HOUSE OF LORDS

Environment and Climate Change Committee

Corrected oral evidence: Electric vehicles

Wednesday 20 September 2023

10 am

Watch the meeting

Members present: Baroness Parminter (The Chair); Baroness Boycott; Lord Bruce of Bennachie; Lord Duncan of Springbank; Lord Grantchester; Lord Lucas; The Lord Bishop of Oxford; The Duke of Wellington; Lord Whitty; Baroness Young of Old Scone.

Evidence Session No. 4 Heard in Public Questions 42 - 54

Witnesses

I: Professor Benjamin Sovacool, Professor of Earth and Environment, Boston University; Andreas Hedum, Senior Adviser in Environmental Affairs, Government of Norway; Frank Burmeister, Senior Expert on Electric Vehicles and Charging Infrastructure, Government of Netherlands.

Examination of witnesses

Professor Benjamin Sovacool, Andreas Hedum and Frank Burmeister.

Q42 **The Chair:** Good morning. We have colleagues and witnesses both in the room and down the line. This is our third inquiry into electric vehicles. We are turning our attention to what has been happening internationally, which is probably sensible, given what we hear about our own Government's potential approach to moving back their commitments to the 2030 target for EVs.

I welcome our three witnesses: Andreas Hedum, senior adviser in the environmental affairs section of the Ministry of Transport in the Government of Norway; Frank Burmeister, the senior expert on electric vehicles and charging infrastructure in the Government of Netherlands; and Professor Benjamin Sovacool, professor of earth and environment—that is probably my favourite title in this inquiry so far—at Boston University in the US—the founding director of the Institute for Global Sustainability, and professor of energy policy at the University of Sussex Business School.

I will punt my initial question towards Andreas and Frank. Could you give the committee an overview of the current and projected levels of EV adoption in your two countries?

Andreas Hedum: We have a lot of EVs in Norway, and the market share for electric vehicles is quite high. We are a relatively small car market, with about 2.9 million passenger cars, but we have still been the third largest market for battery electric vehicles since 2011.

So far this year, about 81% percent of all new passenger cars sold in Norway are battery electric; hybrid is not included in that percentage. Last year, less than 12% of new passenger cars had internal combustion engines. Other kinds of vehicle follow on. Vans and light commercial vehicles have an EV market share of about 27%, and city buses also have quite a high market share. We expect all the other kinds of vehicles to follow on. The market shares are increasing annually, and our market share for new passenger cars will, for all practical purposes, reach 100% within a few years.

Frank Burmeister: In the Netherlands, our ambition for 2030 is to sell only battery electric vehicles, which means vehicles with no CO_2 emissions. Last year, 23.2% of all cars sold were battery electric vehicles. Our total fleet is currently 400,000 battery electric vehicles, and we have a total of 9 million cars, which means that 4% are now fully emission free.

To reach our goals in 2030, we have to do more and to stimulate more. These measures have not been taken until now, so we do not think we can reach our goals without measures in the years 2025 – 2030, and we think that only 60% of vehicles sold will be battery electric in 2030. So we need more measures. We have elections this year, so we will see what happens with the new Government. Perhaps later I can tell you the

main difficulties that mean we cannot reach our goals and why measures have not been taken until now.

On charging infrastructure, our goal is to reach 1.7 million charging infrastructure points in 2030, and we are on the way to achieving that. We have a very dense charging infrastructure network in the Netherlands, which is good; it seems like paradise compared with the other countries around the Netherlands. Nowadays, we have 500,000 charging infrastructure points, which are mainly AC—low charging—infrastructure.

I see that there are a lot of questions later—. [*Interruption.*] Sorry, my telephone is making a noise.

Q43 **The Chair:** Do not worry. Perhaps I can move on to the supplementary question and ask what people see as the main barriers that have been identified in other countries.

Professor Benjamin Sovacool: We find it helpful to use the word "sociotechnical" to talk about barriers. It means that some are technical, like charging and the range of the vehicle, while others are very much political as well as economic and social. Economic barriers still relate to the overall capital cost of EVs: without government incentives, they still cost more, dollar for dollar, than most other vehicles. As Andreas and others said, you need charging infrastructure, which can be expensive, and there are huge issues with who pays for it, who builds it and the cost recovery. In some parts and states of the US, it is constitutionally illegal to supply charging because of the way they regulate monopolies in utilities.

Political barriers relate to many things we have seen in the UK, like policy consistency and policy legitimacy. There are also issues over where government revenue should be funnelled: should it go towards mass transit, active transportation, bicycle lanes, micromobility—things like e-bikes and scooters—conventional cars or EVs? EVs are still cars and need roads, contribute to traffic jams and have other environmental externalities like minerals—and let us not forget battery and vehicle waste.

On social barriers, there is still a lot of misunderstanding about EVs. There are concerns—even in places like Norway and Denmark, where we have done research on fires—about range and about whether they will work in cold environments. There are also social issues like rebounds: we find that, when people get EVs, they tend to feel morally pleasant about themselves and then drive more. There may also be spillover effects where people eat meat, fly or do other environmentally damaging activities because, darn it, they have done their part by adopting an EV. Those are just a few of the barriers that we found across that sociotechnical nexus in some of our research with actual consumers.

The Chair: Thank you. Frank, could you give a bit of perspective on the barriers in the Netherlands?

Frank Burmeister: Up to now, we have had three main barriers. Perhaps the biggest is our internal budget rules within the Government: we have to compensate the loss of revenue from tax incomes from fossil fuels. That means that if we, for example, subsidise a car with €2, we have to pay €3 extra because of the loss of the excise duties on fossil fuels like petrol. EVs do not use petrol, of course, so the Government no longer get that income, so we have to do something about this. So our internal rules are now that you have to compensate for this, which makes every measure very expensive.

