System Development Plan 2022–2031

Towards a doubled use of electricity

SVENSKA KRAFTNÄT

About Svenska kraftnät

Svenska kraftnät is a state owned enterprise with the task of maintaining Sweden's electricity transmission grid, which consists of about 16,000 kilometres of 400 kV and 220 kV transmission lines with substations and interconnectors. Svenska kraftnät is also the system operator for electricity in Sweden.

Svenska kraftnät is developing the transmission grid and the electricity market to meet society's need for a secure, sustainable and cost-effective supply of electricity. In this, Svenska kraftnät plays an important role in implementing national climate policies.

Photographers: Tomas Ärlemo and JohanAlp

Contents

This report constitutes part of Svenska kraftnät's System Development Plan 2022–2031, published November 16, 2021. The complete plan is only available in Swedish and can be found at: **www.svk.se/systemutvecklingsplan.**

1. Introduction

Energy transition is central to solving the climate challenge, and Svenska kraftnät, together with other actors in the electricity sector, is playing a crucial role. An increase in electrification is a key solution, especially for sectors with large climate emissions such as industry and transport. Transition will bring new opportunities but it also creates major challenges by changing the basic conditions for the electricity market and for the operation and development of the power system.

Society faces extensive electrification. This will affect most sectors with high levels of energy consumption. The steel and ore industry is electrifying its processes, freight and passenger transport are becoming fossil-free through electrification, manufacturing and chemical companies are increasing their electricity use and electrically driven heat pumps are already heating many homes. There are also new commercial ventures such as server farms and battery factories, that from the outset are based on electricity as an energy carrier. The driver of this is directly or indirectly the same for everyone, a need and willingness for a transition to a sustainable society in which fossil fuels no longer play a role.

The transition is expected to take place more rapidly than was previously assumed. Forecasts of consumption, published only a few years ago, are already out of date. Svenska kraftnät's own long-term market analysis from two years ago, had a high consumption scenario of approximately 180 TWh in 2040. In the 2021 analyses, this has been replaced by a peak consumption scenario approaching 290 TWh for 2045. However, since publication at the beginning of the year, there have been a large number of additional electrification plans for new and existing industries. In the Government's work on its electrification strategy, it has been communicated that the starting point it has adopted is a planning framework for a possible doubling of electricity use by 2045.
At the same time, it must be noted that electricity use has been nearly constant for many years, despite a sharp increase in GDP. Forecasts are notoriously difficult, and there are constant improvements in efficiency. What leads us to believe that we can actually expect a sharp increase in electricity consumption, is that consumer preferences, policy instruments and market developments now go hand in hand with major technological breakthroughs. What is important, however, is not the exact levels of consumption the forecasts indicate, but that they all show a rapid increase in electricity consumption due to the transition we are facing, and that radical new solutions will be required to meet this need.

Changes in electricity generation provide a new framework. The past decade has already seen major changes to electricity generation. Today, electricity generation in Sweden is essentially fossil-free and is based on wind, hydroelectric and nuclear power, although an increasing proportion also comes from small-scale photovoltaics. Large numbers of wind turbines have been built, initially driven by subsidies through the electricity certificate system, but now increasingly on their own merit as the cost of investment in wind power has fallen. This development has led to the reduced profitability of parts of the dispatchable generation system, partly due to the fact that their marginal costs of production are higher. The owners of the older nuclear power plants have deemed that they are unable to continue operating profitably. While this has been impacted by the increased costs of implementing the safety improvement measures required by legislation, even several combined heat and power plants have been closed down.

Changing incentives influencing production and prices. Naturally, the sharp increase in electricity consumption will also require a substantial supply of additional electricity, either generated in Sweden or imported from abroad. Basically, the supply of additional generation capacity should be achieved as a consequence of the electricity market that has been in place for quite some time, where, in the long term, supply and demand are in balance. A deficit in electricity generation results in higher prices, which attracts new electricity generation and vice versa. However, increased electrification is to a large extent due to factors other than a low electricity price. The competitiveness of industry on the world market for the products it manufactures is increasingly affected by the climate impact those products have. Rising average yearly electricity prices are therefore not likely to restrict demand discernibly. Similar reasoning also applies to the transition to electric cars for example, where political decisions and individual choices will be driven by climate factors, regardless of the price of electricity.

New solutions for continued availability. Current developments in Sweden mean that the increase in electricity generation is primarily accomplished through new wind power, although photovoltaics may contribute an increasing share. Svenska kraftnät does not currently see any clear signals that there are concrete plans for other types of electricity generation plants, despite a discussion about biofuel plants and small nuclear power stations. This is the root cause of many of the challenges we address in our system development plan, as a declining share of dispatchable electricity generation poses major challenges to the security of supply in the electricity system. From a power system perspective, there is a big difference between having large annual electricity energy surpluses and coping with periods when weather-dependent electricity generation such as wind and solar power does not produce as much as demanded by customers. From a purely electrical engineering standpoint, the traditional large rotating synchronous generators differ in many ways from solar installations and wind power plants controlled by power electronics; this affects the stability of the power system. Many different solutions will be needed in the future to reliably supply the electricity that our customers need, including more flexible consumption and additional dispatchable electricity generation.

Modern IT systems monitor the power system. Svenska kraftnät has long worked on the digitisation and development of new IT solutions associated with the power system. The need to manage increasingly intermittent electricity generation and consumption has already led to an increase in our ability to monitor and control the power system. Modern IT systems are fundamental to much of that development. The European integration of the electricity market and the regulatory framework that currently governs all parts of our business, also places great demands on new IT systems and the adaptation of existing ones. As a result, Svenska kraftnät is far from being an authority that just builds steel and concrete infrastructure, we are also in large part a modern IT operation that for many reasons must be at the forefront of digital development. However, this development must strike a balance between the benefits of the far-reaching digitisation of socially critical activities and the need for high IT security.

Offshore wind power has great potential. Until now, most wind power has been built on land in northern Sweden, although higher electricity prices in southern Sweden have led to many wind power installations there in recent years. However, there is a great potential for wind power at sea. To speed up the development of offshore electricity generation, the Government will change Svenska kraftnät's instructions from 1 January 2022. The purpose of the change is to task Svenska kraftnät with extending the transmission grid to areas within Sweden's territorial waters where there is an opportunity to connect several electricity generation facilities. Preparatory work on the design of the offshore wind connection process is already underway and will be intensified in a dialogue with stakeholders. The Government has also tasked Svenska kraftnät with the preparatory work of providing these stakeholders with well-defined guidelines on how the connection process will work. The report on this assignment is to be submitted on 15 June 2022.

The need for forward planning and adaptability. Today, the overall trend towards a significant increase in electricity use and the resulting increase in electricity generation is unmistakable. On the other hand, it is far from clear exactly which industrial projects will be undertaken, or which of the many wind farms that have applied for connection will be built. There are questions about the technical solutions for the large-scale production, transport and storage of hydrogen, and consequently the degree to which it will affect the transmission grid. However, it is likely that the electricity transmission grid will play an increasingly important role in managing society's transition to fossil-free energy sources. Nevertheless, there is a significant risk that in some areas it will be the electricity grid that limits the potential for electrifying certain operational activities or for connecting production at a pace that would otherwise be possible; something we have already witnessed. One reason is the very long lead times needed to strengthen the transmission grid, seen in relation to the time it takes to build new generation capacity, or for industry to switch to electricity. This is something that Svenska kraftnät is actively working to improve, but, if lead times are to be reduced substantially, measures are also required in the licensing process itself.

A great need for renewal. Today's electricity transmission grid is stable and has a high level of availability. Still, large parts of the grid are starting to reach the end of their service lives, and renewing them will involve major investment on our part in the future. In connection with this reinvestment, new transmission lines and substations are being constructed to handle more power than before. In many places older 220 kV grids are being replaced by 400 kV; this means that we can renew the grid in a way that greatly increases the capacity of the new grid.

A focus on a good security of supply, safety and resilience. Society's increasing dependence on electricity, particularly on electricity generated by large facilities and then transmitted for consumption through the electricity grid, combined with an increasing focus on defence, poses new challenges. As the electricity contingency planning authority, Svenska kraftnät has been commissioned with ensuring the ability of the electricity supply infrastructure to withstand severe strain. We are intensifying our efforts to see how we can increase the robustness and security of the physical and digital components of the electrical power system in the future, so that even during crises and high stress situations it can continue to supply the most important functions of society.

All in all, ongoing developments lead to some fundamental issues that we will address in more depth in the system development plan:

> How is the transmission grid to be modernised, changed and strengthened rapidly enough to enable extensive electrification while meeting increasing demands related to environmental impact, robustness and cost-effectiveness?

> How can the power system's security of supply be maintained at a sufficiently high level at all times over the course of the year, with a growing proportion of weather-dependent generation and with a greater dependence on imports?

> How should the increasingly important IT systems that are both critical to the operation of the power system and to the European electricity market solutions resulting from increased regulation, be designed so as not to compromise the security of the power system?

2. Research and development

A wider field for research and development. For Svenska kraftnät, and for the entire sector, the challenges facing the power system in the coming decades will require a new level of ambition when it comes to innovation, new solutions and expertise. This means that, in order to identify the right solutions, Svenska kraftnät and the sector need to conduct research and development both within and outside our traditional areas of responsibility and expertise.

Investment in technology, systems and digitalisation. Svenska kraftnät is investing in our R&D activities in order to meet these needs. Our efforts will be focused on key challenges, in both the context of separate R&D, and development in the context of ordinary business operations.

We see a need for investment in innovation and development in four areas:

> Technologies to make more efficient use of existing and extended infrastructure, along with standardised and interoperable supplier technology.

> System impact related to an increased share of power electronics, increased replacement of overhead lines with cables, integration of offshore wind power, hybrid AC/DC grids and developed planning and forecasting methods.

> Impact of digitalisation in the form of digital working methods, effective decision support systems, automation and cyber security.

> Keeping competence is a challenge. This applies to both Svenska kraftnät and to the sector in general. There need to be joint efforts to attract innovative engineers and researchers, with the aim of securing our future need for competence.

3. Energy transition legislation

A broad and complex responsibility. Svenska kraftnät has several different roles and responsibilities that are determined, among other things, by how Sweden implements EU legislation. We are the transmission system operator and are responsible for ensuring its availability. We must balance the system in real time, maintain and develop the transmission system and allocate transmission capacity to the market with respect to system reliability.

EU energy rule book. The rules applying to us are largely European and very comprehensive. A lot of work has already been undertaken to adapt our activities to the requirements of the legislation, but much still needs to be done. The legislative requirements are not static, current regulations are reviewed and revised, while new regulations are added in parallel with technological development.

The new System Forum for increased cooperation. Svenska kraftnät has a long tradition of close cooperation with the distribution system operators, the DSOs. We are responsible for this cooperation as established by the Regulation on the internal electricity market. As part of the consolidation and development of this cooperation, we have initiated a System Forum for Svenska kraftnät and a number of DSOs in 2021.

Focus on the connection process. To meet the requirements imposed on us regarding connection to the transmission grid, in the years to come we will be focusing on the connection process. This is the process by which we set connection requirements, and the verification process to ensure that the facilities connected to the power system actually meet the established requirements.

4. Long-term transmission needs and power adequacy

The power system is changing ever faster. To reflect possible developments, in both electricity use and electricity generation, the variation in the four scenarios in Svenska kraftnät's latest long-term market analysis (LMA2021) are greater than in earlier scenarios. Because the four scenarios cover a wide range of variations in the development of the power system, this means that robust alternatives for transmission grid reinforcements can be identified.

The key trends and challenges identified are:

> **An increased demand for electricity.** To achieve the transition to an energy system with no net greenhouse gas emissions, the use of electricity will increase radically. In LMA2021 the annual average demand for electricity is between 175 and 290 TWh in 2045.

> **A less predictable power system.** The long-term scenarios show that current seasonal and daily transmission patterns will be broken. The set of outcomes for possible operational cases will also increase significantly. This poses major challenges in balancing the power system and maintaining power system stability and power adequacy. What were rare operating states may suddenly become common. Major changes in consumption and generation also take place far faster than corrective measures can be implemented.

