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**SOLAR**  
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## SOLAR EV CHARGERS AND SUPER FLOW BATTERIES FOR AN EFFICIENT ELECTRIC VEHICLE

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### Abstract

- Solar Energy is a sustainable source of energy, it is an ecofriendly and non-vanishing renewable source of energy.
- The problem is “Are electric vehicles an eco-friendly mode of transportation and can electric vehicles replace traditional vehicles in terms of pollution?”
- This paper gives an overview of advancements in Solar BEV Chargers and battery storage techniques for electric vehicles.
- Prices of solar installations have reduced considerably over time, encouraging more people to invest in one of the most popular forms of renewable energy.
- From the past few years, many government bodies, automotive manufactures, and other stakeholders have come forward to explore the new schemes and new opportunities by Combining Solar and Electric Vehicle Charging.

### 1. Introduction

- Enough sunlight energy strikes the earth's surface to meet the world's energy demand for one year in an hour.

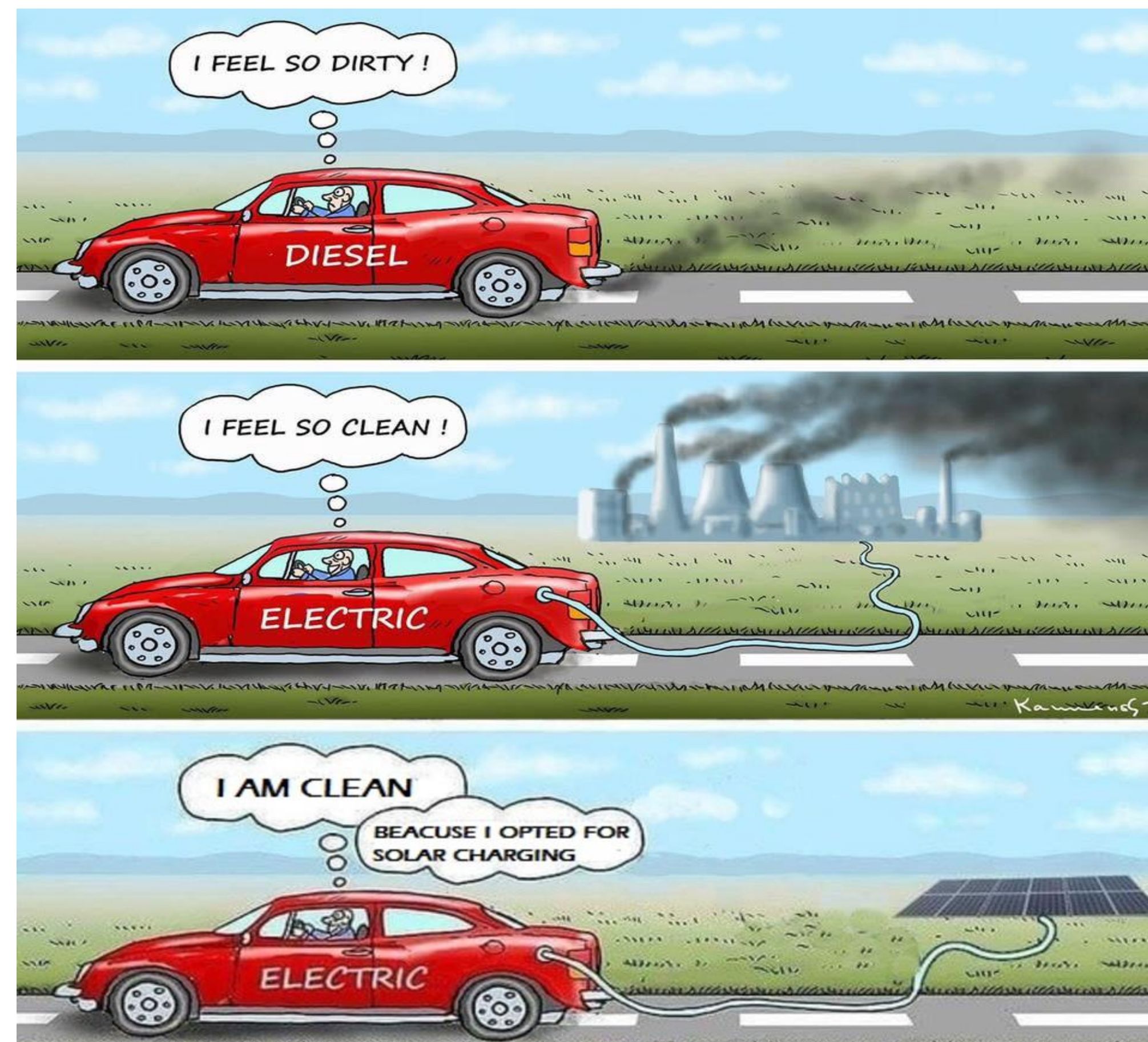


The costs of solar energy technologies have dropped continuously over the last 30 years. For example, the cost of high power solar modules have decreased from about \$27,000/kw in 1982 to about \$2,500/kw in 2019.

