Information class
K1

SVENSKA KRAFTNÄT

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Principles and Guidelines for Connecting to the National Grids

Information class
K1

Svenska kraftnät

Svenska kraftnät is a state-owned transmission system operator, with the task of managing, operating and developing a cost-effective, operationally safe and environmentally sound transmission system. The transmission system includes 400 kV and 220 kV power lines with substations and interconnectors. Svenska kraftnät develops the transmission grid and the electricity market to meet society's need for a reliable, sustainable and cost-effective supply of electricity. Svenska kraftnät therefore plays an important role in climate transition.

Disclaimer

This document is a translation of the Swedish guidance “Principer och vägledning för anslutning till stamnätet”. In the event of any ambiguity, discrepancy, or conflict between this English version and the original Swedish text, the Swedish version shall prevail and be considered the authoritative source.

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Definitions

Plant	Plant refers to production plants, consumption plants and transmission plants.
Connecting Party	The party connecting the Plant to the National Grid.
Connection Point	The physical point at which the Connecting Party's Plant connects to the National Grid, which also constitutes the ownership boundary between the National Grid and the Connecting Party's Plant.
Distribution System	Transmission of electricity through high-, medium-, and low-voltage grids for supply to customers.
Energisation Operational Notification (EON)	Notification from Svenska kraftnät that gives the Connecting Party permission to use the grid connection to energise the Plant's internal grid and associated auxiliary equipment.
Energy Analysis	An analysis of the Plant's energy requirements over time and its power requirements over one hour.
Maturity Level	A measure which indicates the progress of the Applicant's or Connecting Party's connection case, based on the scheduled milestones.
Used Power	The portion of the Allocated Capacity that is actively utilized via production and/or consumption subscriptions, as defined by the usage agreement.
Unused Capacity	The difference between the Allocated Capacity in the connection agreement and the subscription in the usage agreement.
Reserved Capacity	Reserved capacity is the capacity allocated to the Applicant upon signing the pre-design agreement.
Reserved Allocation	Reserved Allocation is the position the Applicant is allocated in Svenska kraftnät's connection queue after a fully assessed application.

National Grid	The national transmission grid owned by the Swedish state and managed by Svenska kraftnät, including national grid facilities, and international connections managed by Svenska kraftnät.
Applicant	The party applying to connect to the National Grid or to increase their existing maximum subscription until the pre-design agreement is signed.
Technical Terms and Conditions	Svenska kraftnät's technical contractual terms and conditions for connecting to the National Grid.
Technical Guidelines	Guidelines that define the technical requirements, safety requirements and operational requirements that Svenska kraftnät has on components in the National Grid or Plants that are connected to the National Grid.
Allocated Capacity	The capacity ultimately allocated to the Connecting Party in the connection agreement in accordance with the terms of the Agreement.
Interim Operational Notification (ION)	Notification from Svenska kraftnät that gives the Connecting Party time-limited permission to use the grid connection for the operation of the Plant, normally to give the Connecting Party the opportunity to continue with conformity testing and model validation with the Plant in operation.
Available Capacity	Capacity that is unused in the National Grid and is available to operators who want to connect.
Transmission Grid	A technically and operationally coherent transmission system with a voltage of minimum 220 kV,that extends over several regions in Sweden and links the national transmission system with electricity grids in other countries.
Final Operational Notification (FON)	Notification from Svenska kraftnät that gives the Connecting Party permission to use the grid connection for continued operation of the Plant.

1 Introduction

This document, Svenska kraftnät's *Principles and Guidelines for Connecting to the National Grid*, provides an overview of the central principles and technical requirements for connecting to the National Grid. It also outlines the various stages of the connection process and the Maturity Level requirements imposed on the Applicant or Connecting Party. The information in this guide is intended to support the application for connection and should therefore be reviewed prior to submission.

1.1 Target group

This guidance is primarily intended for operators planning to connect a Plant to the Swedish National Grid. In most cases, these operators are owners of a distribution system, to which electricity producers, consumers, and other Distribution systems are connected.

Projects intending to connect to the electricity grid via a Distribution System are by the connection process for the Distribution System where the project's expected Connection Point is located.

Although there is an ambition to harmonise the connection processes, they currently differ between various Distribution Systems. One step toward harmonisation is "Branschpraxis Maturitet"[1] [Maturity Industry Practice], developed by Swedenergy in collaboration with representatives from electricity grid companies operating in regional and local grids. This practice is intended for Distribution Systems and connecting customers within the underlying electricity grid (not for connection to the National Grid).

For project owners who are uncertain about which Distribution System is responsible for the connection in a particular geographical area, relevant information is available via Svenska kraftnät's and Lantmäteriet's maps of Swedish local grid and electricity areas[2].

Consultants and project managers working with connection issues, as well as decision-makers in the energy sector and in authorities, can also benefit from this guidance, primarily as reference material.

[1] https://www.energiforetagen.se/49ec63/globalassets/dokument/elnat/branschpraxis-mognadsgrad-2024-06-27.pdf
[2] https://www.natomraden.se/

1.2 Purpose

The purpose of these guidelines is to describe in a structured and clear manner the central principles, technical requirements and process-related expectations for connecting to the National Grid. By clarifying the framework and procedures, Svenska kraftnät aims to facilitate planning and dialogue on connection matters and contribute to increased transparency and predictability in the energy transition.

These guidelines focus on handling applications for standard connections and does not claim to be comprehensive or cover all types of connections or measures. Exceptions to the key principles are not addressed in this document.

1.3 Structure

The guide is divided into three main parts:

Part 1 - Principles and Requirements for Connecting to the National Grid

Part 2 - Maturity Level Requirements for Connecting to the National Grid

Part 3 - Process and Procedure for Connecting to the National Grid

Part 1: Principles and Requirements for Connecting to the National Grid

Describes the principles and requirements for connecting to the National Grid, principles for allocating capacity and overall regulatory framework and technical conditions that the Applicant/Connecting Party needs to comply with.

2 Principles and prerequisites for connection

Svenska kraftnät is a state-owned transmission system operator responsible for managing, operating and developing a cost-effective, operationally safe and environmentally sound transmission system. To fulfil this mission, Svenska kraftnät conforms a number of basic principles for connecting to the National Grid.

2.1 Principles for efficient grid use

2.1.1 Connection to the lowest voltage level appropriate

To promote efficient grid use and cost-effective expansion of the electricity grid, connection should be made to the lowest suitable voltage level.

Svenska kraftnät primarily refers new connection needs to existing Distribution Systems. The transmission capacity and operational reliability of the transmission network are always affected to varying degrees by Plant connections. By gathering several Plants into a common Distribution System, co-storage effects and more efficient use of the grid become possible. Allowing multiple Distribution Systems in each station would mean parallel expansion in the same geographical location, leading to increased costs for the general public, increased land use and inefficient use of existing or planned infrastructure.

