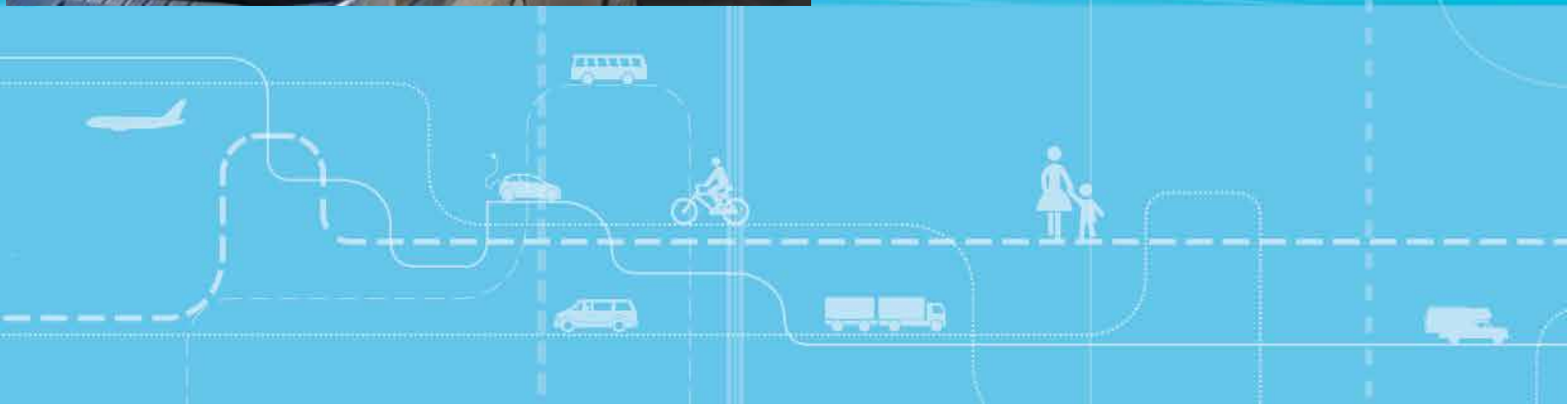


The future of electromobility in Norway – some stakeholder perspectives



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Terje Assum

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Summary:

The results of 13 interviews, two meetings and a workshop undertaken in 2014 with a select group of stakeholders within electromobility in Norway, show that the stakeholders are optimistic as to the future of electromobility in Norway, providing that the incentives be maintained. Almost all stakeholders interviewed support the official policy to reduce the GHG (greenhouse gases) emissions by increasing the number of battery electric vehicles. Nevertheless, the stakeholders realise that the incentives will have to be downsized eventually. However, more charging stations are needed in residential areas without private parking facilities and along the main intercity corridors. Fast-charging stations appear to reduce range anxiety, even though most EV (electric vehicle) owners use them rarely

Sammendrag:

Intervjuer og møter med representanter for myndigheter, bilbransjen og organisasjoner innen elektromobilitet i Norge viser at aktørene er optimistiske til framtida for elektromobilitet, gitt at insentivene for elektriske biler opprettholdes. Nesten alle er positive til den offisielle politikken, å redusere gjennomsnittlig utslipp av klimagasser, der målet i 2020 er 85g/km, ved å øke antall elektriske biler. Aktørene innser likevel at det trengs flere virkemidler for å nå miljø- og klimamål, og at insentivene må trappes ned eller legges om på sikt. Særlig viktig nå er flere ladestasjoner for boliger uten privat parkering og hurtiglading langs hovedveiene mellom de største byene. Aktørenes vurderinger stemmer godt overens med brukernes, slik disse er fremkommet i andre studier.

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Preface

This report is part of the COMPETT project (Competitive Electric Town Transport), financed by national funds which have been pooled together within the ERA-NET Electromobility+ programme. This pool has initiated twenty projects about electric vehicles concerning topics from the development of battery and charging technology to sociological investigations of the use of electric vehicles.

COMPETT is a co-operation between the Institute of Transport Economics (TØI), Norway, the Austrian Energy Agency (AEA), the University College Buskerud and Vestfold, Norway, Kongsberg Innovation, Norway, and the Danish Road Directorate (DRD). The COMPETT project is jointly financed by the EU's 7th FP (Electromobility+ programme), Transnova, the Research Council of Norway (RCN), the Austrian Research Promotion Agency (FFG) and the Ministry of Science, Innovation and Higher Education, Denmark.

The objective of COMPETT is to answer the question “How can electric vehicles come into use to a greater degree?”, thus generating knowledge concerning barriers and potentials for electric vehicles. COMPETT is focussing on individual passenger transport.

More information about COMPETT is available in www.compett.org.

Work package 4 “Regional electromobility” includes a review of the research literature in this field, developing an analytical scenario framework and local studies in Austria and Norway. This report presents the results of interviews with electromobility stakeholders in Norway.

We want to express our gratitude to the stakeholders willing to be interviewed or met with. Without their co-operation this report could not have been realised.

Erik Figenbaum, senior research engineer and project manager, has planned this study together with senior research sociologists Marika Kolbenstvedt and Terje Assum. Having participated in all interviews, Assum has written the draft report. Erik Figenbaum and Marika Kolbenstvedt have each participated in some of the interviews, read and commented upon the draft report. Kolbenstvedt has also written parts of chapters 1.3 and 5.

Trude Rømming has been responsible for the finishing of this report. Chief research officer, Dr. Ronny Klæboe has been TØI's quality assurer.

Oslo, December 2014
Institute of Transport Economics

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Research director

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Acronyms and terminology

BEV - Battery electric vehicle – pure battery electric vehicle

EV - Electric vehicle – any kind of recharge electric vehicle

GHG – Greenhouse gas

HEV - Hybrid electric vehicle – vehicle having both a common combustion engine and an electric motor

ICE -Internal combustion engine vehicle – vehicle using petrol or diesel fuel

NGO – Nongovernmental organisation

PHEV (PHV) - Plug-in hybrid electric vehicle – hybrid vehicle which can be charged from the grid

VAT – value added tax

For more detailed explanations see Figenbaum & Kolbenstvedt (2013, p. 3)

Summary:

The future of electromobility in Norway – some stakeholder perspectives

TOI Report 1385/2014

Authors: Terje Assum, Marika Kolbenstvedt, Erik Figgenbaum
Oslo 2014, 59 pages English language

The results of 13 interviews, two meetings and a workshop undertaken in 2014 with a select group of stakeholders within electromobility in Norway, show that the stakeholders are optimistic as to the future of electromobility in Norway, providing that the incentives will be maintained. Almost all stakeholders interviewed support the official policy to reduce the GHG (greenhouse gases) emissions by increasing the number of battery electric vehicles. Nevertheless, the stakeholders realise that the incentives will have to be downsized eventually. However, more charging stations are needed in residential areas without private parking facilities and along the main intercity corridors. Fast-charging stations appear to reduce range anxiety, even though most EV (electric vehicle) owners use them rarely.

The COMPETT project and the regional vs national perspective

As a part of the COMPETT project, Competitive Electric Town Transport, this report studies how electric vehicles (EVs) can come into use to a greater degree, by surveying national and regional stakeholders' experiences in electrified transport such as the regional potentials and barriers for EVs and the use of recharging facilities. During the project period, the regional perspective has been extended to a national perspective, especially as most of the electromobility stakeholders are active nationally. Most of the stakeholders acting within the field of electromobility, are national, and so are most of the electromobility incentives, shown to be most important for the development of electromobility in the Oslo – Kongsberg region, though they may be more important in urban than in rural areas. However, charging infrastructure may be more important in rural areas because of longer driving distances.

Current incentives for electric vehicles in Norway

The present policy and incentives to promote electromobility in Norway are described in Appendix 3. In summary the incentives for *fully* electric vehicles are:

- **Fiscal:** Vehicle registration tax exemption, the lowest annual vehicle licence fee, reduced imposed benefit taxation for company cars, VAT exemption, increased mileage allowance rate.
- **Local:** Access to bus lanes, road-toll exemption, reduced fares on national road ferries, free public parking with or without free charging, charging stations – normal and fast.
- **Other:** Reserved EL number plates.

Only two incentives apply to *plug-in hybrid vehicles*. These are reduced registration tax and free charging at public charging stations, as described in Appendix 3. The incentives make up extensive economic advantages for the users of electric vehicles, as shown in Appendix 3.

The stakeholders' knowledge, opinions and behaviour

Most of the stakeholders see a combination of less travelling, more public transport and zero-emission vehicles as the way forward in reducing greenhouse gas (GHG) emissions from road transport. In general, all stakeholders, except maybe one, seem to accept the objective of reducing GHG emissions from transport, a fact that, at least to a certain extent, may be due to the selection of the stakeholders, i.e. stakeholders mainly within mobility and environmental affairs. The stakeholders' activities in pursuing the objective of reducing GHG emissions are mainly following-up of the existing incentives. As could be expected the specific activities vary according to the roles of the stakeholders. Informing and influencing the authorities is one important type of activity. Facilitating the use of battery electric vehicles (BEVs) is another. Within the government agencies, finding the balance between ideal solutions and politically acceptable initiatives is important. For EV businesses and NGOs dissemination activities make up a crucial part of their EV promotion. Some stakeholders consider the stimulation of the use of EVs as conflicting with the objective of reducing transport volumes in general.

There is no public strategy specifically for electromobility at present, but the present incentives are agreed to be maintained until 2017 or until the number of BEVs has reached 50 000. A strategy for charging infrastructure was drafted and submitted for hearing in early 2014. The results of this hearing are not published when this report is written (December 2014), although the deadline for the hearing was June 1, 2014.

Accordance between the stakeholders and the BEV users?

In general, the stakeholders seem to be well informed about the BEV owners' knowledge, attitudes and behaviour, but some of the stakeholders appear to be more concerned than the BEV owners or buyers about the future of incentives, the second-hand value of BEVs and the vehicle range. In this respect, these stakeholders are more like the general car-owners than BEV owners.

Barriers and potentials

The stakeholders consider uncertainties about the duration of batteries, the second-hand value of the BEVs and the future of the incentives as the main challenges for the future increase in electromobility. However, the car importers and car dealers do not report concern about these uncertainties among their customers. This fact can

perhaps be related to innovators and other early adopters having a higher risk tolerance than later adopters. This issue could still be relevant as the proliferation of EVs move into later adopter groups, not accepting so much uncertainty, but both technological improvements and a larger market will reduce uncertainties.

Convincing potential BEV buyers that BEVs can be used also for longer weekend or holiday trips, may be a challenge in the one-car household market. Most barriers, however, appear to be transitional, i.e. being due to the early stage of electromobility rather than inherent in electromobility itself.

More fast-charging infrastructure has the potential of further reduction of range anxiety. Getting a wide selection of BEVs into the market is also considered a potential. The low operating costs of EVs are seen as a potential for growth in the vehicle fleet market. In general, the potential for EVs appears promising as long as the main incentives are maintained.

Incentives and need for changes?

Most stakeholders consider the present incentives as sufficient for further growth in the BEV sales, but some NGOs have a strategy to improve the EV situation even more. The stakeholders are also considering the costs of the incentives versus other possible GHG reduction initiatives. The economic incentives, especially the VAT (value added tax) and road-toll exemptions, are considered the most important ones. Access to the bus lanes and reduced ferry fares are controversial. So is the VAT exemption for expensive BEVs such as Tesla. Some stakeholders emphasise the fact that BEV access to bus lanes can be denied on specific road sections if the BEVs cause severe bus delays.

The stakeholders agree that there is presently no strategy for incentive downsizing, and nobody knows what will happen to the incentives after 2017 or the number of BEVs reaches 50 000. With the present sales of BEVs, this number may be achieved in early 2015. An inquiry into motor vehicle taxation in general is announced to be presented in the revised Government budget for 2015 in May 2015. Agreeing that the present incentives are expensive and realising that a downsizing will have to come, most stakeholders emphasise that the downsizing will have to be gradual and predictable.

Plug-in hybrid electric vehicles (PHEVs) do not benefit from the BEV incentives, except for some reduction in the registration tax and free parking in public parking facilities. PHEVs have a greater potential as the only car in the family, but being costly to produce, PHEVs cannot compete in price with BEVs under the present BEV incentives. Thus, the future for PHEVs in Norway remains uncertain, although the sales have been increasing in 2014. Some reduction of the PHEV registration tax is agreed in the 2015 Government Budget. However, some stakeholders say that the incentives should be technologically neutral.

Charging at home and at work are the most important ways of charging, but charging infrastructure is still an important incentive for people living in apartment buildings without private parking facilities and for long-distance travel, and thus for BEVs as the only car in the household. Standards for charging and payment need to be developed, especially for fast charging. Being tested now, inductive charging can make charging much easier.

Other issues

In general, the stakeholders are not concerned by possible increases in traffic volumes caused by the expected further increase in the sales of BEVs, but some emphasize the need to reduce transport volumes. The stakeholders expect a variety of transport modes and technologies to be applied in order to avoid further increase in fossil-fuel based vehicle transport and to reduce GHG emissions from transport. Some stakeholders point to complementary measures needed to limit the growth of transport volumes.

Many stakeholders are active in dissemination and communication. The main target groups are the authorities and the potential EV buyers. The EV buyers appear to be active in information search and sharing of EV experiences. As the EV sales grow, this “neighbour effect” is likely to become even stronger, thus having a potential to affect the EV sales even more.

EV safety is not a great concern among the stakeholders, but some stakeholders claim that EVs require a different safety thinking than do the ICE (internal combustion engine) vehicles. Some stakeholders have disseminated safety information to EV owners and to emergency personnel.

Norway can be an international EV test arena. Other countries may learn that incentives are necessary and effective for the introduction of EVs. Sufficient renewable electricity, 97% is produced in hydroelectric power plants, is an advantage for the use of EVs in Norway. High motor vehicle taxation makes possible the use of tax exemptions to stimulate the purchase and use of environmentally friendly vehicles. The affluence of the country and its population render possible the fast adoption of new technology even though a certain economic risk is implied. The cold climate in Norway contributes to longer battery duration, but limits the driving range. Long driving distances and the widespread ownership of holiday homes may be important barriers to BEVs in single-car households.

Some of the stakeholders are concerned that the industrial potential in the EV market in Norway is not realised. One stakeholder even claims that the BEV incentives can be considered a subsidy to the Japanese car industry. The early, but unsuccessful national industrial efforts in the BEV market in Norway, may be a barrier to future realisation of the industrial potential.

Stakeholders, users and potential buyers

There is a good degree of agreement concerning the importance of the incentives between the stakeholders and the most important motives for buying a car among the three categories of vehicle owners. The stakeholders should perhaps be more conscious of the differences between the present BEV owners, the potential BEV owners and the ICE-car owners who do not want to buy a BEV next time, especially concerning the perceived BEV disadvantages in the latter two groups. Time needed to recharge a BEV, access to charging stations and vehicle range are the factors considered big disadvantages among the ICE-car owners. Disseminating more BEV information to those who have not yet bought a BEV, appears important to increase the percentage of BEVs in the total number of motor vehicles.

Discussion

The share of EVs is still less than 2 per cent of the total number motor vehicles in Norway. Even though BEV sales in Norway are high compared to most other countries, the question of how to increase the EV share rapidly is still important. Maintaining the BEV incentives, especially the economic ones, is crucial, until mass production and further technological development have made BEVs economically competitive without economic incentives. However, mass production, further technological development and consequent lower production prices, do depend on considerable sales in larger markets than Norway. When downsizing the BEV incentives, it is important to do so in a gradual and predictable way.

Putting more efforts into the sales of BEVs to private businesses and public bodies is another possibility. Increasing the marketing efforts emphasising the low operational costs of BEV could be effective in the fleet market according to some of the stakeholders.

The PHEV sales in Norway have been quite limited. Introducing some economic incentives, like halving the VAT to 12.5 per cent compared to 25%, could stimulate the sales. New PHEV models and more PHEV brands coming into the market may also stimulate the sales. However, if PHEVs should receive so many incentives that they become considerably less expensive than ICE vehicles of the same size, there is a risk that some people will buy PHEVs for economic reasons, not bothering to charge them, i.e. running them mostly on fossil fuels. However, the lower fuel costs for electric operation would perhaps motivate PHEV owners to charge their vehicles.

Conclusions

All stakeholders are aware of the political objective of reducing the GHG emissions from transport. All but one stakeholder appear to accept this objective and to try to comply with it and adapt to it. Most stakeholders consider the present incentives positive and even sufficient to continue the high sales of BEVs in Norway. The “neighbour effect” may become stronger as the number of BEVs increases, giving an extra increase in the BEV sales.

The stakeholders appear to agree that the incentives are expensive and will have to be downsized sometime in the future. Apart from asking for gradual and predictable downsizing, most stakeholders seem to think that the main incentives should be maintained until BEVs achieve competitive production prices. If BEV bus-lane access causes congestion in the bus lanes, this access can be denied in the road sections where such problems appear. The potentials of EVs in businesses and public bodies, i.e. in the fleet market, have not been fully utilised yet. Neither has the potential of using PHEVs for reduction of GHG emissions been utilised.

