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The Swedish Commission for Electrification – actions and measures to accelerate the electrification of transports in Sweden

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Executive Summary

Sweden is a pioneering country in the field of electromobility, which is manifested, for example, by the highest market share of plug-in electric vehicles in the EU and the biggest electric bus fleet in the Nordics. In 2020, the Government of Sweden commissioned a taskforce to speed up the electrification of the transport sector, the Commission for Electrification. The Commission for Electrification is chaired by the Minister for Infrastructure and comprises 16 high-level delegates from both public and private sector. The Commission for Electrification is an advisory body to the Government of Sweden. The Commission for Electrification's mandate imposes accelerating electrification of all modes of passenger and freight transport.

This paper presents the results and deliverables from the Commission for Electrification and discusses how collaboration between the most determined stakeholders from both the public and private sectors can energise the policy development, accelerate the electrification of transport and increase the pace of the climate transition.

Keywords: government, market development, policy, ZEV (zero emission vehicle)

1. Introduction

The Sweden Climate Act stipulates a target of net zero emissions by 2045, at the latest, and negative emissions thereafter [1]. The net zero target means that, in principle, greenhouse gas emissions from the transport sector need to be zero by 2045. Greenhouse gas emissions from the transport sector account for about one-third of emissions in Sweden, and road transport is the main source of these emissions [2].

Sweden is a pioneering country in the field of electromobility, which is manifested, for example, by the highest market share of plug-in electric vehicles in the new-car sales in the EU and the biggest electric bus fleet in the Nordics [3,4]. For the Swedish maritime sector, the electrification of passenger vessels is growing in number in public transport [5], as well as for longer cross-border trips [6]. The development of electric aviation is progressing rapidly, and the Government of Sweden has taken several initiatives to promote the electrification of aviation. Several airports are installing charging infrastructure. A fully electric aircraft, a nineteen-passenger airliner, with an operating range of 400 km is being developed in Sweden [7].

The Government of Sweden's ambition is that deployment of charging infrastructure should be expanded at a pace such that it does not become an obstacle to the electrification of the transport sector. The Government of Sweden pronounce that electrification of transport must be made possible throughout the country through a rapid, coordinated and economically efficient expansion of appropriate charging infrastructure. Another guiding principle is that it must be easy to charge an electric vehicle, regardless of type of housing.

There have been demand-side policies in Sweden for plug-in electric vehicles specifically since 2012 and general investment support schemes to deploy public and private charging stations since 2015, which has resulted in a nation-wide expansion of the public charging infrastructure and major investments in for example deployment of charging infrastructure in single- and multi-family households.

In 2016, the first electric bus rebate was introduced and in 2020, this was extended to also include electric trucks. In April 2022, approximately 100 heavy duty electric trucks operate in Sweden. The development of electric road systems (ERS) is also on-going, in cooperation with Germany and France. Four different ERS technologies are being or have been demonstrated on public roads. The first permanent ERS section is financed by the Swedish National Transport Plan and is currently being planned by the Swedish Transport Administration.

In 2020, the Government of Sweden allocated just over 1 billion SEK to so called *regional electrification pilots* for heavy duty trucks with focus on plug-in and fuel cell electric trucks [8]. The regional electrification pilots aim to expand the deployment of public fast charging and hydrogen refuelling stations. The scheme became delayed, but in February 2022 the government decided on the regulation for the aid. The first call, which comprised more than 1,5 billion SEK, was open between mid-March and mid-April 2022. The outcome of that call will be discussed in the results.

In 2020, the Government of Sweden also commissioned a high-level taskforce to speed up the electrification of the transport sector, named the Commission for Electrification [9]. The Commission for Electrification is chaired by the Minister for Infrastructure and comprises 16 delegates from the public and private sector. The Commission for Electrification is an advisory body to the Government of Sweden. It has a mandate to accelerate the electrification of all modes of passenger and freight transport. The work includes all relevant technologies, including hydrogen technology. The Commission for Electrification is appointed until the end of 2022.

The Commission for Electrification comprises representatives from business, academia and regional public authorities and the delegates are grouped in four operative working groups 1) Electrification of the main road system, 2) Electrification of regional freight transports, 3) Electrification of the maritime sector, and 4) Electrification of aviation.

2. Method

With the overreaching mission to accelerate the electrification of transport in Sweden, the Commission for Electrification has been given the possibility to contribute to the policy development as well as to put forward measures and actions together with other stakeholders to increase the pace of the electrification.

The Commission for Electrification has aimed to focus on measures where the public and private sector jointly can move forward to express and illustrate possible actions to increase the pace in the electrification of transport. This paper will present the case of three measures, initiated by the Commission for Electrification, which has influenced and gained the momentum in the work for electrification of regional freight, deployment of fast-charging and hydrogen refuelling stations and improved availability of home-charging for tenants.

3. Results

To illustrate different types of deliverables and contributions, the section presents three concrete results from the Commission for Electrification so far. These results have specific emphasis on the road transport sector.

3.1 Electrification pledges for regional freight transport

The focus in regional road freight is coupled to the high CO2-reduction potential. About three-quarters of domestic road freight transport in Sweden is carried out within one county, i.e., the trucks never leave the county [10]. Electric trucks suitable for regional freight transport are already on the market and therefore the potential for electrification of regional freight transport is high [11].

In the beginning of 2021, the Commission for Electrification and the Ministry of Infrastructure conducted a survey to the County Administrative Boards regarding their view of the possibilities to establish charging infrastructure for heavy trucks. The question asked was *"What is your view of the possibilities to expand the charging infrastructure for heavy vehicles in your county during the next two years, for example with funds from the state's investment scheme for regional electrification pilots?"* Only a few counties responded that they were aware of projects that could result in applications for regional electrification pilots.

