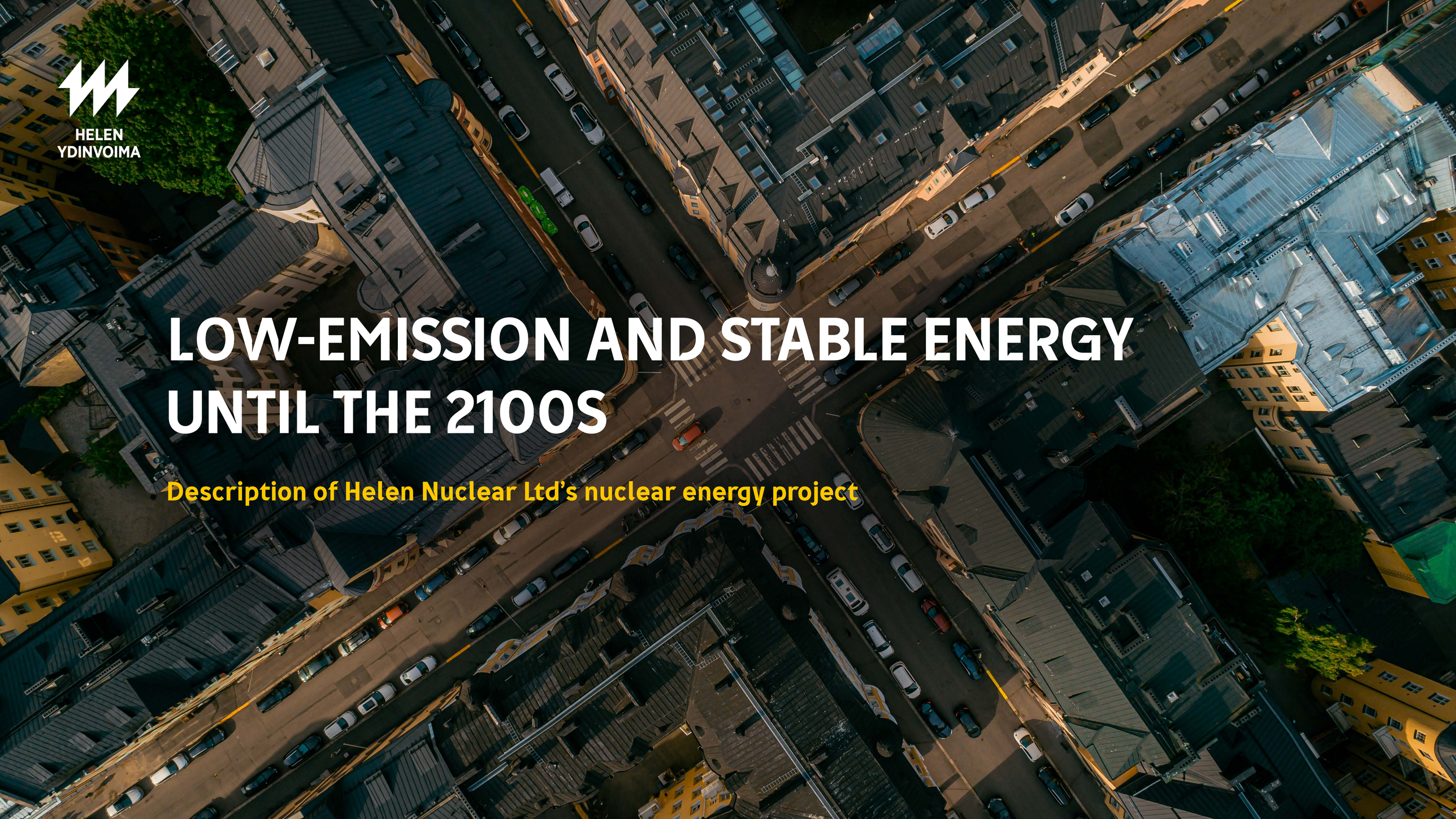
HELEN
YDINVOIMA

LOW-EMISSION AND STABLE ENERGY UNTIL THE 2100S

Description of Helen Nuclear Ltd's nuclear energy project



Helen Nuclear Ltd is exploring the possibility of building a small modular reactor (SMR) plant in Helsinki. The options under consideration are a heat-only plant that produces district heat and a cogeneration plant that produces both district heat and electricity.

The environmental impact assessment examines the project options and their impacts. The possible sites are the current power plant areas in Salmisaari and Vuosaari, and the Norrberget area in Östersundom.

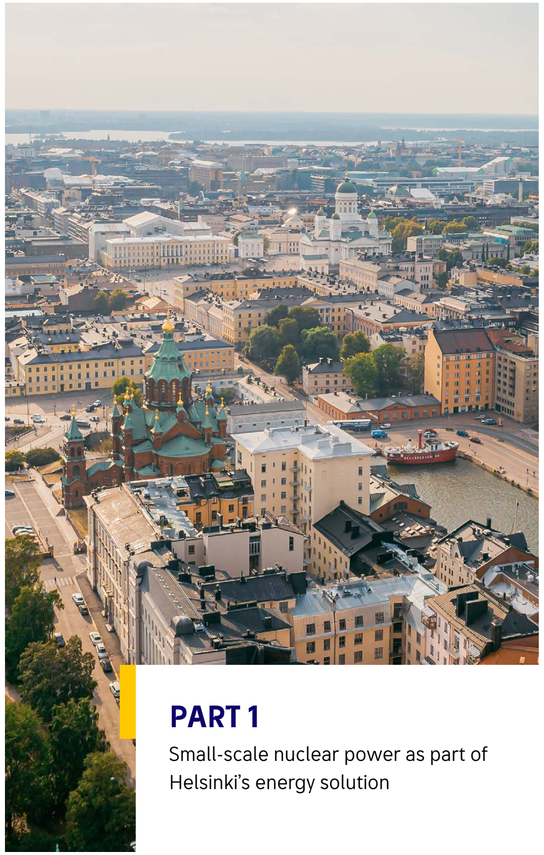
This project description provides basic information about the nuclear energy project and its objectives as part of Helsinki's energy solution. It also includes a discussion of the environmental impact assessment and participation in it, as well as the starting points for the safety of the project and ensuring safety.

