proactive approach are the key characteristics of personnel development. Among other things, a high level of compe-

tence is achieved by means of training requirements targeting various functions, competence mapping, job rotation, induction, and occupational instruction.

Each year, the Group prepares an extensive annual training programme with the aim of maintaining and developing competencies in a centralised manner and with smart use of resources. The programme takes into account function-specific training requirements, other training needs identified in the different parts of the organisation, and requirements concerning various permits and access areas.

As in previous years, the basic training, supplementary training, and continuing training for the Group’s personnel were arranged according to the annual training programme. The topics of the annual

training programme include plant training, nuclear power training, protection training, emergency preparedness training, and operational technology training. The annual training programme was for the most part implemented according to plan. The employees received a total of 10,608 days of training, equalling on average 10.8 days per TVO employee. In spite of the COVID-19 situation, many different types of training courses could be organised and the training operations remained at a good level.

Analysis of detailed role-based competences continued in 2021 within competence development. This will allow the roles within the organisation to inherit the correct requirements for training, induction, and competences. Furthermore, varied learning methods were developed further by constructing a dedicated escape room in Olkiluoto in order to reinforce nuclear professionalism and the TVO Group’s central practices. The purpose of the room is to verify the efficiency of the various training courses and to test the employees’ skill in various important ways of working involving nuclear professionalism.



Despite the COVID-19 situation, many different types of training courses could be organised and the training operations remained at a good level.

**SDG**

**TARGET**



**High-class expertise**

- Actualisation rate of competence surveying over 90% annually.
- Inspection rate of individual training plans over 90% annually.

**Professional development**

- Employees’ changes in position over 10% annually.
- Actualisation rate of navigation discussions over 90% annually.



“  
**OL3 training was arranged for both TVO's and the plant supplier's personnel.**

Supporting functions related to induction were continued, among other things, by means of an induction review discussion that is held with both new employees and employees switching tasks.

The main goal of operations training at OL1 and OL2 was the implementation of high-quality training on the simulator and in the classrooms, in accordance with the annual training programme. The future plant modifications were one of the focus areas. The planned goals were reached.

### Competence based on comprehensive training programmes

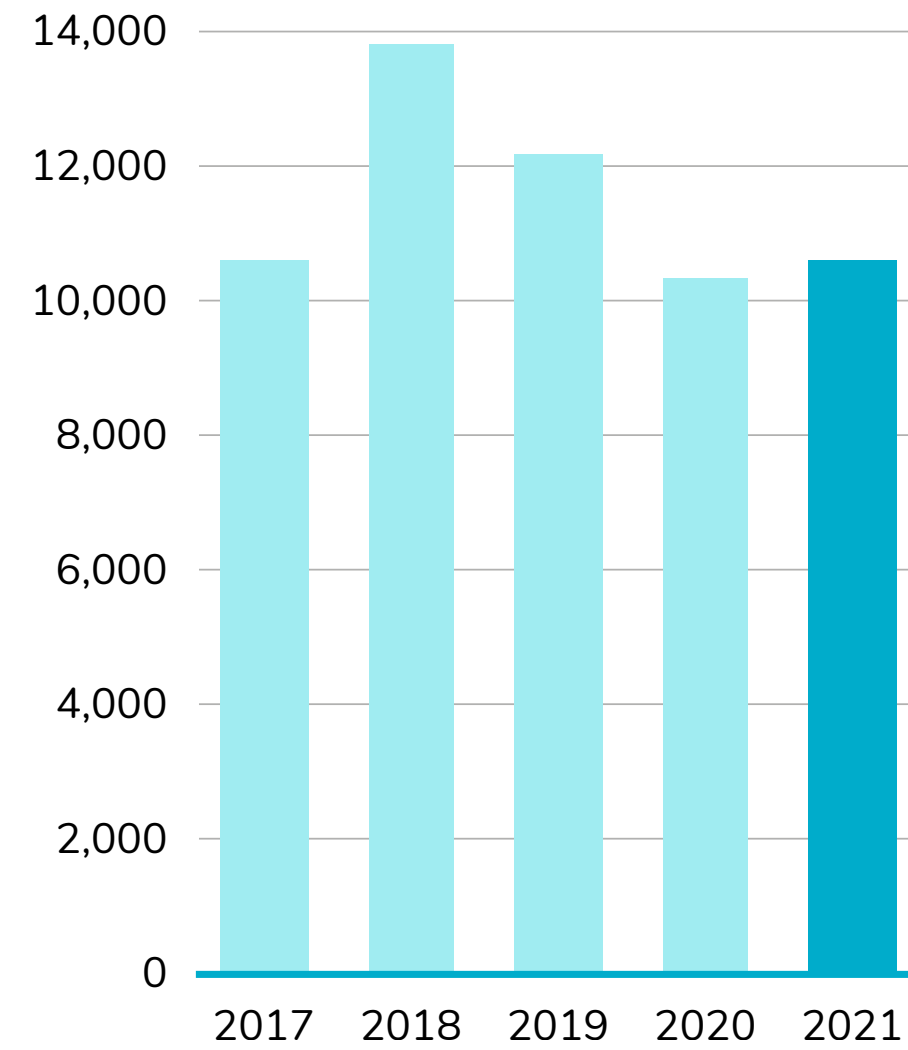
**THE OPERATING PERSONNEL** of the nuclear power plant receive comprehensive training throughout their careers. In 2021, operators of OL1, OL2, and OL3 participated in operating training events and advanced simulator courses in the spring and autumn as required by their refresher training programme. The OL3 operators worked in shifts in the operating organisation jointly established by the plant supplier and TVO, carrying out system operating and monitoring tasks.

OL3 training was arranged online for TVO's and the plant supplier's personnel concerning, for example, the Work Site Standard, the updated instructions and procedures. The qualification and compe-

### Training days

Total

Days



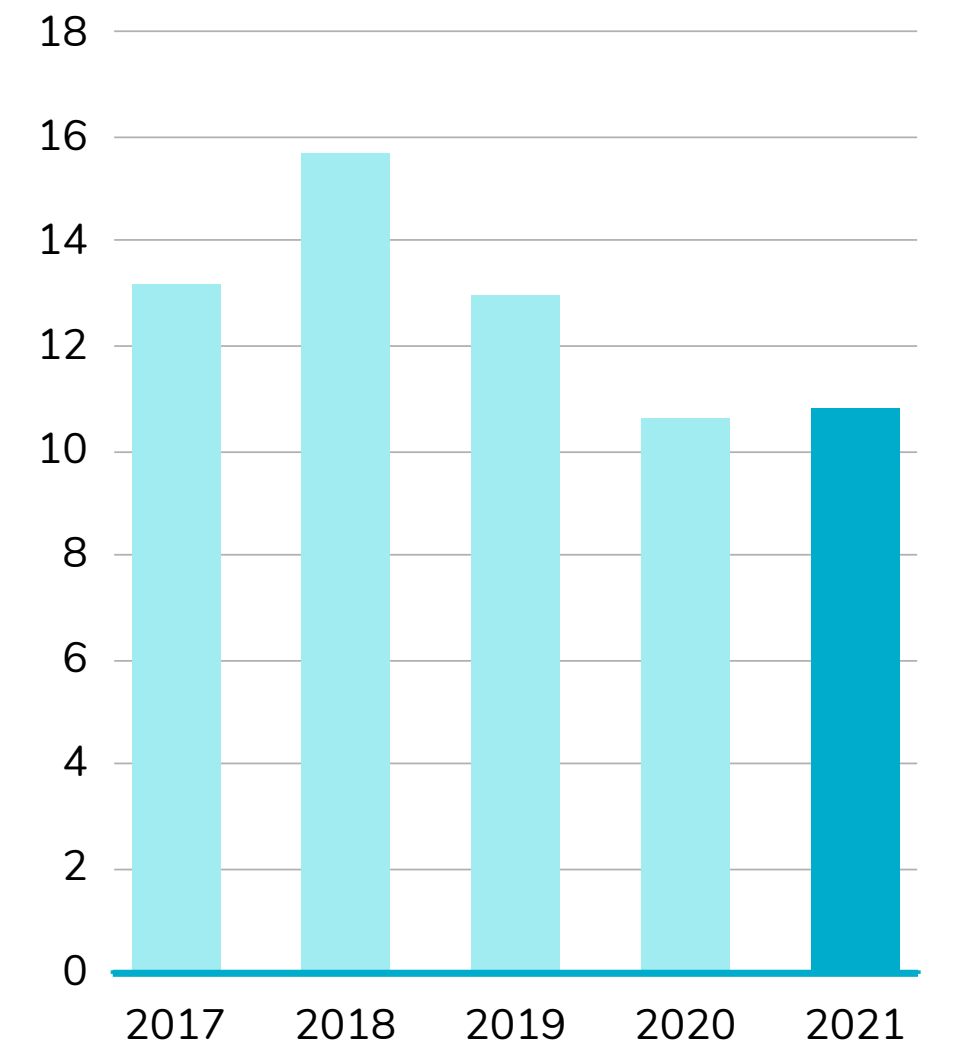
tence management methods of the plant supplier's personnel were verified prior to fuel loading.

A new training programme called Nuclear Professional Leader (NPL) was launched in order to further develop supervisor skills; its aim is to prepare supervisors for their tasks within the nuclear industry in more comprehensive ways than before. The programme consists of several training courses, some of which apply

### Training days

/person

Days



to all supervisors while others apply to separately appointed roles. Furthermore, the supervisors' awareness of the status of the employees' individual training plans was developed by improving opportunities for reporting.

All employees working in the Olkiluoto nuclear power plant area must attend induction training. The general section of the induction training is intended for everyone working in the Olkiluoto

area, while the radiation section is intended for those working in the radiation controlled area. In 2021, a total of 3,011 (3,527) people completed the general section of induction training, and 1,454 (1,614) completed the radiation protection section (reported on 17 January 2022). Both training parts were provided in Finnish and English. They are also available in Finnish and English in both the internal and external learning environments for anyone who needs a refresher.

Basic competence during annual outages was developed by means of online annual outage training, which was also a prerequisite for an access pass. The purpose of the training was to ensure that the employees of the Group and the external annual outage personnel are well aware of the TVO Group's expectations related to high-quality work performance and safe ways of working. A total of 823 TVO Group employees and 1,895 members of the external workforce, of which 54 were authority representatives, completed the online annual outage training course. The total number of participants was 2,718.

