pspa

REPORT

RESEARCH PROJECT BY POLISH ALTERNATIVE FUELS ASSOCIATION (PSPA)

A COMPARATIVE ANALYSIS OF TOTAL COST OF OWNERSHIP (TCO) OF AN ELECTRIC DELIVERY VAN AND ITS CONVENTIONAL EQUIVALENT

TCO

PROJECT PARTNERS

H&M · IKEA · NO LIMIT logistyka · Samochody Użytkowe · Alphabet · engie · GARO · PIMOT

MISJAZEROWAEMISJA.PL

CITY LOGISTICS WITH ZERO EMISSIONS

Ladies and Gentlemen,

The changes in the automotive sector are taking place at a dizzying pace. Corporations invest billions of euro in innovative solutions, the majority of which are to further the development of electromobility. This trend applies not only to passenger cars, but is also increasingly visible in the segment of delivery vehicles.

The zero-emission vehicle models which are being used for goods deliveries do have many advantages. They are eco-friendly and quiet, and their driving systems operate smoothly. Also, they are of a relatively simple design and are easy to drive. Alternative drives are the future of the road transport, and thanks to new technologies such as batteries with solid electrolyte, electric cars are going to get even better, more practical and cheaper.

Despite the doubtless advantages of electric vehicles (EV) an entrepreneur who deliberates whether to buy such one will sooner or later face the question of: "is it going to be profitable"?

This report, which takes into account the current level of technologic development, the existing product offer, and the support system as is made available in Poland, is exploring this very question. It provides a reliable analysis which has been based on comprehensive comparative tests of an electric model and its internal combustion equivalent in real driving conditions.

In our opinion, an investment in an electric delivery truck is definitely worth considering today. Such an investment can give an enterprise economic, environmental and reputation benefits.

I wish you a very good reading.

Maciej Mazur

Managing Director
Polish Alternative Fuels Association

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SUMMARY OF THE TEST

MISSION ZERO EMISSIONS

THE AIM OF THE PROJECT

TCO
A comparison of the total costs of an electric delivery van with and its conventional counterpart (TCO – Total Cost of Ownership)

COSTS
Taking into account the actual, total costs associated with the purchase, commissioning, use, maintenance and sale of the vehicles

ANALYSIS
Performing a reliable and trustworthy comparative analysis of the two vehicles which were put to an everyday use for a prolonged period of time

7 weeks
DURATION

TIMETABLE

03/12/2018 – TEST STARTS
28/12/2018
17/01/2019 – TEST ENDS

	DELIVERIES FOR IKEA	DELIVERIES FOR H&M
NUMBER OF ORDERS:	Around **100 per weeko** (home deliveries)	Around **5 per week** (B2B)
ROUTE:	Within the administrative perimeter of Warsaw	No Limit warehouse (in Pruszków) ⟶ H&M store (at Marszałkowska street, Warsaw)

8
ENGAGED PARTNERS

PARTNERS

MAIN PARTNERS				SUPPORTING PARTNERS			
H&M	IKEA	NO LIMIT logistyka	Samochody Użytkowe	Alphabet	ENGIE	GARO	PIMOT
Senders of parcels as part of the test		Logistics operator	Supplier of vehicles	Supplier of GPSs	Subject-matter partner	Provider of charging stations	Data gathering and analysis

MEASUREMENTS

Columbus V-990 GPS signal recorders

Garo charging stations with AC-LS-4 current, equipped with two sockets of 22 kW each

Volkswagen E-Crafter with an onboard computer

Forms filled out by drivers every day, before and after work

22,000
MEASUREMENTS TAKEN EACH DAY

THE VEHICLES USED FOR TESTING

VOLKSWAGEN E-CRAFTER

BASIC PARAMETERS	
Engine	Electric
Power	136 HP
Torque	290 Nm
Maximum speed	90 km/h
Range (NEDC)	173 km

VOLKSWAGEN CRAFTER

BASIC PARAMETERS	
Engine	2.0 Diesel
Power	177 HP
Torque	410 Nm
Maximum speed	165 km/h

SUMMARY OF THE TEST

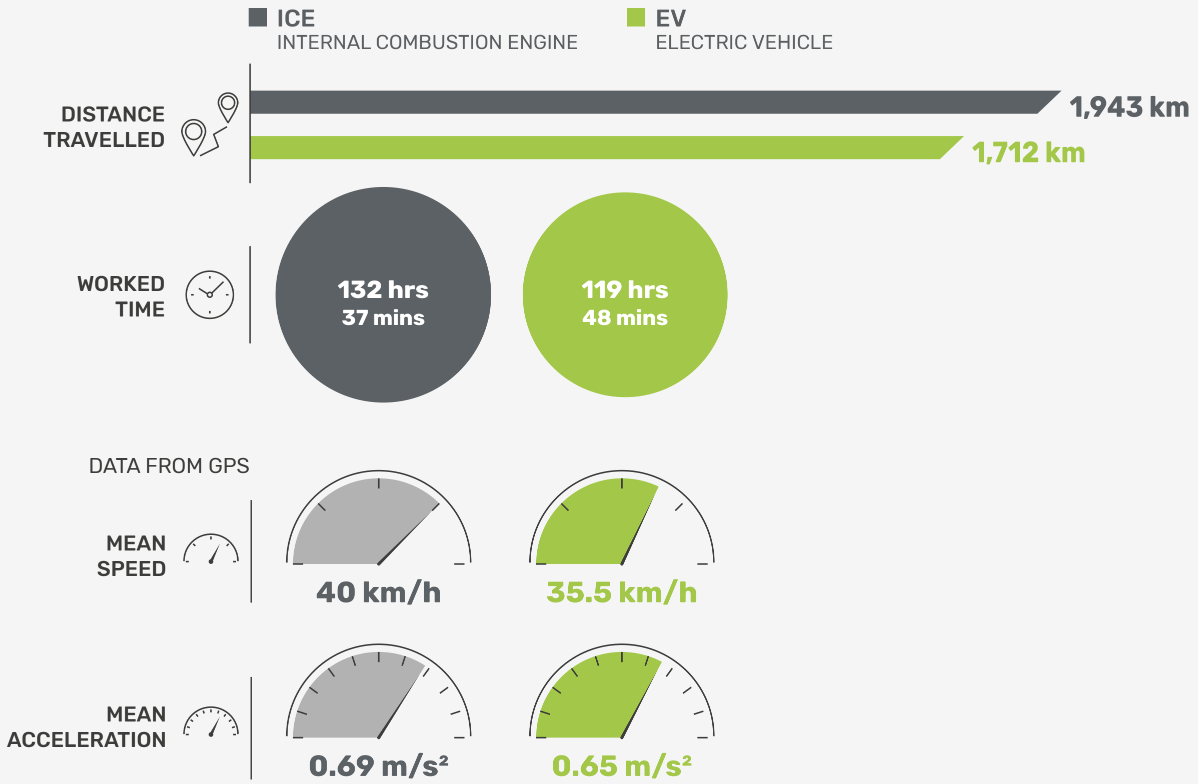
3,600 KILOMETERS DRIVEN

20 WORK HOURS

40% TOTAL TIME IN MOTION

1,000 DELIVERED PACKAGES

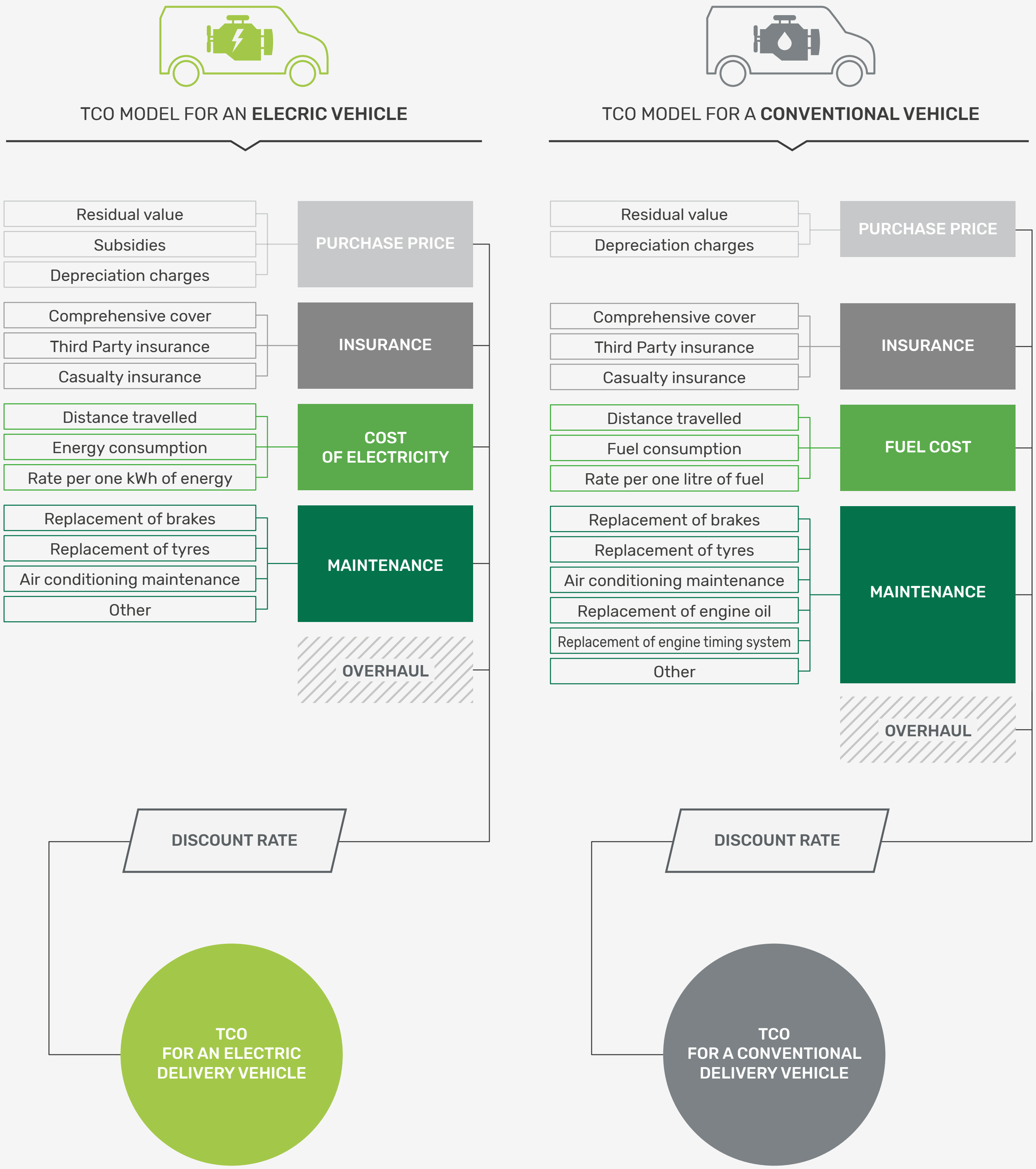
46 tons OF GOODS DELIVERED



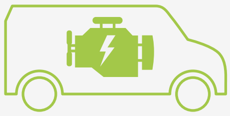
SUMMARY OF THE TEST

MISSION ZERO EMISSIONS

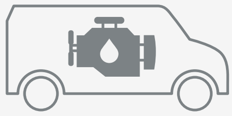
TCO ASSUMPTIONS



INPUT DATA



FOR AN **ELECTRIC VEHICLE**



FOR A **CONVENTIONAL VEHICLE**

VW E-CRAFTER		VW CRAFTER
PLN 275,572 net	COST OF PURCHASE	PLN 184,940 net
PLN 4,672	COST OF INSURANCE	PLN 2,163
29.55 kWh / 100 km	ENERGY CONSUMPTION / FUEL CONSUMPTION	10.25 l / 100 km
PLN 99	COST OF TECHNICAL CHECK*	PLN 99
PLN 0.44 net	ENERGY PRICE (TARIFF C21) / FUEL COST	PLN 4.30 net
70%	RESIDUAL VALUE	80%

MAINTENANCE OF THE EV		MAINTENANCE OF ICE
PLN 600 net	REPLACEMENT OF BRAKES (every 80,000 km / 40,000 km)	PLN 600 net
PLN 160 net	ANNUAL AIR CONDITIONING SERVICE	PLN 160 net
PLN 2,000	REPLACEMENT OF TYRES (every 40,000 km)	PLN 2,000
PLN 300 net	CONTINGENCY FOR EXTRA FIXING COSTS	PLN 300 net
–	REPLACEMENT OF ENGINE OIL AND FILTERS	PLN 200 net
–	CHANGING THE TIMING SYSTEM (every 100,000 km)	PLN 1,000 net

* The VW e-Crafter's standard includes a package of free overhauls for 4 years, manufacturer's warranty for 4 years, and an 8-year battery warranty, which have not been factored in our calculations.

