

**FINGRID**  
ANNUAL REPORT 2020

# Business Review

FINGRID

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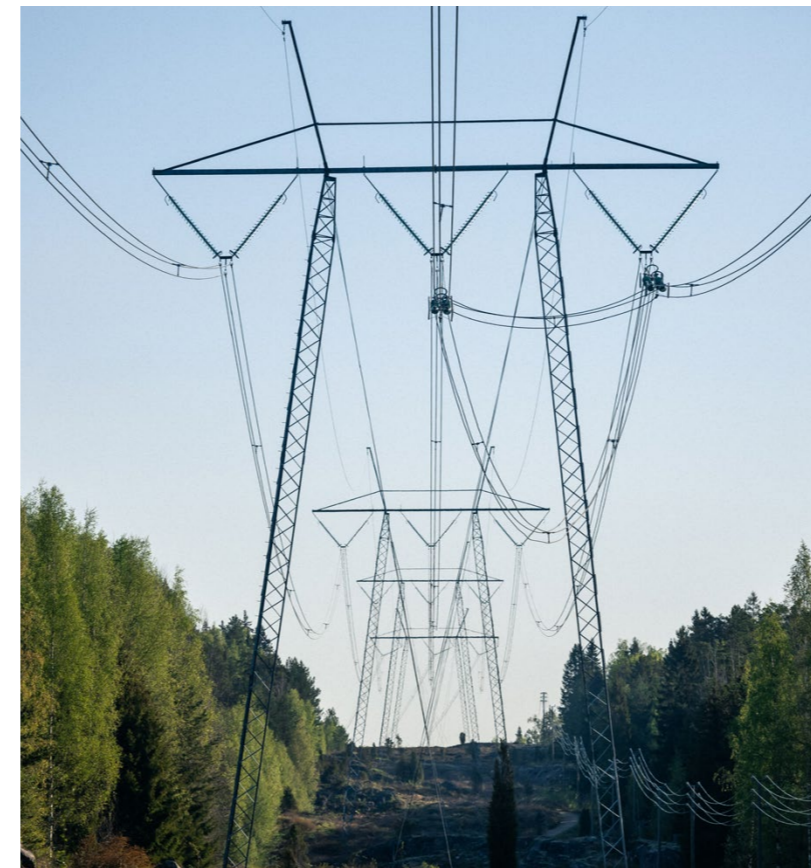
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- > Operating environment and business model
- > Strategy
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”Fingrid is responsible for the functioning of Finland’s power system, which makes it fundamentally a risk management company.”

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# 1. FINGRID 2020

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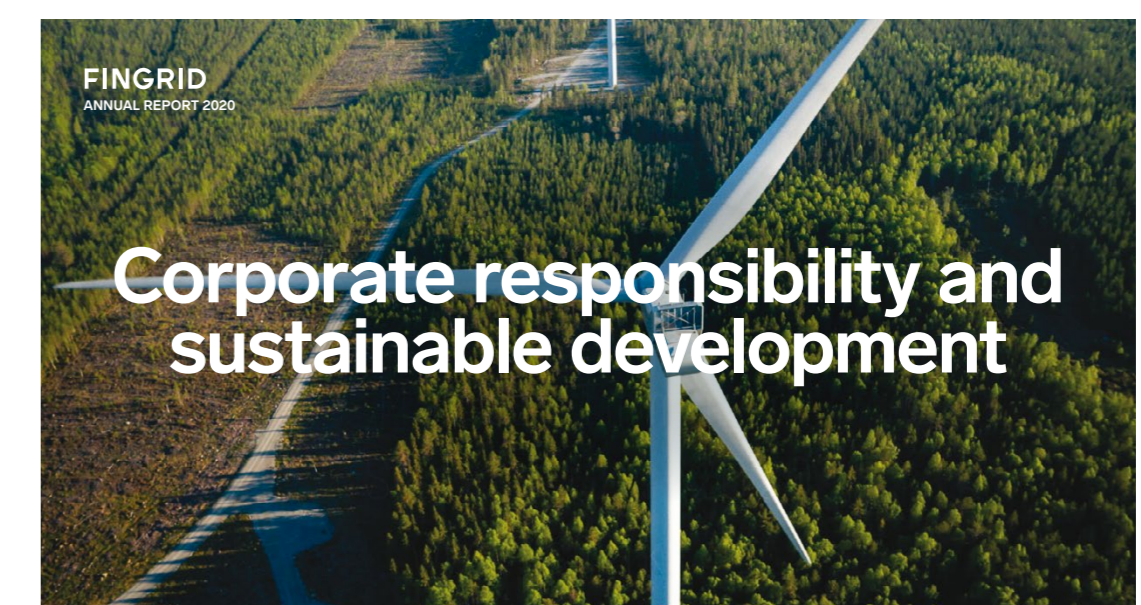
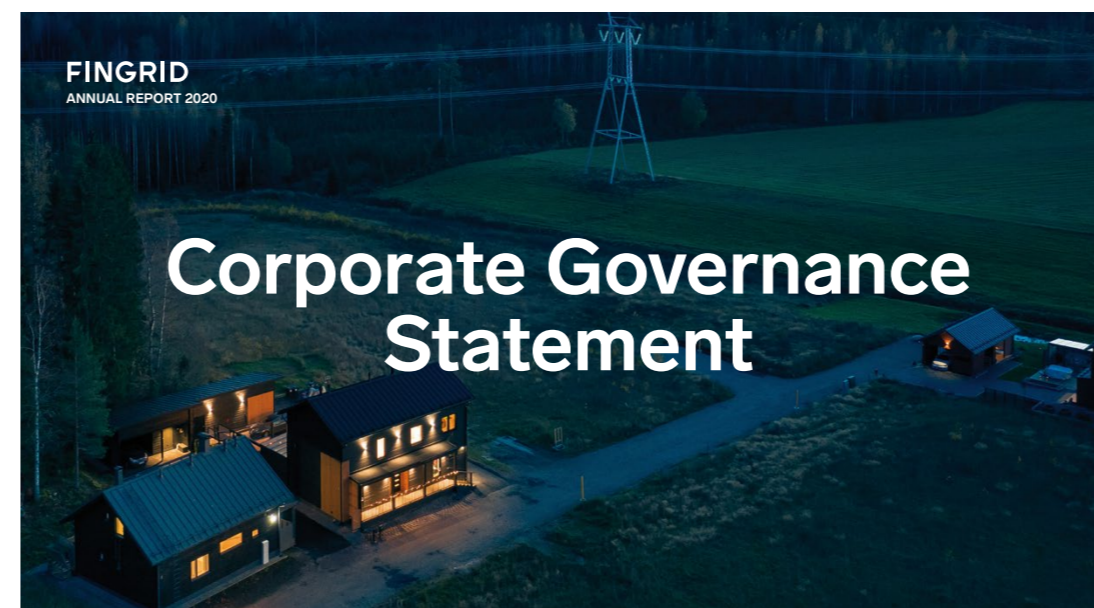
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Fingrid's Annual Report for 2020 consists of six sub-reports: the Business Review, Report of the Board of Directors, Consolidated Group and parent company's Financial Statements and key figures, Corporate Governance Statement, Remuneration Statement, and Corporate Responsibility Report. For the first time, the Financial Statements are published in accordance with the European Single Electronic Format (ESEF) reporting requirements. The format is Extensible Hypertext Markup Language (XHTML), and the document is available on [www.fingrid.fi/en](http://www.fingrid.fi/en)

Fingrid draws up the Consolidated Financial Statements and the half-year report in accordance with the international IFRS reporting standards accepted by the European Union and in accordance with the Finnish Securities Market Act. The Consolidated Financial Statements include the parent company Fingrid Oyj and its wholly owned subsidiaries Finextra Oy and Fingrid Datahub Oy. The Group additionally has a 25.0% holding in one associated company, eSett Oy. The Report of the Board of Directors and the financial statements of the Group's parent company and its subsidiaries are prepared in accordance with the Finnish Accounting Act and the guidelines and statements of the Finnish Accounting Board.

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## 2. REVIEW BY THE PRESIDENT & CEO

Finland and the entire world are experiencing a genuine boom in the construction of a clean power system. In addition to the connection of the Olkiluoto 3 nuclear power plant, we are currently processing enquiries related to additional wind power construction amounting to tens of thousands of megawatts. Clean electricity requires well-functioning transmission connections. We built transmission lines and substations at dozens of worksites in 2020; in terms of number of investment projects, it was a record year. The high tempo of investments will continue at least throughout this decade.

Despite the exceptional situation caused by the coronavirus pandemic, the investments progressed as planned. Even in these unusual circumstances, Finland's main grid operated reliably, with excellent transmission reliability. As a company critical for the security of supply, we are well prepared for a wide range of exceptional circumstances and we actively participate in Finland's National Emergency Supply Organisation.

Weather played the leading role in the Nordic electricity market. An exceptionally mild winter and the resulting substantial decrease in electricity consumption, heavy rains and the consequent good availability of hydropower, as well as hard

winds and high production of wind power, led to very low electricity market prices in the Nordic countries and large regional price disparities. Finland imported electricity from Sweden, using the full transmission capacity between the countries, but the existing transmission capacity did not meet the actual market needs. Our cross-border transmission connections functioned well, however, and we succeeded in making all the existing capacity available to the markets.

Due to the decrease in electricity consumption, our grid service revenue fell year-on-year. The market conditions also resulted in a decrease in the cross-border transmission income for the capacity imported from Russia. The exceptionally intensive spring floods increased the prices for the reserves required for balancing consumption and production for several weeks, resulting in increased costs for us. Due to the weather conditions, our result was significantly lower than planned. Through cost-effective operations, we have managed to keep our transmission tariffs at an affordable level regardless of the intensive investment tempo. We have been able to lower our grid service fees by more than 10 per cent since 2017, and they will remain unchanged also in 2021.

### Focus on the future: Fingrid faces its biggest challenge ever

We recognise our central role in the implementation of the national 'Climate-neutral Finland 2035' vision. We will do everything in our power to enable the ambitious objectives of the government programme through our operations, which provide society with highly impactful electricity market and grid services. Along with our grid investments, we continue developing an electricity market that balances out the supply and demand of electricity at each moment in time and creates flexibility in the power system on market terms. Managing the power system will in the future require shorter and shorter reaction times and the capability to manage vast amounts of data. Our response to these challenges is to increase the degree of automation in the processes linked with operating the power system.

We fully understand that we cannot accomplish our crucial mission without support from society and our stakeholders. The support we can expect from our stakeholders is directly dependent on our reputation. On the other hand, the higher the trust in us, the better we are equipped to serve Finnish society. We have continued our efforts to build and maintain a good reputation. At the end of



the day, our actions always speaks louder than words. Along with maintaining our reputation, we have developed our corporate responsibility management and reporting. Achieving excellence in our mission of key societal importance requires a high level of quality in all areas of corporate responsibility and the ability to evolve along with the changing operating environment.

**Jukka Ruusunen**  
*the President & CEO*

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## 3. OPERATING ENVIRONMENT AND BUSINESS MODEL

## CLIMATE CHANGE

Finland's goal is to be a climate-neutral society in 2035. A key path to this goal is to eliminate emissions from industry, heating and traffic by electrifying these activities. In the clean power system of the future, electricity will be produced without CO2 emissions.

Renewable energy will play an increasing role in power generation. The share of emission-free, non-adjustable and decentralised production is growing. The European internal market in electricity will increase the efficiency and security of supply, while also contributing to increasing weather-dependent, renewable electricity generation.

The structure of electricity production is changing: while the share of renewable energy is increasing, the production of adjustable condensing power relying on fossil fuels is on the decline. The capability for supply-side flexibility in response to changes in the demand will decrease as the share of wind and solar power increases. Fluctuations in electricity prices will increase and create business opportunities for flexible production and consumption as well as energy storage technologies.

Fingrid plays an active role in this energy transition by helping shape a clean power

system on market terms. We closely collaborate with the market parties, our customers, the authorities, and policy-makers. We do our part in mitigating climate change by building and maintaining the main grid, thus creating the platform for a clean power system.

Fingrid's task is to connect the energy produced in a new way to the main grid and prepare for the decrease of flexible production capacity. We develop the electricity market also for the needs of an emission-free power system.

## SECURITY OF SUPPLY AND ELECTRICITY DEPENDENCY

Electricity consumption is increasing and society demands a secure, uninterrupted supply of electricity. Security of supply must be guaranteed in a changing power system with a lot of weather-dependent production of renewables.

Severe disturbances in the power supply are among the most serious security threats to a modern society. Electricity sector risks are being prepared for as part of the European Commission's clean energy Winter Package. The aim is to improve the security of electricity supply at the EU level and reinforce regional cooperation. Measures related to crises must be compatible with the rules for the EU's internal electricity market.

## Renewable energy will play an increasing role in power generation.

Fingrid's investments in the electricity network, grid maintenance, promoting the markets and developing grid operations improve the reliability of power supply and our preparedness in the face of crisis situations. In risk and continuity management, continuous preparations are made for serious disturbances to the power system in different threat scenarios. We are actively involved in international cooperation to develop European network codes, and we prepare for power system disturbances in cooperation with the Baltic Sea region's TSOs.

## GLOBALISATION AND RESPONSIBILITY

Globalisation brings opportunities for service and equipment procurements, the labour markets and financing. Responsibility and increasing regulation will be highlighted in a global economy. Companies are expected to offer solutions to society's common challenges. Longer procurement chains and increasingly international activities mean challenges for responsible business operations.

Increased workforce mobility is making energy companies more international. The global financial market offers well-managed companies with a high credit rating a flexible and affordable way of procuring financing. Corporate responsibility is a key component of Fingrid's operations. The importance of openness is growing even further.

For Fingrid, globalisation means new opportunities in the shape of international suppliers and cooperation partners. We have for a long time made use of international financing markets and were the first Finnish company to have issued a Green Bond. Fingrid's task as a responsible buyer of goods and services is to promote sustainable development and responsible practices worldwide.

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## DIGITALISATION

Digitalisation promotes new practices and operational procedures in the power system and electricity market. It also enables advanced power system operations, grid maintenance management, and automation. Digitalisation increases the importance of data, information technology and telecommunications while enabling new business opportunities. The increasing rate of automation will also change ways of working. Effective management of intellectual capital and cybersecurity are more important than ever.

From Fingrid's perspective, digitalisation enables even more productive operational processes, better customer service, and more efficient sharing of market information. It also provides new tools for managing a changing and increasingly complex power system. Smart grid technology opens up new business opportunities for both current and new operators and, in turn, shapes Fingrid's customer field.



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## 4. STRATEGY

Fingrid is Finland's transmission system operator. Our owners are the State of Finland, and Finnish pension and insurance companies. Our mission is to secure a cost-effective and reliable supply of electricity in our society in all situations and to promote a clean, market-based power system of the future.

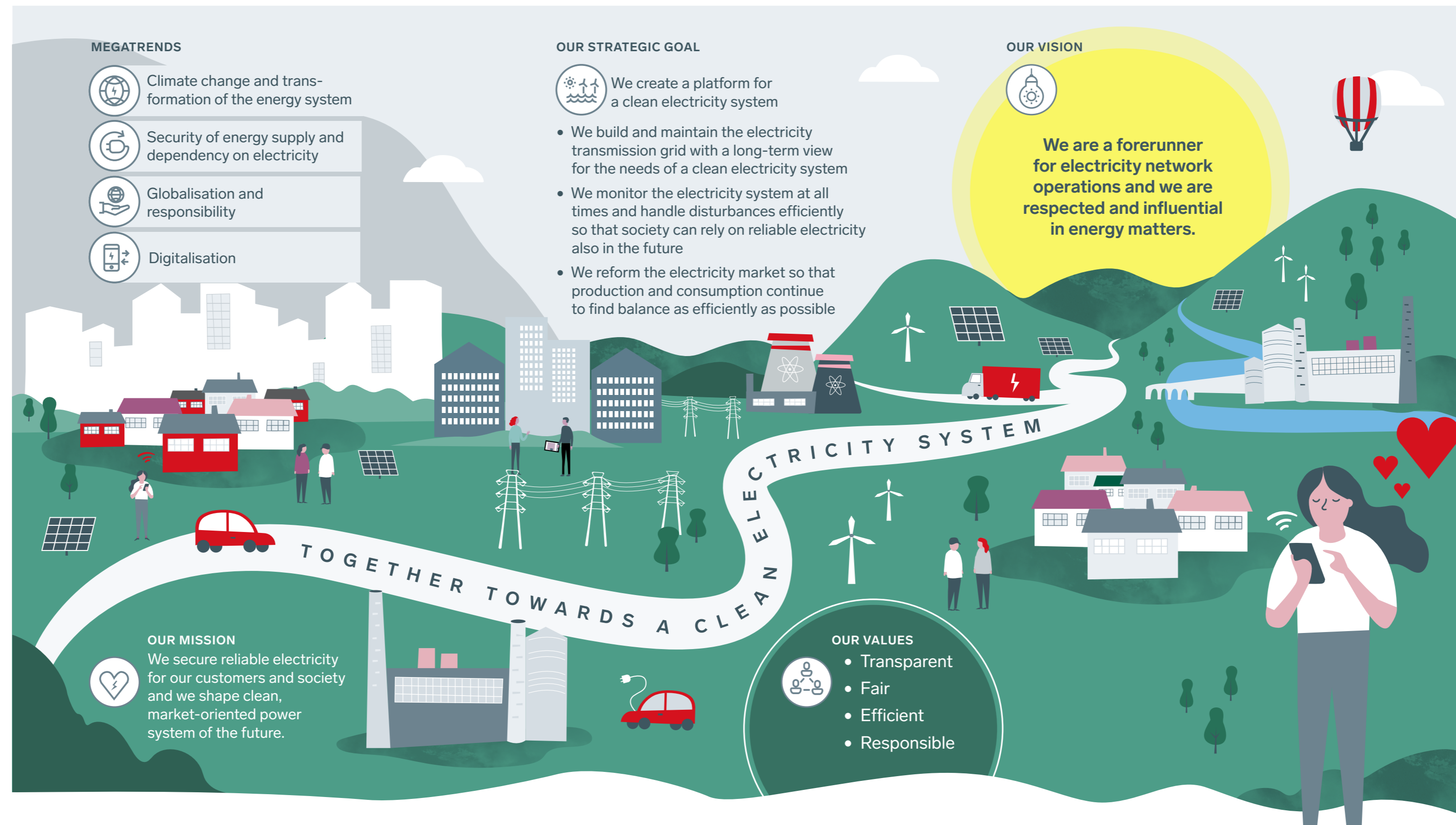


Image. Fingrid's role in society and our strategic targets.

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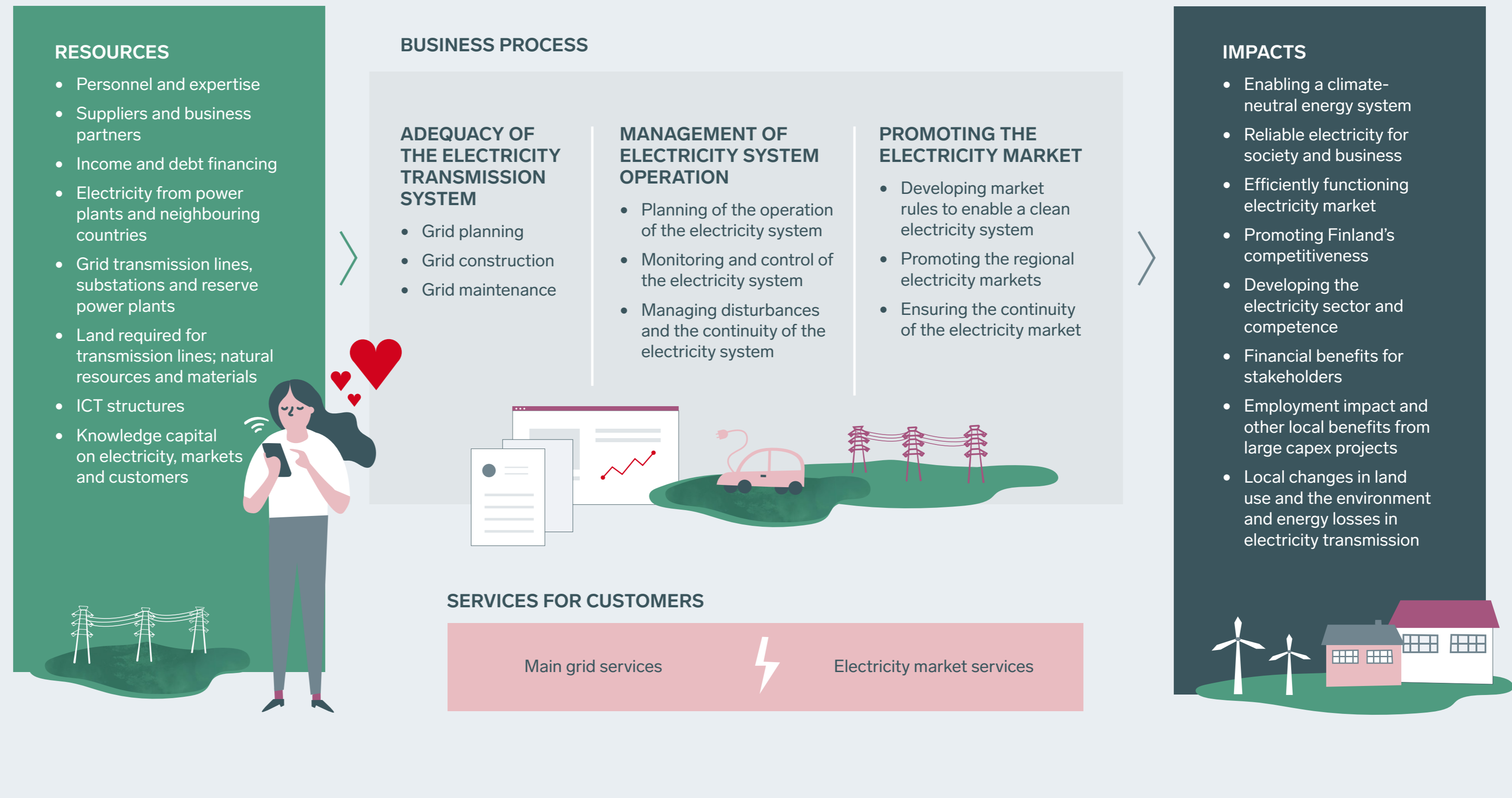
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## Fingrid's business model



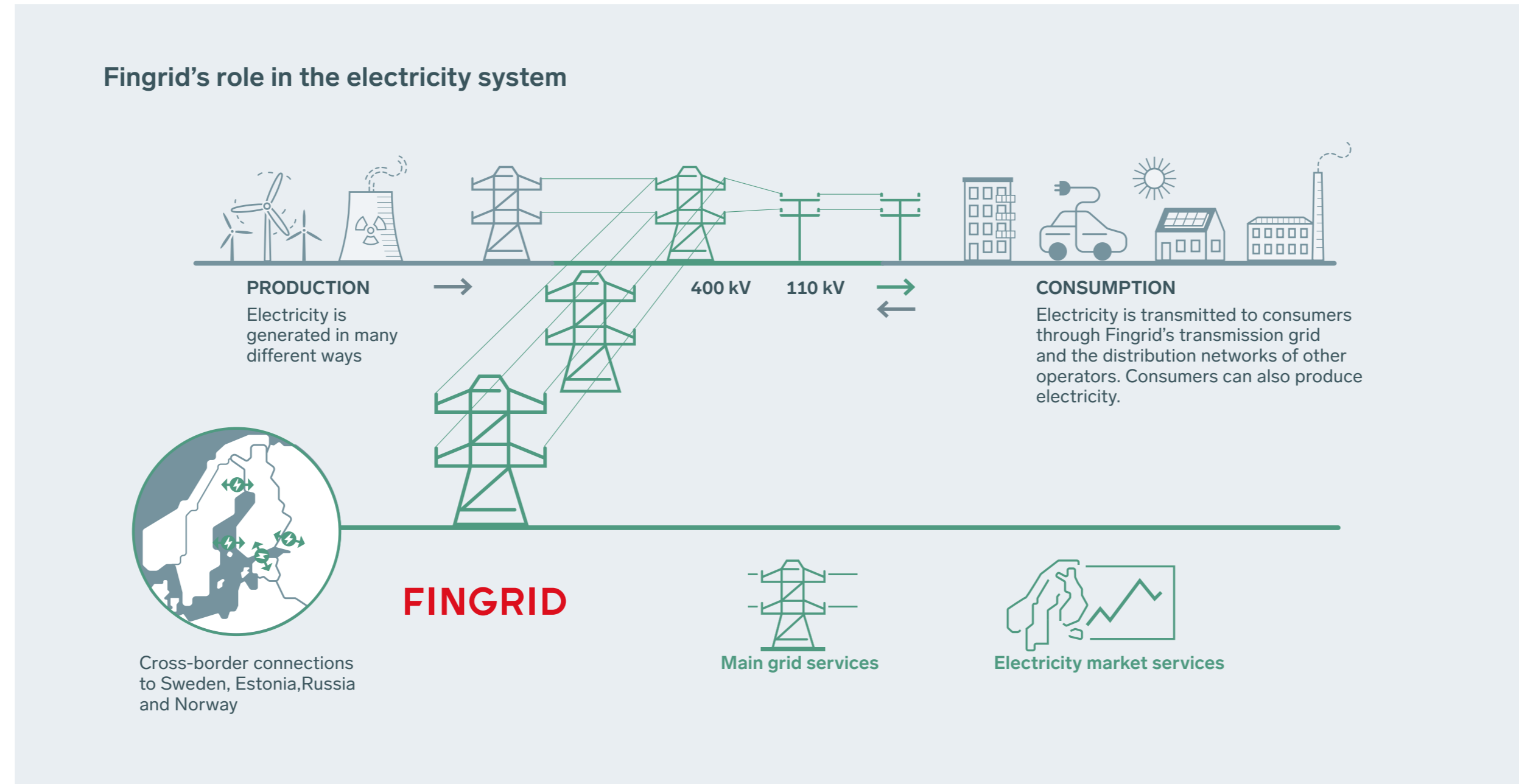


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### BUSINESS MODEL

Our operations are based on Finnish and EU legislation. In accordance with the Finnish Electricity Market Act, we develop the main grid, maintain a balance between electricity consumption and generation, and promote the preconditions for a well-functioning electricity market. The EU Regulation on the internal market for electricity obligates us to cooperate within ENTSO-E, the European Network of

Transmission System Operators of Electricity, and also regionally within the Baltic region, to improve the functioning of the internal market in electricity. Our task is to participate in the drawing up and implementation of the market, operating and connection codes and the proposals prescribed in them. Fingrid's operations are supervised and regulated by the Energy Authority, which has granted the company a licence for the main grid operations.

