

How to connect
to the main grid

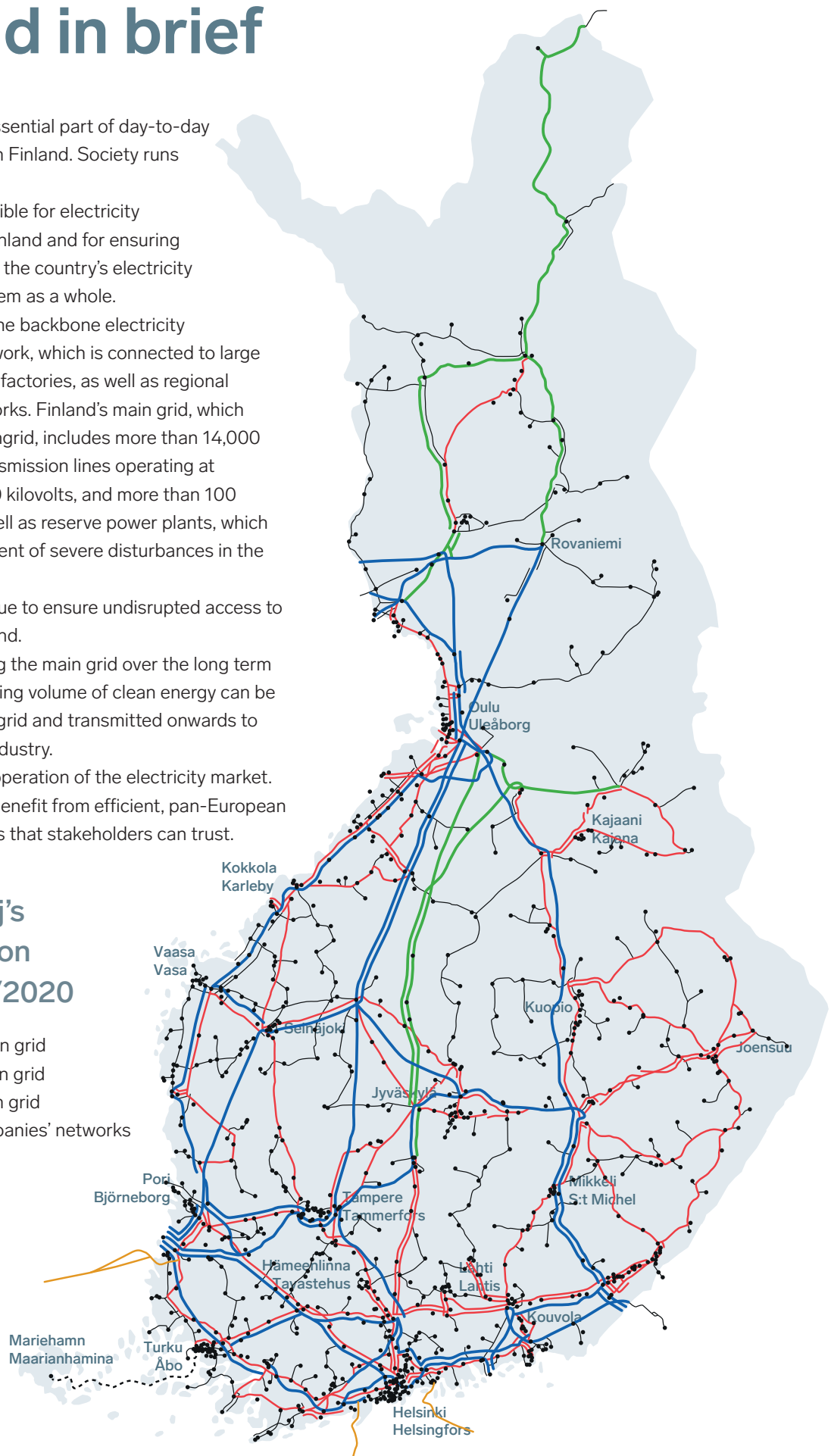
FINGRID

Fingrid in brief

- Electricity is an essential part of day-to-day life for everyone in Finland. Society runs on electricity.
- Fingrid is responsible for electricity transmission in Finland and for ensuring the functioning of the country's electricity transmission system as a whole.
- The main grid is the backbone electricity transmission network, which is connected to large power plants and factories, as well as regional distribution networks. Finland's main grid, which is managed by Fingrid, includes more than 14,000 kilometres of transmission lines operating at 400, 220, and 110 kilovolts, and more than 100 substations, as well as reserve power plants, which are used in the event of severe disturbances in the power system.
- Fingrid will continue to ensure uninterrupted access to electricity in Finland.
- We are developing the main grid over the long term so that an increasing volume of clean energy can be fed into the main grid and transmitted onwards to consumers and industry.
- We promote the operation of the electricity market. Consumers also benefit from efficient, pan-European electricity markets that stakeholders can trust.

Fingrid Oyj's transmission network 1/2020

- 400 kV main grid
- 220 kV main grid
- 110 kV main grid
- Other companies' networks



For the benefit of customers and society

Main grid connections are planned in close cooperation with our customers.

The process of preparing for a main grid connection begins with a connection enquiry, which the customer sends to Fingrid's map service. When connection enquiries are received by the map service, they are taken into consideration when the network is planned, and customers are always responded by email as soon possible.

Before the planning is begun, the technical constraints for the connection and the solutions for implementation are checked, and we agree with the customer on these matters. We also review the steps that need to be taken during the planning and construction of the connection and the connected installation together. Customers can connect either to a substation or to the transmission line.