SUMMARY OF THE TEST

MISSION ZERO EMISSIONS

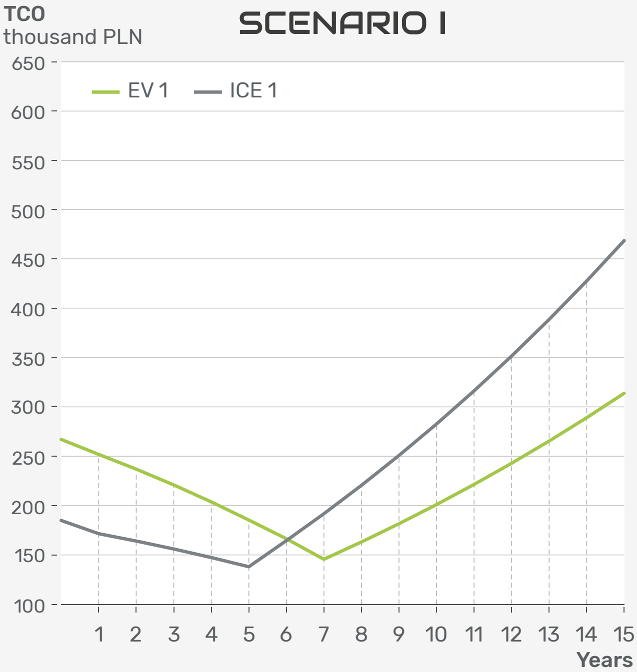
BASIC ASSUMPTIONS

- Analysed time period: **15 years**
- Number of working months in a year: **12 months**
- Number of working days in a month: **21 days**
- Discount rate: **2.87%**

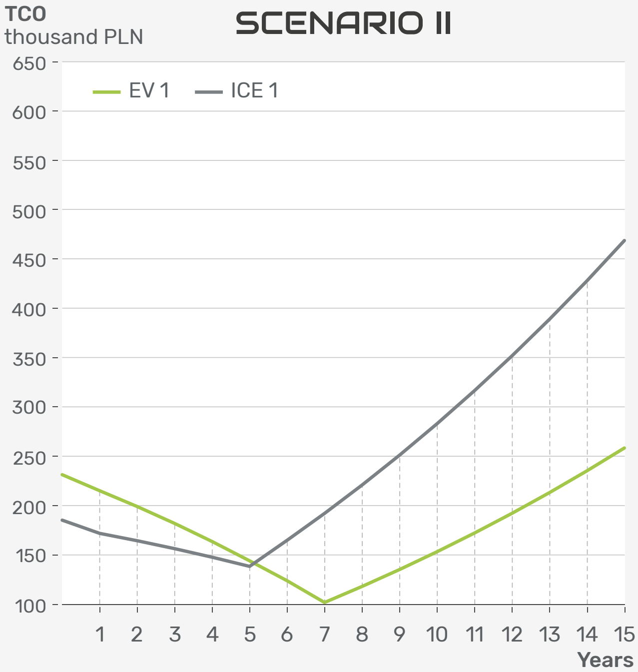
ANALYZED SCENARIOS

	I	II	III	IV
DAILY DISTANCE TRAVELLED	**120 km**	**120 km**	**170 km**	**170 km**
EXEMPTION OF VEHICLES FROM EXCISE TAX AND 100% DISCOUNT OF VAT	YES	YES	YES	YES
SUBSIDIES FOR AN ELECTRIC VEHICLE	None	**PLN 36,000**	None	**PLN 36,000**
DEPRECIATION FACTORED IN	**Linear**	**Linear**	**Linear**	**Linear**

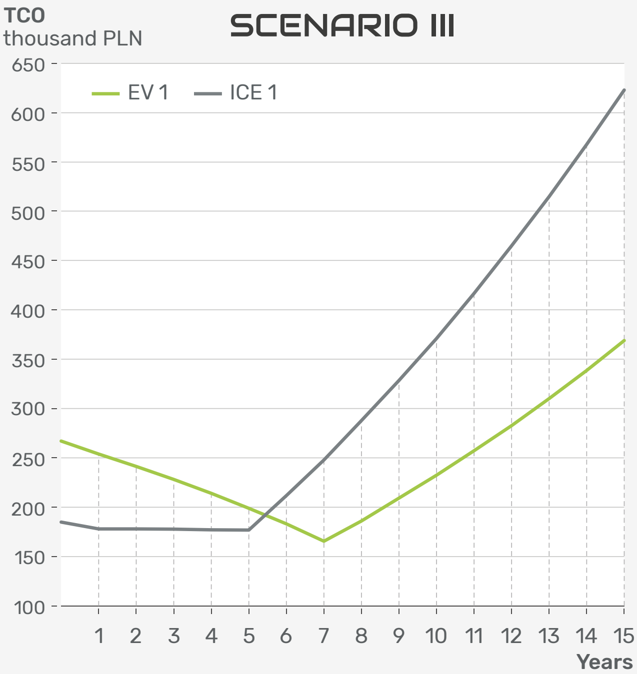
SCENARIO I



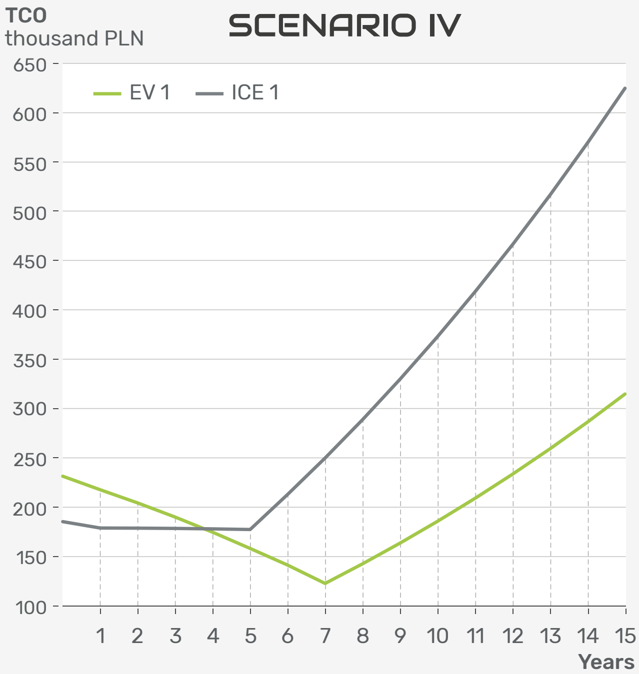
SCENARIO II



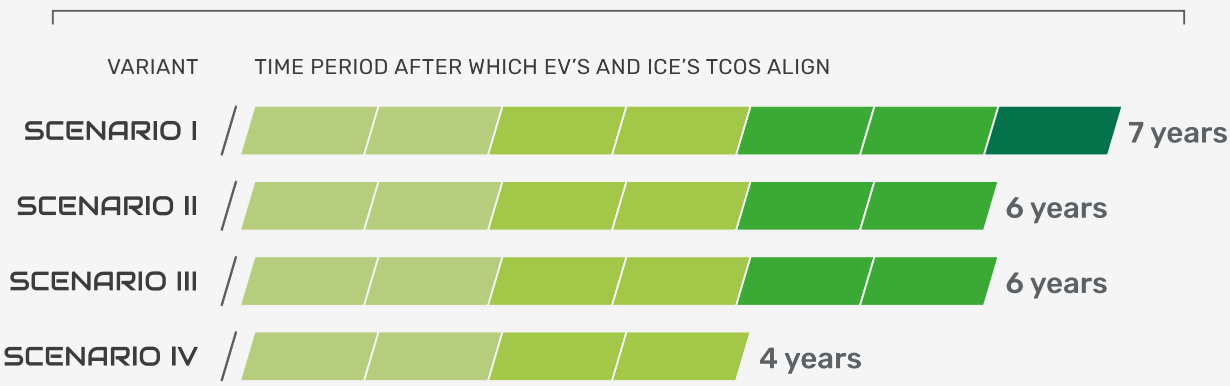
SCENARIO III



SCENARIO IV



SUMMARY OF RESULTS



CONFERENCE TO INAUGURATE THE "MISSION ZERO EMISSIONS" PILOT PROJECT

18/12/2018
WARSAW

1 INTRODUCTION TO THE TOTAL COSTS OF OWNERSHIP (TCO) ANALYSIS

01 **When analysing whether any product purchase is profitable or not, we tend to look at the purchase price as a key determinant of profitability**. Given a very lively discussion about the indispensable support for eco-friendly transport solutions in Poland and the likely directions of this support, a business-minded examination of this issue seems warranted.

02 A simplified cost-effectiveness approach which emphasizes the vehicle's purchase cost may lead one to a conclusion that an electric vehicle will not at present pay off, as it is more expensive to buy. **However, such a simplification is unsupported and leads one's thinking astray, as it does not take into account numerous components of costs other than just a purchase price**.

03 **For this reason, a holistic approach called the TCO (Total Cost of Ownership) is becoming increasingly popular**, as it takes into account the actual total costs associated with a product purchase, its commissioning, use, maintenance, and eventually, sale of resources.

04 Such an approach has been adopted for the pilot project as the most reliable and best suited to the projects' needs. **As a result, we have arrived at the Poland's-first comparison of economic aspects of an electric delivery vehicle against a conventional vehicle, in normal conditions of use, during a prolonged period**.

