KOMMERSKOLLEGIUM
NATIONAL BOARD OF TRADE SWEDEN

Trade Policy for Electrification

How trade policy can contribute
to the electrification of Sweden's economy

2025

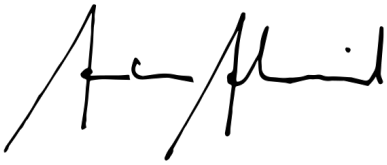
Preface

Electrification is a key strategy for achieving Sweden's climate goals, driving competitiveness, and reducing dependency on imported fossil fuels. Replacing technologies and processes in transport and industry that use fossil fuels with electrified alternatives is expected to lead to a large increase in electricity use. In turn, a vast increase in electricity generation from fossil-free sources and the expansion of transmission and vehicle charging infrastructures is needed. This will require skilled workers and huge volumes of imported materials, inputs, and products.

This study examines how international trade and trade policy can contribute to the electrification of Sweden's economy and help realise efficiencies that lead to lower-cost fossil-free electricity. The report focuses on trade and trade policy's contribution to the electrification of transport and industry and on measures to increase the supply of fossil-free electricity from wind and nuclear sources.

This report was written by Neil Swanson. Data analysis was conducted by Erik Merkus. Valuable comments and suggestions have been gratefully received from Anna Egardt and Anna Sabelström, National Board of Trade Sweden, and Cristofer Remar, Swedish Energy Agency. We would also like to thank the people that kindly gave their time to participate in interviews and answer our questions.

Stockholm, April 2025



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Summary

Electrification is a means to achieve Sweden's climate change goals by replacing fossil-fuel-dependent technologies with electrified alternatives. This will lead to a large increase in the demand for electricity, potentially more than doubling today's needs. In turn, a vast expansion of electricity generation from fossil-free sources, as well as transmission and vehicle charging infrastructures, is needed. Electrification requires skilled workers and huge volumes of imported materials and products.

We have identified several areas where trade policy can lower the costs of electrification and remove policy distortions that favour fossil fuels.

International trade is a prerequisite for electrification – without the import of raw materials, inputs, equipment, and specialist services, progress would grind to a halt. However, the sectors in focus for electrification are at the centre of trade frictions and debates over security concerns, industrial policy, and sustainability. For example, there is a risk that trade conflicts will emerge due to battery electric vehicle subsidies, border carbon adjustments, and supply chain concentration for critical raw materials.

Multilateral and single market trade rules should be followed and defended as they enable imports and functioning global value chains. Trade also gives rise to economies of scale, innovation, and technology transfers that lower the costs of electrification.

Policy makers should prioritise the conclusion and ratification of trade agreements to diversify supplies of critical raw materials needed in technologies for electrification. They should identify and remove non-tariff measures through existing and new trade agreements. Policy makers should seek synergies with development aid for sustainable and mutually beneficial trade partnerships with resource rich regions.

Trade barriers to goods and services raise the cost of electrification and should be removed. Our recommendations include harmonising requirements for wind turbines on the single market, removing most-favoured-nation tariffs on electric vehicles and trucks, and promoting international standardisation to avoid divergent standards for charging infrastructure and near-zero steel (steel that is manufactured with very low carbon dioxide emissions).

To incentivise electrification, policy makers should press for fossil fuel subsidy reform and commit to a stable European policy environment for carbon pricing and border carbon adjustments. They should also investigate opportunities for cooperation on rules for justifiable green subsidies. This could minimise trade distortions and avoid reversion to trade defence measures, which raise the prices of electric vehicles.

In addition, we found that the implementation of rules for the cross-border transport of dangerous goods, hazardous wastes, and used goods are impeding recycling efforts for batteries, metals, and used turbines. Policy makers should consider complementing the Basel Convention with policies to address trade barriers for used lithium-ion batteries and wind turbine rotor blades while maintaining high standards of environmental protection. There is also a supply risk for the cross-border transport of nuclear fuels, with barriers to trade due to regulatory divergence.

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1. Introduction

Electrification[1] involves replacing fossil-fuel-dependent technologies with electrified alternatives and is a means to achieving emissions reductions. Electrification of the transport and industry sectors in Sweden is predicted to lead to large increases in demand for electricity.

The Swedish Government's Bill on the long-term direction of energy policy[2] aims to ensure the creation of an electricity system that can deliver at least 300 TWh by 2045. The current need for electricity is around 140 TWh. To meet increasing demand for electricity, Sweden will need to significantly increase fossil-free electricity generation, while expanding the electricity grid and storage.

The aim of this report is to analyse how trade policy can contribute to the electrification of Sweden's economy. To illustrate trade policy's role, we use examples from the sectors expected to drive future demand for electricity (transport and industry), sectors that have the most potential to add to supply (wind and nuclear power) and grid development. We also examine trade diversification strategies for critical raw materials as these are integral to the technologies that enable electrification.[3]

The report provides an overview of trade policy priorities for electrification in Chapter 2, while Chapter 3 provides more detailed sectoral analyses to illustrate how trade policy can facilitate electrification. Chapter 4 examines the cross-cutting theme of diversifying critical raw material supplies. Chapter 5 draws together the trade policy priorities and analysis to make recommendations for policy makers.

This report is carried out as a desk study. The study is informed by a review of Swedish and EU policies for electrification, sectoral analyses, interviews, and discussions with Swedish and European stakeholders,[4] as well as a half-day workshop.[5]

For a brief overview of the main issues and what can be done about them, we recommend reading chapters 2 and 5. The other chapters present more in-depth details.

1. We use the term electrification throughout this report to describe the long-term transition away from fossil fuel technologies to electrified alternatives and the concurrent need to develop fossil-free generation capacity and infrastructures. The term fossil-free generation is used to reflect the Swedish Government's long-term goal for 100 per cent fossil-free electricity production.
2. Government of Sweden, proposal for long-term energy policy, 2024 (Prop. 2023/24:105).
3. Alternative fuels (e.g. hydrogen, biofuels) and digital trade are closely connected to electrification strategies but are out of scope. Nor do we cover investment, electricity market design, or the cross-border trade of electricity in-depth.
4. Interviews and meetings were carried out with the Swedish iron and steel producers' association (Jernkontoret), Wind Europe, EpSpot (company producing charging stations), the Swedish Energy Agency, The Confederation of Swedish Enterprise, Technology Industries of Sweden, Geological Survey of Sweden, Boliden, and Volvo Cars. These were supplemented with written input from companies, government agencies, and industry associations, as well as discussions on the sidelines of conferences with industry experts.
5. This included representatives from companies, trade associations, consumer organisations, and officials from central government and expert agencies.

2 How trade and trade policy can contribute to electrification

Electrification will require huge volumes of imported materials and products

The transition to electric vehicles and low-emission industrial processes is expected to significantly increase the demand for fossil-free electricity.[6] Today's electricity need is around 140 TWh, and scenarios for 2045 foresee a need somewhere between 200 TWh and 340 TWh.[7] The largest increase in energy use is expected to come from industrial sectors.

Although there is considerable uncertainty about future electricity needs,[8] it is beyond doubt that expanding electricity generation and grid and charging infrastructures will require skilled workers and huge volumes of imported materials and products.

Electrification would grind to a halt without a functioning trade system

International trade is a prerequisite for electrification; without the import of raw materials, inputs, equipment, and specialist services, progress would grind to a halt. The importance of functioning global trade and access to foreign markets for exports and imports were repeatedly highlighted by the organisations consulted for this study.

Multilateral and single market trade rules enable imports and functioning value chains, while giving rise to efficiency gains, economies of scale, innovation, and technology transfers that lower the costs of electrification. The import of intermediate goods and availability of low cost, fossil-free electricity also contribute to the competitiveness of Sweden's firms and thus create a platform for export growth.

International trade policy is relevant in a range of areas

Our analysis and interviews identified several international trade priorities, some with a direct effect on the goods and services needed for electrification and others that indirectly incentivise electrification:

Trade priorities with a direct effect on electrification

- **Secure supplies of critical raw materials.** Critical raw materials are embedded in the technologies required for electrification (e.g. wind turbines, electric vehicles, batteries, and heat pumps), and value chains are often concentrated in a few countries. Trade diversification strategies include extending and enhancing the EU's network of trade agreements with resource-rich regions and setting up strategic partnerships for critical raw materials (see analysis in chapter 4).
- **Improving cross-border transportation.** A theme that is taken up across the sectors investigated in this report concerns issues and administrative costs related to the cross-border transport of dangerous goods, hazardous wastes, and used goods. Transportation issues are currently hindering recycling efforts important to increasing the supply of critical raw materials and are a supply risk for nuclear fuels (see sections 3.1.1, 3.3.3, and 4.3).

6. Sweden's current electricity generation is mostly fossil-free, with generation from hydro (40%), nuclear (29%), wind (20%), combined heat and power (8%), and solar (2%). Condensing and gas turbines account for the remaining one per cent.
7. The Swedish Energy Agency. Cross-agency Report on Society's Electrification (2024).
8. A small number of facilities accounts for around 100 TWh of potential demand.

- **Standardisation for electrification.** International standardisation is mandated in several WTO agreements and can contribute to cost reduction in all the sectors of importance for electrification (see 3.1.2, 3.3.2, 3.4.3, and 4.3).
- **Lower barriers to trade in goods and services for electrification.** Tariff and non-tariff barriers raise the costs of materials, inputs, and goods for electrification. Services are essential to the technologies needed for electrification, including design, installation, operation, maintenance, and ultimately decommissioning and recycling services. For example, public charging stations have integrated payment services, and nuclear power plants rely on technicians from abroad for annual maintenance and refuelling. We investigate tariff barriers for each topic and single market barriers for services in sections 3.1.1 and 3.3.2.

Trade priorities with an indirect effect on electrification

- **A stable policy environment for carbon pricing and CBAM** is needed to reduce greenhouse gas emissions and incentivise electrification. A challenge for policy makers is encouraging investments that reduce industrial greenhouse emissions whilst avoiding imports of emission-intensive products. We investigate this using the steel industry as an example (see Section 3.2.1).
- **Fossil fuel and green subsidies.** Fossil fuel subsidies are inefficient, increase greenhouse gas emissions, and discourage electrification by holding prices for fossil fuels artificially low. This makes it harder for electrified alternatives to compete. Renewable energy subsidies are much lower than fossil fuel subsidies but have been subject to ten WTO disputes and numerous countervailing measures.[9] Furthermore, unfair subsidisation in the electric vehicle sector has led to the use of trade defence measures, raising the cost of electric vehicles (see Section 3.1.1).

9. Sherzod S. Energy Subsidies and the International Trade Regime. [Presentation] World Bank (2024).

3 Trade policy for electrification – sectoral analyses

This chapter presents sectoral analyses illustrating how trade policy can assist with electrification. The analyses illustrate how trade policy can contribute through specific examples. Most of the trade policy topics investigated are relevant to more than one sector. For example, subsidies and countervailing measures are examined in the electric vehicles section but are also relevant to renewables.

A point raised by various interviewees was the importance of functioning international markets. An overarching recommendation that applies across all sectors is thus to adhere to and defend multilateral trade rules and work for an integrated single market.

3.1 Electrification of road transport

The primary role of trade policy is to reduce the costs of importing vehicles, inputs for vehicle production, services, and inputs for charging infrastructure development.

Encouraging the uptake of electric vehicles and developing a supporting charging infrastructure are key goals[10] for the electrification of the transport sector in Sweden.[11] Transport accounts for roughly a third of Sweden's greenhouse gas emissions, with road transport accounting for 90 per cent.[12] In the transport sector, large reductions in fossil fuel use can be achieved with a relatively small increase in electricity use.[13]

10. IEA. *Global EV Outlook*. (2021). Fossil Free Sweden. Roadmap for Automotive Industry – passenger cars (2020).
11. While electrification can play a role in decarbonising shorter flights and commuter marine vessels, these sectors will rely on alternative fuels and are outside the scope of this report.
12. Swedish Environmental Protection Agency. Greenhouse gas emissions in domestic transport (2024).
13. Ibid.

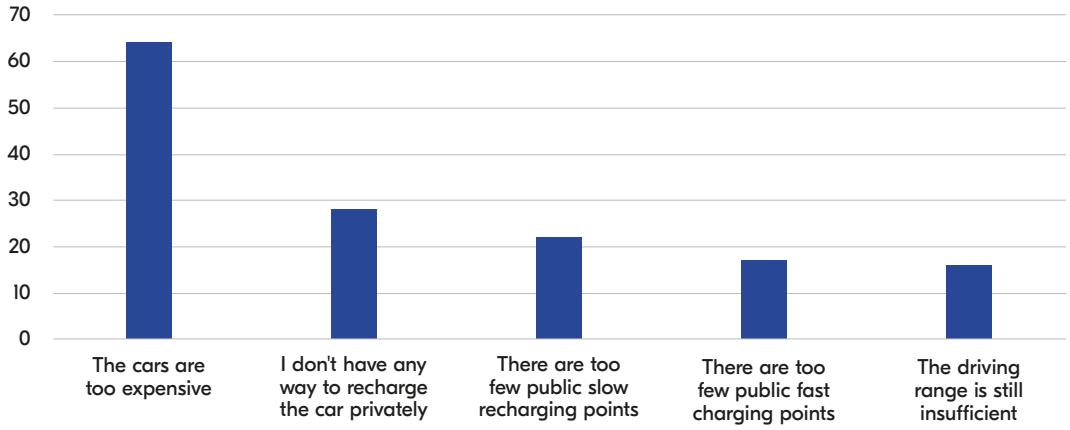
The electrification of transport has wider energy system effects. It can reduce dependence on imported fossil fuels and add battery storage capacity that can be integrated with grids; however, it also increases reliance on critical minerals.[14]

The EU has policies in place for the electrification of transport, which will be implemented in Sweden. The EU Emissions Trading System (EU-ETS2) will include road transport from 2027,[15] and the EU has established CO_2 emission performance standards including a ban on the sale of new petrol and diesel cars from 2035. For charging infrastructure, the EU Alternative Fuels Infrastructure Regulation (AFIR) sets minimum requirements, and the Energy Performance of Buildings Directive creates rules for charging points in buildings and public parking spaces.

3.1.1 Reducing the price of electric vehicles and their batteries

Motorists in Sweden identify price as the biggest disadvantage of electric vehicles, while most of the other issues are related to charging infrastructure.[16]

Figure 1. Swedish drivers' top 5 identified disadvantages of battery electric vehicles (multiple answers were possible)



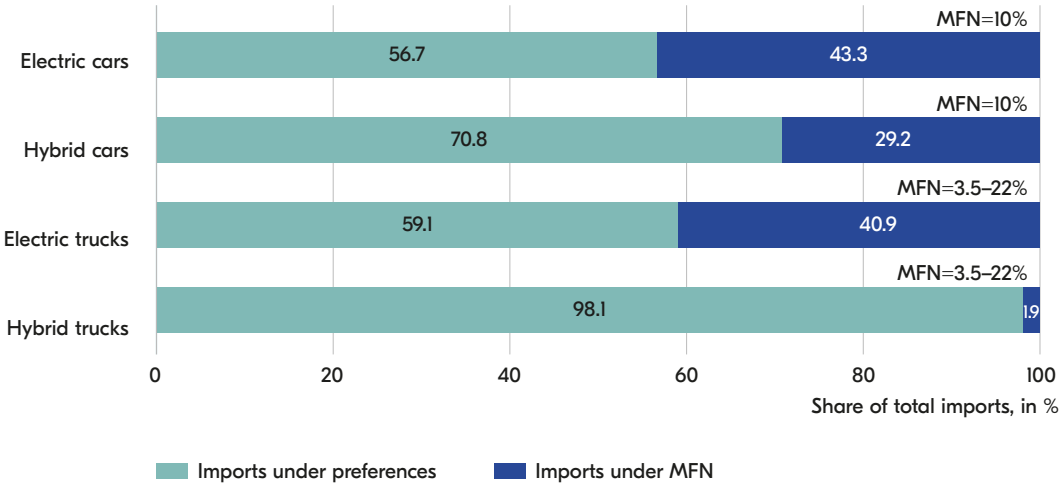
Source: European Commission. Consumer Monitor 2023 – Country Report Sweden (2024).