> **Transmission capacity is needed.** The results of LMA2021 point to benefits both from reinforcing internal constraints in Sweden and in increasing the transfer capacity between Sweden and neighbouring countries. However, further studies are needed to determine the benefits from a broader perspective.

> **Sector integration between electricity and hydrogen.** Areas of application for renewable hydrogen include the industrial, power generation and construction sectors, in which hydrogen can replace fossil fuels. The production of renewable hydrogen can increase the profitability of renewable energy sources. Renewable hydrogen can be produced if there is a surplus of cheap renewable electricity generation. Hydrogen can also be used to generate electricity during shortfall periods. Electrolysers for hydrogen production also have great potential to provide support services.

> **Flexibility is important in the future power system.** Studies of power adequacy in Sweden show that major adequacy problems arise in the two scenarios with the greatest degree of electrification. At its worst, electricity demand cannot be met for 890 of the year's hours in 2045, if there is no flexibility in consumption. Demand-side flexibility can improve power adequacy. However, flexibility can also be created in other ways, for example through wind power combined with storage solutions or dispatchable electricity generation. The addition of dispatchable electricity generation will be crucial to realise the electrification plans for various industrial sectors. Svenska kraftnät intends to initiate dialogue with stakeholders to ensure that future electricity use in industry is combined with flexibility.

5. The defence perspective

Defence capacity is to be restored. Svenska kraftnät is working continuously to strengthen the emergency preparedness of the power system, including from a defence perspective. At present, there is still much to do in order to reach the defence capability required by the restoration of defence planning, by legislation and by Government decisions.

Preparedness for war. According to Swedish law, each authority must take into account the requirements of the defence doctrine in its operational activities. In practice this means that Svenska kraftnät must plan so that critical activities can continue for at least three months of war on Swedish soil or in the neighbouring area. This planning is to take place in partnership with other authorities, but also with relevant commercial stakeholders.

The need for priorities. Svenska kraftnät has identified a number of areas where measures should be taken to reinforce the defence capacity of the power system. This applies to protection and resilience, emergency repair capacity, island operation, management and interoperability capacity, and cyber security. A number of basic and guiding positions and decisions at a national level, regarding the order of priorities and funding, are needed to implement the measures we have identified. Currently, there are examples of potential conflicts between defence policy and other policy objectives, creating challenges in the planning, development and expansion of the power system.

Shared responsibility for electricity sector actors. Operators in the electricity sector, private and public, have important responsibilities and obligations that do not cease to apply in crisis situations. The sector has, and takes, a shared responsibility based on its individual roles. Everyone in the sector must also take part in defence planning.

6. The interplay between society and infrastructure

The need to develop the grid is substantial. Energy transition places great demands on the transmission of electricity, and Svenska kraftnät sees that development of the grid will be needed and will bring great benefits for society.

Taking the right measures is key. The needs of the power system and the electricity market are the starting point. We ensure that the right measures are taken through a thorough licensing process, where Svenska kraftnät, in consultation with stakeholders, can identify appropriate siting and design.

All actors need to cooperate on forecasting. Collaboration with regions, other authorities and the electricity sector is a key factor for the success of electrification in Sweden. Using common long-term forecasts for future needs, we can optimise the electricity grid and reduce the time from demand to solution.

Cost-benefit analysis is important. All relevant effects of a potential measure are made clear, both those that are expressed in financial terms and those that are not. Positive and negative impacts can be compiled and opposing interests weighed against each other. If the positive effects outweigh the negative effects, the measure is profitable for the society.

Overhead power lines generally provide the greatest benefit to society. Overhead power lines continue to be our point of departure when we start planning new lines. Each project has its own unique conditions, and while there may be reasons that justify other solutions, in general overhead power lines are the measure that provides the greatest benefit to society, with high availability, cost effectiveness and resilience.

The legal status of the transmission grid should be strengthened. Svenska kraftnät believes that the transmission grid should have the same legal conditions as other interests of national importance. For example, this could be achieved by designating the existing land claims of the transmission grid a national interest for energy distribution.

7. System responsibility and system challenges

Challenges for a changing power system. The power system is changing at an ever faster rate, creating major challenges for operational security, system stability and balancing. We are moving towards a power system with an increased share of weather-dependent electricity generation connected via power electronics, at the same time as dispatchable electricity generation makes up a decreasing share of total volume. New electricity generation is also to a greater degree connected to the distribution system instead of to the transmission system, and an increasing number of large consumption facilities are connected to the power system. Moreover, there is a geographical redistribution of electricity generation and consumption, which is leading to a change in power flows. An increased use of cables also leads to new challenges.

These changes and challenges must be addressed to achieve the energy transition. Svenska kraftnät will therefore focus on the following areas:

> **Increase the understanding of the need for dispatchable electricity generation.** The lack of generation adequacy needs to be addressed by adding new dispatchable fossil-free generation to the system, and Svenska kraftnät will work to create a better understanding of this need.

> **Strategic work on system stability.** Long-term and forward-looking strategic work on system stability will be initiated.

> **Better support for follow-up and forecasting.** We are introducing increased measuring, data collection, follow-up and feedback as well as better forecasting and modelling tools.

> **More requirements.** We are working to increase the requirements related to power converters. We will also introduce increased requirements on voltage regulation.

> **New ancillary services.** We are addressing an increased need for new ancillary services and remedial action, with a higher degree of assured availability.

> **Increased cooperation within the sector.** TSOs, DSOs and others in the sector need to increase their cooperation in order to set common goals and clarify their responsibilities and interfaces.

> **A new balancing model.** In order to manage with future balancing needs, a completely new and amended model needs to be introduced. According to the timetable, a 15 minute settlement and market period will be introduced before 22 May 2023. The Nordic market for the automatic frequency restoration reserve (aFRR) will become operational in the second quarter of 2022 and is an important milestone on the way to a Nordic balancing model.

Proposed solutions already exist for several of these areas, but to succeed in implementing and achieving them in time, Svenska kraftnät, together with the sector, needs to act quickly.

8. Electricity market development

New electricity market requirements when the power system is changing. As the power system changes, the design and regulation of markets need to be adapted. The need for greater flexibility, efficient management of transmission constraints, with the geographic location of resources and the correct control signals to market actors, is increasing, and places new demands on market solutions. Day ahead and intraday markets make up most of physical electricity trading and are undergoing extensive development to meet the new requirements.

Important steps in the development of the electricity market. Svenska kraftnät will ensure a well-functioning and robust electricity market, close to the moment of operation with good liquidity, correct and clear price signals in both the short and long-term, while meeting the needs of the TSOs to ensure availability.

Svenska kraftnät will therefore:

- Switch to flow-based capacity calculation, which better represents the physical conditions and market demand for transmission capacity.
- Work towards the continued effective management of transmission constraints by continuously reviewing the Swedish and Nordic bidding areas.
- Design the structure of the transmission grid charge so that it is cost reflective and provides the correct control signals.
- Improve the ability of actors to trade in balance through the introduction of 15 minute trading products in the day ahead and intraday markets.
- Expand and deepen established collaboration on market coupling for day ahead and intraday trading in Europe.
- Integrate offshore wind power generation into the market based on its own bidding areas, to ensure good competition and accurate price formation.

9. Digital development

A central role in the digital transformation of the power system. Increased digitalisation and automation are crucial for ensuring security of supply in a power system with smaller margins and greater complexity.

Svenska kraftnät plays an important role in driving digital power system development and the transition to common national, Nordic and European solutions. We want to lead the way for the power system stakeholders in this transition.

To take on this role, we see a need for digital development in six areas:

> **Digital substations,** increased measurement in the power system for reliable status assessment and optimisation of available capacity and modernisation of communication/automation systems for protection and control.

> **Effective decision-making support and automation,** visualisation of the power system state from real time to long-term forecasts, development of data science solutions for proactive system operation and automation to handle smaller margins.

> **International platforms,** efficient integration of power systems and electricity markets with harmonised processes and common IT solutions.

> **Data-driven operations,** complete and accurate data of the entire power system, collected and managed according to a standardised method and structure.

> **Future proof IT delivery,** through increased skills, new ways of working and solutions for managing accelerated digitalisation and increased complexity.

> **High security and continuity,** development to protect sensitive data, fulfil regulation, mitigate increased threats and ensure robust continuity of operation and control of the entire IT architecture.

10. Grid development

New investments and renewal are both needed. Energy transition has created major challenges for the power system and it requires major investments. The need for new investments coincides with the fact that large parts of the transmission grid needs to be renewed. To manage future increases in consumption in the metropolitan regions, in newly established industrial enterprises and the electrification of existing industries, and to enable the extensive connection of new wind power, Svenska kraftnät will need to invest in new transmission facilities in parallel with the comprehensive renewal of existing facilities. To do this as effectively as possible, our grid development strategy is based on coordinating these measures so that, to the greatest extent possible, new transmission lines are constructed in such a way to both increase capacity and to replace the old ones.

Consequently, over the next decade, Svenska kraftnät's plans include a combination of investments in new and renewed assets. As a result of this we will build approximately 800 km of new transmission lines and approximately 25 new substations, provided that current planned connections are realised. In addition, we are renewing 1,700 km of transmission line and approximately 45 substations.

High demand for connection to the transmission grid. There are a large number of applications to connect generation and consumption to the Swedish transmission grid, mainly for wind power. Up to July 2021, Svenska kraftnät had received applications to connect a total of 170 GW of generation and 22 GW of consumption. In total, approximately 11 GW of wind power has been installed in the Swedish grid, corresponding to the approximate capacity of eight large nuclear power plants. However, annual energy generation corresponds to that produced by approximately three such plants.

New interconnectors are under construction to Germany and Finland. To increase trading capacity between Swedish bidding areas and between Sweden and its neighbouring countries, preparations are underway for major investment in the transmission grid. This includes a DC link between southern Sweden and Germany, a third 400 kV AC line between northern Sweden and Finland and major capacity increases between bidding areas, for example SE2 and SE3.

11. Economic development

The power system faces a number of significant challenges. The impact on Svenska kraftnät's finances depends on which changes are implemented, and when these take place. Furthermore, underlying factors such as the electricity price play a critical role in how our costs and fees develop.

Investments will in total reach approximately SEK 100 billion in the period 2022–2031, varying annually between SEK 6 and 12 billion. The need for investment is extensive and will have a significant impact on our costs.

The ancillary services are expected to have a major impact on cost growth. Costs are expected to increase from current levels of approximately SEK 3 billion annually to approximately SEK 4 billion annually in 2025, primarily driven by increased volumes to manage the anticipated system challenges.

As part of our long-term planning for what is needed to fulfil our tasks, a significant increases in resources and a substantial increase in personnel costs of over 100 per cent are planned for the period 2022–2031.

Congestion income is an item that helps offset the growth in costs. Over the period 2022–2031, a considerable inflow of congestion income of approximately SEK 40 billion is expected. This will contribute to reducing the cost of borrowing and will mitigate the need for revenue from transmission grid customers.

The capacity charge from transmission grid customers is estimated to remain unchanged over the period 2022–2025. This is mainly due to the high inflow of congestion income combined with a new regulatory framework, allowing congestion income to be used to cover additional expense items. For the period 2026–2031, the charge is estimated to increase by a total of approximately 30 per cent.

The fees from balance responsible parties are estimated to increase by approximately 65 per cent over the period 2022–2025. The fees for the subsequent years to 2031 are also expected to increase, but at a slower pace. The need for increased revenues is mainly due to higher costs for ancillary services and the depreciation of major investments in IT systems.

5-year plan for development

The following table lists the major development projects that Svenska kraftnät will be working on in the coming years. These development projects make up a significant part of our operational activities and will continue to involve significant expense and resources. Digitalisation is an important part of what is now being undertaken to meet the system challenges facing the power system. The table below lists the most significant development projects, showing the investment for the entire project and that component falling in the period 2022–2026.