- Electric vehicles (EV) have gained Continuous attraction because of their credible alternative fuel and gas-powered vehicles. Since 2010, more than 1.4 million EVs have been sold in us alone by 2019.
- While PV modules may be installed on rooftops to build EV charging stations, Solar canopies installed on parking lots make an excellent Choice for solar-powered EV charging stations as it not only Generate clean electricity but also provides shade to the vehicle.
- I have reviewed how solar EV charger is beneficial and cost-efficient to the user and the environment and also I have discussed a new type of batteries which when combine with solar EV chargers can lead to a fast and efficient electric vehicle.

### 2. Problem Statement And Solution

#### Are Electric Vehicles Purely Green Mode Of Transportation...?



“EVs are not a solution to pollution. It is just transferring the problem from fuel to chimneys. The solution to pollution lies in solar power or renewable energy,”

Let us assume we drive a car 12,000 miles in a year. It takes about eight minutes to fill up a petrol or diesel engine car at a filling station:

25 miles per gallon; \$3.5 per gallon (as per US price)  
\$0.14 per mile  
**\$1,680 per year**

Whereas if we use solar EV chargers to charge the electric vehicle:

4,000 kWh per year; \$0.12 per kWh (as per 2019 tariff)  
\$0.03 per mile  
**\$480 per year**

You can save **\$1,200** per year from charging your EV with solar.

#### Some Best Techniques For Solar EV Chargers :

- The microcontrollers used in a solar PV charging system Ensures maximum efficiency of solar power generation through the **MPPT controllers**.
- They are programmed to control the motor using a **Pulse Width Modulation (PWM)** technique to align the panels for maximum power generation.
- charger output voltage should be  $\geq 400V$  and Current upto **80 amp**. Power upto 75 kW to overcome the problem of range anxiety and introduce fast charging.

### 3. Problem Statement And Solution

#### Are Electric Vehicles Fast And Efficient Mode Of Transportation...?

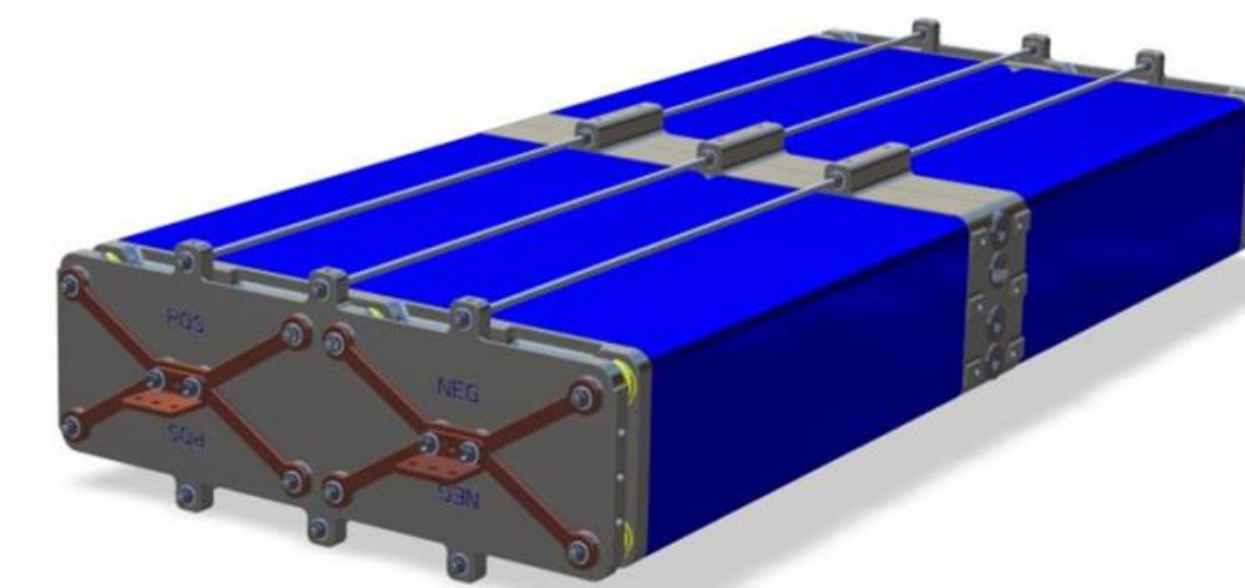


Fast charging is the latest trend in the EV industry, It's ideal for road trips, especially, but also important for everyday use.

If the lithium-ion battery isn't overheated, it can get up to 80% full in just 15 minutes, which is much more efficient than the typical charge time. The average time it takes a person to fill up a gasoline tank is 8 minutes. So, 15 is quite comparable.

So just imagine if you can charge your vehicle in **just 3-4 minutes**. And it can give you hundreds of miles. Here is the solution to the problem...

#### SUPERFLOW BATTERIES



Charge in ~3-5 minutes using fast chargers, and 30 seconds by replacing the electrode.

