IMPACT OF PEV ON ELECTRICAL UTILITIES: A SURVEY

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ABSTRACT

This survey paper focuses on plug-in electric vehicle and from the past some years, plug-in electric vehicle (PEV) technology improvement has gained massive popularity. Current studies show that if PEVs displaced half of all vehicles on the road, they would require only an 8% increase in electricity generation. Results similar to this help encourage the continuing development of PEVs. But due to the charging and maintenance problem the popularity of PEV is regularly decreasing and because of this issues Long distance travel using electric vehicles is largely limited. To overcome this drawback solar power is used as a charging station, the solar power also gaining popularity because the price of petrol is increasing day by day. The electric vehicle has some advantages and disadvantages which is discussed and in this paper survey paper we also discusses the types of PEV and future work.

Keyword *PEV, Electrical Utilities, Charging, Discharging, Vehicle on Road.*

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1. INTRODUCTION

Gasoline- and diesel-powered Internal Combustion Engine (ICE) vehicles ended up dominating transportation in the 20^{th} century. However, concerns about the environmental impacts of ICE vehicles sparked a PEV renaissance at the end of the 20th century. First, advances in electric-drive technologies enabled commercialization of hybrid electric vehicles (HEVs), which integrate an ICE or other type of propulsion source with batteries, regenerative braking, and an electric motor to boost fuel economy. Continued technological advances have spawned PHEVs, which integrate small ICEs (or other types of propulsion sources) and large, grid-chargeable batteries that enable 10- to 40-mile all electric driving ranges. Advanced technologies have also created a new breed of EVs that don't use an ICE at all. Only a few models of new generation PEVs are available today. The market penetration and availability are growing quickly due to its benefits. PEVs are better than conventional vehicles in most performance categories. They are safe and convenient, and they can save money while slashing emissions and increasing the nation's energy security. PHEVs and PEVs have received increased attention because of their low pollution emissions and high fuel economy [1]. Imported oil in US comes from unstable regions, which is a potential threat to US national security. Ultimately, PHEVs/PEVs will transfer energy demands from crude oil to electricity for the personal transportation sector. This shift would reduce pollution and alleviate security issues related to oil extraction, importation, and combustion. Along with the use of grid power, PHEVs/PEVs also have the potential to transfer power to the grid, which alleviates peak power demand and provides ancillary services to the grid. Many automotive OEMs have made their plans to introduce PHEVs and EVs worldwide during the next few years with General Motors introducing the first PHEV - Volt – in production and Nissan with its electric vehicle LEAF in 2011 in the US market [2]. The US government has put a lot of effort in accelerating the introduction and penetration of advanced electric drive vehicles into the market. The US Department of Energy projects that about 1 million PHEVs/PEVs will be on the road by 2015 and 425,000 PHEVs/PEVs will be sold in 2015 alone. At this rate, PHEVs/PEVs would account for 2.5% of all new vehicle sales in 2015. The Electric Power Research Institute (EPRI) projects that 62% of the entire US vehicle fleet will consist of PHEVs/PEVs by 2050 using a moderate penetration scenario [4]. However, there is a need to address the potential problems caused by the emergence of PHEVs/PEVs charging. If properly managed, plug-in vehicles could be charged during low demand periods of the grid which minimizes the strain on the grid and obviating major generation and transmission infrastructure additions. Charging PEV requires electric vehicle supply equipment (EVSE). EVs must be charged regularly, and charging PHEVs regularly will minimize the amount of gasoline they consume. The aggregate load in a public charging facility (e.g., public parking lot) needs to be managed carefully in order to avoid interruptions when several thousand PHEVs/PEVs are introduced into the system over a short period of time (e.g., during the early morning hours when people arrive at work). A large number of PHEVs/PEVs connected to the grid simultaneously may pose a huge threat to the quality and stability of the overall power system. The effective communication technologies are critical to the successful rollout of EVs. Thus, a reliable communication network in a public charging facility is highly needed to enable the successful integration of a large number of sufficient bandwidth is needed to pass needed information between PHEVs/PEVs and the controllers to perform effectively the charging and discharging. Therefore, the authors have developed a digital test bed for a large-scale PHEV/PEV enabled parking lot that integrates both an energy management module and a communications module. Fig. 1 illustrates the Block diagram of the EV-metro connection.

