

THE IMPACT OF SECOND LIFE APPLICATIONS OF ELECTRIC VEHICLE BATTERIES ON CUSTOMER'S MOBILITY COST

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Introduction

Due to competitiveness reasons basic economics suggest that cost of electric mobility (e-mobility) have to be in the range of conventional cars. Therefore, this paper analyses to which extent, benefits of second life applications of electric vehicle (EV) batteries could influence future cost of e-mobility for customers. The EV brands "Nissan Leaf", "Mitsubishi i-MiEV" and "CODA Sedan" are considered taking into account achievable Buy Out Prices triggered by battery second life utilisation for "Residential Load Following" and "Electric Energy Time-shifts".

Methodology

As mentioned in the introduction cost and benefits of second life applications of EV batteries and possible cost reduction impacts for e-mobility at customer level are calculated. Therefore, Figure 3 provides an overview of performed calculation steps. Starting from both, calculation of overall achievable battery second life application benefits and battery assembling cost, possible battery Buy Out Prices will be derived. Subsequently, e-mobility cost calculations are performed taking into account detailed data on possible battery second life benefits (compare [1] to [4]) as well as electric vehicle prices (see [5] to [8]).

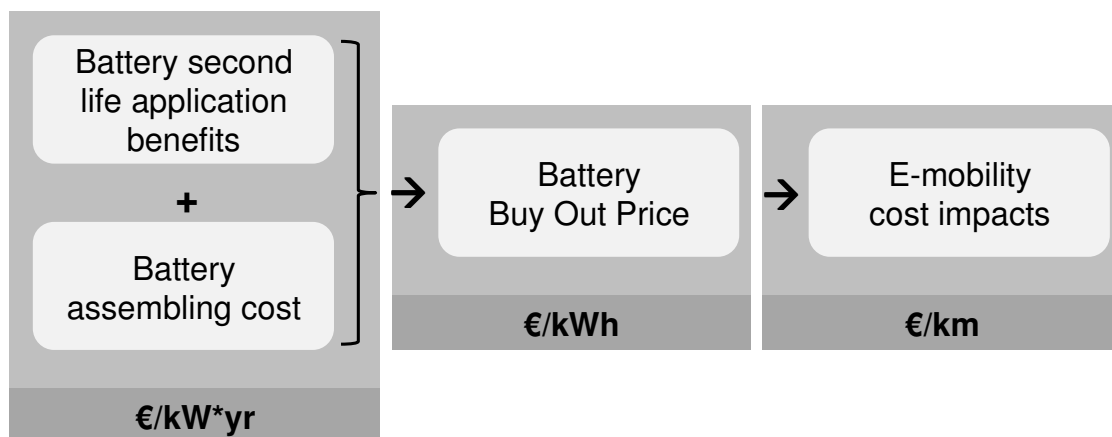


Figure 1 Overview of chosen steps to derive E-mobility cost impacts of battery second life applications

Results

It turns out that there are significant e-mobility cost reduction possibilities leading to more competitiveness of EVs compared to conventional cars, if technological feasibility of implemented battery second life applications is given. Furthermore, results show that it has to be considered that achievable battery Buy Out Prices could partly reduce the necessity of incentive mechanisms such as e.g. Federal Tax Credits. On the contrary, the case study of the CODA Sedan shows that e-mobility cost only can be equal to a comparable conventional car if yearly driven distances are beyond 50,000 km (which might be quite rarely the case for an EV) and both support mechanisms – a granted Tax Credit and in addition a Buy Out Price - are applied.

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References

- [1] J. Neubauer, A. Pesaran: "PHEV/EV Li-Ion Battery Second-Use Project"; Conference paper presented at the Advanced Automotive Batteries Conference (AABC); National Renewable Energy Laboratory; NREL/CP-540-48042; Orlando, 2010
- [2] Market Feasibility for Nickel Metal Hydride and Other Advanced Electric Vehicle Batteries in Selected Stationary Applications, EPRI, Palo Alto, CA, and SMUD, Sacramento, CA: 2000
- [3] Technical and Economic Feasibility of Applying Used EV Batteries in Stationary Applications, Sandia National Laboratories, Albuquerque, NM: 2002
- [4] J. Eyer, G. Corey: "Energy Storage for the Electricity Grid: Benefits and Market Potential Assessment Guide - A Study for the DOE Energy Storage Systems Program", SANDIA Report: SAND2010-0815, Sandia National Laboratory, Albuquerque, NM: 2010
- [5] A. Ohnsman and M. Kitamura: "Nissan Says Cheaper U.S. Leaf Price Due to Tax, Incentive Gaps"; 20.05.2010, <http://www.businessweek.com/news/2010-05-20/nissan-says-cheaper-u-s-leaf-price-due-to-tax-incentive-gaps.html>; last visited on 11.11.2010; 4:24pm
- [6] C. Blanco: "Mitsubishi again discusses lower i-MiEV price target of \$22,000 by 2012"; 19.06.2010, <http://green.autoblog.com/2010/06/19/mitsubishi-again-discusses-lower-i-miev-price-target-of-22-000/>, last visited on 11.11.2010; 4:40pm
- [7] Mitsubishi i MiEV: "Technical parameters"; <http://www.emission-zero.de/mitsubishi.php?ref=http%3A%2F%2Fwww.google.at%2Fsearch%3Fq%3Dimiev%2Bkwh%26ie%3Dutf-8%26oe%3Dutf-8%26aq%3Dt%26rls%3Dorg.mozilla%3Ade%3Aofficial%26client%3Dfirefox-a&scr=1400x1050>; last visited on 11.11.2010; 4:44pm
- [8] K. Fehrenbach: "Coda Unveils Electric Car Pricing at \$45K, Above Volt & LEAF", 21.09.2010; <http://gigaom.com/cleantech/coda-unveils-electric-car-pricing-at-45k-above-volt-leaf/>; last visited on 11.11.2010; 4:50pm