Where there is no existing Distribution System, a new connection to the National Grid in most cases means that the Applicant needs to construct a line requiring a network concession. Such a connection is thus subject to all the requirements stipulated in the Electricity Act and in associated regulations that apply to owners of a Distribution System. This also includes future connections according to the principle of lowest possible voltage level. Against this background, Svenska kraftnät usually signs new connection agreements with existing Distribution System owners.

2.1.2 There must be a tangible, clearly described need for connection

In order to ensure efficient utilisation of the electricity grid and an appropriate connection process, each connection must have a tangible and clearly described need.

Since the transmission capacity in the National Grid is limited, capacity reservations must be made restrictively. Svenska kraftnät reserves capacity only if there is a clear, verifiable need. This ensures that resources for analysing the impact of connections on the National Grid are used efficiently, thereby contributing to a robust, well-functioning connection process.

2.2 Technical connection requirements

To ensure a robust, reliable and efficient power system, there are also a number of technical prerequisites for connecting to the National Grid.

2.2.1 Svenska kraftnät decides the Connection Point and technical design

Each new component that is connected to the National Grid, such as stations or transformer bays, introduces potential sources of error and may affect operational security. Each Connection Point constitutes a physical boundary to the National Grid and affects its function. Therefore, Svenska kraftnät decides the Connection Point and the technical design of the connection. These decisions are based on assessments of operational reliability, network structure, costs and environmental aspects. This is discussed with the Connecting Party and, if necessary, with the Party's customer.

2.2.2 Limiting the number of plant components in the National Grid

Connections should primarily be made at existing Connection Points and through the existing Distribution Systems. Building new Connection Points in the National Grid rather than strengthening the regional networks can impair the transmission capacity of the National Grid. If increased production or consumption is not possible in an existing station, a new Connection Point in a new station may be considered. For a new station to be approved, a total power requirement of at least 100 MW for the 220 kV grid and 300 MW for the 400 kV grid is required. Exceptions to this principle may be granted if there is no existing or planned electricity grid in the area that can be considered an alternative to a connection to the Transmission Grid.

Svenska kraftnät strives to minimise the number of transformer bays within a station. Each new transformer bay means more devices and thus additional potential sources of error. An existing transformer bay must amount to 500 MW for additional bays to be permitted. Exceptions can be

made if redundancy is required to, for example, meet the Swedish Energy Market Inspectorate's prescribed functional requirements for quality in the distribution of electricity to users.

Since the dimensioning fault for the Nordic power system is 1,400 MW, the loss of connected capacity per bay must not exceed 1,400 MW.

2.2.3 Double switchgear required

New stations in the National Grid will be built as double busbar system. New connections must be made in fully equipped bays connected to both busbars, as dictated in the Technical Terms and Conditions. Svenska kraftnät does not permit new tee-off connections to the National Grid.

3 Capacity allocation principles

3.1 Assignment on first come-first served basis

The basic principle for allocating Available Capacity is first come-first served. This means that the Applicant who first submits a complete application for a new connection or extended subscription will be offered Available Capacity first. If capacity remains after the first need has been met, the capacity is allocated to the next Applicant in line. The aim is to ensure equal treatment and create a transparent and predictable first come-first served-based capacity allocation.

The principle of first come-first served is based on:

- The time at which an application has been registered at Svenska kraftnät, provided that the application is complete or has been completed within the set deadline.
- No distinction is made between applications for generation and consumption.

As the connection process has developed, the Maturity Level requirements have increased, including the requirements for an Energy Analysis and scheduling. The Applicant's progress is monitored continuously throughout the connection process. Reserved Allocation may be lost if there is a lack of progress or failure to meet schedules. For more information on how the Energy Analysis and scheduling affect the connection process, see section 3.2.

3.2 Capacity reservation

3.2.1 In case available capacity is lacking

An investigation is conducted to evaluate capacity availability and identify any necessary grid measures. The investigation also considers Allocated Capacity and previous applications that have not yet resulted in commissioning but are further along in the process.If several applications compete for the same Available Capacity, a queue may form. Due to the complexity of the National Grid, it is often not possible to determine in

advance which applications will be competing for the same capacity. The Applicant's actual position in the queue is only determined after the investigation has been completed, but the first come-first served principle always applies.

Potential outcome of the investigation:

- The connection can be accommodated in the existing grid
- Connection cannot be accommodated in the existing grid
- There is a conflict with other applications

In the case that the connection cannot be accommodated in the existing grid, or a conflict with other applications has been identified, capacity can only be made available through system reinforcement measures.

If the connection can be accommodated in the existing National Grid, capacity is allocated to enable connection as soon as possible. This applies even if other Applicants are formally ahead in the queue. This prioritisation requires following conditions:

- no competition exists for the Allocated Capacity, meaning that earlier applications are unable to utilize the capacity, for example due to allocation ramp-up schemes.
- any additional costs for the measures required to enable the connection are covered by the Connecting Party through a connection fee.

3.2.2 Reserved Allocation

A Reserved Allocation is granted once a complete application has been received and approved. If the Applicant does not enter into an agreement within the specified deadlines or does not demonstrate progress according to the schedule, the Reserved Allocation will be lost.

3.2.3 Reserving capacity in pre-design agreements

Reserved Capacity is the capacity reserved upon signing of a pre-design agreement. This capacity remains reserved until a connection agreement is signed, at which point it is allocated to the Connecting Party. The reservation is valid provided that the pre-design agreement is fulfilled and that the connection agreement is signed within the specified time frame.

3.3 Capacity Allocation

3.3.1 Capacity allocation in connection agreements

Allocated Capacity refers to the capacity that is ultimately allocated to the Connecting Party in the Connection Agreement. For new connections, a connection agreement must always be signed. If the Connecting Party wishes to change the Allocated Capacity beyond what is stated in the existing agreement, a new application for connection to the National grid is required.

For Connection Points without a connection agreement, the subscription specified in the usage agreement constitutes the Allocated Capacity. If the connecting party, in this case, wishes to increase its production or consumption subscription, a new application is required. If the investigation shows there is available capacity, a connection agreement must be signed.

3.3.2 Timeframes for capacity allocation

Allocated capacity is subject to utilisation deadlines. For connections planned for future commissioning, the subscription corresponding to the utilised Power must reach the agreed level before the deadline expires. Unused Capacity, i.e. the difference between Allocated Capacity and the actual Used Power after the deadline, will revert to available capacity in the National grid and may be allocated to other actors.

4 Technical prerequisites

The power system is regulated by an extensive legal framework. In addition to Swedish legislation, the business is also subject to EU legal provisions (directives and regulations). An overview of applicable laws and regulations is available on Svenska kraftnät's website (www.svk.se). It is the responsibility of the Connecting Party to ensure compliance with all applicable legislation.

