

RESPONSIBILITY REPORT

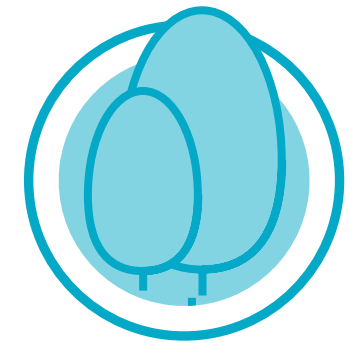
2019



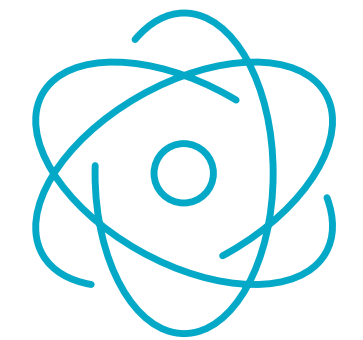
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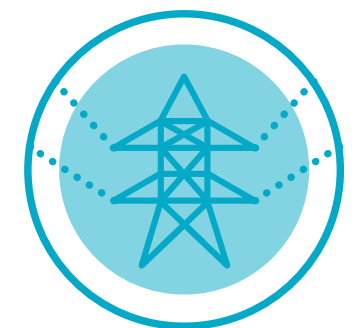
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PAGE 7:
Olkiluoto 3 is the
greatest single contribution
to climate in Finland




PAGE 7:
Once OL3 is complete,
Finland will have one of the
world's most efficient
nuclear power plant units

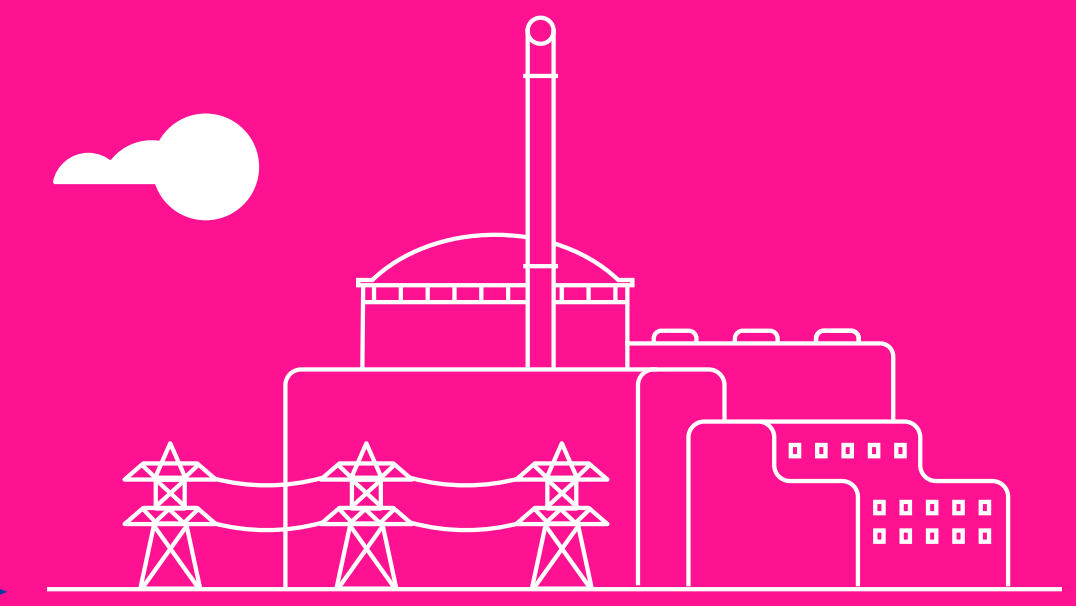


PAGE 39:
Approximately 17% of all
the electricity consumed in
Finland is produced on
the Olkiluoto island

TVO's year 2019

<p>January 23rd</p> <p>1969 2019</p> <p>Teollisuuden Voima celebrated its 50th anniversary</p>	<p>March 7th</p> <p>The Government granted an operating license for the OL3 nuclear power plant unit. The license is valid until the end of</p> <p>2038</p>	<p>April 23rd</p> <p>5000</p> <p>A historical electricity production level of 500 TWh was achieved at Olkiluoto on April the 23rd at 8.50 pm.</p>
<p>June 11th</p> <p>The 2019 annual outages were completed. This year, OL1 underwent a refueling outage and OL2 a more extensive maintenance outage. The annual outages lasted for a total of six weeks.</p> <p>6</p>	<p>September 23rd</p> <p>Foundation stone for Posiva's encapsulation plant was laid.</p> 	<p>December 31st</p> <p>7,54 TWh</p> <p>The Olkiluoto 1 plant unit achieved its best production volume ever, 7.54 TWh. Combined electricity production of the plant units was the second best in the plant's history, 14.75 TWh.</p>

IN FINLAND, nuclear power is together with hydropower the most important form of low-emission electricity production. Nuclear power is used as stable base load power which supports stable electricity production to supplement the variable production of hydropower, wind power, and solar power.



30%
of all electricity produced in Finland is generated on the island of Olkiluoto when OL3 starts production.

Review by the CEO 2019

The energy industry is at a turning point, and nothing is certain at the moment, except for the fact that demand for electricity will increase.

ELECTRICITY CONSUMPTION in Finland slightly decreased in 2019, but the trend is increasing. Combined with the ever-growing concern about climate change and the Government's goal of making Finland carbon neutral by 2035, this guarantees continued demand for CO₂-free electricity production. At the moment, 82% of the electricity produced in Finland is already emission-free, and the figure will rise once the greatest single contribution to climate in Finland, the Olkiluoto 3 plant unit, is completed.

In addition to renewable energy sources, stable and secure nuclear power is considered not only a necessary electricity production method in Finland, but also a globally significant means of combatting climate change. For example, in the scenarios of the Intergovernmental Panel on Climate Change (IPCC), nuclear power has a place in the energy palette of the future, also on a global scale.

RELIABLE GREEN POWER

The Olkiluoto plant units are known for their world-class capacity factors. In 2019, the island produced 14.75 TWh of climate-friendly electricity, reaching a combined capacity factor of 94.8%. OL1 achieved its best annual production volume ever, 7.54 TWh. The production in Olkiluoto eliminated some 12 million metric tons of CO₂ emissions when compared to producing the same volume of electricity with more coal-intensive production methods. This roughly corresponds to emissions from all the traffic in Finland.

TVO's mission is to produce environmentally friendly nuclear electricity for its shareholders safely and competitively, thus creating well-being for the whole of Finland. We will continue the work we have been doing for the past forty years: the operating licenses of all of our plant units are valid 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. We have modernized and developed our plant units throughout their lifecycle. This has

allowed us to continuously improve the safety and reliability of our plant units, and the extension of our operating licenses is a concrete example of this.

We at TVO want to be highly valued trailblazers of the nuclear industry, and management of the nuclear power life-cycle is an integral part of this aspiration. The transfer of Posiva's final disposal project to the construction phase signifies yet another step forward in this process. We have a solution for the final disposal of spent nuclear fuel. In this respect, we set a good example also internationally. Posiva's EKA project is the first final disposal project that has proceeded this far.

TOWARDS FINLAND'S LARGEST CONTRIBUTION TO CLIMATE

Preparations for fuel loading are ongoing at Olkiluoto 3. According to the plant supplier's schedule, regular electricity production at the plant unit will begin in March 2021. This also means that Finland's largest contribution to climate will become a reality and our production volume will increase to approximately 30% of the total electricity demand in Finland. The larger volume will also bring with it more responsibility, which is why TVO's

readiness for the commissioning of the OL3 EPR (European Pressurised Reactor) has been verified by independent experts. The assessments aim to prove that the nuclear industry's best procedures are also used in the case of OL3.

RESPONSIBILITY IS AT THE HEART OF NUCLEAR INDUSTRY EXPERTISE

Being a nuclear industry expert and a trailblazer means that you always responsibly complete your tasks. Other core values of nuclear industry experts include continuous improvement, anticipation, and an open culture. Our company-level policies and procedures have been built on these values to support optimal work.

The responsible operations are also reflected in the results of our stakeholder survey that was completed in fall 2019: TVO was considered a responsible operator and an important player in terms of the mitigation of climate change. The respondents felt that the profitability of nuclear power still requires some additional effort, though. To achieve this, we are about to launch a collaborative project of operators in the nuclear industry to verify the extensive supplier network and



renew component licensing and approval practices. The project will be realized in close cooperation with other nuclear industry operators and authorities.

Ultimately, TVO's success depends on the people who work here, and their well-being enables the well-being of the surrounding society. Hence, ensuring that the workplace allows involvement of the employees and that people are valued and cared for is the most important value in terms of the results of our work. We have invested in the development of well-being at work with the Better Workplace project and management to make daily work more fluent.

The work we do is much more than the terawatt-hours we produce – nuclear power means caring for the climate and each other.

Jarmo Tanhua

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. TVO's goal is not to make profit or pay dividends.

TVO is owned by six shareholders, some of which – like TVO – operate according to the cost price principle. Electricity generated by TVO serves the needs of Finnish industrial and energy companies, some of which were owned by a total of 132 Finnish municipalities in 2019. Olkiluoto nuclear power plant generates approximately 17 per cent of all the electricity consumed by people in Finland.

TVO's operations are based on a strong safety culture and securing the safety of

production. TVO's operational system covers production operations at the Olkiluoto nuclear power plant, maintenance and development of production capacity, construction of additional production capacity, as well as related steering and resourcing operations. The system meets the requirements of international quality management, environmental, and health and safety standards, and it has been certified by DNV GL Business Assurance Finland Oy Ab. The general part of

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Electricity generated by TVO serves the needs of Finnish industrial and energy companies, some of which were owned by a total of 132 Finnish municipalities in 2019.

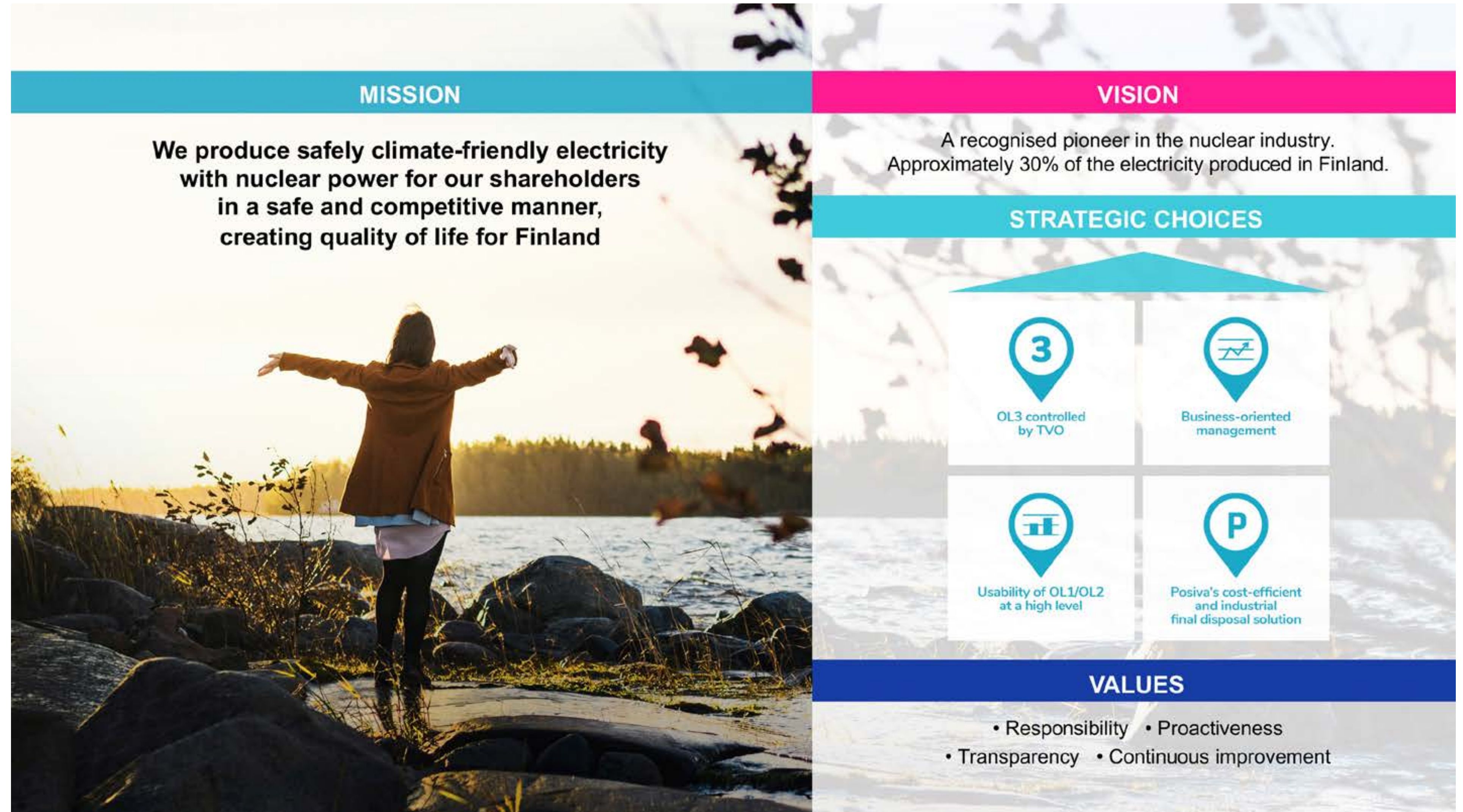
the operational system also acts as the licensee's quality management system approved by the Radiation and Nuclear Safety Authority (STUK).

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

The objectives of TVO's strategy include predictable and competitive price of electricity, solid safety brand, and satisfied customers. The goals are to maintain a competitive average electricity production cost and to ensure that the operability of the plant units meets the company's goals.



The safety culture is maintained at a high level and safety is systematically upheld and developed at all stages of the nuclear power lifecycle. As the result of changes of the operating environment, nuclear power will remain a major part of the energy selection of Finland and the entire EU as we make our way towards a carbon neutral society.



Olkiluoto 3

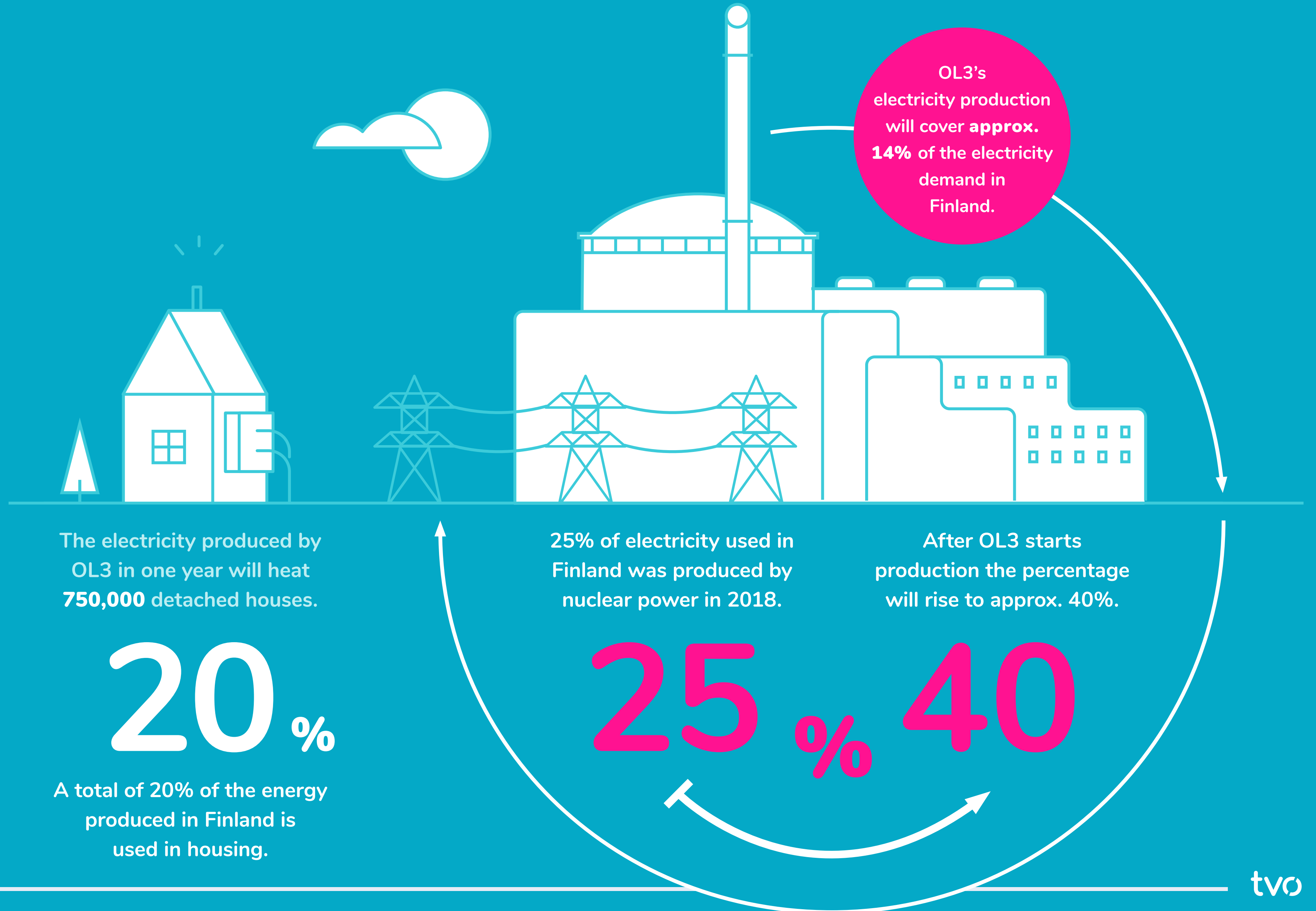
The largest single climate action in Finland

Olkiluoto will see the commissioning of what will be the greatest single contribution to climate in Finland. After the commissioning of the most powerful nuclear power unit in the world, approximately 30% of Finland's electricity will come from one island, where the entire lifecycle of nuclear power will be managed.

THE OBJECTIVE is to cut greenhouse gas emissions by 80–95% by 2050. Electricity production with nuclear power instead of coal means an emission reduction of approximately 12 million metric tons – which corresponds to almost all of the annual greenhouse gas emissions from traffic in Finland.

The EU's objective is to cut greenhouse gas emissions by at least 40% from the level of 1990 by 2030. As an emission-free power generation method, nuclear power has a key role in the mitigation of climate change. The nuclear energy produced in Europe helps prevent at least 700 million metric tons of CO₂ emissions into the atmosphere each year.

Sources: FORATOM, Ministry of Economic Affairs and Employment, Energy and Climate Roadmap 2050, Eurostat 2016



Responsibility in TVO

Particle-larly responsible nuclear power

TVO'S RESPONSIBILITY is based on the maintenance of a high-class safety culture and a good work community, as well as on securing the supply of electricity in Finland. Through its operations, TVO also promotes achievement of the national climate targets and strives to improve the competitiveness and acceptability of nuclear power.

TVO's spent nuclear fuel will be packed in copper canisters and placed in the Olkiluoto bedrock at an approximate depth of 430 meters. The disposal of spent fuel is scheduled to begin in the 2020s; it will continue for approximately hundred years.

FACT



Did you know that some two meters of water is enough to protect you from radiation? In addition, approximately two meters of rock is enough to attenuate the radiation level of spent nuclear fuel down to the level of natural background radiation.

Responsible leadership

Operation of the TVO Group is based on defined principles and values. Ethically sustainable operating practices are promoted, and unethical operating practices and situations are challenged. 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.

THE CORNERSTONES of responsible leadership and operating practices are the Company values, on which the Company-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.

TVO complies with valid laws, regulatory guidelines, and principles of good governance in all its operations. Regulations by the Radiation and Nuclear Safety Authority (STUK) and requirements

laid down in the nuclear power plant guides (YVL Guides) are also followed. Everybody working at TVO is required to comply with legislation and regulatory guidelines and regulations, the principles of good governance, and TVO's voluntary commitments.



TVO's objective is to operate in a responsible, transparent, proactive manner, and to continuously improve its operations.

TVO is committed to promoting the United Nation's Sustainable Development Goals presented to the left in its operations.

The set targets are based on the production of stable and environmentally friendly electricity for society and minimization of adverse environmental effects of the operations at all stages of the electricity production chain.

TVO's managerial and supervisory personnel have the task of starting discussions about TVO'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 organization's activities.

TVO's subcontractors are informed of the Code of Conduct by, for example, including the Code of Conduct in contracts

signed with subcontractors and partners. All employees and subcontractors working at Olkiluoto must complete an online training course on the Code of Conduct. In 2019, a total of 347 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
- Energy efficiency system (ETJ+)
- Occupational health and safety management system OHSAS 18001:2007

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 Commit-

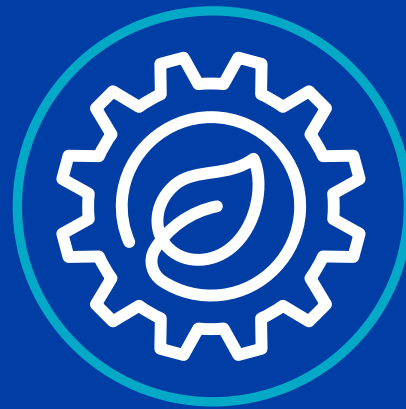
tee's responsibilities include monitoring the development of owner value. The work of the OL3 Committee focuses on the monitoring and promotion of the power plant project designed to ensure the supply of electricity in Finland and a positive impact on climate.

The management of and the efforts taken in relation to the most significant aspects of responsibility concern the entire organization of TVO, including the Management Team, the Business Units, and the service functions. The President and CEO, with the approval of the Management Team, is responsible for the objectives and planning relating to TVO's corporate responsibility. The Management Team 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.

Responsibility aspects are dealt with in the specific working groups determined in the TVO organization and the Organization Manual:



Key responsibility aspects



TVO's organizations and working groups dealing with the matter

Safety

Safety Team, Fuel Team, Occupational Health and Safety Team, ALARA* Team, Safety Culture Workgroup, Management Team of Corporate and Information Security, CAP* Team, Plant Meeting, Ageing Management Team, Fuel Team, R&D Team, Technical Service Control Team, Plant Meeting, Annual Outage Team, Operating Experience Team, Finance Competence Center

Good work community

Occupational Health and Safety Team, ALARA Team, HR Competence Center, Communication Competence Center, Better Workplace Steering Committee

Shareholder value

Risk Management Team, Technical Service Control Team, Finance Competence Center, Communication Competence Center

Supply of electricity in Finland and climate impact

Environment Team, Energy Efficiency Team, ALARA Team, Environment and Nuclear Waste Management Research Team, R&D Team, Chemicals Team, Communication Competence Center, Risk Management Team, Legislative Amendment Team

Duties of the Responsibility Team 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 Team once or twice a year

Material responsibility aspects

THE MOST SIGNIFICANT aspects that affect responsibility as concerns TVO's stakeholders and business activities have been identified by means of a materiality analysis. In addition to its personnel, TVO'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. The 2019 Re-

sponsibility Report is based on a materiality analysis that was updated in 2016. TVO plans to update the materiality analysis by 2021.

The materiality analysis surveyed aspects relevant to TVO on the basis of discussions with the company's management, personnel, and external stakeholders, as well as information obtained from opinion polls. Data for the materiality analysis was obtained from the most recent energy attitude survey and a stakeholder survey carried out as an online survey and targeted at shareholders, decision-makers, public officials, the media, opinion leaders, experts, non-governmental organizations, and the personnel.

In addition, comments and queries received from visitors were taken into account in the analysis. After prioritization of the material aspects, the outcome of the analysis was a materiality matrix confirmed by the key persons responsible for responsibility matters; it describes the view of the company and its stakeholders on aspects of responsibility that are important to TVO, the impact of responsibility, and related development areas. After prioritization, the materiality

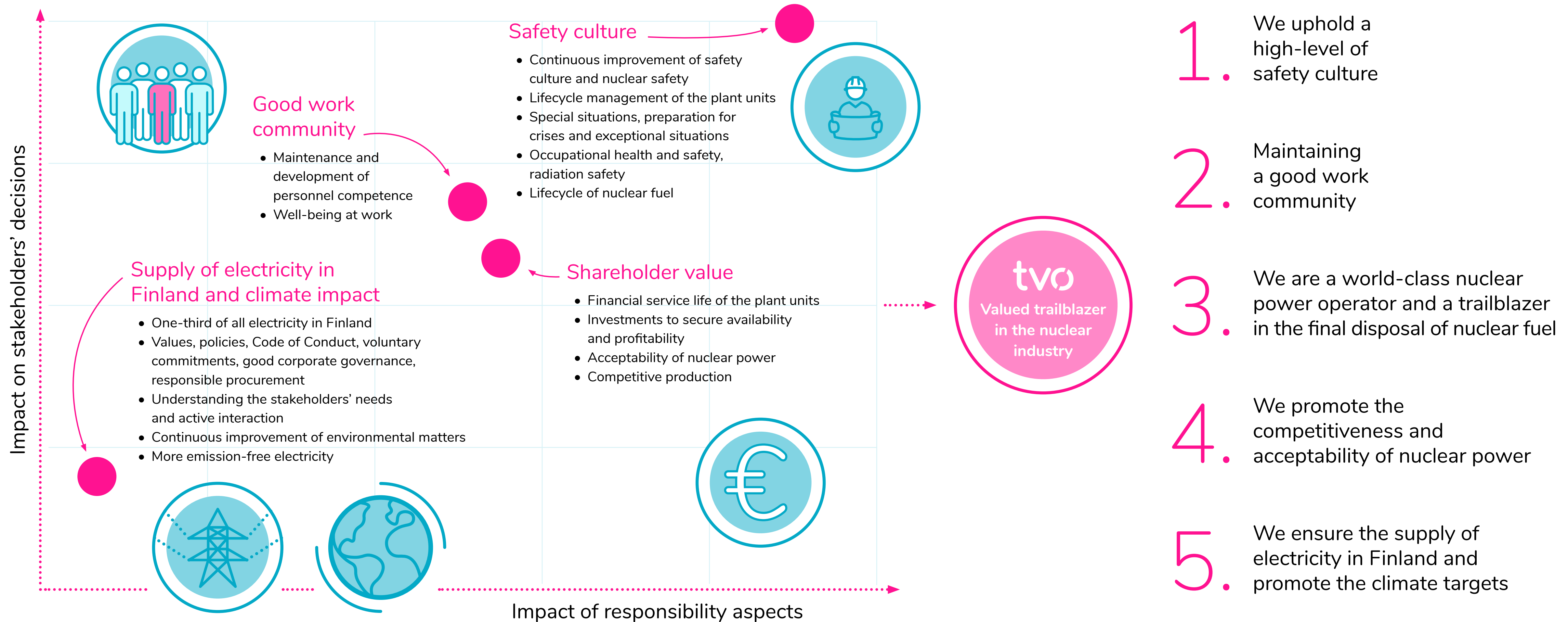
matrix was once more subjected to an approval procedure carried out as discussions between responsibility experts and representatives of the management of the company. The senior vice president in charge of corporate relations approved the aspects most relevant to TVO and the content of the Responsibility Report.



According to the materiality analysis, TVO's key responsibility aspects include a top-class safety culture, a good work community, securing the owner value and verifying power supply to people living in Finland, as well as positive environmental impact.

* ALARA = As Low As Reasonably Achievable, CAP = Corrective Action Program

Materiality matrix



Responsibility targets and results

THE RESPONSIBILITY targets are based on the principle of continuous improvement. The targets enable the company to monitor the realization of the key responsibility aspects.

	Objective 2019	Actual 2019
Reputation index	75	77
Personnel survey, class	_*	_*
Reports of suspected violations of the company's Code of Conduct, pcs	-	3
Sick leaves, %	< 2.2	2.6
Occupational accident frequency	< 3.2	4.0
Collective radiation dose, manmSv	922.87	646.61
Environmental incidents, pcs	0	2**
Unplanned energy unavailability factor, %	0	0.7
Unplanned automatic scrams, pcs	0	0

Reputation index: TVO Group stakeholder survey, average of respondent groups 0–100; less than 50 = Poor, 50–62 = Moderate, 62–70 = Good, more than 70 = Excellent. The survey is conducted and the results are reported every two years. The next survey will be conducted in 2021.

***Personnel survey:** The survey was conducted at the turn of the year 2019–2020. The results were completed in February 2020. The survey is conducted every 18 months.

Occupational accident frequency: per one million working hours. This is a Group-level indicator.

Collective radiation dose: An indicator of the World Association of Nuclear Operators (WANO). Reference point: other WANO members' NPPs. Target: the best quarter.

Environmental incidents: in the class considerable/severe.

Unplanned energy unavailability factor: Percentage of total production.

**The other incident happened at Fingrid's converter.

There is more information on the principles and results of TVO's ethical business operations in the nonfinancial information section of the 2019 report of the Board of Directors.



The EU's objective is to cut greenhouse gas emissions by 40% from the level of 1990 by 2030. As an emission-free power generation method, nuclear power has a key role in the mitigation of climate change.

Environmental management

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

THE SYSTEM is EMAS-registered, and the goal of the management system is increasing the level and continuous improvement of environmental protection. TVO has identified environmental and energy aspects related to its operations and assessed their significance. The significance of environmental and energy aspects are assessed on the basis of statutory and permit requirements as well as by observing the severity/utility of the impact, probability, and impacts to the stakeholder groups. Also TVO's opportunity to influence the issue are affecting the assessment process.

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

of environmental experts from various organizational units monitors the status of the targets approximately every two months. 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.

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

STORAGE AND HANDLING OF HAZARDOUS OR HARMFUL SUBSTANCES

PRODUCTION OF CLIMATE-FRIENDLY ELECTRICITY

SUSTAINABLE LAND USE

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

SPENT NUCLEAR FUEL GENERATED DURING OPERATIONS

EMISSIONS IN THE MANUFACTURE AND DELIVERY OF RAW MATERIALS, PRODUCTS, AND SERVICES

A RADIOACTIVE RELEASE INTO THE ENVIRONMENT DURING A SEVERE ACCIDENT

THERMAL LOAD ON THE SEA CAUSED BY COOLING WATER

Social opinion leader

TVO cooperates with political decision-makers and the Government to develop and execute energy legislation and guidelines. TVO's interaction with stakeholder groups is always guided by strict ethical principles, thus strengthening trust in the operations of TVO and the stakeholder group without jeopardizing the reputation or objectivity of either party.