This is strange, because you can argue that these rules and taxes such as excise duties aim to change people's behaviour. If we are successful and people change their behaviour by buying an EV, for example, they no longer pay excise duties. So we have to pay extra for successful measures. We look to the next Government to investigate possibilities for dealing with this problem. Of course, we are looking at price charging—if you drive, you pay per kilometre or something like that. We have to deal with this, and it is one of the main reasons why we cannot compromise on tax subsidies for the next few years.

Another thing that was mentioned is that electric cars still cost more than conventional cars, so we argue that you have to look at the price not only of getting a car but of using it, and at the total cost of ownership. Then you can see that this is different.

The third thing that could be a problem is the capacity of the electricity grid. We do not think this is a big problem for cars, because they use low charging—AC charging—but it could be a problem for fast charging and heavy-duty trucks and vans, because we must be able to get more electricity to places where there are a lot of fast chargers. These are the three main problems that we are looking at.

The Chair: Thank you. Perhaps we can have some reflections from Andreas on the barriers in Norway.

Andreas Hedum: For passenger cars, the barriers are no longer so obvious. That has something to do with the initial tax system. For us, the system was more or less set, because we had relatively high registration taxes for new cars. We introduced tax exemptions for EVs early on, before the first generation of EVs even hit the market. When they came to market, our tax system was set up to make them competitive from day one. The newer EV models have longer ranges and are better cars in every aspect, and as they hit the market they get very competitive. The prices have perhaps dropped a little, and the price barrier is not obvious in Norway. Actually, they are considered to be competitive, compared to cars with internal combustion engines.

We have used the whole toolbox of EV policies. We have given investment support for EV charging as well. For the passenger car market, we consider this to be a commercially viable business up to market because the demand side is there. There are now enough vehicles to make the actors in the market establish charging infrastructure in the

best places. Of course, there are differences between rural and urban areas, but in general we no longer see so many barriers for the passenger car market. From a political point of view, the emphasis is more on heavy-duty vehicles.

Q44 **Baroness Boycott:** On the back of Baroness Parminter's first question, what is the difference, in monetary terms, between a new EV and a new Norwegian car? We have heard it percentage-wise, and it would be interesting to know how near those prices are. Will you phase out the subsidies and the help you have given to new EV drivers, and with what process will you do it? If you could send us a letter about that supplementary bit, that would be great. It t might come up later, too.

Benjamin, on the adoption of EVs in the UK compared to the uptake in Norway and the Netherlands, I was surprised that the Netherlands was not higher—I thought you were going to come up with a huge figure. What are the limits of the lessons that can be transferred? Presumably, you heard this morning that our Prime Minister is putting back our date by five years. Hopefully, further on, we will get on to things like the role of the car market and all that. Bearing that in mind, what can we learn, and how are we doing?

Professor Benjamin Sovacool: I know you do not hear a lot of positive news about the UK these days, but I think it is really well suited for EVs, despite all the barriers that I mentioned. They are all remediable; none of them is inevitable. The fact that Andreas said that Norway can do it, with a market of only about 2 million vehicles, tells you something. The UK has abundant renewable energy to help to fuel EVs, especially offshore wind and gas, which is arguably cleaner than coal and oil. The policy mix that you need to support EVs is already falling into place.

One of the things that Andreas did not talk about was the role of cities and municipalities. Those policies can be very important. Here, there are a lot of cities, especially London, which has a low-emission zone, road congestion pricing, neat incentives for EVs, and pretty abundant home and street charging, all of which are good.

The other thing that we have learned recently is the importance of phase-outs rather than phase-ins. These are the stick, rather than the carrot—things like banning petrol cars by certain dates, which London, Paris and other cities have done, and increasing the cost of conventional cars, with stronger VAT and other taxes. In Norway, it is different, because with all the tax rebates it is more expensive to have a conventional car. Those are nice things.

It is not just positive things, like the availability of charging; it is also negative things, like heightening the cost of conventional cars, fuel or parking, or other types of incentives, like access to high-occupancy vehicle lanes and other things that consumers value. When that happens, you see what is called the demand pool: the market for EVs takes care of itself.

What is also neat is that not a lot of these policies cost government revenue. They may stimulate the market. Even then, we find that they tend to pay for themselves. As I tell my students, EVs can be a free lunch: you get paid to eat because of the co-benefits. Air pollution, especially, is reduced and there are fuel savings. Those two things alone mean that, socially, EVs tend to pay for themselves within five years and can give thousands of dollars in benefits per vehicle once you reach a certain saturation point.

Baroness Boycott: How much will the announcement of the end of petrol-car manufacture being put back affect our path?

Professor Benjamin Sovacool: There is no question that it will affect it, and it would be nice if that had not happened. At the same time, EVs operate in a global marketplace. We find that, when people buy EVs, the satisfaction level is really high compared to a conventional car. Also, when people experience an EV through a demonstration, a test drive or a friend buying one, that is the strongest predictor of adoption. It is not the policy environment or even the cost of an EV. When you look at all the variables, it is familiarity with an EV that drives adoption. That implies that, once the consumer is in an EV and finds that it is quiet, fast, sleek and clean, they tend to like them.

That means that government policy is not always the most important thing. Those market trends and all the ads you see—the Super Bowl ads in the US or the World Cup ads for football—are propelling EVs. The UK is probably still in the middle of countries with adoption rates. It is not doing badly. It is certainly doing better than the United States, to give you some positive news.

Baroness Boycott: Frank, you were nodding.

Frank Burmeister: Yes. I subscribe to all that Benjamin says. On the first question, we think that EVs will be cheaper than conventional cars by about 2029.

