Mission-oriented R&I policies: In-depth case studies

Case Study Report

The Norwegian EV initiative (Norway)
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European Commission
Directorate-General for Research and Innovation
Directorate A — Policy Development and Coordination
Unit A.6 — Open Data Policy and Science Cloud
Contact Arnold Weiszenbacher
E-mail arnold.weiszenbacher@ec.europa.eu
RTD-RISE@ec.europa.eu
RTD-PUBLICATIONS@ec.europa.eu
European Commission
B-1049 Brussels

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Mission-oriented R&I policies: In-depth case studies

Case Study Report

The Norwegian EV initiative (Norway)

Frank Skov Kristensen
Morten Lauge Thomassen
Leif Henrik Jakobsen

A Study coordinated by the Joint Institute for Innovation Policy

Directorate-General for Research and Innovation

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1 **Summary of the case study**

This document analyses the case study of mission-oriented policy initiatives in the field of the Norwegian EV policy from 1989 until the present day.

The following table describes the main components of the case study:

<table>
<thead>
<tr>
<th>Title:</th>
<th>Norwegian EV Initiative</th>
</tr>
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<tbody>
<tr>
<td>Country:</td>
<td>Norway</td>
</tr>
<tr>
<td>Thematic area:</td>
<td>Transport</td>
</tr>
<tr>
<td>Objective(s):</td>
<td>The first objectives were to create an industry of electric vehicles in Norway. This was done through the first tax incentives. Later on, the Norwegian parliament decided that by 2025, all new cars that are sold shall be zero (electric or hydrogen) or low (plug-in hybrids) emission.</td>
</tr>
<tr>
<td>Main Governing Body</td>
<td>The Norwegian Parliament and the Norwegian Electric Vehicle Association</td>
</tr>
<tr>
<td>Timeline:</td>
<td>1989-2025</td>
</tr>
<tr>
<td>Budget:</td>
<td>The initiative is mainly funded by taxes.</td>
</tr>
<tr>
<td>Brief description of the case (250 words)</td>
<td>The initiative began in 1990 with the environmental organisation, Bellona, being the spearhead to register the first electronic vehicles with the Norwegian Motor Vehicle Register. This helped clarify the regulations and made sure there was the required expertise in Norway. The Think electric vehicle was the first domestically-produced electric vehicle in Norway. In the late 1990s and beginning of 2000s, major operators entered the market. Ford bought Think, etc. It was then the foundations of the most important tax incentives were made. These incentives created an increase in the demand for electric vehicles and especially in 2003, the demand skyrocketed as the trials of Electric Vehicles in bus lanes began. However, when the demand rose, Think had been sold, which meant that they could not deliver cars at that time. The demand was covered by the import of electric vehicles, especially French. One of the disadvantages of the incentives was the fact that people started buying electric vehicles even though they weren't safe – it seemed like they prioritised fast lanes over security. The years after resulted in Think going into bankruptcy several times and by 2011 they were closed. In the meantime, several major car producers had entered the market of electric vehicles. After, Transnova was started; Transnova is a government instrument and was given the responsibility to support a programme for the establishment of charging stations. The different incentives created an even higher demand the following years. All in all, it is the incentives with tax reduction and the structural incentives with the opening of bus lanes, that creates the driving forces and thus the possibility to reach the overall goals (Figenbaum &amp; Kolbenstvedt, 2013).</td>
</tr>
</tbody>
</table>
### Implementation and organisation (a brief description of the governance and policy instruments used)

The Norwegian Parliament has issued several incentives on how to make the people buy more electric cars. The incentives are both tax-related and behaviour-related (or structural related). The incentives are:

- No purchase/import taxes (1990)
- Exemption from 25% VAT on purchase (2001)
- Low annual road tax (1996)
- No charges on toll roads or ferries (1997 and 2009)
- Free municipal parking (1999)
- Access to bus lanes (2005)
- 50% reduced company car tax (2000)
- National investment in charging stations (2008)

### Observed / expected outputs, outcomes, and impacts

**Outputs and new instruments**

Ever since the start in 1989, where the first focus on electric cars began, the development of electric vehicles has been increasing and this has produced certain other outputs:

- In 1994, the Norwegian EV-producer PIVCO successfully operated 12 EVs during the Winter Olympics in Lillehammer;
- In 1995, the Norwegian industry set up the Norwegian Electric Vehicle Association to promote electric vehicle interests;
- In 1998, the international launch of Think at EVS15 in Brussels. Think was a producer of electric cars, originally named PIVCO;
- 1999, introduction of special EL registration plates;
- 2008, Oslo launches municipal EV charging infrastructure programme, which goal was to install 400 EV charging points in the city;
- In 2011, Mitsubishi launched their i-MiEV, which was a mini-electric car. It sells 1050 units the first year;
- In 2012, there were a cross-party political consensus to uphold Zero Emission Vehicles financial incentives until 2018 or until there are 50 000 Zero Emission Vehicles sold in Norway. In 2012, there were 10 000 cars vehicles sold;
- Today app 150 000 EV’s are driving in Norway, and presently there are almost 9000 charging stations across Norway;
- Latest figures from new car sales, October 2017 show that 40 % of new car sales in Norway are zero emission cars.

**Outcomes**

- Since the initiative started, there has been a general increase of focus on electrical vehicles and an expansion of charging infrastructure.
- The Norwegian Parliament has issued several tax incentives and structural incentives, which makes it easier, cheaper and more comfortable to move around in an EV.

**Impacts**

- At the start of 2017, the market share of electric vehicles reached 37%, which is more than 100 000 electric vehicles (Kane, 2017).
- 2003, explosion of demand of electric vehicles due to the permission to travel in bus lanes.
- 2009, ferry ticket exemption.
- 2013, plug-in hybrid vehicles have been given a greater weight reduction of 15% when calculating the registration tax.
From 2011-2014, the electric vehicle market has exploded. It went from 1% market share in 2011 to 14% market share in 2014 (Haugneland, Bu , & Hauge, 2016).

- 2 out of 5 cars sold in Norway are electric vehicles.
- By 2017, the number of registered electric vehicles was above 100,000 (Statistics Norway, 2017).

### Main elements of mission-oriented R&I initiative

<table>
<thead>
<tr>
<th>Directionality (links to societal challenges, industry transformation):</th>
<th>YES. Affordable and clean energy is one of the Sustainable Goals defined by the United Nations, and Norwegian EVs are directly related to it. The goal will make sure, that by 2030 “there will be universal access to affordable, reliably and modern energy services” (The United Nations, 2015). In this case, the Norwegian EV Policy is on its way to be ahead of the goal as the government has already set up several incentives on how to make modern energy services universally accessible. Besides, the Norwegian government has issued clear goals on how to reduce greenhouse gas emissions through the transport policy, etc. This relates to the UN Sustainable Goal of Climate Action.</th>
</tr>
</thead>
</table>
| Intentionality (specific, well-articulated targets): | YES. The Norwegian Parliament has decided on a goal that all new cars sold in 2025 should be zero or low emission. Besides, a White Paper from the Environmental Protection Agency from 2012 declared, that in 2020 the average emissions from new private vehicles will not exceed an average of 85g of CO₂/km. To achieve this goal, the report described different measures and incentives that should be included, i.e.:

- “Continue to use vehicle taxes to contribute to the shift to a greener and a more climate friendly vehicle fleet
- Continue to be internationally at the forefront in facilitating the use of electric and hydrogen vehicles
- Provide plug-in hybrids with access to parking with charging facilities (charge stations for EVs)” (Figenbaum & Kolbenstvedt, 2013)

These measures and incentives have been implemented to a high degree. Most interesting in this case is the willingness to support the intentions by actual investments and measures all along the period. This is most likely due to the fact that the fight against climate change and initiatives to support that fight always have had a broad backing in the Norwegian parliament (Stortinget).

