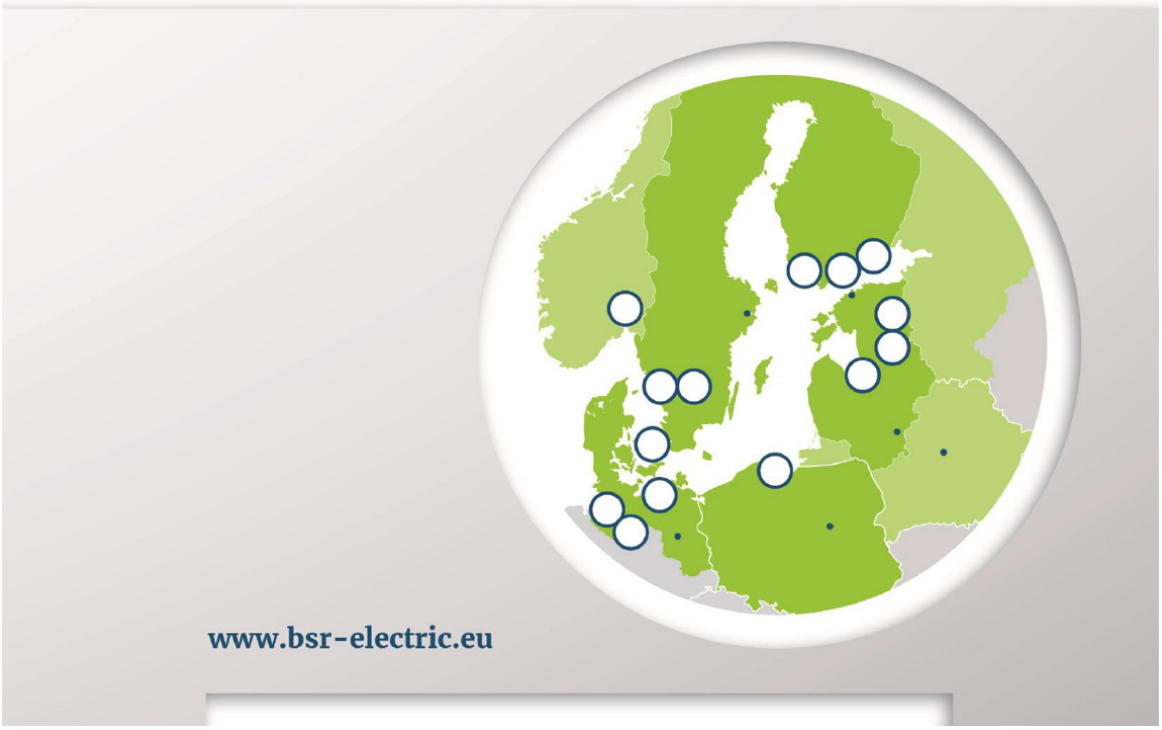
Use Case 3.1: Output report

"Sustainable business model including technical requirements, operational input and financing plan for electric city logistics hub in Høje Taastrup"



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1. Introduction

1.1. Background of the Use Case

As we see a huge global focus on urban environments and climate, we all know that transportation of goods and road travel is a major contributor to emission og greenhouse gases. In Denmark we have seen a recent election for Parliament being heavily dominated by the climate agenda, and the urge to find solutions to Co2 and emission reductions.

As part of the EU, we have seen the European Commission[1] address this political challenge and aim for new climate friendly solutions, and emission reduction in the Transport sector by 70 % in 2050 compared to 2008. This number in Denmark is now a political framework which national target of 70 % reduction of CO2 in 2030 compared to 1990. More focused on transport we find that approximately 30 % of all Co2 emissions in Denmark is related to transport and emissions from cars, vans etc.

To reach these ambitious goals, and to take the first important steps, companies and local municipalities needs to work together, take initiatives, and change the way we do things today – to make a better and greener day tomorrow. Especially the large cities and urban areas faces huge challenges, with pollution, NOx emissions, noise, and road congestions which in total creates a non-sustainable pattern in traffic.

As Denmark for the past 10 years have been mainly focused on the personal transport and introduction of e-mobility into the danish society, we have not seen many initiatives or political programmes support the commercial marked and evolution of new business models or partnerships to change the pattern in modern transport and delivery of goods.

In general, you could state that although political focus has been covering this agenda for some years, we still see an increase in pollution and emission both locally, internationally, and globally. It is not a simple equation and not an easy task, and to create success and change new insights, demonstrations and projects need to find their way.

Therefore, the Municipality of Hoeje Taastrup decided to engage and commit themselves to the Interreg BSR – Electric project.