Baroness Boycott: Is that for all countries?

Frank Burmeister: At least in the Netherlands, because we have special taxes. I do not know whether that will be the case for all countries. We have, for example, a purchase tax on conventional cars, which not every country has. We think that, by about 2029, small new electric cars will be cheaper. For the second-hand market, it will be around 2030-31. We also see that the total cost of ownership is not the only reason why people want to switch; they are worried about the loading on the charging infrastructure. In the Netherlands, we also have caravans, which are sometimes difficult for electric vehicles. But we have arrangements, such as for holidays, whereby you can lease another car and get your electric vehicle back afterwards.

We have learned three good lessons. As I said, the Government looked for a smart way to solve the loss of income problem. On the other hand,

the fuel industry still gets €46 billion in subsidies. Perhaps that could be reduced and the money used so that the Government still has that income. We are also working on a pricing scheme for cars.

Another lesson is that you must give consumers certainty. They have to be aware of what will happen to the taxes in the coming years. You should have a long-term vision and not a new game every year. This will be difficult. With regard to the grid problem, electric vehicles are a solution, because with smart charging you use fewer batteries. We calculated that electric vehicles can reduce the peak on the grid by 20%, which would mean €1.4 billion less investment needed to increase the grid.

Benjamin talked about the positive things, I drive an electric car. It is a real pleasure for people. They have to experience this. There are also what we call flanking measures, which means communication and getting people to try riding in an EV. That is very necessary too.

Q45 **The Duke of Wellington:** My question arises from a letter in the London *Times* yesterday from a professor at Queen Mary University, London. I realise this is not applicable in Norway, but it may be in the Netherlands and in this country. He pointed out that the concern may be that the additional demand for electricity for electric vehicles can be satisfied in this country only by additional power generation from fossil fuels. Therefore, although we like the idea of transitioning to electric vehicles, if we have to generate more electricity from fossil fuels to power them, it might not be as effective as we might have hoped.

I do not know whether that is an applicable point in the Netherlands. Does Professor Sovacool have a comment about that? I am sure that he has looked at this point in many different countries.

Professor Benjamin Sovacool: Generally, it is not true. You do not usually need much of an increase in the electricity supply, as long as you are smart about how you charge. Most places try to charge overnight. I will not bore you with the economics of how electricity utilities and suppliers operate, but they have a lot of idle capacity. The UK is the same: we have a lot of capacity that does not do anything.

I do not have the numbers for the UK, but I have them for the United States, which is almost as fossil-fuelled as the UK is with coal. For the United States, the national labs have calculated that you could fuel 87% of the passenger vehicle fleet without building a single new power plant, just by using your existing infrastructure smartly. Utilities love this because they are now selling electricity around the clock, 24/7.

You also have a separate trend, and sometimes it is not even a utility—it could be a co-operative or household energy from solar panels or distributed generation—where you have what are called "prosumers". These are consumers who also generate their own electricity. Until about 10 years ago, the UK was the leading market for household solar; it was the fastest growing market under your feed-in tariff. So you have a lot of homes that have their own power supply and that can then help to

charge an EV. The size of solar arrays will meet that charging demand as long as you charge slowly overnight. So you could fuel it with fossil fuels, but you do not have to. I do not think that letter is correct.

The Duke of Wellington: That is very interesting, thank you. Is there any difference in the Netherlands?

Frank Burmeister: Again, I agree with Benjamin and will add something. Today we have stormy weather. That means that we have a lot of electricity, but we cannot get it to the grid. You must store it somewhere, and electric vehicles are the perfect way to store it. You can then get it back if cars are ready to use vehicle-to-grid, for example. That is what I mean when I say that electric vehicles are a solution to this problem.

We also looked at Poland, which has a lot of fuel-based electricity centres. Electric vehicles there will be more effective and have lower CO_2 emissions than conventional cars. We have reports on this, which you can have if you want. We have looked at this.

Q46 **Baroness Young of Old Scone:** We have talked a bit about policy mechanisms that are effective in encouraging the shifts in your countries. Are there any that stand out as being seminal and the most important? Have you spotted any that we currently do not use that we ought to be using? I will start with Andreas, and then go on to Frank and Benjamin. Perhaps you could also tell us whether any of the ones that you are recommending had downsides or difficulties in implementation that we ought to be aware of.

Andreas Hedum: The tax exemptions have been very important in Norway, beyond any doubt. The finding is that the economic incentives really work. Besides that, the local policies for urban areas, such as access to bus lanes, free parking and free toll roads have been in effect in all cities in Norway, and have been important in the introduction of EVs in the market here.

We are phasing some of them out, which has to do with the downside of this policy. Of course, the EV incentives have made it very cheap to have and to drive a car. It is very convenient to use it too, so it is in competition with the public transport sector, walking and cycling, and can therefore have downsides in other mobility issues in these cities. We consider this market to be a bit matured, and some of the incentives are being phased out in order for the public transport system to have a significant role.

Baroness Young of Old Scone: Did you have a policy of a target date for no petrol vehicles, or are you anticipating that the market will provide that?

Andreas Hedum: Yes, we have a set ambition in our National Transport Plan, which says that all new passenger cars should be zero emission by 2025.

Baroness Young of Old Scone: Frank, as well as answering the question, could you tell us whether your anxieties about the loss of tax take for the Government would be resolved eventually by the phase-out of tax exemptions, because the market was mature?

Frank Burmeister: Of course, we want to phase out tax exemptions, but I have to subscribe to what Andreas said. Fiscal measures are the main measures to convince people to drive electric. That is the same for us. Something that has been very successful for us is the benefits for drivers of company cars, so they do not have to pay the same amount as they do for driving conventional company cars, and for private use. This was very successful, because the new company cars of today will be the second cars of tomorrow for normal people. You have to start somewhere, and this was a good start. It was very successful, but it also means that you have to stimulate people. A lot of people think that they do not need this: that people who drive company cars have enough money. So we have to argue with this too, and our main argument is that we have to start somewhere.