A training package similar to the annual outage training at the OL1 and OL2 plant units was provided for OL3. The purpose

of the training was to reinforce the expectations related to high-quality work performance and to prepare for fuel loading at OL3. A total of 75 Group employees and 634 members of the external workforce completed the theory part as online training. Mock-up training sessions were organised in a separate facility for a limited number of participants due to the COVID-19 pandemic. During 2021, the mock-up section was completed by 688 persons. The training package must be completed before an access permit to OL3 indoor facilities can be granted.

Considering occupational health and safety and industrial safety from a competence management point of view promotes the implementation of a safe work environment. General industrial safety training is first provided during the TVO induction

”

**TVO aims to do its part for the continued availability of nuclear energy expertise, being aware of its role as a future employer of new nuclear sector experts.**

training, which also includes safety-related working methods and expectations that have been identified as important for the nuclear energy industry. The annual training programme includes regular first aid training that also covers the treatment of electricity-related injuries.

Other training courses that relate to occupational health and safety risks identified at TVO include training for work in closed and confined spaces, training for manhole guard duty, hot work card training, and training for lifting and the use of fall protection equipment. Training courses related to electrical safety include a basic course for people with no training in electrical engineering who require access to electrical facilities, and the SFS 6002 safety training that is compulsory for electrical engineering professionals working in Finland. ATEX training is targeted at people who work in explosive environments or design such facilities and equipment.

Occupational health and safety training courses provided information about the occupational health and safety management system and the management system for risks related to work and the environment. Thematic training events on various issues are held each year to promote employee well-being at work.

## Versatile cooperation for competence development

**TVO ENGAGES** in many levels of cooperation with educational establishments and students. The purpose of this work is for the company to do its part for the continued availability of nuclear energy expertise, being aware of its role as a future employer of new nuclear sector experts.

Late in 2021, TVO participated in the implementation of a national nuclear safety and waste management training course together with other major operators in the industry. Such training courses give students a holistic understanding of the nuclear industry and its central operating models. The training consists of six periods that contain key matters related to nuclear power plants and nuclear waste management.

Together with Swedish nuclear power companies and Fortum's Loviisa nuclear power plant, TVO also participated in the Nordic Nuclear Trainee programme in 2021. The purpose of the training is to raise the students' interest towards the nuclear industry as an employer and to help them see the opportunities nuclear power can offer in the future.



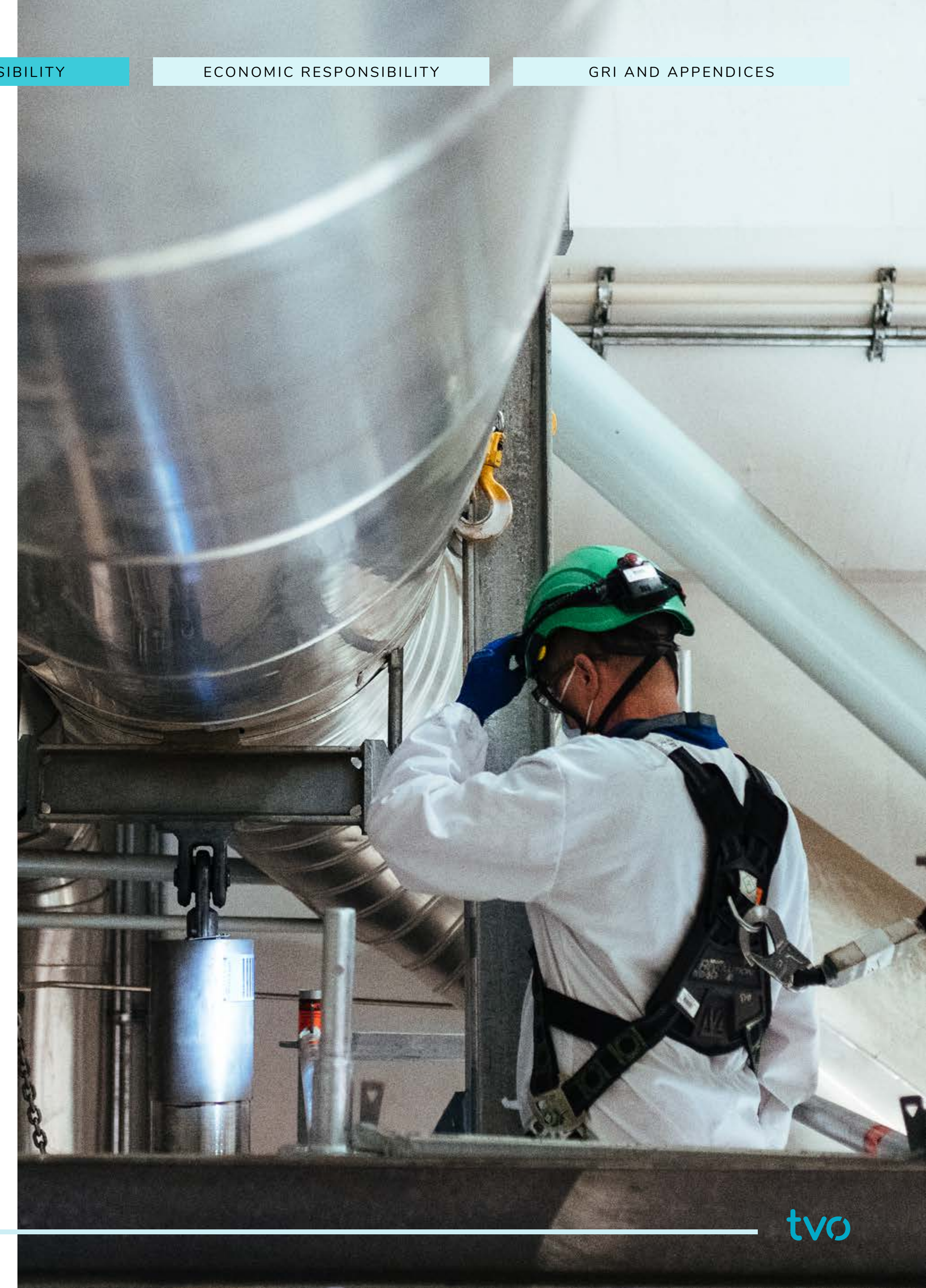
# Occupational health and safety

The TVO Group's goals are to guarantee its employees, contractors, and service providers a safe workplace and operating environment, as well as to verify that standardised operating methods are used in the Group's operating area.

**THE OCCUPATIONAL** health and safety operations are guided by an ISO 45001 certified occupational health and safety system (OHS system). The system also covers TVO's share of the OL3 construction phase.

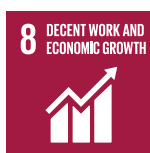
The mission of the OHS organisation is to be an expert organisation that supports, coaches, monitors, and develops occupational health and safety operations and helps the line organisation and the contractors succeed in this area. The contractors working for the TVO Group at Olkiluoto are responsible operators who work in accordance with the Group's expectations and comply with shared operating models. This ensures that Group employees, partners, and contractors can work safely at Olkiluoto, without the work affecting their health. The most important safety objectives for 2021 were clarifying the OHS responsibilities of the line organisation, supporting supervisors in their work, strengthening contractor cooperation, and developing the processes for identifying hazards and managing risks.

The occupational health and safety policy is included in the Group-level policy under social responsibility. Starting points for the occupational health and safety policy are zero accidents, maintenance of a good atmosphere and working conditions, and zero tolerance in terms of workplace harassment or bullying. The goal of every employee in terms of industrial safety is to look after the safety of oneself and others. When making decisions about industrial safety, the Group is committed to hearing the employees and any employee representatives, as well as to ensuring their inclusion. According to the zero accidents principle, all accidents can be avoided by carefully planning the work, identifying hazards in a proactive manner, and adhering to strict quality standards.



## SDG

## TARGET



### Occupational health and safety

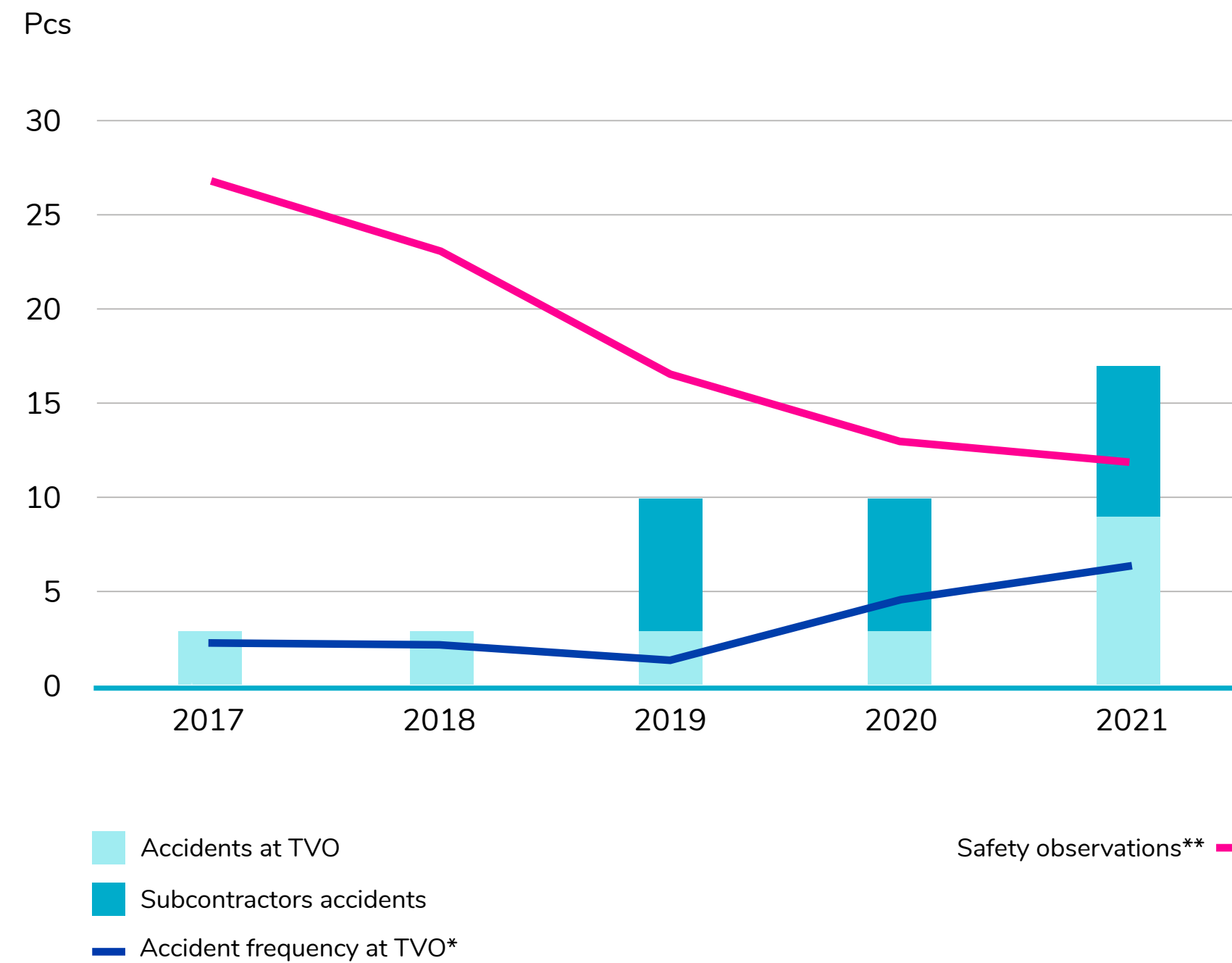
- No serious accidents in the TVO Group, including contractors (continual).
- The TVO Group's accident frequency (accidents per one million working hours) below 1, including contractors, by 2030.