Local communities

ACTIVE STAKEHOLDER COOPERATION

Stakeholders have a key role for a company that is engaged in environmentally responsible operations. The Olkiluoto Visitor Center receives some 12,000 visitors each year. The visitors are openly told about TVO's operations, and their questions are answered. 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 did not receive any expressions of concern related to environmental issues from external sources in 2019.



TVO engages in free-form interaction with the residents of the neighboring areas at open coffee and chat events and the SuomiAreena public debate forum, where discussion about the company and nuclear power is lively. TVO publishes Uutisia Olkiluodosta (News from Olkiluoto) magazine for people living in the immediate region and organizes regular interaction through various forums, such as the Municipal Cooperation Committee. TVO maintains close interaction with Eurajoki in the municipality's own cooperation team. 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, and Eura. TVO also participates in the operations of the Vuojoki Foundation and Vuojoki cooperation group.

TVO is a sponsor company for Eurajoen yhteiskoulu (a lower secondary school). The school and TVO have arranged

themed days for several age groups. A career choice event is arranged each year for upper secondary school students in Eurajoki, while pupils of the fifth grade of the Eurajoki elementary school are able to familiarize themselves with life in the 1950s at Raunola fishing farm in Olkiluoto. Energiaa Länsi-Suomessa (Energy in Western Finland) themed weeks are arranged together with other west coast nuclear power plants.

TVO arranges four science and technology camps per year for elementary school children with the theme Kiinnostus herää kokeilemalla (Whetting your appetite by experimenting). The Olkiluoto science and technology camps have been offered since 2003. Each camp lasts from Monday to Friday and is attended by up to 22 children, a total of 88 children during the summer. At the camp, the children get to learn about natural sciences and technology on their own terms.

TVO'S IMPACT ON THE LOCAL COMMUNITY AND SURROUNDING ENVIRONMENT

TVO'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 have a significant economic impact on the municipality of Eurajoki, and the neighboring municipalities in the region also benefit from the taxes paid by TVO employees. TVO and the OL3 construction site are important sources of employment and economic prosperity in the region, both directly and indirectly. Products 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 ORGANIZATIONS

TVO is an active participant in both the national and international nuclear power community, as well as in various organizations 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 nuclear safety. We also comply with the recommendations and requirements of the International Atomic Energy Agency (IAEA).

Visits

THE VIEWS of stakeholder groups regarding TVO's corporate social responsibility aspects are best obtained from the continuous flow of visitors to Olkiluoto. A visit to the Visitor Center and the Olkiluoto nuclear power plant is the best and most effective way for stakeholders to learn about nuclear power.

The Visitor Center is open to all visitors with no advance booking needed. The Electricity from Uranium science exhibition at the Visitor Center provides information about the production of electricity using nuclear power and covers the entire lifecycle of the uranium fuel from responsible mining to safe final disposal.

Guided tours are arranged for groups who have registered in advance. In 2019, a total of 12,649 people visited the Visitor Center; 5,518 of them viewed the

exhibition independently. The number of visitor groups was 355. Visiting groups most often consisted of schoolchildren or students, or the personnel of various organizations and enterprises. Every summer, open visits referred to as "Summer Wednesdays" are arranged. At best, they have attracted up to a hundred visitors to Olkiluoto in a day.

Sponsorship activities

TVO SUPPORTS sports, cultural endeavors, 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 company'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 supports activities that reach large numbers of people and are open to everyone.

The most important sponsorship targets in 2019 were:

- Rauman Lukko (ice hockey; representative team and juniors)
- Pallo-livot (soccer; representative team, juniors, and supervised exercise for children)

- Fera association (Finnish baseball; Fera women's representative team and Lukko junior girl teams)
- Rauma Golf
- Eurajoen Veikot (various sports)
- Festivo chamber music summer festival in Rauma
- Orienteering super weekend of Rasti-Lukko association in Rauma
- TVO supports the local community by sponsoring sports, cultural endeavors, and associations in the immediate vicinity of the power plant.

In addition to sponsorships, TVO makes annual donations to organizations, communities, and student groups who work for the public good. In 2019, sponsorship recipients included Eurajoen vesiensuojeluyhdistys, an association which protects the Eurajoki river basin.

Decisions concerning sponsorships and donations are made by TVO's HR Competence Center 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 organizations or projects.

Responsible procurement operations

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

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. Purchased 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, environmental management, and competitiveness, while also appreciating domestic and local suppliers. Suppliers are assessed, delivery quality is monitored, and immediate corrective measures are taken when necessary.

TVO only purchases products and services from evaluated and approved sup-

pliers. TVO uses a supplier classification system for all of its suppliers based on how significant their operations are for TVO's safety and potential risks inherent to TVO's production operations. The products must meet TVO's safety, quality, and environmental requirements. Orders can be placed with assessed suppliers only.

Audits – a quality assurance method

TVO REQUIRES that contracting parties use operating methods that comply with TVO's Code of Conduct and Group-level policies. TVO's contractors generally

“

TVO conducts negotiations on the procurement of uranium and signs procurement contracts with the suppliers at all the stages of the fuel production chain.”

apply a quality level in accordance with the ISO 9001 quality system, ISO 14001 environmental system, and OHSAS 18001 / ISO 45001 occupational health and safety system. Auditing is one of the quality assurance methods used. The audits may be carried out by TVO or a third party. TVO has the right to audit quality, safety, information security, and environmental systems, as well as the operations of its contractors and subcontractors to the extent it considers necessary. Contractors are obligated to ensure that the above-mentioned right is included in all contracts between the contractor and its subcontractors in the entire delivery chain. The Radiation and Nuclear Safety Authority (STUK) may participate in the audits to validate the operations of TVO or its subcontractors.

Procurement of uranium

TVO HAS high-level expertise regarding all the phases of the fuel procurement process. TVO procures its fuel mainly

“ The purpose of supplier evaluations is to ensure that suppliers pay appropriate attention to environmental matters, the well-being of personnel, and quality management.”

through a decentralized 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 of the chain, and the procurement operations are regularly subjected to competitive bidding.

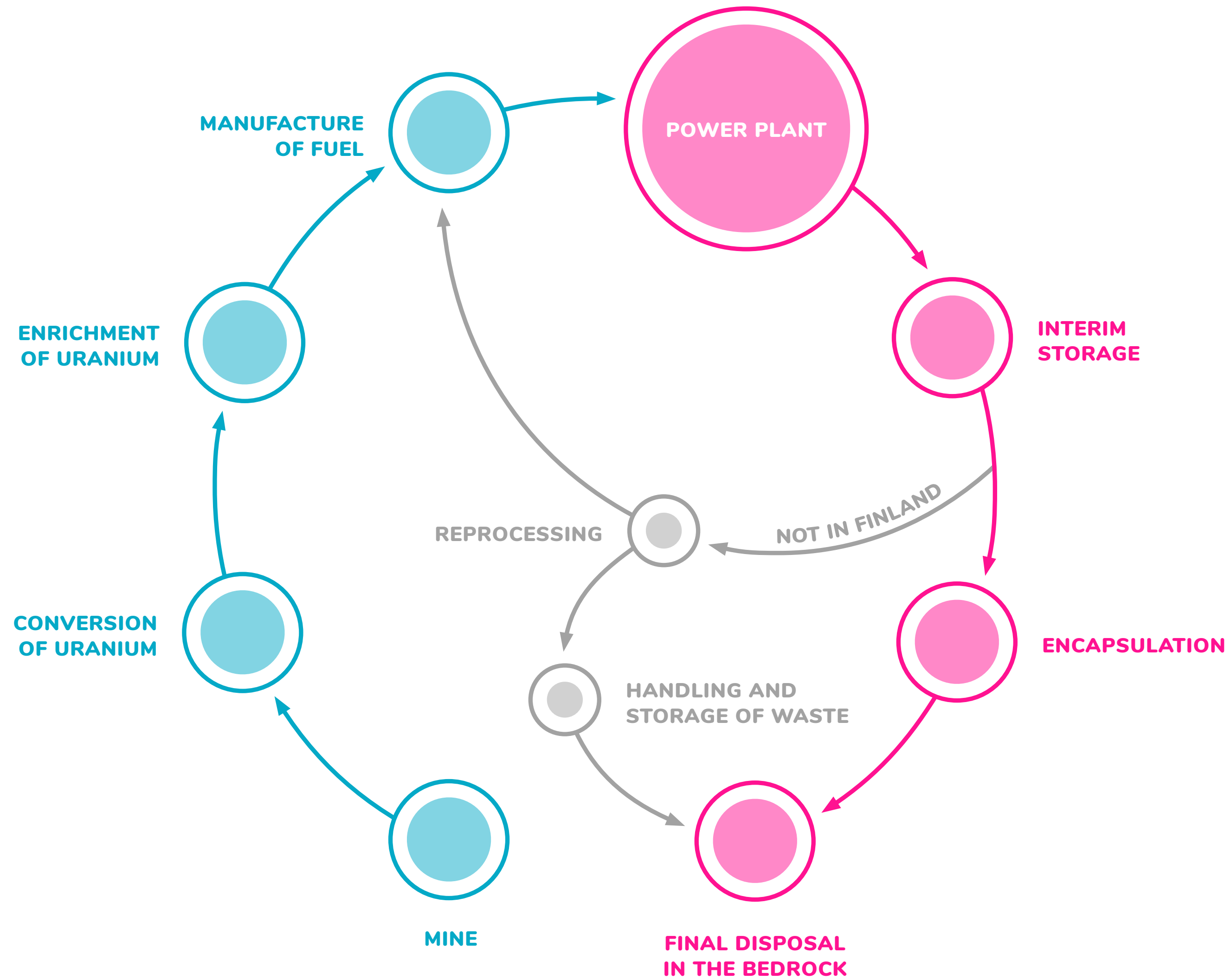
Furthermore, the composition of the fuel and the manner in which it is used are designed by TVO itself. The policy chosen by TVO clearly strengthens the company's position as Finland's leading supplier of nuclear power. Procurement operations are based on long-term contracts with leading suppliers. These 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, and 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 procedure and only procures uranium and nuclear fuel refining services from suppliers who have passed the evaluation process. 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.

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 demand that changes are made. 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.

Circulation of uranium



Research and development

TVO's R&D operations focus on supporting the acquisition and renewal of nuclear power plants' construction and operating licenses through the production of high-quality technical information, and on validating data and calculations for the needs and use of the plant units.

MODERNIZATIONS and modifications carried out at the plant units, as well as the monitoring and use of new technology, also create research needs. Storage, handling, and final disposal of waste comprise another important research area. The development of a safe spent nuclear fuel disposal solution by Posiva Oy remains by far the most important objective of TVO's research work as we enter the 2020s.

TVO is an important nuclear sector researcher and developer

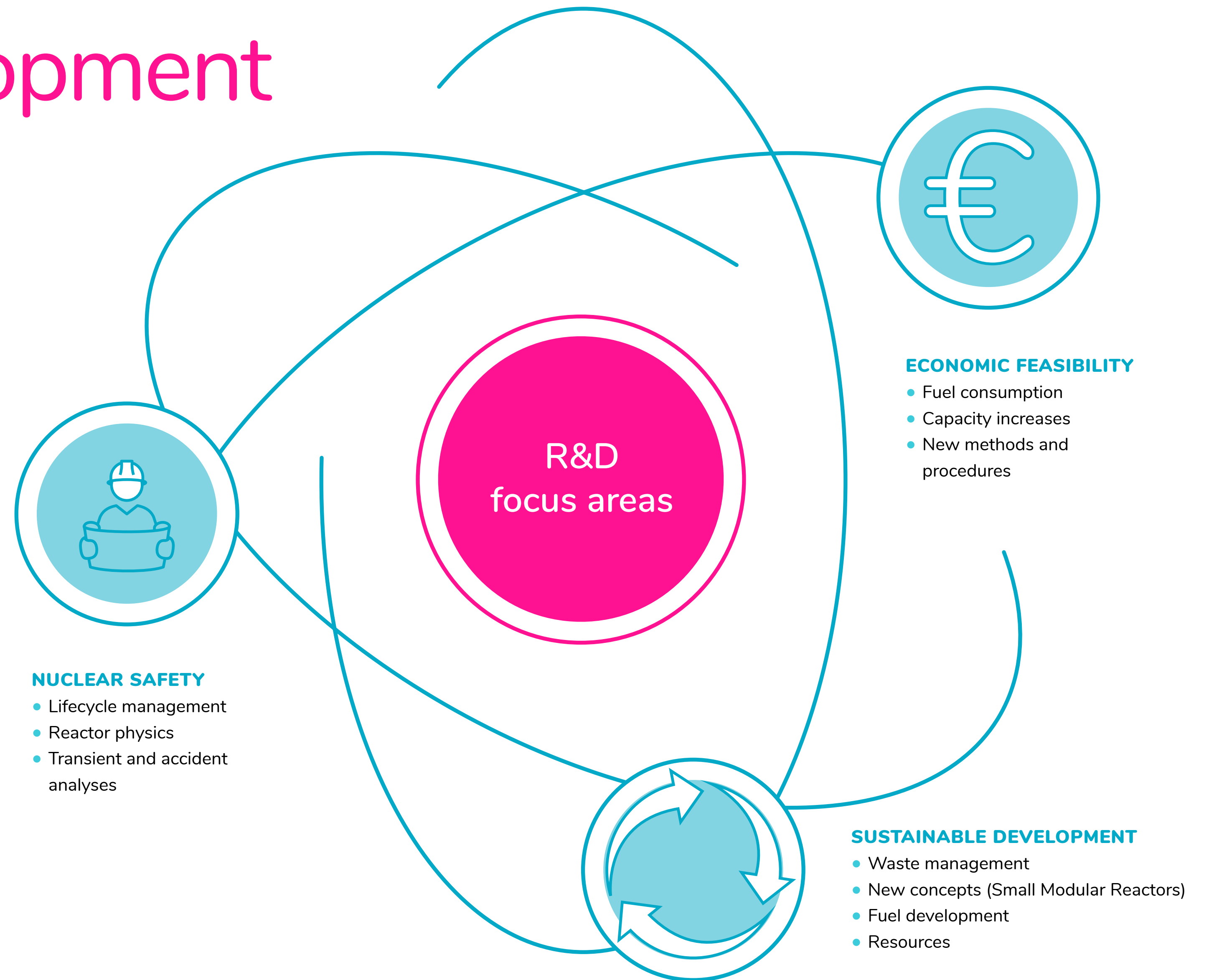
THE TOTAL costs of TVO's research and development operations were EUR 24.1 million, of which the majority was spent on R&D activities related to nuclear waste management.

TVO is the largest contributor to the financing of Finnish national public research programs on nuclear power plant safety (SAFIR2022) and nuclear waste management (KYT2022). In 2019, TVO paid a total of EUR 7.3 million in research fund related contributions to the Finnish State Nuclear Waste Management Fund. TVO also participated in the steering and monitoring of the programs through the work of 30 experts.

Key research projects

AS CONCERNS the lifecycle management and modernization projects of the OL1 and OL2 reactors, primary focus areas for research operations in 2019 included a study into RPV damage mechanisms, development of piping calculations and analyses, as well studies related to the plant structures, and R&C efforts carried out together with VTT Technical Research Centre of Finland in the field of I&C ageing.

Research in I&C technology focuses on solutions required for the maintenance of the I&C systems in OL1/OL2 and the



24.1 M€

In 2019, TVO invested a total of MEUR 24.1 in research and development operations. The investments included major investments in the annual outages and modernization of the plant units.



solutions required for the commissioning of OL3. Primary research areas include the aging of electronics, the commissioning of digital I&C technology, and the enabling of digitalization to support proactive maintenance.

Fuel research is TVO's most important area of international research cooperation, which requires special expertise, available testing reactors, and hot cell studies. The best option to obtain all of these is international cooperation. Research further specifies and validates the safe use of fuel and accident safety margins with a higher burnup. The behavior 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 to investigate the behavior of fuel rods during various transients. The projects previous stage SCIP III ended during the summer 2019 and was followed by the next stage SCIP IV. TVO participate in the next stage of the research program as well.

In 2019, TVO started an R&D program on the utilization of digital methods in

OL1, OL2, and OL3. The program, called DIGI, develops methods to improve availability, safety, and efficiency of the plants.

The processing and final disposal of operational waste, as well as the long-term safety of final disposal operations (VLJ repository), also constitute important research areas at the nuclear power plant.

TVO also actively participates in the work of more extensive international cooperation networks and research projects. TVO is a member of the European NUGENIA association and involved in the management of Euratom's Sustainable Nuclear Energy Technology Platform (SNE TP). The purpose of these organizations is to steer and carry out European research and development in the field of fission energy, focusing on existing reactors, that is, GenII and GenIII nuclear power plants. Furthermore, TVO participates in a Swedish Energiforsk reactor technology research program, the main topics of which are concrete structures, I&C, electrical components and reactor circuit components, as well as materials, vibration management, and the utilization of digital methods.

TVO also supports the development of new research infrastructure in Finland and Europe. New experimental technology is being built into the Jules Horowitz material testing reactor in France. It can be used for reactor material and fuel research required by modern nuclear facilities, supporting the development of new reactor types over the next few decades. The plan is to start the research reactor by the end of 2025.

Safety at TVO

Particle-larly versatile safety thinking

FOR TVO, safety aspects are at the core of all operations and are developed in accordance with the principle of continuous improvement.

All of TVO's employees, suppliers, and sub-contractors are committed to an uncompromising safety culture. According to the safety culture, all factors that affect the nuclear power plant's safety receive attention in proportion to their significance and are given priority in decision-making. Continuous improvement and appropriate safety culture are inherent features of all day-to-day work.

In practical work, a safety culture means operating in accordance with the principles of nuclear professionalism. Nuclear professionalism means following common policies and guidelines, understanding the importance of safety at work, observing, reporting and bold influencing, and learning from new experiences, with the understanding that results come from good collaboration. TVO has a safety culture program that aims at achieving the IAEA's highest safety culture level, i.e. to create a learning organization.

FACT



Thanks to the strong safety culture and proactive measures to improve safety, TVO's safety culture improved also in 2019.

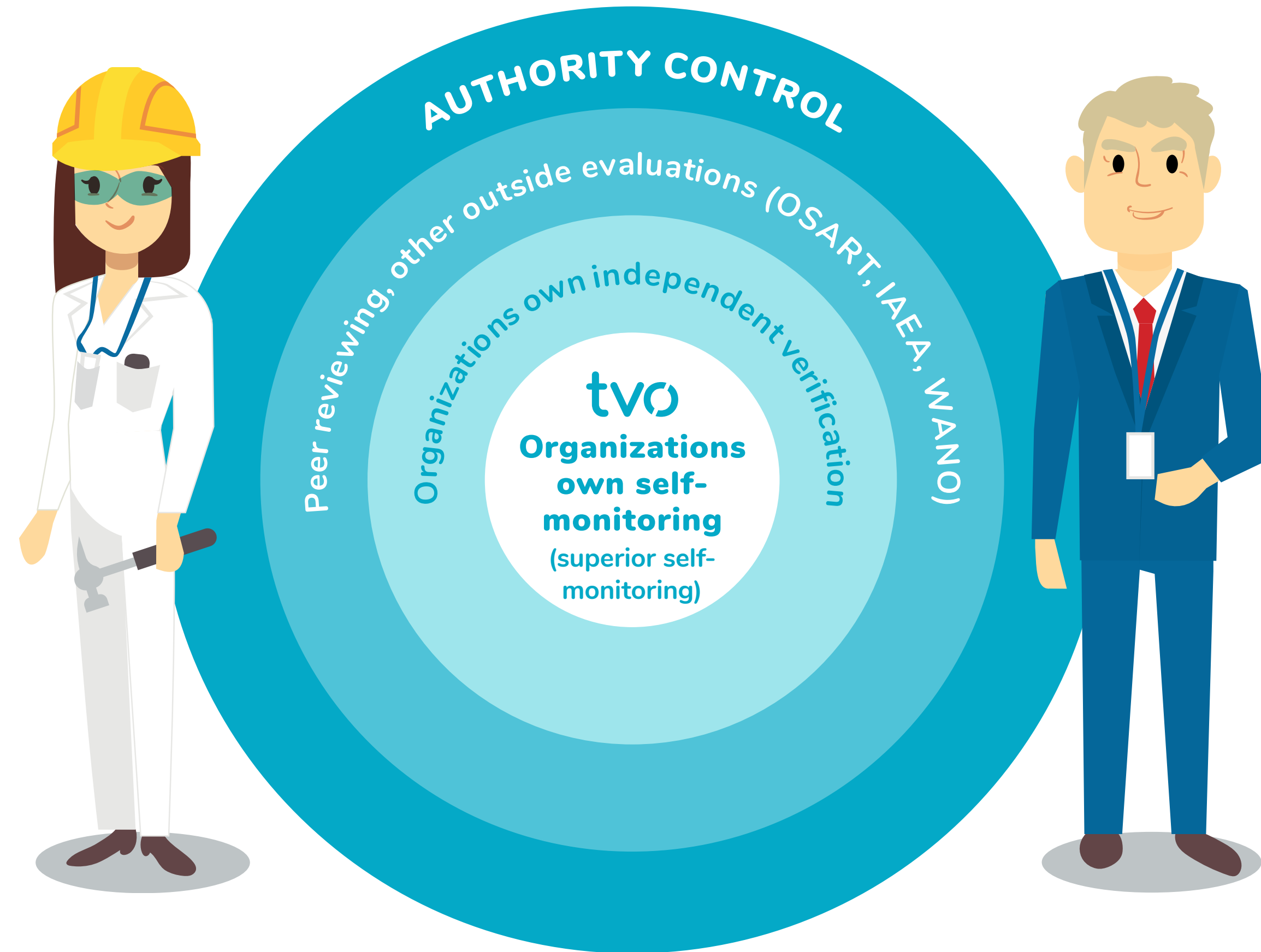
Uncompromising safety

Safety of the operation of the Olki-luoto nuclear power plant is based on design solutions, competence of the personnel, as well as compliance with instructions and procedures.

Safety is built on the following pillars:

- General operational instructions and procedures
- Operational safety
- Commissioning design and testing
- Fire protection
- Maintenance
- Annual outages
- Final disposal

Nuclear power plants are overseen by a variety of parties. The onion graph indicates the currently used oversight model. The oversight model consists of the organization's self-monitoring, independent monitoring within the company, peer reviews, and regulatory oversight.



ACCIDENT FREQUENCY TARGET

3.2
4.0 (2019)

High safety culture is the cornerstone of good and safe production. Strong commitment, responsibility, maintaining competence, and continuous development of activities are prerequisites for the operation and maintenance of the plants.



Safety

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 management system meets the requirements of ISO 9001. In order to ensure safe operations, TVO systematically estimates the level of its safety and safety culture, and all of the employees are committed to observing a high-quality safety culture.

TVO REGULARLY ASSESSES the state of its overall safety from the viewpoints of production, nuclear safety, safety and service life management, as well as management, organization and personnel. The level of safety is good.

The state of the safety culture is regularly assessed according to the IAEA procedure. TVO's safety culture is estimated to be at a level at which the strategic importance of safety has been recognized and proactive practices are used. 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 the operations of its plant units with the help of internationally used safety indicators. Of the safety indicators, collective radiation dose, unplanned energy unavailability factor, and actual unplanned automatic scrams are described in the table on objectives and results of TVO's responsibility principle.

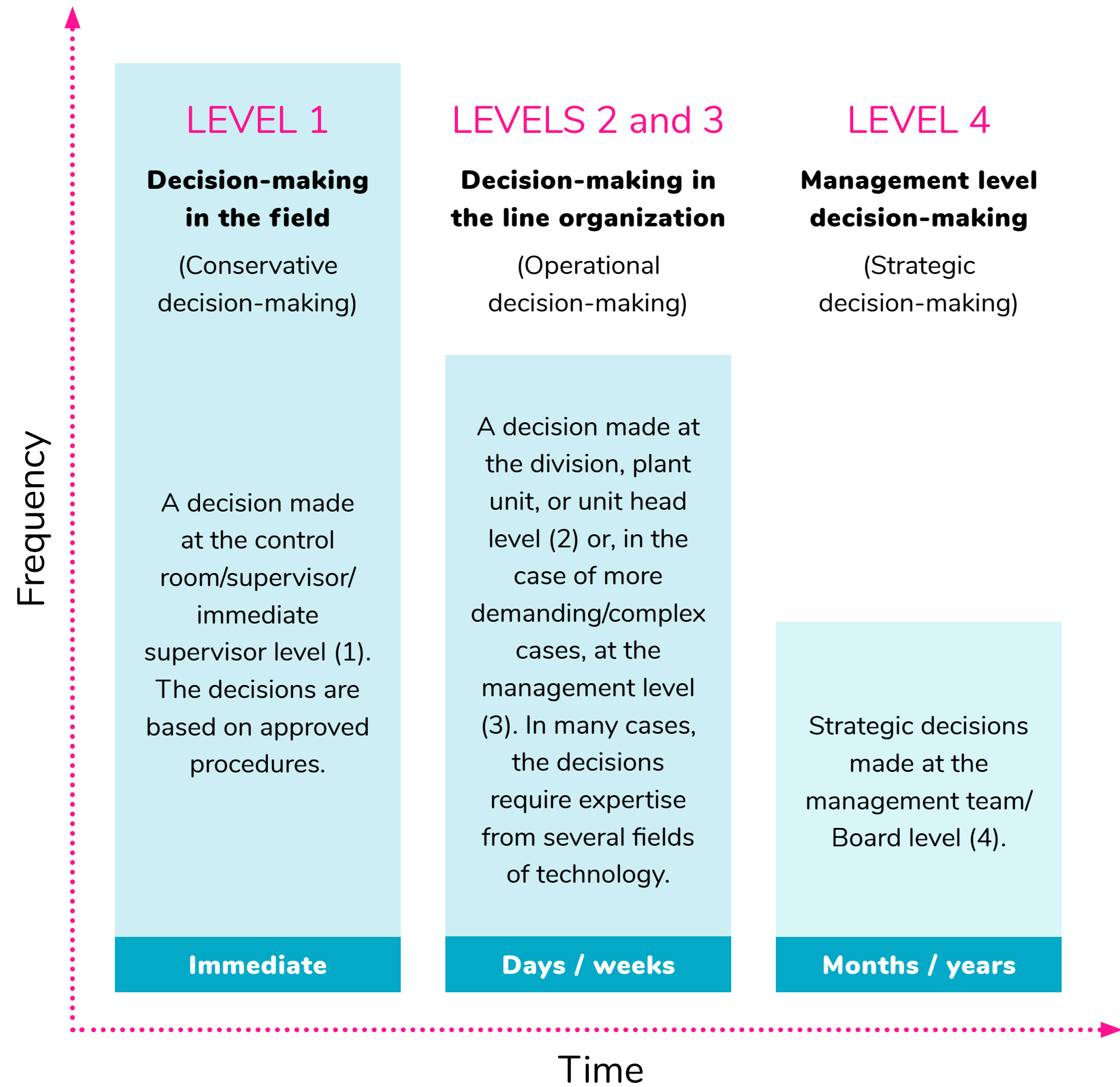
INES events 2019	2019	2018	2017	2016	2015
INES 0	6	8	7	2	5
INES 1	0	1	0	0	1



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 (on a scale of 0–7). In 2019, six events rated at severity level 0 on the INES scale (no significance to nuclear or radiation safety) and 0 events rated at severity level 1 (an anomaly; an exceptional event affecting safety) occurred at the Olkiluoto nuclear power plant. TVO investigates all events that could have an impact on nuclear safety and determines corrective actions. TVO publishes information on every event with public interest on its website.

Read more
about the INES-scale:
[Click here >>](#)

Operating line's decision-making process



Plant modifications to further improve safety

GOOD CONDITION of the Olkiluoto nuclear power plant at all times in terms of production and functionality is ensured through alternating refueling and maintenance outages of the plant units.

The 2019 annual outages of the Olkiluoto nuclear power plant were started on May 1 with a maintenance outage of OL2. The plant's annual outage was started four days prior than originally planned to remove damaged fuel from the reactor. Damaged fuel elements were removed from the reactor and replaced with new ones. In addition to refueling, actions performed in OL2 included a primary circuit pressure test, replacement of a heat exchanger in the reactor coolant purification system, and replacement of Fingrid's 400 kV switchgear. The annual outage took 25 days. The plant unit was resynchronized with the grid according to plan on May 26.

The annual outage of OL1 was a refueling outage. It started on June 2 and ended according to plan on June 11.

In addition to TVO's own personnel, at the most 850 subcontractor employees participated in the annual outages this year.

Proactive environmental safety

THE ASSESSMENT of environmental risks is part of TVO's comprehensive risk management process. Environmental risks have been identified and assessed, and no risks with significant impact were detected. TVO also utilizes a proactive safety observation procedure to prevent environmental damage. A total of 93 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 2019, there was an environmental event at the Olkiluoto nuclear power plant, involving a coolant leak of 104 kilograms (135.2 t CO₂eq). The leak occurred in a subdistribution board cooling system at the OL3 construction site. Eight minor oil leaks from working machines (totaling 52 litres) and some smaller coolant leaks also took place at the power plant over the course of the year.

An oil leak took place at a Fingrid Oy gas turbine plant that is situated at Olkiluoto power plant. Approximately 4,000 litres of fuel oil leaked into the plant's pools. The oil was recovered and no environmental damage was caused by the leak. The environmental authorities are informed of all significant environmental non-conformances and events.

Nuclear industry procedures were enhanced

THE PRINCIPLES of management and nuclear power plant working policies were developed in 2018 by defining expectations for nuclear professionals, i.e. by determining expectations on working at a nuclear power plant and taking action to reinforce these expectations. The expectations were included in TVO's Operating System.

Implementation of the expectations for nuclear professional was continued in 2019. Self-assessments, job satisfaction, the specified safety indicators, and external peer reviews indicate that the development has complied with the goals. Even though nuclear industry expertise is a procedure used in, actions to confirm its implementation will be continued in 2020 to further develop the operations.

PREPARATION FOR CRISES AND EXCEPTIONAL SITUATIONS

Laws, decrees, and regulations provide the framework for fire response operations as well as emergency preparedness and physical protection. Regulatory guides define the minimum requirements for the operations. TVO carries out emer-

gency preparedness operations in accordance with its own action plans.