Tariffs and trade remedies raise prices for imported electric vehicles

Prices for imported electric vehicles from beyond the EU's network of trade agreements are higher than necessary (e.g. from the US and China). Figure 2 shows EU imports of electric vehicles by trade regime (e.g. traded under MFN terms or under preferences through a trade agreement). Around 60 per cent of electric cars and electric trucks are imported under preferences, with the remainder imported under MFN. The MFN tariff on electric cars is 10 per cent, and the MFN tariff for electric trucks is between 3.5 and 22 per cent (due to data limitations, a more detailed investigation is not possible).
A little over 70 percent of hybrid cars are imported under preferences, as well as virtually all hybrid trucks. High prices for electric vehicles are a major barrier to electrification, and removing MFN tariffs would promote affordability and the uptake of electric vehicles.

14. IEA. World Energy Outlook (2024).
15. In practice, this will mean fuel suppliers will be required to monitor and report their emissions.
16. European Commission. *Consumer Monitor 2023 – Country Report Sweden* (2024).

Figure 2. Imports of electric vehicles, by trade regime and type (2022 data)



Note: National Board of Trade's analysis using WTO trade data. The following HS codes are used: Electric cars (870380), hybrid cars (870340, 870350, 870360, 870370), electric trucks (870460), and hybrid trucks (870441, 870442, 870443, 870451, 870452).

A complicating factor is the use of distortive subsidies for battery electric vehicle production in China. This has led to the EU[17] imposing countervailing duties of up to 35.3 per cent on top of the 10 per cent MFN tariff.[18] The use of such measures is a legitimate part of the global trading system, and the EU Commission states it has followed WTO rules when investigating and imposing the duties.[19] There are, however, trade-offs, especially in relation to social sustainability (see textbox).

The ideal approach to addressing unfair subsidies and reducing their potential costs would be to convince China to notify and remove trade distortive subsidies. However, this is unrealistic in the current geopolitical climate.

17. The US and Canada recently introduced 100% tariffs on electric vehicle imports from China.
18. The duties vary by firm and range from 7.8% to 35.3%.
19. European Commission. *EU imposes duties on unfairly subsidised electric vehicles from China* [press release] (29 October 2024).

A basic analysis of the socioeconomic consequences of countervailing duties

Social costs

Countervailing duties will raise electric vehicle prices for consumers and businesses and will likely lead to slower uptake. Chinese-made electric vehicles are perhaps the only affordable choice for some lower income households.

However, the unfair subsidies that countervailing duties address could lead to job losses. It is important to make the distinction between tariffs as a means to address unfair subsidisation, and tariffs as a means to restrict market access and competition. In the latter case, there is little justification for tariffs (such as the EU's MFN tariff), as they are inefficient, stifle innovation, and distort trade. Although not all of the 13.8 million jobs[20] in European automotive value chains are at risk, the potential negative social costs of unemployment in the sector could be large. These could include direct fiscal costs for unemployment benefits and retraining schemes and non-market costs associated with deindustrialisation (e.g. on health and social problems).[21]

Economic costs

The Kiel Institute for the World Economy estimates that an additional 20 per cent tariff on Chinese electric cars would lead to a 25 per cent reduction in imported electric vehicles, redirecting trade worth almost USD 4bn.[22] China has challenged the duties in the WTO[23] and is likely to retaliate,[24] which could lead to further economic costs and trade fragmentation.

The welfare economic costs are likely to be reduced consumer surplus due to increased EU prices from countervailing duties and deadweight losses. In a simple theoretical model, price increases should benefit producers based in Europe, who supply more of the market and see an increase in producer surplus. In practice, the analysis of trade defence (anti-dumping) measures has found that prices are raised but that producers do not regain market share, often due to gains by producers in non-targeted third countries.[25] It remains to be seen if this finding will hold in this case. Government revenue will be raised with the collection of the duties, and investment in the EU by Chinese companies can also be expected (as seen in Hungary[26] and Spain[27]). The magnitude of these effects depends on the elasticities of demand and supply.

It is important to target trade defence instruments, such as countervailing duties, carefully and in a way that addresses trade-distorting subsidies without discouraging climate-friendly policy measures. To get the balance right, the EU should consider introducing a full welfare economic analysis in the EU's Union interest test.[28]

Investigate opportunities for cooperation on rules for green subsidies.

Subsidies for electric vehicles are a specific case of a general issue. Subsidies are a legitimate policy tool to address environmental market failures but can also distort trade. The Agreement on Subsidies and Countervailing Measures (SCM) included an article[29] making certain environmental subsidies non-actionable. However, the provision was

20. European Parliament. *The crisis facing the EU's automotive industry* (2024).
21. Brey, B. and Rueda, V. The persistent human costs of deindustrialisation (2024).
22. KIEL Institute. EU tariffs against China redirect trade of EVs worth almost USD 4 billion (2024).
23. WTO. China initiates dispute complaint regarding EU definitive duties on electric vehicles (2024).
24. Tariffs on brandy and consideration of tariffs on cars, pork, and dairy are interpreted as initial measures.
25. National Board of Trade Sweden. EU Trade Defence (2021).
26. CEPA. Xi and Chinese Electric Cars Drive Into Hungary (2024).
27. Financial Times. China's CATL to build €4.1bn battery factory with Stellantis in European expansion. (2024); Reuters. China's Chery to open its first European manufacturing site in Spain (2024).
28. National Board of Trade Sweden. EU Trade Defence – The unintended effects of anti-dumping measures (2021).
29. Article 8c, Agreement on Subsidies and Countervailing Measures.

limited to the first five years following entry into force. This means that in practice, the SCM does not distinguish between subsidies based on rationale or purpose,[30] for example, subsidies intended to address environmental externalities or to promote harmful fossil fuel use.[31]

An ambitious and long-term approach to avoid unfair subsidies and countervailing measures would be to cooperate on designing rules or principles for green subsidies[32] in the WTO or other international forums. This could help guide the design of subsidies that are less trade distorting and avoid the use of trade defence measures.

International organisations and researchers have suggested various frameworks and ways forward for cooperation on green subsidies. First, improving transparency,[33] data collection, and analysis of green subsidies.[34] Second, categorising subsidies based on their rationale,[35] effects on the environment and trade,[36] efficiency, and economic welfare effects.[37] Third, fostering cooperation[38] and discussion in international organisations such as the WTO,[39] OECD, or G20. For example, a discussion or review of Article 8c of the SCM could be undertaken in the WTO.

Autonomous tariff suspensions could help reduce vehicle and battery costs

The costs of producing vehicles in the EU can also be reduced through autonomous tariff suspensions and quotas. These allow for complete or partial relief of the most favoured nation-tariff on imports of raw materials, semi-finished goods, or components. The purpose is to raise competitiveness and economic activity by reducing the costs of inputs. Companies operating in the EU can apply for new tariff suspensions or quotas, and there are currently tariff suspensions and quotas in place for various components for electrical and hybrid vehicle manufacture. For example, a zero-duty rate quota has been granted for instrument clusters for use in the manufacture of electric vehicles,[40] while a complete tariff suspension has been granted for integrated electric brake units for use in the manufacture of hybrid passenger cars.[41]

Batteries account for around 40 per cent of an electric vehicle's cost, and according to input from stakeholders, it has become increasingly difficult to have applications for products related to battery manufacturing approved. To promote integrated battery manufacturing in the Union, only partial relief from most favoured nation duties is granted for certain products related to battery manufacturing.[42] These include lithium-ion rechargeable battery cells for use in the manufacture of rechargeable hybrid and electric vehicle batteries and for certain power relays for use in the production of

30. Hillman, J.A. and Manak, I. Rethinking International Rules on Subsidies (2023).
31. This creates uncertainty around whether green subsidies are WTO-legal or likely to be challenged
32. Cima, E. Esty, D.C. Making international trade work for sustainable development: toward a new WTO framework for subsidies (2024); Kleimann, D. Climate versus trade? Reconciling international subsidy rules with industrial decarbonisation (2023).
33. Hillman, J.A. and Manak, I. Rethinking International Rules on Subsidies (2023).
34. IMF, OECD, World Bank, and WTO. Subsidies, Trade, and International Cooperation (2022).
35. OECD. Domestic Incentive Measures for Renewable Energy with Possible Trade Implications (2013).
36. Charnovitz, S. Green Subsidies and the WTO (2014).
37. Kleimann, D. Reconciling international subsidy rules with industrial decarbonisation (2023).
38. IMF, OECD, World Bank, and WTO. Subsidies, Trade, and International Cooperation (2022).
39. The Trade and Environment Sustainability Structured Discussions (TESSD) could be a useful forum to start discussions.
40. Council Regulation (EU) 2024/3213.
41. Council Regulation (EU) 2024/3211.
42. Ibid.

rechargeable batteries for hybrid and electric vehicles.[43] Due to the evolution of battery production within the Union, a mandatory review of battery-related tariff suspensions is done every year instead of every fifth year, which is the normal procedure.

Liberal rules of origin can reduce the price of electric vehicles

Rules of origin are used in trade agreements, setting criteria to decide if products originate from a country and thus to determine whether the product will be granted preferential tariffs. The rules are product and trade agreement specific, meaning there is a lot of variation and complexity.[44]

In the case of the EU-UK Trade and Cooperation Agreement, rules of origin for batteries could create perverse incentives for trade in electric vehicles. A situation could arise where internal combustion engines meet the rules of origin and are traded at zero tariff levels, while the rules of origin for batteries are not met and electric vehicles are traded at the 10 per cent MFN level.[45] This would clearly work against the aims of the EU and UK governments to electrify and decarbonise their transport sectors. More liberal rules of origin would solve the problem.

Trade rules for batteries need to be improved to facilitate recycling

Increasing recycling and repurposing of used batteries for storage has several benefits for electrification, including increasing the availability of raw materials and creating more options for energy storage. International trade can help secure supplies of used batteries, avoid landfilling, facilitate economies of scale, and allow for specialisation. For these benefits to be realised, the cross-border movement of used batteries is necessary.

43. Ibid.
44. National Board of Trade. Do Rules of Origin Rule Free Trade? (2024).
45. UKTPO. Trade Policy and the Production of Electric Vehicles (2024).

The National Board of Trade examined how regulations[46] for trade in lithium-ion batteries could be better designed, without compromising international safety standards protecting the environment and human health.[47] First, trade procedures between trusted parties could be simplified to complement the Basel Convention.[48] Second, transport regulations could offer more flexibility. Third, trade facilitation measures for transparency and simplified administration could be adopted. Fourth, fast-track procedures for approved facilities could be introduced. The National Board of Trade also recommended lowering import tariffs on waste lithium-ion batteries.

Removing barriers to the free movement of services for electrification

Costly and heavy batteries increase up-front costs and lifecycle costs of trucks.[49] A point raised during our workshop was that the higher costs of buying electric heavy vehicles provides an incentive for service-based business models. However, barriers for services trade on the single market make it more difficult to provide rental, repair, and financial services, slowing progress on electrification and circular economy goals.

For installation of charging points, there are differences between the standards countries apply for installation procedures and building regulations. Interviewees also pointed out that electrician services are regulated differently across the EU (e.g. variation in licencing and ease of transferability of qualifications). Member States and the Commission should remove barriers to the free movement of services on the single market. See the report 'Green Services in the Single Market'[50] for a more detailed analysis of services barriers in energy-intensive industries.

3.1.2 Improving the availability and price comparability of electric vehicle charging

After vehicle price, the availability of charging is the next biggest barrier.[51] A shortage of public charging points is problematic for households and businesses (e.g. logistics companies)[52] and presents a barrier to the uptake of heavy-duty electric vehicles.[53]

Trade policy is relevant to lowering the costs of charging stations and materials for infrastructure development and ensuring the interoperability of infrastructures between countries. International standardisation is a key strategy for enabling interoperable, reliable, safe, comparable, and accessible charging infrastructure.

Standardisation

The National Board of Trade led a cross-agency advisory council on climate-focused standardisation.[54] A working group of specialists identified more than 20 issues that standardisation could address. This included wireless charging, user-friendliness, accessibility, and variation of payment models.

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46. The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, the Agreement concerning the International Carriage of Dangerous Goods by Road (ADR), and the Convention concerning International Carriage by Rail (COTIF).
47. National Board of Trade. Trade Rules for a Circular Economy (2023).
48. This could be based on the model established in the OECD Decision of the Council on the Control of Transboundary Movements of Wastes Destined for Recovery Operations.
49. ICCT. A total cost of ownership comparison of truck decarbonisation pathways in Europe (2023).
50. National Board of Trade. Green Services in the Single Market (2022).
51. European Commission. *Consumer Monitor 2023 – Country Report Sweden* (2024).
52. European Round Table for Industry. Single Market Obstacles Compendium (2024).
53. Accelerated Electrification of Road Transport in the Nordic Countries conference (14 November 2024).
54. National Board of Trade. Standards can contribute to the green transition (2023).

The working group highlighted European standardisation requests for the Alternative Fuels Infrastructure Regulation, where the participation of Swedish government agencies in standardisation committees is desirable. The standardisation request includes high-power charging (Megawatt Charging Systems), electric road charging, battery replacement technology for heavy-duty and light vehicles, and vehicle to grid communication and management.

Industry standards for fast charging of heavy vehicles (megawatt charging systems) are being developed and could be utilised in international standardisation. A common standard would reduce manufacturing and deployment costs. Indeed, the EU and US Trade and Technology Council agreed on the adoption of a common international standard on megawatt charging systems.[55]

Navigating regulatory barriers on the single market

EpSpot is a small to medium size company selling chargers and meters for use in wall-boxes and pedestals. They also offer a cloud service for controlling and managing charging sessions which is sold in combination with their products and as a separate service. The products are designed and assembled in Sweden, and the company is reliant on international markets for sourcing parts and components. Disruptions in global trade are particularly difficult for the company to manage, as they lack the purchasing power and leverage of larger companies when negotiating with suppliers.

Variation in rules in different Member States makes the manufacture of a single product that meets all requirements very difficult, especially for SMEs. EpSpot designs chargers and meters for the Swedish market and, as such, follows the specifications and requirements of Swedish laws and regulators. The company has investigated the possibility of selling on several other European markets, but regulatory differences have proved to be a significant barrier for a company of their size. In some countries, the physical requirements for products are different (in relation to child safety, for example). In other countries, regulatory texts are only available in the national language and are not collected in one place. Yet another EU country imposes additional licencing and approval procedures. However, the company is developing product lines to address the requirements of as many EU markets as possible.

3.2 Electrification of industry – the example of near-zero steel

Sweden's industrial sectors are export-oriented, meaning trade policy has an important bearing on their competitiveness and thus on future demand for electricity in Sweden. Industry accounts for a third of Sweden's greenhouse gas emissions,[56] with iron and steel production being the largest contributors to emissions. Scrap-based production accounts for around a third of production in Sweden,[57] but investments in near-zero steel[58] production are predicted to account for the majority of future electricity demand from the sector.[59]

55. European Commission. *EU-US Trade and Technology Council* (2024).
56. Swedish Environmental Protection Agency. Greenhouse gas emissions in Industry (2024).
57. Jernkontoret. Production facts and statistics (2024).
58. We use the term near-zero steel in this report following the language used in the WTO Steel Standards Principles. There are many other terms used to describe products or measurement methods. Examples include fossil-free steel, green steel, and carbon-neutral steel. However, these terms are not always interchangeable as they can refer to specific products and measurement methods.
59. Energiforsk. Analysis of Demand for Fossil Free Electricity (2023). The Swedish Energy Agency. Cross-agency Report on Society's Electrification (2023).

The main challenges for trade policy for electrification are reducing industrial emissions in Sweden whilst avoiding imports of emission-intensive products,[60] as well as creating fair, rule-based, technology-neutral conditions for competition, innovation, and trade. Furthermore, lowering trade barriers for metals and chemicals can benefit downstream industries such as renewables and infrastructure.

3.2.1 Maintaining a commitment to carbon pricing and CBAM

A clear priority should be to effectively implement and maintain a commitment to the EU's carbon pricing and CBAM policies. This is needed to ensure decarbonisation and incentivise electrification through investments in steel manufacturing using green hydrogen. The steel sector, like other heavy industrial sectors, has high capital costs and long investment cycles[61] making a stable and predictable regulatory environment around carbon pricing particularly important.