Therefore, despite changing governments over the last 25-30 years, there has been a common consensus that Norway must be willing to invest in the transformations needed, and within a national comparison be a front runner, when it comes to fight climate change and preserve nature. Stating missions and describing intentions is easy and costless, it is the follow through that is the hard and costly part.

A critical assessment of the CO₂ abatement cost within the Norway EV initiative, where all the incentives in form of car tax deductions, lower road tax, free parking and so on showed that the cost of reducing one tonne of CO₂ was USD 13,500. A very high cost compared with simply buying a ton of CO₂ in the market at a price of USD 6-8.

In other words, does making a cost benefit assessment on current cost of abatement as the above make any sense if you, especially when applying procurement incentives like the EV scheme in Norway, are to initiate a transformation?
<table>
<thead>
<tr>
<th>Clearly set timeline and milestones:</th>
<th><strong>YES.</strong> The overall timeline is set; by 2025 the only cars sold should be zero or low emissions. Besides, the Environmental Protection Agency, as mentioned before, stated that in 2020 the average emissions from new private vehicles will not exceed an average of 85g of CO2/km. Currently, Norway is ahead on the target of an average of 85g of CO2/km, and with latest figures showing that 37-40% of new cars in Norway are zero emission, the earlier projections have been surpassed.</th>
</tr>
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<tbody>
<tr>
<td>Mobilises public and private investments:</td>
<td><strong>NO.</strong> The initiative is a public initiative made by the Norwegian Parliament, through tax incentives, so there are no direct private investments. Yet the tax reductions on each car are around NOK 100 000 or EUR 11 000, on top of that add lower VAT, free parking; the cost in terms of lost revenue for the state from the initiative is significantly above EUR 2 billion. And in the National Transport Plan (NTP), 2018-2020 NOK 16.6 billion or approximately EUR 2 billion is allocated to tax incentives, where the incentives given to the EVs are the majority. Within the recent NTP, R&amp;D investments are planned to development of SMART traffic systems.</td>
</tr>
<tr>
<td>Focused on new knowledge creation (basic research, TRLs 1-4):</td>
<td><strong>NO and YES.</strong> Initially the EV policy was designed as a procurement measure where tax incentives were applied to stimulate the demand for EVs built in Norway. At that time, EVs were at a very embryonic stage, having a low range (below 60 km) and in general a poor performance and low safety. This worked in conjunction with R&amp;D funding for development of EVs in Norway and a series of grants to demonstration projects in various municipalities testing and using the first EVs. Some of this funding was co-founded by the EU in earlier WP and EU funds. The understanding of these measures as a procurement measure to spur demand for Norwegian EVs, and thereby R&amp;D within the Norwegian EV sector ran up until around 2010, where Think and another EV initiative Buddy, that was bought in Denmark in the 1990s. After the collapse of the EV sector, in Norway the EV initiative became a climate initiative and a core means to reach the CO2 emission cut targets within transport in Norway. Studies showed that the only way to actually reach the CO2 emission cuts in Norwegian transport was to ensure a transformation into EV and other zero emission cars and vans. Within the last couple of years, the EV initiatives are again spurring R&amp;D investments within the private sector, but now related to first and foremost the development of EV charging and billing stations. Having more than 100 000 EVs on the roads and within the National Transport Plans a dedication to co-invest in a national charging station net, Norway is becoming a global testbed for developers of charging stations and ancillary services to EVs. In conjunction with the EV initiative, Norway is one of the first European countries to have made laws whereby from 1 January 2018, is legal to place self-driving cars on the roads. This, together with earmarked national funding within the NTP 2018-2029 to be handled by Enova, the Norwegian R&amp;D fund for SMART traffic solutions and R&amp;D support for SMART traffic solutions, opens up the EV initiative acting as a base for sectorial development within Norway within self-driving car services, and the development of SMART traffic systems.</td>
</tr>
<tr>
<td>Focus Area</td>
<td>YES. This initiative focuses on an expansion of the charging infrastructure, which requires further development of knowledge and knowledge application.</td>
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<tr>
<td>Multi-disciplinary (inter-disciplinary and/or trans-disciplinary):</td>
<td>YES. Even though the initiative is mainly a transport initiative, it also includes economy, environment, etc. The tax incentives may give the citizens more money to spend on other things, the expansion of the charging infrastructure creates more jobs, etc. Further, the initiatives also rest upon understanding human nature and human behaviour, and what will incentivise humans to change. Within the scheme based on questionnaires send out to EV drivers, who are members of the Norwegian EV association, the economic incentives are vital. Yet figures together with the replies show that especially the rule that allows EV and other zero emission cars to use the bus lanes are very important. This is simply because EV drivers can therefore dramatically reduce their commuting time, especially in the larger cities like Oslo.</td>
</tr>
<tr>
<td>Joint coordination (multi-level and/or horizontal governance of policies/finance):</td>
<td>YES. The Norwegian Parliament stands behind the initiative and there has been a broad coalition of different political parties involved in the programme. This broad coalition has through 25-30 years created stability as to the goals of the mission and the intention to achieve the mission.</td>
</tr>
<tr>
<td>Reflexivity (flexible policy design, timely monitoring):</td>
<td></td>
</tr>
<tr>
<td>Openness (connected to international agendas and networks):</td>
<td>YES. On the EV tax incentive schemes, Norway has been a first mover, and Similarly in infrastructure development, demonstration and testing. Likewise, Norway similarly to the EU has committed to reduce CO2 emissions within the transport sector and as such the initiatives are part of the global agreements to fight climate change and reduce CO2 emissions, to prevent global warming reaching critical levels.</td>
</tr>
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</table>
Involvement of citizens: TO A HIGH DEGREE. The initiative is based on tax incentives, and grants made to infrastructure development to spur a transformation in the demand of private cars. Therefore, the Norwegian EV initiatives are about procurement measures and incentivising citizens to create a transformation.

The Norwegian EV Association has been created, and it represents EV owners in Norway and has existed for over 20 years. They have all along been an active partner in developing policies and collaboration to achieve the goals.

2 Context and objectives of the initiative

This Chapter will contain a more detailed examination of the history of the Norwegian EV Policy with specific examples of incentives, which the Norwegian government has used throughout the years. Furthermore, this Chapter will contain a review of the strategy and milestones that the Norwegian government has undertaken.

2.1 Contextual factors and origins of initiative

The current Electric Vehicles initiative in Norway can be seen as a way to address different challenges that the country and the world faces: conversion to green energy and greenhouse gas emissions. However, the initiative started out with being assistance to the national electric vehicle producers, Think and Buddy, at the beginning of the 1990s. The parliament created incentives for citizens to use electric vehicles. The historical timeline of the Norwegian electromobility transport policy can widely be described as followed (largely quoted from Figenbaum & Kolbenstvedt, Chapter 2):

1970-1990: Concept development

Prototypes of different Electric Vehicles were developed. A man called Lars Ringdal was inspired by the oil crisis and started to develop a small electric car with plastic bodywork in the 1970s. This was the forerunner to PIVCO (later Think), which was created by his son.

