

# E-VEHICLES WITH A FOCUS ON TESLA CARS

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**Abstract:** *The paper presents research on electric cars with an emphasis on Tesla cars. The paper aimed to get to know the development of Tesla and the innovation of their vehicles. As part of the development of their cars, range, consumption and charging play an important role, the research was focused on comparing models and finding the best car. The research found that all Tesla models, that are currently on the market, are comparable, with good range, charging time and consumption. Nowadays, however, an important issue in our lives is the pandemic, so part of the article also describes the consequences of Covid-19 on the company, in which we found that the company managed to operate profitably despite this situation. In addition to cars' good features, it's also important to have charging options, which we explored in this paper using a hypothetical route to various European cities and found that charging stations are the most widespread in Western Europe and that it is almost impossible to drive east.*

**Keywords:** *Elon Musk, Electric cars, Car model.*

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## 1. INTRODUCTION

More and more car manufacturers are looking for new, innovative solutions on how to improve their cars and also more and more of them are opting to produce electric cars. But as advanced as these cars are, they also have their drawbacks. One of them is the range or the distance that a car can travel without refuelling and consequently also filling stations that are not at every petrol station.

All of these, however, are reasons why many people do not choose to buy an electric car. Of course, these cars also have many advantages. In this article, we want to show all the pros and cons and present whether buying a Tesla electric car is worth it or not.

In this article we want to answer three research questions:

- Which Tesla model is the most economical / most worth buying?
- What is the prevalence of filling stations across Europe? Can you go a long way?
- What are the prices of Tesla's cars?

## 2. DEVELOPMENT OF TESLA ELECTRIC CARS

Tesla Inc. or as it was formerly called Tesla Motors, was founded in July 2003. The company was founded by M. Eberhard and M. Tarpenning with three co-founders, one of whom was also, best known to us today, Elon Musk. (<https://www.britannica.com/topic/Tesla-Motors>)

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The first car was produced in 2008 and was called the Roadster. Its regular production began in 2008 and sold for \$ 109,000. With this, however, the company reached its first major milestone. The Roadster was sold at that price until 2012, and by then they had sold 2,450 cars.

Their second car model should have been released in the same year, but when Musk became the company's CEO, he moved the production for three years, until mid-2011. The prototype of the Model S car was unveiled in 2009, after financial assistance, which was helping the company to get out of bankruptcy.

The company's second major milestone, however, occurred around 10 years ago, on June 29, 2010, when the company began selling shares for just \$ 17, earning as much as \$ 226.1 million. (<https://www.businessinsider.com/most-important-moments-tesla-history-2017-2>)

It is also important to mention their battery factory, located in Nevada. With this, Gigafactory wants to lower battery prices through innovative production, waste reduction and simple optimization of placing most production processes under one roof. In 2014, when this project started, it was estimated that this factory will start operating by 2020 and that they will then be able to reduce the price of batteries by as much as 30% and thus also reduce car prices. It was also estimated that the Tesla Model 3 could go on sale for as little as \$ 35,000. ([https://www.tesla.com/en\\_EU/gigafactory?redirect=no](https://www.tesla.com/en_EU/gigafactory?redirect=no))

The first car for the mass market, the Tesla Model 3, was introduced in 2016, which was expected to have a range of 345 km and to sell for only \$ 35,000. In January 2019, however, they began production in China - making them the first independent Western car manufacturer in China. This, in turn, meant an easier breakthrough for the company into the Chinese car market. In this production, they planned to produce 3,000 cars a week, or up to 500,000 cars a year. In 2019, they also announced a new car model, namely the Tesla Model Y, which was expected to have a range of 480 km and sell for \$ 47,000.

