Swedish Electromobility Centre

2025 ANNUAL REPORT

Swedish Electromobility Centre

The national research centre for electrification of transportation.

An arena for Sweden's industry, academies, and society to create new technology, insights, and competence for the future.

Established 2007
Stage V 2022-2027

Annual report 2025

Swedish Electromobility Centre, March 2026

https://emobilitycentre.se

Cover page: Poster exhibition at Roads to the Future. Photo Henrik Sandsjö

Images: Henrik Sandsjö, pp. 5, 6, 9, 26, 64–67; Daniel Ahlqvist, p. 26; Anna Abelius, p. 46; Marcus Folino, pp. 48–49; Shutterstock/ zlicovec, pp. 18–19; /aanbetta, pp. 24–25; /Sharfsinn, p. 27; /Audio und werbung, p. 28; /Summit Art Creations, p. 37; /petovarga, p. 40; / Photoongraphy p. 67 /Gudman, last page

Illustrations: Shutterstock/Blan-k, p. 9;

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Navigating through challenging times

2025 was a year marked by great uncertainty, tariffs, and wars. Through these unknown waters and new challenges, SEC has managed to navigate quite well.

Resilience, internationalization, and circularity have been keywords together with the SEC mantra of collaboration and sharing. European competitiveness was identified as an important driving force already in our roadmap – a conclusion that has only been reinforced throughout the year.

Resilience and safety have become increasingly more important as we continue building the future electrified transport system. Seeing that our work with the focus group on resilience and our roadmap have resulted in exciting new projects is not only very gratifying – it's also a necessity if we are going to stand strong when facing challenging times.

Our conference days, Roads to the Future and E-mobility Day held in Gothenburg in August, gathered 200 participants and there was even a full waiting list. Having the opportunity to discuss with so many knowledgeable people at one place is a fantastic privilege. Daring to test and find new solutions requires courage, and I believe that meeting each other in person matters more than ever in these challenging times. The scope of Roads to the Future was "Circularity in electromobility – where do we stand". The program was very much appreciated and the pitches made from our many talented PhD-students especially so.

The centre has been evaluated externally and received a very positive overall review. One area of possible improvement is the work on equality. In the next stage we will engage more in this, especially within our PhD network.

During the fall, we worked extensively to lay the foundation for the next stage of SEC. The format was set by the Swedish Energy Agency and based on the centre's established activities. However, there were plans to be made, details to set and research scopes to update, meaning all theme road maps were updated.

With all new strong forces affecting our work with e-mobility we need to remember the purpose and realize that we have the potential to offer a transport system that is not only sustainable, but also resilient and customer competitive. This will contribute to the prosperity of both Sweden and Europe.

Linda Olofsson, SEC Director

Nils-Gunnar Vågstedt, Chairman of SEC, reflects on 2025

We can all see that a lot of discouraging and chaotic things are happening in the world right now. But research is a long-term activity, building knowledge and focusing forward on a bright future. Remember, as in bad weather all storms will pass, and no matter how dark the clouds, the sun is shining above them.

I recognise that current geopolitical developments are challenging for e-mobility. Still, I am truly optimistic about the future for both e-mobility and our centre. If we take a look in the rearview mirror back to the centre's origin in 2007; the electrification has gone from a fringe phenomenon to a central part of societal development. Now, every car manufacturer has a range of electric vehicles with great performance and reasonable prices, and the charging infrastructure is rapidly developing. The question is not whether e mobility is possible, but rather how users can become comfortable and feel safe during long distance travel. Don't get me wrong, we still need to continue working on energy efficiency, battery performance and further improvements of the transport eco system. But sometimes we need to acknowledge all the progress that has been made.

E-mobility still has a lot of potential to improve and by pushing forward we will eventually reach a point where the products are both better and cheaper than their counterparts. When that happens, the old technologies will inevitably be phased out, and I would say that we are now very close to seeing this being realised. However, technological shifts don't just magically happen on its own, and that's why centres like SEC are so important. It's an excellent arena for bringing academia and industry together breaking new boundaries.

Competitiveness at a global market is certainly something that I'm concerned about, but I also feel confident that we will continue to have a successful industry, focusing on our own strengths and abilities. Sweden has a fantastic history of innovations and creativity which we must keep building on. It's not easy for a small country to compete in large volume production and we need to focus on our unique strengths. Triple helix collaboration is one of those strengths and we need to get even better at this. Keeping Sweden competitive is a major reason why this centre exists.

In 2025 we saw a milestone for enabling commercial heavy e-mobility capable infrastructure when the standard for megawatt charging was set in place. I would not say that the megawatt charging system is the final piece in the puzzle for heavy transports to scale, but it certainly makes it easier and more operationally competitive towards the old and fossil powered technology. The SEC associated project E-charge has been a fantastic project covering this area which is now moving on as E-charge 2.

V2G is an exciting part of e-mobility where there has been an increasing interest and development. Commercial actors are always trying to improve business value, and if money can be made from unused vehicles it's certainly something corporations will take advantage of. This will perhaps not be suitable for all heavy commercial vehicles, since they are in operation most of the time, but for some applications this could be very interesting.

Regular passenger cars, however, stand still most of the time, so there's a lot of potential to use them for other purposes. SEC's theme area, Vehicle–Grid Interaction, has many great projects and I'm looking forward to following the progress. However, it's not just up to research centres like SEC to deliver in this matter. We also need to have the grid owners and legislators onboard in the dialogue.

I really encourage everyone to participate at SEC's fantastic conference days Roads to the Future and E-mobility Day, even though I understand there are many busy schedules. These face-to-face meetings really build another level of trust and facilitate future collaborations. My favourite part was when all the PhD students lined up and pitched their posters. It really summed up all the amazing research this centre produce, and it made me incredibly proud. This display really represented the essence of Swedish Electromobility Centre. I also want to mention what a fantastic asset the doctoral network is. The connections made there will be very valuable for all PhDs future careers.

Now, SEC is in the processing to continue as a Swedish Energy Agency competence centre for another five years in stage VI. So much great research has been done these past years which we will continue to build on for the anticipated next stage. The most recent years there has been an increasing focus on resilience and security which we obviously must take into consideration. I also think it's necessary to look beyond the end of stage VI. All partners in the centre must reflect on how this successful concept should be developed and shaped for the period after 2031. SEC also has the ambition to expand its network internationally. Many of the partners are operating on a global scene and it's important to have long-term collaborations and constructive dialogues across the borders to keep improving e-mobility.

Swedish Energy Agency

2025 marked the fourth year in Stage V for SEC as a Swedish Energy Agency competence centre. Klaas Burgdorf, the centre's research program manager, reflects on electromobility and the centre in relation to global developments dominated by geopolitical positioning, tariffs, and increasing competion.

"I'm certainly concerned about the unpredictability and shifting political prioritizations that we see. It's not a postitive direction, and it may slow down the progress, but I don't think it will halt the integration into society. In the end there is a difference between what's said and what's done. Oil and coal will not be taken from the ground once it's deemed cost-inefficient," says Klaas.

Technological development has come a long way over the last 20 years, and Klaas thinks that the trajectory toward electric vehicles now looks durable.

"From my own point of view I am happy I can easily drive for two and a half hours before recharging. I think this capability covers most people's needs. With continued improvements and cheaper models entering all market segments, I find it hard to see another technology breaking this trend. That said, we cannot be complacent. There are still many challenges left to increase competitiveness, sustainability, and resilience, and that is why the work done in SEC is so important."

Klaas is pointing out that the **global competition has intensified** since the start of SEC's Stage V.

"We can see that China has emerged as the giant in green technology the last five years who we must work together with in some form. The bankruptcy of Northvolt showed how difficult it is to compete in large volume production, and I think we must find our niches. With that said I'm very glad to see Europe having a bit of a renaissance with auto manufacturers producing some really great vehicles."

The development of vehicle-to-grid is moving forward, and Klaas mentions some milestones that were reached in 2025. "Vehicle-to-grid is now available on the market in more and more models which I think is encouraging. Then I would say that it's now an established fact that the batteries are outlasting the vehicles, which is an important factor for consumers' willingness to use their cars for V2G. Then the European day-ahead electricity market moved to 15-minute price resolution, which strengthens the business case for flexible charging and V2G better reflecting short-term price signals. Now, I just hope that this technology can reach everyone and not only homeowners. SEC's research in the car park 'Dansmästaren' in Uppsala is a good example of a relevant project exploring the potential of this technology."

A less predictable world has put more focus on robustness and resilience, and Klaas has noted that this is reflected in the communication from different actors.

"Resilience and dual use have been mentioned more during the year, both in EU programmes and from Swedish authorities, especially in certain niche areas. I think that it's wise to keep an eye on the topics and problem formulations. SEC's focus group on resilience is a great initiative in this matter."

Does the increased focus on resilience mean less sustainability?

"That question is difficult to give a definite answer to, but I do think that it has come to everyone's attention that sustainability is much harder than we initially thought. Circularity, repairability and life-cycle assessments (LCA) are all very important aspects, but it will probably take time until a holistic reflection in the rules and regulations is implemented. Sustainability is a difficult and complex topic. SEC has contributed significantly to LCA knowledge," says Klaas.

Klaas participated at SEC's conference events Roads to the Future and E-mobility Day, which he proclaimed as the highlights of the year:

"For me personally, these days gave me a lot of energy and enjoyment. It's amazing to have so many knowledgeable people in the same place discussing all types of different technological matters."

Stage V is ending in 2027, and SEC is now in the application process for a five-year continuation as a Swedish Energy Agency competence centre. As part of this process, the external consultancy firm Oxford Research was commissioned during 2025 to evaluate all the Agency's competence centres.

"I have said before that this is a solid centre producing great research and competence. Therefore, I wasn't surprised that SEC performed very well in the evaluation. We will now do our best to finish the application process as soon as possible," says Klaas.

Swedish Energy Agency

Valeria Castellucci (Uppsala University) and Robert Eriksson (Volvo Cars)

Empowering research through real-world electric mobility

Swedish Electromobility Centre continues to advance its long-term engagement with real-world research, working closely with partners to accelerate the transition toward sustainable mobility. As part of this effort, the centre is promoting collaborative activities in demonstration environments, where new technologies can be tested, evaluated, and refined under authentic operating conditions.

Researchers at Uppsala University, together with project partners like Volvo Cars, are gathering practical insights on charging patterns, user behaviour and vehicle–grid integration. These real-world studies strengthen SEC's ability to evaluate how electric vehicles operate within existing infrastructure and how future systems can be designed to support a more sustainable transport sector.

Volvo Cars has contributed with an electric Volvo C40 that will be used by researchers to perform smart charging tests at the Ångström Laboratory, and at the parking garage of Dansmästaren.

Dansmästaren is a multifunctional building located in Uppsala and a test bed for experiments on smart energy systems.


Volvo car charging at the Research Twin at the Ångström Laboratory, UU.

Valeria Castellucci, Robert Eriksson, Ali Fotouhi, Martina Tibaldi, Johanna Trillkott, and Marina Mattos.

SEC’s unique model

SEC encourages knowledge sharing and collaboration. Here, competitors work together, contributing collectively to Sweden’s role in the electrification of the transport sector. This collaborative spirit not only leads to breakthroughs but also plays a role in education, fostering competence and capacity important for the continued advancement of electrification.

Mission

The mission of SEC is to accelerate the development and implementation of electric propulsion technologies into the transport ecosystem by maximizing their applicability, versatility, and efficiency, while minimizing their overall impacts on the environment, human health, and natural resources, and strengthen the Swedish industry’s competitiveness.

The industry’s view of SEC

» Being the hub in Sweden for applied research in electrification of transport.

» Contributing to coordination gains across academia and industry but also across SEC and with other centre formations in adjacent areas.

» Being a recruitment base at licentate/doctoral level and at senior research level.

» Being a platform and trustful network that work for mobility between industrial and academic researchers, thus facilitating bi-directional knowledge transfer.

» SEC should continue to be a catalyst that accelerates the electrification of vehicles.

» SEC should continue to deliver world class research results.

SEC’s task towards academy

» Gather and build long-term knowledge in relevant areas for vehicle electrification and development of associated charging infrastructure.

» Bring industry and university partners together, in order to develop free, strong and creative research environments. Initiate and finance relevant research projects and themes.

» Disseminate the knowledge generated within the centre by providing courses within the framework of postgraduate programs.

» Create knowledge that can be used in undergraduate programs at each university and with industry partners.

» Create value by organising meetings and networking venues.

» Deepen knowledge exchange between automotive companies and companies in the electrification field, and universities.

» Help increase the level of knowledge in relevant areas.

SEC Objectives

1. Create interdisciplinary projects

» 80% of all projects that last for two or more years and are funded by SEC must meet at least one of the criteria below:

» The project must plan and work to ensure that the researcher or PhD student will work for a limited time on-site at one of the industrial partners.

» The project must plan and work for international exchange.

» The project must touch on and collaborate with experts from a field other than its main field.

2. Offer an interdisciplinary research environment

» SEC must offer researchers, PhD students, and those working on degree projects from industry an interdisciplinary research environment.

» The industrial parties must also have the opportunity to participate in SEC's PhD courses.

3. Be scientifically competitive

» SEC's projects must be scientifically competitive internationally. SEC must, on average over the period of the stage, publish at least thirty reviewed articles in international journals and/or at conferences every year.

SEC Objectives

4. Disseminate knowledge & research findings

» The theme groups must convene 1–2 times every month, host 2 seminars/term, and SEC must arrange an activity that concerns all theme areas every year.

5. Collaboration

» SEC must be involved in at least two projects with other centres or research organizations or major international collaboration projects with operations that can be linked to SEC.

6. Supply the field with key competences

» Half of the SEC-funded research projects that last for two years or more must be PhD student projects.

» The PhD student should be involved in the PhD Student Network and SEC's planned PhD courses.

SUSTAINABLE DEVELOPMENT GOALS

Swedish Electromobility Centre activities have strong connections to several of the UN Sustainable Development Goals adopted in 2015. These are the five most direct interrelations.

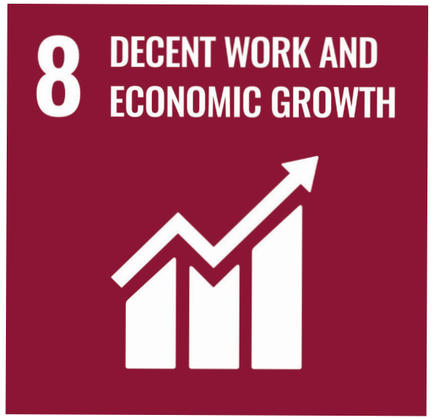
No.7 Sustainable energy for all
Electrifying all or parts of the vehicle fleet enables the energy for these transports to come from several different sources, with low greenhouse gas emissions, in contrast to the current system and its dependence on fossil fuels. Not only does the centre work for an electrification of vehicles. The centre also works for integrating electric mobility and transportation in the full energy system in a sustainable and supportive way.

No.8 Decent working conditions and economic growth
Industrial activity in the field of electromobility is increasing significantly. Most, if not all, vehicle manufacturers have hybrid vehicles, rechargeable hybrid vehicles or fully electric vehicles in their model portfolio. Subcontractors to vehicle manufacturers are also affected. By strengthening the competence and capacity within electromobility in Sweden, SEC contributes to economic growth in the country. It also leads to employees in Sweden, that are included in the Swedish labour laws with, for instance, the right to unionise and with monitored working conditions.

No.9 Sustainable industry, innovations, and infrastructure
Research, innovation and technological progress are the key to developing sustainable solutions for both economic and environmental challenges in the development of electromobility. There is a strong connection between the industries and the research projects funded by SEC.

No.11 Sustainable cities and communities
A very important part of the pursuit of sustainable cities is high utilisation of the city's surface through densification and efficient transport systems for both goods and people. Electromobility plays several roles here. Many of the centre's projects include sustainable logistics, human factors in emobility, and the connection between the vehicle and the cities' and communities' energy systems.

No.13 Fighting climate change
Climate change is a real and undeniable threat to our entire civilisation. An electrification of a larger proportion of the world's vehicles, in combination with climate friendly electricity production has great potential to significantly reduce the transportation sector's total carbon dioxide emissions.



Key performance indicators 2025

92
journal & conference papers

41 master thesis

18 post-doc meriting

37 international collaborations

63 program council reports

14 theme workshops

2 cross-theme workshops

3 university workshops

SEC also arranged the conferences Electromobility Day and Roads to the Future during 2025. Gender balance and media presence are KPIs addressed on pages 20–21 respectively 58–59.