We want to get a fully second-hand market. Each second-hand car was a new car somewhere in the beginning. So we focus on company cars that will stay in the Netherlands—not the very big Tesla models, for example—and use the price of €45,000 for a new car. Above that price, we do not get these benefits, so we focus on these cars up to a maximum amount of €45,000. This was also necessary in order to convince people.

Of course, we also see the result of the price war, which was first started by Tesla. We also see Chinese cars, which will be cheaper, and German cars have to react to it. We want to stop subsidies somewhere around 2027, 2028 or 2029; we want to phase out the financial benefits somewhere in that range. Until then, I believe they are still necessary; otherwise, all the investments we made already are useless, because you fall back on the normal way. That would be very sad, if you ask me.

As I mentioned earlier, we are fortunate to have one of the highest densities of chargers. This is perhaps also a historical thing, as we started very early.

Lastly, in the Netherlands—I do not know the situation in the UK—people drive on average only 32 kilometres a day, so you do not need a car with a very big battery, which is very expensive. You can also use small cars. In communicating on this, you have to be very clear that if you are driving 32 kilometres a day and have a small car with a small battery that will only do 200 kilometres, you do not have to load your car every day. Once a week is enough. It is good to communicate these things.

Q47 **Baroness Young of Old Scone:** Benjamin, can we entice you into commenting on why you think our proposals for the expansion of the ultra-low emissions zone in London have bounced really badly, and are panicking the horses in terms of other electric vehicle and zero-carbon policies? Is that a common phenomenon? Have we done it wrong? What can we now do, in your experience, to get ourselves back from there?

Professor Benjamin Sovacool: I would not say that you have done it wrong. I think this is a normal consumer reaction. I was very young when London announced congestion road pricing, which was one of the first in the world—it and Singapore. There were similar reactions: "Oh my gosh, we have to pay for roads, we have to pay to get into the city", and you had everyone talk about how that would hurt London's economy, which turned out not to be true.

I also think it is part of why EVs in the UK are pretty green compared to other places. I talked earlier about the policy mix for EV promotion. Again, you can see the ingredients already: lots of intervention with taxes and providing the availability of charging infrastructure. It is not a very complicated approach that places such as Norway, the Netherlands and even China have taken. But if you go up a level, how well does your EV policy integrate with your climate policy or sustainability policy? Here, you get into some really tricky issues. EVs, in certain contexts, are actually quite bad socially if they encourage excessive driving, if they get someone who is wealthy to buy a third car, if they only do single-occupancy trips, if they are being recharged with gas, oil or coal, if they are charging at peak times, and if you are not really paying attention to the supply chain—in other words, minerals—if you do not really care where the minerals come from or about waste.

On the flipside, if you integrate EVs with intermodal transport—London has done this, because you integrate it with the Tube, cycling, Boris bikes and all these things—and you have ULEV policies, promote ride-sharing, which London does, and implement it in tandem with active transport, provide incentives for decarbonised electricity supply, charge at off-peak times and care about manufacturing and ethical cobalt and lithium, it is a very different picture.

Whether EVs are novel and re-entrench bad driving, or are transformative and break the chain of fossil fuels and single-occupancy passenger vehicle modalities, remains to be seen. However, it is up to you. The policies can steer whether it makes sense or not. ULEV policies are a piece of that and, I think, the right piece. They are trying to capture these massive externalities with transport.

We did a global meta-assessment of externalities—the hidden social costs of transportation and electricity—and found that for transportation there are more than 13 trillion a year in unpriced transport-based externalities. It was mostly traffic jams and congestion, but also roads, air pollution, noise and so forth. EVs contribute almost none of them. Getting more EVs or other low-emission vehicles on to the road has immense benefits. The air pollution benefits alone pay for them. The downside is that consumers do not like it, because you are interfering with the cars that they can drive and with their sense of freedom.

It is a normal reaction, but in this case it is the right reaction, for healthy air quality in most urban areas. The World Health Organization has said that in the world's 300 largest cities you have 300 violators of air quality standards. Getting dirty air out of our cities for our children, the elderly

and others is important. Air quality benefits are the biggest reason to do low-emission zones.

Q48 **Lord Grantchester:** We have heard how the EV market has had challenges recently—the complexities of affordability, supply and demand and growing distortions from the push and pull of incentives. What role do you see the second-hand vehicle market playing in this transition, and should it be a zone that is free from government interference?

Again, on the complexities of ownership, what role could be played by alternative models to EV ownership such as leasing and car clubs? Are there meaningful results from how these are being structured?

Andreas Hedum: We have no clear evidence of how the second-hand market has been affected by the EV introduction or what role it will play in the car market. However, we know that the second-hand market has been affected. There have been delivery issues for new EVs that have increased the prices of lightly-used EVs in the second-hand market.

We see that the EVs that have the shortest range. Might be hard to sell on the second-hand market. Also, keeping in mind our tax exemption system, the second-hand market has affected the internal combustion engine. The new EVs in Norway have been competitive with the lightly used internal combustion engine cars. EV introduction started with the wealthiest inhabitants of Norway, but it has spread out. However, we have no clear evidence yet of the second-hand market's role in the further spreading of EVs.

