SUSTAINABLE DEVELOPMENT IN RENEWABLE ENERGY: THE NEW STRATEGY DIRECTION FOR THE AUTOMOTIVE INDUSTRY

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Abstract
The demand for energy keeps growing and new energy vehicles represent the future direction of the automotive industry over the next decade. Renewable energy sources provide a strong contribution to greenhouse gas emission reduction. New developments in hybrid, EV or alternative fueled vehicles, another business trend is changing how automobile manufacturers are conducting business, running their operations and planning long-term strategies. The future will not play out the same way for every country or type of car, so this paper present the importance of renewable energy and how manufacturer commitment to new technologies projects.

Key words: *automotive industry, development, renewable energy, strategy, sustainability*

JEL Classification: *L62, O13, Q29*

I. INTRODUCTION

For the last century, the car culture has spread over the entire globe and shaped the global economy. (Jos, Greet et all, 2015) The global automotive industry is about to enter a period of wide-ranging and transformative change, as sales continue to shift and environmental regulations tighten. (Detlev, Müller,et all, 2013)

Global deployment of EVs for road transport, and particularly passenger vehicles, has grown rapidly in recent years. In Figure 1 is showed that in 2016, global sales reached an estimated 775,000 units, and more than 2 million passenger EVs were on the world's roads by year's end. This is believed to be a direct result of the decreasing amount of non-renewable materials, such as gas and oil, as well as government legislation which demands the use of electric cars in the near future. It is expected that in 2018, electric car sales will increase to 5% of the UK market and up to 12% in the USA market. (Robinson, 2018)

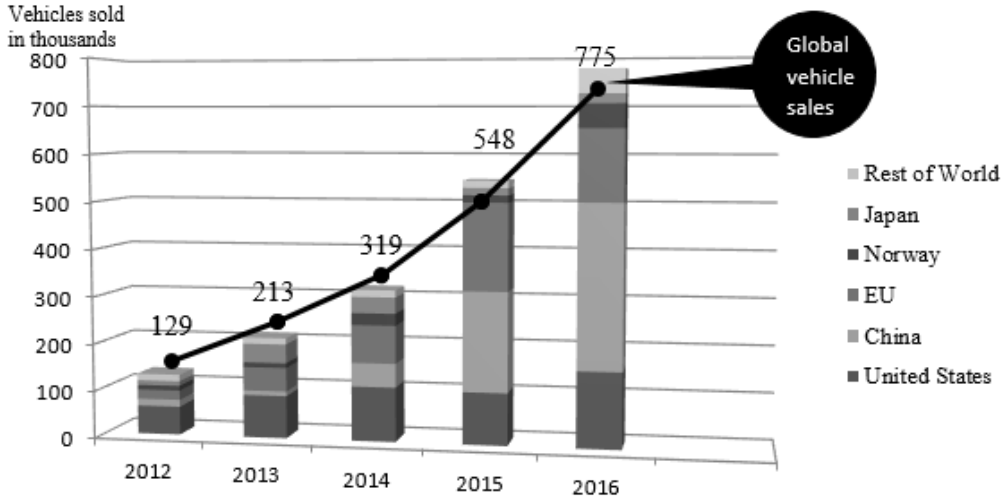

Figure 1- Global Passenger Electric Vehicle Market (Including PHEVs), 2012-2016 (Renewables, 2017)

II. THE DEVELOPMENT OF THE NEW ENERGY VEHICLES

Is obvious that the strategy of automotive industry and the world's car manufacturers race to compete in an electric vehicle (EV) (Zhang, 2018).The significance of the development of new energy vehicles is structured in two parts: by one side, the development of new energy vehicles is an important measure to alleviate the shortage of oil. By the other side, the development of new energy vehicles is an important part of smart grid construction. (Liu, 2015)