Development projects (MSEK)	Total cost	Cost until 2021	Cost 2022-2031
Nytt driftövervakningssystem (ROSE)	350	1	312
Svenska kraftnäts implementation av RSC (SIRSCI)	230	137	64
Elmarknadshubb	479	128	382
Nordisk balanseringsmodell (NBM)	556	272	210
Drift- och marknadssystem (Fifty)	244	242	0
Datautbytesprogrammet	133	112	10
Ny IT-infrastrukturplattform (Infra 2.0)	262	2	254
Other ongoing development projects	653	111	398
Other development projects not yet started	5,232	0	2,295
Total	**8,139**	**1,005**	**3,925**

10-year grid investment plan

This 10-year grid investment plan details the transmission grid investments that Svenska kraftnät today plan to realise during the 10-year period of 2022–2031. The projects reported in the plan constitute today's best assessment. New projects will gradually be added whilst others will be removed or adjusted in time and scope. This is an inevitable consequence of the many parameters that influence the conditions and drivers for making investments. The basic assumptions of the investment plan are also constantly being developed, taking into account for example, opportunities for outages and availability of resources.

The investments are mainly divided into the electricity bidding areas used in Sweden. In each electricity bidding area, the projects are presented in tables and geographically in maps . In this plan, we have, to a greater degree than before, chosen to group projects according to how we refer to them in other contexts to make identification easier.

The projects are divided into the three phases: under consideration, preparation and construction.

Projects under consideration

A project is classified as being under consideration when there is an ongoing investigation regarding whether the conditions are right for an investment to be made. The category also includes projects for which such an investigation has not yet been started but for which a clear need has been identified for starting measures in the next ten years. The majority of the latter type refer to reinvestments of facilities that are nearing the end of their technical lifespan which need to be initiated within the ten-year period. In the case that the conditions for projects to connect external parties have not yet been investigated, the projects have not been included.

In this phase, investigations include grid studies, feasibility analyses and socio-economic profitability assessments. In projects with external parties, work to draw up agreements takes place. It is in the phase under consideration that there is the greatest uncertainty as to whether a project will proceed or not, and if so, when.

A project moves to the preparation phase when a formal decision has been made to commence preparatory work according to Svenska kraftnät's current decision-making process.

Projects in preparation phase

A project is classified as being in the preparation phase when a formal decision has been made to commence preparatory work but the final investment decision on whether to proceed with the realisation has not been made. In this phase, an in-depth technical design is made. For transmission lines, public consultations and licensing is also done. In the preparation phase, after a concession (if required) is rewarded, the contracting services needed in the project are procured to obtain an accurate cost but the contract is not signed until the final investment decision is made to go ahead with the investment.

In some cases, projects in the preparation phase are not realised. This may be because the motives behind the measures no longer are sufficient, but more often it is projects dealing with connection of external parties that are cancelled. In these cases, Svenska kraftnät is not the sole responsible in the decision-making process. Realising the project may be dependent on a wind-power developer obtaining financing for their project in order to be able to sign a connection agreement with Svenska kraftnät.

Projects under construction

A project is classified as being in the construction phase when Svenska kraftnät has made the final investment decision to proceed and to enter an agreement with the main contractor. Only in exceptional cases will ongoing projects be cancelled, but changes to time plans or cost estimates may occur.

[1] Data source background maps © Lantmäteriet

Table keys

The tables for each electricity bidding area and phase contain the following information:

No.: serial number shown on the map.

Project: short description of the measures included in the project.

Start preparation phase: planned time at which the investigation is to be completed and a decision is made to proceed with the preparation phase. Projects for which the preparation phase is planned to start after 2029 have not been included.

Commissioned: planned time at which the facility will come into operation. If commissioning in phases, the interval indicates the earliest and latest times respectively.

Cost (MSEK): the total estimated expenditure including investments and costs. Uncertainties in the estimate are greater in the earlier project phases. Therefore, the expenditure is indicated as a range. As such, the sum of these amounts may not correspond to the amounts indicated in other publications. Projects for which expenditure is estimated to be under five million SEK have not been included in the tables.

Driving force: the project drivers can be divided up into Connection, Market Integration, System Reinforcement and Reinvestment. The tables indicate each project's main driving force.

Stockholms Ström and Storstockholm Väst

Projects under construction

NO.	Project	Commissioned	Cost (MSEK)	Driving force
3131	Ekudden Station	2022	240	System Reinforcement
3129	Snösätra Station	2022–2023	550	System Reinforcement
3130	Snösätra–Ekudden luftledning	2022	300	System Reinforcement
3128	Örby–Snösätra och Snösätra Högdalen Markkabel	2022–2023	800	System Reinforcement
3418	Skanstull Station	2023	800	System Reinforcement
3126	Anneberg–Skanstull tunnel	2027	3,000	System Reinforcement

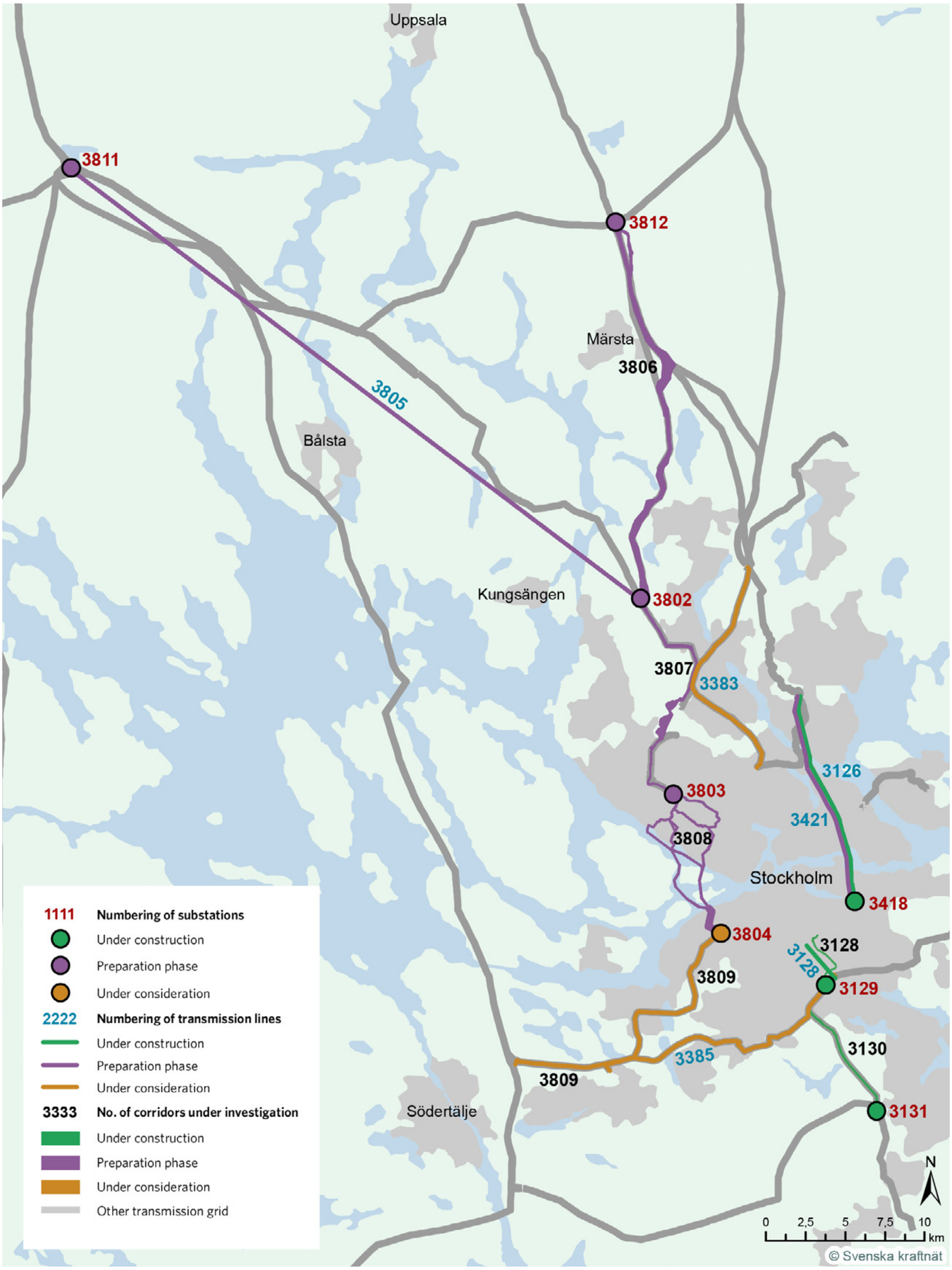
Projects in preparation phase

NO.	Project	Commissioned	Cost (MSEK)	Driving force
3812	Odensala 400 kV om- och utbyggnad	2026	260	System Reinforcement
3803	Beckomberga ny 400 kV-station	2027	500	System Reinforcement
3806	Odensala–Överby ny 400 kV-ledning	2027–2028	1,200	System Reinforcement
3802	Överby ny 400 kV-station	2027–2029	500	System Reinforcement
3421	Anneberg–Skanstull Kabelsystem 400 kV	2028	2,000	System Reinforcement
3808	Beckomberga–Bredäng ny 400 kV-ledning	2028	1,000	System Reinforcement
3811	Hamra 400 kV om- och utbyggnad	2028	310	System Reinforcement
3807	Överby–Beckomberga ny 400 kV-ledning	2028	2,000	System Reinforcement
3805	Hamra–Överby ny 400 kV-ledning	2030	800	System Reinforcement

Projekt under övervägande

NO.	Project	Start preparation phase	Commissioned	Cost (MSEK)	Driving force
3385	Lindhov–Högdalen rivning inkl omkoppling Hågelby	2022	2023	5–25	Reinvestment
3804	Bredäng ny 400 kV-station	2022	2027	500–1,000	System Reinforcement
3383	Hagby–Järva Rivning	2026	2028	5–25	Reinvestment
3809	Bredäng–Kolbotten ny 400 kV-ledning	2022	2030	1,000–2,000	System Reinforcement

Stockholms Ström and Storstockholm Väst



Västkustpaketet

Projects under construction

NO.	Project	Commissioned	Cost (MSEK)	Driving force
4425	Hurva-Sege ledningsförnyelse	2021–2022	600	System Reinforcement