Provisions for exceptional situations are included in TVO's procedures, and they are used as the basis for action, training, and practice plans that relate to emergency preparedness operations, fire safety, and physical protection. The procedures are regularly reviewed and updated. TVO has prepared crisis communication procedures and also practices their execution during drills for exceptional situations. Corporate Communications is responsible for crisis communications.

Several exceptional situation drills were organized in 2019, including emergency preparedness drills, joint drills with the fire department, and joint drills with the security organization. Drills are organized every year, and their scope and duration vary in accordance with the objectives of the drill. The purpose of the drills is to test procedures for their coverage and practical feasibility, and to improve cooperation between various operators. The most important cooperation parties include the Radiation and Nuclear Safety Authority, the police, and the rescue services.

Nuclear professionalism



A central factor for our climate



Towards a particle-larly cleaner world

THE EU'S GOAL is to reduce greenhouse gas emissions at least 40% from the emission level of 1990 by 2030. Nuclear power is a low-emission form of electricity production and has a significant role in combating climate change.

80% of greenhouse gas emissions are generated from energy production, -consumption and traffic.

43% of emissions is created by the energy industry. Reductions done by the energy industry emission have an significant effect of Finland's total emissions.



FACT

Creating 1 KWh of electricity with nuclear power generates as much carbon dioxide as wind power, 12 grams. Solar power generates 48 g CO₂ and coal generates 840 g CO₂.

The environmental impacts of nuclear power

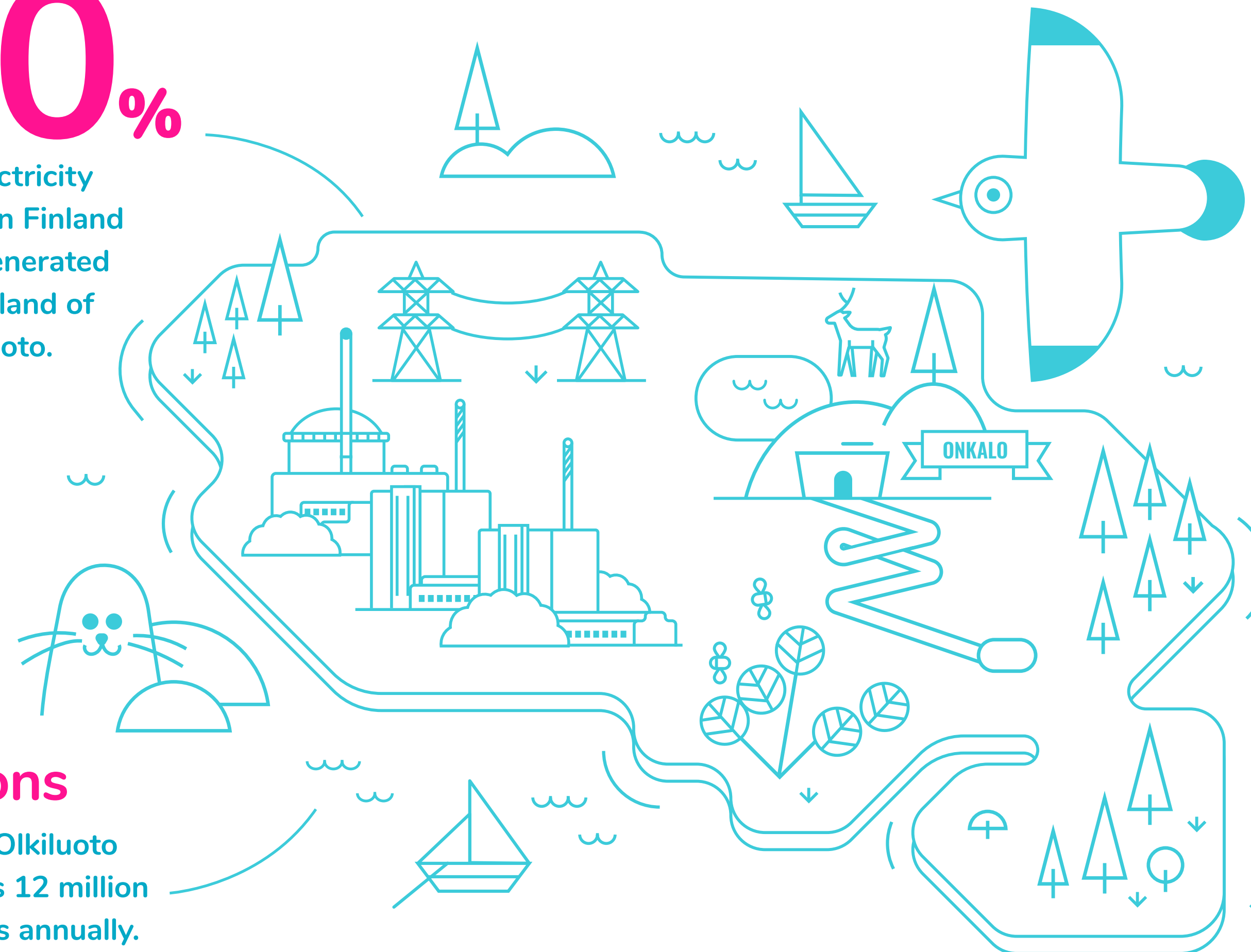
The emissions generated by nuclear power are low: throughout the lifecycle, the emissions remain at the same level as for renewable sources of energy. The long service lives and small land areas required by nuclear power plants make them even more environmentally friendly.

NUCLEAR POWER causes some negative environmental effects as well, such as slight warming of the surrounding sea areas, minor emissions into the air, water, and soil, as well as nuclear waste consisting of spent nuclear fuel. The final disposal of nuclear waste is a key question in the use of nuclear power. TVO has come up with a unique solution known all around the world for the final disposal of nuclear waste, ONKALO®.

30%
of all electricity produced in Finland is soon generated on the island of Olkiluoto.

12
million metric tons

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



NUCLEAR POWER ENABLES MAJOR EMISSION REDUCTIONS

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

In 2019, the Olkiluoto nuclear power plant reached a record-high production volume of 500 TWh. This production volume prevented CO₂ emissions of more than 400 million tons, which correspond to all the greenhouse gas emissions in Finland during a period of approximately six years in a scenario where nuclear power was replaced with condensing coal power, the specific emissions of which amount to 850 g/kWh.

500
TWh

With 500 TWh, you could heat 217 million homes in apartment buildings for one year.

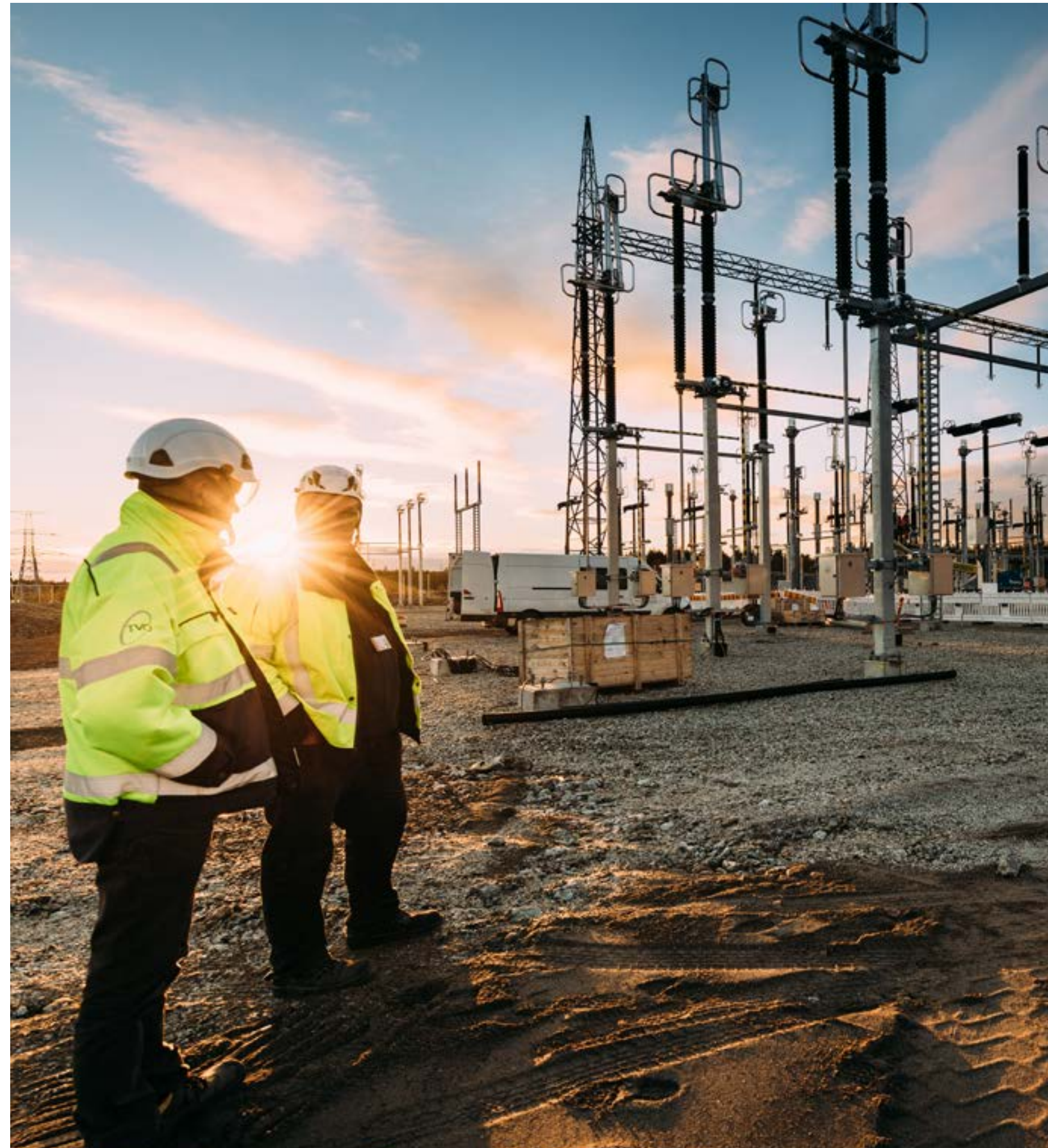
(According to a calculation by the VTT Technical Research Centre of Finland)

Supply of electricity in Finland and climate impact

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

AS A PRODUCER of electricity that is benign to the environment and the climate, TVO safeguards and maintains the diversity of nature. About 22 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 centralization of energy production into a small area minimizes the environmental impact and makes it possible to preserve other areas in their natural state. The Environmental Management System of TVO has been certified against the requirements of the ISO 14001 standard and registered to EMAS.

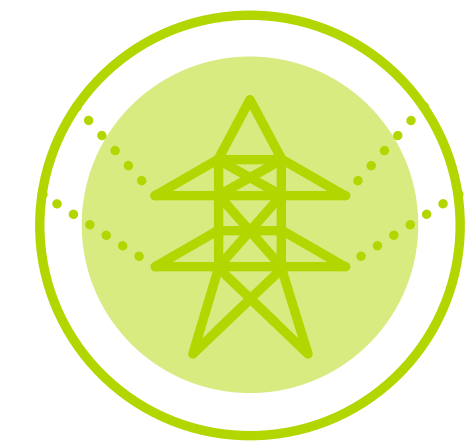
The effects that the operation of the Olkiluoto nuclear power plant has on land,



sea and air are monitored constantly, and environmental baseline studies have been carried out in the area already before the start of electricity production, since the 1970s. Based on the monitoring results, environmental loads are minor. Energy production has had no significant impact on the nature of Olkiluoto, which in main parts is rugged and poor in species. The most significant impact resulting to the environment from the power plant is that the local sea water area is warming.

Finnish people are highly concerned about the climate change and the majority consider the fight against climate change extremely important. Nuclear power is seen to play a major role in the common fight against climate change and an increasing number of respondents believe that it is very difficult for Finland to reduce greenhouse gas emissions to the atmosphere without the construction of new nuclear power plants. Nuclear electricity contributes significantly to the reduction of greenhouse gas emissions and the achievement of the climate target. Without nuclear power, there is no credible path to a low-carbon society.

The number of people who are in favor of nuclear power due to environmental reasons is increasing. The production of nuclear power has low carbon dioxide emissions; emissions remain on the same level with hydropower and wind power during the entire lifecycle of nuclear power. TVO's role in the mitigation of climate change and promotion of sustainable development is significant. Emission-free nuclear power creates the basis for green economy.



22%

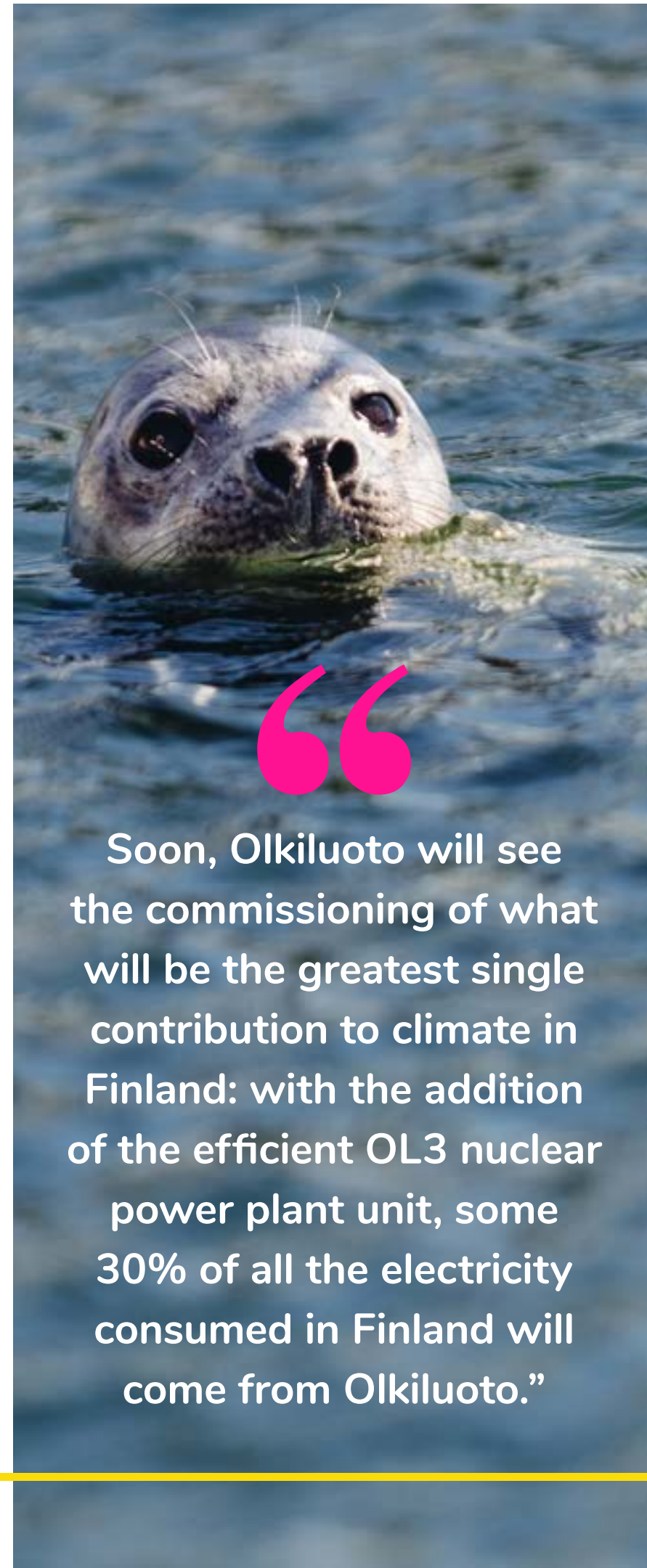
of all electricity produced in Finland is generated on the island of Olkiluoto

Environment and climate

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

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

TVO believes that its overall responsibility of environment at all stages of the fuel cycle is important. TVO ensures that nuclear fuel is used in a safe manner from raw material acquisition to final disposal. TVO monitors and supervises the environmental management of fuel suppliers.



“
Soon, Olkiluoto will see the commissioning of what will be the greatest single contribution to climate in Finland: with the addition of the efficient OL3 nuclear power plant unit, some 30% of all the electricity consumed in Finland will come from Olkiluoto.”

TVO requires responsibility from suppliers in ensuring and developing the living conditions in the surroundings of uranium production and processing plants while taking local people into account. Fuel is taken care of in a responsible manner all the way from uranium mines to final disposal according to the “from bedrock to bedrock” principle.

TVO aims to prevent and reduce the already low emissions of radioactive substances. Potential exceptional events in the plant process are predicted and preparations for the prevention of potential environmental disadvantages are made.

Energy and material efficiency is taken into account in all of TVO's operations

TVO OBSERVES energy efficiency requirements and improves the energy efficiency of its operations throughout the organization. TVO monitors and continuously improves the efficiency of its own energy consumption by taking energy aspects into account in project planning, the procurement of components, and the

development of operating practices and procedures. Plant unit modernization projects improve the energy efficiency of the power plant process.

TVO improves the efficiency of the use of energy and raw materials, and improves the reuse of waste. The goals are to increase the relative share of waste delivered to reuse and to decrease the amount of radioactive waste. TVO also strives to reduce the amount of spent fuel by optimizing the use and properties of the fuel.

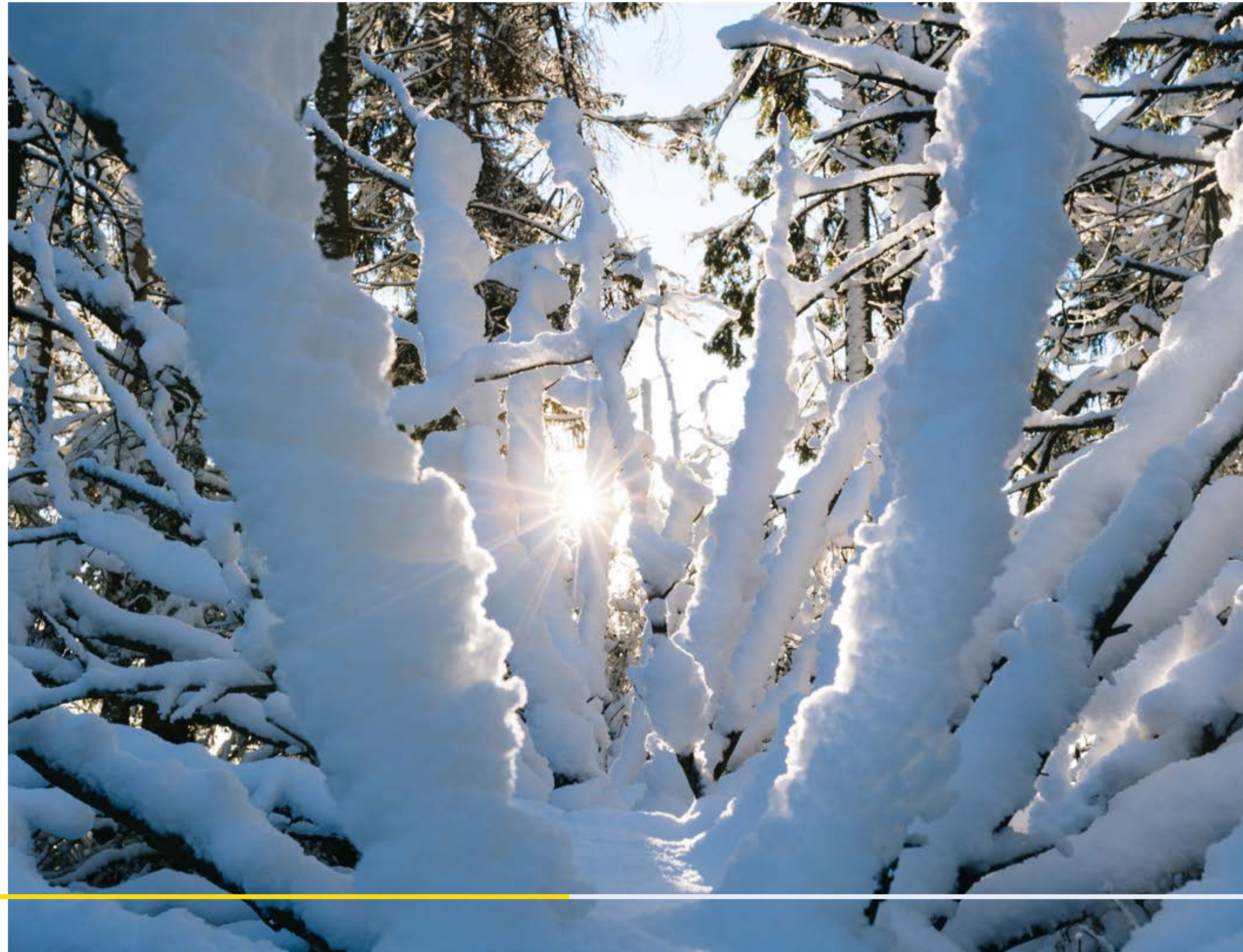
Sustainable utilization of the environment is taken into account in the development of the Olkiluoto area and the expansion of operations. Surrounded by four nature conservation areas, the small island of Olkiluoto currently produces around one-sixth of all the electricity used in Finland. After the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

TVO requires not only from its own employees but also all the companies and partners working in the power plant area commitment to the group-level policies and the TVO Code of Conduct, and that they have a responsible attitude towards environmental matters.

Environment and energy efficiency program 2019–2021

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

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



In 2019, the focus of target setting was on the development of environmental risk management, the improvement of energy efficiency, and the commissioning of a chemical management system (TLTA) in OL3. Long-term efforts on the management of radioactive emissions and the thermal load of the cooling water were also continued.

In 2019, the operations at the Olkiluoto nuclear power plant complied with legislation, environmental permits, and the environmental management system.

Targets and results of the environment and energy efficiency program

DEVELOPMENT OF THE ENVIRONMENT AND ENERGY EFFICIENCY PROGRAM

- **Development of environmental risk management:** Adoption of a new HSE risk assessment program and performance of assessments in accordance with the plan.
Actual result: The new HSE risk management program was commissioned and risk assessments of the functions were supplemented. The oil spill prevention plan included in the nuclear power plant's preparedness plan on the management of environmental risks was updated.
- **Increasing awareness of environmental matters and energy efficiency:** Paying more attention to environmental matters and energy efficiency in projects and modifications, and renewing environmental training.
Actual result: All parts pertaining to environmental and energy efficiency in instructions and templates for projects and modifications were updated. The available environmental training was made more versatile, and all training materials were reviewed and updated over the course of the year. The practical mock-up training approach will also be utilized in orientation to environmental and energy efficiency matters.

MANAGEMENT OF ENVIRONMENTAL LOAD

- **Zero environmental accidents:** There are no serious or significant environmental accidents, there are at least 80 proactive environmental observations.
Actual result: The environmental accident target was not reached. A coolant leak took place at the OL3 plant unit in the Olkiluoto site area, and an oil leak took place at a Fingrid Oy gas turbine plant. Both incidents were classified as significant

environmental accidents. The oil was successfully collected, and the leak did not cause any environmental damage. The proactive environmental observation target was reached: 93 observations were made.

- **Production of climate-friendly electricity:** Production goal for 2019: 14,800 GWh.
Actual result: OL1 and OL2 produced a total of 14,751 GWh of electricity. Hence, the production target was narrowly missed despite the fact that OL1 had its best production year ever.
- **Management of cooling water heat load:** No excesses of the environmental permit target values.
Actual result: The cooling water temperature remained below the target values specified in the environmental permit. Extended voluntary monitoring of seawater temperature was continued in the sea areas near Olkiluoto, and measurements were carried out to obtain more information about the spreading of cooling water into the sea area.
- **Management of environmental issues at OL3:** Harmonizing and updating of the environmental systems of TVO and the plant supplier.
Actual result: A management system based on TVO's general operational system was specified for OL3 in cooperation with the plant supplier (CFS).
- **Optimal and controlled environmental load from the use of chemicals:** Adding new pools for preventing chemical contamination, as well as inspecting and maintaining the pools and their oil trap wells and other similar structures in accordance with the preventive maintenance program (100%).
Actual result: Condition surveys for all structures and components used in the storage, handling, and leak detection of chemicals were included in the scope of the preventive maintenance program, and all inspections and maintenance actions were carried out according to plan.

IMPROVEMENT OF MATERIAL AND ENERGY EFFICIENCY, AND SUSTAINABLE LAND USE

- **Total energy saving target for agreement period 2017–2025:** 150 GWh; the target for 2019 was 30 GWh.
Actual result: Energy efficiency measures carried out in 2019 included the installation of a high-pressure preheater drain pumping system and the commissioning of ejectors. Total energy savings achieved in the site area during the course of the year equaled to 30 GWh.
- **Development of circular economy:** Reduction of waste volume and recycling of waste as material (a minimum of 35% of the overall waste volume, excluding waste sludge).
Actual result: 53% of the site area waste was utilized. Cleaning campaigns were implemented in almost all of the office buildings on site. During the campaigns, employees were given instructions on how to sort waste.
- **Land use planning:** The concentration of energy production in a small geographic area minimizes the environmental impact and allows the preservation of other areas in their natural state.
Actual result: A steering group for infrastructure and land use adapts infrastructure designed and implemented in the area to the natural environment, paying particular attention to natural sites and nature conservation areas. The long-term plan guiding land use in the site area was updated.

SUPPLIERS' ENVIRONMENTAL RESPONSIBILITY

- **Environmental and energy efficiency in procurement:** Energy efficiency assessment questions will be added to the supplier evaluation procedure.

Actual result: Environmental and energy efficiency questions included in the supplier performance assessment were specified and TVO Group's procurement terms were updated. TVO procures products that are durable and have a long lifespan, and takes into account opportunities to recycle or potentially reuse the products at the end of their service lives.

- **Development of supplier monitoring at Olkiluoto:** Evaluating the partners' management of environmental issues and energy efficiency measures.
Actual result: Environmental audits were performed on three partners and three waste management service suppliers operating at Olkiluoto to verify that their operations comply with the environmental and energy efficiency requirements.

ISOLATION OF RADIOACTIVITY ORIGINATING AT THE POWER PLANT FROM THE ORGANIC ENVIRONMENT

- **Ensuring purity of the process:** Adopting and implementing the TLTA (safety-classified supplies) system at OL3.
Actual result: TLTA was introduced in OL3.
- **Keeping radioactive emissions into air and water clearly below the limits set by the authorities:** ALARA program targets.
Actual result: Radioactive emissions into the air and water remained clearly below the limits set by the authorities, despite a fault detected in the liquid waste processing system of OL1. The target of TVO's own ALARA program for emissions into water was reached, but the air emission target level was not reached.

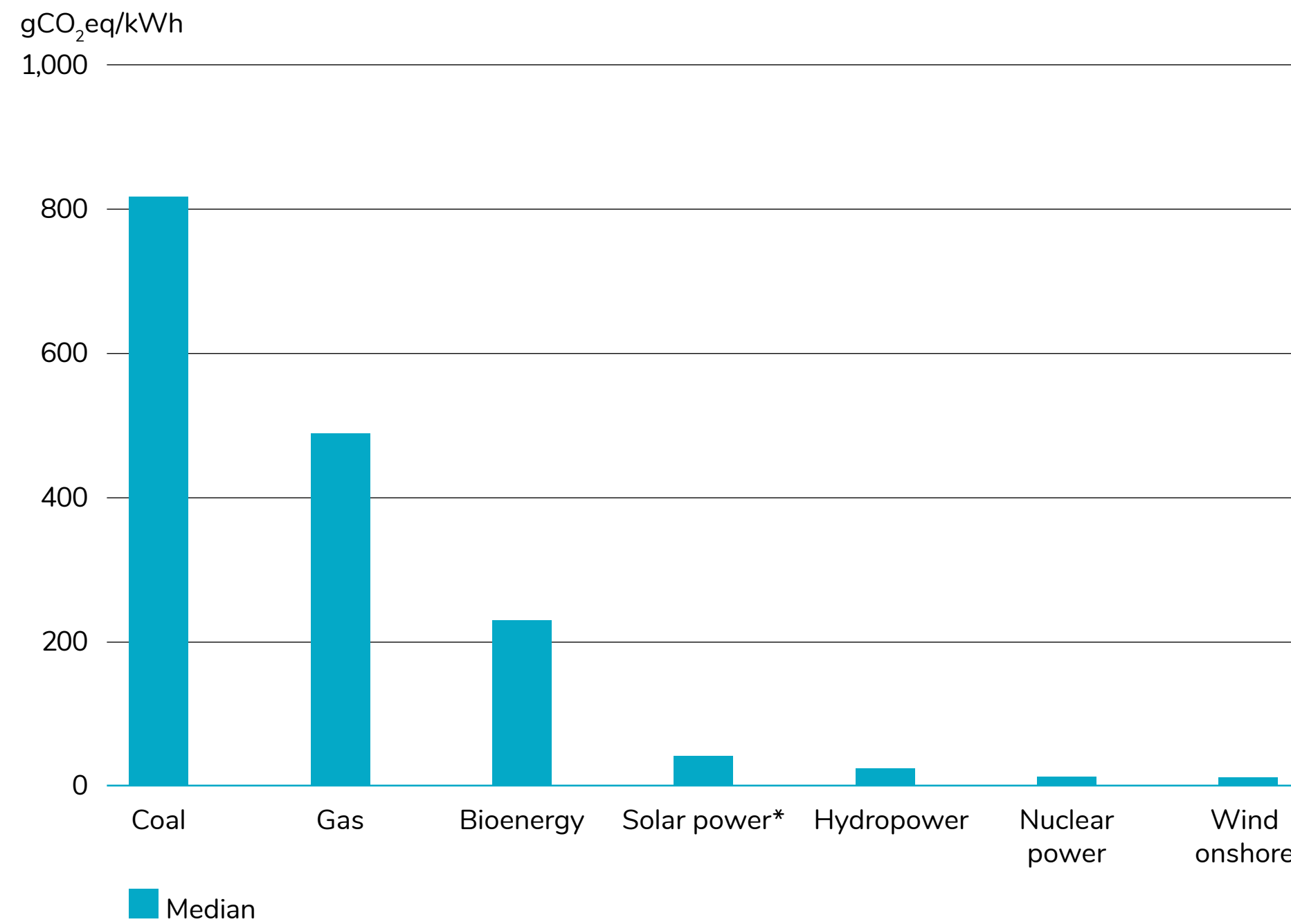
- **Management of nuclear safety risks**
Actual result: Risks are actively identified, and measured for their probability and consequences by means of up-to-date Probabilistic Risk Assessment (PRA). The identified risks are mitigated applying the Safety As High As Reasonably Achievable (SAHARA) principle. Following the Fukushima accident, TVO has further developed the capabilities of the plant units to withstand extreme natural phenomena and a simultaneous loss of power supply. Plant modifications related to these capabilities have been initiated, and most have also been implemented, which has already been reflected as a considerable reduction of the nuclear safety risk. The plan is to implement the rest of the improvements in 2020. The decrease in core damage risk and risk of radioactive emissions assessed using the PRA method in 2019 was due to plant modifications.