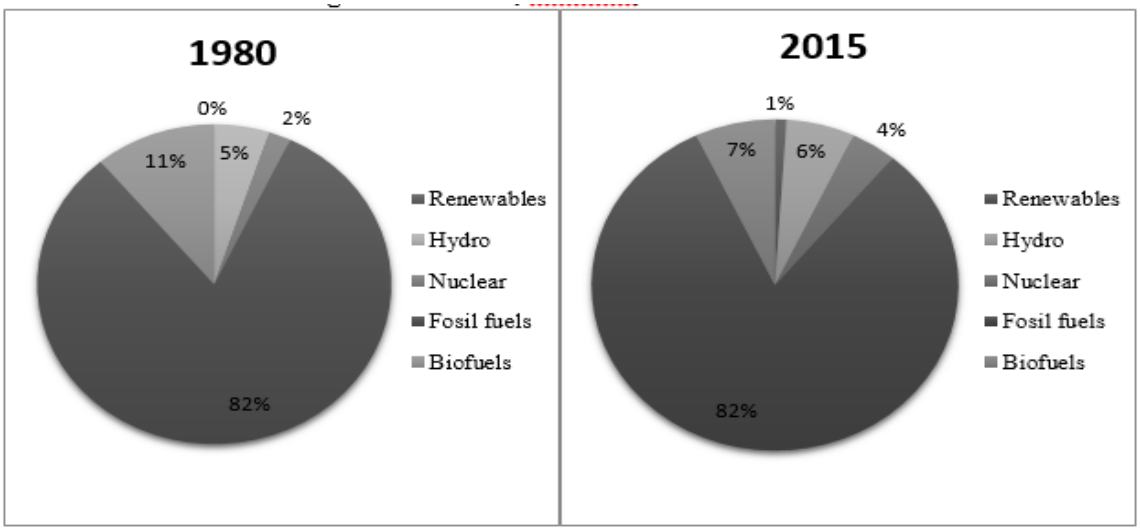

Figure 2 - Our fossil fuel dependence hasn't budged in 35 years

Analysts forecast that the energy demand in 2050 will increase with 30-40% higher than today. Over the past 30 years, worldwide energy demand has more than doubled. Renewables are getting cheaper, and have received more than $2 trillion of investment globally in the past decade. According with the Figure 2, based on data published on the World Bank, Enerdata, Our World in Data, since 1980, renewables have increased from less than 1% of the primary energy mix to just over 1% today. In contrast, fossil fuels have remained at a stubborn 82% of the primary energy mix (Burston, 2018). The International Energy Agency highlights that only three of twenty-six low carbon innovation areas - solar PV and onshore wind, energy storage and electric vehicles (EV) - are mature and commercially competitive. The high-energy-density batteries that are used for both storage and EVs are causing concern around whether the supply of raw materials needed to manufacture them will be able to keep pace with their rapid uptake. According to BNEF, graphite demand where predicted to increase to 852,000 tons in 2030, and the production of lithium, cobalt and manganese will increase more than 100-fold.

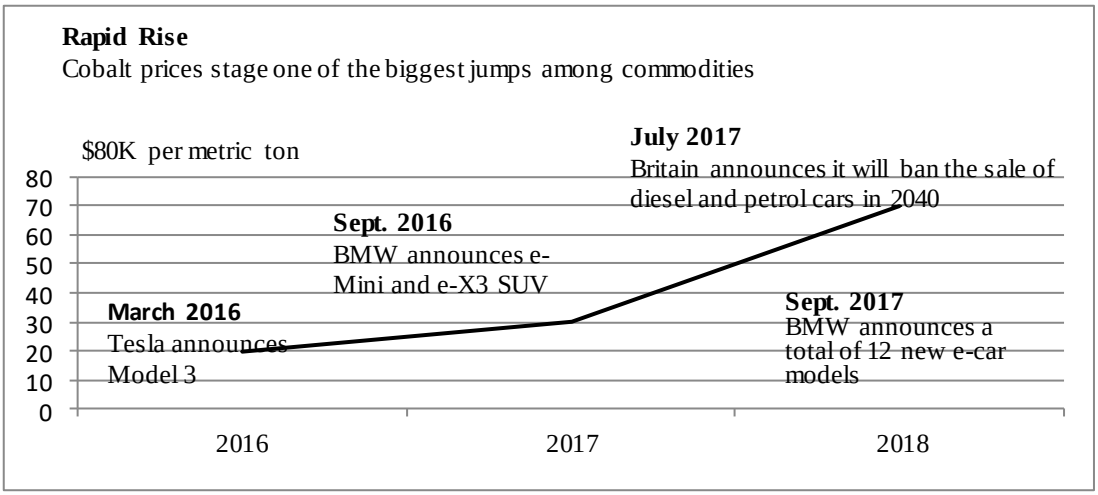

Figure 3 – Demand for EV batteries has caused at surge in demand for raw materials