Sammendrag:

Framtidig elektromobilitet i Norge – aktørenes perspektiver

TØI rapport 1385/2014

Forfattere: Terje Assum, Marika Kolbenstvedt og Erik Figenbaum
Oslo 2014, 59 sider, engelsk språk

Intervjuer og møter med representanter for myndigheter, bilbransjen og organisasjoner innen elektromobilitet i Norge viser at aktørene er optimistiske til framtida for elektromobilitet, gitt at insentivene for elektriske biler opprettholdes. Nesten alle er positive til den offisielle politikken, å redusere gjennomsnittlig utslipp av klimagasser, der målet i 2020 er 85g/km, ved å øke antall elektriske biler. Aktørene innser likevel at det trengs flere virkemidler for å nå miljø- og klimamål, og at insentivene må trappes ned eller legges om på sikt. Særlig viktig nå er flere ladestasjoner for boliger uten privat parkering og hurtiglading langs hovedveiene mellom de største byene. Aktørenes vurderinger stemmer godt overens med brukernes, slik disse er fremkommet i andre studier.

COMPETT prosjektet – aktørenes perspektiv

Rapporten er en del av Electromobility+ prosjektet COMPETT, Competitive Electric Town Transport, med formålet å undersøke hvordan elbiler kan tas i bruk i større grad. For å få fram erfaringer med elektrisk biltransport, som eventuelle regionale og nasjonale hindringer og muligheter for bruk av elbiler og ladestasjoner ble det gjennomført kvalitative intervjuer med 13 aktører samt tre gruppemøter med regionale og nasjonale aktører på området. Aktører i andre relevante sektorer som oljebransje og kollektivtransport ble ikke intervjuet. Oslo-Kongsberg regionen, som har den høyeste elbilettheten i Norge, var valgt som prosjektet regionale case. I løpet av prosjektperioden er det regionale perspektivet utvidet til et mer nasjonalt perspektiv, især når det gjelder aktørene. De fleste aktørene innen elektromobilitet er nasjonale. Det er også insentivene som har stor betydning for utviklingen av elektromobilitet.

Insentiver for elbiler i Norge

Den gjeldende politikken for elektromobilitet i Norge omfatter følgende insentiver for fullt elektriske biler:

- **Finansielle:** Fritak for engangsavgift, redusert sats for årsavgift, redusert sats for fordelsbeskatning for firmabil, fritak for merverdiavgift og økt kilometergodtgjørelse.
- **Lokale:** Tilgang til kollektivfelt, fritak for bompenger, lavere billettpris på riksveiferge, gratis parkering og ladning, samt støtte til ladestasjoner både vanlige og hurtiglading.
- **Andre:** Spesielle EL nummerskilt.

Bare to insentiver gjelder for ladbare hybridbiler, nemlig redusert sats for årsavgift og gratis lading på offentlige ladestasjoner. Insentivene utgjør omfattende økonomiske fordeler for brukere av elbiler.

Aktørenes kunnskap, meninger og atferd

De fleste aktørene vurderer en kombinasjon av mindre reising, mer kollektivtransport og nullutslippsbiler som løsningen på målene om reduksjon av utslipp av klimagasser fra veitransport. Alle aktørene, med mulig unntak av én, synes å godta målene for redusert utslipp av klimagasser fra transport. Dette kan skyldes utvalget av aktører, som hovedsakelig arbeider innen mobilitet og miljø. Deres aktiviteter for å bidra til å nå disse målene er hovedsakelig oppfølging av insentivene.

De konkrete aktivitetene varierer med aktørenes roller. Informasjon til og påvirkning av myndighetene og å lette bruken av elbiler er viktige aktiviteter. Elbilkjøperne selv synes å søke informasjon aktivt og dele erfaringer med andre. Når elbilsalget øker, vil denne «naboeffekten» også øke, og bidra til ytterligere økning av elbilsalget.

I de offentlige etatene er det en utfordring å finne en balanse mellom ideelle og politisk akseptable løsninger. For bilimportører, –forhandlere og frivillige organisasjoner er formidling av informasjon en hoveddel av aktivitetene. Noen aktører mener det er en konflikt mellom å fremme bruken av elbiler og målet om å redusere omfanget av veitrafikken.

Hindringer og muligheter

Aktørene vurderer usikkerhet om batterienes varighet, elbilenes bruktverdi og insentivenes framtid som hovedutfordringene for framtidig økning i elbilbruk. Bilimportørene og –forhandlerne rapporterer imidlertid ikke bekymring om slik usikkerhet hos sine kunder. Dette kan kanskje skyldes at innovatører og tidlige brukere har høyere toleranse for risiko enn senere brukere. Dette spørsmålet kan likevel bli aktuelt etter hvert som utviklingen av elbiler utvides til grupper av senere brukere, som kanskje ikke vil akseptere så mye usikkerhet. På den annen side vil både teknologiske forbedringer og større markeder bidra til å redusere usikkerhet.

Det kan være en utfordring å overbevise mulige kjøpere av elbiler at elbiler også kan brukes på lengre helg- og feriereiser, især i markedet for enbilshusholdninger. De fleste hindringene synes imidlertid ikke å skyldes elektromobilitet i seg selv, men at elektromobilitet er i en tidlig fase. Hurtiglading har potensial for å redusere rekkeviddeangst ytterligere. Det gir også en mulighet for økning at det kommer flere elbilmerker og –modeller på markedet. Elbilenes lave driftskostnadene vurderes som en mulighet for vekst i flåtemarkedet. Potensialet for elbiler synes lovende så lenge de viktigste insentivene opprettholdes.

Behov for forandring av insentivene?

De fleste aktørene vurderer de eksisterende insentivene som tilstrekkelige for videre vekst i elbilsalget, men noen organisasjoner har en strategi for å bedre situasjonen for elbiler enda mer. Aktørene vurderer kostnadene ved insentivene mot andre tiltak for å redusere utslipp av klimagasser. De finansielle insentivene, især fritak for merverdiavgift og bompenger, betraktes som de viktigste. Tilgang til kollektivfeltene

og reduserte billettpriser på fergene er mer kontroversielt. Dette gjelder også fritak for merverdiavgift for dyre elbiler som Tesla. Noen framhever at tilgang til kollektivfelt allerede i dag kan oppheves på konkrete veistrekninger hvis elbilene lager alvorlige forsinkelser for bussene.

De fleste er enige i at insentivene er dyre, og de innser at nedtrapping må komme. De framhever at nedtrapping må skje gradvis og forutsigbart. For tida er det ikke noen konkret strategi for nedtrapping av insentivene, og ingen vet hva som vil skje med insentivene etter 2017 eller at antall elbiler har nådd 50 000. Med nåværende salg av elbiler kan dette antallet nå tidlig i 2015. En utredning om kjøretøyavgifter skal presenteres i revidert statsbudsjett for 2015 i mai 2015. Det er også laget et utkast til strategi for infrastruktur for lading. Dette utkast har vært på høring i første halvår 2014, men resultatene er ikke offentliggjort ennå (desember 2014).

Elbilinsentivene gjelder ikke for ladbare hybridbiler unntatt en viss reduksjon i engangsavgiften og gratis parkering på offentlige parkeringsplasser. Ladbare hybridbiler har et stort potensial som eneste bil i husholdningen, men siden de er dyre i produksjon kan de ikke konkurrere med vanlige elbiler med de nåværende insentivene. Framtida for ladbare hybridbiler er derfor usikker i Norge, selv om salget av slike biler har økt i 2014. Noe reduksjon av engangsavgiften for ladbare hybridbiler er tatt inn i statsbudsjettet for 2015. Noen av aktørene sier at insentivene bør være teknologisk nøytrale, dvs. at de bør gjelde for alle biler med redusert utslipp.

Insentivene ser ut til å være viktigere i byregioner enn i spredtbygde områder, der lademuligheter kan bety mer på grunn av lengre avstander. Å lade hjemme og på arbeid er de viktigste formene for lading, men infrastruktur for lading er viktig for folk som bor i boliger uten privat parkering og for kjøring på lengre strekninger, især når elbil er eneste bil i husholdningen. Det er behov for utvikling av standarder for lading og for betaling for lading, især for hurtiglading. Induktiv lading prøves nå ut, og kan gjøre lading vesentlig enklere.

Andre forhold

Aktørene er ikke bekymret for mulig økning i trafikkmengde som følge av økt salg av elbiler, men framhever samtidig behovet for å redusere trafikkmengden. De forventer at flere transportmåter og teknologier tas i bruk for å redusere fossilbasert trafikk og utslippene av klimagasser. Noen viser til at andre tiltak er nødvendige for å begrense veksten i veitrafikken.

Det er ikke stor bekymring for elbilsikkerhet blant aktørene, men noen sier at det kreves en annen type sikkerhetstenkning for elbiler enn for fossilbiler. Noen har sendt ut sikkerhetsinformasjon til elbileiere og til uttrykningspersonell.

Norge kan bli en internasjonal testarena for elbiler. Andre land kan lære at insentiver er nødvendige og effektive for å ta i bruk elbiler. Rikelig fornybar elektrisitet er en fordel for bruk av elbiler i Norge. Høye motorvognavgifter gjør det mulig å bruke avgiftsfritak for å fremme kjøp og bruk av miljøvennlige biler. Landets og befolkningens velstand gjør det mulig å ta i bruk ny teknologi raskt, selv om dette medfører en viss økonomisk risiko. Det kjølige klimaet i Norge bidrar til lenger varighet for batteriene, men begrenser rekkevidden for elbiler. Lange kjøreavstander og mange hytter kan være hindringsfaktorer for at enbilshusholdninger vil kjøpe elbil.

Noen aktører uttrykker bekymring for at det industrielle potensialet som elbilmarkedet i Norge utgjør, ikke blir utnyttet. En sier at insentivene kan betraktes som støtte til japansk bilindustri. Den tidlige, men lite vellykte innsatsen i elbilindustri i Norge kan være en hindring for framtidig utnyttelse av det industrielle potensialet.

Aktører, brukere og mulige kjøpere av elbiler

Aktørene er godt informert om elbilbrukernes kunnskaper, holdninger og atferd i sin alminnelighet. Noen aktører synes å være mer bekymret enn elbileierne og -brukerne usikkerhet om framtida for insentivene, for bruktbilverdien og elbilenes rekkevidde. Aktørene er dermed mer like eiere av vanlige biler enn elbileierne.

Blant aktørene, elbileiere og potensielle kjøpere er det stor enighet om betydningen av insentivene for kjøp av elbil. De ulike aktørene kunne være mer oppmerksomme på forskjellene mellom de nåværende elbileierne, potensielle elbilkjøpere og fossilbileiere som ikke ønsker å kjøpe elbil, især når det gjelder oppfatningen av ulemper ved elbiler i de to sistnevnte gruppene. Ladetid, tilgang til ladestasjoner og rekkevidde betraktes som de viktigste ulempene av fossilbileierne. Formidling av informasjon om elbiler til dem som ennå ikke har kjøpt slik bil, synes viktig for å øke andelen elbiler i bilbestanden.

Diskusjon

Andelen elbiler er fremdeles (desember 2014) mindre enn to prosent av alle motorkjøretøy i Norge. Selv om denne andelen er høy sammenlignet med andre land, er det nødvendig å vurdere hvordan salget kan økes ytterligere. Det er viktig å beholde insentivene, især de finansielle, inntil masseproduksjon og videre teknologisk utvikling vil gjøre elbiler økonomisk konkurransedyktige. Masseproduksjon, teknologisk utvikling og de lavere produksjonskostnadene som dette vil gi, avhenger av betydelig salg i større markeder enn Norge. Når insentivene skal trappes ned, må dette gjøres gradvis og forutsigbart.

En annen mulighet er å styrke innsatsen for å selge elbiler til private selskaper og offentlige etater. Det kan være effektivt å styrke markedsføringen i flåtemarkedet ved å legge vekt på lave driftskostnader, sier noen aktører.

Salget av ladbare hybridbiler har vært begrenset i Norge. Innføring av insentiver, f.eks. halvering av merverdiavgiften, kan bedre salget. Nye modeller og merker av ladbare hybridbiler kan også bidra til økt salg. Hvis de får så mye insentiver at de blir billigere enn fossilbiler i samme størrelse, er det risiko for at noen vil kjøpe ladbare hybridbiler av økonomiske grunner, men ikke ta seg bryet med å lade dem, dvs. kjøre dem på fossilt drivstoff. Lavere kostnader ved elektrisitet sammenlignet med fossilt drivstoff kan imidlertid motivere eiere av ladbare hybridbiler til å lade.

Konklusjon

Alle aktørene kjenner de politiske målsetningene for reduksjon av utslipp av klimagasser, og alle unntatt én godtar dem og forsøker å følge og tilpasse seg til dem. De fleste aktørene synes at insentivene er positive og til og med tilstrekkelige til å opprettholde det relativt høye salget av elbiler i Norge. «Naboeffekten» kan øke når antall elbiler øker, og dermed bidra ytterligere til salget av elbiler.

Aktørene synes også å være enige i at insentivene er dyre og at de derfor må trappes ned i framtida. Selv om de sier at insentivene må trappes ned gradvis og forutsigbart, synes de å mene at de viktigste må fortsette til elbiler har fått konkurransedyktige produksjonspriser. Hvis tilgang til kollektivfeltene skaper forsinkelser for bussene, kan tilgangen oppheves der dette er et problem. Potensialet for elbiler i private selskaper og offentlige etater, dvs. i flåtemarkedet, og økt bruk av hybridbiler er ikke fullt utnyttet ennå.

1 Background

1.1 Electromobility and the COMPETT project

Electrification of vehicles is an important measure to reduce environmental impacts and greenhouse gas (GHG) emissions from transport. Although electrified vehicles (EVs) have existed for years, the number of such vehicles in practical use is very limited compared to the number of internal combustion engine (ICE) vehicles. To reduce CO₂ emissions by increased use of EVs better knowledge of the barriers against and potentials for EV is necessary.

Achieving such knowledge is the main objective of the ERA-net+ project named: *Competitive Electric Town Transport (COMPETT)*. As part of work package 4 Regional Mobility in the COMPETT project, this report deals with regional mobility in the Oslo-Kongsberg region in Norway. According to the COMPETT project proposal description of Task 4.3 “..... surveys will be carried out to examine the interests and attitudes to the use of e-vehicles... Important questions will be attitudes toward EVs and PHVs, knowledge of the different type of vehicles and their driving distances..... Additional surveys among present and potential e-vehicle users will be carried out.... ...to survey the regional experience in electrified transport and the regional potentials and barriers for e-vehicles in the region and the use of recharging facilities. Qualitative interviews with representatives of public bodies, private businesses, NGO's, schools and local users will be followed up by a workshop...” (Assum, 2012).

This report present results from interviews and meetings with various stakeholders.

Results from the user surveys are presented in Figenbaum, Kolbenstvedt and Elvebakk (2014). In chapter 5 of this report the results from the user surveys are compared with the results of the stakeholder interviews. The Oslo-Kongsberg region is described in Appendix 2, and the electromobility incentives in Norway are described in Appendix 3.

1.2 Main research questions

The aim of this report is to answer the following five questions:

1. What are the knowledge and opinions as well as the strategic and practical behaviour of the stakeholders within national and local authorities, businesses and organisations? The purpose is to capture information that cannot be covered by user surveys, national travel surveys or existing data.
2. Is there an accordance between the opinions of the BEV users and the opinions of the different stakeholders?

3. What barriers and potentials (drivers) do the stakeholders see for increased use of electric vehicles in the Oslo – Kongsberg region or in Norway in general?
4. Are the stakeholders' opinions concerning the existing incentives and the possible need for future changes in these incentives?
5. What are the stakeholders' opinions of what other countries can learn from the situation in Norway and factors being special to Norway?

These main questions made up the basis of the interview guide used in the interviews with the stakeholders, as shown in Appendix 1.

The results presented in this report are qualitative and thus not suitable for hypotheses testing. Moreover, this report does not deal with niches and the ICE car regime. The historical development of BEVs in Norway, including niches, is described by Figenbaum & Kolbenstvedt (2013). This report addresses the stakeholders' opinions as to the effects of economic and other incentives for EVs, as well as policies and to a certain extent visions for the future.

2 Method

2.1 Stakeholders, interviews and meetings

The stakeholders were of three types:

- Authorities at national, regional and local level
- NGOs working in environmental affairs including electromobility, in road traffic and in energy issues
- Car businesses, i.e. EV importers and dealers.

We have selected stakeholders mainly within electromobility to get a good grip on knowledge, attitudes and activities within this field. This selection may, however, imply a positive bias towards electromobility in general. Including more stakeholders from institutions expected to be more opposed to electromobility might have given some different results, e.g. a possible opposition to electromobility from the oil industry or public transport operators may not have been sufficiently covered by the stakeholders included.

The stakeholders were promised anonymity. Consequently the names of the institutions or persons interviewed, are not stated. Neither are the sources of the citations from the interviews and meetings. However, in case of the meetings and interviews attended by two or more persons, anonymity among the participants could not be arranged. Consequently, in these settings the answers to our questions may have been affected by the presence of other people.

The data collection method applied is qualitative interviews with the stakeholders. Each interview was carried out by two researchers. A total of 13 interviews were made between April and October 2014. In five cases two or more interviewees were present. In eight cases only one person was interviewed.

One of the researchers typed the notes from the interviews, meetings and the workshop shortly after each interview or meeting. The other researcher read the transcript, and, if necessary, added to or corrected it. A qualitative, thematic analysis of the interviews was done in parallel with the writing of the report. All three authors have read and commented on the draft report to make sure that the results are correct.