The business model describes the most important material and immaterial resources at Fingrid's disposal that are necessary for our business processes. The impact of Fingrid's operations and the significant added value they generate show in various ways throughout Finnish society.

### OUR VISION

Fingrid's vision is to be an exemplary transmission system operator and a

highly esteemed energy influencer.

### OUR VALUES

Our values guide the work of our professional community and lay a solid foundation for our corporate culture. Fingrid is open, fair, efficient and responsible in all our operations.

### OUR WAY OF WORKING

Our corporate culture is open, collaborative and renewing, and complies with good governance practices. We are known for our expertise.

We develop our operations for the long term and in cooperation with our customers and other stakeholders. We treat everyone impartially and with respect. We achieve the bold and ambitious goals set for our operations.

We provide high quality and efficiency by combining our core expertise with that of the best players in the world.

We always work responsibly, effectively, and through open interaction. This is how we earn the trust of our customers and stakeholders.

### IMPLEMENTATION OF THE STRATEGY

Fingrid's strategy is implemented through four perspectives: Personnel & Expertise, Customers & Society, Finance, and Inter-

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nal Processes. According to the approach chosen by Fingrid for implementing its strategy, all four perspectives are equal and are implemented and developed in a mutually balanced way in accordance with the strategy framework described above. In the strategy house, everything moves from the foundation all the way to the top: when personnel's well-being and competence are in order, the internal processes can function optimally and efficiently produce services and financial benefits for the shareholders, customers and the whole of society. The strategic perspectives play a key role in the day-to-day management of the company.

Fingrid is a specialist organisation in which the objective of the Personnel & Expertise perspective is to maintain and develop an open, social, renewing and high-performing work community.

The Internal Processes perspective consists of the company's three basic functions:

- Ensuring transmission capacity: We carry out investments and maintenance safely and efficiently at the right time.
- System security management: We operate the main grid proactively and reliably.

- Promoting the electricity market: We actively maintain and develop the electricity market.

The objective of the Finance perspective is to operate cost-effectively and create value for shareholders.

The top of Fingrid's strategy house is made up of the Customers & Society perspective, which aims at securing reliable supply of electricity and a well-functioning electricity market for the society, as well as meeting the customers' needs with our services at affordable prices.

The preparation of the goals and operations of each strategic perspective are steered by a steering group appointed by the company's Executive Management Group, which ensures that matters are prepared comprehensively and executed efficiently using the best expertise. Fingrid's primary approach is to serve the best interests of both society and the company's customers.

The key choices in the company's strategy work are approached through each of the perspectives to establish the kind of measures that are required of each of them for the implementation of the strategy.

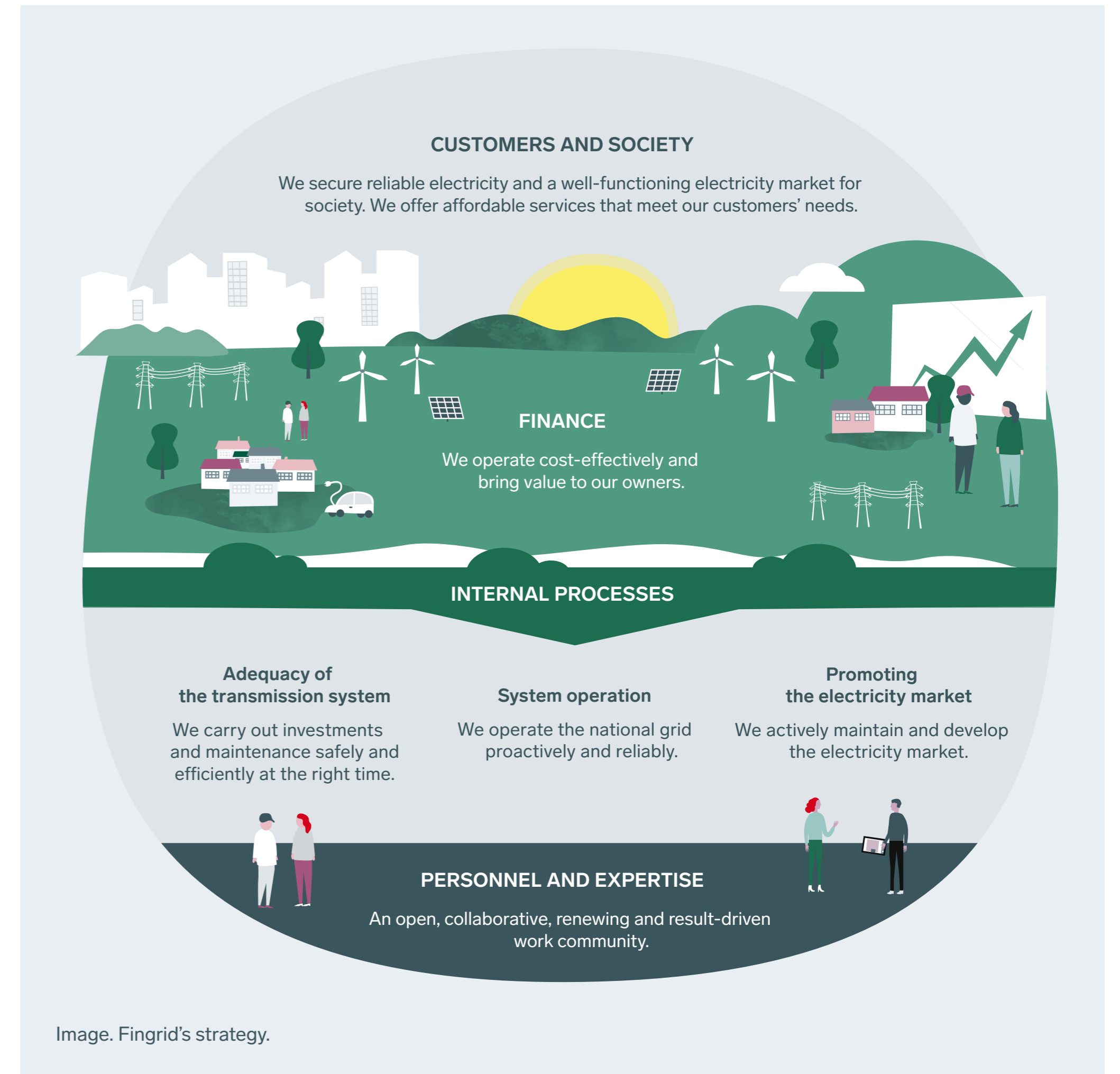


Image. Fingrid's strategy.

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### Our strategic choices are as follows: Focusing on our core mission

- We excel in accomplishing our core mission in a changing operating environment. We do not aim to expand into new businesses or to participate in competitive business.

### Customer focus

- We develop our business operations and operating models with our customers in mind and for the benefit of the entire country.

### World-class efficiency

- We innovatively utilise the best technologies and opportunities enabled by digitalisation. We maintain the necessary core competence in-house. We cooperate with the best partners.

### Market focus

- We apply a market-oriented approach in all areas because we believe that well-functioning markets will produce the best and most innovative solutions.

### Openness to integration

- We actively promote the integration of the electricity markets in Europe and the Baltic Sea region while also taking into account Finland's best interests.

### Security and responsibility

- During the energy sector transformation, we will maintain the current good level of system security. Corporate responsibility and safety are highlighted in everything we do.

Fingrid operates according to a matrix model that pairs the strategy and the organisation. The model pushes collective efforts and shared goals to the forefront. A matrix organisation is challenging, but we have shaped the company into an agile and flexible player with a flat hierarchy. The strategy is implemented as a matrix organisation through the defined four perspectives.

The personnel resources are allocated according to the functions such that managers are in charge of the annual planning and budgeting of the tasks in their respective areas of responsibility and of implementing the action plans according to the business targets set forth in the strategy.

The company's management model assigns a dual role to the managers as heads of both operations and perspectives. The management system is described in more detail in the 'Management principles' document.

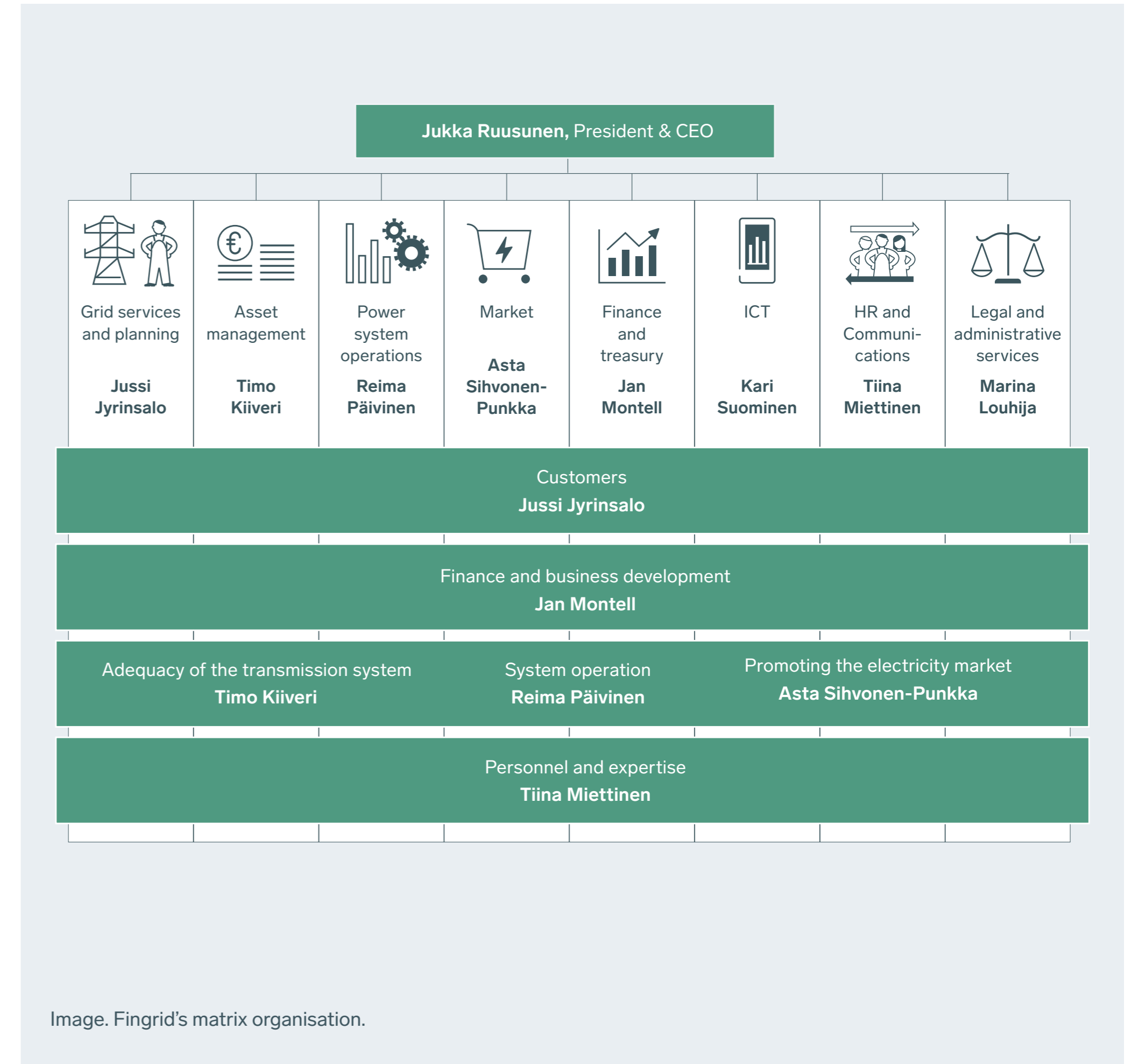


Image. Fingrid's matrix organisation.

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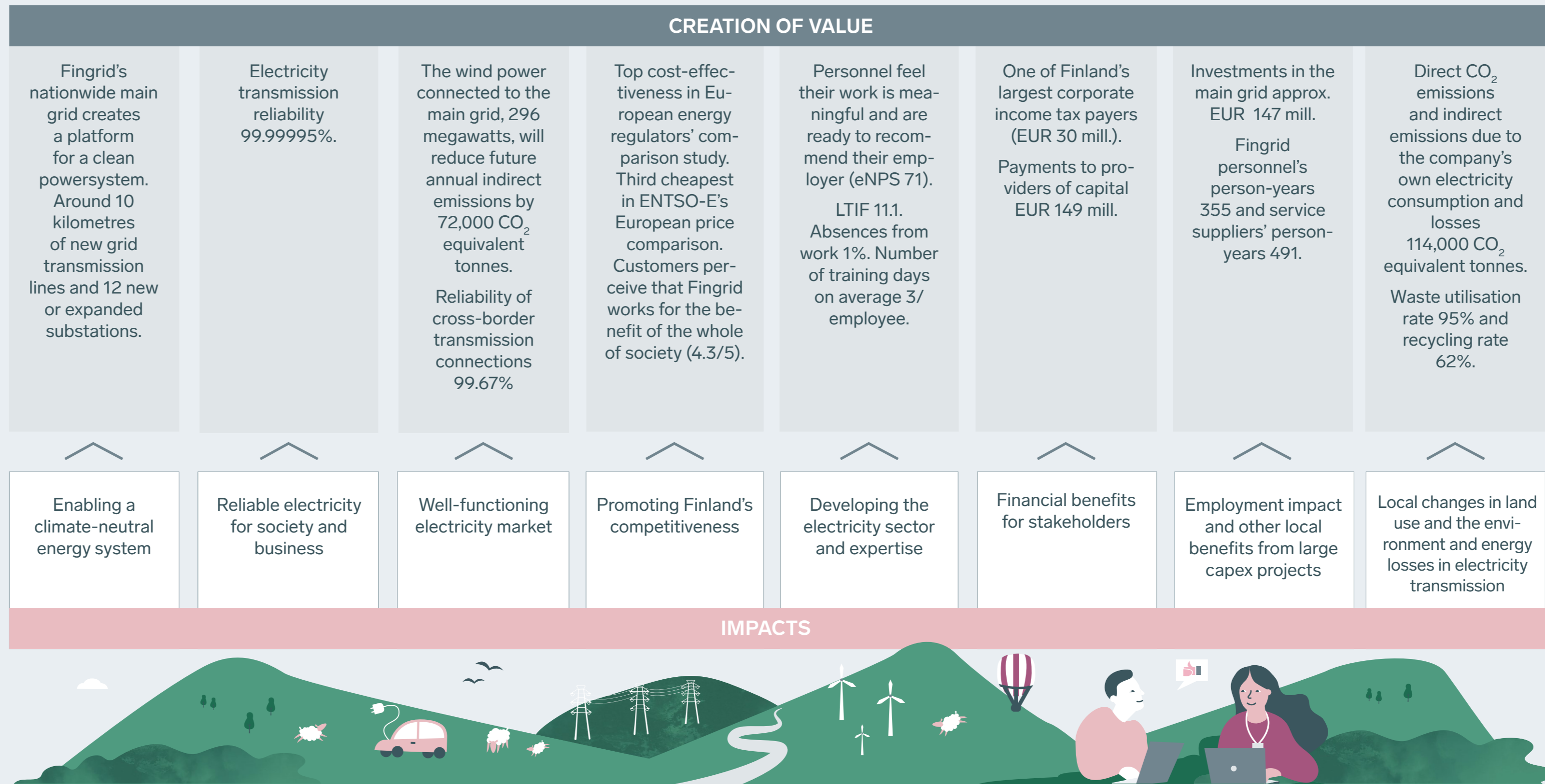
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## VALUE CREATION

Through its business, Fingrid creates significant shared value for its customers, employees, shareholders and the whole of Finnish society.

### Value created by Fingrid in 2020



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## 5. FINGRID'S REPUTATION, CUSTOMERS AND OTHER STAKEHOLDERS

### REPUTATION

Transmission system operators play a special role in society, both in Finland and elsewhere. They are entrusted with a responsibility for the functioning of a vital service for society, the power system. TSOs hold the role of closely regulated natural monopolies.

In Fingrid's point of view, the trust and support of stakeholders is a vital issue. A company with a good reputation can attract better employees, has more satisfied customers, can get more affordable financing and enjoys the support of society. Furthermore, society can intervene in the operations of a TSO by changing regulation, if the company does not accomplish the duties assigned to it. Reputation management is a part of our strategic management. We regularly gauge our reputation among our key stakeholders and develop our operations according to the feedback we receive.

In 2019 and 2020, T-Media studied Fingrid's reputation and the respondents' awareness of Fingrid's activities among decision-makers, media, technology students and professionals, and the general public. According to the survey, the more aware the respondent was of Fingrid, the more satisfied they were with the company. However, as a company, Fingrid is not well known.

Fingrid's achievements have received international recognition: in 2018, we were awarded as the world's Best Transmission Brand in the international CHARGE energy branding competition. During the period under review, Fingrid hosted a TSO reputation webinar in the global CHARGE conference.

### CUSTOMERS

Fingrid provides grid services and electricity market services to its customers: utility companies, electricity-consuming industry and electricity market operators. Fingrid's operations are largely based on performing statutory duties. We conduct our duties with a maximum customer focus, impartially and on equal terms.

We develop our services in cooperation with our customers. We take into account our customers' needs and their business challenges. The foundation for our customer work is listening and clear communication. Our aim is to be impartial and have due consideration for the varying needs of different industry players. We aim to maintain our grid service fees among the most affordable in Europe. We have been able to lower our grid service fees by more than 10 per cent since 2017, and they will remain at the previous year's level in 2021.



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In addition to being able to offer services that meet customer needs, we value openness, trust and active interaction with our customers. We engage our customers in developing our operations through, for example, the Advisory Committee, customer committees, and reference groups. Furthermore, we make our plans public for customers' comments and meet our customers one-on-one for feedback dialogue. We carry out extensive annual customer surveys to measure customers' satisfaction with Fingrid and to collect feedback for developing our operations. According to the 2020 customer satisfaction survey, our customers' trust in Fingrid remains strong and our work for the benefit of society at large is considered a particular strength. Our customers gave us a Net Promoter Score of 45, a good result for a monopoly company in a business-to-business industry.

Digitalisation will empower us to offer even better customer service. We launched My Fingrid service portal for our customers in 2019. In My Fingrid, customers can view various metrics such as transmission metering, invoicing and reactive power, as well as disturbance and unavailability data. The service was developed further in 2020, and new functionalities have been added continuously based on customers' needs and wishes.

The key functionalities launched in 2020 include power quality metrics, a documentation library, and support for the English language. The user interface was additionally modified to meet the requirements of the EU Accessibility Directive. A My Fingrid development team composed of customers also started its activities in 2020. In the future, the development team will participate in the steering and brainstorming of My Fingrid system development.

During the year, we organised two major customer events and several info sessions and webinars targeted at smaller audiences, concerning topics such as the datahub project and the 15-minute imbalance settlement project. The Fingrid Current event in March focused on the Baltic Sea region as a forerunner in the European electricity market. Exceptionally, the autumn event took place online and focused on the major changes in the electricity market, ranging from the go-live of the centralised information exchange system for the retail market, i.e. datahub, to the major changes faced by the wholesale electricity market. The event attracted as many as 400 participants interested in the electricity market.

Our grid services secure reliable transmission, capable of meeting the needs of

## > We value openness, trust and active interaction with our customers.

utility companies and energy intensive industry. Our value proposition is to offer reliable and affordable electricity transmission. Our grid services consist of connection into the main grid and developing, operating and maintaining the grid according to the customer's transmission needs. We implement the grid connections the customer needs, we ensure compatibility between the main grid and the customer's networks and guarantee the transmission capability and quality of electricity at the connection points. We make sure that Finland's power system operates reliably 24/7 and also prepare for any unusual contingencies. We carefully plan our maintenance activities and transmission outages in advance to minimise any disturbance they may cause to our customers.

In 2020, we were successful in accomplishing our value proposition of reliable and affordable electricity transmission. The reliability of electricity transmission hit an all-time record and our grid service fees were among the most affordable in Europe. Significant amounts of wind power capacity are currently being planned and under construction. We received around 160 inquiries about main grid connections, totalling tens of thousands megawatts in capacity. The connection agreements signed during the year enable the grid connection of roughly 1,800 MW of new wind power capacity. We also received enquiries about the grid connection of new types of consumption.

Our electricity market services offer all industry players a unified price area for electricity trade in Finland and the benefits of open European electricity markets. According to Fingrid's value proposition, we are the most market favourable transmission company. By maintaining a strong main grid, we make sure that Finland forms a unified price area for electricity. By means of our cross-border transmission connections, we offer access to the European electricity markets. We provide the market with the highest possible transmission capacity at all times. We develop the market rules and publish electricity market data openly and free

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of charge. In addition, we maintain and develop the marketplaces for reserve and balancing power. We take care of balance settlement and deliver imbalance power to the balance responsible parties. Fingrid Datahub Oy, our subsidiary, will offer an effective information exchange platform for retail market parties in the near future. Finextra Oy issues guarantee-of-origin certificates for renewable energy.

