Driver Preferences for Investment in Flexible Electric Vehicle Charging

Evidence from a Discrete Choice Experiment with 769 Belgian Drivers

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Motivation

- **Flexible charging** allows electric cars to use **renewable energy** when available and shift demand to **off-peak hours,** for lower emissions and grid stability.
- Depends on how drivers value the **convenience, upfront price**, and **future energy bill savings of flexible charging over time**.

Sample choice card

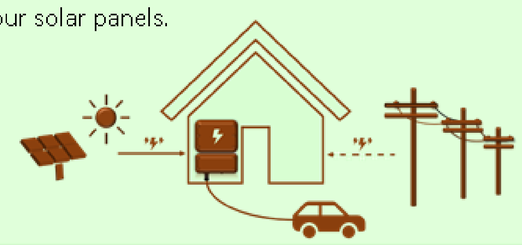
If you had an electric car, which charger would you choose?

	Charger 1	Charger 2	Use your current charger
Smart charging (?)	By your energy retailer	By yourself using your smartphone	The current charger has no advanced features. It simply charges your car at your current price until it is fully charged.
Solar charging (?) (would require existing or additional investment in household solar panels)	No	Yes	
Two-way charging (?)	None	Vehicle to home	
Peak electricity-use management (?)	No	Yes	
Your reward for using the advanced charging features (reflected on your electric bill)	€ 550 annually (€ 5500 total over ten years)	€ 290 annually (€ 2900 total over ten years)	You would not buy any new charger. You would not receive any reward for using the current charger.
Price of charger (including installation)	€ 1600	€ 300	
	○	○	○

Flexible charging features

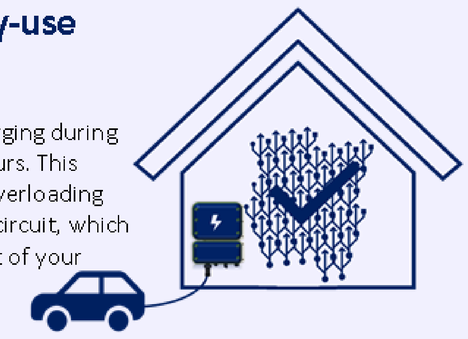
Solar charging

Use the option of charging your car using only your home's solar panels, or a combination of power from the grid and your solar panels.



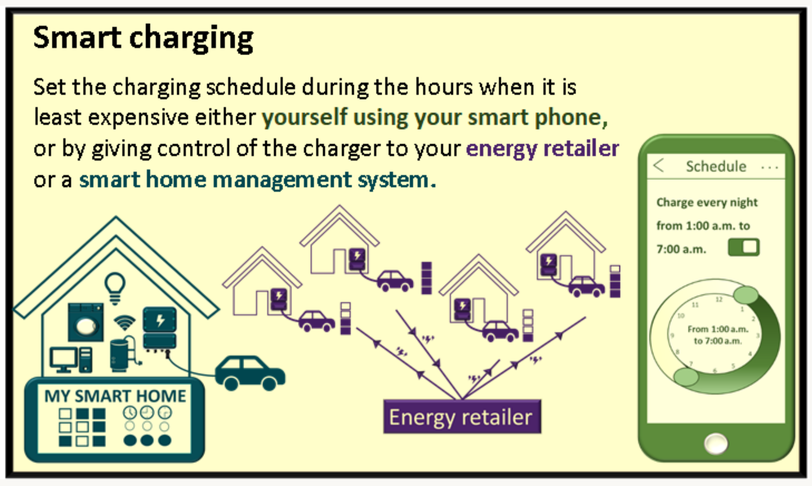
Peak electricity-use management

Slow down or stop charging during peak electricity-use hours. This eliminates the risk of overloading your home's electrical circuit, which could cut power to part of your home.



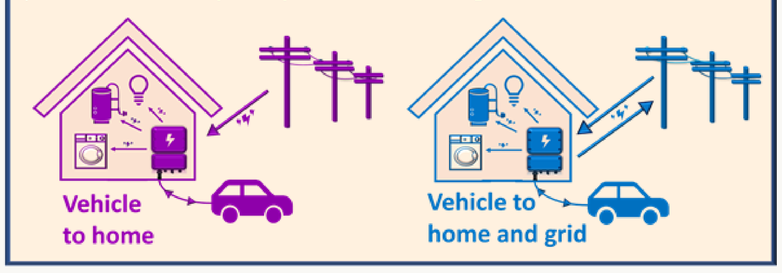
Smart charging

Set the charging schedule during the hours when it is least expensive either **yourself using your smart phone,** or by giving control of the charger to your **energy retailer** or a **smart home management system.**



Two-way charging

Use the car's battery to **power the appliances in your home**. Additionally, you can sell **electricity from your car back to the grid**.



Analysis

- **Future energy bill savings** discounted using the **capital recovery approach** from Hausman (1979) and Min et al. (2014).
- Jointly estimate the **utility gained from adapting each charging feature** and the **implicit discount rate** applied to charger prices and future rewards given as energy-bill savings.

Hausman, J.A., 1979. Individual discount rates and the purchase and utilization of energy-using durables. *The bell journal of economics*, pp.33-54.

Min, J., Azevedo, I.L., Michalek, J. and de Bruin, W.B., 2014. Labeling energy cost on light bulbs lowers implicit discount rates. *Ecological Economics*, *97*, pp.42-50.

Results

Discount rate gap { **28.5%** (P<0.01)

Flexibility discount rate considering driver preferences for price and electric bill savings over time

≤ 7%

Market discount rate

Feature utilities

Peak electricity-use management
β= 0.197 (P<0.01)

Solar charging
β= 0.426 (P<0.01)

Vehicle to home and grid
β= 0.145 (P<0.10)

Other feature coefficients statistically insignificant

Characteristics that correlate with feature preferences

- Youth
- Higher education
- Trust in energy retailer
- Expectations of higher future prices
- Lower daily average driving distance

More information?

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