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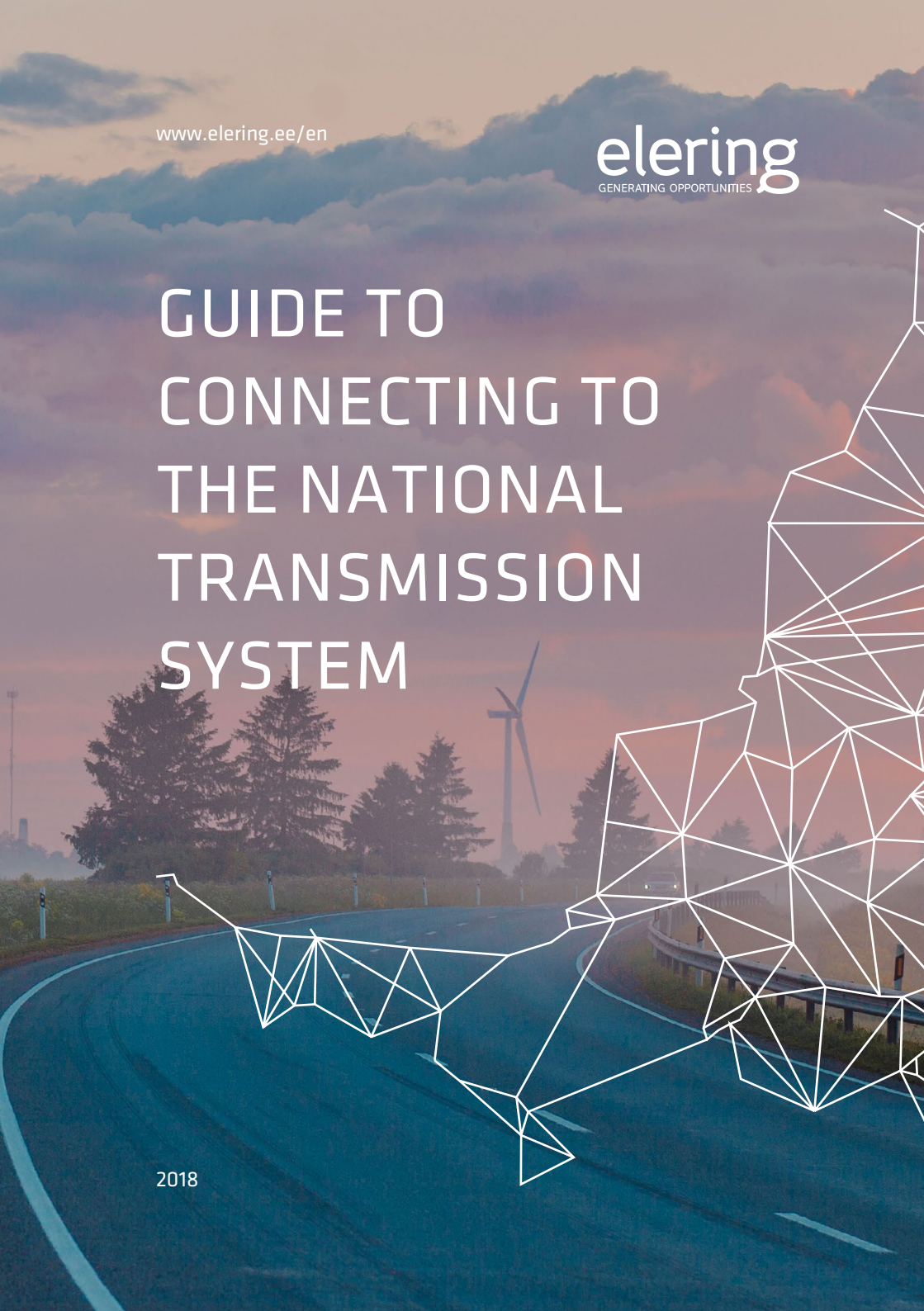
GENERATING OPPORTUNITIES

GUIDE TO CONNECTING TO THE NATIONAL TRANSMISSION SYSTEM



2018

Foreword

The transmission system operated by Elering makes up the backbone of the Estonian power system, and connects distribution grids and major producers and consumers into one whole.

