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ELECTRIC VEHICLES' DEMAND IN THE CONTEXT OF LOWER FUEL PRICES

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Abstract: *The world is rapidly growing and changing and countries need to address vital future energy requirements like achieving sustainable transportation. One of the most promising pathways to increased energy security and reduced emissions of greenhouse gases and other pollutants is to produce and buy Electric vehicles (EVs). EVs reduce dependence on petroleum and work by using a source of electricity that is often domestically produced and relatively inexpensive, when comparing it to petroleum products. Also, EVs create the grounds for innovation and increase the possibilities to develop new advanced industries that create job growth and that enhance economic prosperity.*

Key Words: sustainable transportation, petroleum dependence, motivation for electric vehicles (EV).

1. INTRODUCTION

Electric cars struggled when they were first brought to market in 2006, largely due to high costs, a lack of familiarity, and resistance from major automakers to produce them.

Table - 1*:* Shortlist of the benefits of owning an Electric Vehicle
Source: author's information based on various sources

Shortlist of the benefits of owning an Electric Vehicle:
• **EVs produce no tail pipe emissions and have lower lifecycle emissions than efficient gasoline powered vehicles.**
• **EVs are quiet and many models are fun to drive.**
• **EVs don't rely on imported petroleum, and electricity prices are more stable than gasoline prices.**
• **Charging at home is convenient and takes less time than going to the gas station.**
• **When combined with rooftop solar, "fuel" costs can be completely eliminated.**

But since 2006, quite a lot has changed. Electric cars are commonly spotted on roads around the United States and Europe, and their popularity is growing. As costs have come down, more consumers have purchased an EV than ever before. Battery technology is also improving, which will make EVs more desirable for people who worry about having an 80 mile limit on their daily drives. Electric cars have had the best adoption of alternative powered cars thanks to a number of factors (Table 1). First, the cost of electricity is competitive for consumers with the price of gasoline. Second, nearly everyone with a car has a power outlet in their home. Recharging is easy.[1]

Despite declining gas prices, automakers are showing off a raft of electric and hybrid models, although the average fuel economy of vehicles sold in the United States had been improving steadily until gas prices plunged to $2 a gallon in 2015. In 2015, consumers have opted to buy more trucks and S.U.V.s than passenger cars, resulting in greater overall fuel consumption. 116,597 battery electrics and plug-in hybrids were sold in 2015, a figure that dropped slightly from the 123,049 sold in 2014. In December 2015, the average fuel economy of a new vehicle sold in the United States was 24.9 miles per gallon, according to the University of Michigan Transportation Research Institute. That was the first time in two years that the average fell below 25 miles per gallon, according to figures compiled by the institute.[2]

2. IMPACT OF LOW FUEL PRICES ON EV DEMAND

[1] *"The Electric Vehicle Conversion Handbook HP1568", Mark Warner, June 2011*

[2] *"Who is Exposed to Gas Prices? How Gasoline Prices Affect Automobile Manufacturers and Dealerships∗", Meghan R. Busse, Northwestern University and NBER, March 2016*

Despite the small decrease in sales, more electric cars and hybrids are coming to the market this year, mainly because automakers still have to comply with strict emission standards and also fuel economy.

Moreover, the World Bank offered a forecast that 2016 oil would fall 4% from an average price per barrel of $49.70 to $47.70 based on Brent, Dubai and West Texas Indicators for crude oil but after 2016, The World Bank expects crude oil prices to steadily increase with a projection of $56.90 in 2020 and $70.80 in 2025 in terms of real U.S. dollars rather than nominal dollars.

This means that **low fuel prices continue to have an impact on EV demand among buyers who are solely focused on the short-term price of gas**.

According to Nissan experts, EV sales will continue to rise over time due to increasing emission regulations and other reasons for purchase of EVs such as lower operating costs, reducing dependence on foreign energy sources, environmental concerns, and a great driving experience.

For example, the release of the Chevy Bolt and the Tesla Model S, both at around $US 35,000, put developments ahead of his curve. It means that within a few years, high-performance EVs will cost less than the average car in the US. Within five years they will be competing with low-cost Buicks. List of All-Electric cars selling in 2016 is presented in the Table 2. List of plug-in hybrids cars is presented in the Table 3.