Climate-friendly electricity

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

ACCORDING to a report published by the Intergovernmental Panel for Climate Change (IPCC) in 2019, nuclear energy has a pivotal role in the mitigation of climate change. IPCC has prepared four alternative scenarios to limit the increase of the global temperature to +1.5°C. The increase in the amount of nuclear power between 2010 and 2025 varies between 98 and 501 per cent in the different scenarios.

Average lifecycle greenhouse gas emissions of electricity production



*Solar panels

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

Nuclear power will remain a major part of the energy selection of Finland and the entire EU as we make our way towards a carbon neutral society. In 2019, the share of nuclear power was about 35 per cent of all the electricity produced in Finland.

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



-20
million
metric tons CO₂

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

Environmental impact – low-emission electricity production

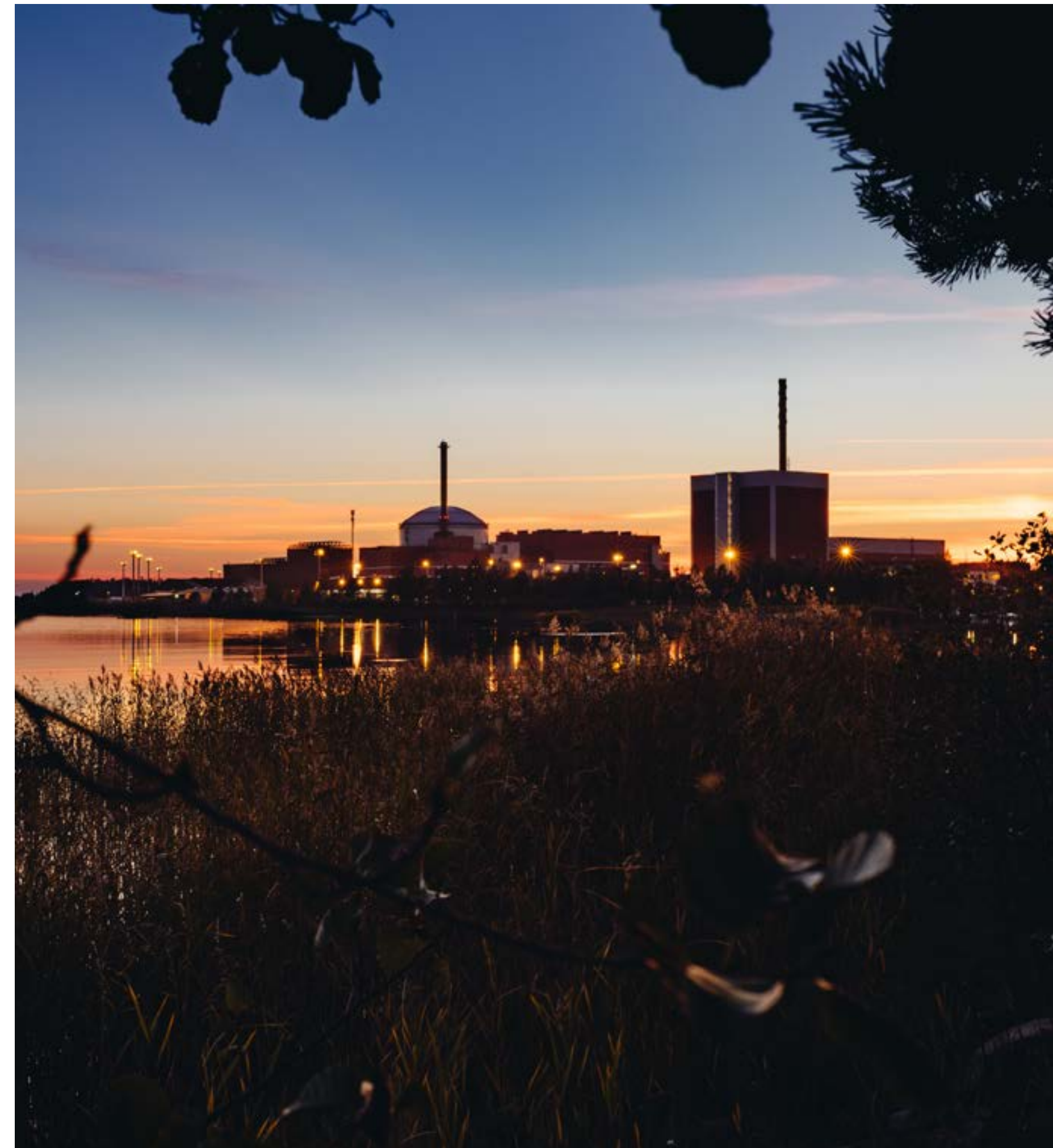
Under normal conditions, the environmental impact from nuclear electricity production does not pose any harm to people or the environment. The impact of Olkiluoto nuclear power plant's operations on land, sea, and air is being continuously monitored. Based on the monitoring results, the operations only 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 warming up of the seawater near the plant. During the year, the plant produced 14.75 TWh of electricity, and the cooling water temperature remained within the limits required by the environmental permit. Radioactive emissions

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 CO₂ emissions due to the commissioning of emergency diesel generators.

Nuclear electricity is climate-friendly, and thus TVO is a significant contributor to the mitigation of climate change and promotion of sustainable development. TVO participates in the Energy Efficiency Agreement Scheme, 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.

“ The low-emission nuclear electricity produced by TVO plays an important role in the reduction of greenhouse gas emissions and the achievement of the climate targets.”

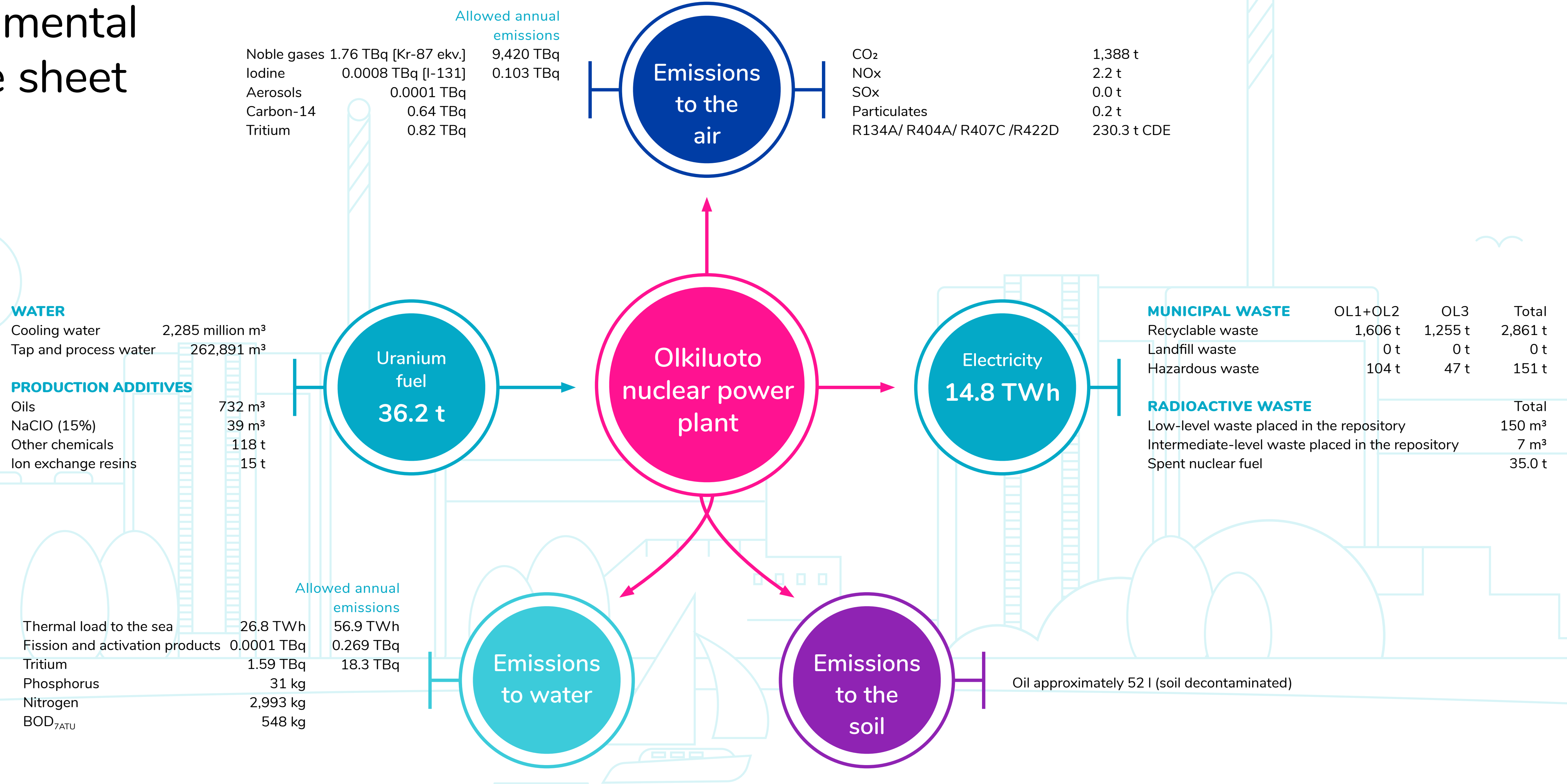


Diverse natural environment in Olkiluoto

The Olkiluoto island is a rich area in terms of flora and fauna. The fact that the island is located in a peaceful area, surrounded by nature conservation areas, gives rise to more animal observations, and many bird species – such as the white-tailed eagle and the gray heron – are common sights in the area nowadays. The number of hoofed animals and, for example, otters, has also clearly increased in the past few years.

The state of the environment in Olkiluoto and its immediate surroundings is continuously monitored by means of observations and by taking samples from flora, fauna, and the water systems. Up to 300 samples are taken annually in cooperation with the Radiation and Nuclear Safety Authority (STUK) to ensure that the power plant operations do not harm the environment.

Environmental balance sheet



Cooling water

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

IN 2019, 2,285 million cubic meters of seawater was used for cooling, and the resulting thermal load on the sea was 26.8 TWh. Seawater temperature is monitored as required by the environmental permit. One of the environmental permit regulations is that the seawater temperature does not exceed the target value of 30°C when measured as a weekly average at a distance of 500 meters from the cooling water discharge channel. Limit values have also been specified for the amount of cooling water (max. 4,415 million m³) and the thermal load (max. 56.9 TWh) in the environmental permit. None of the permit limits were exceeded in 2019.

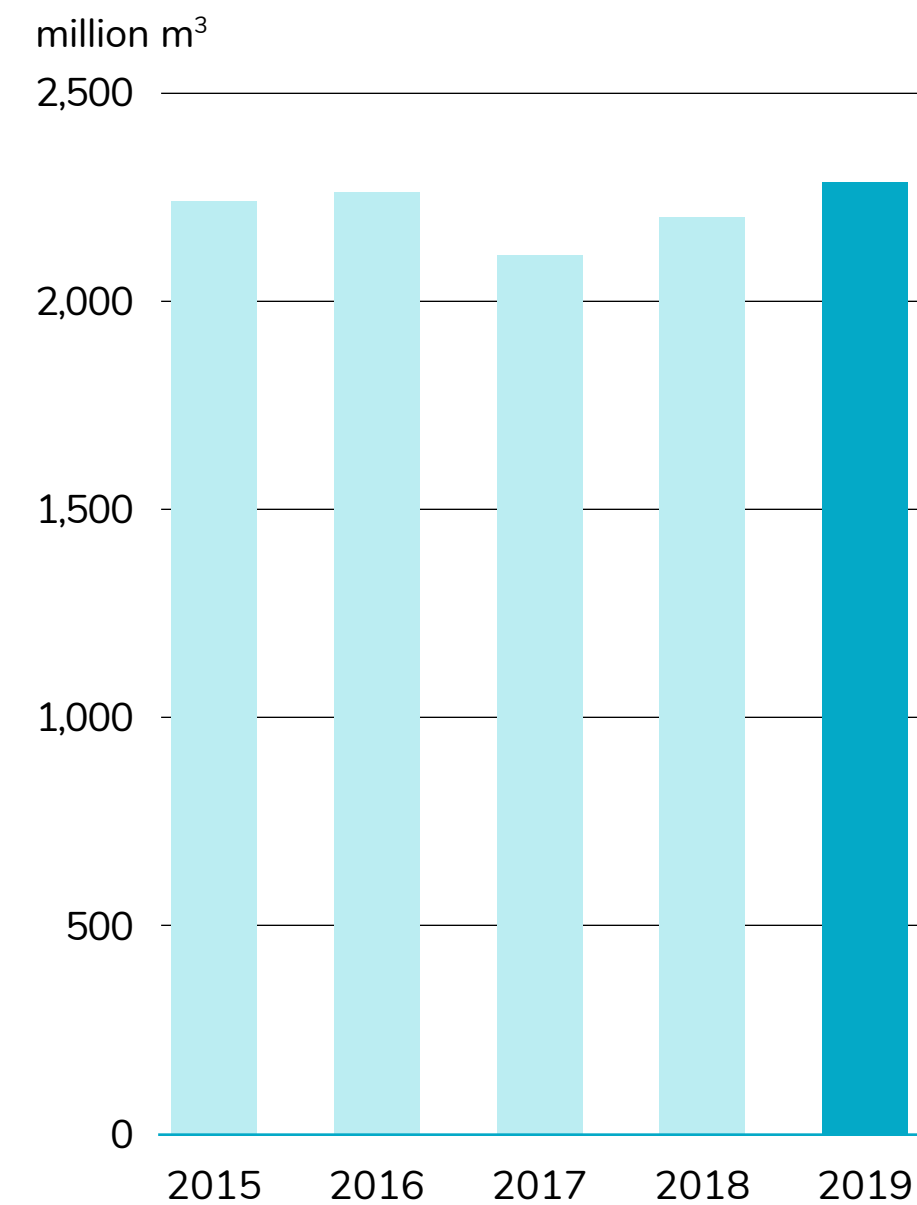
As the cooling water passes through a plant unit, its temperature increases by approximately 10°C, after which it mixes

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

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

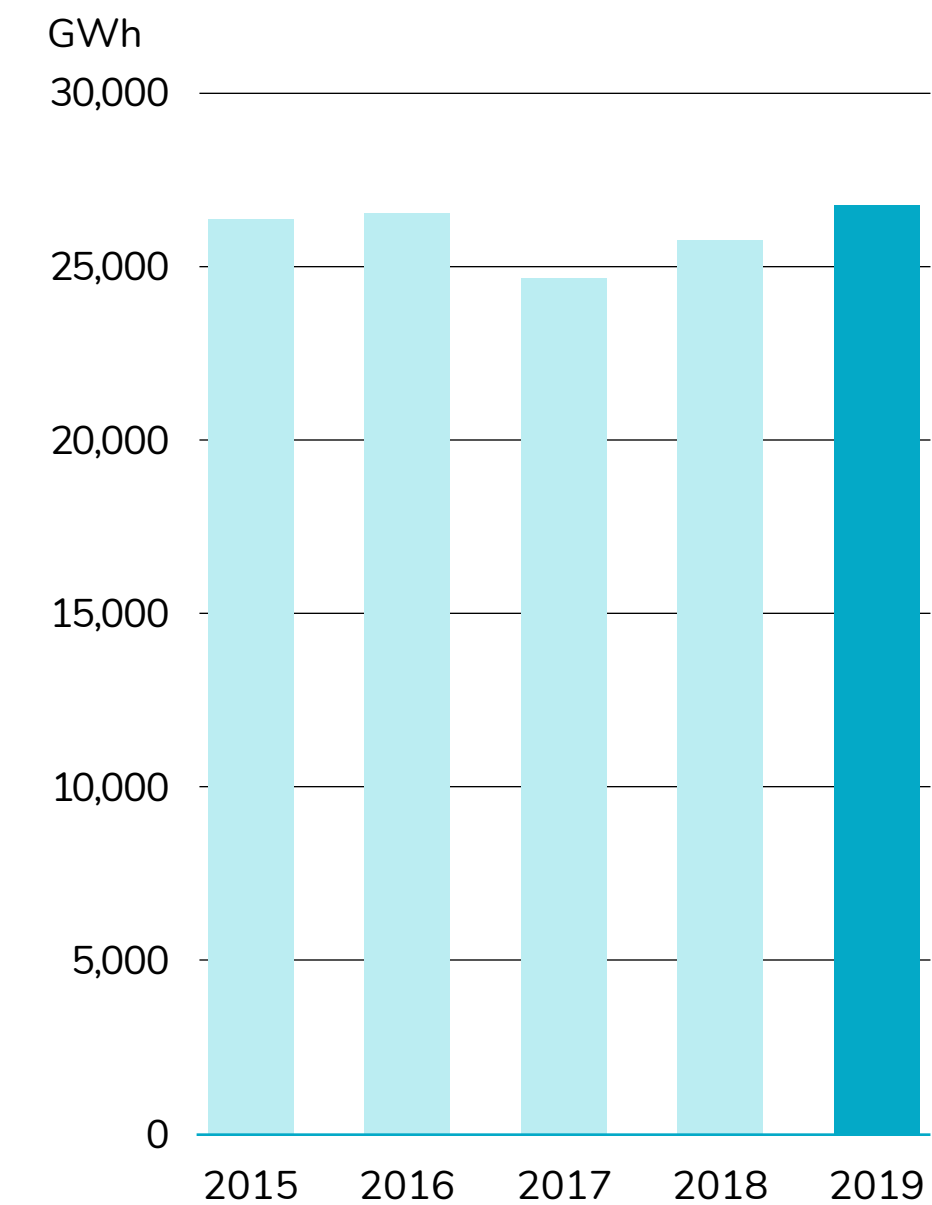
Water usage

Cooling water



Emissions

Thermal load on the sea



Raw materials and material efficiency

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

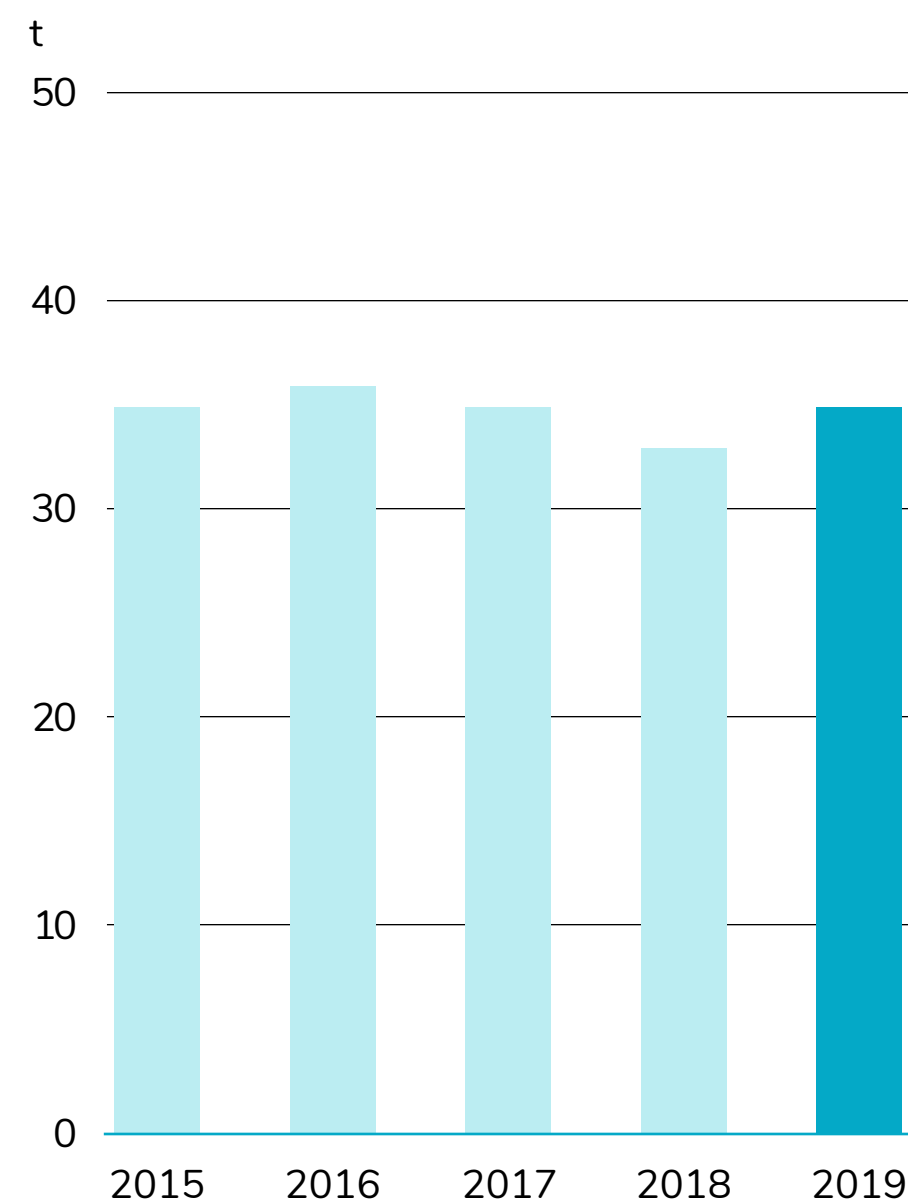
TVO USES a diversified nuclear fuel procurement chain, meaning that separate contracts are concluded for the different procurement stages, usually with several suppliers for each stage. Procurement operations are based on long-term contracts with leading suppliers. Uranium is only acquired from suppliers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

Material efficiency through recycling

TVO 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 long-term operation of the plant units.

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

Material efficiency Nuclear fuel spent



Intermediate agents in production

CHEMICALS are extensively stored and processed by TVO. The Olkiluoto nuclear power plant is a safety report establishment. The intermediate agents include the fuel of the emergency diesel generators, the reserve power boiler plant, and vehicles (oils) and sodium hypochlorite

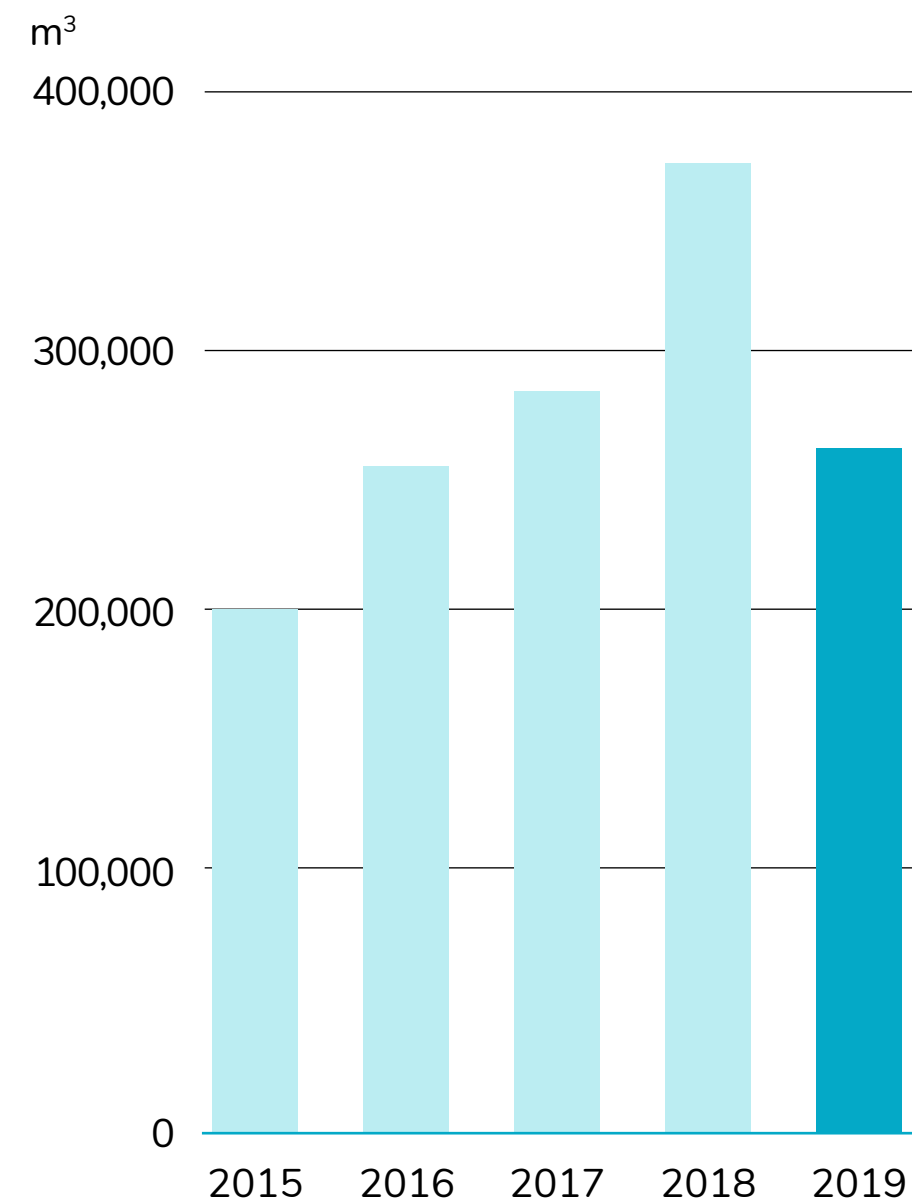
(NaClO) used for hydroid control in the seawater systems. The ion-exchange resin used to clean the circulating water as well as solvents, bitumen, and nitrogen used at the plant (other chemicals) are among the reported additives. Consumption of oil increased due to the commissioning tests of the emergency diesel engines that help ensure the safety of OL3.

Intermediate agents	2019	2018	2017	2016	2015
Oils (m ³)	732	657	258	255	391
NaClO (15%) (m ³)	39	45	40	41	45
Other chemicals (t)	118	137	176	235	139
Ion exchange resins (t)	15	15	17	18	15

Reducing consumption of water

IN ADDITION to the seawater used as cooling water, the Olkiluoto power plant makes use of fresh water, which is used as tap water and circulating water. The circulating water that boils in the reactor must not contain any salts, impurities, or particles that could damage the reactor internals. Olkiluoto has all the necessary plants for water treatment: a water treatment plant, a demineralization plant, a laboratory, and a wastewater treatment plant. The tap and circulating water are treated at TVO's own water treatment plant. Ion exchange and reverse osmosis methods are used to purify the water used in the power plant process. Circulating water is continuously recycled and purified. During annual outages, the fuel pool water is stored in storage pools to wait for reuse. The recycling of water reduces TVO's need for clean circulating water and the amount of circulating wastewater discharged from the plant by approxi-

Water usage Untreated water

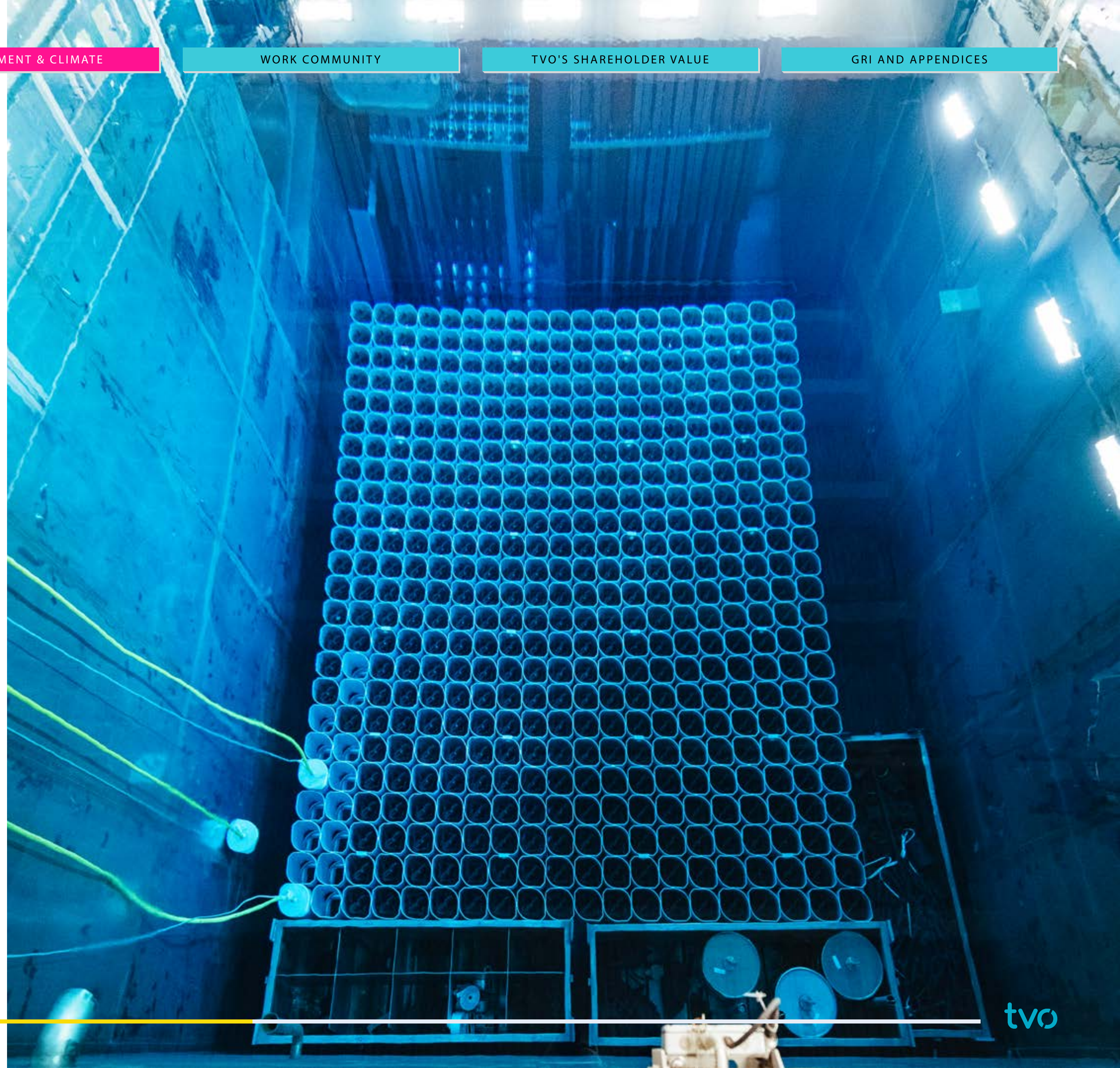


mately 30,000 m³ each year. During the reporting year, 262,891 m³ of fresh water was taken from the Eurajoki river.