Key performance indicators 2022–2025

235
journal & conference papers

122 master thesis

25 post-doc meriting

67 international collaborations

175 program council reports

59 theme workshops

10 cross-theme workshops

7 university workshops

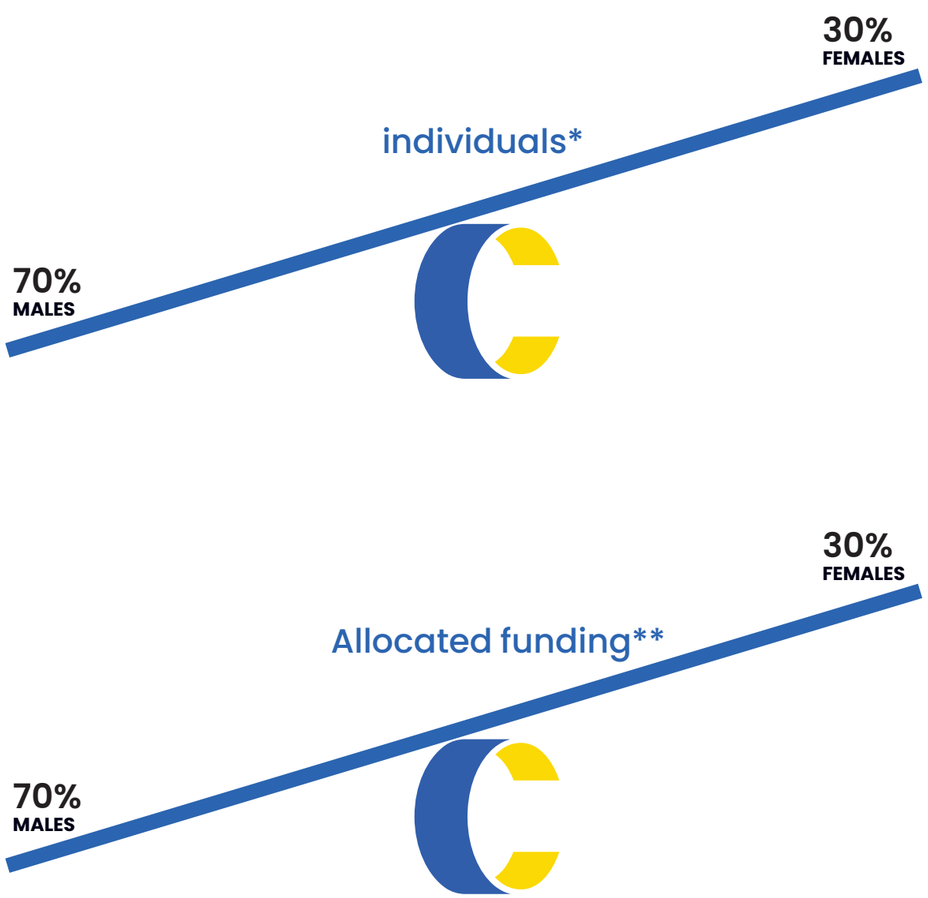
Stage V total KPI targets (March 2022 – Feb 2027):

post-doc meritings, 15
journal & conference papers, 150
master thesis, 100
theme workshops, 75
PhD and licentiate, 25
international collaborations, 10
program council reports, 100
conferences, 5
gender-balance, 60/40 ratio
media presence, 10

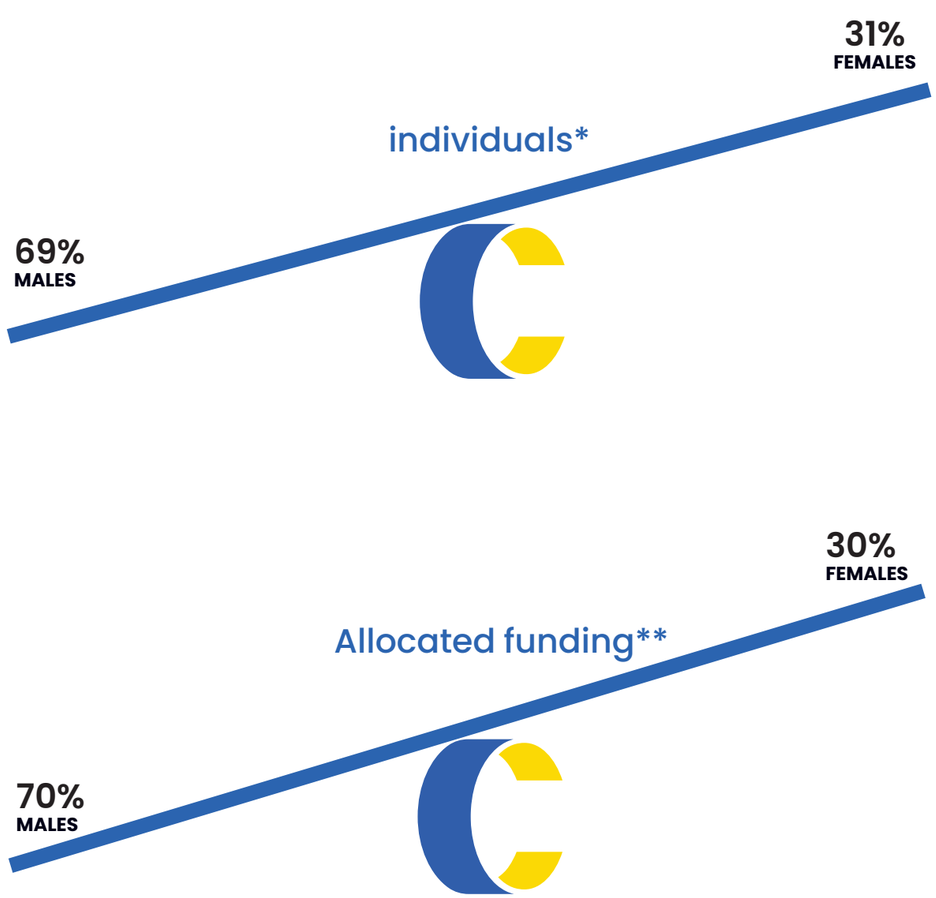
Gender balance

SEC aims to have a balanced number of males and females, as well as allocated funding. The goal of a 60/40 ratio is not yet met.

2025



2022–2025



* Based on number of SEC project participants
** Based on SEC project funding distribution between males and females

* Based on number of SEC project participants
** Based on SEC project funding distribution between males and females

Women in e-mobility

The field of electrical engineering is a predominantly male area, which is reflected in the applications SEC receives, and furthermore, in the gender distribution within the projects. Even though the aim of a 40/60 percent ratio isn't reached yet there are many great women working in e-mobility; and we want to highlight all of SEC's many female project managers.

Frances Sprei - mobility agenda setter

Dagens Industri, the leading financial newspaper in Sweden, has placed Frances Sprei at number 25 on their list of mobility agenda setters. Frances is professor at Chalmers University of Technology researching on sustainable mobility with a focus on e-mobility, and she has been involved in several research projects within Swedish Electromobility Centre the last ten years.

A lot has happened in the electrification of heavy vehicles the last years. Could we see a breakthrough the coming years for long-haul transportation?

"Yes, there has been a fast development, and I would not have guessed that we would be this far ahead ten years ago. If there's a sufficient charging infrastructure that makes logistic operations feasible, and financially sound, there is no real reason for haulage companies not to use electric trucks. Sweden is very far ahead when it comes to charging infrastructure so the main issue here, I would say, is to get cost competitive compared with diesel. Once that happens, I think that we can have a faster breakthrough on the heavy-duty side than for cars."

What's most important for the electrification, technology or policy?

"If we want to see some fast results and speed up the electrification I would say policy, such as higher fossil fuel prices. The technology we have today is good and works, but we still need further development, especially on batteries, to get the costs down and to some extent decrease the dependency on rare earth elements. We are still in an early phase compared to the combustion engine that has had over 100 years of development. So, in the long run we will be seeing increasingly better electric vehicles."

What are your thoughts on gender equality within e-mobility research?

"There are more women in research overall now compared to when I started my career, and that shows by the increasing numbers of women in the e-mobility field as well. I think that it's much easier to talk about gender equality today than it was 20 years ago, so the trend is positive. In the early years of my career, I amused myself at conferences seeing if there were more men speaking with the same first name than women, and surprisingly often that was the case. Luckily, I don't experience that today. However, since I'm involved in several areas, I can see that there are more women in research groups that study mobility and transport issues in general, compared to more technical oriented research groups within e-mobility."

"At the end of the year, we initiated preliminary studies for the next phase, and many of the project leaders were women, which is promising for the future."

Linda Olofsson (left in picture) is the director of SEC and member of several boards related to transportation. During 2025 she became the chairman of the board of the Swedish Transport Agency. Elna Holmberg, also in picture, is the former director of SEC and now Director Electromobility Tech at Volvo Group.

SEC female project managers during 2025

Evelina Wikner
Assistant Professor, Chalmers

Jeanette Andersson
Senior researcher, VTI Data

Maria Taljegård
Assistant Professor, Chalmers

Liselott Ericson
Professor, Linköping University

Sonja Tidblad Lundmark
Associate Professor, Chalmers

Rakel Wreland Lindström
Professor, KTH

Sandra Eriksson
Professor, Uppsala University

Maria Grahn
Associate Professor, Chalmers

Kristina Holmgren
Researcher, RISE

Valeria Castellucci
Senior Lecturer/Associate Professor, Uppsala University

Stacy Trey
Senior resarcher, RISE

Zeinab Raoofi
Post doc, KTH

THEME AREAS

The theme areas are the core of SEC. These constitutes of activity groups where researchers from all partner entities collaborate. To cover the full landscape of the growing fields related to e-mobility, the centre has identified and established five theme areas.

Swedish Electromobility Centre
Intelligent Vehicles & Systems

Swedish Electromobility Centre
Electric Drives & Charging

Swedish Electromobility Centre
Energy Storage

Swedish Electromobility Centre
Environment & Society

Swedish Electromobility Centre
Vehicle–Grid Interaction

Theme 1

Swedish Electromobility Centre

Intelligent Vehicles & Systems

The theme area of Intelligent vehicles and systems addresses total cost optimization of the vehicle system, with a focus on energy efficiency and ownership experience. Addressing this requires knowledge about the customer, the vehicle, its subsystems, and its surroundings.

This is done by utilizing tools, like mathematical modeling, dynamic simulation, performance analysis, control design, and optimization on vehicle system level and fleet level, i.e., design and control of systems and systems of systems. The methods, tools, and techniques developed focus on reducing development time and effort while striving for system cost optimality.

RESEARCH ADVANCEMENTS WITHIN 2025

The projects have evolved around understanding and characterizing the customers, the vehicles, its subsystems, and its surroundings to address the core question. Two thematic research projects were started during the year and are now ongoing. One project addresses the interaction between routing and energy consumption, and the other focuses on predicting driving range.

The theme area has in projects developed an open-source simulation platform for the analysis and design of electric and fuel cell vehicles. It is still undergoing development and validations in the ECOTS project. The platform was demonstrated and disseminated in two workshops, one in Linköping and one at Volvo AB (Gothenburg). The platform is available for download, and the documentation is available as an open-access paper. Two active SEC projects are now using the platform to support their research and are feeding information to the continued development.

Other achievements include modeling and control of fuel cell powertrains, electric machine characterization, and route and charge planning. Researchers in the theme have been active in providing materials for students and supporting engineers in their lifelong learning in model-based systems engineering and electromobility.

NATIONAL AND INTERNATIONAL ATTENTION

Project members have attended different conferences, spreading information and presenting interesting research results. The main channels during the year for communicating research results to the scientific community are internationally high-ranked journals and international conferences. Researchers attended, among others, IEEE ITSC in Australia, IFAC Advances in Automotive Control (AAC) in Eindhoven, the Netherlands.

CHALLENGES AND POSSIBILITIES

Total ownership experience is an overarching theme and goal for the area. It is related to technology selection and utilization for onboard vehicle system energy. It is not limited to just energy used for the propulsion of the vehicle, it also includes energy usage in vehicle subsystems, like heating and cooling of batteries or electric machines. In addition, there is an interplay with charging and route planning that influences the complete experience of driving and owning. This means that the methods and tools needed to address the challenge cannot be by studying the individual systems in the vehicle, but need to address the system as a whole, i.e., system of systems. A central part of the research is directed to dealing with the challenges in complexity that results from more functions and information sources being integrated in the vehicle.

Connected vehicles and machine learning are techniques that open up new possibilities for the electromobility area. Data and information about the vehicle and the surroundings, provide system knowledge of how the vehicle is used, where it will go, and how the traffic situation ahead of the vehicle is. This gives new opportunities, and a lot of functions that are using this knowledge are being developed right now. Vehicle manufacturers already have information-sharing systems in the vehicles on the market. This provides an excellent platform for developing new system functionality, such as route management, charging planning, and traffic flow control. The approach to meet and handle these challenges is to utilize dynamic models, computational methods and simulation techniques to study system properties and optimize the ownership experience, to get attractive, energy-efficient electromobility solutions.

BUSINESS INTELLIGENCE

Electrification, automation, digitalization, and AI are the mega trends in the area. Research is done on the development of methods and tools for addressing the design of systems of systems, like numerical optimization, learning from data, simulation and control design. To ensure the usefulness of these methods and tools for all parties within the Swedish Electromobility Centre, the theme's projects adapt and apply these general methods to hybrid and electric vehicles. To cope with multidisciplinary challenges, a combination of knowledge of general methods and application know-how is the core, the foundation on which the theme area relies.

Swedish Electromobility Centre
Intelligent Vehicles & Systems

PROJECT SPOTLIGHT

Improving air supply systems for fuel cell vehicles

Fuel cell electric vehicles use air system components for efficiency and durability. However, there are energy losses in the air system components, especially in the compressor. Beyza Dursun is a PhD student at Lund University in the project "Air systems modelling for efficient fuel cell electric vehicle", working on improving the air system design to reduce the energy losses.

Beyza, can you give a short explanation of a hydrogen vehicle?
"It's an electrically driven vehicle, but the energy output comes from hydrogen fuel cells instead of stored energy in batteries. The most common concept for vehicles is PEM, which stands for Proton Exchange Membrane. Fuel cells solutions are flexible and can in many cases be a good choice for heavy duty applications. However, they are a bit less energy efficient compared to battery vehicles."

What is the project "Air system modelling for efficient fuel cell EV" about?
"In fuel cell systems, hydrogen reacts with oxygen from the air through an electrochemical process to produce electricity, water vapor, and a bit of heat. It's not a combustion process like in regular engines, so it's much quieter and cleaner.

Now, while you could use air at atmospheric pressure, it's not very efficient. That's why most systems include a compressor to push pressurized air into the fuel cell, which helps improve performance and efficiency. The downside is that the compressor itself uses quite a bit of energy—actually, up to 20% of the system's total losses can come from it. That's one of the things we're trying to improve in this project. To support our work, we're using a truck simulation platform called ECCV (Electric Commercial Vehicle Virtual platform), which was developed by Linköping University (LiU)—they're also one of our project partners. The simulation environment lets us test different design ideas, like new compressor concepts, and see how they would perform in a realistic heavy-duty vehicle setup."

How can the compressor efficiency be improved then?
"The project has not reached that stage yet, but we will be working on a new compressor design. We are also considering integrating an expander to recover energy from the exhaust airflow that results from the electrochemical reaction in the fuel cell. This concept is similar in principle to how a turbocharger utilizes exhaust gases in an internal combustion engine.
However, one significant difference is that fuel cells generate much lower exhaust temperatures compared to combustion engines. While internal combustion engines can reach several hundred degrees Celsius, fuel cell exhaust temperatures typically range between 60–90°C, making the available thermal energy much lower in density. Due to this relatively low temperature, the exhaust gases alone may not provide enough energy to drive the expander efficiently.
Therefore, we may need to integrate an electric motor to support its operation. This introduces a trade-off between motor size, energy recovery potential, and cost, which will need to be carefully balanced in the system design."

What are your thoughts on these design solutions?
"These are not common solutions for PEM cells and people have been sceptical, including myself in the beginning. But then I saw the results from some initial experiments and started to believe it could work. There will be a new design to the compressor and ideas for the expander that we are currently experimenting with. For the first step of the project, we have a good amount of promising simulation results from optimisations for fuel cell parameters. My first paper is currently under review, and hopefully it will be accepted for European Fuel Cells and Hydrogen conference in Capri which I will attend in September. Then I will publish another paper that will be presented at the International Hydrogen Technology Energy Conference in Turkey."

What is next?
"I'm really excited for the next step, which is also the main step, that is designing the air supply system. Hopefully this process can start, at least from my side, during this summer. The designing process is on-going together with Volvo Trucks, with Ulf Aronsson and Fredrik Rahm in particular. They have been supporting me a lot which I'm very grateful for. I'm really looking forward to seeing what we can achieve."

Have there been any challenges?
"The initial models for the fuel cells were based on 20-year-old datasets, and a lot has happened in fuel cell technology during these years. So, my first task was to update the datasets to have correct fuel cell parameters for the simulations. This task turned out to be harder than I thought. It took me over seven months, after desperately sending e-mails to contacts and meeting people at conferences, before I finally got hold of a proper useable dataset."

About Beyza Dursun

"I grew up on Turkeys west coast in the city of İzmir, which is the third largest in the country. I have my bachelor's degree in mechanical engineering and my master's degree within thermodynamics. I got interested in fuel cells and contacted one of my professors in this area, and got the opportunity to join one of his projects. Before coming to Sweden I had actually visited a friend here and I really liked it, at least in the summer, haha. I then thought to myself that at some point I would come back, and I did when I got involved in this PhD project that started in 2023."

Theme 2

Swedish Electromobility Centre

Electric Drives & Charging

Theme Electric drives and charging covers the electric energy transfer and conversion technologies necessary for electrified transportation on roads, water, and air. Most of these technologies refer to electric machines and power electronic solutions for the design, control, operation, and diagnostics of the propulsion system, the onboard charging equipment, and the auxiliary systems in the vehicles.

The theme's research activities span a broad area and use various methodological tools. Numerical analysis of electromagnetic/thermal/fluid dynamics problems and simulation of dynamic models and control solutions cover most project cases. Component integration into a dynamic system model is also performed with suitable software platforms. Prototyping and laboratory testing are essential for the activities using real-life conditions testing.

Research advancements within 2025

Most of the projects associated to the theme are finished by now. Among those still running, it is worth highlighting:
- An IEEE Access publication co-authored by Zeeker industrial PhD student at Chalmers Yu Xu: S. Amirpour, T. Thiringer, S. Soltanipour and Y. Xu, Optimal DC-Link Voltage Mapping for SiC-Based EV Drives: Considering the Impact of a Synchronous Boost Converter, in IEEE Access, vol. 13, pp. 38239-38254, 2025, doi: 10.1109/ACCESS.2025.3546025
- A publication in Results in Engineering by Associated PhD student Emil Lind (Uppsala University): E. Lind, S. Eriksson, Co-simulation model combining dynamic control and FEM for evaluation of PMSM drive cycle performance, in Results in Engineering, vol 27, 2025, ISSN 2590-1230, doi: 10.1016/j.rineng.2025.106149.
- A publication in Energies by AB Volvo industrial PhD student at LTH, Per Widek: P. Widek, M. Alaküla, Methods for the Investigation and Mitigation of Conducted Differential-Mode Electromagnetic Interference in Commercial Electrical Vehicles, in Energies 2025, 18, 859. Doi: /10.3390/en18040859
- A publication in IEEE Trans. on Magnetics by associated PhD student Leonardo Colombo (Lund University): L. Colombo, A. Reinap, P. Fyhr and M. Alaküla, "Enhancing Core Loss Tracking Accuracy in Stator Cores: A Comparative Assessment of Static and Dynamic Jiles-Atherton Model Formulations," in IEEE Transactions on Magnetics, vol. 61, no. 8, pp. 1-12, Aug. 2025, Art no. 7300512, doi: 10.1109/TMAG.2025.3581713.

Moreover, Theme 2 had a strong presence during EVS 38, arranged in June 2025 in Göteborg.

National and international attention

The theme members are very active on the EU arena, with involvement in several EU projects:
- PowerDrive https://www.powerdriveproject.eu/
- EU MSCA HIPO, https://www.hipodoctoral-network.com/
- PowerizeD, https://powerized.eu/
- BEETHOVEN, https://projectbeethoven.eu
- GENIUS, ERA-MIN3 project via VINNOVA, https://www.vinnova.se/en/p/greener-permanent-magnets-without-or-with-less-critical-raw-materials/
- ODYSSEV, ID: 101192612, soon on internet
- MSCA PF HWiTEM, ID: 101274389, soon on internet

There are also reported initiatives from the theme members engaging in projects with the Technical University of Munich, University of the Bundeswehr Munich, Loughborough University, and companies like Mdynamix, Dahren, Vonrol, Borealis and Pulsetrain GmbH.

