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Prospects for electric vehicles and their potential to mitigate GHG emissions

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Key Note presentation at International Conference: Transport, Climate Change and Clean Air

Paris Declaration on Electro-Mobility and Climate Change & Call to Action

- ⊗ 20% of all road vehicles (cars, 2 and 3 –wheelers, trucks, buses and others) are to electrically powered by 2030
- ⊗ For cars that means 100 million EVs on the road in 2030.
- ⊗ According to IEA that corresponds to 35 % of global sales in 2030.

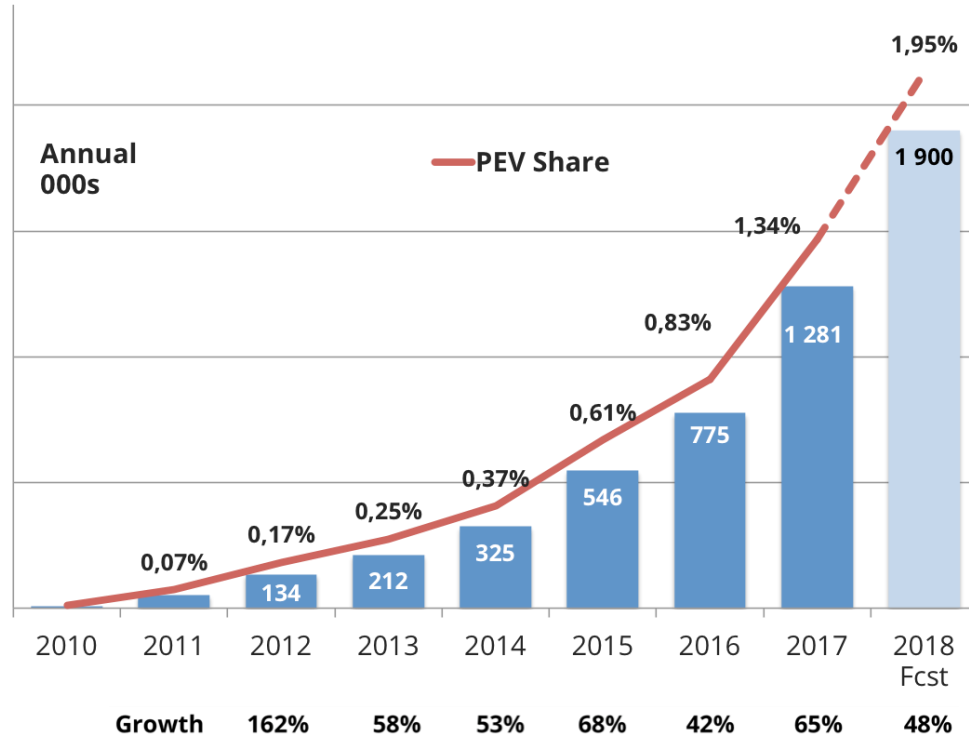


Basically that means
that the world needs to
become like Norway

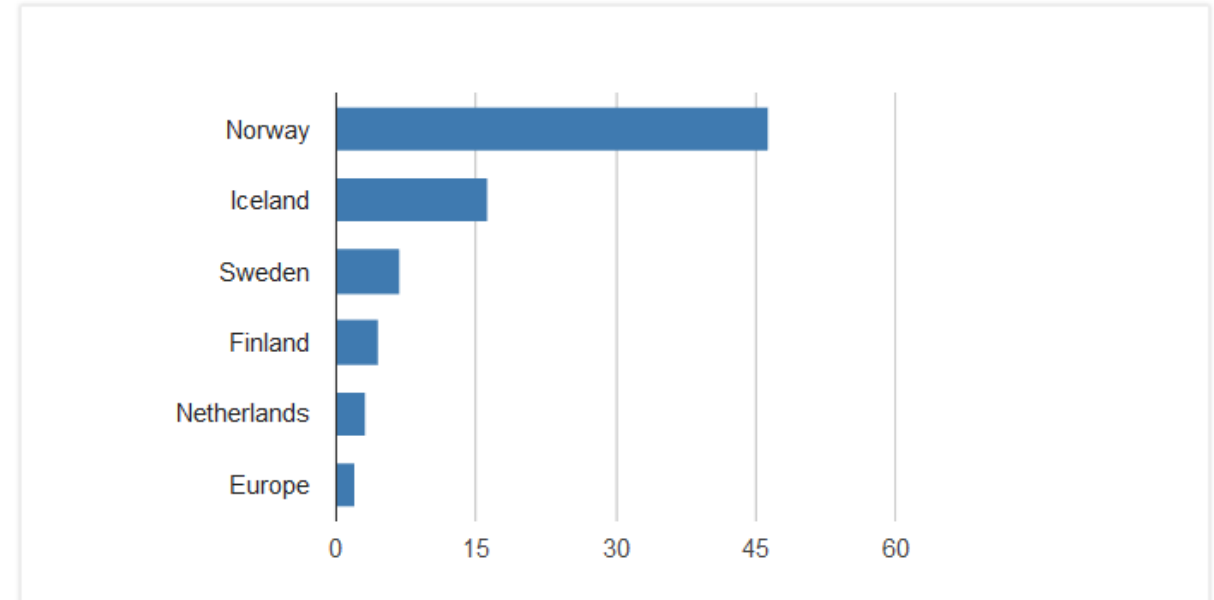
EV sales where are we now?