The Interreg project BSR-Electric addresses the above-mentioned topics and the transformation needed in transport into emission free vehicles, bicycles, and urban transportation in general. As a partner in the project The Municipality of Hoeje Taastrup (HTK) wished to facilitate and encourage local business to start taking an active part in creating new ways to handle transportation of goods in the city logistic and urban areas of Copenhagen. As the Interreg – BSR project aimed to carry out pilot projects including 7 different use cases and showing the feasibility of new solutions in the marked using the current available E-mobility solutions. The Municipality of Hoeje Taastrup could take part by creating pilots in different areas of transportation and specialized in “the last mile” deliveries mainly done from the local Transport Center and into the urban city of Copenhagen situated about 20 km. away.

The local business in Denmark has been waiting for politicians to create better framework conditions and incentive the early uptake of especially E-vans and E-trucks. This has created an exceptionally low amount of business cases and companies demonstrating the new technology and offering “green deliveries” to customers. On that note, projects like BSR-Electric could create the missing link, and build showcases for others to see, learn from, and get motivated by. As the project wish to show

[1] European Commission, 2011. *White Paper on Transport: Roadmap to a single European Transport Area - Towards a competitive and resource-efficient transport system,* Luxembourg: Publications Office of the European Union.

viability and long-term possibilities for companies to grow their business in a new and emission reducing way

1.2. Original task/goals in short of use case 3.1

Urban freight and "last mile" delivery is a continuous part of the discussion on climate, transport, and sustainable living. In this context, HTK decided to facilitate networking of partners in the industry by creating pilot cases in urban freight and logistics. This way, HTK could assess the existing challenges, needs and opportunities in this field.

In Use Case 3.1 of Interreg BSR-Electric, HTK worked as a facilitator between companies, original Equipment Manufacturers (OEMs) and infrastructure partners. The Høje Taastrup Transport Center (HTTC) located in HTK and includes several larger Danish freight & logistic companies which daily commute in and out of Copenhagen. From this starting point, we have created different business case scenarios in E-mobility, city logistics and freight. The analysis of those scenarios helps us find out which solutions are feasible and which ones are not feasible now in time.

As an important part of our project was also to create a greater internal understanding and political strategy on how to support and push forward the green transition and charging infrastructure in the local municipality of Hoeje Taastrup given the current market development and national political climate.

1.3. Aims and outputs for Use case 3.1

The aim of all activities was to foster, evaluate and highlight the challenges and opportunities connected to E-mobility and city logistics in Denmark at the current state. We aimed for real case scenarios, not just "tests" of demos that would not create scenarios that could be scaled or developed into real business. Scenarios of various deliveries and business setups has been tested to create different pilots and output in which E-vans has been integrated in various manners.

As part of that process our team of companies and local project partners should investigate and identify obstacles, barriers or opportunities that would make the demo relevant and useful as a future investment area. Therefore the companies had long testing periods with various cars at no cost, to make sure that their experiences was based on daily business and routines substituting their normal work life environment and usage of vans – and not a special build up scenario for short term evaluation.

Our aim was to see companies experience and learn from activities and to hopefully commit to further investments and implementation in e-mobility solutions in their daily fleets or business.

2. The Chosen implementation method

2.1. The available e-mobility vehicles & the supporting infrastructure

A fixed driver in the HTK methodology is a desire to make the companies' participation as easy as possible. HTK facilitated the companies' participation by dealing with their possible concerns regarding risk, economic costs or any other challenges that could arise during the pilot testing.

To carry out our pilot testing, some fundamental ingredients had to be in place to facilitate the companies' decision making as to whether to take part in the tests. They are listed below:

Vehicles (E-vans) to operate

- We engaged with Renault, Volkswagen, Nissan, and Mercedes for a free trial period of 1 to 3 months: Renault Kangoo, Renault Kangoo Maxi, Nissan NV-200, Mercedes E-Vito and Volkswagen E-crafter and the MAN E-TGE. This carpool almost covers the whole marked for E-vans in Denmark, which therefore gave us a great platform for testing.
- At the same time, the available vans are all sold in the marked, and therefore possible to make TCO comparison analysis of daily operation.
- The different E-van models also has different operational functionalities, battery sizes, costs, and payloads, which again made it possible to evaluate the different scenarios also since the same car models are produced in Diesel models also.
- As a special feature, we have also accomplished to get the first 2 Mercedes E-canter E-trucks to Denmark. One of those is a part of our pilot together with the Danish Ecological home food delivery of groceries company named Aarstiderne.

Infrastructure

- As an important part of daily operations, infrastructure and EV chargers are vital. Therefore, an agreement with EON the biggest network operator of EV charging stations in Denmark was made. The total network of charging for EV´s in Denmark counts approximately 2880 charge spots.

Charge spots.