This section describes the central aspects of the legal framework that are especially relevant for connecting to the electricity grid, as well as the technical requirements and conditions that are regulated in the connection agreement when connecting to the National grid.

4.1 EU legislation

In 2015, the European Commission presented a strategy for an Energy Union with the aim of providing energy consumers in Europe secure, sustainable and competitive energy at affordable prices. In order to achieve these objectives, the Energy Union will focus on establishing an internal market for electricity. In conjunction with the EU's third internal market package, a process was introduced to develop more detailed rules (Commission Regulations) in a few identified areas, including connection to the electricity grid. These rules are contained in three Commission Regulations, "network codes" or more precisely "connection network codes". All connection codes are directly applicable in Sweden.

- Network code on requirements for grid connection of generators (RfG)[3]
- Network Code on Demand Connection (DCC)[4]
- Network code on requirements for grid connection of high-voltage DC systems and DC-connected generation facilities (HVDC)[5]

[3] COMMISSION REGULATION (EU) 2016/631 of 14 April 2016 establishing a network code on requirements for grid connection of generators
[4] COMMISSION REGULATION (EU) 2016/1388 of 17 August 2016 establishing a Network Code on Demand Connection
[5] COMMISSION REGULATION (EU) 2016/1447 of 26 August 2016 establishing a network code on requirements for grid connection of high voltage direct current systems and direct current-connected power park modules

In addition to technical requirements, the Commission regulations also contain a compliance process that the party connecting to the electricity grid must undergo to verify compliance with requirements and receive operational notifications.

The procedure contains three different operational notifications: Energisation Operational Notification, Interim Operational Notification and Final Operational Notification. A detailed description of the compliance process for connecting to the National Grid is published on Svenska kraftnät's website (www.svk.se).

Since Svenska kraftnät primarily connects existing Distribution Systems to the National Grid, it is primarily DCC that is applicable in the Connection Point between Svenska kraftnät and the Connecting Party.

If the Connecting Party plans to connect a new production facility, it should inform the production facility owner early on of the requirements arising from the RfG and from the Swedish Energy Markets Inspectorate's regulations establishing generally applicable requirements that supplement the RfG. The Connecting Party, in its capacity as the relevant system operator under the Commission Regulations, shall consult Svenska kraftnät on project-specific requirements for the connection of power generation modules of type C and D. More information about the process is published on Svenska kraftnät's website (www.svk.se).

In addition to the connection codes, the Connecting Party is also affected by parts of the Commission Regulations on operations:

- System Operation Guideline (SO)[6], for example in terms of data exchange
- Emergency and Restoration (ER)[7], for example in terms of requirements for Plants in the event of serious disturbances or grid failures

4.2 National regulations

- In addition to EU legislation, the Swedish Energy Markets Inspectorate has issued a number of regulations concerning

[6] COMMISSION REGULATION (EU) 2017/1485 of 2 August 2017 establishing a guideline on electricity transmission system operation
[7] COMMISSION REGULATION (EU) 2017/2196 of 24 November 2017 establishing a network code on electricity emergency and restoration

connection to the electricity grid. These regulations establish generally applicable requirements which apply at national level.

- The Swedish Energy Market Inspectorate's regulations about establishing generally applicable requirements for grid connection of generators, EIFS 2018:2.
- The Swedish Energy Market Inspectorate's regulations about establishing generally applicable requirements for grid connection of demand, EIFS 2019:6.
- The Swedish Energy Markets Inspectorate's regulations about establishing generally applicable requirements for grid connection of systems for high-voltage direct current and DC-connected power park modules, EIFS 2019:3.

In addition to the aforementioned regulations, there are also other national regulations that are of significance when connecting to the National grid. For example:

- The Swedish Energy Market Inspectorate's regulations establishing requirements for data exchange between electricity grid companies and significant grid users, EIFS 2024:3.
- The Swedish Energy Market Inspectorate's regulations and general advice on power supply quality, EIFS 2023:3.
- Svenska kraftnät's regulations and general advice on equipment and preparation for and implementation of demand disconnection, SvKFS 2021:1.
- Svenska kraftnät's regulations and general advice on operational safety design of production facilities, SvKFS 2005:2. The regulations may still apply in full or in part to existing power generation modules. If the Swedish Energy Markets Inspectorate decides that only part of the provisions in RfG and EIFS 2018:2 shall be applied, SvKFS 2005:2 shall continue to apply in the other parts.

4.3 Requirements and terms of the connection agreement

The connection agreement governs the general terms and conditions of the agreement and the technical requirements and conditions for connecting to the National Grid. The requirements add to and clarify the requirements set out in regulations.

General technical terms and conditions for connecting to the National Grid are regulated in Technical Terms and Conditions, which form part of the connection agreement. In Technical Terms and Conditions, a reference is made to some of Svenska kraftnät's Technical Guidelines, which are thus part of the agreement.