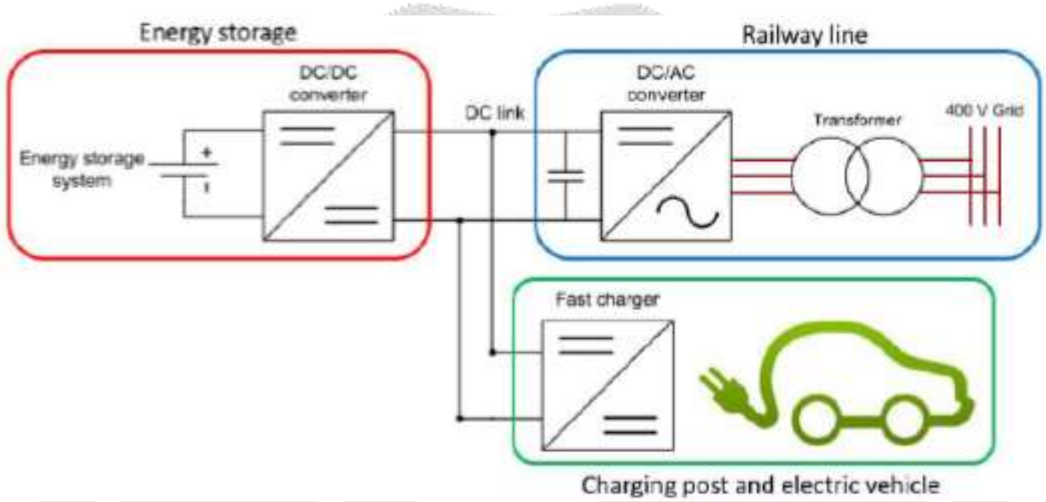

Fig.1: Block diagram of the EV-metro connection

The charging unit consists of two types of energy used for charging of vehicles coming into the parking lot. It used the conventional means of energy as well as solar energy. In the day the charging station charges its vehicle entering using solar power and during night hours it uses conventional energy. The voltage divider circuit gives a reference voltage or produces a low voltage signal proportional to the voltage to be measured ie.5V required for Arduino board. The entrance of the parking area contains the controller unit for driving the vehicles after checking their battery level, entry of parking time. According to the details the car is assigned a slot to charge. After the 100% charging level is reached, the owner of the car is intimated to park his/her vehicle in a separate parking lot, allowing other vehicles to charge.

2. EV CHARGING IN WORKPLACE USING PV

EV charging in Europe is defined by the standards in [4,5]. The charging plug type widely used in Europe for AC charging is the Type 2 Mennekes plug. It supports both single and three phase AC charging at Level 2 charging power level [6]. However in the future, DC charging using Chademo and the Combined Charging Standard (CCS) will be most preferred charging standard for charging EV from PV at workplace due to the following reasons:

1. Both EV and PV are inherently DC by nature.
2. Dynamic charging of EV is possible, where the EV charging power can be varied with time.
3. DC charging facilitates vehicle-to-grid (V2G) protocol.

In this paper, a 10 kW EV–PV charger will be considered that provides both charging and discharging of car for up to 10 kW, as shown in Fig. 2. This is in line with the draft proposal of the Chadmeo standard for enabling 10 kW V2G from EV. The three-port converter connected to the 50 Hz AC grid was chosen as the most suitable system architecture based on [11]. Since the cars are parked for long durations of 7–9 h at the workplace, fast charging of EV at 50 kW or more would be unnecessary. Solar power is the primary power source of the grid connected EV–PV charging system. The solar power is generated using a 10 kWp photovoltaic (PV) array that is located at the workplace. The panels could be located on the roof top of the buildings or installed as a solar carport [9]. The EV–PV charger has two bidirectional ports for the grid and EV, and one unidirectional port for PV. The PV converter, grid inverter and the isolated EV charger are integrated on a central DClink. Direct interfacing of EV and PV on DC would be more beneficial than AC interfacing due to lower conversion steps and improved efficiency [10,11,7,8].