## Cooperation in OHS across organisational borders

**THE OCCUPATIONAL** health and safety activities are coordinated by OHS experts in the Corporate Security competence centre. Furthermore, personnel groups (employees and officials) have named industrial safety delegates and deputy delegates from amongst themselves. There is an Olkiluoto OHS team consisting of OHS experts, industrial safety delegates, representatives of the different business functions and units, and representatives of occupational healthcare services. The team is comprehensive and it has been confirmed to represent the entire personnel. The purpose of the team is to strengthen the communication between the OHS personnel and the line organisation and to support the development of occupational health and safety activities.

Reports on the functionality of the OHS system and the required corrective measures are submitted to the management twice a year in connection with management reviews. Annually set industrial safety targets support the development of the operations. The management performs safety walk-downs that focus on different safety-related topics. Observations made during

### Accidents and safety observations



\*Per million working hours  
 \*\*Figure includes only TVO's observations

the walkdowns are entered in the electronic quality management system for further actions. The company's Board of Directors also monitors the developments in OHS.

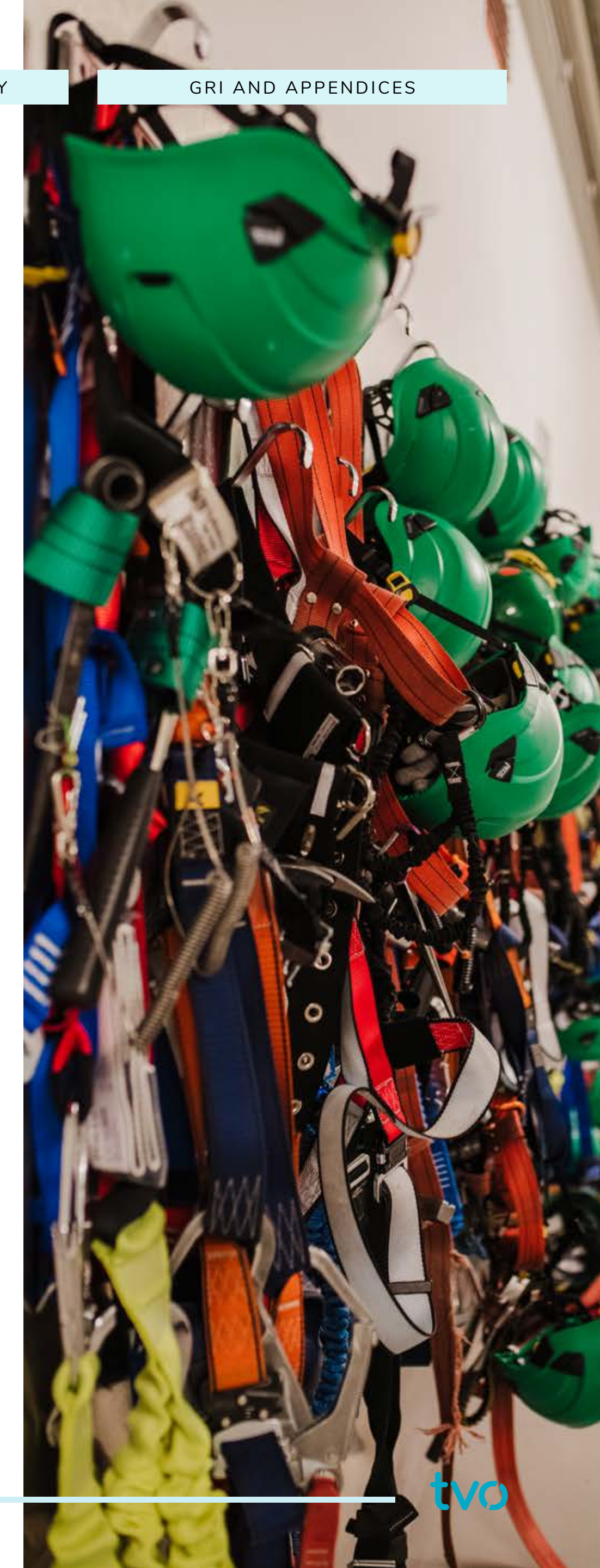
The TVO Group's goal for accident frequency in 2021 was 2.0 (accidents per one million work-hours). Six lost-time accidents occurred during the annual outages, which reflected negatively on

Pcs  
 3 000  
 2 500  
 2 000  
 1 500  
 1 000  
 500  
 0

the accident frequency. The accident frequency considers TVO's personnel, Posiva's personnel, and all subcontractors working in Olkiluoto, with the exception of the OL3 worksite that is reported by the Areva-Siemens plant supplier consortium.

In 2021, the accident frequency for the TVO Group was 6.3 accidents per one million work-hours. During the course of the year, TVO's employees had nine lost-time accidents, out of which one was serious, i.e. leading to an absence of more than 30 days. The accident frequency for TVO personnel was 5.5. The total number of absence days due to accidents was 91 for TVO personnel. Seven commuting accidents took place during the year, six of them leading to absence. All the lost-time accidents were investigated and corrective actions were specified to prevent reoccurrence. A total of eight lost-time accidents happened to TVO's subcontractors in Olkiluoto, one of them serious, and the accident frequency was 7.6 accidents per one million work-hours for subcontractors.

The management of the company has specified goals for 2022 in connection with its strategy planning. Industrial safety is included in the strategic planning for safety. The company-level goal has been set as decreasing the combined accident frequency at Olkiluoto to 1.6 or fewer accidents per one million work-hours.





## Identification of hazards, risk assessment, and accident investigations help prevent future accidents

**IDENTIFICATION OF HAZARDS** and assessment of industrial safety risks is carried out systematically. Proactive identification reveals the main hazards that employees may face at the workplace. As a result, the hazards can be eliminated or assessed and prioritised, and risks resulting from them can be reduced. In addition to task-specific risk assessments, the TVO Group utilises the booklet “Hazard identification on site”. The form in the booklet includes the most common hazards that need to be checked before starting the work in order to ensure its safe completion. The assessment of psychosocial risks is an area of special emphasis when developing the risk assessment process.

Risk assessment is particularly important for high-risk tasks. At the TVO Group, these include working at heights and close to openings, electrical work, demanding lifting work, and working in closed and confined spaces. The personnel receive risk assessment training, and occupational health and

safety specialists are involved in the assessment process. Safety observations are another important part of continuous development of operations. Observations can also be submitted anonymously. The number of safety observations surpassed targets in 2021.

Reporting observed hazardous situations helps in preventing accidents. The investigation of hazardous situations and the implementation of corrective actions aim to prevent recurrence of the events. In 2021, slipping, tripping, various strikes from objects, and injuries to hands were the most common accident types in the areas managed by the TVO Group. A positive feature was the low threshold in reporting events.

The unit manager of the injured employee initiates the accident investigation together with the industrial safety organisation. Accident investigations are reported to the line management, which processes them in its own organisations and ensures that corrective actions are implemented. The progress of corrective measures is followed on the Kelpo observation platform. The safety level of all ongoing construction sites is monitored by means of weekly TR measuring rounds.

# Radiation safety

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

**LIMITING THE DOSES** and keeping the level of radioactive releases as low as possible are already taken into account when designing the plant structures and functions. Each employee must take radiation protection issues into account in their own work. In addition to authority guidelines, the development of radiation protection operations also takes international recommendations into account.

The radiation doses of everyone working in the radiation controlled area of the nuclear power plant are monitored and measured using dosimeters. According to section 13 of the Government Decree on ionising radiation (1044/2018), the effective dose of a radiation worker must not exceed 20 millisieverts per year. The TVO Group's own targets regarding individual annual doses are keeping the dose obtained by all Olkiluoto employees from their work below 10 mSv per year and keeping doses caused by internal contamination below 0.5 mSv. These targets have been reached.

## Radiation exposure below dose limits

**THE RADIATION** exposure of employees in Olkiluoto has been low, remaining clearly below the dose limits specified by the authorities. In 2021, the total dose of

employees subject to radiation exposure in Olkiluoto was 984 manmSv. A total dose of 884 manmSv was accumulated during the power plant's annual outages. A total dose of 0.29 manmSv accumulated during the year from the commissioning of the OL3 plant unit.

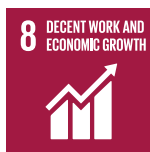
The combined annual dose of own personnel was 233 manmSv (2020: 190), and that of external personnel was 751 manmSv (2020: 375). The highest individual annual dose incurred at the Olkiluoto nuclear power plant was 8.1 mSv. The number of personnel under dose monitoring was 4,008 (2020: 3,348), with recorded doses accumulated by 950 (2020: 667) employees. The average annual radiation dose received by a person living in Finland from radiation sources in the environment is approximately 5.9 mSv<sup>1</sup>.

Note 1. Average effective dose of people living in Finland in 2018, STUK-A263 / April 2020, T. Siiskonen (Ed.), ISBN 978-952-309-446-8

“  
The radiation exposure of employees in Olkiluoto has remained clearly below authority limits.”