Table - 2*:* List of All-Electric cars selling

List of All-Electric cars selling in 2016	
• BMW i3	• Mitsubishi i
• Chevrolet Spark EV	• Nissan Leaf
• Fiat 500e	• Smart Electric Drive
• Ford Focus EV	• Tesla Model S
• Kia Soul EV	• Tesla Model S P85D
• Mercedes-Benz B-Class Electric	• Volkswagen eGolf

Source: author's online research

Table - 3*:* List of plug in hybrid cars

List of plug-in hybrids cars selling in 2016	
• Audi A3 Sportback eTron	• Honda Accord PHEV
• BMW X5 xDrive 4.0e	• Hyundai Sonata PHEV
• Cadillac ELR	• Mitsubishi Outlander PHEV
• Chevrolet Volt	• Toyota Prius Plug-in
• Ford C-Max Energi	• Volvo XC90 PHEV
• Ford Fusion Energi	

Source: author's online research

Plug-in hybrids solve the range problem, but they still need a place to plug in. Electric cars also require no oil changes and minimal maintenance. According to the Nissan experts, the low operating costs should offset the cost of buying in just the first year for a Nissan Leaf, for example.

Ultra-low emission vehicles represented a similar proportion of new car sales in the UK in 2014 as they did in the US, France and Germany, while California (3.2%) and Norway (17.8%) had two of the largest EV market shares globally.
Fig. 1 presents the market share of Ultra-Low Emission Vehicles. Satisfaction with Electric Vehicles in California and in Norway are presented in the Fig. 2 and Fig. 3 respectively.

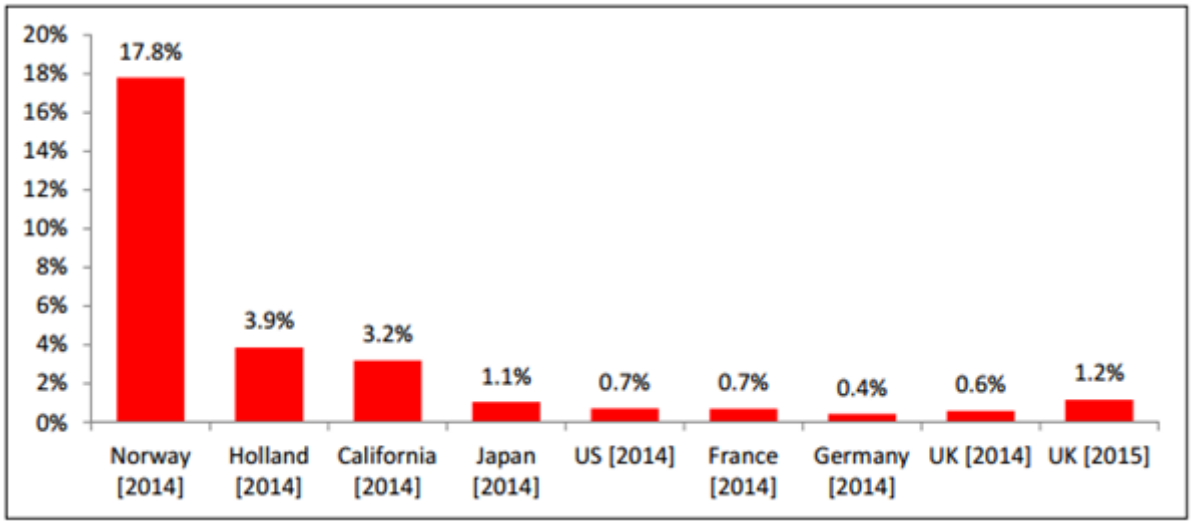

Fig-1: Market share of Ultra-Low Emission Vehicles in the UK and other countries (data from 2014/2015)
Source: Office for Low Emission Vehicles 2016, London, UK

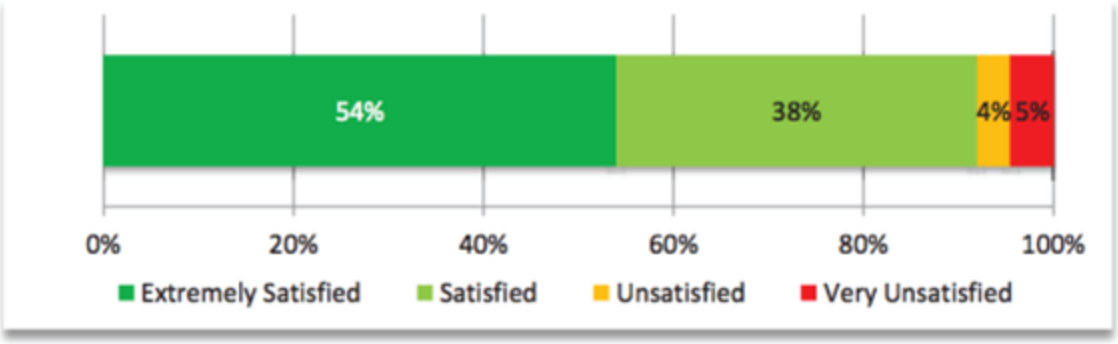

Fig. - 2: Satisfaction with Electric Vehicles in California, USA
Source: Center for Sustainable Energy, 2014