	2019	2018	2017	2016	2015
Raw water treatment					
Amount of water (m ³) ¹⁾	262,891	372,295	284,874	256,237	201,229
Water treatment chemicals (t) ²⁾	73	117	83	70	43

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

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



Production and energy efficiency

In 2019, the combined power output of the Olkiluoto units, OL1 and OL2, was 14,751 GWh. The combined load factor of the plant units was 94.8%. TVO produces approximately 17% of all the electricity consumed in Finland.

THE PLANT UNITS operated safely and reliably. The net output of OL1 was 7,542 GWh, and the plant unit reached

the best annual production volume ever. OL1's load factor was 96.9%. The net output of OL2 was 7,209 GWh and the load factor was 92.7%. Each year, the nuclear power produced at Olkiluoto helps prevent carbon dioxide emissions of over 12 million metric tons in Finland when compared to producing the same amount of electricity using fossil fuels.

OL1	2019	2018	2017	2016	2015
Net production (GWh)	7,542	6,755	7,158	7,048	7,397
The plant units' own electricity consumption (GWh)	268	246	264	258	270
Capacity factor (%)	96.9	87.8	93.1	91.4	96.2
Efficiency (net) (%)	35.5	35.3	35.1	35.0	35.0

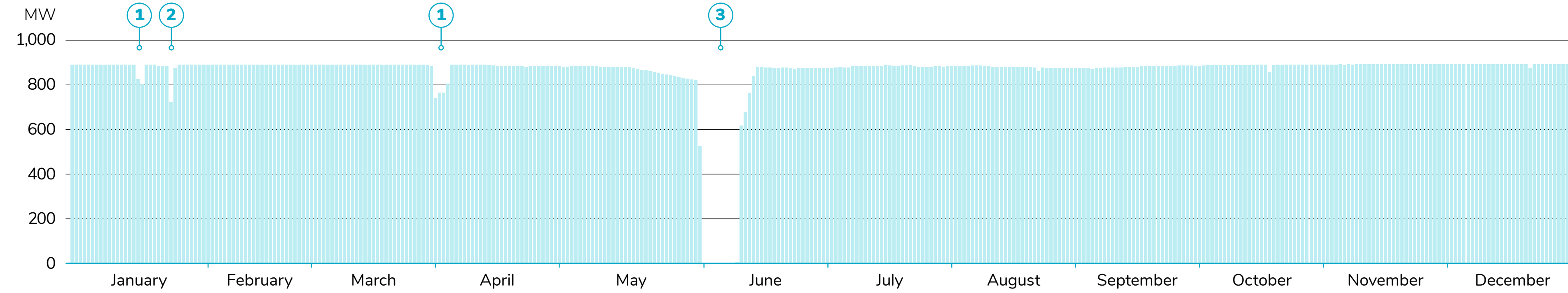
OL2	2019	2018	2017	2016	2015
Net production (GWh)	7,209	7,334	6,256	7,301	6,864
The plant units' own electricity consumption (GWh)	258	264	226	265	248
Capacity factor (%)	92.7	94.3	81.3	94.6	89.2
Efficiency (net) (%)	35.5	35.4	35.4	35.1	35.1

With the annual energy produced by OL1 and OL2 (14.75 TWh) an electric car could be driven for approximately

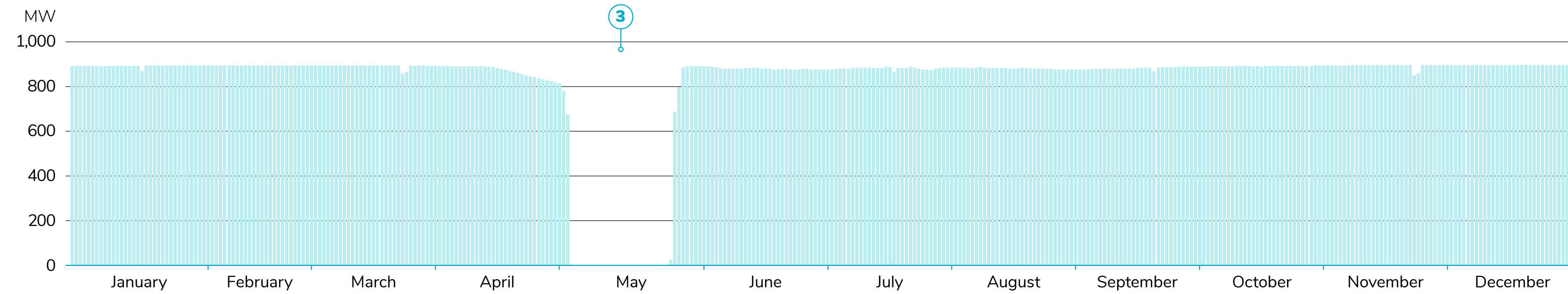
99,000

million kilometers. This would take the vehicle 2.47 million times around the globe.

OL1 Production
Average output MW



OL2 Production
Average output MW



- 1. Repair of a valve in the feedwater system
- 2. Repair of a valve leak in the reheater system
- 3. Annual outage



30 GWh

The energy saving target of 30 GWh was reached in 2019. It equals to the average annual consumption of some 1,500 single family homes heated with electricity.

Improving energy efficiency

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

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

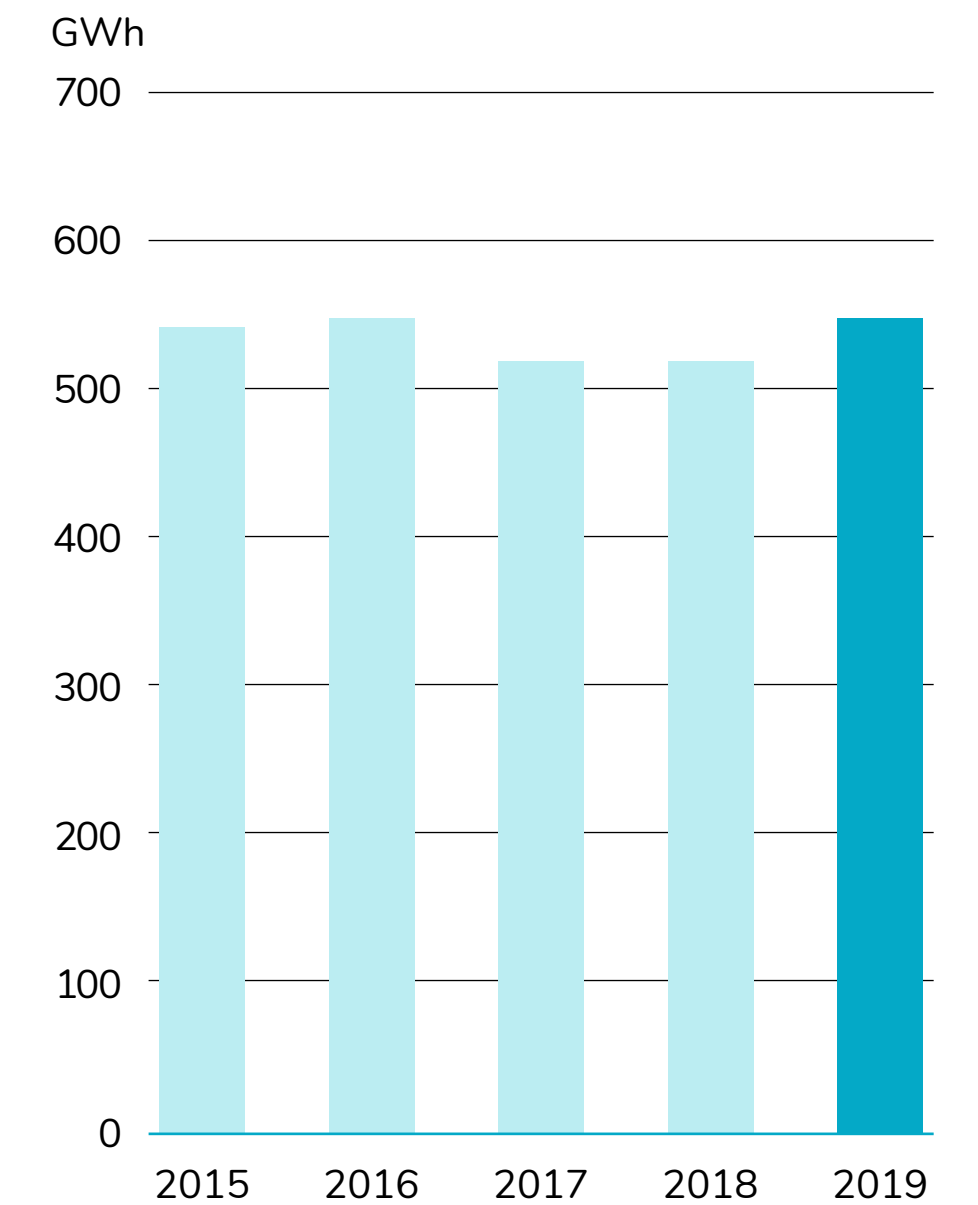
Energy efficiency measures carried out in 2019 included installation of a high-pressure preheater drain pumping system and the commissioning of ejectors. Furthermore, more energy meters were installed in the buildings of the area. Measurements and energy analyses were performed in both of the existing plant units after the annual outages.



TVO carries out activities related to energy efficiency as part of its normal operations. For TVO, the highest potential for savings involves improvement of the efficiency of the electricity production

process; this has been implemented in the long term by means of plant modernization projects throughout the operational history of the company. Another area for improvement of efficiency is the

Energy efficiency TVO's electricity consumption



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

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

Emissions to the air

With regard to the management of radioactive substances, TVO always strives to keep any emissions well below both the emission limits set by the authorities and TVO's own target limits, which are more stringent than the official limits.

Radioactive releases into the air

NOBLE GAS emissions into the air amounted to 0.02% and iodine emissions into the air amounted to 0.74% of the allowed limit value specified by the authorities.

In 2019, TVO observed that the aerosol sampling efficiency of the vent stack's sampling system had not been taken into account in the OL1 and OL2 emission reports during the operating history of the plant units. Measurements will be taken in 2020, based on which the reported aerosol emissions will be corrected.

The theoretical radiation dose caused to neighboring residents in Olkiluoto is esti-

mated to remain clearly below the threshold value. In 2018, the radiation dose was 0.33 μ Sv (threshold value: 100 μ Sv).

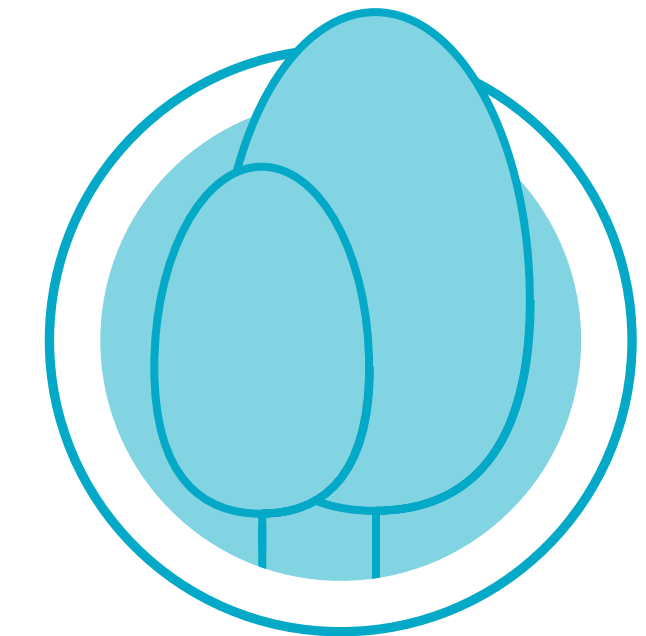
Carbon dioxide emission

TVO TAKES part in Finland's battle against climate change by producing low-emission electricity. The Olkiluoto nuclear power plant is included in the European Union emissions trading scheme that aims at monitoring greenhouse gas emissions and achieving the CO₂ reduction goals. The power plant's actual CO₂ emissions are generated by the releases of the reserve boilers and the emergency diesel generators. The emergency diesel generators would ensure power supply of the plant in a possible but unlikely loss-of-power situation. In order to 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 in OL1 and OL2 during the next few years will reduce particulate emissions to the air.

Radioactive emissions to the air	2019	2018	2017	2016	2015
Noble gas TBq (Kr-87 equivalent)	1.76	0.91	3.43	9.69	0
% of allowed amount	0.02	0.01	0.04	0.1	0
Iodine TBq (I-131 ekv)	0.0008	0.0005	0.0009	0.0016	0.0000008
% of allowed amount	0.74	0.48	0.84	1.50	0
Aerosols TBq ¹⁾	0.0001	0.0006	0.025	0.24	0.000017
Tritium TBq	0.82	1.32	1.07	2.65	1.04
Carbon-14 TBq	0.64	0.93	1.02	1.23 ¹⁾	1.07

¹⁾ The information has been corrected.

Verified CO ₂ emissions of the Olkiluoto power plant	2019	2018	2017	2016	2015
CO ₂ emissions total (t)	1,388	1,505	717	737	832
OL1/OL2 back-up heating boilers (8 MW + 12 MW)	17	1	22	95	496
OL1/OL2 emergency diesels (8 x 1,8 MW)	446	380	355	491	329
OL3 emergency diesels (4 x 6,4 MW, 2 x 2,5 MW, 1 x 1,3 MW)	925	1,124	340	152	7



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

Emissions to water and soil

The emissions of radioactive fission and activation products into water amounted to 0.04% and tritium emissions into 8.7% of the annual limit value specified by the authorities.

IN FALL 2019, a fault that prevented the decontamination of water with evaporators was detected in the liquid waste processing system of OL1. The decontamination was instead performed by means of filtering. Decontamination by means of filtering is not as efficient as decontamination with an evaporator, which is why the emissions into the water slightly increased during the fault. Minor concentrations of radioactive substances were also detected in the sea area as the result of the fault, but the concentrations were insignificant for humans and the environment. Repairs of the waste processing system were completed in December.

Sanitary wastewater is treated at the Olkiluoto wastewater treatment plant before it is discharged into the sea. In 2019, the amount of treated sanitary wastewater was 83,545 m³. The phosphorus load discharged into the sea was 31 kg, the nitrogen load was 2,993 kg, and the biological oxygen demand (BOD_{7ATU}) was 548 kg. The treatment of sanitary wastewater is based on the permit regulations specified for the purification efficiency and loads discharged into water bodies, as well as regulatory requirements. Emissions from the sanitary wastewater treatment plant were a fraction of the nutrient load of the Eurajoki river running to the north of Olkiluoto. Water quality measurements are taken by a third party.

Emissions to the soil

OVER THE COURSE of the year, a total of approximately 52 litres of oil ended up in the soil due to failures of working machines. All oil was recovered, and the used spill control materials were delivered to appropriate further processing.

Radioactive emissions to water	2019	2018	2017	2016	2015
Fission and activation products TBq	0.0001	0.0001	0.0003	0.0002	0.0001
% of allowed amount	0.04	0.04	0.09	0.05	0.04
Tritium TBq	1.59	1.62	2.46	2.32	2.05
% of allowed amount	8.7	8.9	13.5	12.7	11.2

Wastewater treatment	2019	2018	2017	2016	2015
Amount of water (m³)	83,545	89,558	97,207	88,606	77,093
Concentration (mg/l)¹⁾					
BOD _{7ATU}	6.6	10	8.0	13	4.7
Phosphorus	0.37	0.12	0.12	0.24	0.10
Treatment efficiency average (%)¹⁾					
BOD _{7ATU}	97	96	96	94	97
Phosphorus	96	99	98	98	99
Load on sea area (kg)					
Phosphorus	31	11	12	21	7.7
Nitrogen	2,993	4,380	5,840	4,380	3,541
BOD _{7ATU}	548	913	767	1,132	361
Water treatment chemicals (t)²⁾	32	35	39	34	22

¹⁾ The permit regulation for the sanitary wastewater: The maximum BOD_{7ATU} value of wastewater discharged into the seas is 13 mg O₂/l and the maximum phosphorus concentration is 0,52 mg P/l. The minimum treating efficiency for the BOD_{7ATU} value and phosphorus is 95%. All values are calculated as annual averages.

²⁾ Chemicals used for the treatment of sanitary wastewater.

Waste

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

Radioactive waste

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

Waste exempted from control contains such a small amount of radioactive substances that the waste can be reused or delivered to the Olkiluoto landfill for final disposal. Waste is produced during the operation and maintenance of the power plant. In 2019, the amount of maintenance waste exempted from control was 0 tons. Approximately 26 tons of metal was also cleared for recycling.



Radioactive waste	2019	2018	2017	2016	2015
Low-level (m ³) ¹⁾	150	92	47	86	171
Intermediate level (m ³) ¹⁾	7	53	51	9	6
Operating waste cleared after monitoring (t)	0	44	40	96	50

¹⁾ Waste disposed in the VLJ repository.

Amount of spent fuel in the OL1 and OL2 storage polls and interim storage, cumulative	2019	2018	2017	2016	2015
Number of assemblies (pcs)	9,328	9,122	8,922	8,720	8,518
Assemblies (t)	1,564.9	1,531.2	1,498.5	1,465.2	1,432.0

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

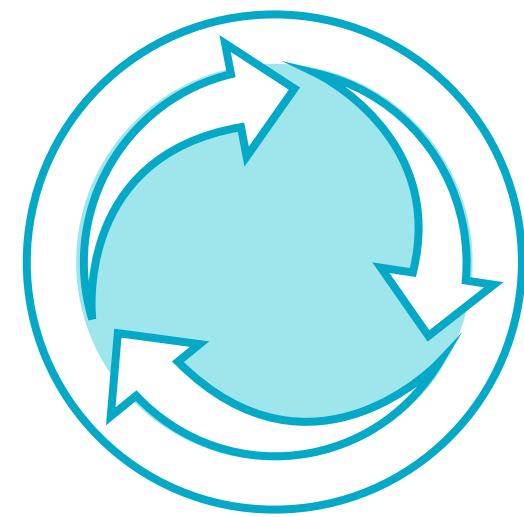
The ion exchange resins used for the treatment of the process water at the power plant are classified as intermediate level waste that is incorporated in

bitumen and embedded in the operating waste repository. The total amount of high-level radioactive waste (spent fuel) generated during the year under review was 35.0 t. It is kept in an interim storage in Olkiluoto until it can be embedded in the bedrock of Olkiluoto for final disposal. The final disposal will start in the 2020s. Decommissioning waste is waste produced in connection with the demolition of the power plants at the end of the operating life. The final disposal of decommissioning waste will also take place in Olkiluoto.

Municipal waste

THE OPERATION of the power plant also generates municipal waste. TVO is committed to the reduction of the amount of waste and to the improvement of the reuse of waste. This is requirement for everybody working at Olkiluoto. All waste generated at Olkiluoto is sorted and processed. The sorted wastes are recycled as materials whenever possible, or reused as energy. Only waste that cannot be reused in any manner is taken to the landfill. In 2019, there was no such waste. All hazardous wastes are collected in the hazardous waste storage to be sent to an appropriate waste treatment plant.

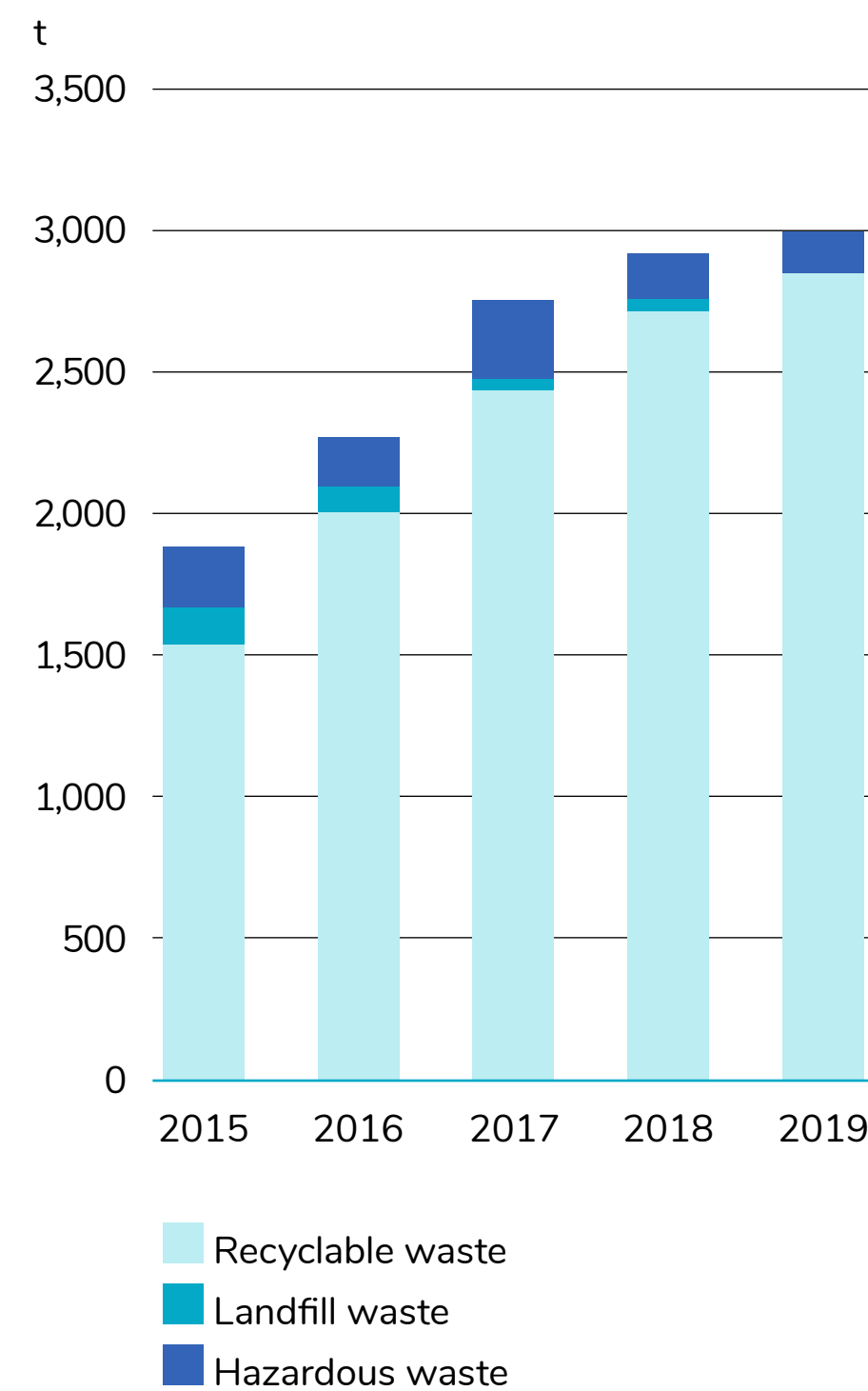
In 2019, the total amount of waste was 3,011 metric tons. Waste suitable for recycling or reuse as energy amounted to 95% of the total amount of waste and the shares of hazardous waste was 5%. Most of the hazardous waste was batteries and WEEE (waste electrical and electronic equipment) waste.



53%

Share of waste recycled as material or utilized in energy production of the total waste volume, excluding waste sludge.

Waste Municipal waste



Municipal and hazardous waste OL1 and OL2 (metric tons)	2019	2018	2017	2016	2015
Mixed waste to energy ¹⁾	64	59	65	103	61
Landfill waste to TVO's landfill	0	44	41	45	54
Paper and cardboard	48	49	50	74	90
Energywaste	113	102	132	114	94
Biowaste	35	57	50	64	65
Wood	111	108	99	67	59
Metal	201	208	107	77	99
Glass	4	5	5	5	2
Plastic	2	-	-	-	-
Cable refuse	8	23	8	7	11
Crushed brick and concrete	5	3	0	0	0
Screening	25	36	79	61	72
Hazardous waste	104	53	62	64	72
Sludge ²⁾	990	1,038	933	807	555

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

Municipal and hazardous waste OL3 (metric tons)	2019	2018	2017	2016	2015
Mixed waste to energy ¹⁾	62	173	168	118	70
Landfill waste to TVO's landfill	0	0	0	44	54
Paper and cardboard	21	26	31	43	33
Energywaste	81	128	140	138	98
Biowaste	31	43	53	35	37
Wood	296	168	214	188	183
Metal	754	43	275	138	58
Cable refuse	3	22	32	65	51
Crushed brick and concrete	0	436	0	20	10
Cable reels	6	0	5	2	10
Hazardous waste	47	112	221	114	146

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

Environmental research and biodiversity

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

ENVIRONMENTAL 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 analyzed in compliance with an environmental radiation monitoring program approved by the Radiation and Nuclear Safety Authority (STUK). There are also several radioactivity monitors in the immediate vicinity of the plant. They continuously measure radiation and are connected to STUK's automatic network for monitoring external radiation.

Over 100 water samples are taken from the sea surrounding Olkiluoto each year. These samples are subjected to about

1,500 different water quality analyses. Furthermore, the condition of fish stocks is monitored by, for instance, fishing for record-keeping purposes and surveys among professional and recreational fishermen. Test fishing takes place every four years in the areas surrounding Olkiluoto in accordance with the environmental monitoring plan. The state of aquatic plants is monitored by means of transect line diving every six years.

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

Centralized production protects biodiversity

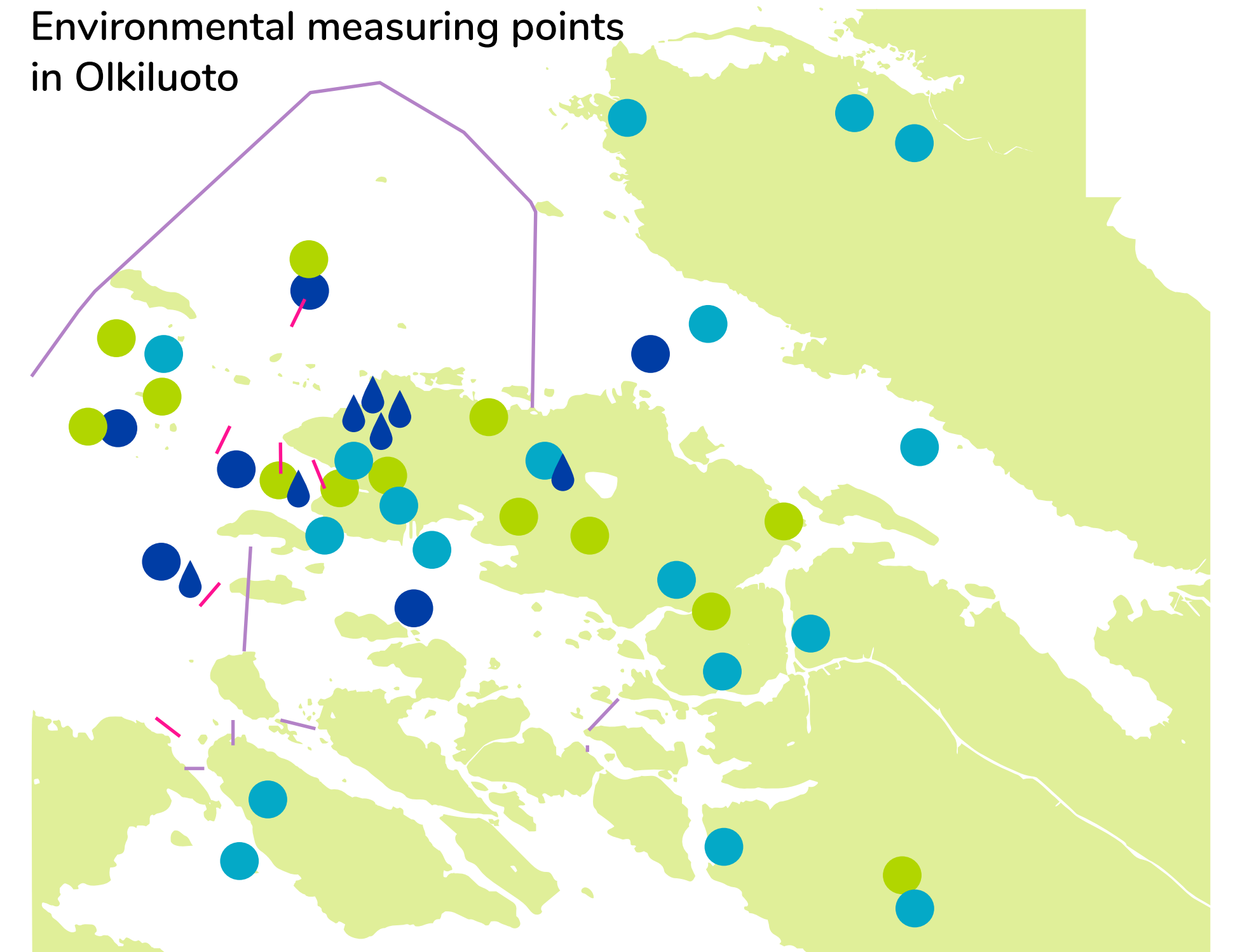
SURROUNDED by four nature conservation areas, the small island of Olkiluoto produces around one-sixth of all the electricity used in Finland. After the commissioning of OL3, the production

volume will increase to around one-third. The concentration of energy production in a small geographic area minimizes the environmental impact and allows the preservation of other areas in their natural state. Climate change also has a major impact on biodiversity. By producing clean and climate-friendly nuclear power-generated electricity, TVO makes a significant contribution to the mitigation of climate change and promotion of sustainable development.

The total surface area of the Olkiluoto island is 900 hectares, of which constructed areas amount to 170 hectares (170 ha in 2018). The total volume of non-water-permeable areas is 41 hectares. TVO does not own any nature-oriented areas.

Nuclear power is approximately 70 times more efficient in terms of its use of land areas than wind power.