We interviewed persons from two national authorities, two local authorities, five NGOs, three car importers and two car dealers. In addition two meetings with organisations were carried out with six and nine people respectively, one with municipalities in the region and the other with partners in an organisations working for innovation. In both meetings, results from the previous COMPETT reports were presented and discussed.

Finally a workshop was arranged with 14 representatives of stakeholder organisations and seven COMPETT project members to feedback and discuss the preliminary results from Task 4.3, i.e. Regional Electromobility in Norway.

2.2 Interview guide

The main research questions mentioned in paragraph 1.2 were used as a basis for an interview guide. However, the detailed questions in the interview guide were selected and adapted to each kind of stakeholder, meaning that all questions were not asked to all stakeholders. Some of the main questions were:

- How to increase the use of EVs?
- Barriers to and opportunities for further increase in EVs?
- Increased EV use vs. reduction in total car use?
- Expectations of car importers and dealers?

A complete version of the interview guide is shown in Appendix 1. For each stakeholder interview or meeting only the most relevant questions or items were selected to avoid taking up too much of the stakeholder's time.

3 The future of electromobility?

The results presented in chapters 3-5 are based on interviews and meetings with the stakeholders described in chapter 2. The purpose of the stakeholder interviews and meetings are to show the range of perspectives, opinions and knowledge within the EV stakeholder community. Consequently, the stakeholder replies are quoted rather than quantified in any way. For the sake of the anonymity the source of each statement is not stated. The *range* of answers is more important than “who said what?”

In this chapter future aspects of electromobility, according to the stakeholders, is outlined.

3.1 How to achieve reduction of GHG from road transport?

The above question was asked to the representatives of the local and national organisations and authorities. The answers are listed below.

3.1.1 Authorities

“We need cost-effective measures against emissions of greenhouse gases, increased taxes for CO₂ and CO₂ quotas.”

“The present incentives will do for further increase in the use of BEVs, but we need more charging stations ... The charging stations should be standardised. All EVs should be able to use them. Searching for the right station should be unnecessary.”

“Land-use plans are fundamental, then walking and cycling, public transport and then individual passenger transport. Land-use plans concern future transport rather than the present. We expect growth in our region ... We have to make intermodal transport work, e.g. park and ride. We cannot start with infrastructure.”

“Reducing the transport volumes. This reduction can be achieved in three ways: 1. Reduce travelling. 2. Shift the travelling to public transport. 3. Use zero-emission means of transport. The latter is the easiest solution, but it needs political consensus and predictability.”

“EVs have environmental advantages, but we will also need strategies to reduce the need for transport and a better allocation between the transport modes. We want people to use public transport.”

“The objective is CO₂ neutral transport in all new vehicles. Passenger transport should be shifted to public transport ... Even cargo should be transported by sustainable vehicles.”

3.1.2 NGOs

“The zero-emission car is the best solution. Many initiatives will be needed, including better public transport. The needs are different in urban and rural areas. Fees and taxes should support new technology in the introductory phase ... We have worked hard to promote EVs ... Zero-emission vehicles (all types from BEV, Bio, and Hydrogen etc ...) should have a priority, but the incentives should only be used in the introductory phase until the EVs have achieved a permanent position in the market. In urban areas all transport modes must be seen together. With urban growth one will need additional measures, especially better public transport. This will give people better opportunities to choose.”

“A combination of public transport and vehicles using renewable energy. We have to produce more electricity in a renewable way ... We are contributing by influencing authorities. We work with electric bicycles also.”

“Transition to electrified vehicles is the solution.”

3.1.3 Businesses

“The climate is one problem. Urban development is a second problem, and local pollution is a third problem. Considering only one problem will produce wrong results. Economic incentives should be used. The present fuel taxes do not target the problems in the right way. Road pricing should be applied to differentiate by time, place and technology.”

“Our objectives for BEVs are not public. We were the first to market BEVs. We are putting efforts into BEVs and zero emission. Our target is to be leading in the BEV market, and we have spent large resources to achieve this target.”

“We intend to become the market leader chargeable vehicles in Norway, i.e. PHEVs and BEVs.”

We have sold 7 million hybrid cars worldwide, and we were the first to produce PHEVs ... Hybrid vehicles make up some 50 per cent of our sales, and we expect this share to increase significantly ... We have an ambition to sell more PHEVs. ... We will market a new model with a longer range than today's model ... Should Norway put all efforts into only one technology? Hydrogen vehicles should also have some years of tax exemptions ... Hydrogen vehicles will do with some introductory support and infrastructure ... Our BEV will come, but it is not in our focus now.”

3.1.4 Discussion

Except for one stakeholder, there is no questioning of the objective of reducing the emissions of GHG. The answers vary, but they boil down to a combination of less travelling, more public transport and zero-emission vehicles. However, there is no agreement on how to get to this combination. Land-use plans are important for the future reduction of GHG gases, but not for the present. As shown above, some stakeholders think that the present incentives will do, whereas others are open to revision of the present incentives. Several stakeholders mention the dilemma of supporting EVs while changes of modality and reduction of total transport volumes in cities are important objectives. This dilemma is outlined further in paragraph 3.8.

Some authorities indicate that finding effective initiatives which are also acceptable for the politicians, may be a challenge. A vehicle importer raises the question of support for one technology only, i.e. for BEVs, why not also for PHEVs, hydrogen vehicles etc.

3.2 What does your organisation do?

The organisations and authorities were also asked what their organisation is doing in this field.

3.2.1 Authorities

“We are constructing charging stations for the citizens and for our own transport. Political decisions are made for 900 charging stations by January 2015 and 1100 by January 2016.”

“All municipalities in our county have to submit their plans to us for approval. We are responsible for compliance with national and regional regulations. Now we have two cases concerning parking. We are restrictive concerning parking capacity, which is difficult for the politicians who do not want to be as restrictive as the administration, even when they agree with the objectives and ambitions. We may also have problems in relation to other sections in the administration, e.g. the industrial development section, which consider parking capacity as a competitive advantage. The administration has to work on a long-term basis, producing a fact basis. We need the trust of the politicians, who may consider us out of touch with real life ... The progress in environmental issues is too slow, but that is a global situation rather than only in our county ... The need for BEVs is more evident in urban than in rural areas. However, energy efficiency is important also in rural areas, but energy efficiency is more difficult to understand than exemption from road toll and access to bus lanes. Being better off, the people in urban areas can afford BEVs and the risk they represent.”

“We consider and assess all possible initiatives, starting with the most cost-effective ones. We go down the list until we find politically acceptable initiatives ... We handle free parking and parking regulations, road-toll exemptions, free ferry fares and access to the bus lanes.”

“We are considering introducing BEVs among our own vehicles ...

We count the vehicles in the bus lanes and collect data on bus delays, which is a difficult task ...

Another agency is suggesting a national strategy for charging, defining principles for charging stations in buildings, locations, distances between stations. Charging stations should not be located in the bottom floor of parking houses.

We have disseminated information to the police, fire brigades and rescue services concerning the handling of BEVs in accidents. BEVs require a new way of safety thinking. We have disseminated information to all BEV owners. BEVs have no higher risk than ICE vehicles, but the risk is different ...”

3.2.2 NGOs

“We are contributing by influencing authorities. We work with electric bicycles also. ... We publish a newsletter by e-mail every month. We visit the Parliament, all parties once or twice a year. We have meetings with car importers. We have a website and a web-based discussion forum. ... The need for information is great. We arrange meetings locally and nationally for the media and for the public in general.”

“Our three main areas of efforts are taxation systems, consumer information, and lobbying. More specifically we succeeded in making a warranty system for duration of batteries in the very early stage of EV development. We have developed a consumer guide to BEVs, which is now used by media. We have trained our local staff to guide consumers and owner and to test BEVs. We work in many different ways, making own studies, participating in committees, meetings, support research programs, paving the way for others by letting them use our members in surveys on BEVs. We have also started to develop a test system for second-hand BEVs, will be the first one in the world. Another task is roadside assistance for BEVs needing electricity ... Cooperation with other organisations is an important tool to reach climate goals and find good solutions.”

“We make available neutral and objective information concerning costs, usage and special offers of BEVs and charging points ... We work with municipalities, counties and a little with industry. We have visited between 170 municipalities so far (of a total of 428 municipalities) ... We offer assistance to the municipalities, visiting those wanting assistance with planning ... The number of fleet BEVs was 50 when I started. Now it is 640, mostly in home care service and home nursing. There are much scepticism and myths, such as BEVs being expensive and functioning poorly. Having three-year leasing contract, many municipalities cannot change their motor vehicles immediately. Many municipalities believe that BEV are expensive, because they consider purchase costs only, disregarding the lower fuel costs. The VAT of the leasing contracts is a problem. It is a pity that the proposed VAT exemption for BEV leasing was transferred for approval to ESA (EFTA Surveillance Authority) and thus postponed until ESA will make a decision.”

3.2.3 Businesses

“We contribute by presenting our perspectives to the politicians. New car and fuel taxes should be considered principally and thoroughly.”

“We have invested in training and competence as well as in charging stations.”

“We disseminate information to media and authorities. We cooperate with an NGO, other importers, dealers, energy companies and suppliers of charging systems. We have joined all NGOs working with charging.”

“We sell low-emission vehicles, and we have direct and indirect dialogues with the authorities. It is important to think widely – several technologies.”

3.2.4 Discussion

The incentives to promote the use of BEVs in Norway are extensive as shown in Table A2 in Appendix 3. Further action to promote the use of BEVs is mostly follow-up of the existing incentives. The contributions to increasing the number of BEVs, and thus to the reductions of GHGs, by vary by type of organisation.

Informing and influencing the authorities appear to be an important activity. Facilitating the use of BEVs by information, charging infrastructure, practical assistance and making purchase plans, is another kind of activity which businesses and NGO's can carry out themselves. The public administrations face a conflict between the ideal solutions and what the politicians may accept, consequently they assess possible measures in terms of both efficiency and acceptability. The need to include more technologies than BEV and more modes of transport is also emphasised.

3.3 Do you have an EV strategy?

3.3.1 Authorities

“The number of BEVs will increase with the present incentives. The important thing is to make BEVs available in the market. People want to stick to “their own” brand, waiting for “their” brand to market a BEV. The ministry prefers a technologically neutral strategy, i.e. rules benefitting the best technology.”

“Charging systems are important if BEVs are to be the main cars in the households both for local use and longer trips. The EU is working with standardisation for plugs/ sockets, and payment systems are important. Charging should preferably be set up at places where the user can spend their time on other activities.”

Transnova¹ is the national agency responsible for charging systems. They sent a draft for a strategy to the Ministry in April (2014). This strategy is submitted for public hearing with deadline 30. June. The principles for charging and payment will be included in next year's budget.”²

3.3.2 NGOs

“Our target is to increase the number of EVs in Norway including PHEVs to 200 000 in 2020. We offer fleet analyses to the municipalities and emphasize the success stories, like municipalities objecting to BEVs, then turning into BEV enthusiasts purchasing only BEVs ... Our strategy is to talk to the users of the municipal vehicles first, in order to make them realise that BEVs will satisfy their needs. Then we talk to the purchasing agents ... After talking to the municipalities, I get in touch with the suppliers. When we succeed in making people try out the BEV, we get positive

¹ According to the proposed government budget for 2015, Transnova will be merged with Enova, a government agency for energy saving and environmentally friendly energy use.

² In the proposed government budget for 2015 these principles are postponed until the revised 2015 budget, to be published in May 2015.

feedback. It is much fun to see the sceptics, changing attitudes after a few km of driving a BEV ... I spend a lot of time explaining charging. The municipalities think they need fast charging, but they don't. The home-care services are doing well driving during the day and charging during the night."

3.3.3 Businesses

"We have put a lot of efforts into training. All dealers sell BEVs now ... A lot of resources have been spent. We have not estimated an exact amount. The costs were high in the beginning. We have one person in Norway working with BEVs only. The Scandinavian headquarters has a special product manager for BEVs. Many people in our company have worked with BEVs, e.g. sales of BEV fleets and dealer support. Soon we will get a person to sell BEVs to the fleet market ... We do not try to influence the authorities directly, but we work with two NGOs promoting BEVs."

"We cooperate with environmental NGO's, political parties, and we have sponsored a political event where we had the globally first presentation of a new BEV model and bio-gas vehicles. We have had meetings with other BEV importers concerning recharging infrastructure. We cooperate with another importer and a supermarket chain concerning 80 charging points, with the long-term intention of making 800 charging points."

"We cooperate with an environmental NGO ... Reducing emissions from all kinds of vehicles ... is important. Our ambition is to sell more PHEVs. We use traditional marketing – website, campaigns etc., extensive marketing, beyond the commercial expectations."

3.3.4 Discussion

The draft strategy mentioned above, is a strategy for charging infrastructure rather than for the increase of the use of EVs in general (Transnova 2014). The more general objectives for reduction of GHGs are described in the Norwegian Climate policy 2012 and the Norwegian Climate Proposition 2012.

These policy documents state that by 2020 the emission of GHGs should be reduced by 30 per cent of the 1990 emissions. The average emission from new passenger cars should be less than 85 gram CO₂ per km. By 2050 Norway should be carbon neutral. However, some 200 000 EVs on the Norwegian roads will be needed to achieve the objective of 85 gram CO₂ per km by 2020 (Transnova 2014), i.e. 20-30 per cent of the sales of new cars. (Figenbaum et al 2013, Appendix 3).

The Ministry of Transport, the Public Roads Administration and the Transnova, will, as governmental agencies, comply with official Norwegian environmental policies. However, the Norwegian Climate policy does not mention much about EVs, but the 85 gram CO₂ per km, making Transnova³ a permanent agency, and environmentally responsible purchases of vehicles for the public sector are mentioned (Meld. St. 21 (2011-2012)). These three initiatives may lead to increases in the use of EVs. Moreover, the present BEV incentives, listed in Table A2 in Appendix 3, valid until

³ As mentioned in footnote 1, page 9, Transnova will be merged with Enova from 2015.

2017 or until the number of BEVs reaches 50 000, are considered sufficient to increase the number of BEVs.

The car importers interviewed have different strategies. One of them works mostly internally in their company with training and support to dealers, only cooperating with NGOs for political purposes, whereas another is much more active in trying to influence authorities. Even though they compete in the BEV market, two importers cooperate concerning charging infrastructure.

The climate policy documents have affected the Norwegian Transport Plan 2014-2023 (Samferdselsdepartementet 2012-2013). This plan confirms that the present incentives are to be continued until 2017 or as long as “the number of clean zero-emission vehicles does not increase beyond 50 000.”

3.4 How to increase the use of EVs?

3.4.1 Authorities

“It is important to disseminate the success stories. The municipality of Oslo will replace all its vehicles below 3.5 metric tons by BEVs, a total of some 1000 vehicles. The municipality disseminates information on BEVs to other authorities and nationally, whereas the Norwegian Electric Vehicle Association disseminates information to the public in general.”

“We have a potential for improvement... Ambitions for a better world are fine, but the municipal economy is more important in practice. The ambitions will get a low priority at the end of the process. Law and economy are realities, deciding in the end of the process... There are still very few BEVs, only 15 000 BEVs in our county, but half a million ICE cars. We have to tell the politicians that the number of EVs must increase. Otherwise EVs are only nonsense... The EV growth may depend on the charging infrastructure. The fast-charging points give reliability.”

“EVs are not mentioned in the municipal plan, which includes objectives concerning transport and environmentally friendly vehicles in general, but not how the objectives should be achieved. Our municipality has its own plan for the municipal vehicles, both light and heavy ones.”

“Our municipality has no plan for EVs. We bought 10-12 Think vehicles (early BEVs), but they are scrapped now. Two other small municipalities expressed no plans for EVs. One of the municipalities are considering electric boats for passenger transport to the capital. The county is also working on this issue.”

3.4.2 NGOs

“Our goal is to achieve 30 per cent EVs of the total number of cars in Norway before 2020 (20 per cent PHEVs and 10 per cent BEVs). To achieve this goal we will communicate to the people in general that their daily travels can easily be made by BEVs. Our strategy is to support incentives for all zero emission vehicles in the start phase. We know that an alternative could be restrictions and prohibition ... Charging facilities in apartment buildings are important. Such facilities can receive economic support”

“We have no specific policy for EVs ... Incentives should be technologically neutral, then the market will decide which technology will win.”

3.4.3 Businesses

“The objective should be technologically neutral incentives, transparency and predictable downscaling of incentives. In Norway we have come far enough when it comes to EVs ...”

“We disseminate information to media and authorities, and we cooperate with organisations, other importers, dealers, energy companies, suppliers of charging stations. We sponsor political events, presenting our new BEV and biogas vehicles. We cooperate with a supermarket chain concerning charging stations.”

“There is a great demand, a craving, in the market for BEVs. People demanding BEVs have bought a different brand, even though they wanted our brand. We have trained our personnel – sales and workshops.”

3.4.4 Discussion

To a large extent the present incentives are considered so effective that no further incentives are necessary. These incentives are stated in several official documents concerning climate policies and transport policies. Some problems like the number of EV brands and models in the market, cannot, however, be solved by public incentives. Some NGOs have a strategy to influence the authorities to improve the EV situation even more, whereas at least one NGO and some of the authorities claim that incentives should be “technologically neutral”, i.e. the point is to support anything that can reduce GHG emissions from transport whether it supports EVs or not. There is also some consideration of the costs of the EV incentives vs. other GHG reduction initiatives. By and large the stakeholders observe the national objectives within their own fields of work, supporting infrastructure development, disseminating information, sponsoring political events etc.