To accelerate the interest, gather pioneering actors and contribute to knowledge-exchange, the Commission for Electrification invited actors to describe their high ambitions in so called *Electrification pledges*. In total by the summer of 2021, over 260 public and private actors, all dedicated to accelerating the electrification of regional freight transport, had expressed the concrete plans in different *Electrification pledges* [12]. The stakeholders include automotive manufacturers, electricity grid operators, charging point operators and hydrogen infrastructure providers, fuel station chains, freight companies, transport service purchasers and property owners. To regard varying regional conditions throughout Sweden, the electrification pledges have been coordinated by the county council and/or the County Administrative Board.

Figure 1 Illustration from Stockholm Environment Institute (SEI) [13], aggregating the top 10 pledges mentioned in the Swedish heavy-duty transport electrification pledges. The size of each square represents the time each measure was suggested in a pledge (largest square size is 33).

By recalling the previously mentioned *regional electrification pilots*, the investment support scheme that focused on the deployment of fast charging and hydrogen refuelling stations for heavy duty trucks, and earlier low interest stated less than a year and a half ago; when summing up the first call in April 2022, the programme management could conclude that the submitted applications came from all parts of Sweden, from the North to the South, and comprehended projects for over 5 billion SEK. More than five times than the already substantial budget allocation.

In the spring 2022 the Electrification Commission's office has carried out a follow-up of the Electrification pledges. An early conclusion from the follow-up and the first call for applications for regional electrification pilots is that the *Electrification pledges* have contributed to improving the understanding of the market development for heavy electric trucks in Sweden, to new forms of collaboration between actors from both the transport and energy sector and to accelerate the interest in facilitating charging infrastructure and hydrogen refuelling stations for heavy trucks. Collaborations like these, between multiple stakeholders from both the public and private sectors, are decisive in the transition to a net-zero society and is central in Swedish policy development.

3.2 Action plan for the electrification of road transport

In December 2021, the Commission for Electrification presented its action plan for the electrification of road transport [14]. The action plan aims to describe how road transports in Sweden can be electrified. It points out the overall development for electrification of the road transport, where the different technologies are discussed in a short- and long-term perspective, as well as presents ten actions, which exemplifies how the electrification of road transport in Sweden can be accelerated

with the focus on deployment of public fast-charging and hydrogen refuelling stations along major routes in Sweden. For each measure, relevant actors have expressed their contribution to the mission to accelerate road transport. In table 1, the ten key steps are presented.

Table 1. Ten key steps presented in the Commission for Electrification's action plan for the electrification of road transport.

Measure	**Brief description**	**Dedicated actors**
Survey of how the electricity networks can meet the charging demands of heavy-duty vehicles	OEMs and grid owners collaborate to understand the grid status at locations suitable for fast charging of trucks	Volvo, Scania, Vattenfall Eldistribution, E.ON Energidistribution, Power circle
Vehicle manufacturers build high-performance charging networks	OEMs have presented joint venture to deploy fast charging network	Volvo, Daimler och TRATON
Electrification pledges to promote charging infrastructure	Concrete commitments from the entire value chain	Over 260 actors
The electricity grid companies ensure grid capacity for the charging infrastructure	Distribution System Operators (DSOs) committed to enable the electrification of road transport	Vattenfall Eldistribution, E.ON, Ellevio, Jämtkraft and Skellefteå Kraft
Sweden's fuel stations will offer charging	Deployment of fast-charging infrastructure at major fuel station chain	OKQ8, Circle K and Preem
The government supports the transition	National policy support	The Government of Sweden
Sweden's first permanent electric road will be built and work on regulating and planning for electric roads will continue	On-going actions to ensure a continued development of electric roads	The Government of Sweden and the Swedish authorities
Access to charging and tank infrastructure is regulated	EU policy support expressed in AFIR	EU member states
Refueling with hydrogen will be made possible in more places	Presentation of on-going actions to deploy hydrogen refuelling stations	Nordic Hydrogen Corridor and STRING network
Knowledge that accelerates the electrification of major roads transport	Presentation of three on-going significant research and innovation projects as well as an introduction to the Swedish Electromobility Centre, the national research centre for electromobility.	

Following up on the stated commitments in the action plan, measures have been taken on each of the ten actions in April 2022. For example, the survey of how the

electricity networks can meet charging demands of heavy-duty vehicles have been carried out and presented [13].

3.3 The housing-company initiative – Prepped for charging

To improve the conditions for tenants living in multi-family building to get access to home-charging, the Commission for Electrification together with six public and private housing companies launched the initiative *Prepped for charging* (Klart för laddplats) in April of 2022 [14].

Here the housing companies manifested their ambitions to facilitate charging for the tenants and their commitment to always effectively and accurately investigate the possibility to offer home-charging for tenants upon request as well as start working strategically to scale-up the deployment home-charging.

The initiative has invited and encouraged other housing companies to join, by adopting the stated commitments, and the initiative now comprise of a growing number of housing companies.

4 Discussion

The results from the actions and measures undertaken by the Commission for Electrification illustrate the power of collaboration between the most determined stakeholders from both the public and private sectors. To highlight the frontrunner stakeholders grouped in relevant consortium, illustrates the cross-sector collaborations necessary for a rapid deployment of example electric trucks and deployment of depot- and public fast charging networks. In addition to traditional policy development, the Commission for Electrification engage and collaborate with stakeholders ready to commit to concrete actions and these joint efforts accelerate the electrification of transport and increase the pace of the climate transition.

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Presenter Biography

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