Large scale electric mobility and its challenges in Germany

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Verpennt und verpestet

Das Stuttgarter Urteil für Fahrverbote kommt genau richtig: Politik und Industrie in Deutschland müssen endlich begreifen, dass die Zeit für Verbrennungsmotoren abläuft.

Klimabilanz 2016: Verkehr und kühle Witterung lassen Emissionen steigen


Streit um Elektromobil: Deutschlands naiver Glaube an den Autogott

Ökobilanz: Der große Schwindel mit den Elektroautos

Source: Spiegel online; Zeit online; Umweltbundesamt
Germanys goals for the transport sector

40% greenhouse gas reductions in the transport sector until 2030

Complete decarbonisation until 2050

...we have a long way to go!

Source: TREMOD (ifeu, 2014); Klimaschutzplan 2050 (BMUB)
Decarbonisation of the transport sector

Electric mobility in Germany

- Backcasting scenarios for the project RENEWIBILITY III show possible pathways until 2050
- Complete decarbonisation of the transport sector
  - Renewable electricity, synthetic fuels (imported and from renewable electricity) and 5% sustainable biofuels
  - Improved vehicle technologies
  - Reduced transport demand
  - Modal shift

Source: RENEWIBILITY III (Öko-Institut, DLR, ifeu and INFRAS 2016)
Energy usage in the scenarios in 2050

Impact of PtX on the electricity demand is significant

Efficiency of PtL: 35-45% (depending on CO2 supply)

Source: RENEWABILITY III; Kasten 2017
Material usage of an electric car

- Different car materialization due to technology changes
- Increasing demand for special materials needed for electric mobility
  → Impacts on emissions from material use and resource demand
Greenhouse gas emissions from cars

Global warming potential

Battery manufacturing: 140 kg CO2-Eq./ kWh

Electricity: German grid mix

Scenario results

Greenhouse gas emissions from transport

Car registrations 2010: 2,9 mio. (conventional cars)

Car registrations 2050: 2,0 mio.

Source: RENEWIBILITY III
Scenario results

Material demand for vehicle manufacturing

Significant increase in lithium, nickel and rare earths
Summary

Direct use of electricity in transport is favorable

- Shift from direct emissions to pre-chains
  - Electric cars need different materials and have higher impacts from car manufacturing than conventional cars
  - Using renewable energy these emissions are more than outweighed by the use phase

- Increasing demand for critical materials like lithium, nickel or rare earth may lead to supply problems especially if other countries have a similar development
  - High uncertainty in resource availability and impacts of future resource extraction
  - Open question: Material demand for PtX supply