1990-1999: Test phase

In this phase, focus was on testing the technology and to remove the ‘disincentives’. The environmental group Bellona started the registration of the first electric vehicle in the Norwegian Motor Vehicle Register. The high value-based tax (VAT) on registration made it extremely difficult to buy an electric vehicle in Norway. Bellona’s successful attempt on gaining an exemption on their electric vehicle from value-based registration tax meant that from 1990 all electric vehicles were exempt. This started the development of nationally developed electric vehicles and the parliament created further incentives. In 1993, free parking for electric vehicles was allowed, in 1996 the annual licence fee was reduced, in 1997 they got the road toll exemption and in 1998 there was a reduced imposed taxable benefit on companies.

1999-2009: Early market

In this phase, major operators entered the field of electric vehicles in Norway. Think was bought by Ford, the French energy company EDF was part owner of Miljøbil Grenland and Elbil Norge were owned by some of the richest families in Norway. It was during this period some of the most important incentives were created – the VAT exemption and the free
access to bus lanes. This access to the bus lanes created a heavy demand, which can be seen in Figure 1. However, the demand could not be met by Think, as the ownership now was through an Indian investor, who could not make the production meet the demand. This created a situation where most of the demand was covered by imported used French electric vehicles and Think Electric vehicles produced in 1998-2002, being sent back to the Norwegian market from Europe and the US.

Figure 1 (Figenbaum & Kolbenstvedt, 2013)

The many powerful and attractive measures created during that time meant that some car buyers bought electric vehicles even though they were not as advanced and safe or comfortable as other cars. Apparently, they traded comfort and security for access to bus lanes, free parking and no road tolls. This was especially significant in cities close to the main roads going into Oslo. Thus, the electric cars were high on the political agenda at that time, and new measures for electric vehicles were established. In the beginning, the dream was to create a sustainable Norwegian electric vehicle industry with Think. Later, the reduction of greenhouse gas emissions became the politicians’ and car buyers’ main interest. The financial crisis ended this phase in 2008 after several attempts at creating more Norwegian-based electric vehicles. Think, especially, ran into challenges with the financial crisis, as they planned to launch a new car. However, due to several capital implications, this was stopped by the financial crisis.

2009-2012: Market introduction

During the market introduction, the Norwegian market was turned upside down. In 2011, Think and Pure Mobility both went bankrupt. The competition seemed too high compared to other car manufacturers who could set the price lower.

Transnova was established during this phase. Transnova is a government instrument whose task is to advance the use of climate efficient transport technologies and concepts, by supporting tests, demonstration and dissemination projects. They were given the responsibility for a support programme for the establishment of charging stations. This generated an acceleration of infrastructure from 2010. The establishment of Transnova and the infrastructure development was the only incentive created in this phase. What really is interesting is that the sale of electric vehicles has increased dramatically since 2011 even though there have been no new incentives. The explanation can be that it was not the lack
of incentives that kept the buyers from buying, but more the lack of variety of attractive vehicles. Another interesting aspect is that the increase of demand in the market made Mitsubishi able to sell 1000 of the I-miev electric vehicle in no time. As Think was not able to meet the demand, other actors took over – including Mitsubishi. Apparently, buyers were more likely to buy a well-known brand with several other advantages than the Think car.

However, the fast chargers ran into some challenges, as they did not provide enough power during winter periods. This meant that local countries involved themselves in setting up charger stations, cooperating with operators other than Transnova.

2012-now: Market expansion

The development from 2012 has been explosive. More and more Norwegians are buying electric vehicles. In 2012, the market share of electric vehicles in Norway was 3%. In 2015, it increased to 23%. For comparison, most other countries only had a 1% market share of electronic vehicles, which makes the Norwegian initiative five years ahead of most other countries. This has been due to the incentives created by the Norwegian parliament, which already have been mentioned. The focus in those years was the typical Norwegian electric vehicle owner and the expansion in the charging infrastructure. The research is mostly based on Petter Haugneland, Christina Bu and Espen Hauge’s findings in “The Norwegian EV success continues” (Haugneland, Bu, & Hauge, 2016).

The typical Norwegian electric vehicle owner has bought the electric vehicle as a supplement to the petrol or diesel car. However, 23% of the respondents claims that they will manage with just an electric car in the household. For the rest, the electric car becomes number one car, when it comes to travel needs. The survey also showed, that 62% bought their electric car solely for economic reasons, but became more aware of their environmental behaviour after buying the car. Even 25% agree that they would consider a solar panel on their houses. More than half of the owners of an electric car say that it was because of economic benefits that they bought it. One out of four say that it is because of environmental benefits. Furthermore, some say that it is because they save time when they go via the bus lanes. Besides this, there has been an increase in the coverage of the market. This means that the market has expanded. First and foremost, in the area around Oslo, but also in other areas.

The charging infrastructure needs to be expanded. The first group of electric vehicles owners have short commutes and does not necessarily need any public charging infrastructure. They can rely on their access to a charging station at home, no matter if they live in an apartment or a house. The biggest obstacle is for those who live in shared apartment buildings and therefore are not able to establish a home charger. However, most of the owners of electric cars do not need the public charging stations. Only 3% said that they need a fast daily charging and 15% said they need it weekly. As fast as the development grows, more public fast electric chargers are needed. In a directive, the EU recommends that there should be an available charging station for every 10 electric cars by 2020. With the big increase in the market share, there should be 25 000 public charging stations available – in 2015, Norway had 1350 charging stations. The Norwegian government was already aware of this issue, and has launched a programme to finance the establishment of at least two multi-standard fast charging stations every 50km on all main roads in Norway by 2017.
2.2 Strategic and operative objectives and milestones of the initiative

This initiative addresses one particular challenge that Norway and the rest of the world faces: transformation to green energy. In Norway, this is done through the transition to zero emission electric cars. Especially in recent years, the initiative has started addressing the challenge after the Think project failed. The initiative can be seen as a tool to tackle this challenge and find solutions through transport policies.

The objectives of this initiative have changed over time. In the beginning, the focus was on creating an industry in which Norway could produce their own electric vehicles. This was done with heavy investments in the Think project (at that time it was called PIVCO). Later, in connection to the bankruptcy of Think, etc., the Norwegian government started to focus more on the tax incentives that was made to reach the goal that all new bought cars in 2025 would be zero (electric or hydrogen) or low (plug-in hybrids) emissions. This focus has continued, but through the years, there has been a simultaneous focus on implementing a charging infrastructure to meet the expectations from the European Clean Power for Transport’s directive on one public available charging point for every 10 electric cars by 2020.

The key events in Norway’s electric vehicle policy can be summarised as follows. However, it is important to notice that all the different incentives created by the Norwegian government have been a part of creating this explosion of demand, thus leading to a greater market share of electric vehicles:

- 1990: The environmental group Bellona started the first registration of an electric vehicle. This started the removal of different incentives to make it easier to buy electric vehicles. The temporary abolishment of import tax was initiated.
- 1994: The Norwegian electric vehicle producer, PIVCO (later Think) operated 12 electric vehicles during the Lillehammer Winter Olympics.