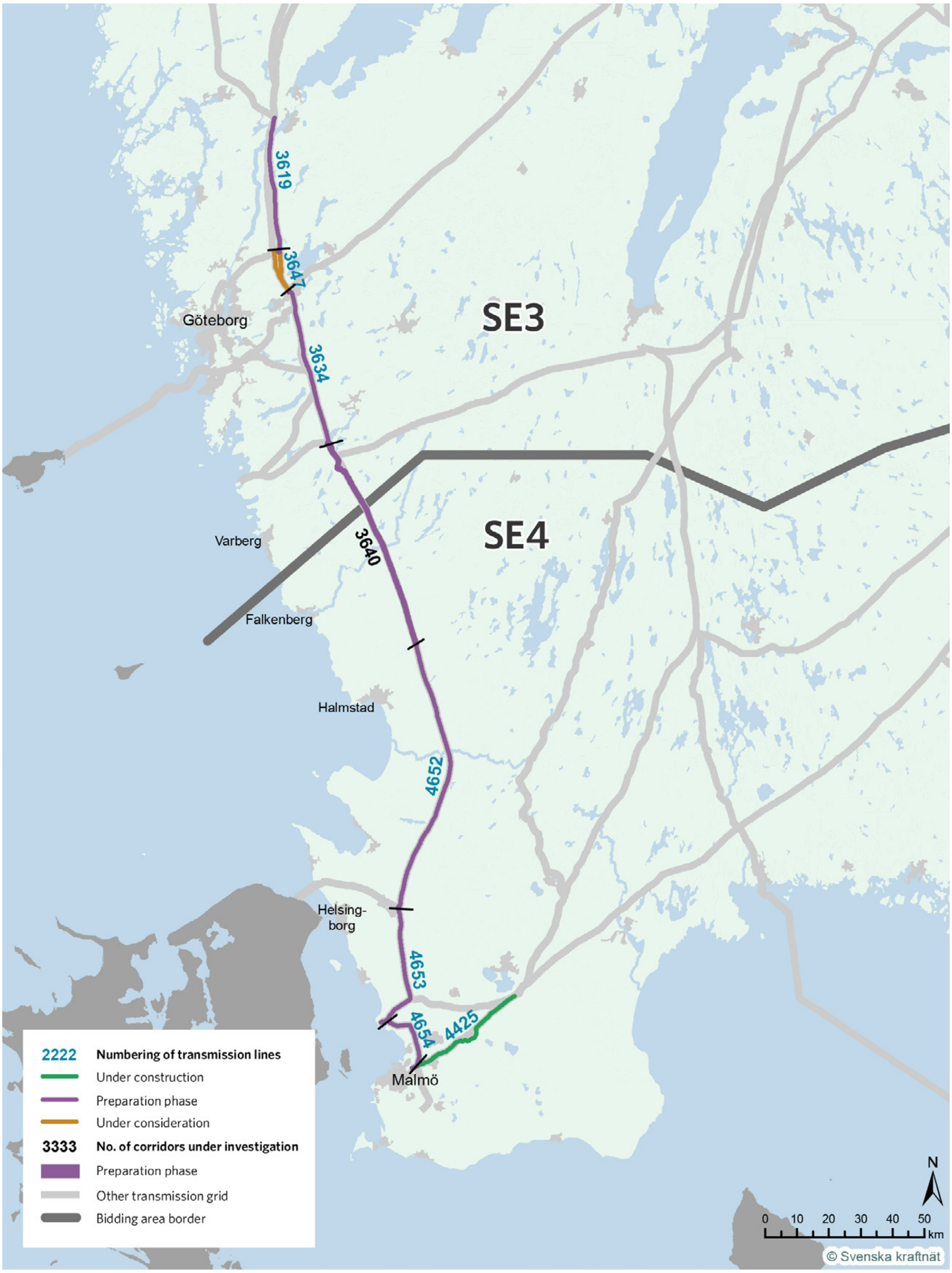
Projects in preparation phase

NO.	Project	Commissioned	Cost (MSEK)	Driving force
4654	Barsebäck–Sege ledningsförnyelse	2023	420	Reinvestment
4653	Söderåsen–Barsebäck ledningsförnyelse	2024–2025	650	Reinvestment
4652	Breared–Söderåsen ledningsförnyelse	2026	800	Reinvestment
3640	Horred–Breared ledningsförnyelse	2028	1,050	Reinvestment
3634	Stenkullen–Horred ledningsförnyelse	2029–2030	700	Reinvestment
3619	Skogssäter–Kilanda ledningsförnyelse	2030–2031	650	Reinvestment

Projects under consideration

NO.	Project	Start preparation phase	Commissioned	Cost (MSEK)	Driving force
3647	Kilanda–Stenkullen ledningsförnyelse	2021	2030	700	Reinvestment

Västkustpaketet



NordSyd

Uppsalabenet

NO.	Project	Phase	Commissioned	Cost (MSEK)
	Uppsalapaketet	Preparation phase		
11	Odensala installation av tillfällig transformator		2024	220
12	Bredåker–Plenninge ledningsförnyelse		2028	110
13	Bredåker–Hovgården förnyelse 220 kV-ledning		2029	90
14	Bredåker–Hovgården ny 220 kV-ledning		2029	80
15	Hovgården ny 400 kV-station		2029–2030	500–1,000
16	Mehedeby–Hovgården ny 400 kV-ledning		2029–2030	1,550
17	Hovgården–Odensala ny 400 kV-ledning		2030–2031	750
18	Plenninge–Vedyxa ny 220 kV-ledning		2030	25
19	Vedyxa ny 400 kV-station		2030–2031	250–500
-	Plenninge–Odensala avveckling 220 kV-ledning		2033	25–100
-	Untra–Bredåker avveckling 220 kV-ledning		2033	100–250
	Sollefteåpaketet	Preparation phase		
21	Nässe ny station		2025–2029	420
22	Betåsen–Nässe ny 400 kV-ledning		2028–2029	550
23	Kilforsen–Ramsele kapacitetsuppgradering		2029	250–500
-	Utbyggnad av Hjälta/Nässe och anslutning till Odensala		2029	25–100
31	**Kustpaketet**	Under consideration	2027–2037	> 10,000

Västeråsbenet

NO.	Project	Phase	Commissioned	Cost (MSEK)
	Västeråspaketet del 1	Preparation phase		
41	Himmeta förnyelse och spänningshöjning		2024–2025	250
42	Karlslund 400 kV-stationsombyggnad		2024–2025	20
43	Munga–Bysingsberg ny 400 kV-ledning		2028	310
44	Munga–Hamra ny 400 kV-ledning		2028–2029	700
-	Horndal–Finnslätten, avveckling		2032–2033	100–250
	Ockelbopaketet	Preparation phase		
51	Horndal stationsförnyelse		2025–2026	220
52	Munga ny 400 kV-station		2028–2029	240
53	Grönviken, utbyggnad av 400 kV-station		2029–2030	25–100
54	Fallviken ny 400 kV-station		2030–2031	250–500
55	Fallviken–Horndal ny 400 kV-dubbelledning		2030–2031	1,000–2,000
56	Grönviken utbyggnad		2030–2031	25–100
57	Grönviken–Fallviken ny 400 kV-enkelledning		2030–2031	250–500
58	Horndal ny 400 kV-station		2030–2031	490
59	Horndal–Munga ny 400 kV-dubbelledning		2031–2032	1,500
-	**Västeråspaketet del 2**	Under consideration	2026–2034	750
-	**Laforsenpaketet**	Under consideration	2029–3033	500–1 000
61	**Inlandspaketet**	Under consideration	2029–3037	8,000–9,000

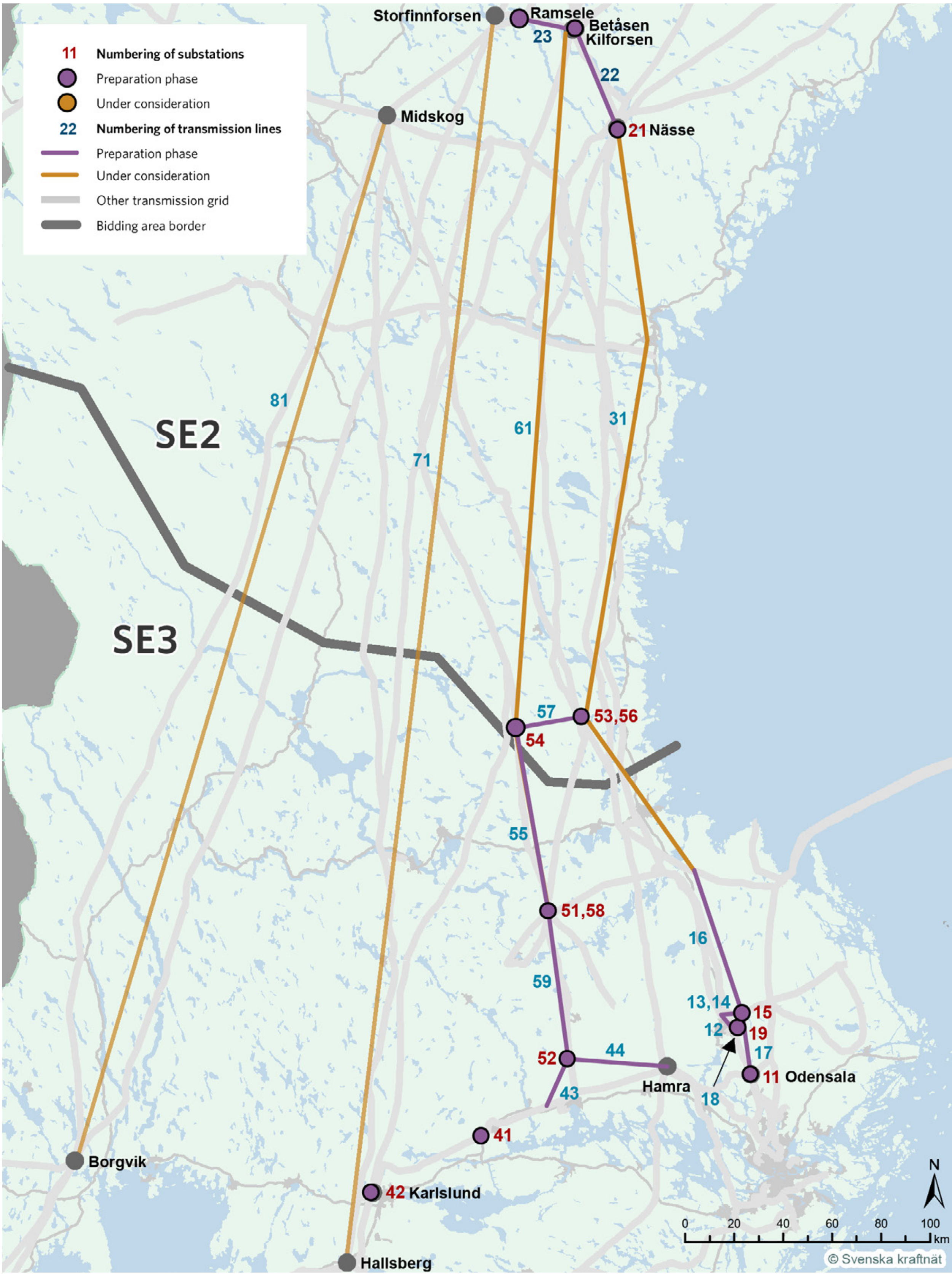
Hallsbergbenet

NO.	Project	Phase	Commissioned	Cost (MSEK)
71	**Hallsbergsbenet**	Under consideration	2037–	> 10,000

Karlstadbenet

NO.	Project	Phase	Commissioned	Cost (MSEK)
81	**Karlstadsbenet**	Under consideration	2035–	> 10,000

NordSyd


11 Numbering of substations
Preparation phase
Under consideration
22 Numbering of transmission lines
Preparation phase
Under consideration
Other transmission grid
Bidding area border
Storfinnforsen
Ramsele
Betåsen
Kilforsen
23
22
Midskog
21 Nässe
SE2
SE3
81
71
61
31
57
53,56
54
55
51,58
16
59
13,14
15
12
19
17
52
44
Hamra
11 Odensala
43
18
41
Borgvik
42 Karlslund
Hallsberg
N
0 20 40 60 80 100 km
© Svenska kraftnät

Connections under consideration

Consumption

NO.	Project	Bidding area
1541	Hybrit - Elektrifiering av industri anslutning av förbrukning	SE1
2965	Midskog anslutning förbrukning	SE2
2533	Kattstrupeforsen anslutning av förbrukning	SE2
3586	Hedenlunda ny 400/130 kV-anslutning	SE3
3356	Ängsberg ny 130 kV-anslutning	SE3
4523	Söderåsen ny systemtransformator	SE4