A connection agreement is made for main grid connections, specifying the rights, responsibilities, and obligations of the contracting parties, as well as the limits of ownership. By signing a connection agreement, the parties can ensure connectivity and the capacity of the main grid.

Connectivity may be restricted, depending on the location and the size of the projects. The connectable power capacity also depends on the placement of other projects in the area. If the project calls for the construction of new lines, transformers, or circuit breakers, it may take several years to build them.

Fingrid's technical terms and requirements, which are a part of the connection agreement, specify the technical requirements for the electrical installations connected to the power system.

The technical connection terms and requirements ensure the technical compatibility of the connected networks and installations and set out the rights, responsibilities, and obligations concerning connection.

Further information is available on Fingrid's website at www.fingrid.fi/en/grid/grid-connection-agreement-phases



The connection solution is agreed together with the customer at the beginning of the project

The connection solution and location are selected by examining various connection options. We also determine the terms for implementing the customer's grid connection. The terms cover system security, transmission capacity, electrical safety, environmental factors, and overall costs. The new connection is constructed in such a way that it does not degrade the reliability of the main grid or other customers' connections.

The customer is responsible for planning their own network and subsequently for the construction, operation, and maintenance of the connection. Fingrid is responsible for all necessary alterations and constructions on the main grid.

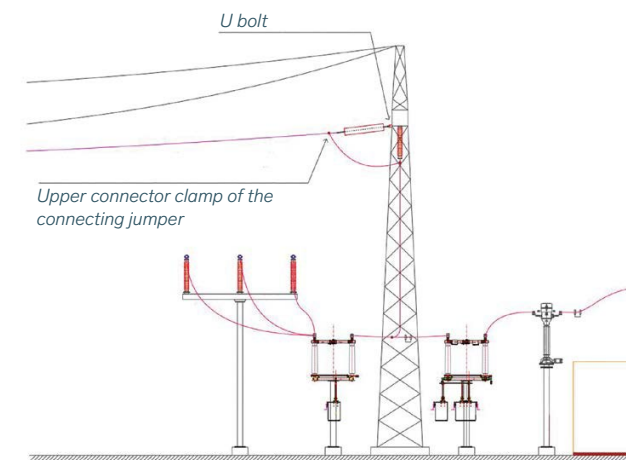


By careful preparation we ensure that the connection is technically feasible before any actual planning and land acquisition is done.