Helen Nuclear Ltd website:
helen.fi/nuclear

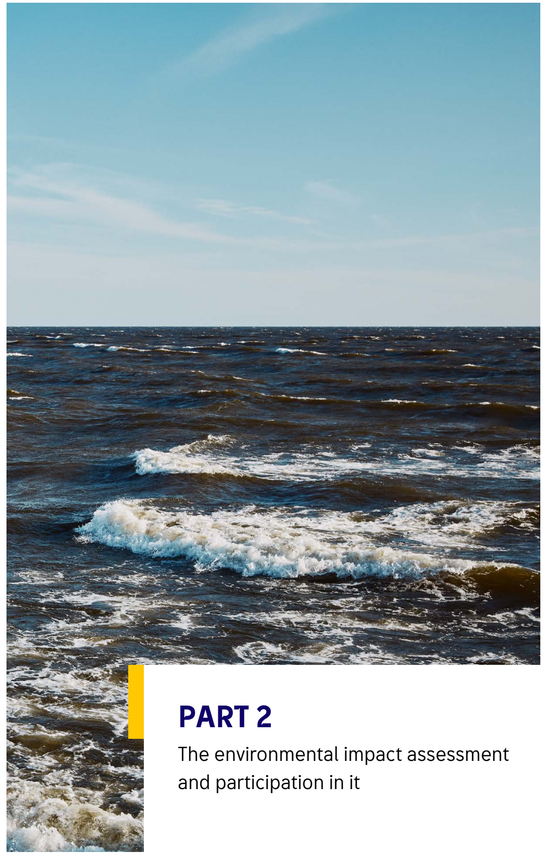
The project's environmental impact assessment programme on the website of the Ministry of Economic Affairs and Employment:
tem.fi/en/helen-eia-programme

The project's map application:
helen.fi/nuclear/maps

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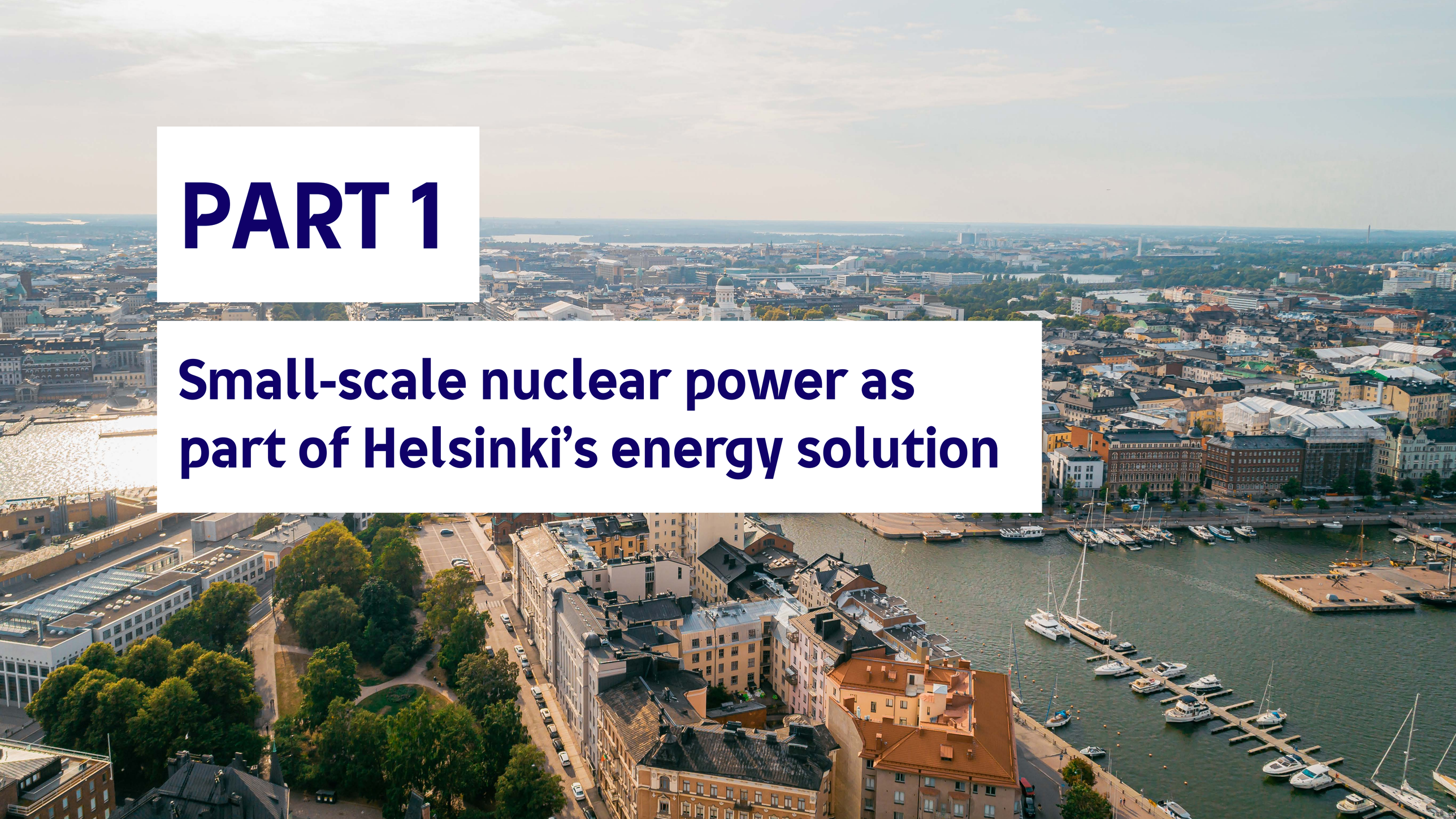
PART 1
Small-scale nuclear power as part of Helsinki's energy solution



PART 2
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PART 3
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PART 1

Small-scale nuclear power as part of Helsinki’s energy solution

Small-scale nuclear power as part of Helsinki's energy solution

The energy system is in transition. The progress of climate change and biodiversity loss, the growing demand for energy, the energy crises of recent years and the changed security environment place new demands on energy production. The energy system of the future must be low-emission, affordable, flexible and reliable. At the same time, it can bring growth and a competitive advantage to Finland.

Current situation

We aim for net zero emissions and phasing out combustion-based energy production by 2040. We have already discontinued the use of coal and also reduced the use of other fossil fuels. This has reduced emissions and our dependence on imported fossil energy. We have made significant investments in wind and solar power, the utilisation of waste and environmental heat, the electrification of heating and flexible energy solutions. We are using biomass in the transition phase of heat production until it is possible to phase out combustion-based production.

The challenge

At the same time as we are reducing emissions, the growth and electrification of the city leads to increasing demand for energy. Renewable electricity and electricity-powered district heat are an important part of the solution, but the production of solar and wind power varies depending on weather conditions. At the same time, some of the current stable energy production capacity in Finland will leave the grid in the coming decades when some of the existing nuclear power plants reach the end of their operational lifespan. This is why we need weather-independent energy production and multiple complementary energy sources to strengthen the reliability of Helsinki's energy system also in the future.

The solution

We are exploring the possibility of small-scale nuclear power as part of Helsinki's future energy system. A small modular reactor (SMR) could produce a significant share of the city's district heat, and potentially also electricity, in a stable and low-emission manner all year round. According to our assessments, small modular reactor technology is the most promising solution for phasing out combustion-based energy production. It would complement renewable energy sources, strengthen the security of supply and support the reduction of emissions and the availability of affordable energy. The feasibility and impacts of the project are investigated by means of an environmental impact assessment procedure and other studies.