In 2020, the full cross-border transmission capacity was utilised for Finland's electricity imports from Sweden. Our transmission capacity did not meet the needs of the market, but our cross-border transmission connections functioned very well nevertheless and we succeeded in making the existing transmission capacity available to the market. More transmission capacity will become available between the countries in 2025. We have also made preparations to significantly increase the transmission capacity between northern and southern Finland in order to keep Finland as a single price area. Another area of the electricity market services visible to the customers are the various power market development projects we have carried forward in cooperation with other TSOs and customers. Along with international projects, a more concrete national initiative was the datahub, which has required significant inputs

also from our customers, in their own IT systems.

### FINGRID'S STAKEHOLDERS

Fingrid's operations have a major impact on the surrounding society. In addition to the customers, the company also has several other key stakeholders that we identify using a materiality analysis, for example. The starting point for identifying key stakeholders is to describe the expectations of stakeholders and Fingrid's activities that respond to the expectations. Being open to the stakeholders' expectations is an essential part of our reputation management and sustainable business. We offer our stakeholders information about corporate responsibility work in more detail in the [Corporate Responsibility and Sustainable Development Report](#) included in our Annual Report.

### Advisory Committee

The Advisory Committee and the two other customer committees (Grid Committee and Market Committee) play an important role in ensuring interaction and that the customer's voice is heard. The Advisory Committee deals with the company's entire field of operations and its success in its duties. The information addressed by the Advisory Committee is openly available to all stakeholders. The Advisory Committee convened four times during the year. The topics addressed in

### Fingrid's key stakeholders and channels of engagement



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the meetings included the management of system security in Finland and other Nordic countries, the continuously increasing need for more transmission capacity due to renewable energy, and the development of electricity markets. Customers' presentations on current topics were also on the agenda in each meeting.

**Members**

Timo Jokinen, Inergia Oy  
 Elina Kivioja, Vattenfall Oy (chair)  
 Jarkko Kohtala, Elenia Oy  
 Mika Lehtimäki, Boliden Kokkola Oy  
 Markus Lehtonen,  
 Helen Sähköverkko Oy  
 Mikko Lepistö, SSAB Europe Oy  
 Simon-Erik Ollus, Fortum Oyj  
 Jouni Pylvänäinen,  
 Kymenlaakson Sähköverkko Oy  
 Jukka Toivonen, Vantaan Energia Oy  
 Ilkka Tykkyläinen, Pohjolan Voima Oyj  
 Antti Vilkuna, Suomen Voima Oy  
 Mikko Vuori, UPM Communication  
 Papers Oy

**Members from Fingrid**

Jukka Ruusunen  
 Jussi Jyrinsalo  
 Rami Saajoranta (secretary)

**Service-specific committees**

The customer committees deal with matters in their respective sectors. The cus-

tomers committees were renewed starting from 2020, to correspond with the renewed services. The committees are advisory bodies that offer insights into Fingrid's operations and the services offered to customers.

**Grid Committee:**

The purpose of the Grid Committee is to participate in developing the service to ensure we can offer reliable transmission of electricity in the main grid according to the needs of utility companies and energy intensive industry.

During 2020, the Grid Committee's meetings focused on the various subareas in grid services. The participants prepared their own statements on the topics to be addressed in the meetings. The meetings additionally included industry-specific presentations by customers.

**Members:**

Tuomas Candelin-Palmqvist,  
 Tuuliwatti Oy  
 Hannu Halminen,  
 Sallila Sähkönsiirto Oy  
 Mikael Heikkilä, Fortum Oyj  
 Sakari Kauppinen,  
 Alva Sähköverkko Oy  
 Petri Kopi, Kemira Chemicals Oy  
 Anne Kärki, Outokumpu Stainless Oy  
 Heikki Paananen, Elenia Oy

Hannu Parkkonen, Kuopion Energia Oy  
 Jyri Tiuraniemi, Rovakaira Oy  
 Mikko Rintamäki, Kokkolan Energia Oy  
 Timo Torvela, Tuike Finland Oy  
 Katja Virkkunen, Oulun Energia Siirto  
 ja Jakelu Oy (chair)  
 Jarno Virtanen, Nivos Energia Oy

**Members from Fingrid:**

Jussi Jyrinsalo  
 Jonne Jäppinen  
 Timo Kiiveri  
 Petri Parviainen  
 Reima Päivinen  
 Katariina Saarinen (secretary)

**Market Committee**

The Market Committee brings together Fingrid and the electricity market parties active in Finland. The committee is an advisory discussion forum, which helps Fingrid to develop the Nordic and European electricity markets. Fingrid informs the committee on the development in the electricity market and on European cooperation, and in return receives feedback on any development plans topical at the time from the committee.

The meetings held in 2020 addressed topics such as the development of open data services, comparisons between Nordic transmission tariffs, the Nordic Balancing Model, calculation of transmis-

sion capacity, and supervision of reserve markets. The customers additionally took turns in presenting their operations and their views on the development of the electricity market.

**Members**

Peter Fabritius, Valio Oy  
 Hannu Jokinen, Hansen Technologies  
 Finland Oy  
 Marja Kaitaniemi, Neoen Renewables  
 Finland Oy  
 Tero Karhumäki, Kuoreveden Sähkö Oy  
 Juha Keski-Karhu, Väre Energia Oy  
 Elina Lehtomäki, Caruna  
 Tomi Pesonen, Metsä Group  
 Ville Pesonen, Gasum Oy  
 Ilkka Tykkyläinen, Pohjolan Voima Oyj  
 Jan Segerstam, Enerim Oy  
 Sebastian Sundberg, Fortum Oyj (chair)  
 Kimmo Tyni, AXPO Oy  
 Ville Väre, Liikennevirta Oy/Virta

**Members from Fingrid**

Asta Sihvonen-Punkka  
 Maria Joki-Pesola (secretary)



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## 6. FINANCE AND TREASURY

### Fingrid's business activities and the regulation of transmission system operations

Fingrid constitutes a natural monopoly as referred to in the Finnish Electricity Market Act (588/2013), with duties defined in legislation. The company's operations, reasonableness in pricing and financial result are regulated and overseen by the Energy Authority. The Energy Authority determines Fingrid's allowable financial income over four-year regulatory periods (2020–2023). Transmission system operations, in other words the transmission of electricity in the nationwide grid owned by the company, constitutes the bulk of Fingrid's turnover, profit and balance sheet. The allowed financial result

- The company's transmission system operations are third most affordably priced in Europe.
- In 2019, we were Finland's 17th largest corporate income tax payer.
- In 2020, Fingrid paid its owners, the State of Finland and Finnish pension and insurance companies, a total of EUR 148 million in dividends.

from transmission system operations is calculated by multiplying the total adjusted capital invested in the transmission network operations (transmission network assets valued at the regulatory value in use) with the reasonable rate of return defined by the Energy Authority. The reasonable financial result allowed by the regulation forms the basis of Fingrid's financial planning and pricing. The required amount of turnover can be calculated by adding up the operating expenses and the result.

Fingrid's turnover mainly constitutes from the pricing of the transmitted electricity, based on both the production and consumption by Fingrid's customers. Fingrid additionally charges fees for output from and input into the main grid, consumption fees, and power-based tariff. Most of the overall invoicing is linked to the consumption of electricity. The company determines in advance for the next year the unit prices for the transmission of electricity necessary to recover the required turnover. Fingrid's total costs consist of the operating expenses and finance costs and taxes, which are excluded from the regulatory calculations.

The so-called adjusted profit, realised in compliance with the regulation, is

Cost-effective operations ensure affordable grid service fees.

calculated by adjusting the parent company's operating profit according to the Energy Authority's regulation methods and by adding the impact, either positive or negative, of the incentives. The incentives include capex, quality, efficiency improvement and innovations incentives (R&D).

Any realised regulatory profit over a regulatory period that exceeds the allowed return constitutes a surplus that must be returned to the customers in the form of lower future prices. If the realised regulatory profit over a regulatory period is below the allowed return, this leads to a deficit which Fingrid may recover from the customers in the form of higher future prices. No regulatory surplus or deficit income is recorded in the financial statements. The aim of Fingrid's business operations is to achieve the allowable financial income over the regulatory period.

### Goals for financial steering

The key long-term goals for Fingrid's financial steering are as follows:

- Good cost-effectiveness, responsible operations, and continuous improvement of productivity in order to maintain service pricing on a moderate level. The company's goal is to be among the most cost-effective TSOs in Europe

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and maintain its grid pricing among the three most affordable in its peer group (companies with a similar grid).

- High credit rating to ensure the long-term availability of diversified funding and affordable funding costs. The company aims to maintain a credit rating of at least 'A-'.
- Creating shareholder value and high debt service capacity, which is achieved by maintaining the company's adjusted income on the level allowed by regulation and paying dividends that correspond to shareholders' profit targets and ensure continuing operations.

### Cost-effective operational activities

Our cost-effectiveness is based on an operating model where we focus on our basic mission and merge our core competence with the best players in the industry. We actively plan our operations in cooperation with our customers and invite external parties to participate in our innovation processes. This produces better and more efficient solutions in areas such as grid investments and development.

Fingrid has outsourced operations such as grid construction and maintenance to help optimise the use of financial and

production resources in a scalable manner. The monitoring and control of the main grid takes place in a centralised system. More and more, we make use of the possibilities created by digitalisation in areas such as grid maintenance and optimising the power system. Good examples include the [Load Frequency Control](#) to support the implementation of the new balancing model and the progress made in the [digital maintenance management project](#). Fingrid's management system is based on a matrix organisation and specialists' mandates to participate in the company's activities across organisational boundaries. [This increases the efficiency of operational activities.](#)

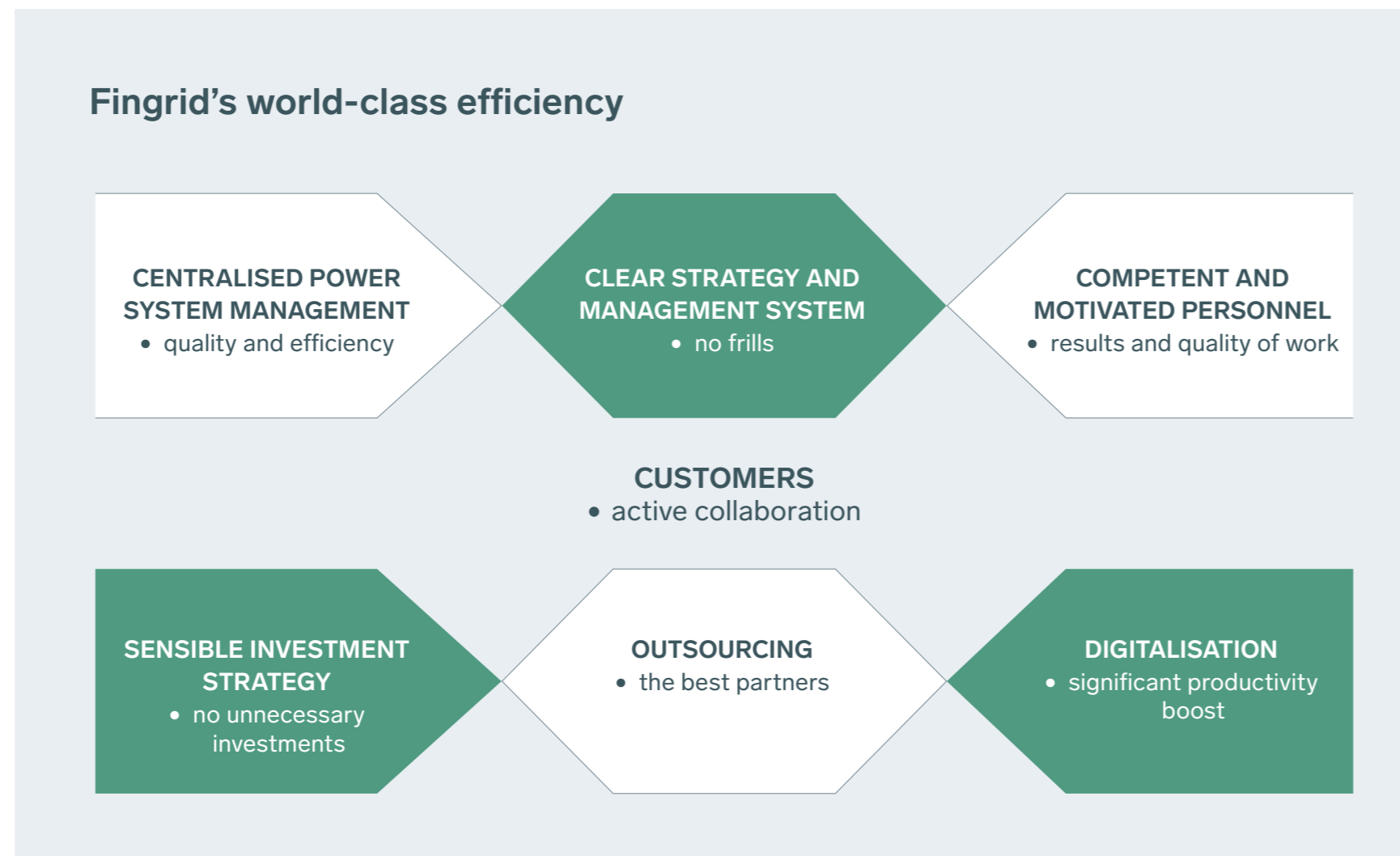
### Grid pricing

Fingrid aims to guarantee the stable pricing development of its services. Neither investment decisions nor any other decisions are dictated by our short-term financial targets. Our transmission fees have an impact particularly on the competitiveness of electricity-intensive industries. While Fingrid does not sell electricity directly to consumers, the small size of the grid service fee portion in an electricity bill makes our cost-effectiveness evident also to consumers. Sales, transmission and taxes each make up a third of consumer electricity prices. In 2020, the transmission tariff accounted

for an average of 2.4 per cent of the total bill (in a calculation where the household consumer's consumption is approximately 5,000 kWh/year).

Fingrid's grid service prices generally apply one year at a time. The aim of the pricing is to secure as stable development as possible, despite market-term uncertainties. However, major volatility on the market may necessitate upward or downward price adjustments even within a single year. The pricing of imbalance settlement and cross-border transmission services is more dynamic, generally on a quarterly basis, reflecting the nature of these services and the need to respond to changes more quickly.

The company's consistently high rankings in the annual international comparison studies on the cost-effectiveness and quality of TSOs (ITOMS and ITAMS), and the international certification for the management of physical assets (ISO 55001) granted to Fingrid are indications of the cost-effectiveness of the company's operations and of its effective management of cost and other risks related to grid assets. The Council of European Energy Regulators' (CEER) benchmarking study placed Fingrid among the most cost-effective TSOs in Europe in 2019.



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**Capital management**

Equity and liabilities as shown in the balance sheet are managed by Fingrid as capital. The balance sheet according to the company's accounting is smaller than the balance sheet under the Energy Authority's regulations, in which grid assets have been measured at the regulatory present value in use. The company's borrowings are presented at their carrying amount also on the regulatory balance sheet. Equity on the accounting balance sheet is, of course, smaller than equity on the regulatory balance sheet, which balances out the difference in the grid asset carrying amount and the actual present value in use.

The company has not set specific key figure targets for accounting balance sheet or regulatory balance sheet capital management, but instead monitors and controls the overall situation, for which credit ratings and their underlying risk analyses and other parameters create a foundation. The company must have a solid capital structure to support consistently strong credit ratings and to secure reasonable cost of capital and adequate dividend pay-out capability. The principal aim of Fingrid's capital management and grid asset management is to ensure uninterrupted operations and value retention as well as rapid recovery from any exceptional circumstances.

**Financing**

The company takes advantage of the opportunities offered by credit ratings at any given time on the international and domestic financial markets. Market-based and diversified financing is sought from several sources. Fingrid's existing loan agreements as well as debt and commercial paper programmes are unsecured and do not include any financial covenants based on financial ratios.

The company is exposed to various financing risks such as market risks, liquidity risks, counterparty risks and credit risks. The aim of financing risk management is to protect shareholder value by securing the financing required for the company's business operations, by hedging against the main financial risks and by minimising financial costs within the risk limits.

Fingrid operates in the debt capital, commercial paper and loan markets as follows:

- For long-term financing (more than 12 months), the company has an international Medium Term Note Programme (EMTN Programme), totalling EUR 1.5 billion.
- For short-term financing (less than 12 months), the company has an international Euro Commercial Paper

Programme (ECP Programme) totalling EUR 600 million.

- Fingrid additionally has a domestic commercial paper programme totalling EUR 150 million.

Furthermore, Fingrid has bilateral loan agreements with commercial banks and both the European Investment Bank (EIB) and the Nordic Investment Bank (NIB). To secure liquidity, the company has a revolving credit facility and overdraft facilities at its disposal.

**Green financing**

Green financing is an important part of Fingrid's financing strategy and responsible operating model. Fingrid was the first Finnish company to issue a [Green Bond](#) in 2017. More detailed information on green financing is available in the [Corporate Responsibility and Sustainable Development Report](#) contained in our Annual Report.

**FINANCIAL RESULT FOR 2020**

Fingrid's financial result for 2020 was weaker than planned, mainly due to exceptionally warm weather. We lowered our transmission tariffs by an average of eight per cent starting from 1 January 2019, and we are keeping them unchanged for 2020 and 2021. Fingrid's own calculations indicate a roughly EUR

- > Green financing is an important part of Fingrid's financing strategy and responsible operating model.



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30 million deficit for 2020 compared to the result allowed by the regulation. Our credit ratings remained high, reflecting our strong overall financial situation and debt service capacity.

Fingrid is still one of the TSOs with lowest prices in Europe, while the company's transmission reliability is among the best in the world. The company's long- and short-term debt management and hedging against financing risks in the international capital markets continued according to plan. The effective use of capital employed

is a key success factor for uninterrupted and continuously developing grid operations, and that will remain in our focus. Overall, the company's finances and financing are on a stable footing, which enables a controlled transition to a clean power system.

The Group's turnover was EUR 682.5 (789.4) million. Grid service income decreased to EUR 373.6 (385.0) million, due to the low energy consumption during the unseasonably warm winter months. Finland's electricity consumption

totalled 80.9 (86.1) terawatt hours in 2020. Imbalance power sales also decreased year-on-year, to EUR 260.8 (346.7) million, due to the low electricity prices. Cross-border transmission income from the connection between Finland and Russia decreased, to EUR 6.9 (11.6) million, due to a lower transmission volume, affected by Finland's low area price compared with north-western Russia. As a result of the transmission situation in the Baltic Sea region, ITC income increased to EUR 171 (14.4) million. Other operating income declined to EUR 2.4 (4.2) million. The Group's total costs amounted to EUR 569.3 (651.6) million. Imbalance power costs decreased, due to low electricity prices, and totalled EUR 234.4 (323.5) million. Loss power costs amounted to EUR 52.6 (53.9) million. The volume of loss power grew slightly, while the price of loss power procurement decreased. The realised average price of loss power procurement was EUR 38.03 (39.57) per megawatt hour. The cost of reserves to safeguard the transmission system security increased to EUR 63.5 (55.9) million, mainly due to the increased hours procured for frequency restoration reserves (FRR). Depreciation amounted to EUR 98.5 (97.8) million and grid maintenance costs to EUR 23.6 (21.6) million. Personnel costs increased to EUR 31.2 (26.4) million because of

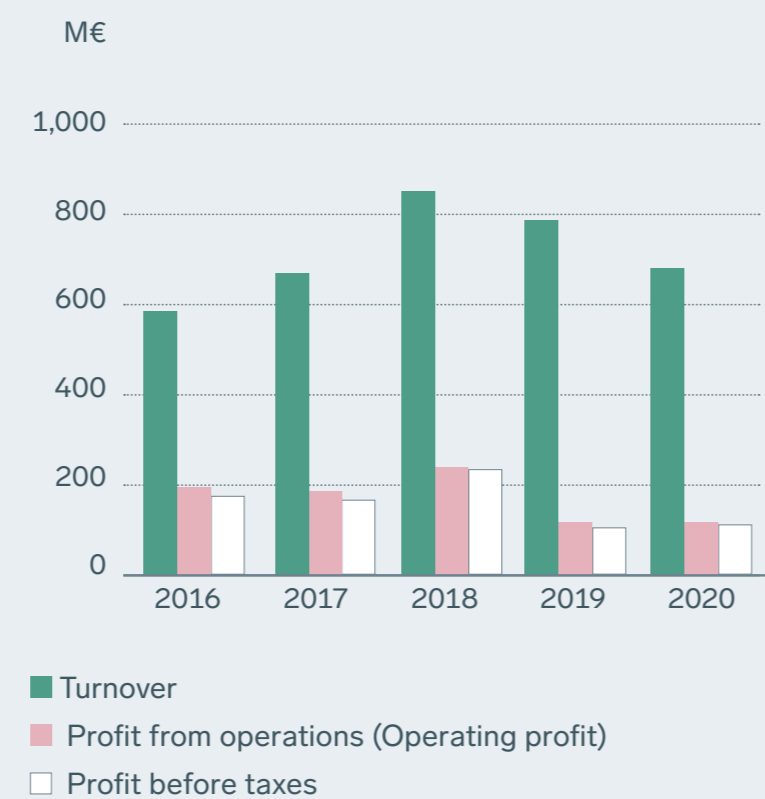
Data is a critically important form of capital, the foundation of digitalisation and a prerequisite for high-quality expert work. The energy revolution calls for investments to be made in data centralisation, refinement and dissemination. Cost-efficiency and time-savings can be realised by automating processes with the help of data.

[Watch Fingrid's Data management video](#)

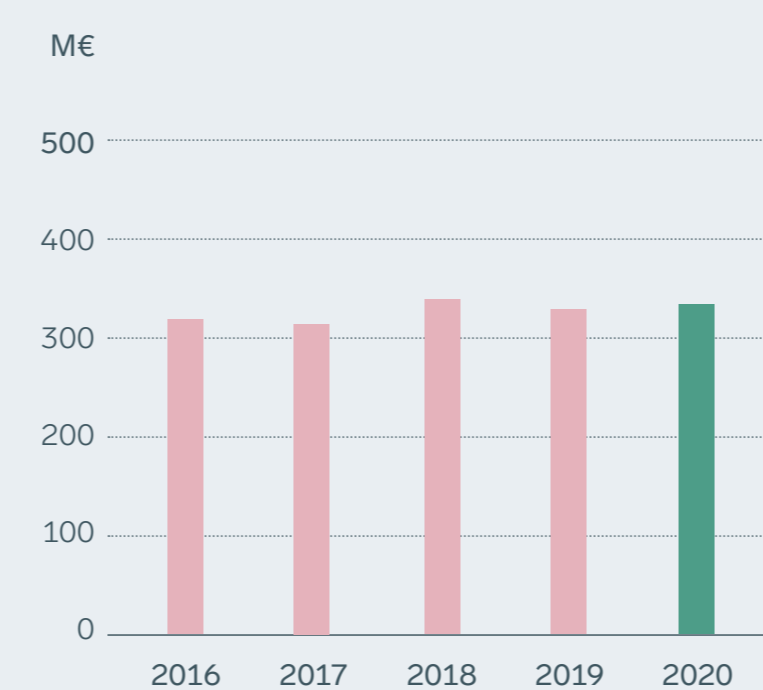
the higher headcount in response to a growing workload, both domestically and in international cooperation.

The Group's net financial costs were EUR 4.0 (10.1) million, including EUR 0.7 million in interest expenses on the lease liabilities booked into the balance sheet. Fingrid's financial capital consists of equity and liabilities, in other words debt financing. In 2020, equity amounted to 27.4% and liabilities amounted to 72.6% of the consolidated balance sheet total. Equity according to the regulatory balance sheet as required by the Energy Authority was 60.2% and the corresponding liabilities 39.8% in 2020.

