National Electrification Strategy

– a secure, competitive and sustainable electricity supply for a historic climate transition

A summary

Government Offices of Sweden

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National Electrification Strategy

A new wave of electrification has begun. The scale of this can be compared to the electrification of society and the extensive expansion of the electricity system that took place in the 20th century through the expansion of hydroelectric power, nuclear power and Sweden's high-voltage networks.

However, the electrification of today poses a more complex challenge. Investments in existing and new technology in the electricity system will be made by a variety of players in a competitive electricity market or in an electricity network monopoly, where conditions to be met are dependent at the same time on similar development in the Nordic countries, the EU and the rest of the world.

"Electrification is crucial to achieving climate goals."

Electrification is crucial to achieving climate goals. Two thirds of Sweden's greenhouse gas emissions come from transport and industry. Car transport is now being electrified at a rapid pace. In the longer term, road transport should mainly be electrified. In industry, current climate transition plans indicate that electrification, partly through hydrogen, will be the single most important solution in the sector. The fact that Sweden and companies in Sweden are leading the way also enables the export of climate-smart products and new technology solutions capable of significantly reducing emissions in other countries. Electrification is, however, a means rather than an end. To attain Sweden's climate goals, energy and resource management and electrification are needed in several sectors in conjunction with a growing bioeconomy within sustainable limits, increased circularity, bio-CCS and, where there are no reasonable alternatives, CCS of fossil fuel emissions.

Electrification offers great opportunities for the whole of Sweden by creating new jobs and sustainable regional development. Initiative in different parts of the country have been highlighted during work on this strategy, and important regional efforts are underway linked to the electricity supply to enable electrification. Swedish innovations and research in the field of energy have historically led to both a better national electricity infrastructure and major export successes. Research and innovation will continue to be important for electrification in the future.

Electrification means a new situation for the electricity system, which is shifting from a managing phase to a highly expansive phase. The government agencies' assessments and long-term scenarios point to a sharp increase in the need for electricity by 2045, with the max-

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imum degree of electrification. The sharply increased future need for electric power must also be met. The pace at which the transmission network is expanded is already increasing dramatically, with investment tripling in the coming three-year period compared to previous years. The power generation mix is also changing, affecting the balance of the electricity system. Onshore wind power is the most competitive option today for new power generation, and investment decisions are made without subsidies. Continued rapid expansion of wind power is expected in the coming years. Energy efficiency and more efficient use of existing infrastructure can facilitate electrification by reducing the need for new power generation and new electricity networks. Electrification also needs to take advantage of the opportunities offered by further digitalisation. At the same time, many more components working together and connected to the internet in the electricity system mean greater vulnerability, which needs to be addressed both by the electricity industry and by society at large.

"Sweden's electricity supply must continue to represent a crucial competitive advantage."

Sweden's electricity supply must continue to represent a crucial competitive advantage. An electricity system with high security of supply, low environmental impact and competitively priced electricity has historically contributed to Sweden's prosperity and will continue to be crucial in the future. Maintaining this competitive advantage requires concerted effort to ensure that the electricity system can develop in line with needs. The sooner the fundamental conditions improve, the sooner industry and transport can be electrified and greater climate benefits can be achieved.

"Power and grid capacity challenges must be resolved."

Power and grid capacity challenges must be resolved. The electricity system needs to provide sufficient power when and where it is needed. Shortage of power and capacity must not preclude electrification. Swift action will be taken in the short term to address the local capacity shortages that are currently posing a challenge in parts of the country. At the same time, the pace of reform needs to be stepped up to prevent similar problems occurring later on. Action will be taken in three areas: more efficient use of existing network capacity, faster network expansion and secured power supply.

Electrification is taking place alongside equivalent development in the other Nordic countries and the EU. The importance of close cooperation in the Nordic region and the EU will increase. Account needs to be taken of the fact that Sweden's electricity system is part of a Nordic and northern European electricity market. According to high electrification scenarios in the Nordic countries, total electricity demand may increase by 65% by 2040. Electrification in other countries can have a major impact on the future expansion of power generation and the electricity networks in Sweden. The European Commission has recently proposed that the level of ambition be raised in a number of areas in order for energy policy to contribute to higher climate goals. Sweden needs to work proactively to shape the EU regulatory framework in a way that supports rather than hinders electrification nationally while benefiting from opportunities for EU funding.