It is about 30 per cent more expensive to produce near-zero steel compared to traditional steel.[62] However, traditional ore-based production of steel in blast furnaces emits a large amount of carbon dioxide, resulting in societal costs that are not paid for by companies in countries with insufficient carbon pricing. The EU Emissions Trading System (ETS) prices emissions by selling tradable emission allowances that companies must surrender in accordance with their annual emissions. Over the next 15 years, the number of new allowances sold will gradually be reduced to zero. Market forces will lead to a higher price for carbon emissions and all production in the EU will eventually be emission free.[63]

The steel sector is included in the emissions trading scheme and competes on global markets with producers from outside the EU that are not covered by the same carbon pricing scheme. There is thus a risk that imports from regions with no or low carbon pricing will displace the more expensive EU production or that EU firms will move production abroad (this is referred to as leakage). The EU issues free allowances to facilities considered to have a significant risk of carbon leakage. These free allowances will be phased out between 2026 and 2034 as the new carbon border mechanism is introduced.

The Carbon Border Adjustment Mechanism (CBAM) will require producers of imported steel products to pay the same price for carbon emissions as in the EU. The mechanism does not include rebates for exports from the EU.[64] This means that EU producers will eventually find it harder to compete on global markets unless other countries introduce equally ambitious measures.

Common approaches to carbon pricing and designs for carbon border adjustments could help avoid the fragmentation of global value chains as more countries develop border carbon adjustments. This would help avoid transaction costs for businesses that currently need to adapt their measurements for multiple schemes.[65]

60. A global carbon pricing system would be the most socioeconomically efficient solution to climate change but is highly unlikely to become a reality due to geopolitics and political and equity issues.
61. IEA. Energy Technology Perspectives (2020).
62. BloombergNEF. Green Steel Demand is Rising Faster Than Production Can Ramp Up. Financial Times. Can the Steel Industry go Green? (2023).
63. Emissions allowances under the EU ETS do not have to be surrendered if CO2 is successfully captured and stored through CCS, meaning this will likely be an important strategy post-2039.
64. The National Board of Trade (2020) concluded that export rebates could risk undermining a justification of parts of the BCA in accordance with Article XX in GATT.
65. National Board of Trade. Making the EU Safer, Greener, more Competitive and Digitalised. IISD. Global Cooperation on Border Carbon Measures – Where should we start? (2024).

3.2.2 International standards for near-zero steel

Trade policy can also support electrification by encouraging technology-neutral, interoperable, international standards for near-zero emissions steel. The development of international standards in this area is a way to facilitate trade in products with a lower carbon footprint.[66] A common approach using international standards would help producers, as they would not need to adapt their measurements according to multiple methodologies. Furthermore, such an approach would help countries ensure compliance with WTO rules.[67]

Harmonising methodologies and definitions of near-zero steel

There is need for harmonisation as there are over 80 different initiatives covering standards and methodologies for measuring the emissions intensity of steel.[68] The variation partly reflects the differing information needs of parties that are interested in the climate footprint of steel, for example, investors, regulators, procurement professionals, and sustainability reporting departments.[69] The divergences relate to the scope of what is included in the different methodologies. For example, there are different units of analysis including at intermediate product, final product, facility, company, and national level. Some methods look at the entire lifecycle of a product from cradle to grave while others look at the emissions embedded in production, material, and energy use. Carbon dioxide is measured in some cases, while other methods look at all greenhouse gases (often converted to carbon dioxide equivalents).[70]

66. Standardisation needs to be complemented with reliable certification, traceability, and labelling as it is an intermediate input to consumer products that may be marketed based on their low carbon footprint.
67. The legal basis for using international standards is established in the WTO's agreements on Technical Barriers to Trade, Application of Sanitary and Phytosanitary Measures, and the plurilateral Agreement on Government Procurement. These agreements require members and public procurement entities to base regulations, measures, and rules on international standards where such exist.
68. WTO. Steel Standards Principles (2023). see link Steel Standards Principles: update
69. Jernkontoret. Investigation of standardization needs linked to the steel industry's climate transition (2023).
70. Ibid.

Another focus area for standardisation is determining the emissions threshold (per tonne of steel produced) for near-zero steel.[71] Again, there is a diffusion of initiatives on definitions, including those that look at broader sustainability concerns. One benefit of defining a threshold for near-zero steel would be that it would help develop the market by driving demand and promoting innovation. A challenge relates to the treatment of scrap-based steel production methods, which have a lower carbon footprint than ore-based methods but are assigned a poorer classification in some of the threshold defining initiatives.[72] Furthermore, some of the threshold-setting methods for near-zero steel are not applicable to the specialist steel products produced in Sweden.[73]

Aim for interoperable standards for near-zero steel and use these in policy making

The WTO secretariat and World Steel Association have developed Steel Standards Principles[74] that recognise 'that divergent, fragmented, and incompatible standards and methodologies for measuring GHG emissions can lead to trade and supply chain disruptions, market uncertainty and consumer confusion, increasing the costs of decarbonizing steel production'. These aim for 'transparency, interoperability, and mutual recognition of methodologies for measuring GHG emissions.'[75] Swedish policy makers and stakeholders should actively engage in the dialogue on this issue in the WTO and standardisation forums.

The Steel Standards Principles should also be borne in mind in the design of other policies that could affect trade flows. For example, the paused discussions between the EU and the US on a Global Arrangement on Sustainable Steel and Aluminium[76] created a technical working group tasked with developing a common methodology for assessing the embedded emissions of traded steel and aluminium. Another example is the development of the delegated act for sustainability requirements for steel under the EU's Ecodesign for Sustainable Products Regulation.[77]

International standards for near-zero steel could be incorporated in national and regional climate policies in a manner that benefits from the efficiencies of international trade. An example is specifying that near-zero steel is used in public procurement of infrastructure or in new buildings.[78] Basing regulation on international standards is preferable to drafting legislation using specific technical requirements, as international standards facilitate trade and can be updated in line with new technological developments.

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71. Including definitions related to fossil-free, green, low carbon steel, etc.
72. Ibid. Several definitions use a sliding scale that requires lower emissions per tonne from scrap-intensive products to be classified as near-zero steel. This reflects the fact that the standards aim to be technology neutral, that scrap-based production will probably not be sufficient to meet demand, and that scrap-based production is already low emission and could be increased to meet thresholds in a manner that would reduce incentives for the global level decarbonisation that requires ore-based production.
73. National Board of Trade. Final Report of the Council for Innovative and Climate-focused Standardisation. Jernkontoret. Investigation of standardization needs linked to the steel industry's climate transition (2023).
74. WTO. Steel Standards Principles. (2023)
75. Ibid.
76. These aim to address global overcapacity from non-market economies and promote more environmentally friendly steel and aluminium production. However, the proposed US scheme fails to follow WTO rules and would be incompatible with the EU's CBAM instrument.
77. The adoption and publication of first ESPR working plan is expected in quarter 2 of 2025, and this will include plans for the steel industry. *European Commission. Implementing the Ecodesign for Sustainable Products Regulation* (2024).
78. The economic rationale for adopting public procurement policies for near-zero steel in Sweden would be based on other negative externalities than climate change because the steel sector is already covered by a policy instrument (EUETS) that addresses the social costs of emissions. Insufficient innovation needed for the climate transition could justify policy intervention in this area.

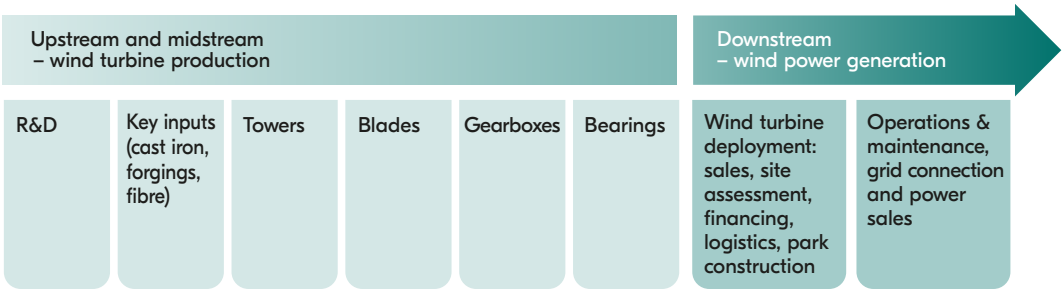
3.3 Wind energy

There is huge potential for wind power in Sweden, and wind is likely to make up most of the new electricity generation over the next 20 years.[79]

3.3.1 Wind turbine supply chains and imports

Wind turbines contain around 9,000 components,[80] which are traded in global value chains. Design, knowledge, and technical know-how[81] are also crucial to the manufacture of high-quality wind turbines, making trade in services important.

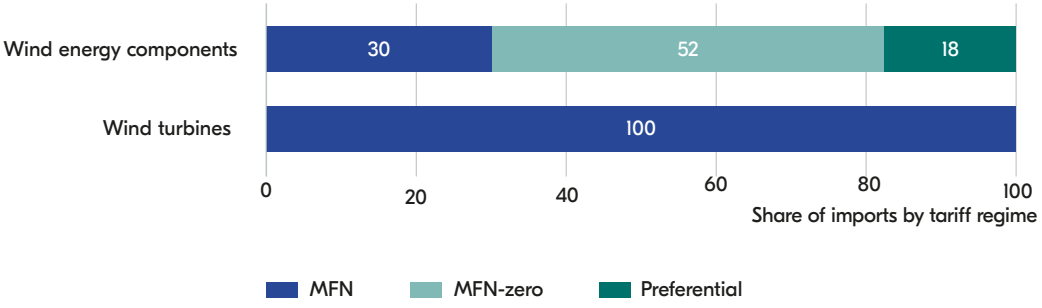
Figure 3. Onshore wind-energy value chain



Source OECD[82]

There are no turbine manufacturers in Sweden. The primary focus of trade policy is therefore the import of components and parts for the installation of turbines. These imports of wind energy components[83] enter Sweden at an average MFN tariff of 0.8 per cent. Most wind energy component imports (in terms of value) enter the Swedish market at a zero-tariff rate, either through MFN-zero regimes or through preferential rates. There is therefore limited room for tariff reductions to make a difference in the costs of wind electricity generation. Wind turbines are mostly sourced from other EU Member States, with around 35 per cent coming from China at an average MFN rate of 1.7 per cent in 2022.

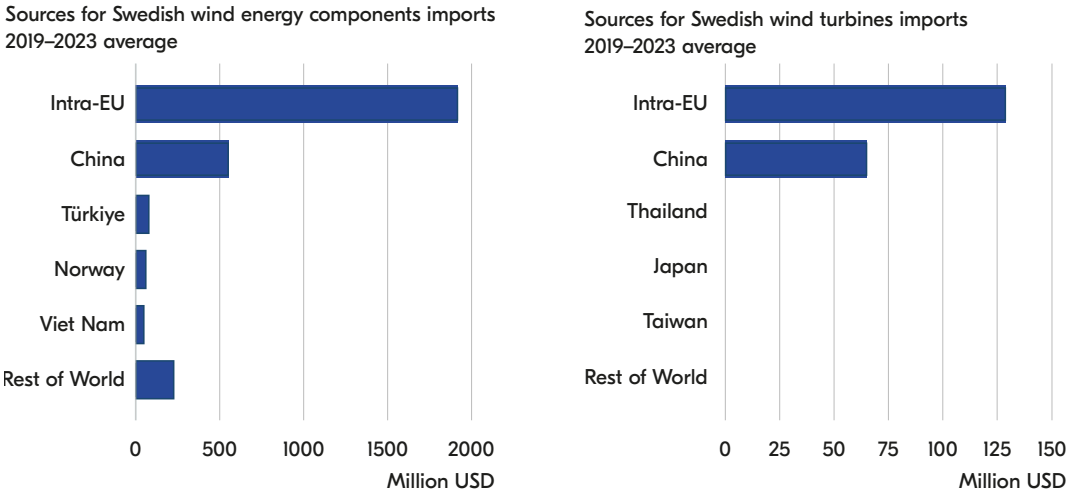
Figure 4. Tariff regime for Swedish imports of wind energy components and turbines from outside the EU



Note: National Board of Trade analysis of WTO WITS data. Wind turbines are products covered by HS code 850231, and wind energy components include HS 730820, 730890, 732611, 732619, 732620, 732690, 841290, 848210, 848230, 8501, 850421, 850422, 850434, 850440 following IISD (2021).

79. Swedish Energy Agency. Webpage on Wind Energy (2023)
80. OECD. Workshop on Optimising Global Value Chains for Environmental Goods and Services (2016).
81. Garsous and Worack. Trade as a channel for environmental technologies diffusion (2021).
82. OECD. Overcoming Barriers to International Investment in Clean Energy (2015).
83. Using the products listed in IISD. How Can Trade Policy Maximize Benefits from Clean Energy Investment? (2021).

Figure 5. Imports of wind energy components and wind turbines, Sweden



Note: National Board of Trade analysis of UN Comtrade data. Wind turbines are products traded under HS code 850231, and wind energy components include HS 730820, 730890, 732611, 732619, 732620, 732690, 841290, 848210, 848230, 8501, 850421, 850422, 850434, 850440 following IISD (2021).

3.3.2 Reducing trade barriers for wind generation

Discussions and interviews with Wind Europe and the Swedish Wind Energy Association identified issues similar to other sectors: the desire for a level playing field, access to critical raw materials, and action on unfair subsidies. Energy market fragmentation is particularly problematic. According to Wind Europe, the use of revenue caps in Member States has undermined the fundamentals of the internal energy market and negatively affected investments. They emphasised how important reform of Electricity Market Design is to the integrity of the single market. Single market barriers that raise the costs of wind generation are summarised below.

Remove regulatory barriers to trade

The European wind industry operates globally and uses international standards. There are considerable costs related to mapping differences in standards and adapting products to individual markets when national standards and requirements are not compatible with international standards.[84]

Requirements for warning lights, the height of wind turbines, and markings on turbines could be harmonised on the single market. In Sweden, lighting requirements differ from international standards, as they require 24-hour obstruction lighting for towers over 150 meters. The practical consequence of variations in rules is that environmental assessments are often rejected by municipalities due to light disturbance for residents.[85]

Facilitate customs procedures

Around 60 per cent of offshore wind operates in the EU's Exclusive Economic Zone, which is outside the customs territory of the Union. Expansion in this area means developers effectively become exporters and importers to the EU. This entails an administrative burden relating to customs procedures, VAT, and excise, which adds time and costs

84. Implement Consulting. A European Green Single Market (2023).
85. Ibid.

when developing new offshore wind farms. Exemptions from certain requirements[86] of the Union Customs Code would help reduce costs.[87]

Facilitate the free movement of services

A common set of skills requirements for wind industry employees and EU standards for wind energy training would facilitate the free movement of wind industry workers. Member States could better align qualification requirements and learning programmes.

The EU's external trade policy could also remove barriers for services. The design, manufacture, assembly, and installation of wind turbines requires both goods and services.[88] Access to services, including skilled professionals, is essential to increasing production capacity and ensuring that EU companies remain competitive. The EU can liberalise trade in services bilaterally through existing and future FTAs and multilaterally in the WTO. The EU should strive to be a constructive partner in the ongoing WTO Trade and Environment Sustainability Structured Discussions (TESSD) and potential future plurilateral and multilateral negotiations.[89]

3.3.3 Improving circularity of material used in turbines

The production and installation of new turbines for electrification will require massive amounts of materials and components. The Swedish Energy Agency estimates[90] that to produce an additional 100 TWh of electricity from wind will require 5.5 million tonnes of concrete, 5 million tonnes of iron and steel, 300 000 tonnes of fiberglass material, 140 000 tonnes of plastics, 50 000 tonnes of aluminium, 28 000 tonnes of copper, and 28 000 tonnes of electronics.

Between 80 and 90 per cent of the mass of a wind turbine can be recycled,[91] and there are established systems and markets for the recycling of steel, electronics, and copper. However, the fiberglass composites contained in the rotor blades are more challenging to recycle.[92] To achieve commercial scale in composite recycling, high volumes of used rotor blades are required. The simplification of cross border movements would help facilitate this.

