Contactless Power Transfer (CPT) System in Electric Vehicles (EV's)

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Situation

The usage of Electric Vehicles (EV's) is increasing in European countries because of the low tax rates for low-emission vehicles in these nations[1]. However, the inconvenient charging procedures associated with EV's have always discouraged consumers from buying and using EV's regularly. Charging of an EV requires the car to be stationary for at least 4 hours. Therefore, current manufacturers of EV's are trying to somehow improve EV's in order to make them more easy to handle for people.

Problems

There are numerous issues associated with reducing the charging time, and improving the convenience of using EV's.

- **Capacity and performance of battery:** Most electrical cars provide less mileage on a full tank as compared to the conventional internal combustion vehicles.

Comparing All Available Electric Vehicles			Time needed to Charge EV(240V)
	Price	Range of EV	
2014 Tesla Model S (85kWh)	$88,000	Large Car	265 miles	12 hours
2014 Tesla Model S (60kWh)	$81,000	Large Car	208 miles	10 hours
2016 BYD e6	$52,000	Small SUV	127 miles	06 hours
2014 Mercedes-Benz B-Class	$50,000	Midsize Car	87 miles	03 hours
2014 Toyota RAV4 EV	$48,000	Small SUV	103 miles	06 hours
2014 BMW i3 BEV	$46,500	Subcompact Car	81 miles	04 hours
2014 Honda Fit EV	$37,500	Small Station Wagon	82 miles	04 hours
2015 Fiat 500e	$32,000	Minicompact Car	87 miles	04 hours
2015 Nissan Leaf	$30,000	Midsize Car	84 miles	08 hours
2014 Ford Focus Electric	$28,000	Compact Car	76 miles	3.6 hours
2015 Chevrolet Spark EV	$27,000	Subcompact Car	82 miles	07 hours
2014 Mitsubishi i-MiEV	$23,500	Subcompact Car	62 miles	07 hours
2014 Smart fortwo electric drive	$23,500	Two Seater	68 miles	06 hours
2013 Scion iQ EV	Not Available	Minicompact Car	38 miles	04 hours

Table 1: Range and price of available Electric Vehicles [2]

- **Charging Time:** EV's take 4-12 hours to fully charge whereas conventional vehicles can be re-fueled within 10 minutes.
- **High cost for improving range of EV's:** The cost to buy an EV with a better performance and range is quite high[2]. The Tesla Model S which provides a better range than most EV's is also the most expensive EV available in the market.

Solutions

This project introduces a Contactless Power Transfer System (CPT) to charge Electric Vehicles. This system works on the principle of induction. Here two systems interact with each other to generate a significant amount of energy. This is then converted to useful form of energy to supply power to the battery to run the car.

Battery Requirements of CPT System

- A CPT system powered EV doesn't require an expensive battery to operate, it can run on the currently available batteries and provide a lot of extra miles[3].
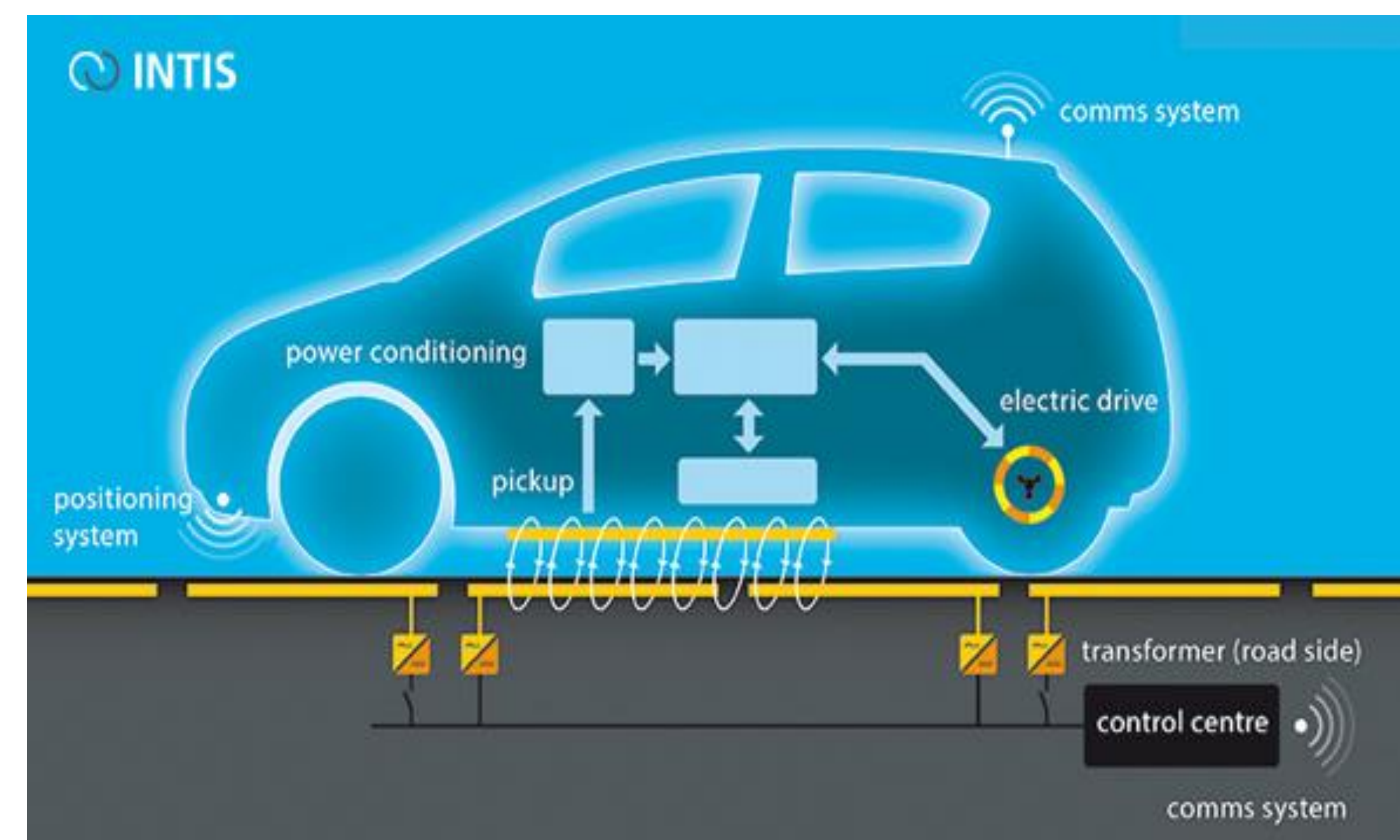