Global Plug-in Vehicle Sales & Share

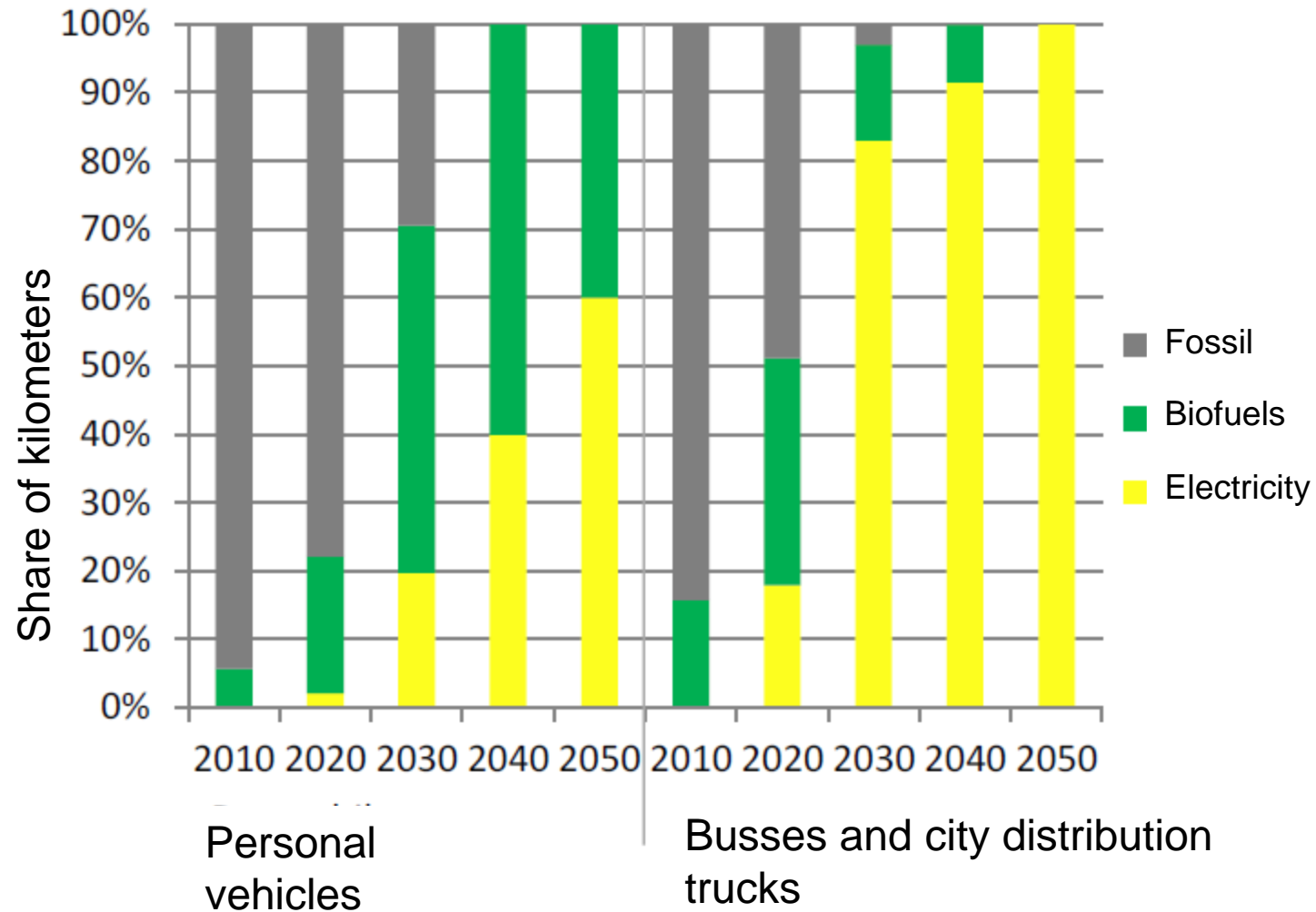
EV VOLUMES.COM



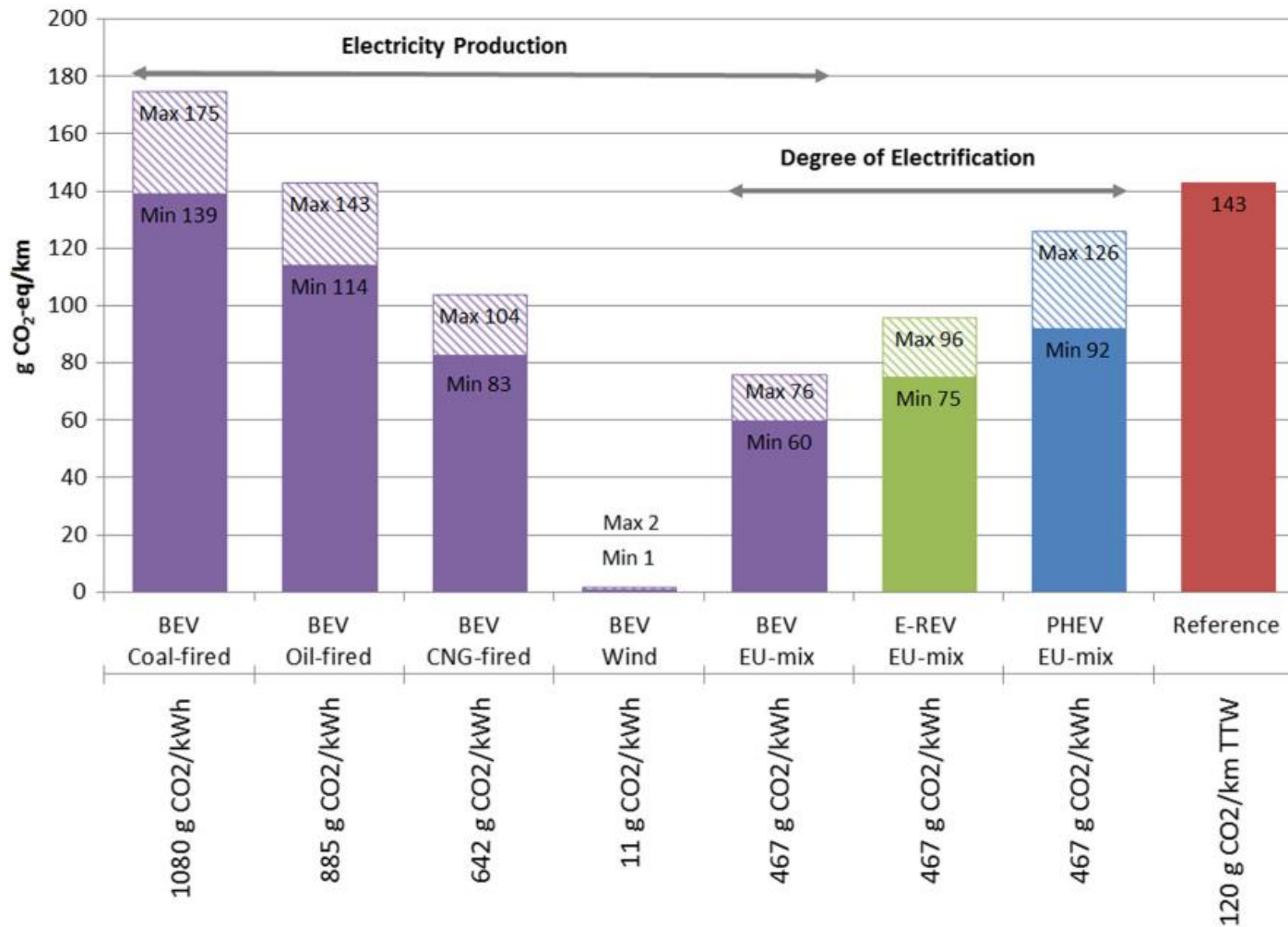
EV market share in 2018 YTD



Scenarios: the example from Sweden