- More than 1.000 are in Copenhagen alone. EON installed a local charging spot with two outlets at each of the companies' designated parking lots. EON also granted access to its charging station network in and around Copenhagen, which encounters for both Quick charging in the City of Copenhagen and along the highway, and for a highly dense slow charging (11 kWh) network in the Copenhagen area. We have granted the participating company's full access to daily charging – free of charge.

Quick charging (QC)

- It was necessary to test different needs in respect to charging. To ensure quick charging thus securing fast vehicle operation and no greater delays during the day, HTK went through a tender process for QC operators in Denmark. With support from the project and local national support from the Regional Capital we managed to install a Quick charging station at the parking lot of IKEA in Hoeje Taastrup. This is situated close to the Transport Center and at the same time open for public charging and therefore a huge benefit to both private and public charging needs. The quick charger has been in operation for about 1 year – and sees a daily use pattern which is growing and a positive trend in usage and volume of customers. This is both in vans and personal car charging.

- As another charging option is the DC charging home charger. With this output, we could also look at the operational impact of fast charging at the home depot for one of our company pilots' cases. A DC-charger has a 4 times as costly hardware price as normal charge spots. But the great effect of this is that the E-van can then charge in short time at home depot, and therefore be in operation for more hours during the day, which will have a great effect on the business case scenario.

2.2. The different pilot case scenarios

During our project we have engaged with 3 different companies and logistic operators in Denmark. These named Danske Fragtmænd Express, Aarstiderne and Nordic Transport & logistics. During the 2-year period of testing, we have conducted daily operations and city logistic parcel and package deliveries in both day and nighttime and with various workloads and quantities.

The main purpose of the implemented pilots was to test both vehicles, infrastructure and daily business routines to identify obstacles and barriers in both working procedures, finances and operational issues that could be identified during test in normal environment and during daily routines.

Our pilot cases consisted of the following delivery and work patterns:

Danske Fragtmænd Express

- Daily service distribution of goods of small size packages (non-fixed routes in greater CPH)
- Daily deliveries to High End goods Retail shops in fixed postal code numbers in CPH.
- Trial period 24 months
- Pilot tested vehicles (Nissan NV-200, Renault Kangoo Maxi, Renault Kangoo, Mercedes E-sprinter, Volkswagen E-crafter)
- Charging at home charger 11 kw installed at home depot, use of QC at local Ikea warehouse

Aarstiderne:

- Internal goods transport from HQ to home depot
- Urban city delivery of fruit basket to customers in CPH
- Trial period 12 months
- Pilot tested vehicle (Mercedes E-canter, 7500 kg. Truck)
- Charging at home depot with 11/22 kW installed, and use of public qc during daily operation

Nordic Transport & Logistics

- Deliveries to end users (customers) in several postal codes in CPH (Home meal and vegetable boxes)
- Trial period 8 months
- Night and day deliveries in city urban areas, mainly the city center of Copenhagen from depot about 15 km. from the city-center.
- Pilot tested vehicle (Man E-TGE)
- Charging at home depot with use of 24 DC-charger installed

Adding to the pilot cases we have been contributing to the general knowledge and network building in the E-mobility area in Denmark. By participating in several workshops and conducting a seminar in Denmark regarding fostering knowledge and experience on E-mobility solutions in the BSR cities and regions back in 2018 as part of the capacity building seminars. More about that on "E-vehicles and infrastructures for freight and goods transport"

3. Challenges to our pilot project implementation (practical end user aspects)

As our pilots have been undergoing for more than 24 months, we have experienced several challenges categorized in the following overall categories

Fleet

As shortly described, we managed to get a variety of E-vans and 1 E-truck tested in our pilot test period. This is a great success. But due to the exceptionally low number of E-vans produced and the availability in the Danish market, we see several challenges regarding this. First, the business of logistics and goods delivery is a low margin business. It is driven by high volume, minimizing cost in all aspects and tight daily deadlines and operational optimization. So, the business must be very well planned and executed, and the vans need for the transport are therefore critical to this operation. Having a large portfolio available today of diesel vans at a low cost, with low operational costs and diesel fuel cost is therefore a difficult opponent to beat. These vans are without limitations in range and price is competitive since the market has been underway for many years. The E-vans in the Danish market is limited in size, payload, battery size and models. To summarize the experiences gained from our 3 pilots, we would conclude that the number of vehicles models based on E-mobility is way too little, and the range from these models is to short and limited. We have experienced a range between 80 – 120 kilometers in all models, which brings a series of limitations to the daily operation.