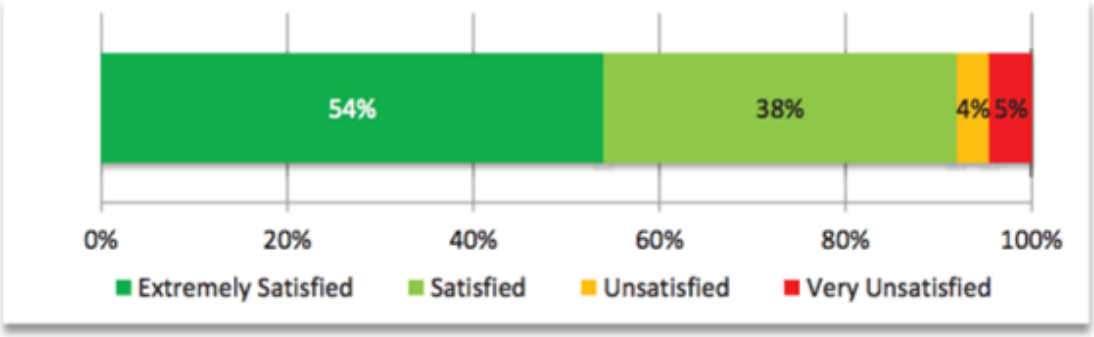

Fig. - 3: Satisfaction with Electric Vehicles in Norway.
[Source: Haugneland, 2014]

Norway, the Netherlands and the US state of California had the largest EV market share in 2014. Robust research with sample sizes of over 1,000 current EV owners has also been carried out in Norway and California in recent years. Comparing evidence from these markets with the UK is challenging because of the various cultural, political and structural differences that are likely to have mediated EV uptake in each.

A survey of EV drivers in California found 92% of the EV owners were "extremely satisfied" (54%) or "satisfied" (38%) with their EVs. Even better, a survey of EV drivers in Norway found 100% were "very satisfied" (91%) or "satisfied" (9%) with their EVs. Results from each of these surveys were again obtained from a Center for Sustainable Energy study.

The profile of the EV owners also complies with the idea that electric vehicles are not being purchased only because of high fuel prices (meaning that low fuel prices will not significantly damage the electric vehicles market demand), **but because of the sum of long term benefits**.

According to the Office for Low Emission Vehicles REA Report in 2015 conducted in UK, **most private EV owners are currently middle-aged, male, well-educated, affluent, and live in urban areas** with households containing two or more cars and with the ability to charge at home.

Looking ahead to the next 3-5 years, and based on insights from more developed EV markets, the basic socio-demographic profile of EV owners in the UK is not likely to change significantly. The evidence suggests more people in this same demographic are going to start buying EVs, and some people with similar demographics are likely to start buying them, too. Identifying specific segments of future EV owners, who can be characterized in terms of their attitudes as well as their demographics, is more challenging and no evidence identified in this rapid evidence assessment provides an off-the-shelf model. Based on the available evidence there are likely to distinct segments of future EV purchasers in the UK, all sharing similar demographics, but characterized by either strong pro-environmental attitudes, the desire to save money on fuel costs or an active interest in new technology. [3]

[3] *"A Rapid Evidence Assessment for the Department for Transport - Uptake of Ultra Low Emission Vehicles in the UK", Office for Low Emission Vehicles, August 2015*

Most **fleet EV owners are currently private sector businesses, working in a range of industries, with fewer than 500 employees, and a small-medium sized fleet**. The identity of fleet EV purchasers in the next 3-5 years is uncertain, and there is little evidence on which to base future projections. Many organizations appear to have initially bought one or a small number of EVs in order to assess their suitability for their wider fleet. Private sector businesses are expected to continue to represent the bulk of future EV fleet owners but further research is needed into the extent to which an initial EV purchase is leading on to large-scale purchasing and the potential for more organizations with larger fleets to start buying EVs.[4]

3. FACTORS FOR CHOOSING A NEW CAR AND TERMS OF SUSTAINABILITY

According to the same study as mentioned before, the most important factors that private and fleet car buyers take into consideration when choosing a new car are:

- costs – both purchase price and running costs;
- size;
- style;
- reliability;
- comfort;
- engine power;
- design;
- safety.

