LESSONS LEARNED

In the BEV trial, ignore days used:

- The viability makes 2-car HHS an important near-term BEV market.
- A cheaper small battery is enough.

2. Is the PHEV a challenge to the BEV?

In 2-car HHS, the PHEV TCO gain is halved compared to a BEV. If optimally used then a BEV has lower TCO in most HHS, Fig. 3. The electric driving is about the same, though, Fig. 4. But there are also other factors favoring a PHEV or BEV, such as no range limitations in a PHEV, work place charging or fast charging along major roads.

Lessons learned: The competition between PHEV and BEV is not yet settled.
- For e-kms driven, PHEVs or BEVs are about equally good.

3. What do commonly used range indicators tell us?

Days requiring adaptation (DRA) is often used as an indicator of the inconvenience of the BEV range. Another option is the number of unfulfilled trips (UFT). These two capture and ignore various situations differently, but roughly give the same average result. They apply to a single car’s driving only and ignore the flexibility in multi-car HHs, see Fig. 5.

Lessons learned: DRA and UFT have different pros and cons but give similar results.
- They are both not appropriate for multi-car households.

4. Do households currently utilize the BEV flexibility?

In the BEV trial, compared to the replaced car, some HHS increased the BEV use, while some decreased it, Fig. 6. In interviews people claimed to increase the BEV use out of economical, environmental, and driving comfort concerns, and to limit it due to, for example, range anxiety, size and towing needs, and company car availability.

Lessons learned: There is a need for HHS to learn to utilize the flexibility. But also:
- Hindrances exist for the full use of the flexibility given by the driving.

Data and Methods

We use 1-3 months of simultaneous GPS logs of both conventional cars in 64 commuting 2-car HHS. These were randomly drawn from the car registry in the Gothenburg region in Sweden.

We model for different battery ranges the possible driving of a PHEV/BEV in each HH for different car usage “strategies”: a PHEV/BEV substitutes a single car only, 1st (“Car1”) or 2nd (“Car2”) car, or both as much as possible (“Both”), see Fig. 5. We assume home charging only (3 kW).

Economic optimization of costs, Table 1 (for propulsion energy, battery, and unfulfilled driving (BEV only)) gives an optimal battery range. Addition of mass production costs as of year 2020 (based on ANL 2016) gives TCO comparisons between PHEV, BEV and a conventional car.

During a BEV trial period of 3.5 months 25 of the earlier logged 64 households had a BEV replacing one of their conventional cars. Both cars were logged again. Interviews with HH members were performed before and after the trial period.

References