Frank Burmeister: The second-hand market is crucial for a successful transition. In the Netherlands, 380,000 new cars and 1.2 million used cars—three times as many—are sold every year. Therefore, we must do something with the second-hand market to get to a successful transition in which everybody can ride an electric vehicle. That is why we help people to buy second-hand electric cars. We subsidise this. We also subsidise private leasing, because we see that a lot of people think that €20,000 is a lot of money to pay out at once. We also use car clubs to make good deals for second-hand cars. It is a very important market for us, making EVs available for normal people.

Lord Grantchester: That suggests that the phase-out of benefits and tax incentives is crucial in the second-hand market in order to enable a smooth flow-through of supply and demand, and affordability. Would that be a fair reflection of your comments?

Frank Burmeister: I totally agree. This is why we started with new cars and company cars. In 2021, we started on the second-hand market, as new cars will come to it and we want them to stay in the Netherlands. Also, the subsidy is linked. You have to use your car for four years. If you have it for only two years, you have to repay some of the benefits that you got when you bought that second-hand car. We created a whole subsidy scheme to get this to work.

Professor Benjamin Sovacool: It is a very good question. I emphasise again what my colleagues are saying about the importance of secondary markets, especially to bring EVs to lower-income communities and families. Ride sharing is a great model of adoption, as is fleet adoption. You can electrify whole fleets, perhaps all those in Manchester or Birmingham, or get local organisations such as the Post Office or the police to adopt all in one go. That would also help to decarbonise huge chunks.

Two other things are worth mentioning. First, it is not always about electric vehicles. It can be about electric mobility. This gets into other forms of e-mobility such as bikes and scooters. I know that London has a lot of them lying around, but they can also be quite good at making electrical mobility very affordable. Similarly, there are things like Zipcar, which has an EV option; you can pay a little extra to have an EV, therefore allowing the consumer visibly to adopt them.

We talked earlier about the capital cost of an EV and how there is a difference compared with conventional cars. The total cost of ownership of an EV is already cheaper over 30 years than it is for a conventional car. EVs are more reliable and last longer, and even make better second-hand vehicles as long as they have been maintained. Also, there are fuel savings, because petrol is expensive, especially with the war in Ukraine driving petrol, oil and gas prices up and down. It is a weird situation in which, rationally, if we only thought about fuel savings into the future, everyone would already be adopting EVs.

My second point is very interesting and connects with an earlier question about hidden barriers. We did over 120 mystery visits to car dealerships, posing as shoppers to buy EVs. We found that the automotive dealerships and franchises were a huge barrier, because they were giving consumers misinformation about vehicles. They would lie, they would deceive, they would derogate. "Don't buy the EV. It'll ruin you", one of the car salesmen told us as we were doing one of these mystery shopping tours.

We got into some of the reasons behind that. One is that most automotive franchises make more money now on maintenance and after-sales service than on vehicle purchases, and because EVs are so reliable they cut the maintenance revenues for a franchise by 60% to 70%. They also found that they take longer to sell. People need more test drives and have more questions, and the automotive sales staff want a quick sale; they do not want to take three hours to sell the darn vehicle.

So there are two disincentives in the automotive sector with EVs, both of which point to the fact that they are so reliable, so they create a better second-hand market. I would also emphasise the need for transparency and strong and fair business practices at the OEM level and the automotive franchise level, along with the secondary market level.

Lord Grantchester: I sometimes imagine, but I may be incorrect, that the challenges in the US are behaviour change, culture and daily habits. Are EVs therefore more of a challenge in the US market than we might

experience here in the EU or in the wider context?

Professor Benjamin Sovacool: You may be surprised to learn that those visits to the dealerships were in Europe, including Norway, not in the United States. We had a study looking at EVs in Denmark, Finland, Sweden, Iceland and—[*Connection lost.*]

The Chair: We now have the connection back. Please carry on, Professor Sovacool.

Professor Benjamin Sovacool: Apologies for that. In our research, the worst country for these automotive practices was Denmark, which is known to be a very clean and green country, because people there were reluctant about EV adoption. Many of these barriers may exist even in places that you would not expect. That said, it is true that the United States is very different than the UK. You know that the US has more cars than people with drivers' licences. That gives you a sense of how entrenched automobility is. There, you have a different set of barriers, but all the stuff that I have been talking about has been based on our research in Europe, which is very replicable for the UK.

Q49 **Lord Duncan of Springbank:** Thank you. That was very helpful. Following on from the point you raised, Professor Sovacool, perhaps it would be useful if you could share the research that you spoke of with the committee. I think it would be instructive with regard to some of the barriers that we have spoken of before.

My question follows Lord Grantchester's question and is about the second-hand market and its evolution. In evidence we have taken so far, there appears to be a barrier to transition for those who have lower incomes. In many instances, even though there are other e-solutions to that, most people cannot essentially scooter off to their work if they live 30 miles away from their destination.

Therefore, how do you move the transition from the fleet, who are often the wealthy and those who can simply afford to have more than one car, to those who are at the other end of the market, who still need a car for access because they do not have access to the convenience of public transport, who will still need to be able to commute or travel distances that are not insignificant and for which other methods, such as car pooling, sharing or the other e-methods of transport, are not available?

Professor Benjamin Sovacool: I will give a short answer. That is a very good point. Just to put these equity issues into perspective, some of the research that we did found that the single tax rebate in Oslo for a battery electric vehicle—say, a Tesla Model S—was the same government revenue that you could have used for 20,000 bus tickets. That serves to give a sense of how certain incentives could benefit private automobile owners rather than others.

Electrifying mass transit—so not just electrifying passenger cars but using sources of mobility that lower incomes are already using—is one very good path forward. Having really good rebates or incentives for the

secondary market is a second one. A third one, as I said, is micro-mobility—small forms of mobility like e-bikes and e-scooters. Lastly—we have not mentioned this—in Finland they have what is called mobility as a service, in which you subscribe for a month and pay a fee, as part of which you get access to mass transport, taxis, and an EV if you need it. So you are paying for the mobility at a fixed rate per kilometres travelled, rather than for an EV, and it is already maintained and charged for you, and all that. So mobility as a service could be yet another business model to extend it to lower incomes.