Challenges and possibilities

- *Sustainable supply chains for critical materials:* Electric machines and power electronics rely on materials such as rare earth elements, copper, and advanced semiconductors. Ensuring secure, sustainable, and ethically sourced supply chains is a key challenge. Sweden has opportunities to lead through initiatives in recycling, circular design, and potential domestic mining and refining, but scaling these while maintaining environmental and social acceptance remains difficult.

- *Efficiency and cost competitiveness at system level:* Future vehicles must deliver higher efficiency, lower weight, and reduced cost simultaneously. This requires breakthroughs in electric machine topology, inverter technology, thermal management, and integration of onboard charging with the traction system. Achieving high performance while reducing dependency on scarce materials (e.g., rare-earth-free motors) is a critical R&D focus.

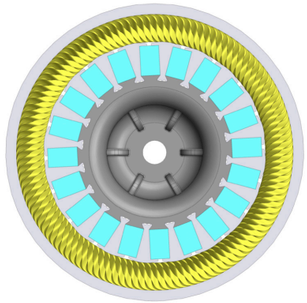
- *Industrialization and charging ecosystem integration:* As electrification scales across passenger cars, heavy trucks, buses, and off-road vehicles, manufacturers must industrialize next-generation drivetrains while ensuring compatibility with evolving charging standards and grid constraints. In Sweden, the long distances, cold climate, and rapid expansion of heavy-duty electrification place additional demands on onboard chargers, bidirectional charging capability, and grid-aware vehicle systems.

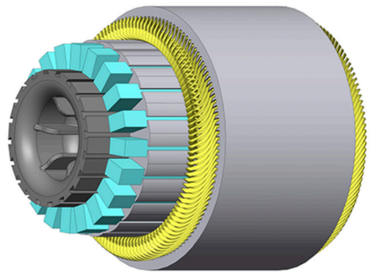
Business intelligence

The electrification of the transport system is an important enabler for the necessary de-carbonization of society. However, the adoption rate has been different in different regions, mostly motivated by political decisions. One interesting trend is the extremely fast adoption of electric heavy-duty vehicles seen in China during 2025, reaching almost 30% of all new vehicle registrations (and an impressive 54% in December). This may be compared to the changes in environmental policies in the USA.

When looking at drivetrain design, one can still see the same trends that were present in previous years. Manufacturers strive to increase efficiency with better control strategies and cooling, reduce the amount of sensitive materials (such as rare-earth permanent magnets), reduce cost through integration of power electronics, motor and gearbox in the same unit, and increased motor speeds (which can also contribute to increased efficiency and reduced costs).

The trade war initiated by the US resulted in the introduction of export controls on heavy rare-earth elements by China on April 4 2025. These export controls were extended in October, and they have resulted in a significant price increase for permanent magnets in Europe, which motivates the use of alternative motor topologies even further.
Wide bandgap semiconductors, in particular Silicon Carbide (SiC) and Gallium Nitride (GaN) are also improving. New SiC devices with lower losses, better integration and better thermal performance have been presented during 2025. Moreover, during 2025 GaN was implemented for the first time in high-voltage automotive converters (400 V and 800 V), mostly targeting on-board chargers and dc-dc converters.





Design of rare earth element free motors for electromobility

Rare earth elements are used in electrical vehicles batteries and motors. These elements have good properties but can also be problematic for environmental and geopolitical reasons. There are alternatives, which Marcelo Dias da Silva, PhD student at Uppsala University, has explored in the design of a rare earth element free motor, using the abundant and much cheaper material ferrite. The electrical motor has been tested at Alstom's lab facility with very good results.

Marcelo, why are rare earth elements used in electrical motors?
"The properties of rare earth elements, like Neodymium and Dysprosium, allows the production of extremly strong and stable magnets with low risk of demagnetization. The stronger magnet you have the better performing motor you can build, basically. I would say that about 95 percent of the electric vehicles today have rare earth elements in their electric motors."

So, what are the options?
"Induction motors do not use magnets at all, but those type of machines tend to be less efficient which would require electric cars to have bigger batteries. There is also reluctance motor which present high efficiency, but these tend to be bigger for a similar torque level, adding weight to electric vehicles. So, a promising viable option to replace rare earth elements is by using ferrite magnets. Hard ferrite is an abundant material that is not constrained by the same supply risks that threaten the supply of rare-earth elements. Also, their cost is a fraction of the costs of magnets based on rare earth elements. The downside however is that the magnets are about a third as strong and demagnetize easier."

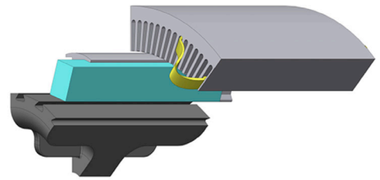
You have come up with some interesting results in this project. Can you tell us about the design of the motor?
"Regular electric motors with magnets-based on rare earth elements are designed with a V-shape, but this has been shown to be less optimal for ferrite magnets. We explore the combination of a Spoke topology for electric motors and ferrite magnets . Scania built a prototype from this design, and we have tested it at Alstom lab facility with very good results. The required torque and power levels were reached with surprisingly high efficiency (98%) in some working points. These results were achieved by only changing the rotor on the power unit. From a previous solution with magnets based on rare-earths elements to a rotor with our design using only ferrite magnets."

What about the demagnetization?
"The prototype did not presented any demagnetization after being tested for all the torque levels and speeds within the applications requirements. Which we were expecting from the simulations. In the future, we hope we can perform a short circuit test on the prototype, which is the most concerning condition for demagnetization.

However, the Spoke topology of our design allows for bigger magnets, which helps at avoiding demagnetization. In addition, the design includes extra details included to protect further the ferrite magnets. This is to say that we designed our prototype to survive the worst short circuit and still be a good performing motor."

How do you see this technology being used in the future?
"I think that we have proved that it is possible to have a high performance electric motor based on ferrite magnets. The magnets based on rare earth elements have physically better characteristics. So, if available, may always be used in high performance applications, such as sports cars. But, ferrite magnets have the potential to be used in motors for the electric vehicles used by most people. Ferrite magnets are cheaper and because their raw materials are abundant, their supply is not under threat of political decisions or the decisions of a single player, as is the case for rare earth elements."

What would you like to do after this project?
"It would be fun to expand this concept to the whole power train and see what further optimizations that can be done. I would also like to explore machine learning more since it has been such an effective tool in this project. We have been able to cut optimization times from days down to minutes, which I think has played a big part when coming up with this design."



Anything you would like to add?
"I really enjoyed working with Scania and Alstom. We had superb, professional support and I would like to thank everyone involved in the project. It would be difficult for us to set up something similar at Uppsala and get such reliable results."

When will you share the results?
"I presented the results at the International Electrical Machines and Drives Conference in May in Houston, USA, a study concerning the machine learning tools we developed during this project. Then I defended my thesis on 9 June in Ångströmlaboratoriet in Uppsala."

About Marcelo Dias da Silva

"I'm Portuguese and grew up near Aveiro. I obtained my bachelor's and master's degrees in electrical engineering at Porto University, and did an Erasmus exchange in Karlsruhe, which was an important international experience. After my university studies I worked as an engineer with induction motors, while I was on the lookout for a suitable PhD student position. I then came across this project and that is how I ended up in Uppsala, Sweden."

Theme 3

Swedish Electromobility Centre
Energy Storage

Within the Energy storage theme, the focus is to understand the energy storage units of different batteries and fuel cells when used in electric vehicles, in order to find more sustainable and better performing solutions. This ranges from materials, components and functionality of the electrochemical cells, to their integration with the vehicle and monitoring during use. By more profound knowledge, ageing can be mitigated, energy losses kept at a minimum, safety be assured, and health maintained.

Research advancement within 2025

The SEC projects running during 2025 have revolved around methods for determination of battery ageing, testing procedures and protocols, different forms of modelling, system safety and diagnostics, and novel battery and fuel cell types targeting vehicles. The large-scale project on heterogeneous ageing, HALIBatt, took significant steps forward and is currently involving four PhD students. Our thematic research project on intermediate temperature fuel cells continued and produced interesting results on performance and ageing.

There are also multiple PhD students and postdocs involved in other Theme 3 projects, spanning the many dimensions of battery and fuel cell research. Several of these include collaborations with industrial PhD students at different SEC partners.

National and international attention

The last year has been a tough one for Swedish battery manufacturers with bankruptcies and shelved projects, and we are still living in the aftermath. This is not unique to Sweden, but difficulties in starting large-scale battery production can be seen throughout Europe. There are large fears for Europe losing out in the international competition with both China and North America. Considering the amounts of jobs at stake, there is plenty of need for the expertise SEC can provide in this area. But not everything is gloom and doom, and we are seeing an increased breadth of small and medium-sized companies emerging nationally within different parts of the battery value chain.

There are national strategies to ensure that the entire value chain for EV batteries develops, and that Sweden can take a leading role in the ongoing green transition. Swedish research and SEC researchers within energy storage are highly competitive by all international comparisons and have important roles in formulating and implementing the strategies. Maintaining these strategies, and enforcing them, will be necessary for keeping pace with the international development. Competence centra such as SEC and Batteries Sweden have a key role to bridge between industry, academia and policymakers. In parallel with batteries, hydrogen and fuel cells also have a role in the electrification of the transport sector. In the hydrogen strategy for a climate-neutral Europe communicated by the European Commission, hydrogen has been identified as a key contributor in the mitigation of climate change. The need for Europe for a more robust energy system based on renewable resources has become even more apparent through the war in Ukraine. The strategy is to make green hydrogen along with electricity the main energy vectors that enable a zero-emission Europe. While hydrogen as an energy carrier can be utilized in many parts of the energy system also outside of transportation – and where the perhaps strongest drive is seen today – it becomes important to obtain synergetic intersectoral effects by integration of hydrogen into the existing systems for energy and transport. With falling costs and improved infrastructure for hydrogen, which can be foreseen in this transition, there are better chances for implementations also in the EV sector through hydrogen powered fuel cells. For road-bound vehicles, the focus is primarily on trucks, but the technology can be competitive also for ships, aviation and rail-bound transport.

Challenges and possibilities

The different levels of maturity for different energy storage solutions, i.e. batteries and fuel cells, means that the challenges and possibilities are fundamentally different. For batteries, the main challenge today for the European and Swedish industry is to complete some of all planned projects on large-scale production and in the end make cost-efficient, reliable and competitive battery cells. The very high volume of batteries being produced puts an extra focus on critical raw materials, materials processing, cell production and recycling. The maturity of the technique and its large-scale implementation also means that safety and lifetime issues become more critical, while the growth of the industry generates large needs for education in the area. Nevertheless, the complexity of the battery cell chemistry and its inherent materials render it necessary to continue to perform research on diagnosis, and also incremental improvements can generate exceptionally large impacts on the overall energy system. Challenges regarding lifetime, diagnosis and predictions still remain, and depend intrinsically on the battery cell chemistry. Moreover, sustainability, lack of raw materials, and increasing costs are emerging as issues for the Li-ion technology, which also motivates the interest in alterative battery and fuel cell technology.

Fuel cell-powered vehicles are in an earlier phase of commercialization than battery-powered ones, and important issues revolve around system integration, costs and the design of auxiliary systems. As with batteries, lifetime and predictability are important and linked to the continued development of improved catalysts and membranes. As with BEVs, infrastructure is another important issue

Business intelligence

With the current crisis for the European – and the Scandinavian – battery industry, it is important to keep a few facts in mind. First, society does need large volumes of batteries for the green transition. The current overproduction of cells will not remain if we will meet our climate targets. Secondly, Sweden and neighbouring countries are highly ranked as ideal countries to produce batteries, partly due to the robustness and environmental impact of the energy system as battery production is energy intense. Third, battery technology is also pointed out by the European Commission as a key technology, where Europe needs to be self-reliant. And finally: the competences are vast in Sweden and not only located to one single producer. This should open for Swedish battery manufacturing, not least due to strong possible integration with the vehicle industry. At the same time, battery technology is developing, especially targeting challenges associated with the supply chains and the creation of closed-loop systems. Novel Li-ion battery cell chemistries strive towards both higher electrochemical performance and more sustainable materials (Si/C composite anodes, Ni-rich and/or Co-free cathodes, iron-based materials). While Na-ion batteries have approach market introduction more rapidly than expected, solid-state systems seem to face further challenges and not as rapid maturity as forecasted. When electrification spreads to the entire transport area, new challenges arise in, for example, the marine sector and in aviation. The technical solutions from road transport cannot simply be copied.

The balance between energy storage in batteries and in hydrogen needs to be analysed. A major challenge for fuel cells to become more important in the transport sector is linked to the availability of a hydrogen infrastructure. The importance of infrastructure issues will therefore grow, in the same way that charging and electricity grids are already key issues for battery vehicles. Already today we can see how regions are investing in leading this development. In the discussion of batteries versus fuel cells, it is important to understand that the conditions for electrification differ greatly between different regions and countries. The Swedish automotive industry has a strong focus on exports, and must maintain a broad perspective to remain competitive. It is also evident that there is a large need for educational efforts, not least re-education of labour in the current vehicle industry, to supply the emerging industry with critical competences.

Swedish Electromobility Centre
Energy Storage

PROJECT SPOTLIGHT

Improving battery management systems with physics-based models and machine learning

The performance and lifetime of battery cells are determined not only by material properties but also to a large extent by how they are used. Even though all batteries inevitably age, their lifetime, safety, and efficiency can be improved by using a sophisticated Battery Management System (BMS). Daniel Jakobson, PhD student at Chalmers University of Technology within the SEC project "Machine Learning Assisted Ageing Prediction and Adaptive Modelling for BMS", is investigating how physics-based models and machine learning can optimise battery usage and prolong battery life-time.

The models used in today's BMSs are relatively simple and must therefore act through more or less fixed constraints when it comes to current, voltage, and temperature. The margins for these constraints can be too conservative at times while not being constraining enough at other times. This normally results in an underutilization of the cells together with potentially prematurely ageing batteries.

"Simply put, you could say that all batteries are kept within the same boundaries like a one-sized box. However, most batteries have variations and would operate better with a different or varying set of boundaries. By using physics-based models called pseudo two dimensional (P2D), instead of the electric circuit models we have now, the hope is to make better matching 'boxes' leading to a more efficient use of batteries", says Daniel Jakobsson.

Capturing the internal electrochemical processes

Today's BMSs are built around electric circuit models, which are easy to implement, but these models do not capture the internal electrochemical processes within the battery. They are also less accurate under extreme conditions. Physics-based models on the other hand simulate the actual physical and chemical processes inside a battery like lithium-ion transport, electrochemical reactions, heat generation, and degradation phenomena.

"A battery can deteriorate in many different ways, and with a better understanding of what is happening in the battery you can set-up more efficient usage boundaries. The challenge with physics-based models is keeping them up-to-date with the changed parameters due to the ageing process. If you don't update the model, and use it as if the battery was new, the error margins will not be accurate. You could compare it with updating the city roadmap of an expanding city. If your map is outdated you can still drive, but the journey will be less efficient and perhaps also less safe", Daniel explains.

Machine learning helps solving complex ageing behaviours

"The problem we are trying to solve is highly complex and difficult to address with traditional methods. Machine learning makes it possible to estimate nonlinear behaviours very fast with few datapoints. This gives us an opportunity to handle the complexity of ageing behavior effects like SEI growth, lithium-plating, cracking and loss of active material. If we know that an SEI-layer has formed on the anode you will not be able to transport ions as efficiently in the electrolyte. This limitation is caused by a more complex pathway for ions to travel and limit the output current. To use another traffic analogy: if the road has developed some bumps, you need to slow down the traffic to avoid congestion or crashes", says Daniel.

Promising results

"Our initial results are very promising and show that this is a plausible method. We are still working on various things, like optimising input, reducing parameter space, post processing and investigating accuracy in critical model variables we want to control. We plan to publish the first results during the end of 2025 or the beginning of 2026."

About Daniel Jakobsson

"I'm born and raised in Gothenburg and moved to Luleå to study the electro and physics engineeering program. Initially, I had no plan of any further studies, at least not engineering, since I took the economy program in upper secondary school. But then I felt like moving from home and someone told me that engineering physics was too advanced for me, so I just had to try it. It went well and after graduation I spent a couple of years in the industry, and then I decided to take on doctoral studies. What I like about this project is that it is a good combination of advanced physics and industrial application. In my spare time I enjoy doing sport activities like sea kayaking and snowboarding."

Theme 4

Swedish Electromobility Centre

Environment & Society

The Environment & Society theme explores environmental, societal, and system-level aspects of electromobility to support strategies for a sustainable large-scale transition of the transport sector. As electrification grows, the theme addresses challenges related to technology development, user behavior, resource needs, business models, and regulation.

Our research focuses on four strategic areas. The first examines how users, transport operators, and mobility services adopt electromobility, including charging behavior, service-based business models, and system resilience. The second addresses resource availability through efficient use and circularity, targeting life-cycle design, reuse, remanufacturing, and recycling. The third assesses environmental and societal impacts across the life cycle, monitoring footprints, resource use, health effects, and potential trade-offs. The fourth evaluates policies and legislation to strengthen effective, sustainable, and resilient electrification.

Research advancements within 2025

Overall, eighteen projects linked to the theme area ran during 2025, twelve funded by the SEC and six in association. The theme provides funding for three academic PhD students, while five of the associated projects link additional PhD students to the theme.

Mudit Chordia, an SEC funded PhD student within the theme area since 2020, successfully defended his doctoral thesis entitled Batteries at Crossroads: Past, Present, and Future Environmental Impacts of Lithium-ion Batteries at Chalmers on 24 September. Faculty opponent was Professor Felipe Cerdas from Technical University of Applied Sciences Würzburg-Schweinfurt. In connection with the dissertation, several seminars and a roundtable discussion on large-scale cell production were arranged with participants from both academia and industry.

Other ongoing research spans multiple aspects of electromobility. Activities include analyzing freight transport and energy dynamics, conducting life cycle assessments (LCAs) of electric aircraft, heavy vehicles, batteries, and critical minerals. Additional work examines tire-wear emissions, regulatory and data-governance issues, and environmental burdens of vehicle-to-grid solutions.

National and international attention

Anders Nordelöf at VTI and Chalmers, and Anita Bongards at BorgWarner, was awarded “Best Lecture Paper” at the international electromobility conference EVS38 for ongoing research in the SEC project Practical LCA-models for strategic and critical EV minerals. The study examines how methodological choices in LCA affect the climate impacts of specific supply routes where some processes yield multiple product outputs. The case study investigates rare earth element extraction, and how fluctuating metal oxide prices influence climate impact results when economic allocation is applied. EVS – the International Electric Vehicle Symposium & Exhibition – is the world’s largest electric-vehicle conference, and this year it was hosted in Gothenburg.
The theme-associated project E-charge and its continuation project E-charge 2 are ongoing. The focus is on scaling the use of long-haul electrified trucks to understand how the system is affected when a large proportion of the fleet becomes electrified. During 2025, several megawatt chargers were installed by the project partners. The project has also launched a “dashboard” that enables users to monitor data from the trucks involved in the project. These data include the distance travelled by electric trucks, their energy consumption, and the associated reduction in climate impact.