<table>
<thead>
<tr>
<th>Drivers</th>
<th>Barriers</th>
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<tbody>
<tr>
<td>Political</td>
<td>•</td>
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<tr>
<td>Economic</td>
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<tr>
<td>Societal</td>
<td>•</td>
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<td>Technological</td>
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<td>Legal</td>
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</table>
• 1996: Reduced annual registration tax
• 1997: Exception from road toll
• 1999: Introduction of special “EL” registration plates. This makes it easier to identify the benefits, such as free parking, etc. Furthermore, free parking in public places was initiated. Ford Motor Company buys Think.
• 2000: Reduced company car tax
• 2001: 0% VAT
• 2002: Ford sells Think
• 2003: Access to the bus lanes in the Oslo region
• 2005: Access to bus lanes made permanent and extended to nationwide. This creates an explosion in the demand of electric vehicles.
• 2008: Oslo launches municipal EV charging infrastructure programme.
• 2009: Free access to road ferries. The government launches Transnova (later Ennova) and a EUR 7 million electric vehicle infrastructure programme, resulting in 1900 charging points by 2011. This has further developed into a goal of 25 000 public charging points available by 2020. Besides, a resource group for clarification of road transport was appointed after pressure from the energy companies. The companies pressed for Norway to establish a target for electrification of road transport. This group consisted of both private and public stakeholders. In 2009, the group presented a plan, which assumed that it would be possible to reach a 10% share for electric and plug-in hybrids in the passenger car fleet by 2020.
• 2011: First CHAdemMO fast charger opened.
• 2012: Cross-party political consensus to uphold Zero Emission Vehicles financial incentives to 2018 or until there are 50 000 Zero Emission Vehicles on the road. 10 000 electric vehicles in Norway. The accounts for over 3% of car sales.
• 2015: The Norwegian EV market reaches 20%, which means they are about five years ahead of most other countries. The average CO2 emissions from new cars was a record low 100 gr/km, mostly because of the high share of electric cars. At this time, there are only 1350 charging points complying with EU standards.
• 2017: The status of the goal of 25 000 public charging points available by 2020; at this moment there are 9034 public charging points in Norway. However, there are a total of 10 112 charging points (private and public added) (Norsk Elbilforening, 2017).

3 Resources and management

3.1 Governance and management model

The Norwegian EV policy is driven by a top down approach. The Norwegian government has from the beginning been the initiator and has supported the industry with tax incen-
tives and more structural/behaviour incentives. In the beginning, it was mostly about supporting the industry. The very same industry initiated the Norwegian Electric Vehicle Association in 1995, and has a declared goal of promoting electric vehicles that run fully or partially on renewable energy (Norwegian Electric Vehicle Association, 2017). These two main actors have become important in order to reach the goals of reducing national greenhouse gas emissions. One would say that the goal act as the governing mechanism and has developed into a procurement measure, applying tax incentives to spur private purchases of EV's. The EV Association has become quite an important actor to reach these goals, and serves as a strong sparring partner with the Norwegian government.

While the overall decision making is done by the Norwegian government, there are other actors within the parliament which have an active role in the initiative. Thus, the Norwegian Ministry of Transport is a key actor in creating the Norwegian policies. With the rather new goals of transition to zero emission electric cars, the establishment of Enova (earlier Transnova) has been a vital part of the initiative. Thus, Enova has as its main goal to cut greenhouse gas emissions, safeguard security of supply and create new values. Therefore, Enova works to get the best solutions in the market and contribute to new energy and climate technologies (Enova, 2017).

However, it is the Norwegian parliament who is the main responsible body and they are the ones who can possibly control the demand of electric vehicles, as they control the tax incentives.

3.2 Financing model

There is no overall budget of the initiative since it is mainly funded through tax exemptions within the EV industry. This means that the funding is being done by the public (the government). However, the tax incentives are up for negotiation in late-2017/start-2018.

The main funding is through the public, whereas some R&D programme are allocated. But there are no direct budgets allocated to it.

In Norway, research projects on electro mobility are financed by the Research Council of Norway, while Transnova/Enova finances demonstration projects. Transnova/Enova also has allocated resources for supporting the participation of Norwegian communities in EU and ERA-NET projects. Before Transnova was established in 2009, the Research Council of Norway also supported near-market demonstration projects.

In addition, the Norwegian Public Roads Administration has some funds for studies. Norwegian research environments are involved in different EV-related research projects.

3.3 Key actors involved in the initiative

The first and most important plans were “White paper on Climate Policy and Climate Policy Settlement in 2007” (Figenbaum & Kolbenstvedt, 2013). These resulted in establishment of a goal that greenhouse gas emissions in the Norwegian transport sector should be reduced by 2.5-4 million tonnes in relation to the reference pathway (what the development would have been without a new policy).
In October 2007, the government adopted a target: on average new passenger vehicles would not emit more CO2 than 120 g/km in 2012. The target was adopted at the time when the EU target was that the average emissions in 2012 would be 130 g/km from the vehicle itself.

Later the resource group for electrification of road transport was appointed after an initiative from the energy companies, and consisted of a selection of private and public stakeholders. On behalf of the Ministry of Transport, the energy companies organised a resource group. In 2009, it presented a plan of action for the electrification of road transport, which assumed that it would be possible to reach a 10% share for electric vehicles and plug-in hybrids in the passenger car fleet in 2020. This would be attained through a continuation and strengthening of the use of existing measures and some new ones. Among other things, an extra grant of 3750 Euro per vehicle was proposed. This was however not adopted by the government.

**Klimakur report 2008-2010**

The Klimakur (Climate Cure) project was established by the government through a joint mission from the concerned ministries for the underlying agencies: The Norwegian Public Roads Administration, the Norwegian Climate and Pollution Agency (the Norwegian Pollution Control Authority at that time), the Norwegian Maritime Authority, the Norwegian National Rail Administration, the Norwegian Petroleum Directorate, Avinor (the Norwegian Civil Aviation Administration) and Statistics Norway. Klimakur assessed the potential for national emission reductions in all the sectors.

**White paper on climate and Climate Policy settlement 2012**

The work with the Klimakur project was part of the basis for drawing up the White Paper on Climate Policy, published in 2012. The White Paper established a goal that the average CO2 emissions from new passenger cars would be reduced to 85 g/km by 2020 (Norwegian Ministry of Environment, 2012)

The Climate Policy Settlement in the Norwegian Parliament from June 2012 maintained this goal (Norwegian Ministry of Environment, 2012). The White Paper that was adopted by the Settlement states the following with regard to the 85g target: “Has as its goal that in 2020, the average emissions from new private vehicles will not exceed an average of 85g of CO2/km.” (Norwegian Ministry of Environment, 2012)

To achieve this goal, the Climate Report describes a number of measures and incentives that should be implemented:

- “Continue to use vehicle taxes to contribute to the shift to a greener and more climate-friendly vehicle fleet.
- Evaluate gradually phasing in requirements for environmental properties and CO2 emissions for taxis that can use bus lanes.
- Contribute to the development of infrastructure for electrification and alternative fuels, among other things, through Transnova.
- Be a promoter of international efforts for the standardisation of solutions, and the harmonisation of regulations, for zero and low-emission vehicles.
- Continue to be internationally at the forefront in facilitating the use of electric and hydrogen vehicles.
• Provide plug-in hybrids with access to parking with charging facilities (charge stations for EVs).
• Establish better systems for monitoring and controlling the development of traffic in the bus lanes so that, as far as possible, electric vehicles and hydrogen cars can have access without this delaying public transport.
• Develop a plan for extended environmental information when selling new vehicles, including information about fuel costs and fiscal disadvantages for vehicles with high emissions, as well as strengthened controls of environment and energy labelling when selling new vehicles“ (Figenbaum & Kolbenstvedt, 2013)

3.4 Monitoring system and evaluation of the initiative

The progress of the initiative is monitored by the Norwegian parliament, as they are the ones who decide whether or not there will be any financing for the initiative. In 2018, it will be revised in the state budget. Thus, the evaluation of the initiative has been an ongoing theme throughout the years.