SDG

TARGET

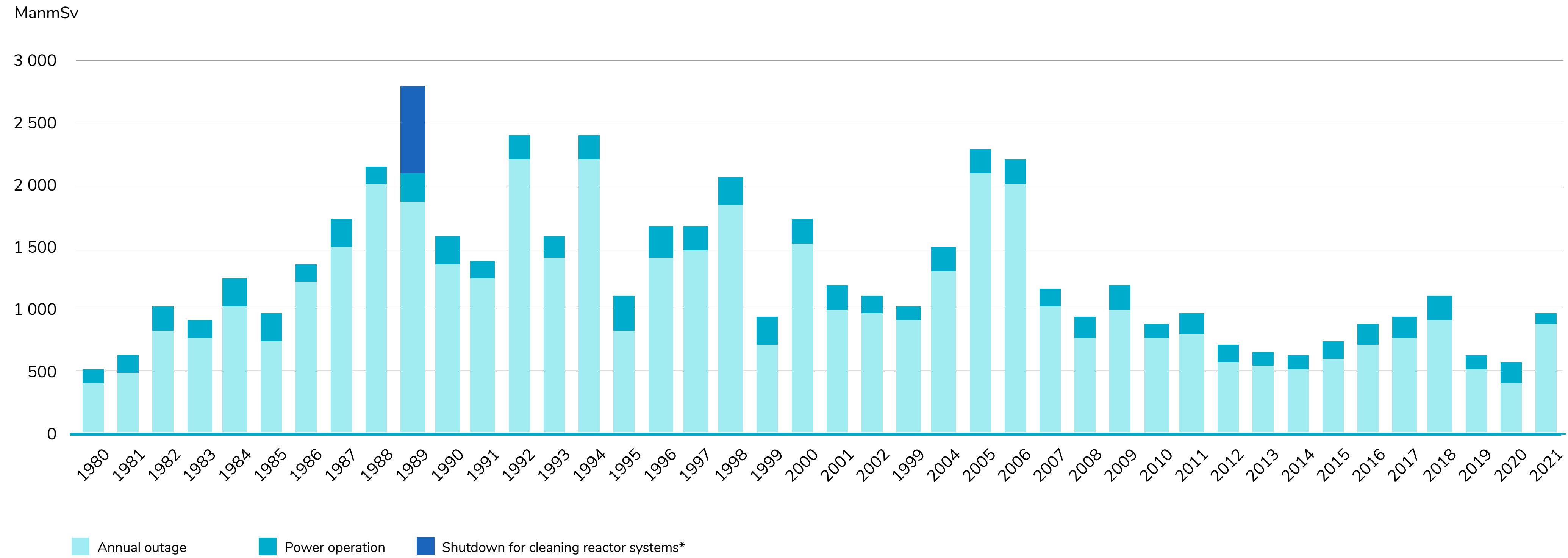


### Radiation protection

- Individual radiation doses incurred in Olkiluoto below half of authority limit (continual).



### Annual radiation doses at OL1 and OL2



\* In 1989, metal particles that had been inside a valve in the OL1 plant unit since its construction started to move and ended up in the reactor, preventing the upwards motion of the control rods. This caused the longest extra shutdown in the history of TVO.

# Social responsibility indicators

## Personnel

Personnel structure	2021	2020	2019	2018	2017
Personnel, permanent, 31 December	963	954	922	862	783
- Male	749	743	722	679	609
- Female	214	211	200	183	174
Personnel, fixed-term, 31 December	19	19	19	15	23
- Male	12	11	13	10	12
- Female	7	8	6	5	11
Personnel, part-time, 31 December <sup>1)</sup>	13	18	20	18	11
- Male	2	4	4	6	4
- Female	11	14	16	12	7
Average age of employees <sup>2)</sup>	43.2	42.7	42.6	42.7	43.2
- Male	43.6	43.2	43.1	43.2	43.6
- Female	41.6	41.2	40.8	40.7	41.8
Employees' place of residence (%) <sup>2)</sup>					
- Eurajoki	17	18	17	18	19
- Rauma	49	48	48	50	51
- Pori	18	17	17	15	14
- Other	16	17	18	17	16
New employees <sup>2)</sup>	70	77	116	134	110
- Male	52	55	87	102	92
- Female	18	22	29	31	18

<sup>1)</sup> The Group employees primarily work full-time.

Personnel structure	2021	2020	2019	2018	2017
Average age of new employees <sup>2)</sup>	34.0	35.9	35.7	34.8	35.8
- Male	33.8	34.6	35.8	35.3	36.2
- Female	34.6	39.3	35.1	33.3	33.7
Average number of years of employment <sup>2)</sup>	11	10	10	11	12
Incoming turnover (%) <sup>2)</sup>	7.3	8.1	12.6	15.5	14
Outgoing turnover (%) <sup>2)</sup>	6.3	4.7	6.1	6.4*	6
Number of retirees <sup>2)</sup>	5	11	13	9	8
Average age of retirees <sup>2)</sup>	64.6	63.9	64.1	63.8	64.6
Summer employees	84	87	107	105	92
- Male	56	65	79	78	68
- Female	28	22	28	27	24
Board of Directors by age (%)					
- Less than 30	0	0	0	0	0
- 30–50	10	20	20	40	45
- More than 50	90	80	80	60	55
Management Group by age (%)					
- Less than 30	0	0	0	0	0
- 30–50	31	15	8	23	21
- More than 50	69	85	92	77	79

<sup>2)</sup> Data reported only for permanent employees.

\* The figure includes 12 employees who were transferred to TVO due to a business transfer.

Personnel groups by gender <sup>1)</sup>	Female (%)	Male (%)	Total
Senior salaried employees	165 (28%)	422 (72%)	587
Regular employees	2 (1%)	189 (99%)	191
Industrial salaried employees	23 (96%)	1 (4%)	24
Technical salaried employees	24 (15%)	137 (85%)	161

<sup>1)</sup> Data reported only for permanent employees.

Personnel groups by age <sup>1)</sup>	Total	Under 30	30–50	Over 50
Senior salaried employees	587	54 (9%)	376 (64%)	157 (27%)
Regular employees	191	39 (20%)	115 (60%)	37 (19%)
Industrial salaried employees	24	0 (0%)	19 (79%)	5 (21%)
Technical salaried employees	161	19 (12%)	106 (66%)	36 (22%)

<sup>1)</sup> Data reported only for permanent employees.

Permanent personnel hired in 2021 by age group and gender	Male	Female	Total
Under 30	22	6	28
30–50	26	11	37
Over 50	4	1	5

Permanent personnel who left in 2021 by age group and gender	Male	Female	Total
Under 30	7	2	9
30–50	28	13	41
Over 50	9	2	11

Employment period of employees who left TVO in 2021 by age group and gender	Male	Female	Total <sup>1)</sup>
Under 30	1	2	2
30–50	5	8	6
Over 50	17	12	16
Total, on average	7	8	7

<sup>1)</sup> Total, on average

## Well-being at work

Occupational health and safety indicators	2021	2020	2019	2018	2017
Sick leaves (%)	2.4	2.3	2.6	3.1	2.1
- Male	2.3	2.1	2.5	2.9	2.0
- Female	2.6	3.0	3.1	3.6	2.5
Sick leaves (hours/person)	43	43	47	55	41
Persons with zero absentee rate <sup>1)</sup>	401	394	309	238	300
- Male	320	326	254	192	243
- Female	81	68	55	46	57
Occupational disease rate	0	0	0	0	0
Health percentage (%)	41	40	31.8	27	38
Proportion of preventive occupational health care of total costs (%)	43.0	46	54.0	68	69.6
Proportion of medical care of total costs (%)	34	44	24	23.1	24.8

<sup>1)</sup> Data reported only for permanent employees.

## Competence development

Competence indicators	2021	2020	2019	2018	2017
Training days/person	10.8	10.6	13.0	15.7	13.2
Training days total	10,608	10,342	12,249	13,813	10,639
- Male	8,538	8,604	10,210	11,946	9,018
- Female	2,070	1,738	2,038	1,866	1,621
Training days (average)					
- Senior salaried employees (8.6 days / person)	5,062	5,224	6,558	7,157	5,343
- Technical salaried employees (18.4 days / person)	2,970	3,269	2,744	4,030	3,475
- Industrial salaried employees (3.7 days / person)	88	55	105	121	107
- Regular employees (7.8 days / person)	1,484	1,373	2,495	2,064	1,436
- Fixed-term and others (52.8 days / person)	1,003	421	347	440	278
Induction training – general part (in Finnish)					
- Number of attendees	2,118	2,471	2,077	2,034	2,119
- Online refresher course	1,258	1,746	1,323	1,113	991
Induction training – general part (in English)					
- Number of attendees	893	1,056	1,116	1,551	1,950
- Online refresher course	533	656	551	454	202
Induction training – radiation part (in Finnish)					
- Number of attendees	990	980	1,234	1,202	1,397
- Online refresher course	763	810	736	655	637
Induction training – radiation part (in English) <sup>1)</sup>					
- Number of attendees	464	634	473	499	
- Online refresher course	177	285	88	42	
- Number of persons who completed occupational safety card training <sup>2)</sup>	-	-	287	398	144

<sup>1)</sup> Reported as of 2018.

<sup>2)</sup> The occupational safety card is no longer required. The topic is included in the induction training.

## Occupational health and safety

Occupational health and safety indicators	2021	2020	2019	2018	2017
Working hours (incl. TVO) <sup>1)</sup>	1,642,227	1,628,034			
Working hours (incl. TVO's subcontractors) <sup>1)</sup>	1,367,618	1,123,432			
<b>TVO employee accidents</b>					
Absences, more than one day	9	3	3	3	3
- Male	5	2	3	3	2
- Female	4	1	0	0	1
Absences due to occupational accidents (days)	91	7	29	81	13
- Male	78	2	29	81	12
- Female	13	5	0	0	1
Accident frequency (accidents per one million working hours)	5.5	1.8	1.28	2.1	2.2
- Male	4.0	1.6	1.9	2.7	2.1
- Female	10.6	2.8	0	0	3.5
Lost day rate (per 100 employees) <sup>2)</sup>	11.1	0.9	4	11.2	
Zero accidents, no absence	10	7	18	16	8
- Male	6	2	13	11	5
- Female	4	5	5	5	3
Commuting accidents	7	7	18	2	5
- Male	5	5	14	1	4
- Female	2	2	4	1	1
Number of safety observations <sup>3)</sup>	1,199	1,309	1,666	2,319	2,602
Work-related fatalities (incl. TVO employees and subcontractors)	0	0	0	0	0
<b>TVO subcontractor accidents</b>					
- Absence of more than one day (LTA1)	8	7	7	6	13

<sup>1)</sup> Reported as of 2020.

<sup>2)</sup> Reported as of 2018.

<sup>3)</sup> Figure includes only TVO's observations.