Cross-border shipments of waste are regulated by the Waste Shipment Regulation,[93] which implements the Basel Convention. The introduction of Basel codes for used rotor blades could assist with the harmonisation of transportation procedures within the EU.[94]

86. Specific requirements: conveyance to appropriate place; presentation of goods; and export and import declaration for wind turbine generators for construction, repair, maintenance or conversion.
87. Implement Consulting. A European Green Single Market (2023).
88. National Board of Trade. Making Green Trade Happen (2014).
89. National Board of Trade. Making the EU Safer, Greener, more Competitive and Digitalised (2024).
90. Swedish Energy Agency Wind power's resource use (2022).
91. Implement Consulting. A European Green Single Market (2023).
92. The Swedish company Vattenfall has committed to a landfill ban and to recycle all wind turbine blades by 2030.
93. Regulation (EU) 2024/1157.
94. Swedish Energy Agency. From Waste to Resources (2024).

3.4 Nuclear

This chapter summarises and draws text from a recent National Board of Trade report on Nuclear Power and International Trade, which was also written by the authors of this report.[95] To make the text more readable, we do not repeatedly reference and cite the report where verbatim quotes are used.

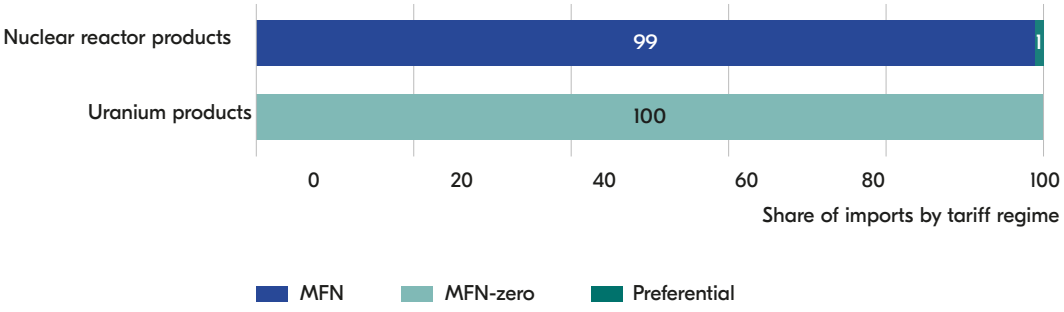
The Swedish Government aims to increase nuclear generation with an additional capacity of at least 2,500 MW in place by 2035 and much higher ambitions for 2045.[96] This compares to a nuclear capacity of 6,900 MW in 2022.[97] Several companies are considering investments in new reactors in Sweden with decisions affected by the economic and political[98] risks involved. Decisions are thus affected by policy choices across a range of domains, including trade policy.

Trade policy can help lower the cost of fuels, components, parts, and services for the operation of existing reactors, while improving the economic feasibility of small modular reactor production for future investments. Several points stand out as important for policymakers.

Tariffs for nuclear products are low

Cost is identified as one of the main barriers for the development of the nuclear industry.[99] Trade policy can help lower costs, while reducing administrative burdens and the time needed to transfer technologies and services over borders. However, it is not likely that these cost reductions will come from the import of uranium products, as all imports from outside the EU are under an MFN-zero regime. Nuclear reactor products (such as fuel elements) from outside the EU are imported almost exclusively under MFN import tariffs at an average 3.2 per cent for Swedish imports in 2022. These nuclear reactor products under MFN mainly come from the U.S., but the majority of Swedish imports actually come from other EU partners and are therefore tariff-free.

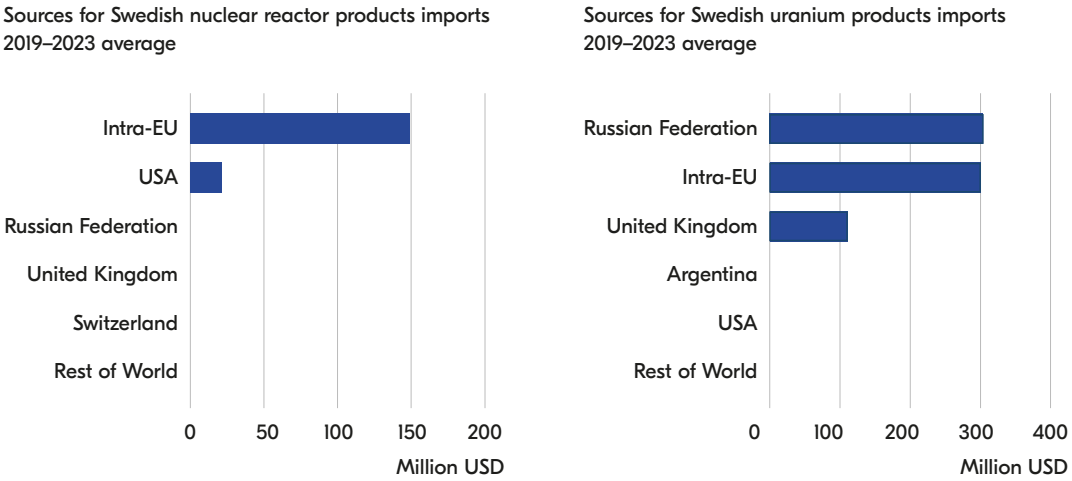
Figure 6. Tariff regime for Swedish imports of nuclear reactor products and uranium products



Note: National Board of Trade analysis of WTO WITS data. Nuclear reactor products cover HS 8401 and uranium products cover HS 2844.

95. National Board of Trade Nuclear Power and International Trade (2024).
96. Climate and Enterprise Department. Roadmap for new nuclear in Sweden (2023).
97. Sweden's total installed electrical capacity was around 46,000 MW at the end of 2022. However, as several generation sources are intermittent, nuclear makes up a higher proportion of the total supply than it does of the total generation capacity. Swedenergy. Energy year (2022).
98. Confederation of Swedish Enterprise. Start program for new nuclear (2022).
99. IAEA. Climate Conference Ends with Call for Major Nuclear Role. (2019). Linares, P., and Conchado, A. The economics of new nuclear power plants in liberalized electricity markets (2013).

Figure 7. Imports of nuclear reactor products and uranium products, Sweden



Note: National Board of Trade analysis of UN Comtrade data. Nuclear reactor products cover HS 8401 and uranium products cover HS 2844. Note that preliminary data shows zero imports from Russia following the invasion of Ukraine. The enriched uranium that was imported into Sweden from Russia was used for fuel production for plants outside of Sweden. Purchasing decisions are made by the operators of these plants rather than businesses operating in Sweden.

3.4.1 A review of export control rules

Trade is conducted according to a system of export controls[100] that manages proliferation risks and thus contributes to facilitating legitimate trade for civil nuclear purposes. Improvements could potentially be made from a trade perspective, but these would need to be carefully assessed by experts so that proliferation and safety outcomes are not weakened. One potential improvement would be to reduce differences in export control licensing processes. Another would be to assess if a risk-based approach could be introduced without risking non-proliferation objectives. These suggestions are also relevant to trade within the EU's single market.

3.4.2 Harmonisation of transportation rules

International transport of nuclear materials, technology, and waste is conducted according to safety and security standards established by the IAEA.[101] In Sweden, domestic transport permits are issued by the Swedish Radiation Safety Authority.[102]

The transport of nuclear materials is often problematic, with barriers to trade due to regulatory divergence. A lack of harmonisation and multiple regulations for authorisation of transport is particularly troublesome for cross-border freight. Divergent approaches lead to scheduling difficulties, interruptions, and delays, which increase operational and administrative costs and can even pose a risk to reactor operations.[103] In addition, local decisions in EU countries to close ports to nuclear materials shipments, combined with the refusal of several shipping companies to handle nuclear materials, have created additional transport problems for the industry. These factors led

100. Including the International Atomic Energy Agency (IAEA) regime, the Non-Proliferation of Nuclear Weapons Treaty, The Nuclear Suppliers Group, and UN Security Council Resolution 1540.
101. International Atomic Energy Agency. Regulations for the Safe Transport of Radioactive Material (2018).
102. This includes the agreement concerning the International Carriage of Dangerous Goods by Road (ADR) and the convention concerning International Carriage by Rail (COTIF), regulating train transport.
103. DG Energy of the European Commission. *Analysis of Nuclear Fuel Availability at EU level from a Security of Supply Perspective* (2020).

the Euratom Supply Agency Advisory Committee working group on prices and security of supply to judge transport to be a risk to security of supply.[104]

The same committee recommends a harmonised pan-European arrangement to approve cross-border transportation packages that would be valid in all Member States. This could be supplemented with an EU project for the licensing of registered carriers. The committee also suggests using dedicated charter vessels for shipping nuclear materials. These measures would help reduce administrative burdens, save resources and time, and contribute to simplified trade in materials at the EU level.

3.4.3 Lowering the cost of small modular reactors through trade

International trade can help enable the development of SMRs as they 'are designed to be deployed in series, using a global supply chain to reduce costs.'[105] For example, mass produced, standardised designs would allow for competition and specialisation in the production of parts and components in countries with competitive advantages. Indeed, a report by the OECD and NEA judges that the economic viability of SMRs is dependent upon the development of a global market.[106] EU activity in this area includes the European Industrial Alliance on SMRs, which aims to accelerate the development, demonstration, and deployment of European SMR projects.

We recommend engaging in international cooperation on regulatory processes, particularly where there is a lack of legislation and regulation (e.g. for licencing of new fuels and different types of waste). Aiming for common or coordinated regulations and rules would simplify trade in reactor technologies and fuels easier and lower barriers to market access. In addition, cooperation efforts should aim for the development and use of international standards[107] as the SME market matures.

3.5 Electricity grid

3.5.1 Increasing efficiency and security of supply through grid development and interconnectors

Grid development is one of the most important factors for succeeding with electrification.[108] Replacing ageing infrastructure and meeting the extensive demand for new connections will require investment in new transmission lines and facilities.[109] The plan in Sweden is to build a total of 7,000 km transmission lines and 200 substations between 2020 and 2045.[110] This includes work to build interconnectors between Sweden's four electricity areas and with neighbouring countries in line with Swedish, Nordic, and EU strategies to enable cross-border trade.[111] This can assist with security of supply, efficient utilisation of generation resources,[112] and management of intermittency from solar and wind generation.[113] Additionally, regional and local networks will need to be expanded to meet increasing demand.

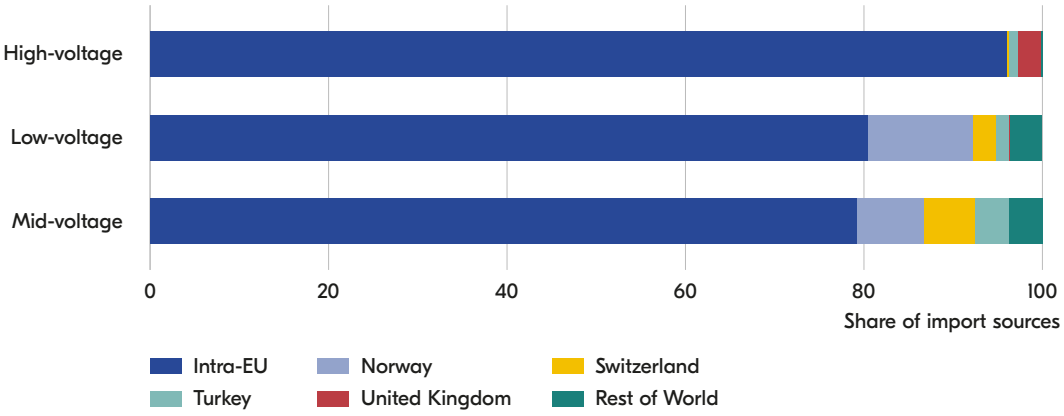
104. Ibid.
105. International Energy Agency. Nuclear Power and Secure Energy Transitions (2022).
106. Nuclear Energy Agency. Small Modular Reactors: Challenges and Opportunities (2021).
107. As encouraged in WTO agreements such as the TBT Agreement and the GPA agreement.
108. Draghi, M. The future of European competitiveness (2024).
109. Svenska Kraftnät. Grid Development Plan 2024-2033 (2024).
110. Swedenergy, Sweden's electricity needs 2045 – How do we close the gap? (2023).
111. Svenska Kraftnät. Grid development – driving forces (2021).
112. Svenska Kraftnät. Grid Development Plan 2024–2033 (2024).
113. Nordic transmission system operators (TSOs). Nordic Grid Development Perspective 2023 (2023).

Most of the grid development challenges need to be addressed at the national level. They include planning and permitting procedures, conflicts of interest, and availability of labour with specialist skills for the Swedish grid. However, trade policy has a role to play in improving cost effectiveness[114] while ensuring the availability and smooth flow of goods, materials, and components for the companies involved in grid development.

Tariff barriers are low for transformers

European companies are prominent in the production of high voltage transformers and high voltage cables and lines, while medium voltage transformer manufacturing is spread globally.[115] Indeed, import data for Sweden shows that it sources most of its transformers from its European partners (see Figure 8). More than 90 per cent of the imports of transformers in 2022 and 2023 came from other EU countries, or from Norway or Switzerland. The remainder are sourced from Turkey or the UK. Therefore, the sourcing of transformers is unlikely to be hindered by import tariffs.

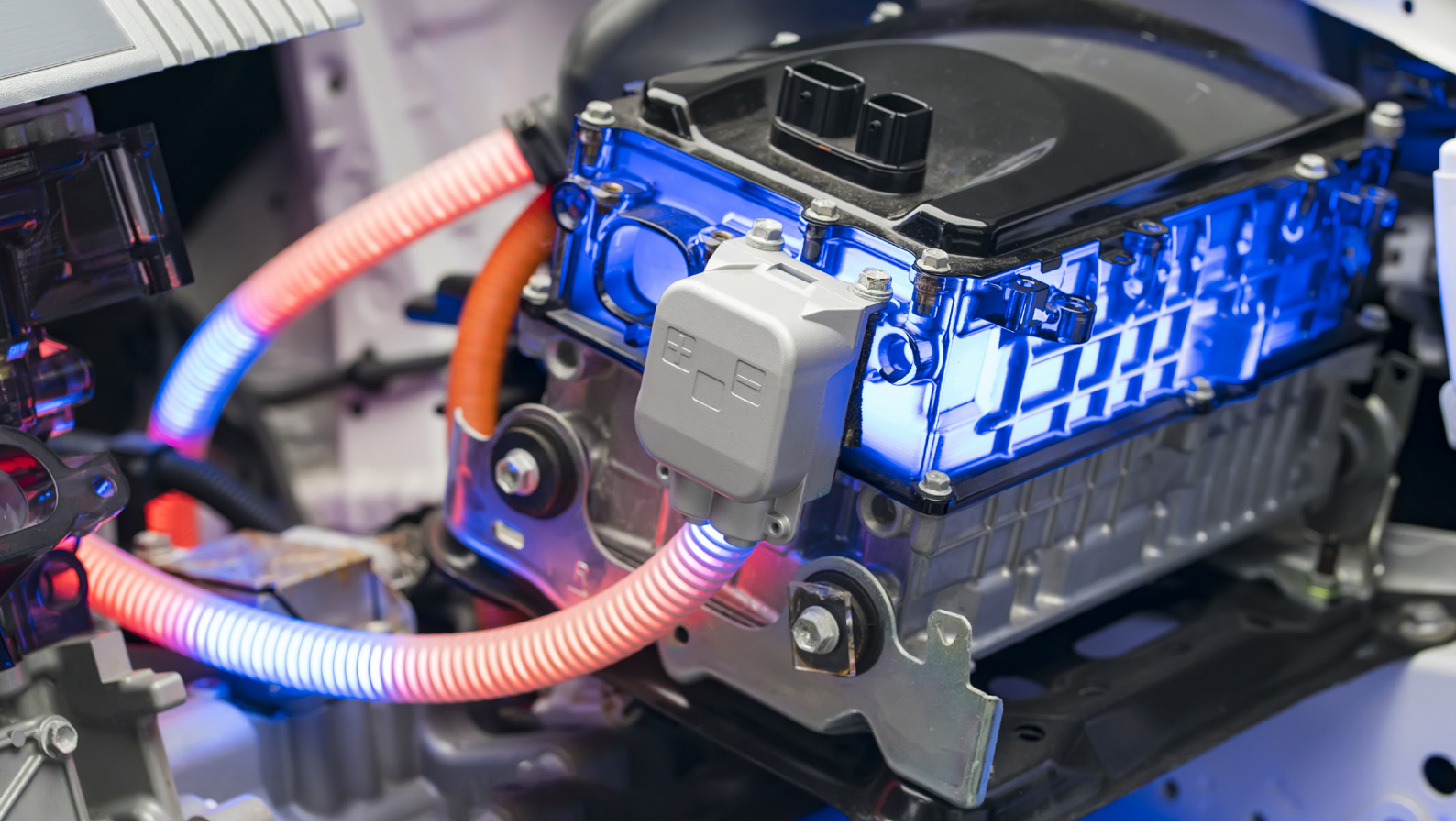
Figure 8. Swedish imports of transformers, by source (2022–2023 average percentages)



Note: National Board of Trade analysis of Eurostat trade data for 2022 and 2023 (averaged). HS codes used in this analysis are: 850421 (low-voltage), 850422 (mid-voltage), and 850423 (high-voltage).

