TVO WELL-BEING WITH NUCLEAR ELECTRICITY

Environmental Report 2013

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Environmental Report 2013

TVO´s environmental report 2013 is a yearly review according to EMAS decree.

TVO publishes the environmental report in Finnish and in English. The figures from year 2012 are presented in brackets. Information in the "further information" - is not part of the EMAS review.

All the information in the report is verified by an accredited and independent third party DNV cerfitication OY/AB. The verification report is in section Verification report.

Information of year 2014 will be updated in this webpage in the spring 2015.

TVO: an overview

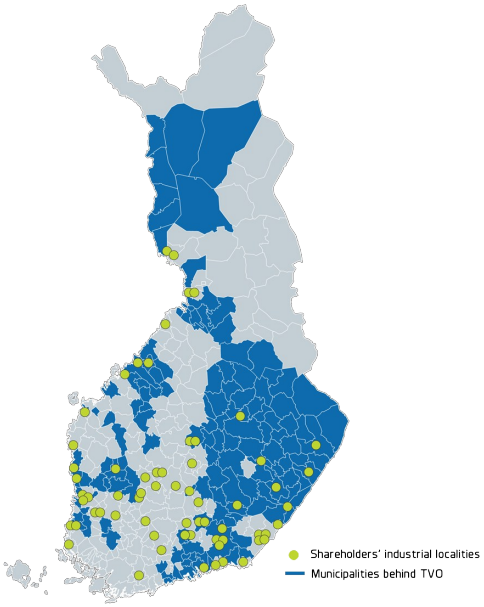
Teollisuuden Voima Oyj (TVO) contributes to the maintenance of sustainable development and the well-being of Finnish people by providing shareholders with cost price electricity produced in a safe, economical, and climate-friendly manner at the Olkiluoto nuclear power plant in Eurajoki.

Established in 1969, TVO is a limited liability company that provides electricity for its owners at cost price. TVO operates two nuclear power plant units in Olkiluoto, Eurajoki, since 35 years. Olkiluoto 1 and 2 were built to satisfy the increasing need for electricity of Finnish energy-intensive industries. During the past decades, TVO has developed from an industrial resource to a base load producer that benefits the entire society. The two Olkiluoto plant units currently produce approximately one sixth of Finland's total electricity output. Approximately half of the electricity produced by TVO is spent by the industry. The other half is used at homes, in service production and in agriculture via power utilities.

After their early years, OL1 and OL2, which were commissioned in 1978 and 1980 respectively, have remained among the most reliable nuclear power plant units in the world. On Olkiluoto Island, TVO has all the competence, structures, functions, and waste management required for the safe production and construction of nuclear electricity. TVO's nuclear power expertise and operating experience attract worldwide interest.

During their 35 years of operation, the Olkiluoto plant units have produced a total of 424 billion kWh of climate-friendly electricity. Every year, the nuclear power produced at Olkiluoto helps prevent approximately 12 million tonnes of carbon dioxide emissions in Finland compared to producing the same amount of electricity using coal. The saved amount corresponds to the total annual CO2 emissions of all road traffic in Finland.

The Olkiluoto site also features a 1 MW wind power plant, as well as a 100 MW gas turbine reserve power plant built as a joint project of Fingrid Oyj and TVO. TVO's share of the power produced by the Meri-Pori coal-fired power plant is 45%. In addition to Olkiluoto, TVO has offices in Helsinki, Brussels, and Rauma and Pori.



The impact of global megatrends on the energy industry

Population increase and economic growth usually also increase the demand for energy. The energy sector plays an important role in ensuring that growth is sustainable. TVO aims to respond to global challenges with a strategy based on an uncompromising safety culture and solid nuclear energy expertise.

As the wealth of the population has increased and energy-efficiency improved, electricity's share of total energy consumption has kept climbing. Electricity can help advance the efficient utilization of natural resources and sustainable economic development. Scarce natural resources, increasing environmental problems and rising fuel prices strengthen electricity's share of total energy consumption. When other energy sources are replaced with electricity, the overall energy requirement decreases, as electricity can be used more efficiently.

Emissions can also be reduced when electricity is produced with no CO2 emissions using nuclear power, for example. Climate change poses a challenge for which the energy industry must help find solutions. The available natural resources and energy sources must be utilized to maximum benefit, and new low-emission technology that saves energy must be developed and adopted. Nuclear power will help us achieve a low-carbon future, which requires the reduction of greenhouse gas emissions by 80–90% before 2050.

Group Structure

TVO's majority shareholder is Pohjolan Voima Oy with its share of 58.5% of the TVO stock. Teollisuuden Voima Oyj is a joint venture of Pohjolan Voima and several other companies.

TVO Nuclear Services Oy (TVONS) is a subsidiary fully owned by TVO. Integration of TVO's fully owned subsidiaries Olkiluodon Vesi Oy and Perusvoima Oy to the mother company was entered into the trade register on December 31, 2013. TVO and Fortum also have a joint venture, Posiva Oy, of which TVO owns 60%.

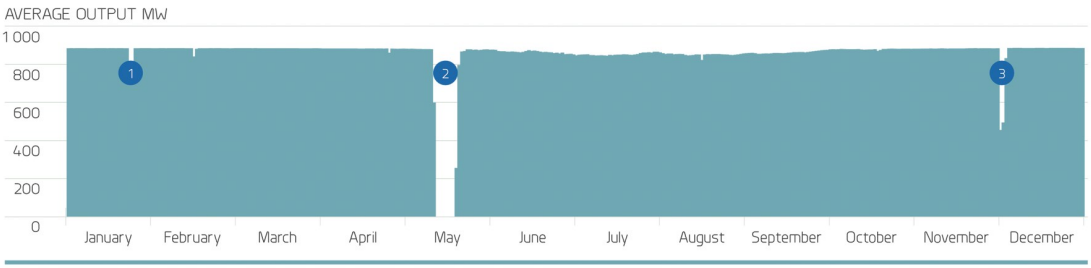
Further information: TVO in brief, TVO's history timeline, Company information and TVO's location.

TVO'S SHAREHOLDERS AND THEIR HOLDINGS, DECEMBER 31, 2013

	A Series	B Series	C Series	Total
EPV Energia Oy	6.5	6.6	6.5	6.5
Fortum Power and Heat Oy	26.6	25.0	26.6	25.8
Karhu Voima Oy	0.1	0.1	0.1	0.1
Kemira Oyj	1.9	–	1.9	1.0
Oy Mankala Ab	8.1	8.1	8.1	8.1
Pohjolan Voima Oy	56.8	60.2	56.8	58.5
	100%	100%	100%	100%

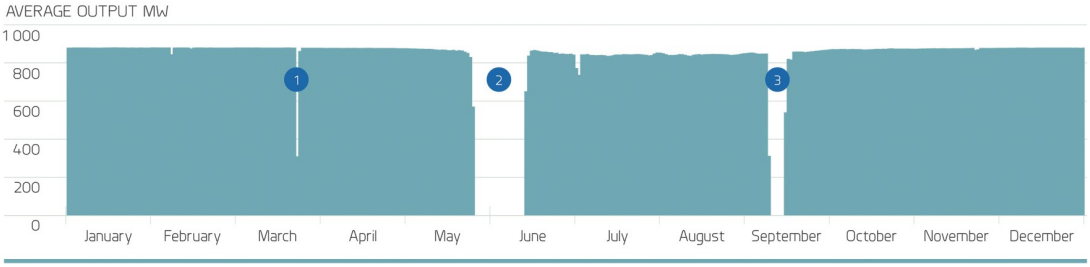
PRODUCTION IN 2013

OL1



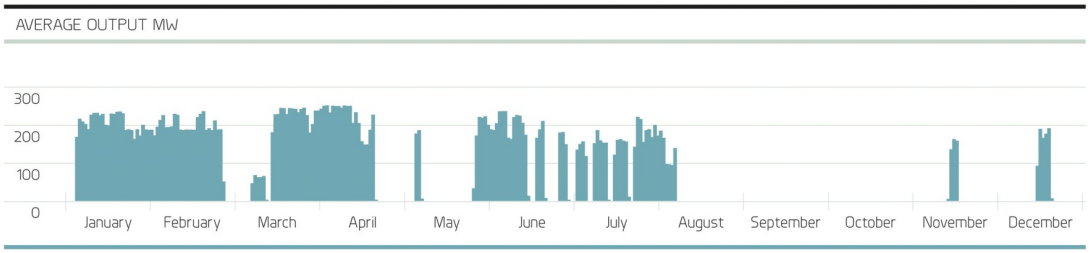
1. Shutdown of the reactor coolant pumps after the control valve of the high-pressure turbine closed spontaneously. Power limitation due to the replacement of the rubbing-face seals of the feedwater pumps.
2. Refueling outage
3. Load drop due to a failure of the over-voltage protection of the exciter rotor.

OL2



1. Reactor shutdown to the hot shutdown state due to the inspection and replacement of the flexible connectors between the generator and the exciter.
2. Maintenance outage
3. Turbine tripped by the earth fault protection of the generator stator.

TVO'S SHARE OF MERI-PORI'S PRODUCTION



Environmental management

Environmental responsibility is a part of TVO's management system, and the company has committed itself to the principles of sustainable development in its policy. The operations are directed with the help of an environmental management system which is EMAS registered and certified according to the international ISO 14001 standard, in which also Energy efficiency system is included. The management system is used for continual improvement and raising the level of environmental protection. The goal of the management system is continuous improvement and increasing the level of environmental protection.