## Group-level indicators

	2021	2020
Personnel, permanent, 31 December	1,044	1,035
- Male	810	802
- Female	234	233
Personnel, fixed-term, 31 December	33	32
- Male	20	18
- Female	13	14
Personnel, part-time, 31 December <sup>1)</sup>	15	22
- Male	3	6
- Female	12	16
Incoming turnover (%) <sup>1)</sup>	6.8	8.1
Outgoing turnover (%) <sup>1)</sup>	5.8	5.0
Summer employees	91	96
- Male	61	72
- Female	30	24
Sick leaves (%), TVO	2.4	2.3
- Male	2.3	2.1
- Female	2.6	3.0
Sick leaves (%), Posiva	1.3	1.6
- Male	1.3	1.5
- Female	1.3	1.7
Accident frequency (accidents per one million working hours)	6.3	4.5

<sup>1)</sup> Data reported only for permanent employees.

## Radiation safety

Radiation safety indicators	2021	2020	2019	2018	2017
Highest radiation dose of personnel (mSv) <sup>1)</sup>	8.1	7.8	7.5	9.5	9
Collective radiation dose (manmSv)	984	565	647	1,101	950
Annual outage dose (manmSv)	884	413	530	918	775

<sup>1)</sup> The maximum permissible radiation dose is 20 mSv / year.

# Economic responsibility at TVO

## A Particle-larly exceptional nuclear island

**AT THE TVO GROUP**, shareholder value is created through customer-oriented and competitive operations. TVO is owned by five shareholders, through which the 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 2021.

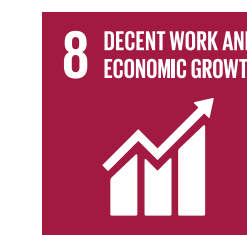
The TVO Group works with diverse projects, which also have a strong vitalising effect on the surrounding society. The most significant projects include Finland's greatest single act for the climate, Olkiluoto 3, after the completion of which approximately 30 percent of Finland's electricity will come from the Olkiluoto island, and Posiva's EKA project, which aims at starting the final disposal of spent nuclear fuel in the 2020s.

TVO is an important nuclear sector research and development organisation. The total R&D expenses in 2021 were EUR 18.2 million, most of which were used for R&D related to nuclear waste management. TVO has been generating electricity for Finnish society for more than forty years. Over the years, the Olkiluoto nuclear power plant units have been modernised in many ways, and their safety has also been improved.

One indication of TVO's nuclear industry expertise is the load factors of the Olkiluoto power plant units, which have been very high even by international standards for a long time now. Ever since the early 1990s, the OL1 and OL2 load factors have ranged between 93 and 97 percent. In 2021, the combined load factor of the OL1 and OL2 plant units was 92.8 percent.

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# Added economic value

**Nuclear power is a competitive, low-emission electricity production method. In the future, the EU's stricter and binding emission reduction requirements will further improve the competitiveness of clean energy when compared to fossil fuels.**

**ONE OF THE BENEFITS** of nuclear energy is its stable and predictable price to the owners. Most of the total costs of nuclear electricity are capital costs, while fuel costs remain fairly low. The construction and production of nuclear

power do not require any financial support from society.

For more than forty years, TVO has produced electricity for its industrial and municipal owners at cost price. TVO's nuclear electricity has boosted the competitiveness of the industrial owners and their prerequisites for providing employment in Finland.

Nuclear power is an extremely efficient electricity production method: for example, the amount of uranium fuel that fits into a matchbox is more than enough

to produce electricity for one year for a family of four living in a detached house with electric heating. Electricity produced in Finland brings well-being and offers the preconditions needed for growth – now and in the future.

In the case of nuclear power, competitiveness challenges include rising costs and increased price fluctuations due to weather-dependent production. However, operators in the nuclear industry are actively developing the industry to secure future operational preconditions.

## Profitable investment

**IN 2021**, TVO produced approximately one-sixth of the electricity consumed in Finland. TVO's operations are based on the production of electricity to shareholders at cost price. The owners cover all of TVO's operating costs and, in return, receive electricity pro-rata to their ownership. The owners consume the electricity themselves or sell it to third parties. The cost-price model allows electricity companies and electricity users of different sizes to participate in major investments, such as those

required for nuclear power, as well as reap the benefits of large-scale production. TVO's owners include 131 municipalities, which means that stable costs and predictability, the benefits of cost-price electricity, are felt all over Finland. Due to the cost-price operating principle, TVO cannot be analysed using conventional financial indicators, as they were created for comparing companies that aim to make a profit. Important indicators to TVO and the owners include the amount of electricity produced, the production cost, and the load factors of the plant units.

In 2021, TVO's most important financial goals included achieving the desired production cost level and reaching the planned electricity delivery volume. The key financial responsibility indicators are discussed in the 2021 Financial Statements.

## Combined electricity production of plant units OL1 and OL2 according to plan

In 2021, the combined electricity output of the Olkiluoto plant units, OL1 and OL2, was 14,438 (14,587) GWh. The combined load factor of the plant units was 92.8 percent.

The plant units operated safely. OL1's net production was 7,404 (7,310) GWh and the load factor was 95.1 (93.7) percent. OL2's net production was 7,033 (7,277) GWh and the load factor was 90.4 (93.3) percent.

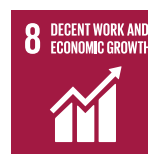
TVO's investments in 2021 amounted to EUR 219.6 million, of which the OL3 project accounted for EUR 163.6 million.



**In 2021, TVO produced approximately one-sixth of the electricity consumed in Finland.**

## SDG

## TARGET



### Customer-oriented & competitive activities

- The load factor of the Olkiluoto plant units is 90-95% as a rolling three-year average (continual).
- The rolling three-year production cost average is below 20 € / MWh in 2021. Calculating from OL3's first full production year, the rolling three-year average is below 30 € / MWh. Reported for the first time in 2026.

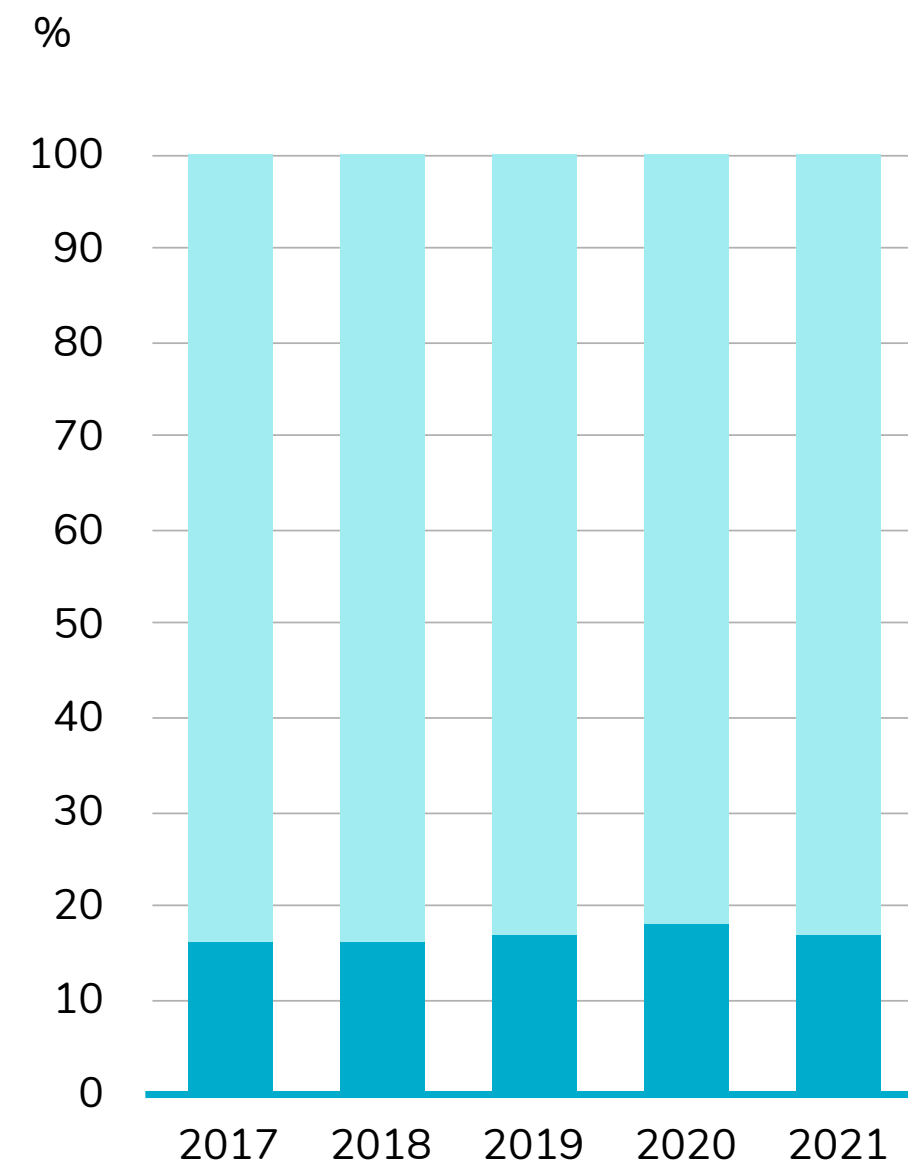
### Nuclear power as a desired production form

- Reputation index over 75 (excellent) in the stakeholder survey (continual).