There is global competition for components and materials for cables, transformers, and substations, which has led to delays due to shortages and long wait times. For example, the IEA documented a waiting time of over 18 months for power transformers,[116] as well as shortages of components like specialist electrical steels and semiconductors. A more detailed look at the supply chains for grid infrastructure would be necessary to identify specific trade barriers affecting the costs of these inputs.

114. Government strategies and Svenska Kraftnät (the agency responsible for grid development) have goals for economic efficiency when building new facilities.
115. IEA. Energy Grids and Secure Energy Transitions (2023).
116. Ibid.



3.5.2 Electric vehicle batteries can contribute to flexibility

Batteries can assist with energy storage needs, including utility scale batteries integrated with the grid and in homes and cars. The chapters on critical raw materials and electric vehicles provide more information on how trade policy can diversify the supply of critical inputs for battery production, avoid unfair subsidies, and enable the transport of used batteries for recycling or repurposing for grid storage.

Flexibility services can draw upon different sources such as managed industrial demand, storage facilities, and electric vehicle batteries. A research project presented to the National Board of Trade's advisory council on climate-focused standardisation examined how standardisation could assist with opportunities for vehicle-to-grid flexibility services.[117] Long term electric vehicle parking was identified as a key source of potential flexibility, as hundreds or thousands of batteries could be utilised. However, the international standard for vehicle to grid communication[118] would need to be updated to meet the reaction times required by grid operators for the fastest frequency regulation services.

More research is needed on the role of digital and services trade in supporting the development of smart grids and flexibility services.

117. RISE. Charging infrastructure and frequency regulation – a case study (2023).
118. ISO 15118-20.

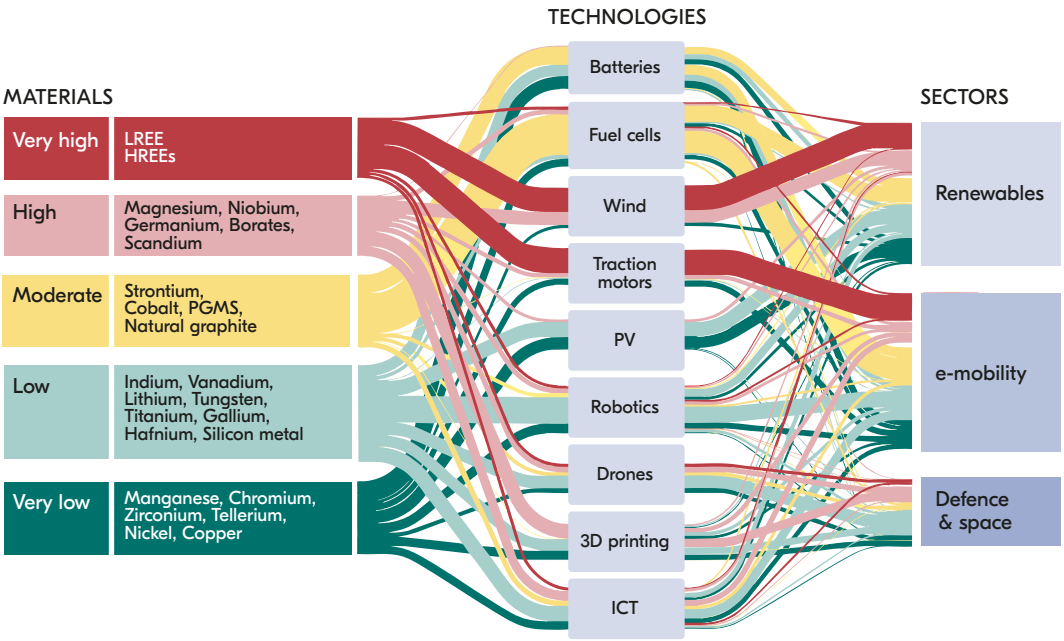
4 Diversifying trade in critical raw materials: a cross-cutting theme

Trade's role in securing raw material supply chains was a dominant theme raised by the Swedish stakeholders consulted for this report. To paraphrase one interviewee: 'Access to critical raw materials is the most important issue – without them [electrification] stops.' The same sentiment is highlighted in the International Energy Agency's (IEA) 2024 energy outlook 'The security of clean energy supply chains and of critical minerals supply is of pivotal importance to clean energy transitions'.[119]

Critical raw materials[120] are ubiquitous in the technologies needed for electrification, for example, in wind turbines, solar panels, batteries, electric vehicles, heat pumps, electrolysers, semiconductors, energy-efficient LEDs, and transmission grids. The IEA estimates that to meet the goals of the Paris Agreement, critical raw materials requirements will quadruple by 2040.[121]

Figure 9, which is taken from the report 'Critical Raw Materials for Strategic Technologies and Sectors in the EU',[122] illustrates supply risk assessments for critical materials and their use in some of the technologies and sectors relevant for electrification and defence.

Figure 9. Semi-quantitative representation of flows of selected raw materials and their current supply risks



Source: European Commission, JRC. The left side shows the occurrence of materials categorised by supply risk; the flows show the percentages estimated to be needed in different technologies multiplied by the occurrence.

119. IEA World Energy Outlook 2024.
120. The EU publishes a list of critical raw materials which is periodically updated. The list is available here: https://single-market-economy.ec.europa.eu/sectors/raw-materials/areas-specific-interest/critical-raw-materials_en#fifth-list-2023-of-critical-raw-materials-for-the-eu
121. IEA. The Role of Critical Minerals in Clean Energy Transitions (2022).
122. European Commission. *Critical raw materials for strategic technologies and sectors in the EU (2020).*

4.1 Trade and critical raw materials

Trade is essential for secure critical raw material supplies

It is worth emphasising that trade will always be required to access critical raw materials. In the words of the Commission: 'the EU will never be self-sufficient in supply of CRMs and will continue to rely on imports for a majority of its consumption'. [123]

Import dependence on a handful of countries, the dominance of China in all stages of many critical material supply chains, and rising export restrictions were the main issues raised by interviewees. For example, China restricted exports of synthetic graphite (used in battery production) to Sweden starting in 2020 and introduced general export restrictions on graphite in 2023.[124]

Indeed, the OECD has found a five-fold increase in export restrictions of critical raw materials since data was first collected in 2009 and reports that export restriction measures affect 10 per cent of trade in critical raw materials.[125] Global Trade Alert has identified local producer subsidies as the most frequently adopted critical raw materials policy.[126]

The EU's strategy to scale up critical raw material production within the EU is a long-term[127] and costly[128] exercise with shortcomings in trade policy aspects of design.[129] Complementary strategies to reduce import risks include demand reduction, recycling, substitution, and stockpiling. Japan has combined these strategies alongside foreign acquisitions to reduce dependency on Chinese rare earths from 90 per cent in 2010 to 60 per cent today.[130]

The vast majority of critical raw materials imports do not pay import duties

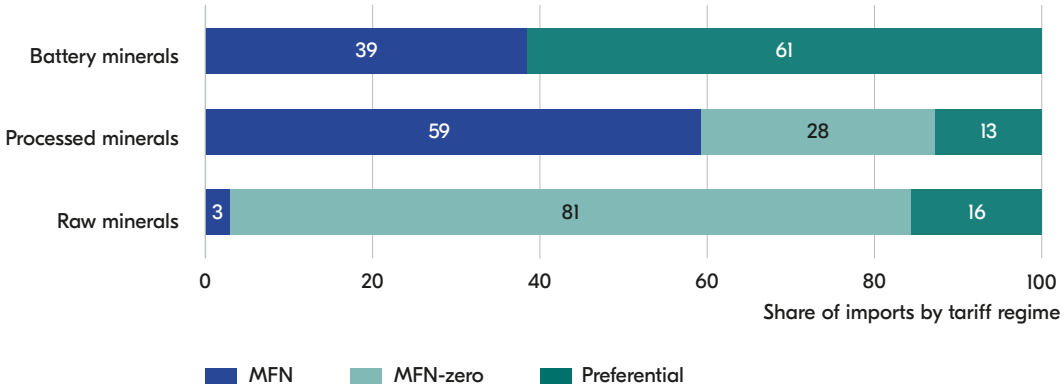
The EU points out that 'the vast majority of EU critical raw materials imports (92 per cent in value) do not pay import duties, thanks to most-favoured nation (MFN) tariffs set at zero or to trade agreements in force.'[131] This is also visible in an analysis of tariff regimes of EU imports for various critical raw minerals at three stages of production (following the UNCTAD report on critical minerals).[132]

As Figure 10 shows, 81 per cent of the raw minerals enter the EU at a zero most-favoured nation tariff, with 16 per cent traded under preferential treatment (likely also zero tariffs). Imports of critical minerals one step up the value chain tend to be traded under most-favoured nation rules, with only around 40 per cent at zero-import tariff levels. Imports of battery minerals are mostly sourced from partner countries with a trade agreement that is under preferential treatment. The remaining 40 per cent of minerals are imported under the most-favoured nation tariff regime.

123. European Commission. *A secure and sustainable supply of critical raw materials in support of the twin transition* (2023).
124. European Commission, Access to Markets – Export restrictions for artificial graphite products by China
125. The rise in export restrictions has mostly been driven by export taxes, which are not prohibited under WTO rules. OECD. Export restrictions on critical raw materials (2023).
126. Global Trade Alert. The Scramble for Critical Raw Materials: Time to Take Stock? (2023).
127. ECIPE. European Economic Security and Access to Critical Raw Materials: Trade, Diversification, and the Role of Mercosur (2023).
128. Findeisen, F. and Wernert, Y. Meeting the costs of resilience: The EU's Critical Raw Materials Strategy must go the extra kilometer (2023).
129. See National Board of Trade. The Cumulative Effect of EU Regulations on External Trade (2024); and ECIPE. European Economic Security and Access to Critical Raw Materials: Trade, Diversification, and the Role of Mercosur (2023) for more information.
130. World Economic Forum. How Japan solved its rare earth minerals dependency issue (2023).
131. European Commission. *A secure and sustainable supply of critical raw materials in support of the twin transition* (2023).
132. UNCTAD. Technical note on critical minerals (2023).

Overall, average trade-weighted import tariffs are low. Raw minerals are imported at an average rate of 0.1 per cent, processed minerals at 2.6 per cent, and battery minerals at 1.6 per cent. This suggests that a focus on non-tariff barriers and other trade policy strategies is likely to be the best approach to take.

Figure 10. Share of EU imports for selected critical raw minerals by tariff regime



Note: National Board of Trade analysis based on WTO data, following UNCTAD's technical note on critical minerals.[133] Raw minerals include lithium ores, lithium carbonate, cobalt ore and carbonate, and graphite flakes and raw material for artificial graphite manufacturing (HS codes 250390, 283691, 260500, 250410, 271312, 270810). Processed minerals include lithium and cobalt processed and/or refined raw materials, and artificial graphite (HS codes 282520, 282739, 282690, 282619, 282200, 810520, 380110), Battery minerals include lithium, cobalt, and graphite cathode materials (HS codes 284290, 284169, 382499, 284190, 285390, 854519).

4.2 Diversification of trade

4.2.1 The EU trade policy priorities are trade agreements and strategic partnerships

The European Critical Raw Materials Act aims to diversify imports[134] by using trade agreements and strategic partnerships as the preferred policy tools. The EU also participates in trade-related initiatives (e.g. the Minerals Security Partnership) to promote secure critical mineral supply chains and the Critical Raw Materials Club[135] and plans to introduce clean trade and investment partnerships.

Trade agreements

The EU has free trade agreements in force with partners with reserves of certain critical raw materials, including Vietnam, Canada, and Chile. Negotiations with India, Australia, and Indonesia offer the potential for diversification in a wider range of critical raw materials and could potentially include text or chapters on energy and critical raw materials.[136] A clear priority should be to prioritise the ratification of the EU-Mercosur agreement and to conclude and ratify the other free trade agreements.

Given the limited potential for trade liberalisation through tariff reduction, other instruments could be used within free trade agreements to facilitate trade in critical raw materials.

133. Ibid.
134. Regulation (EU) 2024/1252, Article 1, 2(a).
135. National Board of Trade. A New Trade Policy Landscape – Mapping trade-related agreements (2024).
136. IEEP. Sourcing critical raw materials through trade and cooperation networks (2024).

A mapping of specific trade and investment barriers for critical raw materials between partners is a necessary first step. Mechanisms within trade agreements could then be utilised to remove identified barriers or improve conditions for investment. For example, commitments to support developing countries with development aid to help meet EU market access requirements (e.g. due diligence requirements) could be included, dedicated chapters on critical raw materials could be drafted, and regulatory cooperation and TBT chapters could include more far-reaching cooperation commitments[137] for critical raw materials. Free trade agreements could seek to limit the use of export restrictions and improve conditions for specific investments in partner countries. Existing mechanisms, such as dialog meetings and working groups, could also include a focus on trade in critical raw materials.

Strategic partnerships aim for cooperation on critical raw materials

The EU has signed a memorandum of understanding for strategic partnerships for raw materials with 13 partners as part of the Global Gateway initiative. The partnerships are with high-, middle- and low-income countries. Commitments include cooperation on sustainable development, trade and investments, local value-added, research and innovation, capacity building, and sustainable and resilient value chains.[138] For example, support for infrastructure planning in Namibia has been announced.[139] However, these partnerships have only recently been established, so it is difficult to judge their ultimate outcomes or potential.