The solution to increase the sustainability is to increase the renewable energy production. (Badea and Angheluta, 2018) Companies including General Motors, Volkswagen, and Ford now invest in renewable energy projects. (Kaye, 2011). Ford operates experiments throughout its global operations, including energy storage projects at its Michigan Assembly Plant facility and wind turbines that toil above European factories and General Motors and Volkswagen have engaged in renewable power purchase agreements (PPAs). According with (Crowder, 2017) PPAs are an ideal energy solution for the automotive industry because these companies:

1. Have high electricity load - Automobile assembly and parts manufacturing are energy intensive processes that rely on energy supplied mostly in the form of electricity. A renewable energy PPA allows companies in this industry to alleviate the weight of their electricity load, by locking in low prices for zero emissions energy sources.

2. ***Have decentralized operations*** - Manufacturing facilities for most large automotive companies are distributed throughout the United States (and across the world in many cases). When choosing Chattanooga in Tennessee as the site of its new manufacturing facility, Volkswagen said that it would be the first Leadership in Energy and Environmental Design (LEED) Platinum-certified automotive manufacturing facility in the world. In pursuing this goal, the company designed environmental sustainability into "every aspect" of the plant (Williams, 2014).

3. ***Operate in a carbon-intensive industry*** - These companies produce a consumer product that generally requires a carbon-based fuel. PPA gives companies the optimal chance to reduce emissions, leave a smaller overall carbon footprint, and decrease their impact on climate change.

4. ***Have a reputation that depends on consumers*** - Customers are the most important stakeholders for companies in the automotive industry. According to (PwC's 2016 Global CEO Survey, 2018), 58% of automotive CEOs are concerned that lack of trust could jeopardize their growth prospects.

III. MANUFACTURER COMMITMENT TO NEW TECHNOLOGIES PROJECTS

The push to bring new technologies to the market is of significant commercial interest to vehicle manufactures. More efficient vehicles typically create a competitive advantage for the manufacturer and create market and economic gains.

Nissan Mexico - An innovative energy project has recently been completed by Nissan Mexico at its Aguascalientes 1 manufacturing plant, which generates power from two separate renewable sources – wind and biogas.

Seat - As part its ongoing environment commitment, Seat completed an ambitious scheme towards the end of 2013 which involved the commissioning of six solar photovoltaic plants at its Martorell manufacturing site in Spain that together produce 15m kWh per year of clean electricity.

BMW - has installed four wind turbines to power a factory in Leipzig where it aims to assemble electric and hybrid models (Evans, 2012).

Audi - aims to pioneer 'e-gas' by using wind-generated electricity to split water molecules through electrolysis. The resulting hydrogen would help to make synthetic natural gas for fueling engines.

In Table 1 according with the (New car CO2 Report, 2018) are presented the current and future car electric manufacturers.

Table 1. The manufacturers current and future car electric plans

Manufacturer	Current	Future
Ford	1 BEV. 1 PHEV	70% of models electrified by 2025. 16 BEVs and 24 PHEV by 2022
Volkswagen	2 BEVs. 2 PHEVs	Every model to have an electric option by 2025 and 25% of sales to be electrified
Vauxhall		By 2020 4 electrified models (e.g. Grandland XPHEV and Corsa BEV). By 2024 all models electrified-including BEV or PHEV version
Mercedes	1 BEV. 3 PHEVs. 4 hybrids	15-25% sales to be electrified by 2025. 10 EV models by 2022
BMW Group	1 BEV. 5 PHEVs. 2 hybrids	25 pure EV and hybrids by 2025
Audi	2 PHEVs	Every model to offer an electric option by 2025 and 25% of sales to be electrified