### Funds ready for final disposal

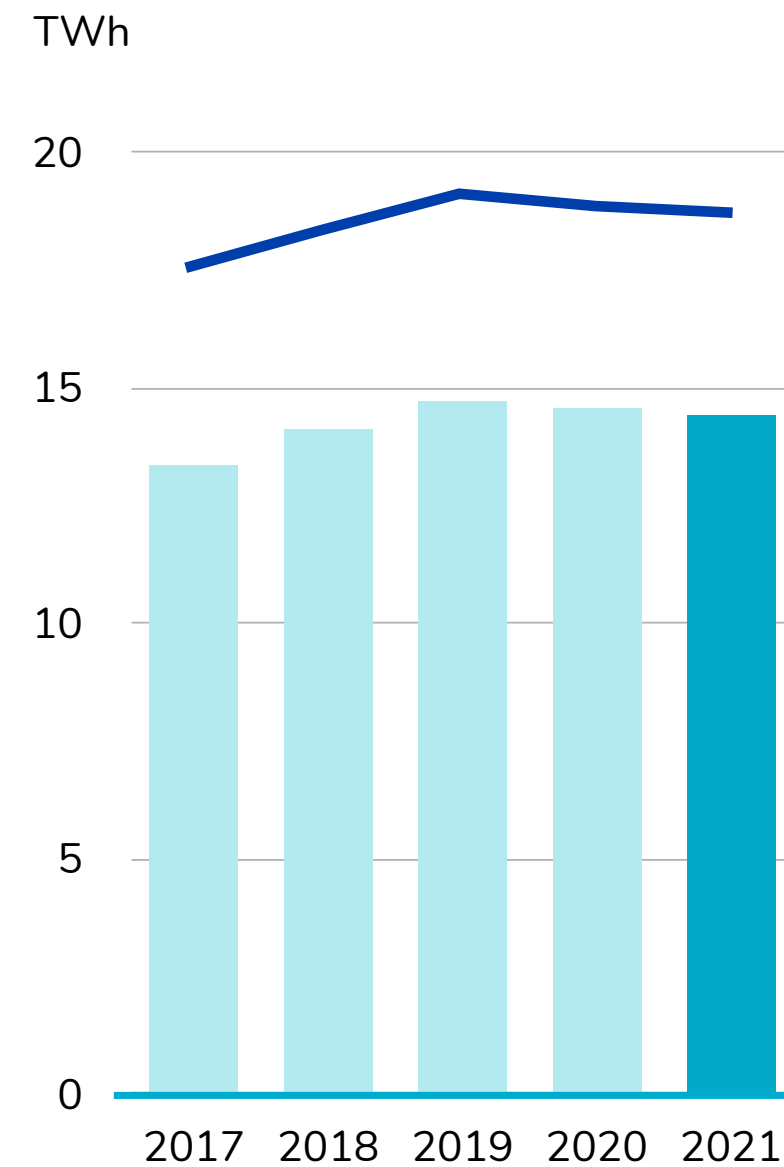
- The necessary funds for final disposal are secured through payments to the Finnish State Nuclear Waste Management Fund (continual).

### TVO's delivery share of the electricity used in Finland



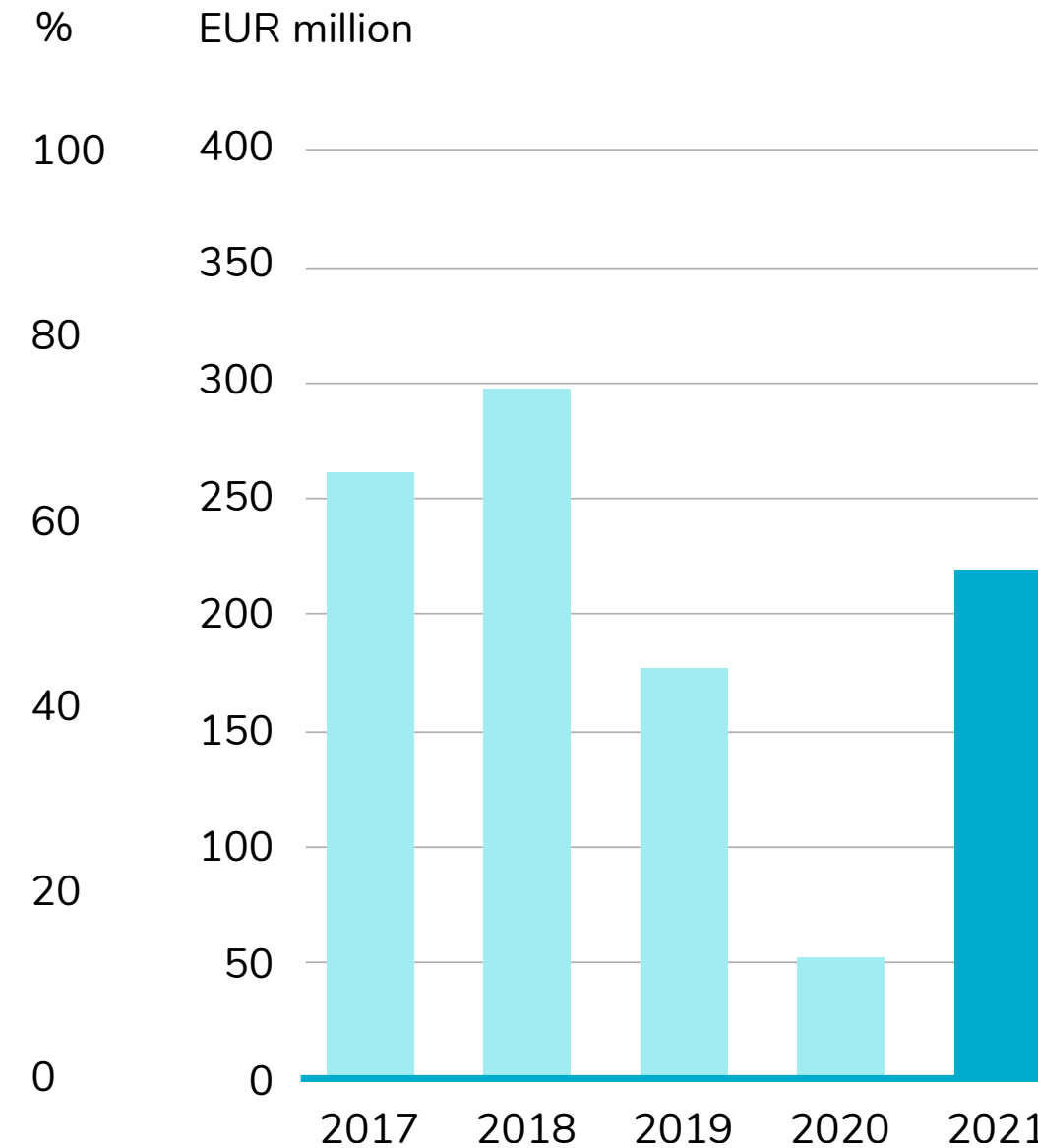
■ TVO's delivery share of the electricity used in Finland

### TVO's electricity production



■ Load factor of TVO's nuclear power production, %

### Investments



### CASE

## Investment activities of the Nuclear Waste Management Fund to become increasingly diversified

**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. The funds have been collected already for 33 years, and the Ministry of Economic Affairs and Employment (MEAE) annually determines the share of each nuclear power company in the Fund as well as the waste management fee to be paid to the Fund.

Until recently, assets from the Fund have been invested in Finnish government bonds of different maturities, in addition to loans related to shareholders. However, TVO has, together with a MEAE working group on the Fund's investment activities, proposed the diversification of investment activities, so that wealth can be generated into the Fund even more efficiently. Long-term research and development has been carried out in order to diversify the investment activities of the Fund, as it has required a change in the Nuclear Energy Act.

This goal was achieved in September 2021, when the first ever full-time CEO, **Jukka Järvinen**, was appointed for the Nuclear Waste Management Fund. Järvinen's objective will be to diversify investments e.g., through shares and company-issued loans. In addition to the CEO, a new board was appointed for the Fund, which will answer for tasks related to investment activities and risk management.



## Economic impacts

**IN THE REPORTING** of its economic responsibility, TVO uses the applicable indicators of the Global Reporting Initiative (GRI). TVO also reports some figures that are gathered as a part of the closing of accounts but that are not included in the actual financial statements.

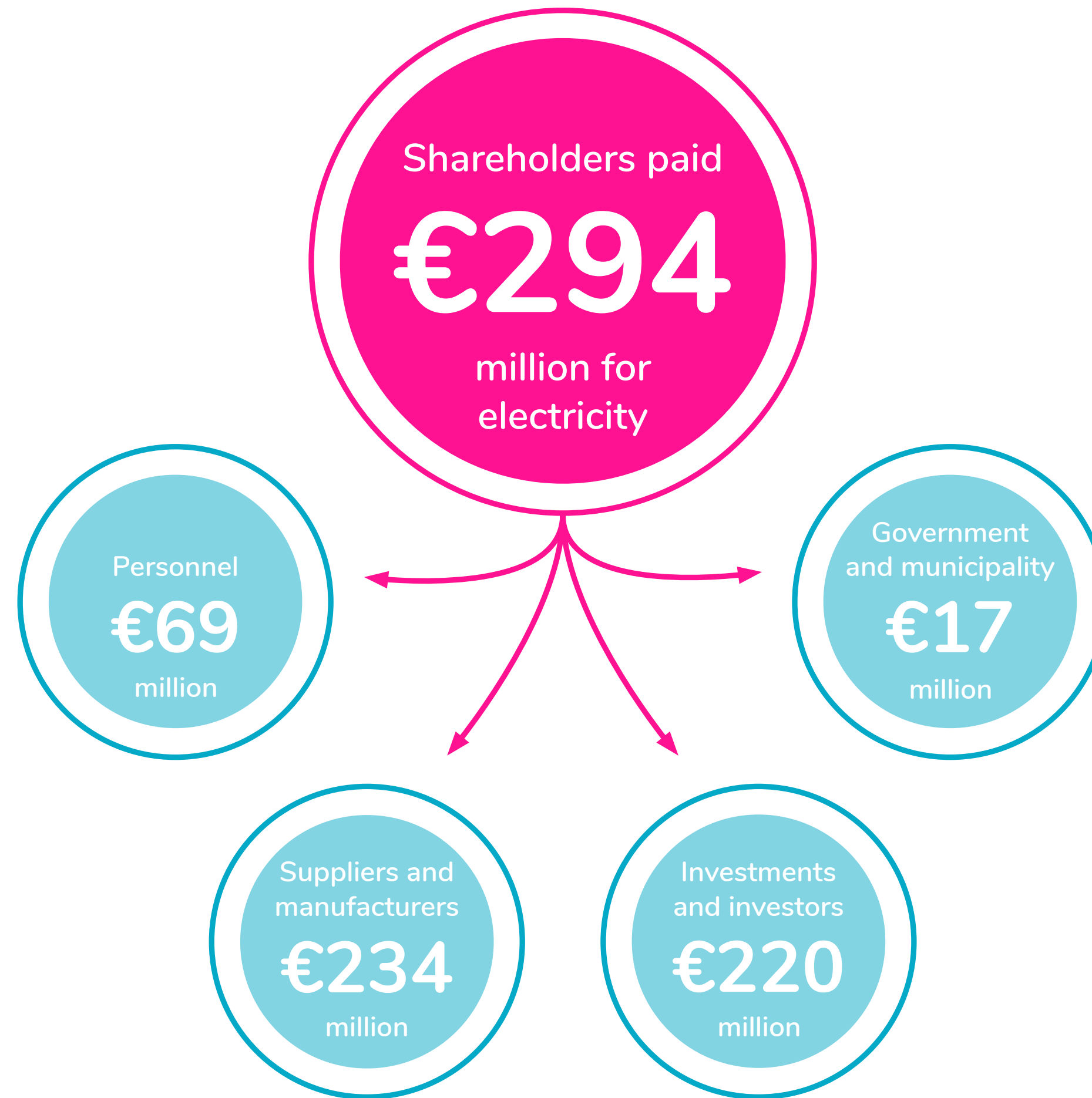
The economic impact (M€) of TVO to the key stakeholders is described in the figure on the right.

