

# Electric Vehicle Battery Swapping Stations

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## ABSTRACT

This paper presents a unique approach for providing a mobile battery swapping service for electric vehicles (EVs) that's provided by a mobile battery swapping van. This battery swapping van will carry several fully charged batteries and near to an ev to swap electric battery among a couple of minutes. First, an inexpensive ev battery swapping design supported electric battery swapping van is established during this paper. The perform and role of every participant and also the relationships between each participant are determined, particularly their changes compared with the battery charging service. Second, the battery swapping service is delineated, together with the service request priority and repair request queuing model. To supply the battery swapping service with efficiency and effectively, the battery swapping service request programming is analysed well, and a minimum waiting time supported priority and satisfaction programming strategy.

**Keywords:** Swapping Stations, PLC system,

## I. INTRODUCTION

In recent years, because of the progressively vital shortage of non-renewable resources, such as oil and coal, excessive consumption, and therefore the resultant setting pollution, electrical vehicles (EVs) have step by step drawn people's attention and become favoured as a sort of fresh energy vehicle [1]. The key issue for the effective operation of EVs is energy renewal. It's celebrated that there square measure 2 main ways that to resolve this problem: ev charging and battery swapping [2, 3]. In general, ev charging requires a protracted charging method. Thus far, because of policy and cash constraints, the charging stations, charging piles and different charging

infrastructure aren't wide deployed. The abovementioned reasons create it probable that ev users are going to be forced to prevent and wait, which ends up in waiting anxiety. In addition, ev users trade-off between the remaining battery energy, the placement distribution of charging facilities and their travel plans, that simply leads to vary anxiety. Therefore, more researchers and ev operators square measure turning their attention to battery swapping. Battery swapping can give a replacement totally charged battery, that doesn't need depleting the energy of the recent battery. Range anxiety is alleviated, and to some extent infinite mileage is obtained. As a result of battery swapping only needs a couple of minutes, waiting anxiety is considerably alleviated. The current ev battery swapping systems and infrastructure are in the main supported battery swapping stations and battery charging factories. A bigger variety of batteries are centrally-charged and transported to totally different battery swapping stations via a provision system [5]. Most analysis is that this area is concentrated on the subsequent issues: battery provision strategy, battery swapping station coming up with and construction strategy, and battery charging strategy for the battery swapping stations [6, 7]. The abovementioned analysis intends to boost the coverage and repair of a battery swapping system. However, these approaches don't notice the target of "get energy renewal anytime and anyplace." ev users should drive to A battery swapping station for battery swapping. Due to the obvious constraints of location and variety of the prevailing battery swapping stations, there should still be a queuing and waiting development. Therefore, an additional affordable and effective ev battery swapping design is required. To solve this downside, one effective plan is to modify from the prevailing

passive battery swapping mode to the active battery swapping mode. Recently, a replacement quick ev battery swapping device has been developed. The patents indicate that this device will be put in on a van, that transforms the van into a mobile ev battery swapping station. This device has the benefits of correct positioning and convenient swapping because of its parts, like a positioning pin, positioning hole, positioning track, positioning slot and PLC system. The operations of removing and installing a battery occur at constant time. Thus, the whole battery swapping method is incredibly quick and lasts solely a couple of minutes (in the experimental setting, it's about three min). EVs drive into the interior preset position of the battery swapping van through the folding slope plate to perform an automatic battery swap. Thus, the particular group action of battery swapping happens within the battery swapping van. The quality of the battery swapping van removes the constraints of location and amount of ev battery swapping stations. The battery swapping locations are additional versatile. When the ev cannot drive because of energy depletion, the battery swapping location is doubtless generated supported the EV's location