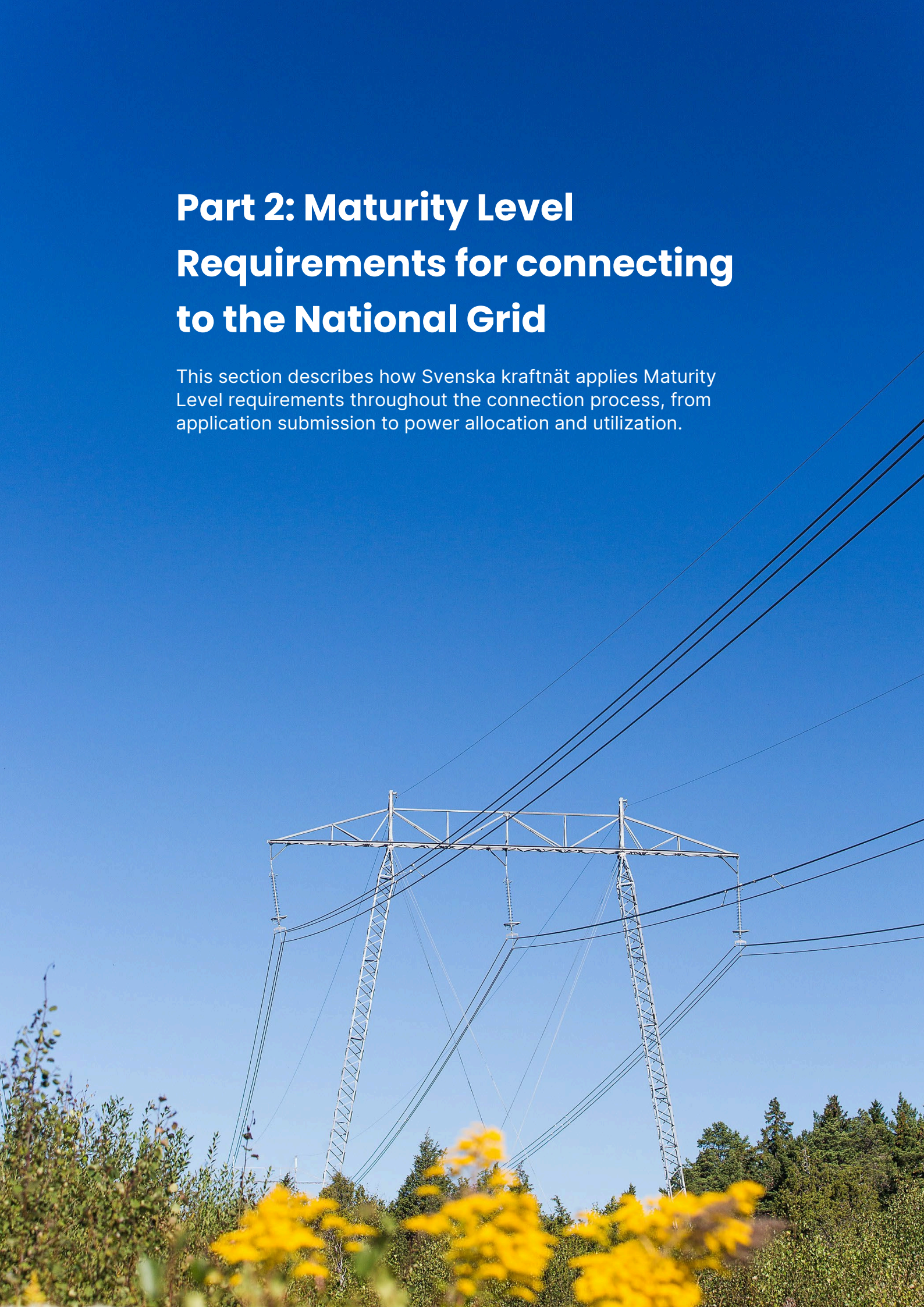
In addition to the Technical Terms and Conditions, connection-specific requirements are also regulated in the connection agreement. The connection-specific requirements may, for example, include a specific set of requirements regarding:

- Voltage regulation and the ability to exchange reactive power
- Power quality
- Risk of unwanted interaction
- Connection of demand facilities with a significant impact on operational security to the Connecting Party's network
- Directly connected battery storages

Connecting Party who in turn plan to connect a demand facility should do so in consultation with Svenska kraftnät. A demand facility that is deemed to have a significant impact on operational security must be covered by a special set of requirements regulated in the connection agreement. To enable the Connecting Party's Plant to be connected, the Connecting Party must ensure that the owner of a new, connected demand facility that will have a significant impact on operational security meets the special set of requirements.

Part 2: Maturity Level Requirements for connecting to the National Grid

This section describes how Svenska kraftnät applies Maturity Level requirements throughout the connection process, from application submission to power allocation and utilization.



5 Maturity level in the connection process

In order to limit the amount of Reserved Capacity and Allocated Capacity in the National Grid that is not based on a tangible, clear described need, the Maturity Level of each individual application will be assessed before it is accepted and the Applicant is assigned a Reserved Allocation with Svenska kraftnät.

For aggregated applications - i.e. when the Applicant has received several underlying applications that have been combined into a joint application to Svenska kraftnät - the assessment will based on the overall Maturity Level of these applications. The assessment also includes the measures that the Applicant needs to take to enable the connection to meet the underlying need.

In response to “Svenska kraftnät’s recommendations to grid companies regarding connection management”, the industry has jointly produced the guideline “Branschpraxis Maturitetsgrad för anslutning till regionalnät och lokalnät” [Maturity industry practice for connecting to regional and local networks]. By obtaining more information from customers during the Connection process, electricity network companies are able to make a better assessment for both the Maturity Level of the customer project and the possibilities for connection to local and regional networks.

5.1 Maturity level assessment

The Maturity Level of the Applicant’s connection is initially assessed based on the information available at the time of application. When applying for connection to the National Grid, Svenska kraftnät requires certain information to be reported.

Svenska kraftnät determines whether the application has reached a sufficient Maturity Level to be allocated a Reserved Allocation, based on the documentation submitted by the Applicant. Each individual application is assessed individually, without being compared to applications that have already been assigned. Svenska kraftnät’s first come-first served principle applies and is based on the time the application was received and on whether the Applicant or Connecting Party maintains progress in their case in line with the Connection Process.

5.1.1 Information required in the application and appendices

- **Technical information requirements:** The application must contain information about the type of Plant and a geographical map showing the entire area of the Plant and its location in relation to the nearest electricity grid. The need for flexibility or ability to be flexible over time must be stated. For aggregated applications, the Applicant must account for all grid-connected production facilities, consumption plants, flexibility resources and hybrid plants included in the application and exceeding 30 MW. Planned power input or output, type of Plant and estimated time of commissioning must be stated.
- **Technical information requirements:** The application must contain information about the type of Plant and a geographical map showing the entire area of the Plant and its location in relation to the nearest electricity grid. The need for flexibility or ability to be flexible over time must be stated. For aggregated applications, the Applicant must account for all grid-connected production facilities, consumption plants, flexibility resources and hybrid plants included in the application and exceeding 30 MW. Planned power input or output, type of Plant and estimated time of commissioning must be stated.
- **Requirement to report overlapping requests:** If the application relates to the same Plant but has been sent to several different Connection Points in the National Grid, regional network or local network, this must be reported in order to make overlapping requests visible.
- **Energy Analysis requirement:** The application must include an Energy Analysis. If the connection is planned in phases, each phase must be reported separately. The Energy Analysis must show the yield in the Connection Point to the National Grid, i.e. the energy requirement and power requirement over time for the Applicant’s Plant, so that alternative solutions for enabling the connection can be investigated. See template for Energy Analysis in Appendix 1.
- **Schedule requirements:** The application must contain a schedule that lists all permits required, planned application dates and estimated times for decisions. In the case of a phased connection, each phase's commissioning date must be listed. See example of schedule in Appendix 2. The schedule must be consistent with the Energy Analysis.

5.1.2 Assessment of maturity level at time of application

- **Documentation quality control:** If Svenska kraftnät deems the documentation to be inadequate or not meeting the requirements for technical information, energy analysis or schedule, additional information will be requested.
- **Plausibility assessment of requested capacity:** Svenska kraftnät assesses whether the requested capacity is reasonable in relation to the permits obtained or planned and the type of Plant. Documentation confirming the need for the requested capacity may be required.
- **Consistency between schedule and Energy Analysis:** The schedule shall be in line with the Energy Analysis. Phased expansion or commissioning must be stated in both documents. The schedule must take into account the operations' lead times for permit applications and contract processes, as well as standard times for reinforcement needs in the electricity network.