3.5 Level and type of citizen engagement in the initiative

The initiative has mainly a top down approach, which means that it is the parliament who mostly controls the engagement of the citizens. However, with the establishment of the Norwegian EV Association, there has been a clearer communication source to the parliament.

Based on the information gathered, the EV policy is widely communicated to the masses through different media. Thus, the initiative is arguably one of the greatest EV policies of its kind and has garnered much attention world-wide.

3.6 State measures and incentives

The financial measures and incentives is taken from the Norwegian electric vehicle Association (Norsk Elbilforening, 2017) and can be listed as follows:

• No purchase/import taxes (1990)
• Exemption from 25% VAT on purchase (2001)
• Low annual road tax (1996)
• No charges on toll roads or ferries (1997 and 2009)
• Free municipal parking (1999)
• Access to bus lanes (2005)
• 50% reduced company car tax (2000)
• National investment in charging stations (2008)
• Exemption from 25% VAT on leasing (2015)

4 Policy instruments and wider policy-mix used for implementing the initiative

Norway has used different dimensions of R&I policy instruments to implement the electric vehicle initiative. The journey that Norway has been through can be illustrated in the picture below.
Since the beginning of the initiative, there have been several both tax and non-tax incentives, which are illustrated above and elaborated earlier. These measures are the most general policy instruments that have been used. But since the establishment of Transnova (now Enova), other policy instruments have been used. As stated earlier, the first focus was on developing an electric vehicle industry in Norway, while since the start of the 2000s and later, the focus has changed to energy emissions and creating a charging infrastructure.

**Gronn Bill** (Green car) – now Nobil: was set up by the association of Norway energy companies, to “facilitate the introduction of 200 000 electric vehicles and plug-in hybrid vehicles in Norway by 2020” (Nobil, 2017). The companies included Energy Norway, Nova Tran, Regional Authorities and ZERO. By the end of 2010, the project was slightly ahead of schedule. The visibility in the public was good and it had assisted almost 40 municipalities and other companies in transition to rechargeable cars (Trip, Lima, & Bakker, 2012). The project focuses on gathering and communicating information on electric vehicles. Thus, Nobil is not a tool to reserve and/or pay for services concerning charging stations or electric
vehicles in general. Its aim is to gather information so that it is publicly available. By 12 December 2017 there were 9034 public charging stations in Norway (Nobil, 2017).

**Transnova – now Enova:**

Enova was established in 2009 to facilitate technologies and concepts that can reduce greenhouse gas emissions from the transport sector, going from the research stage to becoming a commercial activity or enterprise. In particular, there is a focus on the demonstration phase.

Enova shall support project that contribute to:

1. Replacing fossil fuel with fuel and energy carriers that generate low or no CO2 emissions,
2. A transition to forms of transport that have a reduced effect on the climate;
3. Reducing the extent of transportation;
4. Energy efficiency, i.e. less consumption per km or per nautical mile (Enova, 2017).

Enova has been most active when it comes to the first item, while the last item was adopted into the mandate as of 2013. Enova can support projects within all forms of transport, but does not provide support for developing infrastructure beyond what is required for distribution (including filling/charging stations) of alternative fuel and energy carriers.

The Research Council of Norway supports research while Innovation Norway supports the commercialisation phase. Before Enova was established, it was possible to apply for support for demonstration activities from the Research Council of Norway that managed research funds from the Ministry of Transport. The three organisations coordinate activities between them to avoid overlaps.

Formally, Enova is organised as a part of the Norwegian Public Roads Administration, and its leader reports to the Director of that Administration. Enova however has its own budget and its own letter of assignment, and the head of Enova is delegated with authority to allocate the budget. The organisation allows Enova to operate independently, while at the same time it is able to utilise all administrative systems in the Norwegian Public Roads Administration. Enova had ten employees in 2013.

By 2015, Enova was closed and replaced by e-nova, which basically has the same role and purpose as the one vested in Enova.

A central instrument has been the development of charging stations for EVs, and in that development first Enova and later Enova had the governing role.

The charging programmes that have been used have one thing in common – private citizens cannot apply. Otherwise the amount of support and facilities vary. Enova’s support programme for charge points was established with a limit of NOK 50 million in 2009, as part of a larger crisis package to counteract the financial crisis.

The funds were to go to normal charge points, and there were no guidelines related to where these charge points could be established in the country. The first-come-first-served principle applied, and all documented costs up to NOK 30 000 per charge point were covered. The programme resulted in a total of 1800 charge points. By far the most charge points cost less than the maximum amount.
Since then Enova have run similar support programmes based on the PPP model where Enova grants work as a subsidise to private investments in building and running charging stations.

Oslo Municipality have had has its own charge station programme, where, in addition to providing support for establishing charge stations, 404 charge points have been established and are being operated under municipal management up to 2013.

**Charging programmes:** Within the charging programmes, private citizens cannot apply. Otherwise the amount of support and facilities vary very often. Enova has its own programme for charging points, where they covered up to NOK 30 000 per charging point. This programme resulted in 1800 charge points being established. Furthermore, in 2013 Enova supported more than fifty fast charging stations. The support from Enova has resulted in more than 10 000 charging stations being set up around Norway and more to come (Nobil, 2017) (Figenbaum & Kolbenstvedt, 2013). Oslo municipality started its own charging point programme in 2008, where 404 (in 2013) charging points where established and are being managed by the Oslo municipal. As an example, the Oslo municipality has leased a floor in a shopping centre, only to be used by electric vehicles. The programme targets housing cooperatives, condominiums and commercial partners who can receive up to NOK 10 000 in support for every charging point. The charging point can be publicly available or reserved for the organisation related to it. However, the recipient is obliged to manage the charging point for five years.

**Financial incentives**

As earlier written, many different tax incentives has been applied over the years. In 1996, they reduced the annual registration tax on electric vehicles, in 2000 they reduced company tax and in 2001 they put 0% tax on VAT. Further details are described below.
4.1 Connections with other policies

Public procurement:

The public procurement of vehicles is decentralised to municipalities, counties and government enterprises with a great degree of independence. There is no requirement that these must use electric vehicles or plug-in hybrids in their own operations. However, they are confronted with the same framework conditions as other vehicle buyers with regard to taxes, fees and other incentives. Many municipalities and counties prefer leasing vehicles. This presents a challenge since they have to pay VAT on leasing electric vehicles, while they do not have to do this if they purchase electric vehicles. Normally, municipal technical utilities, such as water and sewage works, are distinguished from municipal companies that make their own decisions about which vehicles should be used. The counties purchase a few vehicles for their activities. However, they have great influence on the purchase of public transport and will be an important player in relation to future purchases of electric buses.