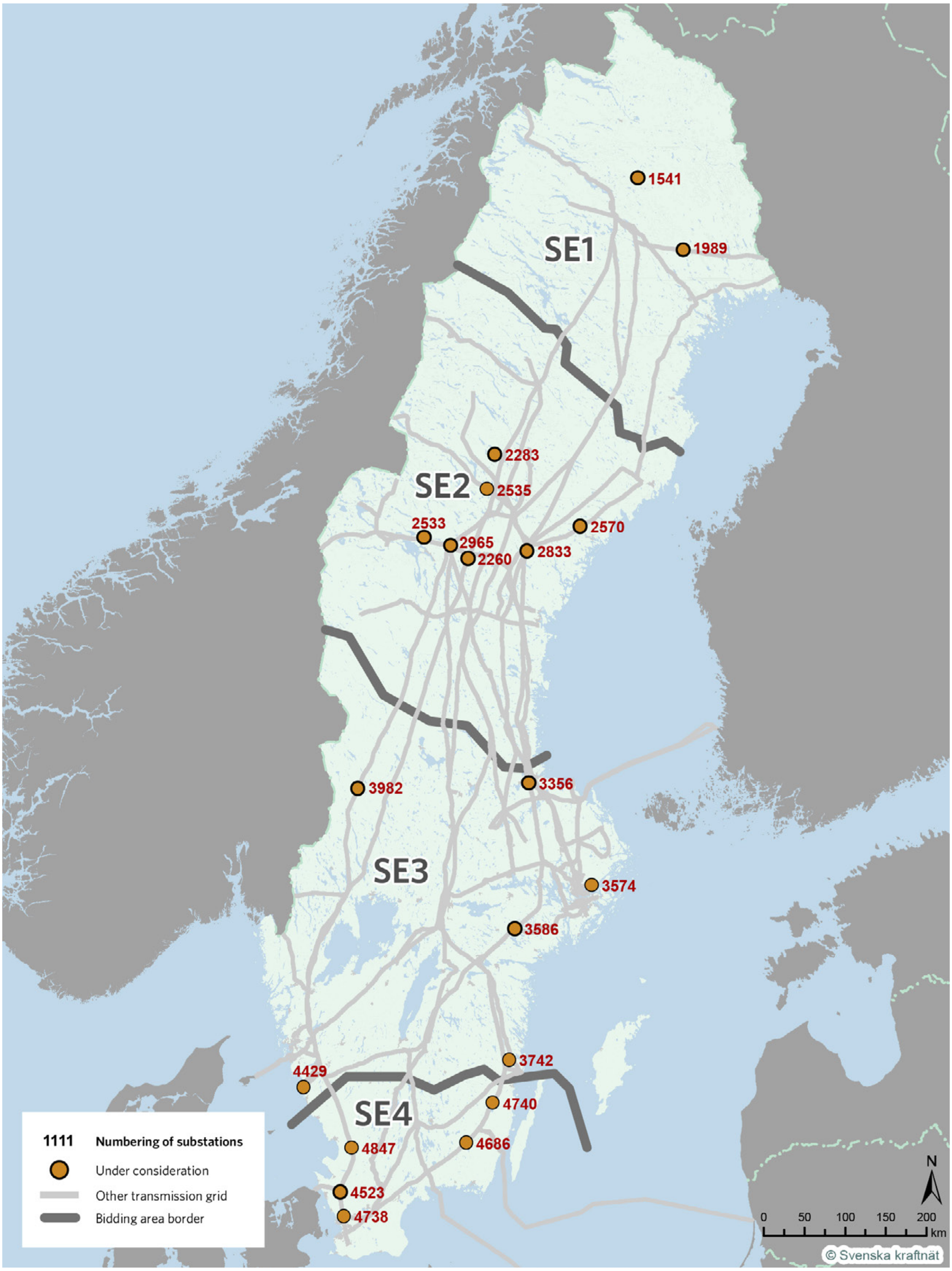
Wind power on shore

NO.	Project	Bidding area
1989	Pålkem (Hällberget) anslutning vindkraft	SE1
2570	Moliden anslutning transformator	SE2
2833	Nässe anslutning	SE2
2260	Midskog anslutning vindkraft	SE2
2535	Långbjörn–Havsnäs anslutning vindkraft	SE2
2283	Långbjörn–Korsselbränna anslutning vindkraft	SE2
3982	Tandö ny 400 kV-station anslutning vindkraft	SE3

Wind power offshore

NO.	Project	Bidding area
3574	Offshore vind SE3 öst	SE3
3742	Ekhyddan Nord anslutningsstation havsbaserad vindkraft	SE3
4686	Blekinge anslutningsstation havsbaserad vindkraft	SE4
4847	Skogaby anslutningsstation havsbaserad vindkraft	SE4
4738	Skånes sydkust anslutningsstation havsbaserad vindkraft	SE4
4429	Väröbacka anslutningsstation havsbaserad vindkraft	SE4
4740	Öland anslutningsstation havsbaserad vindkraft	SE4

Connections under consideration



Project in bidding area SE1

Projects under construction

NO.	Project	Commissioned	Cost (MSEK)	Driving force
1054	Porjusberget stationsförnyelse	2018–2022	210	Reinvestment
1519	Harsprånget–Ligga opto	2020–2022	15	Reinvestment
1514	Porjus–Grundfors opto och statusåtgärder	2021–2023	110	Reinvestment
1132	Harsprånget stationsförnyelse	2022	370	Reinvestment
1525	Vargfors–Tuggen statusåtgärder	2022	80	Reinvestment

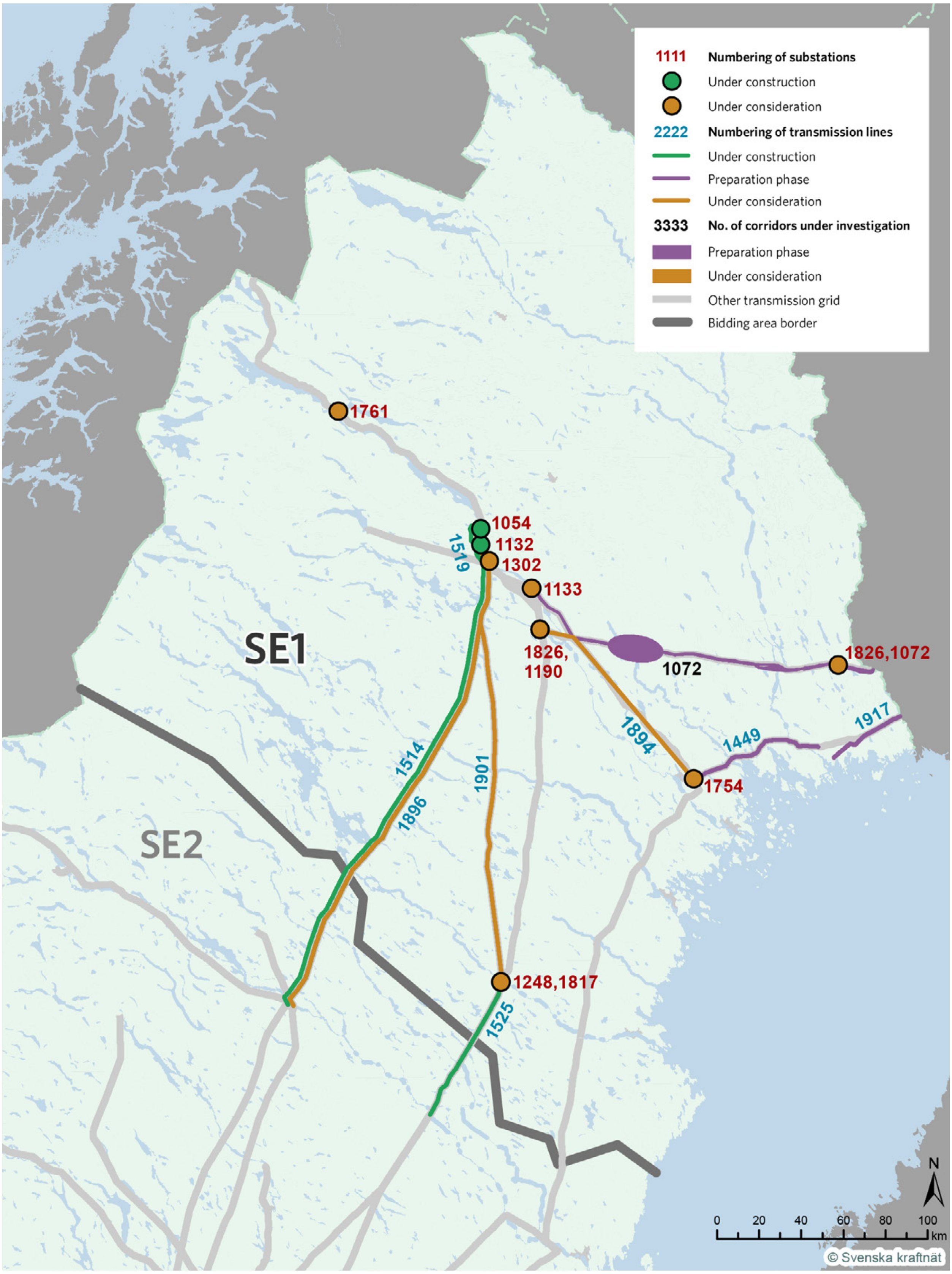
Projects in preparation phase

NO.	Project	Commissioned	Cost (MSEK)	Driving force
1917	Kalix–Finska gränsen markåterställning	2022–2023	20	Reinvestment
1449	Svartbyn–Djuptjärn opto	2023–2024	10	Reinvestment
1072	Aurora Line, ny 400 kV-växelströmsförbindelse SE-FI	2025–2026	2,100	Market Integration

Projects under consideration

NO.	Project	Start preparation phase	Commissioned	Cost (MSEK)	Driving force
1133	Messaure stationsförnyelse	2022	2025	100–250	Reinvestment
1754	Svartbyn stationsförnyelse	2022	2025	100–250	Reinvestment
1190	Letsi stationsförnyelse	2022	2026	100–250	Reinvestment
1302	Ligga stationsförnyelse	2022	2026	100–250	Reinvestment
1826	Seriekondensatorstationer med anslutning Letsi–Finland	2022	2026	100–250	System Reinforcement
1248	Vargfors stationsförnyelse	2023	2026	100–250	Reinvestment
1761	Vietas stationsförnyelse	2023	2026	100–250	Reinvestment
1894	Ny 400 kV-ledning till Svartbyn	2022	2033	1,000–2,000	System Reinforcement
1817	Vargfors uttag ny ledning till Skellefteå	2022	2033	500–1,000	System Reinforcement
1901	Ligga–Vargfors ledningsförnyelse	2027	2037	2,000–3,000	Reinvestment
1896	Porjus–Grundfors ledningsförnyelse	2027	2037	3,000–4,000	Reinvestment