In recent years, Elering has been devoting increasing attention to connecting new production units to the transmission system. We have reformed the process of joining the transmission system, increased the number of employees dealing with customers seeking grid access and increased the effectiveness of cooperation with distribution grids. To make the process of connecting the system more convenient and transparent for developers of generation equipment, Elering has developed an online grid access environment at www.egle.ee.

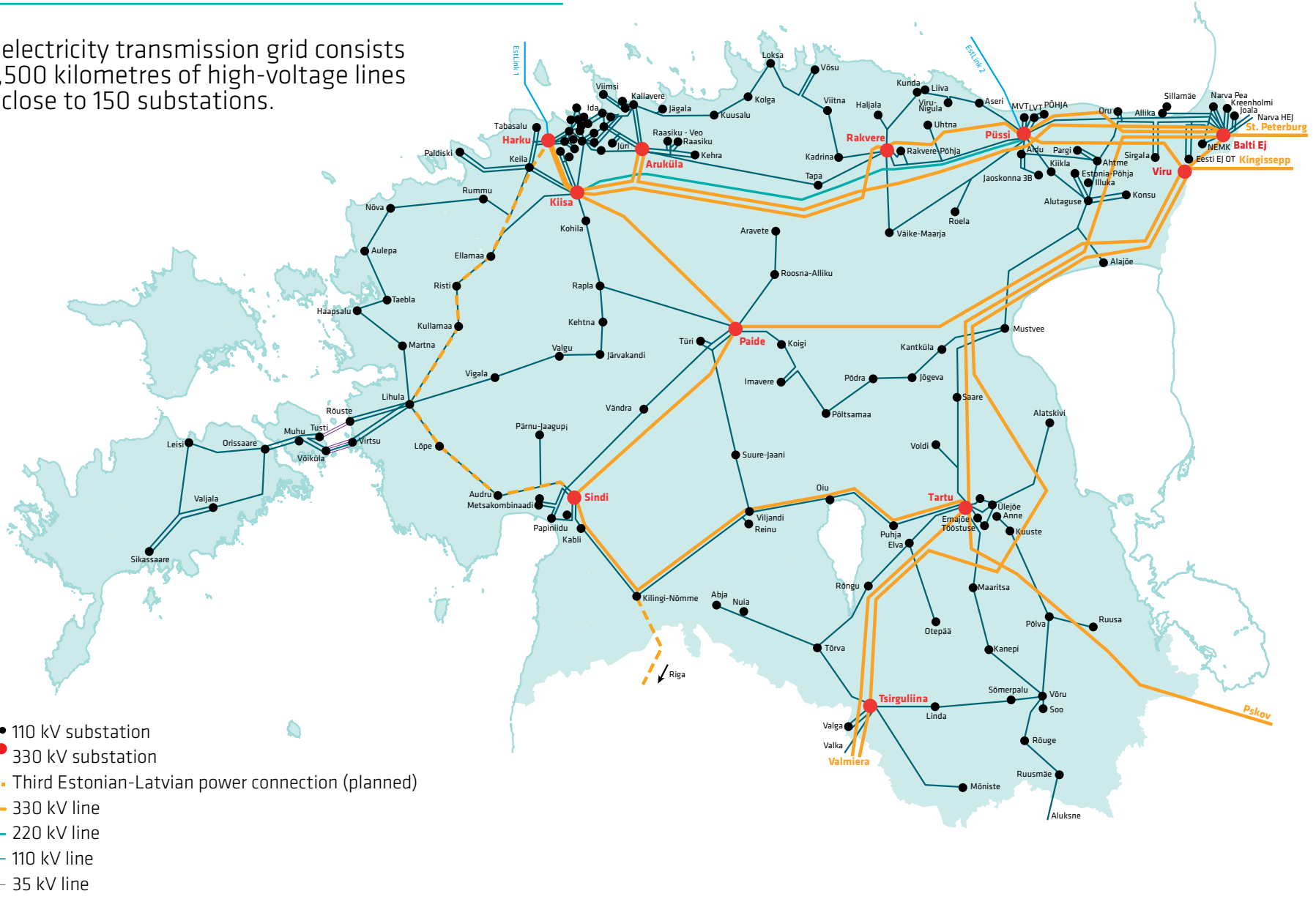
This guide is intended for electricity producers looking to join the Estonian national transmission system, and provides a summarized overview of the connection process. Activities related to connecting to the system are described stage by stage, in chronological order.