Challenges and possibilities

The deployment of electric vehicles presents interconnected social, economic, technical, and environmental challenges. As electromobility expands, society must address user acceptance, affordability, and equitable access to charging infrastructure, particularly for rural and low-income communities. Behavioral aspects such as charging practices, convenience, and the shift from combustion-based flexibility play a central role in adoption. Shared mobility services grow in cities but remain limited in smaller regions, contributing to unequal access.

Larger batteries, higher charging power, and increasing integration of powertrain components place new demands on infrastructure, the electricity grid and vehicle design. Economically, it requires continued investment in charging networks and grid capacity. New business models may reduce the financial risks while increasing system efficiency. From an environmental standpoint, electric vehicles can reduce greenhouse gas emissions when supported by low-carbon electricity, but electrification also brings potential side effects such as increased tire and road wear emissions and the risk of shifting environmental burdens. Continuous environmental monitoring is needed to guide sustainable development.

Electromobility simultaneously offers opportunities for innovation, job creation, digital mobility solutions, and the expansion of circular value chains, ultimately contributing to reduced environmental impacts over time. However, while circular strategies such as remanufacturing and reuse can have an impact sooner, improved large-scale recycling can only become a solution to material availability concerns and strengthen supply chain resilience once electric vehicles have been broadly adopted and end-of-life vehicles reach a significant volume.

Business intelligence

Electromobility is growing in most transport applications, driven by environmental goals, resource concerns, and evolving societal needs. As electric passenger cars move towards larger battery packs, it raises demands for primary raw materials, while chemistries that avoid scarce materials, such as lithium-iron-phosphate and sodium-ion batteries, gain attention for their resilience and suitability for diverse applications. At the same time, novel high-energy technologies like solid-state and lithium-sulfur batteries show promise for heavy-duty transport and aviation.

Business models are also transforming. Service-based concepts such as Transport as a Service are expanding, supported by digital platforms that optimize logistics, charging, and fleet use. Leasing models strengthen circularity by enabling controlled second-life applications and more efficient end-of-life handling.
Societal and infrastructural factors remain central. Charging accessibility, pricing transparency, and user behavior influence electromobility acceptance. Regulatory frameworks, for example the EU Battery Regulation, reinforce traceability, circularity, and the need of a life cycle perspective on environmental impacts.

Swedish Electromobility Centre
Environment & Society

PROJECT SPOTLIGHT

Life-cycle assessment of hydrogen for heavy road freight in Swedish conditions

Hydrogen is being explored as a viable option for decarbonizing heavy road freight. Its environmental footprint depends on how it is produced, transported, stored, and used. Sweden's low-carbon electricity generation, the presence of major industry players such as Volvo and Scania, and the inclusion of hydrogen in European decarbonization strategies motivate this analysis.

The newly published study "Vehicle-oriented and Sweden-framed life cycle assessment: Hydrogen for long-haul trucks" evaluates and compares the environmental footprint of transporting loads in hydrogen-propelled trucks using various truck and hydrogen production and transportation technologies.

There are several methods for producing hydrogen, each with distinct environmental implications. This study compares green hydrogen produced in Sweden and Chile, blue hydrogen from Sweden and Norway, hydrogen from biomethane, and hydrogen generated using the Swedish electricity grid. Hydrogen is labelled as green when produced by electrolysis powered by renewable energy sources. Hydrogen derived from natural gas emits carbon dioxide but is classified as blue hydrogen when combined with carbon capture technologies.

Leakages and payload capacity are sources of concern in long-distance transport

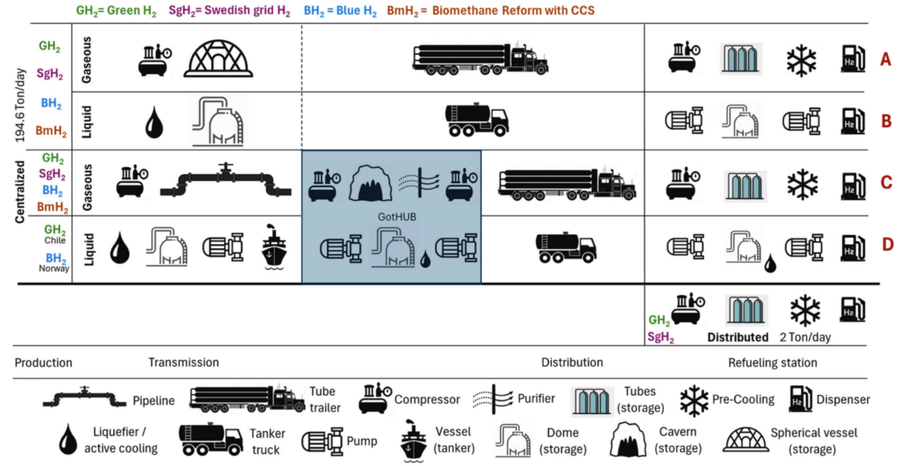
"The use of hydrogen in fuel cells creates only water as residue, but when the entire supply chain is considered, the environmental footprint can increase significantly. Even though green hydrogen from Chile is very clean from a production point of view and benefits from low-cost renewable energy, transporting it to Sweden largely offsets these advantages due to the payload capacity of tanker ships carrying liquid hydrogen, while leakages are also a concern. Our analyses show that onsite production supported by the Swedish grid, despite the lower efficiency of smaller electrolyzers, results in lower greenhouse gas emissions. It seems even more favorable to import blue hydrogen from Norway than green hydrogen from Chile because of the shorter transport distance", says Jorge Velandia, main author of the study.

What about hydrogen from biomethane?

Biomethane was also assessed in the study. When combined with carbon capture and storage, it can potentially remove carbon from the atmosphere. However, due to limited supply, biomethane is unlikely to replace natural gas in the transport sector, while the economic feasibility further constrains its potential. Velandia reflects, "from a well to wheel efficiency perspective using biomethane directly as fuel is preferable to converting it into hydrogen".

Variations depending on how hydrogen is stored and used

The environmental impact of freight transport is also influenced by how hydrogen is stored and used onboard the vehicles. The study compares fuel cell and internal combustion engine trucks, evaluating hydrogen storage in both liquid and gaseous states. For gaseous storage different pressures were evaluated. Higher pressures increase tank storage capacity but also demand more carbon fibre, which is highly energy-intensive to produce. The estimated carbon footprint of different truck configurations can vary by up to 50 tons of CO_2 equivalent per vehicle.



Hydrogen transportation pathways for centralized and distributed production cases

"When trucks use fuel cells, they emit only water as a byproduct. In contrast, hydrogen combustion engines emit nitrogen oxides, some of which are greenhouse gases but hydrogen for combustion does not need to be ultrapure as for fuel cells. Moreover, fuel cell trucks, require batteries and electric motors that rely on critical materials, even rare earths", explains Velandia.

Hydrogen or batteries?

Hydrogen has been considered the most viable option for very-heavy long-haul trucks, but with the rapid development in battery technology in recent years this is no longer as clear-cut. Jorge explains that "hydrogen offered a solution for obtaining long ranges that batteries are unlikely to achieve due to low volumetric energy density. However, the need for frequent stops included in European regulation open the possibility for recharging more often. Thus, we don't know for sure what the future market will look like. It can be that hydrogen will play a role in places where charging infrastructure is scarce while there is a lot of expertise in combustion engines in Europe which suggests synergy with hydrogen".

Higher impact on material scarcity factors with green hydrogen

Material scarcity is also a factor to consider when using hydrogen as a power source. Green hydrogen has a higher impact than blue hydrogen mainly because of the iridium and platinum used in PEM electrolyzers. An established alternative is using alkaline electrolyzers, which are free of precious metals but not well adapted to the intermittency of renewable sources.
"The main focus of this study has been on technical and environmental aspects. We have not performed economical analyses but have held an eye open for the cost of technologies, aiming to propose technologies viable for Sweden in the future. It's also important to take all environmental aspects into account, and not just greenhouse gas emissions", says Velandia.

About Jorge Velandia

Jorge has just finished his postdoctoral at Chalmers University of Technology, within the SEC research project "Fossil-free long-haul trucks in Europe".

"It has been a great time at Chalmers and I would like to thank my supervisors Maria Grahn, and Selma Brynholf. I also want to thank Anders Nordelöf, Linda Olofsson and everyone else at Swedish Electromobility Centre for the support."

Theme 5

Swedish Electromobility Centre

Vehicle–Grid Interaction

Theme Vehicle–Grid Interaction focuses on how the interaction between vehicle and power system should be done to maintain a stable power system and at the same time make sure that all vehicles can be provided with reliable charging. The ambition of the theme is to identify the requirements and demands necessary to fulfil this scope.

Projects within Theme 5 could for example address areas such as local grid constraints, planning charging infrastructure planning, V2G and smart charging strategies, long term energy demand, and the integration of renewable energy and stationary storage. Other examples are regulatory analysis and the human perspective on smart charging, aiming to position EVs as active, flexible resources in a resilient and sustainable energy system.

Research advancements

In 2025, the research theme made progress across several strategic areas of electromobility and smart charging. Uppsala University provided new insights into how user-level demand flexibility - enabled through smart charging - can create value for multiple stakeholders. By combining simulation models with real-world experimental data, the work demonstrated both the technical potential and the practical challenges of implementing flexible charging in everyday contexts. RISE advanced the understanding of V2G economics by developing optimal charge–discharge strategies using dynamic programming and reinforcement learning, confirming that adaptive smart charging is essential for maximizing the economic benefits of V2G. Meanwhile, Lund University contributed system-level knowledge by modelling the impact of fast charging, electric roads, and home/workplace charging on a real Swedish regional grid, revealing how diverse charging behaviours interact with grid capacity and operation.
Two new theme research projects also secured funding during 2025, expanding the research portfolio. A fist project investigates how grid companies can accelerate connections, increase grid efficiency, and thereby support transport electrification. The second project focuses on measuring high-frequency harmonics and electrical disturbances arising from V2X operation, assessing their impact on nearby electronics and grid impedance while exploring possible mitigation strategies.

National and international attention

Theme 5 has gained international attention through workshops with European collaborations in European collaborations, including EV4EU and SCALE, which provide valuable insights into interoperability, energy market integration, and real world V2G deployment. Researchers regularly contribute to global conferences and workshops, fostering dialogue with industry, academia, and policymakers. These activities, combined with growing media interest in smart charging and V2G pilots, reinforce the theme's relevance in both national and international arenas.

Challenges and possibilities

The theme faces several challenges, such as the need for harmonized communication standards, scalable and robust charge control strategies, and regulatory frameworks that enable flexibility markets. Economic uncertainties, consumer engagement, and data privacy also remain significant barriers. At the same time, the possibilities are substantial: EVs can act as distributed energy resources that support grid stability, reduce reinforcement costs, and enhance renewable integration. These opportunities open new value chains and position the theme to influence future energy and transport system design.

Business intelligence

Globally, the field is evolving rapidly with trends such as higher power charging, widespread digitalization, emerging V2X technologies, and expanding charging networks for both light and heavy transport. Standardization efforts for V2G communication are accelerating, and early commercial products are beginning to appear, though full interoperability remains distant. Policy developments focused on decarbonization and grid flexibility are shaping new business models, while flexibility markets and energy storage solutions are becoming increasingly central to the future of vehicle grid interaction.

Swedish Electromobility Centre
Vehicle–Grid Interaction

PROJECT SPOTLIGHT

Developing smart charging strategies in a unique test bed facility – Dansmästaren

The increasing number of electric vehicles and the need for higher charging capacity puts pressure on the power grid, electricity prices, and grid load forecast. Smart charging is a concept that can take the load off the grid during peak hours. Marina Mattos, PhD student at Uppsala University, is developing and testing different smart charging strategies in Dansmästaren, a multifunctional building in Uppsala.

Dansmästaren is a multifunctional building in Uppsala comprising a parking garage with 60 charging stations, student apartments, and a supermarket. It is also equipped with a battery energy storage system (BESS) and photovoltaic panels. Serving as a research test bed, it incorporates an Energy Management System (EMS) that enables the implementation of smart charging strategies and the collection of real-world data. The strategy alleviated the building's peak loads and lowered the electricity bill of the facility owner. Moreover, the building's BESS was less stressed.

Dansmästaren

"Dansmästaren has the unique characteristic of suppling for both public EV users and residential EV owners, with three floors designated for residential use and two floors for public access. It is worth noting that the Uppsala municipality plans to construct additional multifunctional buildings, allowing the impact of the designed strategies to be scaled and become more significant", says Marina Mattos.

What is your research about, Marina?
"My research is focused on smart charging strategies for smart cities. I develop new strategies for implementation in the parking garage at Dansmästaren, currently emphasizing Vehicle-one-Grid (V1G) technology, with plans to extend to Vehicle-to-Grid (V2G) in the future. All designed strategies are first tested on the Research Twin, a free charging station located at Ångströmlaboratoriet, before being applied to the chargers at the parking garage. Additionally, I study electric vehicle user behavior and usage patterns to better understand stakeholder needs and identify ways to alleviate grid congestion.

What's the difference between smart and dumb charging?
"Haha, 'dumb charging' basically refers to when a user plugs in their vehicle and it begins charging immediately, drawing the current determined by the car based on the charger's available capacity. For example, each outlet in Dansmästaren allows electric vehicles to charge at up to 32 A, and the car decides the actual current to draw, up to that maximum. With smart charging, however, the maximum current supplied to the EV is controlled and can be adjusted based on factors such as energy prices, forecasts, or other considerations."

Why do we need smart charging?
"Government policies in several countries have been developed to decarbonize both the power generation and transport sectors. Electromobility is growing rapidly, and the existing grid is not fully prepared to handle the additional load from widespread EV charging. Rather than investing in costly expansions of the distribution grid, a more environmentally sustainable solution is to use existing resources intelligently. Smart charging strategies are designed to alleviate grid congestion while also providing environmental benefits. The main objective is to control EV charging in a way that prevents it from adding to peak demand on the grid."

How effective are the smart charging strategies implemented?
"During the winter of 2024, we implemented a Spot Price control strategy at Dansmästaren for nearly two months, covering January and February. The results were very positive: the strategy alleviated the stress on the building's Battery Energy Storage System (BESS), which normally must supply building demand in addition to the grid during peak hours in winter. This demonstrates that the designed strategies are working as intended, making better use of existing resources to relieve the grid. The effect becomes even more significant when considering multiple multifunctional buildings operating together in a smart grid, as planned for Uppsala´s municipality. Uppsala Parkering, with whom we collaborated on implementing these smart charging strategies at the parking garage, has been very happy with the results."

Does smart charging affect the end user?
"I'm not aware of any complaints with the tests in this project. The adjustments in charging time have probably not been noticeable for the users in any significant way, even for those using the public chargers. The smart charging strategies are always simulated before implementation, and the tests are communicated via an app at the parking garage. User needs and perception are taken very seriously by everyone in the project, and it's discussed regularly in our meetings between academia and industry."

Is it something you would like to add?
"Yes, I would like to add that I am very grateful to be involved in this project and in the collaboration between the university and its industrial partners. I would like to thank you, Volvo Cars, Zeekr Tech, Uppsala Parkering, E.ON, Vattenfall, Charge Amps, STUNS, and Uppsala kommun for all the contributions with different views to find the best solutions together. And also, to thank you my project group, principally Valeria Castellucci and Alexander Wallberg for all the learning and support. Being part of this project has been a rewarding experience both professionally and personally."

About Marina Mattos

Marina comes from Juiz de Fora, a historic city in Brazil known for its university. It is located in the mountains of Minas Gerais, north of Rio de Janeiro state. She has bachelor's degree in electrical engineering with emphasis on power systems, and the master's degree was in electrical engineering with emphasis on energy focus on electromobility and renewable energies.

"I have always wanted to live abroad and when I saw this PhD position in Uppsala, that the subject was very similar to my master's, I decided to apply for it. I like Sweden. It's very organized, and you have come far ahead in women's equality. Sweden and Brazil are very much opposites but there are similarities too, like the "fika" culture that we also share, especially in my home state, where I was born and raised," says Marina Mattos.

Doctoral network

The SEC Doctoral Student Network had a productive year, with several successful PhD defenses across the network. We are genuinely proud to see so many doctoral students completing their journeys and contributing new knowledge to the field of electromobility.

Each dissertation represents years of dedication, collaboration, and intellectual growth, and together they demonstrate the strength of the SEC community. At the same time, SEC continues to thrive. The network now includes just over 100 active PhD students from universities across Sweden. The strong participation in our activities throughout the year demonstrates both the relevance of the research and the value of the national community we are building together.

In 2025, the network organized various activities to promote learning, encourage active participation among doctoral students, and provide a platform for sharing experiences and ideas. Central to these efforts is the goal of supporting doctoral students' academic growth while maintaining connections to industry, ensuring that research remains both scientifically sound and practically relevant. The activities arranged to support this include webinars, courses, and study visits. Together, these formats create opportunities for knowledge exchange, skills development, and interaction with both academic peers and industry representatives.

Webinars
In 2025, we held five interactive webinars with lecturers from industry and academia:

Per Gyllenspetz presented "Why making much lighter cars is a good idea."

Anita Bongards and Gabriel Domingues from BorgWarner Inc presented "Advances in Electrically Excited Motors from a performance and sustainability perspective."

Francisco J. Márquez Fernández, one of the SEC theme leaders in Electric Drives and Charging, VTI, and Lund University, presented "Electromobility and Resilience – WTF!"

Anders Grauers, EV specialist within the SEC and Chalmers University, presented "Are Electric Trucks Ready to Take Over? System Analysis and the Difficulty of Drawing Conclusions from a Very Fragmented Picture."

Emanuella Wallin from Polestar presented "Powering the Future: An Introduction to V2G, Smart Charging & Plug and Charge."

Courses
During the year, the SEC Doctoral Student Network offered two doctoral courses; Hybrid Electric Powertrains: Modeling, Control and Optimization; and a course in vehicle energy analysis and optimal control in May, led by Lars Eriksson at the Division of Vehicular Systems at Linköping University. This course focused on system-level modeling and energy management of hybrid electric vehicles. Participants were introduced to methods for analyzing vehicle energy consumption during driving missions, modeling series and parallel hybrid powertrains, and applying deterministic dynamic programming to develop optimal energy management strategies. The course combined pre-recorded lectures, interactive Q&A sessions, and individual project assignments.