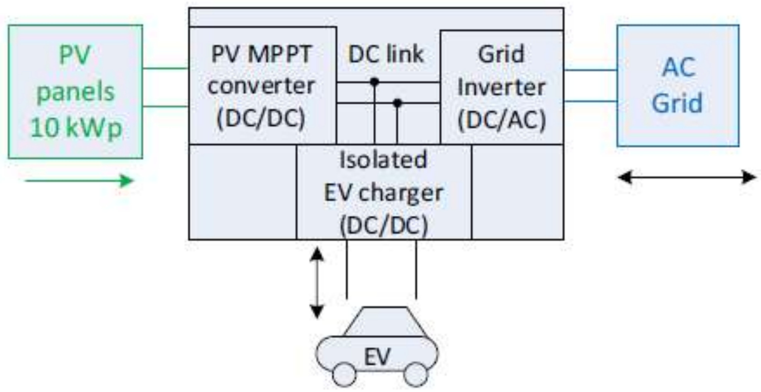

Fig. 2. System architecture of the grid connected 10 kW three-port EV–PV chargers.

3. PLUG-IN ELECTRIC VEHICLES BENEFITS AND TRADE-OFFS

PEVs offer several benefits over conventional vehicles. The most obvious for the owner are lower operating cost, less interior noise and vibration from the power train, often better low-speed acceleration, convenient fueling at home, and zero tailpipe emissions when the vehicle operates solely on its battery. BEVs have no conventional transmissions or fuel-injection systems to maintain, do not require oil changes, and have regenerative braking systems that greatly prolong the life of conventional brakes and thus reduce brake repair and replacement costs. On a large scale, PEVs offer the potential to reduce petroleum consumption and improve urban air quality; the degree to which PEVs affect pollutant emissions will depend on how the electricity that fuels a vehicle is generated, the degree to which charging of the vehicle is managed, and the degree to which emissions from power generation sources are controlled [12]. PEVs might also act as an enabler for renewable power generation by providing storage or rapid demand response through smart-grid applications.

PEVs, however, also have important trade-offs. Current limitations in battery technology result in restricted electric driving range, high battery cost, long battery-charging time, and uncertain battery life. Concerns about battery safety, depending on the chemistry and energy density of the battery, have also arisen. PEVs have higher upfront costs than their conventional-vehicle counterparts and are available in only a few vehicle models. There is also a need to install a charging infrastructure to support PEVs whether at home, at work, or in a public space. Beyond the technical and economic barriers, people are not typically familiar with the capabilities of PEVs, are uncertain about their costs and benefits, and have diverse needs that current PEVs might not meet. If the goal is widespread deployment of PEVs, it is critical to identify and evaluate the barriers to their adoption.

4. TYPES OF PLUG-IN ELECTRIC VEHICLES

Essentially all U.S. vehicles today have an ICE that uses gasoline or diesel fuel that is derived from petroleum and produces CO2 and other harmful emissions as the vehicles travel. Hybrid electric vehicles (HEVs) achieve a lower fuel consumption than conventional vehicles of the same size and performance. They typically have a smaller ICE and a high power battery and electric motor to increase the vehicle's acceleration when needed and to power the vehicle briefly at low speeds. Electric energy is provided to the battery when the vehicle brakes and is produced by the ICE using power that is not needed to propel the vehicle. The lower fuel consumption that can be achieved is illustrated by the 50 miles per gallon (mpg) of gasoline that is achieved by the Toyota Prius, the best-selling HEV. There are many other HEV models available in the market, most of which use much less fuel than their ICE counterparts. Although HEVs still constitute a small fraction of the U.S. vehicle fleet, the more rapid adoption of efficient HEVs could be important for meeting the increasingly stringent corporate average fuel economy (CAFE) and greenhouse gas (GHG) emission standards that are helping to drive down the demand for petroleum and to decrease vehicle tailpipe emissions. However, although HEVs use batteries and electric motors, they derive all of their electric and mechanical energy from their gasoline or diesel fuel. Thus, HEVs are used as a point of comparison for the present report, but they are not its primary focus. The PEVs that are the focus of the present report are often divided into two categories: battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs) that include an ICE and an electric motor. This section uses vehicle AER to distinguish four classes of PEVs. The reason is that the obstacles to consumer adoption and the charging infrastructure requirements differ for the four classes of PEVs. BEVs are separated into long-range BEVs and limited-range BEVs, and PHEVs are separated into range-extended PHEVs and minimal PHEVs. There are now examples in the market for each type of PEV, and the committee uses some of them to illustrate their capabilities (see Table 1).