The Energy Analysis must be submitted in Excel format, by hour (MWh/h), and conform to the applied power requirement. For phased power ramp-up, the Energy Analysis must be phased, with each phase reported in a separate tab. The Energy Analysis must show the yield in the Connection Point to the National Grid. If the underlying need covers several customers or businesses, the combined need must be reported.

It is of great importance the schedule is realistic as it will be used to assess the Maturity Level based on progress. Agreement deadlines and follow-up are based on the application. It is therefore crucial the application contains correct information, reasonable assessments and is kept updated.

5.1.3 Assessing Maturity Level via progress

Svenska kraftnät carries out recurring assessments of a case's Maturity by applying a number of progress requirements and milestones. These are intended to ensure that the Applicant or the Connecting Party maintains the necessary progress in the matter.

If the progress requirements are not met within the specified deadlines, the Applicant's Reserved Allocation and the Connecting Party's reservation of capacity in the Pre-design Agreement and the Allocated Capacity in the Connection Agreement shall cease to apply. This helps to limit the amount of unused capacity in the National Grid.

The following progress requirements apply to the Connection Process:

- **Feasibility study fee must be paid:** The survey fee is invoiced one month before the planned start of the survey and must be paid before the survey begins. The purpose of the fee is to cover Svenska kraftnät's costs for carrying out the survey.
- **Survey and grid analysis report requirement:** During the survey period, the Applicant may be asked to submit further analyses. Svenska kraftnät may also request that grid data be submitted. An ongoing discussion is held with the Applicant and, if necessary, with its customer to ensure the analytical conditions are correct and that the connection can be reliably assessed.
- **Requirements for updated Energy Analysis and schedule:** The energy analysis and schedule must be updated annually or in the event of changes. Before the start of the survey, the validity of the documentation will be checked with the Applicant to ensure that it is up to date. The applied capacity can be lowered in an existing application. However, a new application must be submitted to Svenska kraftnät if the applied capacity increases.
- **Requirement for entering into an agreement:** After preliminary notice has been given, Svenska kraftnät offers a Pre-design Agreement. The Applicant has six months to decide and sign the agreement. If this deadline is not met, the case will be closed and the Reserved Allocation will cease to apply. The same applies to exceeding the deadline for signing the Connection Agreement after notification of connection.
- **Requirement for documentation and cooperation:** In the Pre-design Agreement, the Connecting Party undertakes to provide the documentation Svenska kraftnät requires to enable preliminary planning. If these are not received in line with the agreement, both the agreement and the capacity reservation will cease to apply. In the event of dependencies between Svenska kraftnät and the Connecting Party, ongoing collaboration is required, and the Connecting Party's customer may be involved if necessary.
- **Requirement for permits:** In order for the connection to be realised, the Connecting Party must obtain all permits specified in the application. Svenska kraftnät requires that permit applications for construction and grid licences for connecting lines have been submitted before the Connection Agreement is signed. The Connecting Party must report when permits have been obtained, within the deadlines specified in the connection agreement.

- **Requirement for compliance with technical regulations:** The Connecting Party is responsible for complying with the Technical Terms and Conditions and Technical Guidelines for connecting to the National Grid, see Chapter 4. Svenska kraftnät requests technical data, simulation reports and similar to assess whether the requirements are met. In order for the Plant to be approved for continuous operation, the compliance process must have been completed and the Connecting Party must have been assigned an Energisation Operational Notification (EON), Interim Operational Notification (ION) and Final Operational Notification (FON).

5.2 Changing the schedule in the event of insufficient progress

Svenska kraftnät carries out recurring assessments of a case's Maturity Level based on established requirements and milestones, which aim to ensure Applicant or Connecting Party progress. In some cases, insufficient progress is made, for example due to delays or major changes in the case. An example of a major change is a change in the composition of customers in an aggregated application.

In these cases, it is possible to apply for a revised schedule, which means that a new starting point is established for assessing the progress of the case.

5.2.1 Events outside the power of influence

An application for a revised schedule is normally granted if the reason for the lack of progress lies outside the Applicant's or Connecting Party's control - and, where applicable, its customers'. Examples of such events are permit processes that are delayed, provided that applications for the permits were made in accordance with the applicable schedule.

Svenska kraftnät will assess whether the new, proposed schedule is reasonable and appropriate based on the information provided by the Connecting Party.

5.2.2 Other situations

Other types of schedule change requests require a special analysis of the competitive situation and the possibility of reallocating Reserved Capacity. A competitive situation exists if there is another application in Svenska kraftnät’s queue that claims the same capacity and can use it within the corresponding time frame, provided the change is not granted.

The decision to approve a schedule change is based on this analysis, taking into account both capacity and the extent of the change in time.

Considering the consequences for grid planning as well as efficient grid use, changed schedules will not be approved where no actual progress in the case is reported (where there are “breaks” in the case for connection). Nor will changes to schedules be approved if doing so means cancelling measures already taken or investments already made. In such cases, the current agreement and connection case will be terminated.

Part 3: Process and procedure for connecting to the National Grid

Describes the connection process in its entirety, including who is entitled to submit an early indication request, what is required when applying for connection, what happens when an application is submitted and all subsequent steps up to verification after commissioning.

6 Before submitting an application for connection

6.1 Who can apply for a connection to the National Grid?

According to Svenska kraftnät's principles for connection, see chapter 2, a Plant shall be connected to the electricity grid at the lowest suitable voltage level. This means an owner of a Plant with a need for grid connection should in the first instance contact the electricity grid company which holds permit for the geographical area in question. If, for reasons covered in the Electricity Act, the electricity grid company cannot meet the connection need, the plant owner will in most cases be referred to a network level with higher voltage.

As such, regional network companies are generally those that apply for connection to the National Grid. If a regional grid company identifies a need for increased production to or consumption from the National Grid to enable a connection, an application for connection must be submitted to Svenska kraftnät.

For regional grid company applications that entail significant power requirements and where there is uncertainty about the possibility or suitability of connecting to the regional grid, the regional grid company and Svenska kraftnät should discuss the processing of the application. These discussions aim to investigate technical solutions and determine the appropriate connection level.

6.2 Connections requiring an application

A formal application must be submitted to Svenska kraftnät in order to connect to the National Grid, or to take measures in an existing connection. Apply using the form available on Svenska kraftnät's website (www.svk.se). Typical cases that require an application:

- New connection of production or consumption.
- Increased production or consumption in an existing Connection Point, if no connection agreement exists or if the requested power exceeds the maximum power allocated in the existing connection agreement.

- Measures taken in an existing station without changing the production or consumption.
- Changes in the Connecting Party's Plant that affect the technical capacity of an existing connection to the National Grid. Svenska kraftnät must be notified of such changes in advance.