Van model	Price E-Van ex.vat	Price Diesel	Price difference	% difference	Battery (kWh)	Charging	Range (wltp)
Renault Kangoo Z.E	185.600	152.000	-33.600	22%	33	CCS - slow	180
Renault Kangoo maxi	214.400	178.000	-36.400	20%	33	CCS - slow	180
Man E- TGE	399.000	279000	-120.000	43%	35,8	CCS - slow	115
Mercede E-vito	330.000	238.000	-92.000	39%	41,4	CCS- slow	136
Volkswagen E-crafter	334.112	266.000	-68.112	26%	35,8	CCS- slow	115
Nissan Nv-200	228.000	185.000	-43.000	23%	40	CCS - QC	180
Renault Master Z.E	378.900	228.000	-150.900	66%	33	CCS- slow	119

Figure 1: Table of E-vans tested and their price in the Danish Market

As you see from this list of the E- Vans in figure 1, and their prices compared to the similar models in diesel, the price difference is going from + 20 % up to more than 60 %

Another issue related to the number of available E-vans in Denmark is the charging modules and the payload associated to the vans. All vans in Denmark are equipped with a battery less than 40 kW. At the same time, the payloads are all less than 1000 kg. except from the larger vans from Man e-TGE and the Renault Master Z.E which are bigger vans. With limited payload and only 33-40 kw batteries it is limited how much goods they can carry and therefore the business case is challenge. Since most revenue in goods transport is generated by a price pr. Parcel or delivery – as much payload and space in the van is needed. The heavy battery is a critical factor to this and that combined with the high initial price makes it difficult for the business to see a positive business case to be created.

Finance

As the market of standard diesel and Petrol fueled vans is a competitive market. We see a big difference in pricing between the Diesel and the E-van models that we have tested in Denmark. As shown in figure 1 the initial purchase price is a critical factor. As experience has shown the Electric cars has a profound advantage over time due to reduced operational cost. Therefore, the TCO is especially important to take into consideration buying EV´s. The Danish market has not been very proactive in terms of offering several different financing tools for the commercial actors. Therefore, it has been limited with offers of Leasing and alternative ways of funding the procurement of E-vans during 2018-2020. The market is now changing in a positive way and more car dealers are now offering better financial services, leasing agreements and service deals, that is making the E-vans

better and more affordable to acquire. At the same time, we have not seen many incentive models or direct benefit in kind programs from political side. Therefore, the initial procurement of E-vans has been limited at this stage.

Van model	Price E-Van ex.vat	Batterysize (kWh)	Range km (wltp)	kWh/km (km/kWh)	Cost pr. full charge	Diesel Usage L/km	Diesel L/km	Cost Diesel (equal Wltp E-van)	Price Diff %	20.000 km E-Van	20.000 km Diesel van	Price diff. d.kr
Renault Kangoo Z.E	185.600	33	115,5	3,50	kr. 49,50	17,00	6,79	kr. 59,79	17%	kr. 8.571	kr. 25.905	kr. 17.333
Renault Kangoo maxi	214.400	33	115,5	3,50	kr. 49,50	16,00	7,22	kr. 63,53	22%	kr. 8.571	kr. 24.381	kr. 15.810
Man E- TGE	399.000	35,8	107,4	3,00	kr. 53,70	10,50	10,23	kr. 90,01	40%	kr. 10.000	kr. 17.207	kr. 7.207
Mercede E-vito	330.000	41,4	132,5	3,20	kr. 62,10	16,00	8,28	kr. 72,86	15%	kr. 9.375	kr. 21.256	kr. 11.881
Volkswagen E-crafter	334.112	35,8	107,4	3,00	kr. 53,70	10,20	10,53	kr. 92,66	42%	kr. 10.000	kr. 16.715	kr. 6.715
Nissan Nv-200	228.000	40	140	3,50	kr. 60,00	13,50	10,37	kr. 91,26	34%	kr. 8.571	kr. 16.971	kr. 8.400
Renault Master Z.E	378.900	33	99	3,00	kr. 49,50	10,50	9,43	kr. 82,97	40%	kr. 10.000	kr. 18.667	kr. 8.667

Figure 2: Cost comparison Diesel vs Electric vans

As Figure 2 will show a clear picture of the nature of cost in terms of purchasing and operating a E-van compared to a similar Diesel truck. In this Figure we have tried to make similar assumptions to the two models. We have taken our daily routes and kilometer schemes to see the range of the E-vans and compared that to the standardized km/L In the diesel vans. We used an average price of 1,5 d.kr. for each kWh charged in the battery, and the average price for Diesel in 6 months in 2020 which is 8,90 d.kr. As the figure also shows is the price of fueling both types of vans with an early use of 20.000 km. The cost savings of using E-vans is between 6.700 and 17.300 d.kr. As shown in Figure 2, the running cost (operational costs) of E-vans is low compared to the equivalent Diesel truck. The cost of fueling varies between the vehicle models but from 17 – 42 % more expensive in favor of the E-vans. Adding to this cost is also the service and operational cost which is about 20-30 % less for E-vans than Diesel. All in all, we conclude that savings from 6000-20.000 a year on the operational running cost will make the EV much more competitive and the TCO in a 4-5-year span would be positive for some models. Adding to that number is an insurance fee and yearly tax fee which is also cheaper for an E-van compared to Diesel

This off course is a very simpleminded approach, since we also must deal with some of the operational challenges and the deployment of charge spots, grid connection fee etc.

