

Non-financial incentives: Charging infrastructure

Developing *charging infrastructure* is one of the key incentives in driving the electric vehicle market. The situation is often described as a *chicken-or-egg dilemma*. If there are no electric vehicles, companies will not invest in charging infrastructure and vice versa if there is no charging infrastructure, no one will buy electric vehicles. As a government it is possible to intervene and support infrastructure development in the early days. In these lecture notes we will discuss in what type of charging infrastructure to invest and how policies can be designed.

It is known that recharging times of electric vehicles, for the time being, are considerably longer than refueling times for gasoline cars. Even at fast chargers recharging times are about half an hour compared to 5 minutes for a gasoline car. Electric vehicles can however profit from the fact that cars are parked more than 95% of the time. Charging infrastructure should therefore be available at places with longer dwelling times such as at home, at work or at public locations such as shopping malls. At these places slower, so-called *level 2 charging infrastructure*, should be placed. For the home and workplace, incentives that can reduce the purchase cost of charging infrastructure can be useful. However, in more dense urban areas, in which parking is done in the public space, such incentives will not work. Local governments should step in to provide charging infrastructure for those that rely on on-street parking and charging near their home or workplace.



Creating a public charging infrastructure

Creating a *public charging infrastructure* network can be incentivized in several ways. First governments can decide to operate their own network to invest in early charging infrastructure roll-out. This is rather cost intensive but can provide a solution if market parties are not interested. A second option is to *provide a concession to a company* that is willing to invest. This concession would provide this company the right to operate a network within a certain area for a fixed amount of time. Governments could provide additional financial incentives, to reduce the risk for the company. If proven profitable, such a system can be used to lower future costs for charging point operators as economies of scale are guaranteed. A third option is to *allow companies freely on the market*, by smoothing the process of allowing companies to reserve parking spots only for electric vehicles and reinforcement of this policy. A downside is that prices for charging can be substantially higher in this case.



Figure: Public charging infrastructure in the Netherlands



Besides a slower level 2 charging infrastructure for battery electric vehicles, it is also important to facilitate inter-city travel by providing fast charge opportunities along corridors. Such an incentive is also very useful for hydrogen electric cars. Computer simulations can predict where the demand for fast charging is the highest and therefore to create an efficient charging infrastructure with the lowest amount of government support needed. Governments can also set regulations to ensure that access and payment for charging is standardized to avoid confusing consumers. Access should be equal across larger regions. Payment options can be set in such a way to prevent EV drivers to be connected to charging stations too long, which could result in charging point congestion. A price per time-unit can be used in places where suitable.

Other policy options

Charging infrastructure development is an *effective policy measure* but not the only one out there. Research shows that other measures such as access to High Occupancy Vehicle or bus lanes has proved to be effective. Especially in traffic ridden cities this can provide a strong incentive for those that want to avoid daily traffic jams. Access to such lanes can only be done in the early phase of adoption, as soon these lanes may get congested too if there are too many electric vehicles on the road.



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Figure: Electric Vehicle on bus road in Norway. Source: Norwegian electric vehicle association

Another option is to offer free or preferred parking for electric vehicles. In combination with public charging infrastructure this can be a strong incentive. In cities in which parking pressure is high, dedicated parking for electric vehicles, which are often under-occupied compared to regular parking spots, has shown to be very effective. However, assigning too many parking spots exclusively for electric vehicles can spark protests from non-adopters. Finding the right balance is key.

Depending if your cities or country has toll roads or congestion zones it is possible for electric vehicles to be exempt from tolls or congestion fees. Toll exemptions have proven to be effective in areas with toll bridges, tunnels and ferries which provide a significant travel time reduction. A reduced congestion fee could be offset by higher fees for combustion engine vehicles and could also to help to reduce



congestion. As for high occupancy vehicle lane access, both these incentives can only be used temporarily as they will get too busy if the number of EVs on the road rises.

Considerations

For all of the incentives discussed in this lecture there are some important considerations. These incentives are most effective when combined with each other and with financial incentives. The combination provides a mix to lure consumers to buy an electric vehicle. The incentives should not only be local but spread among a large area if possible. This makes the incentive stronger and prevents unnecessary confusion among the EV owners. Also governments should be transparent about how long they expect these incentives to last. Uncertainty about the longevity of the benefits could render these incentives worthless.



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