By careful preparation we ensure that the connection is technically feasible before any actual planning and land acquisition is done. When preparing the timetable for the customer's project, the changes to the main grid caused by the new grid connections are taken into consideration.

Switchyard connection

A switchyard connection is a connection to 400-, 220-, or 110-kilovolt main grid switchyard. All connections that are planned close to switchyard are connected directly to the main grid switchyard. The customer is responsible for planning and constructing the electrical installations and transmission lines that will remain in its ownership. For technical reasons, connections with a power larger than 250 MW must be connected to 400-kilovolt switchyard. Connections with a power of less than 250 MW can be connected to 110- or 220-kilovolt switchyard. The planning, competitive tendering, and construction of new circuit breaker fields is scheduled to take 24 months.



Switchyard connection

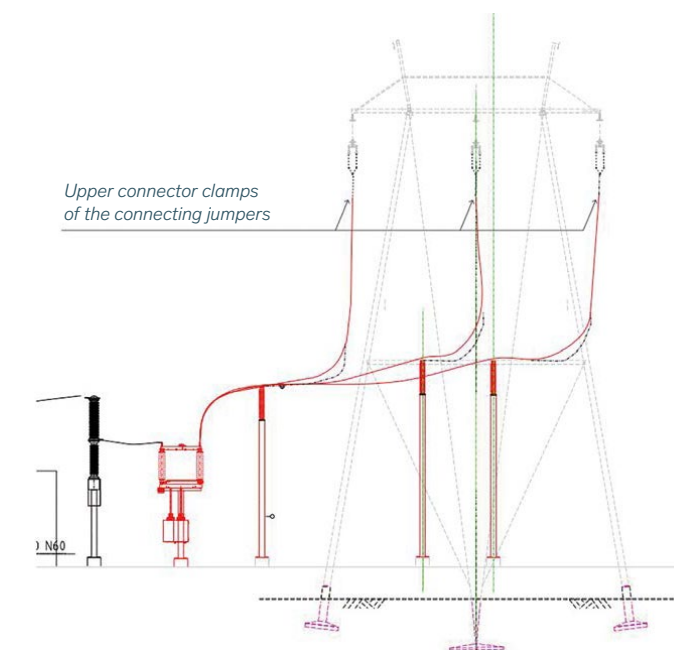
The ownership and administrative limits are the U-bolts on the terminal tower and the upper connector clamps of the connecting jumpers.

Transmission line connection

The main grid transmission lines in Finland are long, and switchyards are far apart due to the geographic transmission distances. On a case-by-case basis, connections to the 110-kilovolt transmission line are allowed, taking into consideration the available transmission capacity on the line and the other technical terms. The transmission line connection is planned together with Fingrid, taking into account the transmission capacity and the system security requirements in the area. The customer is responsible for planning and constructing the electrical installations and transmission lines that will remain in its ownership. For system security reasons, connections are not permitted to the 400- and 220-kilovolt transmission lines.

A transmission line connection means connecting a branch line or a substation connection with a switching device solution to a 110-kilovolt main grid transmission line. The largest permitted nominal size for a transformer connected to a transmission line connection is 40 MVA and the smallest short circuit resistance is 48,0 ohms.. If mechanical ventilation is added to the transformer, the maximum permitted transformer loading is 30 MW. A maximum of 65 MVA transforming capacity can be connected to a single connection point provided that this is permitted by the transmission capacity. Within the separately specified requirements, a single 63/31,5/31,5 MVA three winding transformer may also be used.

Small synchronous generators of less than 5 MW or converter connected power plants of up to 60 MW can be connected to a transmission line connection, and the short-circuit current fed into the main grid can be no more than 1.2 times the power plant's nominal current. The connection must be equipped with disconnectors implemented on the technical basis defined for each case individually.