In 2020, all production was delayed by a few months; in June, the Tesla Model S was brought to a range of 640 km by reducing the car's weight and increasing regenerative braking. (<https://www.businessinsider.com/most-important-moments-tesla-history-2017-2>)

### **3. TESLA CHARGERS ACROSS EUROPE**

When Tesla started selling cars, the charging stations were placed in precisely strategically defined locations among major urban areas. However, as Tesla began to lower prices and now cars were also available to residents who do not have access to home charging, the company began setting up more charging stations in cities and in 2017 began launching Urban Superchargers. (<https://electrek.co/2020/09/10/tesla-urban-superchargers-europe-support-growth/>)

There are more than 2,000 Supercharger stations in Europe with more than 20,000 rapid charging stalls. Most of them are located from Central Europe (Germany) to the West (France). ([https://www.tesla.com/sl\\_SI/supercharger?redirect=no](https://www.tesla.com/sl_SI/supercharger?redirect=no))

#### 4. THE IMPACT OF THE PANDEMIC ON THE COMPANY

Despite the pandemic, the company managed to double its profits in the third quarter of 2020 and was approaching record numbers of cars delivered.

The company delivered as many as 139,300 vehicles in the third quarter of 2020, which was also a new record for vehicles delivered in one quarter. The company's goal was to deliver as many as 500,000 vehicles by the end of the year. Profit for the third quarter was as much as \$ 331 million. In the same period in 2019, the company had a profit of \$ 143 million. So, despite the pandemic, the company managed to increase profits more than once. Revenue also rose 40 per cent to \$ 8.7 billion. (<https://www.dw.com/en/tesla-doubles-quarterly-profits-despite-pandemic/a-55357780>)

Even during the pandemic, Elon Musk worked to quickly add production capacity and add new vehicle models, and nothing stops him from achieving the set goals, especially the goal of making Tesla a regular vehicle manufacturer and not just a niche. Of course, his actions are not without risks, because the crisis will come only when the pandemic is over. In the previous crisis, Elon Musk lost almost everything because of such moves.

As already mentioned, Chinese production has contributed to profits despite the pandemic, with revenues in China doubling compared to previous years. Despite the high numbers, revenues in the USA decreased by as much as 11%. (<https://www.bangkokpost.com/business/1961575/tesla-pulls-ahead-in-coronavirus-era-after-elon-musks-years-of-struggle>)

#### 5. RESEARCH FINDINGS - ANSWERS TO RESEARCH QUESTIONS

The first research question: Which Tesla model is the most economical / most worth buying?

To solve this question, we compared the features of all Tesla models currently available on the market.

Table 1 shows all the compared car models and their characteristics.

**Table 1.** Comparison of different models of Tesla cars

|                              | From<br>0-100km/h | Top speed | Range  | Weight  | Average<br>consumption |
|------------------------------|-------------------|-----------|--------|---------|------------------------|
| <b>Model S (Performance)</b> | 2,5 s             | 261 km/h  | 639 km | 2236 kg | 193 Wh/km              |
| <b>Model S (Long Range)</b>  | 3,8 s             | 250 km/h  | 652 km | 2184 kg | 190 Wh/km              |
| <b>Model 3 (Performance)</b> | 3.3 s             | 261 km/h  | 567 km | 1844 kg | 166 Wh/km              |
| <b>Model 3 (Long Range)</b>  | 4,4 s             | 233 km/h  | 580 km | 1844 kg | 160 Wh/km              |
| <b>Model 3 (Standard)</b>    | 5,6 s             | 225 km/h  | 430 km | 1745 kg | 149 Wh/km              |
| <b>Model X (Performance)</b> | 2,8 s             | 261 km/h  | 548 km | 2494 kg | 236 Wh/km              |
| <b>Model X (Long Range)</b>  | 4,6 s             | 250 km/h  | 561 km | 2466 kg | 226 Wh/km              |

**Source:** <https://www.tesla.com> [https://www.tesla.com/en\\_EU/support/european-union-energy-label](https://www.tesla.com/en_EU/support/european-union-energy-label)

From Table 1, we have found that all three models, and also their different ones are very suitable. We see that the fastest acceleration is the Tesla Model S Performance, and this model also has the fastest top speed, which is as much as 261 km / h. The Tesla Model 3 Performance and the Tesla Model X Performance have the same top speed.

