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Electricity Distribution Network Development Plan

2026

Pursuant to Energy Authority's regulation
3167/000002/2023

12.6.2026

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1. Strategic forecast for the electricity distribution network regarding changes in the operating environment

1.1. Introduction

Distribution system operators are responsible for distributing electricity and connecting customers to the distribution network within their areas of responsibility. Helen Electricity Network Ltd.'s area of responsibility is geographically limited to the City of Helsinki. While the geographic boundaries are relatively stable, the operating environment changes significantly as society and technologies evolve. Identifying these drivers of change is important so that the company can develop its distribution network in a sound manner. This section reviews the most significant changes affecting the operating environment, together with related forecasts.

In Helsinki, population growth, intensive construction activity and improved energy efficiency have had a significant impact on the development of electricity use.

The clean transition is bringing a range of new factors related to electricity use into the operating environment. Electrifying heating and transport are key objectives for achieving emissions-reduction targets.

The electricity system is one of the most important enablers of the clean transition. Shifting electricity generation to zero-emission sources and using clean electricity in end-use sectors such as heating and transport are key means of achieving the targeted emissions reductions. Finland's goal is to be carbon neutral by 2035, meaning that in 2035 Finland's carbon sinks must be equal to its greenhouse gas emissions. This requires emissions to be reduced from the current level.

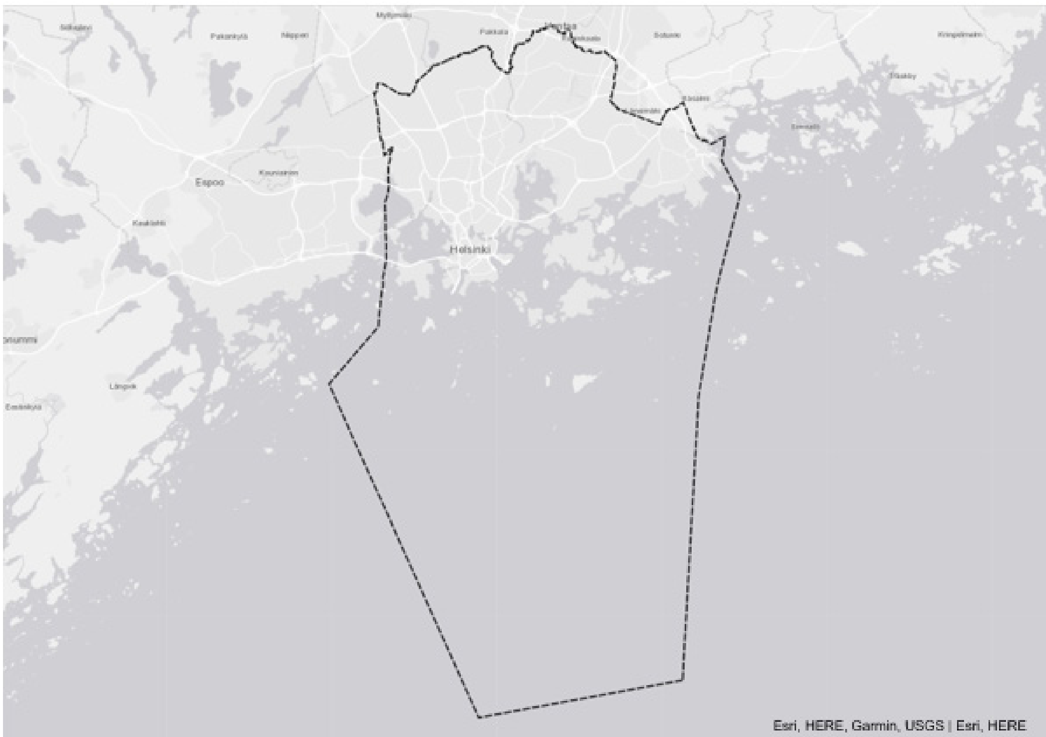

Figure 1. Helen Electricity Network Ltd's area of responsibility.

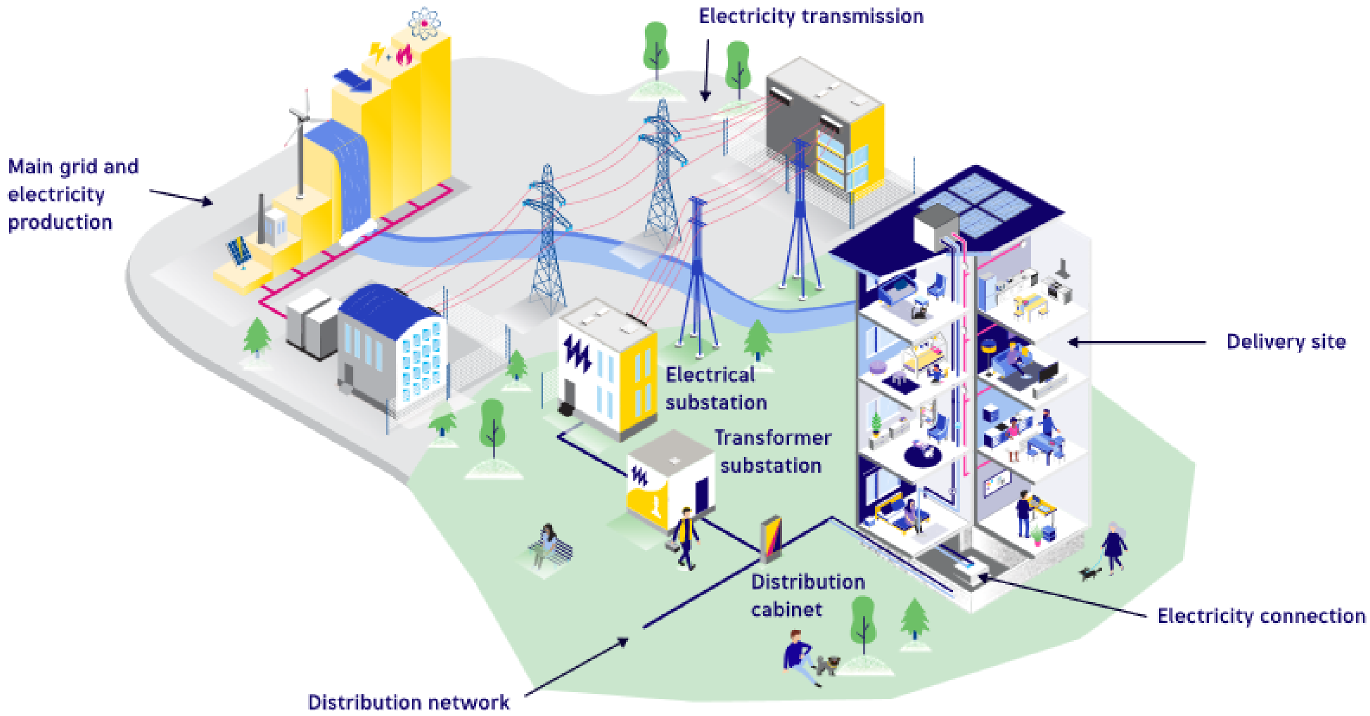

Figure 2. Stakeholders and interfaces of the electricity power system.

In Helsinki, the largest sources of carbon dioxide emissions (estimate for 2025) are transport emissions (43%), heating of buildings (35%) and electricity consumption (17%). To reduce emissions, Helen Ltd, owned by the City of Helsinki, has, among other actions, stopped burning coal in Helsinki. This affects both electricity and heat production. For heat production, alternative solutions must be found locally, because heat cannot be transmitted over long distances as cost-effectively as electricity. Going forward, the electricity system will play a significantly larger role in heat production, since electrical energy can be generated further away and converted into heat energy closer to where it is needed. Electricity can thus be produced where it can be generated as cleanly and cost-effectively as possible.

Helsinki has many significant and highly critical sites where security of electricity supply is vital. These include, among others, the central government administration, the central hospital of Finland's largest hospital district and a total of five hospitals, key functions of Finland's economy, concentrations of energy production, the main rail and metro transport hubs in the Helsinki metropolitan area, a military area, around 60 embassies, data centres, one of Europe's busiest passenger ports (2025), and a major freight port.

1.2. Long-term outlook of electrical energy consumption

Electricity consumption is expected to continue growing due to population growth, changes in heating methods, electric transport, and new solutions by large customers. The biggest factors increasing electricity consumption are changes in building heating systems and the electrification of district heating production, as well as new solutions by large customers. On the other hand, the decline in specific electricity consumption reduces electricity use in services, slightly slowing consumption growth. Rising interest rates and weak economic prospects have affected construction activity, which will be reflected in the coming years as slower-than-usual growth in energy consumption in housing.

Over the past two years, peak demand has increased by approximately 200 MW (25%) and will continue to grow strongly for at least the next two years. In 2028, peak demand is forecast to be around 1,500 MW—al-

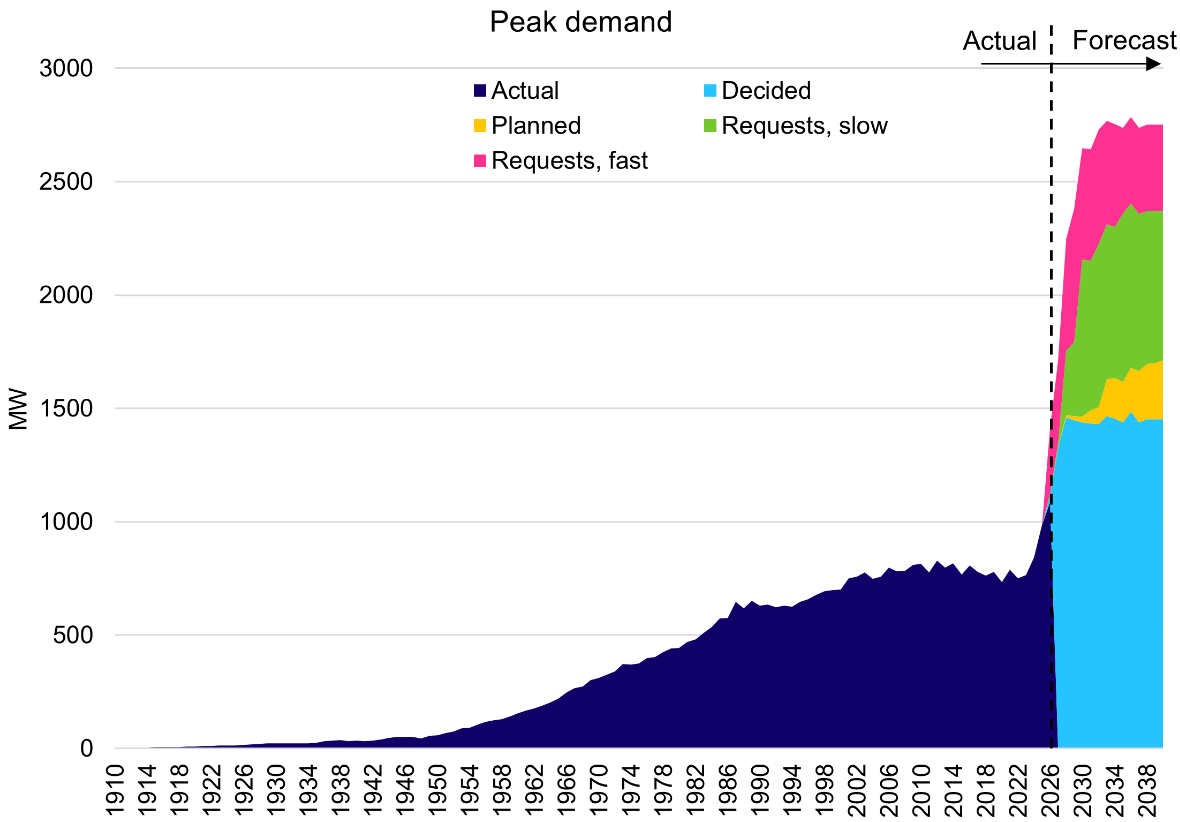

Figure 3. Long-term outlook of peak demand in Helsinki

most double compared to 2024—even if none of the requests were to materialise.

Further into the future, there are significant factors that may increase or decrease electricity consumption, depending on how and where they are used. These include, among others, small modular nuclear reactors and data centres. On the other hand, data centres may reduce electricity consumption for district heating if the centres' waste heat is recovered. Hydrogen production and processing could also significantly increase electricity consumption in Helsinki.

1.3. Electricity consumption drivers

1.3.1. Electrification of district heating and changes in building heating systems

The transformation of heat production in Helsinki is the most significant factor increasing electricity consumption and power flows in the high-voltage distribution network. This is particularly driven by changes in Helen Ltd.'s district heating production. The coal-fired power plant in Hanasaari was closed on 1 April 2023, and exactly two years later the coal-fired power plant in Salmisaari was also closed. As a result of closing these combined heat and power (CHP) plants, both electricity generation and heat production capacities in Helsinki decreased.

Replacement electricity generation capacity is located outside Helsinki, which means that electricity imports from the transmission grid into Helsinki have increased. District heat, in turn, must be produced relatively close to consumption.

Fossil-based district heat production has been replaced in part with bioheat plants, but in particular by increasing the use of heat pumps and electric boilers.

From the perspective of distribution network capacity needs, heat-production solutions based on heat pumps and electric boilers are particularly significant. Heat-pump technology typically produces about 2–3 times as much heat as the amount of electricity consumed. The largest industrial-scale heat pump plants are connected to the 110 kV network. In addition, the combined effect of the increased electricity use of smaller heat pump plants may amount to several tens of megawatts across Helsinki.

In Helsinki, the electricity-consumption impact of district heating production facilities commissioned or to be commissioned in 2021–2026 is at most over 350 MW.

In addition to the above heat-production investments—most of which have already been completed—further investments in electricity-based district heat production are under construction and will be completed in the next few years. The electricity-consumption impact of these investments will rise to hundreds of megawatts across Helsinki, on top of the impact of the investments mentioned in the previous paragraph. In 2027, electric boiler capacity is forecast to be 570 MW. Overall, in 2022–2027 the increase in electricity-based production capacity totals approximately 700 MW, of which about half has already been realised.

The size and location of the heat pump and electric boiler plants that materialise affect their impacts on the electricity network. Much of the existing and committed large-scale heat pump and electric boiler plants are in the inner-city area. This has a very significant impact on power flows in the high-voltage distribution network and in the transmission grid. As a result, substantial reinforcements are required in both the high-voltage distribution network and the transmission grid.

In Helsinki, the aim is to phase out combustion by 2040. This goal would require a so-called small nuclear power plant close to heat consumption. A nuclear plant producing district heat could potentially be in operation in the 2030s. If nuclear power is not realised, this may mean an even greater increase in the electrification of district heat production.

In addition to the heat pump and electric boiler plants used for district heat production discussed in this section, building-specific heating solutions are increasing electricity consumption in Helsinki. The share of heat pump solutions has been seen to grow in both the existing and new building stock.

In the existing building stock, ground-source heat pumps are installed in properties heated by oil or district heating, which in the short-term increase electricity consumption. In new buildings, the alternative to a ground-source heat system would most likely be a district heating connection. In the longer term, ground-source heat may reduce the use of electric boilers in the district heating network and thereby reduce total electricity consumption.