TVO has identified the environmental aspects of its operations and assessed seven of them as important. The importance of the environmental and energy aspects are evaluated based on the legal requirements and permits. Also the severity, probability and magnitude of the aspects are taken into account. The stake-holders and our own impact possibilities affect the evaluation.

The adverse impact involved in the environmental aspects is minimized at all stages of the electricity production chain, and the safe use of nuclear fuel is ensured from raw material acquisition to final disposal. Four long-term objectives have been defined for important environmental aspects, and the company's management confirms specific targets for these objectives each year. An environmental team of experts from various organizational units monitors the status of the targets approximately every two months. Other subjects discussed at the team's meetings include potential environmental non-conformances and observations, as well as topical official matters and other environmental issues. The team acts as an expert, advisor, and information forwarding party in environmental matters.

The feasibility of the environmental management system is assessed semi-annually in the management review. If necessary, corrective actions are defined in order to reach targets. TVO maintains a file of the statutory and other requirements pertaining to the operations and systematically monitors them for changes. Fulfillment of the requirements is evaluated during management reviews. Our operations are regularly assessed both within our organization and by external assessors.

The company level policies and TVO´s code of conduct are the guidelines for responsible environmental actions also for all companies in the power-plant area.

Significant environmental and energy aspects and associated long-term objectives and targets for 2014

Sicnificant environmental aspects	Objectives	Targets 2014
1. The thermal load on the sea caused by the cooling water	1. Management of environmental load	1. Management of the thermal load of cooling water and research into the utilization of the heat 2. Increasing temprature measurements in near by sea area 3. Developing environmeltal risk management
2 .Land use 3. Spent nuclear fuel produced during operations	2. Improvement of material and energy efficiency and sustainable land use	4. Development of energy efficiency activities and system 5. Long term planning of land use 6. Recognition of biodiversity 7. Keeping the amount of landfill waste below 12% of the total amount of waste 8. Decreasing the amount of medium-level waste 9. Reduction of the environmental impact and costs resulting from the personnel's working methods
4. Selecting the product and service suppliers 5. Storage and handling of hazardous or harmful substances	3. Suppliers' environmental responsibility	10. Acquisition of information from suppliers concerning their environmental management
6. Significant radioactive emissions into the environment during an accident situation 7. Radioactive emissions into the atmosphere in an exceptional situation	4. Isolation of radioactivity originating from the power plant from the natural environment	11. Ensuring the purity of the process 12. Keeping radioactive emissions into the atmosphere clearly below the limits set by the authorities 13. Keeping radioactive emissions into water clearly below the limits set by the authorities 14. Prevention of the increase of nuclear safety risk

The targets set for 2014 are based on the targets of the previous year, with new actions added to reach the targets according to the principle of continuous improvement. Long-term work will continue e.g. with the management of radioactive emissions and the thermal load of cooling water. New targets include the temperature measurements in the nearby sea area and decreasing the amount of medium level waste. Training related to energy efficiency and the safe use of chemicals will be increased in 2014. Training is used to increase the personnel's understanding of the significance of environmental issues and, consequently, to decrease the environmental impact and risks of the operations.

Careful investigation of environmental deviations and anticipation

No event or significant environmental non-conformance resulting in an environmental impact took place at the Olkiluoto nuclear power plant in 2013. A total of 13 (9) minor environmental observations or minor non-conformances including for instance to the marking of chemicals or waste containers took place. The number of minor incidents and non-conformances at the OL3 construction site was 29 (26). Even small environmental events are considered. All reported safety observations are monitored, and corrective measures are implemented in order to prevent any damage. All significant environmental non-conformances and events are reported to the environmental authority.

Active stakeholder communications

The Olkiluoto Visitors' Center receives about 15,000 visitors each year. Visitors are told about TVO's operations, and their questions are answered. Each year, TVO also introduces its operations at various events and fairs and organizes public meetings at the marketplaces of nearby towns where people can come and discuss with TVO's representatives. The public can also send feedback and questions via the TVO website. TVO replies to all inquiries made with contact details attached.

The company's initiative operations also support stakeholder involvement in TVO's environmental management. A total of 332 initiatives were made in 2013, and 113 initiatives received recognition. Some of the recognized initiatives had been submitted in previous years. Some of the initiatives directly or indirectly reduce the environmental impact of the operations or increase energy efficiency.

Good environmental results

In 2013, operations at the Olkiluoto nuclear power plant complied with the environmental policy, the conditions of the environmental permits and the environmental management system.

The purpose of the yearly targets is to minimize the adverse impacts in all stages of electricity production. In order to achieve the targets, procedures, responsibilities and timetables are set. According to continuous improvement the implementation of the targets are monitored regularly.

Alltogether 15 targets we set for the year 2013, of which all were achieved fully or partially.

Realization of targets set for environmental objectives in 2013

Target met as planned | Target met partially | Target not met

Objective: management of environmental load

Target 1. Management of the thermal load of cooling water and research into the utilization of the heat

The target was met as planned. The temperature of cooling water remained within the limits required by the environmental permit throughout the year. Separate studies were not planned for 2013.

Target 2. Development of the sanitary waste water treatment plant

The target was partially met. Some improvements, such as the replacement of the sludge mixer, were made in 2013.
Larger investments will be made when increasing the capacity becomes a current issue.

Target 3. Development of environmental risk management

The target was met as planned. Environmental risks are managed and handled as a comprehensive unit.

Objective: Improvement of material and energy efficiency and sustainable land use

Target 1. Development of energy efficiency activities and system

The target was met as planned. Energy efficiency is considered when choosing materials and working methods for modification and repair work.
The energy efficiency improvement plan, which is updated every year, includes information on actions and savings already achieved, as well as actions to be implemented in the future. In total, 11 proposals for action were made concerning energy efficiency in 2013, the most significant of these most likely being the suggestion of extending district heating at Olkiluoto. Participation in the Energy Saving Week and WWF's Earth Hour campaign were included in the year's program.

Target 2. Land use planning

The target was met. The land use team discusses the situation and combined effects of projects in the planning, decision-making and implementation stages.
The land use team includes representatives from the area planning departments of the different functions operating at Olkiluoto island, as well as the Quality and Environment Office. The team convened as scheduled during 2013.

Target 3. Recognition of biodiversity

The target was met as planned. A Power from Nature -Olkiluoto observation trail providing information on the environment was opened to the public on June 8, 2013.
Field work for a biodiversity survey of the environment of the Olkiluoto island was carried out during the spring and summer. The official report was completed at the end of December.

Target 4. Keeping the amount of landfill waste below 12% of the total amount of waste

The target was partially reached. During 2013, the amount of landfill waste was 13, so the situation has improved from the previous year.
A theme day dedicated to the sorting of waste was arranged during Energy Saving Week in 2013. On the day, information was provided on waste components and sorting.

Target 5. Reduction of environmental impacts and costs resulting from the personnel's working methods

The target was reached. In 2013, a total of six video conferencing equipment sets were renewed at Olkiluoto and at the Töölönkatu office in Helsinki.
This has enabled a reduction in travel and the holding of meetings through remote access. The environmental manual was revised and published before the 2013 annual maintenance outages. The new environmental and waste sorting manual has been printed in both Finnish and English, and it is handed out to everyone who starts working on Olkiluoto island.

Target 6. Reduction of the consumption of process water (max. 37,000 m3 per year)

The target was reached. At the same time, the amount of chemicals needed for preparing the process water decreased.

Target 7. Development of the recycling of wood waste

The target was met. The processing of waste wood produced by construction activities following the priority order specified in the Waste Act was implemented according to the target. 18% of wood was recycled, and the rest was used to produce energy.

Objective: Suppliers' environmental responsibility

Target 1. Acquisition of information concerning suppliers' environmental management

The target was partially met. Four environmental inspection rounds were implemented during 2013. During the rounds, the focus was on the management of chemical, waste, fire safety and environmental issues. TVO actively evaluates uranium mines and the nuclear fuel refining chain. In October, TVO carried out an audit according to the supplier evaluation procedure described in the activity based management system at BHP Billiton's Olympic Dam mine in Australia.

Objective: Isolation of radioactivity originating from the power plant from the organic environment

Target 1. Ensuring the purity of the process

The target was met. The loose part workgroup convened three times in 2013. Protective equipment was renewed, and loose part planning was included as an obligatory part in the work planning process. Also the loose part planning was included to the work planning process as a mandatory part.

Target 2. Keeping radioactive emissions into the air clearly below the limits set by the authorities

The target was met. The total noble gas emissions of the plant amounted to 0.002% of the limit value set by the authorities (target value: < 0.04%).

Target 3. Keeping radioactive discharges into water clearly below the limits set by the authorities

The target was met. Radioactive emissions into water (fission and activation products) amounted to 0.03% of the limit value set by the authorities (target value: < 0.3%).
In 2013, the amount of emissions into water was the lowest during the entire production time.

Target 4. Prevention of the increase of nuclear safety risk

The target was met. The target is to prevent the level of nuclear safety risk from increasing. Risks are actively identified and measured for their likelihood and consequences by means of up-to-date Probabilistic Risk Assessment (PRA). The identified risks are mitigated according to the Safety As High As Reasonably Achievable (SAHARA) principle. The risk of core damage and radioactive emissions into the environment is very small, and the variation of the risk remained within the normal range of variation in 2013.
TVO is involved in the further improvement of the plant units' ability to cope with extreme weather phenomena that occur concurrently with a power supply failure. Some of the plant modifications related to the improvements have proceeded to the detailed planning phase, and some will be launched in the near future.