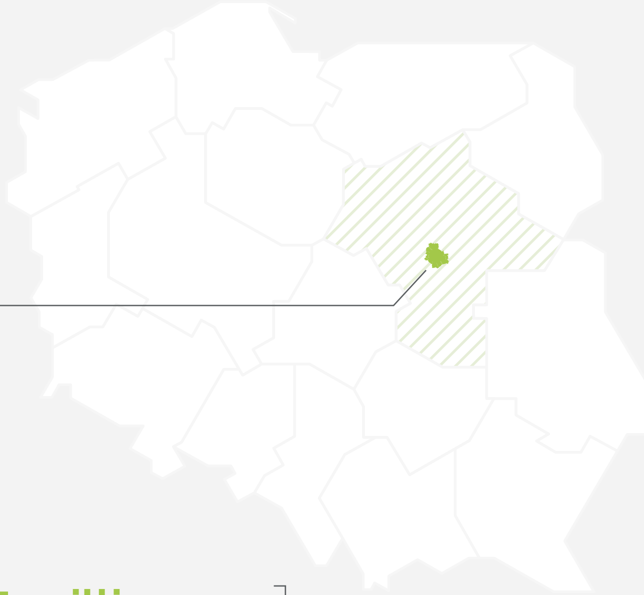
05 The aim was to conduct a reliable and accurate comparative analysis of a Volkswagen Crafter and its electric counterpart, that is an e-Crafter. **We do invite you to familiarize yourselves with the results of the TCO test of these two vehicles with different propulsion systems. They were used for the purposes of urban logistics, and were driven in normal driving conditions on Polish roads**.

MISSION ZERO EMISSIONS

03/12/2018 - 17/01/2019

PLACE OF TESTING

Central Poland is one of the largest TSL (Transport-Shipping-Logistics) markets in the country



WARSAW

173,487

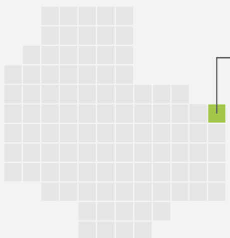
Number of registered lorries, including cargo-passenger cars and vans

1.6 million registered vehicles for **1.7 million** of inhabitants

900 vehicles per 1,000 inhabitants

1 million

trucks and passenger vehicles cross every day the borders of the Warsaw's administrative perimeter both ways



5 km² is the total space taken by 500,000 vehicles (half a million crossing each way)

→ **1%** of the whole area of Warsaw (517.2 km²)

1.75 million tons

of cargo is transported every year in Warsaw by road transport, which includes 1.1 million tons of commercial cargo

15,000 is the number of vehicles working each day in the Warsaw city centre, generating

25,000 logistic operations (loading/unloading)

MISSION ZERO EMISSION

9 ENGAGED PARTICIPANTS

PROJECT PARTNERS

01

A number of companies got involved in our project. They are the usual partners of the **Polish Alternative Fuels Association**(PSPA).

02

The vehicles, that is the e-Crafter and Crafter, were provided by the **Volkswagen Commercial Vehicles**, which since 70 years has been providing light commercial vehicles.

03

No Limit, which is a low-carbon logistics leader in Poland, was our logistics partner

04

At the beginning, deliveries were made for **IKEA**. Goods from shops were shipped directly to customer (B2C) under the home delivery services.

05

Subsequently, deliveries were made to the **H&M** store. Shipments from the No Limit's warehouses were transported to a H&M's store at Marszałkowska str. in Warsaw (B2B).

06

The **Institute of Automotive Industry** also participated in our project. The Institute, together with PSPA, developed the research methodology, and then aggregated and analysed the data.

07

Alphabet is one of the largest European Car Fleet Management service providers. It explores the potential of electrification of fleets. Alphabet provided the project with measuring devices.

08

GARO is the largest manufacturer of infrastructure in Poland. It provided chargers for the project throughout its duration. The chargers were installed at the No Limit's headquarters.

09

The technical support was ensured by **Engie**, which is a world leader energy company with almost 60,000 EV charging devices around the world.

MISSION ZERO EMISSION

B2C DELIVERIES

2 OVERVIEW AND CONCLUSIONS FROM AVAILABLE LITERATURE ABOUT THE TCO OF ELECTRIC VEHICLES

The electric vehicles market is developing fast. For this reason, the subject of comparing the total cost of ownership of electric and conventional vehicles starts to be popular, both for the researchers, and for business.

The authors of the European-based analyses adopt various initial assumptions. This leads to divergent conclusions, which to a different extent seem to be in favour of electric vehicles[1].

Economic and political circumstances do have a significant impact over the results of the calculations. For this reason, the results of analyses conducted for different countries, even if made under the same initial assumptions, are sometimes divergent (the presence and the levels of available subsidies, different prices of electricity and fuel, different provisions for discounts for electric vehicles, differences in levels of depreciation and taxes).

In their analyses, the authors usually compare TCO for vehicles with different types of propulsion which represent the same market segment (mini vehicles, city vehicles, compact or premium cars). For each segment, the curves of total cost of ownership in the multi-year analysis shape differently. For example, in an analysis which was carried out in Belgium the vehicles got divided into three classes: city cars, middle class and premium[2]. According to the results, electric city cars are not economically attractive if the batteries cannot be leased. Leasing is, however, offered by selected manufacturers only. In other vehicle classes the differences in TCO were lower, but even there the electric cars' TCO does not level up to the other vehicles within the assumed period of analysis (that is seven years).

One other analysis, carried out in the Swedish conditions, showed that the analysed electric vehicle (BMW i3) can be profitable if appropriately selected governmental subsidies applied[3]. If the purchase of an electric vehicle is subsidised at 22%, this car's TCO can car be more than 5% lower than in a conventional car or a hybrid after 3 years of use.

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[1] K. Żebrowski, T.Detka, K.Małek, *Analiza porównawcza danych z raportów dotyczących emisji CO_2 oraz całkowitych kosztów posiadania (TCO) pojazdu elektrycznego w odniesieniu do pojazdu z napędem konwencjonalnym [Comparative analysis of data from CO_2 emission reports and total cost of ownership of an electric vehicle in relation to a conventional drive vehicle]*, Maszyny Elektryczne – Zeszyty Problemowe No. 3/2018, pp. 161-170

[2] K. Lebeau, P. Lebeau, C. Macharis, J. V. Mierlo, *How expensive are electric vehicles? A total cost of ownership analysis*, World Electric Vehicle Journal Vol. 6, ISSN 2032-6653, pp. 996-1007, 17-20/11/2013

[3] J. Hagman, S. Ritzen, J. Janhager, Y. Susilo, *Total cost of ownership and its potential implications for battery electric vehicle diffusion*, Research in Transportation Business & Management 18, pp. 11-17, 2016

The authors of the next publication[4] prove that in Germany the most profitable type of a vehicle is a plug-in hybrid, because the variable costs associated with its use are relatively low, and its purchase price is not as high as it is in a case of an electric car. According to another analysis, profitability of electric cars strongly depends on the distance travelled each year. The authors say that electric cars prove an economically advantageous solution as city cars whose daily driving distance is at least 41.6 km. Vehicles from other market segments are likely to pay off if they cover a longer daily distance, that is 77.9 km.

The results of individual calculations do differ from each other even if the analyses examine vehicles of the same type. Their authors adopt various initial assumptions and apply different methods to calculate the total cost of ownership of the vehicles. Our report, supported by a pilot program, presents the rationale for using electric delivery vehicles for urban logistics in the Polish conditions.

We do come across contradictory opinions regarding electric cars.

One day we may hear a comment saying that it involves such a huge CO_2 emission to produce a battery that electric cars are ecologically unviable. Other commentators will claim that electric cars tend to be environmentally-neutral, even if the energy in Poland is such a mix to produce. On a Monday we can read that it is impossible to produce an electric car as cheaply as its conventional equivalent, while on a Friday of the same week we can hear opinions that cheap China-produced electric vehicles are going to "flood the market." Elements of this discussion which an average consumer listens to, and he is the most important part of this equation, are often based on unreliable sets of data. Such data are often a basis of dichotomous, unnecessarily emotionally-loaded messages. This is the reason why we have made our report. During its making, we were so relieved to finally abandon our temptation to start convincing anyone about anything, and rather than that to focus on what ultimately can make electric cars widely popular, that is the money.

Tomasz Detka
Industrial Automotive Institute (PIMOT)

[4] P. Plotz, T. Gnann, M. Wietschel, *Total Ownership Cost Projection for the German Electric Vehicle Market with Implications for its Future Power and Electricity Demand*, Fraunhofer Institute for Systems and Innovation Research ISI, Germany

[5] G. Wu, A. Inderbitzin, C. Bening, *Total cost of ownership of electric vehicles compared to conventional vehicles: A probabilistic analysis and projection across market segments*, Energy Policy 80, pp. 196-214, 2015

For the purpose of our test, the interdependencies and assumptions adopted in many scientific publications and reports in Europe and globally were analysed. On that basis, our own dependency has been developed in order to calculate the TCO.

The dependency takes into account all the criteria which are crucial from the point of view of using vehicles in a logistic company. The dependency presented below became the starting point for the development of the entire methodology for the calculations. Its individual components have been determined on the basis of publicly available data, legal acts, adopted assumptions, and the data gathered during the pilot project.

$$\mathbf{TCO}(t) = P - \frac{P \times d^{n}}{(1-p)^{n}} + \sum_{t=0}^{n} \frac{F(t) + Ins(t) + I(t) + A(t) + M(t)}{(1-p)^{t}}$$

—

P – purchase price
t – subsequent years of the analysis
n – analysed time expressed in years
d – residual value
F – the annual cost of fuel/electricity used to propel the vehicle
Ins – annual cost of the overhaul
I – annual insurance costs
A – rate of annual depreciation write-down
M – annual servicing costs
p – discount rate

MISSION ZERO EMISSIONS

CHARGING

3 DESCRIPTION OF THE ADOPTED METHODOLOGY OF THE TCO ANALYSIS

For any financial analysis one has to adopt certain presuppositions and to forecast changes in key parameters during the period under analysis.

The same applies to the calculation of the total cost of ownership of a motor vehicles. Some values and their changes have to be assumed, including inflation, fluctuations in fuel prices, the car's value impairment during the operation, maintenance costs, and many other. While developing the TCO methodology for this report, efforts were made to look at as many such component costs as possible.

Regardless of the type of a vehicle under scrutiny, the TCO components are divided into:

ONE-OFF COSTS

→ e.g. the purchase price, excise duty, income tax on the purchased fixed asset

RECURRENT COSTS

→ e.g. fuel costs, maintenance and technical checks

In our analysis, all cash flows are discounted to the base year (the year of the vehicle's purchase), therefore it was necessary to determine the value of the discount rate.

The discount rate was set at 2.87%, according to the change of the method for setting the reference and discount rates announced in the Communication from the European Commission[6], binding from 1 July 2008 r. This value is specific to a country where an analysis is being made and depends on many economic factors[7]. The given value is a currently established discount rate for Poland for 2019. However, a possibility of some under-determination may occur due to the lack of information on the value of the future base rate.

[6] Office of Competition and Consumer Protection, *Stopa referencyjna i archiwum [Reference rate and archive data]*, https://www.uokik.gov.pl/stopa_referencyjna_i_archiwum.php, accessed on: 29/01/2019

[7] Bubeck, Steffen, Tomaschek, Jan, Fahl i Urlich, *Perspectives of electric mobility: Total cost of ownership of electric vehicles in Germany*, Transport Policy, pp. 63-77, 2016

3.1 One-off costs

In our analysis, the **purchase cost** of the tested vehicles came from their manufacturer. Since the project envisaged to use delivery vans for urban logistics, it was assumed that the vehicles would be used only for business purposes in a logistics company, just as the case was in the pilot project. In such a case, an entrepreneur can **deduct 100% VAT from the vehicle's purchase price** (for this he has to file a VAT-26 return with a tax office and to record the vehicle's mileage) as well as **VAT from the operating costs**, i.e. on VAT fuel or electricity[8].