Operational Challenges

As our pilots showed us, the biggest hurdles in converting the fleets from diesel to Electric vans was the daily operational challenges in terms of operational durability and range.

As for the Pilot case from Danske Fragtmænd Express they started out by just replacing the normal diesel van with Renault Kangoo and Renault Kangoo Maxi. As the daily tasks are not planned due to a service which is based on customers calling and asking for quick deliveries or bringing parcels from a-b in a hour by hour service, it is hard to plan and know what specific routes the van will be driving each day. For this purpose, the big issue is range and charging time. This was clearly a challenge in this pilot since the driver experienced that during the morning hours and around 12-13 o´clock. The range was down to low numbers. Having been driving on highways and cross country and needed to return to the depot. A range of max. 90 km. was achieved. Since the charging of the vehicles was only a slow charging module, which meant that the charging time was 6-7 hours. The result of this test was clear and operational time was 50 % of what was needed and required to work out in a real-life

scenario. Combined with high price and low operational performance the conclusion would be that non planned or flexible routings and daily tasks is not recommended for the E-vans.

As for Aarstiderne the challenges came from driving the E-canter Truck for more than 100 km. in a day. During normal daytime routines, the Truck had to go from the depot to the north of Zealand and return to Copenhagen. A trip back and forth of about 100 km. Because of limited time for charging the Truck had to find a Quick Charge spot on the route, which was the wrong way on the route and adding 15 km. also. Another challenge was the insecurity of being able to charge at the charge spots since this was blocked by other cars on a regular basis. As another challenge is that Danish charge spot operators has set up most charge spots to operate the private car market. Therefore, simple things as turning space, parking lot size and separation between normal parking and charge spots parking is not dimensioned for trucks. As a result, the E-truck has been challenged in many daily duties due to the lack of Quick Charging spots and if so, there design and functionality for Trucks and not private cars. This requires were different installation procedures, the availability of the charger in working hours and the possibility to book timeslots at specific hours for commercial vehicles.

As a key point and learning from the operational side of all our pilots is the infrastructure and the charging modules in the vehicles. If they do not offer the quick charge modules and therefore needs charging of 6-8 hours, the vans are not suitable for business related activities. They simply offer to little range and minimize flexibility and operational use. The limited battery capacity makes the daily life and operation very challenged at first hand and if charging is not done quick and easy accessible in the urban areas, the vans will not operate in full daytime and workday – this will be a crucial demand from the companies if they are to get involved in large scale in this business.

The pilots therefore showed us that not having Quick Charging at hand at the depots, or access to these during working days at specific times or places makes it very difficult to operate the E-vans compared to normal diesel vans or trucks.

Charging

A particularly important part of the pilot projects and learnings from last mile logistics is the availability of the charging modules that support Quick charge. But also, the widespread network associated to the urban logistic. This said, the companies that we engaged in the pilots all suffered from different challenges in the charging facilities and the lack of charge spots and booking of timeslots during daily operations.

The installation of private/home depot DC chargers is a highly effective way of optimizing charging of E-vans and does not demand any extra modules in the vans or requires an expensive installation. The common challenge in this area is that the E-vans already has an extra cost related to purchase as showed in Figure 1, but also comes with an installation and deployment price of typically 25 – 35 % cost of the purchase price.

As for charging the cost are quite substantial and must be added to the equation of purchasing an E-van. It is simply a demand that the van Is fully charged every morning before leaving the depot. We therefore calculated the cost of purchasing, deploying, and connecting the charger to the grid, to showcase the value and cost of charging.

Our pilot cases have been working with 3 types of charging access. The standard charging of 3,7 kW pr. Hour (slow charging), the 50 kW Quick Charging (QC), and the 24 kW DC-charging facility. All 3 are different ways of charging the vans in a daily operation and has several pros and cons related.

Cost of 1 charge spot 11/22 kW (slow charger):

Cost of deployment of 1-piece of 11/22 kW Charge spot with 2 outlets in d.kr. ex. vat	
Deployment (Excavation work, cabling, establishing)	20.000
Purchase of hardware (Single charge spot pole 11/22 kW)	18.500
Connection fee to grid (35 A)	24.125
Electric Control cabinet	5.000
Total Costs	67.625 d.kr

Positive benefits to 11/22 kW charging:

These charge spots are easy deployed, and the cost can vary from 6 – 10.000 €. They can be deployed in parking lots and can have 2 outlets, which enables more vans charging at the same time. The 11 or 22-kW functionality makes the cars charge with full power in about 2-3 hours. This is the cheapest way of creating a home charging facility that can handle E-van charging. You will also find many of these chargers in the urban area (in Copenhagen).