Environmental impacts

The environmental impact of electricity production through nuclear power is not harmful to people or the environment under normal conditions.

The most important environmental impact of the Olkiluoto nuclear power plant is the warming of seawater in the vicinity of the plant. A long term goal is to control and find possible usages for the cooling water. During the year 2013 the temperature of the cooling water remained within the requirements set in environmental permit.

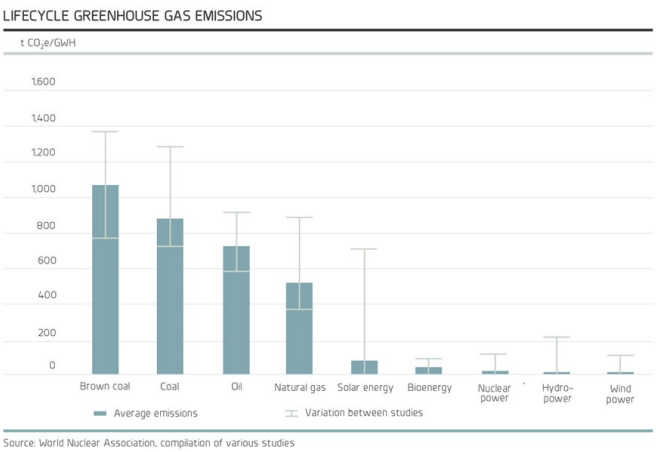
Nuclear power is climate-friendly energy, which makes TVO an important contributor the the mitigations of climate change and advocate of sustainable development. TVO is a party to the Energy Efficiency Agreement and complies with the related energy energyproduction action plan that aims at the implementation of energy efficiency improvement measures as well as improving the efficiency of primary energy usage and overall efficiency of energy production.

The radioactive emissions from the Olkiluoto nuclear power plant into the air and water were extremely minor, mainly less than one percent of the limits set by authorities. The radioactive water emissions in 2013 were the lowest during the operating time.

The environmental impacts of Olkiluoto 3 construction site have been minimized for example by improving recycling and sorting of the wastes. The recycling of wood waste was increased by a pilot project where about 20 % of the material was used for construction material according to the priority order specified in the Waste Act. The remaining wood material was crushed and used for energy production.

Nuclear power is spearheading the prevention of climate change

According to IPCC (Intergovernmental Panel on Climate Change), the carbon dioxide emissions of base load energy generated with nuclear power are comparable to the carbon dioxide emissions of renewable energy sources, such as wind or solar power, over their lifecycle. Increasingly, climate and energy researchers are voicing their support for nuclear power – the requirements of increasing energy consumption can only be met with the reasonably priced and reliably produced nuclear power. For instance, Ken Caldeira, a researcher from the Carnegie Institution, and climate researchers Kerry Emanuel from MIT (Massachusetts Institute of Technology), James Hansen from Columbia University and Tom Wigley from NCAR (the National Center for Atmospheric Research) are of the opinion that the world's energy consumption is rapidly growing, and the growth must continue because of the needs of developing countries.



Environmental balance sheet

OLKILUOTO NUCLEAR POWER PLANT'S ENVIRONMENTAL BALANCE SHEET 2013 (2012)

Emissions into the air

		Allowed annual emissions
Noble gases (TBq)	0.22 (Kr-87 equivalent) (1,21)	(9.420)
Iodine (TBq)	0.0000907 (I-131 equivalent) (0,000017)	(0.103)
Aerosols (TBq)	0.000020 (0,000016)	
Carbon-14 (TBq)	0.80 (0,88)	
Tritium (TBq)	0.62 (0,36)	
CO_2 (t)	483 (384)	
NOx (t)	0.63 (0,52)	
SOx (t)	0.0017 (0,001)	
Particles (t)	0.44 (0,36)	

URANIUM FUEL (t) 36.8 (37.6)

Intermediate agents:	
- Oils (m³)	303 (238)
- NaClO (15 %) (m³)	62.6 (67)
- Other chemicals (t)	139.3 (115)
- Ion exchange resins (t)	10.1 (10.8)
- Water treatment chemicals (t)	108.3 (94)
Raw water (tap and process water) (m³)	274,549 (211,312)
Cooling water (million m³)	2,288 (2,267)

ELECTRICITY (TWh) 14,6 (14,5)

Municipal waste	OL1 and OL2	OL3*	Total
- Recyclable waste (t)	586 (539)	1,231 (1 571)	1,817 (2,110)
- Landfill waste (t)	101 (108)	210 (296)	311 (404)
- Hazardous waste (t)	137 (109)	103 (73)	240 (182)

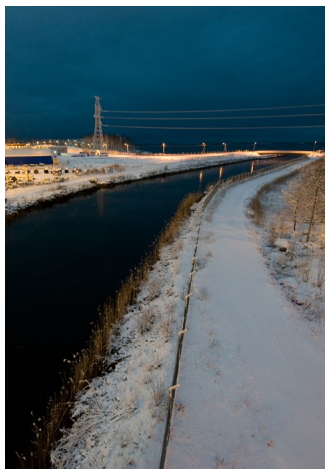
*construction phase

Radioactive waste	
- Low level waste (m³)	0 (172)
- Intermediate level waste (m³)	42 (20)
- Spent nuclear fuel (t)	35.7 (35.8)

Emissions into the water

		Allowed annual emissions
Cooling water (million m³)	2,288 (2,267)	
Thermal load to the sea (TWh)	27.1 (26.8)	
Fission and activation products (TBq)	0.00009 (0.002)	(0.296)
Tritium (TBq)	1.46 (1.31)	(18.3)
Phosphorus (kg)	10 (31)	
Nitrogen (kg)	4,380 (5,475)	
BOD_{7ATU} (kg)	548 (985)	

Cooling water the most significant environmental aspect



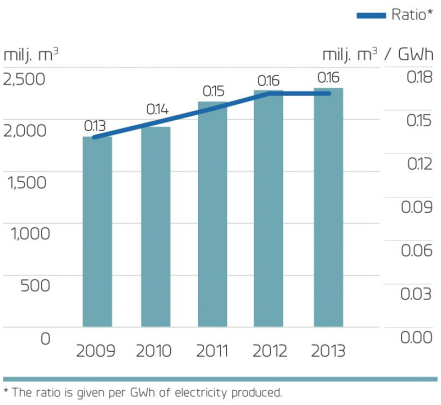
In total, approximately 76 m^3 of seawater per second is used for cooling at the OL1 and OL2 plant units. In 2013, the amount of seawater used for cooling was 2,288 (2,267) million m^3 , and the heat conveyed into the sea was 27.1 (26.8) TWh. In fact, the cooling water's thermal load on the environment is the most significant environmental aspect of the operations. Seawater temperature is monitored as required by the environmental permit. One of the permit regulations is that the seawater temperature must not exceed the target value of 30°C (measured as a weekly average) at a distance of 500 meters from the cooling water discharge channel. The target value was not exceeded in 2013.

As the cooling water passes through a plant unit, its temperature increases by approximately 10°C, after which it is mixed with seawater. The cooling water does not come into direct contact with the power plant's process water. Throughout the operation of the power plant, TVO has monitored and surveyed the impact of cooling water. The cooling water spreads in the surface layer of an extensive sea area, where some of the heat is transferred into the air. Depending on the weather conditions, an increase in temperature can be observed up to an approximate distance of three to five 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 from three to twenty square kilometers, depending on the winter weather. Residents of nearby areas are warned of the unfrozen area through newspaper announcements and thin ice warning boards. 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.

The impact of the operations on the Natura area of the Rauma archipelago, located in the sea area off Olkiluoto, has also been investigated during the Natura assessment procedure concerning the OL4 project. Based on the assessment, the combined impact of warm cooling water discharged from the four plant units would not result in a significant harmful impact on the protection sites in the Natura area of the Rauma archipelago.

WATER USAGE

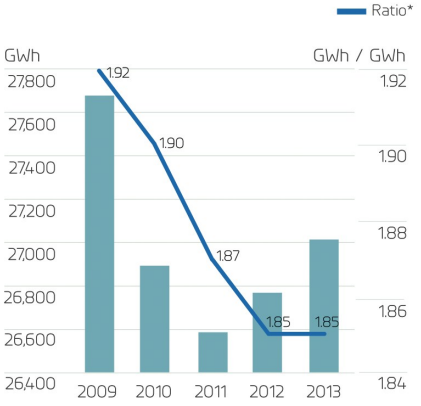
COOLING WATER



* The ratio is given per GWh of electricity produced.

EMISSIONS

THERMAL LOAD ON THE SEA



* The ratio is given per GWh of electricity produced.
The scale of the graph does not begin at zero.

Cooling water (milj. m^3) [1]	2013	2012	2011	2010	2009
OL1	1 170	1 096	1 151	877	923
OL2	1 118	1 171	1 093	906	903
Total	2 288	2 267	2 243	1783	1 827

1) The permit regulation for the amount of cooling water is 3.800 milj. m3/yr (total aggregate amount for the OL1, OL2, and OL3 units). The figures from year 2011-2012 are revised.