### Generation of added value

► **Shareholders:** TVO produces electricity to its shareholders at cost price. In 2021, TVO's shareholders paid a total of EUR 294 (271) million for the electricity. TVO supplied 14,414 GWh of electricity, which amounts to approximately one-sixth of the total volume of electricity consumed in Finland.

The electricity is distributed all over Finland via a chain of ownership which consists of TVO's principal owner Pohjolan Voima as well as companies and power utilities of 131 municipalities, which own Pohjolan Voima and receive the produced electricity.

About half of the electricity produced by TVO is used by industrial companies owned by TVO's shareholders at various locations. The other half is consumed by households, agriculture, and the service sector.



! The figures in the image have been derived from TVO's income statement and balance sheet. The legend does not include all effects.

### Distribution of added value

► **Suppliers and subcontractors 234 (205):** A total of 939 external workers participated in the annual outages, 759 of them Finnish. In addition to companies from Finland, subcontractors from 22 other countries participated in the effort.

TVO's major cooperation partners have included Securitas Oy, in charge of security; Rauman Hovi Oy, in charge of the staff restaurants; and RTK-Palvelu Oy, responsible for cleaning and sanitation services. These companies employ over 350 people in Olkiluoto. In total, TVO regularly provided work for almost 850 subcontractors and consultants in Olkiluoto.

### Investments and investors:

**Investors:** At the end of the year, TVO's current and non-current liabilities amounted to EUR 5,206 (5,109) million. The company raised a total of EUR 800 (354) million in non-current liabilities, while repayments amounted to EUR 567 (257) million.

**Investments:** Good condition of the Olkiluoto nuclear power plant at all times in terms of production and functionality is ensured through alternating refuelling and maintenance outages of the plant units. In the maintenance outage of 2021, major tasks included pump and piping replacements in the shut-down cooling

system, the replacement of containment electrical penetration modules, repair work of the seawater channel, a feed water system recirculation line modification, a containment leak-tightness test, and the inspection and vacuum cleaning of the reactor pressure vessel bottom.

In 2021, investments in the OL3 project amounted to EUR 164 (9) million. Despite the COVID-19 pandemic, work at the OL3 construction site has continued under special arrangements.

Research and development costs totalled EUR 18.2 (18.5) million. R&D on nuclear waste management accounted for most of this.

► **Personnel:** At the end of the year, TVO employed 982 (973) people.

In 2021, TVO hired 70 (77) new employees, and 5 (11) employees retired.

The OL3 construction site employed almost 1,200 people at the end of the year. In addition, the subcontract work for the project provides employment both in Finland and abroad.

► **State and municipality:** TVO paid the municipality of Eurajoki EUR 16 (16) million in real estate tax.

# GRI and appendices

## Assured responsibility

**TVO'S CORPORATE** Social Responsibility Report has been prepared in compliance with the Core option of the Global Reporting Initiative (GRI) Standards. The report covers TVO's most material financial, social, and environmental responsibility aspects.

The employment, occupational health and safety, and training data in the report has been verified. The environmental reporting data has also been verified by an independent, objective party.

The Corporate Social Responsibility Report 2021 is part of TVO's overall annual reporting. Other reports published in TVO's annual report include the following:

- Report of the Board of Directors and Financial Statements for 2021, prepared in accordance with the IFRS standard, which provide information on the company's financial development. The Report of the Board of Directors covers the requirement set out in the Finnish Accounting Act for the reporting of non-financial data.
- TVO's Corporate Governance Report 2021, which describes TVO's management systems and the duties of TVO's administrative bodies.
- TVO's Environmental Report 2021, which complies with the EMAS regulation concerning environmental reporting, and the information of which is based on a certified environmental management system.

Posiva publishes the Report of the Board of Directors and Financial Statements for 2021 in accordance with the Finnish Accounting Act and related provisions. The report provides information on the company's financial development and covers the requirement set out in the Finnish Accounting Act for the reporting of non-financial data.

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# Responsibility reporting

**TVO has reported on its responsible management of the environment since 1996, and corporate social responsibility aspects since 2001.**

**TVO'S CORPORATE** Social Responsibility Report for 2021 (1 January to 31 December 2021) has been published in Finnish and English on TVO's website. The Corporate Social Responsibility Report includes an environmental report, which provides information on the environmental impact of TVO's operations, TVO's environmental protection targets, their achievement, and key environmental indicators.

The responsibility reporting data for 2020 was published on TVO's website in February 2021. The 2022 data will be published in spring 2023. Limited external assurance of the Corporate Social Responsibility Report was carried out by KPMG Oy Ab. The limited assurance covered the information on employment, occupational health and safety, and training in the Corporate Social Responsibility Report. The assurance report is available under

Independent Assurance Report in the Corporate Social Responsibility Report. DNV Business Assurance Finland Oy Ab, an independent and impartial accredited certification body, has verified the environmental report data. The statement is available under Verification Report in the Environmental Report. The accounting, financial statements, annual report, and administration for 2021 have been audited by PricewaterhouseCoopers Oy, Authorised Public Accountants.

## Measurement and calculation principles

**TVO'S CORPORATE** Social Responsibility Report is based on the data required by the Global Reporting Initiative (GRI) Standards for the Core option. The reporting principles pertaining to quality in the GRI Standards have been taken into account during the reporting process.

Starting from 1 January 2021, the report covers the operations of the Teollisuuden Voima Group and the operations in

Finland by regions, unless separately specified in conjunction with reporting that the information concerns the parent company level. The reporting has previously covered the operations of the parent company Teollisuuden Voima Oyj. In order to maintain comparability, some of the indicators in the report are reported only for the parent company. TVO reports accident and training data to some extent for TVO's contractors. Final disposal activities of spent fuel implemented by Posiva Oy, a company jointly owned by Fortum Power and Heat Oy and TVO, is described in the reporting.

The TVO Group has defined several of its own aspects for reporting purposes to complement the material aspects included in the GRI Standards. These describe material responsibility aspects that are typical for the TVO Group. The aspects that are material specifically for the Group include number of subcontractors during the annual outage, average number of subcontractors at the OL3 construction site, occupational health and safety, preparation for emergencies and exceptional situations, level of safety, accepta-

bility of nuclear power, investments to secure the availability and profitability of the plant units, and the decommissioning of nuclear power plants. Any changes to previously reported information are indicated separately in conjunction with the information in question.

The majority of the data presented in the Corporate Social Responsibility Report is based on the data to be reported to the authorities, which has also been published in TVO's other annual reports. The occupational safety information concerning the personnel is based on the occupational health and safety management system. Other personnel information has been collected on the company's or the Group's operations. As concerns the reporting of economic responsibility, TVO uses the key indicators referred to in the GRI Standards where applicable and presents in the Corporate Social Responsibility Report some figures obtained from the financial statement process that are not included in the actual financial statements. An independent greenhouse gas verifier has verified the amount of carbon dioxide emissions.

# GRI content index

This report has been prepared in accordance with the GRI Standards: Core option.  
The Corporate Social Responsibility Report is published in the Financial Publications section of TVO's website.

TVO's responsibility aspect	Location and comments
<b>GENERAL DISCLOSURES</b>	
<b>Organizational profile</b>	
102-1: Name of the organization	<b>TVO as a company</b>
102-2: Activities, brands, products, and services	<b>TVO as a company</b>
102-3: Location of headquarters	<b>Responsibility contact persons</b>
102-4: Location of operations	<b>TVO as a company</b>
102-5: Ownership and legal form	<b>TVO as a company</b> , Corporate Governance Statement - General
102-6: Markets served	<b>TVO as a company</b>
102-7: Scale of the organization	<b>Good work community, TVO as a company</b> , Financial Statements – Key figures of Teollisuuden Voima Oyj
102-8: Information on employees and other workers	<b>TVO as a company, Social responsibility indicators - Personnel</b>
102-9: Supply chain	<b>Responsible procurement operations, Good work community, Added economic value</b> , Report of the Board of Directors – Nuclear fuel, <b>Final disposal of spent nuclear fuel</b>
102-10: Significant changes to the organization and its supply chain	A change took place in TVO's shareholding at the beginning of July 2021, when Oy Mankala Ab purchased all the A and B series shares of Loiste Holding Oy.
102-11: Precautionary Principle or approach	<b>Safety, Environment and energy efficiency programme, Radiation safety</b> , Report of the Board of Directors – Regulatory environment; Risk management, Major risks and uncertainties, <b>Final disposal of spent nuclear fuel</b>
102-12: External initiatives	<b>Responsible leadership</b>
102-13: Membership of associations	<b>Responsible leadership, Social opinion leader</b>

TVO's responsibility aspect	Location and comments
<b>Strategy</b>	
102-14: Statement from senior decision-maker	<b>Review by the CEO 2021</b>
102-15: Key impacts, risks, and opportunities	<b>Review by the CEO 2021, Responsible leadership, Environmental management, TCFD at TVO</b> , Report of the Board of Directors – Risk management, Major risks and uncertainties
<b>Ethics and integrity</b>	
102-16: Values, principles, standards, and norms of behaviour	<b>Responsible leadership</b>
102-17: Mechanisms for advice and concerns about ethics	<b>Responsible leadership</b> , Report of the Board of Directors – Results of Ethical Business
<b>Governance</b>	
102-18: Governance structure	<b>Responsible leadership</b> , Corporate Governance Statement
102-19: Delegating authority	<b>Responsible leadership</b>
102-20: Executive-level responsibility for economic, environmental, and social topics	<b>Responsible leadership</b> , Corporate Governance Statement – Management Group
102-22: Composition of the highest governance body and its committees	Corporate Governance Statement – The Board of Directors in 2021
102-23: Chair of the highest governance body	Corporate Governance Statement – The Board of Directors in 2021
<b>Stakeholder engagement</b>	
102-40: List of stakeholder groups	<b>Responsible leadership, Social opinion leader</b>
102-41: Collective bargaining agreements	<b>Good work community</b>
102-42: Identifying and selecting stakeholders	<b>Responsible leadership</b>
102-43: Approach to stakeholder engagement	<b>Responsible leadership, Social opinion leader</b>
102-44: Key topics and concerns raised	<b>Responsible leadership, Social opinion leader</b>