Figure 1: CPT system in EV's[4]

Improved Charging Time

- This system will eliminate the excess time required to charge EV's.
- Because of continuous contactless energy transfer between two systems, EV's will be charged when driven on roads or even when they are stationary at parking lots [3].
- Time can further be improved by building additional CPT charging stations.
- A separate CPT system can be beneficial because it can store and transfer more energy, and is more efficient than the one on roads.

CPT is compatible with all EV's

- This system can also be used in cheap EV's.
- It doesn't depend on the motors or other parts used to build the car.

Evaluation

- EV's are environmentally friendly than internal combustion vehicles.
- They are less noisy as compared to normal vehicles.
- The demand for EV's will only increase if they are made more user friendly for consumers by using CPT.

Limitations of CPT

- CPT systems are expensive because they require a lot of changes to the existing infrastructures.
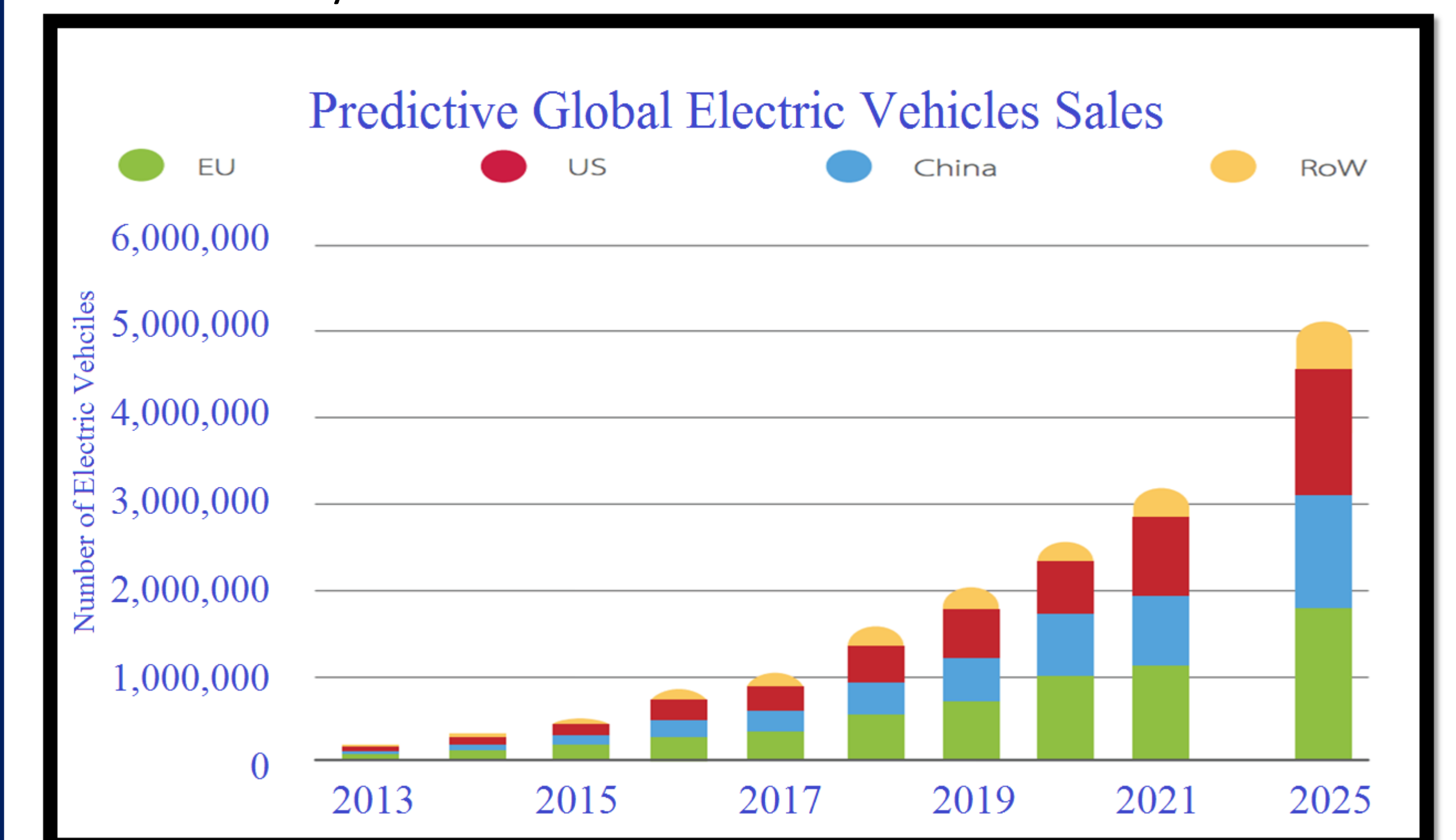- However, with an increase in supply of CPT systems its price will eventually decrease.

Figure 2: Chart showing increase in EV sales [5]

References

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