Q50 **Lord Duncan of Springbank:** That sounds interesting. It does not sound practical, however, if I am honest. I live in a rural area where none of those options would be available to me. I merely put that out there. Do any of the others on the panel want to pick that up?

If not, I will move on to my second question, which goes to the notion of what happens when you move the tax incentive to a tax take. The challenge right now is that we are heavily subsidising the uptake of electric vehicles, which is driving forward the transition. That is important, but we heard last week from some of our witnesses that there could be a billion-pound black hole in tax revenues in a given year. Clearly, in order to fill that black hole, at a certain point you have to flip from it being fully an incentive to take on an electric vehicle to there being a return to the Government. That, again, would mitigate the point made by some of the contributors this morning that, once you move to the point when you leave the subsidy behind, it becomes much harder to maintain the other elements which the monies from the car fleet currently pay for.

I wonder again how you see that as an issue and ask you perhaps to reflect on whether, indeed, it is affecting your countries as we speak, and what alternatives there are for a Government to bring in income without necessarily jeopardising what could still be a fragile evolution of the electric vehicle market. That is a general question that is open to all of you.

Andreas Hedum: That is a very relevant question for Norway: what do we do when the financial gap is increasing? Our tax exemptions were introduced before the EVs came on to the market, so there was no tax revenue loss to speak of. Now, there obviously is. That is why many would suggest phasing out the incentives, but it is not easy to remove incentives when they are first introduced into politics, so it gets a lot of attention.

I do not have a clear answer to the question of how to restore the financial gap that has occurred because of the incentives, but we are taxing EVs, and we want to ensure that EVs are still competitive so that their introduction continues and we do not stop the development. It is not very easy balancing EV introduction and the reduction in financial revenues from taxing cars.

Frank Burmeister: There are perhaps two things to add. First, we want to phase out the financial incentives. Perhaps it is a good thing not to get

money from the excess duties on petrol because you are no longer using petrol. That is what we want. But it means a loss of revenue for the Government.

That is why we also look at road-pricing schemes whereby you have to pay per kilometre of driving. We then have to take into account the external costs, which Benjamin spoke about, and how much the price should be—but that is in the long run. In the short run, we have to phase out. Perhaps we can use the subsidy for the fossil fuel industry, which is €46 billion in the Netherlands, to finance the loss of revenue from taxes on fuels.

Q51 **Lord Lucas:** What reflections do you have on charging infrastructure in different settings—for example, urban areas compared to rural ones? Within urban areas, there is also the example of people who have access to their own parking spaces and can therefore charge from their houses, compared to those who cannot because they live in flats, or for other reasons? How has that problem been dealt with well?

Frank Burmeister: This a good question. In the beginning, we thought that we could use regulation, but comparing Amsterdam—an urban city—with towns with only 100 people, we did not think we could use regulation. So we defined a nationwide charging network, as we call it. The definition is that at least one charging point has to be present in an area of 500 by 500 metres with at least 125 households. Of course, if there are more households in that square, there have to be more charging points. We also measure how many times a charging point is used. If it is used a lot, we see the data and say, "There have to be more charging points here". We do this together with regional entities, private parties and the grid networks.

Lord Lucas: Who puts in and pays for these networks? Is it private enterprise or the local authorities?

Frank Burmeister: We work together with the regions, which have to buy the charging points. I say "buy", but actually you do not have to buy them because there is a business case. No euro of public money is used to realise the charging infrastructure: you sell energy, which people pay for.

We do not do this in every city, which is why we define some regions to get some cross-subsidy, because some regions are less frequented, so the business case will perhaps be less good. In some cities, there is a good business case for charging points, so we have to cross-subsidise. That is why we work with six regions in the whole Netherlands. We agreed the definition of this nationwide charging network with all the people, and it has a focus on AC charging, which is dominant in the Netherlands, as I said.

Lord Lucas: Andreas, how does this work in Norway?

Andreas Hedum: In Norway, a lot of people charge at home. EVs started in the urban areas of Oslo, and in the beginning the

municipalities—Oslo specifically—established a lot of chargers around the cities. We now have a lot of chargers in Norway: we have public chargers and people charge at home. We consider this to be left to the market, and we do not see the need, from a national point of view, to establish any more charging points for passenger cars. The municipality of Oslo has now set prices and made it more costly to use the charging points in the city.

It is obviously a different picture if you have a charger at home or if you use a public charger on the street, but the market seems to be mature. Further development of charging infrastructure for passenger cars in Norway is more or less considered to be commercially viable and something that can be left to the market to develop.

Lord Lucas: Professor, have you seen other aspects of this more broadly? Something that particularly concerns me is that we in the UK are producing a large incentive for people to pave over their front gardens and put their cars in them, because they can use cheaper electricity and get a dedicated parking space. Have you seen or solved that elsewhere?

Professor Benjamin Sovacool: That is a concern—I do love my garden. So far, we have talked about charging as home charging or charging at work—those are the two standard places where people tend to park their vehicles. But you can do three other things if you want to incentivise charging. You can have what are called community charging hubs, often for free. These could be in social housing estates, near the Whitgift Centre in Croydon or in places where consumers do not have off-street parking or the ability to charge closely.

The second interesting thing, which I have read about, is BP and others putting chargers in petrol stations. There is already fuel there, they have already purchased the land, and they are able to install them right where people are going anyway to get their petrol.