Environmental measuring points in Olkiluoto



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

Cooperation with authorities

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

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

Radiation monitoring samples taken from the Olkiluoto environment are submitted to STUK for analysis. TVO annually prepares a report on the waste and emissions caused by its operations and submits the report to several regional and national authorities. TVO annually reports its environmental investments and environmental protection activity expenses to Statistics Finland. After verification, the annual carbon dioxide emissions of the emergency diesel generators and reserve boilers are reported to the Energy Authority. The Finnish Safety and Chemicals Agency (Tukes) acts as the supervising authority for the industrial processing and storage of hazardous chemicals.



Six special events in 2019

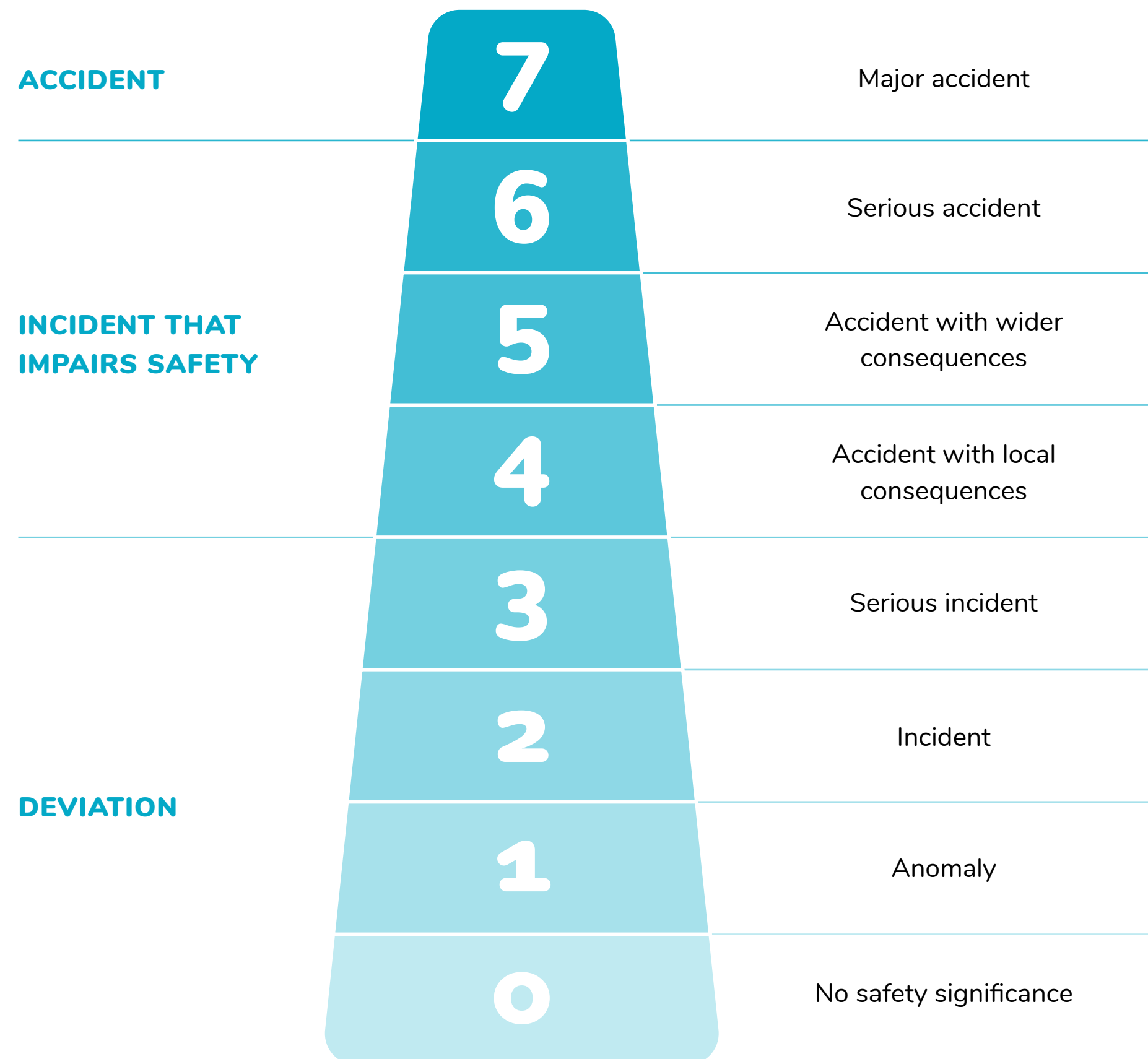
THE OLKILUOTO nuclear power plant units, OL1 and OL2, operated safely throughout the year. TVO classifies events affecting nuclear safety in accordance with the international INES scale (0–7). In 2019, six events rated as INES category 0 events (no nuclear or radiation safety significance) took place at the Olkiluoto plant. TVO investigates all events that could have an impact on nuclear safety and determines corrective actions. TVO publishes information on every event with public interest in the News section of its website.

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

Permits govern the activities

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

INES-scale



according to the Water Act. The permits decisions are valid until further notice.

Environmental and water permit decisions cover power plant operations and its emergency power generation systems. The permit conditions control the nuclear power plant's cooling water volume and the amount of heat contained in it, wastewater treatment efficiency, the processing of waste, operations in transient and abnormal conditions, as well as monitoring and reporting. In addition, there are separate environmental permits for supporting operations of the Olkiluoto nuclear power plant, such as the landfill and the crushed stone storage area.

Licenses according to the Chemicals Act have been granted for the handling and storage of hazardous chemicals. The reserve boilers of the Olkiluoto nuclear power plant, as well as the emergency diesel generators of OL1, OL2, and OL3 (a total of 15 generators), are included within the scope of the emissions trading system. In compliance with the Finnish Emissions Trading Act, TVO submits an annual verified emissions report and a verifier's statement to the emissions trading authority.

Compliance with environmental legislation

TVO CONTINUOUSLY monitors statutory regulations and other requirements pertaining to its operations. People in charge of different parts of the operations are in charge of ensuring that the organizations receive sufficient up-to-date information about statutory regulations and their impact on TVO's operations. Compliance with the regulations and requirements is regularly assessed in internal and external audits as well as management reviews. In 2019, the operations complied with environmental legislation, licenses, and permits.

Nuclear waste management

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

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

Spent nuclear fuel from the nuclear power plants of Teollisuuden Voima and Fortum will be packed in copper canisters and embedded in Olkiluoto bedrock at a depth of 430 meters. The final disposal of spent nuclear fuel is based on the use of multiple release barriers, which ensure that the nuclear waste cannot be released into organic nature or become accessible to humans. A deficiency of a single barrier or a predictable geological or other change will not endanger the performance of the insulation. The release barriers include the physical state

of the fuel, the disposal canister, the bentonite buffer, the backfilling of the tunnels and the surrounding rock.

Plenty of time has been reserved for the preparation and practical execution of final disposal. Thorough preparations and careful implementation ensure the safety of the final disposal. The disposal of spent fuel is scheduled to begin in the 2020s, and it will continue for approximately hundred years.

Responsibility for nuclear waste management lies with the nuclear power companies that must carry out the necessary nuclear waste management measures for their own waste at their own cost. According to the Finnish Nuclear Energy Act, nuclear waste generated in Finland must be treated, stored, and finally disposed of in Finland and the import of nuclear waste into Finland is prohibited. Posiva Oy will manage research into the final disposal of spent nuclear fuel, construction and operation of final disposal facilities, and eventual closing up of the facilities on behalf

“Olkiluoto will make history in nuclear waste management – currently under construction, ONKALO® will be the world's first disposal facility for spent nuclear fuel.”

of its owner companies. Posiva and ONKALO® are internationally renowned in the nuclear industry for their final disposal solution, and Posiva Solutions Oy offers this expertise in a dozen countries.

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 the shareholders of TVO 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 State Nuclear Waste Management Fund. Each year, the Ministry of Economic Affairs and Employment determines the share of each nuclear power company in the State Nuclear Waste Management Fund as well as the waste management fee to be paid to the fund. The liability share of the nuclear power companies in the Fund is decreased by the investments they make in final disposal.

The annual fee payable to the fund is determined on the basis of the difference between the amount of accumulated nuclear waste for final disposal and the measures implemented for nuclear waste management. The fee is also increased

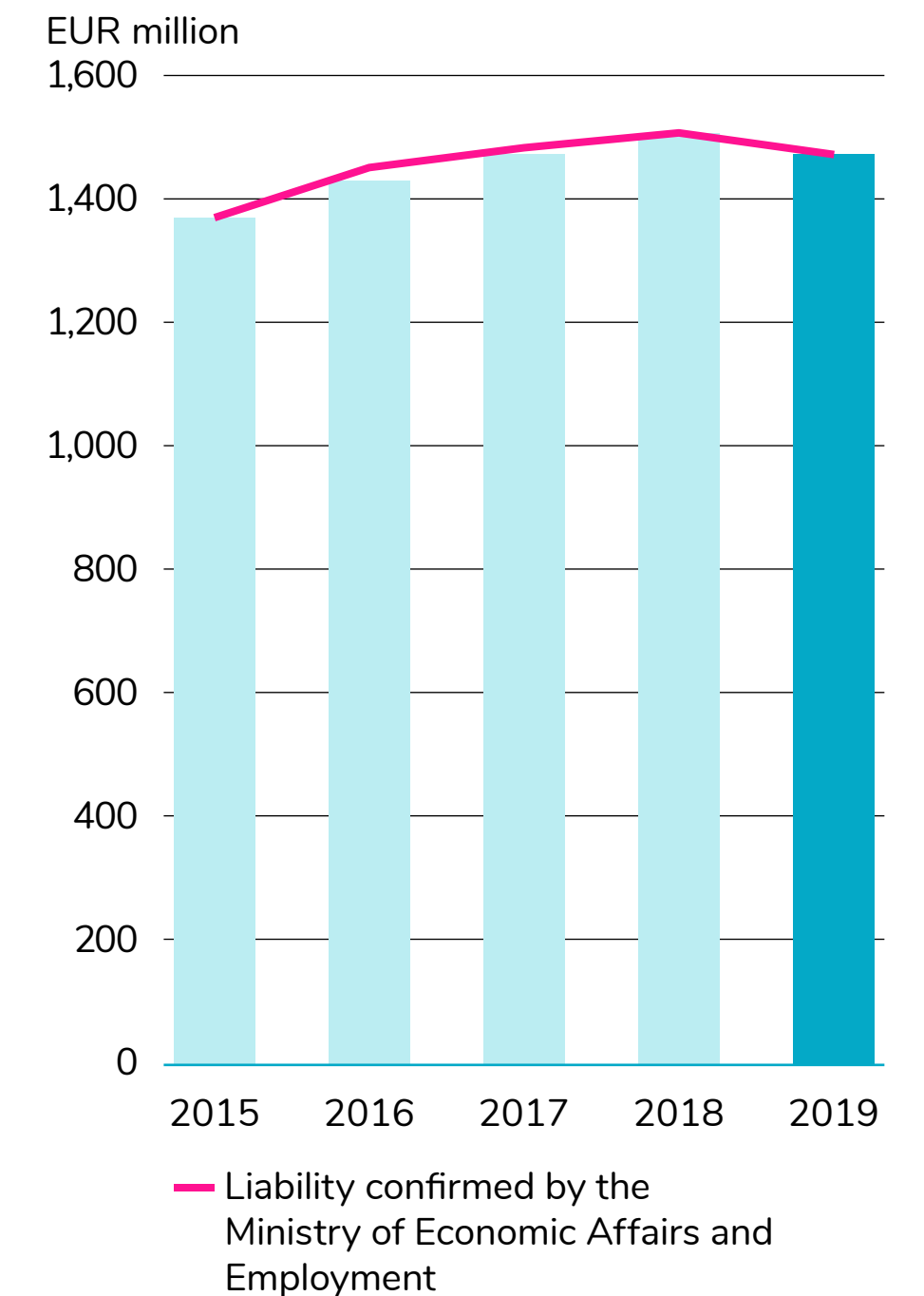


430m

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



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



or decreased on the basis of how well the Fund succeeds in its investments: if the interest income is higher than expected, the liability share in the Fund is correspondingly reduced. The objective is to accumulate enough assets in the Fund for the final disposal of accumulated nuclear waste.

Work community



Particle-larly great jobs

THE TVO GROUP is a nuclear industry expertise hub in Finland. The company's top-quality results are produced by skilled, professional, and experienced employees. The nuclear industry employs some 4,000 people in Finland, of whom approximately 1,000 work for TVO. In 2019, 116 new employees were hired. In addition, TVO employed a total of 107 summer trainees.

TVO provides its personnel with varied duties and an opportunity for professional development. The operating personnel of the nuclear power plant receive comprehensive training throughout their careers. The high level of competence is achieved with the help of unit-specific training requirements, job rotation, induction training, and work guidance. In 2019, the employees received a total of 12,249 days of training, which means on average 13.0 days per TVO employee.

TVO is aware of its role in the development of the competence of new energy industry experts, and aims to do its part in the development of competence. TVO is involved in varied cooperation with a variety of educational establishments and student communities, for example.

FACT



Did you know that almost 2,000 people work at Olkiluoto during an annual outage?

TVO as an employer

OLKILUOTO is a highly networked island where new top experts will be able to develop their own work and to build valuable networks at the nuclear power branch. TVO is a significant employer in Eurajoki and in the whole of southwestern Finland.



116

New recruits
in 2019

Average age
of employees

42.6

10y

Average
service time

Output
variability

6.1

3/4

have an **university**
(or similar) **degree**

Summer employees
in 2019

107

Good work community

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

TVO'S Code of Conduct and company-level policies determine the HR policy principles. A prerequisite for TVO's operations is that all of its employees remain motivated, take responsible care of their duties, and commit to compliance with the agreed procedures.

TVO provides its personnel with varied duties and an opportunity for professional and career development. TVO provides competitive rewards and encourages employees to work profitably, to meet their goals, and to operate at a high level every day.

In 2019, TVO continued its activities to develop the work community culture and promote the safety culture. TVO carries out a personnel survey every 18 months. A personnel survey was started in late 2019. The results will be available in February 2020. The survey is carried out by Corporate Spirit Ltd.

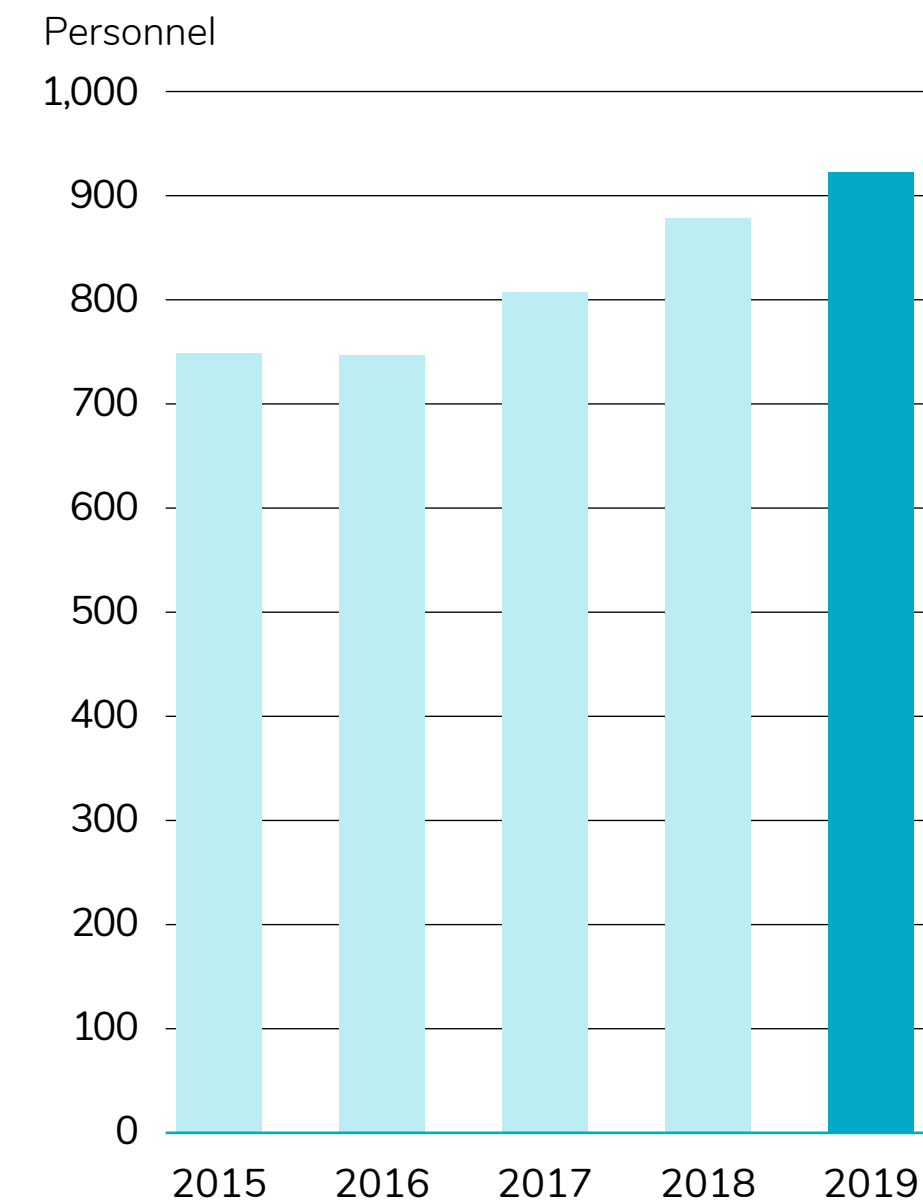
More than 110 new employees joined the Olkiluoto team to do a Particle-larly Better Job

IN 2019, TVO continued with its preparations for the commissioning of Olkiluoto 3 (OL3) by recruiting new talent. The theme of the recruitment campaign, "Particle-larly Better Jobs", was clearly visible in different communication channels over the course of the year. A total of 116 new employees were hired during the year.

At the end of 2019, TVO employed 941 people. The average number of employees during the year was 942. Most of TVO's employees work at Olkiluoto, with some 20 people working in Helsinki. The average age of TVO's employees was 42.6 years in 2019.

At the end of 2019, 21.7% of the permanent employees were female. The Board of Directors had ten members, one of them female. The Management Team had thirteen members, four of them female. The Management Team includes

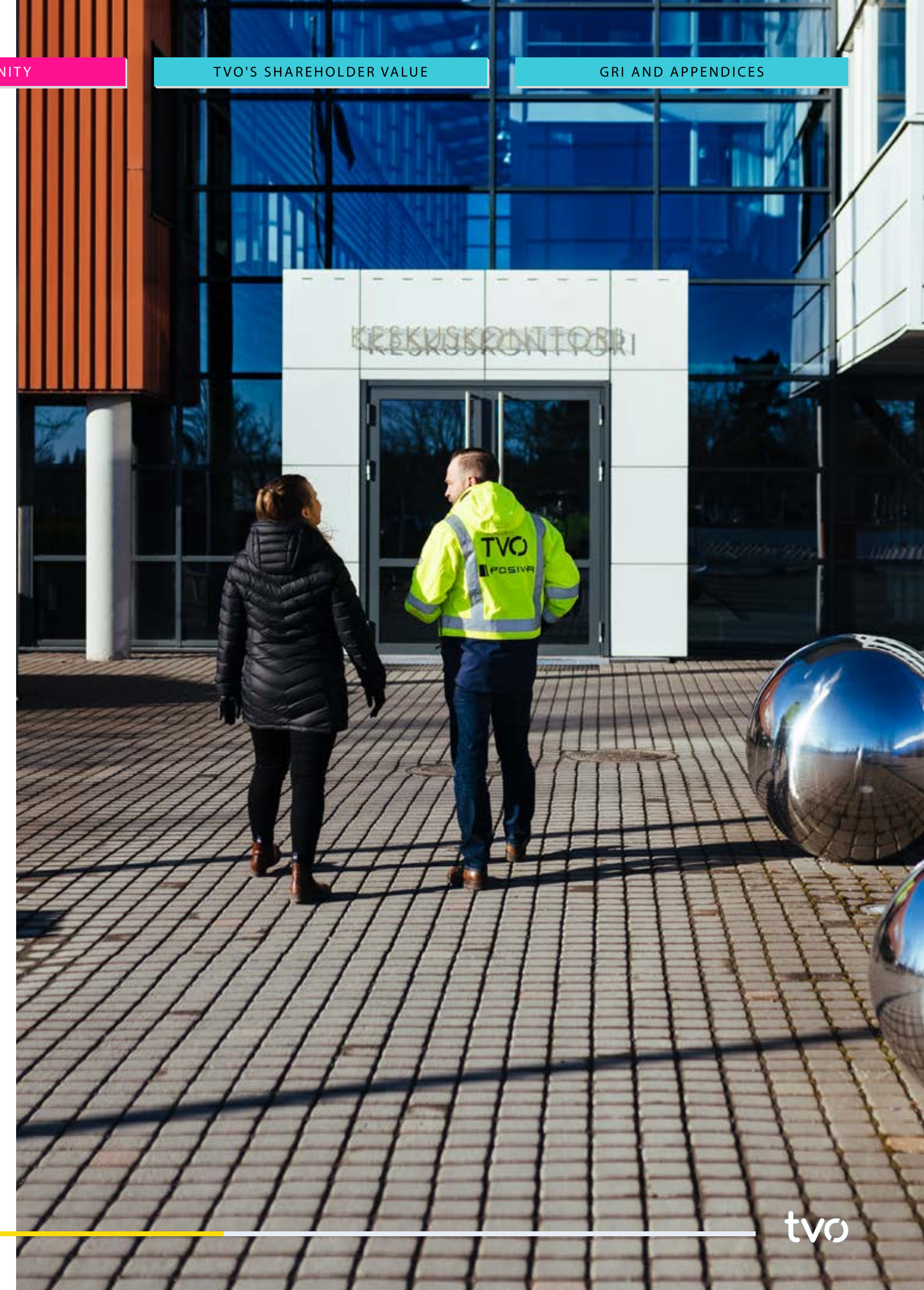
TVO's personnel



“

Mainly due to OL3, Rauma is a highly multinational town that has attracted highly trained and well-paid experts.”

– Kari Koski, the mayor of Rauma



“ In 2019, TVO continued with its preparations for the commissioning of Olkiluoto 3 by recruiting new nuclear industry experts. The expertise here ranks among the best in the world, and Olkiluoto is a unique workplace.”



three personnel representatives. There were no changes in TVO's Management Team in 2019. A total of 56 permanent employees left the company, 13 of them due to retirement. In 2019, TVO employed 107 summer trainees. As in the previous year, TVO participated in the Responsible Summer Job campaign of the Children and Youth Foundation. The campaign aims to develop summer jobs and the readiness of youth between the ages of 16 and 25 to transfer to working life. For TVO, the participation meant applying the campaign's principles to the summer jobs of interns. TVO also continued its cooperation with educational institutions in the adjacent area and participated in recruitment events arranged by institutes of higher education in different parts of Finland.

Over the course of the year, 8% of TVO's permanent employees took parental leave. The competence and expertise of TVO's employees are based on systematic development of professional competence and long employment relationships.

TVO complies with the applicable collective labor agreements for the energy sector in all its operations. The current

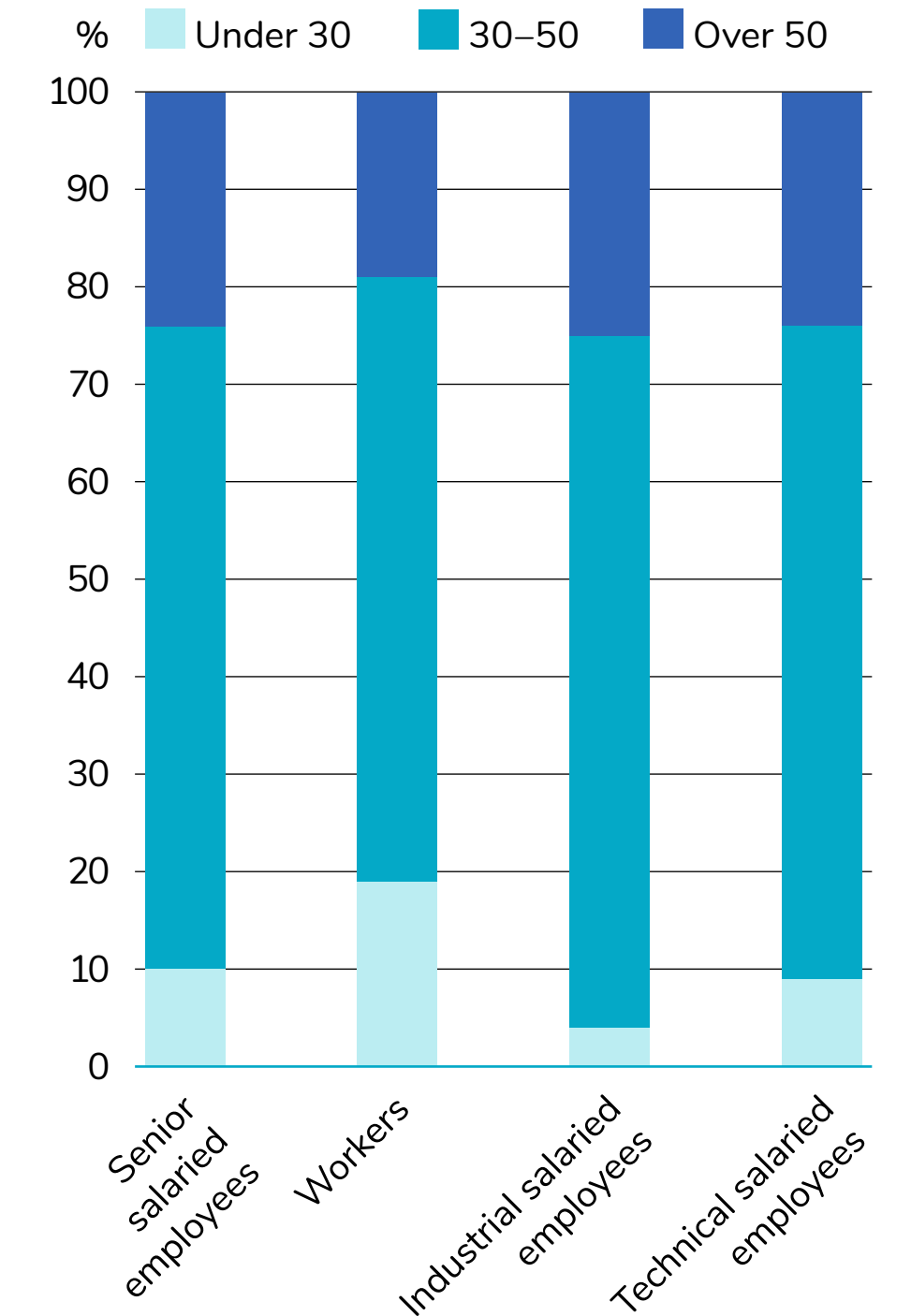
agreements are valid until early 2020. All of the employees fall under the scope of the collective agreements. TVO has freedom of association. The energy sector's agreed salary systems for technical and industrial officials and employees are based on the job requirement categories and support the implementation of an equal salary policy. As a rule, the various employment benefits apply to the entire personnel, excluding very short employment relationships.

Large projects provide employment for thousands of people in Olkiluoto

OL3 EPR is a large international project, and the plant supplier's average workforce at the Olkiluoto 3 construction site was 1,583 in 2019. 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.

Annual outages of the OL1 and OL2 plant units employ dozens of subcontractors from Finland and abroad every year. In 2019, a total of 1,009 people participated in the annual outages.

TVO's personnel by age group



Well-being at work

Better Workplace project develops the Group's management and operating culture.

GOALS of the Better Workplace project 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 2019 themes of Better Workplace were:

- "You, me, us – nuclear industry experts", including the highlighting of concrete safety culture procedures, 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.
- Work based on motivation provided by results, aiming at clear decision-making and improved cooperation. Other issues included the modern working environment and changing ways of working.
- Safety attitude, where the concrete actions involved well-being at work and occupational health and safety.

In 2019, Better Workplace continued with the implementation of development actions based on actual development proposals from the field and development actions derived from the results of the 2018 personnel survey. Goals included promoting the concrete development actions, making practical work more fluent, and communicating information about these issues. Better Workplace and the related supervisor and personnel training will continue in 2020 in compliance with the above-mentioned goals. The 2020 goals will be updated on the basis of personnel survey feedback, for example.

Well-being at work as part of the development of corporate culture

KEY DEVELOPMENT actions related to the maintenance and development of well-being at work in 2019 involved occupational health and safety, personal safety, development of the atmosphere at work, and operations arranged together with occupational healthcare services. In addition, lectures on the progress of large projects,



107

summer trainees
employed by TVO!



1,000

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

the loading of one's brain, and the significance of exercise, among other subject matters, were arranged for the employees to develop the work community.

Close cooperation with occupational healthcare services has continued. The company uses an early intervention model and has created models for substitutive and lighter work. In 2019, supervisors were encouraged to have a low threshold to talk to employees in accordance with the early intervention model. Occupational healthcare services focus especially on proactive management and maintenance of working capacity and risk-based working capacity analyses. An example of this are lively small groups targeting the factors that threaten the working capacity of special groups.

In addition to the comprehensive occupational healthcare services that are available to all of the Group's employees, supplementary insurance coverage for

the employees promotes well-being at work. All of the Group's permanent employees have access to voluntary medical expenses insurance, additional accident insurance, and travel insurance. The employees' ability to reconcile work and leisure is supported by using flexitime and a sabbatical leave system. A new system introduced to support the reconciliation of work and leisure is a working-time account system. The working-time account system covers senior officials who are included in the scope of the total compensation system.

Employees of TVO Group can use Smartum sports and culture balance, through which the employer supports the employees' voluntary working capacity maintenance. Over the course of the year, well-being at work and community spirit were maintained and promoted also by arranging a variety of family and employee events. In addition, the employees have access to several holiday locations.

Navigation discussions have become an established part of everyday work

PERFORMANCE, workload, and coping at work of the employees 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 procedure 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.

Competence development

Competent and motivated employees create the foundation for the safe operation of a nuclear power plant.

TVO CONTINUOUSLY offers training to maintain the competence and expertise of its employees and the external workforce. Internal training courses are arranged on topics such as plant, nuclear power, and operating technology. A high level of expertise can be achieved by using training requirements tailored for the different units, job rotation, employee orientation, and work guidance. An individual training plan has been prepared for each employee of TVO. The plan includes training requirements involving the unit, licenses/permits, and special roles.