Negative benefits to 11/22 kW charging:

If the charging is not optimized and only will deliver a 3,7-kW pr. Hour, the charging is to slow, and the E-vans operational time will be limited and ineffective. So, charging from this charge spot must be either 11- or 22-kW pr. Hour. The charge spots situated in the urban area of Copenhagen are mainly installed to service the private electric vehicles and therefore not suited to host the E-vans or E-trucks. This is due to the parking lot facilities and space created for the chargers.

Cost of Quick Charging Charge spot (QC):

Cost of deployment of 1-piece of 11/22 kW Charge spot 50 kW QC in d.kr. ex. vat	
Deployment (Excavation work, cabling, establishing)	30.000
Purchase of Hardware (Single QC Charge spot 50 kW, 3 outlets CCS)	250.000
Connection fee to grid (125A)	124.800
Total Costs	404.800

Positive benefits to QC:

As more and more QC charge spots are established in the urban city, access and charging is now easier in Copenhagen. The need for this type of charging is vital in a distribution and goods transport environment. The charging is about 80 % in 25 minutes and gives the needed flexibility and limit charging time for the E-vans during operation.

Negative benefits to QC:

Expensive to install in private use, and in a home depot would be costly. The grid connection fee is remarkably high and adds a huge cost to the budget. The chargers can only charge 1 E-van at a time and cannot be booked in advance (not yet) for commercial use. This adds a risk to the operation and waiting time can be expected since the users are typically charging in 20-30 minutes pr. Stop. We experienced this challenge in all our pilots, and therefore see this as a huge challenge and operational critical issue to address both politically and to the market operators.

Cost of deployment of 1 24 kW DC-Charger (home DC-quick charging)

Cost of deployment 1-piece 24 kW DC charger (3-phase 16A) in d.kr. ex. vat	
Deployment (excavation work, cabling, establishing)	25.000
Purchase of Hardware (Single 24 kW DC-Charge, 1 outlet CCS)	75.000
Connection fee to grid (50 A)	40.625
Total Costs	140.625

Positive benefits to home DC-charging:

This charging method is now growing in most depots since it is easy to install and deploy. The charging is highly effective and works with all CCS modules and therefore very suitable for all European vans in the marked. By charging with 24 DC, the charging is less than 1-hour which brings the operational time during the day to a much higher level. This benefits the business case and limits the challenges due to charging daily. We deployed this type of charging to the pilot case of Nordic Transport and Logistics, and their daily operation was much more effective and made it possible to do 2 shifts and deliveries in and out of the city during a working day.

Negative benefits to home DC-charging:

Since this is not a standard way of charging in the urban area, these charge spots must be installed on private home depot parking lots. This off course is an initially costly investment and adds cost to the budget. The chargers can only charge 1 E-van at a time also, that limits the functionality if several E-vans are bought and needs to be in operation at the same time.

Conclusions:

In general, we would conclude that charging is such an important factor and has a great impact on the operation of E-vans daily. None of our pilots would work effectively or would have a positive outcome if not the adequate charging was/would be installed. At the same time, the functionality of charging in the urban areas, access to charge spots, Quick Charging and simply fundamental and needed for business working in goods transport. The last several years, the focus has been on Purchase price, lack of vehicle models and unprofitable business cases but very little on the “charging regime” and how to operationally integrate E-vans into city urban areas, charging facilities, incentive programs. How to make charging affordable, easy, and quick for business both at home and on the road is particularly important subject to address. Looking at the business case, this has a great impact on both the purchasing of the van, and the related cost to make it operate daily and the issues

regarding the operational time the E-van will be able to conduct during the day, which in the end is all about money and revenue generated.

Political and legal framework in Denmark

As described shortly earlier in this report, we have seen little political framework and direct incentive models or benefit in kind programs directly pointed at the logistic and transport of goods in Denmark. The programs so far have been addressed to the private electric car marked, and the private consumers. With a limited focus to the commercial marked and with no greater funding to support the market, the roll out of E-vans has been close to zero. As highlighted the need for this to happen, and for the legal framework also to support this segment is vital if any greater market development should happen in the short and long term. Shortly you could argue that if the E-vans do not fulfill market demands in terms of price, operational capabilities, and range – the companies will not transform their business. Otherwise political and legal programs will have to push and set new demands for this to happen.