Also, under the current regulations delivery vehicles are exempt from excise duty[9]. Therefore, we lowered the initial prices of both vehicles by 3.1%. Our calculations also take into account the vehicles' sale at the end of the assumed time period. For this, it was necessary to estimate the residual value of the tested vehicles. There are lots of available data for conventional vehicles in this regard. However, it is somewhat harder to arrive at such data regarding electric vehicles, especially delivery vans, because they only start to be used, while their presence at the secondary market is virtually none. Since the data on the residual value of such vehicles are not directly available[10 11 12], it is hard to determine their residual value. For our analyses we assumed the residual value based on the data available from scientific articles and publications.

A green, smog-free city is a future worth jointly working on.

As part of the global IKEA sustainable development strategy, we want by 2025 to be making all our deliveries to customers by zero-emission vehicles. In Shanghai, a partner co-operating with IKEA has based its entire fleet on electric cars, and it happened as early as in 2018. It is time the electric revolution started in Poland. The Zero Emissions Mission project is especially dear to IKEA, as it is a bold declaration of our values, and on the other hand , it is a source of truth about how ready we are to effect deliveries by electric vehicles, and what still remains to be refined, together with our carriers

Wiktor Zaremba
Sustainability Developer, IKEA

[8] Infor.pl, *Odliczenie 100% VAT od samochodów a ewidencja przebiegu (kilometrówka) [Deduction of 100% VAT on cars and record of mileage]*, https://ksiegowosc.infor.pl/podatki/vat/odliczanie-i-zwrot-podatku/699780,Odliczenie-100-VAT-od-samochodow-a-ewidencja-przebiegu-kilometrowka.html, accessed on: 29/01/2019

[9] Act of 6 December 2008 on excise duty, Article 109(a)

[10] J. Hagman, S. Ritzen, J. Janhager, Y. Susilo, *Total cost of ownership and its potential implications for battery electric vehicle diffusion*, Research in Transportation Business & Management 18, pp. 11-17, 2016

[11] Arjan van Velzen, *Electric Vehicles: a cost competitive game changer or technology's false hope? Total Cost of Ownership analysis of Electric Vehicles for the 2015-2030 timeframe*, Delft University of Technology, Delft, 2016

[12] G. Wu, A. Inderbitzin, C. Bening, *Total cost of ownership of electric vehicles compared to conventional vehicles: A probabilistic analysis and projection across market segments*," Energy Policy 80, pp. 196-214, 2015

Since the study concerned vehicles used in various types of enterprises, we looked at a possibility of **making depreciation deductions** from fixed assets, which delivery vehicles are. As of 1 January 2019, by the force of an amending Act as of 23 October 2019 (Journal of Laws, item 2159) new limits of depreciation deductions on passenger cars will have been introduced. Under this amendment, maximum write-offs are going to increase, respectively, to PLN 150,000 for vehicles with conventional drive and up to PLN 225,000 for electric vehicles[13]. Depreciation of costs of company car can be done in several ways: straight-line depreciation, individual depreciation, and one-off depreciation. Our analysis uses the straight-line depreciation method, with an annual write-down rate in line with the Annual Depreciation Rates List, which makes an annex to the Corporate Income Tax Act. The adopted deduction rates are, respectively, 20% for a truck with a conventional drive system, of a gross vehicle weight below 3.5 t, and 14% for a similar vehicle with an electric drive[14].

SUMMARY

ONE-OFF COSTS

- **Purchase price as quoted by the manufacturer**
- **Deduction of 100% VAT of the purchase price and of the operating costs, i.e. fuel/electricity**
- **Vehicles exempt from excise duty (the purchase price less 3.1% of the vehicles' value)**
- **Residual value (an estimate of the value of the electric vehicle was based on data available in scientific articles and publications)**
- **Possibility of depreciation write-downs has been taken into account**

It was with no hesitation at all when at the beginning of the year we decided to join the Mission Zero Emissions project.

We are convinced that the new Crafter, which has been created virtually from scratch, is the best model in its class. It ensures driving comfort and safety and is ideally suited for long intercity and international routes. We have complete faith in the new electric version of this model, which is a complement to our offer and is ideal for urban deliveries, that is the so called "last-mile deliveries". The test's results are very positive for us. Each car drove over 1,700 km and effected over 1,000 deliveries with a total weight of 46 tons during the whole test period. The test confirmed that the electric Crafter is ideal for the daily logistics tasks and that its range is sufficient to fulfil urban orders. We are especially pleased with the TCO results, as they clearly show that after only four years of being in service and utilizing purchase support from the Low-Carbon Transport Fund, the TCO costs are lower than the costs of a traditional internal combustion vehicle. It is worth saying that the new Crafter has got a number of additional benefits as part of its standard version, such as a service package for 4 years, which means that during this period a customer does not pay for periodic technical services. The car has also got a manufacturer's warranty for 4 years and a battery warranty for 8 years.

Patryk Grzeczka
Marketing Director, Volkswagen Commercial Vehicles

[13] eGospodarka.pl, 3 December 2018, http://www.podatki.egospodarka.pl/152772,Amortyzacja-samochodu-osobowego-po-zmianach-w-2019-r,1,68,1.html, accessed on: 29/01/2019

[14] Chancellery of the Sejm, Act of 15 February 1992 on corporate income tax

3.2 Recurrent costs

Recurrent costs are all costs incurred by the owner of a vehicle throughout its lifetime. Among them, the greatest impact on the final value of the TCO are the **operating costs associated with the consumption of energy which is used to drive the vehicle**[15]. In urban logistics, vehicles which carry out individual orders move on various routes with different driving dynamics. This is because, for example, the very nature of an order, one's driving style, the cargo's weight, road conditions, etc.
In order to perform a comparative analysis of the costs of a vehicle, **energy consumption and fuel consumption should be averaged**, so that this value stays level for the whole period under analysis. Similarly, an identical daily average distance travelled by the vehicles should be assumed, basing on the data obtained.

Currently, **electricity used for cars is so much cheaper than liquid fuels, hence the greater the daily distance adopted for the analysis, the better the electric cars perform in comparison to their conventional counterparts**. However, the purchase price of an electric vehicle is usually higher, which means that in the early years of the analysis, the TCO of electric cars will be higher.

SIMPLIFIED METHOD OF CALCULATING DAILY EXPLOITATION COSTS:

EV	Energy consumption (kWh/100 km)	x	Distance travelled daily (100 km)	x	Electric energy price (PLN/kWh)	=	Total driving cost of an electric vehicle (PLN)
ICE	Fuel consumption (L/100 km)				Stawka za paliwo (PLN/L)		Total driving cost of a conventional vehicle (PLN)

The values so calculated ought to be multiplied by the analysed time-period, respectively, by the number of working days in a month, the number of working months in a year, and the number of years which we envisage to be using the vehicle for.

In Poland, a vehicle's insurance premium is dependent on a number of factors, i.e. the vehicle's value, its owner's data (their age, length of driving experience, length of accident-free driving, place of residence), engine's power, vehicle's version, and its intended use. It is mandatory to buy only a third party liability cover, but it is advisable to also buy a comprehensive cover against the results of a collision, damage by elements of the nature, theft of the vehicle or its physical damage, as well as the cover for the driver's and passengers' of life and health.

Our analysis includes the costs of all such insurance premiums. Currently, insurance premiums for electric vehicles are higher than for their conventional counterparts, which is primarily due to a higher initial value of an electric vehicle. Our analysis assumes the actual amounts for the tested vehicles, as stated in their insurance policies.

[15] K. Palmer, J. E. Tate, Z. Wadud, J. Nellthorp, *Total cost of ownership and market share for hybrid and electric vehicles in the UK, US and Japan*, Applied Energy 209, pp. 108-119, 2018

The maintenance costs depend on the vehicle's type, intended use, and the distance travelled in a year. They include all the repairs and replacements of expendable parts (brake pads, tyres, fluids, etc.) throughout the entire service life. **Maintenance costs are lower for electric vehicles, due to the fact that electric vehicles have fewer moving parts, they do not require replacing engine oil or fuel filters**. Tarcze hamulcowe oraz klocki zużywają się także znacznie wolniej w związku z możliwością hamowania maszyną elektryczną w znacznym stopniu[16 17 18].
Our model assumed market rates for individual repair costs and estimated an expected frequency of replacements on the manufacturer's and service manual's recommendations. Then, the service costs were spread evenly over all the years of the analysis.

The costs of the technical services were adopted in accordance with the applicable rate, that is PLN 99 annually (including the registration fee). However, due to the fact that in the given case the newly purchased vehicles are being analysed, it should be taken into account that such a vehicle must pass a technical inspection only after 3 years into its operation, and then within 2 years of the first technical examination. After this period, subsequent checks are carried out annually[19].

It is worth noting that it is a standard for e-Crafter to have the manufacturer's warranty and a package of free technical checks for the period of 4 years, which have not been factored in our calculations.

[16] K. Lebeau, P. Lebeau, C. Macharis, J. V. Mierlo, *How expensive are electric vehicles? A total cost of ownership analysis*, World Electric Vehicle Journal Vol. 6 - ISSN 2032-6653, pp. 996-1007, 17-20/11/2013

[17] K. Palmer, J. E. Tate, Z. Wadud, J. Nellthorp, *Total cost of ownership and market share for hybrid and electric vehicles in the UK, US and Japan*, Applied Energy 209, pp. 108-119, 2018

[18] J. Hagman, S. Ritzen, J. Janhager, Y. Susilo, *Total cost of ownership and its potential implications for battery electric vehicle diffusion*, Research in Transportation Business & Management 18, pp. 11-17, 2016

[19] M. I. K. Opawski, Rozporządzenie Ministra Infrastruktury z dnia 29/09/2004 r. w sprawie wysokości opłat związanych z prowadzeniem stacji kontroli pojazdów oraz przeprowadzaniem badań technicznych pojazdów [Regulation of the Minister of Infrastructure of 29/09/2004 regarding the amount of fees associated with running a vehicle inspection station and conducting technical tests of vehicles], 2004

SUMMARY

RECURRENT COSTS

- **Electricity or fuel used (in accordance with the prices which were actual during the pilot program)**
- **Vehicle insurance (comprehensive, third party, accident)**
- **Servicing and repairs (costs estimated on the basis of current prices for standard replacement services or repairs of individual components)**
- **Technical checks**
- **Taxes**

For H&M, quality is more than just a fabric that you can feel under your fingertips.

The quality is also about the environment, about society, and about offering fashion to customers who are conscious and socially responsible. As our company vision states it, we want to be a leader of change when it comes to circular and renewable fashion, while at the same time being an equitable company which treats everyone equally. This vision applies to every brand within the H&M group and it clearly shows the direction which our aspirations are taking. We want to actively participate in solving the problem of the global warming and climate change. Our goal is to achieve a climate-friendly chain of values by 2040. Participation in the project "Zero Emissions Mission" matches our aspirations perfectly, so our participation in it came very naturally. We are going to support projects which contribute to the development of electromobility in Poland, and to the development of renewable energy.

Michael Schulz
Head of CEE logistics division, H&M

3.3 The TCO model

Taking into account all the costs which have been mentioned so far offers an opportunity to build a mathematical model which can help to calculate the TCO. Such an analysis enables comparison of the purchase and running costs of various vehicles. It can prove extra useful in companies in which vehicles are meant to be a source of profit. In order to maximize the profit, a key aspect is to reduce operating expenses, including the fleet's operating costs.

This comparative analysis looks at an electric delivery van and its conventional equivalent, both intended for urban logistics. **The diagrams show all the one-off and recurrent financial components included in the TCO analyses**.