Turnover and profit from operations 2016–2020, MEUR



Total costs (without imbalance power) 2016–2020, MEUR



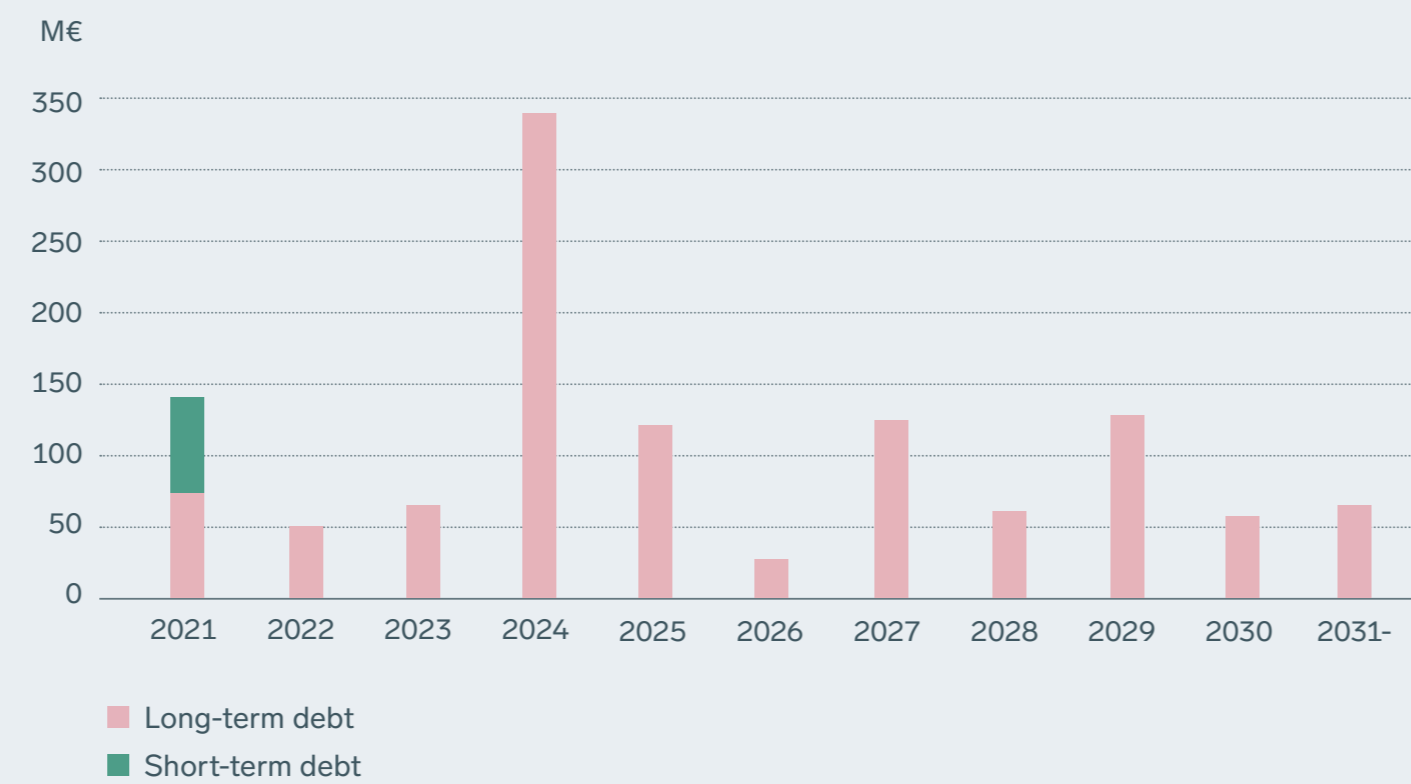
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Debt maturity profile, MEUR



Interest-bearing borrowings totalled EUR 1,174.9 (1,120.0) million, of which non-current borrowings accounted for EUR 1,032.8 (884.7) million and current borrowings for EUR 142.1 (235.3) million.

The company's liquidity remained good. Cash and other financial assets totalled EUR 125.9 (82.8) million on 31 December 2020. The company additionally has an undrawn committed revolving credit facility of EUR 300 million to secure liquidity (until 11 December 2022)

and a total of EUR 225 million in committed and uncommitted bilateral facility arrangements with banks. The counterparty risk arising from derivative contracts relating to financing was EUR 26.2 (22.4) million. Fingrid's foreign exchange and commodity price risks were hedged.

We provide more information on our tax obligations and tax footprint in our [Corporate Responsibility and Sustainable Development Report](#).

## CASE

### STANDARDISED SUBSTATIONS INCREASE COST-EFFECTIVENESS

Fingrid improves the cost-effectiveness of the substations in its transmission system through standardisation, meaning that the long-term construction solutions of the stations always follow the same proven design types. This shortens the lead times of construction projects and makes maintenance easier, which in turn leads to better quality and cost savings. The earlier standard solutions in Fingrid facilities include using slab foundations for reactors, which leaves more degrees of freedom for reactor suppliers in the external dimensions of reactors and enables more efficient and safer maintenance work. A standardisation process is currently underway in the secondary systems, with the related system tests having gone on intensively for around two years. Due to the coronavirus pandemic, some tests originally planned to be carried out onsite in the UK had to be done online.



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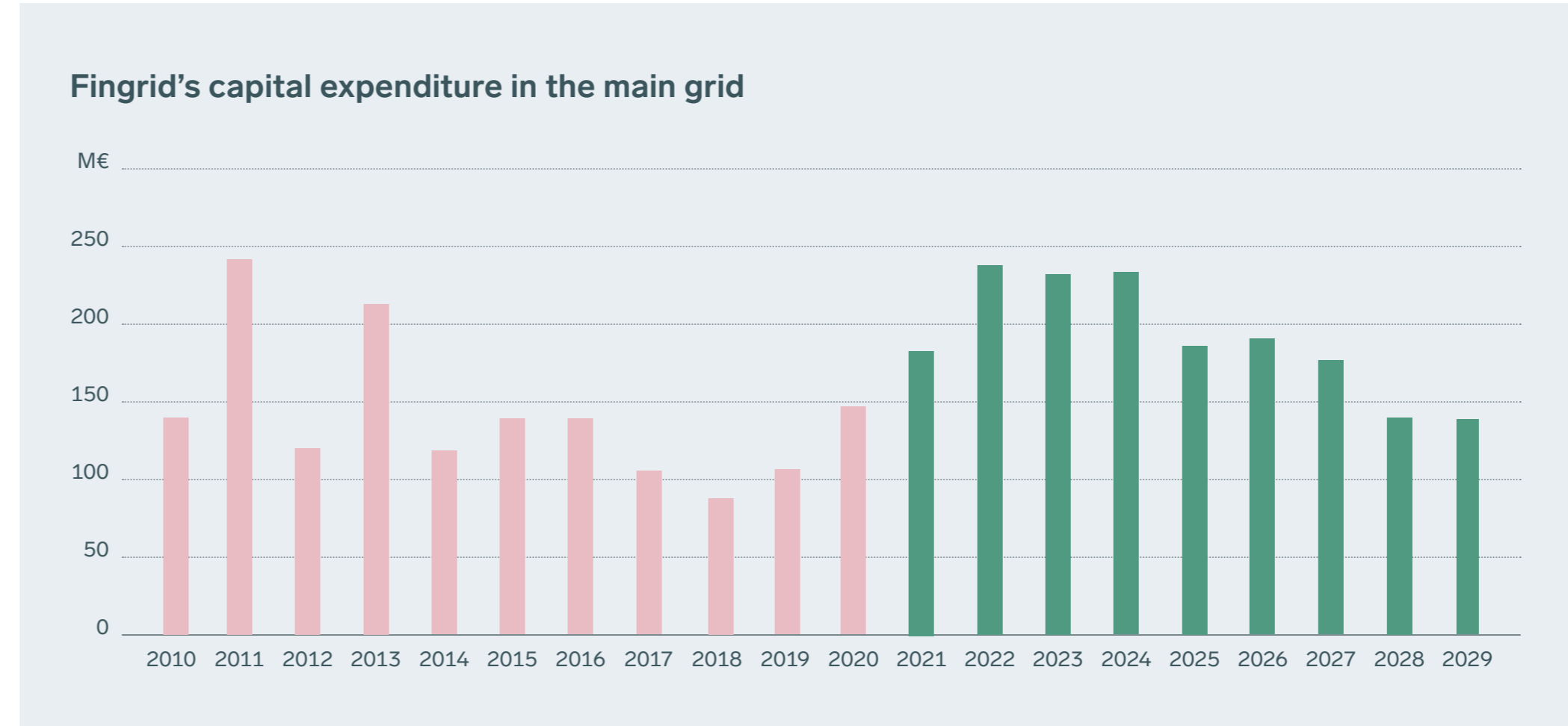
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## 7. BUSINESS OPERATIONS

### MAIN GRID

The starting points for Fingrid's capital expenditure include the needs of society and the customers, developments on the European internal market in electricity, securing the preconditions for the company's business operations, and the financial and business targets set by the owners. The investments must be cost-effective and financially profitable. The long-term planning of the main grid and the related investment programme support the implementation of the national climate and energy strategy, maintain system security, increase transmission capacity, and promote the electricity market.

In this decade, Fingrid will make record investments of two billion euros in Finnish electricity networks and substations. The main grid will be substantially reinforced, as the goal of a climate-neutral Finland by 2035 means that the generation and consumption of emission-free electricity will increase significantly. The foundation for investments is laid by long-term planning, cost-effectiveness, and by meeting the needs of society and the customers. Investments will be required especially due to the stronger than forecasted growth of wind energy production. Grid planning takes place in close cooperation with the customers and the other TSOs in Europe and the Baltic Sea region.



We are now experiencing the second wave of wind power construction, which can be seen in the larger sizes of the projects. In 2020, we built transmission lines and substations extensively throughout Finland. Roughly ten kilometers of new transmission lines and 12 substations were completed. Around 570 kilometres of transmission line and 22 substation are under construction. Fingrid currently has around 250 kilometres of new transmission lines in the general planning phase. For Fingrid, the expansion of construction activities increases the risk of not being able to meet the higher expectations at an adequate speed. Delays may occur in the

customers' grid connections, or the transmission capacity may be inadequate. The sufficiency of north-south transmission capacity (so-called Cross-section Central Finland) has been bolstered with extensive investments, such as by building the Forest Line, a roughly 300-kilometre-long transmission connection consisting of several subsystems. Individual local grid reinforcement needs have been taken into account by starting a record number of investment projects throughout Finland. Also earlier capex plans have been brought forward. The challenges involved include securing the adequacy of resources, and maintenance and outage man-

agement going on simultaneously with grid construction projects; new operating models have been developed to address them. In the local control measures of capex projects, increasing use is made of remote control techniques and cooperation with external supervision consultants. We have also successfully met challenges related to the grid maintenance backlog throughout this process. Investment projects have been streamlined by eliminating work that can be classified as maintenance. In our new improvement maintenance model, this type of work is compiled into sensible maintenance packages.

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During a busy stage of construction work, we make sure that all the related parties are equally aware of all the necessary connections. We design and build the grid as flexibly as we can and using solutions that match several different future scenarios. It is also our duty to communicate actively and to influence the development needs of our operating environment. Any required changes must be initiated quickly, which means Fingrid must have the capability to adapt, be flexible and to prioritise as needed. The work related to construction and maintenance is procured by making use of both the company's in-house and outsourced resources in a flexible combination.

Increasing wind power production requires capability to connect decentralised generation capacity into the main grid. We proactively build so-called power collection substations and implement any necessary upgrades in the surrounding network.

In 2020, we started up work on a grid vision aiming to create an understanding of the development needs in the main transmission grid (400 kV and 220 kV) and proposed solutions for the long term. The selected review years of the grid vision are 2035 and 2045 to enable a sufficiently long-term approach in terms of the grid planning. In particular 2035 will be an interesting review year as it coin-

cides with the deadline set for Finland's carbon-neutrality goal.

**Construction projects all across Finland.** Fingrid's ongoing major electricity transmission projects during the period under review include the construction of a transmission line from Oulu to Petäjavesi, the so-called 'Forest Line'. The construction of a third AC connection to Sweden is under preparation, to boost the functioning of the international electricity markets. Another project currently in the planning phase is the upgrading of the Oulu–Lappeenranta connection, or 'Lake Line'. These projects constitute a part of the electricity infrastructure necessary for a climate-neutral Finland.

**Forest Line – an enabler of many benefits.** The Forest Line will substantially increase the north–south transmission capacity necessary for the Finnish electricity system. The roughly 300 kilometres long, 400-kilovolt transmission link is being built in place of or next to the current power lines, running from Petäjavesi through Haapavesi and to Muhos. The project progressed well, despite the exceptional circumstances, and is due for completion in 2022. We additionally carried out modifications related to the Forest Line at the Petäjavesi and Toivila substations. [Watch the video on Metsälinja.](#)

## CASE



## HISTORIC GRID SYSTEMS UNDER MODERNISATION

The first substation of Finland's main grid, the [Imatra substation](#) completed in 1929, continues to be an important component of the transmission grid in South Karelia. Due to the extensive industrial activity still present in South Karelia, Lappeenranta ranks third in the volume of electricity consumed in Finland's municipalities, behind Helsinki and Tornio.

The original switching substation, which had reached the end of its life-cycle, was replaced with a new station completed in the summer of 2020. The substation has been designed in cooperation with the Finnish Heritage Agency, the regional Centre for Economic Development, Transport and

the Environment, and the City of Imatra, honouring the historic Imatra rapids landscape, including its protected sites. Modernisation and foundation work also started on the Imatra–Huutokoski transmission line, originally built in the 1930s, during the summer. The project is due for completion in the autumn of 2022 and will consist of modernising 130 kilometres of transmission line and replacing the wooden towers with steel ones.

Read more: [Renovation of Imatra substation completed](#)

[See a drone video to enjoy an aerial view of the new substation](#)

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**New transfer connection to Sweden will de-bottleneck the power system.** We are preparing, in cooperation with the Swedish TSO Svenska kraftnät, a new transmission connection from Pyhänselkä at Muhos via Keminmaa to Messaure in Sweden. Due for completion in 2025, the transmission line will even out the price differences between the countries and improve the availability of electricity in Finland. Fingrid's and Svenska kraftnät's joint project has been included in the European Commission's list of Projects of Common Interest (PCI). In March, the Finnish and Swedish energy authorities decided on the cost-sharing

principles to be applied to this capex project. The estimated capital expenditure is EUR 250 to 300 million.

**Grid upgrade in North Karelia to increase system security.** The transmission line being built in the municipality of Kontiolahti and the city of Joensuu to reinforce the grid in North Karelia is proceeding as planned. The project will be completed in the spring of 2022.

**Lake Line to reinforce north-south transmission capacity.** The planning for Lake Line from Oulu to Lappeenranta, a

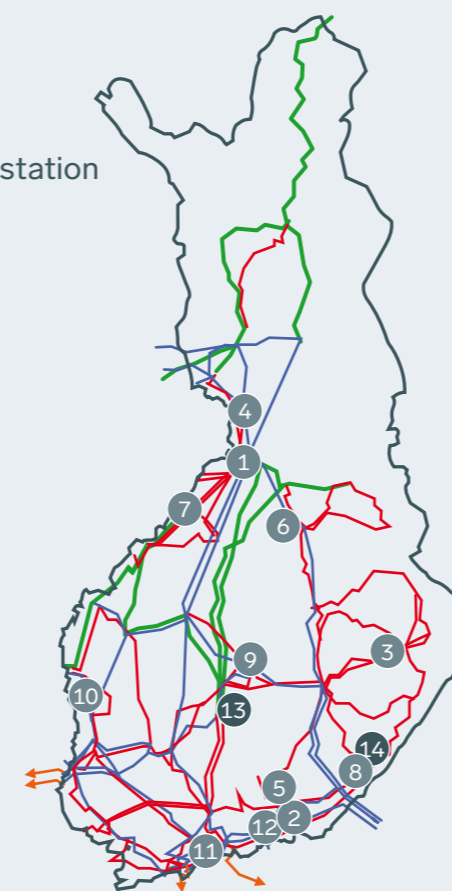
### Substation projects, completed

- 1 Refurbishment of the 110-kV Pikkarala switching station
- 2 The new 110-kV Tehtaanmäki substation
- 3 Expansion and refurbishment of the 110-kV Kontiolahti switching station
- 4 Expansion of the 110-kV Isokangas switching station
- 5 Expansion of the 110-kV Kymi switching station
- 6 Expansion of the 110-kV Vuolijoki switching station
- 7 The new 110-kV Raahe substation and the expansion of the 110-kV Siikajoki station
- 8 Modernisation of the 110-kV Imatra substation
- 9 Expansion of the 110-kV Koivisto switching station
- 10 Connection of the Kristiina reserve power plant
- 11 Modernisation of the 110-kV Ruotsinkylä switching station
- 12 Refurbishment of the 110-kV Pernoonkoski switching station

### Transmission line projects, completed

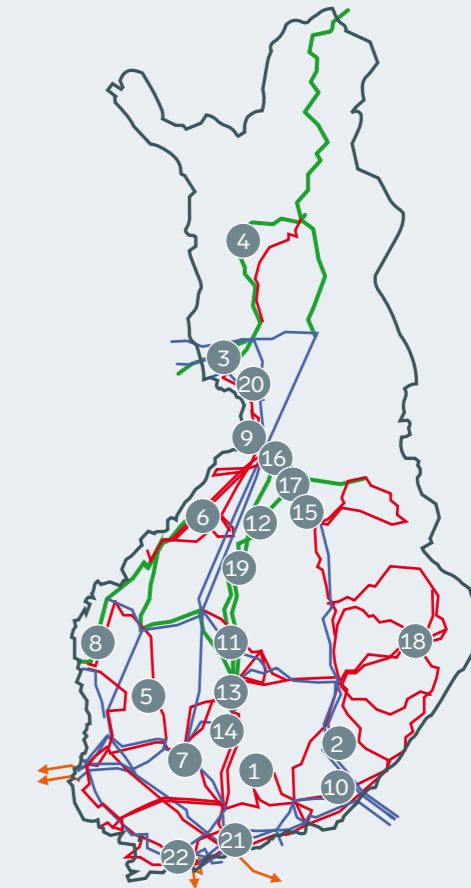
- 13 Lentola-Lahdesjärvi 110 kV (10 km)
- 14 Modifications to the transmission lines at Imatra

- 440 kV transmission line
- 220 kV transmission line
- 110 kV transmission line



### Substation projects, ongoing

- 1 Modernisation of the 110-kV Heinola switching station
- 2 Switched busbar circuit-breaker at Puumala
- 3 Modernisation of the 110-kV Isohaara switching station
- 4 Expansion of the 220/110/20-kV Isoniemi substation
- 5 The 110-kV Julmala substation
- 6 Third transformer at Jylkkä
- 7 Refurbishment of the 400/110-kV Kangasala switching station
- 8 The new 400/110-kV Kärppiö transformer substation
- 9 Modernisation of the 110-kV Leväsuo switching station
- 10 Modernisation of the 110-kV Luukkala switching station
- 11 Hoikansalmi series capacitor station
- 12 Pihlajaranta series capacitor station
- 13 400/110-kV transformer at Petäjavesi
- 14 Relocation of a 110-kV transmission line at Toivila
- 15 The new 110-kV Nuojuankangas switching station
- 16 Expansion of the 400/220/110/20-kV Pyhänselkä substation
- 17 The new 110-kV Utanen switching station
- 18 The new 110-kV Palojärvi substation
- 19 The new 400/110-kV Pysäysperä transformer substation
- 20 The new 110-kV Simojoki switching station
- 21 Modernisation of the 110-kV Tammisto switching station
- 22 Expansion of the 110-kV Virkkala switching station

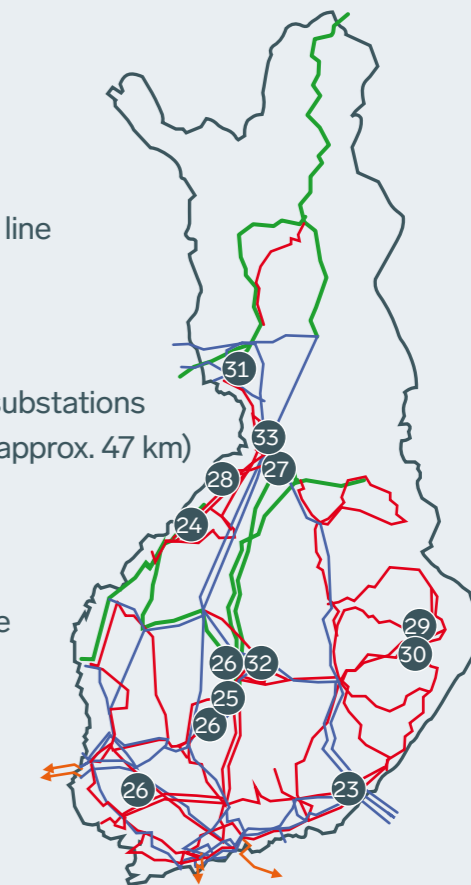


### Transmission line projects, ongoing (in total approx. 570 km under construction)

- 23 Modernisation of the 110-kV Imatra-Juva-Huutokoski transmission line (approx. 130 km)
- 24 Transmission line modifications at Jylkkä (approx. 1.6 km)
- 25 400-kV Petäjavesi-Pyhänselkä transmission line (approx. 296 km)
- 26 Transmission line modifications at the Petäjavesi, Jämsä and Toivila substations
- 27 The new 400+110-kV Pyhänselkä-Nuojuankangas transmission line (approx. 47 km)
- 28 Transmission line modifications between Pyhäkoski and Pyhänselkä
- 29 Modernisation of the 110-kV Kontiolahti-Pamilo transmission line (approx. 40 km)
- 30 Modernisation of the 110-kV Kontiolahti-Uimaharju transmission line (approx. 53 km)
- 31 Relocation of the 110-kV Isohaara-Raasakka transmission line to the Simojoki substation (approx. 1.6 km)

### Under general planning (approx. 252 km)

- 32 Hämeenlahti-Hännilä (98 km)
- 33 Aurora Line (154 km)





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transmission connection almost equal in length to the Forest Line, consisted of environmental assessments during the period under review. The targeted start of construction is in 2024 and the transmission line is due for completion in 2026.

### Record number of substation projects.

In 2020, we had more than 30 substation projects in the implementation phase. Twelve of them were completed during the year, Nine more will be completed in 2021 and twenty in 2022. Several investment decisions were made during the period. Wind power interconnections have in particular increased the capex needs.

- New wind power stations with a total capacity of roughly 4,000 megawatts are planned in the area between Kristinestad, Vaasa and Seinäjoki. Haapajärvi and the neighbouring municipalities, in central Finland, are planning new wind power projects totalling more than 1,000 megawatts. We made investment decisions to build a substation at Pysäysperä in the municipality of Haapajärvi and another substation at Kärppiö in the municipality of Teuva. The total capital expenditure will be roughly EUR 55 million. The investments include the substations as well as the modifications to the surrounding transmission lines necessary for linking the transmission lines with the new substations. The

planned commissioning dates for the substations are in the summer of 2022.

- A 400/110-kilovolt substation will be modernised at Tammisto in Vantaa. The investment will improve the system security of electricity supply in the Helsinki region. The Tammisto substation is one of the stations supplying electricity to the capital region and a key node of the main grid. The construction work on this project will start in June 2021. The new substation will be commissioned in late 2022.
- The 110-kilovolt Luukkala substation in Lappeenranta, which plays an important role for electricity transmission in the South Karelia and Lappeenranta area, will be modernised. The station is the starting point of several grid ring connections and also supplies the city of Lappeenranta as well as local industries with electricity. The project will be completed in the autumn of 2023.
- The Jylkkä substation, located in Kalajoki, will be expanded and fitted out with a third transformer, making the substation Finland's most important connection point for wind power. The project will be completed during 2022.
- During the period under review, investment decisions were made concerning

## CASE

### NEW LIGHTWEIGHT CONNECTION STATIONS IMPROVE THE QUALITY OF ELECTRICITY

There is some variation in the transmission reliability in Finland's main grid, depending on the connection method. The system security is at its weakest when customers are connected to long transmission lines on the main grid by branch lines. These customers can be affected by downtimes if any faults or maintenance outages occur on the trunk line and the lines connecting to it.