Production units can be connected to the Elering-operated national transmission system at voltages of 110 kV and 330 kV. Wind and solar power stations with a capacity of 10 megawatts and up are required to join the transmission system.

As connecting production units to the system is a complicated and long-term process, prospective customers are advised to consider all of their actions carefully and discuss the most important stages with Elering well ahead of time.

The Estonian power transmission grid

The electricity transmission grid consists of 5,500 kilometres of high-voltage lines and close to 150 substations.



- 110 kV substation
- 330 kV substation
- Third Estonian-Latvian power connection (planned)
- 330 kV line
- 220 kV line
- 110 kV line
- 35 kV line

First steps – preliminary application and estimate of the connection fee

Preliminary application – why are they necessary?

The key to smooth construction of production unit is thorough planning of activities.

If you're looking to connect your production unit to the Estonian electricity system, we'll start by determining the possibilities for connecting the unit to the grid and the necessary monetary expenditures and time.

Expansion of the power grid can prove very costly, which makes it important to find a place or solution that does away with the need to rebuild the electricity network or keeps the conversions to a minimum.

In cooperation with the customer seeking grid access, Elering will determine the possibilities of where and how the customer's production units can be connected to the power transmission system. To do so, Elering issues technical conditions for prospective customers – basically, an estimate of the necessary volume of renovations, connection fee and potential time for completing the connection.

The technical conditions often serve as the basis for initiating planning documents and applying for the necessary permits from local governments..

How to obtain the technical conditions and the preliminary estimate?

To obtain the technical conditions, an application must be submitted in the online environment for grid connection, egle.ee. When applying for technical conditions, we recommend that the following details be specified in the application:

1. What type of production unit will be built (solar, wind, co-generation or other type of power station)?
2. What is the nominal active power rating of the planned production unit?

3. Where is the production unit planned to be constructed?
4. What is the nominal active power rating of the planned production unit?

To apply for technical conditions, it is not necessary to submit all of the aforementioned data, but a more detailed set of starting data will make it possible for Elering to give a more precise answer.

Elering will issue the technical conditions within a maximum 90 days of receiving the application, yet generally tries to respond in a much a shorter time.

Elering will contact you if there are any questions or a need for additional information. The technical conditions are not binding, as they are based on the best of the knowledge at a given time. Of course, should circumstances change, Elering has the right to also change the technical conditions.

Entering into a grid connection agreement

Grid connection contract

The grid connection contract is the guarantee that the producer will have a network connection. It constitutes an agreement on what kind of production unit is to be connected to the network, and under what conditions.

Before applying for technical conditions and submitting an grid connection application, you should meet with Elering employees to further specify your plans in connection with the grid and details of the application.

The conclusion of the contract consists of the following stages:

- customer submits a grid connection application
- Elering prepares an offer for grid connection
- the grid connection contract is concluded and the invoice for the first instalment is paid

Submission of the application for grid connection

To submit the grid connection application, the producer must have selected the type of production unit, and the environmental impact assessment and detailed plan must also be ready.

The grid connection application and the necessary annexes can be submitted in the online environment for grid connection, www.egle.ee.

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Elering will officially make an offer to the customer within 90 days. After receiving the offer, the producer seeking grid access has 60 days to sign the contract.

The offer will include the following:

- the schematic diagram of the location of the connection point and the metering point
- the forecasted amount of the connection fee, the conditions for paying it, and the calculation of the fee
- conditions for connection to the network or consumption or generation conditions, including the term

- conditions for amendment and termination of the grid connection agreement
- other conditions of the grid connection contract

In the course of drafting the grid access contract, Elering performs grid calculations so that besides the physical connection, it can also examine the operation of the generation equipment and its impact in the specific area of the grid. The analyses will show whether any work must be undertaken on the power grid in preparation.