For the purposes of the test, a mathematical model was built, presented above in Chapter 2. The model was developed in MatLab, in its interactive environment used for scientific calculations and engineering. Additionally, to speed up the calculations and to enable a quick analysis of many scenarios (such as different daily distances, various subsidies), a user interface has been developed which bases on the App Designer application, which is an integral part of the MatLab environment. The results of the calculations are curves which show the total costs of using the vehicles in two subsequent years.

The created algorithm pinpoints the year of the two vehicles' TCOs' alignment and generates various pie charts to illustrate the percentage share of individual TCO components for the entire period under the analysis. An advantage of the developed solution is the ability to compare the TCO of any two vehicles (electric and diesel) if their parameters in the two variants are known.

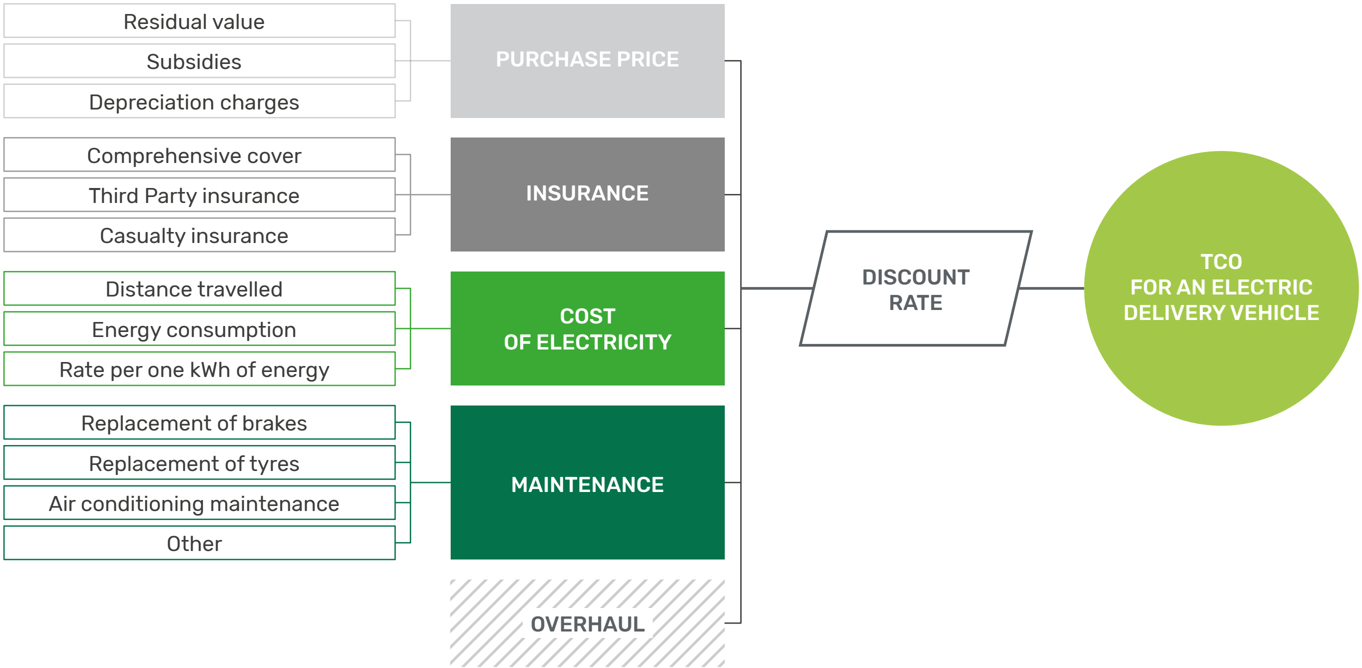
The Mission Zero Emissions is coming to an end. For "No Limit" it has been another step in the implementation of a green strategy called "Environment-friendly logistics", which we implemented in 2016

It implements and further promotes green solutions in the TFL industry, including through deliveries by vehicles which use alternative fuels. These weeks of testing of the electric VW Crafter during its deliveries for IKEA and H&M have provided answers to a lot of questions and further confirmed our conviction that we ought to continue work using electric vehicles for the "last mile" deliveries in cities such as Warsaw. The summary report presents many conclusions and we do agree on one thing: the key factors which condition the success of investments in e-mobility solutions are the access to infrastructure, as well as the range, load capacity, and the price.

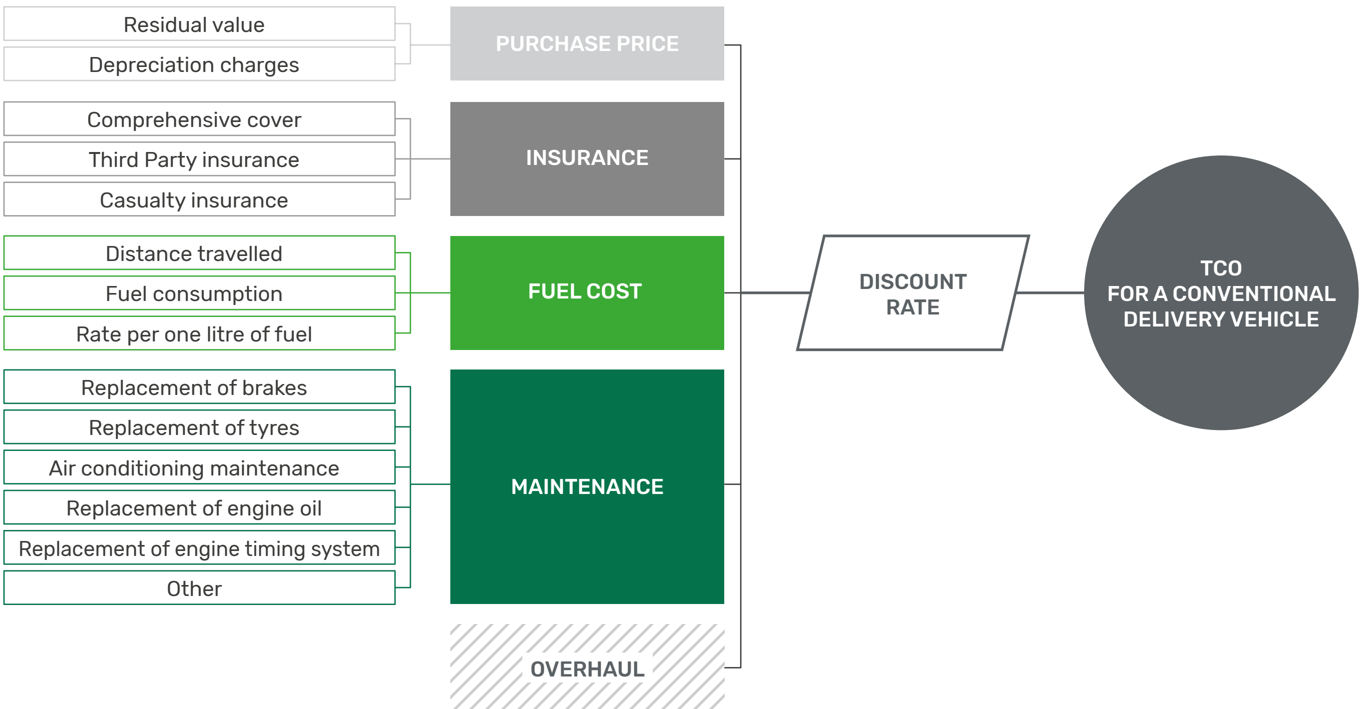
Maciej Rybak
Home Delivery Development and Sales Director, NO LIMIT

THE TCO ASSUMPTIONS

THE TCO MODEL FOR THE **ELECTRIC VEHICLE**



THE TCO MODEL FOR A **CONVENTIONAL VEHICLE**



MISSION ZERO EMISSIONS

CHARGING

4 DATA GATHERED DURING THE PILOT PROJECT

DURATION OF THE TEST

03/12/2018
TEST STARTS

DELIVERIES FOR IKEA

NUMBER OF ORDERS
Around **100 per week**
(home deliveries)

ROUTE
obszar administracyjny m.st. Warszawy

28/12/2018

DELIVERIES FOR H&M

NUMBER OF ORDERS
Around **5 per week**
(B2B)

ROUTE
No Limit warehouse (in Pruszków) → **H&M stpre** (at Marszałkowska str., Warsaw)

17/01/2019
TEST ENDS

THE VEHICLES USED FOR TESTING

VOLKSWAGEN E-CRAFTER

BASIC PARAMETERS	
Engine	**Electric**
Power	**136 HP**
Torque	**290 Nm**
Maximum speed	**90 km/h**
Range (NEDC)	**173 km**

VOLKSWAGEN CRAFTER

BASIC PARAMETERS	
Engine	**2.0 Diesel**
Power	**177 HP**
Torque	**410 Nm**
Maximum speed	**165 km/h**

SOURCES OF THE DATA

Throughout the pilot project period, **the vehicles were equipped with Global Positioning System (GPS) recorders** (Columbus V-990), which recorded time, GPS coordinates, speed and travel rates at the frequency of 1 Hz. The devices recorded vehicles' speed with an accuracy of ± 0.1 km/h and the distance travelled with an accuracy of ± 0.1 m[20]. The devices were powered from the cigarette lighter socket, which ensured uninterrupted signal recording during vehicle operation.

The electric vehicle was charged every day after work, **using the AC-LS-4 Garo AC charging station**, which was equipped with two 22 kW sockets. **The drivers had RFID cards for identification purposes at the charging point**. Additionally, the charger could use 3G and Ethernet and therefore **register and record details of each charging session of the electric vehicle. The station was equipped with an electricity meter**.

Additional verification was provided by the forms which the drivers were filling every day, before and after work. The data in the forms included: the date, odometer reading at the beginning and at the end of the working day, start and end times, number of vehicle charging/refuelling sessions, fuel price, **and the data from the on-board computers**.

Better air quality, less noise, improved traffic in the cities.

These are the areas with which we deal at ENGIE. We want to help cities to catch a breath, so we work on changing the type of mobility. Projects such as the "Mission Zero Emissions" help verify whether using electric vehicles is viable, and also show the TCO for delivery vehicles operating in the Polish climatic conditions. This is an important step towards making transport companies aware of green alternatives. ENGIE operates on the global market, and our experience from Western Europe indicates that electromobility in transport, especially in cities and on repetitive routes is a good direction to take. While varying and longer routes might cause some inconveniences because of the charging stations, doing orders within cities and on relatively short distances is the way to take with electric delivery vehicles. Globally, and in Poland, we offer our partners ready, tried-and-tested solutions which provide access to charging points. We put our installations also in logistic centres. Choosing the right charging infrastructure enables one to take full advantage of fast recharging, and proper selection of charging profiles helps reduce the cost of buying energy.