North Karelia is one area with these types of connection lines vulnerable to outages, and Fingrid decided to improve the situation by building new connection stations in cooperation with the local companies Outokummun Energia and PKS Sähkösiirto. Fingrid will build 110-kV connection stations on the Kontiolahti–Alapitkä and Kontiolahti–Varkaus grid sections, to divide the long transmission lines into shorter sections. The stations are expected to be completed in 2022.

A connection station is a reliable, simplified switching substation with around 50% lower operating costs compared with a regular power system substation. The goal for the new stations is to substantially improve the quality of electricity and the security of supply.

Read more

[New lightweight connection stations](#)



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the refurbishments of the substation located in Kangasala and the Isohaara substation located in Keminmaa.

- A 400/110-kilovolt substation system will be expanded and modernised in Alajärvi. New wind power capacity amounting to roughly 2,000 megawatts is currently under construction or planning in the vicinity of Alajärvi. The connections for the new capacity require upgrades in the main grid. The project is due for completion in 2023.
- The 220/110-kilovolt Kellarijätkä substation is under construction in Kemijärvi to prepare for future wind power connections. The new substation will also promote the development of distribution networks and improve system security in the area. It will also enable the connection of a new biorefinery project under planning in the area. The project will be completed during 2023.

### Life cycle management backed up by careful maintenance and systematic operations

The main grid represents a totality of assets amounting to several billion euros. In addition to new grid extensions, it is also very important to service and maintain the grid properly. Digitalisation has made this easier. Furthermore, the data linked with

grid operations also represents a type of asset for Fingrid. We have digitalised our asset management one step at a time:

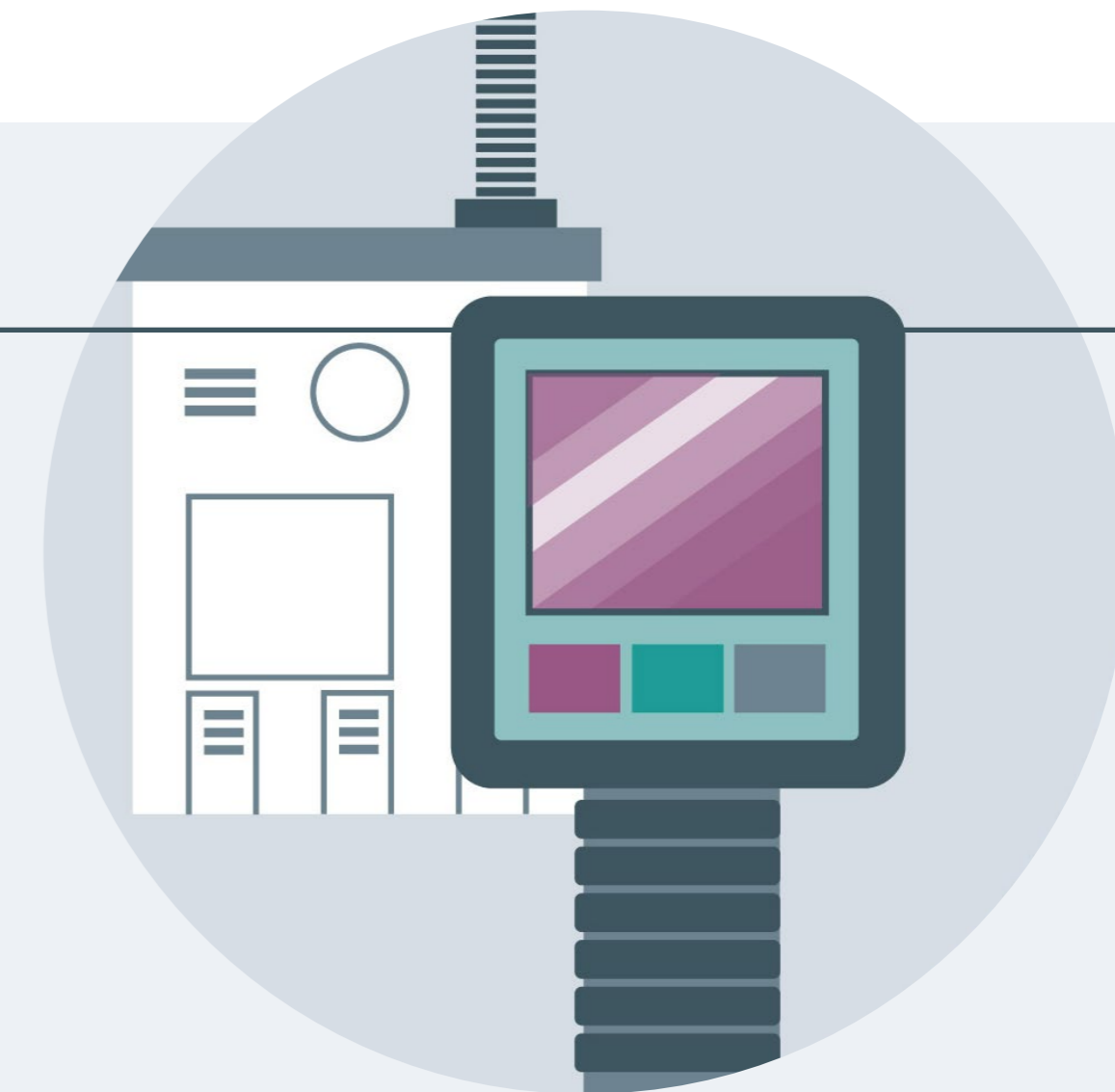
- 2017: company-level data archives
- 2018: information quality up to par
- 2019: IoT concept – sensors and the platform
- 2020: value creation with IoT data
- 2021 and onward: AI, new maintenance concepts, autonomous decision making

Our goal is to have an autonomous maintenance system in use in 2025 to communicate to our staff, with the help of artificial intelligence (AI), what types of preventive maintenance the transmission system needs.

With this proactive approach, we will save in maintenance costs and improve the system security. A token of our successful maintenance management, we scored top results in ITOMS (The International Transmission Operations & Maintenance Study) and were the only TSO to achieve a Top Performer nomination both in the transmission line and substation maintenance categories in March. ITOMS looks into the effectiveness of maintenance based on criteria such as maintenance costs and disturbance statistics.

Fingrid's consistent success in this survey over several years has attracted a lot of

CASE



### DIGITAL MAINTENANCE MANAGEMENT FOR IMPROVED SYSTEM SECURITY

The goal of digital maintenance management is to improve the system security of the grid through more effective condition monitoring of the substation equipment. Digital condition monitoring in its turn modernises maintenance activities, based on actual needs, and makes them more efficient. Control measures have been developed, for example, through innovation competitions arranged in cooperation with new supplier partners. In 2020, all automation systems in substation control room buildings were integrated into Fingrid's digital condition monitoring systems. Various systems developed for the verification of mechanical and electrical defects in grid equipment were additionally adopted at substations. New monitoring solutions will be launched at a rapid pace starting from early 2021.

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international attention. We have received particular praise for our proficient organisation focused on our core competences as well as for our optimised order-supply chain management. Additional success factors include our investments in IT systems, digitalisation and other new ways of working.

By participating in ITOMS, we want to promote best practices throughout our operations. Furthermore, the study supports systematic efficiency and continuous improvement of transmission system

operations and provides an opportunity to compare our operations with peer TSOs.

A total of 29 TSOs participated in the comparative study worldwide, including companies from Central Europe and Asia.

### Reserve power provides security in disturbances

We own ten reserve power plants that help to secure a reliable supply of electricity for our customers and society. The reserve power plants are rarely used but we maintain readiness at all times. When

the need arises, Fingrid has roughly a 1,000-megawatt capacity reserve ready to be started up instantaneously.

The reserve power plants are only used in major disturbances of the power system, such as a large power station being temporarily incapable of feeding electricity to the main grid. The reserve power plants are not used for commercial electricity production. Another reason for maintaining and developing the reserve power plants is the unlikely, but nevertheless possible event of a major disturbance, or

a blackout. Furthermore, we develop the reserve power plants to compensate for the reactive power generated in the power system.

We maintain up-to-date security standards at our reserve power plants. In 2020, we completed a refurbishment project at the Vanaja reserve power plant, which included replacing the fuel oil and extinguishing systems, among other things. The main objective of the upgrade was improving environmental and fire safety.

### Weighted overall score in ITOMS

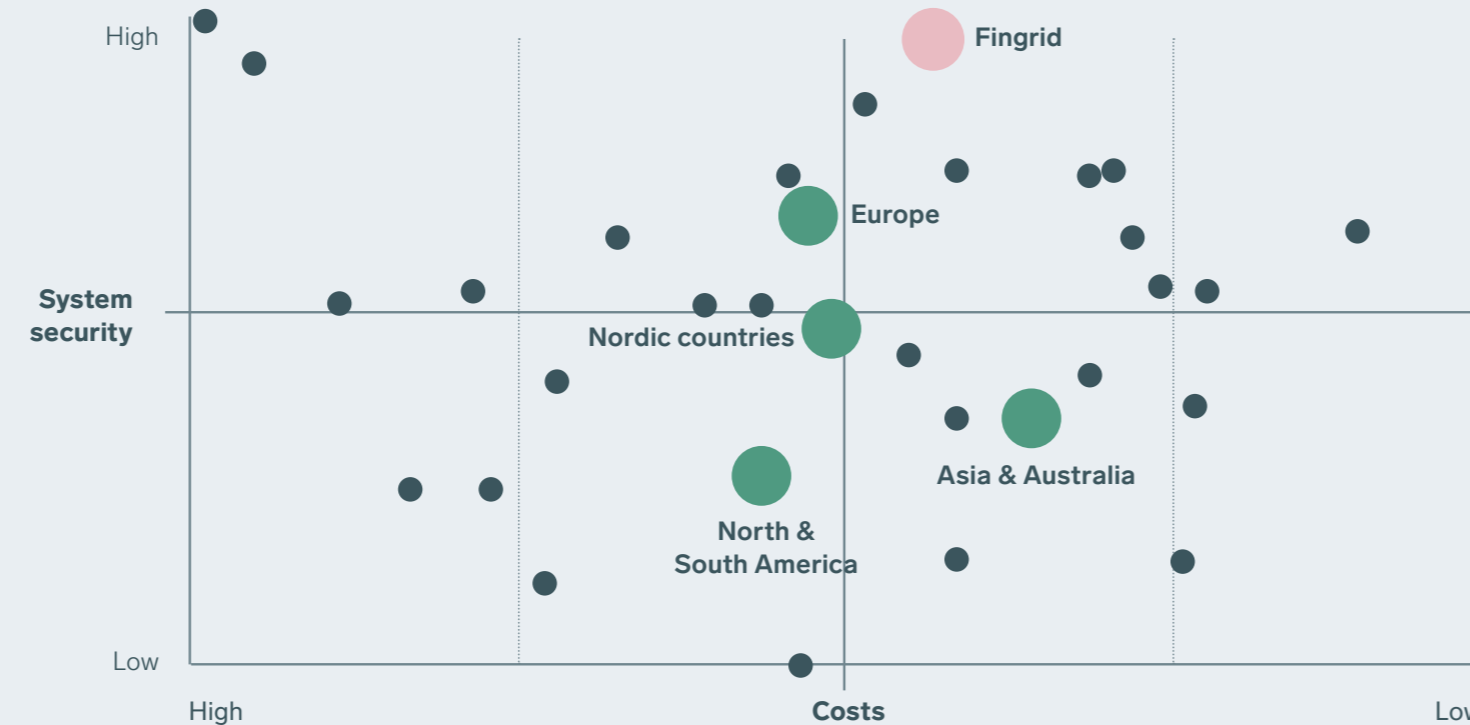


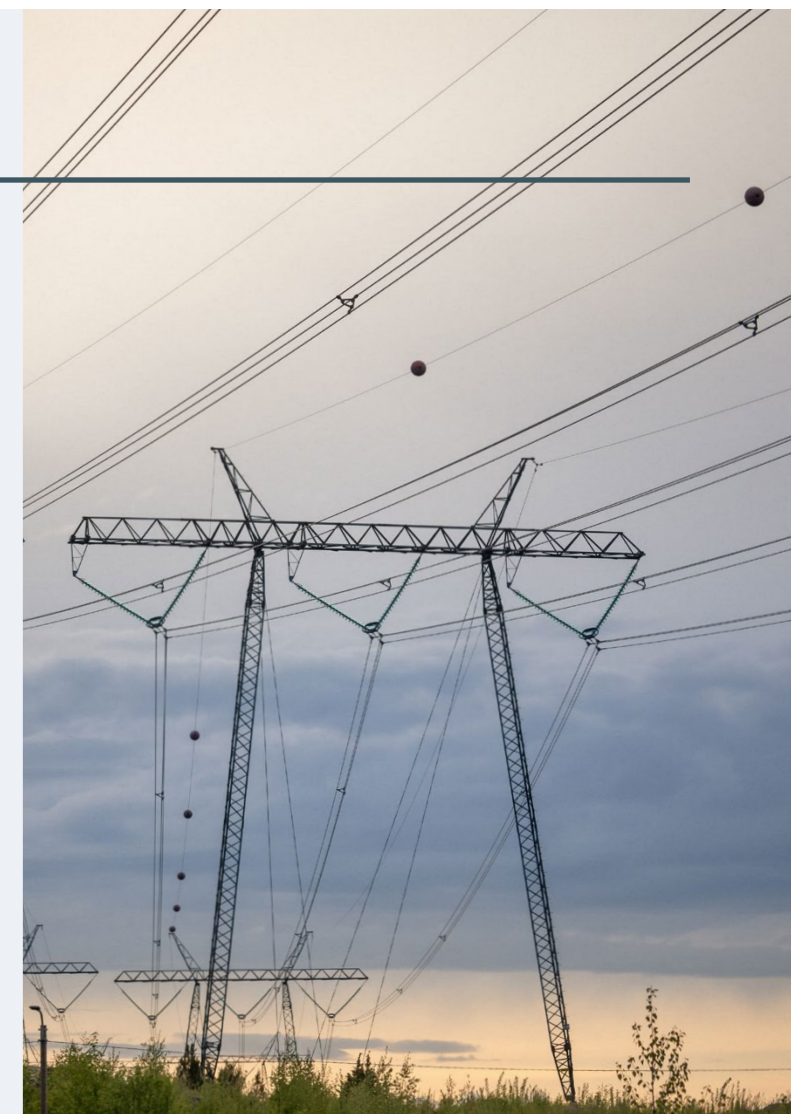
Image: Fingrid scored top results in ITOMS.

### CASE

#### ALL MAIN GRID LINES PHOTOGRAPHED FROM THE AIR

Fingrid carried out aerial photography of all the transmission lines during the summer of 2020. Amounting to roughly 12,000 kilometres of transmission line, it was the most extensive imaging project of Finland's grid system ever completed. The previously created images covered 2,000 kilometres of grid lines. The aerial photography will bring the documentation of the main grid up to date, while also helping to assess the condition of the grid and enable planning of future maintenance work.

[Watch the video](#)



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### POWER SYSTEM

It is crucial for society that the power system operates reliably and that electricity is available at all times for the needs of industry and consumers alike. Previously, production was adjusted according to the consumption, by means of hydro-power as well as thermal power stations. Now thermal, mostly coal-powered energy is not available anymore for adjusting the production of electricity, as it has been replaced with the harder-to-control solar and wind power. The development of technology and new innovations have introduced new possibilities and ways of managing the power system.

The shift in the energy mix has also changed grid design. It has become necessary to expand electrical networks and build more substations. Due to the increased production of renewable energy, the management of various operational conditions of the power system has become more demanding and requires new approaches.

**There is a need for technological development.** Vital societal functions are increasingly reliant on electricity. This consequently increases the significance of a disturbance-free power system. Advancing technology will support the change, however. Artificial intelligence, automation

as well as real-time data and situational awareness enable new ways of operating and their introduction at Fingrid. On the other hand, an increasingly electricity-dependent society needs a secure and robust power system that must be carefully protected against various threats, including cyber threats. European network codes, a clean energy package, forms of Nordic cooperation and data protection requirements guide our grid operations, which we develop together with our customers. Security of supply and preparedness for various exceptional circumstances are also factors affecting our operations.

**Clean energy will require a higher demand response.** The energy transformation will increasingly the call for demand-side flexibility. The volume of renewable production is increasing and the capacity generated by renewables varies according to weather conditions. The change is enormous and in particular challenges the operational capability of our power system, where generation and demand must be in balance at all times. The possibilities for demand response are under development, but the capacities available through demand-side measures do not yet meet the adjustment needs. Fingrid's mission is to enable the utilisation of demand response, which has attained an important role in society.

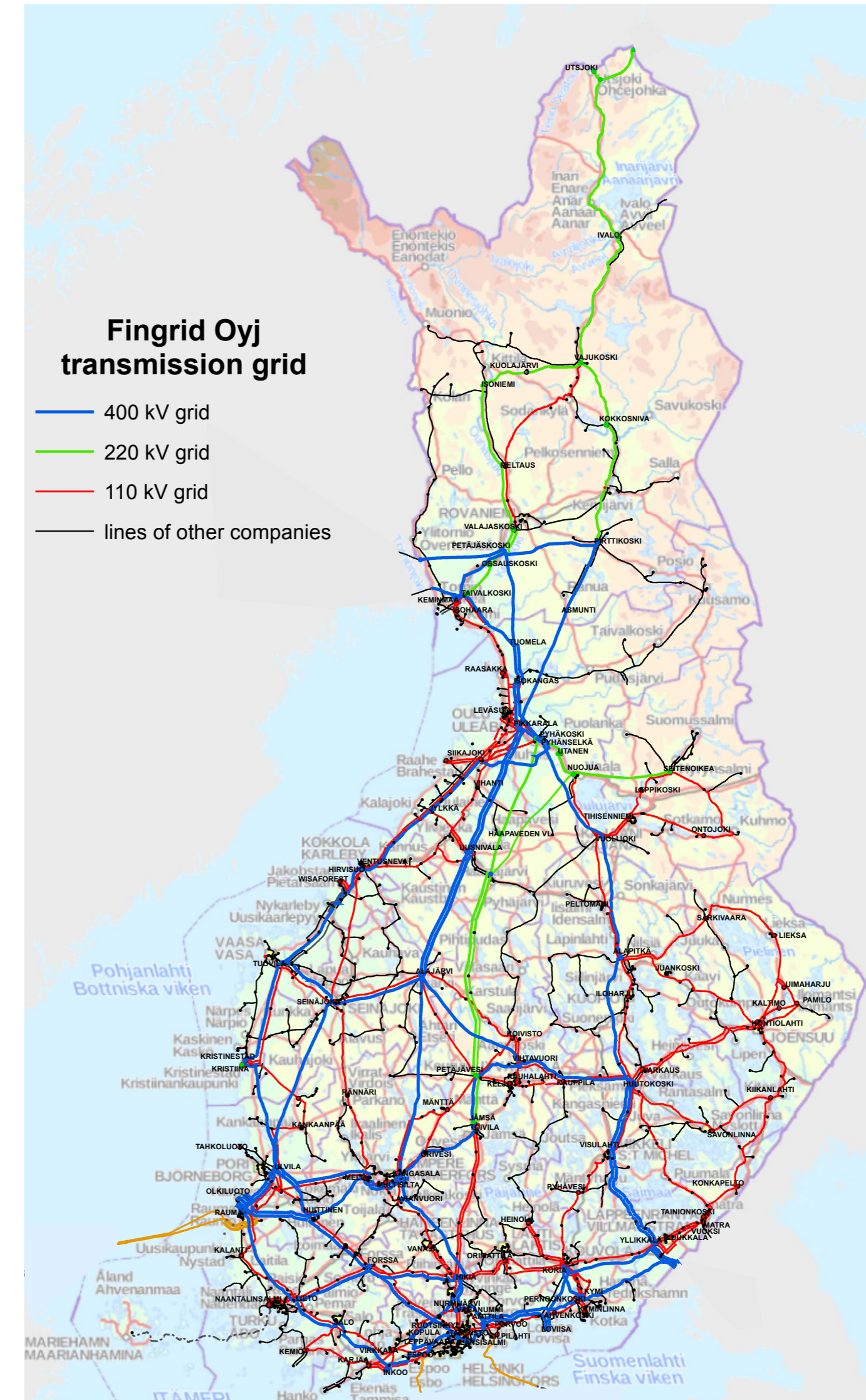


Image. Finland's transmission grid.

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**Network Code for Emergency and Restoration: a more unified operational framework for the power system**

The purpose of the Network Code for Emergency and Restoration (NC ER) is to prevent major disturbances and, on a more general level, to prevent the escalation of all disturbances and deterioration of the system. Should a blackout nevertheless occur, the goal must be a rapid and effective restoration. The network code became effective at the end of 2017 and the measures it requires are currently being implemented. The 24-hour capability of continued operations and an automatic under-frequency control scheme must be implemented in December 2022 at the latest. A testing plan related to the measures of the system defence plan and the restoration plan was drawn up during the period under review.

**Commissioning of joint operational planning services progresses**

The operational planning office (Regional Security Coordinator, RSC) of the four Nordic transmission system operators started its operations in Copenhagen in 2016. The operational planning office will in the future be in charge of joint Nordic operational planning. RSC has received five tasks: the calculation of cross-border transmission capacity, system security analyses and risk identification, coordination of cross-border transmission out-

ages, maintenance and development of joint grid models, and regional short-term electricity sufficiency reviews.

In 2020, the coordinator agency particularly focused on the continued development of software for the new methodology of transmission capacity calculation, which is one component in the adoption of the agency's services. In 2022, RSC will be incorporated and renamed Regional Coordination Centre (RCC).

**The consumption of electricity decreased in 2020, level of system security remained high**

In 2020, the consumption of electricity decreased in Finland by approximately six per cent compared with the previous year. The factors underlying the decline in consumption include the mild winter and the lower year-on-year consumption slightly of electricity by the industry and service sector, due to the COVID-19 pandemic. The total consumption was 80.3 (86.1) terawatt hours. We transmitted a total of 68.4 (68.7) terawatt hours of electricity in Fingrid's grid, representing 77.9 (76.0) per cent of the transmission volume in Finland (consumption and inter-TSO).

The imported and domestic production capacity was high enough to meet the peak demand of the year. The electricity consumption peaked at 12,388 (14,542)

## Our transmission reliability rate was 99.99995%

MWh/h on Friday 28 February between 8 and 9 a.m., with Finland's electricity production contributing 9,849 MWh/h and the remaining 2,539 MWh/h being imported. The area price of electricity on the day-ahead market in Finland was €46.98/MWh during the peak consumption hour.

The main grid operated reliably in 2020, at an excellent transmission reliability rate. The importance of electricity transmission reliability is illustrated by the fact that the cost of a nationwide major disturbance to customers and society at large would be in the region of EUR 100 million for each hour of outage.

Two occasions called for raised disturbance-clearing readiness in 2020. We proactively raise our readiness when factors such as difficult weather are expected to pose challenges to grid maintenance to enable as rapid clearing and communication of disturbances as possible.

Our transmission reliability rate was 99.99995 (99.9998) per cent. Transmission disturbances mainly occurred in eastern Finland, where the several on-going investment projects caused power system abnormalities. The biggest frequency deviation in the Nordics occurred during a test of the NordLink transmission line between Norway and Germany in September. The failure was evident in Finland's main grid as brief voltage and frequency variations. At least one Finnish power station disconnected from the grid.

An outage in a connection point in the grid caused by a disturbance in Fingrid's transmission system lasted an average of 0.5 (4.3) minutes. The cost of the disturbances (regulatory outage costs) was EUR 0.9 (2.7) million, and including the quick reclosures, EUR 3.2 million.

The availability and reliability of Fingrid's high-voltage DC transmission links remained very high and better than during the previous year. Disturbance-clearing and fault elimination measures were highly successful, and the connections were quickly restored and made available to the market.

Countertrade costs amounted to EUR 0.7 (0.9) million. The number of disturbances resulting in countertrade costs remained low and at the same level as in 2019.