Nuclear power solves key challenges of the energy system

Will there be enough electricity for everyone when consumption increases? Will the price of energy rise unreasonably? How can we strengthen our energy independence?

The construction of a nuclear power plant is being explored because it could complement renewable energy sources and simultaneously respond to several of the current challenges associated with the energy system. According to our estimate, Helsinki's electricity demand could even double by 2030*, and the growth in the demand for electricity is expected to continue. At the same time, the energy system must function reliably in all circumstances and weather conditions.

**Comparison year 2024*

Nuclear power

1 Provides low-emission energy for the needs of a growing city

Helsinki's energy demand will increase in the coming decades due to population growth and the electrification of society. Nuclear power could produce heat and potentially also electricity close to consumption while simultaneously strengthening the city's energy independence. A cogeneration plant that produces electricity and heat could improve the reliability of the Finnish electricity system as a whole.

2 Ensures stable energy production regardless of weather conditions and mitigates volatility in energy prices

The energy system of the future will be increasingly reliant on renewable forms of production. Nuclear power produces energy in a stable manner and complements weather-dependent wind and solar power. Stable nuclear power production increases the predictability of the energy system, supports the adequate availability of energy and can help mitigate volatility in energy prices.

3 Strengthens the security of supply

The energy system must function reliably even in exceptional circumstances and during disturbances. That is why it must be based on multiple complementary forms of production. District heating production, in particular, must also be reliable during the coldest winter months. As part of a diverse energy system, a small modular reactor could strengthen the security of supply, reduce dependence on fuel deliveries and help safeguard the availability of energy during disturbances.

4 Generates a large amount of energy within a small land footprint

Compared to many other energy sources, nuclear power can generate a large amount of energy within a small space. It leaves more space for nature and other land use. Situating a nuclear power plant close to where energy is consumed would also reduce the need to build new transmission connections.

5 Helps us to achieve our climate targets

As nuclear power has very low life-cycle carbon dioxide emissions, it supports Helsinki's climate targets as part of a low-emission energy system. Because the energy production is not based on combustion, it also does not generate fine particle emissions or other flue gas emissions. Phasing out combustion plants reduces traffic related to fuel transport and traffic emissions in the areas around the current power plants.

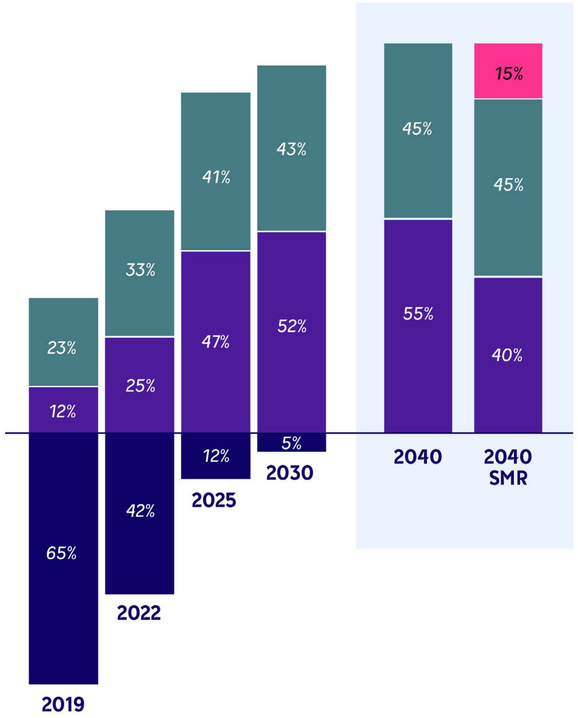
The goal is to phase out combustion in energy production by 2040

We are committed to reducing emissions from energy production by 97% by 2040, using 2019 as the baseline. At the same time as emissions decrease, we are building a flexible and reliable energy system.

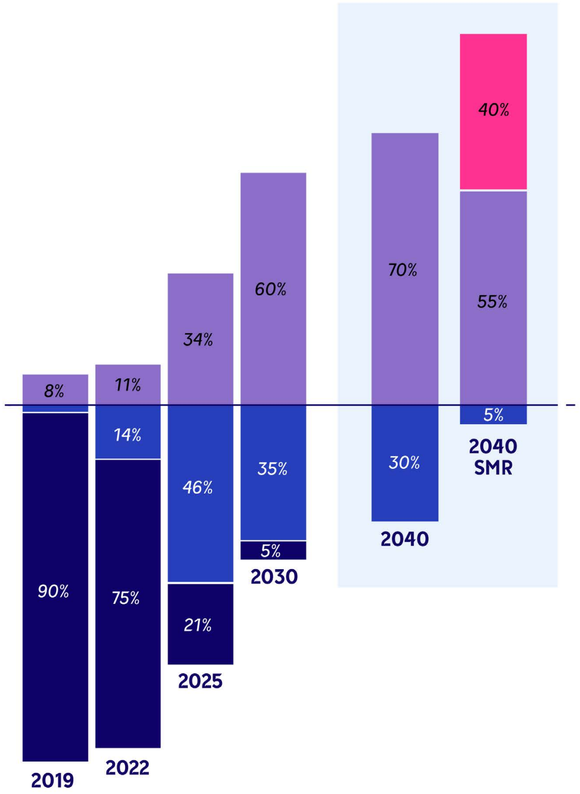
In electricity production, we have significantly increased renewable energy production by investing in wind and solar power. We have also built battery energy storage systems to balance fluctuations in production. We have been involved in Finnish nuclear power production for decades now. Olkiluoto 3 has further increased nuclear power's share of Helen's electricity production, and it would rise even higher if we were to opt for a combined heat and power nuclear plant.

We have significantly electrified heat production by commissioning electric boilers and large heat pumps. They utilise waste heat from wastewater and data centres, for example, as well as other environmental waste heat. We are also developing energy storage systems. A share of district heat is still produced from biomass, such as wood chips and pellets. However, they are a transitional solution before we completely phase out combustion-based energy production. A nuclear power plant could replace the use of biomass and complement electricity-based solutions in heat production.

Energy sources in electricity production



Energy sources in district heat production



Non-combustion-based energy production

- SMR
- Conventional nuclear power
- Electricity-based heating solutions (heat pumps and electric boilers)
- Renewable electricity (wind, hydro and solar)

Combustion-based energy production

- Biomass
- Fossil

In the chart, the years 2030 and 2040 are based on Helen's current plans. The energy sources for 2040 are presented for two scenarios: without the SMR plant and with the SMR plant in operation.

A nuclear power plant in Helsinki would support the entire Finnish energy system

In the past, coal-fired plants produced both electricity and heat for Helsinki. After they were decommissioned, we have built replacement electricity production elsewhere in Finland. At the same time, we have made electrified heat production, which increases electricity consumption and the need for electricity transmission to Helsinki.