Janusz Grądzki
Director of the New Technologies Department,
ENGIE Polska

[20] Columbus, V – 990 Multifunction GPS Data Logger User Manual, Victory Co., Ltd, 2011

SELECTED VALUES

ICE | EV

3,600
KILOMETERS DRIVEN

ICE: 1,943 km
EV: 1,712 km

DISTANCE TRAVELLED

250
WORK HOURS

ICE: 132 hrs 37 mins
EV: 119 hrs 48 mins

WORKED TIME

40%
TOTAL TIME IN MOTION
(parking time was connected mainly with loading, unloading, and traffic lights)

DATA FROM GPS

ICE: 40 km/h
EV: 35.5 km/h

MEAN SPEED

ICE: 0.69 m/s²
EV: 0.65 m/s²

MEAN ACCELERATION

1,000
DELIVERED PACKAGES

46 tons
OF GOODS DELIVERED

ca. 100
DELIVERIES PER WEEK FOR IKEA
(home deliveries)

22,000
MEASUREMENTS DURING AN AVERAGE WORKING WEEK

ca. 5
DELIVERIES PER WEEK FOR H&M
(B2B)

MISSION ZERO EMISSIONS

INFRASTRUCTURE

5 RESULTS OF THE ANALYSIS

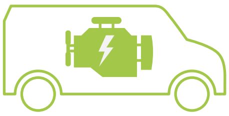
The main purpose of the analysis was to determine whether an electric delivery vehicle can at present be competitive if compared with an internal combustion engine vehicle used in urban logistics.

For this aim, data obtained during the pilot project were used. The pilot program preceded the analysis. The two vans of a permissible total weight below 3.5 t were being compared. These were respectively: Volkswagen Crafter, and its electric equivalent, Volkswagen e-Crafter. **The pilot study enabled gathering data which was relevant for the analysis. However, since the analysis of the total cost of ownership regards a much longer period of time than the pilot program itself, it was necessary to adopt certain assumptions, e.g. regarding the vehicles' service costs**. This chapter presents the input data for the analysis, the adopted scenarios, and the results of the calculations.

5.1 Input data and assumptions for the analysis

On the basis of the data from the pilot project, legal regulations, and the prices check, input values were adopted for the calculations. Taking into account the fact that the pilot project took place in winter and the vehicles were operated at sub-zero temperatures, a decision was taken to determine the fuel/electricity consumption as a mean value from the actual data recorded by the cars' computers after the pilot period had ended, and from the manufacturer's catalogue data. Service costs were estimated on the basis of current prices for standard replacements or repairs of given car parts. The prices of fuel and electricity were adopted as current during the pilot program. The assumption of the prices of fuel/electricity was however somewhat under-valued as the prices are bound to change during every vehicle's life time. An unambiguous prediction of such values is difficult, because there exist many influencing factors, including economic and political conditions. The data assumed for the analysis are presented below.

INPUT DATA FOR THE ELECTRIC VEHICLE



VW E-CRAFTER

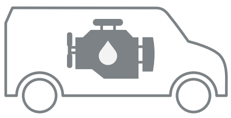
COST OF PURCHASE	PLN 275,572 net
COST OF INSURANCE	PLN 4,672
ENERGY CONSUMPTION	29.55 kWh / 100 km
COST OF TECHNICAL CHECK*	PLN 99
ENERGY PRICE (TARIFF C21)	PLN 0.44 net
RESIDUAL VALUE	70%

MAINTENANCE OF THE EV

REPLACEMENT OF BRAKES (every 80,000 km)	PLN 600 net
ANNUAL AIR CONDITIONING SERVICE	PLN 160 net
REPLACEMENT OF TYRES (every 40,000 km)	PLN 2,000
CONTINGENCY FOR EXTRA FIXING COSTS	PLN 300 net

* The VW e-Crafter's standard version includes a package of free reviews for 4 years, manufacturer's warranty for 4 years and an 8-year battery warranty, which were not factored in the calculations.

INPUT DATA FOR A CONVENTIONAL VEHICLE



VW CRAFTER

COST OF PURCHASE	PLN 184,940 net
COST OF INSURANCE	PLN 2,163
FUEL CONSUMPTION	10.25 L / 100 km
COST OF TECHNICAL CHECK	PLN 99
FUEL COST	PLN 4.30 net
RESIDUAL VALUE	80%

MAINTENANCE OF ICE

REPLACEMENT OF BRAKES (every **40,000 km**)	PLN 600 net
ANNUAL AIR CONDITIONING SERVICE	PLN 160 net
REPLACEMENT OF TYRES (every 40,000 km)	PLN 2,000
CONTINGENCY FOR EXTRA FIXING COSTS	PLN 300 net
REPLACEMENT OF ENGINE OIL AND FILTERS	PLN 200 net
CHANGING THE TIMING SYSTEM (every 100,000 km)	PLN 1,000 net

5.2 The analysed scenarios

The analysis assumed two values of the daily distance covered:

- **120 km** – it is a distance that can be driven during an eight-hour work day of a vehicle in urban logistics (this is the Volkswagen e-Crafter's range on a single charge),
- **170 km** – it is a distance which relates to a shift-based work, for example in suburban or intercity logistics in a specific area. However, to cover such a distance, an electric vehicle needs to be charged between the shifts.

The impact of linear depreciation was analysed for these options, in line with the binding regulations including the impact of subsidies amounting to **PLN 36,000** as per the draft regulation by the Minister of Energy of 7 February 2019 on detailed conditions and the method of accounting for support provided from the resources of the Low-Emission Transport Fund.

Overleaf the analysed scenarios for which the TCO were calculated are presented.

As part of the GARO AB Group, we have been producing electric vehicle charging stations for more than a decade

We might boast of considerable successes in this area such as holding 60% stake of the Swedish market of AC charging stations, and over 25,000 wallboxes manufactured in our factory in Szczecin. But so far, we have never participated in projects to so comprehensively scrutinize cost-effectiveness of e-mobility solutions for city logistics. Therefore we, with great enthusiasm, decided to join the Zero Emissions Mission project. I sincerely hope for the report to explain or dispel some myths, especially those concerning the economics of such solutions

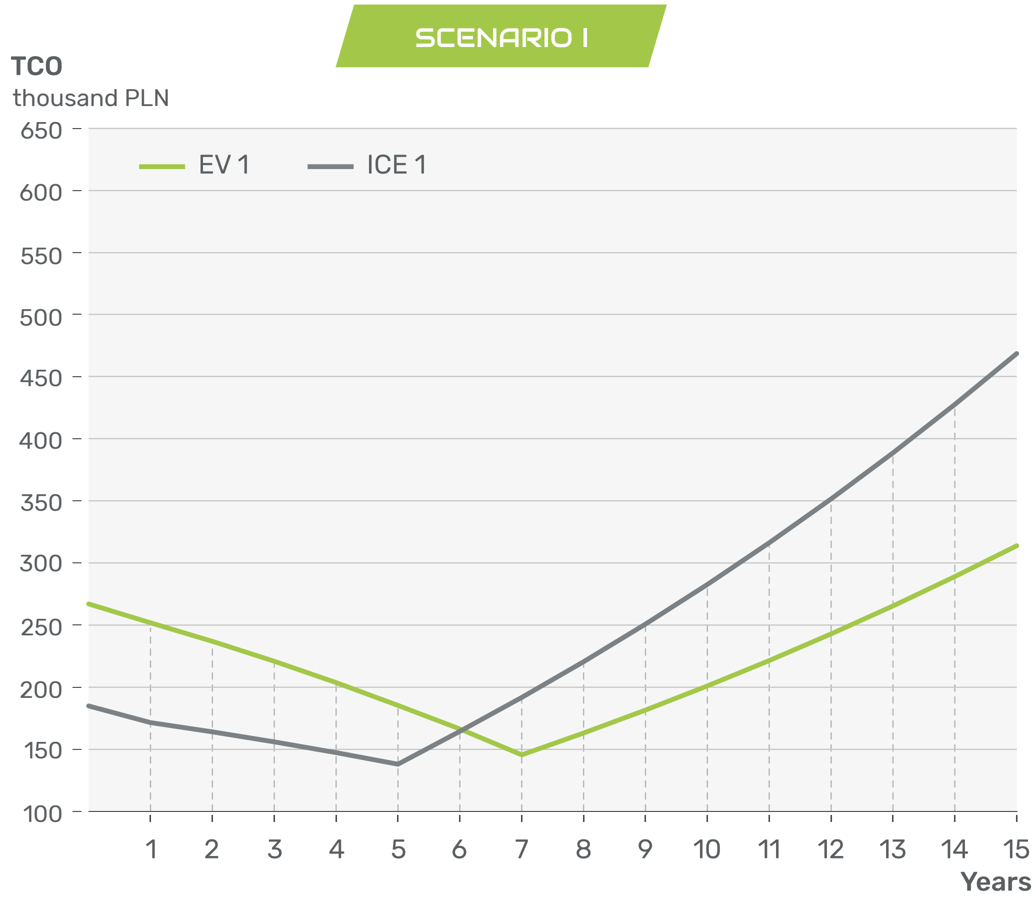
.