Writing bootcamp
The SEC Doctoral Student Network arranged a writing bootcamp at Lund University in December, led by Öivind Andersson, Professor of Sustainable Energy Systems. The goal of the bootcamp was to make academic writing more productive and easier to initiate. The bootcamp concluded with a surprise visit from Marie Dacke, Professor of Sensory Biology, IgNobel Prize winner for her dung beetle research, and known from Studio Natur. Dacke shared insights from her popular science books and offered practical advice on staying inspired and productive as a writer.

Focused training in research communication
The SEC Doctoral Student Network hosted a PhD gathering in August in Gothenburg, in conjunction with Roads to the Future and E-Mobility Day. The goal was to strengthen the doctoral community while offering targeted training on research communication. The afternoon featured a seminar and an interactive workshop focused on effectively presenting research. Communications coach Anders Sahlman shared practical insights on communicating research clearly and effectively, followed by hands-on exercises that allowed participants to immediately apply the tools and techniques discussed. The day concluded with a joint dinner, providing space for continued dialogue, new connections, and the exchange of ideas across research disciplines.

Study visit at Alstom
The SEC Doctoral Student Network concluded 2025 with a study visit to Alstom in Västerås in November, starting with a joint dinner the evening before. The purpose of the visit was to strengthen collaboration between academia and industry and to offer insights into how railway systems are developed and tested in an industrial setting. The program featured presentations and discussions on signaling, train control, and system integration. A highlight was touring an anechoic test chamber, where components are evaluated in a sound-absorbing environment to accurately measure noise, vibration, and performance. This visit helped increase the understanding of industrial processes and fostered dialogue between doctoral researchers and industry representatives.

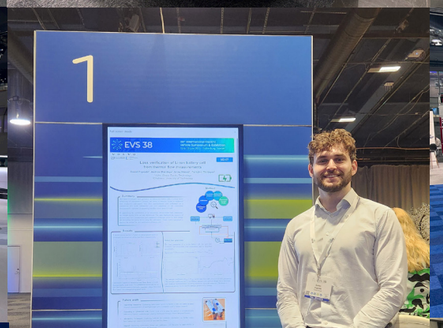
EVS 38

The Electric Vehicle Symposium, EVS 38, took place in Gothenburg in June, and was attended by about 3,800 participants from over 55 countries. Swedish Electromobility Centre had a strong presence at the conference with many speakers, and partners in the exhibition area. SEC also had the opportunity to participate at both Chalmers University Technology's and RISE's exhibition stands.

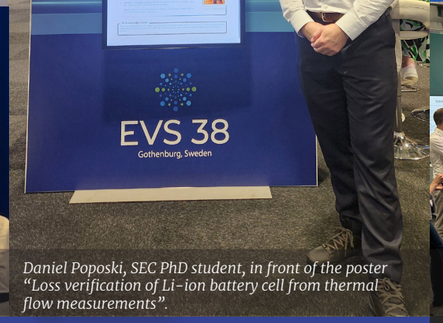
BEST PAPER AWARD

One of the conference highlights was when Anders Nordelöf, leader of SEC theme area Environment & Society, together with Anita Bongards at Borgwarner, received EVS 38 Best Lecture Paper Award for, "Allocating the environmental burdens in co-production of rare earth elements for EV magnets". The selection was done by the EVS 38 International Programme Committee based on the quality of the abstracts, the full paper reviews, and the overall contribution to the field.

Photo: Anders Nordelöf (right) on stage with other recipients.



Francisco Márquez Fernández presenting "Electrified road freight transport in the Nordics: status, challenges and opportunities".



Daniel Poposki, SEC PhD student, in front of the poster "Loss verification of Li-ion battery cell from thermal flow measurements".

SEC representatives had the opportunity to meet and engage with conference participants at Chalmers' stand.

Increasing interest in charging and infrastructure at EVS 38

One reflection from EVS 38 was the trend of an increasing interest for charging and infrastructure. At EVS 30 in Stuttgart 2017 the conference contributions within this topic was 17 percent, which then increased slightly in Lyon and Oslo. At EVS 38 in Gothenburg the interest had risen up to 30 percent. The increasing interest in charging and infrastructure was also visibly notable in the exhibition area with many different actors present. There was also a lot of focus on heavy-duty vehicles and megawatt charging.

SEC presenters at EVS 38

Swedish Electromobility Centre had a strong presence at EVS 38 with speakers all three days covering a variety of topics. Director Linda Olofsson got the opportunity to present the findings from SEC's extensive workshop identifying critical milestones necessary for electrifying the transport system. The workshop was attended by stakeholders, experts and decision makers at the forefront of electromobility.

LINDA OLOFSSON, SEC
Critical electromobility milestones: learning from a triple helix workshop in Sweden

ANDERS GRAUERS, Chalmers
The market for public fast charging of heavy trucks and how it influences prices, capacity, and queues MSC

ALI FOTOUHI, Volvo Cars
Grid compliance and advanced control features of Volvo Cars' V2G system

MIKAEL LANTZ, Lund univ.
The impact of zero emission zones on Sweden's electrification of heavy-duty trucks

ANDERS NORDELÖF, VTI
Allocation the environmental burdens in co-production of rare earth elements for EV magnets

FRANCISCO J. MÁRQUEZ FERNÁNDEZ, VTI
Electrified road freight transport in the nordics: status challenges and opportunities

VIKTOR LARSSON, Volvo Cars
Impact of power tariff on electric vehicle smart charging

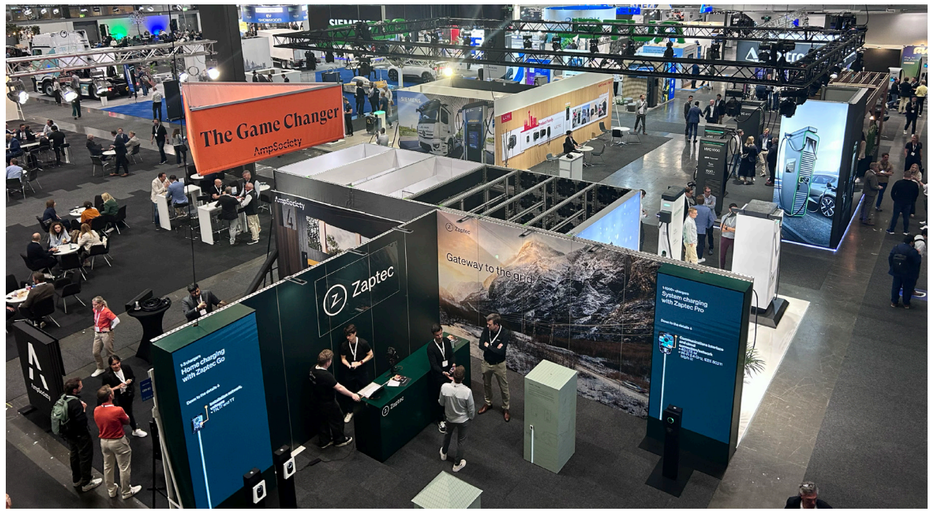
PEDRO ANCHUSTEGUI, Chalmers
Climate and economic impacts from reinforcement of the distribution grid due to different EV charging strategies

FRANCES SPREI, Chalmers
Electromobility in Sweden: navigating the phases of change and global influence

NIKITA ZAIKO, Lindholmen Science Park
E-Charge: Initial system demonstration of MCS-capable battery electric heavy-duty trucks

ROBERT ERIKSSON, Volvo Cars
Three years of experience with wireless charging fleet in Gothenburg green city zone

JEANETTE ANDERSSON, VTI
The data regulation puzzle of EV charging



Exhibition area

"I'm very proud that we had so many SEC researchers presenting at EVS38, and of course, I want to congratulate Anders on winning the best paper award. EVS is an arena that gives a lot of value to all actors, so it's important for us as a research centre to participate.

I found it very interesting to listen to many influential actors and their discussions on how tariffs and other global uncertainties are affecting e-mobility. The path towards e-mobility might not be as a straight path as we thought, but my impression is that everyone is working on solutions to overcome these obstacles.

At the exhibition floor it was clear that megawatt charging solutions are emerging on a broad front, and this was the first time that I've seen the heavy duty vehicle manufacturers at EVS. This shows that e-mobility is constantly progressing."

Linda Olofsson, SEC director

Focus group

The SEC Focus Group on "Resilience in an Electrified Transport System" has organized a series of seminars featuring experts from the Swedish Defence University, VTI, and Université Laval. The purpose has been to develop a shared understanding of resilience and identify implications for a rapidly electrifying transport sector.

Seminar with Thomas Ekström, Försvarshögskolan

This seminar was an important first building block for the focus group "Resilience in an Electrified Transport System." Thomas contributed by providing a fundamental understanding of the underlying context for resilience in an electrified transport system. Continued work on resilience within SEC will take these elements into account while also adding aspects specifically related to electrification.

Seminar with David Daniels, VTI

The seminar with David Daniels was a valuable continuation of the focus group "Resilience in an Electrified Transport System." Like Thomas Ekström in the first seminar, David emphasized the importance of understanding the underlying concepts. His presentation was primarily based on a scientific article in which he is a co-author. The article presents a framework for how resilience—particularly for electrified transport—can be modeled and analyzed using a system-of-systems methodology.

Seminar with Akhtar Hussain, Universite Laval

Compared to the previous seminars, Akhtar's presentation examined the relationship between electric vehicles (EVs) and the power grid in a bidirectional manner: how EVs can contribute to the resilience of the power grid — and how the power grid can enhance the resilience of EVs.

Jens Hagman

Francisco J. Márquez-Fernández

Jens Hagman from RISE and Francisco J. Márquez Fernández from VTI have led the work together with a small core group. The focus group will continue during 2026 and at least one seminar is planned along with a final presentation at SEC's E-mobility Day. All SEC partners are welcome and encouraged to participate.

Learning electromobility

- A live open online course for engineers

Learning Electromobility, a live, teacher-led online course, was offered during the fall of 2025. The course, developed by the Swedish Electromobility Centre in collaboration with the five university partners, has been a great opportunity for engineers and professionals to learn the fundamentals and build a solid understanding of electromobility. The course had up to 75 participants and it's been very well received and praised for having relevant material.

Learning Electromobility has been designed for engineers and professionals in the transport and energy sectors to support lifelong learning by offering in-depth knowledge of the technologies and systems that underpin the transition to electric mobility. The course spanned over ten weeks and was divided into five specialised modules. The course has covered both personal electric vehicles and electric trucks, ensuring a broad and practical understanding of the entire electromobility ecosystem.

Below is a brief overview of the modules:

Module 1: EV Energy Management and Control
Understand how energy is consumed and managed in electric vehicles. Learn modeling, simulation, and control strategies like Equivalent Consumption Minimization Strategy and dynamic programming.

Module 2: Electric Drives and Charging
Explore electric motors, power electronics, and charging systems. Includes design studies and simulation tools for powertrains and infrastructure.

Module 3: EV Energy Storage
Dive into batteries and fuel cells, from electrochemistry to integration and safety. Covers Li-ion, Na-ion, and next-gen storage technologies.

Module 4: EV Sustainability
Examine the environmental and societal impacts of EVs. Topics include life cycle analysis, battery recycling, how logistics systems need to be adapted, and how adjusted business models can be made to fit with electrification.

Module 5: EV Charging Infrastructure and Grid Interaction
Learn about the Swedish power system, smart charging, V2G, and how EVs interact with the grid. Includes economic and regulatory perspectives.

Collaborations

Collaboration is essential for the progression of e-mobility, and is strongly encouraged. Associated projects, and other forms of collaboration, are great opportunities for knowledge sharing and expansion of the network. Here are some examples of organisations and projects that SEC worked with in 2025.

BASE

BASE (Batteries Sweden) is a VINNOVA-funded competence Centre. SEC and BASE complement each other since BASE has a focus on the materials within the cell and has battery industry as partners and SEC contribute with knowledge in how to apply it in electromobility. The strongest connection between the centres is through SEC Theme 3, both in terms of the participating universities (Uppsala, KTH, Chalmers), industries, and key people.

BATTERY 2030+

European research initiative with the vision of inventing the sustainable batteries of the future. SEC is a supporting organisation to BATTERY 2030+. It actively gave support in designing the vision, aims and goals of the BATTERY 2030+ initiative and roadmap. SEC also gives input to the activities in the initiative as a part of the European battery eco-system that can ensure the uptake of new knowledge and technologies.

IFP

IFP Energies Nouvelles is a major research and training player in the fields of energy, transport and the environment. SEC collaborates through having theme leader Lars Eriksson as a teacher in the French institute's courses and the institute also contributes with researchers who are participating in to SEC connected PhD students' grading committees.

SEDDIT

Sensor informatics and Decision-making for the Digital Transformation constitutes a platform for collaboration between universities and companies to conduct research and education in digital societal transformation with the aim of strengthening Sweden's competitiveness. There is an overlapping environment between the SEC researchers and the SEDDIT researchers and many of the centre's industrial partners also have a good collaborating environment. Tema 1

PUSH

Production, Use and Storage of Hydrogen is an Agenda 2030 Research Centres funded by SSF , Swedish Foundation for Strategic Research, and was started in 2020. The main goal of the research centre is to address scientific and technical hurdles impeding the widespread use of hydrogen in sustainable energy systems, by combining activities on production, storage and distribution, and use of hydrogen in a single coordinated research effort. PUSH activities focus mainly on new concepts and research issues with a longer time horizon. For example polymer-based fuel cells that work at slightly higher temperatures, which if implemented would impact the system design in vehicles. By the fact that several of the doctoral students and faculty members active in PUSH also participate in SEC activities and the doctoral network, a mutual transfer of knowledge takes place.

EVS/AVERE

AVERE, a European association representing and advocating for electromobility on behalf of the industry, academia, and EV users at both EU and national levels, organizes the Electric Vehicle Symposium, EVS, every year. Together with other actors SEC was part of the Swedish organization supporting Avere for the EVS 38 in Gothenburg 2025. SEC has participated in the Swedish delegations for EVS 35 and EVS 36 to market Swedish activities in electromobility. The main contribution from SEC in EVS38 was to the scientific program but the centre also collaborated in promoting the event.

E-Charge

E-Charge is a national project for electrification of heavy-duty trucks on long-distance routes. SEC has both been active in the application phase of the project and there are also researchers from SEC's projects active in E-Charge. SEC participates with researchers and industrial partners. SEC is also part of the steering committee. In November E-charge 2 was launched with the purpose to further accelerate the transition to a future logicist system.

SAFER

SEC and SAFER Vehicle and Traffic Safety Centre are in close regular dialogue concerning supporting each other in the development of the centres and possible collaboration. SAFER has initiated a network focused on accidents with vehicles with alternative fuels. SEC participates with one representative in the network to monitor how the cooperation in this field can be increased between the centres.

SEEL

SEEL Swedish Electric Transport Laboratory is a test center for research and development in the field of electromobility owned and run by Chalmers and RISE as a joint venture. SEEL consists of three facilities - in Gothenburg (Söve), Nykvarn and Borås. The aim is to consolidate efficient knowledge development and improve the conditions for collaboration in the field of electrified transport in Sweden and Europe.

Alstom Mobility & Innovation Lab

A centre that concentrate Alstom's innovation capabilitis in Sweden and enable collaboration across industries, higher education institutions, and start-ups. SEC researchers have used the facilites to test prototypes.

EARPA

Several partners of SEC are part of EARPA, European Automotive Research Partners Association, a community of leading European independent R&D providers in the automotive sector. SEC Director Linda Olofsson is a member of the executive board. EARPA foresight groups support R&I frame programmes and policy decisions through high level position papers and EARPA collaboration groups facilitate successful R&I proposal development.

Swedish Transport Agency

SEC Director Linda Olofsson is chairman of the board.

Swedish Transport Administration

Magnus Lindgren from the Swedish Transport Administration is adjunct to the SEC program council and invited to the center activities.

ACE

VTI has involvement in the Arctic Center of Energy which is an ambitious initiative to accelerate society's sustainable energy transition. Through cutting-edge research and groundbreaking education, the center creates the knowledge and abilities required to succeed with the electrification of society.

SweBIIC

A consortium, consisting of RISE, Uppsala University, Chalmers, and the Blue Institute, has conducted a preliminary study on the conditions for establishing SweBIIC – a research and technology infrastructure for scaling up battery production.

Competence centres

SEC management has participated in the Swedish Energy Agency's "Leadership forum" to exchange knowledge and experience with other competence centres funded by the Swedish Energy Agency. SEC has participated in resilience centre conference days, and a workshop within resilience.

Compell

This is a strategically supported initiative and is carried out within the Compel platform (Competence and Excellence in the battery research and education for the transport sector, today also including KTH and Luleå University of Technology together with Chalmers, Uppsala and Lund University). The aim is to strengthen Sweden's long-term competitiveness in battery development and the electrification of the transport sector.

Integrated transport laboratory research

ITRL is a transdisciplinary and multi-stakeholder research and demonstration arena, responding to global environmental transport challenges. They have been involved in SEC's pre-studies working on project proposals.

Outreach & communication

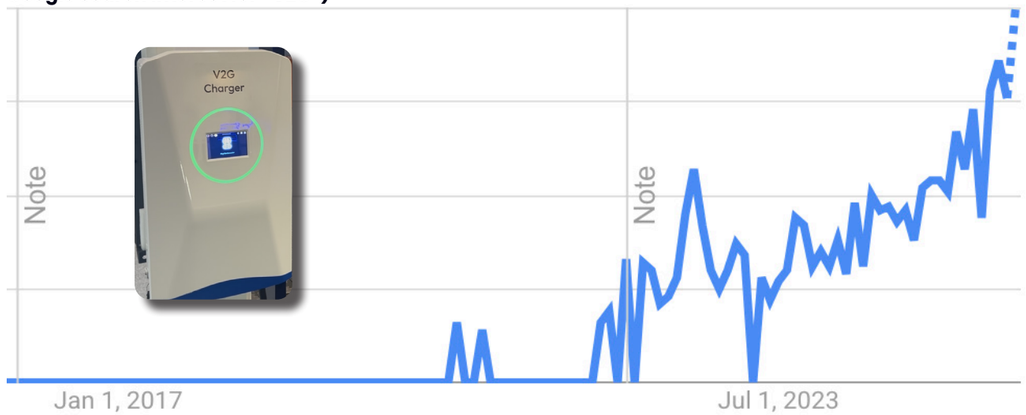
SEC is a virtual centre organisation with activities all over Sweden. The communication efforts are meant to increase the knowledge of what is going on in all of the five themes, participating universities and industries. The outreach activities are also strengthening the brand and in the long-run contributes to the impact of e-mobility in society.

SEC Newsletter
SEC's newsletter has over 3,000 subscribers which mostly are professionals in the partner organisations. The newsletters contain news about ongoing SEC-funded projects, opportunities, partners and upcoming events. The main purpose is to get engagement from all partners and increase collaborations and knowledge sharing.