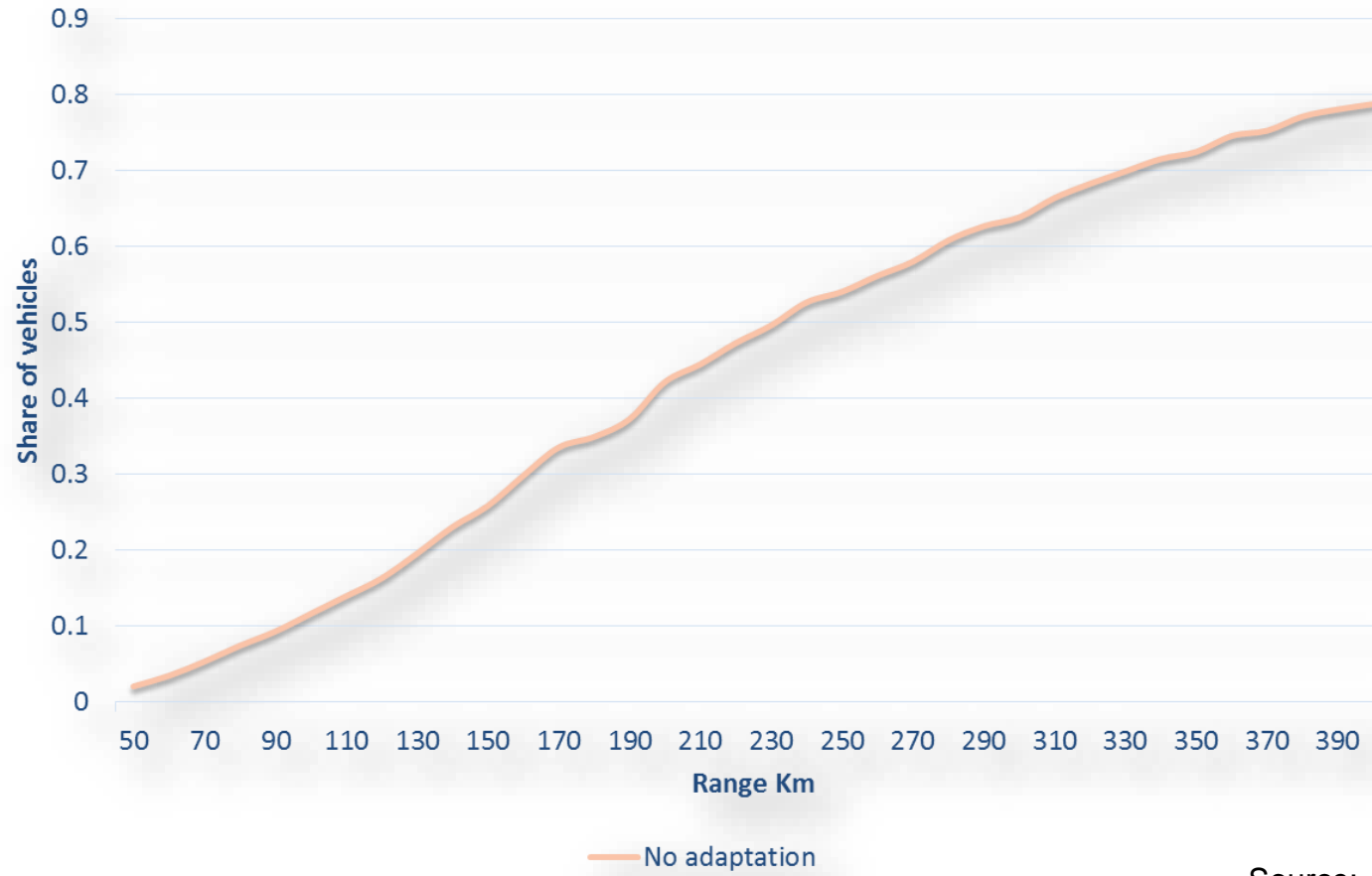


Impact depends on electricity source



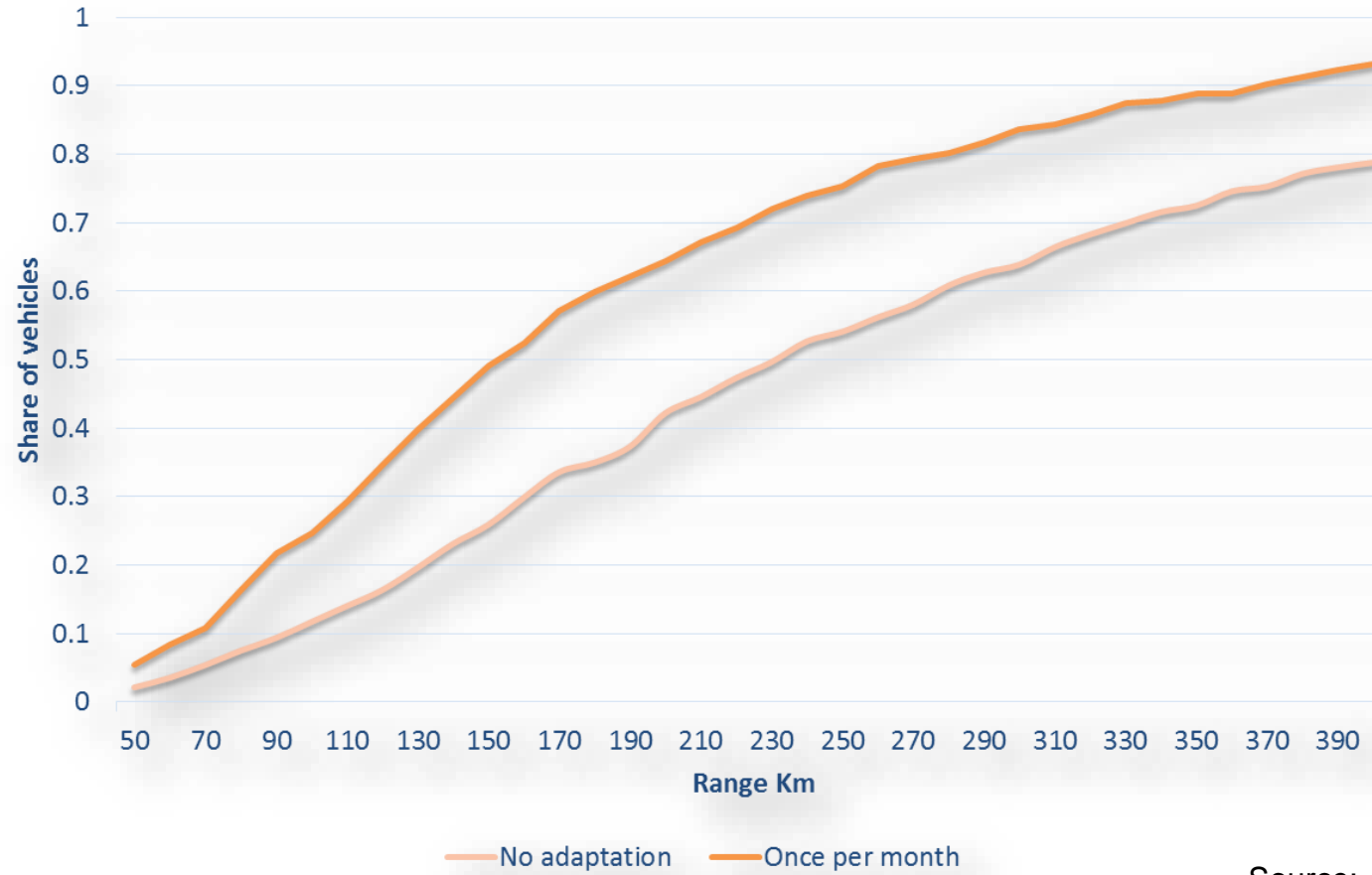
Source: Nordelöf et al, 2014

Share of vehicles that can cover all their driving on a given range