The third thing is to integrate charging with parking lots, making sure that every parking structure in a municipality or local authority has charging spaces. You can then bundle in parking with charging in novel ways. So you can get a little creative with it. However, as you said, it is still a significant barrier, and you run the risk of people modifying their homes in ugly ways to accommodate EVs.

Baroness Young of Old Scone: On that last point, what is happening to the existing petrol-dispensing areas in Norway and the Netherlands, both on long-distance motorways and in cities? Are they becoming charging points, or are they dying? Perhaps we could start with Andreas, because you are further ahead.

Andreas Hedum: The petrol stations are not necessarily located where the grid is. That might be an issue to have in mind. But we witnessed that a lot of petrol stations are establishing charging points in their current locations, so there is some coexistence, although it is not clear

yet. But, of course, the demand for charging is increasing, and this obviously affects the petrol-station market.

Baroness Young of Old Scone: How about the Netherlands?

Frank Burmeister: I agree with Andreas. We think that the dominant way of loading your car is destination loading. For example, if you go to a supermarket and park your car, you can load energy, come back and drive home again. There are not so many petrol stations around Eko supermarkets.

So we think that petrol stations will die out in the long run (2040/50). You have to take into account that 4% of the whole fleet now is electric. In 2030, we will perhaps have 2 million electric cars, but that still means 7 million conventional cars. You have to take it into account. We cannot say for sure that they are dying out, because we do not know if this emphasis in the Netherlands on destination loading will be dominant in the future. If the technique changes, and if cars can be loaded just as quickly as you can fill cars up with petrol, perhaps it will change and then fast charging will be more dominant. But we think that will be another way of loading, and it will be different from filling up with petrol.

Q52 **The Duke of Wellington:** My question is not to do with charging; it is a more general question. We have heard, very interestingly, that additional electric vehicles need not necessarily put a greater strain on the grid. We had some examples of how electric vehicles have been increased without increasing the strain on the grid. How important do you all think deadlines or target dates, however defined, are in persuading or encouraging consumers to move to electric vehicles? I am trying to understand the sensitivity of decisions that have been made in Europe and that may be about to be made in the UK about relaxing deadlines. I want to understand whether that really may alter the speed of the move to electric vehicles.

Professor Benjamin Sovacool: I am sure that everyone will want to weigh in on this. Obviously, relaxing deadlines is not good. I do think that it shapes consumer preferences. They read the *Daily Mail*, read newspapers, and are up to date. That builds momentum or detracts from it. I have also seen similar misinformation campaigns recently against heat pumps and other things, so it does seem like there is a battlefield in the UK over low-carbon technology, with some quite scathing opinion pieces written critiquing different vehicle choices. So when they see the Government roll back targets in that sort of environment, it certainly has a prophylactic effect.

However, the other thing that you signal is industry and policy reactions. Policymakers learn from each other, so when there is momentum building in a certain direction and then it reverses, other policymakers, say in China or in parts of the southern US, may point to the UK and say, "Oh, they couldn't do it. They're rolling back their legislation, so we need to roll back our targets".

The other one that certainly responds to these targets is the industry—the automotive OEMs and the manufacturers. They will respond; they track industry trends very closely, and that could create bottlenecks and shortfalls in supply of vehicles down the road. This risks lessening the enthusiasm not only of consumers, but of manufacturers and other policymakers.

The Duke of Wellington: Would the gentleman from the Netherlands like to comment on that?

Frank Burmeister: I agree totally. There has to be some certainty, but the reality is that sometimes this is difficult to combine with certainty. We also have zero-emission zones that we want to establish. That means that if you want to drive a van in a zero-emission zone, it has to be a zero-emission van. We think that a lot of vans have to be loaded privately and sold by firms, and the electricity has to be there. Sometimes we see this as a problem, because you have to load your car, so you need electricity. If you do not have electricity, you cannot drive in these zones. That is why we would also look strongly, together with another ministry, at investing in the grid over eight years, or something like that, so that you have enough grid.

The second thing we also try to look at are measures to mitigate this problem. You may, for example, have a 10-megawatt electricity loading point, but perhaps you do not need 10 megawatts and can use only five. Then you can share this with other firms in the area, or we can use batteries.

The Duke of Wellington: As Norway is clearly ahead of all of us, I imagine that this question about target dates or deadlines is not really relevant in a way, because you are almost there already. Is that correct?

Andreas Hedum: I guess so, but we introduced our ambition to have 100% EVs by 2025. That was national policy that was launched in previous year, and I think that has had some effect on the EV policies.

The Duke of Wellington: Norway has had incredible success. To what extent do you think that success is because of the target date of 2025 for 100% EVs being established early on, or do you think there were other policies that induced that move in such an impressive way?

Andreas Hedum: I think it is the latter. The tax exemptions came way before the phase-out ambitions were set, so they were obviously important. I think the ambitions have had some effect. They have been central in the political discussion, and it has been hard for the politicians to look away from them when they were first set.

The Duke of Wellington: Thank you very much.

Q53 **Lord Bruce of Bennachie:** We are slightly getting ahead of ourselves by talking about the end of life of vehicles that we are only just phasing in. Before I do that, I am slightly concerned about having a split market, where fossil fuel cars and electric cars are still being made and sold, and

people are not sure when and how to switch, how long they have, and what the market is going to do. Vauxhall told us that they are phasing out all fossil fuel car manufacture by 2028. Will the market actually tell the consumers that they just cannot buy fossil fuel cars, that they just will not be there, because they have to make a commitment one way or the other?

When we do get rid of these, do we have an accelerated scrappage scheme for fossil fuel cars? How will we ensure that the recycling of electric vehicles gets rid of the embedded carbon, effectively, and how do we ensure that batteries are effectively and safely recycled or disposed of? Do you have plans in place for that? Is that all envisaged, or is it a bit premature? Maybe I will ask Professor Sovacool first and then get the country reactions.