Effective action is required at a new level with everyone contributing. This electrification strategy has been developed in broad collaboration with many community stakeholders. Broad collaboration must also be an important part of the work going forward. Stakeholders in both the public and private sectors need to contribute and pull in the same direction. Constructive cooperation in which everyone contributes based on their areas of responsibility will be crucial to attaining the overall vision.

Through this electrification strategy, the Government is adopting a holistic approach to the conditions that exist in the energy sector. The aim of the electrification strategy is to lay the foundation for widespread electrification that contributes to attaining the climate goals. At the same time, Sweden must have a robust electricity system with high security of supply, low environmental impact and competitively priced electricity. Due regard has been paid to the Electrification Commission's analysis and proposals regarding electrification of the transport sector. A concerted effort is now needed to complete a large number of ongoing processes, while new actions need to be developed and implemented.

The twelve areas of the Electrification Strategy lay the foundations for stepping up work on 67 actions to be implemented over the three-year period spanning 2022–2024. Some actions will be implemented by government agencies, for which the Government will return with separate decisions during the implementation period. Other actions will be dealt with by the Government Offices of Sweden. The Government intends to seek broad support for the focus presented in the strategy among the parties represented in the Riksdag. At the same time, implementation of the actions contained in this strategy will begin swiftly.

The twelve areas of the Electrification Strategy

Planning and cooperation

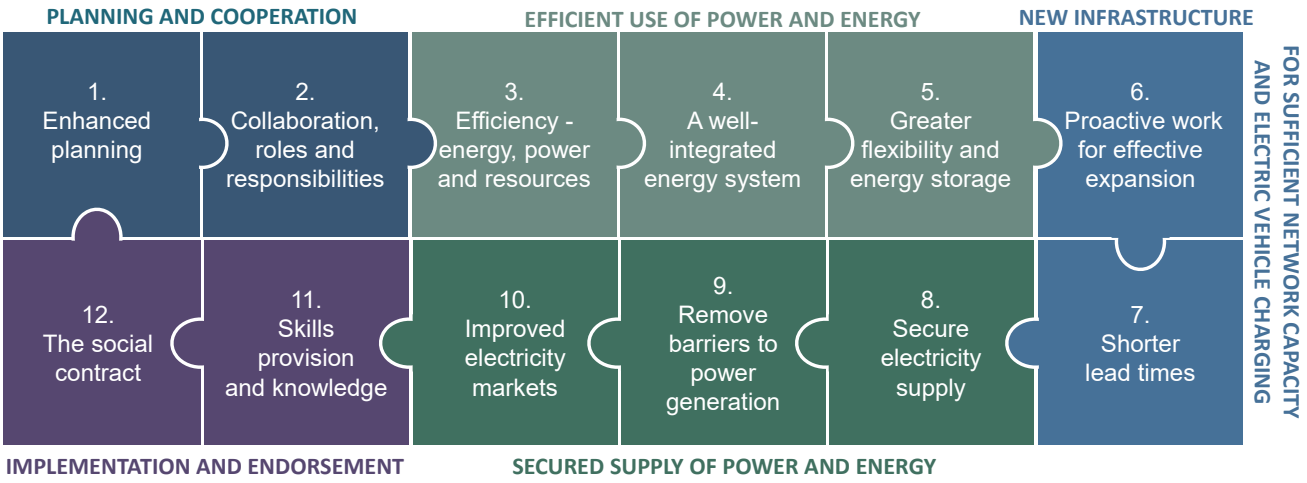
Electrification signifies the electricity system moving from a managing phase to a highly expansive phase. The government agencies' current scenarios point to a sharp increase in electricity demand by 2045. Enhanced planning and collaboration, with everyone pulling in the same direction, must help to clarify and meet future needs for electricity, power and network capacity.