TVO's responsibility aspect	Location and comments
<b>Reporting practice</b>	
102-45: Entities included in the consolidated financial statements	Report of the Board of Directors - Notes to the consolidated financial statements, <b>Responsibility reporting</b>
102-46: Defining report content and topic Boundaries	<b>Responsible leadership, Responsibility reporting</b>
102-47: List of material topics	<b>Responsible leadership, Responsibility reporting</b>
102-48: Restatements of information	No significant changes.
102-49: Changes in reporting	<b>Responsibility reporting</b>
102-50: Reporting period	<b>Responsibility reporting</b>
102-51: Date of most recent report	<b>Responsibility reporting</b>
102-52: Reporting cycle	<b>Responsibility reporting</b>
102-53: Contact point for questions regarding the report	<b>Responsibility contact persons</b>
102-54: Claims of reporting in accordance with the GRI Standards	<b>Responsibility reporting</b>
102-55: GRI content index	<b>GRI content index</b>
102-56: External assurance	<b>Responsibility reporting</b>
<b>MANAGEMENT APPROACH</b>	
103-1: Explanation of the material topic and its Boundary	<b>Responsible leadership, Social opinion leader, Responsible procurement operations, Safety, Supply of electricity in Finland and its climate impact, Responsibility for the environment and climate, Final disposal of spent nuclear fuel, Good work community, Competence development, Added economic value, Responsibility reporting</b>
103-2: The management approach and its components	<b>Responsible leadership, Environmental management, Social opinion leader, Responsible procurement operations, Safety, Responsibility for the environment and climate, Environment and energy efficiency programme, Final disposal of spent nuclear fuel, Good work community, Competence development, Occupational well-being, Occupational health and safety, Added economic value</b>
103-3: Evaluation of the management approach	<b>Responsible leadership, Environmental management, Social opinion leader, Responsible procurement operations, Safety, Responsibility for the environment and climate, Environment and energy efficiency programme, Final disposal of spent nuclear fuel, Good work community, Competence development, Occupational well-being, Occupational health and safety, Added economic value</b>

TVO's responsibility aspect	Location and comments
<b>ECONOMIC RESPONSIBILITY</b>	
<b>Economic performance</b>	
201-1: Direct economic value generated and distributed	<b>TVO as a company, Added economic value, Financial Statements – Key figures of Teollisuuden Voima Oyj</b>
<b>Indirect economic impacts</b>	
203-2: Significant indirect economic impacts	<b>Social opinion leader, Research and development, Supply of electricity in Finland and its climate impact, Competence development, Added economic value</b>
<b>ENVIRONMENTAL RESPONSIBILITY</b>	
<b>Materials</b>	
301-1: Materials used by weight or volume	<b>Responsibility for the environment and climate, Raw materials and material efficiency, Cooling water</b>
<b>Energy</b>	
302-1: Energy consumption within the organization	<b>Responsibility for the environment and climate, Raw materials and material efficiency, Production and energy efficiency</b>
302-4: Reduction of energy consumption	<b>Environmental management, Responsibility for the environment and climate, Environment and energy efficiency programme, Production and energy efficiency</b>
<b>Water and effluents</b>	
303-1: Interactions with water as a shared resource	<b>Follow-up of environmental impacts, Environment and energy efficiency programme, Cooling water, Raw materials and material efficiency, Releases into water and soil</b>
303-2: Management of water discharge-related impacts	<b>Cooling water, Releases into water and soil</b>
303-3: Water withdrawal	<b>Cooling water, Raw materials and material efficiency</b>
303-4: Water discharge	<b>Cooling water, Raw materials and material efficiency</b>
303-5: Water consumption	<b>Cooling water, Raw materials and material efficiency</b>
<b>Emissions</b>	
305-1: Direct GHG emissions	<b>Follow-up of environmental impacts, Releases into the air</b>
305-7: Nitrogen oxides (NOX), sulfur oxides (SOX), and other significant air emissions	<b>Follow-up of environmental impacts, Releases into the air</b>

TVO's responsibility aspect	Location and comments
<b>Waste</b>	
306-1: Waste generation and significant waste-related impacts	Responsibility for the environment and climate, Raw materials and material efficiency, Waste, Final disposal of spent nuclear fuel
306-2: Management of significant waste-related impacts	Waste, Final disposal of spent nuclear fuel
306-3: Waste generated	Waste
<b>SOCIAL RESPONSIBILITY</b>	
<b>Employment</b>	
401-1: New employee hires and employee turnover	Good work community, Social responsibility indicators
<b>Occupational health and safety</b>	
403-1: Occupational health and safety management system	Occupational health and safety
403-2: Hazard identification, risk assessment, and incident investigation	Occupational health and safety
403-3: Occupational health services	Occupational well-being
403-4: Worker participation, consultation, and communication on occupational health and safety	Occupational health and safety
403-5: Worker training on occupational health and safety	Competence development
403-6: Promotion of worker health	Occupational well-being
403-7: Prevention and mitigation of occupational health and safety impacts directly linked by business relationships	Occupational health and safety
403-8: Workers covered by an occupational health and safety management system	Occupational health and safety
403-9: Work-related injuries	Occupational health and safety, Social responsibility indicators
<b>Training and education</b>	
404-1: Average hours of training per year per employee	Competence development, Social responsibility indicators

TVO's responsibility aspect	Location and comments
<b>TVO'S OWN INDICATORS</b>	
TVO: Number of employees during annual outage	Safety
TVO: Average number of subcontractors' employees on Olkiluoto 3 construction site	Good work community
TVO: Occupational health and safety TVO: Työterveys ja -turvallisuus	Good work community, Social responsibility indicators
TVO: Disaster/Emergency Planning and Response	Safety
TVO: Level of safety	Safety
TVO: Investments to improve the availability, profitability, and safety of its nuclear power plant	Added economic value
TVO: Decommissioning of nuclear power plant	Environmental research and biodiversity, Final disposal of spent nuclear fuel, Added economic value

# Independent Assurance Report to the Management of Teollisuuden Voima Oyj

This document is an English translation of the Finnish report

We have been engaged by the Management of Teollisuuden Voima Oyj (hereafter “TVO”) to provide limited assurance on selected corporate responsibility indicators presented in TVO’s Corporate Responsibility Report 2021 (hereafter “Selected Corporate Responsibility Information”) for the year ended 31 Dec 2021.

The Selected Corporate Responsibility Information consists of:

**The following indicators presented in the “Sustainability Roadmap 2030” section:**

- Occupational health and safety: Accidents and Accident frequency
- Occupational health: Personnel survey result, Sick leaves and Employees’ pension insurance (TyEL) category
- High-class expertise: Actualisation rate of competence surveying and Inspection rate of individual training plans
- Professional development: Employees’ changes in position and Actualisation rate of navigation discussions

**The following indicators presented in the “GRI Index” section:**

- General Disclosures: GRI 102-8: Information on employees and other workers and GRI 102-41: Collective bargaining agreements

- Employment: GRI 103: Management Approach and GRI 401-1: New employee hires and employee turnover
- Occupational Health and Safety: GRI 103: Management Approach and GRI 403-9: Work-related injuries
- Training and Education: GRI 103: Management Approach and GRI 404-1: Average hours of training per year per employee
- TVO’s own indicators: Subcontractors working in Annual Outages of OL1 and OL2 and Average workforce at the Olkiluoto 3 construction site

## Management's responsibilities

**THE MANAGEMENT** of TVO is responsible for the preparation and presentation of the Selected Corporate Responsibility Information in accordance with the reporting criteria, i.e. *GRI Sustainability Reporting Standards*, and the information and assertions contained within it. The Management is also responsible

for determining TVO’s objectives with regard to sustainable development performance and reporting, including the identification of stakeholders and material issues, and for establishing and maintaining appropriate performance management and internal control systems from which the reported performance information is derived.

## Our responsibilities

**OUR RESPONSIBILITY** is to carry out a limited assurance engagement and to express a conclusion based on the work performed. We conducted our assurance engagement on the Selected Corporate Responsibility Information in accordance with International Standard on Assurance Engagements (ISAE) 3000 (Revised), *Assurance Engagements other than Audits or Reviews of Historical Financial Information*, issued by the International Auditing and Assurance Standards Board IAASB. That Standard

requires that we plan and perform the engagement to obtain limited assurance about whether the Selected Corporate Responsibility Information is free from material misstatement.

KPMG Oy Ab applies International Standard on Quality Control ISQC 1 and accordingly maintains a comprehensive system of quality control including documented policies and procedures regarding compliance with ethical requirements, professional standards and applicable legal and regulatory requirements.

We have complied with the independence and other ethical requirements of the Code of Ethics for Professional Accountants issued by the International Ethics Standards Board for Accountants IESBA, which is founded on fundamental principles of integrity, objectivity, professional competence and due care, confidentiality and professional behavior.

## Procedures performed

**A LIMITED ASSURANCE** engagement on Selected Corporate Responsibility Information consists of making inquiries, primarily of persons responsible for the preparation of information presented in the Selected Corporate Responsibility Information, and applying analytical and other evidence gathering procedures, as appropriate. In the engagement, we have performed the following procedures, among others:

- Interviewed the members of TVO's senior management and relevant staff responsible for providing the Selected Corporate Responsibility Information;
- Assessed the application of the *GRI Sustainability Reporting Standards* reporting principles in the presentation of the Selected Corporate Responsibility Information;
- Assessed data management processes, information systems and working methods used to gather and consolidate the Selected Corporate Responsibility Information;

- Reviewed the presented Selected Corporate Responsibility Information and assessed its quality and reporting boundary definitions and;
- Assessed of the Selected Corporate Responsibility Information's data accuracy and completeness through a review of the original documents and systems on a sample basis.

The procedures performed in a limited assurance engagement vary in nature and timing from, and are less in extent than for, a reasonable assurance engagement. Consequently, the level of assurance obtained in a limited assurance engagement is substantially lower than the assurance that would have been obtained had a reasonable assurance engagement been performed.

### Inherent limitations

**INHERENT LIMITATIONS** exist in all assurance engagements due to the selective testing of the information being examined. Therefore fraud, error

or non-compliance may occur and not be detected. Additionally, non-financial data may be subject to more inherent limitations than financial data, given both its nature and the methods used for determining, calculating and estimating such data.

### Conclusion

**OUR CONCLUSION** has been formed on the basis of, and is subject to, the matters outlined in this report.

We believe that the evidence we have obtained is sufficient and appropriate to provide a basis for our conclusions.

Based on the procedures performed and the evidence obtained, as described above, nothing has come to our attention that causes us to believe that the information subject to the assurance engagement is not prepared, in all material respects, in accordance with the *GRI Sustainability Reporting Standards*.

Helsinki, 16 February 2022

KPMG Oy Ab

Tomas Otterström  
Partner, Advisory



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