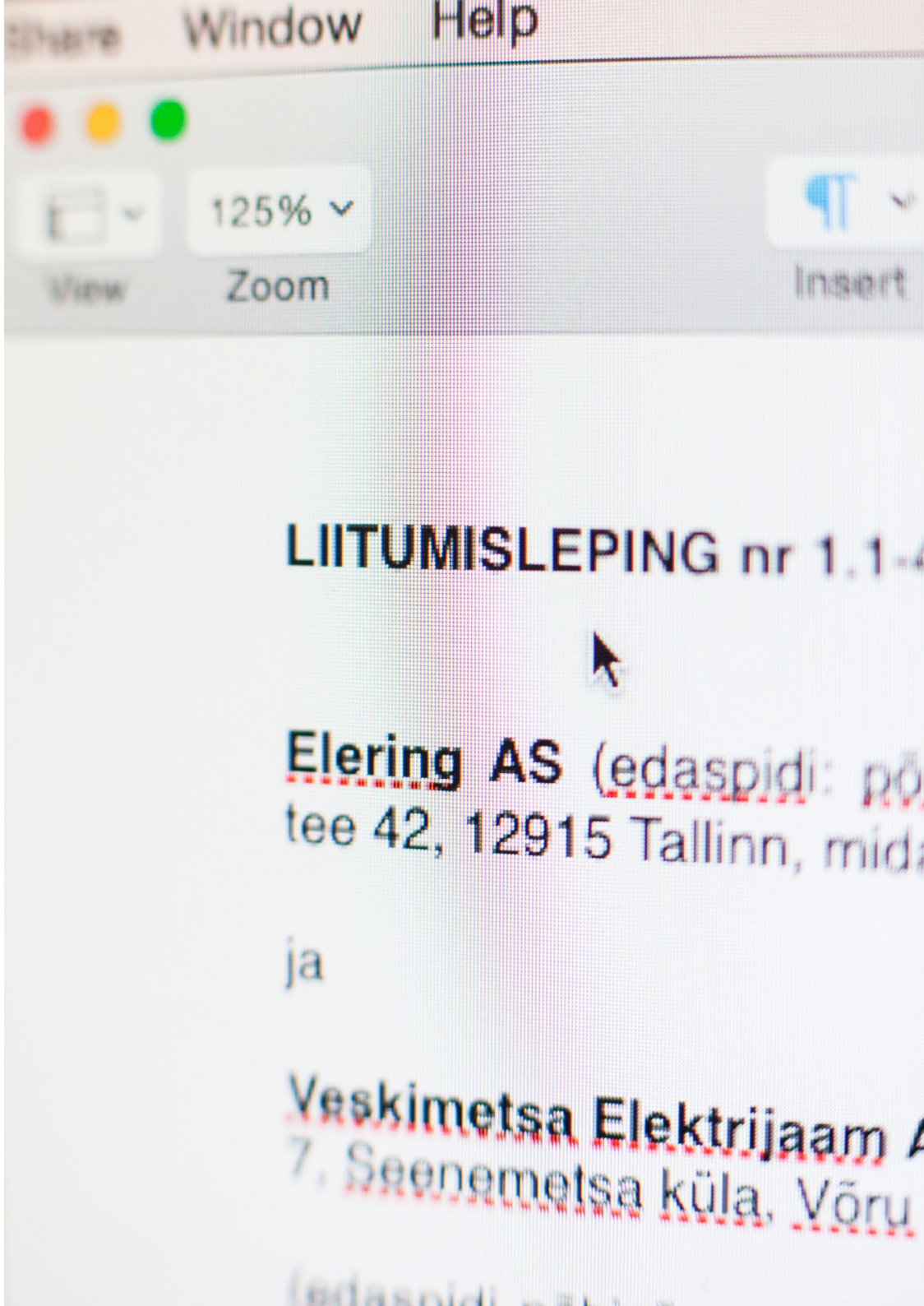
Connection fees and processing

When submitting a grid access application, procedural costs must be paid. The amounts of the processing and procedural fees are listed in Elering's conditions for joining the grid, which can be found on the website at https://elering.ee/en/conditions-connecting-grid.

The connection fee is expense-based and includes expenses on preparing the connection point, any expenses on reinforcing the grid and processing and procedural expenses.

Connecting to the grid does not always mean only the construction of a connection point. Depending on the location of the substation, it may prove necessary to reinforce the power grid to allow it to transmit all of the output from the generation system. Reinforcement of the grid consists of renovation of existing lines or the building of additional connections between substations. A producer joining the system may result in the cost of grid reinforcement work being added to the grid access fee.

As per the grid code, the connection fee shall be paid in three instalments. The first instalment must be paid by the customer within 60 days of entering into the grid access contract. The second instalment must be paid within 20 days of the announcement of the connection point construction contract and the third instalment must be paid within 45 days of completion of the connection point.



Construction of network connection and production unit

After the first instalment is received, Elering shall begin constructing the network connection and other necessary grid reinforcement works connected to the specific connection. The new customer meanwhile starts engineering and building its production unit and connections up to the connection point.