As results of our pilots has shown the need of direct incentive programs to accelerate the uptake of E-vans in Denmark, we would summarize aspects of which funding programs could support the early market development nationally and the legislation that would support this area

National political initiatives that would accelerate E-van uptake in Denmark:

- Incentive models to support the purchase of E-vans
- Incentive models to support the infrastructure and charging network to support Commercial business of goods transport and logistics
- Zero emission zones in urban city areas
- Procurement of all public company owned vehicles into zero emission vehicles
- Procurement of 100 % green deliveries in public organizations and municipalities
- Reduced registration tax of E-vans in purchase
- National infrastructure strategy and funding program
- Climate goals of reducing Co2 in transport – ambitious and long termed
- Support to projects integrating E-vans, infrastructure, and commercial business development
- Road taxation on polluting vehicles – and no fees on zero emission vehicles

Legislation to promote the uptake of E-vans:

- Demand for deploying infrastructure at public spaces and buildings
- Free parking of E-vans in city areas
- Nighttime deliveries of parcels and goods
- Emission free zones
- Municipalities should have more local authority to decide
- Ban of selling Diesel and Petrol
- Limit tax on energy used for charging of e-vehicles
- Taxation to Diesel and Petrol fuels and less tax on Biogas and kW
- Reduction on fee to grid connection from charge spots
- Dispensations to public charge spots and facilities to support E-van & E-truck parking in connection to Urban areas, shopping streets and warehouse deliveries
- Long term delivery agreements to secure investments of E-vans

The Above mentioned propels have been a part of the agenda and political discussion for some years in Denmark already. As a positive effect from the NGO work, and with highlighted positive results from our pilots and others in Denmark, we now see some initiatives carried out in Denmark. This year we have seen the first direct subsidy pool of money (3 mil. €). This subsidy scheme will aim to

accelerate E-vans and E-trucks by direct subsidy of 3.000 € to each E-van and 8.000 € to each E-truck procured in a project in 2020, and at the same time the connected infrastructure will be supported by a 50 % funding of total deployment and hardware cost. We have also seen that the Municipality of Copenhagen has proclaimed that all procurement of goods should be 100 % green inside the next 5 years and onwards. That it is a total of 1,8 billion €, which will be a huge contribution to the commercial actors to invest in infrastructure and E-mobility that can support the green delivery needed.

We have also experienced a new legal act, that demand charge spots at all buildings with more than 20 parking spots, and preparation for charging on all new established parking lots and new construction buildings in the period from 2020-2025. This will enforce the development of public access to charging and for the private market to ensure charging for workers and people that lives in multi-storied buildings. But the legal act did not take into consideration anything regarding commercial fleets and logistics, which off course is a challenge in this concern.

As a contribution to the Interreg BSR – Electric project the city of Hoeje Taastrup has also supported to the Theme-specific recommendations section based upon our findings and results I our pilot activities. You will find our contribution via this link:

E-Vans and e-Logistics - Action Checklist for Municipalities, local and national politicians

Overall environmental impact and benefits to climate, noise, and direct local pollution

Trucks, busses, vans direct pollution from the exhaust pipe is about 32 % of all Co2 emission in Denmark generated from Transport. Of this 99 % of all Trucks are driven by Diesel engines[2]. This equals a total emission of 4,4 ton of Co2 related to the heavy-duty transport in Denmark.

Emissions from road transport by vehicles in Denmark[3]:

[Ton CO2]	1990	2017	2030
Road transport			
Trucks	1.770	1.610	1.500
Vans	1.700	2.030	2.010
Trains	300	240	70
Bus	620	560	330
Total emission	**4.390**	**4.440**	**3.910**

In Denmark we have about 390.000 vans on the roads. From that number a total of about 12.000 are used for the parcel and goods deliveries. So, the majority is mainly bought and used in the service business for craftsmen, electricians etc.[4].

As shown in the Figure 3 below, we see that the pollution and emission from vans is on a stable state since 2014 but still in and index number of more than 100 compared to 1990. This is a result of improvements in technology, filters and cleaner diesel fuel among others. But the tendency of more and more E-trade, last mile logistic deliveries from online groocery shopping, meal deliveries etc. this is not a sustaniable rute and development. To create the need reduction and decrease in Nox and Co2

[2] Rapport - Partnerskab for Landtransport 2019 page 6
[3] Rapport – partnerskab for Landtransport 2019 page 13
[4] Rapport – partnerskab for Landtransport 2019 page 13

emissions created from Vans. Differennt issues in regards to the solutions to this challenge would also be to optimize the transport.