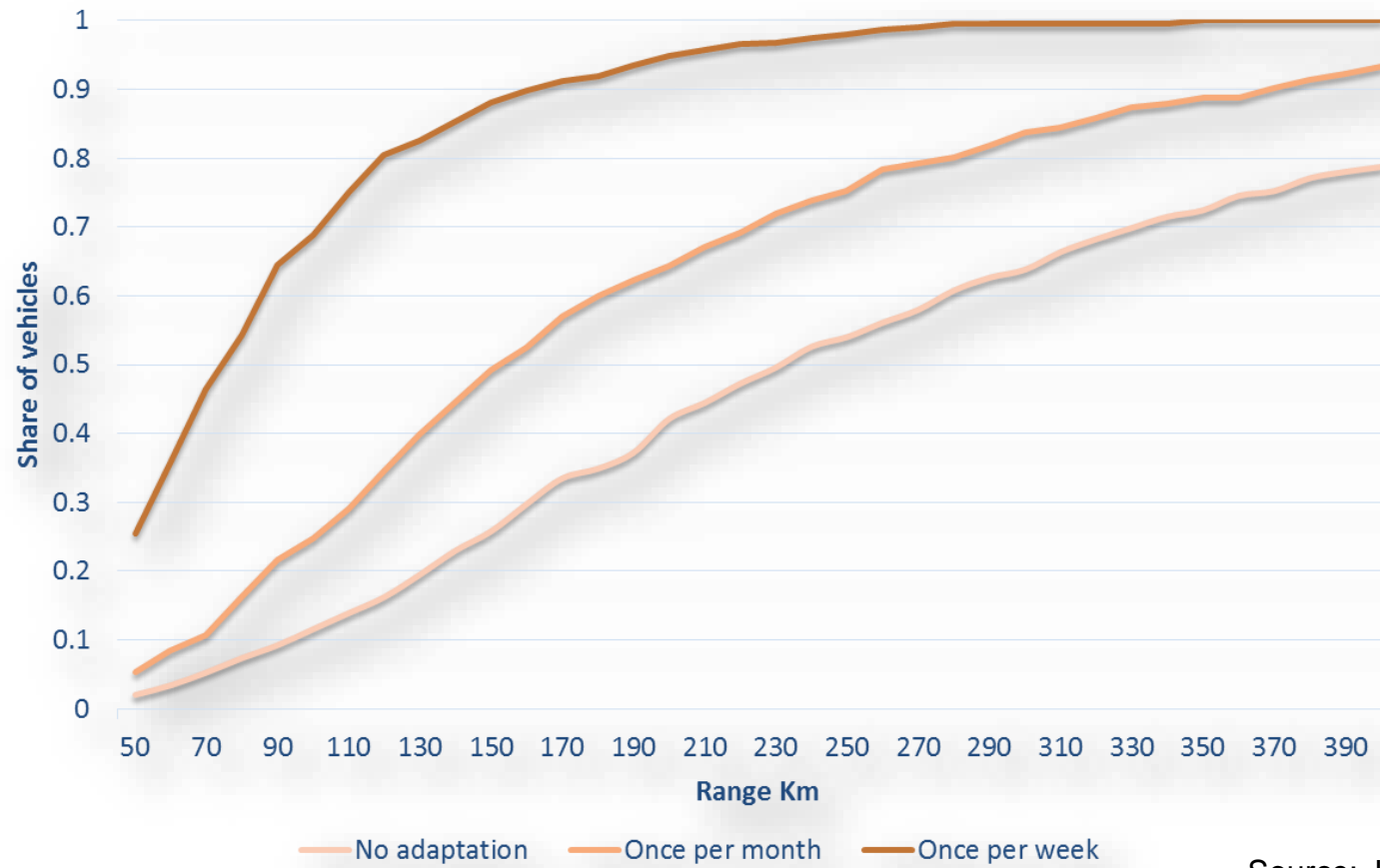
Source: Jacobsson et al, 2016

Share of vehicles that can cover all their driving on a given range – with adaptation once per month