Government enterprises and other government agencies can use electric vehicles on a relatively large scale. In particular, this applies to the Norwegian Postal Service that has an environmental strategy involving the replacement of 1300 diesel vehicles with electric “trolleys”, 3-wheeled electric MCs and other electrically-propelled transport vehicles. With support from Transnova, Trondheim has served as a test area for the strategy of the Norwegian Postal Service. Gradually, however, electric vehicles will be introduced into more places (Transnova, 2011). By the end of January 2013, the Norwegian Postal Service had 643 electric vehicles at its disposal of which 24 were electric cars, 261 electric mopeds.
213 electric jeeps and 145 electric trolleys (Figenbaum & Kolbenstvedt, 2013). However, the investments have not gone as smoothly as hoped.

An example of an electric vehicle procurement is showed below:

**Table 2 (Trip, Lima, & Bakker, 2012)**

<table>
<thead>
<tr>
<th>Municipality</th>
<th>Current procurement of EV fleets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oslo</td>
<td>Tender on framework agreement for purchase of up to 1,000 Electric cars and electric vans in the period from 2013 to 2016. Have allocated NOK 50 million to the scheme where the city districts can be granted a loan without interest rate for purchasing Electric vehicles.</td>
</tr>
<tr>
<td>Oppegård (Akershus)</td>
<td>29 Nissan Leaf will be delivered in April 2013</td>
</tr>
<tr>
<td>Trondheim</td>
<td>60 Electric vehicles in 2013 (previously has 38 Electric vehicles)</td>
</tr>
<tr>
<td>Bergen</td>
<td>Will increase to 200 before 2015; previously has 33 Electric vehicles</td>
</tr>
<tr>
<td>Municipalities in Nord-Møre</td>
<td>26 Mitsubishi i-MiElectric vehicles</td>
</tr>
</tbody>
</table>

**Non-financial incentives**

Through the years, the Norwegian government has launched different types of non-financial incentives. These include:

- Free access to public areas;
- Free parking in public car parks;
- Free use of toll roads;
- Permission to drive in bus lanes and LEZ (this created an explosion in the demand of electric vehicles);
- Free use of domestic ferries.

**4.2 Lessons learned and key messages for European R&I policy**

An initiative like this implies the courage of a government to heavily invest in tax reductions within certain areas. The Norwegian electric vehicle policy has been implemented through both financial incentives and non-financial (behavioural incentives). These incentives cover especially the demand of electric vehicles. Specifically, the tax reductions created the demand from a financial perspective, whilst especially the initiative to let electric vehicles drive through the bus lanes created an explosion in demand. Furthermore, the funding of organisations like Enova, creates a framework for both the public and the private sector to work within. This is done through funding of national, regional or local initiatives created especially by the counties and municipalities. Thus, the perspective of citizens is important in this type of initiative. The government or needs to take the citizens into account and make the investments clear to the public.

However, creating incentives and accepting that there needs to be heavy investment, governments need to determine whether or not they will keep on investing in the initiative, or decide that the public needs to start paying taxes. These things will be discussed by the Norwegian government in 2018.

**4.3 Key turning points of the initiative and policy adaption measures**
The Norwegian EV policy initiative has changed over time in order to adapt to what the demand has been. It quickly realised that the creation of an electric vehicle industry was difficult to do, but instead, they created the right framework in order to pursue new goals on zero emission or low emission vehicles and to create incentives for the citizens to take care of the environment.

<table>
<thead>
<tr>
<th>Major changes / turning points of the initiative</th>
<th>Description of the flexibility mechanism / policy adaptation measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>The current situation of the electric vehicle initiative is that it is going extremely well. This is specifically illustrated in both Figure 5 and Figure 6, which states that the market share of electric vehicles has increased over the years together with the number of electric vehicles. Besides, the number of charging stations has also increased, which shows that the infrastructure that allows the existence of the electric vehicles is working well.</td>
<td>There has been an ongoing adaption of the policy adaption measures. In the beginning of the initiative, there was a focus on creating an industry of electric vehicles in Norway. This was mainly done by tax incentives, but with limited success. Thus, the Norwegian parliament grabbed the idea, but changed the overall objectives to focus on zero or low emission vehicles.</td>
</tr>
</tbody>
</table>

5 Results

The Norwegian EV initiatives are part of the Norwegian climate strategy to reduce CO2 emissions from transport with 50% by 2030, measured against the CO2 emissions in 1990.

The National Transport Plan 2018-2029, is the main strategic instrument, and the politically agreed roadmap in Norway.

The main targets affecting road transport in the plan are:

- After 2025 new private cars, city busses and light vans are to be zero-emission vehicles;
- By 2030, new heavy vans, 75% of new long-distance buses, and 50% of new lorries are to be zero emission vehicles;
- By 2030, goods distribution in major urban centres are to be almost emission free (The Royal Transport Department, 2017).

Besides these targets for road transport the NTP encompasses clear targets for reductions of emissions on sea transport, e.g. that new ferries and speed boats are to run on biofuel, low or zero emission technology.

Likewise, investments are key in the rail sector where a major objective is to move transport of goods from the roads to rail and sea.

The figure below is from the plan and displays the millions of tonnes CO2 from the different segments within Norwegian road transport in 2014.

Figure 3 (The Royal Transport Department, 2017)
- Personbiler: cars
- Varebilar og tunge kjøretøy: vans and heavy vehicles
- Andre mobile kilder: also includes tractors
- Sjøfart og fiske (inneriks): sea transport and fishery (domestic)
- Flytrafik (innenriks): aviation (domestic)
- Motorsykler og mopeder: motorcycles and mopeds
- Jernbane: railway

As seen in the figure, the CO2 emissions from cars (personbiler) was 5.5 million tonnes and the EV initiative is entirely directed towards lowering emissions from that segment within the Norwegian transport.

On 31 March 2017, there were 2,646,348 cars in Norway out of a total of 5,355,818 road transport vessels.

**Figure 4 (Norsk elbilforening, 2017)**

<table>
<thead>
<tr>
<th>Cars</th>
<th>Number November 2017</th>
<th>Change to November 2016</th>
<th>Year to date</th>
<th>Change year on year to 2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>New</td>
<td>13,743</td>
<td>+ 4.2 %</td>
<td>142,573</td>
<td>+ 1.1 %</td>
</tr>
<tr>
<td>Used imports</td>
<td>1,933</td>
<td>+ 48.1 %</td>
<td>19,432</td>
<td>+ 28.0 %</td>
</tr>
<tr>
<td>Used car sales</td>
<td>40,495</td>
<td>+ 1.9 %</td>
<td>437,555</td>
<td>+ 1.8 %</td>
</tr>
</tbody>
</table>
In November 2017 there were 13 743 new cars registered and in 2017 there were 142 573 registered by November which indicates total new sales of around 155 000 – 160 000 cars a year.

Of the 13 743 new cars registered in November in Norway, 4790 were EV’s or hybrid cars, meaning that 34.9% of all newly sold cars in Norway in November were EV hybrid cars. The 4790 hybrids displayed an increase of 1605 cars or an increase of 50.4% compared to November 2016.

On top of that, 1128 of the 1933 in Norway, newly registered used cars, were EV’s or hybrids, which is the first time that the total share of hybrids is higher.

**Figure 5 (Norsk Elbilforening, 2017)**

The figure above is from [www.elbil.no](http://www.elbil.no) and displays statistics on the number of electrical vehicles in Norway on 1 June 2017, at which time there were around 123 000 electric cars in Norway.