- A heat-generating nuclear power plant would reduce the need to produce district heat using electricity-based solutions. This would strengthen Helsinki's self-sufficiency in terms of energy, reduce dependence on electricity produced elsewhere and reduce the load on the electricity transmission grid. At the same time, it would support the transition away from combustion-based energy production.

- A combined heat and power nuclear plant would benefit Finland as a whole by producing energy in close proximity to the country's largest centre of energy consumption. This would reduce the need for electricity transmission, improve the regional balance of energy production and support the reliability of the entire Finnish electricity system.

- If a nuclear power plant is not built and the phasing out of combustion is achieved by further electrifying heat production, Helsinki will be increasingly dependent on energy produced elsewhere. This would also increase the need for new transmission connections.

Heat-generating plant

Produces low-emission district heat for Helsinki and replaces combustion-based energy production.



Heat must be produced close to where it is consumed, i.e. close to the district heating network.

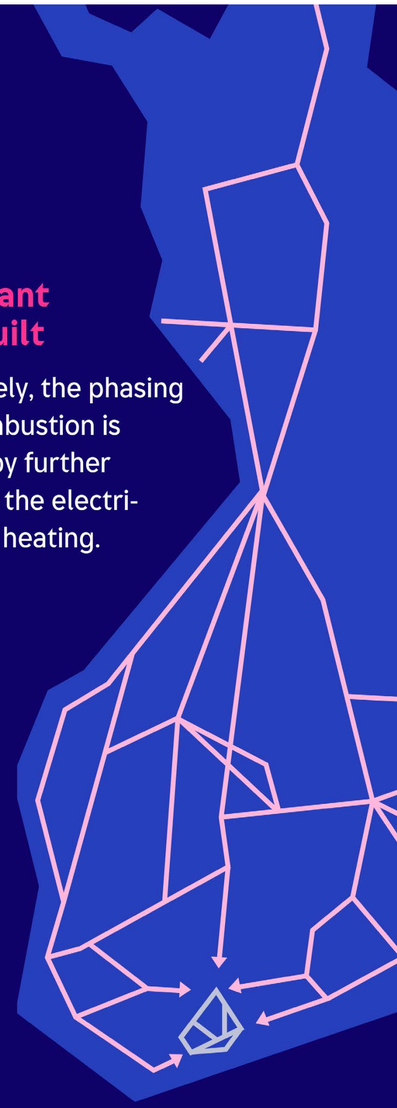
Combined heat and power plant

In addition to district heat, the plant produces electricity for the national grid and strengthens the entire Finnish electricity system.



If the plant is not built

Alternatively, the phasing out of combustion is achieved by further increasing the electrification of heating.



Helsinki is dependent on electricity produced elsewhere.

Energy-efficient SMR plants recover heat

SMR plants are smaller than conventional nuclear power plants in terms of their reactor capacity and size. They can be situated close to energy consumption once the safety of the plants has been assessed and confirmed. They make it possible to utilise nuclear energy in both district heat production and the cogeneration of electricity and heat.

There is no official or established definition for a small modular reactor (SMR). Small modular reactors are typically compact in size, modular in design and feature modern safety solutions.

The design of the plants is based on passive safety solutions that are independent of external power and therefore do not require a connection to the electricity grid in the event of a disturbance, for example. This means that safety is based on, for instance, gravity or the natural transfer of heat. The passive safety solutions ensure that the reactor shuts down and cools automatically in the event of a power outage or disturbance.

Modularity means that the plant's components can be manufactured as ready-made modules in factories, and these modules are then assembled on site. Serial production enables the management of the project's schedule and costs.

In terms of their size, the SMR plants assessed by Helen are comparable to medium-sized industrial plants. There is no official upper limit for the reactor capacity of an SMR plant. A major advantage of SMRs is that nearly all of the energy they produce can be utilized. Depending on the configuration, a combined heat and power plant can achieve an efficiency of approximately 75%, while a heat-only plant can achieve an efficiency of up to 95%.