110 kV transmission line connection

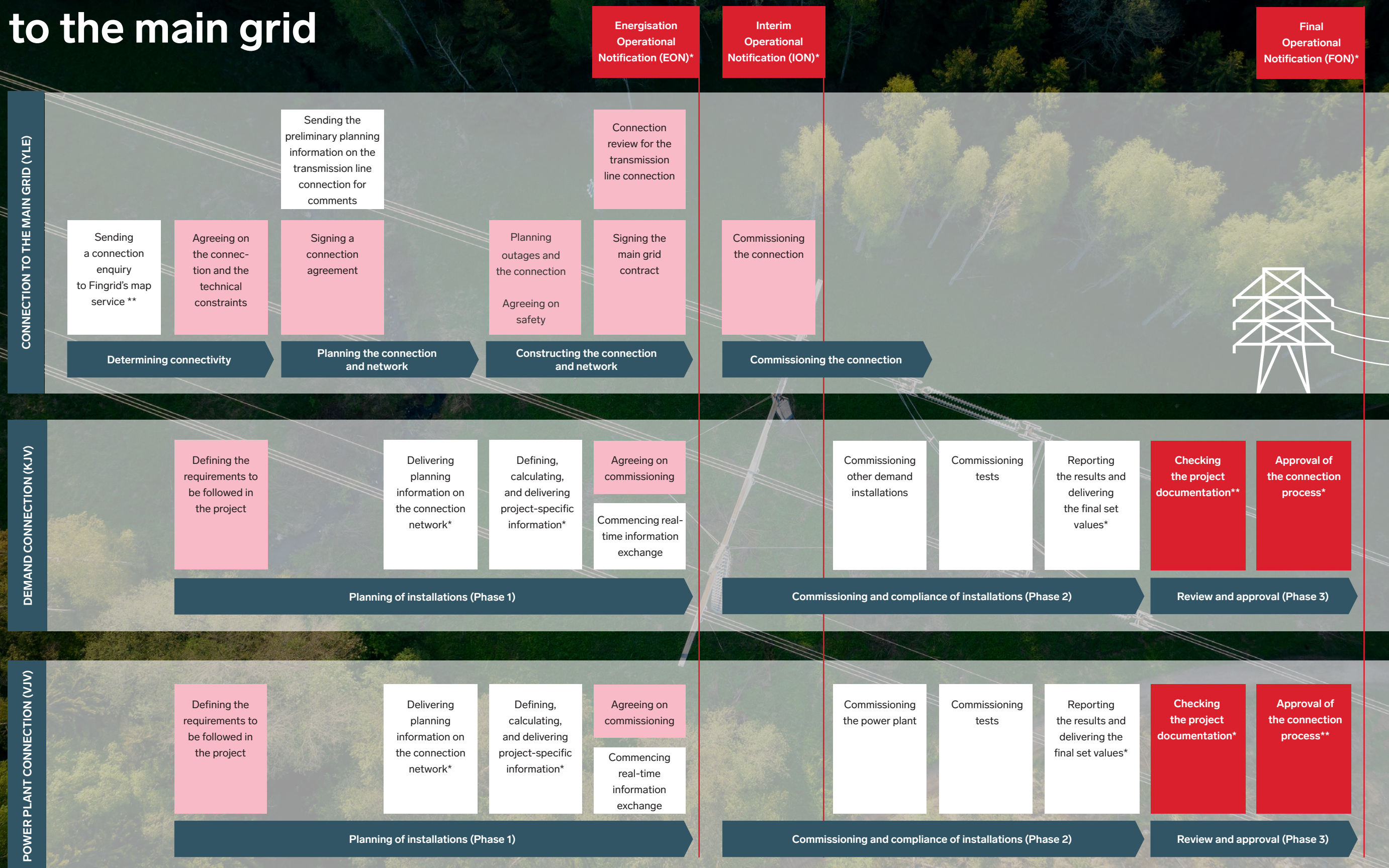
The connection point and the limit of ownership are the upper connector clamps in the customer's connecting jumpers in the main grid line.