Global Watch
The omEV newsletter and podcast is a global watch service run through SEC. The newsletter is sent three times a week and new podcasts are out almost every month. It gathers, analyses and shares information and keeps you updated on the latest from the world of e-mobility and what may influence Swedish mobility development.

LinkedIn
SEC's LinkedIn page has about 3,000 followers. The purpose is to gain attention to a wider audience. The most viral post in 2025 reached over 6,600 impressions.

Google search interest for "V2G")



The global search interest for V2G (Vehicle-to-grid) has steadily been increasing since 1 July 2023.
Source: Google trends

Media coverage

SEC representatives take an active part in the public debate and appear regularly in both Swedish and international press. Below is a selection of apperances in various media outlets.

"40 makthavare inom mobilitet: Så blir 2025"; Dagens Industri, 2 Jan
https://www.vibilagare.se/nyheter/nya-siffror-kina-overlagset-storst-pa-batterier

"Nya siffror: Kina överlägset störst på batterier"; Vi Bilägare, 4 Apr
https://www.vibilagare.se/nyheter/nya-siffror-kina-overlagset-storst-pa-batterier

"Ny teknik kan både hjälpa och stjälpa resiliensen"; VTI, 31 March
https://www.vti.se/arkiv/nyhetsarkiv/nyheter/2025-03-31-ny-teknik-kan-bade-hjalpa-och-stjalpa-resiliensen

"Forskningsprojekt visar vägen till omställning utan elbrist"; Dagens logistik, 16 June
https://dagenslogistik.se/forskningsprojekt-visar-vagen-till-omstallning-utan-elbrist/

"Elbrist hotar klimatomställning av svensk godstrafik"; Dagens näringsliv, 17 June
https://www.dagensnaringsliv.se/20250617/281211/elbrist-hotar-klimatomstallning-av-svensk-godstrafik

"Global research teams propose standards for structural power composites", Composites world, 18 Aug
https://www.vti.se/arkiv/nyhetsarkiv/nyheter/2025-03-31-ny-teknik-kan-bade-hjalpa-och-stjalpa-resiliensen

"Experternas analys av amerikanska Lytens köp av Northvolt"; SVT, 25 Aug
https://www.svt.se/nyheter/lokalt/vasterbotten/hor-experternas-analys-av-lytens-kop-av-northvolt-kravs-ganska-mycket

"Battery life prediction takes a leap"; Electric Vehicle Charging & Infrastructure, 29 Aug
https://www.evcandi.com/news/battery-life-prediction-takes-leap

"Elbilar ger lägre utsläpp än andra bilar – visar studie"; Sveriges Radio, 2 Sep
https://www.sverigesradio.se/artikel/elbilar-ger-lagre-utslapp-an-andra-bilar-visar-studie

"New AI Model Could Help Electric Vehicle Batteries Last Much Longer"; MSN, 5 Sep
https://www.msn.com/en-us/autos/news/new-ai-model-could-help-electric-vehicle-batteries-last-much-longer/ar-AA1LjO4V

"Experten dömer ut framtidens batterier: 'Inte revolutionerande'"; SVT, 5 Sep
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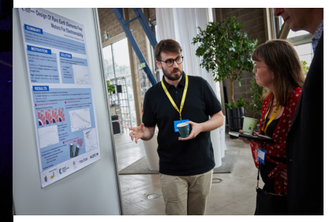
Roads to the Future

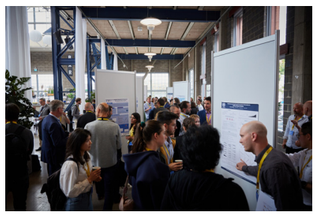
Roads to the Future is SEC's biannual open international e-mobility conference. The highlighted topic was "Circularity and electromobility – where do we stand?". The conference took place in Gothenburg, 27 August.

Panel discussion with all invited speakers which was excellently moderated by Anders Nordelöf.



Klaas Burgdorf, from the Swedish Energy Agency, addressed the topics of investments and how shifts in various regulatory frameworks now emphasize security, resilience, and dual use.

Director Linda Olofsson, together with chairman Nils-Gunnar Vågstedt, welcoming everyone to Roads to the Future.



Roads to the Future is a great networking opportunity and a chance to discuss the latest in e-mobility research. The poster exhibition was a much appreciated event.

Invited speakers

Prof. Christine Minke from TU Clausthal, Germany. Christine gave the audience a comprehensive overview of circularity and the current status and drivers. She talked about aspects of circularity like repairability, reuse, and remanufacturing, but mentioned recycling as the current big topic in e-mobility. Metal recycling globabally is very low with many metals that can't be recycled at all.

Dr. Carl Dahlhammar from The International Institute for Industrial Environmental Economics in Sweden began by stating that the climate and resource challenges are connected, mentioning the IEA report "the Role of Critical Minerals in Clean Energy Transitions". Carl's speech was focused on circular grids and circular economy laws in relation to a sustainable circular vehicle electrification.

Dr. Guinevere Giffin, Scientific Head of Fraunhofer R&D Center Electromobility, Germany, gave an insightful speech on how to to empower a sustainable battery value chain, with focus on direct and hydrometallurgical recycling from production scrap. Guinevere stressed that the greatest impact for circularity of batteries is in the early design phase, since it's very problematic to repair, reuse or remanufacture batteries without an initial idea of how this can be done in a later stage. The presentation contained many specific examples and mentioned ongoing research at Fraunhofer on marker particles and aqueous binders.

Dr. Omer Onar gave an insightful overview of Oak Ridge National Laboratory's (USA) power electronics and electromagnetic research activities. Onar gave the audience a list of improvements ranging from substrates for power electronic modules to optimized heat sinks, and more. Oak Ridge National Laboratory evolved as part of the Manhattan project during World War 2 and has today the world's fastest supercomputer.

Hans Eric Melin, founder and director of the London-based company Circular Energy Storage, UK, talked about the current status and advancements in global battery circularity. A key take out was that the fate of a battery is shaped by its current owners, and downstream values rarely influence upstream decisions. Hans Eric mentioned lack of feedstock, a weak EV market, low material prices, and lack of downstream customers as causes to why recyclers may suspend their plans.

Nicholas Gendre, head of battery industrialization and logistics at Volvo Energy, France, talked about total cost of ownership as one of several conditions that must be in place to develop e-mobility. Here, battery circularity, on top of the environmental benefit, plays a vital role to reduce the costs. Nicholas mentioned challenges in the different stages of circularity like battery degradation, diagnostics, individual follow-up, competitiveness, and volumes. This was put in a context areas of geopolitical changes, industrial maturity, and new business models.

E-mobility Day

SEC's annual partner event took place in Gothenburg 28 August. Researchers from the five theme areas presented their ongoing work, and the day covered a wide range of topics from a wide range of projects.

SEC theme leader Jonas Fredriksson moderated E-mobility Day with excellence.

Workshops & seminars

Leading the way to greener and smarter mobility solutions at Alstom
Magnus Jansson, senior expert in electrical drives at Alstom, gave a lunch seminar entitled “Leading the way to greener and smarter mobility solutions”. During the seminar, Magnus talked about Alstom’s mission and vision moving forward.

Future of Truck Electrification in Europe: Megawatt and Depot Charging
An open online seminar held by Theme (4) Environment and Society. Guest speaker was Patrick Plötz from Fraunhofer Institute for Systems and Innovation Research ISI in Germany, and the title is “Future of Truck Electrification in Europe: Megawatt and Depot Charging”.

Charging infrastructure – challenges and opportunities
This cross-theme workshop served as a first collective brainstorming session to identify relevant research topics concerning charging infrastructure. The results from the workshop was later analysed by the theme leaders, classified according to the different themes, and then incorporated into the themes’ roadmaps when applicable.

Inverter testing and development
The workshop discussed how inverter and electric drive verification will be done in the future. The workshop covered development processes and skills that will be needed in the future. During the workshop both industry and academia had the opportunity to discuss their needs and how through collaboration we can make the best use of coming investments. The workshop is initiated by SEEL Swedish Electric Transport Laboratory and is kindly hosted jointly by Scania and SEEL.

A hands-on introduction to the ECCV simulation platform - workshop
This worksop was about simulating electric vehicles, without building a model from scratch. The workshop was held by Theme (1) Intelligent Vehicles & Systems.

Energybank - webinar
SEC Theme (5) Vehicle–Grid Interaction invited to a webinar where the company Energybank presented their work on V2G and showed some real-time data from their test site.

Battery lifecycle management in charging networks
Theme (4) Environment & Society arranged an online webinar to hear if used truck batteries are feasible as energy storage system connected to truck charging stations. During the webinar, Farnaz Goudarzi and Christoph Futter from Einride together with Patricia van Loon and Mats Johannson from Chalmers University of Technology and Sara Fallahi from RISE presented the results from the demonstration project BATMAN (Battery Lifecycle Management in Charging Networks).

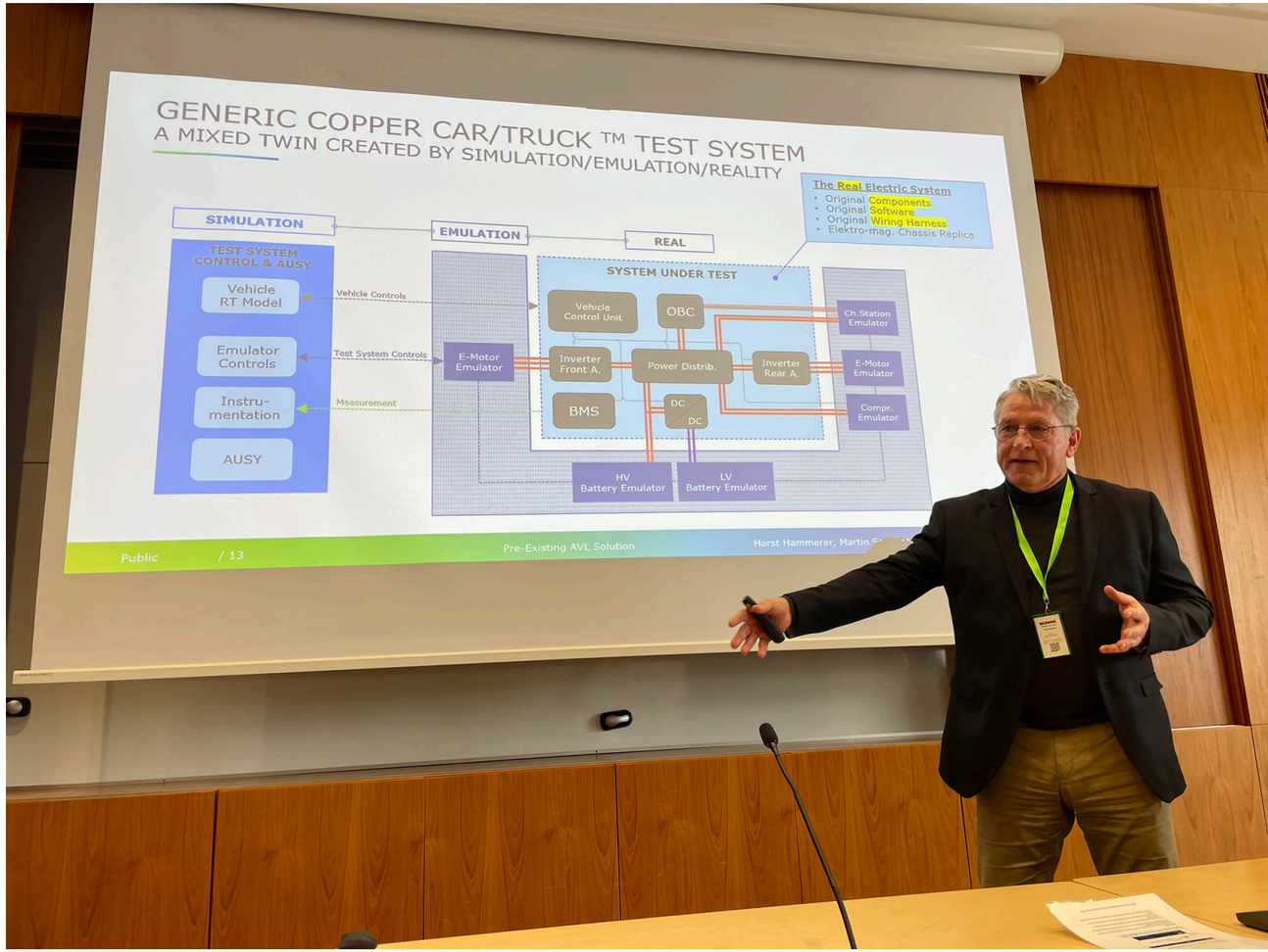
Engaging workshop on soft magnetic materials
Theme (2) Electric Drives & Charging held a workshop on Soft Magnetic Materials. Presentations were given by PhD students Leonardo Colombo, Lund University; Sima Soltanipour, Chalmers University of Technology; Pär Ingelström from RISE/SEEL, focusing on recent research into modeling and characterizing iron losses in electric machines under real-world operating conditions in vehicles. Representatives from Traton and Volvo Cars also shared their perspectives on the issue, highlighting the importance of accurate loss modeling and how it is applied in their products. The day concluded with a visit to the Chalmers laboratory.

Social aspects of cobalt in lithium-ion batteries
Theme (4) Environment & Society arranged this webinar with Rickard Arvidsson from Chalmers University of Technology. Rickard presented the results from the research project “Blood Batteries? Social Life Cycle Impacts of Lithium-Ion Batteries” financed by the Swedish Energy Agency.

Workshop: ECCV platform
Theme (1) Intelligent Vehicle and System arranged a workshop on the ECCV platform. The ECCV platform is a simulation tool/model developed within SEC projects. The workshop presented the tool/model and provided hands-on experience with it.

Power Tariffs as a Speed Bump: The Financial Threat to Electric Vehicle and Charging Infrastructure Adoption
Theme (5) Vehicle–Grid Interaction arranged a webinar with Alexander Sandström, Project Leader Charging at Polestar. The latest power tariffs change the game plan for charging infrastructure as well as the economy for the end user of an EV. The different implementation of the tariffs makes it extremely difficult utilize smart charging or V2G functionalities to support the grid. In several cases the cost for the tariffs and power transfer that are the highest cost, even more than the actual cost of electricity.

Workshops, seminars and study visits are an important part of SEC. Cross-theme activities provides a great opportunity for knowledge sharing and possible collaborations.



Magnus Karlström, Editor in Chief

omEV Newsletter

The year 2025 in electromobility has continued the trend of 2024, which was a turbulent period with many facets. Sales are increasing globally, but more unevenly in the United States and Europe. Northvolt went bankrupt. There have been tariffs, geopolitical instability, and higher interest rates. Some policy measures supporting electric vehicles have been reduced.

Rechargeable vehicles have reached significant sales shares in several vehicle categories. The highest sales share was for buses (43%), followed by two- and three-wheelers (39%), passenger cars (26%), light trucks (10%), and medium- and heavy-duty trucks (5%). One of the most exceptional events was the extremely high sales of heavy electric trucks in China at the end of 2025, when sales exceeded those of diesel trucks.

From a sales perspective, an important trend was the rapidly increasing sales of electric vehicles in developing economies. Two particularly interesting regions to watch are South America and Southeast Asia.

2025 is a year in which trade policy and industrial strategies are central to understanding developments. A few years ago, horizon scanning was focused mainly on technology, policy, and the market, but today geopolitical analysis is central to understanding developments. In most regions, policies for electromobility have been motivated by climate concerns, but today, security of supply and industrial competitiveness are at least as important. In the European context in particular, competitiveness has been discussed extensively, especially in relation to Chinese battery and vehicle manufacturers. However, 2025 was also a year in which several Western car companies launched new products that were strong from a technological perspective.

One aspect is that policies for electric passenger cars have become more focused on issues of fairness, that is, ensuring that the transition benefits more groups in society. A question is how charging infrastructure can be expanded for groups that cannot charge at their own parking space. This implies a growing interest in distributional and acceptance issues. Property owners and their strategies are key actors in this regard. In relation to charging, a technology trend was V2G.

The second-hand market for electric passenger cars has become a greater focus area. More research has emerged on who buys used cars, how second-hand vehicles are exported between countries, how battery condition is assessed when purchasing a used car, and how the price development of used cars has actually evolved.

In the battery field, interesting developments included sodium-ion cells entering an early commercialization phase, major overcapacity in cell production in China, and also the rapid increase in sales of stationary batteries, driven by falling prices. Finally, one of the major trends is that tensions in the world are rising as Western countries raise tariffs and introduce other policy measures to reduce their dependence on China, while China responds with export restrictions on battery technologies. Analysis of access to critical metals continues to be a central part of understanding development pathways for batteries and electric vehicles.

A general trend is also that more of the debate and interest in Sweden, as well as in other countries, has shifted toward the electrification of trucks, mining machinery, and other heavier vehicles. Here, the debate often concerns access to power capacity, how policy measures should be designed so that operating costs become comparable to diesel, and a stronger focus on policies that stimulate demand. A development has been the introduction of MCS – the Megawatt Charging System – to enable faster charging for heavy commercial vehicles.

A brief summary of key observations is an increased focus on understanding geopolitics, policy for competitiveness and trade, charging infrastructure for trucks, and a shift toward maturity-related issues, such as the second-hand market and distributional aspects. The market and overall development are more uncertain, but it is important to remember that global sales of electric vehicles continue to grow. The power struggle over vehicles, raw materials, market access, and innovation between China, the United States, and Europe will continue to be a central part of the ongoing development of electromobility.

omEV is a newsletter and podcast about electric road vehicles that has been published since 1997. It's released 2-3 times per week with summer and winter breaks. omEV is funded by Swedish Energy Agency and hosted by Swedish Electromobility Centre.