The EU's 'Political Guidelines for the Next European Commission' include proposals to develop clean trade and investment partnerships on critical minerals and raw materials.[140] It is not yet clear how these will complement existing trade approaches. The Commissioner-designate for International Partnerships voiced the need for the EU to have a better offer than China to secure raw materials. In addition, he raised connections between securing critical raw materials and development aid.[141]

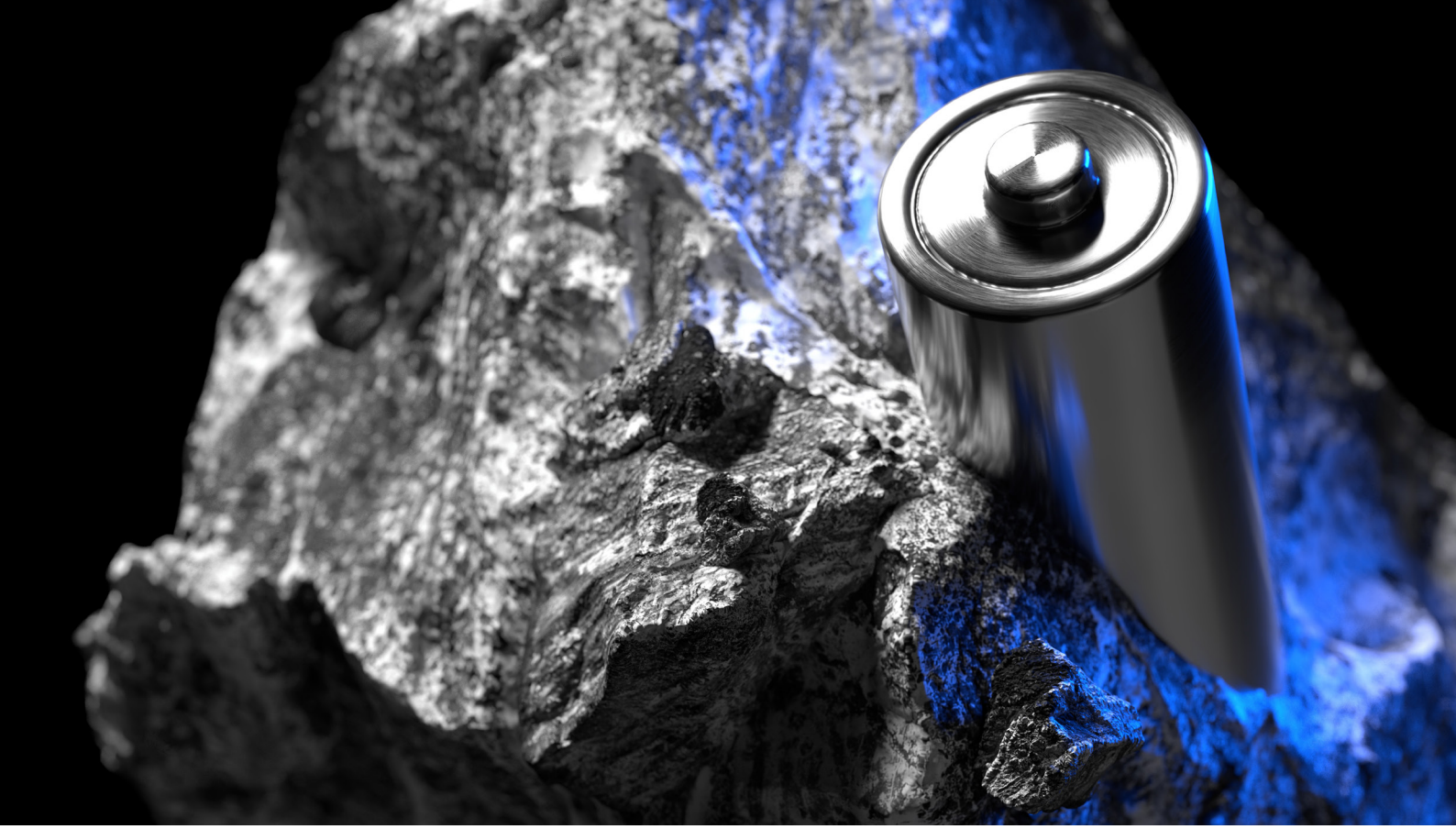
4.2.2 Improving synergies with development aid and sustainability

Development cooperation could support the EU's strategic partnerships or proposed clean trade and investment partnerships. Key principles should be engagement on the terms of the partnership countries in a way that promotes sustainable development[142] and investment in higher value segments of raw material value chains.

There is potential to better coordinate European development efforts and improve the European offer to developing countries. This can be done by strengthening the Team Europe approach, whereby the European Union, development banks, and Member States and their agencies join forces.

Assistance with improvements in quality infrastructure could help suppliers operating in developing countries provide reliable information to EU companies to fulfil regulatory obligations (e.g. for compliance with the Corporate Sustainability Due Diligence

137. See examples of how regulatory cooperation can be improved in trade agreements in the National Board of Trade's publication, An All-Star Approach to Regulatory Cooperation in the Area of Technical Barriers to Trade (2022).
138. European Commission press release. *EU signs strategic partnerships on critical raw materials value chains with DRC and Zambia* (2023).
139. European Commission press release. *EU and Namibia agree on next steps of strategic partnership on sustainable raw materials and green hydrogen* (2023).
140. von der Leyen, U. Europe's Choice – Political Guidelines for the Next European Commission 2024-2029 (2024).
141. Concord news article. Economy and EU interest raised in Commissioner for International Partnerships hearing (2024).
142. National Board of Trade. Critical minerals – important pieces on the geopolitical chessboard (2023).



Directive or the Regulation on Prohibiting Products made with Forced Labour). Another potential benefit would be to improve information gathering and verification systems to support applications for so called 'strategic projects' under the Critical Raw Materials Act.[143] However, interviews undertaken for this study highlighted substantial challenges with traceability in raw material supply chains and concerns that there will be difficulties meeting EU and investor sustainability requirements.

Development aid can also support processing, logistics, and infrastructure in partner countries. Investments in hard infrastructure could be supplemented by technical assistance for trade facilitation. This would ensure complex processes and bureaucracy related to the physical movement, clearance, and release of goods across borders operate smoothly.

4.3 Facilitating cross border flows for recycling

Recycling is also encouraged in the Critical Raw Materials Act. Recycling can help reduce the demand for, and associated sustainability impacts of, primary raw material production while increasing the supply of raw materials. Interviewees pointed to the need for improved classification of waste, scrap, and secondary raw materials to enable recycling and resource efficiency ambitions. Trustworthy information about the content and quality of secondary raw materials could be encouraged through international standardisation and certification.[144] Furthermore, trade statistics can also be improved, as the six-digit level codes of the harmonised system (HS) do not distinguish between secondary raw materials and waste and scrap.[145]

143. The act requires classification of these projects according to the United Nations Framework Classification for Resources (UNFC) supported by appropriate evidence (Article 7 ECRMA).
144. Bellmann, C. The Circular Economy and International Trade (2021).
145. Ibid.

The Basel Convention is implemented through the new EU's Waste Shipment Regulation.[146] The changes coming into effect, and procedures related to shipments, are leading to problems for companies that import waste products for recycling. An example is provided in the box below.

Cross-border transport of electronic waste

Boliden's Rönnskär smelter in northern Sweden recycles electronic waste into metals, including copper, which is essential for electrification and is classified by the EU as a critical raw material.[147]

Waste is primarily sourced from the Nordic countries and Europe before being transported for smelting in a specially adapted furnace in Rönnskär.[148]

Rules and classification for the shipment of electrical and electronic waste (e-waste) have recently been changed. The amendments of the EU Waste Shipment Regulation,[149] which implements the Basel convention, require that all shipments of electronic waste have a Prior Informed Consent procedure. This requires written consent from the importing state and all transit states and can take up to six months to complete.

For intra-EU shipments of non-hazardous e-waste, two delegated acts were published in December 2024,[150] which provide derogations for intra-EU green-listed e-waste shipments until the first of January 2027. This covers the period until the new electronic systems for the exchange of information and documents related to waste shipments are expected to be fully operational.

Extra-EU shipments of hazardous and non-hazardous e-waste to and from OECD countries will be subject to the prior written notification and consent procedure, and shipments of hazardous and non-hazardous e-waste to non-OECD countries will be prohibited. There are concerns regarding imports from third countries to the EU, since countries like the US, Canada, and Japan are not willing to comply with the new Basel e-waste codes and notification procedure, while the EU requires this for imports. This may lead to the risk of an e-waste shortage in the European market as material flows from OECD countries will not reach the EU.

At present, Prior Informed Consent is only required for around 25 per cent of electronic waste shipments, and the procedure involves taping a paper copy of the notification to the shipping container. These often get lost or damaged due to poor weather. As a consequence, shipments are stopped and suppliers risk fines. The interpretation and implementation the regulation diverges across European countries. While officials in most European countries accept photographic evidence that missing documents were originally attached to the containers, officials in Sweden require a physical version of the paper copy.

The EU plans to have a digital system in place by 2027, when the new rules for intra-EU shipments enter into force. However, the increased notification requirements and varying interpretation of EU law creates delays and increases the cost of recycling activities that contribute to an increased supply of copper, promote resource efficiency, and improve waste management.

146. Regulation (EU) 2024/1157.
147. European Commission. Webpage on critical raw materials
148. Boliden. One of the largest recyclers of electronic material (2024).
149. (EU)2024/1157.
150. (EU)2024/3229 and (EU)2024/3230.

5 Summary and recommendations

5.1 Trade policy for electrification

This report provided an analysis of how trade and trade policy can contribute to the electrification of Sweden's economy. The focus is on sectors that will replace fossil-fuels with electric technologies (industry and transport) and on the technologies with the highest potential to expand electricity generation (wind and nuclear) and transmission. The analyses and interviews found sector-specific challenges and trade barriers, as well as several cross-cutting issues.

If electrification is to be successful, there is an overarching need to follow and defend the multilateral trade rules and work to create an integrated single market. In addition, we identify six priorities for trade policy.

Figure 11. Trade policy priorities for electrification

Trade priorities with a direct effect on electrification

Secure supplies of critical raw materials
Securing raw material supply chains for electrification was a dominant theme raised by the Swedish stakeholders interviewed for this report. We recommend the following measures:

- Prioritising the negotiation of trade agreements with resource rich trading partners: Australia, Indonesia, and India. Ratifying the Mercosur agreement as quickly as possible.
- Focusing on non-tariff measures in existing and new trade agreements by including chapters or text on critical raw materials, avoiding export restrictions, or using mechanisms in existing agreements (e.g. dialogue meetings and working groups) to identify and remove barriers to trade and investment.
- Investigating the potential for synergies between development aid and the EU's strategic partnerships for critical raw materials.

Improve cross-border transportation rules
A theme that is taken up across the sectors investigated in this report concerns issues and administrative costs related to the cross-border transport of dangerous goods, hazardous waste, and used goods. These issues are hindering recycling efforts that increase the supply of critical raw materials needed for electrification and pose a risk to the safe supply of nuclear materials. We recommend the following measures:

- Reforming trade-related rules for the transport of used batteries, for example, by complementing or amending the Basel Convention to address trade barriers while maintaining high standards of environmental protection.
- Reviewing the implementation of the Waste Shipping Regulation in Sweden to avoid administrative hurdles for the transport of electronic waste that is recycled into copper.
- Pushing for the establishment of waste codes for used rotor blades in the Basel convention and the EU shipping rules. This would assist with recycling and the reuse of materials.
- Supporting a harmonised pan-European arrangement to approve cross-border transport packages of nuclear materials, technologies, and wastes, following the recommendation of the Euratom Supply Agency Advisory Committee.

Standardisation for electrification
International standardisation is mandated in several WTO agreements and can contribute to cost reduction in all the sectors of importance for electrification. We recommend the following measures:

- Supporting the WTO and World Steel Association's Steel Standards Principles initiative to harmonise and promote interoperable standards that measure and define near-zero steel. The principles could help guide legislative processes (e.g. in the delegated acts for the EU's Ecodesign for Sustainable Products Regulation) or other trade-related agreements.
- Encouraging the engagement of Swedish agencies and businesses in European and international standardisation work on vehicle charging infrastructure (e.g. high-power charging, battery replacement technology for heavy-duty and light vehicles, and vehicle to grid communication and management).

- Engaging in international standardisation and cooperation on regulatory processes for small modular reactors.
- Considering the German standardisation organisations' strategic vision for an 'All Electric Society'[151] as inspiration for a cross-sectoral standardisation strategy in Sweden.

Remove barriers to trade in goods and services for electrification
Tariff and non-tariff barriers raise the costs of materials, inputs, and goods for electrification. Services are essential to the technologies needed for electrification, including design, installation, operation, maintenance, and ultimately decommissioning and recycling. We recommend the following measures:

- Removing the EU's 10 per cent MFN tariffs for electric cars and vehicles and liberalising rules of origin, as these unnecessarily increase electric vehicle prices.
- Pushing for the harmonisation of requirements for warning lights, the height of wind turbines, and markings on turbines on the single market.
- Investigating the potential for exemptions from certain requirements of the Union Customs Code to reduce administrative burdens for offshore wind operating in the EU's Exclusive Economic Zone.
- Removing service barriers in the single market. See the National Board of Trade report 'Green Services in the Single Market' for more detail.[152]
- Liberalising trade in services bilaterally through existing and future FTAs and multilaterally in the WTO. The EU should be a constructive partner in the ongoing Trade and Environment Sustainability Structured Discussions (TESSD) and potential future plurilateral and multilateral negotiations.

Trade priorities with an indirect effect on electrification – getting the incentives right

Maintain a predictable and stable policy environment for carbon pricing and CBAM
Carbon pricing means that producers of greenhouse gasses pay the social cost of emissions, which incentivises electrification by raising the price of fossil fuels used in internal combustion engine vehicles and industrial processes. A challenge for policy makers is encouraging investments that reduce greenhouse emissions whilst avoiding imports of emission-intensive products. The EU has policies in place to achieve this. The EU Emissions Trading System will gradually reduce emission allowances to zero, and CBAM will require various imported products to pay the same price for carbon emissions as in the EU. We recommend the following measures:

- Committing to a stable and predictable policy environment for carbon pricing and CBAM as this is essential for investments in near-zero steel production and other industrial sectors with high capital costs and long investment cycles.
- Supporting other countries when they develop border carbon adjustments, as common approaches can reduce transaction costs associated with adapting to multiple schemes.

151. The strategy encompasses electrification, digitalisation, and automation across sectors and is grounded on the 'application of safe, internationally harmonised and interconnected technologies in norms and standards'. DKE. All Electric Society (2023).
152. National Board of Trade. Green Services in the Single Market (2022).

Reform fossil fuel and green subsidies

Fossil fuel subsidies are inefficient, increase greenhouse gas emissions, and discourage electrification by holding prices for fossil fuels artificially low and making it harder for electrified alternatives to compete. We recommend the following measures:

- Pressing for fossil fuel reform in European and global forums. Chapter 6 in the National Board of Trade's report 'Trade and Climate Change'[153] presents recommendations for achieving this reform.

Unfair subsidisation of the electric vehicle sector has led to the use of trade defence measures, raising the cost of vehicles. We recommend the following measures:

- Targeting trade defence instruments carefully and in a way that addresses trade-distorting subsidies without discouraging climate-friendly policy measures. In order to create the right balance in the future, the EU should consider introducing a full welfare economic analysis in the EU's Union interest test.
- Investigating possibilities for cooperation on rules for justifiable[154]green subsidies whilst minimising trade distortion and avoiding reversion to trade defence measures.

153. National Board of Trade. Trade and Climate Change (2021).

154. Welfare enhancing subsidies correcting an environmental externality or other market failure.

5.2 Concluding remarks

Many of the challenges related to electrification, such as permitting delays, increasing flexibility,[155] and building out charging and grid infrastructures, are addressed at national or European level, and this is where the primary focus of policy makers working on energy lies. While trade policy is perhaps not the most important factor for electrification, functioning trade is an important prerequisite for success, and we have identified several areas where trade policy can contribute to electrification goals.

In addition to the topics investigated in this report, we also noted several common themes. A theme arising in discussions and interviews was the connection between electrification and security, including China's dominance in supply chains, risks of economic coercion, and electrification as a strategy to reduce import dependence for fossil fuels. We included a section on critical raw materials as this was raised most often. However, more could be done to explore questions related to cyber security and digital trade (e.g. for smart grids), software and hardware risks from imports (e.g. electric vehicles), and geographical risks caused by a warming climate.

Another emerging theme concerns problems and administrative costs related to the cross-border transport of dangerous goods, hazardous waste, and used goods. We found issues in all the sectors we investigated. A suggestion for future research would be to conduct economy-wide research to investigate how widespread the issue is and assess the economic costs. This is important for enabling a circular economy.

Sustainability is another important theme; it was often mentioned in discussions and interviews, where participants expressed broad support for sustainability goals. In relation to social sustainability, the main challenges identified were traceability, exposure to human rights risks (e.g. in critical raw material and solar value chains), and difficulties fulfilling due diligence requirements. Environmental trade-offs were identified by interviewees due to the vast resource requirements of electrification, the carbon footprint of inputs, and extraction and processing of raw materials. Energy efficiency was raised as a solution that can reduce demand for electricity, and where electrification is also seen as a part of the solution.

A final point is that although scenario analysis and planning are required to manage the complex system changes required for electrification, real world economic developments and innovations never fail to surprise. Trade is an important driver of innovation, and the only pathway for companies based in smaller countries like Sweden to scale up production and to take ideas and prototypes to the level of mass market penetration. This is centrally important to electrification, as the IEA notes that 'around 35 per cent of the cumulative CO_2 emissions reductions needed to shift to a sustainable path come from technologies currently at the prototype or demonstration phase.'[156]

155. Fossil Free Sweden. Roadmap for electricity sector (2020).
156. IEA. Special Report on Clean Energy Innovation (2020).