Besides, the full electrical cars manufacturers also make combined cars running on a combination of electricity and gasoline and where the batteries are charged when running on gasoline or otherwise in a charging station.

The figure below displays the number of these dual engine cars in Norway.
Combining the dual engine cars and the electrical cars by June 2017 gives a total of just above 180 000 low emission cars on the roads in Norway. Looking at the latest figures from November of the monthly sales of newly registered EVs in Norway, they may well climb above 150 000 EVs and 220 000 low emission cars in total.

**CO2 emissions**

While the number of EVs in Norway and the share of EVs as newly sold cars are important to follow because of the target that all cars sold after 2025 have to be zero emission cars, the actual intention by supporting EVs in Norway is still to reduce CO2 emissions from the transport sector, and specifically targeting cars.

**Figure 7 CO2 emissions from cars sold in Norway November 2017 (Norsk Elbilforening, 2017)**

<table>
<thead>
<tr>
<th>Cars</th>
<th>CO2 emissions November 2017</th>
<th>Change to November 2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>All cars</td>
<td>81 g/km</td>
<td>(- 7 g/km)</td>
</tr>
<tr>
<td>Gasoline driven cars (incl. charged hybrids)</td>
<td>92 g/km</td>
<td>(- 8 g/km)</td>
</tr>
<tr>
<td>Diesel driven (all incl. charged hybrids)</td>
<td>125 g/km</td>
<td>(- 3 g/km)</td>
</tr>
</tbody>
</table>

It is a target to reduce the CO2 emissions from cars in Norway to below 85g of CO2/km and with the current mix, of sold cars in November 2017, Norway actually are below that target, as the emission average for all cars is 81g/km, which is an improvement of 7g compared to November 2016.
Figure 8 CO2 emissions for cars sold in 2017 (Norsk Elbilforening, 2017)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>All cars</td>
<td>83 g/km</td>
<td>(- 10 g/km)</td>
</tr>
<tr>
<td>Gasoline driven cars (incl. charged hybrids)</td>
<td>94 g/km</td>
<td>(- 5 g/km)</td>
</tr>
<tr>
<td>Diesel driven (incl. charged hybrids)</td>
<td>126 g/km</td>
<td>(- 2 g/km)</td>
</tr>
</tbody>
</table>

From the figure above, we see that the average CO2 emission is 83 g/ km for all the cars sold in 2017, which is an improvement of 10g compared to 2016.

What is also evident from the figures is that reaching the 85 g/km target will be very difficult in any country without a strong uptake of EV, simply because gasoline driven and especially diesel driven cars have emissions of 94 g/km and 126 g/km respectively, which is way above the 85 g/km line and further the speed of reductions within that segment alone will not bring Norway or any country below the target.

That becomes more clear and present in the figure below. The figure displays the average CO2 emission for newly registered cars per month in 2016 and 2017 respectively. The full red line is emissions from gasoline cars in 2016, the full blue line is emissions from diesel cars in 2016, and the full yellow line is emissions for all cars sold in 2016. The dotted blue line is for diesel cars sold in 2017, the dotted red line is for all gasoline driven cars sold in 2017 and finally the dotted green line is the emissions for all cars sold in 2017.

Source http://www.ofvas.no/co2-utsippet-i-november/category749.html
Evidently emissions from diesel cars are by far the highest and at the same time also diesels are the cars that display the lowest level of improvement of lowering CO2 emissions. Looking at gasoline driven cars the improvements become more visible. The improvement is not necessarily because the cars have improved their CO2 emission standards but, most of the change is created from the mix of gasoline cars, where more charged hybrids are sold and likewise more smaller and more energy efficient cars are sold.

Yet the bulk of the improvement we see when comparing emissions from cars in 2016 and emissions in cars sold in 2017 comes from the increased sales of EVs and other zero emission cars.

5.1 Changing the car fleet takes time

As we saw above the total number of passenger cars in Norway is more than 2.6 million and is increasing. The total number of newly sold cars in Norway may end around 160 000 cars in 2017, which is about a 6% turnover rate. At that turnover rate it may take 15 to 20 years to swap the entire car fleet in Norway.

As the emissions from cars sold 10-15 years ago was much higher it is an absolute necessity, if Norway or any other country are to reach the emissions reduction targets within transport to change the car fleet to zero emission cars, be they EVs or hydrogen driven. Yet at present levels where zero emission cars are closing in on a 50% market share of all newly sold and newly registered cars in Norway and further a clear mark of 2025 as the year from where only zero emission cars are sold, Norway will have five full years by 2030 that most alone will contribute to a 30% turnover rate where fossil driven cars are substituted with zero emission cars. Presently there are around 150 000 zero emission cars and with the pace of EV market share that may well be above 750 000 cars in 2024 or close to 25-27 %, whereby the total of zero emission cars in Norway by 2030 may be between 55-60 % of the entire fleet, whereby Norway may reach the targets.

5.2 Infrastructure, comfort and safety is a key to succeed

The success in turning over the car fleet to EV driven cars is as mentioned based on a more than 27 year long effort in Norway, where EV have been heavily subsidised.

But another part of that story is also that the Norwegian government along the process has invested heavily in the development of charging stations, so that EV was not just a possibility in the large cities like Oslo, Bergen and Trondheim. And as the EVs’ range have increased, charging stations have also been built along the major highways in order for EV owners to be able to go from one end of the country to the other.

In the figure below we see the number of public charging stations in Norway as of June 2017.

*Figure 9 (Norsk Elbilforening, 2017)*
As we can see from the figure there are close to 9000 charging stations of which almost 1500 are fast charging stations.

The fact that there are many charging stations in the public environment and the fact that Norway has invested in a national charging grid, means that EV owners today buying the new EV with ranges from 300-500 km, are more or less equal to people buying fossil driven cars, as charging times on the fast charging systems are becoming ever faster.

Thereby the disadvantages of being an EV owner, especially in calculating the tax and VAT cuts, the cheaper parking, the ability to save commuting time by driving in bus lanes, are becoming fewer.

Finally, as also evident from the history of EV market shares, the quality in terms of comfort, safety and design also plays a huge role in people’s willingness to buy EVs. Especially when Nissan introduces the Nissan Leaf, which was an EV enjoying the same comfort, design and safety as a traditional car, the sales increased in Norway.

In the latter years, Tesla has been a favourite among EV owners around the globe because these cars set a new standard for design and performance both in terms of range and speed. The availability of a car within the luxury segment has surely had an impact on the propensity for some groups to buy.

The table below shows the number of cars sold in 2017 in Norway ranked by their emissions, and as we see the Tesla models, together with BMW i3, Renault Zoe and Nissan Leaf, are among the most sold cars across all the models.

European car makers are increasingly developing new EVs and have stated that by 2023 they will have a full package of different EV models. This will most likely spur an increased interest in Norway, as people are loyal to their brands.

It will spur competition among manufacturers, increase their learning and raise their investments of scale within the EV car industry, increasing quality and performance while lowering prices.

By supporting the uptake of EVs and creating a market where around 40 000 – 50 000 EV can be sold next year, Norway has had a significant impact in driving these changes, which
is why the EV success of Norway is also a part of the possible success for EVs in the rest of Europe.

