

Counting the reasons of electric vehicle revival, it has already mentioned three reasons.

- (i) Air pollution or end-of-pipe line pollution.
- (ii) well-to-wheel pollution,
- (iii) politics.

All three mentioned reasons are about the money. When we talk about end-of-pipe pollution, we can say about cost of increasing of healthcare budget, ~~about the~~ the decrease of productive age of population and about out flow of high-level professionals.

When we talk about well-to-wheel pollution, we can say about cost of remediation and decreased tax revenue and when we talk about politics, about conflicts and wars. We also can mention different direct or indirect financial losses.

It is really important reason and it would be rather useful to mention it. When we talk about reason of electric vehicle supporting governmental support. In such country as the United States, Germany, Japan, France, UK, South Korea and others we always have to keep in mind that all these countries have its own national car markets - global car markets and welfare of these companies is very important for countries.

The very vivid example of such a support in China we can see. They spend a lot of budget, a lot of efforts in order to support the development, the steady development of new energy vehicles, new engine vehicles we can see, by increasing EV sales, they not only solve their ecological problems and ensures the political stability in case of different possible conflicts. They also

enable, help to local car producers to leap ahead, to become a new leader in global auto industry. It is very hard to come all the way from the beginner to the leader, especially in such industries and auto industry and incipient changes in this car industry are a very good moment, a good chance just to try it. For the countries like, US, Germany, Japan, such changes are a kind of point to think whether they can hold the position or may be they are even thinking about improving their market share.

When they started to be interested in developing and in the science of technology, economics of electric vehicles, there were a three main newcomers, challenging auto companies in US: Tesla, Fisker and Coda. Tesla had become a true leader and nowadays, for example, Tesla is a kind of symbol for all the US are one of the leaders in car industry. Tesla model S and Tesla model X became the symbol of success and Tesla model 3, solar roof, power wall, power packs become the symbol of new hopes and such national ideas of leadership and national idea of new hopes is really important for countries and the price was not so high even if we compare it with the cost of remediation for example, of oil spills. Tesla became such a leader just because of some financial support and one of the most important is the governmental loan about half hundred million dollars for ten years from the US Dept. of energy and the loan was repaid in just four years by Tesla.

2.5. Age of Electricity (Grid balancing)

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Economic losses due to air pollution and due to oil spills due to decreasing of tax revenue, and soon. The battle between gasoline and electricity as a kind of battle between two ancient deities, ancient gods one is oil, more generally fire, for example, and another one is electricity and these ancient deities are relatives, they are closely related to each other because how we can get fire. Fire is often produced due to atmospheric electricity. A lightning is hitting some wood, for example, and causes fire or, for example, talking about internal combustion engine in order to start our engine we have to use electricity. We have to use battery and electric motor, starter, in order to start engine and in order to start burning fuel in internal combustion engine and in contrast, on the other hand when we are talking about ~~the~~ energy, electrical energy generation, we almost a huge amount of electricity is still produced by fuel burning by fire.

The 20th century was a kind of age of oil age of fire and oil was a symbol of this century, it was symbol of money, symbol of success and symbol of conflicts. The coming century, the 21st Century, is looking to be the age of electricity and all we see modern trends, for example, the portable electronics, telecom and all social networks are much more closely related to electricity than to oil or to fire and portable electronics and batteries, portable electronics was one of the most important reasons of raising batteries of batteries revival because in order to be portable, electronics has to store energy and this energy storage has to be light and compact and portable electronics is a kind of

revived. Helps to revive battery science, battery technology and after that battery become much more efficient, much more effective and such battery and technology development helped to revive electric vehicles.

Keeping in mind, three main markets for batteries, it is portable electronics, electric vehicles and the last one is grids and energy, energy generation and energy transportation.

Let's focus on the third market i.e. about more using batteries and the role of batteries for energy storage for renewables and for grid, smart grids and so on.

When we talk about electrical energy generation and transportation and the reason why batteries should be so successfully used in this field we have to mention very important terms such as peak demand. If we see the demand in electricity for some interconnection, kind of small town or, maybe, not so small town and you see that the demand in electricity is not something flat. It varies within one day. It has a clear maxima at about 4 pm. and again clear minima at about 4 am. and besides a kind of variation within one day it has rather clear variation of minima and maxima within a week and if we will see the annual demand and consumption of electricity we see that energy, electricity demand varies within seasons from one season to another season. It means that from the point of consumer the electricity and production and electricity generation should be so called demand following. It means that we need more electricity we produce more electricity. If we need less electricity we produce less electricity.

in fact a big problem of electrical energy production and generation is the fact that the production doesn't like to be peak or demand following or more correctly to say not like, but demand following generation is more expensive. So we can see that peak energy generation is about 10 times more expensive than off-peak one. It is because the lowest cost of energy generation: for example, engine and turbine or something like that is working at an optimal regime and produce the same amount of electricity during all day long or ~~all~~ week long or all year long or more correct to say produce the same electric power and not only cost does matter because when we talk that during peak hours electricity generation is more expensive. It means that it is usually less efficient. And less efficient means it consumes more fuel and very often it is fossil fuel which produce more pollution.

The peak shaving and electricity generating the same amount of electricity will result not only in cost reduction but also in decreasing of pollutions and decreasing of fuel consumption. The idea of peak shaving is rather popular and important for any energy system of all countries.

The concept of electrical vehicles was rather popular for electrical grids due to the fact that usually electric vehicle is considered to be charged during nights. As overnight charging and it means, for example, ~~you~~ we can see use an energy demand for house hold with electric vehicles and without electric vehicles and if we have an electric vehicle we have a kind of peak of electric demand during night. If we have a lot of house hold with electric vehicles, it save our peak

and makes our electricity demand more flat more stable.

It is more general to say that in order to have peak smart grid is required. The smart grid means the grid which can manage the electricity generation, the shape of electricity demand and it manipulates, makes these curves looking similar.

So keeping in mind, that off-peak energy generation is much less expensive and produces less pollution in atmosphere and consume less fuel. The smart grid should imply some electrical energy storage. Now a days we can speak about less than 1% of stored electric energy. So it is a lot of plenty of room to grow and it is a huge opportunity for energy storage for batteries and when we talk about energy storage it is important not only for large scale, for utilities it is very important, if you have ^{not} only consumption of electricity but also if we have a production of electrical energy. For example, if we have a rooftop solar panels and we see panel produce electricity and the peak of production is about the noon, but usually main part of people at noon are at work, but not home and so this energy should be stored. The stored energy and talking about renewables, it is important that not only at the house hold level, scale also, it is very important for any renewables, for large scale renewables it is very important too.