Thermal load on the sea(GWh) [2]	2013	2012	2011	2010	2009
OL1	13 872	12 993	13 635	13 183	14 006
OL2	13 208	13 778	12 954	13 716	13 694
Total	27 080	26 771	26 589	26 899	27 700

2) The permit regulation for the thermal load: 205 000 TJ/yr (total value for the OL1, OL2 and OL3 units)

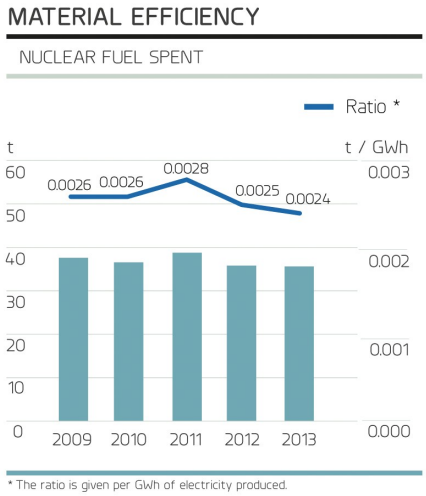
Raw materials and material efficiency

Uranium fuel

The safe use of uranium fuel is ensured at all stages of the power production chain, from the responsible procurement of uranium to the safe final disposal of spent fuel. The power plant units OL1 and OL2 use all together approximately 40 tons of low-enriched uranium.

TVO applies a diversified nuclear fuel procurement chain, which means that separate contracts are concluded for the different stages of procurement, usually with several suppliers for each stage. Procurement operations are based on long-term contracts with leading suppliers. TVO employs a supplier evaluation method and only procures uranium and nuclear fuel refining services from suppliers who have passed the evaluation process.

Further information: Procurement of uranium



Material efficiency is continuously developed

With the help of advanced reactor-physical design and continuous fuel technology development work, the fuel efficiency of reactors has improved since the beginning of operation (within about 35 years) by approximately 30%, and during the past ten years, by approximately 5%. This means that proportionally less natural uranium and enrichment work is required for energy production.

In the production of uranium, as in all mining production, methods requiring less energy and smaller land areas have been sought. The energy consumption of isotopic enrichment plants has dramatically fallen as the traditional gaseous diffusion technology (with an energy consumption of 2,000–3,000 kWh/SWU) has been replaced with modern centrifuge plants (with an energy consumption of 50–60 kWh/SWU). Today, all TVO's suppliers use centrifuge technology. TVO constantly works towards decreasing the footprint of the fuel chain.

TVO operates in a material-efficient manner, minimizing the environmental load. This was realized, for instance, by donating buildings and lockers from the old accommodation village from the years of building OL1 and OL2 to various recipients and unused water filters as educational material to the Academy of Fine Arts of the University of the Arts in Helsinki. These measures decrease the amount of waste taken to the landfill site and implement the priority order specified in the Waste Act. Remainder concrete and soil material has been used in excavation works in Olkiluoto.

Intermediate agents of production

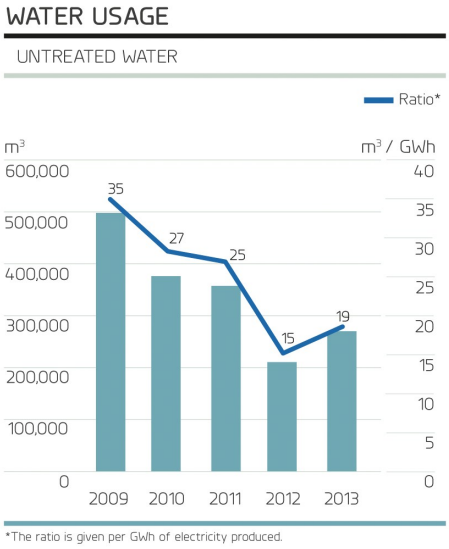
The intermediate agents are the fuel used in emergency diesel generators, auxiliary boilers and vehicles and sodium hypochlorite used for preventing algae growth in cooling water channel. Also the chemicals used for process water purification ion exchange resins and solvents, bitumen and nitrogen are reported as intermediate agents.

Intermediate agents	2013	2012	2011	2010	2009
Oils (m3) 1)	303,0	238,0	269,7	268,6	267,4
NaClO (15 %) (m3)	62,6	67,1	86,2	67,6	37,0
Ion exchange resins (t)	10,1	10,8	19,1	16,2	14,3
Other chemicals (t)	139,3	114,6	204,1	137,6	133

1) Since year 2010 the used oil amount is changed to represent also the fuel used by TVO subcontractors.

Recycling reduces fresh water consumption

In addition to seawater used as cooling water, the Olkiluoto power plant makes use of fresh water, used as tap and process water. The process water that boils in the reactor must not contain any salts, impurities, or particles that could damage the reactor internals. Olkiluoto has all the necessary plants for water treatment: a water treatment plant, a demineralization plant, a laboratory, and a waste water treatment plant. The tap and process water are treated at the water treatment plant. Ion exchange and reverse osmosis methods are used to purify the water used in the power plant process. Process water is continuously recycled and purified. During annual outages, the fuel pool water is stored in storage pools for redeployment. In total, recycling of water reduces the need for clean process water and the amount of process waste water discharged from the plant by approximately 30,000 m^3 each year. During the year under review 274,549 (211,312) m^3 of fresh water was taken from the River Eurajoki.



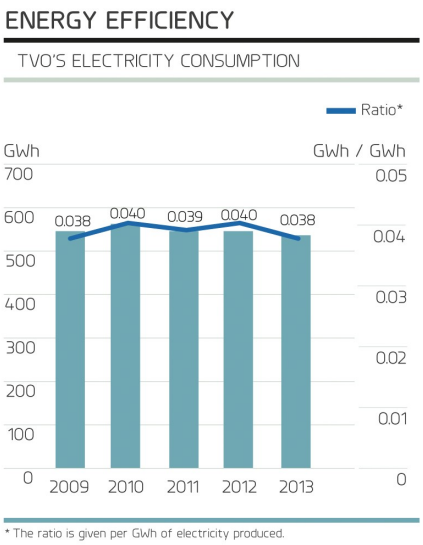
Raw water treatment	2013	2012	2011	2010	2009
Amount of water (m3) 1)	274 549	211 312	357 659	378 470	500 669
Water treatment chemicals (t) 2)	74,0	52,3	63,3	65	69,2

1) Surface water pumpud from the River Eurajoki to the Korvensuo storage pool.

2) Chemicals used for the treatment of raw water (H_2SO_4, NaClO (10 %), NaOH, chemical precipitation agents).

Production and energy efficiency

In 2013, TVO's plant units operated safely and achieved their best production output, 14.63 (14.45) TWh regardless of few unplanned shutdowns. The net output of OL1 was 7.47 (6.97) which was the highest in operation history. The combined capacity factor of the plant units was 95.1 (93.7)% . Olkiluoto site also features a 1 MW wind power plant. Olkiluoto accounted for approximately 17% of all the electricity produced in Finland.



Production

OL1	2013	2012	2011	2010	2009
Net production (GWh)	7 470	6 973	7 290	6 977	7 296
The plant unit's own electricity consumption (GWh)	273	256	268	258	266
Capacity factor (%)	97,1	90,4	94,8	91,8	97,0
Efficiency (net) (%)	35,0	34,9	34,8	34,6	34,2

OL2	2013	2012	2011	2010	2009
Net production (GWh)	7 163	7 477	6 914	7 167	7 156
The plant unit's own electricity consumption (GWh)	258	271	250	258	256
Capacity factor (%)	93,1	96,9	90,9	95,2	95,1
Efficiency (net) (%)	35,2	35,2	34,8	34,3	34,4

Wind power plant	2013	2012	2011	2010	2009
Net production (GWh)	1,0	1,5	1,9	1,1	1,5
Capacity factor (%)	12	17	22	13	17
Electricity production capacity (	1	1	1	1	1

The improvement of energy efficiency is a part of our daily operations

TVO has a long history in systematically implementing various energy-saving measures and assessing and surveying the effects and feasibility of various measures. TVO signed the energy conservation agreement drafted between the government and the energy sector as early as in 1998. In compliance with the agreement, investments have been made in the improvement of the plant units' energy efficiency. In 2008, TVO joined the industries' energy efficiency system, established in 2007 as a part of the action plan for electricity production. According to this system and the action plan, measures promoting energy efficiency have been extended to also cover operations outside the power plant units. The energy efficiency system

has been integrated into the certified environmental system, and TVO implements energy efficiency measures as part of its regular operations, such as the modification process.

TVO carried out an energy review of its facilities that was used as a basis for the energy efficiency improvement plan for 2011–2016. TVO is extending the district heating network in its area, enabling the utilization of waste heat from the plant units for district heating. One of the planned energy-efficiency improvement measures at the plant units involves the replacement of 4,500 lighting fixtures. Other measures affecting energy efficiency have included the demolition of the old accommodation village, the replacement of direct electric heating with air source heat pumps at separate sites, and adding meters to locations significant for energy efficiency during modifications and repairs.

Emissions to 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 our own target limits, which are more stringent than the official limits.

Radioactive emissions to air

As in previous years, the radioactive emissions from the Olkiluoto nuclear power plant into the air and water were extremely minor, and we managed to keep the emissions below both the limit values specified by the authorities and the stringent emission limits that we set ourselves. Our noble gas emissions into the atmosphere amounted to 0.002% (0.01%) and iodine emissions to 0.09% (0.02%) of the allowed limit value specified by the authorities.