Table 1: Definitions and Examples of the Four Types of Plug-in Electric Vehicles [13]

Vehicle	Battery Capacity[a]	All-Electric Range[b]
Type 1. Long-Range Battery Electric Vehicle. Can travel hundreds of miles on a single battery charge and then be refueled in a time that is much shorter than the additional driving time that the refueling allows, much like an ICE vehicle or HEV.		
 **2014 Tesla Model S** © Steve Jurvetson, licensed under Creative Commons 2.0 (CC-BY-2.0)	85 kWh nominal	265 miles
Type 2. Limited-Range Battery Electric Vehicle. Is made more affordable than the long-range BEV by reducing the size of the high-energy battery. Its limited range more than suffices for many commuters, but it is impractical for long trips.		
 **2014 Nissan Leaf** ©2014 Nissan North America, Inc. Nissan, Nissan model names, and the Nissan logo are registered trademarks of Nissan	24 kWh nominal (~21 kWh usable)	84 miles
 **2014 Ford Focus Electric** Image courtesy of Ford Motor Company	23 kWh nominal	76 miles
Type 3. Range-Extended Plug-in Hybrid Electric Vehicle. Operates as a zero-emission vehicle until its battery is depleted, whereupon an ICE turns on to extend its range.		
 **2014 Chevrolet Volt** © General Motors	16.5 kWh nominal (~11 kWh usable)	38 miles
Type 4. Minimal Plug-in Hybrid Electric Vehicle. Is mostly an HEV. Its small battery can be charged from the grid, but it has an all-electric range that is much smaller than the average daily U.S. driving distance.		
 **2014 Toyota Plug-in Prius** Image courtesy of Toyota Motor Corporation	4.4 kWh nominal (~3.2 kWh usable)	11 miles (blended) 6 miles (battery only)

[a] Nominal battery capacities, reported by manufacturers in product specifications, are for a battery before it goes into a vehicle. Vehicle electronics restrict the usable battery capacity to what becomes the vehicle's all-electric range.
[b] The all-electric ranges noted are average values estimated by EPA. The motor size and design architecture of the Toyota Plug-in Prius require the use of its ICE to complete the Federal Test Procedure; therefore, its range is given for both blended, charge-depleting operation and battery-only operation. All other vehicle ranges are given only for fully electric, charge-depleting operation. NOTE: HEV, hybrid electric vehicle; ICE, internal combustion engine.
Despite the increasing number of PEVs entering the market, however, far fewer vehicle types and features are available compared with the types and features available for conventional ICE vehicles and HEVs. As PEVs become more common, however, the variety of choices will increase, and some models could emerge that do not fit perfectly into one of the four categories described here.

4.1 Type 1: Long-Range Battery Electric Vehicles

Today's drivers are accustomed to ICE and HEV vehicles that are able to drive for hundreds of miles and then be refuelled at any gasoline station in several minutes. Extended trips are practical insofar as the refueling time is much shorter than the additional driving time that refueling provides. The full size Tesla Model S is a demonstration that hundreds of miles are also possible with a BEV that gets its energy entirely from the electric grid. It has a range based on the EPA driving cycle of 265 miles for a single charge of its 85 kWh battery (DOE/ EPA 2014a). Half of the charge of a depleted battery can be replenished in 20 minutes at any of the superchargers that Tesla is installing for its customers along major U.S. highways. That charge would extend the driving distance by about 132 miles. Thus, the Tesla Model S is considered a long-range BEV because it can drive for hundreds of miles on a charge and then be refueled in a time that is much shorter than the additional driving time that the refueling allows. Although filling a vehicle with gasoline or diesel would be much quicker, the ability to travel almost 400 miles stopping only once for a 20-minute recharge is a notable achievement for a BEV. With its high acceleration performance, low noise, high-end styling, and expected low maintenance, the Tesla Model S has earned several consumer performance awards [14]. The Tesla Model S is priced as a high-end luxury vehicle comparable to a high-end BMW and is not affordable for most U.S. drivers. Nonetheless; it is an important demonstration of the possibility of a long-range BEV for consumers. For now, however, high battery cost is a barrier to the mass adoption of the Tesla Model S and other BEVs. The fuel cost per mile and maintenance costs are much smaller for BEVs than for ICE vehicles, but not enough to offset their higher purchase price at current U.S. petroleum prices. The situation can be quite different in countries where gasoline and diesel fuel cost 2 or 3 times as much as in the United States. Finding: The possibility of a long-range BEV that is powered by grid electricity rather than gasoline or diesel and that meets consumer performance needs has been clearly demonstrated by the full-size Tesla Model S.