## II. LITREATURE SURVEY

In the construct of decarbonizing the energy sector and moving to associate all-electric energy system provided by renewable energy sources (RES), the electrification of transportation is one of key pillars. The variable and unsure nature of RES requires reconciliation and participation of flexible and manageable sources, particularly on the buyer facet. As EV are parked throughout most of the day, by plugging them and sanctionative their individual charging necessities in time, they become a valuable resource for mitigating the intermittent nature of RES [1]. Providing these further flexibility services results in lower facility operational prices, which means that the heat unit owner might reciprocally even have substantial benefits [2], [3]. While this would possibly eventually happen, majority of ways today evolve around creating heat unit charging

obtainable at as many locations as potential and shortening the time for service provision by putting in quick chargers. The idea is that the experience of owning an ev ought to match that of owning a conventional vehicle since a mean user won't opt for a new product if it doesn't offer a similar level of comfort. Detailed analysis of move behaviour has shown that EVs can match driving desires for eighty four of travels taken; this range increases even additional if the user's ar willing to create tiny changes in driving behaviour, like additional frequent charging [4]. more development of the technology, by increasing the battery's specific energy to a complicated analysis comes Agency-Energy (ARPA-E) target price of 200kWh/kg whereas keeping its mass constant, would mean EVs will satisfy virtually 96% of traveling demand with no changes in users behaviour [5]. It's attention-grabbing to note that whereas many analysis surveys, from a few of years back, have shown massive interest in EVs because the next vehicle of selection [6], but a pair of of personal vehicles nowadays ar electrical [7]. Challenge of getting additional EVs on the road lays the maximum amount in social acceptance because it will in overcoming technical barriers. In order to beat the anxieties potential users wear range, charging times, charger locations and charger availabilities, especially throughout longer travel distances, different business models and choices ar being developed. The construct of BSS is intriguing because of many aspects; besides providing the charging service time's superior to even classical gas stations, it maintains the potential of slow chargers to produce flexibility to the ability system. By combining these 2 effects BSS construct appears because it may well be an appealing possibility to each the utilities/system operators and heat unit users. There is an increasing range of papers associated technical reports dealing with the BSS siting, filler and operation, e.g. The BSS business and operational models haven't solely been treated in theory. Business businesses have developed around the BSS construct to require advantage of the present EV owners and to attract new ones. The corporate that was the most serious concerning this business was called better Place. Their plan was to separate

the automobile possession from battery ownership, which might create the price of associate heat unit love the cost of an interior combustion engine (ICE) vehicle, since battery value would be excluded from the initial automobile purchase. Better Place developed a business model and launched in 2008, with \$200 million in venture funding and partnership with Renault-Nissan. Among first eighteen months higher Place had reached agreements and partnerships with governments in six countries and began getting into markets for complete commercialization. However, when sturdy begin, business was not developing in line with the arrange and higher Place filed for bankruptcy in 2013. The company's financial difficulties were caused by the high investment needed to develop the infrastructure and therefore the under expected penetration [2]. Another example is Tesla Motors Company that in 2013 introduced battery swapping technology for his or her EVs. However, it's like Tesla homeowners don't seem to be terribly interested in battery swapping, that the development of Tesla battery swapping system is presently on hold. One would possibly say that examples of these 2 firms are proof that battery swapping does not work, however its value noting that Tesla Motors uses fully completely different business model from higher Place (Tesla's core business is automobile production, whereas higher Place's core business was battery swapping). Namely, Tesla Motors does not provide the choice to lease the battery (reduced initial car price) and that they provide free supercharging, whereas battery swapping is being charged for. Therefore, battery swapping offers no financial benefit to Tesla homeowners and this is often most likely the reason why they're showing no real interest during this technology, in spite of the actual fact that solely individuals with higher incomes will afford to shop for Tesla.

### III. WORKING

#### 1. Battery Swapping Van

The current battery swapping service with a battery swapping station as its core, in essence,

is a passive service that has to expect users and swap their batteries. If the service doesn't satisfy the need of ev users, they still suffer from vary anxiety. However, the applying of a battery swapping van causes an elementary modification. once the quantity of battery swapping vans gets sufficiently big, a battery are often sent to ev users anytime and anyplace. ev users will favor to stop to attend for a battery swapping van or keep driving till the battery swapping van catches up with them. This will appear as if ev users travel with Associate in Nursing energy filling device, which is able to finally eliminate waiting anxiety and vary anxiety.