Radioactive emissions to the air	2013	2012	2011	2010	2009
Noble gas TBq (Kr-87 equivalent) 1)	0,217	1,21	1,24	0,58	0
% of allowed amount	0,0023	0,01	0,007	0,0033	0
Iodine TBq (I-131) 1)	0,0000907	0,000017	0,000002	0,000094	0,0000001
% of allowed amount	0,088	0,02	0,0015	0,0082	0,00009
Aerosols TBq	0,00002	0,000016	0,000011	0,000012	0,000059
Tritium TBq	0,62	0,36	0,24	0,27	0,32
Carbon-14 TBq	0,80	0,88	0,81	0,71	0,78

1) Permit regulation for radioactive emissions into the air: Noble gases 17 700 TBq (Kr-87 equivalent), Iodine 0,114 TBq (I-131)

Carbon dioxide emissions

TVO participates to the national climate action by producing emission free base load power. Olkiluoto nuclear power plant is a part of the European Union Emission Trade System where the purpose of the system is to monitor and reduce industrial greenhouse gas emissions. The sources of the certified CO_2 emissions are the back-up heating boilers and emergency diesel generators, which are used in case of possible, but highly unlikely situation of power loss. To ensure the safe function of the diesels, they are tested according to the operational license regulations and thus no emission reductions are possible. Renewal of the OL1 and OL2 emergency diesel generators will decrease the fine particle emission.

Verified CO_2 emissions of the Olkiluoto power palnt (t)	2013	2012	2011	2010	2009
OL1/OL2 back-up heating boilers (8 MW + 12 MW)	1	1	1	32	2
OL1/OL2 emergency diesels (8 x 1,8 MW)	478	383	455	424	483
OL3 emergency diesels (4 x 6,4 MW, 2 x 2,5 MW, 1 x 1,3 MW)	4,5				
Total	483	384	456	456	485

Emissions to water and soil

In year 2013, the emissions of radioactive fission and activation products into water were the lowest in operation history.

Radioactive emissions to water

The emissions of radioactive fission and activation products into water amounted to 0.03% (0.07%) and tritium emissions to 8.0% (7.1%) of the limit value specified by the authorities.

Radioactive emissions to water	2013	2012	2011	2010	2009
Fission and activation products TBq 1)	0,00009	0,0002	0,0001	0,0002	0,0002
% of allowed amount	0,03	0,07	0,05	0,08	0,07
Tritium TBq 1)	1,46	1,31	1,31	1,50	1,85
% of allowed amount	8,0	7,1	7,2	8,2	10,1

1) Permit regulation for radioactive emissions to water: Tritium 18,3 TBq, other beta-active nuclides 0,298 TBq

Sanitary waste water

Sanitary waste water is processed at the Olkiluoto waste water treatment plant. The treated water is discharged into the sea. In 2013, the amount of treated sanitary waste water was 84,025 (111,565) m^3. The phosphorus load discharged into the sea was 10 kg (31 kg), the nitrogen load was 4,380 kg (5,475 kg) and the biological oxygen demand (BOD7ATU) was 548 kg (980 kg). The nutrient load to sea water has decreased significantly. The sanitary waste water is treated in accordance with the permit regulations concerning treatment efficiency and emissions into water, as well as statutory requirements. The emissions from the sanitary waste water treatment plant were a fraction of the nutrient load of the River Eurajoki running to the north of Olkiluoto, totaling 13,000 kg of phosphorus and 402,000kg of nitrogen. The measurements ensuring the water quality are carried out by a third party.

Sanitary waste water treatment	2013	2012	2011	2010	2009
Amount of water (m^3)	84 025	111 565	139 251	154 503	157 383
Concentration (mg/l) 1)					
BOD_{7ATU}	6,7	8,9	7,4	16,0	9,3
Phosphorus	0,12	0,28	0,14	0,16	0,10
Treatment efficiency average (%) 1)					
BOD_{7ATU}	97	96	96	96	97
Phosphorus	99	97	98	99	99
Load on sea area (kg)					
Phosphorus	10	31	19	25	15
Nitrogen	4 380	5 475	6 935	8 800	8 400
BOD_{7ATU}	548	985	1 022	2 500	1 500
Water treatment chemicals (t) 2)	34,3	41,6	44,7	54,5	56,1

1) The permit regulation for the sanitary waste water: The maximum BOD_{7ATU} value of waste water discharged into the seas is 15 mg O_2/l and the maximum phosphorus concentration is 0,7 mg P/l. The minimum treating efficiency for the $BOD_{7\ ATU}$ value and phosphorus is 90 %. All values are calculated as annual averages.

2) Chemicals used for the treatment of sanitary waste water

Emissions to soil

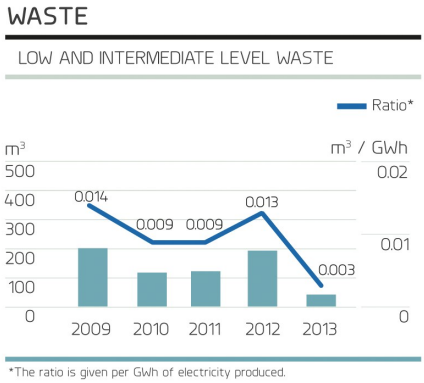
No events leading to the contamination of the soil occurred in 2013.

Waste management

TVO is committed to reducing the amount of waste, and to improve reusage. Radioactive waste is isolated from the natural environment until its radioactivity has decreased to a harmless level.

Radioactive waste

The waste produced at the power plant is classified as waste exempted from control, low and intermediate level operating waste, high level waste (spent fuel), and decommissioning waste according to its level of radioactivity.



Waste exempted from control contains such a small amount of radioactive substances that the waste can be returned to utilization or disposed of at the landfill site in Olkiluoto. Waste is produced during the operation and maintenance of the power plant. The amount of maintenance waste exempted from control was 24 (20) metric tons. In addition, approximately 32 (50) metric tons of metal was released for recycling and 6 (7) m^3 of hazardous waste was delivered for further processing.

The protective gear used in operating and maintaining the power plant, equipment removed from the process, and the insulating materials are low level waste. They are packed tightly and placed in the repository for operating waste (VLJ repository) located at an approximate depth of 100 meters in the plant area. No low level waste was disposed in the VLJ repository in year 2013 (172 m^3 of low level waste was disposed to VLJ repository in 2012).

The ion exchange resins used for cleaning the power plant's process water are classified as intermediate level waste. They are blended with bitumen and placed in the VLJ repository. The amount of intermediate level waste disposed of in the VLJ repository totaled 42 (20) m^3 in 2013. The total amount of high level radioactive waste (spent fuel) produced during the year under review was 35.7 (35.8) metric tons. It is placed in interim storage at Olkiluoto until it can be disposed of in the Olkiluoto bedrock. It is estimated that final disposal can begin in 2020´s. Decommissioning waste is waste created in conjunction with disassembly after power plant decommissioning. Decommissioning waste is also disposed of at Olkiluoto.

	2013	2012	2011	2010	2009
Operating waste cleared after monitoring (t)	62	78	130	266	66

Waste disposed of in the VLJ repository	2013	2012	2011	2010	2009
Low-level (m3)	0	172	132	117	163
Intermediate level (m3)	42	20	0	10	36

Amount of spent fuel in the OL1 and OL2 storage polls and interim storage, cumulative	2013	2012	2011	2010	2009
Number of assemblies	8 096	7 884	7 668	7 434	7 210
Assemblies (t)	1 362,3	1 327,3	1 291,8	1 253,4	1 216,9

Municipal waste

TVO is committed to reducing the amount of waste, and everyone working at Olkiluoto are required to do the same. All waste generated at Olkiluoto is sorted and processed. Sorted waste is forwarded to recycling. Ordinary municipal waste is sorted into nine different groups, and only waste that is unsuitable for utilization is taken to the landfill. All hazardous waste is gathered to the hazardous waste storage facility. From there, the waste is taken to an appropriate processing facility for further processing.

The share of waste utilized for recycling or energy in the total amount of waste was 77% (78%), the share of landfill waste was 13% (15%) and the share of hazardous waste was 10% (7%). Most of the hazardous waste consists of batteries and electrical waste.The total amount of waste was 2,368 (2,696) metric tons.

Ordinary municipal and hazardous waste (t)

OL1 and OL2	2013	2012	2011	2010	2009
Landfill, total amount	101	108	183	270	531
TVO's own landfill 1)	41	78	138	176	335
Paper and cardboard	69	81	117	121	107
Energywaste	77	96	144	206	326
Biowaste	51	62	83	95	99
Wood	170	88	177	146	206
Metal	157	102	212	176	220
Cable refuse	14	17	34	20	40
Glass	4	8	9	19	14
Crushed brick and concrete	25	21	37	22	182
Screening 2)	19	42	26	59	
Hazardous waste	137	109	48	56	60

1) The maximum value allowed by the permit regulation is 1 000 t/yr (total aggregate amount for the OL1, OL2 and OL3 units)

2) The collection of screenings from the sea began in 2010 in accordance with the environmental permit

Ordinary municipal and hazardous waste (t)

OL3	2013	2012	2011	2010	2009
Landfill, total amount	210	296	405	928	1 601
TVO's own landfill 1)	170	225	284	777	560
Paper and cardboard	47	61	73	67	74
Energywaste	297	376	431	451	1 459
Biowaste	43	34	48	26	24
Wood	429	613	1 629	3 115	5 310
Metal	369	335	1 815	2 959	3 645
Cable refuse	12	37	31	8	8
Glass	0	0	0	0	0
Crushed brick and concrete	12	114	107	1 913	376
Clable drums	21				
Hazardous waste	103	73	149	79	71

1) The maximum value allowed by the permit regulation is 1 000 t/yr (total aggregate amount for the OL1, OL2 and OL3 units)

Environmental research

Environmental research has been conducted on Olkiluoto island since the 1970s, years before electricity production was started. 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.