It can handle upto 1200 Amp. Each cell is 2.4 V

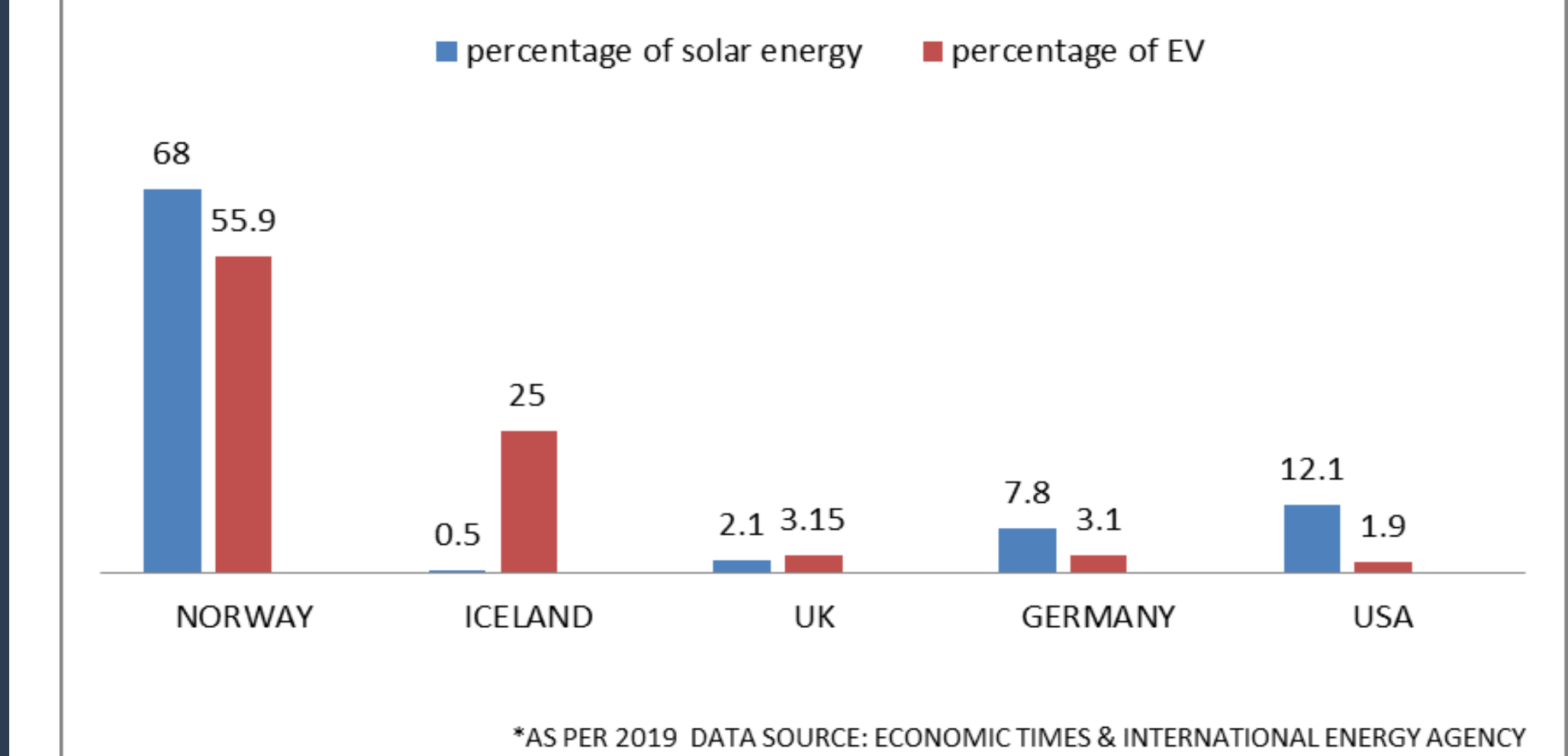
No degradation to the life of the battery. IP68 rating

It does not need to be replaced every 5-10 years like Lithium-ion batteries do.

They can be discharged and charged >10,000 times without replacing the Cells

### 4. Results And Findings

#### SOLAR ENERGY AND EV GRAPH\*



- Global PV capacity additions hit **115 GW in 2019**. Annual installations are expected to rise to around 125 gigawatts per year by the early 2020s.
- From the graph, it is clear that Norway is the first country to have more than **50% population with electric vehicles**, and a large percentage of its electricity is equipped with solar power, thus, they can easily use solar EV chargers to charge their electric vehicles.
- Also, the US has approximately **250,000 EVs and about 500,000 solar rooftops**, and both industries are still growing exponentially.

### 5. Conclusion

- I have explored the benefits of integrating renewable solar energy with an EV charging infrastructure placed at the car parking lot.
- The market for technologies to harness solar energy has seen considerable expansion over the past decade.
- The study shows that if solar energy is used for EV charging will lead to a great decrease in the depletion of fossil fuels, that were used to produce electricity conventionally.
- With the combination of SuperFlow batteries, solar energy utilization and customer satisfaction will increase. It will lead to sustainable energy development, and more people will tend to buy electric vehicles.

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