6.3 Indication of available capacity

Upon request, Svenska kraftnät can provide an indication of whether a specific Connection Point to the National Grid has available capacity. Unlike an application for connection, this indication does not involve any formal survey or reservation of capacity. Instead, the indication is a preliminary assessment based on previously conducted analyses and planned investments.

An early indication can be given to regional network companies or to actors referred from the regional network. This process is voluntary and independent of Svenska kraftnät's formal connection process.

Indication enquiries can be submitted for needs up to 300 MW, provided that the need lies at least three years in the future. For greater needs, a dialogue and formal connection application are required.

Use the form available on Svenska kraftnät's website to make this request (www.svk.se). The indication request is free of charge and will normally be answered within three months of being received. The reply includes:

- An indication of whether capacity is available at the requested Connection Point, or whether the possibility of increased production or consumption is far in the future.
- If capacity is available, a flat-rate cost estimate for enabling the connection will be provided.

If there are several applications in the connection queue, or ongoing surveys for the same Connection Point, it may be assessed that additional capacity cannot be allocated without additional reinforcement measures. If applicable, this will be indicated in the reply.

Note that the early indication expires on the same day as the reply is sent as new applications or other changes affecting the system may have been received after the reply was sent, potentially affecting the conditions in the Connection Point in question. In order to proceed with a connection, a formal connection application must always be submitted.

7 The connection process

Svenska kraftnät's connection process includes new connection to an existing or new station in the National Grid. The process starts when an application for connection is submitted and ends when verification is made after commissioning of the Plant.

The connection process is divided into two main phases:

- **Phase 1:** Starting when the application is received and ending when the connection agreement is signed
- **Phase 2:** Starting when the connection agreement is signed and ending with verification after commissioning

Each phase contains a number of steps and milestones to ensure that technical, legal and systemic requirements are met and that connection to the Transmission System can be made safely and efficiently.

7.1 The process from application to signing of the connection agreement

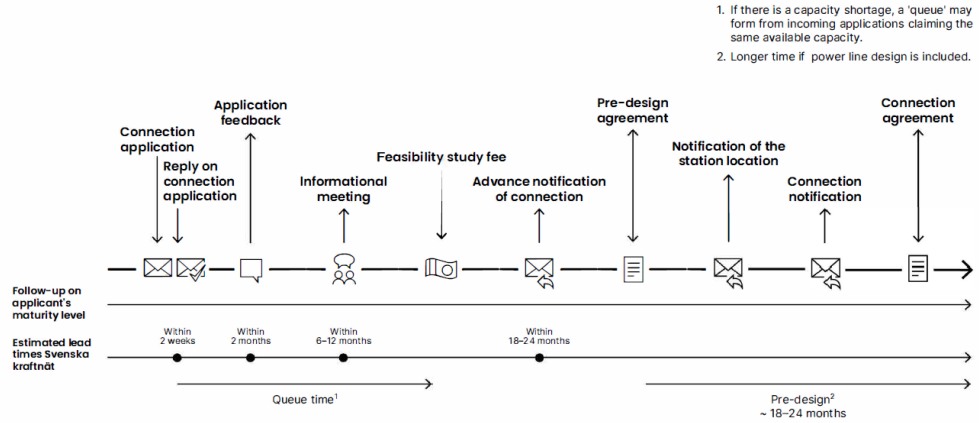


Figure 1 The process from application to signing of the connection agreement. The lead times illustrate a typical example of the implementation of a medium-sized connection to a new station along an existing power line.

7.1.1 Connection application

An application for connecting to the National Grid must be made using the form available on Svenska kraftnät's website (www.svk.se). For an application to be accepted the requirements set out in chapter 5.1 of this document must be met.

7.1.2 Reply on connection application

When an application for connection has been received, Svenska kraftnät will send a confirmation receipt to the Applicant within two weeks. In the confirmation, the Applicant is assigned a contact person at Svenska kraftnät to enable ongoing communication, including regular status updates on the progress of the case and handling of any changes in submitted documentation, such as the Energy Analysis or schedule.

Within two months of receiving the application, Svenska kraftnät will confirm whether the application meets the requirements or whether additional information is required. If the application is complete, the Applicant will be informed of a preliminary date for a future informational meeting.

If the application does not meet the requirements, the reply will specify what information is needed as well as provide a deadline for submitting it. If the Applicant does not submit the requested information within the specified deadline, the application will be rejected and Svenska kraftnät will close the case.

7.1.3 Informational meeting

When Svenska kraftnät has determined a preliminary start date for the feasibility study, the Applicant will be called to an informational meeting. The meeting has several purposes:

- To give the Applicant an overview of the connection case in relation to other ongoing cases and surveys.
- To present an overview of the technical requirements and conditions that apply when connecting to the National Grid.
- To inform about the feasibility study fee amount.
- To give the Applicant the opportunity to describe the project in more detail, including the needs listed in the application, and to ask questions about the continued process.

In connection with the informational meeting, Svenska kraftnät will provide a preliminary schedule for conducting the survey. The schedule includes the expected start and end time of the survey and time plan for invoicing.

7.1.4 Feasibility study fee

If an application requires Svenska kraftnät to conduct a feasibility study, a feasibility study fee will be charged. The fee consists of a fixed part and a

variable part. The fixed fee amounts to SEK 100,000 and applies to all applications that require some form of investigation, regardless of the scope of the application. The variable fee depends on the size of the application, as larger applications require more extensive analysis. For 2025, the variable fee is SEK 1,200 per megawatt (MW). The survey fee is adjusted annually based on the consumer price index (KPI).

The survey fee is invoiced one month before the planned start of the survey and must be paid before the survey begins. The fee will not be deducted from the connection fee once connection is complete.

7.1.5 Feasibility study

The feasibility study begins after the feasibility study fee has been paid. The initial phase consists of a grid analysis in which Svenska kraftnät carries out capacity calculations and other relevant studies to identify which measures are required to enable the connection. In this phase, work activities are also initiated to produce a preliminary schedule and a rough cost estimate for the connection based on the measures identified in the grid analysis.

If the study shows that capacity is available, or can be made possible through identified measures, the Applicant will receive an advance connection notification. If capacity is not available in the existing grid or within the framework of planned or ongoing grid reinforcement measures, a more extensive system analysis may be required. Such an analysis covers a larger geographical area and may result in a longer processing time, which may delay issuance of the advance notification.

7.1.6 Advance notification of connection

Advance notice of connection is normally provided within twelve months of the start of the feasibility study. In the notification, Svenska kraftnät presents the measures deemed necessary for the connection, the capacity that can be offered to the Applicant, a preliminary schedule and an estimated cost for the connection. The notification also contains an overall description of the technical requirements that will apply in the event of a connection. A pre-design agreement will also be sent to the Applicant with the advance notice.