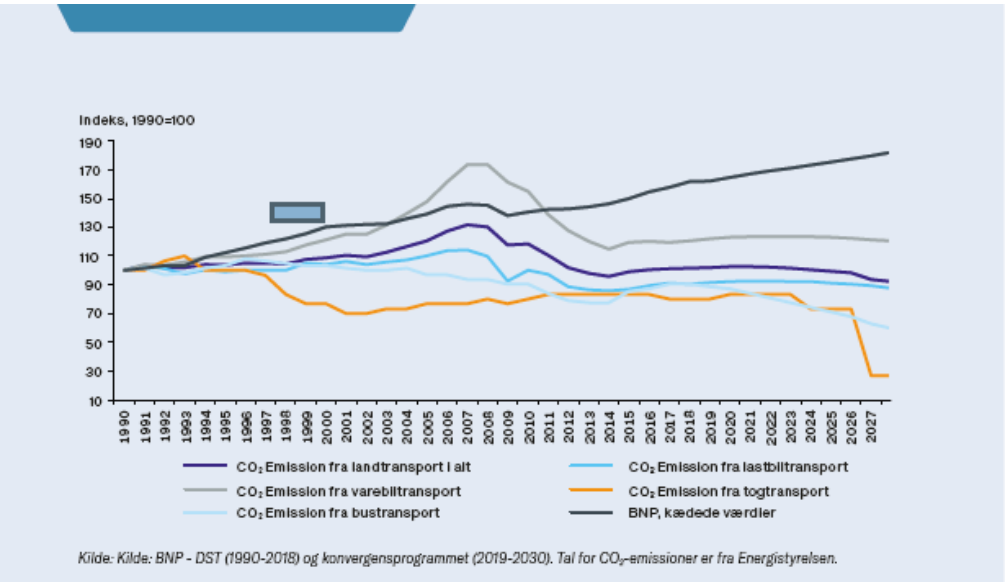

Figure 3: Overview of Co2 emission from road transport in Denmark

As we experienced in our pilotcase from Danske Fragtmænd Express is that full vans are going into the city, but they return empty. In general the business talks about 50-60 % "empty driving" which off course is creating and ineffective system. As a positive result from our Pilot is a new cooperation with a local business in Copenhagen that collects and repairs mobile phones. As the vans during the daily operation delivers the parcels in city urban areas, they also collect boxes from this company in the city and bring them back to Hoeje Taastrup Transport Center, from where there are repaired. This optimizes both the business case on behalf of Danske Fragtmænd, but also from a goods delivery and transportation perspective and shows how cooperations can be fruithfull to both parties and reduce emission from transport.

4. Final output and conclusion to the Danish Pilots

As stated, we need several actions to be carried out in the Danish market. To summarize those we have made the Action Checklist for Municipalities "Fostering e-mobility solutions in urban areas in the Baltic Sea Region and beyond", which can all be accessed on the BSR results website and by the link **E-Vans and e-Logistics - Action Checklist for Municipalities, local and national politicians**

In general, we need to see the electricity van marked develop in several ways to make it profitable to invest and use E-vans in daily business.

- The purchase price must be reduced with about 20-30 %
- The range must go up from 100 -120 km today to about 250 km.
- Charging modules should be quick charging as a standard
- Payloads must go up – so more goods can be transported at the same time
- Charging time should be minimized
- Parking facilities and charging facilities in urban areas must be improved and be commercial fleet friendly

- More green procurement must be implemented in public procurement – to ensure business and volume to businesses and commercial actors to do the long-term investments.

Direct outputs in business from our Pilots.

We are really happy to see that the snowball started rolling due to our efforts and success in the initial pilot activities. From all 3 main pilots we have seen over the time of the pilots that more interest, new way of thinking and direct investments, product development and new cooperation's in real life business scenarios has been created – that is a huge success.

Below we will briefly highlight the individual actions taken from each pilot project partner:

Danske Fragtmænd Express:

- Investment in 2 new E-vans has been implemented
- Brand new cooperation for 3 years has been agreed – 100 % zero emission delivery
- New cooperation regarding return on mobile phone equipment from dealers in City urban areas has been initiated
- Charge spot is now to be deployed in Home Depot
- New products to customers offering green delivery as a premium offer has been implemented
- Expect to invest in 5 new E-vans in 2021 – and 1 Gas Truck for long haul deliveries

Aarstiderne:

- 4-year deal with E-truck has been finalized
- Brand new strategy towards zero emission production and delivery in 2025
- New cooperation with sub-contractors on emission free deliveries from E-vans
- More daily use and more routes done from the E-truck than expected
- Installation of permanent charge spot at home depot

Nordic Transport and Logistics:

- Procurement of 5 more vans for 2021 has been initiated
- Test of new brands of E-vans are undergoing
- New customer contract of daily green deliveries has been signed
- Permanent installation of DC-charging has created better business case from daily drives – usage up by 50 %
- New product added to the company profile – offering premium green deliveries

As for the municipality of Hoeje Taastrup the related activities to the pilots has been undergoing also. This has resulted in several internal actions; among those a background report and analysis has been made during the summer of 2020. This has supported the politicians and the employees to more knowledge and understanding of the marked and trends. A strategy has now been purposed to the politicians regarding infrastructure planning, procurement of public fleet, investment strategy and prioritization from 2020-2025. The outcome of those activities is yet to be determined.