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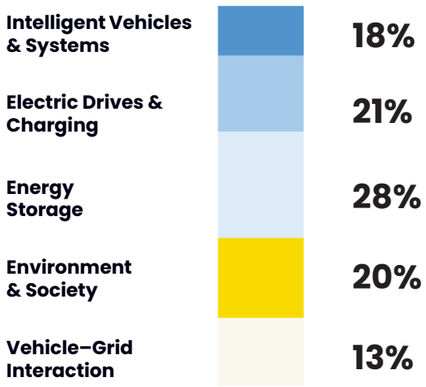
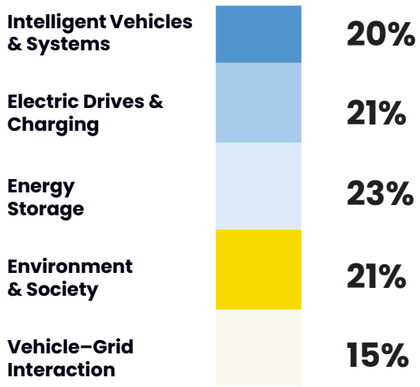
Centre finance 2025

Theme project distribution 2025

Main theme involvement



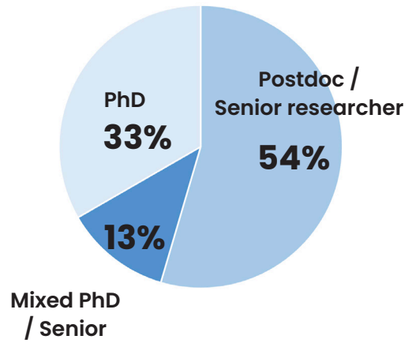
All themes involvement



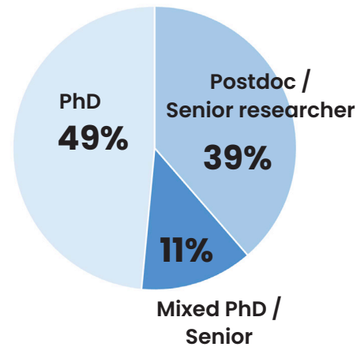
All SEC projects have a main responsible research theme, but other themes may also be involved. The left bar chart shows the distribution of the main theme, while the right bar chart shows involvement of all themes across all levels.

Project type distribution 2025

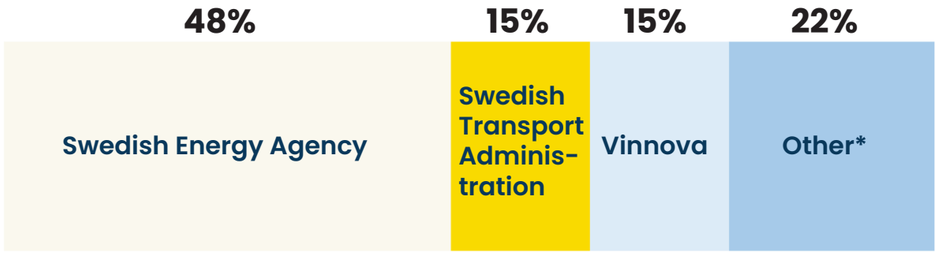
Distribution based on number of projects



Distribution based on funding



Cash funder distribution in SEC associated projects 2025



SEC associated projects plays an important part for expanding knowledge and experiences within the electromobility research community.

* Volvo Group, Chalmers Area of Advance Energy, Horizon Europe, Statens Vegvesen, Swedish Research Council and The Knowledge Foundation

Appendix

Projects 2025 (61 in total)

Project title	Theme(s)	Project manager	Partners	International collaborations	Females	Males
Access to Power: The Facilitating role of DSO:s	5	Mikael Lantz	LTH, Scania, Volvo Group, Volvo Cars, Zeekr, E.ON		0	2
ACTUAL grid and road simulation for e-mobility (extension)	5, 2	Francisco Marquez-Fernandez	LTH, KTH, Scania, Volvo Group, Volvo Cars, Zeekr, E.ON	Texas A&M University, Texas, USA	1	2
Air System Modeling for Efficient FCEV – ASMEF	1, 3	Öivind Andersson	LTH, LiU, Volvo Group		1	4
Alternative PFAS free binders and electrolytes	3, 4	Stacy Trey	RISE, UU, Volvo Group		5	4
Battery pack design for efficient cooling and ageing mitigation	3, 1	Daniel Brandell	UU, LiU, Scania, Volvo Group, Zeekr		2	5
CHARGE – Charging and Trip Planning of Electric Vehicles	1, 5	Nikolce Murgovski	Chalmers, VTI, Volvo Cars, Zeekr, E.ON	TU Delft, Netherlands, TU Eindhoven, Netherlands	0	3
Circularity in Electromobility	4	Anders Nordelöf	VTI, Scania, Volvo Cars, Aurobay		1	2
Cost & Benefit Analysis of V2G Scenarios	5, 1, 3	Jonas Hellgren	RISE, LiU, Volvo Cars, E.ON, Vattenfall		0	3
CRITIC – CRItical Transports and Infrastructure in Crisis	4, 5	Francisco Marquez-Fernandez	VTI, LiU, LTH, RISE, Scania, Volvo Group, Alstom, E.ON		1	4
Dansmästaren Project – Smart Charging Strategies	5	Valeria Castellucci	UU, Volvo Cars, Zeekr	Politecnico di Milano, Italy, University of Naples Federico II, Italy	2	2
Data REgulation And electroMobility (DREAM)	4	Jeanette Andersson	VTI, Scania, Volvo Cars, Zeekr	University of Groningen, Netherlands	2	2
Design and Control of Brushless Excitation for EESMs	2	Yujing Liu	Chalmers, Volvo Group, Volvo Cars	Stuttgart University, Germany	0	3
Developing and testing a realistic AST for FCHDVs	3, 1	Björn Eriksson	KTH, Scania, Volvo Group, Powercell	Politecnico di Milano, Italy	1	0
Diagnostics of dynamically configurable battery systems	1, 2	Mattias Krysander	LiU, Scania	Inria centre at Rennes University, France, Institute of Automation Technology Helmut-Schmidt-University, Germany, Fraunhofer IEM Paderborn, Germany	1	2
Direct on-board AC-DC charging versus traditional charging	2, 4, 5	Torbjörn Thiringer	Chalmers, RISE, Volvo Cars, Aurobay		0	3
Dr EIS - Advancing Distribution of Relaxation Times (DRT) Analysis for Lithium-Ion Battery Testing with Multi-Sine EIS	3, 1	Lars Eriksson	LiU, Scania, Alstom, Epiroc, Polestar		0	1
Durability effects of high frequency pulse charging	3, 2	Torbjörn Thiringer	Chalmers, Volvo Cars		0	2
ECOTS – Evaluation and Control Of Thermal management Systems	1, 2, 3	Lars Eriksson	LiU, Volvo Group, Volvo Cars, Epiroc, TitanX	IFPEN Paris, France	0	2
Eddy current effects in electrical steel	2	Pär Ingelström	RISE, Chalmers, LTH, Volvo Group, Volvo Cars		1	5
EESM and LCA extension of EPOS powertrain optimization tool	2, 4	Francisco Marquez-Fernandez	LTH, BorgWarner		0	1

Projects 2025

Project title	Theme(s)	Project manager	Partners	International collaborations	Females	Males
Electric motor + hydraulic pump fusion for electrification	2, 1	Liselott Ericson	LiU, Volvo Group	Purdue University, Indiana, USA	1	3
Electrified Freight – Exploring Resource Sharing	4	Henrik Gillström	LiU, Scania		1	1
E-machine design and environ-mental impact - part 2	2, 4	Torbjörn Thiringer	Chalmers, VTI, UU, Volvo Group, Volvo Cars, Aurobay, BorgWarner, Alvier Mechatronics		2	2
EMPOWER – Electric Machine Power Loss Modelling for Simulation and Control	1, 2	Lars Eriksson	LiU, Scania, Volvo Group, Aurobay, BorgWarner		0	1
FLEX – Finding the Limits of EV2X	2, 5	Anton Karlsson	VTI, Chalmers, LTH, Volvo Cars, Zeekr		0	6
Flexible model for cell design and mass breakdown	3, 4	Evelina Wikner	Chalmers, VTI, Volvo Cars		3	5
Fossil-free long-haul trucks in Europe	4	Maria Grahn	Chalmers, Scania, Volvo Group, TitanX	California State University, Los Angeles, USA, Colorado state University, USA	2	3
Fuel Cell Performance Prediction – Continuation	3	Rakel Wreland Lindström	KTH, Powercell	Paul Scherrer Institute (PSI), Switzerland	2	4
FUTURITE – Ferrite synchronous motors for future electromobility	2, 1, 4	Sandra Eriksson	UU, Scania, Alstom	UCL London, England, University of Kentucky, USA	3	4
Gas evolution in aged commercial battery cells	3	Rakel Wreland Lindström	KTH, Scania, Volvo Cars	Aalto University, Finland, University of Lorraine, France	3	1
Health-Aware Predictive Energy Control for Fuel Cell HEVs	1, 3	Lei Feng	KTH, Volvo Group	Arizona State University, Tempe, USA	2	2

Project title	Theme(s)	Project manager	Partners	International collaborations	Females	Males
Heterogenic Ageing in Large Intercalation Batteries (HALIBatt-KTH) – KTH	3	Rakel Wreland Lindström	KTH, Scania, Volvo Group, Volvo Cars, Zeekr		1	4
Heterogenic Ageing in Large Intercalation Batteries (HALIBatt-UU) – Uppsala	3	Fredrik Björefors	UU, Scania, Volvo Group, Volvo Cars, Zeekr	Paul Scherrer Institute (PSI), Switzerland	2	2
How to test V2G technology. Institute-projekt	5, 1, 3	Jonas Hellgren	RISE, LTH, Scania, Volvo Cars, Zeekr, E.ON, Vattenfall	dSPACE GmbH,Paderborn, Germany	0	2
INSLIFE – Prediction of lifetime for a sustainable insulation system for electromobility applications	2	Sandra Eriksson	UU, LTH, Scania, Volvo Group, Polestar		2	3
Investigate battery degradation via LSRI techniques	3	Simone Sala	RISE, Scania, Volvo Group	TU Delft's Reactor Institute (RID), Netherlands	1	4
LEAR – Robust LEArning methods for electric vehicle Route selection	1, 2, 5	Balazs Kulcsar	Chalmers, Volvo Group	University of Washington, Seattle, USA, HEC Montréal, Canada, University of Bath, United Kingdom	0	3
Life Cycle Assessment of Large-Scale Lithium-Ion Battery Production and Recycling – Part 2	4	Anders Nordelöf	Chalmers, Scania, Volvo Group, Volvo Cars, Zeekr		1	3
Life Cycle Assessment of vehicle-to-x	4, 2, 5	Anders Nordelöf	Chalmers, Volvo Cars		1	2
Logging of Electric Vehicles – Characterization of Charging Patterns and Grid Impacts	5, 4	Maria Taljegård	Chalmers, Volvo Cars, Zeekr		0	2
Marine charging systems for light watercraft	2	Nicholas Honeth	KTH, Scania, Volvo Group		1	5
ML Assisted Ageing Predicition and Adaptive Modelling for BMS	3	Torsten Wik	Chalmers, UU, Volvo Group, Volvo Cars, Zeekr, Epiroc, ABB	National Renewable Energy Laboratory, CO, USA		

Projects 2025

Project title	Theme(s)	Project manager	Partners	International collaborations	Females	Males
Modeling and Optimal Control of Electric Vehicles in Driving Missions	1	Lars Eriksson	LiU, Chalmers, Scania, Volvo Group, BorgWarner		0	1
Modelling of a PMSM accounting for 'position harmonics' and control in order to establish the possibility of reducing ripple and keeping highest possible efficiency	2	Torbjörn Thiringer	Chalmers, Volvo Cars, Alstom, Aurobay		0	5
Multi-criteria optimal motion control of automated EVs	1	Wenliang Zhang	KTH, Volvo Cars		2	2
Optimal Design Platform for Variable-Pole Induction Machines	2	Luca Peretti	KTH, Volvo Group		0	1
PEMFC durability at intermediate temperatures	3, 1	Björn Eriksson	KTH, Scania, Volvo Group	University of Connecticut, Connecticut, USA	0	1
Postmortem analysis: pulse charging effects on electrodes	3	Evelina Wikner	Chalmers, RISE, Scania, Polestar		6	5
Powering freight: Dynamics of transport & energy	4	Zeinab Raoofi	KTH, Scania	TU Delft, Netherlands	2	1
Practical LCA-models for strategic and critical EV minerals	4	Anders Nordelöf	VTI, Volvo Group, BorgWarner		0	2
Predictive remaining driving range for reduced range anxiety for EV users	1	Jonas Fredriksson	Chalmers, LiU, Volvo Group, Volvo Cars, Zeekr		0	3
Prospective life cycle assessment of electric passenger aircraft - LCAir	4	Anders Nordelöf	VTI, Chalmers, BorgWarner, TitanX		1	2
Quantifying Harmonics Caused by Smart Charging and V2X	5, 2	Alexander Wallberg	UU, Volvo Cars, Zeekr, Vattenfall		3	6
Resource-Effective Batteries and Charging for BEVs	4, 3	Kristina Holmgren	RISE, VTI, Volvo Cars, Zeekr		3	3
Reversed Li-trapping cycling	2, 5	David Rehnlund Maibach	UU, Polestar		0	4

Projects 2025

Project title	Theme(s)	Project manager	Partners	International collaborations	Females	Males
Sodium-ion Batteries for Automotive Applications	3	Charles Aram Hall	UU, Volvo Group		0	2
Sustainable axial flux motors for vehicle applications	1	Sonja Tidblad Lundmark	Chalmers, Volvo Group, Volvo Cars		3	1
Sustainable Li-ion battery electrode fabrication using PFAS free binder and solvent-free method	3, 4	Dhrubajyoti Bhattacharjya	RISE, Polestar		1	3
Total loss minimization algorithms in electric drives for e-mobility	2	Luca Peretti	KTH, Volvo Cars, Zeekr, ABB		0	1
Tyre wear and tyre particle emissions from electric vehicles	4, 1	Mats Gustafsson	VTI, Volvo Cars		2	3
V2G to manage variations in the electricity system – environmental performance	5, 4	Maria Taljegård	Chalmers, Volvo Cars, Zeekr		2	1

Associated projects 2025 (24 in total)

Project title	Funder	Theme(s)	Project manager	SEC partners	Other organisations
Battery lifetime prediction	FFI	3, 1	Faisal Altaf	Chalmers, Volvo Group	
BEETHOVEN – substitution of rare-earths for advancednovel magnets in energy and trans-port applications	Horizon Europe	2	Sandra Eriksson	Uppsala university	13 partners in EU
Business models for electrified logistics	Swedish Transport Administration	4	Magnus Blinge, Maria Huge-Brodin	Linköping university, Traton	
Condore – Customer-oriented operations research for electrification	FFI	1	Viktor Leek	Linköping university	Ragn-Sells, DAGAB
Control and Machine Learning for Sustainable Battery Recycling	Swedish Research Council	3	Changfu Zou	Chalmers	
Data-driven lifetime extension and performance optimization for vehicle battery systems	Swedish Energy Agency	3	Changfu Zou	Chalmers, Zeekr	
E-charge System demonstra-tion of electrified long-haul transports	Vinnova	4	Gunnar Ohlin	Linköping university, ABB, Vattenfall, Volvo Group	Tommy Nordbergh Åkeri, Circle K, OKQ8, ICA Sverige AB, DB Schenker
Electrification for sustainable energy system – Educational project	The Knowledge Foundation	5	Boel Ekergård	Uppsala university, Högskolan Väst	
Energy efficient thermal management	FFI	1	Kristian Nicklasson	Chalmers, Zeekr	
EVÅLUTION – The development of electrification from a haulage perspective	Swedish Transport Administration	4	Jessica Wehner	VTI, Linköping university	
High performing circular battery flows	Swedish Energy Agency	4	Patricia van Loon	Chalmers, Traton, Volvo cars	Nilar, Umicore, Göteborg Energi, LTS
Life cycle assessment of future battery chemistries – high storage capacity without scarce resources?	Swedish Energy Agency	4	Rickard Arvidsson	Chalmers	

Project title	Funder	Theme(s)	Project manager	SEC partners	Other organisations
Low carbon transport solutions	Statens Vegvesen	5, 4	Maria Taljegård	Chalmers	
MANOEUVRE: Mission manage-ment of electric heavy-duty vehicles with uncertainty awareness	Swedish Energy Agency	1	Nikolce Murgovski	Volvo Group	
Modelling of electric power systems in electric vehicles	Volvo Group	2	Mats Alaküla	Lund university, Volvo Group	
Multi-Scale Modelling the Interfacial Chemistry in Solid-State Batteries	Swedish Energy Agency	3	Daniel Brandell	Uppsala university	Karlstad University
Projecting future sodium-ion battery production and use	Chalmers styrkeområde Energi	4	Rickard Arvidsson	Chalmers	
Sustainable battery materials from European waters? Life cycle assessment and resource analysis	Swedish Energy Agency	4	Rickard Arvidsson	Chalmers	Gothenburg university
System-level impact of elec-trification on the road freight transport system – a System Dynamics apporach	Swedish Transport Administration	4	Anna Pernestål	KTH, Linköping university	
The Game of Own: exploring the impact of charging stations ownership on the potential of V2G	Swedish Energy Agency	5	Jiaming Wu	Chalmers	
Towards safe energy communi-ties – Protected data collection and data sharing for demand flexibility at Dansmästaren	Swedish Energy Agency	5	Valeria Castellucci	Uppsala university, Vattenfall, Volvo Cars	Uppsala Parkerings AB, Uppsala kommun
Tracer – Transport DemAnd Centric Decision Support for Electric ChaRging Infrastructure and Planning Operations	Swedish Transport Administration	1	Gyözö Gidofalvi	KTH, Traton	
Truck2Grid: Assessing V2G Applications in Freight Transport	Swedish Energy Agency	5	Fran Márquez	VTI, Lund university	
User behaviour informed optimal control for vehicle-home-grid integration	Swedish Energy Agency	5	Changfu Zou	Chalmers, Polestar	

Events 2025

Event name	Date	Theme(s)/Academic partner	Event type
University workshop KTH (inför utlysningen)	2/13/2025	KTH	University workshop
Lunchwebinarium med Magnus jansson, Alstom	2/21/2025	Uppsala University	University workshop
Patrick Plötz, Future of truck electrification in Europe: Megawatt and depot charging	2/26/2025	Theme 4	Theme workshop
Charging infrastructure – challenges and opportunities	3/20/2025	Theme 1, 2 and 5	Cross-theme workshop
Inverter testing and development	4/9/2025	Theme 2	Theme workshop
Intelligent vehicles and systems: A hands-on introduction to the ECCV simulation platform	5/14/2025	Theme 1	Theme workshop
Vehicle grid interaction and energy bank webinar	5/19/2025	Theme 5	Theme workshop
Thesis bonanza	6/9/2025	Theme 4	Theme workshop
Thesis bonanza	6/10/2025	Theme 1	Theme workshop
SEC call for prestudy project workshop	9/16/2025	Chalmers	University workshop
Soft Magnetic Materials	10/21/2025	Theme 2	Theme workshop
Charge smarter not harder	10/21/2025	Theme 5	Theme workshop
BATMAN: Battery Lifecycle Management in Charging Networks	11/17/2025	Theme 4	Theme workshop
A cross-theme seminar organized by Swerim and co-sponsored by SEC	11/20/2025	SEC + Swerim	Cross-theme workshop
Optimizing EV Infrastructure: Insights from the EV4EU Project	11/25/2025	Theme 5	Theme workshop
Social aspects of cobalt in lithium-ion batteries	12/1/2025	Theme 4	Theme workshop
ECCV platform	12/9/2025	Theme 1	Theme workshop
Power Tariffs as a Speed Bump: The Financial Threat to Electric Vehicle and Charging Infrastructure Adoption	12/10/2025	Theme 5	Theme workshop
Thesis bonanza	12/16/2025	Theme 2	Theme workshop