Krzysztof Zamożny
Head of Sales e-Mobility Poland, GARO

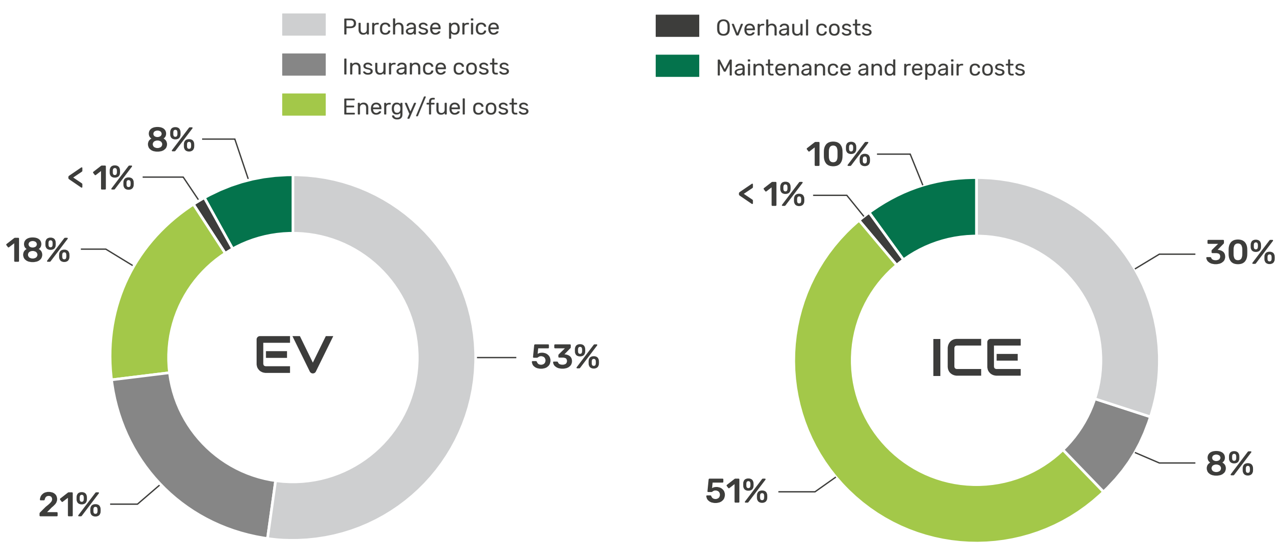
SCENARIOS

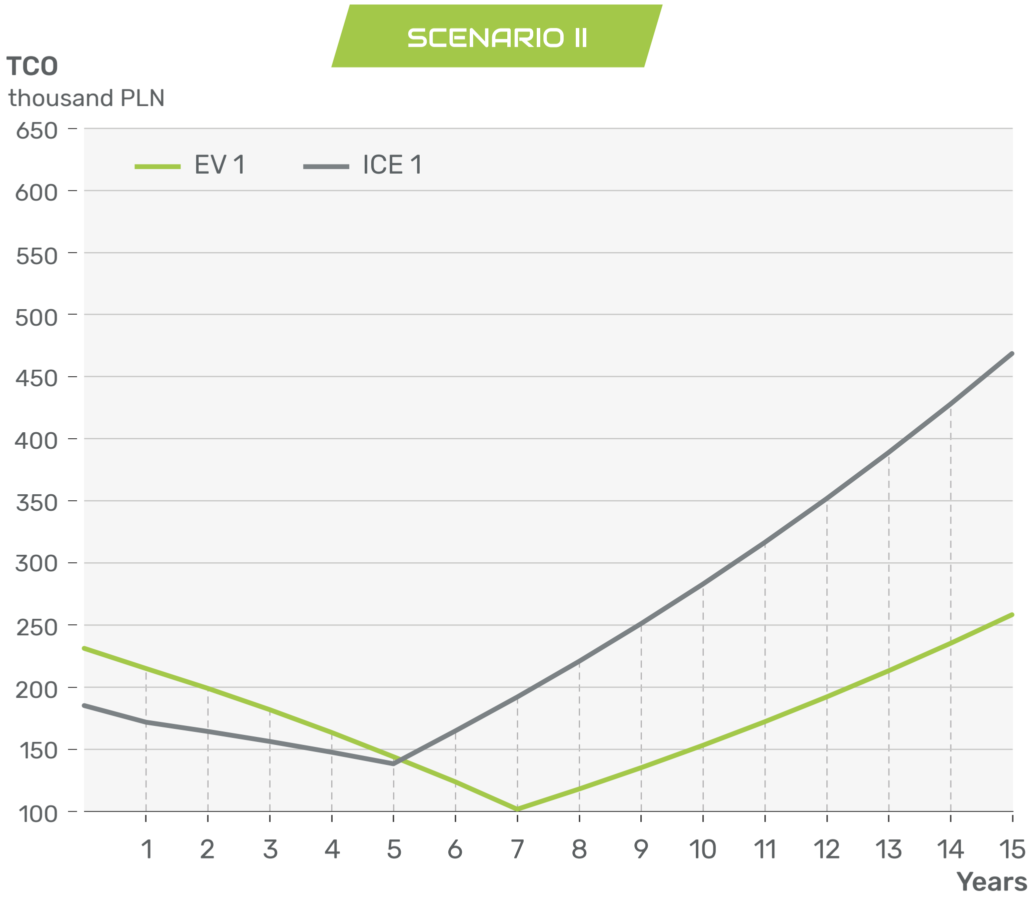
	I	II	III	IV
DAILY DISTANCE TRAVELLED	120 km	120 km	170 km	170 km
EXEMPTION OF VEHICLES FROM EXCISE TAX AND 100% DISCOUNT OF VAT	YES	YES	YES	YES
SUBSIDIES FOR AN ELECTRIC VEHICLE	None	PLN 36,000	None	PLN 36,000
DEPRECIATION FACTORED IN	Linear	Linear	Linear	Linear

5.3 Obtained results

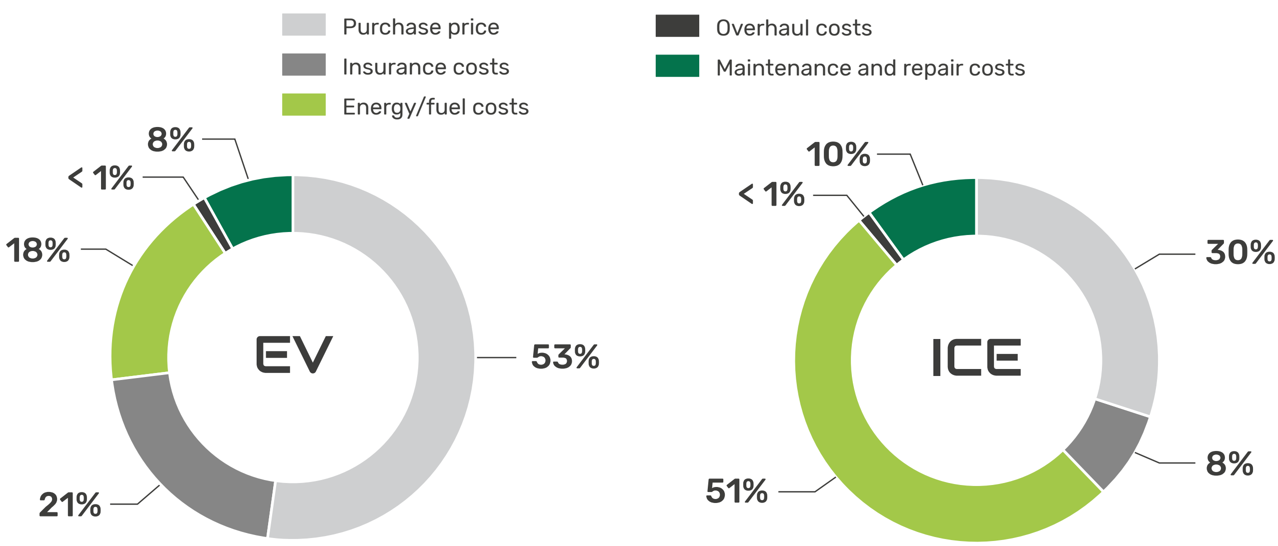


COST DISTRIBUTION ONTO INDIVIDUAL COMPONENTS:





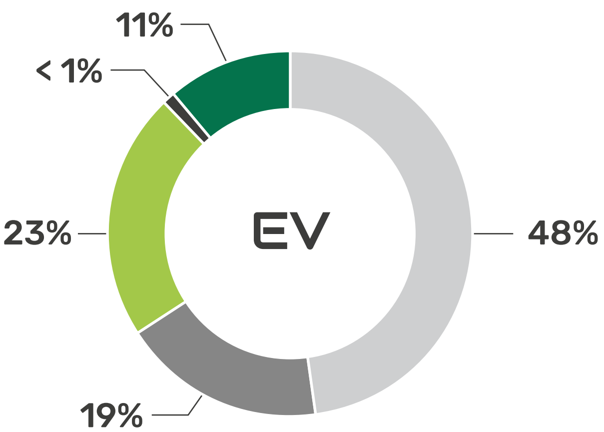
COST DISTRIBUTION ONTO INDIVIDUAL COMPONENTS:

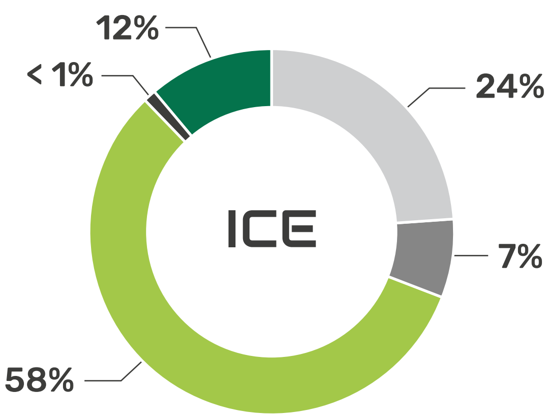


SCENARIO III

COST DISTRIBUTION ONTO INDIVIDUAL COMPONENTS:

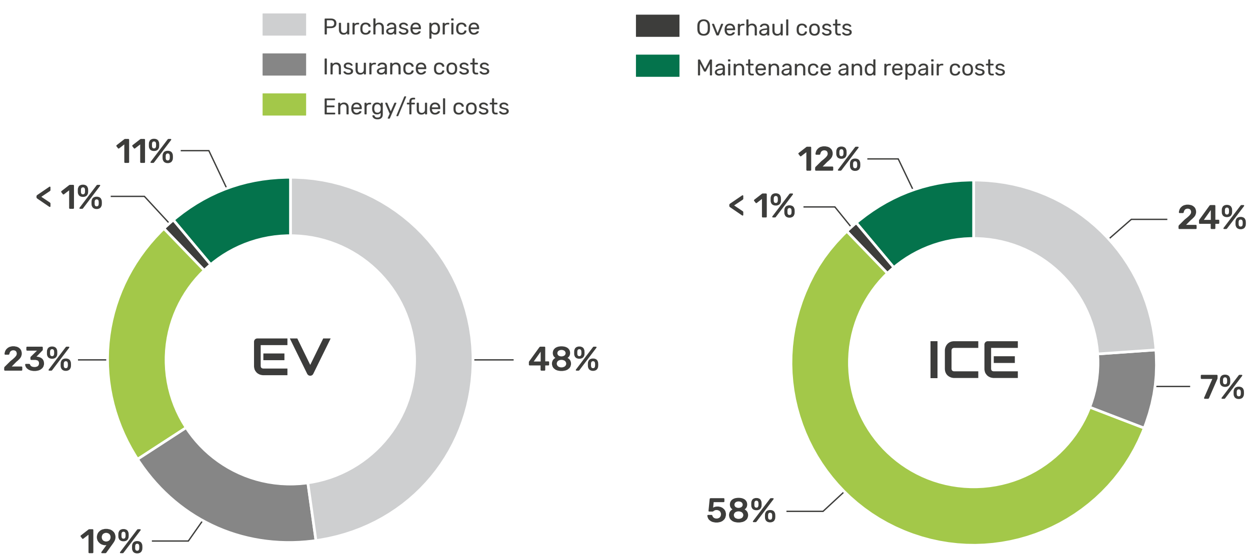
- Purchase price
- Insurance costs
- Energy/fuel costs
- Overhaul costs
- Maintenance and repair costs





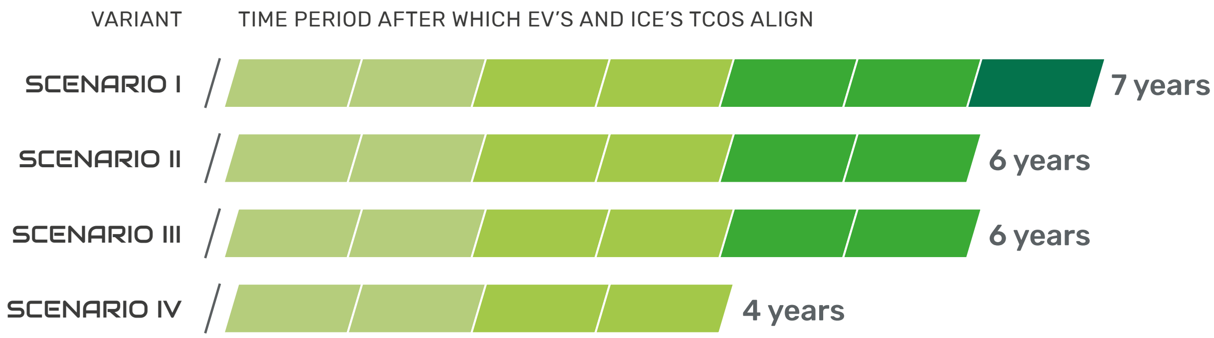
SCENARIO IV

COST DISTRIBUTION ONTO INDIVIDUAL COMPONENTS:



5.4 Summary of the results

The analyses enabled calculation at what point after the purchase, expressed in the number of years, the TCO of an electric van catches up with the TCO of its internal combustion equivalent. This value defines the minimum estimated time of using the vehicle for which a purchase of an electric car becomes economically viable. The obtained results are shown below.



Various analyzes which allow to measure the effects of replacing traditional drive vehicles with their electric counterparts have been successfully used for years by our customers who maintain fleets of passenger car.

This analysis, however, which studies the segment of electric vans, is a completely new stage in the propagation of ecological awareness on the basis of economic facts. We are proud that our cooperation in this project has helped make this analysis, which is so needed on our market.