7.1.7 Pre-design agreement

After receiving the advance notice, the Applicant has six months to decide whether they wish to proceed with the connection by signing a pre-design agreement. If the agreement is not signed before the specified

deadline, Svenska kraftnät will close the case and any Reserved Capacity will no longer apply.

The pre-design agreement governs the conditions for the preliminary planning, including the cost items that can be attributed to the Connecting Party. The Applicant undertakes to provide the documentation above and beyond the information required in the application for Svenska kraftnät to carry out the preliminary design. If the required information is not provided in line with the agreement, the agreement and thus the capacity reservation will no longer apply.

7.1.8 Pre-design

When the pre-design agreement has been signed by both parties, Svenska kraftnät makes a directional decision after which the pre-design phase can begin. The pre-design stage includes, e.g., selecting the implementation options (preliminary study), preparing documentation for permit applications and land access, submitting applications for grid licences, geotechnical surveys and preparing technical and commercial procurement documents. For line projects, the preliminary design also includes planning up to the procurement of the construction contract.

Svenska kraftnät will also start work activities to develop the project-specific technical requirements for the connection. This may include electricity quality measurements to determine limit values for parameters relevant to the electricity quality. Svenska kraftnät may also request additional documentation from the Connecting Party to determine the requirements.

7.1.9 Notification of the station location

When the preliminary study has reached the point of determining the coordinates for the Connection Point, the Connecting Party will be notified of the station location. In most cases, a connecting line to the Connection Point will be required, and the Connecting Party can apply for a permit for this line using the information in the notification. The permit application must be submitted to the Swedish Energy Markets Inspectorate before a connection agreement can be signed.

7.1.10 Connection notification

On the connection notification, Svenska kraftnät will inform the Connecting Party of parameters for the location and the overall technical design, as well as the latest available estimate of the cost and schedule for the connection.

7.1.11 Connection agreement

The Connection Agreement will be sent to the Connecting Party upon notification of the connection and must be signed within six months of receipt. The connection agreement cannot be signed until the Connecting Party has submitted a permit application for the connecting line. If the agreement is not signed before the specified deadline, Svenska kraftnät's commitment to the connection will cease to apply, and a new application must then be submitted.

The Connection Agreement sets out the final terms and conditions for the connection to the National Grid. This includes, e.g.:

- The technical design of the connection
- Allocated capacity and associated deadlines
- The connection fee amount, if any
- Costs attributable to the Connecting Party's Plant

Allocated Capacity is conditional and only valid if the corresponding production or consumption power is subscribed to in the usage agreement before the time limit in the connection agreement is reached. The subscription in the usage agreement must in turn reflect the actual Consumed or produced Power. Capacity is thus allocated based on actual utilisation.

Furthermore, the connection agreement governs the general terms and conditions of the agreement as well as the technical requirements and conditions that apply to connecting to the National Grid. These requirements add to and clarify applicable regulations and ordinances. The technical requirements can be found in the Technical Terms and Conditions and in a connection-specific set of requirements, which may include, for example:

- Voltage regulation and the ability to exchange reactive power
- Power quality
- Risk of unwanted interaction
- Connection of demand facilities with a significant impact on operational security to the Connecting Party's network
- Directly connected battery storage

7.1.12 Connection fee and other costs attributable to the connection

The Connecting Party is responsible for covering the costs incurred by Svenska kraftnät for connecting to the National Grid. These costs are regulated by a connection fee, which is set out in the relevant connection

agreement. Invoices will be sent continuously from the time the agreement is signed and will continue until the connection case is closed.

The connection fee shall reflect the additional costs arising as a result of customer-specific measures. Such measures may include:

- Establishment of radial lines
- New construction of stations for connection
- Adaptations in existing stations
- Other technical measures directly linked to the connection

The fee also includes costs for project management, consultation processes and permit granting necessary for the implementation of these customer-specific measures.

In addition, Svenska kraftnät shall be compensated for other customer-specific costs arising as a result of the connection. For example, this may concern costs for early decommissioning of existing transmission system installations. Costs attributable to the construction of the Connecting Party's own plant parts are regulated in a separate construction agreement.

7.2 The process from signing the connection agreement to commissioning

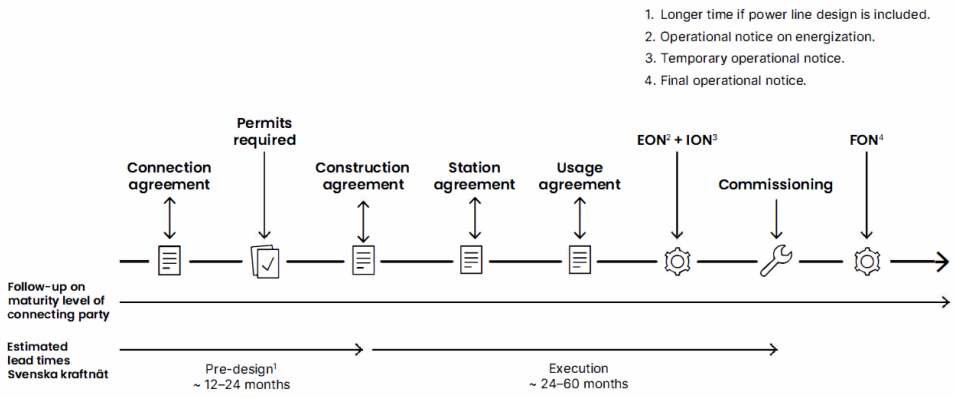


Figure 2 The process from signing the connection agreement to verification after commissioning. The lead times illustrate a typical example of the implementation of a medium-sized connection to a new station along an existing line corridor.

7.2.1 Permits required

When the Connecting Party, where required, has obtained a legally binding permit for its connection line, the document “Required permits” must be submitted to Svenska kraftnät by the deadlines specified in the connection agreement. The necessary permits are required for Svenska kraftnät to send out tender documents for the contract.

7.2.2 Construction agreement

A construction agreement must be signed by the deadline for signing construction contracts specified in the connection agreement. The construction agreement is required for Svenska kraftnät to send out tender documents for the contract. If the construction agreement is not signed by the specified deadline, the connection agreement will no longer apply. Among other things, the construction agreement will regulate the parties’ liability for the measures during new construction, extension or renovation.

7.2.3 Implementation

Planning, procurement and signing agreements with contractors normally take 1.5-2.5 years when one station is to be built. If transmission lines also need to be built, the time normally increases to 4-5 years. After the construction agreement has been signed, the implementation phase of Svenska kraftnät’s connection process begins. Normally, it takes 2-4 years to build a station and the equivalent time for a transmission line.

7.2.4 Station agreement

The Station Agreement regulates the ownership of the station and the relationships between the parties during the life of the Plant. The plant cannot be commissioned before the station agreement has been signed.