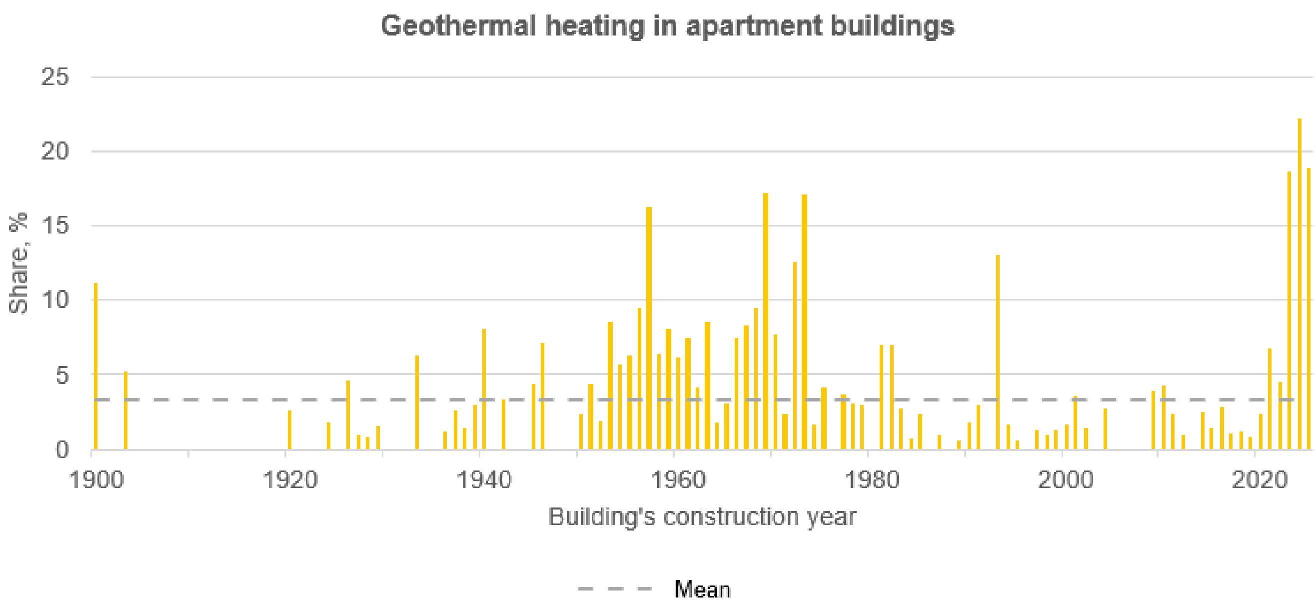

Figure 4. Share of ground-source heat pumps (etc.) in residential apartment building properties.

1.3.2. Electric transport

Electricity consumption at Helsinki's ports is expected to increase due to both the expansion of shore power connections for vessels and the electrification of shipping. At present, shore power systems are available at all Helsinki ports except Hernesaari. During this decade, shore power is expected to expand as the deadline set by EU legislation requiring shore power approaches. However, the role of the South Harbour's Olympia Terminal is expected to diminish as part of port reorganisation. Tallinn traffic would be concentrated in the West Harbour and Stockholm traffic in Katajanokka. New vessel concepts have been developed for the Tallinn route that would operate on electricity. The electricity demand of these vessels is significantly higher than that of shore power connections. Hernesaari has been planned especially as a port for large international cruise ships, where shore power capacities can be high. Port power demand is likely to grow so much that a high-voltage connection—or even multiple high-voltage connections—will be needed. In connection with the ports, opportunities for electric vehicle charging are also being examined. A European regulation requires vessels over 5,000 gross tonnes to use shore power or other zero-emission technology from 2030. Under certain conditions, up to 10% of port calls by vessels of this size may be exempted until 2035.

The electrification of passenger car traffic will significantly increase electricity use in Helsinki. According to Traficom, at the beginning of 2026 there were 214,233 passenger cars in traffic use in Helsinki. Of these, more than 54,492 were electric cars, with "electric car" including both battery electric vehicles and plug-in hybrids. The share of electric cars among newly registered passenger cars in Helsinki is currently around 75%.

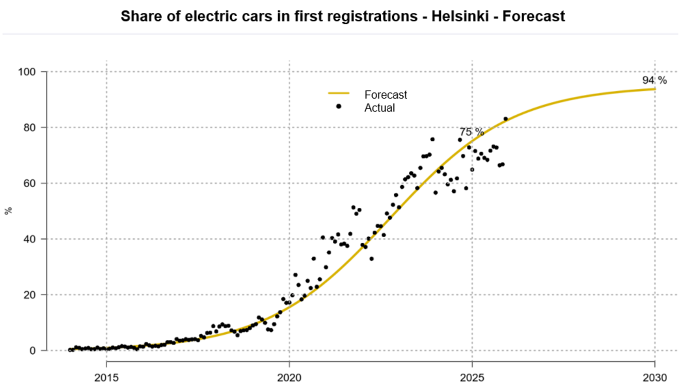

Figure 5. Development of the share of first registrations of electric cars in Helsinki. Data: Traficom

At the forecast registration rate, more than half of passenger cars in traffic use in Helsinki will be electric cars in 2028 and around 95% in 2035.

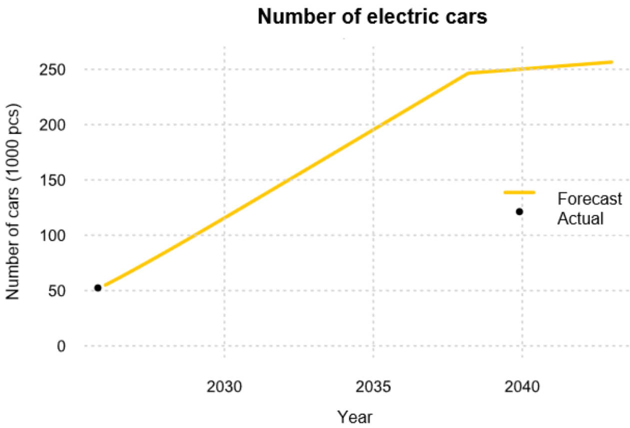

Figure 6. Forecast of the number of electric cars in Helsinki. Data: Traficom

The number of public charging points is expected to grow. The City of Helsinki's target is that by 2030 Helsinki would have around 8,500 public charging points, of which about 10% would be located on streets and in public areas. The charging network will be expanded in accordance with the master plan for Helsinki charging stations. In addition to city streets, charging locations can be found at shopping centres, sports facilities and parking garages.

Electrification is also visible in public transport. The Helsinki Regional Transport Authority (HSL), which operates in the Helsinki region, has published information on the current number of electric buses and forecasts. In 2025, HSL had 600 electric buses in operation, corresponding to more than a 35% share of all buses. The target is to have 733 electric buses in 2026. Electric buses increase electricity use in Helsinki especially locally, as buses are typically charged centrally at depots, and these depots are also located in Helsinki.

Numerous new tramways are planned for Helsinki over the next 10 years:

- Raide-Jokeri began operations at the end of 2023, and the tram line running from Kalasatama to Pasila began operations in summer 2024.
- The Kruunusillat project includes a new light rail line from the Central Railway Station to Kruunuvuorenranta via Korkeasaari, and a tram line from Pasila to Yliskylä. Operations are expected to start in 2027.

- The new Vantaa light rail line is expected to begin operations in 2029 from Mellunmäki via Tikkurila to Aviapolis.
- In West Helsinki, a new light rail line is planned from Lasipalatsi via Munkkiniemi to Kannelmäki, as well as a new tram line from Eira to Meilahti. According to estimates, the new routes in West Helsinki would be in service in the early 2030s.
- Around 2035, two separate light rail lines are planned: from the Central Railway Station via Tuusulanbulevardi to Pakila, and from the Central Railway Station via Viikinmäki to Malminkenttä.

1.3.3. Electrification of industry and data centres

In Helsinki, areas that can be classified as industrial areas include parts of Vuosaari, Pitäjänmäki and Herttoniemi. The share of industry in Helsinki's electricity use is relatively small: around 8% in 2025. Industry accounts for less than 1% of the city's carbon dioxide emissions. Because industrial carbon dioxide emissions are very low, no significant increase in electricity use is expected in Helsinki because of the clean transition in existing industry. Instead, Helsinki may have opportunities to start producing hydrogen on an industrial scale.

In the future, Helsinki may have significant electricity consumption related to hydrogen production. Helen Ltd is developing, within the BalticSeaH2 project, a 3H2 – Helsinki Hydrogen Hub pilot plant in Vuosaari, which combines electricity, heating, transport and energy storage with hydrogen production. The project brings necessary infrastructure to the Baltic Sea region, enabling decarbonisation in several industrial sectors and increasing security of energy supply both in Finland and elsewhere in Europe. Finland and Estonia are the project's most central countries.

At present, there are three data centres in Helsinki, one of which is connected to the high-voltage network and two to the medium-voltage network. So far, the impact of data centres on electricity use has been manageable, but the number of data centres is expected to grow. At the moment, new enquiries total around 500–1,000 MW by 2035, and their number is expected to increase. As a result of a European Union decision, new data centres must utilise waste energy if it is technically and economically feasible.

1.4. Changes in electricity generation

1.4.1. Development of large, combined heat and power (CHP) plants

At present, there are two combined heat and power (CHP) plants producing electricity and heat in Helsinki. Their production capacities are listed in Table 1.

Table 1. Helen Ltd.'s CHP plants in Helsinki.

Power plant	Electricity generation (MW)	Heat generation (MW)
Vuosaari A	165	162
Vuosaari B	510	420

https://www.helen.fi/tietoa-meista/energia/voimalaitosten-tuotantotehot

The closure of Hanasaari and Salmisaari power plants has had a significant impact on electricity transmission in the high-voltage distribution network and the transmission grid. Previously, in winter it was often the case in Helsinki that electricity generation exceeded electricity consumption, in which case electricity was transmitted from Helsinki to the transmission grid. The highest transmission from the transmission grid was achieved during summers, when CHP plants were not in operation. The situation has now changed due to the closure of the Hanasaari and Salmisaari power plants and the increase in electricity use. The highest transmission from the transmission grid now occurs in winter, and significantly more electricity than before has been transmitted in the high-voltage distribution network to the inner city. As electricity consumption continues to increase, transmission from the transmission grid and transmission in the high-voltage distribution network to the inner city will increase further in 2026 and 2027.

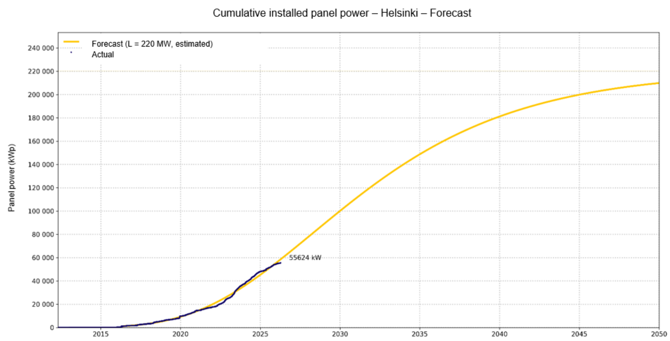

Figure 7. Cumulative rated capacity of installed solar panels and forecast.

In Helsinki, microgeneration is in practice solar power generation. Approximately 56 MW of solar panels have been installed in Helen Electricity Network Ltd.'s area. Over the past year, around 6 MW of solar generation has been installed. At this pace, over ten years about 108 MW of additional solar generation sites would be installed, but the low electricity price may slow down the installation rate faster than falling technology costs speed it up. In Helsinki, it has been observed that at most around one quarter of installed generation is visible as power fed into the distribution network. The share of installed capacity that is visible in the network has increased, but most of the generation is still used for self-consumption.

1.5. Urbanisation and population development in the distribution area

Helsinki's population has grown for a long time and is expected to continue growing. At the end of 2025, Helsinki had 694,392 residents. The latest population forecast by the City of Helsinki includes three scenarios: slow, baseline and fast. In every scenario, the population increases. In ten years (2036), the population is expected to be around 770,000.

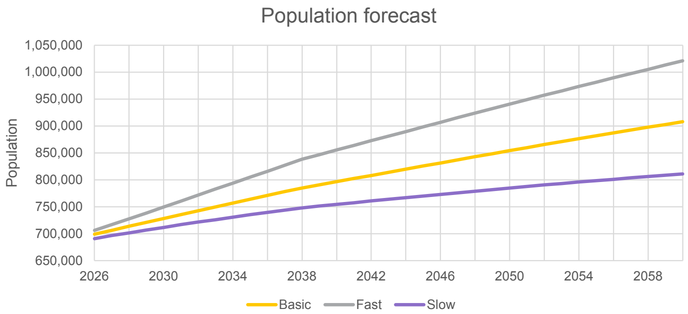

Figure 8. Forecast of Helsinki's population by year.
Data: City of Helsinki, City Executive Office, City data

Population growth implies substantial additional construction. The City of Helsinki has produced a forecast for residential floor area. In 2020, the total residential floor area was 31 million m2. In 2028, residential floor area is expected to be 35 million m2 (+13%) and in 2036 correspondingly 39 million m2 (+26%).

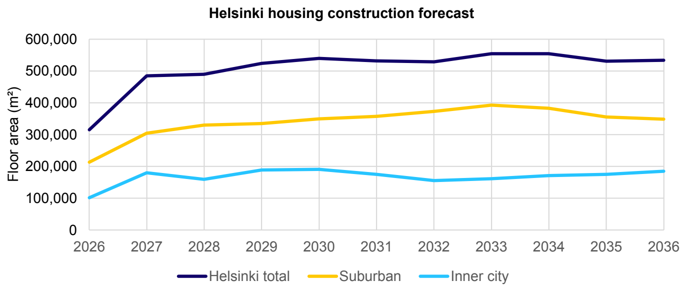

Figure 9. Forecast of residential construction across Helsinki, in the suburbs and in the inner city.
Data: City of Helsinki, City Executive Office, City data

In Helsinki, construction volumes vary locally. In some districts—especially in the inner city—no new production is planned, and the population may even decrease slightly in some areas. In the suburbs, by contrast, residential construction is expected to increase from the current pace, which would also mean population growth.

In the latter half of 2022, residential construction experienced a downturn. Contributing factors include economic uncertainty and rising interest rates. The impact of these factors is also visible in the commercial property market. The downturn will appear with a lag in the annual number of completed dwellings. Over the long term, construction activity in Helsinki remains high and the population will continue to grow.

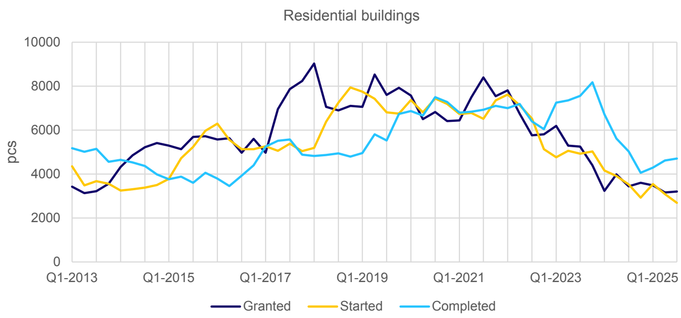

Figure 10. Rolling annual totals of permitted, started and completed residential buildings in Helsinki.
Data: City of Helsinki, City Executive Office, City data

1.6. Changes in electricity consumption in housing, services and heating methods

In Helsinki, roughly one quarter of total electricity consumption is used in services and roughly one quarter in housing. The population is forecast to grow.

Population growth combined with improved energy efficiency in housing has kept the total amount of electricity used in housing nearly unchanged. Electrification of heating and transport will increase electricity use. Electric cars are mainly charged at home, so the specific electricity consumption of housing increases most significantly in this respect. In the service sector, specific electricity consumption has decreased, likely due to energy efficiency, even though building utilisation rates increased before the pandemic. The pandemic increased remote work, which has remained at a higher level than before. The impact of remote work has been reflected in lower specific electricity consumption, for example in office buildings. Solar generation, which is becoming more common in the building stock, is expected to reduce the energy transmitted through the network in spring, summer and autumn. In winter, solar generation does not yet have a significant impact. Across Helsinki, electricity use is highest in winter. So far, solar generation has not eased network dimensioning criteria, even though distributed microgeneration typically reduces the total energy transmitted from the distribution network to the customer. This is because solar generation is seasonal and in Helsinki the highest electricity demand is in winter, when very little solar generation is available.