1. Enhanced planning

The government agencies should develop their planning to meet a sharp increase in need for electricity by 2045. Their work must contribute to enabling the electricity system to develop in line with the increased need for electricity and electric power and in a manner consistent with the energy policy objectives adopted by the Riksdag[1]. Joint-agency analyses and scenarios can contribute to better planning and follow-up of electrification. The development of the electricity system should be endorsed in community planning based on national, regional and local electricity network planning, coordination of regional efforts, municipal energy planning and national interests in the energy field.

2. Collaboration, roles and responsibilities

The Government intends to establish an Electrification Council for continued collaboration between the public sector, industry and other community stakeholders to support effective implementation of the



[1]Energy policy focus (Govt Bill 2017/18:228, Report 2017/18:NU22, Government Communication 2017/18:411).

electrification strategy. The government commitment to respond to the rapid changes taking place in the electricity system is evolving. A review will be made of the roles and responsibilities of the government agencies in the field of energy.

Efficient use of power and energy

More efficient use of existing infrastructure and integrated energy systems can keep costs and resource use down while paving the way for more rapid electrification. More flexibility in the electricity system is needed to cope with a sharply increasing and more variable need for power.

3. Efficiency – energy, power and resources

The pace of energy efficiency improvements should be boosted for rapid, resource-efficient and environmentally sustainable electrification that also contributes to greater security of supply. The principle of energy efficiency first should guide electrification, and economically effective efficiency improvement measures must be put to use in all sectors. There is a special focus on measures to reduce peak loads.

4. A well-integrated energy system

A clear energy system perspective must guide electrification. The role of district heating and combined heat and power in the energy system and as a solution for local capacity shortages in electricity networks needs to be clarified and system benefits safeguarded. Fossil-free hydrogen is crucial to the climate transition of industry. Electrolysers need to be efficiently integrated with the energy system, and the potential for hydrogen storage to cost-effectively balance the electricity system of the future must be exploited. The Swedish Energy Agency's proposals for Sweden's national strategy for hydrogen, electrofuels and ammonia[2] are under discussion within the Government Offices of Sweden.

5. Greater flexibility and energy storage

More flexible use of electricity is crucial for electrification. The possibility of flexibility must be promoted in new connections of electricity-demanding activities, including electrolysers and data centres. A high degree of smart charging and flexible electric heating must be accomplished. The new EU Electricity Market Directive[3] is being implemented to remove barriers to new players and business models in the electricity market so that they can provide innovative solutions for greater flexibility. Digital solutions that can provide better management, analysis and optimisation must be promoted. Network tariffs will be developed to promote more efficient use of the electricity network.

[2]ER2021:34.
[3]Directive (EU) 2019/944 of the European Parliament and of the Council of 5 June 2019 on common rules for the internal market for electricity and amending Directive 2012/27/EU.

Photo: Niklas Forsström/Government Offices

New infrastructure for sufficient network capacity and electric vehicle charging

The transmission capacity of the electricity network needs to be increased significantly for large-scale electrification, while lead times for investments in electricity networks are too long in relation to the needs of industry. Electrification of transport requires both sufficient network capacity and access to charging infrastructure.

6. Proactive work for effective expansion

Proactive work is needed for the efficient expansion of electricity networks and charging infrastructure based on a clearer picture of needs and to avoid capacity shortages in the future. The rate of investment in the transmission network must continue to increase and maximum transmission capacity must be maintained. A more proactive approach to the efficient expansion of the electricity network should be applied at all levels, and the conditions that need to be met for this should be clarified. At the same time, the costs of expanding the electricity network must be reasonable for electricity customers. Revenue regulation is being developed to meet future needs arising from electrification, balancing the interests of all stakeholders.

The charging infrastructure should be expanded at a pace such that it does not become an obstacle to the electrification of the transport sector. Electrically powered transport must be made possible throughout the country through a rapid, coordinated and economically efficient expansion of appropriate charging infrastructure. Another guiding

principle is that it must be easy to charge an electric vehicle, regardless of type of housing. An action programme for the expansion of charging infrastructure will be developed, as well as monitoring. Policy instruments and support for the expansion of charging infrastructure will be reviewed to ensure they are effective and appropriate.