5.3 Summary of the key indicators

<table>
<thead>
<tr>
<th><strong>Key indicators</strong></th>
<th><strong>Details</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Timeline:</td>
<td>1989-2025</td>
</tr>
<tr>
<td>Objective and targets:</td>
<td>The first objectives were to create an industry of electric vehicles in Norway. This was done through the first tax incentives. Later on, the Norwegian parliament decided that by 2025, all new cars that are sold shall be zero (electric or hydrogen) or low (plug-in hybrids) emission.</td>
</tr>
<tr>
<td>Total budget:</td>
<td>There is not a clear budget on the initiative, as it is based on taxes.</td>
</tr>
<tr>
<td>Annual budget:</td>
<td>The annual budgets relate to the national budgets.</td>
</tr>
<tr>
<td>Share of budget, public funding:</td>
<td>100%</td>
</tr>
<tr>
<td>Share of budget, private investment:</td>
<td>0%</td>
</tr>
<tr>
<td>Leverage effect (additional public/private investments the initiative has triggered):</td>
<td>There have been both private and public investments triggered by the initiative. As an example of private investments, in 1994, the electric vehicle producer PIVCO operated 12 electric vehicles during the Winter Olympics in Lillehammer. In the aftermath, Think was established, which was a successor of PIVCO. The public investments are done through tax incentives and structural incentives. For example, in 2000 the Norwegian parliament decided to reduce the company tax by 50%. And in 2005, they decided to open up the bus lanes for electric vehicles, which increased the demand of electric vehicles.</td>
</tr>
<tr>
<td>Key (official/public) indicators applied for monitoring the progress towards the targets:</td>
<td>The Norwegian industry sat up the Norwegian Electric Vehicle Association in 1994 to monitor and promote the work with electric vehicles. Another indicator which has been applied is the Transnova, which is a government instrument, whose task is to advance the use of climate efficient transport technologies and concepts. Besides, there is a general focus of the objectives from the changing governments.</td>
</tr>
<tr>
<td>Other key indicators (e.g. outputs/outcomes/impacts):</td>
<td>Since the beginning of the initiative, there has been issued several tax incentives and structural incentives, which makes it easier for owners of electric vehicles to get around – especially in the bigger cities. The increased focus has also resulted in an increase of the market share of electric vehicles, which was 37% in 2017 – or more than 100 000 registered electric vehicles.</td>
</tr>
</tbody>
</table>

6 Conclusion

The Norwegian EV initiative is today a success. Norway has become a beacon of light, not just in Europe but across the world as the country having by far the highest share of EVs within their car fleet. Norway has actually not only reached but surpassed the original targets in their first white papers back in 2006, and latter 2009, where they aimed at the
target of 85 g/km of CO2 emissions from newly sold cars, this because 2017 will most likely end around 82-83 g/km CO2 emissions. Likewise, they by far have overreached their vision on number of EVs in Norway that by the end of the year 2017 most likely will surpass 155,000 EVs driving on the roads in Norway.

Yet this success is the result of a long and costly journey that has taken its turns. The initiative began in 1990 with the environmental organisation, Bellona, being the spearhead in order to register the first electronic vehicles with the Norwegian Motor Vehicle Register. Later came The Think electric vehicle which was the first domestic produced electric vehicle in Norway.

So initially the EV initiative was about support for the development of EVs in Norway or basically R&D driven industrial policy, to which the economic incentives given to private car owners were a procurement measure, set in place to stimulate demand. These incentives can be summarised as follows:

- No purchase/import taxes (1990)
- Exemption from 25% VAT on purchase (2001)
- Low annual road tax (1996)
- No charges on toll roads or ferries (1997 and 2009)
- Free municipal parking (1999)
- Access to bus lanes (2005)
- 50% reduced company car tax (2000)
- National investment in charging stations (2008)
- Exemption from 25% VAT on leasing (2015)

Later and after, Transnova was started in 2009 who was given the responsibility to support a programme for the establishment of charging stations. The different incentives created an even higher demand the following years.

Yet with Think and Buddy going bankrupt during the aftermath of the financial crisis, as such, the EV initiative cannot be perceived as an R&D measure to develop an industry.

Instead the EV initiatives in the first climate change plans, already in 2006, became a core component of the first and the following climate change plans, as can be seen from the latest National Transport Plan 2018-2029 (the plan, amongst others, seeks to reduce CO2 emissions from all transport in Norway, roads, rail, sea and aviation).

The main targets are to reduce CO2 emissions from newly sold cars to 85 g/km and further that there by 2025 are only sold zero emission cars in Norway. As mentioned Norway has surpassed the first target and with close to a 40% market share of EVs in total car sales in Norway in November 2017, it seems feasible that the 2025 target may be reached in advance.

The reason for success is not the formulation or the intention, but the will to enforce and the stability of the targets. Since the early 1990s and the Bruntland report, named after
the then Norwegian Prime Minister, which was the first large environmental report, there has within the Norwegian parliament (Stortinget) and the Norwegian people been broad consensus on fighting climate change, and which is why changing governments and conjunctures have had little impact.

All around the world there have been made many national white papers, many strategies and have been held many speeches among politicians, ministers. We find many large programs, like Energie Wende in Germany, the climate change theme in the Horizon 2020, and the Commission strategy for reaching the CO2 reduction targets within the EU transport sector. Yet, none of these is by any comparison at all, as successful as the Norwegian initiative.

The use of incentivising instruments, and giving grants to infrastructure have been cleverly performed, vis-à-vis the needs to support the increasing uptake of EVs. Changing private behaviour is not just about money, but about what matters to people in their everyday life. Allowing EVs in bus lanes clearly spurred demand simply because it reduced commuting time, especially for EV owners in Oslo.

So really it is not about words and intentions but the actual willingness to carry through. So far tax incentives and other measures have today cost more than EUR 2 and maybe EUR 3 billion, and an additional EUR 2 billion are set aside for procurement and tax incentives from 2018-2029.

In the NTP 2018-2029, an additional NOK 16.6 billion or EUR 2 billion is set aside for tax and other incentives for EV, more grants for commercial development of charging stations, R&D spending on SMART traffic systems.

And finally, a new law of 1 January 2018 allowing self-driving cars in Norway, thereby setting Norway as a front runner on driverless cars, which most likely will be one of the key enablers for safer driving and even more energy savings and thereby CO2 reductions in the future.

To sum it all up:

- As a procurement initiative to develop an EV production sector in Norway the initiative is a failure.

- Today the massive tax incentives help Tesla and other foreign manufactures. Understood as a CO2 reduction initiative the cost associated with reducing CO2 emissions are, extremely high, and are therefore a massive failure, seen within a cost benefit perspective.

- Yet as a means to spur transformation within the transportation sector and reaching goals for CO2 emissions it is a massive success, and perhaps a necessity.

- As a means to solve missions that matter to people in the country, not industry, and not RTD, it is a massive success.

- As a means to create an EV infrastructure that can act as the basis and testbed for SMART traffic systems, SMART mobility, SMART grid and SMART cities, Norway has created a global testbed.
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The nowadays Electric Vehicles initiative in Norway can be seen as a way to address different challenges that the country and the world has; conversion to green energy and greenhouse gas emissions. However, the initiative started out with being a help for the national electric vehicle-producers, Think and Buddy in the beginning of the 1990’s. The first objectives were to create an industry of electric vehicles in Norway. This was done through the first tax incentives. Later on, the Norwegian parliament have decided that by 2025, all new cars that are sold shall be zero (electric or hydrogen) or low (plug-in hybrids) emission.

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