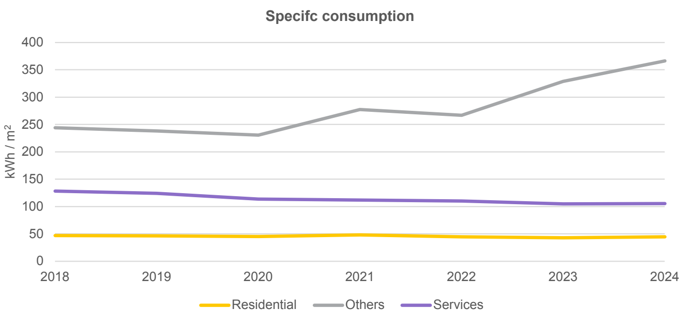

Figure 11. Development of specific electricity consumption in housing, services and other uses. Data: Helsinki area series and Finnish Energy

In residential buildings, an increase in ground-source heat sites has also been observed in apartment and terraced houses. In detached houses, ground-source heat has been a popular heating method for longer. The main reason for the shift has been seen as the higher price of district heating and oil. With the closure of coal-fired power plants, the price of district heating has come down, which may slow the shift to ground-source heat especially in apartment buildings. However, heat pump solutions also enable cooling, so price alone does not directly determine the chosen heating method. Heat pumps are expected to increase a customer's electricity use when they replace district heating or oil heating. In addition, heat pumps are also used for cooling, which may be one reason why the specific electricity consumption of housing has not decreased much in recent years. Most apartment and terraced houses are connected to the district heating network, and the share of oil heating is still a few percent. In detached houses there are more oil-heated buildings than in apartment and terraced houses.

1.7. Requested numerical information

1.7.1. Numerical values for the requested information

Verbal explanations for the numerical values in Table 2 are provided below.

Table 2. Helen Electricity Network Ltd.'s current-state and forecast values.

	Current state (*2025*)	**Forecast (*2035*)**
a. Energy transmitted in the network area (MWh)		
i. Energy transmitted to network service customers	5 396 000	7 372 000
ii. Energy received from network service customers	637 000	170 000
b. Number of delivery sites (pcs)	440 400	530 000
c. Distributed generation		
i. Total rated capacity (kWp)		
a) Connected to the high-voltage distribution network (HV)	735 000	675 000
b) Connected to the medium-voltage distribution network (MV)	17 700	48 700
c) Connected to the low-voltage distribution network (LV)	40 500	111 300
ii. Number of sites (pcs)		
d) Connected to the high-voltage distribution network (HV)	less than 5	less than 5
e) Connected to the medium-voltage distribution network (MV)	140	400
f) Connected to the low-voltage distribution network (LV)	2 900	7 900
d. Number of connections used for public charging of electric transport (pcs)	500	2 000

1.7.2. Verbal explanation of how the above numerical values were derived

Current state

- Energy transmitted and received has been measured per delivery site.
- The number of delivery sites equals the number of installed energy meters.
- The distributed generation data comes from the network information system. The number of sites and rated capacities correspond to information reported by customers. A generation facility is marked as connected to the medium-voltage (MV) distribution network if the customer's connection point where the facility is located is an MV connection. It is likely that within the customer's internal network the generation facility is connected to the low-voltage (LV) network.

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- The number of connections for public chargers is the sum of those connections in the customer information system that mention electric vehicle charging (no distinction is made between public and private, because the network information system does not contain information on which devices in a connection's internal network are for private use and which are for public use). According to the customer information system, there are around 600 connection points referring to EV charging and 500 connections.

Forecast
- Energy transmitted to network service customers is an estimate of the annual energy volumes of future electricity delivery sites. This includes forecasts for construction in Helsinki, the development of specific consumption, changes in heating methods, electric transport, and the transfer-reducing impact of solar generation.
- Energy received from network service customers estimates the annual output of future generation facilities into the distribution network. It includes both large-scale generation and distributed microgeneration.
- The number of delivery sites is an estimate of the number of meters in use based on historical data. The forecast assumes that the weak economic situation will improve quickly.
- Total installed solar panel capacity is a forecast based on the observed pace of growth in generation and its development, as well as Helsinki's overall solar electricity potential, of which around 40% is estimated to be realised. The split between the LV and MV networks is assumed to follow current shares.
- The number of connections referring to charging is a forecast assuming growth continues at the same pace.

1.8. Weather phenomena

In Helsinki, the low-voltage and medium-voltage networks are, in practice, storm resilient due to the high cabling rate. In rare cases, flooding may affect low-voltage and medium-voltage substations and distribution cabinets. The high-voltage network is still largely an overhead line network, which is more exposed to weather phenomena.

Severe climatic events may involve flooding. Flooding may be caused by sea-level rise or flooding of the Vantaa River, or by heavy rainfall. Damage to a large trunk water main or a district heating pipeline may locally cause a flood like situation. Flood levels are considered in the overall planning of the City of Helsinki's infrastructure. From the perspective of electricity distribution to properties, it is not sufficient that the supplying distribution network components are protected from flooding, because power supply must also be disconnected in situations where customers' electrical installations are exposed to floodwater. For this reason, preparedness for flooding is implemented in accordance with the Flood Strategy through comprehensive temporary or permanent area-based solutions (typically flood embankments, pumping stations and improved drainage). Because flood risk management is to a significant extent carried out through measures that do not fall under electricity network development and are implemented by other parties, connection points located in risk areas have not been included within the scope of non-compliance with quality requirements. However, risks caused by sea-level rise have been considered in this development plan.

Based on the network information system's flood map, it is possible to see which sites a potential rise in water level would affect. In a flood situation, this helps prioritise sites that should be kept energised, for example by pumping water away, and which sites should be de-energised if necessary. For properties, responsibility for actions lies with property owners. To this end, the City of Helsinki has prepared flood guidance that advises residents on how to prepare independently for sea and inland flooding. The guidance has been distributed to all properties located in flood hazard areas.

After the exceptionally high sea level experienced on Finland's southern coast in January 2005 (recurrence about once every 110 years), the City of Helsinki appointed a working group tasked with preparing a plan for flood preparedness and flood protection for the City of Helsinki. As part of preparing the plan, electricity distribution network risk sites in flood-prone areas were also investigated. The outcome of the working group's work was the City of Helsinki's Flood Strategy, which prioritises protection measures in different areas and revises guidance on minimum permitted building elevations. In addition, the Centre for Economic Development, Transport and the Environment for Uusimaa

(ELY Centre) has prepared a flood risk management plan for the coastal area of Helsinki and Espoo for 2022–2027. The above documents describe the responsibilities of different actors and the measures to be taken in the event of flooding.

As the climate warms, changes in extreme temperatures, increased precipitation and changes in flood boundaries are considered in dimensioning. With respect to wind, Helsinki has coastal conditions, and this is considered in dimensioning the 110 kV overhead line network.

1.9. Other factors

1.9.1. Impact of the regulatory model on investment capacity

The regulatory model that entered into force at the beginning of 2024 significantly weakens Helen Electricity Network Ltd.'s investment capacity. Helen Electricity Network Ltd has provided more detailed public statements on the impacts of the regulatory model in the consultation "Consultation on the draft confirmation decision on monitoring methods for electricity distribution system operators for the monitoring periods 2024–2027 and 2028–2031" and in the latest consultation "Consultation on amendments to the monitoring methods for pricing of electricity distribution and high-voltage network operations". Due to historically large tightening of the monitoring methods, the profitability of electricity network investments decreases significantly, and therefore Helen Electricity Network Ltd has been forced to adjust its investment programme to safeguard its financial position in the future. The adjustment of the investment programme resulting from the monitoring methods is discussed in more detail in Section 4.8.

1.9.2. Services/competence needs

In Finland, distribution system operators largely purchase, among other things, network construction, maintenance and metering services from external service providers. Sound procurement models and partnership relationships are vital for high-quality operations and their continuity. The service market must also remain healthy and functional so that operations can continue to be high-quality in the future as well. In terms of competence, it is necessary to ensure that both Helen Electricity Network Ltd and all service providers have the required expertise and that this expertise is maintained over time. Attracting young people and students in recruitment and enabling them to complete thesis work is important.

1.9.3. Technology and IT/IT security

There are various ongoing technical developments in the sector that affect development plans. Here are a few examples.

Calculating and minimising the carbon footprint is being incorporated into the operational plans of electricity distribution system operators because of carbon-neutrality targets. First, the company's own carbon footprint must be calculated before it can be reduced. Emissions caused by losses and emissions from procurement are typically the most significant components. This topic area is also linked to the F-gas Regulation, the updated version of which entered into force on 11 March 2024. For electricity distribution system operators, the regulation includes a ban on installing new SF6-insulated switchgear: at medium voltage the ban entered into force on 1 January 2026, and at the 110 kV level it will enter into force on 1 January 2028. SF6-insulated switchgear has been widely used and continues to be used particularly in city-owned companies and at the transmission-grid level. After those dates, only switchgear using alternative gases, compressed air, or small amounts of F-gases may be installed, provided they are competitive in terms of carbon footprint. At Helen Electricity Network Ltd, a study on strategies for using SF6 alternative gases at medium voltage and at the 110 kV voltage level has been completed. The public version of the study is available on our website. Helen Electricity Network Ltd already transitioned at the end of 2024 to procuring SF6-free switchgear for these voltage levels. For the 400 kV voltage level, the SF6 ban will only enter into force at the beginning of 2032, and alternative solutions at this voltage level are still partly under development. Another carbon-footprint-related technology topic is alternative transformer insulating fluids. Instead of mineral oil, natural esters or synthetic esters can be used; the latter are more suitable for Finland's environment. Esters are more environmentally friendly, have a lower ignition risk and may enable reduced fire protection requirements. On the other hand, their price is still higher compared to traditional insulating fluids.

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Especially as loading levels in Helsinki's 110 kV transmission network increase sharply, there is a need to study the loading capability of cables and overhead lines. At Helen Electricity Network Ltd, including with support from consultants, we have assessed the continuous and emergency loading capability of 110 kV cables, refined these limits, and identified possibilities for short-term overloading in exceptional situations. The public version of the report is available on our website. For overhead lines, overloading capability depends largely on outdoor temperature. For both cables and overhead lines, temperature monitoring systems are available, and such a system is already in use on one of the company's 110 kV double-cable connections.

The development and increasing deployment of automation is continuous. In a digital substation, all communications are digitalised and instrument transformer technology is also changed to sensor-based technology. Automation provides additional information about the process and its condition, as well as fault events, and helps reduce time-based maintenance while improving the quality and speed of fault investigations. Sensors can also deliver cost savings. In connection with digital substations, Helen Electricity Network Ltd has carried out studies and assessments on transitioning to the latest technology. Progress has been made, and an application site is the ongoing Pitäjänmäki 110/20 kV substation project. There, the use of sensors and a process bus will be implemented for the first time in Finland at this scale. The substation is scheduled to be commissioned in 2028. The next step could then be centralised and virtualised protection and automation, first at a medium-voltage substation.

Automation extending into the distribution network can be referred to as network automation or substation automation. In Helsinki, the coverage of substation automation is already over 35%. Automation coverage is expanding in the distribution network and is beginning to extend also into the low-voltage network. Automation deeper in the network must be cost-effective, as volumes are already larger. At Helen Electricity Network Ltd, development of low-voltage network management and improved visibility is being increasingly prioritised. With the improved power quality measurement capabilities of the latest generation of remotely read meters (the installation project is already underway), together with a new and more advanced network management system being introduced this year, the situation can be improved.

Network maintenance and condition monitoring are vital parts of network operations. At Helen Electricity Network Ltd, a master's thesis on the topic was completed in 2023. One of the key outcomes was that existing condition-monitoring data and measurements should be utilised more effectively. On the other hand, it is difficult to achieve cost-effectiveness for new condition-monitoring systems, because the number of faults and the amount and cost of maintenance are already low at Helen Electricity Network Ltd. Each new system must be economically justified. In relation to this topic, a pilot is underway for a new type of condition-monitoring system for main transformers based on reviewing an electrical model, at the Herttoniemi substation.

Telecommunications and cybersecurity have become increasingly important in electricity distribution as well. Automation systems require communications for remote operation both between substations and within substations. Telecommunications activities have increasingly shifted toward software-related work and updates. Consequently, cybersecurity for operational information systems and related measures are becoming more necessary and are increasing. This work requires closer cooperation between the IT sector and the OT sector (operational information systems), as well as consideration of these topics in the context of electricity network conditions and network components.

1.9.4. Flexibility

Distribution system operators are encouraged to identify and utilise flexibility as part of more efficient network use, benefiting both customers and the network company. The need for flexibility at the high-voltage distribution network level has materialised on a fast schedule due to changes in electricity and heat production in the area. Electricity generation from combined heat and power (CHP) plants has been phased out, and in its place district heating electrification has brought significant electricity consumption. In addition, other changes that increase electricity consumption (electrification of transport and heating, data centres) are expected to materialise during this decade at large scale. Electricity transmission from the transmission grid will increase. Similar developments are naturally

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occurring in other network companies' areas as well, and this change also challenges transmission-grid development. Due to constraints in the transmission grid, consumption in the Helsinki area must repeatedly be restricted, especially during periods of low temperatures and low electricity prices. In addition, bottlenecks may arise in the 400/110 kV transformation under Fingrid's responsibility and in the area's 110 kV network in certain special operating situations. In the clean transition, schedules are tight, and we want to enable our customers to connect to the network as quickly as possible. Together, we are seeking solutions for potential special network situations that are time-limited, where the customer has the capability to provide flexibility upon request. By utilising flexibility, customers' connections to the network can be accelerated. In this development work, coordination between the transmission system operator, the distribution system operator and customers is particularly important.

Flexible connections are used as the primary flexibility tool. For the time being, all new large-scale connections are implemented as flexible connections until the required network reinforcements have been completed. A flexible connection means that the customer commits to reducing consumption when the available network capacity requires it. This makes it possible to connect customers to the network before the capacity reinforcements have been completed.

In spring 2025, Helen Electricity Network Ltd and Fingrid opened Finland's first flexibility market for congestion management. Through the marketplace, both distribution system operators and the transmission system operator can purchase customers' flexibility capacity when they need power limitation. Customer-side flexibility capability and willingness must also be identified. This same development is guided towards customers, among other means, through customer communications, tariff development and management of connection sizes. Through research and development, the sector is aiming for coordinated, market-based flexibility. Once this activity becomes established, it will be possible to genuinely consider flexibility as an alternative to reinforcing the high-voltage distribution network.

The inherent flexibility of both large and small customers' electricity use has become visible in the strong volatility of electricity energy prices, which materialised in autumn 2022 and has continued. Some customers respond to price changes by adjusting their electricity use based on spot prices—using more electricity during cheap hours and less during expensive hours. Customers therefore have flexibility capability in response to electricity prices. In the electricity distribution network, responding to spot prices means stronger simultaneity of electricity use and a weakening of the traditional natural diversity of loads (load diversity). In the network, this may appear as increased loading during periods of low spot prices, and in some cases as overloading of a customer connection or parts of the network. Price-driven response has made customers' flexibility capability visible. Utilising this flexibility capability in distribution network operations is future development work, including, for example, services at the customer connection interface and the company's internal development projects related to distribution network state information and controllability.

Tools are being developed for the customer interface to promote flexibility in electricity use. Helen Electricity Network Ltd has developed a connection capacity tool for customers' self-service use, enabling customers to assess the available, unused capacity of their connection. For the time being, the tool can be used to assess the available capacity of an existing connection when the customer is planning new electric vehicle charging infrastructure for that connection. This service promotes flexibility in the customer's charging infrastructure and charging events. Both the customer and the company benefit when available capacity is utilised first and reinforcing the connection—or further, the low-voltage network—may not be necessary. The tool will be further developed, for example to assess electricity use in connection with changes in heating methods.