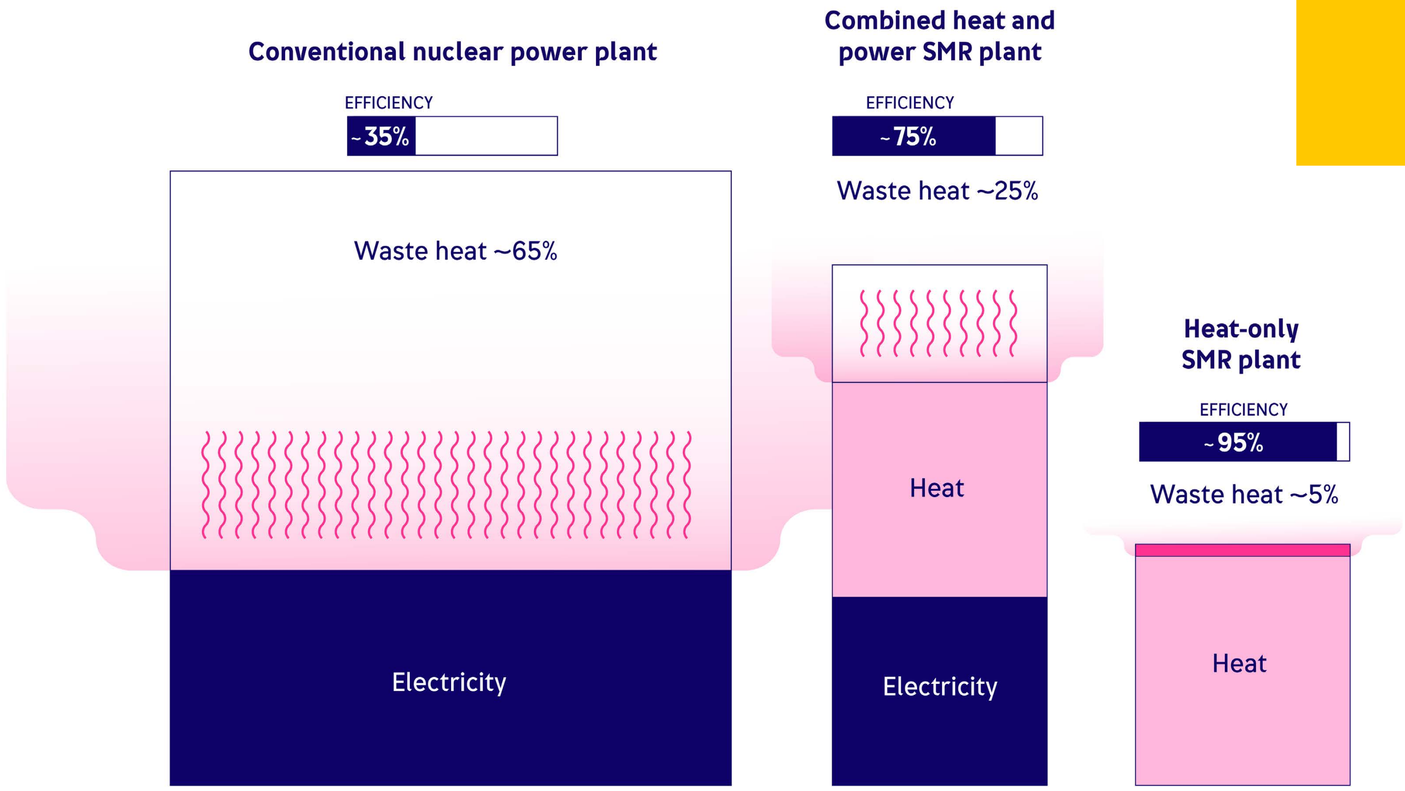
Helsinki has a population of over

700,000

and approximately

90%

of the city's buildings are connected to district heating. This makes Helsinki exceptionally well suited to the use of nuclear energy as a heating solution. Nuclear power could reliably provide as much as half of Helsinki's heat demand.



The proportions in the image illustrate the reactor capacity of the plants. The project's environmental impact assessment examines the potential maximum capacity of the plants: the maximum reactor capacity is 630 MW for heat-only plants and 1,400 MW for cogeneration plants. The nuclear power plants implemented in recent decades can have a reactor capacity exceeding 4,000 MW.

Small modular reactors' capacity and the production ratio of electricity and heat vary according to energy demand. Waste heat is mainly directed to the sea.

Low-emission energy until the next century

Helen's nuclear energy project is based on thorough studies. In recent years, we have examined various ways to produce district heat without combustion and adopted new production methods.

In the coming years, we will focus particularly on the utilisation of waste heat from data centres. They will be a significant part of heat production by 2040. Waste heat can significantly reduce the need for combustion, but it alone is not enough to replace it. As data centres also consume electricity, they also do not eliminate the risk of Helsinki's heat production being fully dependent on electricity transmission.

Examples of other alternatives for heat production which we have investigated include the transport of industrial waste heat to Helsinki from the Kilpilahti industrial area in Porvoo or from the Loviisa nuclear power plant. We have also investigated the possibility of using seawater heat. While the solutions are technically possible, moving forward with them is not feasible due to a number of challenges. All of the explored options are similar in the sense that they would require significant investments, implementation would be complex and the long-term functionality would be uncertain.

For the use of seawater heat, the biggest challenges would consist of very high investments and the uncertain availability of sufficiently warm water during the winter.

The operational lifespan of the Loviisa nuclear power plant will end in 2050. The structure of industry in Kilpilahti is also undergoing a transformation, so there is no certainty about the availability of waste heat in the future.

The new nuclear power plant built in Helsinki, in turn, would have an operational lifespan of at least 60–80 years, which means it would guarantee low-emission energy production into the 2100s.

In order for Finland to achieve its climate targets, electricity and heat production must be virtually

emission-free

by the end of the 2030s. Nuclear power plays a significant role in achieving this goal.

The energy system of the future needs to be not only low in emissions but also

reliable.

To this end, energy will be produced using multiple complementary solutions, such as renewable energy and nuclear power. At the same time, energy storage systems will be strengthened.

Several countries have incorporated small modular reactors into their plans to strengthen low-emission energy production and

energy security.

The objective of the European Commission is that the first commercial small modular reactors will be taken into use in the 2030s.

The **electrification**

of transport, heating and industry, as well as the growth of the data centre industry, will increase the need for stable electricity production in the coming decades.

The stages of Helen's nuclear energy project

The planning and construction of a small modular reactor is a long process that involves many different stages. The planning, zoning and various permit procedures associated with the project will take several years.

The environmental impact assessment examines the project's impacts and provides information to support planning and decision-making. The Government can issue a decision on the building permit after the environmental impact assessment has been carried out, the City of Helsinki has zoned the area and the Radiation and Nuclear Safety Authority (STUK) has assessed the safety of the project.

Residents and stakeholders can participate in the discussion and influence the project both in connection with the environmental impact assessment and during zoning. During these stages, it is ensured that the project's impacts are carefully assessed and the various parties concerned are consulted before decision-making.





PART 2

Environmental impact assessment

Environmental impact assessment

The alternatives associated with the project and their impacts are assessed within the environmental impact assessment procedure. Residents, public authorities, communities and other stakeholders have the opportunity to participate in the assessment and present their views on the project.

Environmental impact assessment is a two-step process

The EIA procedure starts with the EIA programme in 2026. It explains which impacts are assessed and how the assessment is carried out. It is possible to give feedback on the programme and present views on which impacts would be important to take into consideration in the assessment.