The longest charging distance can be corrected by the Tesla Model S Long Range, otherwise 652 km. Tesla Model 3 Standard has the lowest consumption, otherwise 149 Wh / km.

So, the question - which model is the best is hard to answer, as it is necessary to ask beforehand what we want from the car. If we want fast acceleration with a long range, we will buy the Tesla Model S as the best, while we want the lowest consumption and the best purchase of all the different Tesla Model 3 models.

The second research question is: What is the prevalence of Tesla chargers across Europe? Can you drive a long way?

To answer the question, it is necessary to look at the distribution of chargers in different parts of Europe. We took three different routes for the research, a route from Slovenia to Paris, to Lisbon and Belgrade.

In this experiment, we paid attention to the travel time, the charging time and the number of stops. We also used Audi and Ford electric cars for comparison.

We set a maximum speed limit at 120 km/h. The limitations in this research were the prices of electric charging at charging stations for electric cars of other brands, or at charging stations where there are no Tesla chargers, as certain stations did not have publicly announced prices.

Table 2 shows the route from Velenje, Slovenia to Paris, France.

**Table 2.** Comparison of electric cars on the way from Velenje to Paris

|                                     | Cost  | Charge Duration | Distance | Drive duration | Time together | No. of stops |
|-------------------------------------|-------|-----------------|----------|----------------|---------------|--------------|
| <b>Tesla 3 Performance 2021</b>     | 52 €  | 1h 35min        | 1317 km  | 13h 3min       | 14h 39min     | 6            |
| <b>Tesla S 2020 Performance</b>     | 47 €  | 1h 44min        | 1317 km  | 12h 45min      | 14h 30min     | 4            |
| <b>Tesla X 2020 Performance</b>     | 63 €  | 2h 4min         | 1317 km  | 13h 3min       | 15h 8min      | 6            |
| <b>Audi Q4 e-Tron</b>               | 38 €+ | 1h 15min        | 1317 km  | 15h 41min      | 16h 57min     | 4            |
| <b>Ford Mustang Mach-E Extended</b> | 37 €+ | 1h 17min        | 1317 km  | 15h 34min      | 16h 51min     | 3            |

Source: own research, 2020

**Table 3.** Comparison of electric cars on the way from Velenje to Lisbon

|                                     | Cost   | Charge Duration | Distance | Drive duration | Time together | No. of stops |
|-------------------------------------|--------|-----------------|----------|----------------|---------------|--------------|
| <b>Tesla 3 Performance 2021</b>     | 134 €  | 4h 59min        | 2728 km  | 25h 55min      | 30h 54min     | 9            |
| <b>Tesla S 2020 Performance</b>     | 127 €  | 4h 49min        | 2728 km  | 25h 28min      | 30h 17min     | 8            |
| <b>Tesla X 2020 Performance</b>     | 194 €  | 5h 33min        | 2728 km  | 26h 49min      | 32h 23min     | 13           |
| <b>Audi Q4 e-Tron</b>               | 110 €+ | 3h 2min         | 2728 km  | 32h 8min       | 35h 10min     | 8            |
| <b>Ford Mustang Mach-E Extended</b> | 102 €+ | 3h 22min        | 2728 km  | 35h 26min      | 35h 26h       | 8            |

Source: own research, 2020

From Table 2 we can see that the trip to Paris can be done without major problems, as there are enough charging stations on the way; we also see that charging all Tesla cars is faster. The data show that the fastest is the Tesla Model S, which requires the least stops.

Table 3 shows the route from Velenje, Slovenia to Lisbon, Portugal. Here we can see that, again, the drive is possible and that there are enough charging stations on the way. We can also see that the Tesla Model S is the fastest and needs the least charging time.

The last route we wanted to examine was to the eastern part of Europe. First, we wanted to plan the drive to Greece, but we quickly saw that there are not enough charging stations on the way. So, we decided to plan a route to Belgrade, Serbia. All of the cars we compared needed one stop on the way and there was exactly one charging station on the way. The driving time and charging time, is like in the last two cases, the best with Tesla Model S.