In future strategic development, flexibility solutions for the high-voltage distribution network are currently an urgent measure implemented in cooperation with the transmission system operator and customers. Development of commercial flexibility market operations will continue, keeping an eye on the future network code on demand response. More generally, the flexible nature of smaller customers' electricity use has become visible as a result of reactions to energy prices. Digital tools will continue to be further developed at the customer connection point to support the utilisation of flexibility for both customers and the network company. In this work, various development initiatives related to customer communications, tools, products and markets, as well as steering mechanisms, form part of future strategic network development. Development work on flexibility naturally also extends to network operations and the planning of future electricity networks.

1.9.5. Reactive power

In addition to active power, reactive power is also transferred in the network. Reactive power arises because the phase angles of alternating voltage and alternating current differ from each other. Reactive power causes additional loading and losses in power lines and other network components. Reactive power also affects network voltage such that reactive power production increases voltage and reactive power consumption decreases voltage. Over the past roughly ten years, the amount of reactive power fed from distribution networks into the transmission grid during low-load situations has increased, raising transmission-grid voltages in some areas. The transmission system operator Fingrid has defined a reactive power window for distribution network companies and other customers, which determines the permitted reactive power transfer between the transmission grid and the customer. If the reactive power window is exceeded, the customer must pay charges to Fingrid. For this reason, network companies have widely invested in reactors to prevent reactive power being fed into the transmission grid, especially during low-consumption periods. Helen Electricity Network Ltd has done the same.

In Helsinki, the medium-voltage network and low-voltage network are almost fully cabled. A large part of the high-voltage distribution network is also cabled. At medium voltage and high voltage, cables produce significant reactive power. On the customer side, reactive power has changed significantly over the past ten years. Especially at low voltage and medium voltage, inductive devices that consume reactive power have decreased, while capacitive devices that produce reactive power have increased. Reactive power produced by the network and customers is fed into the transmission grid unless it is compensated. Helen Electricity Network Ltd has two 110 kV reactors for reactive power compensation, with a total capacity of approximately 86 Mvar at a typical network voltage of 117 kV.

Across Helsinki, the trend in reactive power change for customers connected at low voltage and medium voltage has been around 6 Mvar per year. This describes the combined effect of decreasing inductive reactive power and increasing capacitive reactive power. In addition, 110 kV cabling will increase reactive power production. Due to these factors, reactor capacity must be further increased. At present, the estimate is that before 2030 there will be a need to add approximately 50 Mvar of reactor capacity.

As a new phenomenon at the end of 2023, transmission-grid voltages in Southern Finland were observed to drop to worryingly low levels in situations of high consumption and low generation—i.e., the opposite phenomenon compared to the previously observed voltage increase during low consumption. A decrease in transmission-grid voltages may in the near future restrict electricity consumption in the Helsinki metropolitan area more than other technical transfer constraints. Fingrid will make significant investments in reactive power compensation to raise voltages during periods of high consumption. The transmission grid has already added and will add several capacitors for reactive power compensation in the coming years. In addition, Fingrid plans to install a static synchronous compensator (STATCOM) at the Anttila substation in 2028. Despite this, reactors will still be needed during low-load situations. Helen Electricity Network Ltd does not plan to add capacitors to its network, because in Helsinki voltages remain within the target range provided that the transmission-grid voltage is at a normal level. It may be possible for power plants and customers to support transmission-grid voltage by producing reactive power during high-consumption situations, if an incentive for this can be found.

1.9.6. Utilisation rate

In Helsinki, there is a relatively high share of large low-voltage and medium-voltage connections, and their sizing is also significant for reserving distribution network capacity. Traditional connection sizing methods have considered growth in electricity consumption within the connection itself, but over the past 10–15 years energy efficiency has clearly improved, especially in the service-sector customer segment, and specific consumption has decreased. It has been observed that in large customer connections there is free capacity in the Helsinki area on average as much as 4–5 times compared with measured hourly maximum power. Connection sizing guidelines should be further developed, and, on the other hand, customers can be offered sizing tools as services based on measured data and probabilistic load models derived from it. Helen Electricity Network Ltd has recently developed for its internal use a statistical, probability-based connection sizing tool, and in addition there are tools in use for sizing electric vehicle charging connections. New load curves have been built into the network information system's power flow calculation tool for new user groups. Sähköinfo Oy has just updated the ST 13.31 card used by electrical designers for sizing connections (Sizing the building's electrical network and low-voltage connection), and Helen Electricity Network Ltd has provided material to support the update of that guidance. These tools make it possible to rationalise connection sizes in a more realistic direction.

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2. Basis for the electricity distribution network development plan

2.1. Definition of the electricity distribution network development zones

2.1.1. Development zones

Helen Electricity Network Ltd.'s distribution area is divided into two development zones: the local detailed plan area (1) and the area outside the local detailed plan (2). The distribution area within the City of Helsinki is almost entirely within the local detailed plan area; only a few special areas (including Santahamina and Suomenlinna) and certain islands are outside the local detailed plan, as shown in the figure below. In the map, areas outside the local detailed plan are shown in red.

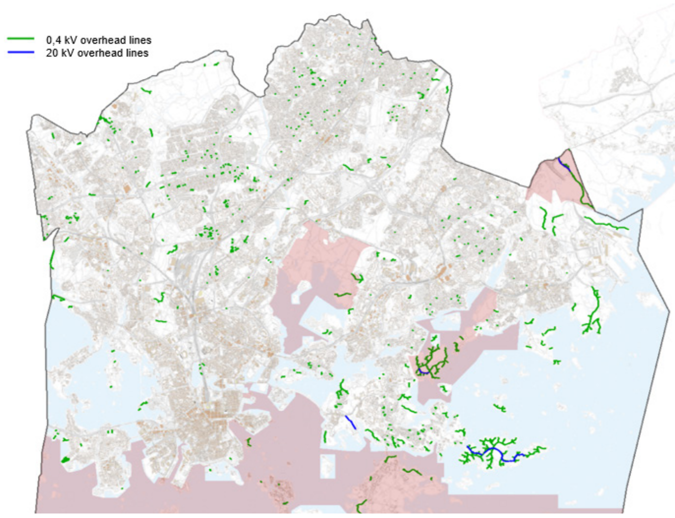

Figure 12. Helen Electricity Network Ltd.'s development zones and overhead line network map

2.1.2. Criteria for the division into development zones

The division into development zones is based on the service-quality requirement levels under the Electricity Market Act, i.e., local detailed plan areas and areas outside the local detailed plan, where unified principles are applied as appropriate in both. Helen Electricity Network Ltd.'s distribution network is almost entirely located within the local detailed plan area, and the network is developed across the whole area in accordance with the same security-of-supply, network planning and construction principles. In other words, the technical solutions are the same across the entire local detailed plan area, with a few minor exceptions. In some areas outside the local detailed plan area (including the islands of Santahamina and Suomenlinna), the electricity network has already been built and developed in the same way as in the local detailed plan area. The local detailed plan is expected to expand later to these and potentially other islands. Since the previous development plans were submitted, the local detailed plan has expanded to Vallisaari and Kuninkaansaari.

The above-mentioned local detailed plan area in Helen Electricity Network Ltd.'s distribution area is, as a whole, a large metropolitan area. The area has a high customer and population density. The service sector's share of consumption is the largest in the area, and the cost caused by interruptions is extremely significant for customers, the city, and in Helsinki's case even for all of Finland. Long and widespread power outages must be avoided. In Helsinki, security-of-supply criteria must be significantly stricter than the spirit of the Electricity Market Act (12-hour interruption-compensation and 6-hour planning criteria), and the security-of-supply criteria and network structure have therefore been designed based on cost caused by interruptions.

The security-of-supply level of the electricity distribution network is measured by the annual average interruption duration per customer, using the term System Average Interruption Duration Index (SAIDI). Around the turn of the millennium, SAIDI in Helsinki was over 20 minutes; in the early 2000s it was at a level of 12–15 minutes. Occasional wider distribution interruptions made it reasonable and cost-effective to target halving the interruption level to 6 minutes by 2015. Several system-technical measures were used to achieve this, which are described in more detail in Section 2.1.3. In the latter part of the last decade, the SAIDI level was reduced to around 3 minutes as a 5-year average, even though low-voltage interruptions have also been included since 2016. A record value of 1.0 minutes was achieved last year, in 2025. These results are already among the best in Europe. Planned low-voltage interruptions must still be added to the figures above; their impact is around 1 minute. It can be said that in Helsinki a customer experiences, on average, a half-hour power outage only once every ten years.

As a planning target level, the security-of-supply target values published by Finnish Energy in 2010 have been used. For city environments, the planning target level set for 2030 is a cumulative interruption time of 1 hour per customer per year, with one exceedance permitted over a three-year period. This target has been pursued for 110 kV and medium-voltage network interruptions; at low voltage, the repair times for individual faults most often exceed this time. This target is largely already being met, and only for a few thousand customers is the annual interruption time of one hour exceeded, which is about one percent of the total number of customers.

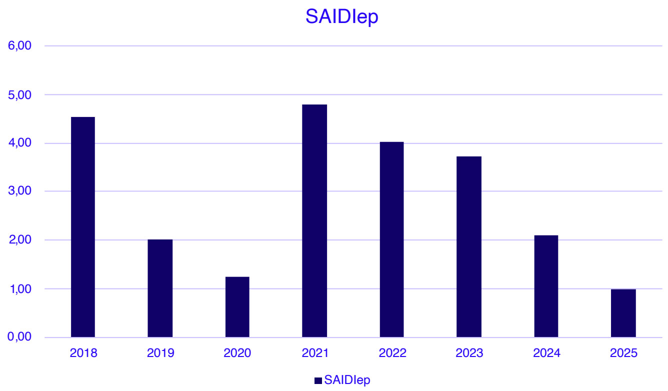

Figure 13. Customer's annual unplanned interruption time, energy-weighted (SAIDIew) 2018–2025

2.1.3. Description of the prevailing factors in the development zones

The descriptions apply to both development zones.

a. Technical characteristics of the development zone and network structural solutions

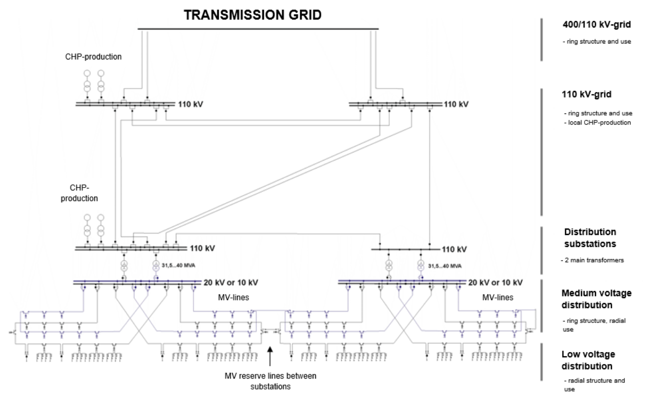

Figure 14. Illustrative basic structure of Helsinki's electricity distribution network

An amendment to the Electricity Market Act that entered into force on 1 January 2026 gave distribution system operators the opportunity to build their own regional 400 kV network as well. In the Helsinki area, the phasing out of combined production and strong growth in consumption creates a need for a 400 kV transmission network. In 2026, Fingrid's 400 kV substation in Vanhakaupunki will be completed, initially fed radially by a 400 kV cable from Länsisalmi. The substation includes one 400/110 kV transformer. In any case, a local 400 kV network is planned in Helsinki as an extension of Fingrid's transmission grid. This concerns 400 kV cables and substations with 400/110 kV transformation. Work on the network model for Helsinki's 400 kV network together with the transmission system operator Fingrid is ongoing, and the model will be refined during 2026.

Figure 14 shows the illustrative basic structure of Helsinki's electricity distribution network, still without the part related to the planned local 400 kV network. Helsinki's electricity network has been built and is being built according to the security-of-supply principles required by a large city. Based on these principles, the network planning principles for the area—and further, the detailed specifications for devices and systems—have been derived. Network development has been carried out in a customer-oriented manner, because widespread and long interruptions are highly harmful in the capital. High customer density easily makes distribution interruptions very significant. The management of both unplanned and planned interruptions is designed based on the customer impacts they cause. Interruptions in the 110 kV network should generally have no impact on customers at all; in the medium-voltage network, typically no more than the fault isolation

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and switching time is allowed; and only in low-voltage network situations would a customer interruption occur, at most for the duration of repair time or planned interruption time.

In cable networks, repair times are generally long. For this reason, network-based redundancy is needed in the 110 kV and medium-voltage networks, which naturally reduces interruption durations to a level an order of magnitude lower than in a radial network.

The security-of-supply and planning principles are implemented, among other things, through the following network principles:

- Looped 110 kV and medium-voltage networks and the ability to restore supply in fault situations
- Redundancy and compartmentalisation of switchgear; gas-insulated 110 kV switchgear
- Cabling of the medium- and low-voltage networks; backup supply connections in the medium-voltage network
- Utilisation of automation at all substations and increasingly at secondary substations
- Use of alarm-based earth-fault protection at medium voltage
- Typical structure of the low-voltage network (service cable network and feeder cable network)

Going forward, a looped transmission-grid connection at 400 kV and a secured 400 kV network must be added to the above. The principles for the 400 kV network must be at least at the same level as those for the 110 kV network, or stricter.

Helsinki has a strong local 110 kV high-voltage network that transmits power to customers and, on the other hand, transmits power from large local CHP plants to the transmission grid. Until now, during the winter season there has been more generation capacity than consumption within the distribution area. The 110 kV network is strongly looped. In the inner-city area, a large part of the 110 kV network is cabled. In the suburban area, the 110 kV network is mainly an overhead line network. The underground cable network is expanding, but no new overhead lines are built anymore. The network includes larger 110 kV hub substations and smaller line substations. In addition to electricity distribution, hub substations also have a through-transmission role for power flowing through the area; for security of supply, their switchgear always has two busbars and at least two sections (often more). Since the late 1970s, gas-insulated switchgear has been used at 110 kV substations; it is more compact than air-insulated switchgear, more reliable and requires less maintenance. In the 110 kV network, N-1 contingency is applied in all outage situations. Where possible, common-mode contingency is also considered.

The objective of the medium-voltage network planning principles is to implement the general medium-voltage distribution network as a ring network operated radially, looped between substations. The distribution rings and loops are implemented so that the load of a substation to be backed up can be supplied via the distribution network from the backup substation.

Substations are duplicated in terms of main transformer capacity, medium-voltage busbars and grouping. The medium-voltage network is also looped in structure, and it is operated as open rings. At least two cable connections are always built to secondary substations. The medium-voltage network is dimensioned so that an entire substation can be fully backed up from neighbouring substations. The medium-voltage network is in practice fully cabled and its capacity is the same throughout the network. In the inner city, due to historical reasons, the distribution voltage is 10 kV; elsewhere the distribution voltage is 20 kV. Secondary substations are either located within properties or are standalone secondary substations. Gas-insulated Ring Main Unit (RMU) type switchgear has been used for a long time. Many medium-voltage customers have connected to the medium-voltage network.

Urban substations are particularly large and include many functions. Therefore, significant effort has been invested in substation automation. Nearly every substation today has station-level communications based either on IEC 61850 communications or serial communications. Field devices are numerical and include extensive protection and control functions. Telecommunications between remote control and substations has also been developed: structurally fault-tolerant fibre-optic connections and the company's internal process communications network are used. Investments have been made in secondary substation automation for more than 15 years. Currently, over 30% of secondary substations are automated with remote control connections, medium-voltage fault location, alarms and low-voltage measurements. Secondary substation automation is beneficial both in normal operation and in fault situations. Going forward, equipping new secondary substations with automation will be considered case by case.