Nissan	2 BEVs	20% of sales to be BEVs by 2020
Toyota	6 hybrids. 1 PHEV. 1 FCEV	An electrified option across every model by 2025. 60% of UK sales be electrified (HEV. PHEV. FCEV) by 2020. BEVs from 2020s
Hyundai	1 BEV 1 FCEV 1 PHEV 1 hybrid	Up to 38 green models by 2025 many BEVs
Kia	3 PHEVs 1 hybrid	11 new models by 2020 – including BEV FCEV PHEVs and hybrids
Lexus	9 hybrids	98% of UK states full hybrid electric and a diversity of electrified options by 2025 (PHEVs BEVs FCEV)
Mitsubishi	1 hybrid	20% of cars to be EV-based by 2020
Jaguar Land Rover	2 hybrids	Every model from 2020 to have electrified variant
Aston Martin		100% hybrid by mind 2020s
LEVC	PHEV	All PHEVs including new van
McLaren Automotive		Following the PHEV PITM model (the furs hybrid supercar) 50 % of cars will feature hybrid technology by 2022. Full electric prototype being tested.

But as the world's car manufacturers race to compete in an electric vehicle (EV) market focused on range, acceleration and speed of charging, no one is addressing the central challenge - electric vehicles are only as clean as the electricity they run on. How do we ensure the millions of EVs entering the market are powered by clean, sustainable energy? (Zhang, 2018). One energy vector mentioned there that is often forgotten is hydrogen. Hydrogen has the potential to decarbonize electricity generation, transport and heat. That's because when produced by electrolysis - using electricity to split water (H2O) into hydrogen and oxygen - hydrogen does not produce any pollutants. Perhaps the best-known use for hydrogen currently is in transportation. With electric vehicles, drivers are often concerned about their range and the time it takes to recharge. Fuel cell electric vehicles, which run on hydrogen, avoid these concerns, as they have a longer range, a much faster refueling time and require few behavioral changes. (Burston, 2018)

For example, Toyota's solution is the Mirai a hydrogen-powered car that only emits water. Currently only manufactured by hand and in small numbers, the Mirai is not yet able to significantly impact the market. However the Mirai's chief engineer, Yoshikazu Tanaka believes that by 2020, production will increase ten-fold, up to 30,000 vehicles a year. Quicker to recharge and able to drive longer distances, hydrogen cars are more like gasoline-powered cars than electric ones. This makes them a more easily accepted replacement for the majority of car owners. However, they also require refueling stations very similar to gasoline-powered cars (Bgadamosi, 2017).

But can be the hydrogen the fuel of the future? According (T-Raissi, 2004) hydrogen is the perfect partner for electricity, and together they create an integrated energy system based on distributed power generation and use. Hydrogen is the perfect fuel because:

- ✔it can be produced from a variety of energy resources
- ✔it satisfies all energy needs—from transportation to electric power generation
- ✔it is the least polluting since its use produces water
- ✔it is the perfect carrier for solar energy in that it affords solar energy a storage medium.

In UK in March 2017, the government announced a £23 million fund to stimulate the infrastructure and uptake of hydrogen vehicles. Hydrogen fuel providers will be able to bid forfunding in partnership with organisations that produce hydrogen vehicles to help build high-tech infrastructure, including fuel stations. In 2016, there were nine publicly accessible Hydrogen Refuelling Stations (HRS) on UK roads. 2017 will also see an installation by Shell of three hydrogen stations located in Cobham, Gatwick and Beaconsfield.

While the industry welcomes this positive trend, it should be ensured that the right infrastructure is located in the right place (UK Automotive Sustainability report, 2017).

IV. CONCLUSIONS

There is going to be a suite of great challenges to be met, in increasing the sustainability of the automotive industry. The environmental strategy of automobile manufacturers will define their survival during the next decade (Nunes and Bennett, 2009). The new technology and how they are produced all going through significant change. The automotive sector is committed to reducing overall vehicle emissions and spends more than 5% of its turnover on research and development. Most manufacturers have plan to bring to market lower CO2 emitting vehicles, particularly electrified products. EVs can also reduce the emissions that contribute to climate change and smog, improving public health and reducing ecological damage.