Private EV owners most commonly cite the following motivations for buying an EV: **interest in new technology, saving money on fuel costs and environmental factors**. The most commonly cited **motivations for buying an EV for fleet purchasers are: financial factors; and environmental factors (linked to CSR).**

The most commonly cited barriers to private car buyers buying an EV in the future are: range concerns; purchase price; and a lack of knowledge about/familiarity with EVs.

The most commonly cited barriers to fleet purchasers are largely the same as those for private car buyers: range concerns; purchase price; and a lack of knowledge about/familiarity with EVs.

[4] https://www.cse.org.uk/

However, as more EVs are produced and sold, we will also need a way to power those EVs. Today, most of our power comes from coal power plants, which pollute just as much as the gasoline we are trying to eliminate. We may be able to eliminate our gas guzzlers in the coming years, but we are certainly not moving toward a greener world until we find a way to charge those cars with clean, renewable energy. In industrial countries, the consumption of electrical energy increases by 4 % to 7 % per year. For this purpose, considerable amounts of primary energy carriers such as coal, petroleum or natural gas must be provided. All over the world, a reduction of the resources of primary energy carriers takes place. At the same time, their prices have been increased continuously. Water power is not in all countries available to a sufficient degree. Mention should be made of the fact that electrical energy can be transported conveniently through large distances at low losses. On the other hand, there is the disadvantage that electrical energy can be stored only in small amounts at high cost. Production and consumption must take place largely at the same time. However, Electric Cars seem to steal the show in terms of sustainability, cutting costs, protecting the environment through nonpolluting emissions and low resource usage: they use the energy stored in a battery or series of batteries for vehicle propulsion. **Electric motors provide a clean and safe alternative to the internal combustion engine**. **The electric vehicle is known to have faster acceleration but shorter distance range than conventional engines**. They produce no exhaust but require long charging times. EV producers state that electric vehicles will cost 10 times less than internal combustion engines to charge. Electrons are easier to move than petrol and diesel. Solar powered charging stations will deliver refills at zero marginal cost. Maintenance will also be significantly cheaper. An international combustion engine has more than 2,000 moving parts. An electric vehicle has fewer than 20 moving parts. It will have negligible maintenance costs. All these benefits continue to motivate the customers to invest in Electric Vehicles and also motivate producers to innovate in order to diminish the current list of shortcomings.

4. CONCLUSION

It is expected that in the future the car industry will reach a point where the fuel prices will not even be relevant, because the current trajectory towards investing in Electric Vehicles is becoming more and more important to governments, automakers and customers. EV sales will rise faster in countries that invest early in charging infrastructure or strongly limit air pollution in cities, and also more and more people are becoming educated in understanding the strengths and weaknesses of owning an Electric Vehicle.

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REFERENCES:

[1] Mark Warner, "The Electric Vehicle Conversion Handbook HP1568", June 2011
[2] Meghan R. Busse, Northwestern University and NBER, "Who is Exposed to Gas Prices? How Gasoline Prices Affect Automobile Manufacturers and Dealerships∗", March 2016
[3] Office for Low Emission Vehicles, "A Rapid Evidence Assessment for the Department for Transport - Uptake of Ultra Low Emission Vehicles in the UK", August 2015
[4] https://www.cse.org.uk/ Accessed on 15.07.2016.
[5] http://www.afdc.energy.gov/fuels/electricity_benefits.html. Accessed on 10.06.2016.
[6] https://cleanvehiclerebate.org/eng. Accessed on 10.06.2016.
[7] http://www.rff.org/blog/2016/how-do-gasoline-prices-affect-new-vehicle-sales.. Accessed on 29.06.2016.
[8] http://www.investopedia.com/articles/personal-finance/062515/do-oil-prices-affect-auto-industry.asp. Accessed on 20.06.2016.
[9] http://www.consumerreports.org/cro/2013/03/electric-cars-101/index.htm. Accessed on 22.06.2016.
[10] http://www.forbes.com/sites/michaellynch/2016/01/14/will-low-gasoline-prices-whipsaw-the-auto-industry-again/#5494ee335e7e. Accessed on 18.07.2016.
[11] http://fortune.com/2016/01/25/elon-musk-oil-prices-electric-cars/. Accessed on 10.06.2016.
[12] https://www.theguardian.com/environment/2016/feb/25/electric-cars-will-be-cheaper-than-conventional-vehicles-by-2022. Accessed on 19.07.2016.

BIOGRAPHY

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