Around 300 samples are taken from the environment of Olkiluoto each year and 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. Forty to fifty water samples are taken from the sea surrounding Olkiluoto each year. These samples are subjected to more than a hundred different water quality analyses. Furthermore, the condition of fish stocks is monitored by, for instance, surveying professional fishermen. The state of aquatic plants is monitored by means of transect line diving every six years.

Extensive environmental impact assessment procedures were carried out for the new OL3 and OL4 plant unit projects. The final disposal of spent nuclear fuel has been studied since the 1980s, and it has also been evaluated with environmental impact assessment procedures.

Biodiversity survey

In 2013, a biodiversity survey was carried out in the area of Olkiluoto island. During the survey, vegetation and biotopes, nature conservation areas, endangered and noteworthy species, nesting birds and mammals were studied.

BIODIVERSITY

Surface area of the constructed area: 165 hectares.

Olkiluoto island is total 900 ha in surface area.

Forest area has decreased on the island, giving way to infrastructure, but the island also includes four nature conservation areas that increase biodiversity. The biotopes found in Olkiluoto are, to a large extent, naturally barren and include few species, which diminishes the impact of forestry and construction. In some areas in Olkiluoto and the surrounding region, the avifauna is rich in species and numbers, even though the most representative bird areas are centered in the least processed areas. The bird species in the land areas are numerous but common. The constructed areas offer some noteworthy bird species possibilities for nesting.

The observations and recommendations arising out of the survey will be taken into account, for instance, in the land use team's planning work, protecting biodiversity in the area. During 2014, TVO will participate in the Master Class biodiversity

training program arranged by Finnish Business Society (FiBS), the leading corporate responsibility network in Finland. The program's goal is to increase companies' awareness of the significance of biodiversity in corporate business and to support the development and improvement of companies' own environmental responsibility.

OLGIS geographical information system

Geographic information of the Olkiluoto island is gathered centrally in an ArcGIS-based OLGIS geographic information database. The information is obtained from TVO and Posiva, and the material stored on the OLGIS server is available to both companies. The geographic information server stores information concerning the location of various buildings, roads, cables, boreholes, environmental monitoring areas, parking lots, etc. The system also enables retrieving property information for different cables and other infrastructure components. This information can include, for instance, cable installation depths, lamp post heights or the identification number of a water pipe. Thus it can be used as a tool for planning and implementing maintenance work.

The OLGIS server also includes remote survey material from Posiva and TVO, such as high-resolution aerial photographs and laser scanning material. They can be used as map templates, upon which various observation points or cables can be inserted. The shared geographic information server of TVO and Posiva also acts as a portal for geographic information exchange between the companies, enabling both of them to better take each other's work and structures into account when planning their own work and thus improving the cooperation between the companies.

Cooperation with authorities

Our operations are subject to a license, and they are supervised by the authorities. The Finnish Radiation and Nuclear Safety Authority (STUK) supervises nuclear and radiation safety.

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 the environmental concerns include the environmental department of the municipality of Eurajoki (where the facility is located) and the Ministry of Employment and the Economy, which acts as the liaison authority in the EIA Procedure.

Radiation monitoring samples taken from the Olkiluoto environment are submitted to STUK for analysis. An annual report is prepared on the amount of waste and emissions caused by the operations and submitted to several regional and national authorities. Environmental investments and environmental protection activity costs are reported annually to Statistics Finland. After verification, the annual carbon dioxide emissions of emergency diesels and back-up heating boilers are reported to the Energy Market Authority (currently Energy Authority). Tukes acts as the supervising authority for the industrial processing and storage of hazardous chemicals.

No special events resulting in environmental impact

No nuclear or radiation safety-related special events or operating disruptions resulting in an environmental impact took place at the Olkiluoto power plant in 2013. In case of special events and operating disruptions, separate case-specific reports are submitted to STUK.

The events taking place at a nuclear power plant are classified on the international INES scale according to their degree of severity. The INES scale has seven categories of severity. Category 4–7 events are classified as accidents, category 1–3 events as incidents or anomalies with a negative effect on safety, and category 0 events as deviations with no significance to safety. The most severe events ever to occur at Finnish nuclear power plants have been classified as INES category 2 events. During the operating history of the Olkiluoto nuclear power plant, there have been a total of three INES 2 events.

In 2013, four special reports were prepared on the operations. All of these were rated at severity level 0 on the INES scale (a deviation with no safety significance). One event that occurred in 2012 and was rated at level 0 on the INES scale was reported in 2013. All operational events taking place at the Olkiluoto nuclear power plant are processed, and events taking place at other nuclear power plants around the world are also continuously monitored. We develop our operations based on the observations made.

Our operations are regulated by various permits

In addition to the nuclear energy and radiation laws, the operations are regulated by the requirements set out in environmental legislation. Operating the Olkiluoto power plant is subject to a license according to the Environmental Protection Act, and cooling water intake is subject to a license according to the Water Act.

The permit regulations control the amount of the power plant's cooling water and the amount of heat contained in it. The regulations also specify the target value for the temperature of the sea area, taking into account the thermal load. The permit regulations also apply to matters such as waste water treatment efficiency, processing of waste, operations in case of disruptions and exceptional situations, and monitoring and reporting. The Olkiluoto nuclear power plant landfill has its own environmental permit. Permits referred to in the Chemicals Act have been granted for the processing and storage of hazardous chemicals. Tukes performed a periodic inspection at TVO's nuclear power plant in 2013.

The 8 MW and 12 MW back-up heating boilers of the Olkiluoto nuclear power plant, as well as the 15 emergency diesel generators of OL1, OL2 and OL3, are included in the Emissions Trade 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. An emissions permit for the period 2013–2020 was approved in 2013. In 2013, the decision was made to renew the emergency diesel generators at OL1 and OL2. This will be the largest individual plant modification in the history of Olkiluoto.

Compliance with environmental regulation

TVO constantly monitors statutory and other requirements pertaining to the operations. The persons responsible for the different sectors are responsible for ensuring that TVO's organizations receive sufficient, up-to-date information on statutory requirements and their impact on TVO's operations. The fulfillment of the requirements is regularly assessed during internal audits and management reviews.

Nuclear waste management

Low and intermediate level waste, also called operating waste, accumulates during the operation and maintenance of the nuclear power plant. Some of the nuclear power plant structures become radioactive during the operation of the plant and need to be finally disposed of when the plant has been decommissioned. Nuclear power plants use uranium fuel which becomes high level radioactive waste during operation and requires final disposal at a repository. Before final disposal, spent nuclear fuel is kept in the interim storage facility for spent nuclear fuel.

TVO also takes care of the operating waste and the power plant decommissioning waste. The waste is finally disposed of in the repository for operating and decommissioning waste, also called the VLJ repository, located at Olkiluoto. The VLJ repository also receives the small radioactive waste created by Finnish healthcare, industries, and research institutions.

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.

Further information: Nuclear waste management, Operating waste and Interim storage for spent nuclear fuel.

Emas table

REQUIREMENT	REPORT PAGE
A clear and unambiguous description of the organization registering under EMAS and a summary of its activities, products, and services, and its relationship to any parent organizations as appropriate.	TVO: an overview
The environmental policy and a brief description of the environmental management system of the organization.	Company-level policies Environmental management
A description of all the significant direct and indirect environmental aspects which result in significant environmental impacts of the organization and an explanation of the nature of the impacts as related to these aspects.	Environmental impacts
A description of the environmental objectives and targets in relation to the significant environmental aspects and impacts.	Environmental management Environmental program 2013
A summary of the data available on the performance of the organization against its environmental objectives and targets with respect to its significant environmental impacts. Reporting shall be on the core indicators and on other relevant existing environmental performance indicators.	Environmental management Environmental program 2013 Environmental impacts Emas table Cooling water Raw materials and material efficiency Production and energy efficiency Emissions to air Emissions to water Waste management Environmental research
Other factors regarding environmental performance including performance against legal provisions with respect to their significant environmental impacts.	Environmental management Cooperation with authorities Cooling water Emissions to air Emissions to water Waste management
A reference to the applicable legal requirements related to the environment.	Cooperation with authorities
The name and accreditation number of the environmental verifier and the date of validation.	Confirmation of compliance

Our power plant at Olkiluoto has been EMAS (Eco-Management and Audit Scheme) registered with code FI-000039 (NACE code D35.1.1).

The registration is valid until June 30, 2015.

Confirmation of compliance

CONFIRMATION OF COMPLIANCE

DNV Certification OY/AB has, as an accredited certifier (FIN-V-0002), reviewed the internal procedures observed at Teollisuuden Voima Oyj's Olkiluoto power plant and the resulting data and documentation. Based on this review, DNV Certification OY/AB states that the environmental policy, the management program, the environmental system, audit procedures, and the environmental statement including the indicators fulfill the requirements of Decree (EC) No. 1221/2009.

Scope and methodology of certification

The EMAS report was certified at the Olkiluoto location of Teollisuuden Voima during 24–28 February 2014.
The certification was performed with the ISO 14001 certification auditing by processing the requirements for both systems, and compliance with them.

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

The 2013 environmental report has the same structure as the 2012 report and continues along the same lines as previous reports, which means that the content and environmental indicators can easily be compared year by year. However, in the 2013 report, environmental indicators are next to the text describing them, and not as a one page of indicators like before. The report provides a clear and accurate image of Teollisuuden Voima Oyj's operations and their impact on the environment. The environmental system is implemented by taking the goals into account, and the implementation of the system is monitored by the environment team and management reviews. The environmental report (and related environmental review and environmental indicators) which describe the impact of the system meet the EMAS 1221/2009 requirements.