Professor Benjamin Sovacool: Those are very good questions. In answer to the first one, a battery electric vehicle is in many ways superior to a conventional car. In the same way that we do not have incandescent light bulbs and single-use plastic bags in the UK, the market has evolved. Many manufacturers—Fiat Chrysler and BMW, for example—are shifting to electric mobility to respond to market demands. In a way, it is normal to force the issue by supplying only a certain technology. There is a long history of phasing out innovations that are harmful to the environment.

The point about waste and batteries is excellent—and no, it is not too early. The other thing is that EVs can last for 20 years, so every one that is bought now can be driven in the UK for decades to come. So we could literally now shape consumer preferences going into the middle of the century—and even longer, if we are talking about the secondary markets.

The automotive and battery manufacturers are pretty much the only two organisations that can safely handle those waste streams. Our researchers found that people at landfills do not really understand this. There is lots of improper disposal, and you can have lead, acid leaking, fires and improper dismantling, particularly in places like China, where something like 90% of EV batteries are not properly disposed of—China is the largest market by volume, even though Norway is the largest market per capita. On this, you need strong take-back schemes or extended producer responsibility schemes that are strongly regulated. There is a key role for government here, because the market is not taking care of it and consumers do not know what to do with their batteries or vehicles at the end of life.

Lord Bruce of Bennachie: Are policies and plans in place for this in Norway and the Netherlands?

Andreas Hedum: There are policies on this in Norway. We have strict regulations, and we follow EU regulations on the disposal of batteries. Companies that recycle batteries are starting to be established, so we expect some business to develop to make use of the used batteries and to handle this in a good way. It is still early, and I guess more will be put

in place. We have strict regulations, but more is happening on the innovation side.

Lord Bruce of Bennachie: Do you expect there to be government regulation? Professor Sovacool said that if batteries are not disposed of safely, there is a problem, so it requires government to set a framework.

Andreas Hedum: Yes, I guess so.

Frank Burmeister: On your first point, we do not force people to drive electric cars in the Netherlands; we just want to convince them that, for the same money, you could drive an electric car and that sometimes you will steal from your own purse if you still drive a petrol car. We hope that, by 2035, all new cars will be zero-emission—this is an agreement in the European Union. This data is important, but it has to be combined with measures to reach the goals. With this Government, for example, we still have the goal that, in 2030, all new cars have to be electric, or at least zero-emission, but we have no measures, which is strange.

On batteries, we see the same thing. We think that circularity is an important aspect. European Union battery regulation also sets important goals.

Lord Bruce of Bennachie: Presumably, the cars will last longer than the batteries, and people will have to change their batteries before they change their cars.

Frank Burmeister: I do not know. We think that the batteries in electric cars can last a long time. The OEM manufacturers cite at least eight years or 160,000 kilometres and guarantee the batteries, and some batteries will last for longer than 1 million kilometres. I do not know whether that is true. We look at how this works, but we think there are good batteries that can last a long time, and, if they are not good enough, we can use them for other things.

Lord Bruce of Bennachie: That suggests that you should have a policy to encourage longer-life batteries, because that takes the pressure off the recycling and disposal.

Frank Burmeister: That is true. For us, as I said, batteries are covered by regulations, and if the batteries in the cars are no longer useful, we can use them in the way we do in Amsterdam's Cruyff arena, for example, where 184 EV batteries are combined as a storage facility for the lights. A modern recycling facility is being built in the Port of Rotterdam. We have to look at the recycling capacity for the batteries.

Q54 **Baroness Boycott:** This is a short question. Frank and Andreas, you have obviously made extraordinary strides. We are currently in the middle of a huge political argument about whether we should pass these laws. Did anything similar happen in either of your countries, or were you able to embark on your EV transition with a general fair wind behind you and everyone in the Government being able to see that this was a necessary move? Did you have what we are reduced to now, which is

literally more or less arguing about whether climate change exists, how serious it is and how far you can kick it down the road? Before we let you go, I would love to hear your reflections on how it worked out in both your countries, and then have a final word from Benjamin.

Frank Burmeister: Unfortunately, I recognise this problem. Our current Government still have the goal, but we have no measures because of a lack of money. We do not know what the next Government will do. We have a climate law, but it is in all the different sectors—industry, mobility, et cetera—and this makes it more difficult to get specific goals on mobility, for example. So we are doing two things. First, there is a potential gain for mobility, because cars in the Netherlands emit 10% of all the CO_2. Secondly, we make electric vehicles available for all people in the Netherlands, not only the rich.

Andreas Hedum: Our discussion on the ambitions for when we should have 100% EVs came some time ago. We follow the EU CO_2 standards, which will be put into Norwegian law. Of course, they are not very ambitious from a Norwegian perspective, so they do not attract any attention. This has something to do with our timelines: our EV policies were introduced very early, before there were any financial issues for the Government. The debate is currently more about what to do now and what to do with the revenue loss than about implementing new policies.

Baroness Boycott: So it is getting trickier. Benjamin?

Professor Benjamin Sovacool: We keep talking about the climate emergency, and rightly so; it is a huge moral and environmental quandary. But it is also a market failure. Transportation and energy generate so many externalities that EVs still have multiple co-benefits that justify intervening, but that means that your EV policies also have to account for the externalities of EVs, such as batteries, waste, charging, and all of that. The fundamental lesson for me is that EV adoption is neither good nor bad; it needs to be governed, and how you do so will determine the outcomes that you achieve.

The Chair: On that point, I thank our three witnesses. I apologise for the hiccup in proceedings, but you have given us lots of food for thought, and we really appreciate your time.