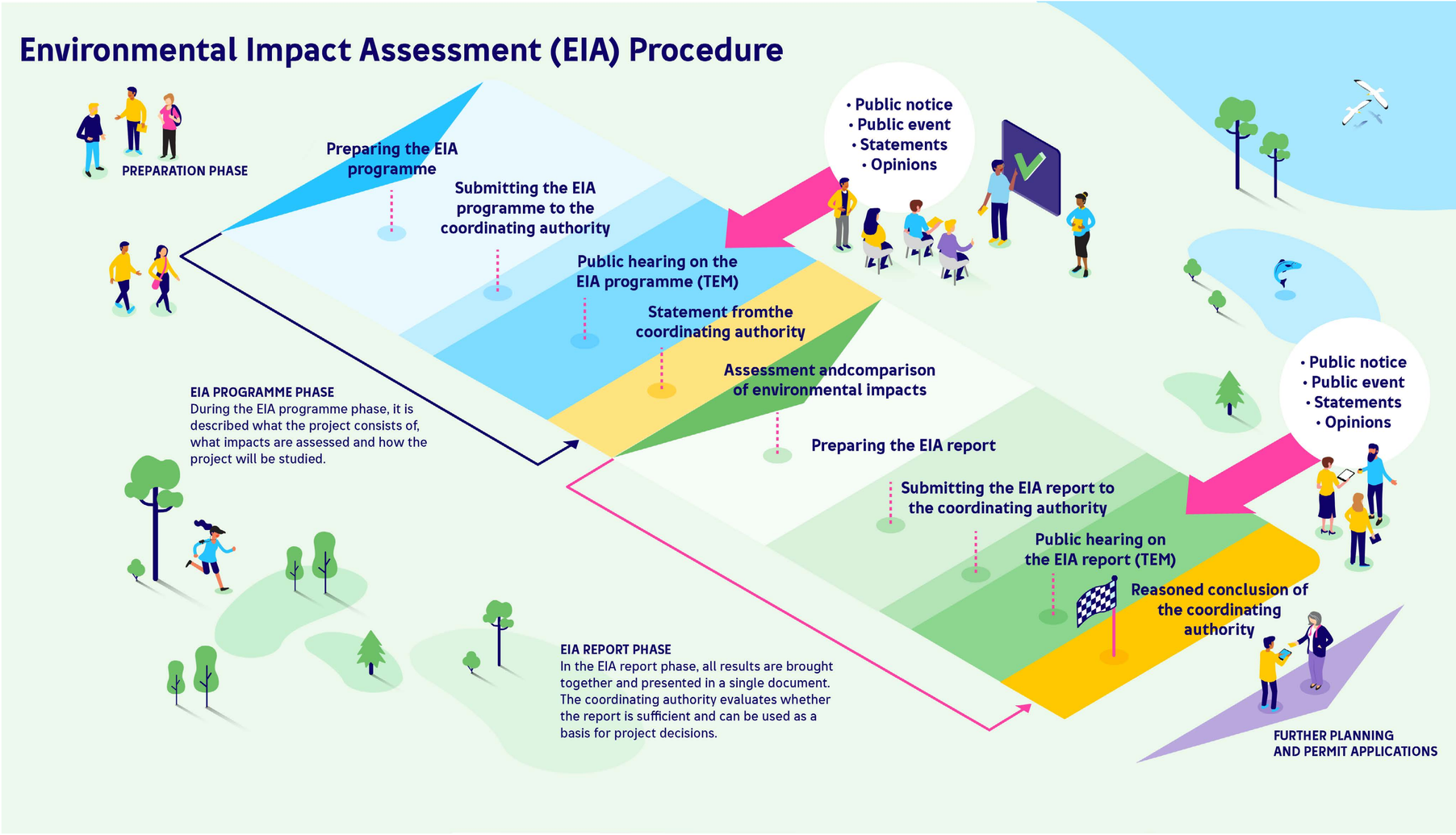
When the assessments have been completed, their results will be compiled in an EIA report in 2027. It is also possible to submit opinions and statements on the EIA report. The Ministry of Economic Affairs and Employment, which acts as the competent authority in the EIA procedure, will then evaluate the adequacy and quality of the EIA report, also taking into consideration the statements and opinions submitted. Based on its evaluation, the ministry issues a reasoned conclusion on the likely significant environmental impacts of the project.

The results of the EIA and the reasoned conclusion are used in the subsequent planning of the project and the related permit procedures.

You can participate in the EIA process in the following ways, for example:

- by reviewing the material published about the project
- by giving feedback on the EIA programme and EIA report during the public display period for each
- by participating in public events and discussions

More information about participation opportunities:
helen.fi/nuclear
tem.fi/en/helen-nuclear-power-plant
tem.fi/en/helen-eia-programme



What issues are addressed in the EIA?

The objective of the EIA procedure is to determine what kinds of impacts the project could have on the environment, people and the surrounding society during the construction and operation of the nuclear power plant. No decisions concerning the project are made in the assessment procedure. Instead, it provides information to support decision-making and enables an open discussion about the impacts.

The assessment examines, among other things:

- impacts on people's health, living conditions and comfort
- impacts on nature, fauna and birds
- impacts on surface water and groundwater
- impacts on the landscape and cultural environment
- impacts on traffic
- impacts on air quality
- noise and vibration during construction and operation
- climate impacts
- impacts on safety and the impacts of exceptional and emergency situations
- impacts on land use and urban structure

A survey on regional economic impacts will also be conducted in connection with the project. The results of the survey are presented in the EIA report.

Examples of assessed impacts

Marine area and the impacts of cooling water

A cogeneration plant that produces electricity and heat requires a cooling solution in which part of the heat generated in the plant is transferred into seawater. For this reason, the environmental impact assessment involves a careful study of the impacts of cooling water on the temperature, water quality and biodiversity of the marine area. The assessment examines, among other things, the dispersal of warm water in the marine area and the potential impacts on the fish stock, benthic animals and underwater nature. The impacts of cooling water are assessed with the help of modelling, information on the current state of the area and separate water systems surveys and nature surveys.

Nature and protected areas

The project's impacts on nature are comprehensively investigated in all of the areas under examination. The assessment covers, among other things, vegetation, habitats, fauna, birds and ecological corridors. In addition, potential impacts on nature reserves and Natura 2000 areas are assessed. The aim of nature surveys is to identify valuable nature sites and ensure that their special characteristics are taken into consideration in the planning of the project. Particular attention is paid to areas where protected species or significant natural values are located.

Radioactive waste and spent nuclear fuel

The EIA examines the on-site treatment and interim storage of spent nuclear fuel generated by the plant's operations, as well as the treatment, storage and potential on-site final disposal of low level and intermediate level waste. The final disposal of spent nuclear fuel is excluded from this EIA procedure. The assessment investigates what kinds of environmental and safety-related impacts may be associated with nuclear waste.

Impacts on people's everyday life

The impacts of the nuclear energy project are also examined from the perspective of people. The assessment examines, for example, the impacts of the project on the living environment, recreational areas, mobility, perceived safety and land use. Impacts during construction can include, for example, increased traffic, noise, vibration and construction site operations. Studies, expert assessments and feedback from residents and stakeholders are utilised in the assessment. The aim is to establish as comprehensive a picture as possible of the project's impacts on people in the surrounding areas.