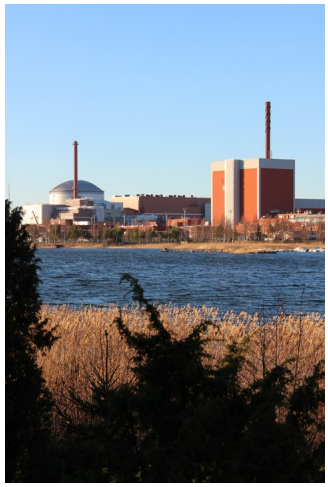
The dedicated level of Teollisuuden Voima's commitment to a high standard of safety, quality and environment protection, and continuous development is shown in the 2013 Environment Report.

Mustasaari, 10 March 2014
DNV Certification OY/AB
EMAS-accredited certifier
FIN-V-0002

Seija Meriluoto
Lead Auditor

Company-level policies

Safety culture



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

Company-level policies

TVO and its personnel follow the policies determined by the company. Applicable laws, decrees, and official regulations as well as international agreements are strictly followed. TVO sets objectives for its operations, which are stricter than those set out in the applicable laws. TVO requires its partners and their personnel working at Olkiluoto to be committed to the high safety culture and high-quality operating methods. This means that the companies and personnel in a direct or indirect contractual relationship engage in responsible operations according to TVO's environmental, nuclear safety and quality policy, and information security principles.

Nuclear safety and quality policy

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

Nuclear safety

TVO is committed to maintaining operating conditions where efficient procedures can be implemented by taking safety, quality, and costs into account. This ensures the capacity to also produce competitive electricity in a safe and reliable manner over the long term. TVO's operations shall not cause any damage to people, the environment or property.

Radiation protection

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 practical measures. Restricting the amount of doses and keeping the amount of radioactive emissions as low as possible are already accounted for when designing the structures and functions. All employees shall observe matters affecting radiation protection in their work. In addition to authority guidelines, the development of radiation protection operations also takes international recommendations into account.

Nuclear material supervision

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

Quality

TVO ensures that high-quality working methods are used in the company. They lay the foundation for safe and economical operations. The personnel of TVO is aware of the safety significance of their work. Matters are discussed in an open manner. Know-how and operations are developed according to the principle of continuous development. The sharing of development themes, identified deficiencies, deviations, and errors is encouraged.

We consider our internal and external customers equally important. We perform all work tasks appropriately, according to schedule, and with high quality. TVO develops co-operation with its suppliers so that the safety, availability, and environmental friendliness of the plant units remain at a high international level.

Corporate social responsibility policy

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

Environment

TVO complies with the principles of sustainable development.TVO takes responsibility for the environment by identifying the environmental aspects of its operations and minimizing the harmful impacts they cause. TVO specifies objectives and targets for its operations according to the principle of continuous development. TVO monitors the impact of its operations on the state of the environment and launches immediate corrective measures when necessary. TVO takes care of the environmental competence and expertise of its personnel and others working at the Olkiluoto power plant. TVO aims to be a forerunner in the management of environmental matters.

The objective of TVO is to prevent and reduce the already low emissions of radioactive substances. Potential exceptional events in the plant process are predicted and preventing potential environmental damage is prepared for. TVO believes its overall responsibility for all stages of the fuel cycle is important. The company monitors and supervises the environmental management of fuel suppliers. 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 all the way from uranium mines to final disposal according to the “from bedrock to bedrock” principle.

TVO observes energy efficiency requirements and improves the energy efficiency of its operations. TVO monitors its own energy consumption and aims to improve its efficiency by taking energy into account in equipment procurement and the development of operating methods. Plant unit modernization improves the energy efficiency of the power plant process.

TVO minimizes the amount of waste by improving the use of energy, supplies, and raw materials, and by developing the utilization of waste. The goal is to increase the relative share of waste delivered to utilization and to decrease the amount of radioactive waste. TVO also aims to decrease fuel consumption by optimizing the use and features of the fuel. The development of the Olkiluoto area and expanding the operations observe the sustainable use of the environment. The design and construction of new nuclear power plant units aim to minimize harm and disruption to the environment.

Procurement

High-quality procurement operations ensure safe, competitive, and reliable production and long-term operation of the plant units. The products procured must meet TVO’s safety, quality, 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.

Supplier selection pays particular attention to the supplier operations’ continuity, delivery reliability, quality, and environmental management and competitiveness while appreciating domestic and local suppliers. Suppliers are assessed, delivery quality is monitored, and immediate corrective measures are taken when necessary. TVO operates responsibly and ethically in relation to the supply chain and business partners. TVO requires its partners to follow a high safety culture and responsible operating methods in their activities.

Personnel

The objective of TVO is to ensure that personnel are motivated and competent, they carry out their tasks in a responsible manner and are committed to observing the agreed operating methods. TVO ensures that the company has sufficient, competent HR resources to meet the objectives specified for the company. TVO provides its personnel with opportunities to develop in their work and occupation. TVO provides competitive rewards and encourages employees to work profitably, to meet objectives and to carry out good operations on a daily basis. TVO creates the preconditions for its personnel to take care of their working capacity. The principles of the HR policy are implemented through good co-operation with the personnel. The objective of TVO is to have an equal, healthy working environment which does not approve of any discrimination and which promotes the implementation of equality.

Occupational health and safety

The objective of the company's occupational health and safety operations is to promote occupational health and safety according to "zero accidents" thinking. TVO maintains a good work atmosphere and good working conditions. TVO and its employees do not approve of any workplace harassment or bullying. The occupational health and safety objective of everyone working in the plant area is to ensure their personal safety and that of others. Occupational health and safety is observed in all functions.

Communications

TVO increases mutual trust by promoting open, responsible interaction with all its stakeholder groups in the neighborhood, Finnish society, and the international co-operation network of its sector. TVO promotes general nuclear power awareness and general acceptance by participating in social debate and by openly communicating the operations and events of the company and the Olkiluoto nuclear power plant.

The Olkiluoto Visitor Center serves those interested in the company's operations, and an exhibition is open to visitors. Through internal communication, TVO supports an interactive corporate culture and ensures that the personnel understands the company's objectives and policies and is aware of the company's financial and production status.

TVO's interaction with stakeholder groups is guided by a high ethical principles, thus strengthening trust in the operations of TVO and the stakeholder group and does not jeopardize their reputation or objectivity. Promoting culture, sports, research, and non-profit activities is part
of TVO's corporate responsibility. When selecting partners and sponsorships, their reputation, values, and suitability for TVO's strategic objectives and principles are taken into account. Being Finnish, reliable, interactive, and a forerunner are key selection criteria.

Production policy

The production policy includes the operation and maintenance of the plant and increasing its production capacity.

Operation and maintenance

Disruption-free, predictable and competitive electricity production is the objective of TVO's operation and maintenance activities. Nuclear and operating safety always comes first. Plant safety and reliability is developed in a well-planned way. Modifications or renovations carried out at the plant are implemented according to plans approved in advance so that the plant can be used for as long as possible. Well-planned, correctly sized testing and inspection measures ensure the safe and reliable operation of the plant. Plant maintenance operations are implemented in a well-planned manner, predicting potential disruption situations, and preparing for the measures the situations require.

Increasing production capacity

TVO monitors nuclear power technology development and participates in international co-operation with power plant suppliers and nuclear power companies. The output of the existing plant units at Olkiluoto is increased by utilizing the most recent available technology whenever possible. The design and implementation of Olkiluoto 3 applies the best, financially feasible technology which minimizes environmental harm, while taking into account the full life cycle of the plant unit.

Corporate safety policy

The corporate safety policy includes production and operating safety, personnel and facility safety, rescue and preparedness operations, and information security.

Production and operating safety, personnel, and facility security

The procedures related to safety are implemented in a well-planned, proactive, and comprehensive way. The procedures ensure the safe operation of the plant and the integrity of the personnel and others working at the plant.

Rescue and emergency

TVO maintains and develops action preparedness for special situations. Rescue and emergency are rehearsed on a well-planned and regular basis. The company continuously maintains its awareness of risks related to the company, personnel, and the operating environment.

Information security

The information security procedures are dimensioned according to the importance and risks of TVO's functions. The objective is to protect nuclear safety, the financial interest and privacy of personnel, to ensure the availability of correct, reliable information, and to prevent damage caused by information processing. TVO's information security procedures cover the availability, authenticity, and confidentiality of information and information systems as well as access right management procedures.

TVO's employees are assigned access rights to the company's information and information systems according to their work tasks. Handing over information to outsiders is only allowed for the benefit of TVO. Processing information submitted by other parties to TVO is at least subject to the information security procedures used or required by the party submitting the information.

Glossary

A

Activation product: A radioactive nuclide created by neutron radiation in the reactor.

Activity: The number of spontaneous nuclear disintegrations occurring in a given quantity of radioactive material within a certain time. The unit of radioactivity, the becquerel (Bq), equals one disintegration per second.

Aerosols: A gaseous medium containing solid or liquid particles. In the case of emissions or releases from a nuclear power plant, these particles may be radioactive.

ALARA (As Low As Reasonably Achievable): An internationally used principle regulating the amount of radiation doses at nuclear power plants.

Alpha-active element: A radioactive element that emits an alpha particle upon decomposing. An alpha particle consists of two protons and two neutrons.

AVI: Regional State Administrative Agency

B

Background radiation: Radiation emanating from natural sources, such as radon from the soil, radiation from space, and radioactive materials in the human body.