In a cabled, urban medium-voltage network with an extensive grounding network, it is possible to use alarm-based earth-fault protection, i.e., to continue operating the network during an earth fault. Touch voltages during an earth fault are not a problem because grounding conditions are good and fault currents mainly flow into the grounding network. The fault location is isolated without customer interruptions, or at most via short switching interruptions; this approach is applicable in approximately half of medium-voltage network fault situations. Alarm-based earth-fault protection has been used in the 10 kV network for decades. It was also implemented in the 20 kV network as part of the earth-fault current compensation project, which was completed in 2018.

The low-voltage network is radial in structure. However, backup connections have formed naturally during network construction to neighbouring transformer service areas. Some customers are connected directly to the low-voltage switchboard of the secondary substation, while others connect to distribution cabinets located along the low-voltage feeder cables. There are also backup connections between transformer service areas; these often make it possible to back up the load of a transformer service area during a fault or maintenance situation. The connections also provide the grounding connections required by the extensive grounding network.

Outside the local detailed plan area there are no substations, only ring/radial medium-voltage networks and low-voltage networks. The 110 kV network exists in both development zones, but outside the local detailed plan area the 110 kV network is only present as through lines. As the local detailed plan expands, the electricity network will also expand as part of the development of municipal infrastructure.

b. Electricity consumption sites and special needs related to electricity use in the development zone

The technical characteristics and structural solutions of the development zone are described in the previous section.

At present, there are only a few large, point loads connected to the 110 kV network, but their number will increase in the coming years, and the power level of individual connections will rise to the 200 MW range. In the local detailed plan area, a significant customer group in terms of electricity use is the private and public service sector, which uses around 25% of the area's electrical energy. Part of this customer group consists of highly critical consumption, with low tolerance even for short power outages. Important consumption is present at every substation and on a large share of medium-voltage feeders. On average, each medium-voltage feeder has at least one medium-voltage customer connection. Another significant customer group is municipal services (including electric heat production), which uses around 25% of the area's electrical energy.

Outside the local detailed plan area, there are mainly holiday homes and island settlements.

c. Environmental conditions and soil in the development zone

As source data for defining the network's construction environment, CLC (Corine Land Cover) data has been used. In development zone 1, which covers the local detailed plan area, the placement environment of the electricity network consists mainly of built-up areas, which account for about 70% of the development zone's land area when water bodies are excluded. The other parts of the area consist mainly of open heathlands, rocky ground, forests and agricultural areas, but these areas do not have significant electricity consumption and therefore also very little electricity network. In development zone 1, both the high-power density of electricity use and the density of other infrastructure are emphasised, which create significant costs for building the electricity network, especially in terms of surfacing and land-use costs. The area also includes several significant and critical electricity consumers. The five largest CLC (Corine Land Cover land-use dataset 2018) classes within the built-up areas of development zone 1 are:

1. Continuous urban fabric (CLC class 111) – 21%
2. Discontinuous urban fabric (CLC class 112) – 27%
3. Industrial or commercial units (CLC class 121) – 23%
4. Road and rail networks and associated land

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(CLC class 122) – 15%
5. Green urban areas and parks (CLC class 141) – 4%

Continuous urban fabric, industrial or commercial units and road/transport areas make up about two thirds of the built-up areas in development zone 1. In these areas, excavation work is often restricted, and the electricity network frequently must be placed in pedestrian/cycle routes or on roads due to city requirements or other infrastructure. These areas are mostly asphalted and heavily trafficked, resulting in significant costs for electricity network design and construction, for example in the form of asphalt restoration and traffic management costs. In addition, cable routes in development zone 1 are often exposed to excavation damage due to dense infrastructure and extensive other construction, which increases maintenance needs and raises costs.

In the monitoring methods for electricity network companies, excavation costs are treated based on the location of excavation, and the Energy Authority has refined the excavation area classifications for coming years. Although the definitions have been refined, they still do not describe electricity network construction costs in Helsinki's urban areas at a sufficient level of detail. This means that, for example, in Helsinki's apartment-building districts the electricity network cannot be built at the cost level assumed in the monitoring methods. In Helen Electricity Network Ltd.'s view, taking continuous urban fabric areas (CLC class 111) into account in excavation costs would improve the cost correspondence of the monitoring methods, enabling sustainable and profitable development of the electricity network in Helsinki also in the future.

Development zone 2, which mainly comprises the area outside the local detailed plan, is maritime in character and dominated by islands. Approximately 96% of the area is water. When water bodies are excluded, the five largest CLC classes are as follows:

1. Coniferous forest (CLC class 312) – 29%
2. Mixed forest (CLC class 313) – 13%
3. Bare rock (CLC class 332) – 9%
4. Industrial or commercial units (CLC class 121) – 8%
5. Arable land (CLC class 211) – 13%

In development zone 2, distances are long, customer density is low, and building the electricity network between islands requires special solutions such as submarine cables, which makes construction expensive. In addition, challenges in maintaining the electricity network increase due to distances and accessibility. However, the area does not contain as many critical customers as development zone 1.

Helen Electricity Network Ltd.'s 110 kV high-voltage distribution network is located mainly in development zone 1, where the power density of electricity use is high and electricity consumption is critical due to, for example, the numerous important and critical electricity consumers. The criticality of electricity consumption and security of supply has required the high-voltage distribution network to be implemented with the highest possible level of reliability in its structure. The criticality of Helsinki's high-voltage distribution network will become even more pronounced in the future as district heating is electrified, making district heat production increasingly dependent on electrical energy. This development increases electricity consumption and makes reliable operation of the high-voltage distribution network in all situations even more important.

In the structure of Helsinki's 110 kV overhead line network, proximity to the sea and the intensification of climatic extremes are considered, for example in the maximum wind loads defined by standards. Due to numerous crossings of important transport corridors, the 110 kV overhead line network has an exceptionally large number of tension towers so that, in potential accident situations, tower damage can be limited to as small an area as possible. Freestanding, exceptionally tall steel towers with short span lengths are used to narrow the line corridors and to ensure safe operation for city residents. Because the city is growing, short line relocations affecting a few spans are often required.
In the 110 kV cable network, heavy protection (concrete ducts and conduit systems) is generally used due to the large number of crossings and nearby construction activities. For some cable connections, space can no longer be found at ground level, and therefore cables have been placed in rock tunnels. For the most important transmission cable routes, rights of use and restrictions have been obtained through easement acquisition.

d. Impact of the operating environment changes forecast in Section 1 on the development zone

As described in Section 1, electricity use in Helsinki is expected to grow due to area development and infill development, electrification of transport, and the energy transition. Growth will occur across the entire local detailed plan area—more in some areas and less in others.

Already during 2024 and 2025, large point loads have been connected to Helsinki's high-voltage distribution network in the form of new 110 kV connections. Over a time horizon of a few years, we are talking about several hundred megawatts of electric boiler and heat pump load. These loads secure the city's heating capacity for the district heating network as fossil-fuel-based back-pressure CHP plants are closed. The Hanasaari power plant was closed in spring 2023 and the Salmisaari B power plant in spring 2025. As a result, a significant amount of electricity generation—nearly 400 MW—was removed from the network and replaced by electricity consumption of several hundred megawatts. This more than doubles the power transfer in the 110 kV network and challenges the current transfer capability of the transmission grid. Over the next approximately year, a further almost 400 MW of point loads connected to the 110 kV network will be added. In addition, there is a large volume of enquiries, for example for data centre connections; for these, the realised peak power is still somewhat uncertain.

2.1.4. Numerical baseline data for the development zones and network figures

a) Network in the development zone

i) Average age

Development zone 1: 26 years
Development zone 2: 35 years

ii) Average technical lifetime

The average technical lifetime in development zone 1 is approximately 55 years.
The average technical lifetime in development zone 2 is approximately 56 years.

b) Electricity distribution network quantities

i) MV

In development zone 1, the total length of the MV network is approximately 1,643 km.
In development zone 2, the total length of the MV network is approximately 56 km.

ii) LV

In development zone 1, the total length of the LV network is approximately 4,630 km.
In development zone 2, the total length of the LV network is approximately 65 km.

c) Quantities of network meeting the operational quality requirements

i) MV

In development zone 1, approximately 1,643 km of the MV network meets the operational quality requirements for the electricity distribution network.
In development zone 2, approximately 56 km of the MV network meets the operational quality requirements for the electricity distribution network.

ii) LV

In development zone 1, approximately 4,611 km of the LV network meets the operational quality requirements for the electricity distribution network.
In development zone 2, approximately 65 km of the LV network meets the operational quality requirements for the electricity distribution network.

d) Number of connections

i) In the local detailed plan area

In the local detailed plan area, there are 37,269 connections.

ii) Outside the local detailed plan area

Outside the local detailed plan area, there are 340 connections.

e) Number of electricity delivery sites

i) In the local detailed plan area

In the local detailed plan area, there are 439,391 delivery sites.

ii) Outside the local detailed plan area

Outside the local detailed plan area, there are 981 delivery sites.

f) Number of delivery sites meeting the operational quality requirements

i) In the local detailed plan area

In the local detailed plan area, there are 439,234 delivery sites that meet the operational quality requirements for the electricity distribution network.

ii) Outside the local detailed plan area

Outside the local detailed plan area, there are 959 delivery sites that meet the operational quality requirements for the electricity distribution network.

g) Underground cable quantities

i) MV

In development zone 1, the MV underground cable network is approximately 1,640 km.
In development zone 2, the MV underground cable network is approximately 55 km.

ii) LV

In development zone 1, the LV underground cable network is approximately 4,570 km.
In development zone 2, the LV underground cable network is approximately 49 km.

h) Length of overhead lines located in forest

i) MV

In development zone 1, the length of MV overhead lines in forest is approximately 2.9 km.
In development zone 2, the length of MV overhead lines in forest is approximately 0.4 km.

ii) LV

In development zone 1, the length of LV overhead lines in forest is approximately 19 km.
In development zone 2, the length of LV overhead lines in forest is approximately 14 km.

i) Length of overhead lines along roads

i) MV

In development zone 1, the length of MV overhead lines along roads is 0 km.
In development zone 2, the length of MV overhead lines along roads is approximately 0.6 km.

ii) LV

In development zone 1, the length of LV overhead lines along roads is 0 km.
In development zone 2, the length of LV overhead lines along roads is approximately 3 km.

j) Length of overhead lines meeting the operational quality requirements

i) MV

In development zone 1, approximately 2.8 km of the MV overhead line network meets the operational quality requirements.
In development zone 2, approximately 0.4 km of the MV overhead line network meets the operational quality requirements.

ii) LV

In development zone 1, approximately 41 km of the LV overhead line network meets the operational quality requirements.
In development zone 2, approximately 16 km of the LV overhead line network meets the operational quality requirements.

k) Other network components

In addition to MV and LV overhead lines and underground cables, the electricity network includes many other components that significantly contribute to meeting the operational quality requirements. These include, for example, secondary substations equipped with automation, as well as substation switchgear with circuit breakers and disconnectors, which enable faulted parts of the network to be quickly isolated. The impact of these components on the quality of electricity distribution is particularly emphasised in an urban distribution system operator like Helen Electricity Network Ltd, where the above-mentioned components are numerous relative to cable and overhead line lengths.

2.2. Network development strategy for the network in the electricity distribution network development zones

The development strategy applies to both development zones.

2.2.1. Planning criteria meeting the operational quality requirements

a. 6-hour quality requirement

The distribution network is developed in accordance with the planning criteria described in Section 2.1.3. The greatest development need targets the 110 kV network, because hundreds of megawatts of new heating load will be connected to it. Because a large share of this load is expected especially in the southern part of the inner city, this creates a need for new substations and 110 kV transmission connections, as well as for strengthening existing connections. In addition, development of 400 kV transmission-grid connections is needed, and in the future the development of a local 400 kV network.

The medium-voltage network is developed in line with connection needs, area development and substation development. In addition, network topology improvements are carried out. In the near future, priority areas for developing loop/ring structures are the distribution areas of Meilahti, Laajasalo and Vuosaari.

b. 36-hour quality requirement

The distribution network is developed in accordance with the planning criteria described in Section 2.1.3. The 36-hour quality-requirement area will shrink as local detailed planning expands. Even in the 36-hour area, the aim is largely to follow the 6-hour quality requirements applicable in a large metropolitan area.

2.2.2. Taking special features into account in network planning

a. Joint construction and connections to other network operators' networks

Helen Electricity Network Ltd participates in the City of Helsinki's Joint municipal engineering worksite concept, under which parties that build municipal infrastructure networks cooperate. The parties maintain their upcoming construction projects in the shared Louhi service, geographically and temporally bounded, enabling other parties to align their own projects into a joint worksite. Network construction projects in the Louhi service are also visible in the national verkkotietopiste.fi service. In addition, in the city's area development projects, the construction needs of infrastructure actors are surveyed (MEGP, municipal engineering general plan).

b. Flexibility services

At Helen Electricity Network Ltd, the development of flexibility services is actively monitored. Temporary flexible connection agreements have been concluded for a few 110 kV connections. Flexibility services and the completed and ongoing pilots and studies are described in more detail in Sections 5 and 6 of the development plan.

c. Critical sites for the functioning of society

Helen Electricity Network Ltd engages in regular cooperation with vital operators in its distribution area. The operators have been grouped in accordance with the Government Decree on the prioritisation order of electricity delivery sites to be included in preparedness planning.

d. Energy efficiency measures

Managing and reducing losses has long been an objective to minimise both financial and environmental impacts. The relatively low utilisation rate—enabled and required by redundancy in the distribution network—together with low-loss components such as transformers, has ensured low loss levels. Overall, the losses in Helen Electricity Network Ltd.'s distribution network are only slightly over 2%. Helen Electricity Network Ltd reports annual measures to improve energy efficiency as part of Helen Ltd.'s Energy Efficiency Agreement. To support reviewing and optimising customers' connection capacity, a tool was introduced in 2024 that allows customers to see the available spare capacity of their own connection, helping avoid unnecessary connection upgrades and ensuring customer needs are met in an optimised way. A tool has also been developed for Helen Electricity Network Ltd.'s internal use to assess the connection size of new connections using existing typical load curves. This tool provides a statistical view, for example of the 99% non-exceedance probability for maximum power.

2.3. Calculation of network lifecycle costs in the development zones

Lifecycle costs for a development zone refer to the costs incurred over the review period from, among other things, investment and various operational costs during use.

a. Defining the factors of lifecycle costs

The cost-efficiency comparison has been carried out in accordance with the Energy Authority's regulation concerning the development plan. In the lifecycle costs, the following items are included:

- investment (design and construction)
- operational costs (condition inspections, maintenance and fault repairs)
- Cost caused by interruptions (Customer Interruption Cost, CIC) using the Energy Authority's CIC values (price of undelivered energy)

b. Joint construction in lifecycle cost calculations

In investments, the aim is to utilise joint construction in accordance with the City of Helsinki's Joint municipal engineering worksite concept. The benefit of joint construction is reflected as part of the investment cost.

c. Other network solutions in lifecycle cost calculations

As described in Section 3, in Helen Electricity Network Ltd.'s geographically compact distribution area there are, for example, no realistic alternatives such as 1 kV distribution or electricity storage to the network construction solutions normally used. The local flexibility market opened last year is also still low in liquidity and, so far, has not provided a genuine alternative for congestion management or network development.

d. Monitoring lifecycle costs

Actual lifecycle costs and cost-efficiency are monitored as part of the company's reporting of financial and other key figures. Improving cost-efficiency is also included in long-term partnership agreements for network construction and maintenance.