Construction of network connection

The preparations for construction of network connection consists of the following stages:

- preparing and carrying out the construction procurement
- network connection construction work
- electrifying the connection point – before this occurs, the new customer has to complete the activities specified in the connection contract

The time necessary for establishing the network connection depends largely on the volume of the project and the construction works to be performed, but this usually takes approximately 30 months not including grid reinforcement works.

To carry out the construction procurement, Elering shall draft procurement documents that the new customer has the right to comment on. These documents describe the technical solution for connecting the production unit and the volume of the works to be performed.

The calculation of the cost of the network connection specified in the grid connection contract will be adjusted once the procurement results are in. Before commencing construction works, Elering shall coordinate the updated cost of the connection with the customer. If the procurement results are not as expected, the customer has the right to withdraw from the grid connection contract without bearing significant expenses.

Submission of technical project for production unit

To ensure the smooth connection of the production unit and rule out a later need to rebuild the equipment, the customer must submit a technical

project for the production unit already before the installation of the production unit. The technical project gives an overview of the equipment to be used and the cooperation between them. Elering assesses how the production unit described in the technical projects conforms to the requirements.

The technical project must be submitted six months before the planned energizing of the new customer's electrical equipment. Among the most important parts of the technical project are the full models of the production unit, which require great attention from the customer. In addition, a cooperation simulation report based on computerized model must be submitted. It is important to consider that modelling and reporting can sometimes take months. A delay in the completion of the technical project may postpone the launch of the entire production unit.

It is important that the technical project be sent to Elering at as early a stage as possible in the production unit planning process. To agree on the volume of models and reports, contact Elering immediately after entering into the connection agreement.

The guide for preparing a technical project is listed in annex no. 5 of the conditions for joining the transmission grid and can be found here: https://elering.ee/en/conditions-connecting-grid.

Energizing and/or synchronizing the production unit is possible if the following conditions have been met:

- the technical project has been approved
- the testing schedule for the production unit has been agreed
- a temporary agreement on use of the network connection has been concluded
- Elering has performed an inspection of the electrical installation
- the certificate of conformity required by law has been issued for the electrical installation
- there is a functional and tested solution for communicating with the control centre
- depending on the type of production unit, the production unit has been tested on idle

Notify Elering as early as possible of the desired energizing and/or synchronization date as the preparations can take up to one month.

Testing the production unit and declaring it in conformity

The objective of testing the production unit is to verify that it is conformant to the requirements specified in the grid code and the grid access contract.

After the successful completion of the testing period, Elering shall issue a certificate of conformity, after which it will be possible to apply for the support set forth in the Electricity Market Act.

The testing is conducted by the customer in cooperation with Elering pursuant to the agreed plan. The testing period depends on the type of the production unit and its specifics and it may last up to 12 months.