6 References

Bellmann, C. *The Circular Economy and International Trade.* (International Chamber of Commerce, 2021) https://icc.se/wp-content/uploads/2021/12/20211214_Circular-Economy.pdf

BloombergNEF. *Green Steel Demand is Rising Faster Than Production Can Ramp* Up. [Article] (2023) https://about.bnef.com/blog/green-steel-demand-is-rising-faster-than-production-can-ramp-up/

Boliden. One of the largest recyclers of electronic material. [Webpage] (2024) https://www.boliden.com/sustainability/case-studies/largest-electronic-material-recycler-in-the-world/

Brey, B. and Rueda, V. *The persistent human costs of deindustrialisation: Lessons from the collapse of the British coal industry.* (2024) https://cepr.org/voxeu/columns/persistent-human-costs-deindustrialisation-lessons-collapse-british-coal-industry

CEPA. *Xi and Chinese Electric Cars Drive into Hungary.* [Article] (May 7, 2024) https://cepa.org/article/xi-and-china-electric-cars-drive-into-hungary/

Charnovitz, S. *Green Subsidies and the WTO.* (European University Institute, 2014) https://scholarship.law.gwu.edu/cgi/viewcontent.cgi?article=2341&context=faculty_publications

Cima, E. and Esty, D.C. *Making international trade work for sustainable development: toward a new WTO framework for subsidies,* (Journal of International Economic Law, Volume 27, Issue 1, March 2024, Pages 1-17) https://academic.oup.com/jiel/article/27/1/1/7612726

Climate and Enterprise Department. *Roadmap for new nuclear in Sweden.* [Presentation] (2023) https://www.regeringen.se/globalassets/regeringen/dokument/klimat--och-naringslivsdepartementet/ppt/231116-presentationsbilder-fardplan-for-ny-karnkraft-i-sverige.pdf

Confederation of Swedish Enterprise. *Start program for new nuclear.* (2022) https://www.svenskt-naringsliv.se/hallbarhet-miljo-och-energi/startprogram-for-ny-karnkraft

Council Regulation (EU) 2024/3211 of 16 December 2024 amending Regulation (EU) 2021/2278 suspending the Common Customs Tariff duties referred to in Article 56(2), point (c), of Regulation (EU) No 952/2013 of the European Parliament and of the Council on certain agricultural and industrial products. OJ L, 2024/3211, 27.12.2024, ELI: https://eur-lex.europa.eu/eli/reg/2024/3211/oj/eng ELI:

Council Regulation (EU) 2024/3213 of 16 December 2024 amending Regulation (EU) 2021/2283 opening and providing for the management of autonomous tariff quotas of the Union for certain agricultural and industrial products. OJ L, 2024/3213, 19.12.2024 ELI: https://eur-lex.europa.eu/eli/reg/2024/3213/oj/eng

DG Energy of the European Commission. *Analysis of Nuclear Fuel Availability at EU level from a Security of Supply Perspective.* (2020) https://op.europa.eu/en/publication-detail/-/publication/5fad2d20-8fa2-11ea-812f-01aa75ed71a1/language-en

DKE. *All Electric Society.* [Webpage] (2023) https://www.dke.de/en/standards-and-specifications/all-electric-society

Draghi, M. *The future of European competitiveness.* (European Commission, 2024) https://commission.europa.eu/topics/strengthening-european-competitiveness/eu-competitiveness-looking-ahead_en#paragraph_47059

Energiforsk. *Analysis of Demand for Fossil Free Electricity* (2023) https://www.energiforetagen.se/globalassets/dokument/fardplaner/scenario-2045-april-2021/scenarioanalys-efterfragan-fossilfri-el-2045-slutrapport.pdf

European Centre for International Political Economy (ECIPE). *European Economic Security and Access to Critical Raw Materials: Trade, Diversification, and the Role of Mercosur.* (2023) https://ecipe.org/publications/trade-diversification-the-role-of-mercosur/

European Commission. *Consumer Monitor 2023 – Country Report Sweden.* (2024) https://alternative-fuels-observatory.ec.europa.eu/system/files/documents/2024-06/Country%20Report%202023%20Sweden_0.pdf

European Commission. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. *A secure and sustainable supply of critical raw materials in support of the twin transition.* (2023) https://data.consilium.europa.eu/doc/document/ST-7551-2023-INIT/en/pdf

European Commission. *Critical raw materials for strategic technologies and sectors in the EU – a foresight study* (2020) https://op.europa.eu/en/publication-detail/-/publication/8e167f11-077c-11eb-a511-01aa75ed71a1/language-en

European Commission. *EU and Namibia agree on next steps of strategic partnership on sustainable raw materials and green hydrogen.* [Press release] (2023) https://ec.europa.eu/commission/presscorner/detail/en/ip_23_5263

European Commission. *EU imposes duties on unfairly subsidised electric vehicles from China while discussions on price undertakings continue.* [press release] (October 29, 2024) https://ec.europa.eu/commission/presscorner/detail/en/ip_24_5589

European Commission. *EU signs strategic partnerships on critical raw materials value chains with DRC and Zambia and advances cooperation with US and other key partners to develop the 'Lobito Corridor'.* [Press release] (2023) https://ec.europa.eu/commission/presscorner/detail/en/ip_23_5303

European Commission. *EU-US Trade and Technology Council.* [Fact sheet] (2024) https://digital-strategy.ec.europa.eu/en/factpages/eu-us-trade-and-technology-council-2021-2024

European Parliament. *The crisis facing the EU's automotive industry.* (2024) https://www.europarl.europa.eu/RegData/etudes/ATAG/2024/762419/EPRS_ATA(2024)762419_EN.pdf

European Round Table for Industry (ERT). *Single Market Obstacles Compendium.* (2024). https://ert.eu/wp-content/uploads/2024/02/Single-Market-Compendium-of-obstacles-13-Feb-2024.pdf

Financial Times. *Can the Steel Industry go Green?* [Video] (2023) https://www.ft.com/video/d70764be-05d4-4a81-95f7-163bb00cd8fc

Financial Times. *China's CATL to build €4.1bn battery factory with Stellantis in European expansion.* [Article] (Dec 10, 2024) https://www.ft.com/content/

Findeisen, F. and Wernert, Y. *Meeting the costs of resilience: The EU's Critical Raw Materials Strategy must go the extra kilometer.* [Policy brief] (Hertie School, Jacque Delors Centre, 2023) https://www.delorscentre.eu/en/publications/eu-critical-raw-materials

Fossil Free Sweden. *Roadmap for automotive industry – passenger cars.* (2020) https://fossilfrittsverige.se/en/roadmap/the-automotive-industry-passenger-cars/

Fossil Free Sweden. *Roadmap for electricity sector.* (2020) https://fossilfrittsverige.se/en/roadmap/the-electricity-sector/

Garsous, G.and Worack, S. *Trade as a channel for environmental technologies diffusion: The case of the wind turbine manufacturing industry.* (2021) OECD Trade and Environment Working Papers, No. 2021/01, https://doi.org/10.1787/ce70f9c6-en

Global Trade Alert. *The Scramble for Critical Raw Materials: Time to Take Stock?* (2023) https://www.old.globaltradealert.org/reports/gta-31-report

Government of Sweden. *Proposal for Long Term Energy Policy,* (2024, Prop. 2023/24:105, https://www.regeringen.se/rattsliga-dokument/proposition/2024/03/prop.-202324105

Hillman, J.A. and Manak, I. *Rethinking International Rules on Subsidies.* (Council on Foreign Relations, Special Report No. 96, 2023) https://cdn.cfr.org/sites/default/files/report_pdf/Rethinking%20International%20Rules%20on%20Subsidies_0.pdf

IMF, OECD, World Bank, and WTO. *Subsidies, Trade, and International Cooperation.* (2022) https://www.wto.org/english/res_e/booksp_e/repintcoosub22_e.pdf

International Atomic Energy Agency (IAEA). *Climate Conference Ends with Call for Major Nuclear Role.*[News item] (2019) https://www.iaea.org/newscenter/news/iaea-climate-conference-ends-with-call-for-major-nuclear-role

International Atomic Energy Agency. *Regulations for the Safe Transport of Radioactive Material,* IAEA Safety Standards Series No. SSR-6 (Rev.1). (2018) https://doi.org/10.61092/iaea.ur52-my90.

International Council on Clean Transportation. *A total cost of ownership comparison of truck decarbonization pathways in Europe.* [Working Paper]. (2023). https://theicct.org/wp-content/uploads/2023/11/ID-54-%E2%80%93-EU-HDV-TCO-paper-working-paper-28-A4-50145-v2.pdf

International Energy Agency. *Energy Grids and Secure Energy Transitions.* (2023) https://www.iea.org/reports/electricity-grids-and-secure-energy-transitions

International Energy Agency. *Energy Technology Perspectives* (2020) https://www.iea.org/reports/energy-technology-perspectives-2020/clean-energy-technologies-the-state-of-play#abstract

International Energy Agency. *Global EV Outlook 2021 – Accelerating ambitions despite the pandemic.* (2021) https://www.iea.org/reports/global-ev-outlook-2021/policies-to-promote-electric-vehicle-deployment

International Energy Agency. *Nuclear Power and Secure Energy Transitions.* (2022). https://www.iea.org/reports/nuclear-power-and-secure-energy-transitions

International Energy Agency. *Special Report on Clean Energy Innovation – Accelerating technology progress for a sustainable future.* (2020) https://www.iea.org/reports/clean-energy-innovation

International Energy Agency. *The Role of Critical Minerals in Clean Energy Transitions.* (2022) https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions

International Energy Agency. *World Energy Outlook.* (2024) https://www.iea.org/reports/world-energy-outlook-2024#

The Institute for European Environmental Policy (IEEP). *Sourcing critical raw materials through trade and cooperation networks.* (2024) https://ieep.eu/wp-content/uploads/2024/03/Sourcing-critical-raw-materials-through-trade-and-cooperation-frameworks-IEEP-2024.pdf

International Institute for Sustainable Development (IISD). *How Can Trade Policy Maximize Benefits from Clean Energy Investment?* (2021) https://www.iisd.org/publications/trade-clean-energy-investment

International Institute for Sustainable Development (IISD). *Global Cooperation on Border Carbon Measures – Where should we start?* (2024) https://www.iisd.org/articles/policy-analysis/global-cooperation-border-carbon-measures-where-should-we-start

Implement Consulting. *A European Green Single Market.* (2023) https://implementconsulting-group.com/article/a-european-green-single-market

Jernkontoret. *Investigation of standardization needs linked to the steel industry's climate transition.* (2023)

Jernkontoret (Swedish iron and steel producers' association). *Production facts and statistics.* (2024) https://www.jernkontoret.se/en/the-steel-industry/industry-facts-and-statistics/production/

KIEL Institute for the World Economy. *EU tariffs against China redirect trade of EVs worth almost USD 4 billion.* (2024) https://www.ifw-kiel.de/publications/news/eu-tariffs-against-china-redirect-trade-of-evs-worth-almost-usd-4-billion/

Kleimann, D. *Climate versus trade? Reconciling international subsidy rules with industrial decarbonisation.* (Bruegel, 2023) https://www.bruegel.org/policy-brief/climate-versus-trade-reconciling-international-subsidy-rules-industrial

Linares, P., and Conchado, A. *The economics of new nuclear power plants in liberalized electricity markets.* (Energy Economics, 40, S119-S125, 2013). https://www.sciencedirect.com/science/article/abs/pii/S0140988313002028

National Board of Trade Sweden. *A New Trade Policy Landscape – Mapping trade-related agreements.* (2024) https://www.kommerskollegium.se/en/analyses-and-seminars/publications/reports/2024/mapping-trade-related-agreements/

National Board of Trade Sweden. *An All-Star Approach to Regulatory Cooperation in the Area of Technical Barriers to Trade* (2022). https://www.kommerskollegium.se/en/publications/reports/2022/an-all-star-approach-to-regulatory-cooperation-in-the-area-of-technical-barriers-to-trade/

National Board of Trade Sweden. *Border Carbon Adjustments – An analysis of trade related aspects and the way forward.* (2020) https://www.kommerskollegium.se/en/publications/reports/2020/border-carbon-adjustments/

National Board of Trade. *Critical minerals – important pieces on the geopolitical chessboard.* [Policy brief] (2023) https://www.kommerskollegium.se/en/about-us/trade-policy-insights/critical-minerals--important-pieces-on-the-geopolitical-chessboard/

National Board of Trade Sweden. *Do Rules of Origin Rule Free Trade?* (2024) https://www.kommerskollegium.se/en/publications/reports/2024/do-rules-of-origin-rule-free-trade/

National Board of Trade Sweden. *EU Trade Defence – The unintended effects of anti-dumping measures.* (2021) https://www.kommerskollegium.se/en/publications/reports/2021/eu-trade-defence--the-unintended-effects-of-anti-dumping-measures/

National Board of Trade Sweden. *Green Services in the Single Market – facilitating the transition of the EU's industrial ecosystems.* (2022) https://www.kommerskollegium.se/en/publications/reports/2022/green-services-in-the-single-market/

National Board of Trade Sweden. *Making the EU Safer, Greener, more Competitive and Digitalised.* (2024) https://www.kommerskollegium.se/en/publications/reports/2024/making-the-eu-safer-greener--more-competitive-and-digitalised----trade-policy-recommendations--to-the-new-european-commission/

National Board of Trade Sweden. Making Green Trade Happen (2014) https://www.kommerskollegium.se/globalassets/publikationer/rapporter/2016-och-aldre/making-green-trade-happen_webb.pdf

National Board of Trade Sweden. *Nuclear Power and International Trade* (2024) https://www.kommerskollegium.se/en/publications/reports/2024/nuclear-power-and--international-trade/

National Board of Trade Sweden. *Standards can contribute to the green transition.* (2023). [News Item] https://www.kommerskollegium.se/om-oss/nyheter/2023/standarder-kan-bidra-mer-till-den-grona-omstallningen/#:~:text=Kommerskollegium%20har%20p%C3%A5%20uppdrag%20av,nya%20standarder%20kopplade%20till%20klimatomst%C3%A4llningen

National Board of Trade Sweden. *Final Report of the Council for Innovative and Climate-focused Standardisation.* (2023). https://www.kommerskollegium.se/om-oss/nyheter/2023/

National Board of Trade Sweden. *The Cumulative Effect of EU Regulations on External Trade* (2024) https://www.kommerskollegium.se/publikationer/rapporter/2024/the-cumulative-effect-of-eu-regulations-on-external-trade/

National Board of Trade Sweden. *Trade and Climate Change – promoting climate goals with a WTO agreement.* (2021) https://www.kommerskollegium.se/en/publications/reports/2021/trade-and-climate-change/

National Board of Trade Sweden. *Trade Rules for a Circular Economy.* (2023) https://www.kommerskollegium.se/en/publications/reports/2023/trade-rules-for-a-circular-economy/

Nordic transmission system operators (TSOs): Energinet, Fingrid, Statnett, and Svenska kraftnät. *Nordic Grid Development Perspective 2023.* (2023) https://www.statnett.no/globalassets/for-aktorer-i-kraftsystemet/planer-og-analyser/ngpd2023.pdf

Nuclear Energy Agency. *Small Modular Reactors: Challenges and Opportunities.* (2021) https://www.oecd-nea.org/jcms/pl_57979/small-modular-reactors-challenges-and-opportunities

The Organisation for Economic Co-operation and Development (OECD). *Domestic Incentive Measures for Renewable Energy with Possible Trade Implications* (2013) https://www.oecd.org/en/publications/domestic-incentive-measures-for-renewable-energy-with-possible-trade-implications_5k44srlksr6f-en.html

The Organisation for Economic Co-operation and Development (OECD). *Expert Workshop on Optimising Global Value Chains for Environmental Goods and Services: Summary of the Workshop.* (2016) https://web-archive.oecd.org/2016-09-26/401900-Conference-GVCs-Environmental-Goods-Services-Summary-Report.pdf

The Organisation for Economic Co-operation and Development (OECD). *Export restrictions on critical raw materials.* [Webpage] (2023) https://www.oecd.org/en/topics/sub-issues/export-restrictions-on-critical-raw-materials.html