3.5 The future of the EV incentives

As shown above, the EV incentives play an important part in the Norwegian EV market. As described in paragraph 3.3 Norwegian public policy documents confirm that the present tax exemption incentives will be maintained until 2017 or until the number of BEVs has reached 50 000. Local incentives, such as exemptions from road toll as well as access to bus lanes and free parking can, however, be reconsidered in view of the traffic volume development in the big cities (Nasjonal transportplan 2014-2023, p. 214). An important question is to what extent the incentives are sustainable in a long-term perspective. Figenbaum, Kolbenstvedt and Elvebakk (2014, p. 75) have shown that the total annual economic value of the local incentives for the users are some 400 million NOK (48.2 million Euros) a year or 16 000 NOK (1928 Euros) per vehicle per year. See also Tables A3 and A4 in Appendix 3.

The incentives are summarised in paragraph 1.2. The sustainability of the incentives may vary a lot between the different kinds of incentives. The stakeholders were asked about the possible downsizing of the incentives, about plans for the future of the incentives as well as possible alternative incentives.

3.5.1 The most important incentive for increased EV use?

Authorities

“The use of bus lanes. Vehicle registration tax exemption is important for Tesla, but not for the other BEVs which would have had a low registration tax anyway because of their low CO₂ emission and low weight. Free parking in public parking lots.”

“The economic incentives are important. A good charging structure is necessary if the BEV should be something more than a local additional car.”

“We have no opinion about incentives ... Only very few local incentives meet the needs of people in the rural municipalities.”

“Vehicle registration tax exemption and road-toll exemption.”

NGOs

“VAT exemption is the most important one. The registration tax exemption is not as important as the VAT exemption because BEVs would have a low registration tax anyway. The annual license fee does not mean much. Road-toll exemption and free parking are more important. Most people realise that the access to the bus lanes will disappear, at least on the busiest roads.”

“A survey among our members show that road-toll exemption is the most important incentive. VAT exemption and registration tax exemption come second. Access to bus lanes is number three, free parking number four, and reduced ferry fares number five.”

“Registration tax exemption. The tax exemption incentives are no doubt the most important. Reduced ferry fares are important in Western Norway.”

“The VAT exemption is the most important for fleets as well as for individual consumers.”

Businesses

“Access to bus lanes and road-toll exemption are definitely the most important ones, making a basis for car number two, which can be paid back in 2-3 years. Registration-tax exemption is number two.”

“VAT exemption is number one.”

“VAT and registration-tax exemption as well as low annual vehicle license fee are equally important.”

“Exemption of VAT and other taxes are the most important incentives. Being the basis, these incentives have to continue. Producing BEVs are more expensive. Consequently, tax exemptions are important to get customers. The importance of the local incentives vary according to where the

customer lives, e.g. the access to bus lanes ... Charging infrastructure is important because of predictability, even though most users recharge their vehicles at home during the night. It is important that the charging points work when the users need them and that the payment system is standardised.

“The combination of VAT exemption, road-toll exemption and access to the bus lanes is the most important incentives for BEVs.”

Discussion

In Table 1 the opinions of the most important incentives are shown by type of stakeholder.

Table 1. The most important incentives by type of stakeholder.

Incentive	Authorities	NGOs	Automotive business
Road-toll exemption	x	x	x
VAT exemption		x	x
Vehicle registration tax exemption	x	x	
Economic incentives in general	x		x
Access to bus lanes	x	x	
Lowest annual licence fee			x
Reduced imposed benefit taxation for company cars			
Increased mileage allowance rate			
Reduced ferry fares			
Free public parking			
Fast charge stations			
Reserved EL number plates			

The economic incentives are considered important, especially VAT exemption and road-toll exemption. The opinions vary concerning the access to the bus lanes, which has perhaps been the *most* controversial incentive. Reduced ferry fares are important in some areas, but not so in the Oslo – Kongsberg region. Incentives related to the use of space seem to be most controversial in the long run, such as access to bus lanes and parking in charging places when not actually using the charger. However, some opposition to the tax exemptions has been presented in the media lately, because these exemptions are considered too expensive (Aftenposten 2014).

3.5.2 Should the present incentives be downsized, changed or maintained?

Authorities

“The incentives are expensive, but they are protected until 2017 or until the number of BEVs reaches 50 000. This is a matter of time, but there are no specific plans to remove or downsize the tax exemption incentive now. The local incentives are more uncertain. If the bus lanes get congested, the BEV access can be removed on certain road sections. We have an example already on one road during road maintenance work.

In the recently revised government budget (2014), the loss of revenue caused by the incentives was assessed, but there was no proposal for reduction.

Road-toll exemption creates problems for road financing in Oslo. This loss is calculated to be 200 million NOK (24 million Euros) next year. This means that the road-toll period will be extended.

Registration tax exemptions are estimated to cost 4 000 million NOK (480 million Euros) annually, most of which is attributed to Tesla Model S, but this exemption includes all vehicles having a lower-than-limit emission rather than BEVs only. However, the estimated loss depends on what alternative kind of car the Tesla customers would have bought.”⁴

“There is no governmental plan for changes of tax exemption incentives, but there is no guarantee for road-toll exemption or access to bus lanes. The road projects financed by road toll will need extended periods of toll collection if the revenue is reduced because of an increasing number of BEVs. There is a real risk for three such projects (Averøy, Finnøy and Osterøy) already.

The access to bus lanes will go first, then the road-toll exemption, but there is no strategy for this downsizing. There are no criteria defined for downsizing apart from those agreed in the “Climate policy settlement.”

“The access to bus lanes can be removed. Having a legal basis in the Road Traffic Act, it can be regulated by existing road signs. PHEVs can to a greater extent be the only car in the household - so if a reduction of the number of cars is wanted, incentives for PHEVs should be considered. But there are no such plans... E-bikes get no incentives. It is important to support demonstration projects. E-bikes could get MVA exemption, but then what about pedal bikes?”

“We should think about the development of the incentives after 2017, especially for those who do not own a BEV now. The economic incentives will be maintained until 2017, but what will happen then? Downsizing is a political matter. We should not speak about that, but downsizing can become a topic for discussion if there will be too many BEVs in the bus lanes. Changes will have to be made in the Parliament.

Road-toll exemption will be critical soon for some of the road-toll projects. It is technically possible to deny access to bus lanes. It can be done by road signs. A system with separate lanes for environmentally friendly transport (low emission or 2+ persons in the car) is possible. Also E-bikes could be exempted from VAT. Equal incentives for PHEVs and BEVs could be fair – but

⁴ This estimate was based on a similar-size, luxury sports car.

probably too expensive... Charging points for people living in apartment buildings will be needed. Reduced ferry fares is absurd. BEVs take up the same space as other cars.”

“The BEVs should leave the bus lanes. Public transport is more important than BEVs. Free electricity is unnecessary, and free parking should be removed first. Exemption from road tolls should be downsized gradually.”

“Lower road-toll revenues because of BEVs will only cause a longer road-toll period. Free parking should be for charging only. The access to bus lanes in no problem in the city – only when entering or exiting the highways. Access to bus lanes is a problem only for certain road sections rather than for the whole country. We already deny access to the bus lane where a road is being reconstructed.”

NGOs

“Incentives must be changed when the supported car type has got a sustainable market level. But not before 2020. BEVs must be supported since other alternatives take longer time than expected. The incentives must be downsized gradually. Access to bus lanes could be taken away. Access should rather be given to 2+ cars. PHEVs has insufficient conditions to thrive. They should get 50 per cent VAT exemption, reduced tax for business cars, increased weight reduction in the registration tax system, effectively lowering the taxes.”

“Reduced ferry fares will go first.”

“The future of the incentives depends on the global situation. If the international market picks up, we can downsize incentives in Norway.”

“The VAT and road-toll exemptions should have a limit, e.g. for vehicles up to NOK 400 000 (48 000 €). The fact that Tesla gets full VAT exemption even for luxury like a glass roof, is negative. We don't expect changes in 2015. The government budget said that the incentives will be maintained throughout 2015. But what will happen then? Access to bus lanes could have a time limit. Giving PHEVs the full incentives, is difficult, because they can be driven as ICE cars. It is important to keep in mind that the number of BEVs makes up only 1.5 per cent of the total number of cars. The incentive framework is good as it is, but the use of an ICE car for occasional, long trips could be included in the purchase price, so that long-distance driving was covered.”

Businesses

“It is time to start downsizing - even before 2017... ... There is no connection between the support for new technology and development of Norwegian industries... The BEV incentives are support to the Japanese car industry.”

“Access to bus lanes will not be maintained for a long time... Downsizing will come, bus lanes first, then free ferry fares and free parking... Downsizing has to be done gradually and predictably...”

“We don't want the incentives to be changed, but we want more favourable incentives for PHEVs.”

“Maintaining the incentives is still important. Many manufacturers are still early in the process. BEVs are expensive, that is why incentives are necessary. Some incentives can be removed, such as free fast charging. The BEV users understand that charging has to be paid for.”

“The BEV incentives will have to be phased out.”

Discussion

The incentives are protected by the “Climate policy settlement” agreed by the Norwegian parliament, until 2017 or until the number of BEVs reaches 50 000. The number of BEVs in Norway was 37 392 by October 2014, and the number increased by 17 per cent during the latest three months (August, September and October 2014) (Grønn bil 2014). If this increase continues, the number of BEVs may well reach 50 000 in early 2015. What will happen to the incentives then?

Figenbaum, Kolbenstvedt and Elvebakke (2014) write: “What is known for the time being from the Parliament’s Climate Policy Settlement from 2012, and the recently accepted National Transport Plan (2014 - 2023), is that no major changes will be made until 2017, or until the number of BEVs in Norway reach 50 000, i.e. 2 per cent of the total fleet of passenger vehicles. What happens after this is up for discussion. The Ministry of Finance in the summer of 2014 started a process of reviewing the tax and incentive structure for all types of vehicle technologies.”

According to the stakeholder interviews there is no strategy for downsizing of the incentives. The relevant political document (Stortinget 2011-2012) says only “*The present tax exemptions for purchase and use of pure zero-emission vehicles will be maintained for the remaining parliamentary period (2017), providing that the number of pure zero-emission vehicles does not exceed 50 000.*” Nothing is said about what should happen or be done when this number is actually exceeded. Zero- and low-emission vehicles will, however, continue to be favoured within the tax system according to this agreement.

The stakeholders agree neither as to which incentives are most important nor which incentives will have to go first. Two stakeholders emphasise the fact that access to bus lanes can be denied already on road sections where the number of BEVs is a problem for the busses. In fact, they mention a case where this is already done. Two car importers emphasise the need for maintaining the incentives, but they also realise that the incentives will have to be downsized in a long-term perspective.

The BEV incentives are debated publicly (Holm 2014; Fridstrøm 2014). The media debate on the BEV incentives seems to be increasing, focussing especially on the costs of the incentives, a reasonable fact since BEV sales have reached 13 per cent of the total new car market in the first six months of 2014 (OFV 2014). The 2015 government budget as proposed to the Parliament in October 2014 says that a ministry-internal committee will look into motor vehicle taxation, presenting their proposals in the revised government budget in May 2015 (Grønn bil 2014).

The continuation of the incentives does, supposedly, depend on the technological and global market situation. When BEVs have reached a stage of competitiveness with other vehicles, the incentives are likely to be reduced and even removed completely. Given the small Norwegian market, the timing of this stage will depend on the development in the large automotive markets.

One stakeholder points to the incentives being support to Japanese car industry rather than to technological and industrial development in Norway.

The incentives are expensive in a short-term perspective, but necessary to continue the relatively high sales of BEVs in Norway. The incentives may, however, become profitable in a long-term perspective (Fridstrøm & Østlie 2014). The stakeholders emphasise the importance of gradual and predictable downsizing.

3.6 Infrastructure for charging

The incentives to promote infrastructure for charging are national. Consequently, the stakeholders' statements below have national rather than regional perspectives.

3.6.1 Authorities

“A government agency (Transnova) has made a strategy for charging of EVs. This strategy was submitted for public hearing with deadline June 1st, 2014. This topic will be included in the government budget for 2015. Models for financing of charging are described in this strategy. Fast charging should be paid for. Present and future infrastructure outside homes is a question of voltage and cable capacity. Charging of EVs makes up about 0.5 per cent⁵ of the total electricity consumption. ... Charging can be commercial in cities, but profitable charging is difficult for charging stations on the long-distance routes between cities. Such charging will require financial support from the government. A potential problem is that people could freeze to death in BEVs in the mountains in winter if they get stuck in the snow. ... Safety and security, e.g. explosion risk, is part of charging strategy. In some cases BEVs have caught fire, but mainly because of “home-made” solutions to the charging problem. There are examples of fires in Tesla in the US, but not in Norway. ... Basically we have enough knowledge of charging.”

“The EU is working on a standard for payment for charging. ... In this sense it is a drawback for Norway to be in the BEV front. Transnova (a government agency) is also working with this problem. A simple procedure for payment is important, but not a governmental responsibility. The cost of electricity is so low. That is why charging is free of charge. The strategy plan for charging says that charging should be paid for, in order to create a market for charging points. Models of financing paid charging, including construction and operation, are a political issue for which the Ministry of transport is responsible. If BEVs are to be used for more than local travel, charging points will have to be available. Constructing charging points in existing filling station is expensive because of the risk of fire, but new filling stations are hardly built anymore. Charging takes longer than filling gas or diesel, consequently other activities should be available at the charging points.

“Construction of charging stations are inexpensive when new car parks in apartment buildings are built, but extremely expensive to fit in later on... The costs of the infrastructure should be paid by the users. There is no reason for free fuel.”

“Our municipality has objectives concerning charging points and charging in local areas.”

“Normal charging is free of charge, but should be paid for. We need a market strategy to collect the payment. We are building charging infrastructure for the inhabitants and for our own transport.

⁵ This estimate is likely to be far too high. A more likely estimate is 0.01 per cent.

There is a political decision about 400 new public charging stations, i.e. 900 charging stations by January 1, 2015 and 1100 by January 1, 2016. We use street parking area for this purpose. All these charging stations are normal charging. Moreover, we are constructing 700 charging points for our own EVs. ... All agencies having EVs are responsible for their own charging points.

We have a strategy for charging, and we do not engage in fast charging. We have a preliminary support system for new products for the consumers, e.g. booking time for charging to establish predictability for private businesses using EVs. There are not that many who do so now. We do not take responsibility for electricity supply. The private electricity market should take responsibility for the capacity of the grid. We participate in testing for a limited period of time. ... The costs for the city is the free electricity and the construction of the charging stations. One charging station with two charging points is about NOK 40 000 – 50 000 (4 800 – 6 000 Euros) to construct and NOK 8 (1 Euro) per day per charging point. Charging money for this service will cost more than this amount, but simple payment methods such as an annual subscription card could have been tried. We need a political decision to test this possibility. ... As to parking, charging should be mandatory in parking facilities equipped with charge points. There is a lot of new technology, and many companies are trying to do something. We can only test the possibilities. If the charging should be paid for, payment for charging and parking should be combined.

Fast charging is a challenge because the maximum required power of electricity supply has to be paid for on a monthly basis even when the fast charging point is not used. This has to be changed. Grid fee is paid by dimensioning rather than by consumption, a system which makes up a large cost for fast charging. We have to find models for sale of electricity and service products, maintenance and certified green electricity, not only the least expensive electricity, but the right quality. The consumers should have the possibility to choose.

The city has built charging stations in areas where people have bought EVs, especially close to apartment buildings, but there is no balance between east and west in the city. More EVs will come in several areas. We have a proposal for 6 per cent of all parking should be reserved for charging. The city has rules for EV charging in new construction of buildings. The builders should be responsible for safety of charging points in new buildings.”

3.6.2 NGOs

“Public infrastructure for charging is decisive. The problem is that fast charging is not much used. Consequently, commercial operation is difficult, but charging stations have to exist to avoid range anxiety. Getting charging points in apartment buildings and workplaces is important.”

“Fast charging is important psychologically and for vacation driving.... The charging stations should be located at transportation hubs to promote public transport. Charging stations at park-and-ride facilities may increase use of EVs and of public transport. Charging stations should also be located at schools, for the teachers, and at the town hall for the municipal civil servants. ... Charging stations in private garages and in residential streets have a high priority now. Fast charging stations should be located in city centres for the future use of taxis and vans.”

“Public charging infrastructure is getting less important. Access to charging at home and at work is more important. Public charging is important for people living in city centres, but not for commuters from the suburbs. We need charging stations where people live and fast charging as a guarantee for

driving range, e.g. at the longest distances from home. There are 5000 normal charging points in Norway. Ideally, charging access should be 100 per cent at home and 20-25 per cent public access including at work. Normal charging stations should be constructed where people live and where they travel. The energy companies say that shopping malls should have fast charging rather than where people live. Fast charging should be located along the main corridors. Fast charging is not economically sustainable yet. There are too many stakeholders, and the economy is difficult.”

3.6.3 Businesses

“Charging infrastructure is important, even though most people charge at home. Infrastructure gives security and increases the sales of EV in rural areas.”

“The charging infrastructure should be developed in line with the number of EVs, including PHEVs”.

“Charging infrastructure is extremely important. The capacity is already too small. We have to build more. Infrastructure is even more important for hydrogen vehicles. People cannot fill hydrogen at home. The charging stations should be deployed where people live and use their cars, i.e. by main roads in the outskirts of the cities in southern Norway and some points between the cities. We do not want cars in the city centres. In northern Norway there are huge distances and few people.”