Another benefit is that because electric motors react quickly, EVs are very responsive and have very good torque. EVs are often more digitally connected than conventional vehicles, with many EV charging stations providing the option to control charging from a smartphone app (Electric Vehicle Benefits, 2018)

Taking all these into account automotive industry is demonstrating its commitment to monitoring, assessing and improving its economic and environmental performance due to renewable energy.

V. REFERENCES

1. 1. Badea C.G., Angheluta P.S., (2018) Sustainable development and energy resources, ECOFORUM, Vol.7, Issue 3(16)
2. Burston J., (2018) Why hydrogen could be the future of green energy, https://www.weforum.org/agenda/2018/05/this-forgotten-element-could-be-the-key-to-our-green-energy-future-heres-why/
3. Crowder D., (2017) 4 Drivers for Renewable Energy in the Automotive Industry, https://www.renewablechoice.com/blog-automotive-industry-renewable-drivers/
4. Detlev M., Muler M., Krieg A., (2013) The road to 2020 and beyond: What's driving the global automotive industry?, https://www.mckinsey.com/~/media/mckinsey/dotcom/client_service/Automotive%20and%20Assembly/PDFs/McK_The_road_to_2020_and_beyond.ashx
5. Evans P., (2012) Car Manufacturers Seek a Solar Boost, https://www.renewableenergyworld.com/articles/print/special-supplement-large-scale-solar/volume-2/issue-3/solar-energy/carmakers-seek-a-solar-boost.html
6. Gbadamosi T., (2017) How Renewable Energy Is Changing the Car Industry, https://themarketmogul.com/renewable-energy-car-industry/
7. Jos O., Greet J., Muntean M., Peters J., (2015) Trends in global CO2 emissions: 2015 Report, Netherlands Environmental Assessment Agency, publication number 1803 . http://edgar.jrc.ec.europa.eu/news_docs/jrc-2015-trends-in-global-co2-emissions-2015-report-98184.pdf
8. Kaye L., (2011) Why automakers are the new renewable energy investors, https://www.theguardian.com/sustainable-business/automakers-new-renewable-energy-investors-sustainable-cars
9. Liu J., (2015) Survey on Development of Renewable Energy Car Industry, Advanced Science and Technology Letters Vol.81 (CST 2015), pp.61-64 http://dx.doi.org/10.14257/astl.2015.81.13
10. Nunes B., Bennett D., (2009) Green technologies in the automotive industry, https://www.researchgate.net/publication/40498499_Green_technologies_in_the_automotive_industry
11. Robinson I., (2018) Top 2018 Trends of Renewable Energy for Automotive Industry, https://www.azocleantech.com/article.aspx?ArticleID=731
12. T-Raissi A., (2004) Hydrogen: Automotive fuel of the future, https://www.researchgate.net/publication/3438299_Hydrogen_Automotive_fuel_of_the_future [accessed Jun 26 2018]
13. Williams A., (2014) Renewable energy for manufacturing, https://automotivemanufacturingsolutions.com/technology/renewable-energy-for-manufacturing
14. Zhang L., (2018) Renewable energy meets design: the intelligent future of cars, https://www.wired.co.uk/article/renewable-energy-luxury-design-intelligent-car-future
15. Electric Vehicle Benefits (2018), https://www.energy.gov/eere/electricvehicles/electric-vehicle-benefits
16. New car CO2 Report (2018), https://www.smmt.co.uk/wp-content/uploads/sites/2/SMMT-New-Car-Co2-Report-2018-artwork.pdf
17. PwC's 2016 Global CEO Survey (2018), https://www.pwc.com/gx/en/ceo-agenda/ceosurvey.html?WT.mc_id=CT1-PL50-DM3-TR2-LS4-ND2-BPA30-CN_GLOBAL-CEO-SURVEY-INDUSTRY.AUTOMOTIVE-social&sf21019072=1
18. RENEWABLES (2017), Global Status Report, http://www.ren21.net/wp-content/uploads/2017/06/17-8399_GSR_2017_Full_Report_0621_Opt.pdf
19. UK Automotive Sustainability Report (2017), https://www.smmt.co.uk/wp-content/uploads/sites/2/SMMT-Sustainability-Report-2017-online.pdf