Bidding area SE1



Project in bidding area SE2

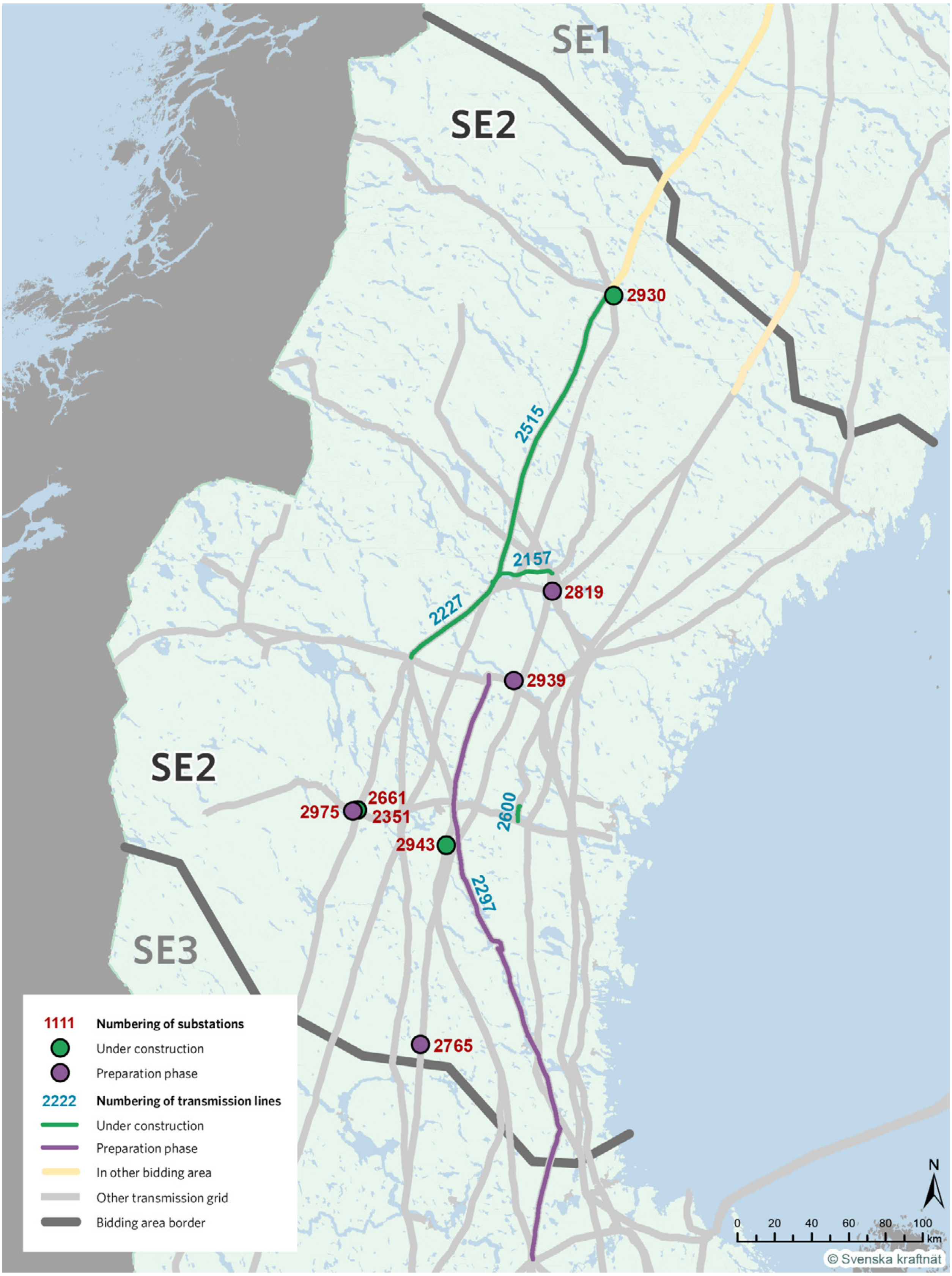
Projects under construction

NO.	Project	Commissioned	Cost (MSEK)	Driving force
2351	Rätan förnyelse omstrukturering och anslutning vindkraft	2019–2025	430	Reinvestment
2515	Grundfors–Storfinnforsen opto och statusåtgärder	2021–2022	45	Reinvestment
2157	Långbjörn–Storfinnforsen ny 400 kV-ledning	2021–2022	550	System Reinforcement
2930	Grundfors stationsförnyelse och anslutning vindkraft	2022–2023	390	Reinvestment
2661	Reaktor Rätan	2022	60	System Reinforcement
2227	Storfinnforsen–Midskog ledningsförnyelse	2022	700	System Reinforcement
2600	Torpshammar-avgr Torpshammar ledningsförnyelse	2022–2023	100	Reinvestment
2943	Tovåsen ny 400 kV-station	2022	180	Connection

Projects in preparation phase

NO.	Project	Commissioned	Cost (MSEK)	Driving force
2975	Rätan kraftstation upprustning fundament	2022	10	Reinvestment
2819	Betåsen anslutning Krange Vind-klustret	2024	30	Connection
2297	Krångede–Horndal livslängdsförlängning	2025–2026	310	Reinvestment
2765	Gäddtjärn ny 400 kV-station med seriekondensator	2026	330	Connection
2939	Hammarstrand ny station	2026	70	Connection

Bidding area SE2



Project in bidding area SE2

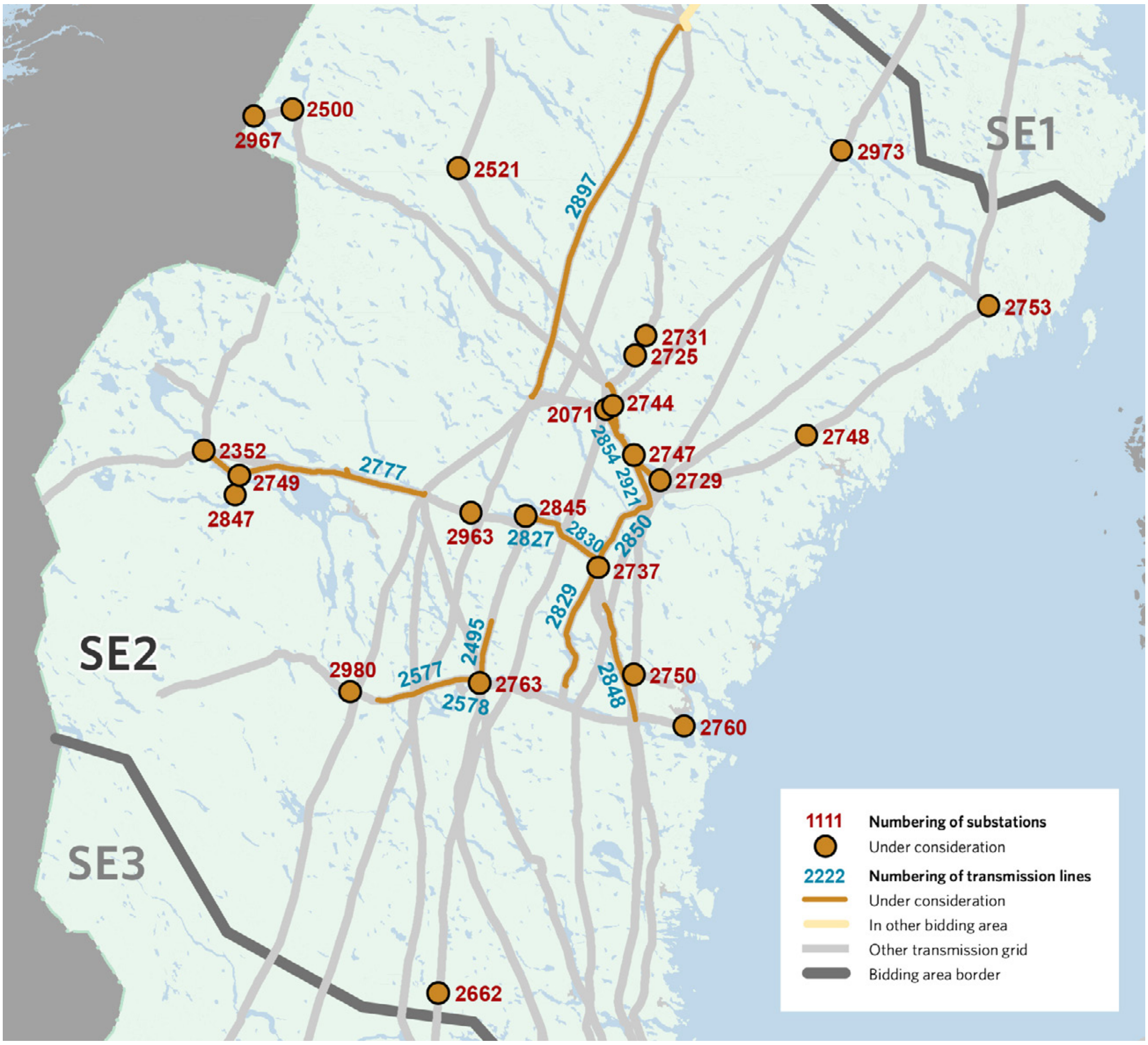
Projects under consideration

NO.	Project	Start preparation phase	Commissioned	Cost (MSEK)	Driving force
2521	Korsselbränna förnyelse och utbyggnad	2022	2024	25–100	Reinvestment
2753	Stornorrfors stationsförnyelse	2022	2024–2025	100–250	Reinvestment
2500	Blåsjön ny reaktor	2023	2025	25–100	System Reinforcement
2071	Kilforsen stationsförnyelse	2022	2025	250–500	Reinvestment
2980	Rätan stationsförnyelse	2023	2025	25–100	Reinvestment
2725	Degerforsen stationsförnyelse	2023	2026	25–100	Reinvestment
2729	Forsmo stationsförnyelse	2023	2026	25–100	Reinvestment
2737	Hölleforsen stationsförnyelse	2023	2026	100–250	Reinvestment
2744	Lasele stationsförnyelse	2022	2026	100–250	Reinvestment
2662	Seriekondensatorstationer med anslutning Betåsen–Hallsberg	2023	2026–2027	100–250	System Reinforcement
2760	Vaple stationsförnyelse	2022	2026	100–250	Reinvestment
2731	Gulsele stationsförnyelse	2024	2027	100–250	Reinvestment
2747	Moforsen stationsförnyelse	2023	2027	25–100	Reinvestment
2578	Järnvägsforsen avgr-Ånge opto	2026	2028	5–25	Reinvestment
2749	Mörsil stationsförnyelse	2025	2028	100–250	Reinvestment
2577	Turinge–avgr Järnvägsforsen topplinebyte	2025	2028	5–25	Reinvestment
2827	Krångede–Gammelänge ledningsförnyelse	2022	2030	25–100	Reinvestment
2967	Linnvasselv stationsförnyelse	2026	2030	25–100	Reinvestment
2748	Moliden stationsförnyelse	2025	2030	25–100	Reinvestment
2830	Stadsforsen–Krångede ledningsförnyelse	2022	2030	250–500	Reinvestment
2495	Bräcke–Ånge Ledningsförnyelse	2023	2031	250–500	Reinvestment
2854	Forsmo–Lasele–Långbjörn ledningsförnyelse	2023	2031	500–1,000	Reinvestment
2777	Midskog–Järpströmmen 220 kV uppgradering till 400 kV	2022	2031	1,000–2,000	System Reinforcement
2973	Tuggen stationsförnyelse	2026	2031	25–100	Reinvestment
2848	Stadsforsen Hällsjö ledningsförnyelse	2024	2032	500–1,000	Reinvestment
2963	Stugun stationsförnyelse	2027	2032	25–100	Reinvestment
2763	Ånge stationsförnyelse	2027	2032	100–250	Reinvestment
2845	Krångede stationsförnyelse	2029	2033	100–250	Reinvestment
2750	Nysäter stationsförnyelse	2028	2033	100–250	Reinvestment

Project in bidding area SE2

Projects under consideration

NO.	Project	Start preparation phase	Commissioned	Cost (MSEK)	Driving force
2829	Stadsforsen–Torpshammar ledningsförnyelse	2024	2033	500–1,000	Reinvestment
2847	Sällsjö stationsförnyelse	2028	2033	25–100	Reinvestment
2352	Järpströmmen 220 kV-stationsförnyelse	2029	2034	100–250	Reinvestment
2850	Stadsforsen–Hjälta kraftstation ledningsförnyelse	2026	2034	250–500	Reinvestment
2897	Grundfors–Storfinnforsen ledningsförnyelse	2027	2037	2,000–3,000	Reinvestment
2921	Kilforsen–Hjälta ledningsförnyelse	2030	2038	500–1,000	Reinvestment
2946	Kvarken ny HVDC-förbindelse SE2-FI	2029	2040	2,000–3,000	Market Integration