3.6.4 Discussion

The charging strategy was expected to be followed up in the government budget for 2015, which was published October 8, 2014. However, this budget document proposed that Transnova should be merged with Enova, a government agency for general energy saving and transition to environmentally friendly energy. What consequences this possible merger, starting in January 1, 2015, will have for charging strategy and infrastructure, is impossible to say.

According to the stakeholders, charging at home and at work seem to be the most important ways of charging, but public charging is of course important for people living in apartment buildings with no parking facilities and for long-distance driving. Moreover, the pure existence of public charging stations appears to reduce range anxiety, possibly extending EV mileage. However, commercialising charging stations will be difficult if their main function is to reduce a psychological problem rather than being used for charging.

There is a need for a standard of payment, especially if the free normal public charging incentive will be removed in the future. Now the situation is such that collecting the payment is more costly than the electricity used for charging at normal charging stations, as pointed out by one of the stakeholders.

The stakeholders agree that fast charging is a service which the users should pay for, and, ideally, fast charging should cover the costs of electricity and installation. Most fast chargers are, however, installed with a 25 – 40 per cent support from the government agency Transnova.

3.7 Plug-in hybrid vehicles

“Using cars with low emissions such as hybrids, electric vehicles..., should be economically advantageous.” (Stortinget, 2011-2012). Hybrid cars, especially PHEVs, have lower emissions than ICE cars, and the use of such cars should consequently be stimulated by some incentives. However, PHEVs have not received as many incentives as pure BEVs (see chapter 1.2). Giving incentives to PHEVs appears more controversial than incentives for BEVs, because the reduction of emissions depends on the way the PHEVs are driven. PHEVs can be driven without charging from the grid, as a traditional hybrid vehicle.

The stakeholders were asked about their opinions of PHEV incentives.

3.7.1 Authorities

“It is important to increase the use of PHEVs. PHEVs can to a greater extent be the only car in the family. PHEVs have no special incentives now, except somewhat lower registration tax. . . . Too large incentives for BEVs prevent the development of PHEVs. No plan exists for incentives for PHEVs.”

“BEVs have too many incentives. Having the same rules for both types of vehicles would be fair, but there is hardly an atmosphere for that. . . . PHEVs should be a transition to pure BEVs, which is not necessary in Norway. BEVs sell well in Norway.”

“If PHEVs are to have support, their electric share of driving should be higher than today.”

“It is important to increase the use of PHEV, but not at the sacrifice of zero-emission vehicles. . . . Taxes should be related to the emissions rather than to technology.”

“The municipality continues to phase in EVs, including PHEVs. . . . Charging of EVs and PHEVs is provided for visitors and employees at municipal services as charging infrastructure is constructed.”

3.7.2 NGOs

“Efforts are needed for PHEVs, e.g. remove more of the weight-related registration tax for electric components (weight-related exemption up from 15 per cent to 20 per cent). 50 per cent reduction of the VAT for PHEVs could be an initial assistance. . . . Being controversial, these issues have to be discussed in the near future. . . . Access to bus lanes and road-toll exemption are not going to happen for PHEVs. Plug-in is expensive technology. PHEVs would be easy to sell if the prices were lower. PHEVs are still at an early stage. More models are coming up. The market for PHEVs is primarily the large-car market. Large cars are used for longer travel and holidays as well as for trailer towing.”

“The incentives for PHEVs are too poor. They should have 50 per cent reduction of the VAT, reduction for company cars and reduced weight-related fees. . . . The sales are low, because the prices are too high. The prices decide. We buy bigger and more expensive cars in Norway than in other countries. Consequently, the incentives have to apply to these kinds of vehicles.”

“We thought PHEVs should make up the first wave of EVs, and then the BEVs. PHEVs do not sell well. They are too expensive for the municipalities. There are about 2000 PHEVs in Norway as of October 2014. It is a matter of taxes and tax exemptions.”

“The present differentiated registration tax is OK... The tax should be correlated to the emissions.”

“PHEVs should have the same incentives as BEVs... PHEV is an expensive solution. A PHEV with a simple IC engine as an emergency solution, not for daily travel, should be made. Such a PHEV would solve most range-anxiety problems.”

3.7.3 Businesses

“PHEVs should to a greater extent have the same incentives as BEVs. The present incentives for PHEVs are insufficient. Our first PHEVs get insufficient incentives to compete. They get a higher price from the manufacturer, up to a double price... They should have exemption from road-toll and from company car tax as well as increased exemption from weight-related tax. PHEVs can be user-friendly family cars, as car No 1, and they have towing bars, which is important in Norway.”

“The customers ask for PHEVs – when will they come? If the taxes were reduced, PHEVs and BEVs would take over the market completely... People like environmentally friendly things, as long as they won't have to pay for them.”

“PHEVs have several incentives. They can drive with no emissions, and consequently get a much cheaper fuel. They can be driven more or less environmentally friendly. Consequently, it is natural to distinguish between BEVs and PHEVs. Pure zero-emission vehicles should have a priority.”

“The framework for PHEV must be established. The most important conditions are VAT exemption and registration tax exemption, even though the registration tax is almost zero already for our model. ... The competition against BEVs is tough, because they have a much better framework. ... We have proposed lower toll-road charges, lower company-car tax and reduced VAT. We are hoping for the revised government budget (spring 2015)... PHEVs have a potential for growth. All big manufacturers are putting PHEVs on the market now, a fact which will stimulate the market interest for PHEVs... We are testing inductive charging now. Inductive charging will make charging much easier ... People interested in environmental technology, like researchers and engineers, make up our present target group. We can expand the target group later on. We have computed the profits of PHEV. There would be a greater demand for PHEV if the framework were the same for all kinds of vehicles. In other countries BEVs are more expensive than PHEVs ... Everything depends on the framework.”

3.7.4 Discussion

Two different opinions appear concerning incentives for PHEVs. PHEVs should have more or less the same incentives as pure BEVs because they contribute to reduced emissions and could be the only car in the family, or PHEV should not have the same incentives as BEVs because PHEVs are not zero-emission vehicles. No plan exists for PHEV incentives, but the Government has announced a total

assessment of the motor vehicle-taxation system to be presented in the revised government budget in May 2015 (Grønn bil 2014).

PHEVs have the advantage over BEVs as being more suitable as the only car in the household. However, PHEVs are much more expensive for consumers in Norway than BEVs. Having both ICE and electric motor, PHEVs get higher production prices than BEVs, prices for which the current incentives do not compensate. New PHEV incentives are uncertain, but reduced vehicle registration tax for PHEV has been agreed in the negotiations of the 2015 Government budget (Frydenlund 2014). However, the PHEV sales have increased by 34.6 per cent during August – October 2014 (Grønn bil 2014). Larger PHEVs may fare better in the tax system, however, than the compact PHEVs sold so far, have done.

Consequently the future of PHEVs in Norway is uncertain for the time being, most likely depending on political pressure from environmental NGOs, but also on possible technological development which may result in price reductions.

3.8 Total traffic volume and transport technology

3.8.1 Authorities

“Avoiding that an increased number of EVs will lead to increase road traffic volumes, is impossible. BEVs have no emissions, but other external costs such as tire noise, congestion, accidents and dust. ... We should have a technologically neutral approach, i.e. general regulations favouring the best technology as to emissions. Having spent 20 million euros on hydrogen vehicles, we have so far got 10 hydrogen vehicles. All the time it has been said that it will take only a couple of years before the hydrogen vehicles will take off.”

“Road pricing is effective, but a political matter. Why do politicians not want it? Public transport is the most important technology – walking and public transport.”

“We have to accept a short-term increase in traffic volumes. EVs are fun because they are new. We have to think of the year 2050 and count backwards. We have to have both ICE vehicles and EVs in the beginning, and then dispose of the ICE vehicles. The objective is to reduce the emissions. A BEV costs so much that most people do not buy a BEV in addition to an ICE car. The objective is to reduce the total number of cars, especially in towns and cities.... We buy cars for the worst scenarios, going to the winter cottage in minus 30° C. The market has to develop a response to this problem.”

“Car sharing and dispersion of the road traffic in time. An increased number of EVs is not a big problem when there is no pressure on the roads. For private cars electricity is the right technology. For public transport and heavy goods transport, biogas and biodiesel are the right solutions.”

The questions concerning traffic volumes and future transport technology were only asked to four stakeholders. Another stakeholder asked about the future market, answered:

“50 per cent of the vehicles on the roads in ten years, are already there. BEVs and PHEVs will make up large shares of the sales of new cars, but there will also be a high share of ICE vehicles.”

3.8.2 NGOs

“Private cars should become zero-emission vehicles. Ambitious objectives have to be made even if they may be difficult to reach. Our target is 30 per cent EVs in 2020. Making ICE vehicles more energy and weight efficient is also important. Our target is that the most environmentally friendly vehicles in each vehicle segment should become less expensive.”

“Public transport and bicycles are mainly urban phenomena. In rural areas people depend on cars. What is the percentage of the population living in urban areas? We may close city centres to car traffic.”

3.8.3 Businesses

“EVs are mainly for the small-car market, though Tesla has shown the opposite. PHEVs are well suited for long-distance travel. Hydrogen vehicles are still in an early phase of development, but are well suited for medium-sized cars. Hybrids will increase. Larger cars will come as PHEVs. Both battery and electric engines are expensive.”

“In ten years the battery technology will be good enough for people to use BEVs only. Until then PHEVs will be the solution. ... Hydrogen vehicles will come after 2020 ... Our estimates for the 85g target in 2020 indicate 10 per cent BEVs, 20 per cent PHEVs and 3 per cent annual improvement of energy efficiency, but the energy efficiency development will come to an end.”

“... more car brands coming into the EV market is positive. The more brands in the market, the faster the development. We will get longer ranges with new generations of cars, and a larger share of the population will choose BEVs.It is difficult to say whether BEVs or PHEVs will be more important. Today, the situation is more positive for BEVs. Both kinds of vehicles will increase. Getting good models into the market, is important. We are cooperating with another car manufacturer concerning hydrogen vehicles, which should be in the market in 2017, also in Norway. We have agreed to deployment of hydrogen vehicles in the Nordic countries, but this deployment is delayed.”

“We are positive to lower emissions in the cities and more public transport. The cars should be used as little as possible in the cities. There is no conflict here. Cars are needed outside the cities. Car sharing can be a solution in the cities – maybe even in Norway. Why have your own car in Oslo?”

3.8.4 Discussion

Asked about a possible increase in traffic volumes because of EVs, the stakeholders did not appear worried. However, the need to keep transport volumes in cities down, was voiced. Solving the problems of GHG emissions and local pollutants, EVs do not solve such problems as tire noise, congestion, accidents and dust.

The question concerning future transport technology gave answers like public transport, walking, electricity, hydrogen, biogas and biodiesel, i.e. more or less all possible technologies. This means that there is no single and clear idea about the

future in individual transport apart from the fact that it has to comply with emission regulations. Though not asked directly about compliance with emission regulations, all stakeholders seem to take such compliance for granted.

3.9 Dissemination and communication

Dissemination and communication are important for the introduction of new technology, such as BEVs. Some of the answers below are answers to the question “what does your organisation do?” Consequently, some of the passages quoted below may consequently be the same as those quoted in paragraph 3.2.

3.9.1 Authorities

“The debate about BEV incentives is influenced by media. The BEVs are considered the problem, but the problem is actually the total number of motor vehicles, including the BEVs. The challenge is the accesses to and the exits from the highways where the other cars have to cross the bus lanes to get to the other lanes, rather than the BEVs driving in the bus lanes, but the media simplify the problem too much.”

“Disseminating the success stories, is important in order to increase the number of BEVs.”

“Our second main effort is dissemination, but we need a basis. How to disseminate the main research results, doing something practical to engage politicians and business people?”

3.9.2 NGOs

“We work with municipalities, counties and a little with private businesses ... offering assistance and visiting those who need help for planning,.... We talk with the vehicle importers about innovations in the market, service costs etc.... It is important to make people test the BEVs. Then we get positive feedback.”

“One of our main efforts is consumer information concerning BEVs, a purchase guide ... Politically, we disseminate information to politicians. We also participated in a committee, e.g. a committee proposing the BEV incentives ... Information and communication are also important in relation to our members. Knowledge concerning BEVs is a condition to overcome opposition and myths ... We are concerned about negative media coverage ... Our most important target group is our members. Other consumers should get knowledge about BEV testing through websites ... Information and facts about range are important in rural areas ... The politicians should have information concerning the effects of motor vehicle taxes and tax exemptions ...”

“Our main role is dissemination of information ... dissemination concerning BEVs and PHEVs ... to our members, decision makers and the public at large. We publish a monthly newsletter, talk to the Parliament, all parties, once or twice a year ... We own a website where BEV owners can discuss and exchange information ... It is a challenge to handle the information flow, giving correct information and correcting misleading information. Our target groups are BEV owners, potential buyers, facilitators and authorities.”

“Using our website for dissemination, we are directly in touch with journalists. Sometimes we are successful, sometimes not ... Public bodies and politicians are our prime target groups.”

3.9.3 Businesses

“We do traditional marketing – websites, campaigns, - normal channels ... We have a dialogue with the authorities directly and through environmental organisations.”

“We visit politicians and authorities, often together with organisations ... We cooperate with our members in disseminating information concerning BEV. We intend to be providers of facts, having a technical role ... Politicians, authorities and organisations are our prime target groups.”

“We disseminate information to media and authorities, cooperating with organisations, other importers, dealers, etc ... We have a dialogue with the media, and we disseminate Norwegian experience to the country where the BEVs are produced ... We get a lot of questions from customers, organisations and the media ... We contribute to public analyses, and we provide data to the Ministries of Finance and Environment. We answer questions from organisations and from the Public Roads Administration ... We participate in conferences and seminars ... We have made an app concerning BEV functionality.”

We have a website and a customer magazine, but not especially for BEVs. We receive delegations from all over the world – both journalists and politicians.”

3.9.4 Discussion

Many stakeholders are quite active in dissemination and communication. What they do, depends to a large degree on their roles, but influencing authorities directly or through media and environmental organisations appears important for NGOs. The public in general or potential BEV buyers are also important target groups. These target groups also appear to be communicating a lot between themselves and to be searching actively for information:

“There is a strong «neighbour effect» in the diffusion of BEVs. In rural areas the people have less BEV experience.”

“The customers are well informed and interested. They know what they want, more than before. They learn a lot from the internet.”

“Friends and acquaintances share their experiences, and more types of customers are coming. A BEV is now an “ordinary” car... BEV customers have talked to their friends before buying ... The customers are our best ambassadors, disseminating positive information about BEVs ...”

As more people buy BEVs this “neighbour effect” is likely to grow even stronger. If this communication is mainly positive, as it appears to be, the sales of BEVs may grow even faster in the future.

3.10 What can other countries learn from Norway?

3.10.1 Businesses

“It is important to market Norway as a test arena - both nationally and internationally. As a test arena Norway will be in the forefront of product development.”

“It is important and possible to market new technology using incentives. It is necessary to go from the especially interested to the big mass of customers, such as we have succeeded in Norway. The customers are our best ambassadors, i.e. disseminating positive EV information.”

“Other countries can learn that the incentives are effective, especially when high taxation gives a lot of possibilities for exemptions. The money has effect, but few countries can do like Norway. Giving money to EV buyers is more difficult than tax exemptions.”

“Other countries are interested in the co-operation between various stakeholders in Norway. It is important that everything comes into the market at the same time – product, incentives, charging, infrastructure. Charging points between the cities are important. Infrastructure has been deployed fast in Norway.”

3.10.2 Discussion

This question was only asked to the business stakeholders. Consequently, only a few answers were received. Norway can be an international EV test arena. Incentives are necessary and effective for the marketing of new, expensive, environmental technology such as BEVs. Norway has achieved an interesting co-operation between the stakeholders in this field.

3.11 What factors are special to Norway?

3.11.1 Authorities

“Clean, renewable electricity in Norway.”

3.11.2 NGOs

“Combination of renewable energy and transport. Norway can afford to be experimental. Being outside the EU we can choose. Norway has no car manufacturing. Vehicle taxation is generally accepted. Long distances, topography, climate, special electricity grid gives compatibility with fast charging. Travelling to mountain cabins implies longer driving distance than European average. The general car use – we travel longer in Norway.”

“Many people want four-wheel drive, which will require lower battery costs.”

“We buy bigger and more expensive cars in Norway than in other countries... We need technology good enough for winter conditions. High motor vehicle taxation makes possible the means to change behaviour, e.g. in vehicle purchasing and vehicle use. Norway has enough renewable electricity for EVs. Norway is rich, putting a lot of money into motor vehicles. Norwegians are more

technologically interested than others, a country of early adopters. Norwegian do not travel that much. The everyday travels can be handled by new BEVs.”

3.11.3 Businesses

“BEVs have a range fit for urban driving. High registration tax gives the opportunity to use the taxes actively.”

“The climate limits the range, but a cool climate is positive for battery duration. An EV cannot stand still for a week in – 30 degrees Celsius without harming the batteries. Strong heat is worse for battery duration.”

“The climate is a challenge, giving shorter range. Longer distances and longer driving in Norway than in other countries. Sufficient renewable electricity...Possible to produce hydrogen from this electricity. Other countries lose a lot in the production of electricity and hydrogen. Renewable energy develops slowly in other countries.”