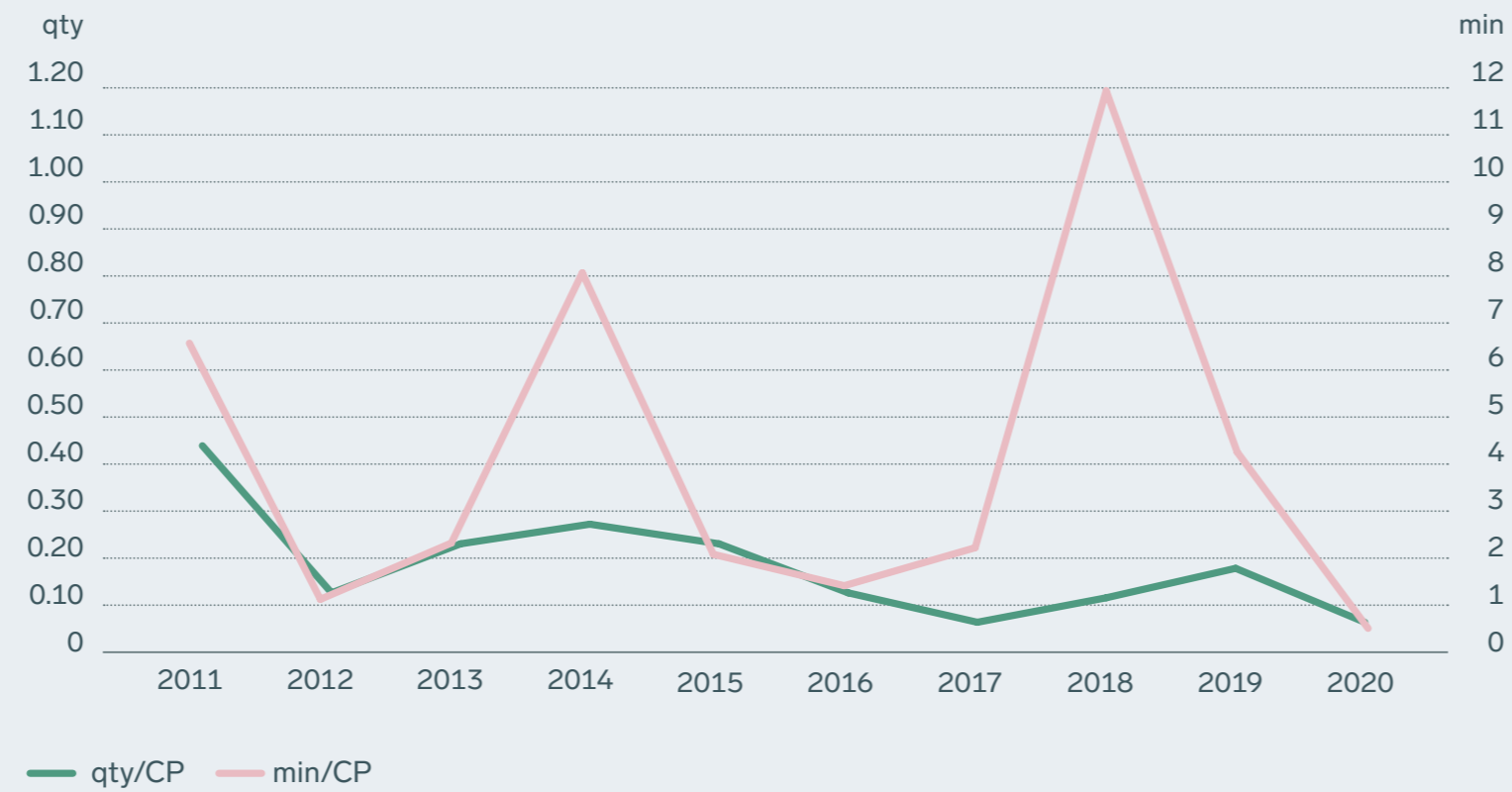
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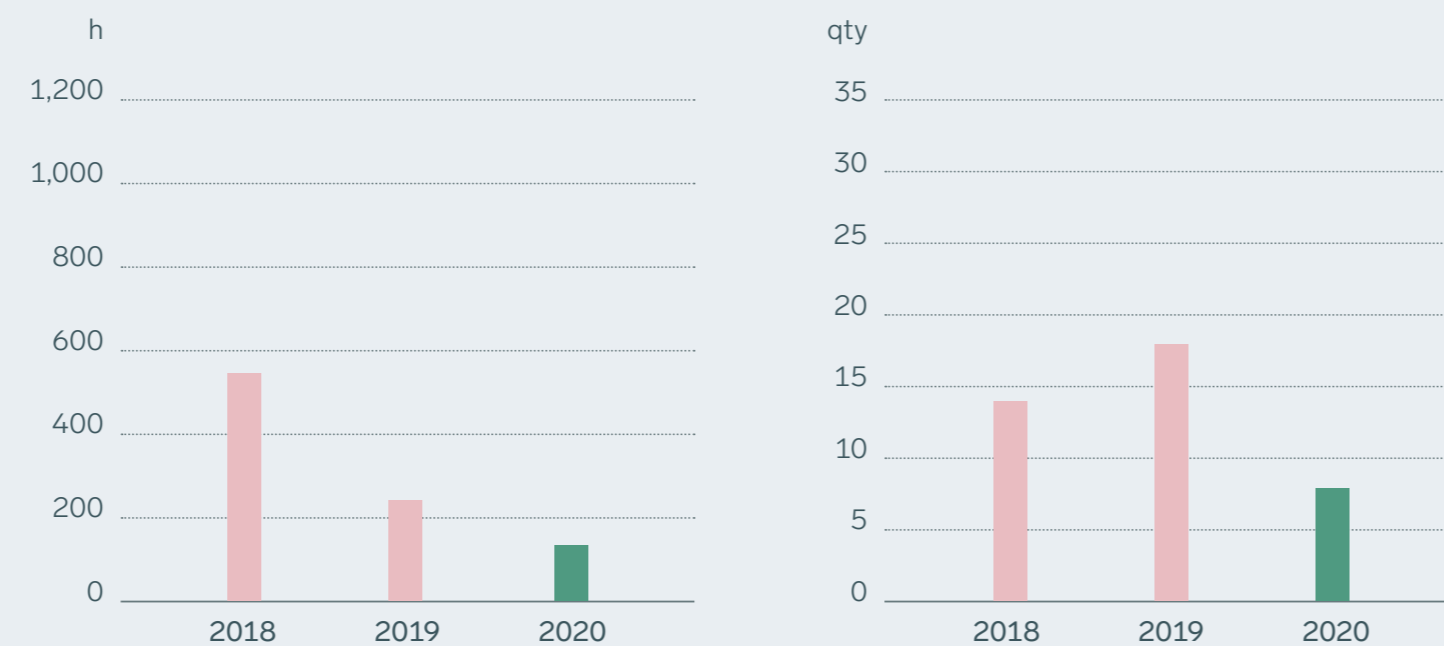
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### Interruptions at connection points due to grid disturbances



### HVDC disturbances, total duration and quantity



Countertrade refers to special regulations for transmission management purposes which are used to eliminate short-term grid bottlenecks, i.e. areas where electricity transmission is congested. Fingrid additionally guarantees the cross-border transmission it has confirmed by carrying out countertrades, i.e. purchasing and selling electricity, up until the end of the 24-hour usage period. The causes of countertrade include outages and disruptions in power plants or in the grid.

Some transmission outages in connection with capex projects took place throughout Finland. The focus has been on eastern Finland, where a large number of projects is currently underway. Demanding outages require careful advance planning and close cooperation with customers.

Reserves required to maintain the power balance of the power system were procured from Finland, other Nordic countries, Estonia and Russia. The availability of reserves was good, with the exception

of the intense spring flooding season. The floods affected all the Nordic countries at the same time, which restricted the availability of hydropower plants for maintaining the reserves. Electricity consumption is increasingly active in various reserve resources, particularly in the frequency-controlled disturbance reserve. Sales of frequency-controlled reserves to Sweden grew compared to the previous year. In accordance with the agreement between the Nordic TSOs, the hours required for maintenance of the automatic Frequency Restoration Reserve were increased, and the procurement costs for the reserve type correspondingly increased compared to the previous year.

The volume of transmission losses in the main grid remained at the level of the previous year, 1.5 (1.3) terawatt hours. This was 1.8 (1.5) per cent of the total volume of transmitted electricity. The losses are affected by the quantity of the electricity consumed and transferred.

Countertrade	1-12/20	1-12/19	10-12/20	10-12/19
Countertrade between Finland and Sweden €M	0.1	0.1	0.0	0.0
Countertrade between Finland and Estonia €M	0.2	0.5	0.0	0.1
Countertrade between Finland's internal connections €M	0.4	0.3	0.3	0.0
<b>Total countertrade €M</b>	<b>0.7</b>	<b>0.9</b>	<b>0.3</b>	<b>0.1</b>

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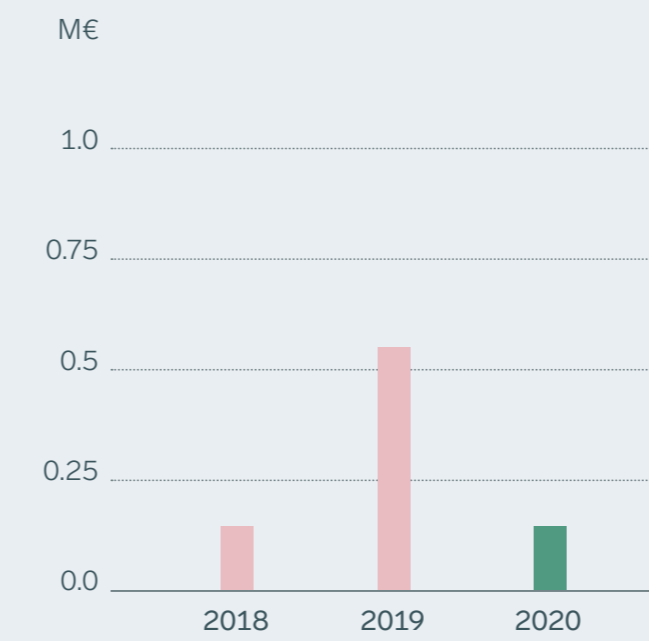
### Development of demand response

- **Industrial use:** The industry has for a long time decreased its production if the wholesale price of electricity peaks.
- **Heating and cooling systems in real estate:** Shopping centres, for example, automatically adjust their systems according to the price of electricity.
- **Consumer use:** Individual consumers can allocate their use of electricity according to the price.
- **Electric vehicles:** The charging of electric vehicles can be allocated to hours of low demand, and in the future, they may even discharge their batteries during short demand peaks, by means of an intelligent charging system.

### Effective demand response requires three things:

- **There must be rules in place.** Legislation should enable easy demand response. This has largely been accomplished in Finland, where both possibilities and preconditions have been created for demand-side management.
- **There must be functional technological solutions in place.** The infrastructure must support demand-side management. Without hourly readable electricity meters, for example, consumers are not able to manage their demand. Technology is a key enabler also for process automation, which in turn enables financial profitability.
- **There is a need for companies that develop and offer new business models.** Electricity retailers offer add-on services to consumers and the industry. New players aggregate sources of demand response, in other words they build up larger entities of response measures that can profitably be offered to the markets.

### Countertrade costs caused by HVDC disturbances



### Transmission and distribution losses (%)

Power system operation	2020	2019	2018
Electricity consumption in Finland, TWh	80.3	86.1	87.4
Fingrids transmission volume, TWh	68.4	68.7	68.6
Fingrids's loss power volume, TWh	1.470	1.335	1.2
<b>Electricity transmission Finland-Sweden</b>			
Exports to Sweden, TWh	0.3	0.5	1
Import from Sweden, TWh	18.8	16.3	14.5
<b>Electricity transmission Finland-Estonia</b>			
Exports to Estonia, TWh	6.6	3.8	2.4
Import from Estonia, TWh	0.04	0.3	0.9
<b>Electricity transmission Finland-Russia</b>			
Exports to Russia, TWh	0.02	0	0
Import from Russia, TWh	3	7.5	7.9
<b>Electricity transmission Finland-Norway</b>			
Exports to Norway, TWh	0.04	0.1	0.1
Import from Norway, TWh	0.3	0.2	0.2

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## CASE

### COMPETITIVE SOLAR ENERGY

To reach the agreed emission control targets, it is necessary to make use of all available electricity from renewable sources. In addition to reducing their own emissions, the interest of companies in renewable energy production may also be based on financial benefits and a desire to improve their public image.

A private individual can use solar panels to produce affordable electricity when energy consumption is low. Solar power is indeed a relevant source of energy at holiday homes, for example. Anyone acquiring a solar power system also becomes more aware of their consumption of energy, as the system needs to be selected according to the required capacity.

By combining weather data with assessments of the total production capacity of solar panels installed in Finland and their locations, it is possible to create a solar power generation forecast. Fingrid's solar power generation forecast is updated once an hour and is valid for the next 36 hours.





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## ELECTRICITY MARKET

Fingrid maintains and develops the electricity market. By maintaining a strong main grid, we make sure that Finland forms a unified price area for electricity. With our cross-border transmission connections, we offer the market parties access to the European electricity markets. We plan transmission outages so that they cause minimal harm to the functioning of the markets. We make the highest possible transmission capacity available for the markets at all times. We develop the market rules and publish electricity market data openly and free of charge. We maintain and develop the market-places for reserve and balancing power. We take care of balance settlement and deliver imbalance power to the balance responsible parties. Fingrid Datahub Oy will in the near future offer an effective information exchange platform for retail market parties.

## Electricity market outlook

The wholesale area prices on the Nordic and European electricity markets were the lowest in market history in 2020. The price differences between areas were significant, both among the Nordic price areas and on the Central European markets. The price decrease in the Nordic market area was primarily caused by extremely high hydropower production and

warm weather. A new phenomenon in the Nordic countries was the several occasions when the electricity prices on day-ahead markets sank to negative figures. The impact of the coronavirus pandemic on the production and consumption of electricity and on the electricity markets was fairly insignificant in the Nordic market area. The prices of emission rights remained on a par with the level they rose to in 2018 and 2019. An exception was the drop in the price of emission rights during the first wave of the coronavirus pandemic in the spring of 2020.

The electricity transmitted between Finland and Sweden mostly consisted of large imports from Sweden to Finland. The transmission of electricity between Finland and Estonia was dominated by exports from Finland to Estonia. A clearly smaller quantity of electricity was transmitted from Russia to Finland than in 2019. This was a result of the affordable price of electricity in the Nordics. In contrast to the previous year, electricity was also exported from Finland to Russia on a few occasions.

Electricity trading takes place per hour, and the direction of transmission can change from one hour to another. The price of electricity in the Nordic markets was often lower than in Finland. Large

⊙ By maintaining a strong main grid, we make sure that Finland forms a unified price area for electricity.

quantities of electricity were imported to Finland, based on market incentives, throughout the year under review. Finland has been dependent on imported electricity, as the domestic production capacity does not meet the demand. The price differences between the Nordic countries in 2020, which were large at times, resulted mainly from a different production mix and limitations of the transmission capacity. The Norwegian production is mainly hydropower, while Sweden has hydropower as well as wind and nuclear power. The price differences became particularly high when Finland's neighbours offered a large supply of hydro and

wind power compared with the demand. The area prices in Finland and Sweden diverged in situations where the transmission capacity between the countries was insufficient to meet the demand. Our cross-border transmission connections functioned very well, however, and we succeeded in making all the existing capacity available to the markets.

The situation in Finland was also affected by the decrease of imports from Russia, due to the more affordable electricity prices in the Nordics. There were substantial intraday variations in the quantities of electricity imported from Russia. The maximum transmission capacity was available almost throughout the year, with the exception of the annual maintenance work carried out at the Vyborg DC station and on the Russian grid in July, August and September. Maintenance-, capex- and fault-related transmission outages were implemented both on the cross-border connections between Sweden and Finland and on connections within the countries. The numbers and durations of the outages were at the normal level. The connections to Estonia and Russia were only subject to normal annual maintenance. Maintenance work was scheduled on weekends and similar periods to limit the impact on the market and electricity prices.

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Sufficient transmission capacity is a necessary prerequisite for the markets to function effectively. To increase the cross-border transmission capacity between Finland and Sweden, we are currently preparing, in cooperation with the Swedish TSO, a third AC connection to Sweden. The increased transmission capacity will help to decrease the price disparities between the countries. The transmission link is due for completion in 2025. The Forest Line connection will significantly increase the north–south transmission capacity necessary for the Finnish power system and help to keep Finland as a single price area in electricity trading. The project will be completed in 2022, a record achievement. Once the Forest Line is finished, we will upgrade the north–south transmission capaci-

ty by building the Lake Line connection, for which environmental impact assessments (EIA) were prepared during 2020. The targeted construction start for the Lake Line is in 2024 and the transmission line is due for completion in 2026.

### Developing the electricity market

Fingrid's mission is to develop the electricity market. In order for the power system to operate as much on market terms as possible, it is important that the electricity market and the technical system characteristics are optimally in synch. The arrival of a wide range of flexible resources on the market and enabling of a broad scope of market options close to the consumption hour and to the customers lowers the threshold for various players to participate in the electricity market.

Electricity market	2020	2019	2018
Day-ahead system price, €/MWh	10.93	38.94	43.99
Area price Finland, average €/MWh	28.02	44.04	46.8
Congestion income between Finland and central Sweden (SE3), €M	70.6	53.9	22.9
Congestion hours between Finland and central Sweden (SE3), %	44.5	37.0	20.7
Congestion income between Finland and northern Sweden (SE1), €M	174.8	77.1	33.6
Congestion hours between Finland and northern Sweden (SE1), %	62.8	40.1	23.6
Congestions income between Finland and Estonia M€	48.1	14.97	2.79
Congestions hours between Finland and Estonia, %	32.9	11.8	5.4

## CASE



### NORTHERNMOST VIRTUAL POWER PLANT

The Hullu Poro resort in Kittilä, Lapland connected its 11 glass-roofed suites, named 'Aurora pyramids', to a virtual power plant in the spring of 2020, as a result of which Aurora pyramids became a Fingrid Reserve Unit. With the help of the service run by Vibeco, a subsidiary of Siemens Oy, the hotel can adjust its electricity consumption up or down for grid balancing purposes.

The area has a smart micro-network, which was complemented with a solar energy system and 1.3-megawatt battery storage to enable local production and storing of electricity. The micro-network is in other words capable of independent operation, which secures a reliable supply of electricity for the resort even in various emergencies.

The calculated annual energy output of 114 megawatt-hours makes the solar panel field one of the largest in Finland.

Read more:

[Aurora pyramids – the world's northernmost virtual power plant](#)

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The growing share of variable renewable capacity is a welcome addition to the power system, but at the same time, it is a challenge to the functioning of the system. In order to successfully connect all renewable capacity, such as wind power, to the electricity system, making it increasingly cleaner, the market environment and its rules must be developed.

Fingrid has several ongoing projects for developing the electricity market, including the Nordic Balancing Model, the centralised information exchange system i.e. datahub, flexibility market solutions for the transmission grid, and transmission capacity calculation and its development. The projects link together the development of both the electricity market and of the power system operations. The said projects, as well as many other electricity market projects, continued to progress during 2020 and will be a major focus also going forward.

**NBM progressed on a broad front in 2020.** A key mission of TSOs is the real-time settlement of imbalance between electricity production and consumption, in other words balance management. The Nordic Balancing Model (NBM) modifies and automates the way in which the power system is balanced in the Nordic synchronous area, which consists of Fin-

land, Sweden, Norway, and eastern Denmark. The NBM develops new Nordic marketplaces for automatic and manual Frequency Restoration Reserves to enable the TSOs to procure reserve energy necessary for balance management. The NBM also helps the Nordic TSOs to prepare for joining the pan-European reserve marketplaces currently under development. In addition to the development of reserve energy marketplaces, other significant updates to the electricity market include the adoption of a shorter imbalance settlement period enabling 15-minute trading, and a new balancing model. An updated NBM roadmap was published in November 2019, and the work on the model has since then progressed on several fronts and the Nordic stakeholder reference group, consisting of the key stakeholders, convened several times during the period under review. A joint Nordic plan on the new balancing model and a new target timeline were published in 2020. The new balancing model will replace separate production and consumption balances and transfer from the corresponding pricing to a single balance model in early November 2021.

A derogation request process for the implementation of a 15-minute imbalance settlement period (ISP) was started in early 2020. A public consultation was

## CASE

### DIGITAL TECHNOLOGY TO HELP IN GRID MAINTENANCE

Fingrid will invest two billion euros in the main grid over the next ten years. In addition to building new systems, the servicing and maintenance of the grid are also important activities. Digital condition monitoring helps to allocate resources and forecast maintenance needs as efficiently as possible, which will save costs and improve the system security.

Furthermore, the data linked with grid operations represents a type of asset for Fingrid, and the control of which has become increasingly digitalised over the years. The installation of sensors necessary for data acquisition at substations started in 2016 and have continued ever since. The data collected with sensors is transferred into cloud platforms for analyses. Additionally, the data can also be processed as needed, as close to the source as possible.

Our vision for 2025 is an autonomous maintenance system that can communicate, with the help of artificial intelligence, when any preventive maintenance should be started.



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carried out concerning the request for derogation on the 15-minute ISP, and the regulator's decision on the request is expected during the first quarter of 2021. The new target timeline for the 15-min ISP will be confirmed once the decision has arrived.

The adoption of a 15-min ISP will be significantly affected by the new Nordic marketplace for a manual Frequency Restoration Reserve, which has involved extensive development activities both on a national and Nordic level. Until now, the Swedish and Norwegian TSOs, Svenska kraftnät and Statnett, have taken care of balancing in the Nordic synchronous area, using balancing power, whereas the new energy marketplace currently under development will enable specific power system balancing for each price area. Furthermore, the marketplace will be based on the 15-minute trading period, so, overall, the changes have made it necessary for the Nordic TSOs to significantly modify their IT systems and to upgrade their process automation.

The regulatory process on the new Nordic capacity market for automatic Frequency Restoration Reserve (aFRR) has been very active in 2020. The Nordic national regulatory authorities (NRAs) referred the decision on the market rules to

the European Union Agency for the Cooperation of Energy Regulators (ACER) in February 2020. Now, having received the regulatory authorities' views and the ACER decision, there is better clarity on the preconditions for launching the marketplace, and the earliest possible launch date has been postponed. The Nordic TSOs also arranged a public consultation on the exact gate closure time of the Nordic aFRR capacity market.

**Datahub version 1.0 functionalities implemented in 2020.** A centralised information exchange platform for the retail market of electricity, datahub, is scheduled to go live on 21 February 2022. The datahub will contain data from about 3.7 million accounting points in Finland. The datahub go-live readiness of the energy sector is monitored according to the milestones determined jointly with the Energy Authority. A precondition for a successful launch, the close cooperation with the entire sector was continued in 2020.

Starting from June 2020, the datahub was gradually made available to the entire sector for test operation. A total of 53 electricity retailers and 75 distribution system operators successfully completed the first milestone in the certification process within the set deadline, in December. The complete set of the data-

## CASE



## COMPETITIVE TRADING BETWEEN POWER EXCHANGES

Competitive trading between the Nordic power exchanges started in June 2020. The competition between electricity exchanges will increase the number of alternative trading services available to electricity market operators. The competition makes it possible for more than one Nominated Electricity Market Operator to connect with the European market coupling on the day-ahead market in the Nordic price areas. Despite competitive trading between the exchanges, the general principles of capacity calculation and allocation between the price areas will remain unchanged.

The Nordic countries became the second area in Europe to implement competition between power exchanges. The start of competition between power exchanges marks a new development step towards pan-European energy markets.

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hub service agreements was submitted to the Energy Authority for approval in late November.