The Organisation for Economic Co-operation and Development (OECD). *Overcoming Barriers to International Investment in Clean Energy.* (2015) https://doi.org/10.1787/9789264227064-5-en

Regulation (EU) 2024/1157 of the European Parliament and of the Council of 11 April 2024 on shipments of waste, amending Regulations (EU) No 1257/2013 and (EU) 2020/1056 and repealing Regulation (EC) No 1013/2006. OJ L, 2024/1157, 30.4.2024, http://data.europa.eu/eli/reg/2024/1157/oj

Regulation (EU) 2024/1252 of the European Parliament and of the Council of 11 April 2024 establishing a framework for ensuring a secure and sustainable supply of critical raw materials and amending Regulations (EU) No 168/2013, (EU) 2018/858, (EU) 2018/1724 and (EU) 2019/1020. OJ L, 2024/1252, 3.5.2024, http://data.europa.eu/eli/reg/2024/1252/oj

Research Institutes of Sweden (RISE). *Charging infrastructure and frequency regulation – a case study.* (2023) https://www.diva-portal.org/smash/record.jsf?pid=diva2%3A1740609&dswid=-2951

Reuters. *China's Chery to open its first European manufacturing site in Spain.* [Article] (Apr 16, 2024) https://www.reuters.com/business/autos-transportation/chinas-chery-will-open-spain-its-first-european-manufacturing-site-2024-04-16/

Sherzod S. *Energy Subsidies and the International Trade Regime.* [Presentation] World Bank 2024. https://thedocs.worldbank.org/en/doc/066f80bf77301b1f5933386d1c234a4c-0360012024/related/Sherzod-Energy-Subsidies-and-Trade-Regime.pdf

Svenska Kraftnät. *Grid development – driving forces.* [webpage] (2021) https://www.svk.se/en/grid-development/driving-forces/

Svenska Kraftnät. *Grid Development Plan 2024-2033.* (2024) https://www.svk.se/siteassets/om-oss/rapporter/2024/grid_development_plan_2024-2033.pdf

Swedenergy. *Energy year.* [*Presentation*] (2022) https://www.energiforetagen.se/globalassets/energiforetagen/statistik/energiaret/2022/energiaret_2022.pdf

Swedenergy. *Sweden's electricity needs 2045 – How do we close the gap?* (2023). https://www.energiforetagen.se/4917e4/globalassets/dokument/gap-rapport-handlingsplan/sveriges-elbehov-2045---hur-stanger-vi-gapet-20230215.pdf

Swedish Energy Agency. *Cross-agency Report on Society's Electrification.* (2023) https://energimyndigheten.a-w2m.se/System/TemplateNavigate.aspx?p=Arkitektkopia&view=693&q=myndighetsgemensam

Swedish Energy Agency. *Cross-agency Report on Society's Electrification.* (2024) https://energimyndigheten.a-w2m.se/System/TemplateView.aspx?p=Arkitektkopia&id=04b90e827bd84cdea37ecdfabe133f93&q=myndighetsgemensam&lstqty=1

Swedish Energy Agency. *From Waste to Resources.* (2024) https://energimyndigheten.a-w2m.se/System/TemplateView.aspx?p=Arkitektkopia&id=6e9958b2b8674caaa55d22fddc0c01c7&q=cirkul%C3%A4r&lstqty=1

Swedish Energy Agency. *Wind Energy.* [Webpage] (2023) https://www.energimyndigheten.se/forskning-och-innovation/forskning/elsystem/vindkraft/?

Swedish Energy Agency. *Wind power's resource use* (2022) https://energimyndigheten.a-w2m.se/System/TemplateView.aspx?p=Arkitektkopia&id=d5538f8b48d54fb6897686e729f65a1c&q=resursanv%C3%A4ndning&lstqty=1

Swedish Environmental Protection Agency. *Greenhouse gas emissions in domestic transport.* (2024) https://www.naturvardsverket.se/data-och-statistik/klimat/vaxthusgaser-utslapp-fran-inrikes-transporter/

Swedish Environmental Protection Agency. *Greenhouse gas emissions in Industry.* (2024). https://www.naturvardsverket.se/data-och-statistik/klimat/vaxthusgaser-utslapp-fran-industrin/

UN Trade and Development (UNCTAD). *Technical note on critical minerals.* (2023) https://unctad.org/publication/technical-note-critical-minerals

UK Trade Policy Observatory. *Trade Policy and the Production of Electric Vehicles.* [Briefing Paper] (2024) https://blogs.sussex.ac.uk/uktpo/publications/trade-policy-and-the-production-of-electric-vehicles/#_ftnref12

von der Leyen, U. *Europe's Choice – Political Guidelines for the Next European Commission 2024-2029.* (Strasbourg, 2024)

World Economic Forum. *How Japan solved its rare earth minerals dependency issue.* [Article] (2023) https://www.weforum.org/stories/2023/10/japan-rare-earth-minerals/

World Trade Organization. *China initiates dispute complaint regarding EU definitive duties on electric vehicles.* [News item] (6 Nov 2024) https://www.wto.org/english/news_e/news24_e/ds630rfc_06nov24_e.htm

World Trade Organization. *Steel Standards Principles.* (2023) https://www.wto.org/english/tratop_e/envir_e/steel_standards_principles_e.pdf

Sammanfattning på svenska

Summary in Swedish

Elektrifiering är en viktig strategi för att nå Sveriges klimatmål. Ersättning av fossilbränsle i industriprocesser och som drivmedel till transport med elektrifierade alternativ förväntas leda till en stor ökning av efterfrågan på el, vilket kan mer än fördubbla dagens behov. Regeringens proposition om energipolitikens långsiktiga inriktning[157] syftar till ett elsystem som kan leverera minst 300 TWh år 2045. Dagens elbehov är cirka 140 TWh. Detta kräver en omfattande utbyggnad av fossilfri elproduktion, elnät och lagring. Elektrifiering kommer innebära ett ökande behov av kvalificerad arbetskraft och enorma mängder material, insatsvaror och produkter.

Denna rapport utreder hur internationell handel och handelspolitiken kan bidra till elektrifieringen av den svenska ekonomin. Fokuset ligger på sektorer som förväntas öka elförbrukning på ett signifikant sätt (industri och transport) och på de tekniker som har störst potential att utöka elproduktionen (vind- och kärnkraft) samt på utbyggnad av elnätet. Vi identifierar sektorsspecifika handelshinder och utmaningar samt flera övergripande frågor som påverka Sveriges elektrifiering.

Elektrifieringen skulle stanna av utan internationell handel

Internationell handel är en förutsättning för elektrifiering. Import av råvaror, materiel, insatsvaror, utrustning och specialisttjänster är väsentliga för driften av energisystemet och utvecklingen av elektrifiering. Vikten av en fungerande global handel och tillgång till utländska marknader för export och import lyftes av de organisationer som intervjuades inom ramen för denna studie.

Multilaterala handelsregler och den inre marknaden möjliggör import och väl fungerande värdekedjor samtidigt som de ger upphov till effektivitetsvinster, stordriftsfördelar, innovation och tekniköverföring, vilket sänker kostnaderna för elektrifiering. Importen av insatsvaror och tillgången till billig fossilfri el bidrar också till konkurrenskraften hos svenska företag och skapar därmed en plattform för exporttillväxt.

En övergripande förutsättning för att lyckas med elektrifieringen är därför att följa och försvara de multilaterala handelsreglerna och verka för en integrerad inre marknad. Dessutom identifierar vi sex prioriteringar för handelspolitiken, vissa med direkt effekt och andra som bidrar indirekt till elektrifiering.

Handelsfrågor med direkt påverkan på elektrifiering

En säker och hållbar försörjning av kritiska råvaror. Kritiska och strategiska råvaror ingår i tekniken som krävs för elektrifiering (t.ex. vindkraftverk, elfordon, batterier och värmepumpar) och värdekedjorna är ofta koncentrerade i ett fåtal länder. EU strävar efter att diversifiera försörjning av dessa kritiska metaller och mineraler. Strategierna för diversifiering av handeln omfattar utvidgning och förbättring av EU:s nätverk av handelsavtal och inrättandet av strategiska partnerskap om kritiska råvaror. Vi rekommenderar att EU prioriterar förhandlingar av handelsavtal med resursrika handelspartner som Australien, Indonesien och Indien och att ratificering av Mercosuravtalet görs så snart som möjligt. Praktiska åtgärder kan vidtas när det gäller icke-tariffära handelshinder i befintliga och nya handelsavtal. Till exempel genom att inkludera

157. Prop. 2023/24:105

kapitel eller text om kritiska råvaror, undvika exportrestriktioner eller använda mekanismer i befintliga avtal (t.ex. dialogmöten och arbetsgrupper) för att identifiera och undanröja hinder för handel och investeringar. Det finns även potential för synergier mellan utvecklingssamarbete och EU:s strategiska partnerskap om kritiska råvaror.

Förbättra reglerna för gränsöverskridande transport. Ett tema som upprepas inom sektorerna av vikt för elektrifiering är administrativa problem och kostnader för gränsöverskridande transporter av farligt gods, avfall och begagnat gods. Problemen hindrar återvinningsinsatser som ökar tillgången på de kritiska råvarorna som behövs för elektrifiering och utgör en risk för en säker försörjning av kärnämne.

Det finns potential att reformera de handelsrelaterade reglerna för transport av förbrukade batterier samt att åtgärda administrativa hinder för transport av elektroniskt avfall som återvinns till koppar. För att hjälpa till med återvinning och återanvändning av rotorblad till vindturbin skulle nya avfallskoder införas i Baselkonventionen och EU:s sjöfartsregler. För att minska kostnaderna för kärnkraft skulle ett harmoniserat europeiskt system för godkännande av gränsöverskridande transportpaket av kärnmaterial, kärnteknik och kärnavfall kunna införas i enlighet med en rekommendation från den rådgivande kommittén för Euratoms försörjningsbyrå.

Standardisering för elektrifiering. Internationell standardisering uppmuntras i flera WTO-avtal och kan bidra till kostnadsminskningar inom alla sektorer som är viktiga för elektrifieringen. Till exempel, WTO:s och World Steel Associations initiativ ”Steel Standards Principles” syftar till att harmonisera och främja interoperabla standarder som mäter och definierar stål med nära nollutsläpp. Kommerskollegiums råd om innovativ och klimatfokuserad standardisering hade en arbetsgrupp om stål med nära nollutsläpp som rekommenderade att specialiserade stålprodukter tillverkade i Sverige tas hänsyn till vid utvecklingen av sådana standarder.

Rådet om innovativ och klimatfokuserad standardisering rekommenderade även att uppmuntra svenska myndigheter och företag att engagera sig i europeiskt och internationellt standardiseringsarbete när det gäller laddningsinfrastruktur för elektriska fordon (t.ex. högeffektsladdning, batteribytesteknik för tunga och lätta fordon samt kommunikation mellan fordon och elnät).

Standardisering är en viktig strategi för kostnadsminskning inom små modulära reaktorer och här är deltagande av svenska aktörer inom internationell standardisering och samarbete om regulatoriska processer önskvärt.

De tyska standardiseringsorganisationerna har en strategisk vision för ett All Electric Society som skulle kunna inspirera till en tvärsektoriell standardiseringsstrategi förelektrifiering i Sverige.

Undanröja handelshinder för de varor och tjänster som behövs för elektrifiering. Tariffära och icke-tariffära handelshinder ökar kostnaderna för råvaror, insatsvaror och produkter för elektrifiering. Priserna på elbilar kan sänkas genom att slopa EU:s MGN-avgifter för elbilar och liberalisera ursprungsreglerna inom frihandelsavtal. Inom vindkraftssektorn skulle kraven på varningsljus, höjden på vindkraftverk och märkningar på vindkraftverk kunna harmoniseras på den inre marknaden. Det finns även möjlighet till undantag från vissa krav i unionens tullkodex för att minska de administrativa bördorna för havsbaserad vindkraft i EU:s exklusiva ekonomiska zon.

Tjänster är väsentliga för den teknik som behövs för elektrifiering, i alla faser av deras livscykel (t.ex. i design, installation, drift, underhåll och avveckling och återvinning). Mer kan göras för att undanröja hinder för tjänster på den inre marknaden, och handel

med tjänster kan främjas bilateralt genom befintliga och nya frihandelsavtal och multilateralt inom WTO. EU bör vara en konstruktiv och drivande partner i de pågående strukturerade diskussionerna om handel och miljömässig hållbarhet (TESSD) och eventuella framtida förhandlingar om miljövaror och tjänster.

Handelsfrågor som påverkar elektrifieringen indirekt

Upprätthålla en stabil politisk miljö för koldioxidprissättning och koldioxidjustering vid gränserna. Koldioxidprissättning innebär att producenter av växthusgaser betalar de sociala kostnaderna för utsläpp, vilket ger incitament till elektrifiering genom att höja priset för fossilbränsle för fordon och industriella processer. En utmaning för beslutsfattarna är att uppmuntra investeringar som minskar utsläppen av växthusgaser i Europa samtidigt som man undviker import av utsläppsintensiva produkter. EU har en politik för att uppnå detta. EU:s system för utsläppshandel kommer gradvis att minska utsläppsrätterna till noll och CBAM kommer att kräva att olika importerade produkter betalar samma pris för koldioxidutsläpp som betalas i EU. En stabil och förutsägbar politisk miljö för koldioxidprissättning och koldioxidjustering vid gränserna är avgörande för framtida investeringar i industrianläggningar med lågutsläpp produktionsprocesser. När andra länder utvecklar koldioxidjusteringar vid gränserna kan EU stödja dem genom att föra över kunskap samt utveckla gemensamma metoder som kan minska transaktionskostnaderna för företag att anpassa sig till olika system.

Reformera fossila bränslen och gröna subventioner. Subventioner till fossila bränslen är ineffektiva, ökar utsläppen av växthusgaser och motverkar elektrifiering genom att hålla priserna på fossila bränslen artificiellt låga och göra det svårare för elektrifierade alternativ att konkurrera. Vi rekommenderar att beslutsfattare verkar för reform av fossilbränslesubventioner i europeiska och globala forum. I kapitel 6 i Kommerskollegiums rapport Trade and Climate Change[158] förklaras hur detta skulle kunna göras.

Globalt är subventioner till förnybar energi mycket lägre än subventioner till fossila bränslen, men de har varit föremål för tio WTO-tvister och flera utjämningsåtgärder. Dessutom har konkurrenssnedvridande subventioner inom elfordonssektorn lett till att handelspolitiska skyddsåtgärder används, vilket ökar kostnader för elbilar. Vi rekommenderar att eventuella handelspolitiska skyddsinstrument utformas på ett sätt som hanterar handelssnedvridande subventioner utan att motverka klimatvänliga policyåtgärder. För att få rätt balans i framtiden bör EU överväga att införa en välfärdsekonomisk analys i EU:s prövning av unionens intresse innan åtgärder införs. Ett ambitiöst mål skulle vara att undersöka möjligheterna till internationellt samarbete kring regler för välmotiverade och tillåtna gröna subventioner som samtidigt minimerar snedvridning av handeln och undviker användning av handelspolitiska skyddsåtgärder.

158. National Board of Trade. *Trade and Climate Change.* (2021)

The National Board of Trade Sweden is the government agency for international trade, the EU internal market and trade policy. Our mission is to facilitate free and open trade with transparent rules as well as free movement in the EU internal market.

Our goal is a well-functioning internal market, an external EU trade policy based on free trade and an open and strong multilateral trading system.

We provide the Swedish Government with analyses, reports and policy recommendations. We also participate in international meetings and negotiations.

The National Board of Trade, via SOLVIT, helps businesses and citizens encountering obstacles to free movement. We also host several networks with business organisations and authorities which aim to facilitate trade.

As an expert agency in trade policy issues, we also provide assistance to developing countries through trade-related development cooperation. One example is Open Trade Gate Sweden, a one-stop information centre assisting exporters from developing countries in their trade with Sweden and the EU.

Our analyses and reports aim to increase the knowledge on the importance of trade for the international economy and for global sustainable development. Publications issued by the National Board of Trade only reflect the views of the Board.

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