“High motor vehicle taxation makes possible the use of taxation to influence behaviour to achieve political objectives.”

“Road standards and climate. Poor public transport. Park-and-ride is missing. The high motor vehicles taxes give possibilities. Clean and inexpensive electricity. Affluent public economy gives possibilities for stimulation the right kind of behaviour.”

3.11.4 Discussion

On the one hand Norway has several important advantages for the introduction of EVs. Sufficient renewable and relatively inexpensive electricity is an important advantage for the use of EVs and hydrogen vehicles in Norway. Moreover, the high motor-vehicle taxation in Norway makes possible the use of tax exemptions to stimulate environmentally friendly vehicle purchase and use. The relative affluence of the country and its population renders possible the fast adoption of new technology even though it implies a certain economic risk. The cold climate contributes to longer battery duration.

On the other hand there are also some disadvantages. The cold climate limits the electric driving range. Norway has a land area comparable to Italy or Great Britain, but only some five million people, facts meaning that travel distances are longer in Norway than in many other countries. Moreover, the general affluence and the sparsely populated countryside have made possible the widespread ownership of holiday homes, often located considerably more than 100 km away from home (Hjorthol et al 2014). Driving a vehicle to their countryside holiday home without time-consuming stops for recharging may be an important barrier to the purchase of EVs, especially for single-car households with a holiday home.

3.12 The future of electromobility

The stakeholders, except maybe one, do not question the objective of reduction of GHG emissions. There is a positive BEV situation in Norway, i.e. the incentives are effective in contributing to the sales and use of BEVs, especially the VAT exemption and the road-toll exemption. The stakeholders follow up the incentives within their fields of work and some lobby for even more incentives. For public administration some conflicts may exist between ideal and politically acceptable initiatives.

The EV incentives are to be maintained until 2017 or the number of BEVs has reached 50 000. An important question is, however, whether the incentives are sustainable. The stakeholders agree that the incentives will have to be downsized eventually. There is no strategy for downsizing, and no stakeholder knows what will happen to the incentives after 50 000 BEVs or after 2017. Most stakeholders agree that the downsizing has to be predictable and gradual.

Most stakeholders realise that some increase in traffic volumes must be accepted as a consequence of an increased number of EVs, at least temporarily. EVs are just one of many technologies needed to reduce GHG emissions from transport.

More technologies are needed to achieve the objectives, such as hydrogen vehicles and the use of biofuels. Some reduction in individual road transport by car is also necessary and is deeply rooted in the Norwegian environmental and transport policy (Climate policy settlement 2012; Samferdselsdepartementet 2012-2013).

Charging at home and at work are the most important ways of charging. Public charging points are important for people without private parking facilities and for long distance travel.

PHEVs face an uncertain future, but more support for PHEVs is announced in the 2015 Government Budget negotiations, i.e. further reductions in the vehicle registration tax for PHEVs.

Many stakeholders are active in dissemination and communication concerning EVs. A “neighbour effect” seems to exist, i.e. communication between BEV owners and potential BEV buyers concerning BEV experience.

Norway has the potential to be an international EV test arena, or may be considered so already, but Norwegian industry does not seem to be using this possibility for product development or marketing.

The high motor-vehicle taxation in Norway makes possible the stimulation of environmentally friendly vehicle purchase and use. Sufficient renewable electricity is another advantage for electromobility in Norway. The affluence of the country and its population render possible a certain risk-taking in adopting new technology.

4 Barriers and potentials for EV development?

What are, on the one hand, the barriers and challenges to the increased use of EVs in Norway? And on the other hand, what are the potentials and opportunities? The stakeholders' answers to these questions are provided in this chapter.

4.1 Barriers and challenges to the increased use of EVs

4.1.1 Authorities

“Norway has all possible incentives. The most important barrier is scepticism among the public in general. Having experienced that their computer battery loses capacity, most people will think that the same problem will apply to the BEV batteries. There are no political barriers to increased use of BEVs (in Norway)... Electromobility is an expensive measure to reduce emissions of greenhouse gases, about NOK 30 000 (3 600 Euros) per metric ton CO₂ avoided, with the present incentives. The Tesla gets a tax exemption of 0.5 million NOK per car (some 60 000 Euros). It is expensive, but it may be right if it leads to innovation.”

“Safety is important. Much attention has been paid to fires in BEVs, but BEVs are safer than “fossil” vehicles. Uncertainty about the duration of the batteries produces uncertainty about costs. The second-hand value of BEVs is also uncertain. Fast technological improvement may reduce the second-hand value ... Other challenges are related to the use of road space. Buses can be delayed a few minutes when cars drive on and off the public roads, crossing the bus lanes. This problem should be possible to solve with better design. We do not know exactly the size of these delays. It is difficult to get data from the bus companies ... Increased use of BEVs might replace “carpooling”, because EVs have low marginal costs per km.”

“Uncertainties about changes in incentives. Availability and price of BEVs. Uncertainty about second-hand value, but this is less of a problem now than earlier. The second-hand value of plug-in hybrids will plunge.”

“Political attitudes – hydrogen vehicles make up a barrier because the politicians will rather go for infrastructure for hydrogen ... We are waiting for an action programme for hydrogen mobility ... Hydrogen infrastructure will require too large efforts ... The competition between electric vehicles and hydrogen vehicles has become a barrier ... With the hydrogen policy, finding municipalities interested in BEVs has become a problem ...

The idea that the BEV problem is solved, is another barrier. In reality BEVs have come a short way only. There are 15 000 BEVs and 500 000 ICE vehicles in our region.”

4.1.2 NGOs

“We depend on the products mix marketed by the manufacturers.”

“No challenges for us. We focus on handling the abundance of information, providing the right information and correcting misleading information.”

“Some of our members are sceptical, but that is OK. There is a wide consensus within our organisation to go for BEVs. To build know-how about battery capacity, charging and testing to help the staff at the test stations and our members in general, is a technological challenge. Few people using fast chargers is a problem with respect to commercialisation.”

“The most important challenge is the question of continuing the incentive framework or not. The sale of BEV will stop if the incentives should be removed. The continued framework is crucial ... The high leasing prices charged by the leasing companies are a barrier. Leasing a BEV is twice as expensive as leasing an ICE vehicle. We have to study this problem more closely. Maybe the companies assume a zero value of the BEV after three years of leasing. Leasing is important for small municipalities to avoid maintenance and second-hand sales. Leasing is expensive, however. One town saved 1 NOK (0.12 €) per km driven by owning vehicles compared to leasing ... The municipalities get VAT compensation for vans, but not for passenger cars, but the home care staff do not want to drive vans.”

“Leisure travelling to cottages (a normal weekend and holiday destination in Norway) where charging is not available, may be a barrier, especially for one-car households”

4.1.3 Businesses

“The challenges are the same as for other kinds of transport – local environmental problems, congestion, and land use. EVs take up the same space as other vehicles. Road construction needs financing. The vehicle registration tax is important for road financing. The exemption from this tax causes a problem.”

“To establish a sufficient network of charging stations is a challenge. A strategy for such a network is still missing. Another challenge is a system for booking a charging station. People in Norway want the car to satisfy all travel needs when buying vehicles ... BEVs make up a new technology for the car manufacturers, having scarce experience with this technology ... Consequently, they put severe software limitations on the use of the batteries to avoid discharging. Nobody knows how the batteries will work in 10 years from now. This caution is in conflict with the need for increased capacity.”

“We need to invest a lot, about NOK 300 000 for each dealer, in training. Almost all dealers agreed to sell BEVs.”

“Training the sales staff and the workshop staff has been a large investment, but we are used to training personnel.”

“EVs represent a new technology, entailing a lot of training.”

“The incentives are not good enough for PHEVs. Some municipalities are opposed to allowing PHEVs to use public charging points ... We have proposed lower VAT and lower company-car benefit tax, but these are uncertain.”

“The grid capacity is a problem – especially for Tesla. Other barriers are the lack of standardisation for charging as well as the taxi regulations which do not allow requirements concerning BEVs or hydrogen vehicles to be linked to the taxi permit.”

4.1.4 Discussion

The main challenges seem to be uncertainties about durability and life of batteries, of the second-hand value of the vehicles and of the future of incentives. According to the stakeholders these uncertainties seem to make at least parts of the population sceptical to BEVs. These uncertainties pose a challenge for those who are responsible for correct information about BEVs. A car importer and car dealer, however, hardly sees any barriers to the sales of BEVs, but the staff training has been a large investment and thus a challenge.

The limited number of BEV types available in the market has been and may still be a barrier, especially if potential BEV customers want to stick to their favoured car brand. Convincing the consumers that BEVs can be used for everyday short trips as well as for longer weekend or holiday trips, may be a severe challenge for BEVs in the single-car household market. Charging – especially for long distance travel can still be a problem, especially on days with much long-distance holiday traffic. Tax exemption and congested bus lanes may become increasing problems as the number of BEVs increase.

The idea that the BEV challenges are solved already and the political interest now focussing on hydrogen vehicles may be barriers for further improvement of the BEV conditions in the Oslo-Kongsberg region.

Most barriers, however, appear to be transitional in kind, i.e. they are due to electromobility being in an introductory stage rather than inherent in electromobility itself. Examples of challenges that may be more than transitional, are grid capacity for fast-charging stations and faster home charging wanted by owners of EVs with large batteries as well as standardisation of charging.

4.2 Potentials and opportunities

4.2.1 Authorities

“The number of BEVs will increase with the present incentives. The important thing is to make BEVs available in the market.”

“The (present) incentives are more than sufficient for further increase. Introducing BEVs among our own vehicles is being considered. This is a great potential. We should be a good example.”

“It is important to disseminate the success stories.”

“Vehicle fleets are a possibility, but it develops slowly. There is a potential in the population as can be seen from the sales statistics. Infrastructure for charging is also a potential. A Japanese study shows that there are more BEV owners in areas with fast charging stations. Fast charging stations

provide security even when they are not used. Car rentals should offer ICE vehicles for long trips for people having BEVs for their daily trips. The profitability of BEVs is a potential for municipalities because of lower operating costs. The purchase of BEVs should be the responsibility of the accounting departments rather than the environmental departments, to show the profitability of BEVs. One municipality has saved about 100 000 Euros in one year, using BEVs.”

“One of the municipalities are considering BEVs and hydrogen vehicles to be used as taxis.”

“The high motor vehicle taxes and road tolls in Norway make tax exemption incentives possible ...”

4.2.2 NGOs

“EVs give us more members, higher incomes and consequently more importance ... Batteries will be developed further, and smart charging will come ... The incentives should be sustainable.”

“The development of zero-emission vehicles means that less attractive alternatives like restrictions and increased taxes and prices can be avoided. Communicating this information to the consumers is important to increase certainty ... Increased support for business cars, leased cars, is important. Business cars constitute 50 per cent of the total sale, but only 25 per cent of the BEV sale. One should look at incentives for these cars.”

“The continuation of the incentive framework is crucial to the BEV sales. The potential fuel economy. Spreading the success stories.”

Having the potential users trying to drive BEVs, changing attitudes after a few km driven.”

4.2.3 Businesses

“Introduce technologically neutral incentives and let the market decide.”

“Charging stations were discussed as a possibility for our members, but we do not work with that now. Our members do not see a common policy for charging now. Public transport is the most important matter in handling environmental challenges in the cities.”

“A large number of BEVs is important to test new technology. Norway is in the front concerning the number of BEVs. As a test arena Norway can be in front in developing new products. Consequently, maintaining the incentives is consequently of great importance to Norwegian industry.”

“EVs are a part of our public responsibility. We want to shift towards BEVs. Having a large share of the car market in Norway, we want to change towards an environmental profile to achieve the climate objectives in Norway and in the world. We have made a sustainability report.”

“Coming into the market early with a good product, has been extremely positive. We have got new customers this way. The brand value has increased because we are a world leader in BEVs. We gambled and had success.”

“Our kind of EV, the PHEV, has a potential for growth. All manufacturers will produce this kind of vehicle now, a fact which will increase the interest in the market. Maybe our kind of vehicle will get improved incentives in 2016?”

4.2.4 Discussion

The question of EV potentials and opportunities overlap to a certain extent with the question of how to increase the use of EVs. The present incentives are considered important, even sufficient, to the further development of electromobility in Norway. Fast-charging infrastructure will reduce range anxiety. To have a wide selection of BEVs available in the market is also considered an important condition to the further development of electromobility. Several manufacturers seem to be about to market new BEV models, and Norway seems to get a high share of the new BEVs produced, because the number of incentives and the expected high sales in the near future. Moreover, the incentives make Norway an important test arena for BEVs, especially consumers' use of EVs. BEVs being considerably less expensive to operate than ICE vehicles, creates a potential for BEV fleets in municipalities and businesses. In total the potential for BEVs in Norway appears promising at least as long as the main incentives are maintained. For PHEVs the outlook depends on possible improvements of incentives and the supply of more brands.

4.3 BEV safety

BEV accidents and fires have been issues in the media and in the public BEV debate.

4.3.1 Authorities

“Safety is an important barrier. A lot of attention has been paid to fires in BEVs, but BEVs are safer than ICE vehicles. We need to communicate more about this issue ... A lot has been done. We have informed the police, the fire brigades and the security services about how to handle BEVs involved in accidents. Charging points should not be located on the bottom floor of parking houses. BEVs require a different way of thinking safety. We have sent information to all BEV owners.”

“Safety is part of the charging strategy, e.g. the risk of explosion. Sweden and Norway have cooperated in this topic. Some cases of fire in BEVs have happened, but these are said to be the result of “home-made” solutions to charging ... BEV give poor heating possibilities if stopping in the mountains in winter” ... (Many main roads in rural Norway pass through mountain areas with rough winter weather occasionally causing closed roads and leaving the vehicles to wait for snow clearing.) “... We have sufficient knowledge to solve these problems.”

“BEVs require a new way of safety thinking ... BEVs have no higher risks than ICE cars, but the risks are different ... We have disseminated safety information to all BEV owners ... Good ventilation is necessary for charging points inside parking basements in apartment buildings.”

4.3.2 Businesses

“We have trained fire brigades and the emergency services.”

“We try to convince the BEV customers to install the home-charging unit, primarily for safety reasons. Our BEV has an artificial sound when driving up to 30 km/h and when backing...”

4.3.3 Discussion

Today the *road safety* of EVs are rated by EuroNcap like that of other cars, and their ratings are equal to ICE-cars of the same size (EuroNCAP 2014; Figenbaum & Kolbenstvedt 2014, chapter 8). Some incidents related to *fire and electric safety* have happened, but the current vehicles have automatic functions turning off the electric power in cases of crash and when potential electric hazards occur in accordance with safety standards applying to electric vehicles and established industry practices.

Safety does not appear to be an important issue in electromobility, according to the stakeholders, even though some attention was paid to BEV fires in the beginning. As one stakeholder says *“BEVs are safer than ICE vehicles...BEVs require a different way of thinking safety.”* Some safety training and dissemination have been carried out, and BEV safety does no longer seem to pose a problem. There may, however, be a need for continued training of emergency staff, especially as EVs sell more also in rural areas.

4.4 Industrial potentials

New technology could imply industrial potentials. In the early years, this potential was realised through the production of BEVs in Norway (Figenbaum & Kolbenstvedt 2013, pp. 10 – 19). In the current interviews with the stakeholders the BEV industrial potential was only mentioned by three stakeholders, but then as a potential which is not realised, at least not yet.

4.4.1 NGOs

“Private industries will have to become more active in constructing charging stations – together with the bus companies, the railway and the car dealers. Nissan is a good example ... Shopping malls should also have charging points.”

4.4.2 Businesses

“The gas stations have not started yet. They will start being charging stations as soon as the need arises or when the single members see a market ... We are deeply concerned about the lack of relation between support for new technology and the development of Norwegian industry ... Other countries are much more efficient in using support for new technology also as a support for industrial development. The present incentives (in Norway) subsidise Japanese car industry. We should get something in return ourselves also, e.g. in the aluminium industry. When Norway is putting a lot of efforts into being the global test arena for BEVs, we should get something in return ourselves. I miss a strategy for industrial development connected to the development of new technology ... The main challenge is that the potential in the BEV efforts is not to the advantage of the Norwegian industries.”

4.4.3 Authorities

“Marketing Norway as a test arena for BEVs both nationally and internationally, giving Norway an advantage in product development. Consequently, maintaining the incentives is of industrial interest.”

4.4.4 Discussion

However, this latter passage is quite general, not mentioning a single example of how the alleged advantage is exploited. In the meeting with one of the organisations an idea called «Charging many» was presented by a group of students, but nothing was said about Norwegian industry wanting to develop this idea further. On the one hand the early industrial development of BEVs in Norway⁶ and the following bankruptcies may act as barriers to further industrial exploitation of electromobility. On the other hand Norway has an active automotive supplier industry and several companies manufacturing part for EVs, such as chargers and gear shifters.

4.5 Barriers and potentials

According to the stakeholders uncertainties about durability of the batteries, of the second-hand value of BEVs and of the future of the incentives, are the main challenges. The limited number of BEVs available in the market has been a challenge up to now. The limited range, or the idea of range limitations, is also a challenge, especially to stakeholders trying to provide correct information about BEVs. Charging, especially during longer trips, may also be a challenge. Tax exemptions and congested bus lanes may become challenges as the number of BEVs increases. Most challenges are transitional, but the grid capacity for fast charging and faster home charging as well as standardisation of charging may be more permanent challenges.