4.2 Type 2: Limited-Range Battery Electric Vehicles

The high cost of high-energy batteries leads to three types of more affordable PEVs. The first sacrifices driving range and the other two sacrifice zero tailpipe emissions for longer. The cost of producing a Model S is currently offset somewhat in that Tesla is able to sell the zero-emission-vehicle (ZEV) credit it earns for each vehicle to other vehicle manufacturers to allow them to comply with the ZEV mandate. See Chapter 7 for a detailed discussion of the ZEV program. trips. A limited-range BEV is more affordable simply because a smaller high-energy battery is installed, giving it a shorter range. The 2014 Nissan Leaf, a midsize car, is the best-selling example. It has a 24 kWh battery and an 84-mile range [15]. A more recent addition to the limited-range BEV market is the Ford Focus Electric compact car, which has a 76- mile range [16]. As noted earlier in this chapter, the actual range of a BEV will depend on a variety of factors, including climate, road grade, and driver behavior. The difference between the range, fuel economy, and emission performance estimated for regulatory compliance and what is actually experienced by drivers of all types of light-duty vehicles continues to be controversial and is discussed in other NRC reports [17,18]. The ranges that are achievable by limited-range BEVs are much longer than the 40 or fewer miles that 68 percent of U.S. drivers drive in a day, making these vehicles adequate for normal commuting and the average daily use [19]. However, drivers of ICE vehicles are accustomed to being able to travel well beyond the average daily distance when the need arises and can add hours of additional traveling time by simply refilling a gasoline or diesel fuel tank in several minutes. For a limited-range BEV, however, a half hour of the fastest available charging will typically allow an hour or even less of additional driving, making extended trips impractical. For extended trips and driving distances much beyond the AER, the limited-range BEV driver needs to have access to a second vehicle that has no serious range limitations or to some other transportation means. Many households have two or more vehicles, so trading vehicle utility within a household is already common. For its customers, BMW is experimenting with offering access to an ICE vehicle for the occasional long trip to see if this perk lowers the barrier to adoption of its vehicles. Rental companies like Hertz have also indicated that they are interested in filling that same niche [20]. Finding: Limited-range BEVs are the only type of PEV that have a considerable range limitation. However, the range that they do have more than suffices for the average daily travel needs of many U.S. drivers. Finding: Given the substantial refueling time that would be required, limited-range BEVs are not practical for trips that would require more than one fast charge.

4.3 Type 3: Range-Extended Plug-in Hybrid Electric Vehicles

A range-extended PHEV2 is similar to a long-range or limited-range BEV in that the battery can be charged from 2 The term range-extended PHEV is a general category based on the all-electric range of the PHEV and should not be confused with the term extended-range electric vehicle that General Motors uses to describe the Chevrolet Volt. The electric grid. However, the battery is smaller than that in a BEV, and the vehicle has an onboard ICE fueled by gasoline or diesel fuel that is able to charge the battery during a trip. Although extended trips fueled only by electricity are not practical, the vehicle has a total range comparable with that of a conventional vehicle because of the onboard ICE. The 2014 Chevrolet Volt with an AER of 38 miles [21] is the best-selling example, and the 2014 Ford Energi models (Fusion Energi and CMax Energi) that have AERs of 20 miles are other prominent examples. The AERs are comparable to the average daily driving distance in the United States. The consequence of eliminating the range restrictions of a limited-range BEV is that the added ICE uses petroleum and produces tailpipe emissions.

Although the ICE can be operated to maximize efficiency and minimize emissions, the fraction of miles travelled propelled by electricity depends on how willing and able a driver is to recharge the battery during a trip longer than the AER. On the basis of data collected by DOE through its EV Project, early adopters of the Chevrolet Volt appear to be very motivated to minimize their use of the ICE engine by charging more frequently and logging more electric miles per day than Nissan Leaf drivers [22]. In [23] reported that 63 percent of all miles travelled by the Chevrolet Volt are fuelled by electricity. Finding: The Chevrolet Volt demonstrates that if they become widely adopted, range-extended PHEVs with AERs comparable to or greater than the average U.S. travel distance offer the possibility of significant U.S. petroleum and emission reductions without range limitations.