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3. Cost comparison of solutions used in the electricity distribution network development zones

3.1. Solutions used in the development zones

a. Solutions used

In both development zones, the solutions used are underground cable, overhead line and aerial cable. A widened line corridor is utilised in the 110 kV networks. Flexible connection agreements are used as a demand flexibility service for managing transfer capacity. By far the most significant solution is the use of underground cables.

b. Solutions excluded from the comparison

Underground cabling is in practice the only network construction option in most local detailed plan areas, because street plans define the possible placement locations for underground municipal infrastructure networks and overhead line solutions cannot be used. The 6-hour quality requirement in local detailed plan areas under the Electricity Market Act also, in practice, means the use of underground cabling.

Sheathed overhead line is not used, because aerial cable requires less maintenance and is more durable in windy archipelago conditions.

No need has been identified in Helen Electricity Network Ltd.'s distribution area for 1 kV electricity distribution or 1.5 kV DC systems, because voltage drop in the low-voltage network remains acceptable in a dense urban area where secondary substation density is also high.

Due to Helen Electricity Network Ltd.'s extensive cabling and the backup supply connections of ring networks, the quality-requirement-improving benefits offered by electricity storage remain limited and not cost-effective. In the example solution, the savings potential in Customer Interruption Cost (CIC) is small compared to the cost of the required battery systems. We develop flexibility services by utilising the local flexibility market. Helen Electricity Network Ltd and Fingrid established Finland's first local flexibility market together. This market opened in April 2025. Through the market, flexibility is procured for congestion management together with flexible connection agreements. Increasing the liquidity of the new marketplace has proven challenging. During 2025, no market-based flexibility could be procured from the market. Therefore, no market value has yet been established for the value of flexibility. Work to increase liquidity continues. Because the market is still weak in liquidity, it has not so far provided a genuine alternative for congestion management or network development.

Alongside flexibility market development, flexible connection agreements are used. These agreements cover more than 200 MW of controllable capacity. With these agreements, customers have been able to be connected to the network faster. Based on flexible connection agreements, network congestion can be managed as an operational measure.

3.2. Description of electricity distribution solutions proposed for the development zones

a. Solution with the lowest lifecycle costs

Helen Electricity Network Ltd.'s network area consists mainly of an urban network located in the local detailed plan area, and the same solutions are generally used for building the electricity network across the entire network area, and thus in both development zones. In Helen Electricity Network Ltd.'s network area, the large number of low-voltage connections drives the use of numerous secondary substations and distribution cabinets. The low- and medium-voltage networks are built with underground cables, apart from special sites, due to the densely built urban environment. Helen Electricity Network Ltd has studied an optimal network structure suitable for an urban environment in several theses in earlier years and, in recent years, for example in the following publications: Distribution Automation and Self-Healing Urban Medium Voltage Networks, Kaupunkikeskijänniteverkon optimointi.

To ensure capacity in network fault situations, distribution networks are built with ring-network-like structures. In fault situations, supply to customers can generally be routed from other transformer service areas by changing switching boundaries. If necessary, during the implementation of investment projects, backup generators are utilised if the low-voltage network cannot be backed up via neighbouring transformer service areas.

Most of the investment costs of the solution consist of distribution network design and construction. In Helen Electricity Network Ltd.'s investment projects, both in-building secondary substations and standalone secondary substations are utilised; in addition, costs arise from space compensation for in-building substations and from permit and placement compensation for standalone substations. In some investment projects, costs are limited to refurbishment of the existing distribution network cables. The operating costs of the solution are very small compared to the investment costs and consist of preventive maintenance (condition inspections, servicing), corrective maintenance, and Customer Interruption Cost (CIC) compensation.

b. Alternatives to the lowest-cost solution

In Helen Electricity Network Ltd.'s network area, the investment alternatives are underground cable networks using distribution cabinets (Solution 1, the least expensive), a distribution network without distribution cabinets (Solution 2) by cabling new connections directly from the low-voltage switchboards of secondary substations or using the shortest possible cabling routes (Solution 3). In the alternative implemented without distribution cabinets, low-voltage interconnections between secondary substations are needed in any case due to the extensive grounding network and the ability to provide backup supply in fault situations.

In Solution 2, the medium-voltage cabling was implemented in the same way as in the selected least-cost Solution 1. The difference compared to the implemented solution is building the low-voltage network without distribution cabinets. This implementation method increased the project's cabling and civil works costs due to the greater amount of cable needed from the secondary substation to low-voltage connections. Solution 1 is also more sensible from the perspective of network development. In Solution 2, the low-voltage switchboard of the transformer fills up with connection service cables, leaving no room for network expansion.

Cabling routes in Helsinki are affected by many factors, such as the placement of other municipal infrastructure in street areas, local detailed plans and their amendments, and the city's own guidelines and regulations on the placement of municipal infrastructure. As a rule, electricity cables are placed under pedestrian/cycle routes so that, in fault situations, repairs can be carried out without interrupting vehicle traffic. In some cases, it is also not possible to build the most direct route, for example because it would pass through a city-owned park area where cables cannot be placed. Likewise, cables cannot be placed close to trees, because roots are damaged during excavation and in potential fault situations mechanical excavation in root areas is not desirable. The costs of the solution using the shortest possible cabling routes increase significantly, because the shortest route for the medium-voltage cable between secondary substations does not follow the same route as the low-voltage cables. The cost of two separate cable trenches is higher than that of one, even if the medium-voltage cable length is shorter. Therefore, the most cost-effective solution is to install both low- and medium-voltage cables in the same trench.

3.3. Comparison of lifecycle costs for the development zone

a. Description of a project package typical for the development zone used in the cost comparison

In the selected Solution 1, renewal of the distribution network was implemented using an underground-cabled medium- and low-voltage network, utilising low-voltage distribution cabinets installed in suitable locations. Route selection was implemented using the existing distribution network routes. By using distribution cabinets, the lengths of service cables to connections are significantly reduced and fewer secondary substations are needed, because multiple connections can be supplied from the same distribution cabinet and the low-voltage switchboards of secondary substations can be utilised more effectively.

b. Comparison of the typical project package in the development zone

The total costs for the different solutions are:
- Solution 1 (optimal network structure): 141 000 €
- Solution 2 (without distribution cabinets): 142 000 €
- Solution 3 (shortest possible route for the MV cable, in a different trench than the LV cables): 183 000 €

4. Long-term plan

Investments in network assets in 2026–2035 under Helen Electricity Network Ltd.'s long-term plan exceed 500 M€. The investments include major transformation investments that increase network capacity to enable the city's development and the clean transition, including construction of a new 400 kV network, as well as renewal of the ageing electricity network. A large share of these investments is allocated to the high-voltage distribution network and substations. Over the next ten years, nearly 20 M€ will be used for maintenance and inspections of network assets.

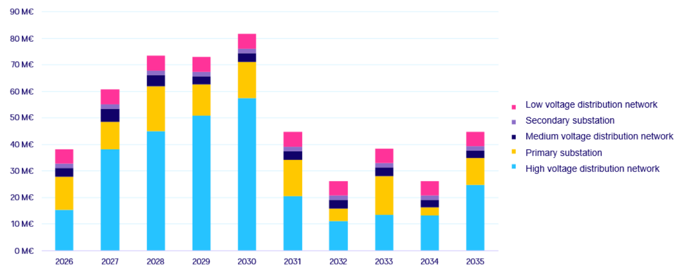

Figure 15. Helen Electricity Network Ltd.'s planned investments in the electricity network in 2026–2035

4.1. Use of funds in different periods

a. High-voltage distribution network

i. Investments
a) 2014–2021 24.8 M€
b) 2022–2028 31.7 M€
c) 2029–2036 29.8 M€

ii. Maintenance
a) 2014–2021 0.59 M€
b) 2022–2028 0.57 M€
c) 2029–2036 1.0 M€

b. Substations

i. Investments
a) 2014–2021 49.8 M€
b) 2022–2028 46.9 M€
c) 2029–2036 60.9 M€

ii. Maintenance
a) 2014–2021 3.6 M€
b) 2022–2028 9.45 M€
c) 2029–2036 9.82 M€

c. Medium-voltage distribution network

i. Investments
a) 2014–2021 30.5 M€
b) 2022–2028 22.2 M€
c) 2029–2036 13.1 M€

ii. Maintenance
a) 2014–2021 0.05 M€
b) 2022–2028 0.08 M€
c) 2029–2036 0.14 M€

d. Secondary substations

i. Investments
a) 2014–2021 22.8 M€
b) 2022–2028 7.7 M€
c) 2029–2036 6.2 M€

ii. Maintenance
a) 2014–2021 0.29 M€
b) 2022–2028 1.02 M€
c) 2029–2036 1.26 M€

e. Low-voltage distribution network

i. Investments
a) 2014–2021 38.0 M€
b) 2022–2028 29.3 M€
c) 2029–2036 22.9 M€

ii. Maintenance
a) 2014–2021 0.25 M€
b) 2022–2028 0.74 M€
c) 2029–2036 1.22 M€

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4.2. Points of delivery meeting the quality requirements at the times specified in Section 119 of the Electricity Market Act

a) In the local detailed plan area

i) 31.12.2023

In the local detailed plan area, the number of delivery sites covered by the quality requirements as of 31 December 2023 was 428,873.

ii) 31.12.2028

In the local detailed plan area, the number of delivery sites covered by the quality requirements as of 31 December 2028 is approximately 460,000.

b) Outside the local detailed plan area

i) 31.12.2023

Outside the local detailed plan area, the number of delivery sites covered by the quality requirements as of 31 December 2023 was 959.

ii) 31.12.2028

Outside the local detailed plan area, the number of delivery sites covered by the quality requirements as of 31 December 2028 is approximately 1,000.

4.3. Electricity distribution network meeting the quality requirements at the times specified in Section 119 of the Electricity Market Act

a) MV network, km

i) 31.12.2023

Approximately 1,695 km of the MV network met the operational quality requirements as of 31 December 2023.

ii) 31.12.2028

Approximately 1,732 km of the MV network meets the operational quality requirements as of 31 December 2028.

b) LV network, km

i) 31.12.2023

Approximately 4,651 km of the LV network met the operational quality requirements as of 31 December 2023.

ii) 31.12.2028

Approximately 4,700 km of the LV network meets the operational quality requirements as of 31 December 2028.

4.4. Underground cabling rate of the electricity distribution network at different voltage levels after measures, at the times specified in Section 119 of the Electricity Market Act

a) MV, %

i) 31.12.2023

The underground cabling rate of the MV network was approximately 99.8% as of 31 December 2023.

ii) 31.12.2028

The underground cabling rate of the MV network is approximately 99.8% as of 31 December 2028.

b) LV, %

i) 31.12.2023

The underground cabling rate of the LV network was approximately 98.3% as of 31 December 2023.

ii) 31.12.2028

The underground cabling rate of the LV network is approximately 98.7% as of 31 December 2028.

4.5. New generation and new loads expected to connect and require significant distribution network investments over the next ten years

As highlighted in Sections 1 and 2, in the future energy production will shift significantly from current fossil sources toward energy production that uses substantial

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amounts of electricity (heat pumps, electric boilers, hydrogen production), which requires significant investments in the high-voltage distribution network.

Over the past five years, electricity-based heat production plants have increased electricity consumption by approximately 300 MW. Over the next 0–5 years, electricity-based heat production plants that will be completed are expected to increase electricity consumption by a further 300–400 MW. In addition to several heat-producing plants, the high-voltage distribution network is also likely to connect data centres during the ten-year period. Moreover, shore power electrification of cruise shipping under the EU directive, as well as solutions enabling electrification of shipping, require connections to the high-voltage distribution network. In addition to strengthening the 110 kV high-voltage distribution network, the above connections also require construction of a 400 kV network in the inner city.

According to the City of Helsinki's population and housing production forecast, published at the beginning of 2026 and used as the basis for the development plan's expansion investment programme, about 5.0 million m2 of new residential gross floor area will be completed in Helen Electricity Network Ltd.'s operating area over the next ten years. This is about 9% less than in the previous forecast from two years earlier. Since 2024, the official target for residential construction in Helsinki has been 7,000 new dwellings per year. In the current market situation, this target will not be met also in 2026. In 2025, the number of completed dwellings was 4,186, and at year-end 4,700 dwellings were under construction. However, population forecasts indicate that Helsinki's population growth has been strong and the population threshold of 700,000 will likely be exceeded in 2026. This creates a need for the housing production presented in the forecast.

The slightly lower housing production in the coming years is primarily due to the market situation, even though economic cycles are not directly considered in the city's forecast. Near-term projects can be assessed through building permits, plot reservations and area development projects. Based on these, the most likely realisation currently appears lower and has been reflected in the latest forecast. Other challenges for residential construction in the coming years include, for example, phasing out Hitas and national measures to discontinue right-of-occupancy housing production. In both of these tenure forms, the city would have planned construction.

The city has not produced a forecast at this level for office, service and commercial construction. These types of construction are assumed to develop in line with residential construction.

4.6. Significant distribution network investments over the next ten years to connect new generation and new loads

a. Over the next 0–5 years

Over the review period, total investments of approximately 210 M€ are estimated for the high-voltage distribution network and the distribution network to connect new heat production and new loads, of which approximately 25 M€ is allocated to secondary substations and the medium-voltage network.

b. Over the next 6–10 years

Over the review period, total investments of approximately 90 M€ are estimated for the high-voltage distribution network and the distribution network to connect new generation and new loads, of which approximately 25 M€ is allocated to secondary substations and the medium-voltage network.

4.7. Illustration of connecting new generation and new loads in the network area

a. Geographical allocation of investments

Heat produced into the district heating network using industrial-scale heat pumps and electric boilers will be distributed across the entire city. Larger centralised solutions are being built close to heat consumption at existing energy production areas (Salmisaari, Hanasaari and Vuosaari) and near peak heat plants. Large compressors intended for cooling are typically located by the sea close to the district cooling network.

Potential data centres will be located across the entire city area.

Potential locations for a nuclear power plant are being studied for the Vuosaari and Salmisaari power plant areas as well as Östersundom's Norrberget area. If the plant would be a combined heat and power (CHP) plant, electricity generation would primarily be connected to the transmission grid.

According to the City of Helsinki's housing production forecast 2025–2039, half of new residential construction over the next ten years will be completed in new areas and boulevards (Tuusulanväylä and Vihdintie). However, boulevard construction will become visible only in the second half of the ten-year period and beyond. New areas in Helsinki include Kalasatama, Koivusaari, Kruunuvuorenranta, Kuninkaantammi–Honkasuo, Länsisatama, Malmi Airport and Pasila.

City renewal is the City of Helsinki's new way to develop residential areas. City renewal is carried out to increase residents' housing satisfaction and to attract new residents to the area. The selected city renewal areas are Malminkartano, Kannelmäki, Malmi, Mellunkylä and Meri-Rastila. The city's target is to build one third more homes in these areas by 2035.

Infill construction has been enabled across the entire Helen Electricity Network Ltd operating area along corridors with good public transport connections. Along the Raide-Jokeri line, residential construction of the same magnitude as in the area development sites in Länsisatama or across the entire Pasila area is expected to be completed during this decade.

Electricity connections serving shipping will be located at the City of Helsinki's ports.