In 2019, the development of competence focused on development of a new competence management system, preparation of more specific role-based competence analysis based on the requirements of the organization, and renewal of the online training environment. Furthermore, more varied learning methods were added to internal training



“In 2019, the employees received a total of 12,249 days of training.”

to improve effectiveness of the training. The main goal of operation training at OL1 and OL2 was the implementation of high-quality training, with particular focus on plant modifications. The planned goals were reached.

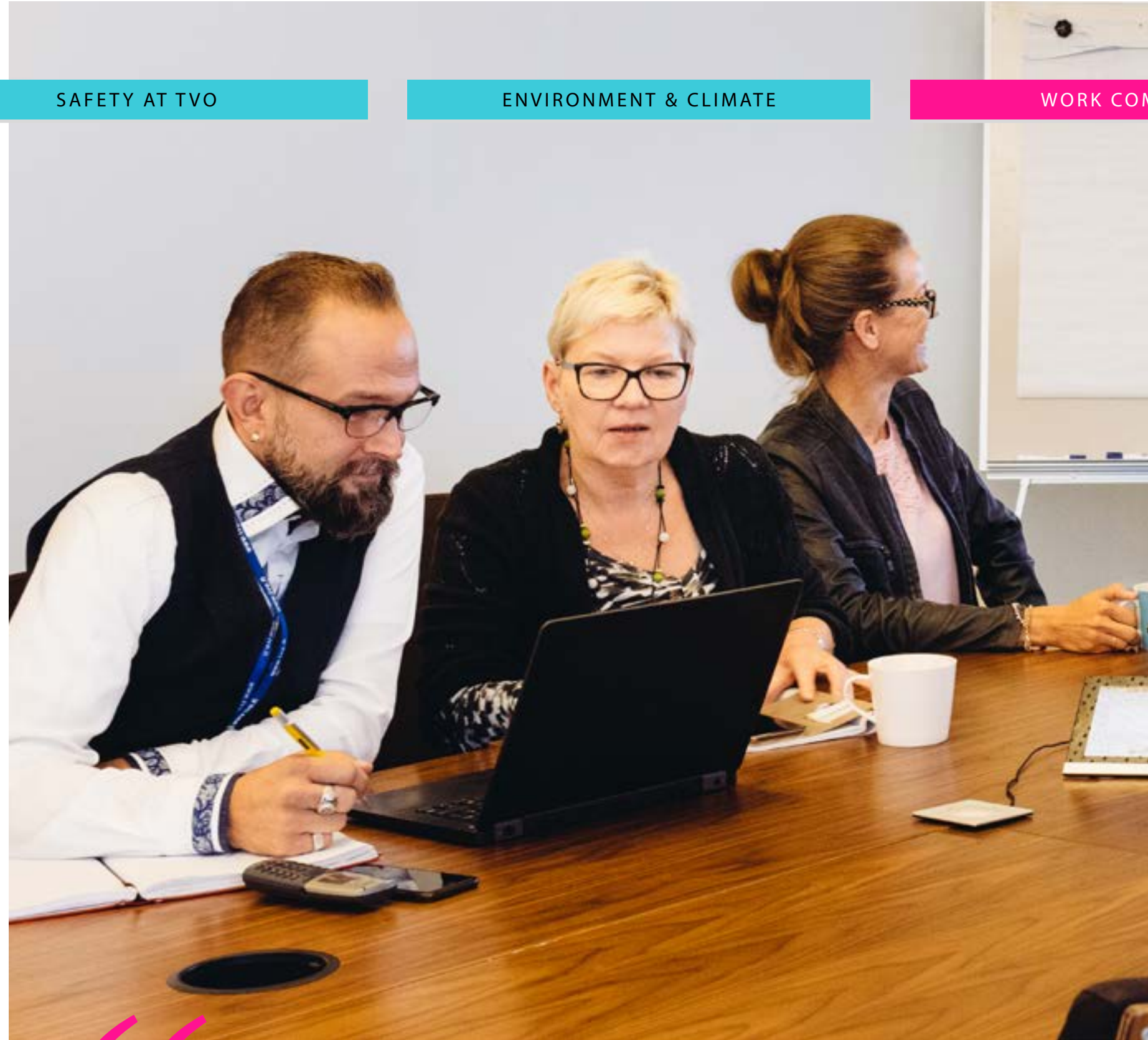
The operating personnel of the nuclear power plant receive comprehensive training throughout their careers. In spring and autumn 2019, operators of OL1 and OL2 participated in operating training events and advanced simulator courses as required by their refresher training program.

Several supervisor training events focusing on a variety of themes were arranged to develop supervisory skills. In addition, a number of people completed supervisor training and special training on supervisory operations. Development of basic annual outage competencies was continued with two separate training courses. The prerequisites for receiving an access permit were completion of the annual online training course and practical training (in a “mock-up tent”). The pur-

pose of these actions was to inform the employees of the Group and all persons working on the site during the annual outages of TVO Group's expectations related to high-quality work performance and correct procedures. A total of 900 TVO Group employees, 1,530 subcontractors and 57 representatives of authorities were trained. The total number of persons attending training was 2,430.

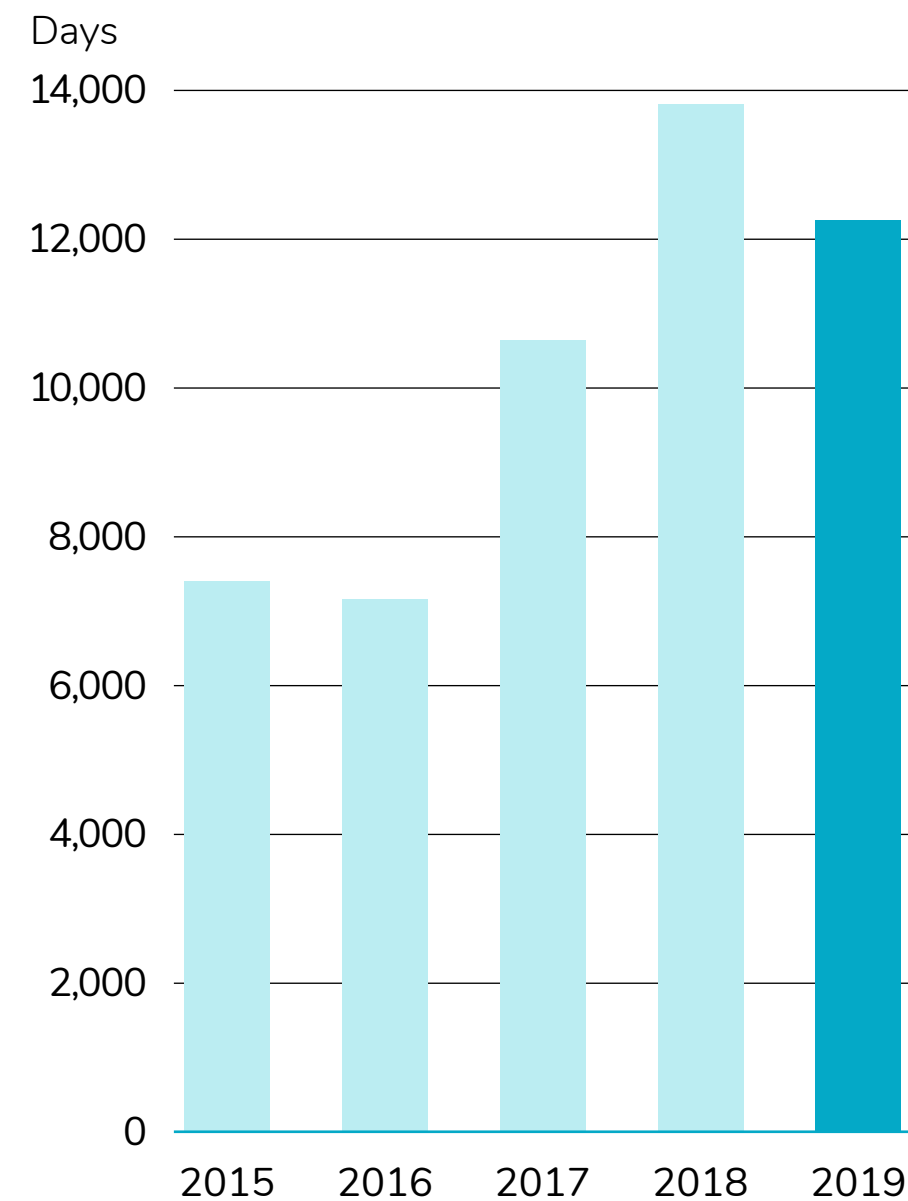
TVO aims to do its part in the development of competence, being aware of the fact that it will continue to employ new nuclear sector experts in future. Cooperation with educational institutions and schools takes place in many different forms.

The Group prepares an extensive annual training program that takes into account unit-specific training requirements and other special training needs observed in the organization. The annual training program was mostly implemented according to plan. In 2019, the employees received a total of 12,249 days of training, which means on average 13.0 days per TVO employee.



“A total of 1,707 people completed the radiation protection part of the induction training.”

Training days
Total



All employees working at the Olkiluoto nuclear power plant site must complete the general part of the introduction training and all persons working in the controlled area must complete the radiation protection part of the training. The general part of the introduction training was renewed in the fall to make it more practical. Some of the topics covered

during the occupational safety card training were also included in the introduction training. As of the fall of 2019, the Group no longer required completion of separate occupational safety card training.

The figures for the general and radiation protection part of the introduction training include the attendance of TVO Group

employees and subcontractors. Both the general part and the radiation protection part must be repeated every three years. In 2019, a total of 3,193 people completed the general part of the introduction training. Of these, 66 people completed the renewed general part of the introduction training. A total of 1,707 people completed the radiation protection part.

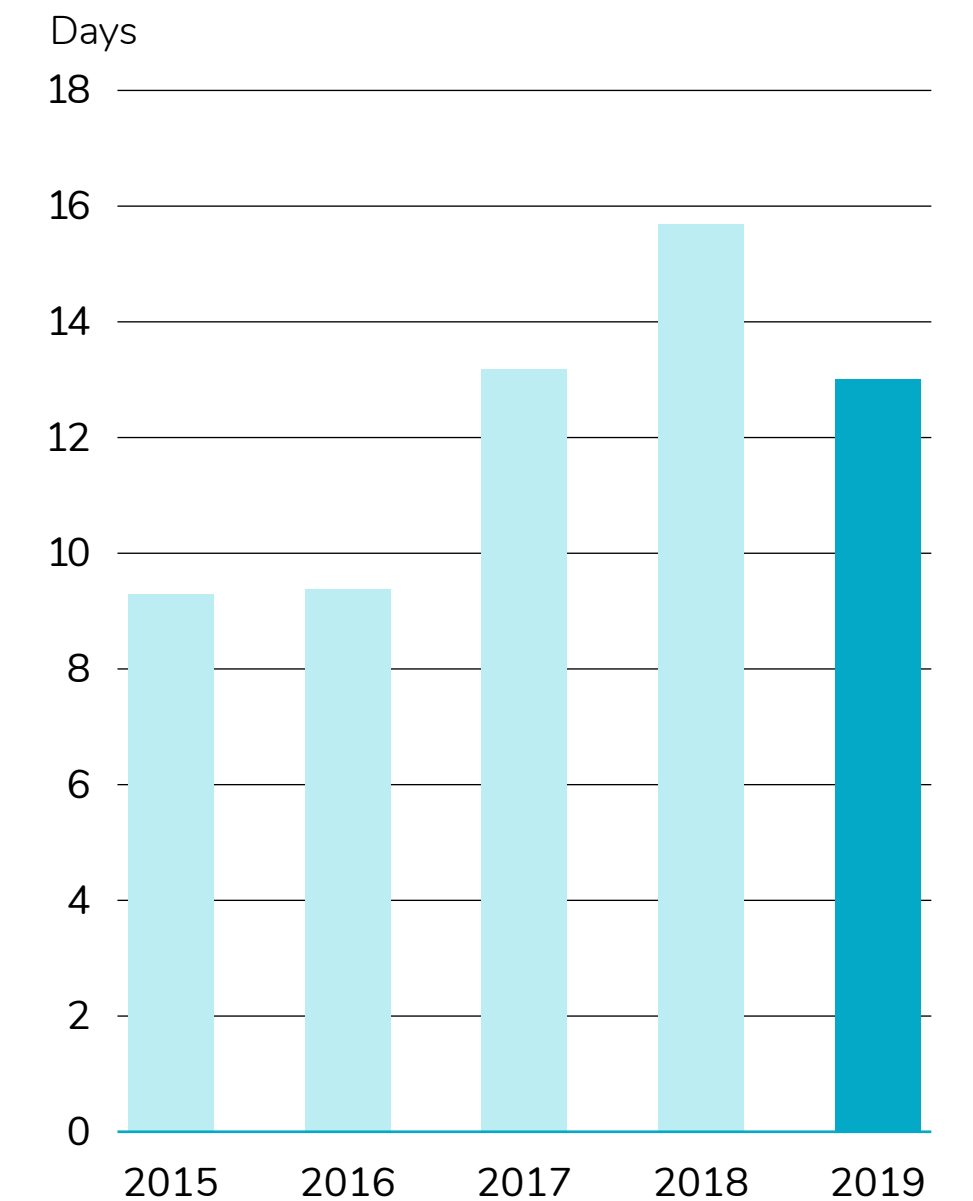
Both training parts were provided in Finnish and English. The components of the introduction training are repeatable in an internal and external e-learning environment.

OL3 training

THE OL3 TRAINING focused on expectations from the work of nuclear industry experts and special features of the nuclear industry. These requirements apply to the personnel of the OL3 plant supplier and subcontractors working at OL3. In the case of the personnel of the Group, the training focused especially on component and system expertise.

In 2019, OL3 operators participated in an advanced simulator training course arranged by the plant supplier. They also participated in operating training events in the spring and in the fall as required by their refresher training program. The OL3 operators work in shifts in the operating organization jointly established by the plant supplier and TVO, carrying out system operating and monitoring tasks. In 2019, the OL3 operators also participated in extensive review and validation of OL3 operating procedures. Plant training was arranged for training team KR16, and a basic simulator course started in late 2019.

Training days
/person



Occupational health and safety

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

THE OCCUPATIONAL health and safety operations are governed by a certified occupational health and safety system (OHS system) compliant with OHSAS 18001. It also covers TVO's share of the OL3 construction site operations. Work to renew the OHS system to make it compliant with ISO 45001 was started in 2018. The plan is also to merge the OHS systems of TVO and Posiva. Certification of the new system will take place in February 2020.

The mission of the OHS organization is to be an expert organization that supports, supervises, and develops occupational health and safety operations, as well as assists the line organization. The most important OHS goals for 2019 were creating the prerequisites needed for the ISO 45001 certification of the joined OHS system, clarifying the OHS responsibilities of the line organization, supporting supervisors in their work, as



Target	Indicator	Actual
Accident frequency at Olkiluoto (excl. CFS) <3.2 (accidents per one million working hours)	Monthly cumulative accident frequency monitoring for previous 12 months	4.0

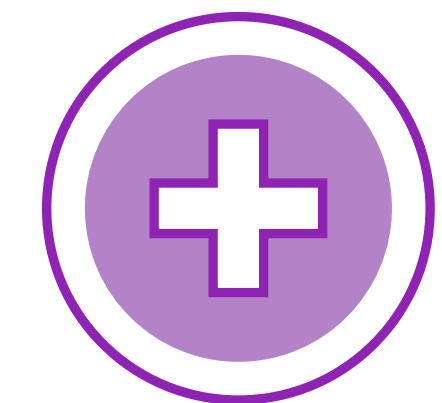
well as developing the identification of dangers and risk management.

The occupational health and safety policy is included in the company-level policy under social responsibility. Starting points of the occupational health and safety policy are zero accidents, maintenance of a good atmosphere at work and habitability, as well as zero tolerance in terms of workplace harassment or bullying. According to the zero accidents principle, all accidents can be avoided by carefully planning the work, using preventive safety measures, and adhering to strict quality standards.

OHS cooperation across organizational borders

THE OCCUPATIONAL health and safety operations are coordinated by OHS experts in the Competence Center's Corporate Security Team. 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, as well as representatives of occupational healthcare services. The comprehensive assembly of the team ensures that the team is representative of the entire personnel.



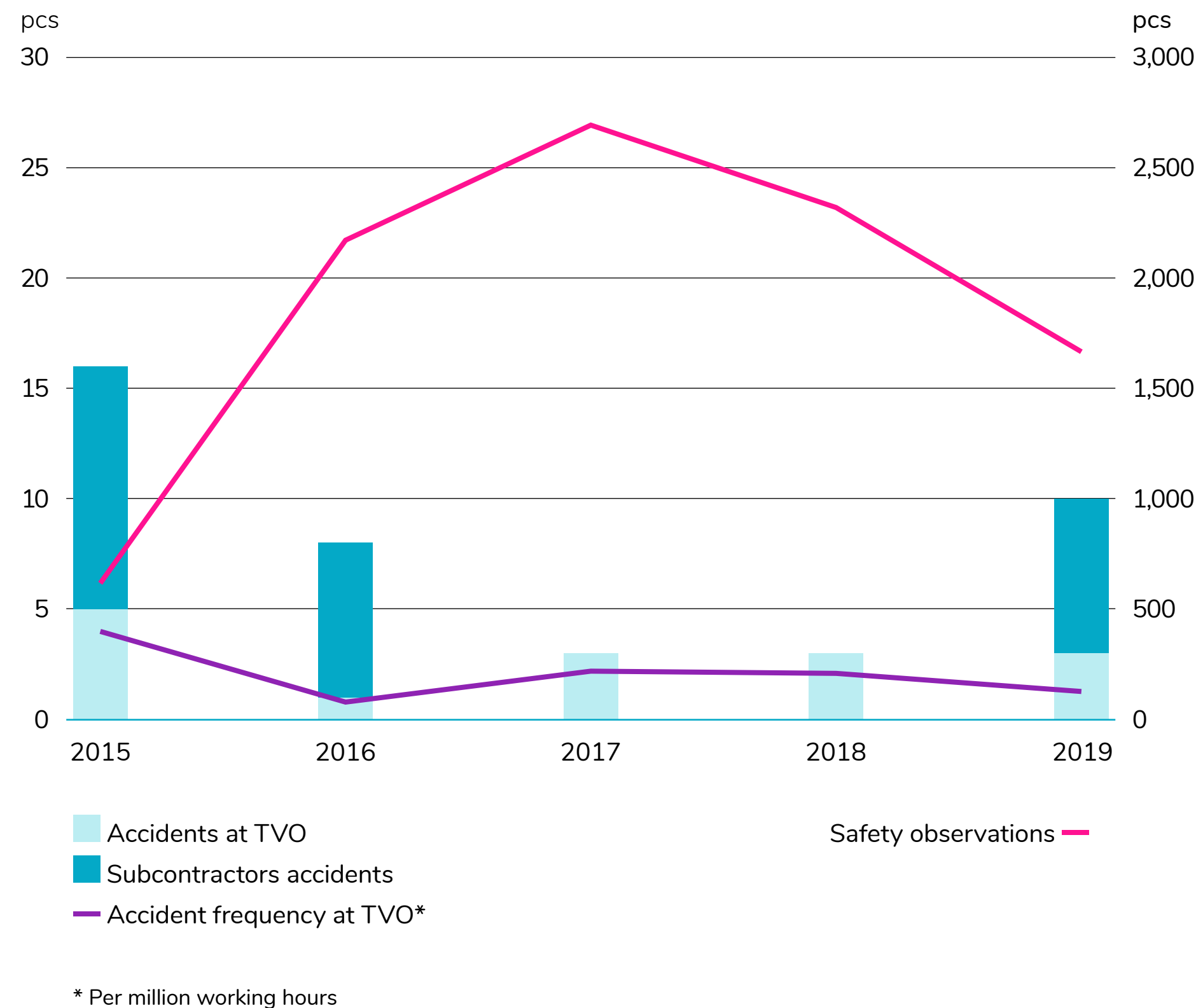
The management of the company has specified goals for 2020 in connection with its strategy planning. Occupational health and safety is included in the planning of the safety strategy.

Reports on functionality of the OHS system and the required corrective measures are submitted to the management twice a year in connection with management reviews. Development of the operations is supported by annually set OHS targets. Once a month, the management performs a safety walkdown of an agreed site. Observations made during the walkdowns are entered in the electronic quality management system for further actions. The development of OHS issues is also monitored by the company's Board of Directors.

TVO Group's target accident frequency target level for 2019 was 3.2 accidents per one million working hours. The target level was achieved for the majority of the year, but it was exceeded during the winter months: the accident frequency was 4.0 at the end of the year. The accident frequency figure includes TVO's employees, Posiva's employees, and all contractors operating in Olkiluoto, except for the OL3 construction site, which is reported by the AREVA-Siemens plant supplier consortium.

The number of accidents resulting in absence among TVO's own personnel over the course of the year was 3, the accident frequency being 1.28 accidents per one million working hours. The total number of absence days due to acci-

Accidents and safety observations



dents was 29. A total of 4 commuting accidents resulting in absence took place during the year. All the accidents resulting in absences were investigated and corrective actions were specified to prevent reoccurrence of the accidents.

Employees of TVO's subcontractors in Olkiluoto had 7 accidents resulting in absences, the accident frequency being 5.85 accidents per one million working hours. The total number of absence days of subcontractor employees due to accidents was 164.

The management of the company specified goals for 2020 in connection with its strategy planning. OHS is included in the planning of the safety strategy. The company-level target was set as decreasing the combined accident frequency at Olkiluoto to 2.4 or fewer accidents per one million working hours.

Careful investigations and instructions prevent future accidents

REPORTING all observed hazardous situations assists in the prevention of accidents. The investigation of hazardous situations and implementation of corrective actions aim to prevent reoccurrence of the events. The most common accident types in the areas managed by the TVO Group in 2019 were slipping and stumbling.

The supervisor of an employee involved in an accident initiates the accident investigation together with the occupational health and safety organization. A report of all accident investigations is submitted to the line management. The line management processes the accident in its own organizations and ensures that corrective actions are implemented. 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, TVO and its personnel are committed to following the ALARA (as low as reasonably achievable) principle. According to the principle, individual and collective radiation doses are kept as low as possible by means of practical measures.

RESTRICTING the doses and keeping the amount of radioactive emissions as low as possible are already considered when designing the structures and functions. All employees must consider radiation protection matters 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 controlled area of the nuclear power plant are monitored and measured using dosimeters. According to section 13 of the Government Decree on Ionizing Radiation (Valtioneuvoston asetus ionisoivasta säteilystä, 1044/2018), the effective dose of a radiation worker must not exceed 20 millisieverts per year. TVO's own targets regarding individual annual doses are keeping the dose ob-

tained 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 at Olkiluoto has been low, remaining clearly below the dose limits specified by the authorities. In 2019, the total dose of employees subject to radiation exposure in Olkiluoto was 647 manmSv. A total dose of 530 manmSv was accumulated during the power plant's annual outages.

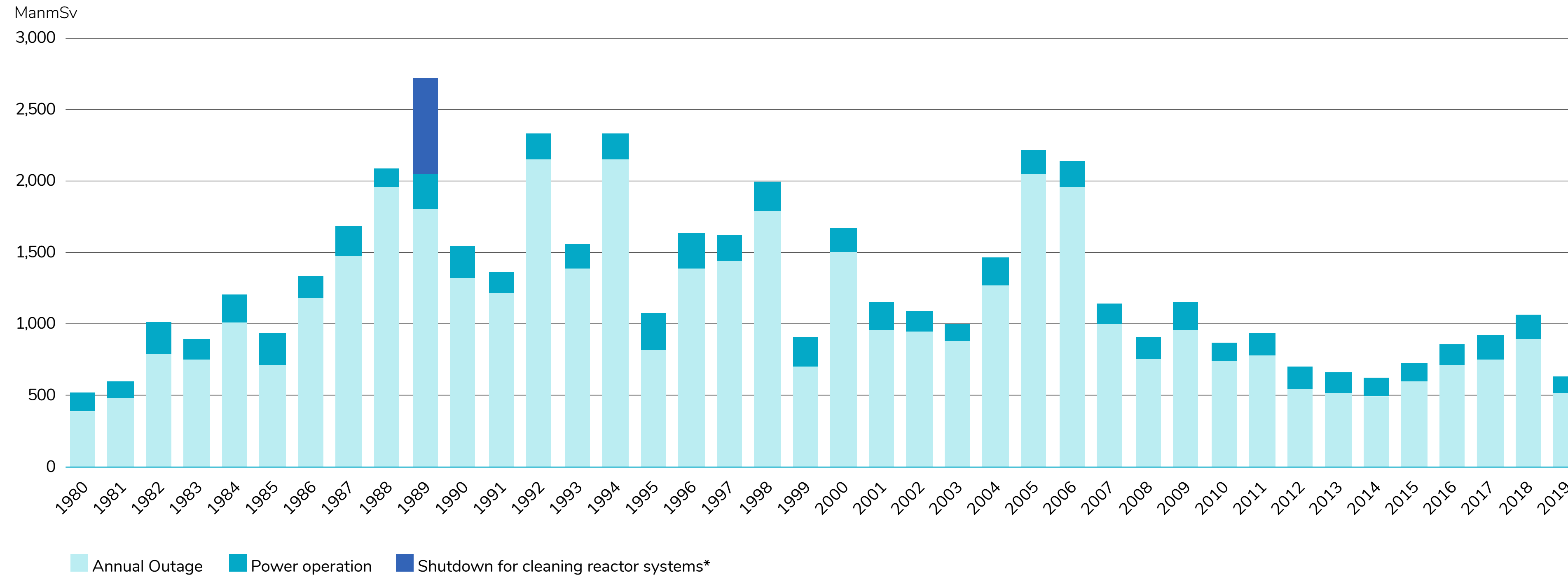
The combined radiation dose of TVO's own personnel was 155 (2018: 250) manmSv, and that of external personnel was 492 (2018: 851) manmSv. The highest individual annual dose incurred at the Olkiluoto nuclear power plant was 7.5 mSv. The number of employees under dose monitoring was 3,853 (2018: 4,324), with recorded doses accumulated for 894 (2018 1,226) employees. The average annual radiation dose received by a person living in Finland from other radiation sources is approximately 3.2 mSv.



“

For everyone working at the nuclear power plant control area radiation levels are monitored and measured with dosimeters.”

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	2019	2018	2017	2016	2015
Personnel, permanent, December 31	922	862	783	720	730
- Male	722	679	609	555	570
- Female	200	183	174	165	160
Personnel, fixed-term, December 31	19	15	23	26	18
- Male	13	10	12	14	6
- Female	6	5	11	12	12
Personnel, part-time, December 31 ¹⁾	20	18	11	17	14
- Male	4	6	4	7	5
- Female	16	12	7	10	9
Average age of employees ¹⁾	42.6	42.7	43.2	43.3	42.8
- Male	43.1	43.2	43.6	43.8	43.2
- Female	40.8	40.7	41.8	41.8	41.4
Employees' place of residence (%) ¹⁾					
- Eurajoki	17	18	19	17	17
- Rauma	48	50	51	53	54
- Pori	17	15	14	14	13
- Other	18	17	16	16	16
New employees ¹⁾	116	134	110	48	69*
- Male	87	102	92	32	48*
- Female	29	31	18	16	21*

Personnel structure	2019	2018	2017	2016	2015
Average age of new employees ¹⁾	35.7	34.8	35.8	34.1	38.4*
- Male	35.8	35.3	36.2	34.8	36.6*
- Female	35.1	33.3	33.7	32.8	42.3*
Average number of years of employment ¹⁾	10	11	12	13	13
Incoming turnover (%) ¹⁾	12.6	15.5	14	6.7	9.5*
Outgoing turnover (%) ¹⁾	6.1	6.4***	6	8.1**	12.3
Number of retirees ¹⁾	13	9	8	17	28
Average age of retirees ¹⁾	64.1	63.8	64.6	63.7	63.3
Summer employees	107	105	92	79	75
- Male	79	78	68	49	46
- Female	28	27	24	30	29
Board of Directors by age (%)					
- Less than 30	0	0	0	0	-
- 30–50	20	40	45	30	30
- More than 50	80	60	55	70	70
Management Team by age group (%)					
- Less than 30	0	0	0	0	-
- 30–50	8	23	21	31	23
- More than 50	92	77	79	69	77

¹⁾ Data reported only for permanent employees.

* The figure includes 30 employees who were transferred to TVO due to a business transfer.

** The figure includes 9 employees who were transferred to TVO due to a business transfer.

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

Personnel groups by gender	Female (%)	Male (%)	Total
Senior salaried employees	147 (27%)	405 (73%)	552
Regular employees	23 (15%)	129 (85%)	152
Industrial salaried employees	27 (96%)	1 (4%)	28
Technical salaried employees	3 (2%)	187 (98%)	190

Personnel groups by age	Total	Under 30	30–50	Over 50
Senior salaried employees	552	55	362	135
Regular employees	152	14	102	36
Industrial salaried employees	28	1	20	7
Technical salaried employees	190	36	118	36

Permanent personnel hired in 2019 by age group	Male	Female	Total
Under 30	31	9	40
30–50	45	17	62
Over 50	11	3	14

Employment period of employees who left TVO in 2019 by age group and gender	Male	Female	Total
Under 30	2	0	2
30–50	6	6	6
Over 50	25	25	25
Total, on average	13	9	12

Well-being at work

Occupational health and safety indicators	2019	2018	2017	2016	2015
Sick leaves (%)	2.6	3.1	2.1	2.4	2.6
- Male	2.5	2.9	2.0	2.5	2.5
- Female	3.1	3.6	2.5	2.2	3.2
Sick leaves (hours/person)	47	55	41	48	53
Persons with zero absentee rate ¹⁾	309	238	300	246	289
- Male	254	192	243	202	235
- Female	55	46	57	44	54
Occupational disease rate	0	0	0	0	0
Health percentage (%)	31.8	29	38	33.8	
Proportion of preventive occupational health care and medical care of total costs (%)	54.0	68	69.6	66.8	
Proportion of medical care of total costs (%)	35.0	25	23.1	24.8	

¹⁾ Data reported only for permanent employees.