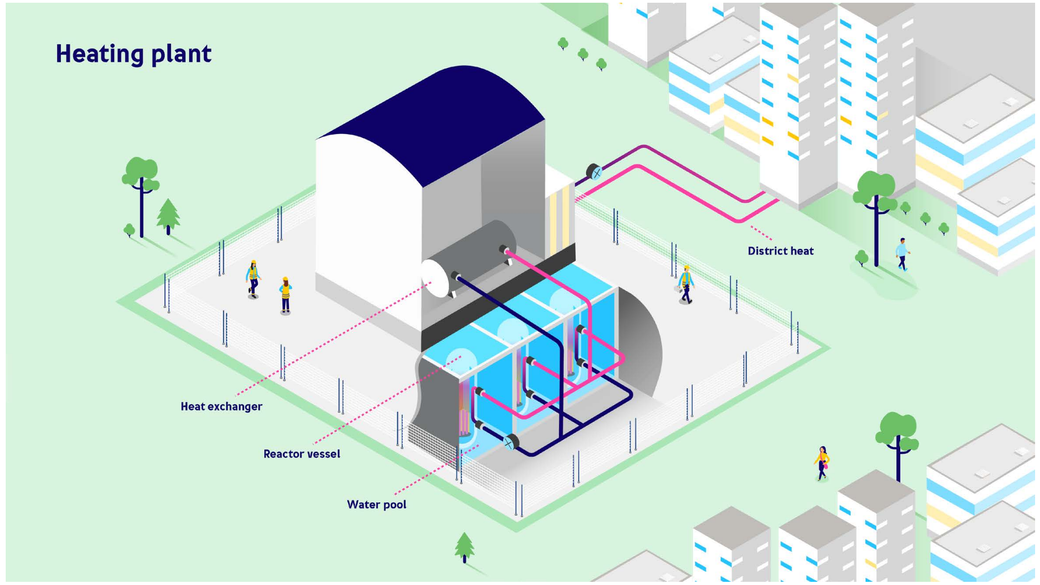
The climate impacts of the project

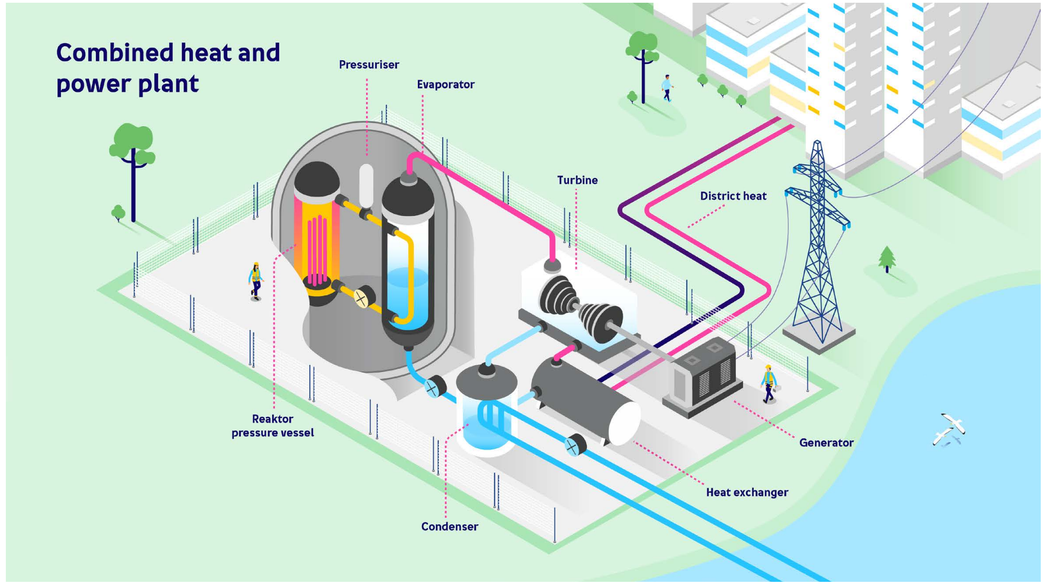
The climate targets of Helsinki, Uusimaa and Finland require significant emission reductions in the coming decades. The EIA examines the climate impacts of the project from the full life-cycle perspective. The assessed issues include, among other things, greenhouse gas emissions during construction and use, the fuel chain and decommissioning. The assessment also compares the project options with a scenario where the nuclear power plant is not built, and energy production is based on other forms of production.

Comparison of options

The EIA does not examine only one option. The assessment compares different sites, plant types and technical solutions, as well as the zero option in which the nuclear power plant is not built. The aim is to identify the key differences, benefits and potential adverse impacts of the different options to support decision-making. The EIA report also presents the means by which the project's adverse environmental impacts can be prevented or reduced.

Preliminary technical data of the plants





In the plant options explored by Helen, the plant's reactor is placed either completely or partially underground. The illustration shows a pressurised water reactor but, for a CHP plant, a boiling water reactor is also an option.

A heating plan produces only district heat. The heat generated in the reactor is transferred directly to the district heating network for the heating of buildings and domestic water. As all of the heat generated is used in heat production, the plant does not require seawater cooling and does not discharge heat into water systems.

A combined heat and power plant produces both electricity and district heat simultaneously. Unlike in the existing Finnish nuclear power plants, part of the heat generated by the reactor is used via district heating for the heating of buildings and domestic water. This way, a larger amount of useful energy can be produced from the same amount of energy and the efficiency of the energy system can be improved.

	Heating plant	Combined heat and power plant
Energy generated	District heat	District heat and electricity
Number of reactors (max.)	18	1.
Reactor heat output (max.)	630 MW	1,400 MW
District heat output	600 MW	700 MW
Electric power	-	500 MW
Efficiency	about 95%	65–75% (35% in condensing mode)
Heat output discharged to the water system, maximum	-	about 1,000 MW
Cooling water requirements	-	about 25 m³/s
Space requirements of the plant area	about 12 ha	about 20 ha

The EIA examines the maximum outputs of the plant options. Helen is exploring several different plant options. The characteristics of the final plant will be specified further as the planning process moves forward, and may be smaller in scale.



Plant site options

Three potential plant sites in Helsinki are examined in the EIA. The options differ in terms of the existing energy infrastructure, the environment and the new connections required, for example.

1. Salmisaari

Salmisaari is located in the inner city Helsinki, in an area that has been used for energy production for several decades. For the Salmisaari site, the only option investigated is a heat-only SMR plant in the existing energy production area, in close proximity to high demand for district heat. As the plant would only produce district heat, it does not involve any requirement for new electricity transmission connections or cooling water systems.

The strength of the area is its existing energy infrastructure and its central location as part of Helsinki's district heating network. At the same time, Salmisaari is located in a densely built-up urban environment, which is why the impacts on the cityscape, traffic, land use and nearby residents are assessed particularly carefully.

2. Vuosaari

The Vuosaari power plant area is one of Helen's most important energy production hubs, where several energy production solutions are already in operation at present. Both a heat-only plant and a combined heat and power plant are considered for the area. The location in an existing power plant area makes it possible to take advantage of the existing energy infrastructure and district heating network.

Vuosaari's strengths include its existing energy and network connections and long history of energy production. The implementation of a combined heat and power plant would also require new electricity transmission connections and cooling water arrangements, the impacts of which will be assessed as part of the EIA procedure. The project's impacts on the surrounding urban structure, protected areas and the marine area are examined in particular detail for the area.

3. Norrberget

Norrberget is located in Östersundom in the eastern part of Helsinki. Unlike Salmisaari and Vuosaari, the area is mostly undeveloped, and there is no current energy production in the area. Both a heat-only plant and a combined heat and power plant are considered for the area.

The undeveloped area provides more space for the plant and the infrastructure it requires. At the same time, the project would require the construction of new district heat transmission connections, electricity transmission connections, road connections and other technical infrastructure. For this reason, the impacts on nature, protected areas, land use, the landscape, recreational areas and the construction of new infrastructure are assessed in particular detail for the area.

How is the plant site selected?

The suitability of the plant site options will be investigated in the coming years by means of the EIA procedure and several other studies. Helen's goal is to make a decision on a possible plant site in 2028.

Zoning is the responsibility of the City of Helsinki. The master planning is intended to begin for all of the examined areas in 2027. The zoning process will only proceed until completion for the selected plant site if one of the examined areas proves to be suitable for a nuclear power plant. The master planning is expected to be completed in 2029–2030 and the local detailed planning in approximately 2030–2031.