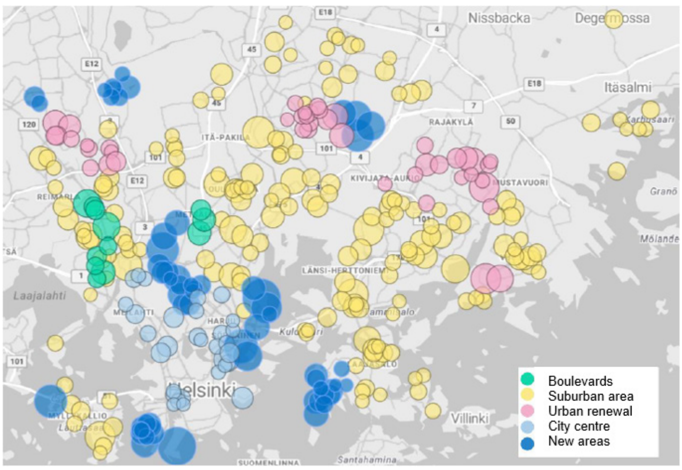

Figure 16. City of Helsinki, Housing production forecast 2025–2039: completed dwellings by zoning categories, 2025–2039

b. Available network capacity for connecting new generation and new loads

In Helen Electricity Network Ltd.'s map service, you can review the available capacity in the distribution network (medium and low voltage) and in the high-voltage distribution network (110 kV or higher) by area within Helen Electricity Network Ltd.'s distribution area. The values differ by year and take into account Helen Electricity Network Ltd.'s investment plan. At present, the high-voltage distribution network voltage level is 110 kV, but in the future the high-voltage distribution network will also include a 400 kV network in accordance with the investment plan. In practice, the capacity map describes available capacity for 110 kV connections. The available-capacity calculations also consider capacity limits within the high-voltage distribution network above 110 kV, but not constraints in the transmission grid. Potential connections to the future 400 kV high-voltage distribution network will be assessed separately on a case-by-case basis.

In the high-voltage distribution network, there is currently, in principle, plenty of available capacity if you examine the normal operating situation where the network has no faults or planned outages. Transfer capacity in a normal situation without faults or outages is referred to as N-0 capacity. In the high-voltage distribution network, Helen Electricity Network Ltd prepares for faults so that, as a rule, the worst singular fault does not cause a transfer interruption for customers. In the most severe fault or outage situations, the network's transfer capacity is significantly lower than in normal operation. Transfer capacity in the worst single-fault situation is referred to as N-1 capacity.

The capacity map shows available capacity for flexible and non-flexible connections:

- Flexible = available capacity for connections that can provide flexibility in rare fault situations
- Non-flexible = available capacity for connections that cannot provide flexibility in rare fault situations

For defining non-flexible capacity, consumption is compared against N-1 capacity, i.e., transfer capacity in the worst single-fault situation. For defining flexible capacity, consumption is compared against N-0 capacity, i.e., the transfer capacity of an intact network. However, in the flexible-capacity case a margin is applied so that network loading is not at the extreme limits in normal operation. The idea is that in rare and severe faults, consumption at a flexible connection can be curtailed if necessary. Faults in the high-voltage distribution network that create a need for flexibility occur, very roughly, only about once every 30 years—meaning flexibility needs for flexible connections are very rare.

Non-flexible capacity may also be negative. This means that peak consumption exceeds N-1 capacity. The situation can be temporarily possible thanks to flexible connections.

In the capacity map, only the transfer capacity of Helen Electricity Network Ltd.'s high-voltage distribution network and the resulting constraints have been examined. At present, the transfer capability of the transmission grid limits growth in electricity consumption more than the transfer capability of Helen Electricity Network Ltd.'s high-voltage distribution network. The capacity of the 400/110 kV transformers feeding Helsinki and Vantaa that belong to the transmission grid is currently insufficient. Consumption has at times had to be restricted for this reason. Fingrid is targeting a significant increase in transformer capacity by the end of 2026. At present, it is not known with certainty how much power can be transferred from the transmission grid starting from 2027.

Helen Electricity Network Ltd estimates that, despite transmission-grid reinforcements, in at least 2027–2029 the transmission grid will likely restrict transfer more than the high-voltage distribution network. The high-voltage distribution network is not expected to restrict transfer in these years in the network's normal operating situation. Potential transmission-grid constraints may be based on the thermal capacity of 400/110 kV transformers, low voltage in the 400 kV network during high consumption, or capacity constraints in the upstream network. These potential constraints are not included in Helen Electricity Network Ltd.'s capacity map.

Due to transmission-grid-related constraints, Fingrid requires flexibility of consumption or generation as a condition for connecting new consumption to the network. In practice, the condition applies to new connections to the high-voltage distribution network. This means that connection agreements may need to be made as flexible even if constraints in Helen Electricity Network Ltd.'s high-voltage distribution network would not require it. Fingrid requires a connection agreement enquiry for consumption sites of at least 10 MW and for electricity storage of at least 5 MW.

The development of available capacity shown in the map service reflects Helen Electricity Network Ltd.'s current investment plan. For new 110 kV customer connections, the figures include only those for which a decision and a connection agreement exist. In addition, there are enquiries and partly even projects already well advanced in planning amounting to several hundred megawatts. Helen Electricity Network Ltd updates its investment plans as needed to respond to customer demand. However, it should be noted that implementing network reinforcements typically takes several years. Helen Electricity Network Ltd cannot directly influence Fingrid's investment programme, but we clearly communicate customer needs and consistently highlight the need for the fastest possible transmission-grid reinforcements.

The amount of available capacity varies across different parts of the high-voltage distribution network. To illustrate this, different transfer interfaces have been defined, which are shown in the figure below and in the map service.

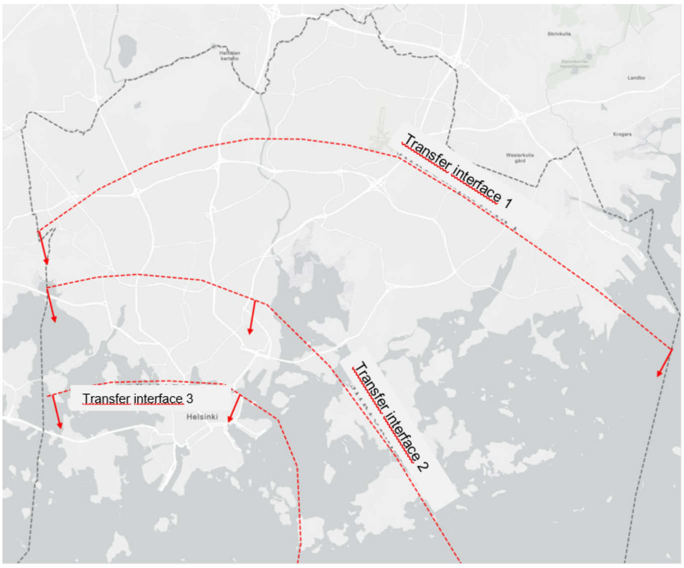

Figure 17. Transfer interfaces of Helsinki's 110 kV network

The available-capacity tables shown in the capacity map describe available capacity for electricity con-

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sumption. The studies have focused on this because a significant amount of electricity generation has been, and will be, removed from Helsinki, and there have been very few enquiries for new large-scale electricity generation plants to be connected to the 110 kV network. Following the closure of the Salmisaari and Hanasaari power plants, in southern Helsinki—i.e., within transfer interfaces 2 and 3—there are, from a transfer perspective, several hundred megawatts of available capacity for electricity generation. However, for new large-scale electricity generation plants, impacts on short-circuit currents must also be assessed. In the Vuosaari area, a large amount of electricity generation will remain, and at present it is not possible to significantly increase electricity generation there.

Available capacity in the distribution network (medium and low voltage) is presented in the map service by substation supply areas. Available capacity describes the substation supply area's available capacity, taking into account the realised peak load over the past 12 months in the supply area and an estimated share of the main transformer capacities that can be substituted in fault situations in line with security-of-supply principles. This share is estimated to be, on average, 60% of substations' main transformer capacities if the substation has more than one main transformer. If all substations were at 100% load, neighbouring substations and other main transformers at the same substation would not be able to supply the interrupted load for a sufficient period, potentially causing power quality issues. In general, it can be stated that Helsinki's distribution network has substantial available capacity. Naturally, the available capacity in the high-voltage distribution network described above imposes constraints on additional loads in the distribution network. Distributed microgeneration can be connected to the distribution network throughout the entire network area.

4.8. Impacts of changes to the electricity network business monitoring methods on Helen Electricity Network Ltd.'s investment programme 2024–2036

Network service pricing in electricity network operations is strictly regulated by the Energy Authority, and regulation is based, among other things, on electricity market legislation. The Energy Authority determines the monitoring methods for electricity network operations in a confirmation decision, which confirms the methods for determining the network operator's return on network operations and the charges collected for transmission services (including valuation principles for committed capital, the method for determining the acceptable return on committed capital, and various incentives for network operations). Based on the methods, the network company's allowed annual revenue is calculated, and this is monitored in four-year monitoring periods. The confirmation decision is valid for eight years, i.e., two four-year monitoring periods. After the end of a monitoring period, the authority issues each network company a supervision decision determining whether the company's pricing during the period complied with regulations and orders. Any excess amount collected (surplus) is returned to customers during the next period through lower prices, and correspondingly any deficit can be collected from customers retroactively during the next periods through higher prices.

Financing investments

The monitoring methods for electricity distribution network operations for the sixth and seventh monitoring periods (2024–2031) were confirmed at the end of 2023. The confirmed monitoring methods differ significantly from previous ones and weaken, especially in the long term, the profitability of electricity network investments. The methods limit allowed revenue and thus network companies' ability to finance investments in a sustainable manner. As a result, Helen Electricity Network Ltd must adjust its investment level and operations to the financial constraints set by the regulatory model. Without sufficient investment profitability, financing electricity network operations is not sustainable in the long term.

The historically large weakening in the monitoring methods have coincided with a time when electricity distribution investment needs in Helsinki have grown significantly. Progress of the clean transition, electrification of heating and strong growth in electricity use require substantial investments especially in the high-voltage distribution network and substations.

An amendment to the Electricity Market Act that entered into force in 2026 expanded distribution system operators' role in developing the electricity transmission network and transferred tasks previously under the responsibility of the transmission system operator

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to local distribution system operators. In Helsinki, this also means prerequisites to develop local and regional 400 kV high-voltage solutions to secure growing electricity consumption. The investment needs caused by these new and expanded obligations coincide with a time when the regulatory model for electricity network operations limits the financial feasibility of investments.

These additional investment needs were not fully visible in the electricity network development plans submitted in 2024, because after they were submitted the investment needs to enable the clean transition have increased further in Helsinki. In Helen Electricity Network Ltd.'s view, an unprecedented tightening of the monitoring methods at a time when investment needs have increased significantly poses a substantial risk to the progress of the clean transition and to the security of electricity supply and security of supply in Helsinki in an unstable global situation. The regulatory model should promote the green transition while also encouraging responsibility and emissions reductions in building and maintaining electricity networks.

Due to the changes in the monitoring methods, Helen Electricity Network Ltd had to adjust its investment programme to a financially feasible level. In practice, this means postponing and scheduling replacement and maintenance investments further into the future, which naturally increases the maintenance backlog of the electricity network. Growth in the maintenance backlog increases the need for maintenance in the long term and raises the risk of a deterioration in security of supply.

In the short term, the condition of Helen Electricity Network Ltd.'s network is good and the quality requirements set for distribution network operations are met. In the long term, however, the current regulatory model does not enable developing and maintaining the electricity network to the extent required by both long-standing and new statutory obligations that have been specified in recent years. In Helsinki, the importance of security of supply will continue to be emphasised as the role of electricity grows in heating, transport and critical societal functions. Even a short interruption in electricity distribution can have significant societal and economic impacts.

In Helen Electricity Network Ltd.'s view, long-term development of the monitoring methods is necessary so that they support implementation of the clean transition, enable compliance with obligations under the Electricity Market Act, and safeguard the security of supply and security of energy supply of electricity networks in a growing and electrifying urban environment. In its current form, the regulatory model does not enable sustainable, needs-based development of the electricity network in the long term. Helen Electricity Network Ltd has highlighted this view together with other electricity network companies and is actively seeking changes to the monitoring methods.

An operating model based on continuously postponing replacement and maintenance investments cannot continue in the long term, and the regulatory model must be developed so that network companies have real operating prerequisites to fulfil all statutory obligations—both for connecting new consumption to the network and for maintaining the electricity network. Growth in the network's maintenance backlog weakens security of supply and security of energy supply in the long term, increases the need for corrective maintenance, and raises risks related to major disturbances. Although in the short term the condition of Helen Electricity Network Ltd.'s network is good and the risk of long-lasting major disturbances is low, maintaining this level becomes increasingly difficult over time under the current regulatory model.

The obvious need to correct the monitoring methods is further emphasised by the fact that the importance of security of supply will grow significantly in the future. As heating in Helsinki becomes electrified and other electrification progresses, even short electricity distribution interruptions can have significant societal impacts. Helen Electricity Network Ltd has analysed the impacts of electricity distribution interruptions in Helsinki in the long term and found that the actual costs in Helsinki are clearly higher than national averages, due among other reasons to the large number of critical electricity delivery sites under the Government Decree. In the future, the economic cost from potential major electricity distribution disturbances in Helsinki would be even greater if it were to materialise, because even a short electricity distribution interruption can cause a heat distribution outage over a wide area. The figure below shows the change in the cost of interruption experienced by Helsinki's electricity distribution customers in a potential major disturbance at different durations in 2023 and in 2034.

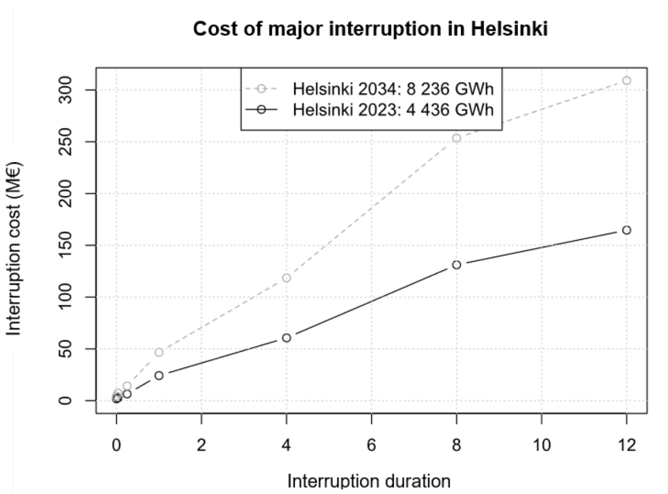

Figure 18. Interruption cost in Helsinki in a potential major disturbance: 2023 vs. 2034

The time window for achieving the core objective of the clean transition—carbon neutrality—is tight in both Finland and Helsinki. Helen Electricity Network Ltd does not want to delay the ongoing transition; therefore, the upcoming investment programme is weighted toward enabling this transition. In particular, investment levels targeted at the high-voltage distribution network will be significantly higher in the future than the company's investments implemented in recent years. The growth in investment needs is a result of the significant increase in electricity transfer needs over a short period of time and amendments to the Electricity Market Act. Thus, electricity network investment needs have increased significantly at the same time as the investment environment has been tightened. Due to weakenings in the monitoring methods, maintenance investments for the electricity network have had to be, and will have to be, deferred. In the short term, the resulting security-of-supply risk is manageable, but in the long term the current regulatory model does not enable sustainable operations. Together with other electricity network companies, Helen Electricity Network Ltd is seeking changes to the monitoring methods so that in the future they would enable profitable development and maintenance of electricity networks to the extent required by need.

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5. Development measures for the electricity distribution network during the current and following year

5.1. Investments and maintenance to meet and maintain network quality requirements and to maintain capacity needs during the current and following year

a. High-voltage distribution network

i. Investments 23.8 M€
ii. Maintenance 0.25 M€

b. Substations

i. Investments 20.5 M€
ii. Maintenance 2.74 M€

c. Medium-voltage distribution network

i. Investments 5.6 M€
ii. Maintenance 0.04 M€

d. Secondary substations

i. Investments 1.6 M€
ii. Maintenance 0.31 M€

e. Low-voltage distribution network

i. Investments 5.5 M€
ii. Maintenance 0.30 M€

5.2. Points of delivery covered by the quality requirements after the measures implemented during the current and following year

a. In the local detailed plan area

As of 31.12.2027, 453,000 delivery sites will be covered by the quality requirements.

b. Outside the local detailed plan area

As of 31.12.2027, 1,000 delivery sites will be covered by the quality requirements.