The existing incentives make up a great potential for further sales of BEVs, as long as they are maintained. Extended fast-charging infrastructure has a potential for reducing range anxiety. The increasing number of EV models available in the market makes up another potential. The electromobility potential appears promising in Norway, at least as long as the main incentives are maintained.

The safety of BEVs can be considered a barrier, as stories of BEV fires and accidents have appeared in the media. These events, however, were related to earlier EVs, see paragraph 4.3.2. One stakeholder claims that BEVs are actually safer than ICE vehicles, but they require a different safety thinking, i.e. a potential. As a rather new technology electromobility has an industrial potential, which was used in BEV manufacturing in Norway in the 1990's, but the failure of these industrial efforts may have become a challenge to further industrial exploitation of electromobility.

⁶ Two manufacturers, Think and Buddy, produced BEVs some 15 years ago, but his manufacturing has ceased.

5 Stakeholders, users and potential buyers

5.1 Possible to compare?

Knowledge of the experiences and attitudes of current EV owners as well as possible future EV owners is important for stakeholders on various levels in society. The knowledge, attitudes and behaviour of BEV users and potential users among ICE car owners are reported by Figenbaum, Kolbenstvedt & Elvebakk (2014). Data concerning BEV users and potential users in this chapter are taken from that report, unless otherwise referred to. Data concerning stakeholders are taken from chapters 3 and 4 of this report. For obvious reasons exactly the same questions were not asked to the stakeholders and to the users and potential users of BEVs. Moreover, open questions were used in the stakeholder interviews, whereas the users were asked to respond by fixed alternatives of BEV advantages and challenges.

Topics in common for the stakeholders and the users are:

- The incentives
- Charging
- Attitudes to and experience with BEVs
- Information and communication
- Future perspectives

5.2 The incentives

Norway has many incentives giving the BEVs a competitive price, lowering the operating costs and furnishing the BEV-owners with comparative advantages, see Table A2 in Appendix 3. When asked to evaluate the degree of importance of different factors when buying a BEV or an ICE car, around 70 per cent of the BEV owners and the ICE owners rated “*Best car for my need*” as important or very important, see Table 2.

When buying a BEV *Low operating costs* is by far the most frequently mentioned factor of large or very large importance; mentioned by 81 per cent of the BEV owners. Among ICE owners no more than 39 per cent give operating costs the same rating. This factor includes several incentives such as no road toll, free parking, and reduced annual vehicle license fee, as well as lower energy cost per km driven. The most frequently mentioned single incentive is no road toll, said to have “large” or “very large” significance by a total of 66 per cent of the users.

Table 2. Reasons for buying a BEV and an ICE car, factors having a large or very large importance. Per cent.

Reason	BEV owners	ICE car owners
Best car for my need	68	72
Save time using bus lanes	30	
Economically favourable		
Competitive price	55	48
Free toll roads	66	
Free accessible parking	40	
Low operational costs	81	39
Interested in		
Environment	64	25
New technology	40	22
Car safety	29	63

Source: Data from Figenbaum, Kolbenstvedt and Elvebakk (2014)

The stakeholders also consider the economic incentives important, especially the *VAT exemption* and the *road-toll exemption*. Thus they have the same opinion as BEV owners on the importance of free toll roads, an incentive lowering the operative costs. As to VAT exemption the stakeholders seem to emphasise this factor more than the users do. This factor is included in a question concerning competitive price, which also includes the registration-tax exemption. 55 per cent of the BEV owners and 48 per cent of ICE owners say that competitive price has a “large” or “very large” significance. However, both BEV and ICE-car owners find low operational costs more important than *competitive price*.

30 per cent of the BEV owners consider *bus-lane access* as being of “large” or “very large” significance. However, their opinions of the local incentives vary greatly between regions. The opinions concerning the importance of access to the bus lanes vary considerably also among the stakeholders. ICE-car owners were not asked questions related to factors giving the EVs local competitive advantages.

5.3 Charging

Support for establishing a charging infrastructure is another type of EV incentive. Even though charging is a topic in common for stakeholders and users, the stakeholders were asked about infrastructure for charging whereas the BEV owners were asked about their own charging behaviour. Some 50 per cent of the BEV owners say that they charge *only* at home, in their own garage, carport or parking space. 15 per cent say that they charge daily at work. All other charging possibilities are less frequent. This is well in accordance with the stakeholders saying that charging at home or at work are the most important ways of charging.

71-73 per cent of the BEV users say that they use fast charging “infrequently or never”, and 46-55 per cent say they use normal public charging facilities or charging facilities at shopping centres “infrequently or never”. Nevertheless, 88 per cent of the owners say they feel comfortable to use up to 80 per cent or more of the battery capacity when driving.

The newer generations of BEVs have batteries giving enough energy for daily travel (see Hjorthol et al 2014). Range anxiety in Norway is no longer a daily challenge. It is the longer weekend or holiday trips that make charging infrastructure necessary. These facts fit well with the stakeholders saying that “*the pure existence of public charging stations appears to reduce range anxiety*”. It is also in line with Transnova’s (2014) suggested charging strategy with urban charging stations, regional corridors with charging stations and car-sharing programmes for urban areas.

5.4 Attitudes to BEVs

The BEV owners as well as ICE owners were asked several questions concerning attitudes to different aspects of BEVs. Table 2 shows an overall picture of the great differences between BEV owners and ICE-car owners who will not consider buying a BEV next time they should buy a car.

Table 3. BEV aspects considered “big advantage” or “big disadvantage” by three categories of car owners. (A = advantage, DA = disadvantage.) Per cent*.

BEV aspects	ICE car not considering EV		ICE car considering to buy an EV		EV owners	
	Big A	Big DA	Big A	Big DA	Big A	Big DA
Uncertainty about incentives	0	39	0	40	0	31
Uncertainty of second hand value	0	32	0	25	0	15
Vehicle heating system	1	15	7	10	19	10
Operating costs	30	6	60	0	80	0
Purchase price	12	18	28	10	31	2
Vehicle safety	2	9	9	9	34	1
Time to charge	5	64	7	41	0	18
Access to charging stations	3	73	11	48	0	22
Vehicle range	2	85	8	64	5	21

*The categories in between “big advantage” and “big disadvantage” not shown.

Source: Data from Figenbaum, Kolbenstvedt & Elvebakk (2014).

As shown in Table 3, the former group having actual experience of BEVs sees far more advantages and fewer disadvantages of this vehicle type than does the latter, in which group the disadvantages dominate. It seems like they evaluate two completely different products. Between these two groups we find ICE-car owners who will consider a BEV next time, evidently having established somewhat better knowledge of this product. These facts show the great importance of information and knowledge of the new product, an issue that was also emphasised by some stakeholders.

The stakeholders were not asked directly about their attitudes to BEVs. Nevertheless, they expressed their attitudes indirectly in their answers to several questions asked.

Themes that both users and stakeholders evaluated were:

- Purchase price
- Operating costs
- Charging related themes
- Uncertainty about incentives
- Uncertainty about second-hand price
- Safety and environment.

All over, the stakeholders seem better informed than the public in general, here best represented by the ICE-car owners not considering a BEV. This difference is positive, but if the stakeholders suppose that the public in general has the same level of knowledge this might be a challenge; the latter group being the one that must be stimulated to more environmentally friendly choices in the future.

5.4.1 Charging related themes

The stakeholders claimed that charging at home and at work were the most important ways of charging. For these ways of charging time has only a minor importance, because the battery can be fully charged during the time most people spend at home or at work. Thus, the stakeholders are in accordance with the majority of the BEV owners considering the time to charge, the range, etc. as small disadvantages.

Some 20 per cent of the BEV owners consider the three charging related items big disadvantages as shown in Table 3. The difference between the BEV owners and the ICE-car owners is large. Among those persons in the latter group who are not potential BEV buyers in the near future, the share considering these aspects big disadvantages is much larger. 64 per cent found time to charge, 73 per cent access to charging stations and 84 per cent the vehicles range to be big disadvantages. For these items the attitudes of ICE owners considering buying a BEV are found to be in between the other two groups, as can be seen from Table 3.

The stakeholders also said that convincing the consumers that BEVs can be used for everyday short trips as well as for longer weekend or holiday trips, may be a severe challenge for BEVs in the one-car household market. Challenges for stakeholders

might be to see the large need for knowledge among ICE-car owners and not to underestimate the need for establishing charging infrastructure or other solutions for longer trips.

5.4.2 Uncertainty about incentives

This is a factor for which the BEV owners and the ICE-car owners have a more similar evaluation than for other factors. 69 and 61 per cent among BEV owners and ICE-car owners respectively consider the uncertainty about incentives a disadvantage (small or big). The stakeholders considered the future of the incentives as one of the three most important challenges to the increased use of BEV, emphasising the importance of gradual and predictable downsizing of the incentives, factors which may reduce the uncertainty for the users.

5.4.3 Uncertainty of second-hand value

Of the BEV owners 15 per cent consider the second-hand value a big disadvantage. The ICE-car owners have a larger degree of uncertainty. 25 per cent of potential BEV buyers and 30 per cent of other ICE-car owners consider uncertain second-hand value a big disadvantage. The stakeholders consider the uncertainties about duration of batteries and the second-hand value of the vehicles as two of the three most important challenges to the increased use of BEVs. Thus, most stakeholders seem to consider the uncertainty of second-hand value as more severe than the users do.

However, a car dealer says that “*the customers do not talk much about this (second-hand value). Historically, our brand does well in the second-hand market.*” An importer of another brand says “*We guarantee the battery for five years or up to 100 000 km driven, with a minimum of 75 per cent capacity... This guarantee gives predictability... In the US we have consequently seen a higher second-hand value and certainty for the customers.*” The fact that the car dealers and importers do not worry about the second-hand value, may indicate that the uncertainty of second-hand price is a problem getting lower on the list of concerns in Norway. This situation may be different in countries with fewer BEVs on the roads. Moreover, the cold climate in Norway may contribute to improved battery life. Most battery-life issues reported are related to hot climates.

5.5 Assets of BEVs

Seen from the users' perspective the important assets of BEVs are the lower operational costs, that the cars satisfy their needs, and the environmental assets of the car, see Table 2 in section 5.3. 63 per cent of the BEV owners mention *the car's environmental characteristics* as a reason for buying a BEV. Among ICE owners in general environment is only mentioned by 25 per cent. The stakeholders interviewed are well informed on the environmental asset of different types of EVs.

ICE-car owners are generally very much engaged in *the vehicles safety* when buying a car, see Table 2. Evidently, this fact represents a challenge for the diffusion of BEVs.

Only 2 and 9 per cent of ICE-car owners, not considering respectively considering to buy a BEV, consider the vehicle safety of BEVs to be a big advantage. Among the BEV owners 34 per cent consider vehicle safety as a “big advantage”. Only five stakeholders mentioned safety at all, of which two were asked directly about vehicle safety. One stakeholder claims that *“BEVs have no higher risks than ICE cars, but the risks are different.”*

As mentioned in paragraph 4.3.3, the *road safety* of EVs is no longer a great challenge. Car dealers, the Public Roads Administration, the Norwegian Directorate for Civil Protection, as well as some organisations, educate their staff and the buyers and emergency personnel according to the stakeholders. In total BEV safety does not appear to be an important issue, according to the stakeholders, a result which is well in accordance with the BEV owners’ evaluation and the general experience (see Figenbaum & Kolbenstvedt 2013, chapter 8).

5.6 Information and communication

Among the BEV owners 77 per cent mention media as an information source before buying a BEV, and 28 per cent mention family and friends. The COMPETT surveys show the importance of social networking in the diffusion process. 30 per cent of current BEV owners have friends who have bought a BEV after them, and 37 per cent have friends considering to buy a BEV next time. Some 30 per cent of the ICE-car owners will consider buying a BEV. Among the potential BEV owners who have friends with BEVs the share of potential buyers is significantly higher, 44 per cent. This “neighbour effect” probably works in different ways, getting information from persons they trust and getting an opportunity to see and test a BEV in real life.

As described in paragraph 3.8 the stakeholders see the potential buyers as an important target group for their dissemination activities. They underline that the customers are well informed, especially through sharing experiences with friends and neighbours.

5.7 Future perspectives

According to the stakeholders there is no detailed strategy for incentive downsizing. Political documents state that the incentives should be maintained until 2017 or until the number of BEVs reaches 50 000. Nothing is said about what will happen after this number is reached, which is likely to occur in early 2015. However, in the government budget for 2015, a ministry-internal committee has been announced to inquire into the motor vehicle taxation, including BEV tax exemptions, presenting their results in the revised government budget in May/June 2015.

Access to bus lanes can be denied already on road sections congested by BEVs. The incentives are expensive, but considered necessary for still some time to maintain the relatively high sales of BEVs in Norway.

The latter statement is confirmed by the BEV owners. Lower operating costs for BEVs and free toll roads are the two most important factors when buying a BEV, mentioned as having large or very large significance by 81 per cent and 66 per cent respectively of the BEV owners, whereas 64 per cent mention the environment. The share mentioning local incentives is smaller; 30 per cent mention access to bus lanes and 40 per cent free parking. This low share for access to bus lanes and parking spaces reflects that there are large regional differences for the local incentives.

5.8 Stakeholders, users and potential buyers compared

Table 4. The most important incentives by type of stakeholder. Factors of great importance when buying a car mentioned by BEV owners, potential BEV buyers and other ICE car owners.

Incentive	Authori- ties	NGOs	Industry	BEV owners	Potential BEV buyers	Other ICE-car owners
Economic incentives in general	x		x			
Competitive price						
VAT exemption	x	x	x	x	x	x
Reg. tax exemption						
Lower operating costs				x		
*Road-toll exemption	x	x	x	x		
*Low annual licence fee			x			
*Fast charge stations					x	x
*Reduced ferry fares						
*Reduced imposed benefit taxation for company cars						
*Increased mileage allowance rate						
Practical car for my need				x	x	x
*Access to bus lanes	x	x				
*Free public parking						

In general the stakeholders are well informed about the BEV owners' knowledge, attitudes and behaviour, but some stakeholders appear unnecessarily concerned about the owners' or buyers' uncertainty about the future of the incentives, the second-hand value of BEVs and the vehicle range. Table 4 shows a high degree of agreement concerning the importance of the incentives between three categories of stakeholders and the most important motives for buying a car among the three categories of vehicle owners.

However, the stakeholders should perhaps be more conscious of the differences between the present BEV owners, the potential BEV owners and the ICE-car owners who do not want to buy a BEV next time, especially concerning the perceived BEV disadvantages in the latter two groups, as shown in Table 3. Disseminating information concerning the practical BEV use and safety to the BEV owners is important, but disseminating more BEV information to those who have not yet bought a BEV is maybe even more important to increase the percentage of BEVs in the total number of motor vehicles. Time needed to recharge a BEV, access to charging stations and vehicle range are the factors considered big disadvantages by 64, 73 and 85 per cent of the ICE-car owners not wanting to buy a BEV next time.

6 Discussion and conclusions

6.1 Discussion

The share of EVs is still less than 2 per cent of the total number motor vehicles in Norway. Even though BEV sales in Norway are high compared to most other countries, the question of how to increase the EV share rapidly is still important. Maintaining the BEV incentives, especially the economic ones, is crucial, until mass production and further technological development have made BEVs economically competitive without economic incentives. However, mass production, further technological development and consequent lower production prices, do depend on considerable sales in larger markets than Norway. When downsizing the BEV incentives, it is important to do so in a gradual and predictable way.

Putting more efforts into the sales of BEVs to private businesses and public bodies is another possibility. Increasing the marketing efforts emphasising the low operational costs of BEV could be effective in the fleet market according to some of the stakeholders.

The PHEV sales in Norway have so far been quite limited. Introducing some economic incentives, like halving the VAT to 12.5 per cent, could stimulate the sales. New PHEV models and more PHEV brands coming into the market may also stimulate the sales. However, if PHEVs should receive so much incentives that they become considerably less expensive than ICE vehicles of the same size, there is a risk that some people will buy PHEVs for economic reasons, not bothering to charge them, i.e. running them mostly on fossil fuels. However, the lower fuel costs for electric operation would perhaps motivate PHEV owners to charge their vehicles.

The incentives appear decisive for the BEV future in Norway. The economic incentives are to be maintained until 2017 or the number of BEVs has reached 50 000. The latter is likely to occur in early 2015. Will all incentives be maintained even when this number is reached, or will the downsizing of some of the incentives start? Will changes in incentives be postponed until the results of the inquiry into motor vehicle taxation are to be published in May 2015? The questions can be asked, but trying to answer them at the time being, will be mere speculation.

A high population growth is expected in the Oslo-Kongsberg region in the coming 10 – 20 years. Though contributing to the reduction of the GHG emissions from road transport, EVs cannot contribute to solving congestions due to the expected population growth and the consequent growth in transport volumes. How to reduce congestion in areas with population growth? Only one stakeholder indicated that there are more problems to be solved in the transport sector than the GHG

emissions. However, the questions in the interviews focussed on climate problems rather than transport problems in general.

6.2 Conclusions and the need for further research

All stakeholders are aware of the political objective of reducing the GHG emissions from transport. All but one stakeholder appear to accept this objective and to try and comply with it and adapt to it. Most stakeholders consider the present incentives positive and even sufficient to continue the high sales of BEVs in Norway. The “neighbour effect” may become stronger as the number of BEVs increases, giving an extra increase in the BEV sales.