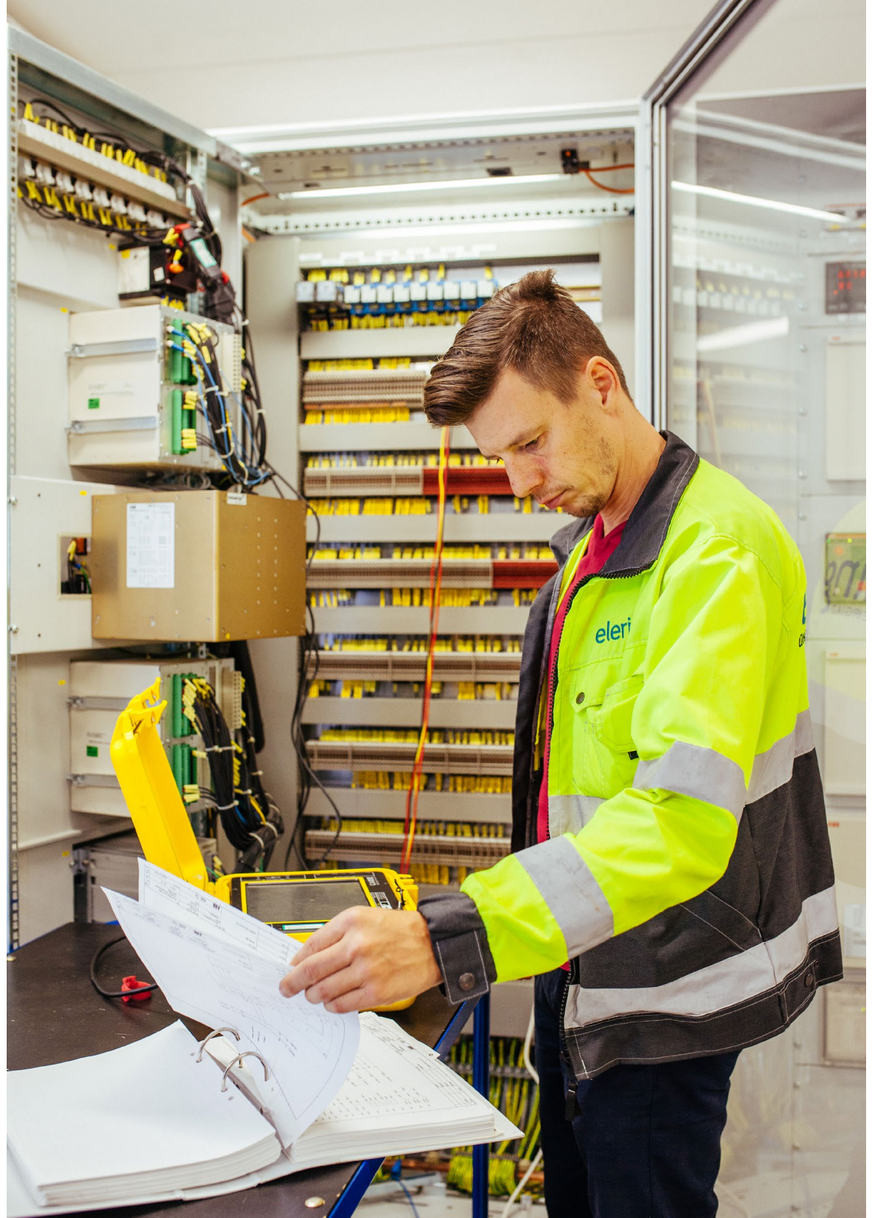
Elering evaluates the conformity of the production unit to the grid code requirements at the connection point where the customer is installing the metering device for the testing period. On the basis of the testing results, the customer prepares a report, on the basis of which Elering will assess the conformity of the production unit to the requirements.

During the testing period, the quality of electricity is inspected, the functionality of the production unit is tested. As the final step, the capability to ride through a voltage drop-off is tested. This test is conducted by Elering, which involves an independent expert in assessing the test results.

If the producer is connecting its production unit to the grid by stages, the testing of the production unit will likewise take place by stages. After connecting each stage, the conformity of the production unit as a whole shall be checked.

After the testing period has been successfully completed and the certificate of conformity has been issued, the inspection of the production unit model and verification of model start. This means the model is brought into conformity with the results of the testing and the model is configured so that the testing results would be as similar as possible to it. Verified models are used by Elering to study the functioning of the transmission system in various grid modes.

If the production unit has received the certificate of conformity to the grid code, the models are verified and other obligations assumed under the grid access contract have been discharged, the process of joining the transmission system can be considered finalized.



Going from the idea of establishing production unit to receiving a renewable energy subsidy can take an average of five years.

Customer submits free application for obtaining technical conditions

Elering will issue conditions within a maximum of 90 days.

Customer submits grid connection application and pays the connection fee

Elering will officially table its offer within 90 days.

Entering into a connection agreement

The connection agreement must be signed within 60 calendar days after the offer was made

The first instalment must be paid by the new installation within 60 days of entering into the grid connection contract.

Elering will build the connection point within 30 months of payment of the first instalment

EXCHANGE OF INFORMATION

Consultation between customer and Elering and development of the design of the electrical installation

Elering will prepare the construction procurement documentation, with the customer given an opportunity to comment on it

EXCHANGE OF INFORMATION

Submission of customer's technical project

The technical project must be submitted at least six months before the energizing, but advisably as soon as possible after conclusion of the grid connection contract

Elering will announce the procurement within 6 months of the payment of the first instalment

The second instalment must be paid by the customer within 20 days of the awarding of the contract.

EXCHANGE OF INFORMATION

Construction of the customer's installation

Construction of the connection point by the winning tenderer

The third instalment must be paid by the customer within 45 days of the completion of the connection point.