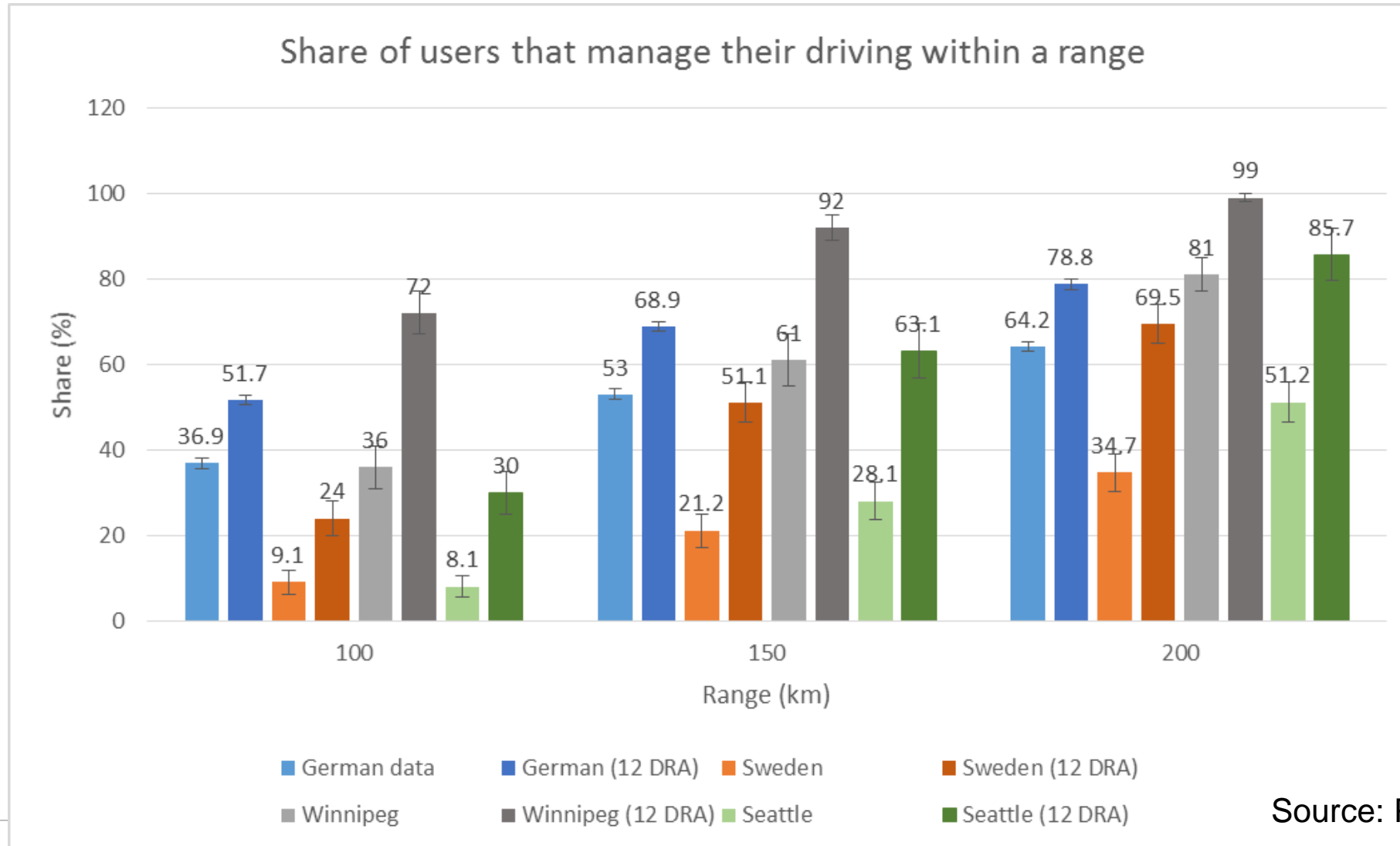
Source: Jacobsson et al, 2016

Share of vehicles that can cover all their driving on a given range – with adaptation once per week



Source: Jacobsson et al, 2016

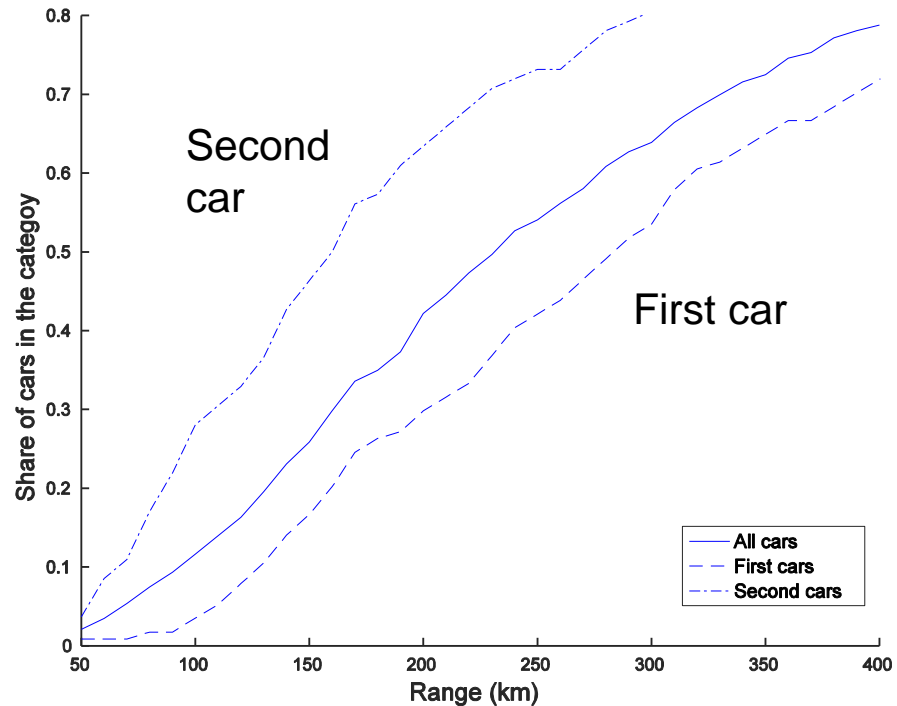
Comparing 4 different data sets (no adaptation and once a month)



Source: Plötz et al, 2017

BEVs in Two-Car Households

Share of cars that fulfill all driving



Fulfill all driving at range

120 km:

First cars < 10%

All Cars ≈ 15%

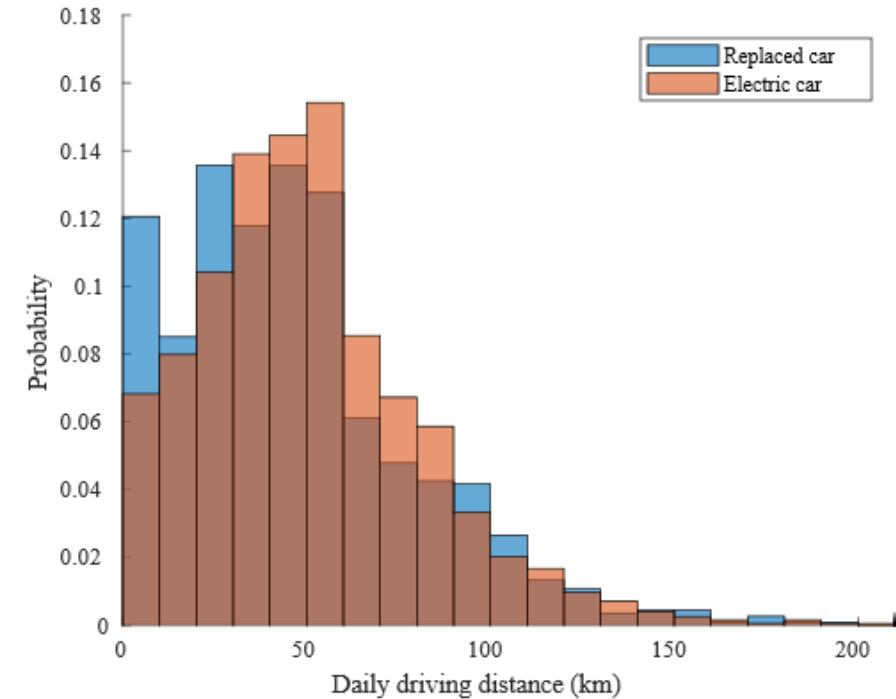
Second cars ≈ 30%

How are battery electric vehicles used in 2-car households?

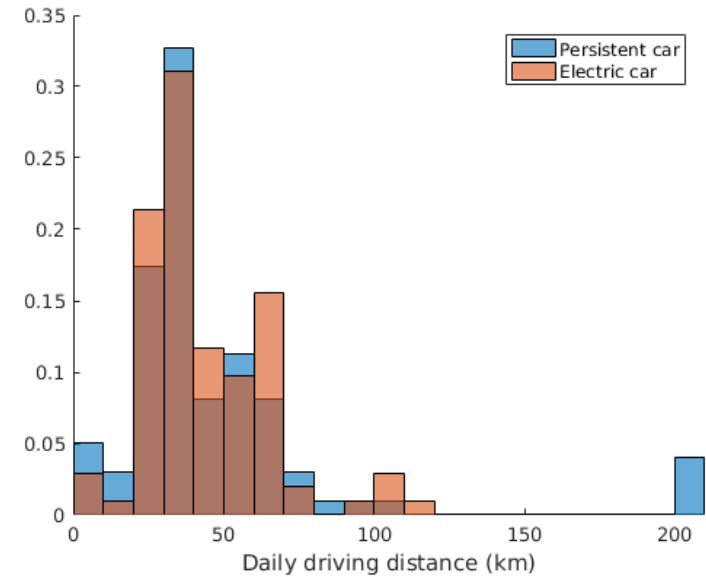
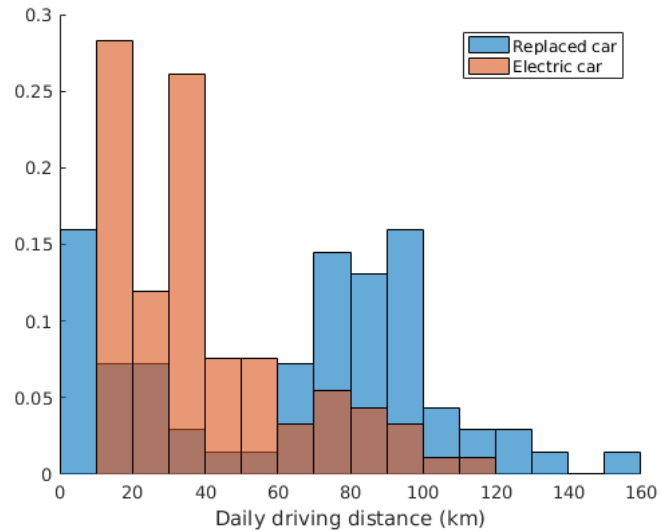
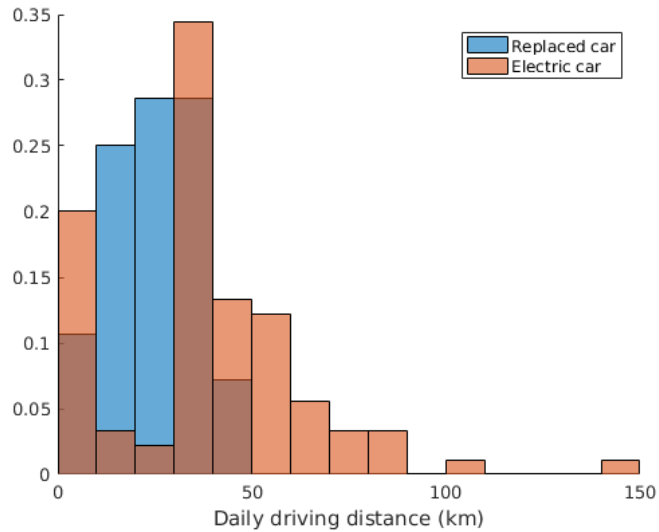
On average (20 households):

- Long daily driving distances are reduced.
- Short daily driving distances are reduced.
- Distances congregate at 40-90 km.

Distribution of daily driving distances



Large differences between households – interviews help explain why



How does range and charging power affect charging need? Germany

Power	50 kW		
Range [km]	100	200	300
Time (min)	14.09	22.8	27.0
fast charging stations/1,000BEV (VRI)	6.8	5.3	3.7

Based on German driving data, queing model, max 5 min waiting

Source: Gnann et al, 2018

How does range and charging power affect charging need? Germany

Power	50 kW			100 kW		
Range [km]	100	200	300	100	200	300
Time (min)	14.09	22.8	27.0	7.0	11.4	13.5
fast charging stations/1,000BEV (VRI)	6.8	5.3	3.7	2.4	1.8	1.2