On a case-by-case basis, it may also be permitted to connect to a 110-kilovolt transmission line.

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Customer Fingrid Joint



* Information exchanged in My Fingrid service

** <https://fingrid.navici.com>



Agreements

Connection agreement

Main grid connections are agreed upon by making a connection agreement. The prerequisites for the agreement are that the land-use plan (or decision on the need for planning) required by the project is legally valid, the connection solution corresponds to the technical terms, and any expropriation permit applications that may be required for the connecting line have been submitted to the authorities. For power plant connections, a further prerequisite for the agreement is that the land-use plan (or decision on the need for planning) for the power plant is legally valid, along with the building permits.

The connection agreement takes effect when the parties have signed it and the customer has paid the connection fee specified in the agreement.

The customer's high-voltage line shall be completed within 36 months of signing the connection agreement. Fingrid shall be entitled to terminate the agreement and release the network capacity for other customers if the connection is not commissioned as agreed.

The connection agreement shall be valid indefinitely, with a three-year termination period and a minimum term of 15 years from the date of signature.

Project agreement only if needed

A project agreement is made before a connection agreement when Fingrid builds a new substation in the main grid for the purposes of a single customer alone. The customer is responsible for the construction costs of the switchyard in full.

Statement

If necessary, we will issue a technical statement to the customer on the potential connection solution and the free transmission capacity on the statement date. A statement may be given if the environmental impact assessments required by the authorities have been completed, the land-use process has been started or a decision concerning the planning solution has been made.

Main grid contract

Electricity transmission is agreed upon by means of a main grid contract before the main grid connection is commissioned and energised. The contract requires the technical terms for the main grid connection to be fulfilled and the customer to have a valid connection agreement and an open electricity supplier agreement. The grid service fees, and price components are published on our website.



The customer's high-voltage line shall be completed within 36 months of signing the connection agreement.

Technical terms and requirements

The main grid connection must fulfill Fingrid's General Connection Terms (YLE). In addition, the type of installation connected determines which other connection terms and requirements must be followed. Requirements are set separately for demand connections (KJV), power plant connections (VJV), and grid energy storage connections (SJV).

General connection terms

Compliance with Fingrid's connection terms ensures that the connected networks are technically compatible with the grid and specify the rights, responsibilities, and obligations associated with the connection. The customer is obliged to collaborate directly and indirectly with their own customers connected to their network to ensure that these parties' networks and associated electrical installations fulfill Fingrid's general connection terms, and other guidelines and requirements governing the implementation of a connection.

Specifications for the Operational Performance of Power Generating Facilities, Demand Connections and Energy Storage Systems

The customer must notify Fingrid at the earliest possible stage of the type of technology that is planned for the connected power plant, grid energy storage, or demand unit. The customer must verify the fulfillment of the technical requirements during the connection project. Special care must be taken during the planning phase with respect to installations that have not previously been connected to the power system of Finland.

The technical system requirements ensure that:

- the installation can endure the voltage and frequency fluctuations that occur in the power system
- the installation supports the functioning of the power system in the event of disturbances and functions reliably during and after disturbances
- the installation does not harm other installations connected to the power system when it is operational
- Fingrid and the network operator at the connection point have access to the necessary information about the installation.

The connecting party is responsible for fulfilling the requirements and verifying fulfillment, and this must be taken into consideration when making agreements with service providers. Planning and information exchange between the service provider, the connecting party, and the transmission system operator, and potentially also with the distribution system operator, must begin in good time.



Special care must be taken during the planning phase with respect to installations that have not previously been connected to the power system of Finland.

Information exchange concerning the technical terms and monitoring of verification take place in the [My Fingrid](#) service. You can obtain a user account for My Fingrid from your company's admin user or, in the case of new customer relationships, from Fingrid's specialists.

Notes

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FINGRID

Delivers. Responsibly.

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