Peer reviewed journal articles and conference papers 2025

Title	Author(s)	Journal/Conference/ University	doi or other reference
A compact algebraic model for electric machine losses	Eriksson, L.	IFAC-PapersOnLine, Volume 59, Issue 5, 2025, Pages 205-210 (2025)	10.1016/j.ifacol.2025.07.106
A Coupled Modeling Approach for a 21700 Cylindrical-Cell Battery Pack: Mitigation of Ageing through Different Thermal Strategies Adapted for Nordic Climate	Verma, A., Guo, W., Brandell, D., Yin, L., Roy Chowdhury, N., & Moosavi, A.	ECS Meeting, Chicago (2025)	10.1149/MA2025-023409mtgabs
A data-driven probabilistic frame-work for estimating grid impacts of EV charging at scale	Callanan, A., Samuelsson, O., & Márquez-Fernández, F. J.	International Journal of Electrical Power & Energy Systems, 172, 111204 (2025)	10.1016/j.ijepes.2025.111204
A Physics Informed Gaussian Process Regression-Based Meta Model for Rapid Characterization of Permanent Magnet Synchronous Machines	Silva, M. D., Badewa, O. A., Alden, R. E., Asef, P., & Ionel, D. M.	2025 IEEE International Electric Machines & Drives Conference (IEMDC) (pp. 1311–1316) (2025)	10.1109/IEMDC60492.2025.11061045
A Real-Time Optimal Control Algorithm for Fuel Cell Hybrid Trucks	Johansson, M., & Eriksson, L.	International Journal of Powertrains (2025)	10.1504/IJPT.2026.10075298
Allocating the environmental bur-dens in co-production of rare earth elements for EV magnets	Nordelöf, A., & Bongards, A.	38th International Electric Vehicle Symposium and Exhibition (EVS38), Gothenburg, Sweden (2025)	-
An Optimal V2G Charging and Discharging Schedule for Electric Vehicles in Sweden's Day-Ahead and FCR-D Markets	Majeed, M., Jung, D., Sundström, C., & Hellgren, J.	4th International Conference on Automation, Computing and Renewable Systems (ICACRS), pp.17-25 (2025)	10.1109/ ISGTEurope64741.2025.11305294
Assessment of real-world driving patterns for electric vehicles: an on-board measurements study from Sweden	Kobayashi, Y., Taljegard, M., & Johnsson, F.	Applied Energy, Volume 401, Part A, 15 December 2025, 126608 (2025)	10.1016/j.apenergy.2025.126608

Peer reviewed journal articles and conference papers 2025

Title	Author(s)	Journal/Conference/ University	doi or other reference
Batteries at Crossroads: Past, Present, and Future Environmental Impacts of Lithium-ion Batteries (PhD thesis)	Mudit Chordia	Chalmers University of Technology, 2025	-
Characterization of Heterogeneous Ageing in Large Intercalation Batteries (Midway Review)	Gian Marco Trippetta	KTH Royal Institute of Technology, 2025	-
Charge Smarter, Not Harder: Electric Vehicles Smart Charging Strategies in a Multifunctional Building (Licentiate thesis)	Marina Martins Mattos	Uppsala University, 2025	-
Charging Requirement and Grid Impact from Electric Heavy Construction Equipment	Callanan, A., Frank, B., Márquez-Fernández, F. J., & Samuelsson, O.	2025 IEEE Kiel PowerTech (pp. 1–6) (2025)	10.1109/ PowerTech59965.2025.11180247
Circular electric vehicle batteries: integrating the circular supply chain and logistics perspectives	Shafi, S., Lopes, T.O., Altuntas Vural, A., van Loon, P.	EurOMA, 13-18 June 2025, Milano, Italy (2025)	-
Climate and economic impacts from reinforcement of the dis-tribution grid due to different EV charging strategies	Anchustegui Balner, P., Lundblad, T., Taljegård, M., & Nordelöf, A.	38th International Electric Vehicle Symposium and Exhibition (EVS38), Gothenburg, Sweden (2025)	-
Commercial freight electrification: unravelling inter-firm coordination between logistics service providers and shippers	Jobrant, M., Sallnäs, U., & Gillström, H.	International Journal of Logistics Research and Applications, 29(4), 534–556 (2025)	10.1080/13675567.2025.2473595
Computational modelling of Li-ion transport in composite solid-state electrolytes - methods and under-standing (PhD thesis)	Melania Kozdra	Uppsala University, 2025	-
Co-simulation model combining dynamic control and FEM for evaluation of PMSM drive cycle performance	Lind, E., & Eriksson, S.	Engineering, Volume 27, September 2025, 106149 (2025)	10.1016/j.rineng.2025.106149

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Title	Author(s)	Journal/Conference/ University	doi or other reference
Cost Evaluation of Vehicle-to-Grid Technology in Sweden Using Learning-Based Trading Strategy	Hellgren, J., & Jung, D.	4th International Conference on Automation, Computing and Renewable Systems (ICACRS), Pudukkottai (2025)	10.1109/ICACRS67045.2025.11324124
Design and Optimization of Spoke Type Permanent Magnet Synchronous Machines: A Rare-Earth Element Free Solution For Electromobility (PhD thesis)	Marcelo Dias da Silva	Uppsala University, 2025	-
Effect of PEM Fuel Cell Technology Advancement on the Energy Efficiency of a Heavy-Duty Vehicle	Dursun, B., Johansson, M., Tunestal, P., Aronsson, U., et al.	SAE Technical Paper 2025-24-0111 (2025)	10.4271/2025-24-0111
Electrical vehicles charging: an optimal control approach via Pontryagin's Maximum Principle	Montalto, L., Murgovski, N., & Fredriksson, J.	IEEE Conference on Intelligent Transportation Systems, Proceedings, ITSC (2025)	-
Electrifying logistics - The importance of learning for a commercial vehicle manufacturer in the transition to electric freight transport	Gutierrez, J., Huge-Brodin, M. & Sallnäs	Nofoma conference, 10-12 June, Copenhagen, Denmark (2025)	-
Electrifying road freight: Comparative insights from a multiple case study with hauliers from Sweden, Italy and Turkey	Brunner, S., Huge-Brodin, M., Evangelista, P., Haag, L., Creazza, A., Colicchia, C.	LRN Conference, September 2025, Sheffield, UK (2025)	-
Electrifying the fleet - The role of learning in logistics companies transitioning to electrified transport	Gutierrez, J, Huge-Brodin, M. & Sallnäs, U	LRN Conference, September 2025, Sheffield, UK (2025)	-
Electro-Hydraulic Energy Converters: Development of Axial Piston Machines and Their Integration with Electric Machines (PhD thesis)	Thomas Heeger	Linköping University, 2025	-

Peer reviewed journal articles and conference papers 2025

Title	Author(s)	Journal/Conference/ University	doi or other reference
Electromagnetic Modeling based Life Cycle Assessment of Rare-Earth-Free Propulsion Electric Machines for Vehicles (PhD thesis)	Meng-Ju Hsieh	Chalmers University of Technology, 2025	-
Enhancing Battery Health Prediction during Fast Charging Using Digital Twins Based on Physical Insights	Guo, W., Vilsen, S. B., Li, Y., Stroe, D. I., Verma, A., & Brandell, D.	ECS Meeting, Chicago (2025)	10.1149/MA2025-023479mtgabs
Enhancing Core Loss Tracking Accuracy in Stator Cores: A Comparative Assessment of Static and Dynamic Jiles-Atherton Model Formulations	L. Colombo, A. Reinap, P. Fyhr and M. Alaküla	IEEE Transactions on Magnetics, Volume: 61 Issue: 8 (2025)	10.1109/TMAG.2025.3581713/mm1
Equilibration of ion distribution at polymer/ceramic interfaces	Melania Kozdra, Laura Hölzer, Daniel Brandell, Andreas Heuer	Phys. Chem. Chem. Phys., 2025,27, 24918-24931 (2025)	10.1039/D5CP01988E
Experimental Validation of a Spoke Type Ferrite Permanent Magnet Machine Design for Heavy-Duty Traction Applications	Silva, M. D., Naghibian, M., Jansson, M., & Eriksson, S.	IET Electric Power Applications, 19(1), e70133 (2025)	10.1049/elp2.70133
Grid Capacity Impact from the Charging of Electrified Long-Haul Trucks	Callanan, A., Ingelström, M., Samuelsson, O., & Márquez-Fernández, F. J.	2025 IEEE Texas Power and Energy Conference (TPEC) (pp. 1–6) (2025)	10.1109/TPEC63981.2025.10906869
Harmonic characterisation of electrically driven pumps	Heeger, T., West, M., & Ericson, L.	Advancements in Fluid Power Technology, 01 September 2025, pp 357–376 (2025)	10.1007/978-3-031-84505-5_23
Hauling power: Capturing multi-system transition dynamics of road freight transport and electricity systems. Environmental Innovation and Societal Transitions	Schmid, J., Raoofi, Z., Pernestål, A., Tanzer, S. E., & Tavasszy, L.	Environmental Innovation and Societal Transitions (2025)	10.2139/ssrn.5554642
Hybrid FEA and Meta modeling for DE Optimization of a Highly Saturated Spoke IPM	Badewa, O. A., Silva, M. D., Alden, R. E., Asef, P., & Ionel, D. M.	2025 IEEE International Electric Machines & Drives Conference (IEMDC) (2025)	10.1109/IEMDC60492.2025.11060953

Peer reviewed journal articles and conference papers 2025

Title	Author(s)	Journal/Conference/ University	doi or other reference
Impact of aggregated electric vehicle home charging in the sub-transmission grid	Callanan, A., Samuelsson, O., & Márquez-Fernández, F. J.	Advances in Electrical Engineering, Electronics and Energy, Volume 13, September 2025, 101066 (2025)	10.1016/j.prime.2025.101066
Investigating the Impact of Electrifying Heavy-Duty Trucks on Power Grids Using Agent-based Simulation and Probabilistic Load Modelling	Ingelström, M., Jansson. A & J. Márquez-Fernández	38th International Electric Vehicle Symposium and Exhibition (EVS38), Gothenburg, Sweden (2025)	-
Laminar burning velocities and lean flammability limits of H2/CO/CH4/ CO2/air mixtures associated with gases vented out Li-ion batteries after thermal runaway	Andrei Lipatnikov	Engineering, Volume 28, December 2025, 108274 (2025)	10.1016/j.rineng.2025.108274
Learning for routing: A guided review of recent developments and future directions	Zhou, F., Lischka, A., Kulcsár, B., Wu, J., Chehreghani, M. H., & Laporte, G.	Transportation Research Part E, 202, 104278 (2025)	10.1016/j.tre.2025.104278
Life after use: circular supply chains for second-life of electric vehicle batteries	Altuntas Vural, C., van Loon, P., Halldorsson, A., Fransson, J., Josefsson, F.	Production Planning and Control, 36(9), 1229-1246 (2025)	10.1080/09537287.2024.2353379
Linking cell design and production energy demand to estimate environmental impacts of NMC lithium ion batteries	Chordia, M., Wikner, E., Nordelöf, A., Vaidya, K., & Arvidsson, R.	Journal of Industrial Ecology, 29(6), 2039–2052 (2025)	10.1111/jiec.70125
Machine learning-based lifelong estimation of lithium plating potential: A path to health-aware fastest battery charging	Zhang, Y., Wik, T., Bergström, J., & Zou, C.	Energy Storage Materials, Volume 74, July 2025, 103877 (2025)	10.1016/j.ensm.2024.103877
Methods for the Investigation and Mitigation of Conducted Differential-Mode Electromagnetic Interference in Commercial Electrical Vehicles	P. Widek, M. Alaküla	Energies, 18(4) (2025)	10.3390/en18040859

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Title	Author(s)	Journal/Conference/ University	doi or other reference
Minimum-delay opportunity charging scheduling for electricbuses	McCabe, D., Ban, X., & Kulcsár, B.	Communications in Transportation Research, Volume 5, December 2025, 100209 (2025)	10.1016/j.commtr.2025.100209
Mirrored dual-displacement axial piston pump with pressure-compensated axial force	Ericson, L., & Heeger, T.	Proceedings of IDETC/ CIE (2025)	10.1115/detc2025-164758
Model Predictive Current Control for Electrically Excited Synchronous Machines Considering Magnetic Mutual Coupling	Jiang, B., & Liu, Y.	2025 IEEE International Conference on Predictive Control of Electrical Drives and Power Electronics (PRECEDE) (pp. 1–6) (2025)	10.1109/ PRECEDE63178.2025.11130955
Model-Based Design and Evaluation of State-of-the-Art Thermal Management Systems for Electrified Trucks	Johansson, M., & Eriksson, L.	Energies, 18(673) (2025)	10.3390/en18030673
Modeling Cyber–Physical Systems for Fault Diagnosis	Diedrich, A., Krysander, M., Heesch, R., & Niggemann, O.	IEEE Transactions on Systems, Man, and Cybernetics: Systems, 55(12), 9266–9279 (2025)	10.1109/TSMC.2025.3614484
Modeling of a 4kW Axial Flux Machine - Measurements and 2D/3D Modeling (Licentiate thesis)	Vineetha Puttaraj	Chalmers University of Technology, 2025	-
Multi-Objective Optimization of a Spoke Type Synchronous Machine With Ferrite Magnets Considering Torque Ripple and Demagnetization	Silva, M. D., & Eriksson, S.	IEEE Access, Volume 13, 110497–110507 (2025)	10.1109/ACCESS.2025.3583163
Multi-Stage Design and Analysis of a Permanent Magnet Synchronous Machine with Parallel Comparison Tracks	Wang, Q., Thiringer, T., & Härsjö, J.	2025 IEEE International Electric Machines & Drives Conference (IEMDC) (2025)	10.1109/IEMDC60492.2025.11061174

Peer reviewed journal articles and conference papers 2025

Title	Author(s)	Journal/Conference/ University	doi or other reference
Optimal DC-Link Voltage Mapping for SiC-Based EV Drives: Considering the Impact of a Synchronous Boost Converter	S. Amirpour, T. Thiringer, S. Soltanipour and Y. Xu	IEEE Access, Volume 13, (2025)	10.1109/ACCESS.2025.3546025
Performance and aging of a lithium-ion battery in a non-uniform temperature distribution condition	Mussa, A. S., Smith, A. J., Trippetta, G. M., Lindbergh, G., Klett, M., & Wreland Lindström, R.	Journal of Energy Storage, Volume 114, Part B, 10 April 2025, 115869 (2025)	10.1016/j.est.2025.115869
Simulation of hydrostatic pockets between the cylinder block and valve plate of a piston-type pump	Han, H., Heeger, T., Shang, L., & Ericson, L.	Proceedings of the 19th Scandinavian International Conference on Fluid Power (SICFP'25), ser. River Publishers Series in Proceedings (2025)	10.13052/rp-9788743808251A12
Simulation study on harmonic torque injection for suppressing flow pulsations in electrified axial piston pumps	T. Heeger and L. Ericson	Proceedings of the 19th Scandinavian International Conference on Fluid Power (SICFP'25), ser. River Publishers Series in Proceedings, Art. no. 13 (2025)	10.13052/rp-9788743808251A13
Smart sensing breaks the accuracy barrier in battery state monitoring	Xiaolei Bian, Changfu Zou, Björn Fridholm, Christian Sundvall, Torsten Wik	Energy Storage Materials, Volume 80, July 2025, 104410 (2025)	10.1016/j.ensm.2025.104410
System-level impact of electrification on the road freight transport system: a System Dynamics approach (PhD thesis)	Zeinab Raoofi	KTH Royal Institute of Technology, 2025	10.1108/IJPDLM-11-2023-0436
The Dataregulation Puzzle of EV charging	Andersson, J., & Pakki, E.	38th International Electric Vehicle Symposium and Exhibition (EVS38), Gothenburg, Sweden (2025)	-

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Title	Author(s)	Journal/Conference/ University	doi or other reference
The effect of temperature and load as a stressor for proton exchange membrane fuel cells durability at intermediate temperatures	Eriksson, B., Butori, M., Batool, M., Strandberg, L., Sanumi, O., Pedram, S., ... Lindberg, G.	Journal of Power Sources, Volume 658, 1 December 2025, 238258 (2025)	10.1016/j.jpowsour.2025.238258
The electrification of material moving machines: An overview of opportunities and challenges regarding noise	Ericson, L., & Heeger, T.	IDEAS 2024 Proceedings (pp. 15–32) (2025)	10.1007/978-3-031-96173-1_2
The environmental impact of electric vehicle range – in a life cycle perspective	Zackrisson, M., Svensson, N., Ogink, R., Holmgren, K., Lindquist Holmberg, J., & Jarlsmark, E.	38th International Electric Vehicle Symposium and Exhibition (EVS38), Gothenburg, Sweden (2025)	-
The impact of zero emiossion zones on Sweden electrification of heavy-duty trucks	Lantz, M., Colpier, U. and Karlström, K.	38th International Electric Vehicle Symposium and Exhibition (EVS38), Gothenburg, Sweden (2025)	-
Torque-Speed Characteristic Estimation Based on Gaussian Processes and Adaptive Sampling Strategy for Permanent Magnet Synchronous Machines	Silva, M. D., Asef, P., Badewa, O. A., Alden, R. E., & Ionel, D. M.	2025 IEEE Energy Conversion Conference Congress and Exposition (ECCE) (2025)	10.1109/ECCE58356.2025.11260187
Towards electric road freight transport service? A study of Swedish shippers	Jobrant, M., & Haag, L.	Nofoma conference, 10-12 June, Copenhagen, Denmark (2025)	-
Uncovering the impact of battery design parameters on health and lifetime using short charging segments	Guo, W., Vilsen, S. B., Li, Y., Verma, A., Stroe, D. I., & Brandell, D.	Energy & Environmental Science, Issue 18 (2025)	10.1039/D5EE03268G
Vehicle-oriented and Sweden-framed life cycle assessment: Hydrogen for long-haul trucks	Velandia Vargas, J. E., Brynolf, S., Grahn, M., Rodriguez, F., & Blekhman, D.	iScience, Volume 28, Issue 10, 17 October 2025, 113607 (2025)	10.1016/j.isci.2025.113607

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Where do EVs charge and how long are they parked at different locations? Logging of EV driving and charging patterns	Kobayashi, Y., Taljegard, M., & Johnsson, F.	38th International Electric Vehicle Symposium and Exhibition (EVS38), Gothenburg, Sweden (2025)	-

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