The stakeholders also appear to agree that the incentives are expensive and will have to be downsized sometime in the future. Apart from asking for gradual and predictable downsizing, most stakeholders seem to think that the main incentives should be maintained until BEVs achieve competitive production prices. If BEV bus-lane access causes congestion in the bus lanes, this access can be denied in the road sections where such problems appear. The potentials of EVs in businesses and public bodies, i.e. in the fleet market, have not been fully utilised as yet. Neither has the potential of using PHEVs for reduction of GHG emissions been utilised.

One project will never answer all questions even within a limited topic. Questions for further research within electromobility are:

- How to make EVs attractive to people in rural areas?
- Evaluation of possible future changes in incentives.
- So far, BEVs have mainly been car number two in multi-car households, though the beginning of BEVs as the only car in the households has been observed by Figenbaum, Kolbenstvedt & Elvebakk (2014). What requirements must be fulfilled to make BEVs attractive also for single-car households or as the only kind of car for multi-car households? Is PHEV the solution?
- Electromobility includes electric bicycles, but in practice this kind of EVs are not included in the Norwegian part of the COMPETT project. To what extent can e-bikes contribute to reduced GHG emissions? Are e-bikes suitable during cold winter months? E-bikes are, however, included in the Austrian parts of COMPETT.

In Norway private consumers make up the dominant BEV owner group, whereas private businesses and public bodies, with some exceptions, lag behind in the BEV development. How can these latter markets be developed? Will new incentives be needed? Can more BEVs in private businesses and public bodies contribute to improvement of the charging infrastructure?

Some of the stakeholders state that handling the amount of information concerning EVs and disseminating correct information are important challenges. In what way

can research contribute to correcting EV myths and disseminating facts about the EV development?

Economic factors such as production and marketing costs, training of sales personnel, fuel costs, battery costs, fiscal incentives, etc. will be decisive in the further EV development. How much do each of these factors and the combination of them mean for the further EV development, and how can these factors be used to stimulate the further EV development?

As mentioned, the incentives, both the fiscal and the local ones, are debated because of their costs. What are the real costs and benefits of the incentives in short-term and long-term perspectives, in terms of tax revenues and for local as well as global environmental issues?

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Appendix 1: Interview guide

The interview guide below is a maximum version including questions to all kinds of stakeholders interviewed. In the practical interviewing questions were selected for each kind of stakeholders.

Topics for all interviews and meetings

How to increase use of EVs?

- What are the most important incentives today? Why?
- Could/Should today's incentives be changed in some way?
- Should different types of EVs such as BEVs and PHEVs, be treated more equally?
- Are there other new incentives that would be better? Why?

Barriers and opportunities

- Which barriers for the diffusion of EVs can you see?
- At different levels, local, regional, national, global?
- What opportunities or potentials do you see for further increase in EVs?

Knowledge use

- Can research based knowledge contribute to the market development and the political decisions? (Maybe give the respondent some examples?)
- EV infrastructure (Fast/Semi-fast chargers, park and charge solutions, inter-modal transportation)
- What kind of information related to EV-diffusion do you miss?

Topics for national authorities

Incentives for increased EV-use vs reduction in total car use

- When should different incentives be downscaled?
- Are criteria for downscaling defined? (In addition to the limit of 50.000 EV-cars in bus lanes)? What should the criteria be?
- Do you know governmental plans with regard to the incentives we have?
- How can one avoid EVs leading to more cars in total, i.e. EVs not becoming additional vehicles?
- For which type of transport technologies should society pave the way?

The societal responsibility for charging infrastructure

- What is the need for charging infrastructure away from home now and in the future?
- Which principles or criteria should be used for building the charging system geographically? ,
- How should the number of normal vs fast chargers be balanced? What consideration are made?
- Do you think there are any safety and security problems related to EVs? What does society do to handle such possible challenges?
- Who should pay the charge and the infrastructure for charging?

Topics for local and regional authorities and politicians

Local area- and transport planning

- Does your county/municipality have a strategic master plan or transport plan with a clear policy for lower emissions including an EV policy?
- Do you have a strategy for intermodality and for measures to make EV more useful in combination with intermodality?
- Can you give some examples of such measures and how they work?

Local vs national incentives

- Which local incentives do you have here in X-county and Y-municipality?
- What are the plans for your local incentives?
- Should they be kept, taken away or changed? Why?
- Any plans or ideas for new types of incentives?

Incentives for increased EV-use vs reduction in total car use

- When should different incentives be scaled down?
- Are there defined criteria for downscaling?
- Do you know the central government's plans for the current incentives?
- How to avoid that EVs become additional vehicles that might/could increase the total car use significantly?
- How to combine EV incentives with the defined policy that all further growth in transport in our urban regions should be handled by public transport, walking and cycling?

Niches for fleets of different EVs

- Which kind of fleets do you have in your county/municipality?
- Do you know the EV adoption rate in your area? Totally and for private users vs fleets?
- For which type of businesses or public fleets do you find EVs, PHEVs, EREVs most useful?
- For which type of businesses or public fleets do you find compact, medium, SUV, sports, luxury EVs, most useful?

Barriers on various levels

- Which barriers for the diffusion of EVs can you see in your region?
- Among different stakeholders; politicians, users, car industry?
- How can counties and municipalities contribute to overcome such barriers?

Topics for car importers

The producers' expectations to the development

- Do you face problems in acquiring the vehicles you want for Norway?
- What do they think about the EV future in the Norwegian as well as the European market?
- How is the sale in different parts of the country? Are there regions with a saturated market? Regions with strong growth or potential growth? _

Different types of cars

- What about the market for PHEVs vs BEVs?
- What about alternative fuels, e.g. hydrogen?

Organisation of the sale

- What do importers emphasize when they choose types of cars?
- Organisation of the sale, are there elements that influence the dealers, e.g. bonus to salesmen?
- Is the sale organized in relation to the local incentives at hand?

Others

- Number and types of complaints from the dealer to importers?
- Do importers have data for mileage and date of registration, or is this a task for the dealers?
- What are the characteristics of a well-functioning and sustainable EV market?
- Which experiences are important to pass over to other countries/counties/municipalities from establishing a new EV market

Topics for car dealers and workshops

What influenced the EV marketing in your business?

- Why did you start to sell EVs?
- What is the role of importers? Do they decide, or how do they try to convince you to sell EVs?
- Did you test the cars before getting the models for sale, how long, in what way?
- Do you have an overview of charging stations and other EV-assets in your region?

How did you prepare for the EV marketing?

- Did you organize special education of salespersons and staff in the workshops?
- Investment in special equipment?
- Investment in charging stations? Was this challenging?
- Introducing your own incentives just for your vehicle brand

EVs' importance for economy of the business?

- Are EVs easy to sell? Has this changed over time?
- Is it easier to sell in summer than in winter months?
- How many EVs have you sold?
- Are your provision the same for EVs and conventionally fuelled cars?
- What is the EV's share of the annual turnover?
- How many of your employers drive an EV?
- Do you get the cars needed or do you have a queue of customers waiting for cars?
- Do you lose customers due to this lack of cars?

What is the share of car buyers handing in a used car?

- What are the brands and fuel technology of the used cars?
- What are the sizes of the used cars compared to the EV's bought?
- For customers who do not hand in a used car, do you know if they have sold their former cars, or do they buy the EVs as the second or third car in the family?

The sales process related to individual customers

- Can you give an example of your typical EV client? Do the EV buyers differ from clients for other cars?
- (Gender age, education, economy, technology interest, living area etc...)
- Do your clients have competence on electromobility and charging, and in case - where did they get it?
- Can you estimate the share that make the EV decision after they got to the car dealer?
- Do you find that the EV buyers have made up their minds for which make and model in advance to a larger extent than those who buy other cars?
- What do your salesmen tell the customers about the EVs range, climate mitigation advantages, winter challenges, charging system, incentives etc.?
- Are the customers concerned that the period for the incentives might come to the end? If so, what do you tell them?

Fleet customers

- Do you have a marketing strategy for fleet customers?
- Do you sell many EVs to this type of customers?
- Do you have special actions or incentives to sell more EVs to fleet customers? Which ones?
- To what kind of fleet customers have you sold cars?
 - Companies, Public agencies, Car sharing, Welfare services, craftsmen?
- Is the sales process mostly organized by use of tenders? Does this mean that you only deliver the cars directly to the user?
- Difference between public vs private fleet buyers?

After the sale

- What kind of feedback do you get from your EV clients?
- Do you get more or less complaints for EVs than for ICE vehicles?
- Do importers handle EV complaints well? Better or worse than for other car types?

Maintenance

- What is the profit on maintenance and service?
- What do the car mechanics think about EVs? Do they prefer to take care of the EVs?
- Are all workers at the workshop trained for EV maintenance?

Future market.

- What do you believe the market for EVs (and your EV brand in particular) will be the next two years?
- What will the competition for PHEVs look like the next years?
- Is the market for used cars an issue theme in the sales process? What kind of used car market is it now?
- Do you have data on the EV mileage in relation to registration date (from service notes) Are there data for energy consumption per km that can be collected from the service register?

In addition for each importer or dealers

- Some questions concerning their specific models and sales packages, marketing strategies etc.

Appendix 2: National and regional perspectives The Oslo – Kongsberg region

According to the COMPETT project proposal, Wp4 should focus on “Regional electromobility”, and in Norway the Oslo-Kongsberg region was chosen as the test region. During the project work, however, the regional perspective has been extended to a more national perspective, especially as the electromobility stakeholders are concerned. Nevertheless, some information concerning the Oslo – Kongsberg region may be of necessary for some readers of this report.

The Oslo-Kongsberg region is defined as the Norwegian study area in COMPETT. The region is located in the southern part of Norway to the south-west of the capital Oslo, see figure.1. In COMPETT the Oslo-Kongsberg region has been defined to include the following municipalities: Oslo, Bærum, Asker, Lier, Hurum, Røyken, Nedre Eiker, Øvre Eiker, Drammen, Kongsberg, Svelvik, Sande, Hof and Holmestrand.



Figure 1. Map of the main study area, the Oslo-Kongsberg region.

The region covers various types of living areas, i.e. city centre, urban region, smaller towns and countryside. Some characteristics of the region are found in table A1. The region includes 20 per cent of the total population of Norway, 20% of the total fleet of vehicles and 40 per cent of the total number of the EVs in Norway. The share of EVs in the total fleet was 1.6 per cent on January 1st 2014 in the Oslo-Kongsberg region and 0.8 per cent for all of Norway. Table A1 shows that the highest share of EVs is found in the suburban community of Asker. By October 2014 the total EV fleet in this region reached 12 654, an increase of almost 60 per cent since January.

Table A1. Population and vehicles in the Oslo-Kongsberg region and in each municipality. January 1, 2014

Municipality	Type of municipality	Population	Total vehicle fleet	EV fleet	EV share of total fleet
Oslo	City	634 463	263 807	4 237	1.6%
Bærum	Suburb	118 588	81 839	1 255	1.5%
Asker	Suburb	58 338	28 282	1 454	5.2%
Lier	Rural and suburb	25 175	13 087	251	1.9%
Hurum	Rural	9 330	4 943	81	1.6%
Røyken	Rural	20 621	10 772	195	1.8%
Nedre Eiker	Rural	23 811	11 928	45	0.4%
Øvre Eiker	Rural	17 919	9 722	19	0.2%
Drammen	Town	66 214	40 669	266	0.7%
Kongsberg	Town	26 406	13 606	30	0.2%
Svelvik	Rural	6 580	3 365	15	0.4%
Sande	Rural	9 036	4 736	33	0.7%
Hof	Rural	3 091	2 756	9	0.5%
Holmestrand	Town	10 456	5 327	19	0.4%
Total		1 020 992	493 839	7 909	1.6%

(Source: Statistics Norway 2014. Population January 1, 2014, Total fleet of passenger vehicles and EVs January 1, 2014, EVs registered as 4 wheel MCs added to both fleet of passenger vehicles and EVs, from the vehicle register of the Norwegian Public Roads Administration)

Appendix 3: Electromobility in Norway – the current incentives

Increasing the number of EVs is a defined part of the Norwegian Climate Policy and Norway is using a broad spectre of incentives to make BEVs competitive and attractive. The present policy and incentives to promote electromobility in Norway are described in Table A2, taken from Figenbaum and Kolbenstvedt (2013).

Only two incentives apply to plug-in hybrid vehicles (PHEV), i.e. reduced registration tax and free charging at public charging stations (Figenbaum & Kolbenstvedt 2013, pp. 25-29).

In summary the incentives for fully electric vehicles are:

Fiscal

- Vehicle registration tax exemption
- The lowest annual licence fee
- Reduced imposed benefit taxation for company cars
- VAT exemption
- Increased mileage allowance rate

Local

- Access to bus lanes
- Road-toll exemption
- Reduced fares on national road ferries
- Free public parking with or without free charging
- Charging stations – normal and fast

Other

- Reserved EL number plates

In total these incentives make up extensive economic advantages for the owners or users of electric vehicles, as shown in Tables A3 and A4.

The COMPE'IT project has also calculated the average economic value of the local incentives for the average BEV driver based on the estimates for each incentive. In Table A4 the results have been scaled up to the size of the BEV fleet in April 2014, 25 000 BEVs. The total economic value of the local incentives 400 million NOK, (48.2 million Euros) or 16 000 NOK (1928 Euros) per BEV.

There will be huge differences between BEV owners. In extreme cases an owner could save up to 70 000 NOK (8 434 Euros) per year, whereas others could save nothing from the local incentives.

Table A2. BEV incentives in Norway. Source: Figenbaum and Kolbenstvedt (2013)

Incentive	Introduced	Importance	Evaluation
VAT exemption when buying EVs	2001	++	EV's are more expensive to produce than traditional vehicles causing VAT to be higher. A 12 500 € price increase of the vehicle results in a 3125 € increase in VAT making the vehicle 15 625 € more expensive to the consumer. This would actually increase government income unless the VAT is exempted. The Exemption in Norway has evened out the price difference between EV's and conventional cars.
Access to bus lanes	2003/2005	++	Very efficient in regions with large rush-hour delays in the traffic. The disadvantage is that only a limited number of vehicles can use the bus lane before buses are delayed. There is a risk of increased vehicle ownership if people drive an EV in the bus lane rather than taking the bus. Minibuses were banned from the bus lanes in 2009, leaving EV's as the only vehicle type consumers can buy to get access to bus lanes.
Exemption from registration tax	1990/1996	+	The exemption from the registration tax was introduced temporarily in 1990, and permanently from 1996. It was based on the value of the car and the exemption was very important to initiate test programs in the 1990s. Today this tax is totally changed and most EV's with a weight below about 1540 kg would anyway get a zero tax, given the way the tax system works. Examples of tax on gasoline vehicles: VW Up: 2 600 -3 600 €. VW Golf typical taxes: 5 600-9 400 €. The tax on these competing vehicles makes the EV's more competitive.
Free parking	1999	+	Effective where parking space is limited. A limited number of places are available and many have a time limit. Little influence on the total number of EV's unless parking spaces are converted to EV parking on a larger scale.
Free toll roads	1997	++	This measure has a large impact when the toll roads are expensive. This is the case many places in Norway. In the Oslo-area the costs are 600-1 000 €/year for commuters. Some places in Norway there are tolls exceeding 2 500 €/year, resulting in EV sales in unexpected areas such as small Islands with underwater tunnels to the mainland.
Reduced annual vehicle license fee	1996/2004	+	Three rates apply for private cars. EV's and hydrogen vehicles have the lowest rate of 52 € (2013-figures). Conventional vehicle rates: 360-420 €.
Reduced rates on ferries	2009	0	Not important up to now, few use it and the value of the incentive is limited.
Reduced imposed taxable benefit on company cars	2000	0	This incentive had little impact up to 2012 but might be more important from 2013 for the sales of Tesla Model S. This should be an attractive company car, given its long range and the free of charge supercharger network put in place by Tesla in Norway.
Financial support for charging stations	2009	+	Reduce the economic risk for investors establishing charging stations, and the range issue for EV owners is alleviated as they can charge the vehicles during a longer trip. Contributes to expansion of the EV market, and aids in get more EV miles out of every EV. The EV alternative becomes more visible to the population.
Fast charge stations	2011	+	Fast charging increases the EV miles driven and the total EV market. It becomes easier for fleets to use EV's and is a premise for using EV's as Taxis.
Reserved EL number plates	1999	+	Increases visibility and makes other incentives easier to control, i.e. free parking, exemption from toll road charges.

Table A3. Total costs of fiscal incentives. Norway 2014. (Figenbaum 2014)

Incentive	Cost million €
Registration tax exemption	120
VAT exemption	140
Free toll roads	16
Reduced annual tax	10
Reduced ferry rates	5
Total	About 300

Table A4. Calculated, approximate values per year of local incentives per car and for total fleet*.

Incentive	Value per car NOK/year	Value for EV fleet million NOK/year	Value per car Euros/year	Value for EV fleet million Euros /year
Toll-road	3 622	91	434	11
Bus lane	7 832	196	940	24
Free parking	3 347	84	398	10
Free ferries	1 195	30	145	4
Total	15 996	400	1 928	48

*) Total fleet in Norway = 25 000 EV's in April 2014. 25000 BEVs, April 2014; 1 € = 8.3 NOK , August 2014. (Figenbaum, Kolbenstvedt and Elvebakk (2014)

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