**Flexibility markets approaching pilot stage.** As the energy transformation accelerates, new solutions are needed on market terms to maintain the power system. Flexible response is necessary both for balancing the consumption and production and to support efficient use of the grid infrastructure. Yet another driver of demand response solutions is the EU legislation, which was prepared for adoption in Finland's national legislation in 2020. The significant issues in the legislative package, in terms of demand response markets, are the requirement for network operators, in addition to investments, to implement demand side response and to coordinate the procurement of DSR services.

Fingrid's development of flexibility market solutions has progressed within the INTERRFACE and OneNet projects funded from the EU's Horizon2020 research programme. In the INTERRFACE project, which started in 2019, Fingrid has focused on the cooperation between TSOs and DSOs as well as on the development needs in the transmission and frequency management of the power system. Read more in [Research and development](#)

**Major progress in the reserve markets.** The Nordic TSOs adopted a new Fast Frequency Reserve (FFR) for managing minor inertia incidents in the spring of 2020. Inertia refers to the ability to resist changes in the frequency thanks to the kinetic energy stored in the rotating masses of the power system. The new Fast Frequency Reserve (FFR) responds to any changes in the electricity production by cutting back consumption or by increasing production within roughly a second.

In the Nordic countries, the required FFR capacity range, depending on the situation, is roughly between 0 and 300 megawatts, of which Finland accounts for 20 per cent. As a part of the implementation of the Nordic FFR system, Fingrid has opened a marketplace for FFR capacity. A pilot project for independent aggregation in the balancing power market was started in July 2020. The purpose of the pilot is to test the scalability of previously tested solutions and to increase the participation of aggregated flexibilities in the balancing power market and in power balancing.

The pilot for a one megawatt minimum bid size on the balancing power market was also extended until the end of 2020. Each Balancing Service Provider had a

## > The accelerating energy transformation calls for flexibility in power system management.

chance to submit one bid of less than five megawatts for each hour of operation. Decreasing the minimum bid size will lower the threshold of participation in the balancing power market. The smaller bid size will enable more efficient utilisation of distributed decentralised resources for balancing the power system and will be the future standard practice on European balancing power markets as well.

**Flow based capacity calculation methodology to improve capacity allocation.** A transmission-based capacity calculation methodology will be adopted in the Nordic countries to improve the allocation of capacity available to the markets. In 2020, the Nordic energy regulators approved the updated capacity calculation methodology for day-ahead and intraday markets, which will be used to calculate the transmission capacity bids offered to the market. RSC, the Nordic TSOs' joint operational planning office in Copenhagen, will acquire the necessary new calculation software. The new methodology will be adopted as soon as it has matured enough to enable effective functioning of the markets, yet no sooner than April 2022.

**Sector integration** refers to the integration of the energy sectors and the energy vectors, both on the system level and on

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the end-user level. The energy sectors consist of traffic, built-up environment and the industry, while the energy vectors consist of electricity, heat and gas. Sector integration can help to achieve a clean energy system both resource- and cost-effectively through the capability to process energy in the most optimal form in each stage of production, transfers and consumption, such as as electricity, heat, gas or liquid.

From Fingrid's point of view, sector integration brings to the table both challenges and opportunities. The integration of various energy sectors and their electrification will increase the consumption of electricity and cause new types of variations in consumption. The increasing demand must be met with a sufficient transmission grid capacity while at the same time taking into account the geographical locations of new generation capacity. New consumption and energy storage systems in their various forms will also provide more opportunities for demand-side management, which will in the future help both in system balancing and in the management of grid congestions. Other key factors in the operation of the power system will also include the forecasting of new types of demand variation on the power system level and the

insights into the demand-side flexibility potential at a specific moment of time. Both preparing for the challenges and taking advantage of the opportunities will require development work with other energy sector players on the national, Nordic as well as the European level.

In 2020, Fingrid participated in a working group directed by the Ministry of Economic Affairs and Employment, tasked to promote sector integration in Finland and to produce insights for the national energy and climate strategy to be completed at a later date. Fingrid additionally coordinated strategy work to create a joint vision for the Nordic TSOs and a roadmap on the development of sector integration on the Nordic level.

**Roadmap for open data.** A roadmap was drawn up jointly with in-house experts and customers for the Open data service maintained by Fingrid. The roadmap was created by surveying the current situation of the service and its development needs with interviews, after which the vision for the service and the development themes were defined in separate workshops. While some improvements were implemented already in the autumn, the development work will start in earnest in 2021.

## CASE



## NEW POWER TRANSFORMERS BOOST CAPACITY

Fingrid procured two new 400-MVA power transformers for the Pyhäselkä and Petäjavesi transformer substations from the Slovenian KOLEKTOR ETRA company. The nearly [300-tonne transformer](#) arrived at the Pyhäselkä substation on 18 October.

The revamp of the Pyhäselkä transformer substation is a part of the modernisation of the Oulujoki network, planned to be completed in stages by 2022. In addition to updating the ageing transmission network, the region is expecting new wind energy capacity worth several

hundred megawatts. The transformer substation modernisation in Petäjavesi is connected with the Forest Line project, where the intention is to upgrade the transmission links between northern and southern Finland.

The contract includes an option for five additional transformers linked with several planned wind power projects throughout Finland.

Read more: [Fingrid is acquiring new 400 MVA power transformers](#)

## 8. PERSONNEL

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Our operations are based on an open, collaborative, renewing and high-performing work community. Our personnel is strongly committed to the company's vision and mission. The meaning of our work – responsibility for the functioning of the power system – has always been an integral part of our daily work. In addition, we work to achieve the clean power system of the future. The meaningfulness of the work inspires and creates a sense of belonging, as does the opportunity to carry out autonomous specialist work. In our HR strategy, we highlight four goals: being the CEO of one's own work, bold supervisory work, continuous development and learning, and securing expertise.

### CEO of one's own work

Fingrid's specialists enjoy the opportunity to do their work autonomously, taking independent responsibility for it, while at the same time supporting the team and the common goals. At Fingrid, specialist positions come with an inherent responsibility for the work and for developing it and one's own skills.

In this sense, all of our employees are the CEOs of their own work. This model of specialist work faced a tough challenge in the exceptional year under review, as the coronavirus pandemic forced most of our specialists to work almost exclusively

from home. Working remotely increased the significance of individual responsibility even more.

Being the CEO of one's own work involves power and freedom, but also helping others and working as a team. The team aspect suffered from increased remote work. Working remotely offers many benefits, such as flexible working hours, less commuting and better work-life balance. The feeling of togetherness at work suffers from physical distancing, however. Creating new ideas and cooperative development becomes inevitably more difficult when working remotely.

We tried to ensure the best possible connectedness, engagement and support for our personnel during the most difficult times of the pandemic. Webinars on ergonomics and efficiency when working remotely and on ways of staying in touch with colleagues online, as well as a presentation on the coronavirus by an occupational health physician, were arranged shortly after going over to remote work in March. Our President & CEO gave weekly online briefings to the personnel throughout the spring. Our teams had coffee breaks online. The entire personnel was invited to the traditional Fingrid Coaching Day in May, this time online, to discuss and comment on our value dialogue.

### Bold supervisory work

Our operations are characterised by openness and a flat hierarchy. Supervisors hold a key role in managing the work community culture and communication. This is why the company has invested in training and guidance for supervisors. The daily management and leadership skills of supervisors play a key role in ensuring our work community's job satisfaction and ability to cope at work.

In 2020, it was not possible to arrange the traditional Supervisor Days, but our supervisors came together for five online events. Training was offered to supervisors on topics such as labour law, communication, and performance management.

Fingrid supervisors received clear instructions to 'prioritise and facilitate' in early 2020. The need to focus on the execution of primary tasks and to make everyday work as smooth as possible were clearly highlighted in the feedback from personnel. Our investment rate and major changes in our operating environment have caused a sense of urgency and scheduling pressure in recent years. The theme of making everyday work run more smoothly was perfect in the context of the coronavirus pandemic, when developing anything new would be difficult in any case. Smooth work was supported by Virta projects, where teams were asked to come up with ideas for streamlining their tasks.

Number of employees	2020			2019			2018		
	Men	Women	%	Men	Women	%	Men	Women	%
Permanent	363	82	23%	338	77	23%	327	251	76
	89%	77%	23%	89%	77%	23%	86%	77%	23%
Temporary	45	13	29%	42	14	33%	53	40	13
	11%	71%	29%	11%	67%	33%	14%	75%	25%
Full-time	376	84	22%	359	82	23%	349	268	81
	92%	78%	22%	94%	77%	23%	92%	77%	23%
Part-time	32	11	34%	21	9	43%	31	23	8
	8%	66%	34%	6%	57%	43%	8%	74%	26%
Total	408	95		380	91		380	291	89
Average	400			384			376		

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### Skills development

Fingrid is essentially a specialist organisation where the most important resource is the knowledge and skills of the personnel. It is extremely important for the company to ensure that no critical skills are lost. Measures such as work rotation and swapping tasks within a team are employed to ensure the important knowhow is retained. All employees must also have deputies as needed. The significance of substitute planning and securing knowhow became very evident during the coronavirus pandemic. As a preventive measures against the virus, teams were split into smaller groups.

As technology and the entire operational environment evolve, working life changes continuously. Fingrid responds to changes by offering its employees opportunities to develop and grow their competence. The approach of securing expertise as a strategic choice improves the quality of personnel planning and helps the company to better prepare for future needs.

Skill development needs are agreed on in the My strategy discussions, which are held twice a year with each permanent Fingrid employee. Each employee and his/her supervisor is responsible for the implementation of the measures agreed on in the development plan.

In 2020, Fingrid Academy offered coaching for supervisors, project management coaching, the Loikka training programme for increasing specialists' communication and engagement skills, language training, and unit-specific coaching mainly related to change, work community and emotional skills. We invest more than a million euros annually to develop both the work community and each employee's personal development. In addition to shared training provided by the company, personnel can take the initiative by proposing specific training to boost their knowhow. In 2020, each Fingrid employee received an average of 3 (5) days of training, and the training costs amounted to EUR 1.1 million.

Education level of permanent personnel	2020	2019	2018
Basic and secondary education	20	18	20
Lowest level of tertiary education	31	31	32
Bachelor's degree	126	118	116
Master's degree	176	159	150
Post-graduate degree	10	8	9

Training hours by employee group and gender	2020	2019	2018
Training hours, women	31	48	40
Training hours, men	23	31	39
Training hours, total	9 832		
Training hours per person	25		
Training days per person	3	5	5

## CASE



### LOIKKA – A LEAP IN EFFECTIVE CRISIS COMMUNICATION

Over the course of three years, Fingrid has invested in several training programmes called Loikka (i.e. 'Leap'), aimed at developing the communication, interaction and engagement skills of the personnel. Substance specialists with a training and experience background in technology are coached to become proactive 'CEOs of their own work'. We made bold progress by listening both to the specialist and the coaches and by modifying the coaching topics in ways appropriate to the specific context. Work was continued online on the Zoom platform, when meeting face to face was not possible due to the coronavirus pandemic. Everyone's screens gave off a warm and genuine feeling of influence during the final Loikka session when everyone opened their gift packages to mark the final coaching session and found woollen socks in Fingrid red, target dashboards and diplomas, finishing off with a sparring session. Making an impact – person to person.



# 9. INTERNAL CONTROL AND RISK MANAGEMENT

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## RISK MANAGEMENT AT FINGRID

Fingrid's risks are managed according to the internal control and risk management principles approved by the Board of Directors. The risk management development project started in 2019 was finished in 2020. The assessment of key risks was revised, the process was made more efficient and risk management measures were specified in more detail.

## RISK MANAGEMENT GOVERNANCE

The nature and crucial importance of Fingrid's operations to society are strongly reflected in the company's risk management culture and its development. Fingrid is responsible for the functioning of Finland's power system, which makes it fundamentally a risk management company. Risk management is planned and governed holistically. The objective is to comprehensively identify, assess and monitor various threats and risks that the company's operations, environment, personnel and property are subjected to and which also have societal implications, and to be protected against them. Ensuring systematic corporate safety & security is a part of risk management.

Continuity management is included in comprehensive risk management, and its objective is to improve the organisation's readiness and to prepare, in the

### Fingrid's societal responsibility as the foundation for risk management



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best possible way, for the realisation of various risks and ensure the continuity of operations in such situations.

The planning of comprehensive risk management during normal times contributes to the contingency planning during societal state of emergency as required of a company with duties critical to the national security of supply.

### PROACTIVE RISK MANAGEMENT

The company's risks are divided based on significance into strategic and major business risks to be reported to the company's Board of Directors, and operational risks.

Risks are identified and assessed in a consistent manner as part of the company's strategy process and in connection with significant changes affecting operations. Risk management measures are planned, recorded and followed up on regularly in the risk management system. The system and the management process was overhauled in 2019 and the go-live date of the entire system in commercial use was in 2020.

Risks identified in the risk assessment are classified in relation to the risk management measures into one of three groups:

- risk factors that are deemed significant in terms of their impacts and which are to be transferred, if possible, by con-



- tracts, insurance, derivatives or similar means,
- risk factors that are deemed moderate in terms of their impacts and which are under the company's control through clear controls and other practical measures, and
  - risk factors deemed minor in terms of their impacts but which require monitoring.

The company's risk management is continuous and aims to engage the entire

personnel to identify the risks associated with the company's operations and implement risk management measures as part of their day-to-day work. An overall risk assessment is carried out annually based on an assessment of the operating environment. The planning of risk management measures is part of strategy implementation planning. In order to manage the risks with significant impacts, risk management projects are launched as needed on the company level in order to arrange supplementary measures and monitoring.

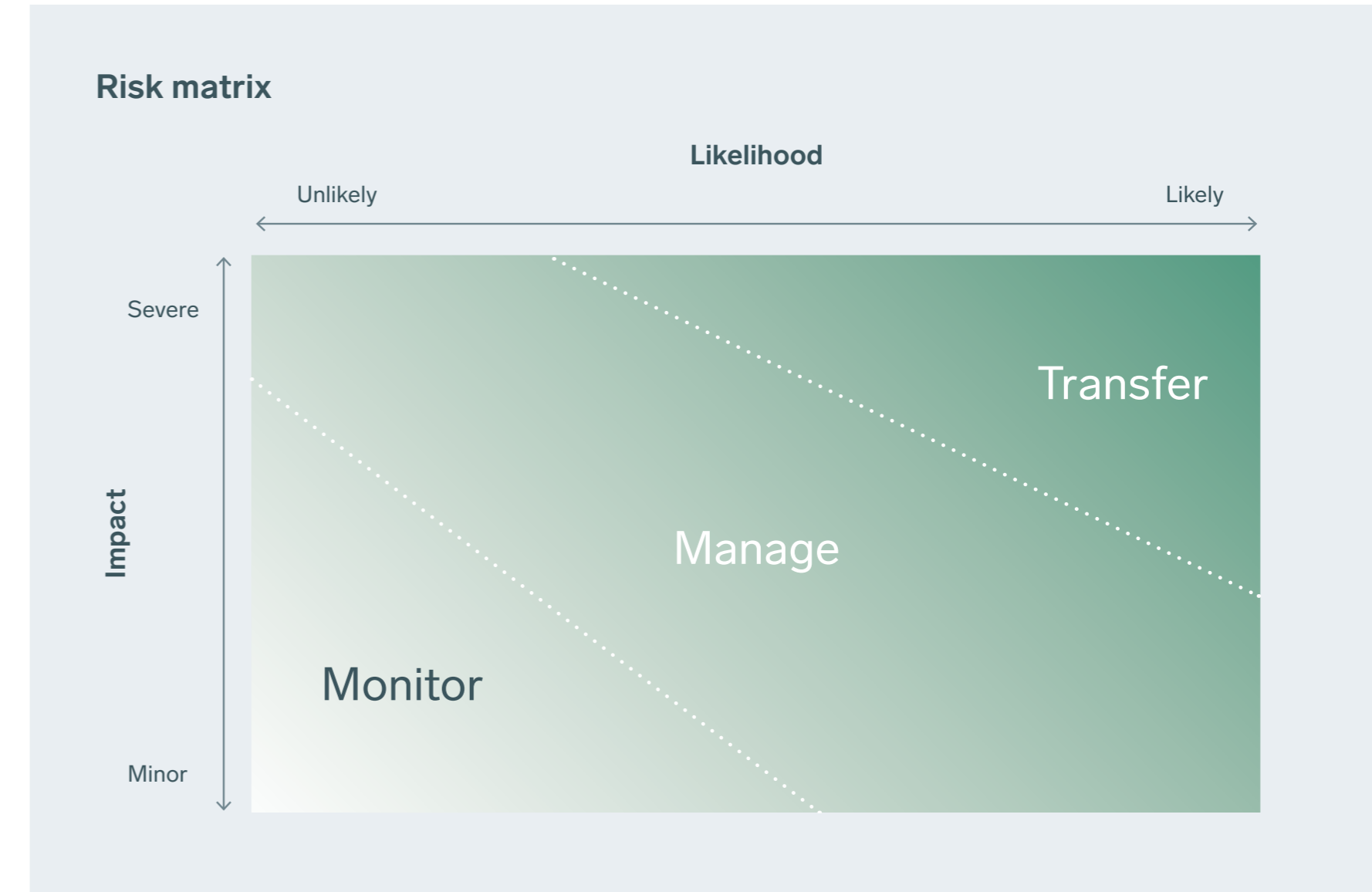
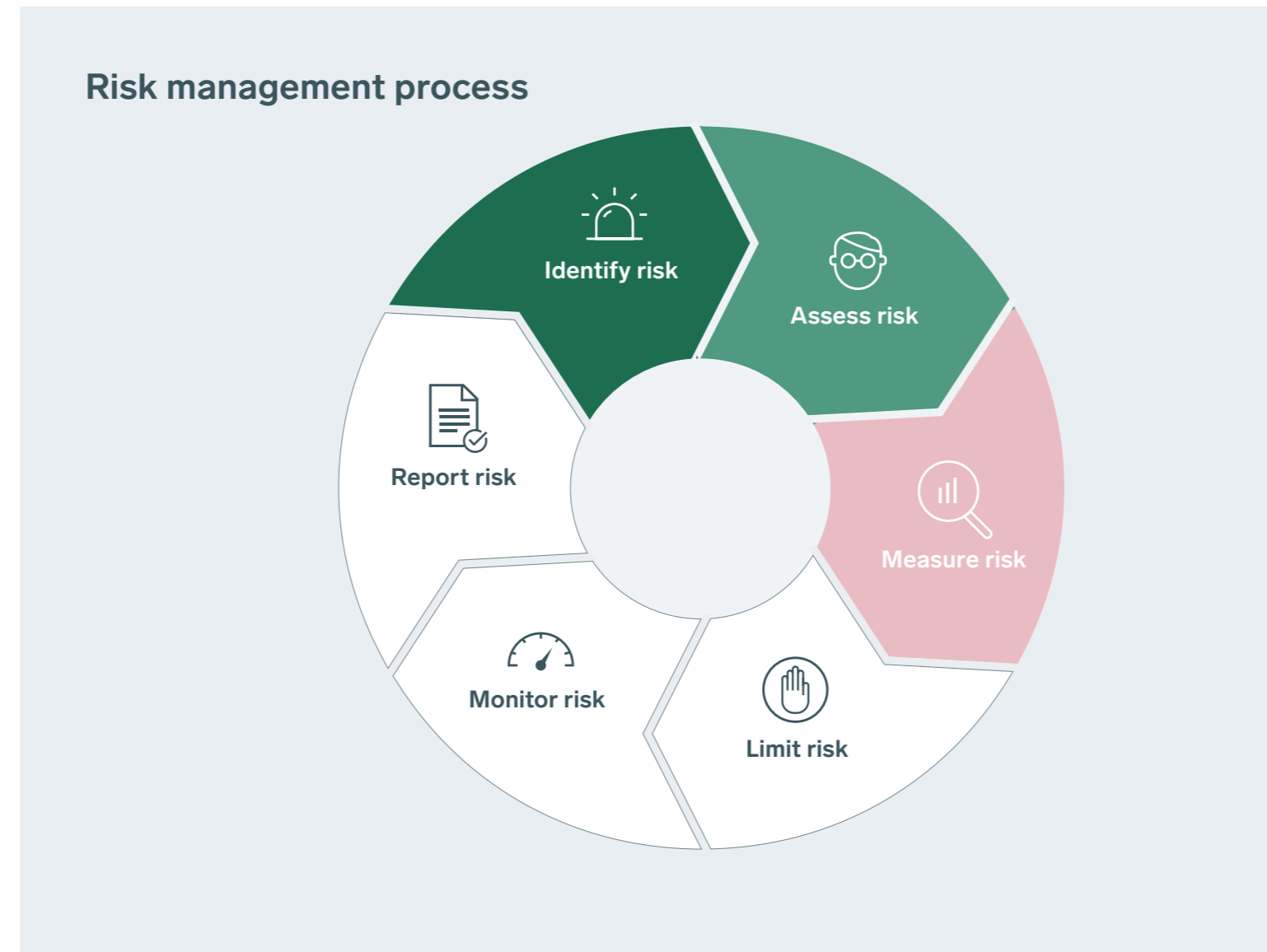
⦿ Fingrid is responsible for the functioning of Finland's power system, which makes it fundamentally a risk management company.

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Both strategic and financially significant business risks are reported to the company's Board of Directors annually. Risk reporting is supplemented in connection with significant business projects and changes in the operating environment.

As a general rule, risks are protected against if the costs that the protection entails are justified in relation to the magnitude of the risk. Risks related to major personal injury and environmental damage are always protected against.

Risk protection takes place by reducing the likelihood of an adverse event and/or its impacts on Fingrid and society. The most important protection measures are:

- supporting Fingrid's risk management culture and improving employees' risk awareness,
- comprehensive strategy work and operational planning,
- influencing the regulation of operations,
- limiting risk through contractual arrangements,

- developing technical solutions and operations, and modifying procedures,
- auditing operations and reporting on and monitoring the implementation of measures, and
- derivatives and insurance policies.

### CONTINUITY MANAGEMENT

Continuity management, included in comprehensive risk management, is used to reduce the direct impacts of a realised risk and to accelerate recovery from an

adverse event. The planning of continuity management is based on threat scenarios that are created based on a risk and operating environment analysis. The scenarios are used to assess the company's ability to maintain the functionality of critical processes and systems during emergencies when proactive risk management has failed. Among the scenarios that must be analysed are the loss of business premises or IT systems, a prolonged blackout or extreme weather conditions.

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The technical and administrative preparedness required by proactive risk management and, in particular, continuity management is guided on the company level by the preparedness policy, and by the system defence plan that the company maintains in accordance with the Finnish Electricity Market Act.

The threat scenarios are decided on as part of the company's strategy, and the necessary recovery plans are drawn up and the implementation of the plans are rehearsed for the most significant continuity threats. The rehearsals are planned together with the company's preparedness unit.