4.4 Type 4: Minimal Plug-in Hybrid Electric Vehicles

Minimal PHEVs are PEVs whose small batteries can be initially charged from the electric grid to provide electric propulsion for an AER that is much less than the average daily travel distance for the U.S. driver. Among many examples, the 2014 Plug-in Toyota Prius is a minimal PHEV in that its AER is only 6 miles. It is an extreme example of a car that is designed for minimum compliance with regulations rather than to give good electric-drive performance. Minimal PHEVs allow a manufacturer to comply with regulations for obtaining PEV emission credits without the expense of designing and producing a car that is optimized for using electricity instead of petroleum. They allow their drivers to comply with requirements for high-occupancy-vehicle (HOV) lane access whether or not they bother to charge from the grid [25]. As might be expected, driver usage surveys of Plug-in Prius drivers show that a substantial fraction do not regularly charge their vehicles [24]. Minimal PHEVs are essentially HEVs. Finding: Minimal PHEVs with AERs much shorter than the average daily driving distance in the United States are essentially HEVs. Recommendation: Minimal PHEVs should be treated as
HEVs with respect to financial rebates, HOV access, and other incentives to encourage PEV adoption.

5. ADVANTAGES AND DISADVANTAGES OF PEV

An electric car can be a great way for you, as a consumer, to save a lot of money on gas. However, there are so many different reasons why you should invest in an electric car in the modern-day of technology.

5.1 Advantages of PEV

1. No gas required

Electric cars are entirely charged by the electricity you provide, meaning you don't need to buy any gas ever again. Driving fuel-based cars can burn a hole in your pocket as prices of fuel have gone all-time high? The average American pays about 15 cents a mile to drive a gas-powered vehicle, whereas many electric cars run on five cents a mile. Electricity is largely less expensive than gasoline. If most people charge their cars in the garage installing a few solar panels, that price can get cut even further, offering savings on powering your entire home. With electric cars, this cost of $2000 – $4000 on gas each year can be avoided.

2. More convenient

The electric vehicle is easy to recharge, and the best part is you will no longer need to run to the fuel station to recharge your car before hitting the road! Even a normal household socket could be used for charging an electric car.

3. Saving

These cars can be fuelled for very low prices, and many new cars will offer great incentives for you to get money back from the government for going green. Electric cars can also be a great way to save money in your own life.

4. No Emission

The biggest advantage of an electric vehicle is its green credential. Electric cars are 100 percent eco-friendly as they run on electrically powered engines. It does not emit toxic gases or smoke in the environment as it runs on a clean energy source. They are even better than hybrid cars as hybrids running on gas produce emissions. You'll be contributing to a healthy and green climate.

5. Popularity

EV's are growing in popularity. It is nearly three times as efficient as cars with an internal combustion engine, according to Wikipedia. With popularity comes all new types of cars being put on the market that are unique, providing you with a wealth of choices moving forward.

6. Safe to drive

Electric cars undergo the same fitness and testing procedures test as other fuel-powered cars. An electric car is safer to use, given their lower center of gravity, which makes them much more stable on the road in case of a collision.
In case an accident occurs, one can expect airbags to open up and electricity supply to cut from the battery. This can prevent you and other passengers in the car from serious injuries. They are even less likely to explode in the absence of any combustible fuel or gas.

7. Cost Effective

Earlier, owning an electric car would cost a bomb. But with more technological advancements, both cost and maintenance have gone down.

The mass production of batteries and available tax incentives further brought down the cost, thus, making it much more cost-effective. Consult a tax specialist to learn more about any tax credits that might be available to you on the state or federal level.

8. Low Maintenance

Electric cars run on electrically powered engines, and hence there is no need to lubricate the engines, anything related to the combustion engine or a ton of maintenance tasks that are usually associated with a gas engine. Other expensive engine work is a thing of the past. Therefore, the maintenance cost of these cars has come down. You don't need to send it to the service station often as you do for a standard gasoline-powered car.

9. Reduced Noise Pollution

Electric cars put a curb on noise pollution as they are much quieter. Electric motors are capable of providing smooth drive with higher acceleration over longer distances. Many owners of electric cars have reported positive savings of up to tens of thousands of dollars a year.