**Table 4.** Comparison of electric cars on the way from Velenje to Belgrade

|                                     | Cost    | Charge Duration | Distance | Drive duration | Time together | No. of stops |
|-------------------------------------|---------|-----------------|----------|----------------|---------------|--------------|
| <b>Tesla 3 Performance 2021</b>     | 76 HRK  | 21min           | 530 km   | 5h 31min       | 5h 52min      | 1            |
| <b>Tesla S 2020 Performance</b>     | 52 KKK  | 14min           | 530 km   | 5h 21min       | 5h 35min      | 1            |
| <b>Tesla X 2020 Performance</b>     | 85 HRK  | 25min           | 530 km   | 5h 31min       | 5h 56min      | 1            |
| <b>Audi Q4 e-Tron</b>               | 41 HRK+ | 11min           | 530 km   | 6h 29min       | 6h 41min      | 1            |
| <b>Ford Mustang Mach-E Extended</b> | 26 HRK+ | 7min            | 530 km   | 6h 29min       | 6h 37min      | 1            |

**Source:** own research, 2020

Overall, we can see that all three models of Tesla electric cars, that are currently available, are compatible on longer drives with drive duration and charging duration, but out of these three, the best model is Tesla Model S. With the other two brands we can see that the drive and charging take longer.

The numbers of stops for all cars are quite similar, except for Tesla Model X, which is an SUV car and it's bigger, so it was expected for this model to have bigger consumption.

As for charging stations, with this research, we saw that long drives are possible in Western Europe, especially in France and Germany. But if we would want to drive to Eastern or South countries of Europe, we would face a lot of difficulties with finding Tesla chargers or other electric chargers along the way.

The last research question is: What are the prices of Tesla's cars? For this question, we took the prices of Tesla cars in the different markets, Slovenian, UK and American, as we can see in table 5.

From this table, we can see that the prices are the lowest in the USA and the most expensive in the United Kingdom. We can also see that the Tesla Model 3 is the cheapest, no matter which version we're interested in. Then is the Tesla Model S which is almost double the price of the Tesla Model 3. And the most expensive is, of course, the SUV model, Tesla Model X. With these prices in different markets, it's also important to keep in mind, that some countries offer financial subsidies and tax relief options; for example, in Slovenia, you are entitled to 6.000€ subsidy when buying an electric car.

**Table 5.** Comparison of prices for Tesla cars

|                              | Price SLO | Price UK             | Price USA           |
|------------------------------|-----------|----------------------|---------------------|
| <b>Model S (Performance)</b> | 101.990 € | 106.187 € (£94.980)  | 71.264 € (\$84.990) |
| <b>Model S (Long Range)</b>  | 84.990 €  | 89.415 € (£79.980)   | 52.339 € (\$62.420) |
| <b>Model 3 (Performance)</b> | 58.990 €  | 63.129 € (£56.490)   | 39.564 € (\$47.190) |
| <b>Model 3 (Long Range)</b>  | 53.990 €  | 52.512 € (£46.990)   | 32.857 € (\$39.190) |
| <b>Model 3 (Standard)</b>    | 43.999 €  | 45.245 € (£40.490)   | 25.311 € (\$30.190) |
| <b>Model X (Performance)</b> | 110.990 € | 115.039 € (£102.980) | 78.121 € (\$93.190) |
| <b>Model X (Long Range)</b>  | 93.990 €  | 98.333 € (£87.980)   | 61.363 € (\$73.190) |

**Source:** own research, 2020

## 6. CONCLUSION

Every year, more car companies are opting to produce electric cars, as many countries plan to ban gasoline cars in the coming decades. For many years, Tesla has been trying to introduce electric cars that would be accessible to everyone. Thus, all three models of Tesla cars currently available are leaders in this market.

However, we note that in order to implement the plans, it is first necessary to expand the network of charging stations around the world so that they will be available to everyone, regardless of whether they are from larger cities or suburbs because only then will people start buying electric cars.

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