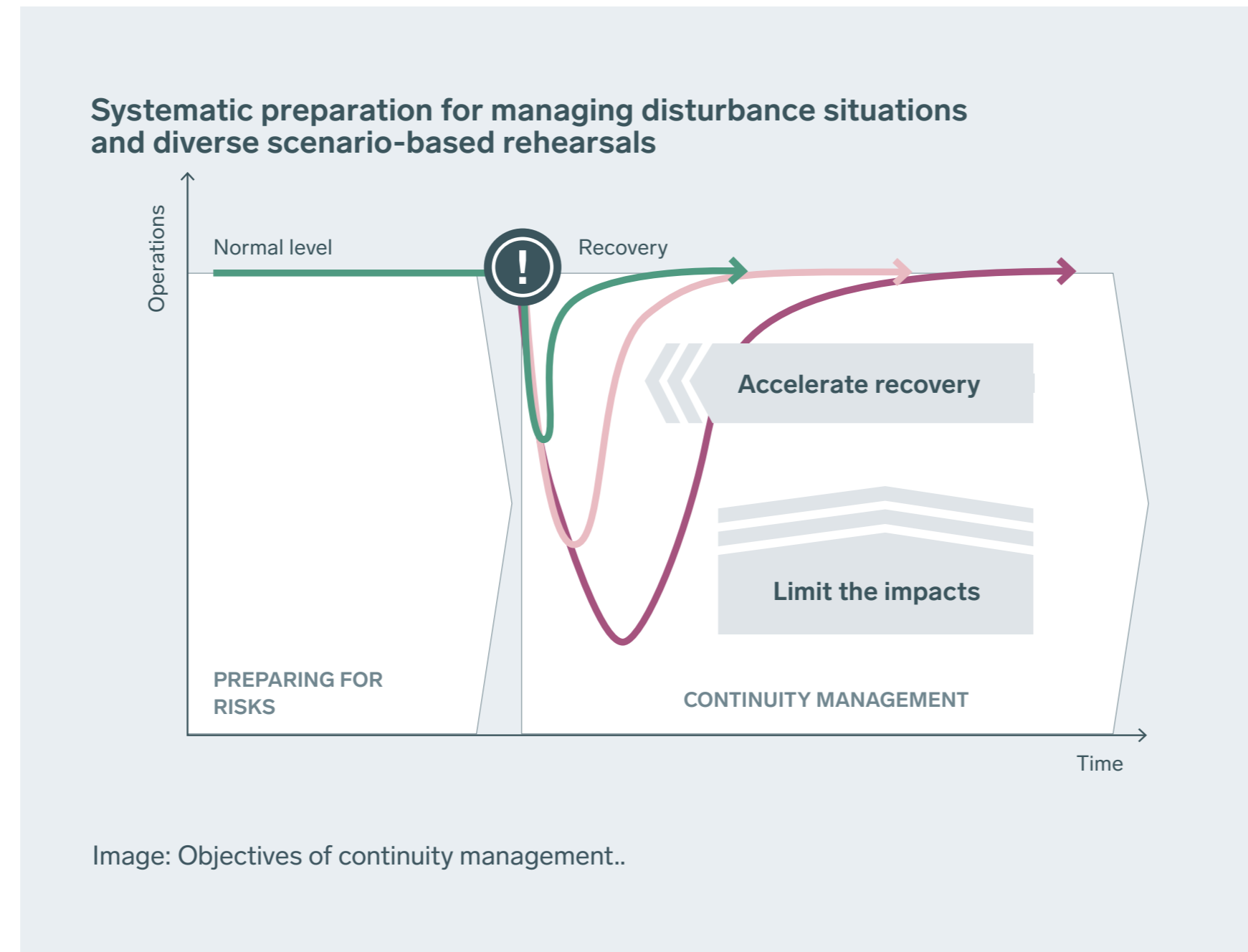


Image: Objectives of continuity management..



### CASE

#### LESSONS LEARNED FROM THREAT SCENARIO REHEARSALS

Risk management in the energy sector always includes preparedness for various threat scenarios. Fingrid was able to successfully prepare for the exceptional circumstances caused by the coronavirus pandemic and the power system continued to function normally throughout the spring, despite the pandemic.

Challenges were mainly encountered in the early stages of the lockdown, when our employees had problems in entering Finland from abroad. All worksites remained operational and any delays were insignificant, however. The challenges and operational changes at the worksites caused by the coronavirus were reviewed jointly with suppliers, for example in the suppliers' occupational safety group.

Measures were taken early on to protect the operations and the personnel of Fingrid's control centre, due to its critical role. Controlled decentralisation meant that all visits and contacts were cut back and that the control centre functions were distributed to several locations.

Read more:

[Coronavirus prevention procedures are well embedded on worksites – contingency measures proved their usefulness](#)

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### CONTINGENCY PLANNING

Fingrid is a company with duties critical to the national security of supply and must be able to continue its operations even when emergency legislation is in force. Fingrid maintains a contingency plan as part of the system defence plan referred to in the Finnish Electricity Market Act. Fingrid is an active participant in the collaboration to develop the energy sector's preparedness activities and, together with the National Emergency Supply Agency, governs the authorities' and Finnish industries' joint Power and District Heat Pool, which co-ordinates emergency preparedness. In recent years, the Pool has invested in extensive preparedness rehearsals, called 'Jäätyvä', for municipal, rescue and law enforcement authorities, the Finnish defence forces, and energy companies.

### CORPORATE SAFETY & SECURITY

At Fingrid, corporate safety & security and the related preparedness and cooperation with authorities are planned and managed as part of the company's overall risk management. Essential elements of corporate safety & security planning and operations guidance are electrical safety and occupational safety, the safety of properties and premises, information security, personal and travel safety, emergency rescue operations and internal and

external protection against crime related to the company's business.

### RISK CONTROLS

Risk management controls that are significant in terms of the company's operations and finances are described and implemented by each process and function to support good governance, overall efficiency, the quality of internal control and operational audits.

The preparation and description of decision-making controls take into account the segregation of duties, as well as existing approval authorisations and other factors that ensure appropriate decision-making. The effectiveness of the existing controls is assessed regularly.

The company complies with the Board-approved insider guidelines and related party principles, as well as separately maintained guidelines concerning conflicts of interest and judicial disqualification.

Risk management at Fingrid is described in more detail on the company's [website](#).



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## 10. RESEARCH AND DEVELOPMENT

Fingrid's research and development activities respond to the challenges of the energy transformation, improve the cost-effectiveness of the operations and increase competence. In 2020, a total of EUR 4.5 (3.4) million was used for Fingrid's own research and development. The projects are often carried out in cooperation with industry players and top experts to enable the industry to utilise synergy benefits and improve their impact.

R&D activities was tied even more closely with the business operations by merging the focal points of R&D with Fingrid's strategic development themes. The project portfolio is steered both by the strategic development themes and the business needs.

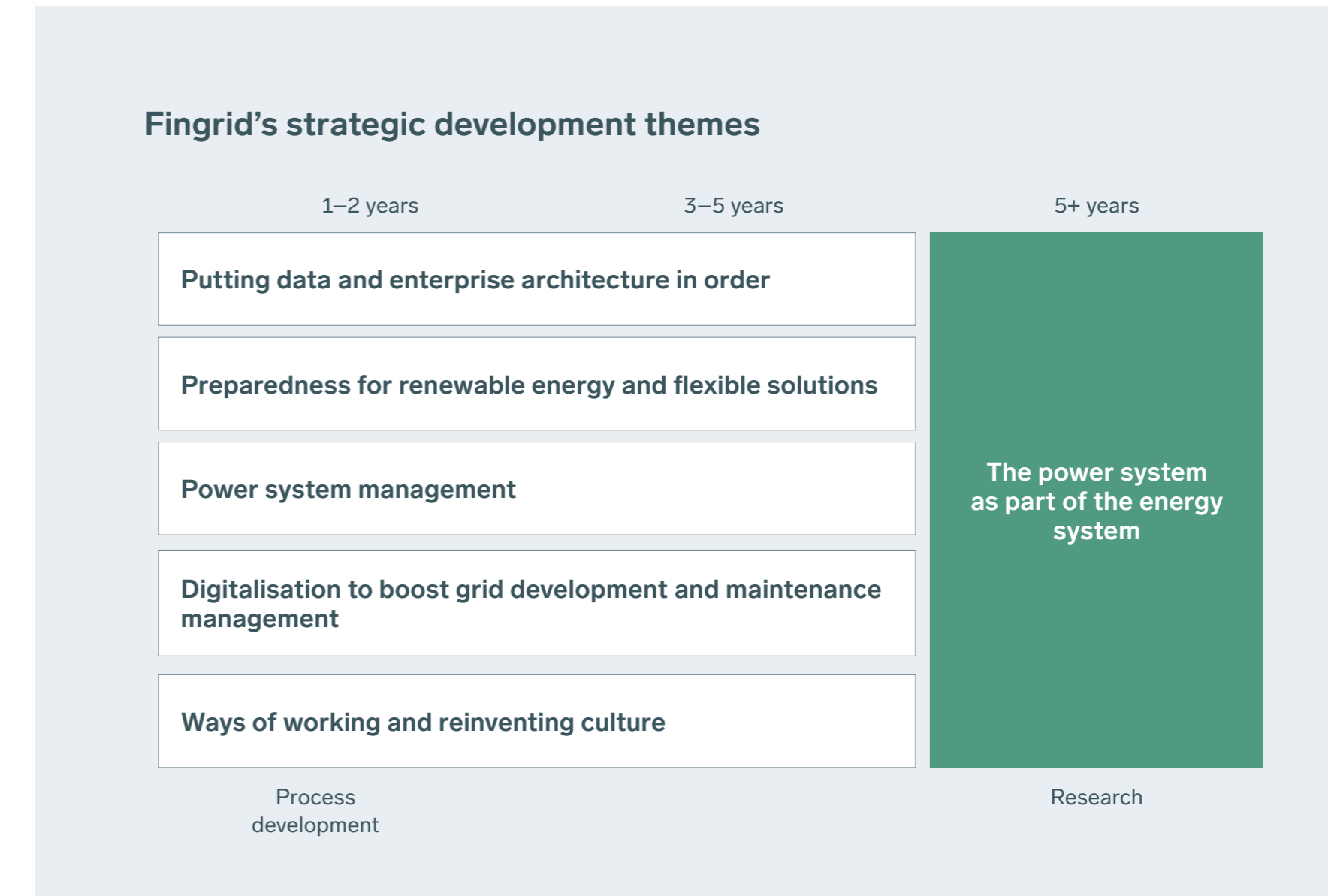
The number of ongoing R&D projects in 2020 was more than x. Nearly y per cent of the projects were carried out using external resources. Most of the the R&D projects approved for the Energy Authority's innovation incentives in 2020 were linked with one of the three development themes presented above: 1) Preparedness for renewable energy and flexible solutions, 2) Power system management, and 3) Digitalisation to boost the efficiency of grid development and maintenance management. The key project of the third development theme is the digitalisation

of substation maintenance management by means of IoT technology. [Read more about this project here](#). As regards the fourth topic, 'The power system as part of the energy ecosystem', the preparations for sector integration were started in late 2020. [Read more in the 'Electricity market' section](#)

In the following section we have some examples of the projects included in the first two strategic development themes.

### Preparedness for renewable energy and flexible solutions

The load capacity of transmission lines varies depending on the weather conditions. The aim of Fingrid's **Dynamic Line Rating (DLR)** project is to measure the load capacity and to take all of the available thermal transmission capacity in the existing grid into use. Three different Dynamic Line Rating systems based on different technologies have been tested. The measurement equipment has been installed on the 400-kV Isokangas–Pyhänselkä transmission line. According to the measurement data and calculations obtained to date, the capacity available for utilisation is much higher than the standard transmission capacity normally in use, particularly in windy weather, which improves the cooling of the conductors. Based on the obtained results,



the DLR systems will be adopted for more extensive use as wind power production increases.

Fingrid continued its work to develop flexible markets in 2020 in the [INTERRFACE flexibility market pilot project](#) under the EU's Horizon 2020 programme, where Fingrid has primarily focused on the development needs linked with the hour of electricity delivery, particular-

ly from the standpoints of transmission management and balance management. Fingrid additionally participates in the **OneNet flexibility market** project started in October 2020, also principally funded by Horizon2020. The three-year project further developing the methodologies created in the INTERRFACE and conducts pilot testing of various flexibility market solutions, which help to solve the challenges posed by the energy trans-

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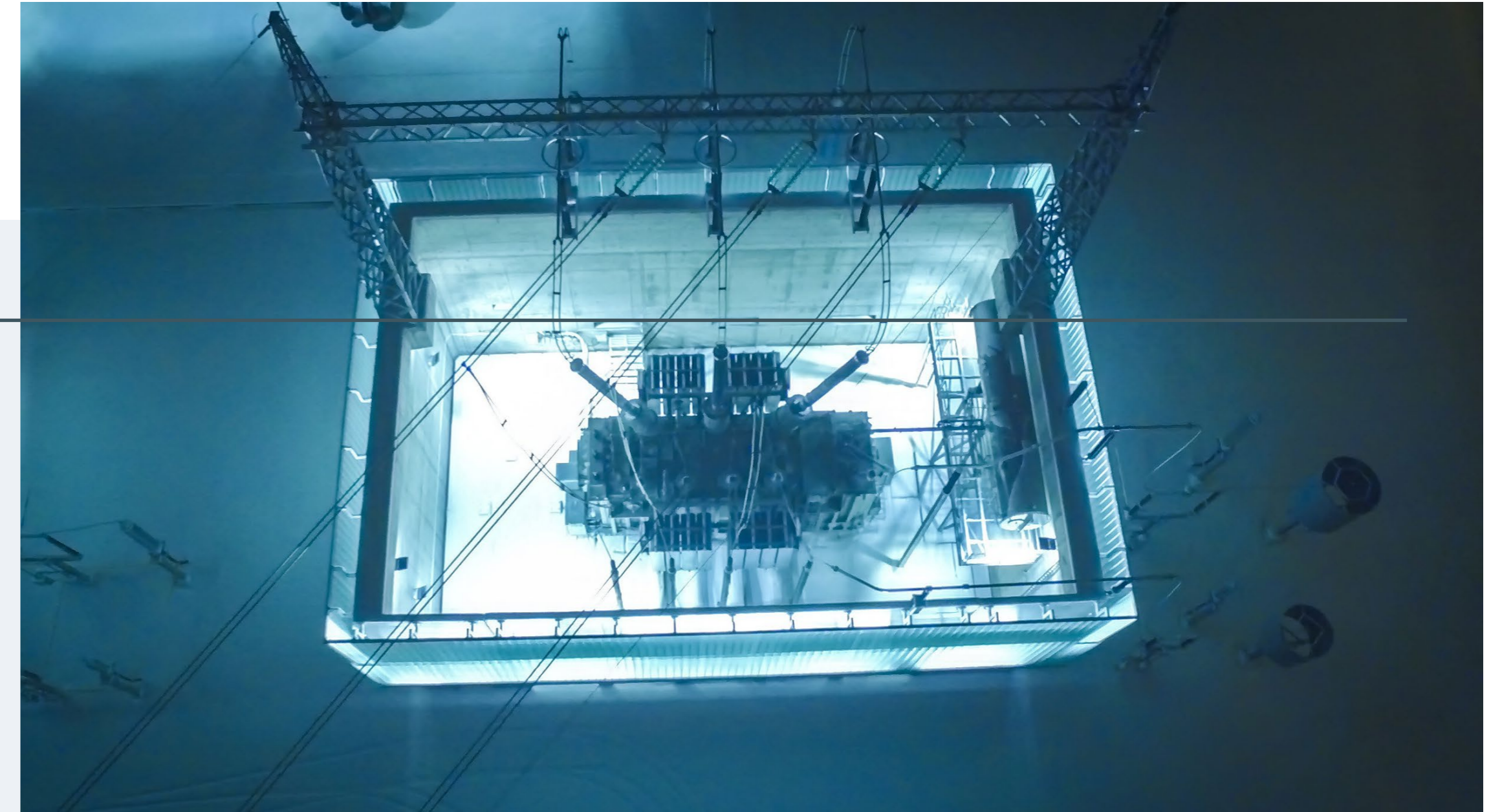
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formation to the power system. The test environments used in the projects enable the joint development and testing of flexible solutions with partners, both for Fingrid's own purposes and for the needs of our customers. Thanks to these projects, Fingrid R&D costs can be recovered with subsidized funding and we get to be one of the first to test the new European flexibility solutions. We will also start new studies aimed at more extensive utilisation of demand-side management.

The purpose of the extended **independent aggregator pilot** is to test the scalability of previously tested solutions and to increase the participation of aggregated flexibilities in the balancing power market and in power balancing. The balancing power market pilot was started in July 2020.

**The smaller bid-size pilot on the balancing power market** continued until the end of 2020. The goal of the pilot was to ease entry to the balancing power market and make the transition towards the European markets smoother. During the pilot phase, each Balancing Service Provider can submit one balancing bid of less than 5 MW for each hour of operation on the balancing power market. The minimum bid size during the pilot is 1 MW.

### CASE



### HOW TO CREATE INNOVATIONS THAT ARE USEFUL FOR SOCIETY AT LARGE?

A key prerequisite for innovation at Fingrid is the working culture based on trust, which emboldens everyone to try new solutions and even to fail at times.

The company encourages everyone to participate and to develop their own tasks and also larger processes. One example of every-day innovation was one the brainstorming challenges in

2020, where we asked our personnel to think about how workplace camaraderie could be increased during the coronavirus pandemic and how new employees can be included in the work community.

Examples of more conventional innovations include new technology and digital tools for streamlining opera-

tions and improving the management of the power system.

Our innovative approach benefits both our customers and society at large. System security stays at a high level, and the power system is capable of connecting more and more emissions-free energy.

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**New lightweight connection stations** improve the quality of electricity. Fingrid, Outokummun Energia and PKS Sähkösiirto are together realising a solution for reducing the number of outages caused to customers on long grid lines by more than half, by as much as just over half. The connection station is a streamlined version of a standard grid substation. It is a reliable, minimalist switching station with no room for expansion. In addition to shorter disturbance outages, the new solution also reduces the geographical extent of planned maintenance outages. It is also possible to use the stations for connecting new power plants, such as future wind turbines.

### POWER SYSTEM MANAGEMENT

Fingrid developed, jointly with the Nordic TSOs, a new type of reserve product, **Fast Frequency Reserve** (FFR) to handle conditions of low **inertia**. In low-inertia conditions, the FFR prevents the frequency of the power system from sinking excessively during a major disturbance in electricity production. The FFR was adopted taken into use in the spring of 2020, and Fingrid acquires these reserves on a market which it maintains.

We tested jointly with the Leppäkosken Sähkö utility company, a **fuel cell solution** that can charge the batteries of a



substation when needed and this way secure its critical functions, even during a disturbance. The fuel cell produces energy from a water-methanol mixture. The pilot test was successful. The methanol fuel cell turned out to be an adequate, though costly, way to secure the operation of a substation. The solution is most suitable for loads less than 4 kW and run times of more than 24 hours.





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## 11. GLOSSARY

**Aggregation:** Aggregation means combining regulation-capable, smaller electricity production, consumption and storage sites into larger entities that enable electricity trade in different electricity marketplaces.

**Network Code for Emergency and Restoration:** Network code concerning the emergency and restoration of the electricity network.

**ENTSO-E:** (European Network of Transmission System Operators - Electricity) is a cooperation organisation of European transmission system operators (TSO). Its task is to develop the European Union's electricity markets and to improve cooperation between TSOs. The organisation is headquartered in Brussels, Belgium.

**eSett:** A company that carries out the imbalance settlement of the Nordic electricity market parties' actual electricity consumption and production. The company, eSett Oy, is owned equally by the Nordic TSOs Energinet, Fingrid, Svenska Kraftnät, and Statnett.

**GRI (Global Reporting Initiative):** Corporate sustainability reporting standards in wide use throughout the world.

**Horizon2020:** An international project financed by the EU Commission. The

project aims at developing a new kind of platform for electricity market flexibility services and related processes.

**Inertia:** In physics, inertia means an object's resistance to change in its velocity. Electricity grid inertia refers to the kinetic energy in the electricity grid. The energy is contained in machines at power plants and factories which rotate at the same frequency as the electricity grid. The rotating machines' mass produces inertia for the electricity grid.

**INTERFACE project:** The European INTERFACE flexibility market platform project is one of the research projects financed under the EU's extensive Horizon 2020 programme. Fingrid and Elering are involved in the project, which seeks solutions for flexibility market platforms that enable the utilisation of distributed decentralised resources for both maintaining power system balance and the needs of distribution system operators and balance responsible parties.

**IoT solutions in grid operations:** In future, the Internet of Things (IoT) and digitalisation will help monitor the condition and lifecycle of substation equipment, making the substation condition management more effective and reducing transmission outages for customers.

**ITAMS:** International Transmission Asset Management Study. ITAMS evaluates the efficiency of TSOs' asset management. The study has been carried out five times, and Fingrid has placed at the top each time. Fingrid focusses especially on making use of digitalisation, which is one factor behind the good success in the study.

**ITOMS:** International Transmission Operations & Maintenance Study. This study looks into the efficiency of maintenance based on criteria such as maintenance costs and disturbance statistics. The goal is to save costs and improve the system security. Fingrid has often placed close to the top and has received Top Performer nominations both for the maintenance of transmission lines and substations.

**Cross-section Central Finland:** Also referred to as Cut P1. The Cross-section Central Finland refers to a trans-section across the transmission lines between northern and southern Finland defined on electrotechnical grounds. The exact future location of the cross-section is affected by factors such as the new production and consumption connecting on the north-south transmission lines.

**Demand-side management/demand response:** Demand-side management means reducing the consumption of electricity or transferring it to another point in

time based on price. Electricity consumption is reduced when the price in the electricity market is high.

**Net Promoter Score (NPS):** The percentage of promoters, i.e. those willing to recommend the company, minus that of detractors. Example: if 45% are promoters and 6% are detractors, NPS is 45% - 6% = 38%. The maximum score is 100%.

**Materiality analysis:** The materiality analysis is used to identify topics that are the most important for Fingrid's primary operations and corporate responsibility. It includes an assessment of the substantial financial, social and environmental impacts of Fingrid's operations, as well as of the impacts on stakeholders' decision-making based on, among other things, operating environment and stakeholder analyses and a strategy update.

**PCI (Project of Common Interest) status:** Such status can be granted to projects that are essential to the EU's internal energy market and to achieving the targets of the EU's energy policies. Projects with PCI status can benefit from, among other things, faster permit processing, and they are entitled to later apply for financial support from the EU.

**Clean power system (also low-carbon power system):** A power system where

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electricity generation is based on carbon-free production, such as wind, solar, biomass, hydro or nuclear power.

**Reserve markets:** The amount of electricity generated and the amount consumed must be equal at any given moment. The electricity market parties draw up an advance plan for balancing their consumption and production, but the balancing of deviations during each hour of operation requires reserves, which Fingrid acquires from the markets it maintains.

**SDG (Sustainable Development Goals):** In 2015, the UN member states agreed on the Agenda 2030 for sustainable development. It includes 17 global sustainable development goals to be achieved by 2030.

**Electricity market operators:** Electricity producers, retailers and consumers – including households that participate in the electricity market.

**Power exchange:** A public marketplace for selling and purchasing electricity.

**Balancing power markets:** The balancing power markets help maintain a balance in real time between electricity pro-

duction and consumption. Fingrid orders up- or down-regulating power according to the needs of the power system. Up-regulation refers to an increase in generation or reduction in consumption. Down-regulation refers to a decrease in generation or increase in consumption.

**Imbalance power:** For the electricity consumer, imbalance power is the difference between the electricity purchased and actual electricity consumption. For the electricity producer, it refers to the difference between the electricity sold and the actual electricity produced.

**Load Frequency Control:** Load Frequency Control is an integral part of the implementation of the new Nordic Balancing Model based on Area Control Error (ACE). It calculates ACE, i.e. the difference between electricity transmission measured at Finland's borders and electricity transmission according to market results, in real time.

**Security of supply:** Security of supply refers to how reliable the electricity supply is.

**Lost time injury frequency (LTIF):** Number of occupational accidents that led to at least one day of inability to work per million completed work hours.

**Network codes:** The goals of the EU's third energy package adopted in July 2009 for an internal electricity market in the European Union. The main players preparing the network codes are the European Commission, energy regulators through their cooperation agency ACER, and European transmission system operators through their cooperation organisation ENTSO-E.

**Day-ahead market:** The day-ahead market refers to an electricity marketplace where electricity is sold and purchased for different hours of the following day.

**Smart grid:** The smart grid, i.e. intelligent electricity system, is an electricity network that makes broad use of digitalisation and which is connected to electricity generation and consumption, and in future, increasingly to grid energy storages. Smart grids provide customers with more possibilities to actively participate in the electricity market.

## Fingrid's stock exchange releases

[FINGRID.FI/EN/PAGES/NEWS](https://www.fingrid.fi/en/pages/news)



## Fingrid delivers. Responsibly.

For more detailed information on Fingrid and the contact persons for various functions, see the company's website at [www.fingrid.fi](http://www.fingrid.fi)

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