Energizing the connection point and/or synchronizing the production unit, providing that preconditions are fulfilled.

TESTING PERIOD

Customer carries out testing in cooperation with Elering's energy system control centre. The testing period may last up to 12 months.

Elering carries out a fault ride through (FRT) test on the production unit within 30 days

Issuing of a certificate of conformity

The certificate shall generally be issued within 2 weeks of the FRT fault ride through test

Possible to apply for renewable energy or efficient co-generation subsidy pursuant to Electricity Market Act

The last stage in the process – all obligations assumed under the grid connection contract are discharged and a permanent agreement on grid access is concluded

Technical requirements and rules for electricity producers

Grid access is governed by the Electricity Market Act and the grid code established by government regulation.

The Electricity Market Act can be found here: https://www.riigiteataja.ee/akt/123032015099?leiaKehtiv.

The grid code can be found here: https://www.riigiteataja.ee/akt/603256?leiaKehtiv.

In addition to the Electricity Market Act and the grid code, connection to the grid is governed by the Elering conditions for connecting the national transmission system and the annexes thereto, which can be found on Elering's website: https://elering.ee/en/conditions-connecting-grid.

The electronic environment for grid connection is at www.egle.ee.

The following principles govern joining Elering's power grid:

- new network connections can be established only at a voltage of 110 or 330 kV
- wind and solar power stations with a capacity of 10 megawatts and up are required to join the national transmission system.
- the connection is generally established at an existing Elering substation
- the customer must build its own installation up to the connection point, meaning that the customer builds the installation from the generator up to the connection point located at the Elering substation
- the equipment built in exchange for the connection fee will henceforth remain the property of Elering
- the customer must provide and install fuses to protect its equipment
- PSS/E and PSCAD models must be submitted to Elering concerning the production unit
- the testing of the production unit is conducted by the customer, except for the FRT test
- the customer is required to pay a processing and procedural fee

Terms and definitions

Distribution grid - the part of the grid that is not the transmission grid and is intended for distributing power. It is used to transfer electricity from a transmission grid substation to end consumers. The distribution grid also provides access to smaller producers.

Testing report – a report prepared on the basis of the results of physical testing conducted, and used by Elering to assess the conformity of the production unit to the requirements in the grid code and grid connection contract

Customer – the owner of the production unit who wishes to connect their production unit to the power grid

Connection fee – expense-based fee paid in exchange for receiving a connection to the grid. The connection fee includes all of the expenses on establishing the connection, including developing the connection point, any expenses on reinforcing the grid and processing and procedural expenses.

Model verification – supplementing the PSS/E and PSCAD computing models on the basis of the testing results conducted to ensure that the test results are as similar as possible

FRT test – a test conducted by Elering to verify that the equipment meets the requirement, set forth in the grid code, of being able to ride through a voltage drop

PSCAD model – models created using the PSCAD software are used to study the electromagnetic transfer processes related to the functioning of the electrical installation and power grid. The most important areas of study are the quality of electricity, overvoltage, coordination of insulation, transformer saturation, the mutual influences of the control systems of different equipment (including generators, direct current connections, electric wind turbines), subsynchronous oscillations and processes related to relay protection and computerized equipment.

PSS/E model – Models created using PSS/E software are used to analyse how the electrical installation being connected will influence the power flows and reactive power levels at different points of the power grid and evaluate conformity to the technical requirements set forth in the grid code and other documents

Technical project– data set concerning the equipment to be installed in the generation system, functionalities, linkages, cooperation etc. used by the network operator to assess the interoperability of the production unit with the power system

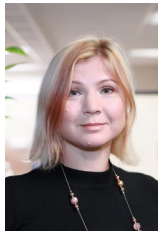
Technical conditions and preliminary calculation – conditions issued by Elering to customers (distribution grid undertaking) in which Elering estimates the connection fee and the time expenditure on completion of the connection point

Production unit – Under clauses 3 25) and 9) of the Electricity Market Act, this is an operational assembly of equipment, conductors and accessories necessary for generating, transmitting, transforming, metering, selling or consuming electricity

Network operator – company whose power grid the generation equipment is to be connected to

Connection contract – contract between customer and network operator, on the basis of which the network service is provided and payment for the service takes place. The connection contract establishes the limits of ownership of the customer's and Elering's equipment and liability.

Network connection - electrical connection between the grid and another electrical installation.



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