Becquerel (Bq): The unit expressing the activity of a radioactive substance. 1 Bq is equal to one spontaneous nuclear disintegration in the substance per second.

Beta-emitting substance: Radioactive material that emits negatively charged particles (electrons).

BOD_{7ATU}: The biological oxygen demand in wastewater.

BWR, Boiling water reactor: A light-water reactor in which water used as the coolant boils as it passes through the reactor core. The steam generated rotates the turbines.

C

Capacity factor: The figure depicting the production at a power plant; for example, for one year. The capacity factor is the energy produced in a year by a power plant as a percentage of the energy it would have produced had it been operating at full capacity for the entire year.

Carbon-14: Carbon-14 is a long-lived, naturally occurring, beta-emitting radioisotope created by cosmic rays in the Earth's atmosphere. It is also formed in a nuclear reactor when the oxygen in the coolant is activated. Carbon-14 then enters the atmosphere bound to carbon dioxide.

CO_2: Carbon dioxide

Consortium: A temporary merger of companies, formed for a particular business venture.

Controlled area: The area that contains or may contain radioactive materials; separated from other plant facilities. The doors to the controlled area are locked.

Control rod: A rod holding material that absorbs neutrons. It regulates the number of neutrons in the reactor core and thus the power of the reactor. A power plant reactor has a large number of control rods.

Conversion: The chemical transformation of one substance into another substance. In nuclear technology, conversion usually refers to the conversion of uranium oxide (U3O8) into uranium hexafluoride (UF6) for enrichment purposes, and the conversion of uranium hexafluoride into uranium dioxide (UO2) for the fuel manufacturing process.

D

Decibel, dB: Noise is measured by a decibel scale expressing sound intensity.

Dose rate: A dose of radiation per time unit (e.g. mSv/h) expressing the amount of radiation a person is exposed to within a certain period of time.

DNV: An abbreviation of Det Norske Veritas. Det Norske Veritas acts as an independent third party in various inspection/assessment tasks. DNV's central fields of operation include services relating to the classification of ships and the certification of management systems.

E

EIA, Environmental Impact Assessment procedure: The Environmental Impact Assessment (EIA) procedure is a procedure related to the granting of an environmental permit. It must be performed in the planning phase of a project if the project causes, or may cause, significant environmental impacts.

ELY center: Center for Economic Development, Transport and the Environment.

EMAS: Eco-Management and Audit Scheme.

Emission right: EU-wide carbon dioxide emission rights trading began in 2005. For the entire EU area, annual carbon dioxide quotas were specified for industry and energy plants emitting carbon dioxide. The target is to allocate cost-efficiently emission reduction measures to where their implementation is the most inexpensive. Plants that successfully and cost-efficiently reduce their emissions to a lower level than their quota allows may sell their spare emission rights in emissions trading. The plants for which the reduction of emissions is costly can purchase emission rights from the market.

Environmental policy: The overall intentions and direction of an organisation relating to its environmental performance as formally expressed by top management including compliance with all applicable legal requirements relating to the environment and also a commitment to continuous improvement of environmental performance. It provides a framework for action and for the setting of environmental objectives and targets.

Environmental performance: The measurable results of an organisation’s management of its environmental aspects.

Environmental aspect: An element of an organisation’s activities, products or services that has or can have an impact on the environment. Significant environmental aspect’ means an environmental aspect that has or can have a significant environmental impact.

Environmental impact: Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation’s activities, products or services.

Environmental programme: A description of the measures, responsibilities and means taken or envisaged to achieve environmental objectives and targets and the deadlines for achieving the environmental objectives and targets.

Environmental objective: An overall environmental goal, arising from the environmental policy, that an organisation sets itself to achieve, and which is quantified where practicable.

Environmental target: A detailed performance requirement, arising from the environmental objectives, applicableto an organisation or parts thereof, and that needs to be setand met in order to achieve those objectives.

Euratom: A unit of the EU Commission that supervises nuclear material.

F

Fission: The splitting of one heavy atomic nucleus into two or more intermediate-mass nuclei, releasing neutrons and a considerable amount of energy in the process.

Fission products: The medium-heavy nuclei produced in nuclear fission. They are usually radioactive.

Fuel assembly: An element formed by fuel rods.

Fuel rod: A slender metal tube holding fuel pellets. The fuel inside the tube is generally uranium oxide compressed into pellets.

G

Gamma radiation: Electromagnetic radiation emitted during alpha and beta decay.

Gigawatt, GW: A unit of power. One gigawatt is one million kilowatts.

Gigawatt hour, GWh: A unit of electrical energy. One gigawatt hour equals one million kilowatt hours.

GRI (Global Reporting Initiative): Reporting guidelines for social responsibility that were approved by a meeting of the UN in Johannesburg in 2002. The reporting covers a company's financial, human, and environmental responsibility.

H

Half-life: The time it takes for the activity of a radioactive isotope to be reduced by half.

I

IAEA: International Atomic Energy Agency.

INES (International Nuclear Event Scale): A seven-level scale used internationally to depict the seriousness of accidents and incidents at nuclear power plants. The lower levels (1-3) depict incidents that have weakened plant safety and the upper levels (4-7) accidents that could cause emissions into the environment that require protective measures against radiation.

Iodine: From the point of view of radiation safety, the most important isotope of iodine among fission products is iodine-131, which has a half-life of eight days.

Ion exchange resins: Substances used to remove impurities from water.

ISO 9001 standard: International standard for quality management systems.

ISO 14001 standard: A standard for the management of environmental matters that is widely used in various parts of the world.

Isotope: Atoms of the same element differing from each other in the number of neutrons in their nucleus. Almost all natural elements occur as more than one isotope.

K

KAJ Store: Storage facility for intermediate-level waste.

KPA: Interim storage for spent fuel.

M

ManSievert, manSv: The unit used to indicate the collective radiation dose received by a certain number of people.

MTT: MTT Agrifood Research Finland.

Megawatt, MW: A unit of power. One megawatt equals 1,000 kilowatts, or one million watts.

MWth: Thermal power produced in a nuclear power plant.

N

Natura area: Protected areas selected on the basis of EU-wide nature conservation goals. In Natura areas, nature conservation is
implemented so that the normal use of the area is limited as little as possible.

Noble gas: The name for certain gases rarely found in the atmosphere. The noble gases are helium (He), neon (Ne) argon (Ar), krypton (Kr), xenon (Xe), and radon (Rn).

Nuclide: A type of atom or nucleus with a specific number of protons and neutrons.

O

ONKALO: ONKALO is the name of the underground bedrock research facility for the final disposal facility for spent nuclear fuel.

ORC (Organic Rankine Cycle): Rankine cycle process using a suitable organic fluid as circulation medium.

Occupational accident: An accident that occurs at work or on the way home from work or vice versa and which causes an absence of at least one day.

P

Power delivered to the owners (GWh): Electricity produced - (internal consumption at the plant + consumption in the plant area).

PRA: Probabilistic Risk Assessment.

PWR, Pressurized water reactor: A light-water reactor with such a high reactor pressure that water used as the coolant does not boil in the reactor. The hot water is conducted from the reactor to a steam generator in which the water in the secondary circuit evaporates and the steam is led to rotate the turbine.

R

Radiation: Electromagnetic waves or particle radiation consisting of the smallest particles of matter.
Radioactive operating waste: Waste such as plastic, paper, and cloth generated during maintenance work at the power plant. The volume can be reduced by baling.

S

SAHARA (Safety As High As Reasonably Achievable): An internationally used principle emphasizing safety at a nuclear power plant.

Screenings: The organic matter which accumulates on the screening plant's fine screen and traveling basket filters in cooling
water intake. The screenings mainly consist of debris, algae, mussels, and fish carried with cooling water.

Sievert (Sv): A radiation dose unit indicating the biological effects of radiation. As it is a very large unit, millisieverts (1 mSv = 0.001 Sv) and microsieverts (1 µSv = 0.001 mSv) are more commonly used.

STUK: Finnish Radiation and Nuclear Safety Authority. STUK is the authority that regulates the Finnish nuclear energy sector.

T

TEM: The Finnish Ministry of Employment and the Economy.

Transuranium element: An element with an atomic number greater than that of uranium (92). Transuranium elements are not found in nature, but are created from uranium for example in nuclear reactors under the influence of neutron radiation.

Tritium: Tritium is a hydrogen isotope with a nucleus consisting of one proton and two neutrons. The nucleus is called tritium.

Tukes: The Finnish Safety and Chemicals Agency.

TW, terawatt: A unit of power. One terawatt equals one billion kilowatts.

TWh, terawatt-hour: A unit of energy. One terawatt-hour equals one billion kilowatt hours.

U

Uranium: An element with the chemical symbol U. Uranium comprises 0.0004% of the Earth's crust. All uranium isotopes are radioactive. Natural uranium is mostly in the form of isotope U-238, which has a half-life of 4.5 billion years. Only 0.72% of natural uranium is in the form of isotope U-235, which can be used as a nuclear fuel.

V

VLJ repository: A repository for low and intermediate-level radioactive waste.

VTT: Technical Research Centre of Finland.

W

WANO: The World Association of Nuclear Operators.

Y

YVL guide: Nuclear power plant guide.

Further information

Anna Lehtiranta
Senior Vice President, Corporate Relations
+358 2 8381 5200

Sini Gahmberg
Corporate Social Responsibility Manager
+358 2 8381 5204

Harri Salonen
Quality and environment, Manager
+358 2 8381 5166

Please visit the TVO website for a lot more additional information about TVO, environmental matter, and nuclear power.