#### 2. EV/EV Users

The existence of A battery swapping van permits ev users to fully get eliminate the recent "refueling" mode. they are doing not have to search for a charging station or battery swapping station to urge their energy replenishment however simply call A battery swapping service anytime and anyplace. They simply ought to send their SOC and data regarding speed, direction and position. Then, they're going to get quick and accurate battery swapping service with A battery swapping van and don't have any ought to contemplate however much the SOC is. albeit we set the rule to specify that solely the battery whose SOC is a smaller amount than a certain level are often swapped to prolong the service lifetime of the battery, the commuter demands of ev users still are often secure. The mileage of ev looks to be considerably increased

#### 3. Battery Swapping Station

Generally, as a commuter tool, an ev is that the main mode of daily transportation. An ev is employed to commute to figure within the morning and return home at night-time, with occasional uses for driving to purchase a meal and alternative destinations throughout the day. Throughout the height commute hours, energy consumption is comparatively high, and consequently, the battery swapping demand is high. Thus, to only fill again the absolutely charged battery storage mistreatment the battery provision system is also not enough

because of the restricted capability of the absolutely charged battery storage within the battery swapping station. To guarantee the battery filling and alleviate the transportation pressure of the battery provision system, a good answer is to deploy a battery charging system at the battery swapping station. This battery charging system is barely wont to charge the batteries that ar swapped out and it's not open to ev users. This not solely improves the absolutely charged battery storage however conjointly plays a vital role in reconciliation peak load within the sensible grid.

#### 4. Battery Swapping Service Mobile APP

EV users receive the battery swapping data that is printed by the battery swapping service management system and send their period battery swapping request via the APP put in on the sensible mobile device [38]. Specifically, through the mobile APP, data regarding the distribution of battery swapping stations, period battery swapping value, and period distribution of battery swapping vans are acknowledged. To boot, the ev users will send their period position, SOC, driving speed and direction, etc. to launch an correct battery swapping request for getting quick and accurate battery swapping service.

#### 5. Battery Swapping Service Management System

As the elementary communication and management platform of battery swapping, the battery swapping service management system offers a range of battery swapping applications like battery swapping service reservation, battery swapping service customization, and so on. The battery swapping service management system frequently releases period costs. The charge of 1 battery swapping service isn't constant however determined by each period value and period remaining battery energy of an ev user.

## IV. CONCLUSION

The results of this survey counsel that the respondents are generally receptive EVs and to the concept of battery swapping. The biggest obstacle in wider adoption of EVs is high investment cost. This concern could also be eased by the preparation of BSS, i.e. initial investment may well be reduced by leasing the batteries from the BSS rather than buying them with the automotive. His biggest drawback of the battery swapping idea is the compatibility between totally different automotive brands and models. Standardization of battery packs that are being swapped would greatly facilitate spreading of the BSSs, therefore increasing battery availability and relieving the vary anxiety issue.

## REFERENCES

- [1] European Commission, "Delivering a New Deal for Energy Consumers," Brussels, 2015.
- [2] I. Pavi c, T. Capuder, and I. Kuzle, "Low carbon technologies as providers of operational flexibility in future power systems," *Applied Energy*, vol. 168, pp. 724–738, 2016.
- [3] T. Brijs, K. de Vos, C. De Jonghe, and R. Belmans, "Statistical analysis of negative prices in European balancing markets," *Renewable Energy*, vol. 80, pp. 53–60, 2015.
- [4] N. S. Pearre, W. Kempton, R. L. Guensler, and V. V. Elango, "Electric vehicles: How much range is required for a day's driving?" *Transportation Research Part C: Emerging Technologies*, vol. 19, no. 6, pp. 1171– 1184, 2011.
- [5] Z. A. Needell, J. McNerney, M. T. Chang, and J. E. Trancik, "Potential for widespread electrification of personal vehicle travel in the United States," *Nature Energy*, vol. 1, no. 16112, 2016.
- [6] Deloitte, "Global Automotive Consumer Study - The changing nature of mobility - Exploring consumer preferences in key markets around the world," 2014.
- [7] European Automobile Manufacturers Association, "New passenger car registrations by alternative fuel type in the European Union," 2016