7. Shorter lead times

A vision of halving lead times for new electricity networks on average by 2025 will be set. Broad collaboration on mutual actions with clear follow-up will be established. Following the Riksdag's decision in the Budget Bill (Govt Bill 2021/22:1 expenditure area 21) a decision was made to increase the resources of the reviewing agencies. More efficient, innovative and parallel working methods will be developed while maintaining environmental protection in order to increase the pace of ongoing network reinforcements. Regulatory frameworks will be developed for even shorter lead times, including by clarifying the choice between overhead and underground cables at different voltage levels.

Secured supply of power and energy

Sweden faces a sharp increase in need for electricity by 2045, while most of the existing power generation is reaching the end of its planned lifetime. The electricity supply needs to be able to cope with the power demand during all hours of the year so that electrification is not slowed down. The electricity market needs to be developed to ensure continued high security of supply and competitive electricity prices.

8. Secure electricity supply

The ability of the electricity system to cope with normal operation and crisis situations across the entire scale of threats needs to be maintained. A security of supply target in the form of a reliability standard will be introduced and complemented by a review of existing operational reliability targets. The power reserve has an important role to play in ensuring security of electricity supply and should be maintained for as long as it is needed and is compatible with the EU regulatory framework. Furthermore, the aim is for power generation in the power reserve to come from renewable energy sources. The ability to manage electricity crises will be developed through national efforts and international cooperation on preparedness issues.

9. Remove barriers to power generation

Barriers to the historic renewal and expansion of power generation will be removed. Knowledge must increase on realistic development pathways for power generation to meet the needs of the climate transition by 2045 through a robust, competitive and sustainable electricity supply. Electricity generation close to where electricity and power is needed can facilitate electrification. All safe, ecologically sustainable and climate-smart power generation can contribute to meeting the sharp increase in demand for electricity. Irrespective of the development of nuclear power, renewable power generation needs to increase significantly. Sweden must take advantage of unique conditions and continue to be a net exporter of electricity. Wind power has the potential to contribute a large amount of electricity quickly at low cost. The

conditions for offshore energy will improve. The ability of electricity generation to contribute power, support services and flexibility will be clarified and developed. Hydroelectric power has a key role to play in cost-effective electricity supply, especially with greater shares of variable power generation. The storage capacity and flexibility of hydroelectric power will be harnessed, while environmental considerations will be addressed through modern environmental permits.

10. Improved electricity market

The electricity market will be improved in both the short and long term. The electricity market must contribute to high security of supply and ensure efficient pricing. The electricity market will be strengthened in the short term through new EU legislation, enhanced support service markets and local flexibility markets to improve the investment climate. Better follow-up with electricity market checkpoints will be introduced, together with further analysis and intensified discussion on the future electricity market model in a Nordic and European perspective.

Implementation and endorsement

Secured skills provision is crucial for electrification and climate transition, which is otherwise at risk of being slowed down. The expansion of the electricity system needs to be better endorsed at different levels of society to increase acceptance.

11. Skills provision and knowledge

Electrification makes the energy sector and related sectors the industries of the future. The attractiveness of the energy sector must be further strengthened to ensure that skills shortages do not become an obstacle to electrification. The energy sector must be equal and inclusive for all, regardless of background. The Government intends to initiate a national effort in cooperation with the industry and with the support of the relevant agencies to achieve this. Boosting knowledge and innovation, as well as increasing transparency and accessibility of data and analyses, will strengthen Sweden's leading position in electrification, contributing to international competitiveness.

12. The social contract

A social contract and a society-wide vision for the construction of the future electricity system can increase participation and endorsement by local communities and citizens. Everyone who wants to must be able to contribute to the climate transition and electrification. There must be stronger incentives for municipalities to allow the establishment of wind power. The Government intends to conduct an inquiry into this and to continue to work on a broad basis with practical measures to increase acceptance and achieve greater endorsement by society. Electrification must take place in an ecologically sustainable way. It must be fair and equitable and benefit the whole country.

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