Based on German driving data, queing model, max 5 min waiting

Source: Gnann et al, 2018

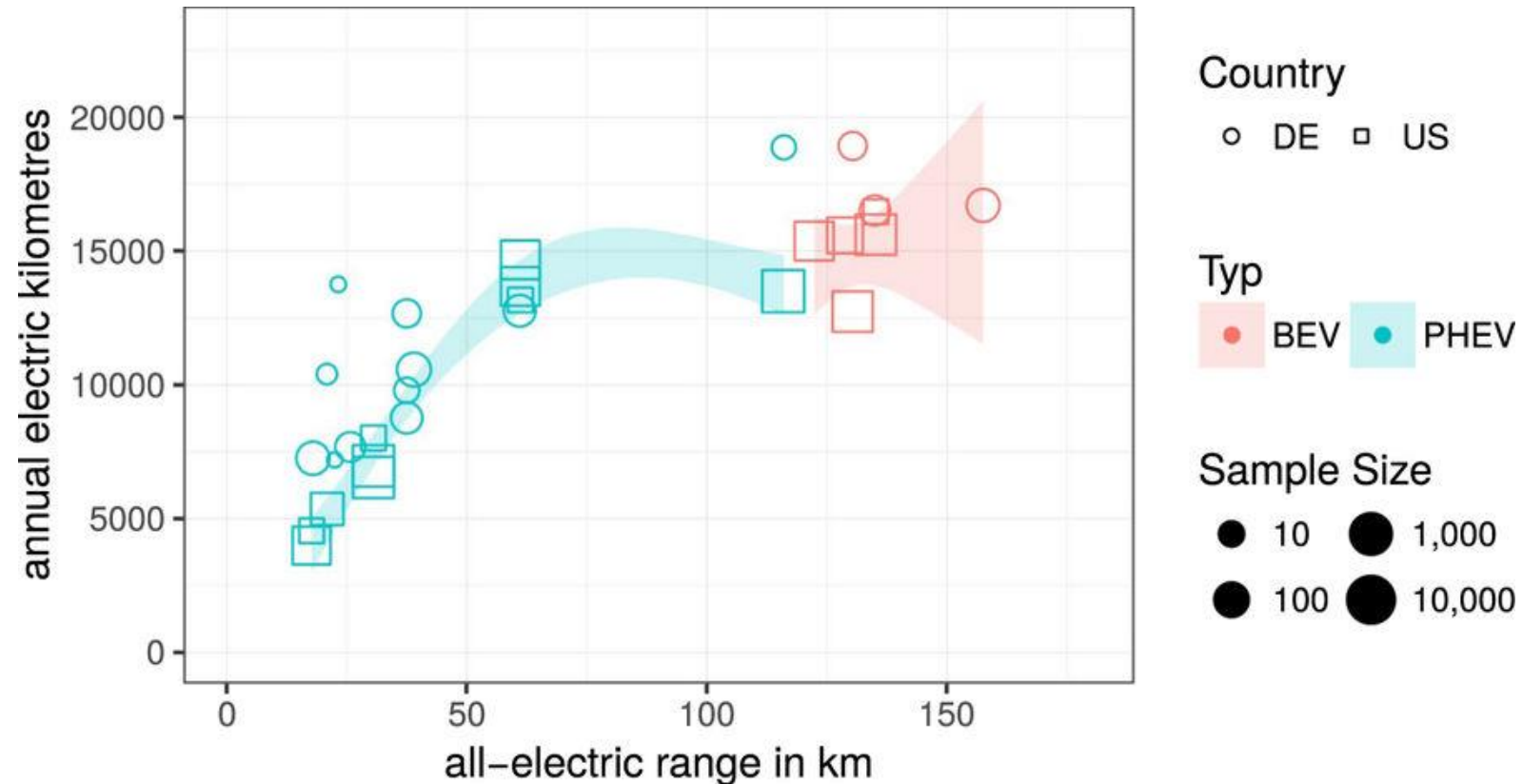
How does range and charging power affect charging need? Germany

Power	50 kW			100 kW			150 kW		
Range [km]	100	200	300	100	200	300	100	200	300
Time (min)	14.09	22.8	27.0	7.0	11.4	13.5	4.7	7.6	9.0
fast charging stations/1,000BEV (VRI)	6.8	5.3	3.7	2.4	1.8	1.2	1.4	1.0	0.7