5.3. Measures during the current and following year

During the current and following year, the measures are almost entirely focused on the development zone within the local detailed plan area.

In the development zone within the local detailed plan area, the 400 kV high-voltage distribution network will be prepared at general-planning level and construction of cable routes will begin. In the 110 kV network and substations, 110 kV cable relocations and undergrounding of 110 kV overhead lines will be carried out in connection with the city's development, 110 kV transmission lines will be renewed, substation security systems will be renewed, and substations will be renewed and expanded.

In the development zone within the local detailed plan area, around 25 km of new medium-voltage cable network will be built and around 20 km of the existing network will be renewed. Around 80 km of new low-voltage cable network will be built and around 15 km of the existing network will be renewed. Around 25 new secondary substations will be built and around 10 existing ones will be renewed.

In the development zone within the local detailed plan area, the planned maintenance costs are almost entirely made up of maintenance of substation properties and primary and secondary equipment. The second-largest share of costs arises from maintenance of the high-voltage networks, the third largest from maintenance of secondary substations, and the remainder from maintenance of the medium- and low-voltage networks.

In the development zone outside the local detailed plan area, preventive maintenance of the distribution network will be carried out.

5.3.1. Electricity distribution network meeting the quality requirements after the measures of the current and following year

a) MV, km

As of 31.12.2027, approximately 1,730 km of the MV network meets the operational quality requirements for the electricity distribution network.

b) LV, km

As of 31.12.2027, approximately 4,700 km of the LV network meets the operational quality requirements for the electricity distribution network.

5.3.2. Underground cabling rate of the electricity distribution network at different voltage levels after the measures of the current and following year

a) MV

As of 31.12.2027, the underground cabling rate of the MV network is approximately 99.8%.

b) LV

As of 31.12.2027, the underground cabling rate of the LV network is approximately 98.5%.

5.3.3. Share of planned joint construction

The share of planned joint construction is around 20 km, corresponding to approximately 19% of all construction.

5.3.4. Measures to promote joint construction

Helen Electricity Network Ltd participates in the City of Helsinki's Joint municipal engineering worksite concept, under which parties that build municipal infrastructure networks cooperate. The parties maintain their upcoming construction projects in the shared Louhi service, geographically and temporally bounded, enabling other parties to align their own projects into a joint worksite. Network construction projects in the Louhi service are also visible in the national verkkotietopiste.fi service. The publication horizon of investment plans in the Louhi service varies from about one year to several years ahead of implementation. In addition to the Louhi service, Helen Electricity Network Ltd.'s network construction partner informs infrastructure contractors operating in the City of Helsinki area by email about upcoming investment projects for potential joint construction. For these projects, the lead time to implementation ranges from a few weeks to a few months.

5.3.5. Significant distribution network investments during the current and following year to connect new generation and new loads

During the current and following year, 36.5 M€ will be invested in the network to connect new generation and new loads.

In the development zone within the local detailed plan area, the 400 kV high-voltage distribution network will be prepared at general-planning level and construction of cable routes will begin. During the current and following year, new heat-production plants will be connected to the 110 kV network, requiring expansion investments at substations.

New loads connected to the distribution network require expansion investments in the medium-voltage cable network and secondary substations across the city.

5.3.6. Utilisation of flexibility services during the current and following year

a. Studies and pilot projects on utilisation of flexibility services

In studies related to flexibility, the aim has been to model flexibility and to obtain information on the impacts of flexibility on connections and, further, on network loading levels and dimensioning. The roles of different actors in utilising flexibility and potential future flexibility products have been examined. The development work aims to utilise existing transfer capacity more efficiently.

In Helen Electricity Network Ltd.'s operating area, the electrification of district heating and the end of large-scale local electricity generation have increased—and will continue to increase—electricity transfer from the transmission grid at an unprecedented volume. In implementing the clean transition, timelines are tight and we want to enable our customers to connect to the network as quickly as possible. Together, we are seeking solutions for potential special network situations of limited duration, where customers provide flexibility by curtailing power in power-limitation situations. This operating model accelerates customers' connection to the network. In the development work, coordination between the transmission system operator, the distribution system operator and customers is particularly important. This type of need for power limitation/flexibility has materialised very rapidly. At Helen Electricity Network Ltd, we are developing short-term electricity-use forecasting combined with continuous power flow calculations, updating loading limits for network components, identifying network power-limitation situations and flexibility needs, and developing cooperation between the network company, the transmission system operator and customers to manage power-limitation situations successfully. The urgent measures must be implemented immediately.

Helen Electricity Network Ltd and Fingrid opened Finland's first local flexibility market at the end of April 2025. Through the market, both distribution system operators and the transmission system operator can purchase flexibility—i.e., adjustment of consumption or generation—for congestion management. Experience gained from the market can be utilised in developing a national flexibility market solution.

As a starting point, the network company seeks flexibility as a tool for load management, but at the same time changes in electricity use can create new load peaks due to increased simultaneity of electricity use. More information is generally needed about the amount, price and capabilities of flexibility to identify further development needs for flexibility services.

b. Utilisation of flexibility services

Helen Electricity Network Ltd does not plan to introduce new flexibility services in 2026–2027. Helen Electricity Network Ltd will continue to utilise and develop the local flexibility market.

c. Estimated costs of utilising flexibility services

i. Implementation costs 0 €
ii. Annual operating costs
Up to 1,400,000 €/year
iii. Lifecycle cost benefits 0 €

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6. Electricity distribution network development measures over the previous two years

6.1. Investments and maintenance to meet and maintain network quality requirements and to maintain capacity needs over the previous two years

a. High-voltage distribution network
- i. Investments 1.3 M€
- ii. Maintenance 0.14 M€

b. Substations
- i. Investments 5.9 M€
- ii. Maintenance 2.69 M€

c. Medium-voltage distribution network
- i. Investments 5.9 M€
- ii. Maintenance 0.01 M€

d. Secondary substations
- i. Investments 1.9 M€
- ii. Maintenance 0.25 M€

e. Low-voltage distribution network
- i. Investments 6.8 M€
- ii. Maintenance 0.22 M€

6.2. Points of delivery covered by the quality requirements after the measures of the previous two years

a) In the local detailed plan area

In the local detailed plan area, there were 439,234 delivery sites covered by the quality requirements as of 31.12.2025.

b) Outside the local detailed plan area

Outside the local detailed plan area, there were 959 delivery sites covered by the quality requirements as of 31.12.2025.

6.3. Measures over the previous two years

Over the previous two years, approximately 99% of the measures were implemented in the local detailed plan area development zone and approximately 1% in the development zone outside the local detailed plan area.

In the local detailed plan area development zone, in relation to the 110 kV network and substations, 110 kV cable and overhead line relocations were carried out due to the city's development, 110 kV customer connections were implemented, substations were refurbished, and a new substation was built.

In the local detailed plan area development zone, around 15 km of new medium-voltage cable network was built and around 32 km of the existing network was renewed. Around 53 km of new low-voltage cable network was built and around 79 km of the existing network was renewed. 13 new secondary substations were built, and 39 existing ones were refurbished.

In the local detailed plan area development zone, the planned maintenance costs consisted almost entirely of maintenance of substation properties and primary and secondary equipment. The second-largest share of costs arose from maintenance of secondary substations, and the remainder from maintenance of the high-, medium- and low-voltage networks.

In the development zone outside the local detailed plan area, around 2 km of the existing medium-voltage cable network was renewed. One existing secondary substation was refurbished. As maintenance work, servicing of overhead line networks was carried out.

6.3.1. Electricity distribution network meeting the quality requirements after the measures of the previous two years

a) MV

Of the MV network, approximately 1,699 km meets the operational quality requirements for the electricity distribution network.

b) LV

Of the LV network, approximately 4,695 km meets the operational quality requirements for the electricity distribution network.

6.3.2. Utilisation of joint construction

Joint construction was utilised in investments over a distance of around 15 km, corresponding to approximately 17% of all construction.

6.3.3. Significant distribution network investments over the previous two years to connect new generation and new loads

Over the previous two years, 27 M€ was invested in the network to connect new generation and new loads.

Over the previous two years, on the high-voltage side, due to new district heating production solutions and shore power connections for shipping, a new substation was built and existing connections previously used for generation were converted for consumption.

Over the previous two years, new loads connected to the distribution network required expansion investments in the medium-voltage cable network and secondary substations across the city.

6.4. Utilisation of flexibility services over the previous two years

a. Studies and pilot projects on utilisation of flexibility services

In studies and pilot projects related to utilising flexibility services, the focus in 2024 and 2025 has been on demand response and pricing of flexibility. Below are mentions of flexibility projects and studies carried out by Helen Electricity Network Ltd or in which it has participated: Increasing flexibility Through the Electricity Research Pool, Helen Electricity Network Ltd participated in a project by LUT University that started in autumn 2023, which analysed the impacts of electricity market price volatility on demand response among low-voltage customers as well as impacts on the electricity distribution system. Results from this project were received at the end of 2024. At the same time, we carried out our own work to examine the impacts of price volatility on consumption by high- and medium-voltage customers.

In addition, Helen Electricity Network Ltd procured and set up Finland's first local flexibility market together with Fingrid during 2024 and 2025. Flexibility procured through the market is used for congestion management together with flexible connection agreements.

b. Utilisation of flexibility services

Helen Electricity Network Ltd, together with Fingrid, set up Finland's first local flexibility market in April 2025. During 2025, no flexibility could be procured from the market due to a lack of liquidity. Work to build liquidity began already before the market opened and is still ongoing. In addition, we utilise flexible connection agreements alongside the market. Helen Electricity Network Ltd has more than 200 MW of flexible capacity available, which has enabled customers to be connected to the network faster.

c. Realisation of market-based flexibility

Helen Electricity Network Ltd uses a local flexibility market that is open to all, through which parties can offer their flexibility to us on market terms. In this context, we hold discussions with stakeholders and assess their opportunities to offer flexibility.

d. Actual costs of utilising flexibility services

i. Implementation costs 225,497 €

ii. Annual operating costs 78,902 €/year

iii. Cost benefits achieved through flexibility services over the previous two years 0 €

6.5. Actuals compared to the previous development plan

Actual investment costs for substations and 110 kV networks were lower than the investment costs presented in the 2024 development plan, because project schedules were refined for both 110 kV networks and substations. Over the previous two years, investments have been weighted toward expansion and modification investments in substations and 110 kV networks. In addition, the allocation of investments between replacement and expansion investments has been interpreted differently in the 2024 development plan and in allocating realised investments for 2024–2025. With the start of 400 kV planning, development of the 110 kV network has also been lightened, and some planned investments have not been implemented.

Over the previous two years, slightly less network meeting the quality requirements was implemented than forecast. Construction costs for the medium- and low-voltage networks have increased compared to the situation two years ago, so construction has been more expensive per kilometre or per item. Utilisation of joint construction differs significantly from the forecast because the forecast was based on cable lengths, whereas the actuals were based on excavation lengths, which more accurately describe construction.

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7. The hearing on the development plan

7.1. Implementation of the hearing on the development plan

The development plan was published in full for hearing in PDF format in Finnish, Swedish, and English on Helen Electricity Network's website. A news article on the website provided a brief overview of the content of the development plan and the hearing process. The website also included a link to the hearing application used to conduct the hearing, as well as a link to a webpage presenting a concise summary of distribution network development. Within the hearing application, questions relating to the key topics of the development plan were presented. Some of these questions were dependent on the respondent's electricity usage group, which was identified at the beginning of the survey. In addition to multiple-choice questions, respondents were also able to provide open written feedback. Information about the development plan and the hearing opportunity was communicated not only via Helen Electricity Network's website, but also through a customer newsletter distributed by email and via the company's social media channels (LinkedIn, Instagram, Facebook). The transmission system operator, neighbouring network companies, and the City of Helsinki were informed of the publication and the opportunity to provide comments via email. The largest customers were also notified of the publication by email.

7.2. Hearing period

The development plan and the link to the hearing application were published on Helen Electricity Network's website on 30 April 2026. At the same time, an email concerning the hearing was sent to the transmission system operator, neighbouring network companies, and the City of Helsinki. The hearing period ended for all parties on 31 May 2026. One written comment was received by email by the deadline of 31 May 2026.

7.3. Respondents by group

A total of 11,730 responses were received through the hearing application (11,038 in Finnish, 267 in Swedish, and 425 in English). These responses were distributed across respondent groups as follows:

- Households: 10,414 (88.78 %), of which approximately 78 % lived in apartment buildings
- Housing or real estate companies: 365 (3.11 %)
- Public sector: 23 (0.20 %)
- Associations or communities: 34 (0.29 %)
- Private companies: 133 (1.13 %)
- Other: 761 (6.49 %)

In addition, one written comment was received by email from a neighbouring network company (Caruna Espoo Oy).

7.4. Processing of stakeholder comments

Summaries of responses to multiple-choice questions submitted through the hearing application were compiled internally by Helen Electricity Network. Text-based responses were also reviewed and summarized internally, supported by an AI-based language model solution. The written comment received by email was likewise reviewed internally. All responses submitted via the hearing application and all written comments received by email are stored on Helen Electricity Network's file server.

7.5. Key results of the hearing

The following provides a summary, by theme, of the questions that included predefined response options.

Changes in electricity consumption

Approximately 20 % of household respondents expect their electricity consumption to either increase or decrease in the future. Among housing or real estate companies, private companies, and public sector respondents, nearly one-third anticipate changes in electricity consumption. Among housing or real estate companies, just under one-quarter reported having plans related to changes such as switching heating methods, installing electric vehicle charging points, adding solar panels, or implementing energy efficiency measures. Such plans were less common among other respondent groups.

Investments to enable the clean transition

More than 80 % of all respondents fully or somewhat agreed that the distribution network should enable the clean transition rather than slow it down. More than half of respondents considered security of supply to be important or somewhat important, even if it leads to higher network tariffs. More than half of respondents also preferred to retain the current time-based structure of the capacity charge (Monday–Friday, 7 a.m.–9 p.m.), rather than adopting alternative time structures defined in tariff harmonisation regulation.

Open feedback on the development plan

Slightly more than one-third of respondents provided open written feedback on the development plan.

The majority of the feedback was positive. No concrete proposals for changes or clear needs to revise the content of the plan were identified in the open feedback. Respondents expressed some concern about the impact of network investment costs on electricity distribution prices and about the resilience of the electricity network in crisis situations. Maintaining a high level of security of supply was also considered important. A relatively large number of responses addressed issues outside the scope of electricity network operations, particularly topics related to energy production, electricity prices, or data centres.

Comments received by email

In its written comment, Caruna Espoo Oy noted that open dialogue on electricity network development and its underlying assumptions contributes to the development of the overall electricity system in a reliable and cost-efficient manner. Caruna Espoo considers the plan to be a comprehensive and versatile presentation of the transformation of the operating environment and its impacts on electricity network development. According to the company, the projected increase in electricity consumption in the capital region is well aligned with its own view. This growth is expected to require significant investments, particularly in increasing the capacity of high-voltage networks, both in the distribution network and the transmission system. Caruna Espoo also emphasised that ensuring the overall functionality of the capital region's electricity system requires sufficient predictability and close cooperation between network companies. The company shares the view presented in the development plan that the regulatory model should promote the clean transition while encouraging responsibility and emission reductions in network construction and maintenance. Furthermore, Caruna Espoo considers it important that regulation enables the long-term planning and implementation of investments in a changing operating environment.

7.6. Need for changes to the development plan

The results of the hearing were encouraging and confirmed the choices made by Helen Electricity Network in developing the distribution network in Helsinki, particularly with regard to enabling the clean transition and maintaining a high level of security of supply. The hearing did not identify any clear thematic areas requiring changes to the development plan at this stage. Some feedback also concerned matters outside the scope of electricity network operations.

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