Competence development

Competence indicators	2019	2018	2017	2016	2015
Training days/person	13.0	15.7	13.2	9.4	9.3
Training days total	12,249	13,813	10,639	7,157	7,392
- Male	10,210	11,946	9,018	6,021	6,362
- Female	2,038	1,866	1,621	1,136	1,030
Training days (average)					
- Senior salaried employees (11.9 days/person)	6,558	7,157	5,343	3,992	3,393
- Technical salaried employees (18.1 days/person)	2,744	4,030	3,475	2,188	1,986
- Industrial salaried employees (3.8 days/person)	105	121	107	67	148
- Regular employees (13.1 days/person)	2,495	2,064	1,436	751	1,719
- Fixed-term and others (18.3 days/person)	347	440	278	159	146
Introduction training – general part (in Finnish)					
- Number of attendees	2,077	2,034	2,119	717	1,599 ¹⁾
- Online refresher course	1,323	1,113	991	973	756
Introduction training – general part (in English)					
- Number of attendees	1,116	1,551	1,950	1,847	1,977
- Online refresher course	551	454	202	197	56
Introduction training – radiation part (in Finnish)					
- Number of attendees	1,234	1,202	1,397	647	936
- Online refresher course	736	655	637	489	555
Introduction training – radiation part (in English) ²⁾					
- Number of attendees	473	499			
- Online refresher course	88	42			
- Number of persons who completed occupational safety card training	287	398	144	137	190

¹⁾ An error was detected in the number of persons who participated in the general part of the introduction training in Finnish. The error has been corrected.

²⁾ Reported as of 2018.

Occupational health and safety

Occupational health and safety indicators	2019	2018	2017	2016	2015
TVO employee accidents					
Absences, more than one day	3	3	3	1	5
- Male	3	3	2	1	5
- Female	0	0	1	0	0
Absences due to occupational accidents (days)	29	81	13	7	16
- Male	29	81	12	7	16
- Female	0	0	1	0	0
Accident frequency	1.28	2.1	2.2	0.8	4
(accidents per one million working hours)					
- Male	1.9	2.7	2.1	1	5.2
- Female	0	0	3.5	0	0
Lost day rate (per 100 employees) ¹⁾	4	11.2			
Zero accidents, no absence	18	16	8	13	11
- Male	13	11	5	11	9
- Female	5	5	3	2	2
Commuting accidents	18	2	5	1	3
- Male	14	1	4	0	2
- Female	4	1	1	1	1
Number of safety observations	1,666	2,319	2,602	2,171	618
Work-related fatalities (incl. TVO employees and subcontractors)	0	0	0	0	0
TVO subcontractor accidents					
- Absence of more than one day (LTA1)	7	6	13	7	10

¹⁾ Reported as of 2018

Radiation safety

Radiation safety indicators	2019	2018	2017	2016	2015
Highest radiation dose of personnel (mSv) ¹⁾	7.5	9.5	9	8.1	7.91
Collective radiation dose (manmSv)	647	1,101	950	884	752
Annual outage dose (manmSv)	530	918	775	730	614

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



TVO's shareholder value



A Particle-larly better nuclear island

SOON, Olkiluoto will see the commissioning of what will be the greatest single contribution to climate in Finland. After the commissioning of the most powerful nuclear power plant unit in the world, approximately 30% of Finland's electricity will come from one island, where the entire lifecycle of nuclear power will be managed.

TVO is also an important nuclear sector research and development organization. The total R&D expenses were EUR 26.2 million, of which most 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 modernized in many ways, and their safety has also been improved.

TVO reached the milestone of 500 TWh in the spring of 2019. People in Finland consume this much electricity in approximately six years.

One indication of TVO's nuclear industry expertise is the capacity 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 capacity factors have remained between 93 and 97 per cent.

Olkiluoto 1 (OL1) reached its production record in 2019: the plant unit produced more electricity than ever before, 7.54 TWh, with a capacity factor of 96.9%.

Shareholder value

Nuclear power is a competitive, CO₂-free electricity production method. In future, the EU's stricter binding emission reduction requirements will further improve competitiveness of clean energy when compared to the fossil options.

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 competitiveness of the industrial owners and their prerequisites for providing employment in Finland.

Nuclear power is an extremely efficient energy 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 – and it will continue to do so in future as well.

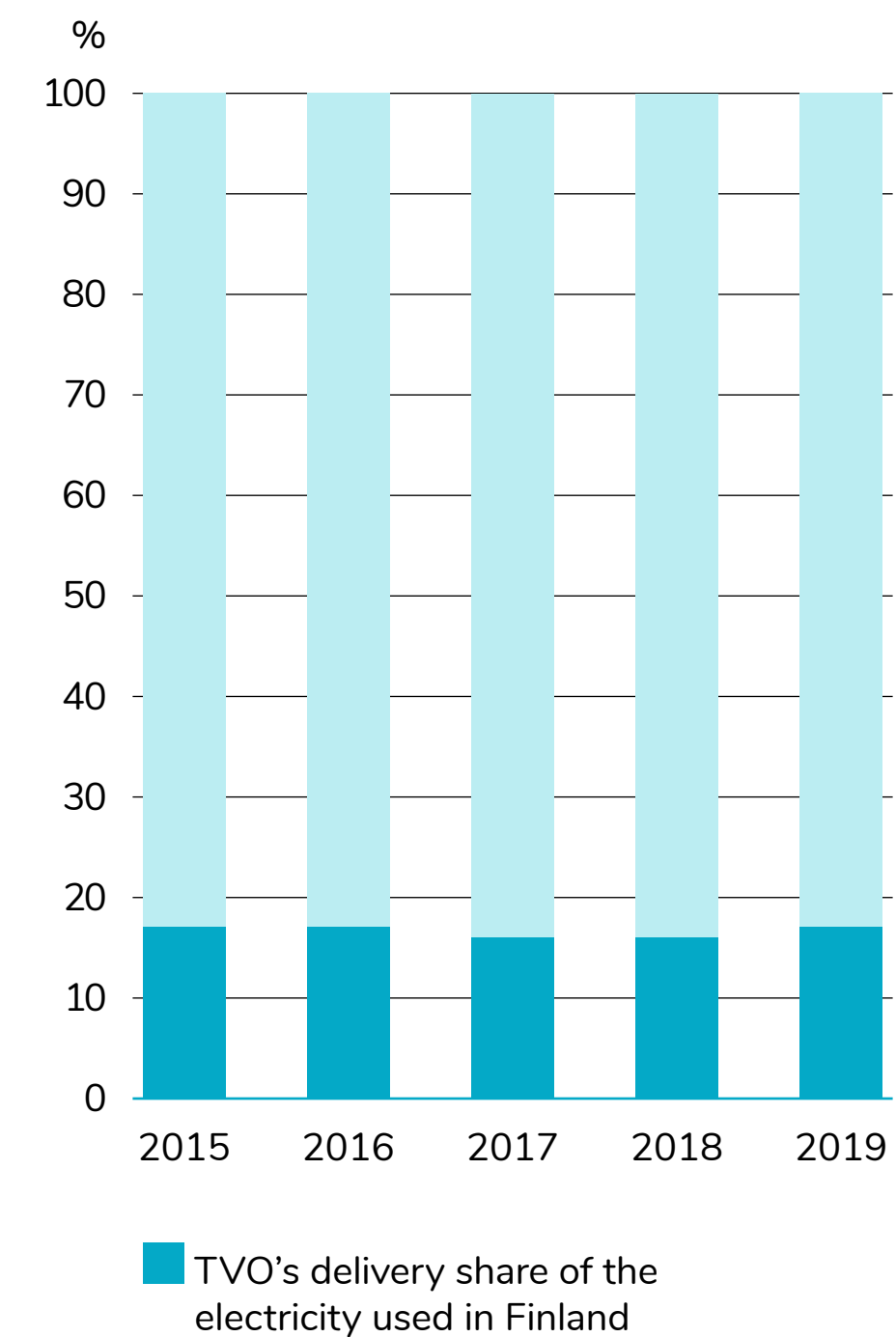
In the case of nuclear power, competitiveness challenges include rising costs and increased price fluctuation due to weather-dependent production. However, operators in the nuclear industry are actively developing the industry to secure future operational preconditions.

Profitable investment

TVO produces approximately 17% of all the electricity consumed in Finland.

TVO's operations are based on the production of electricity to shareholders at cost price. Owners cover all of TVO's operating costs and, in return, receive electricity pro-rata to their ownership. They 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

TVO's delivery share
of the electricity used in Finland



as those required for nuclear power, as well as reap the benefits of large-scale production. TVO's owners include 132 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 analyzed 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 and the load factors of the plant units.

In 2019, 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 2019 financial statements.

COMBINED ELECTRICITY PRODUCTION OF PLANT UNITS OL1 AND OL2 SECOND BEST IN PLANT HISTORY

In 2019, the combined electricity output of the Olkiluoto plant units, Olkiluoto 1 (OL1) and Olkiluoto 2 (OL2), was 14,751 (14,089) GWh, which is the second

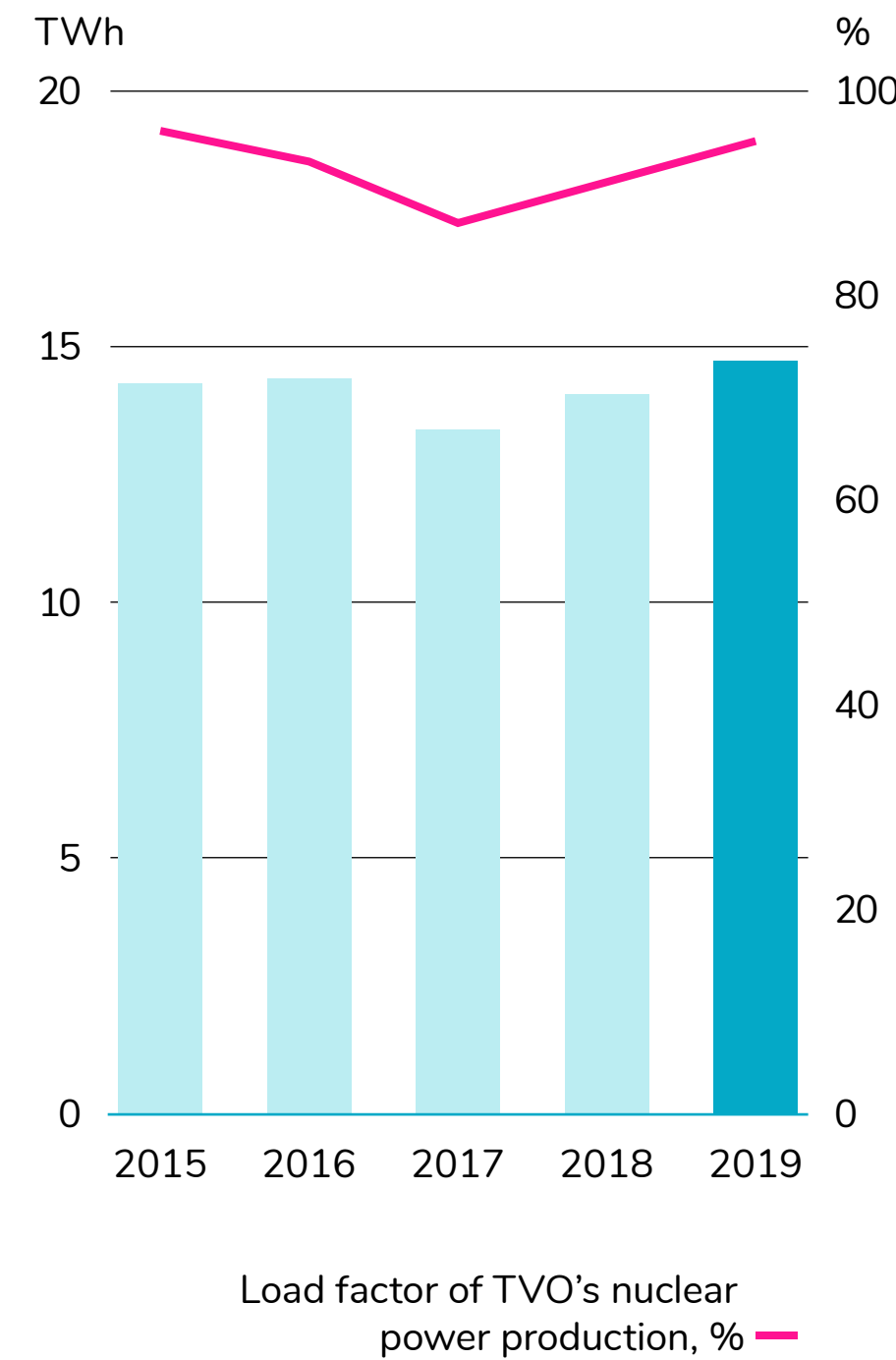
highest result in the plant's history. The combined load factor of the plant units was 94.8%.

The plant units operated safely. OL1 had its best production year ever: the net output of was 7,542 (6,755) GWh and the load factor was 96.9% (87.8%). The net output of OL2 was 7,209 (7,334) GWh and the load factor was 92.7% (94.3%). OL2's production volume and load factor remained lower than in the previous years due to a longer annual outage.

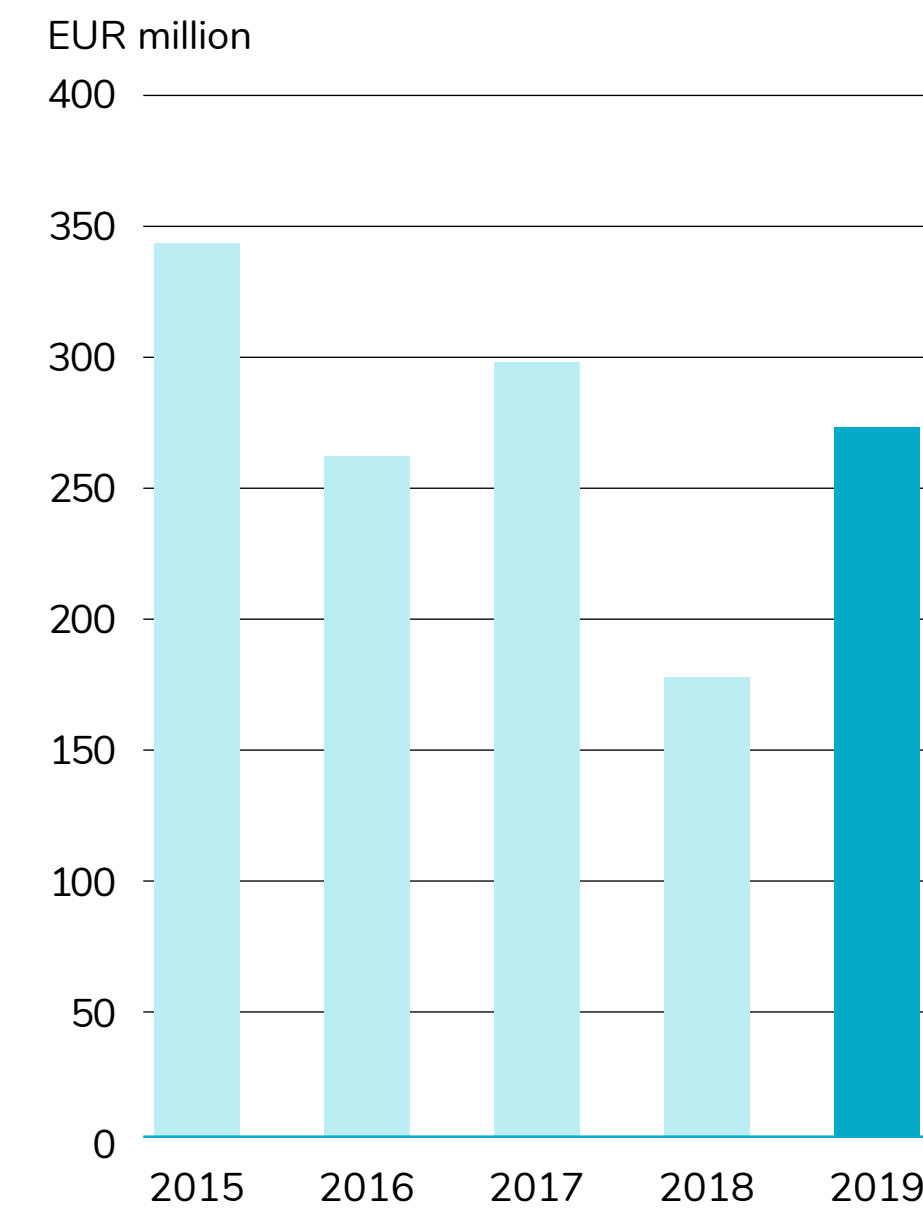
In September 2018, the Government confirmed an extension for the operating licenses of OL1 and OL2 until 2038. According to the Radiation and Nuclear Safety Authority (STUK), the operation is safe and complies with legislation, and the company has the prerequisites, procedures, expertise, and resources needed to continue safe operation of OL1 and OL2 until 2038.

TVO's investments in 2019 amounted to EUR 278 million, of which the OL3 project accounted for EUR 225 million.

TVO's electricity production



Investments



Olkiluoto 1 (OL1) reached its production record in 2019: the plant unit produced more electricity than ever before, 7.54 TWh, with a capacity factor of 96.9%.”

Economic impact

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 by in the figure on the right.

GENERATION OF ADDED VALUE

► **Shareholders:** TVO produces electricity to its shareholders at cost price. In 2019, TVO's shareholders paid a total of EUR 251 (346) million for the electricity. TVO supplied 14,729 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 132 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 203 (220):** A total of 1,009 external workers participated in the annual outages, 826 of them Finnish. In addition to companies from Finland, subcontractors from 15 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 restaurant; and RTK-Palvelu Oy, responsible for cleaning and sanitation services. These companies employ over 300 people at Olkiluoto. In all, TVO regularly provided work for more than 800 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 4,962 (4,750) million. The company raised a total of EUR 943 (894) million in non-current liabilities, while repayments amounted to EUR 742 (718) million.

Investments: Good condition of the Olkiluoto nuclear power plant at all times in terms of production and functionality is ensured through alternating refueling and maintenance outages of the plant units. In the maintenance outage of 2019, major works included replacement of the reactor's main internal pumps and their frequency converters, replacement of condenser tube bundles, and a reform

of the reactor coolant make-up supply system.

In 2019, investments in the OL3 project amounted to EUR 225 (108) million. Training of the operating personnel has proceeded, and the first statutory decisions on operator licenses were obtained in December. Hot functional testing was completed in May 2019.

Research and development costs totaled EUR 24 (26) million. R&D on nuclear waste management accounted for most of this.

► **Personnel:** At the end of the year, TVO employed 942 (871) people. In 2019, TVO hired 116 (134) new employees, and 13 (9) employees retired.

The OL3 construction site employed some 1,700 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.

In 2019, TVO paid EUR 26.7 million in nuclear waste management fees to the State Nuclear Waste Management Fund to cover the future costs of nuclear waste management.

GRI and appendices

Assured responsibility

TVO'S Responsibility Report has been prepared in compliance 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 Responsibility Report 2019 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 2019, prepared in accordance with the IFRS standard, which provide information on the company's financial development. The Report of the Board of Directors, which covers the requirement set out in the Finnish Accounting Act for reporting of nonfinancial data.
- TVO's Corporate Governance Report 2019, which describes TVO's management systems and the duties of TVO's administrative bodies.
- TVO's Environmental Report 2019, which complies with the EMAS regulation concerning environmental reporting, and the information contained in which is based on a certified environmental management system.

FACT



Did you know that TVO has reported its responsible management of the environment since 1996, and corporate social responsibility aspects since 2001?

Responsibility reporting

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

TVO'S Corporate Responsibility Report for 2019 (January 1 to December 31, 2019) has been published in Finnish and English on TVO's website. The Corporate 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 2018 was published on TVO's website in February 2019. The 2020 data will be published in spring 2021. Limited external assurance of the Corporate 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 Responsibility Report. The assurance report is available under Assurance report in the Corporate Responsibility Report. DNV GL Business Assurance Finland Oy Ab, an independ-

ent and impartial accredited certification body, has verified the environmental report data. The statement is available under Assurance report in the Environmental Report. The accounting, financial statements, annual report, and administration for 2019 have been audited by PricewaterhouseCoopers Oy, Authorized 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 Global Reporting Initiative (GRI) Standards have been taken into account during the reporting process.

The report covers the operations of the parent company, Teollisuuden Voima Oyj, as well as operations in the whole of Finland by regions. TVO reports accident and training data to some extent also for the personnel of the TVO Group (TVO and Posiva) as well as for TVO's contractors. This data is presented in the report

with an indication of to which personnel group it pertains. The research into the final disposal of spent fuel implemented by Posiva Oy, a company jointly owned by Fortum Power and Heat Oy and TVO, is described in the reporting. Data on the Meri-Pori coal-fired power plant is not included in the Responsibility Report, as the exclusion of the data will not result in any continuous positive or negative material impact being omitted from reporting.

TVO has defined for reporting several company-specific aspects to complement the material aspects included in the Global Reporting Initiative (GRI) Standards. These aspects describe social responsibility issues that are typical for TVO. The aspects that are material specifically for TVO 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, acceptability of nuclear power, investments to secure availability and profitability of the plant units, and decommissioning of nuclear power plants. Any changes to previously reported information are indi-

cated separately in conjunction with the information in question.

The majority of the data presented in the 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 gathered during the company's operations. As concerns the reporting of economic responsibility, TVO uses the key indicators referred to in 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

The Corporate Responsibility Report contains a comparison against the GRI Standards requirements. TVO's reporting complies with the Core option of the GRI Standards.

TVO's responsibility aspect	Location and comments
GENERAL DISCLOSURES	
Organizational profile	
102-1: Name of the organization	TVO as a company
102-2: Activities, brands, products, and services	TVO as a company
102-3: Location of headquarters	Responsibility contact persons
102-4: Location of operations	TVO as a company
102-5: Ownership and legal form	Corporate Governance Statement - General
102-6: Markets served	TVO as a company
102-7: Scale of the organization	Good work community, TVO as a company, Financial Statements – Key figures of Teollisuuden Voima Oyj
102-8: Information on employees and other workers	Good work community, Social responsibility indicators
102-9: Supply chain	Responsible procurement, Good work community, Shareholder value, Report of the Board of Directors – Nuclear fuel, Nuclear waste management
102-10: Significant changes to the organization and its supply chain	No significant changes.
102-11: Precautionary Principle or approach	Safety, Environment and energy efficiency program 2019–2021, Radiation safety, Report of the Board of Directors – Regulatory environment; Risk management, major risks and uncertainties, Nuclear waste management
102-12: External initiatives	Precautionary principle taken into consideration according to regulatory requirements.
102-13: Membership of associations	Responsible leadership
Strategy	
102-14: Statement from senior decision-maker	Review by the CEO 2019
102-15: Key impacts, risks, and opportunities	Responsible leadership, Review by the CEO 2019, Report of the Board of Directors – Risk management, major risks and uncertainties

TVO's responsibility aspect	Location and comments
Ethics and integrity	
102-16: Values, principles, standards, and norms of behaviour	Responsible leadership
102-17: Mechanisms for advice and concerns about ethics	Report of the Board of Directors – Results of Ethical Business
Governance	
102-18: Governance structure	Responsible leadership, Corporate Governance Statement
102-19: Delegating authority	Responsible leadership
102-20: Executive-level responsibility for economic, environmental, and social topics	Responsible leadership, Corporate Governance Statement – Management Group
102-22: Composition of the highest governance body and its committees	Corporate Governance Statement – Board of Directors
102-23: Chair of the highest governance body	Corporate Governance Statement – Board of Directors
Stakeholder engagement	
102-40: List of stakeholder groups	Responsible leadership
102-41: Collective bargaining agreements	Good work community
102-42: Identifying and selecting stakeholders	Responsible leadership
102-43: Approach to stakeholder engagement	Responsible leadership, Social opinion leader
102-44: Key topics and concerns raised	Responsible leadership, Social opinion leader
Reporting practice	
102-45: Entities included in the consolidated financial statements	Responsibility Reporting
102-46: Defining report content and topic Boundaries	Responsible leadership, Responsibility Reporting
102-47: List of material topics	Responsible leadership
102-48: Restatements of information	No significant changes.
102-49: Changes in reporting	No significant changes.
102-50: Reporting period	Responsibility Reporting
102-51: Date of most recent report	Responsibility Reporting
102-52: Reporting cycle	Responsibility Reporting

TVO's responsibility aspect	Location and comments
102-53: Contact point for questions regarding the report	Responsibility contact persons
102-54: Claims of reporting in accordance with the GRI Standards	Responsibility Reporting
102-55: GRI content index	GRI content index
102-56: External assurance	Responsibility Reporting
MANAGEMENT APPROACH	
103-1: Explanation of the material topic and its Boundary	Responsibility Reporting, Safety, Supply of electricity in Finland and climate impact, Good work community, Shareholder value
103-2: The management approach and its components	Responsible leadership, Environmental management, Social opinion leader, Safety, Environment and climate, Environment and energy efficiency program 2019–2021, Good work community, Competence development, Occupational health and safety
103-3: Evaluation of the management approach	Responsible leadership, Environmental management, Social opinion leader, Safety, Environment and climate, Environment and energy efficiency program 2019–2021, Good work community, Competence development, Occupational health and safety
ECONOMIC RESPONSIBILITY	
Economic performance	
201-1: Direct economic value generated and distributed	TVO as a company, Shareholder value, Financial Statements – Key figures of Teollisuuden Voima Oyj
Indirect economic impacts	
203-2: Significant indirect economic impacts	Social opinion leader, Research and development, Supply of electricity in Finland and climate impact, Competence development, Economic impacts
ENVIRONMENTAL RESPONSIBILITY	
Materials	
301-1: Materials used by weight or volume	Environment and climate, Raw materials and material efficiency, Cooling water
Energy	
302-1: Energy consumption within the organization	Environment and climate, Raw materials and material efficiency, Production and energy efficiency
302-4: Reduction of energy consumption	Environment and climate, Environmental management, Environment and energy efficiency program 2019–2021, Production and energy efficiency

TVO's responsibility aspect	Location and comments
Water	
303-1 (2016): Water withdrawal by source	Environmental impact, Cooling water, Raw materials and material efficiency
303-3 (2016): Water recycled and reused	Environmental impact, Raw materials and material efficiency
Emissions	
305-1: Direct GHG emissions	Environmental impact, Emissions to the air
305-7: Nitrogen oxides (NOX), sulfur oxides (SOX), and other significant air emissions	Environmental impact, Emissions to the air
Effluents and waste	
306-1: Water discharge by quality and destination	Environmental impact, Cooling water, Emissions to water and soil
306-2: Waste by type and disposal method	Environmental impact, Waste, Nuclear waste management
306-3: Significant spills	Cooling water, Emissions to water and soil
306-5: Water bodies affected by water discharges and/or runoff	Cooling water, Emissions to water and soil
SOCIAL RESPONSIBILITY	
Employment	
401-1: New employee hires and employee turnover	Good work community, Social responsibility indicators
Occupational health and safety	
403-2 (2016): Types of injury and rates of injury, occupational diseases, lost days, and absenteeism, and number of work-related fatalities	Occupational health and safety, Social responsibility indicators
Training and Education	
404-1: Average hours of training per year per employee	Competence development, Social responsibility indicators
TVO'S OWN INDICATORS	
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	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	Economic impacts
TVO: Decommissioning of nuclear power plant	Nuclear waste management, Economic impacts

Independent Assurance Report to the Management of Teollisuuden Voima Oyj

We were engaged by the Management of Teollisuuden Voima Oyj (hereafter "TVO") to provide limited assurance on TVO's Employment, Occupational Health and Safety as well as Training and Education information (hereafter "Corporate Responsibility Information") for the year ended Dec 31, 2019.

THE CORPORATE Responsibility Information has been presented in TVO's Corporate Responsibility Report 2019, in the "Corporate Responsibility" section's GRI Index. The scope of the assurance included the following GRI disclosures:

GENERAL DISCLOSURES

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

EMPLOYMENT

- GRI 103: Management Approach
 - 103-1: Explanation of the material topic and its Boundary
 - 103-2: The management approach and its components
 - 103-3: Evaluation of the management approach
- GRI 401: Employment
 - 401-1: New employee hires and employee turnover
 - TVO: Subcontractors working in Annual Outages of OL1 and OL2
 - TVO: Average workforce at the Olkiluoto 3 construction site

OCCUPATIONAL HEALTH AND SAFETY

- GRI 103: Management Approach
 - 103-1: Explanation of the material topic and its Boundary
 - 103-2: The management approach and its components
 - 103-3: Evaluation of the management approach

- GRI 403: Occupational Health and Safety
 - 403-2: Types of injury and rates of injury, occupational diseases, lost days, and absenteeism, and number of work-related fatalities

TRAINING AND EDUCATION

- GRI 103: Management Approach
 - 103-1: Explanation of the material topic and its Boundary
 - 103-2: The management approach and its components
 - 103-3: Evaluation of the management approach
- GRI 404: Training and Education
 - 404-1: Average hours of training per year per employee

Management's responsibilities

THE MANAGEMENT of TVO is responsible for the preparation and presentation of the Corporate Responsibility Information in accordance with the reporting

criteria, i.e. GRI Sustainability Reporting Standards, and the information and assertions contained within it; for determining TVO's objectives in respect of 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 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 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 Corporate Responsibility Information consists of making inquiries, primarily of persons responsible for the preparation of information presented in the Corporate Responsibility Information, and applying analytical and other evidence gathering procedures, as appropriate.

These procedures included for example:

- Interviews with members of the Management to reassert our understanding of the objectives for corporate responsibility and of the connection between corporate responsibility and the business strategy and operations;
- Interviews with relevant staff responsible for providing the information in the Corporate Responsibility Information;
- An assessment of the Corporate Responsibility Information's conformity with the principles of the GRI Sustainability Reporting Standards for defining content and reporting quality;

- An assessment of data management processes, information systems and working methods used to gather and consolidate the presented Corporate Responsibility Information, and a review of related internal documents;
- Testing of data accuracy and completeness through samples from information systems and original numerical information;
- A site visit

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

BASED on the procedures performed and the evidence obtained, nothing has come to our attention that causes us to believe that the information subject to the assurance engagement for the year ended Dec 31, 2019 is not prepared in all material respects, in accordance with the reporting criteria GRI Sustainability Reporting Standards.

Helsinki, 25th February 2020

KPMG OY AB

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