



Market Building Issues

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What creates a market for electric vehicles and/or plug-in hybrids?

- Vehicles
- Infrastructure
- Policy instruments
- Customer acceptance
- R&D strategies/ Technology Development



Today's EV or PHEV vehicle market

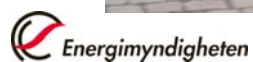
- In general: no ordinary vehicles for sale
 - Electric vehicle
 - On some markets there are some car sales
 - Plug-in hybrids
 - Demonstrations are planned
 - Heavy vehicles: demonstrations
- A lot of vehicles are shown at fairs/shows
- => small sales the coming 5-10 years
- Too much focus at cars?
- Many research and demonstrations ongoing or planned



Plug-in hybrid development by Volvo, Vattenfall supported by the Swedish Energy Agency



Ethanol hybrid buss with supercapacitors by Scania supported by Swedish Energy Agency



Hybrid garbage truck with plug-in garbage handling system



Infrastructure – comments to most road maps

- **Charging when parking – no parking for charging**
 - Evaluations from EV activities shows this
 - The driving range for a plug in will be even shorter
- Public fast charging/battery exchange for vehicles with an electric range less than 100 km? No, or at least very seldom, why:
 - Fast charging or battery exchange is not fast enough per km driven: who would pay for or like to spend tenfold time at a “charging” stations compared with today?
 - With short range it is a major disadvantage to drive extra just for charging
 - Rapid charging was felt as a security by users in Sweden but was not used a lot

Infrastructure 2

- Energy efficiency is the major motivation for electric propulsion?
 - It is easy to make electric propulsion less efficient; examples fast charging and contactless charging
 - Ordinary vehicles or vehicles on other renewable fuels are rapidly getting more efficient, i.e. a strong competitor

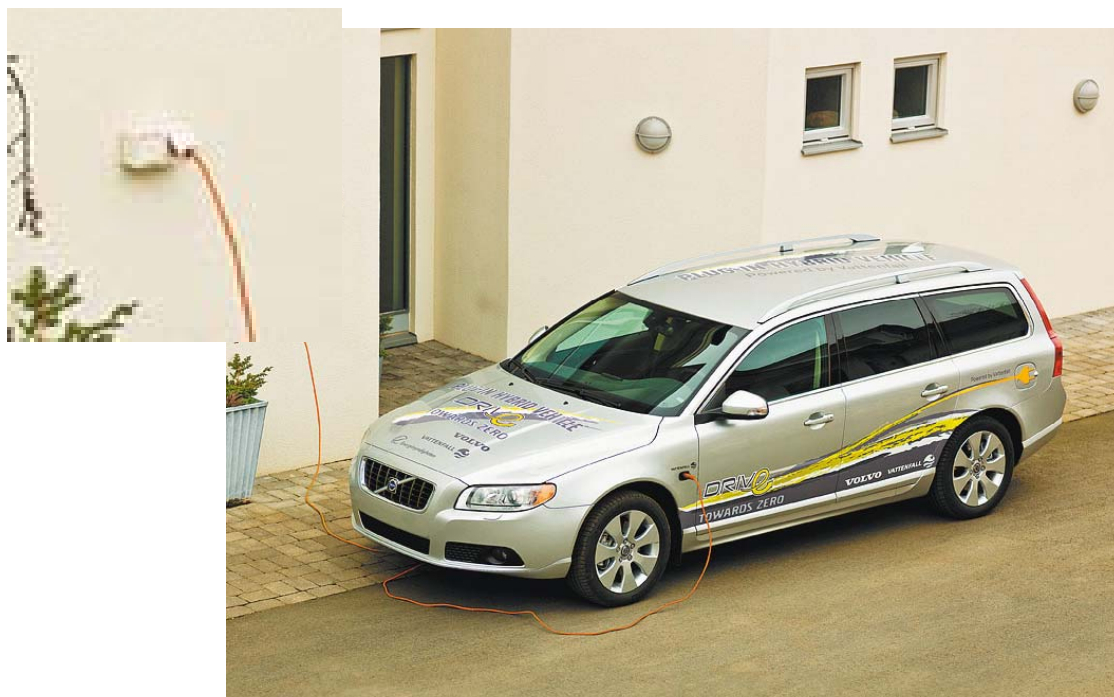
Infrastructure 3

- Given short range like today's planned EVs and PHEVs
 - The driver would like to start charging when parking to be able to make the next trip on electricity
 - This implies that charging mainly will be done during daytime; Swedish evaluations supports this
 - Demand side management is easily and cheaper done on other users than on EVs or PHEVs
 - Most charging will be made at “homebase” where DSM could be done on an higher system level than the vehicle (DSM on house or office level)

Summary of infrastructure

- For EVs or PHEVs with short range charging will be done mostly when parking?
- This implies:
 - Often there are time enough to charge in a normal outlet
 - Most private houses and many companies has or can easily get cheap ordinary outlets
- Most of the necessary infrastructure is in place or can be in place rather cheap with normal outlets (except when you need to dig into street to set up un outlet)
- No extra charger has to be produced; the vehicles power system will handle the charging

Ordinary outlet



Customer acceptance

- How much extra is a customer ready to pay for driving electric?
- For EVs: can the customer rely on the necessary driving range?
- For Plug-ins: do the customer charge electricity? What is the needed energy storage capacity?
- How and where are **added** infrastructure increasing the kilometers driven on electricity?

Policy instruments

- Demonstration programs combined with general economic incentives can overcome the initial extra cost?
- The general policy instruments has to be designed to make the electrification is done energy efficient
- It is important to have sustainable policy instruments; the instruments are being implemented now; the real market reaction will take place ten years from now?

R&D strategies and road maps

- Long term R&D strategies are necessary
 - The technology and the market is not even here
 - Market evaluations including infrastructure use are most important
 - Sweden is now investing in an evaluation platform through TSS (Test Site Sweden) including winter and cold climate testing
- Road maps important
 - Sweden has a forecast with today's policy instruments ending in 85 000 EVs or PHEVs 2020