Project in bidding area SE3

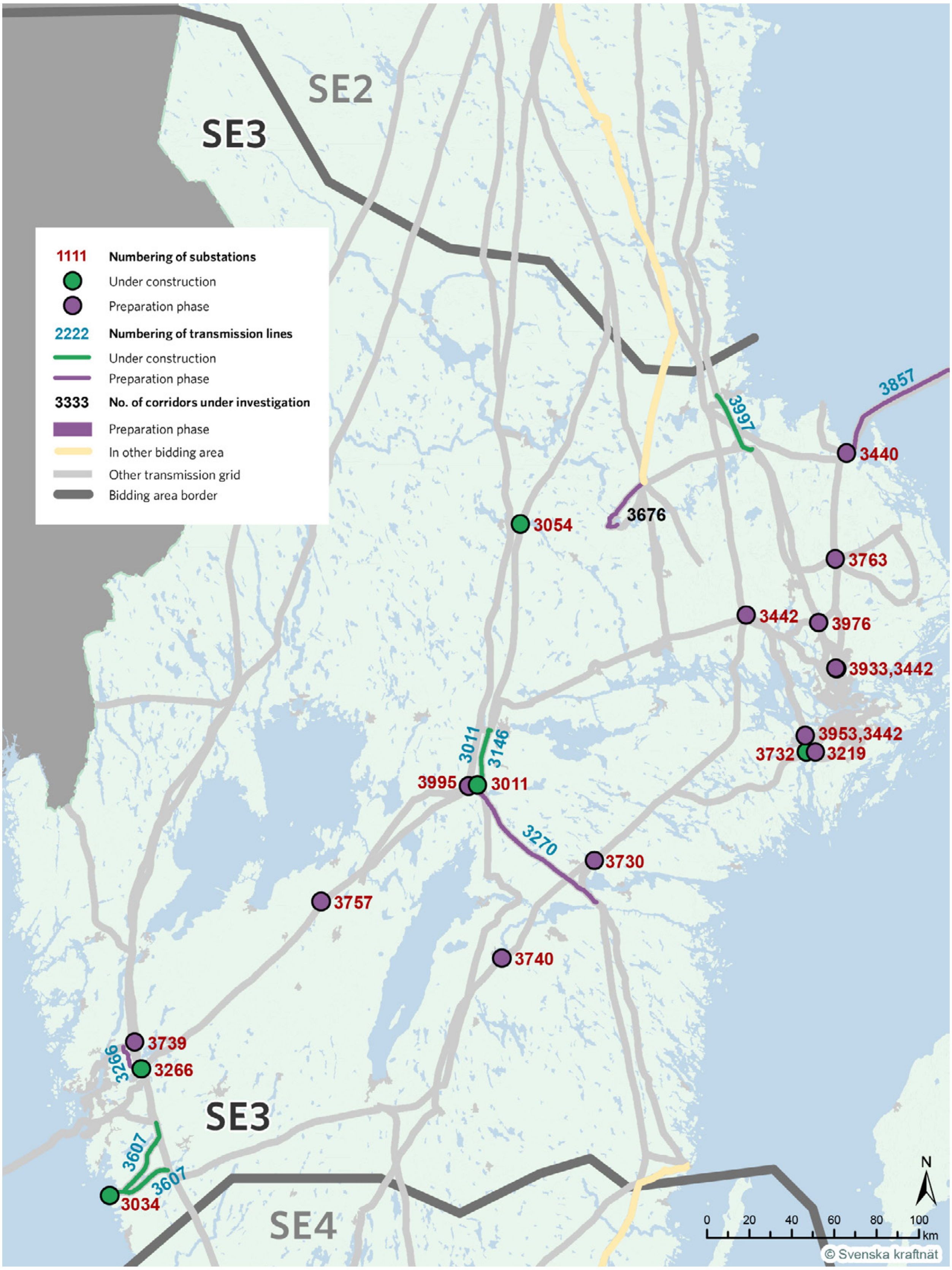
Projects under construction

NO.	Project	Commissioned	Cost (MSEK)	Driving force
3607	Strömma–Ringhals statusåtgärder	2020–2022	100	Reinvestment
3011	Avveckling 220 kV-nätet kring Hallsberg	2022	90	Reinvestment
3146	Lindbacka–Östansjö ny 400 kV-ledning	2022	360	System Reinforcement
3054	Morgårdshammar shuntkondensator och kontrollanläggning	2022	50	System Reinforcement
3034	Ringhals stationsförnyelse	2022–2024	220	Reinvestment
3997	Valbo–Untra högtemperaturlina	2022	100	System Reinforcement
3732	Hall stationsförnyelse	2023	280	System Reinforcement

Projects in preparation phase

NO.	Project	Commissioned	Cost (MSEK)	Driving force
3270	Hallsberg–Kimstad anpassning	2022–2023	45	Reinvestment
3933	Hagby ny 400/130 kV-anslutning	2023	40	Connection
3995	Hallsberg installation av shuntkondensatorer	2023–2024	35	System Reinforcement
3953	Kolbotten nya 400/130 kV-transformeringar	2023	15	Connection
3757	Timmersdala stationsförnyelse	2023–2024	110	Reinvestment
3440	Forsmark stationsförnyelse	2024–2025	120	Reinvestment
3442	Hamra förnyelse SVS-anläggning	2024–2025	220	Reinvestment
3266	Ingelkärr–Stenkullen ny 400 kV-ledning	2024–2025	500	System Reinforcement
3739	Kilanda stationsförnyelse	2024	170	Reinvestment
3740	Kolstad stationsförnyelse	2024	160	Reinvestment
3976	Odensala 400/130 kV-anslutning	2024–2025	50	Connection
3763	Tuna ny 400/220 kV-transformator	2024	250	System Reinforcement
3730	Glan stationsförnyelse och ny reaktor	2025	350	System Reinforcement
3219	Hall ny SVS-anläggning	2025–2026	230	System Reinforcement
3676	Horndal–Avesta ledningsförnyelse	2025	350	Reinvestment
3794	Ekhyddan–Nybro-Hemsjö ny 400 kV-ledning	2027	3,100	Market Integration
3857	Fenno-Skan 1 livslängdsförlängning	2032–2035	140	Reinvestment

Bidding area SE3

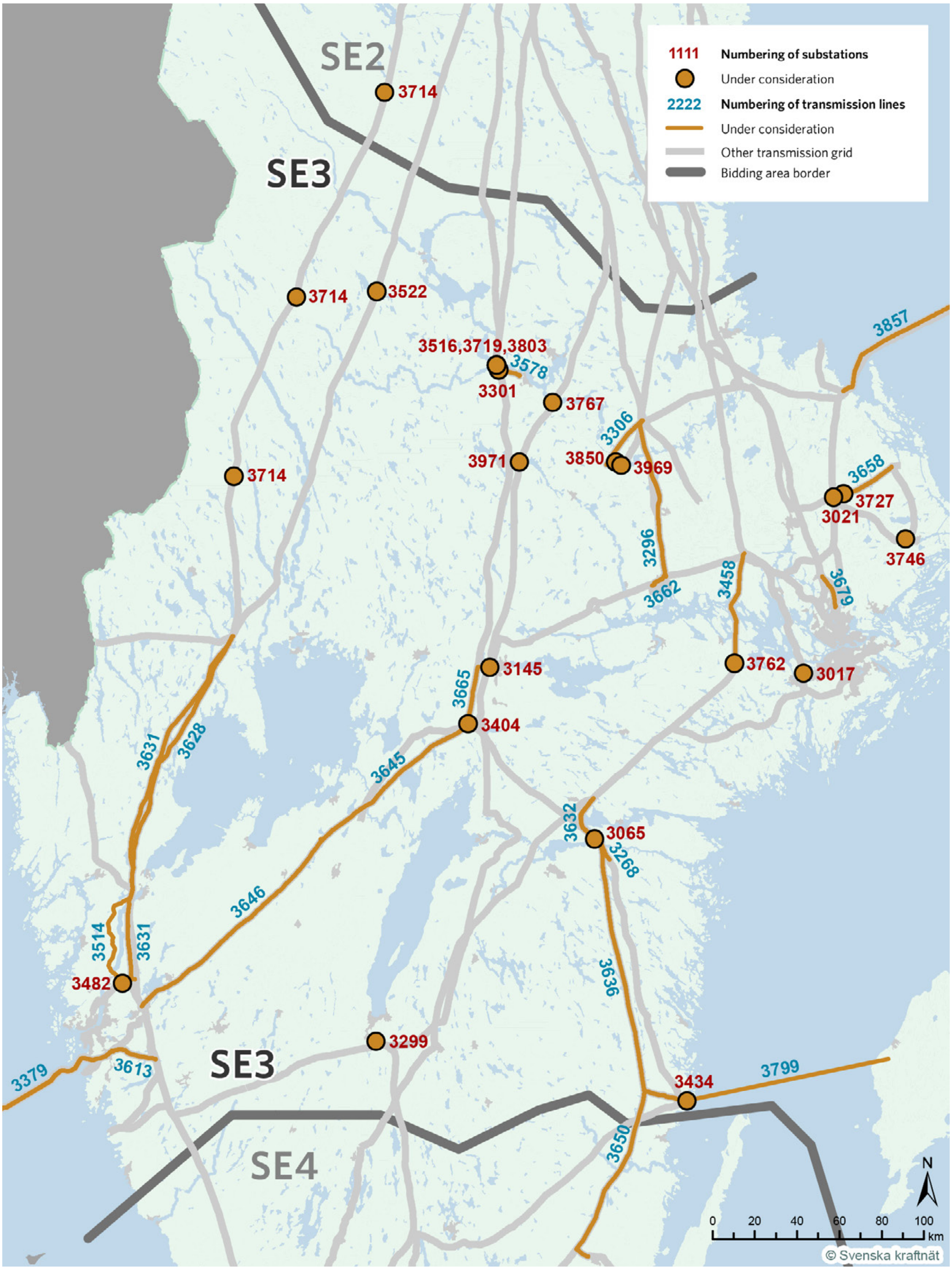


Project in bidding area SE3

Projects under consideration

NO.	Project	Start preparation phase	Commissioned	Cost (MSEK)	Driving force
3306	Tälle–Nässjö uppgrävning av kvarvarande fundament	2022	2023	100–250	Market Integration
3301	Bäsna stationsförnyelse	2022	2024-2025	100–250	Reinvestment
3296	Horndal–Finnslätten livslängdsförlängning	2022	2025	25–100	Reinvestment
3482	Ingelkärr ny 400 kV-station	2022	2025	100–250	System Reinforcement
3522	Kättbo stationsförnyelse	2022	2025	25–100	System Reinforcement
3299	Tenhult stationsförnyelse	2022	2025	100–250	Reinvestment
3762	Åker stationsförnyelse	2022	2025	100–250	Reinvestment
3714	Midskog–Borgvik Seriekondensatorstationer	2022	2026	250–500	System Reinforcement
3516	Djurmo stationsförnyelse	2023	2026	250–500	System Reinforcement
3727	Edinge stationsförnyelse	2023	2026	25–100	Reinvestment
3404	Hallsberg ny dynamisk shuntkompensering	2022	2026	100–250	System Reinforcement
3268	Kimstad anpassning ledningar vid Göta kanal	2022	2026	25–100	Reinvestment
3746	Malsta stationsförnyelse	2023	2026	25–100	Reinvestment
3803	Seriekondensatorstation med anslutning Storfinnforsen–Lindbacka	2023	2026	100–250	System Reinforcement
3767	Seriekondensatorstationer med anslutning Midskog–Karlslund	2023	2026	500–1,000	System Reinforcement
3021	Tuna 220 kV-stationsförnyelse	2024	2026	100–250	Reinvestment
3719	Avveckling Djurmo EK4	2023	2027	5–25	Reinvestment
3065	Kimstad stationsförnyelse	2022	2027	250–500	System Reinforcement
3578	Bäsna–Repbäcken ny 400 kV-ledning och nytt fack i Bäsna	2022	2028	100–250	System Reinforcement
3658	Edinge–Gråska opto	2025	2028	5–25	Reinvestment
3434	Ekhyddan ny dynamisk kompenseringsanläggning	2023	2028	250–500	System Reinforcement
3514	Skogssäter–Ingelkärr ny 400 kV-ledning	2022	2028	500–1,000	System Reinforcement
3613	Strömma–Lindome–Billdal opto	2023	2028	5–25	Reinvestment
3662	Finnslätten–Himmeta opto	2027	2030	5–25	Reinvestment
3665	Hallsberg-Lindbacka-opto	2027	2030	5–25	Reinvestment
3017	Kolbotten 400 kV-stationsförnyelse	2023	2030	250–500	Reinvestment