The final decision on the approval of the plans for the area will be made by the City Council in due course. The start of construction also requires a Government decision in principle, building permits and the approval of the Radiation and Nuclear Safety Authority (STUK).

The goal is for the nuclear power plant to start production during the 2030s.



PART 3

Safety

Safety

Nuclear power has been produced globally since the 1950s and in Finland for nearly half a century. The SMR plants investigated in Helen's nuclear energy project are based on tested technology whose safety has been confirmed and which is also in use in Finland's current nuclear power plants. In addition, SMR plants feature modern safety solutions that further enhance plant safety.

In a nuclear energy project, safety covers the safe design, construction and operation of the power plant, the protection of people and the environment, and safe operation in all circumstances. Safety is ensured by careful planning, continuous monitoring, risk management and preparedness.

Safety is based on multiple levels of protection

The safety of a nuclear power plant is based on the *safety principle of defence-in-depth*. This means that security is ensured through multiple independent layers of protection. If one system fails, the other systems prevent the situation from escalating.

There are also multiple safety systems in parallel. Each of them is able to perform important safety tasks independently if necessary. According to current requirements, the systems must be able to function for several days without external electricity.

Modern safety solutions improve safety even further

Some of the safety systems take advantage of natural phenomena and can function without electricity or operator intervention. This is called *passive safety*. In the event of a disturbance, the reactor shuts down automatically. The cooling of the reactor can be maintained with systems that take advantage of gravity and natural water circulation, for example. The reactor is designed so that the reactor power automatically decreases if the temperature rises.

The reactor can be cooled for extended periods of time with the help of passive safety systems, even if all external connections are severed. All of the plant options investigated by Helen utilise passive safety solutions.

A nuclear power plant is designed for extreme circumstances

A nuclear facility is not an ordinary industrial building. Its design must account for a wide range of scenarios, including unlikely events.

Examples of scenarios that are taken into account include exceptionally strong earthquakes, the crash of a large commercial aircraft, severe storms, flooding, explosions, extended loss of off-site power, as well as illegal and even professional hostile activity.

Safety-critical equipment is protected by strong structures. In all of the SMR plant options explored by Helen, the plant is partially underground. This improves protection against, for example, extreme weather phenomena, collisions and other external threats.

The safety of a nuclear power plant cannot depend on a single source of electricity. That is why a nuclear facility features multiple independent power supply systems. In addition to the actual connection to the electricity grid, nuclear facilities have separate backup power connections and their own backup power systems.

SMR plants contain less fuel and generate less decay heat

Small modular reactors are smaller in size and capacity than the large nuclear reactors built in recent years. Nevertheless, they must meet the same stringent safety requirements as large nuclear power plants.

Due to the lower capacity, the reactor contains less nuclear fuel and radioactive substances. The amount of decay heat, which is a key aspect of the cooling of the reactor, is also smaller when compared to large reactors.

The reactor continues to generate heat after it is shut down, which is why it is important for nuclear safety to ensure the removal of decay heat under all circumstances. Due to the lower amount of decay heat, the cooling systems for many SMR solutions can be implemented more simply than in large nuclear plants.



The authorities monitor safety throughout the plant's lifespan

In Finland, the safety of nuclear energy is based on independent supervision by the authorities, strict legislation and a transparent safety culture. The use of nuclear energy is supervised by an independent authority, the Radiation and Nuclear Safety Authority (STUK), which assesses the safety of nuclear plants at all project stages: before construction, during construction and during the operation of the plant.

Emergency preparedness protects nearby residents

Nuclear power plants also prepare for incidents in which radioactive substances are released due to an accident or disturbance, for example. Although such scenarios are highly unlikely, nuclear facilities draw up contingency plans, train their personnel and conduct exercises on emergency scenarios in cooperation with the authorities.

Emergency preparedness ensures that the plant is brought into a safe state and the potential consequences are minimised even if the reactor sustains damage and the multiple safety measures fail.

The precautionary action zone and emergency planning zone are part of the safety arrangements

The precautionary action zone and emergency planning zone are designated around a nuclear power plant to support the safety arrangements. The existence of these zones does not mean that the areas in question are hazardous to people or the environment. They are safe to live in, move around and lead a normal everyday life. The precautionary action zone and emergency planning zone are based on the precautionary principle and the requirements of the authorities. Their purpose is to ensure that the authorities maintain adequate preparedness to act even during potential emergencies.

The precautionary action zone refers to the area around a nuclear plant where land use can be restricted on the basis of safety requirements. Potential measures to protect the population and the needs of rescue services are particularly taken into consideration in the precautionary action zone. The precautionary action zone may include residential areas, ordinary business activities, recreational areas and nature sites, for example. The precautionary action zone should not include sites that are difficult to evacuate, such as densely populated areas or so-called sensitive sites, such as hospitals or nursing homes.

The emergency planning zone covers a larger area than the precautionary action zone, and the authorities prepare rescue plans for it in advance. Its purpose is to ensure that potential disturbances or accidents can be effectively and systematically prepared for. There are no restrictions on housing or other land use in the emergency planning zone.

The process of determining the precautionary action zone and emergency planning zone of Helen's nuclear power plant is under way. According to estimates, the precautionary action zone of a combined heat and power SMR plant would have a radius of about 500–1,000 metres from the plant and the emergency planning zone would extend less than five kilometres from the plant. For a heat-only plant, the corresponding distances would be less than 200 metres and less than 800 metres respectively. The determination of the zones is influenced by factors including the amount of fuel used, which is why the zones are larger for a combined heat and power plant due to its higher capacity.

Nuclear fuel is managed throughout its life cycle

The amount of nuclear waste produced by a nuclear power plant is small in relation to the amount of energy produced, and a large proportion of the nuclear waste consists of supplies used during the maintenance of the plant, such as personal protective equipment and cleaning equipment. The treatment and final disposal of nuclear waste is subject to strict requirements, and compliance is monitored by the Radiation and Nuclear Safety Authority. Helen will be responsible for the safe management of nuclear waste, and the related costs, throughout the plant's lifespan.

Nuclear power plants use fuel made from uranium, the procurement of which takes into account safety, the security of supply and responsibility. In accordance with general industry practice, spent fuel is stored safely on site prior to final disposal.

Finland is an international forerunner in the final disposal of spent nuclear fuel. The aim of final disposal is to permanently isolate radioactive substances from the environment so that they do not cause harm to people or nature. Helen will plan the final disposal solution for spent nuclear fuel as the project progresses. The construction of a nuclear power plant is conditional on a nuclear waste management implementation plan approved by the authorities.



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Helen Nuclear Ltd website:
helen.fi/nuclear

The project's environmental impact assessment programme on the website of the Ministry of Economic Affairs and Employment:
tem.fi/en/helen-eia-programme

The project's map application
helen.fi/nuclear/maps

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