Krzysztof Leszczyński
Project Manager, Alphabet Polska Fleet Management

MAIN CONCLUSIONS

01 Under the assumptions which were adopted, using of an electric vehicle in comparison with an combustion vehicle **starts to become profitable when it is in use between 4 and 7 years** (depending on the variant).

02 In the case of logistics companies which replace their fleets regularly, using electric vehicles may prove beneficial, especially in scenario IV, which says that after four years of using an electric vehicle, the totals costs of ownership are lower than the costs of a traditional combustion vehicle (at a daily driven distance of 170 km including top-up or shift work, plus factoring in an envisaged subsidy of PLN 36,000 from the Low-Carbon Transport Fund).

03 Within the all cost components, the cost of purchase of an electric car has the biggest impact on the TCO. In the analyses which were carried out, **the cost of acquiring an electric vehicle accounts for about 50% of all costs**.

04 Therefore, supporting the purchase of electric vehicles is essential. **The support from the Low-Carbon Transport Fund, which is envisaged at 30% of the eligible costs but not more than PLN 36,000[21], in the case under analysis results in a much faster catch of the e-Crafter's TCO with its conventional counterpart**.

05 In scenarios in which the daily distance covered by each vehicle was 170 kilometers, **the existence of such a support shortens the TCO's aligning time by nearly 2 years**.

06 Even though the maximum amount of amortization write-downs is higher for electric vehicles, in the case of trucks the maximum proportional write-down off the value of a vehicle is less[22]. This extends the total amortization period of such vehicles.

[21] *Draft Regulation of the Minister of Energy on detailed conditions for granting and the method of settlement of support granted from the resources of the Low-Emission Transport Fund Version 1.1,* 07/02/2019

[22] Chancellery of the Sejm, Act of 15 February 1992 on corporate income tax

MISSION ZERO EMISSIONS

B2B DELIVERIES

6 GOOD PRACTICES IN OPERATING ELECTRIC DELIVERY VANS

The study brought about interesting conclusions regarding best practices that might affect the reduction of the TCO for electric delivery vehicles.

Because the electric delivery vehicles market is underdeveloped and their purchase price is higher, in order to make electric cars competitive with their diesel counterparts, it is worth taking steps to lower the TCO.

The most important single factor affecting the total cost of ownership during a vehicle's exploitation period is **the average daily distance travelled by a vehicle**. If it is used daily and runs distances close to its maximum range or more (which means additional charging during a work day), the sum of costs in this category proves much lower for electric cars.

Taking into account the data adopted for this analysis, **an electric vehicle generates savings on the operational costs alone of over PLN 700 net per month.**

Therefore, when planning a purchase of an electric car, it is worth considering how often it will be used and what average daily distance it would be driving.

The second factor which determines the operating costs of electric vehicles is **the energy price**. It can be extra important for logistic companies which plan to buy more eco-friendly vehicles. The price of energy is determined by energy suppliers, but almost all of them offer zonal tariffs (i.e. with a varying electricity prices). Those who take a decision to implement this option and properly schedule their vehicles' charging times, can significantly reduce the cost of the electricity consumed. **Within the data assumed for the analysis, using a sample C22 tariff price could bring about savings of about PLN 1,000**.

MISSION ZERO

When looking at electricity prices, one should also think about the infrastructure for charging vehicles. **It is worth making an investment in a quality charger with a high power factor, to avoid additional charges related to the reactive power consumption from the network**. Also, possible likely charging profiles ought to be considered. It is better to buy a smaller or medium power charger (e.g. 22 kW), which should be sufficient for most electrical applications of commercial vehicles. This will slow down the battery degradation and will save company's money on purchasing its charging infrastructure.

Under such assumptions, when a vehicle needs to be urgently recharged, its driver should resort to the public infrastructure wherever it offers such a possibility.

Another good practice to help reduce the costs associated with energy consumption and partly with servicing a vehicle is one's economical driving manner. During the pilot project, **e-Crafter drivers drove with an average speed of 35 km/h, which is 5 km/h less than in the case of an internal combustion equivalent**. Also, even though in electric cars a significantly higher torque is available even at low speeds, **average accelerations and decelerations were slightly lower than in combustion vehicles** an average acceleration of the electric car was 0.65 m/s^2). The obtained results may result from the fact that e-Crafter's limited maximum speed is almost 90 km/h. It is likely that drivers on their first contact with electric vehicles could have been driving in a more conservative manner. A less dynamic driving style can also arise from one's conviction that in order to meet all the daily targets they have to adopt a smoother driving style ("a range anxiety")

EMISSIONS

Growing privileges of ecological vehicles are also worth looking at. Electric cars are currently exempt from parking fees. This is not going to significantly affect the TCO of delivery vehicles used in urban logistics, though. Assuming a daily parking time of one hour, **an annual saving will amount to around 750 PLN**. For those who have to park their vehicles in payable zones for the duration of their work days (8 hours), the annual savings could be over 6,000 PLN. This amount can significantly affect the TCO in favour of electric cars. Another issue is clean transport zones, which are admitted under the Act on electromobility and alternative fuels, and further clarified in the Act on Biofuels and biocomponents.

According to the Act, drivers of conventional vehicles in order to be able to drive in clean transport zones will have to pay a fee which can be **PLN 2.50 per hour**. On assuming the maximum possible rate, driving a vehicle with a combustion engine in such a zone for two hours per day (e.g. to deliver products to customers) can cost PLN 1,260 per year. Under this assumption, using an electric van will bring another financial benefit. One more bright point about electric vehicles is the right to drive them on bus lanes which allows more efficient mobility in urban agglomerations with high traffic and can affect the delivery times as well as reduce the energy consumption in electric vehicles.

7 OVERVIEW OF THE ELECTRIC DELIVERY VEHICLES MARKET

Vans with a maximum total weight not exceeding 3.5 t are one of the most frequently used means of transport in enterprises which deliver and supply services in urban agglomerations

One of the main advantages of such vans is the fact that drivers who hold a category B license are entitled to drive them. Undoubtedly, delivery vans play a significant role in the transport sector, especially in high-volume conurbations and in places where traffic of large vehicles is limited.

In recent years, electric delivery vehicles are making it to the portfolio of offers of the largest suppliers of vehicles. A possibility therefore arises to utilise electric vehicles' advantages such as: low total cost of ownership, low noise emission, and the absence of emissions (local). Other advantages include favourable legal conditions, including: the possibility of driving on bus lanes, no parking fees, as well and the possibility of entering zero-emission zones in the strict city centres.

Below is a summary of vans as they are available on the market or which are about to be available, whose permissible weight is 3.5 t and which are fitted with only the electric drive. It should be noted that the German law has increased the permitted weight of electric vehicles to 4.25 t, which allows competing electric vehicles, which are relatively heavy, with vehicles with conventional drives.

The comparison of the vehicles shows parameters which are the most important from a user's point of view: the New European Driving Cycle (NEDC) range, the real range, vehicle's capacity with regards to both its mass and volume, and the maximum speed. Also, technical parameters such as the power, electric drive torque as well as battery power are noted. It is worth noting that in the case of vehicles available on the French market, a user may lease a battery rather than own it, in which case a user pays a monthly cost of leasing the battery amounting to 70-110 euro.

CITROËN BERLINGO ELECTRIC

BASIC PARAMETERS

NEDC range	170 km
Real range	120 km
Power	49 kW
Torque	200 Nm
Battery capacity	22,5 kWh
Maximum load 3,5 t	571 kg
Cargo capacity	3.7/4.1 m³
Maximum speed	110 km/h
Net purchase price (France)	from EUR 22,000

MERCEDES-BENZ EVITO

BASIC PARAMETERS

Real range	150 km
Power	85 kW
Torque	300 Nm
Battery capacity	41 kWh
Ładowność DMC 3,5 t	up to 1,015 kg
Cargo capacity	up to 6.6 m³
Maximum speed	120 km/h
Net purchase price (Germany)	EUR 39,990

MERCEDES-BENZ E-SPRINTER

BASIC PARAMETERS

NEDC range	115/150 km
Power	84 kW
Torque	300 Nm
Battery capacity	41.4/55.2 kWh
Maximum load 3,5 t	1,040/900 kg
Cargo capacity	10.5 m³
Maximum speed	120 km/h
Net purchase price	Available at a later time

NISSAN E-NV200 FURGON

BASIC PARAMETERS

NEDC range	300 km
WLTP range	200 km
Power	80 kW
Torque	254 Nm
Battery capacity	40 kWh
Maximum load 3,5 t	701 kg
Cargo capacity	4.2 m³
Maximum speed	123 km/h
Net purchase price	from PLN 156,825

PEUGEOT E-PARTNER

BASIC PARAMETERS

NEDC range	170 km
Real range	120 km
Power	49 kW
Torque	200 Nm
Battery capacity	22.5 kWh
Maximum load 3,5 t	636 kg
Cargo capacity	3.7 m³
Maximum speed	110 km/h
Net purchase price (France)	from EUR 27,000

RENAULT KANGOO Z.E.

BASIC PARAMETERS

NEDC range	270 km
Real range	200 km
Power	44 kW
Torque	225 Nm
Battery capacity	33 kWh
Maximum load 3,5 t	up to 800 kg
Cargo capacity	up to 4.6 m³
Maximum speed	130 km/h
Net purchase price	from PLN 111,196

RENAULT MASTER Z.E.

BASIC PARAMETERS

NEDC range	200 km
Real range	120 km
Power	57 kW
Torque	225 Nm
Battery capacity	33 kWh
Maximum load 3,5 t	up to 1,128 kg
Cargo capacity	up to 13 m³
Maximum speed	100 km/h
Net purchase price (France)	from EUR 55,320

SAIC MAXUS EV 80

BASIC PARAMETERS

NEDC range	do 192 km
Power	100 kW
Torque	320 Nm
Battery capacity	56.0 kWh
Maximum load 3,5 t	up to 955 kg
Cargo capacity	up to 11.5 m³
Maximum speed	no data available
Pojazd dostępny w ramach wynajmu długoterminowego/leasingu	

VOLKSWAGEN E-CRAFTER

BASIC PARAMETERS

NEDC range	173 km
Real range	130 km
Power	100 kW
Torque	290 Nm
Battery capacity	35.8 kWh
Maximum load 3,5 t (4,25 t)	970 kg (1,720 kg)
Cargo capacity	up to 10.7 m³
Maximum speed	90 km/h
Net purchase price (Germany)	from EUR 69 500

ELECTRIC VOLKSWAGEN CADDY

BASIC PARAMETERS

NEDC range	220 km
Power	82 kW
Torque	200 Nm
Battery capacity	37.3 kWh
Maximum load 3,5 t	636 kg
Cargo capacity	4.2 m³ (van version)
Maximum speed	120 km/h
Net purchase price	Available at a later time

ELECTRIC VOLKSWAGEN TRANSPORTER

BASIC PARAMETERS

NEDC range	208/400 km
Power	82 kW
Torque	200 Nm
Battery capacity	37.3/7.6 kWh
Maximum load 3,5 t	1,186/695 kg (van version)
Cargo capacity	6.7 m³ (van version)
Maximum speed	120 km/h
Net purchase price	Available at a later time

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POLISH ALTERNATIVE FUELS ASSOCIATION

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The largest fully representative body in the industry, building and helping to grow the e-mobility and alternative fuel market in Poland

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