7.2.5 Usage agreement

The Usage Agreement governs the producing and consuming power that the Connecting Party subscribes to in the National Grid, as well as the associated tariffs and payment terms. The Agreement must be signed before any power can be fed into or taken out of the Connection Point.

For the Allocated Capacity specified in the Connection Agreement to remain in force, the subscription in the Usage Agreement must amount to the corresponding levels before the deadline specified in the Connection Agreement is reached. The subscription must reflect the actual Utilized

Power. If, at the end of the term, the subscription is less than the agreed power in the connection agreement, the maximum permitted power in the connection agreement will be reduced to the level that is actually subscribed to and utilized. The unused power returns to the National Grid as Available Capacity and potentially available to other actors wishing to connect.

7.2.6 Commissioning

Before energising and commissioning the Connecting Party's Plant, the Connecting Party must have made the necessary preparations successfully and reported theoretical compliance with the requirements. If applicable, they must also have been awarded an Energisation Operational Notification (EON) and an Interim Operational Notification (ION) by Svenska kraftnät.

When all agreements have been concluded and the requirements have been validated according to the above, commissioning can take place.

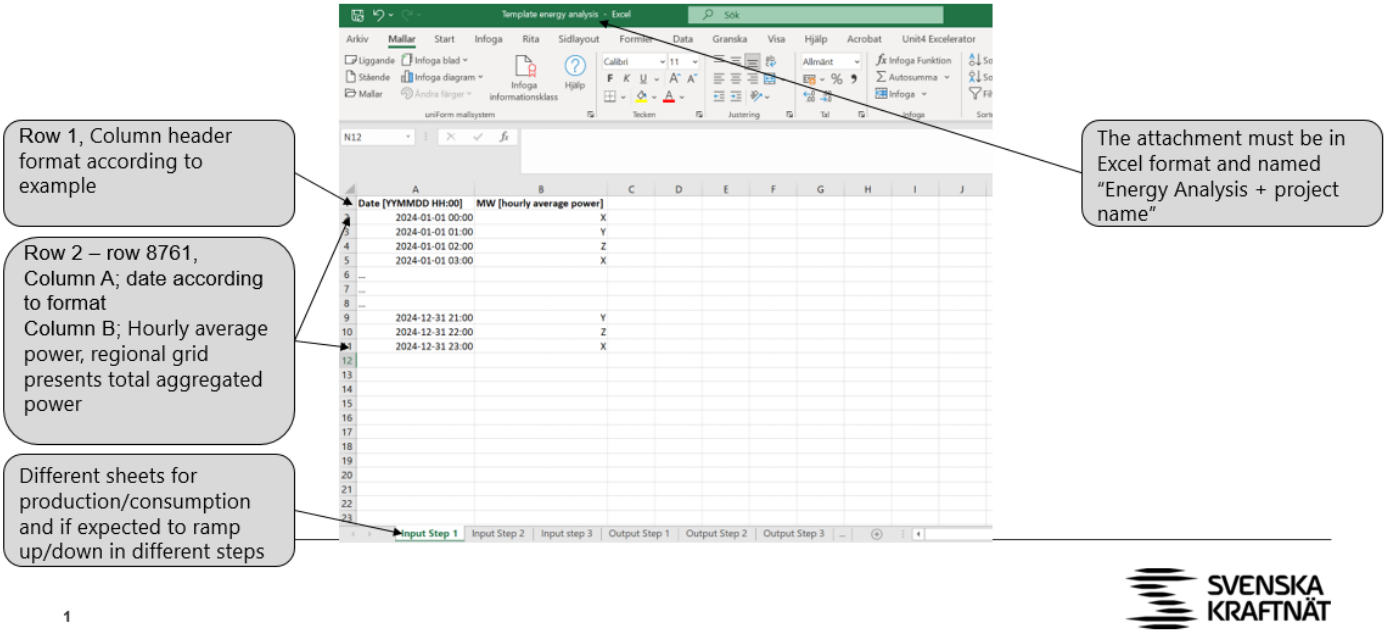
7.2.7 Verification after commissioning

For the Connecting Party's Plant to be approved for continuous operation, the Connecting Party must successfully verify measurements and conformity testing and, if applicable, have been awarded a Final Operational Notification (FON) by Svenska kraftnät.

Appendix 1: Template for the Energy Analysis

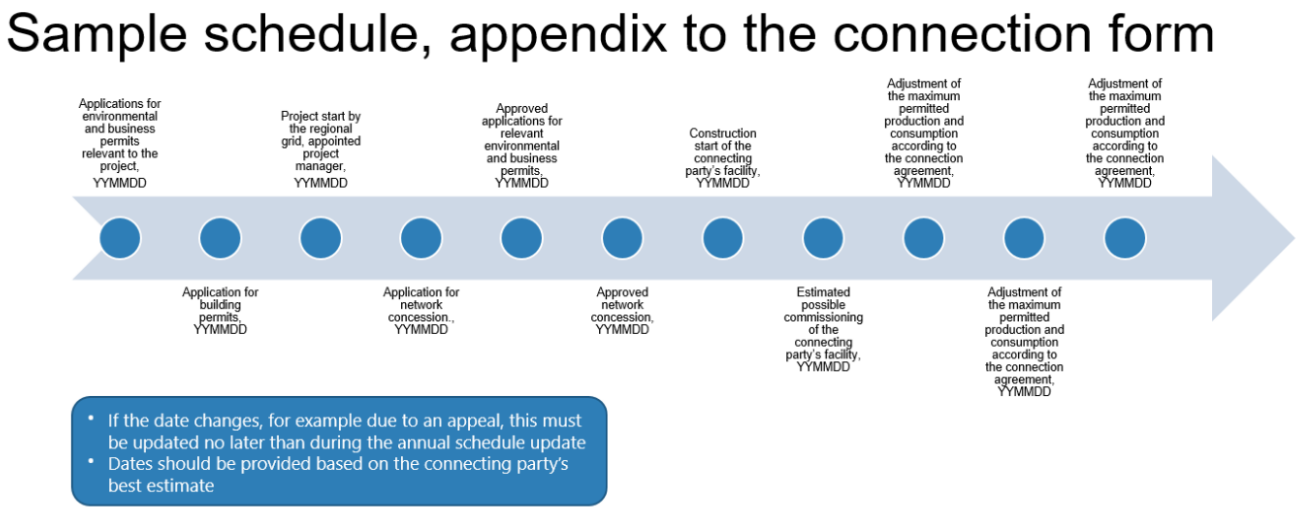
The Energy Analysis template can be downloaded from Svenska kraftnät's website (www.svk.se).

Energy analysis template, appendix to the connection form



Appendix 2: Sample schedule

Sample schedules can be found on Svenska kraftnät's website (www.svk.se) and can be downloaded and used as templates.



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