Bidding area SE3

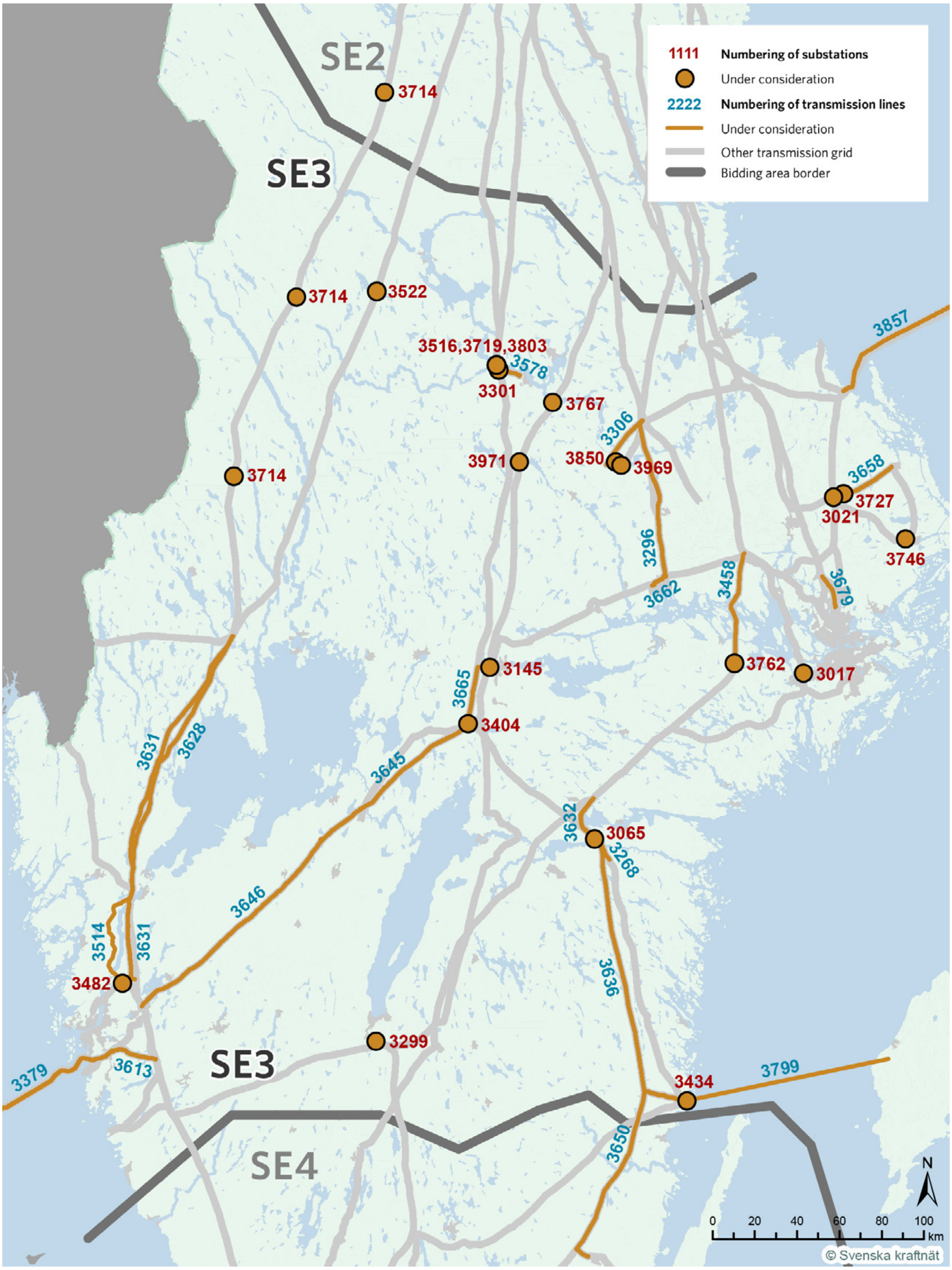


Project in bidding area SE3

Projects under consideration

NO.	Project	Start preparation phase	Commissioned	Cost (MSEK)	Driving force
3379	Konti-Skan 1 förnyelse likströmsförbindelse	2022	2030	3,000–4,000	Reinvestment
3969	Krylbo stationsförnyelse	2026	2030	25–100	Reinvestment
3850	Avesta stationsförnyelse	2027	2031	25–100	Reinvestment
3628	Borgvik–Skogssäter ledningsförnyelse	2023	2031	1,000–2,000	Reinvestment
3650	Ekhyddan–Nybro ledningsförnyelse	2023	2032	1,000–2,000	System Reinforcement
3145	Lindbacka 400 kV-stationsförnyelse	2027	2032	100–250	Reinvestment
3679	Måby–Hagby ledningsförnyelse	2026	2032	25–100	Reinvestment
3799	Gotland ny kabel	2023	2033	3,000–4,000	System Reinforcement
3971	Morgårdshammar stationsförnyelse	2028	2033	100–250	Reinvestment
3636	Glan–Ekhyddan ledningsförnyelse	2024	2034	2,000–3,000	Reinvestment
3631	Skogssäter–Kilanda ledningsförnyelse del 2	2028	2038	500–1,000	Reinvestment
3632	Glan–Kimstad ledningsförnyelse	2027	2039	250–500	Reinvestment
3645	Hallsberg–Timmersdala ledningsförnyelse	2029	2039	1,000–2,000	Reinvestment
3646	Timmersdala–Stenkullen ledningsförnyelse	2029	2039	1,000–2,000	Reinvestment
3857	Fenno-Skan 1 förnyelse likströmsförbindelse	2029	2040	2,000–3,000	Market Integration
3458	Hamra–Åker ledningsförnyelse	2031	2041	500–1,000	Reinvestment

Bidding area SE3



Project in bidding area SE4

Projects under construction

NO.	Project	Commissioned	Cost (MSEK)	Driving force
4288	Hageskruv ny 400 kV-station	2023	130	Connection

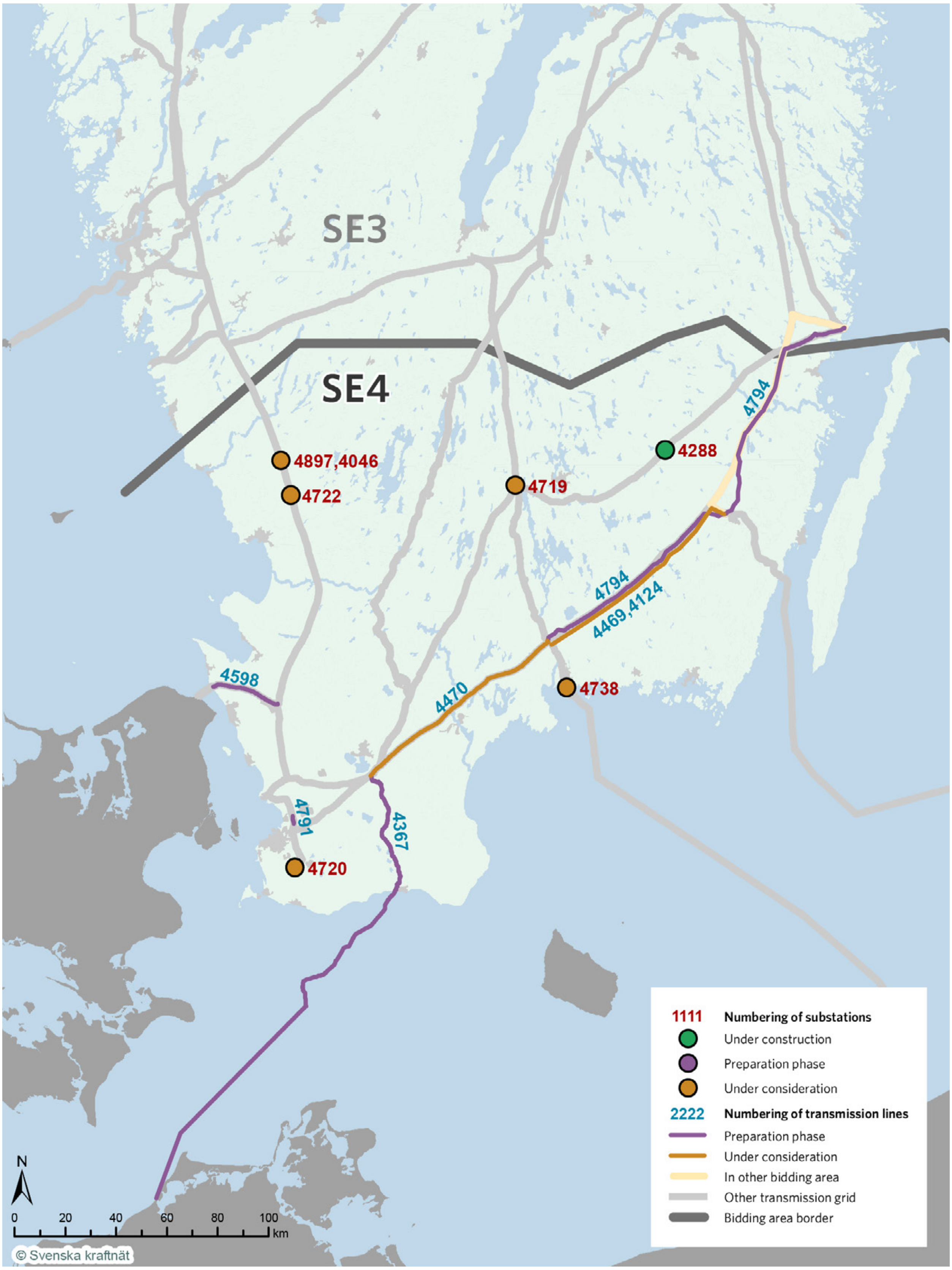
Projects in preparation phase

NO.	Project	Commissioned	Cost (MSEK)	Driving force
4791	Staffanstorp ledningsflytt Sege–Barsebäck	2023	10	Reinvestment
4367	Hansa PowerBridge	2025–2027	3,600	Market Integration
4598	Danmark–Sverige Kabelförband förnyelse	2029	60	Reinvestment

Projects under consideration

NO.	Project	Start preparation phase	Commissioned	Cost (MSEK)	Driving force
4046	Häradsbo åtgärda skruvningar	2022	2023	5-25	Reinvestment
4897	Häradsbo, ny shuntkondensator	2022	2024	25–100	System Reinforcement
4722	Breared stationsförnyelse	2023	2026	100–250	Reinvestment
4738	Karlshamn stationsförnyelse	2024	2027	25–100	Reinvestment
4124	Nybro–Hemsjö topplinebyte	2025	2029	25–100	Reinvestment
4720	Arrie stationsförnyelse	2029	2034	100–250	Reinvestment
4719	Alvesta stationsförnyelse	2030	2035	100–250	Reinvestment
4469	Nybro–Hemsjö ledningsförnyelse	2025	2036	1,000–2,000	System Reinforcement
4470	Hemsjö–Hurva ledningsförnyelse	2026	2038	1,000–2,000	Reinvestment

Bidding area SE4



Revision of transmission lines and other projects

Revision of transmission lines

Project	Commissioned	Cost (MSEK)	Total length (km)
Ledningsrevisioner paket 0	2019–2024	100–150	700
Ledningsrevisioner paket 1	2020–2025	250–500	800
Ledningsrevisioner paket 2	2022–2027	250–500	1,700
Ledningsrevisioner paket 3	2024–2029	250–500	2,000

Other project in bidding area SE1-SE4

Project	Commissioned	Cost (MSEK)	Driving force
Förnyelse kontrollanläggningar	2019–2033	500–1,000	Reinvestment
Utbyte primärapparater	2020–2022	70	Reinvestment
Manöver reaktorbrytare i spänningslöst tillstånd	2021–2022	5	Reinvestment
Steg- och beröringsspänning	2021–2024	500–1,000	Reinvestment
Installation energimätare	2022	5	Reinvestment
Livslängdsförlängande stationsåtgärder paket 1	2022–2023	25–100	Reinvestment
Livslängdsförlängande stationsåtgärder paket 2	2022–2023	25–100	Reinvestment
Stödisolatorer komposit byte i flera stationer	2022–2026	40	Reinvestment
Stängsel byte och anpassning flera stationer	2025–2026	25–100	Reinvestment
Teknikbodar reservkraft flera stationer	2025	5–25	Reinvestment


N
NO4
Russia
SE1
Sweden
SE2
Finland
FI
NO3
NO5
NO1
Norway
NO2
Oslo
SE3
Stockholm
Helsinki
Tallinn
Estonia
EE
Riga
Latvia
LV
SE4
DK1
Denmark
DK2
Copenhagen
Lithuania
LT
Vilnius
Russia
Belarus
Nether-
lands
Germany
Poland
0
100
200 km

The transmission grid for electricity 2021

The Swedish transmission grid consists of about 16,000 km power lines, more than 175 transformer and switching substations as well as AC and HVDC interconnectors.

Svenska kraftnät
Phone: +46 10-475 80 00
Fax: +46 10-475 89 50
www.svk.se
E-mail: registrator@svk.se