10. Battery Life & Cost

Batteries are an integral part of an electric vehicle. Most electric vehicle batteries are lithium ones, and their costs are improving every year. The full capacity of a lithium-ion battery cell should be good for 300 to 500 cycles. A good battery could last you up to ten years. With the improving technologies, the cost of these batteries is expected to come down even more.

11. Easy Driving

In the world of automobiles, electric cars have the simplest driving method. Commercial electric cars come with a transmission comprising of only one really long gear and also don't suffer from the stalling problem as petrol cars do. This effectively eliminates the need to add a clutch mechanism to prevent that from happening. Therefore, you can operate an electric car with just the accelerator pedal, brake pedal and steering wheel. Another really useful feature is regenerative braking. In normal cars, the braking process is a total wastage of kinetic energy that gets released as frictional heat. However, in an electric vehicle, the same energy is used to charge the batteries.

5.2 Disadvantages of PEV

Although the evidence of the positives has become very clear, there are also some downsides that each individual needs to consider before they decide to make an electric car their next big investment. These reasons are:

1. Recharge Points

Electric fuelling stations are still in the development stages. Not a lot of places you go to on a daily basis will have electric fuelling stations for your vehicle, meaning that if you're on a long trip or decide to visit family in a rural or suburban area and run out of charge, it may be harder to find a charging station. You may be stuck where you are.

However, until charging stations are more widespread, be sure to have a charging station maps where you live and where you frequently go so that you'll be able to charge your new EV when you need to.

2. The Initial Investment is Steep

As EVs are very new, you may be surprised when you take a look at the sticker price for EVs. Even the more affordable brands can be around $30,000 to $40,000.

If you're looking for a luxury option, you may be paying $80,000 or even more. Though technology is advancing and the price to produce electric cars continues to drop, you still have to pay $10,000 to $50,000 more for an EV than for a gas-powered car.

3. Electricity isn't Free

Electric cars can also be a hassle on your energy bill if you're not considering the options carefully. If you haven't done your research into the electric car you want to purchase, then you may be making an unwise investment.

Sometimes electric cars require a huge charge to function properly – which may reflect poorly on your electricity bill each month.

4. Short Driving Range and Speed

Electric cars are limited by range and speed. Most of these cars have a range of about 50-100 miles and need to be recharged again. You just can't use them for long journeys as of now, although it is expected to improve in the future.

5. Longer Recharge Time

While it takes a couple of minutes to fuel your gasoline-powered car, an electric car takes about 4-6 hours and sometimes even a day to get fully charged.

Therefore, you need dedicated power stations as the time taken to recharge them is quite long. Thus, the time investment and necessary planning do put some people off.
There are some kits that can cut the charging time down. But again, that is going to be an additional investment. So consider that, too.

6. Silence as a Disadvantage

Silence can be a bit disadvantage as people like to hear the noise if they are coming from behind them. An electric car is, however, silent and can lead to accidents in some cases.

7. Normally 2 Seaters

Most of the electric cars available today are small and 2 seated only. They are not meant for the entire family, and a third person can make a journey for the other two passengers a bit uncomfortable.

8. Battery Replacement

Depending on the type and usage of battery, batteries of almost all electric cars are required to be changed every 3-10 years.

9. Not Suitable for Cities, Facing Shortage of Power

As electric cars need the power to charge up, the cities that already facing acute power shortages are not suitable for electric cars. The consumption of more power would hamper their daily power needs.

10. Lower Amount of Choices

The market today for electric cars is expanding, with no signs of slowing down. However, the truth is that there are fewer options to customize and choose the aesthetics of your EV.
At the same time, the vast amount of customization is available with traditional cars. This is likely to change over time, but for many people, it is going to be a disadvantage.

11. Minimal Amount of Pollution

Electric vehicles are also not 100% emission-free; they cause a little amount of pollution indirectly. The batteries and electricity needed for charging are not necessarily generated from renewable energy sources.

6. CONCLUSION

PEV development has gained massive attractiveness. Although its demand on whole power generation capacity may not be substantial, the probable impacts on power delivery systems, particularly the dissemination system can be a concern if the charge is completely uncontrolled. Depending on the charging technologies and probable penetrations, impacts on power distribution system may comprise power quality, voltage, transformer life, etc. Mitigation strategies should be developed while promoting the PEV. In this paper we present the types of PEV and their advantages and disadvantages. In future work, we will develop a technology which will help in minimizing the drawback occurs in PEV using dynamic charging station and maintenance center.

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