Based on German driving data, queing model, max 5 min waiting

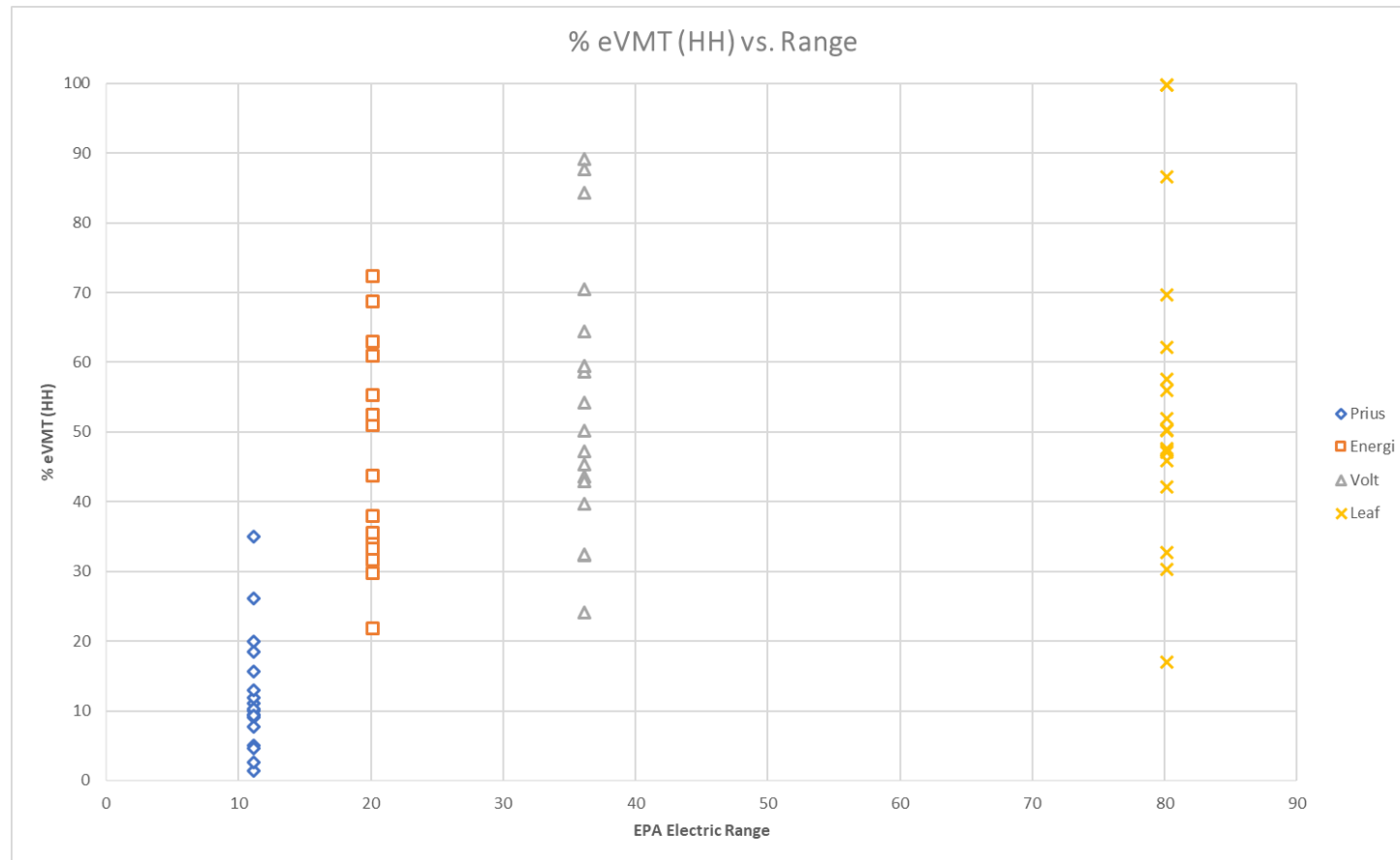
Source: Gnann et al, 2018

Long ranged PHEV can achieve similar electric VKT as shorter range BEV



Source: Plötz et al (2017)

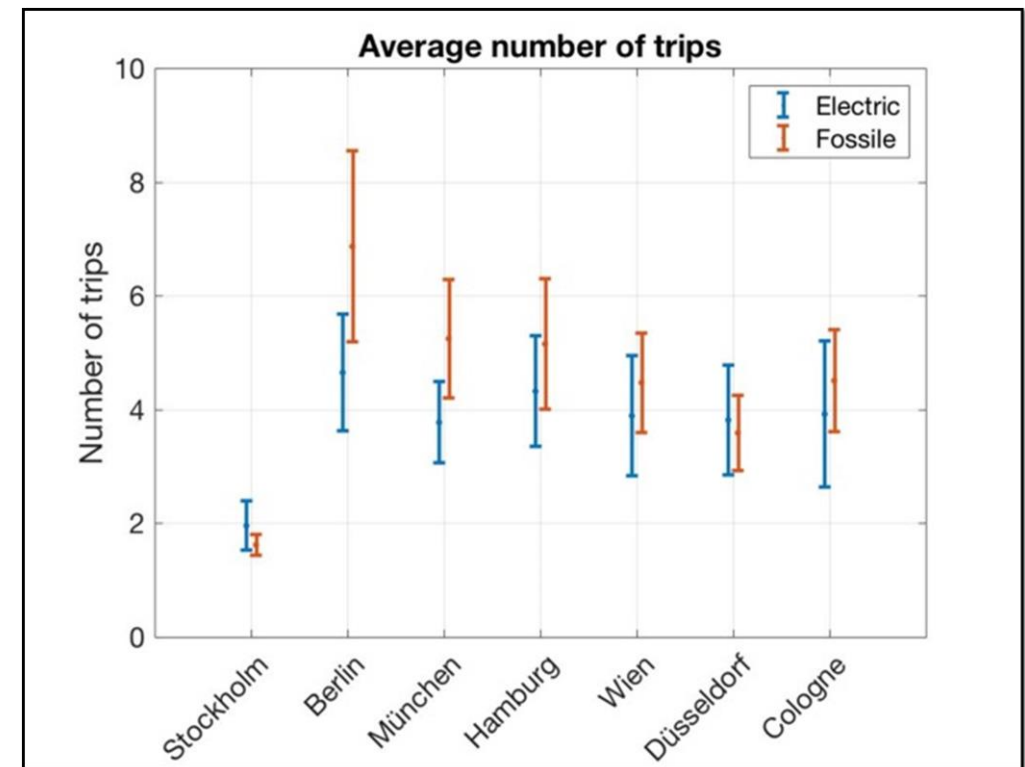
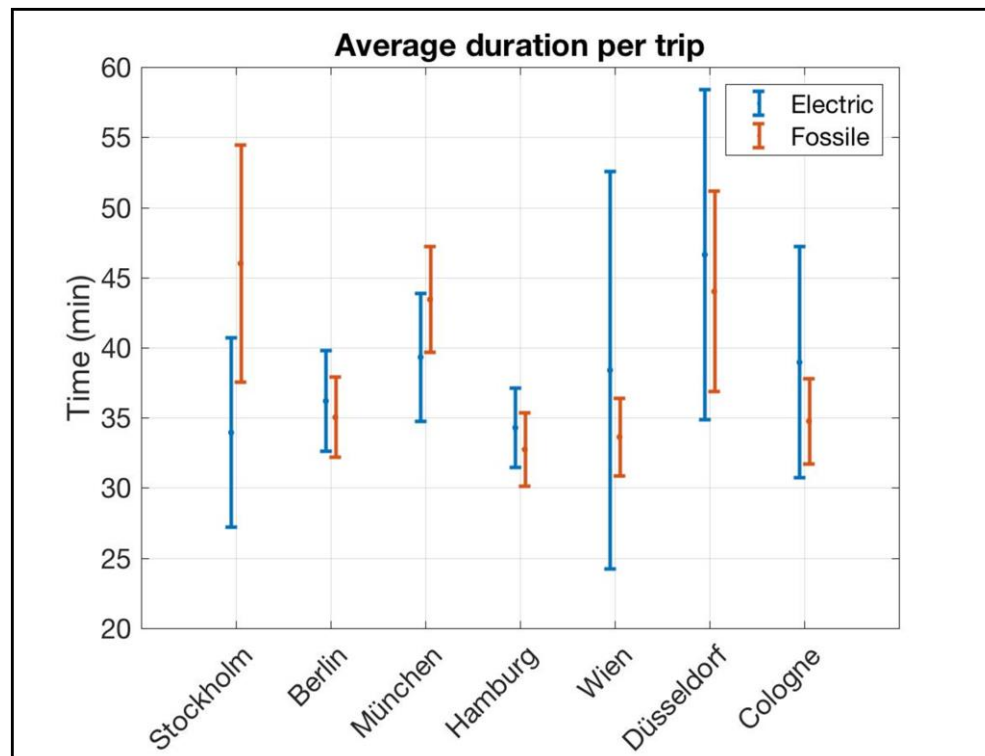
Share of eVMT in 2+ car households in California



- Based on 74 households with 2+ cars with a PEV
- Similar shares between longer range PHEV (Volt) and Leaf

Data source: UC Davis

Comparison between EV and ICE in free-floating car sharing cars

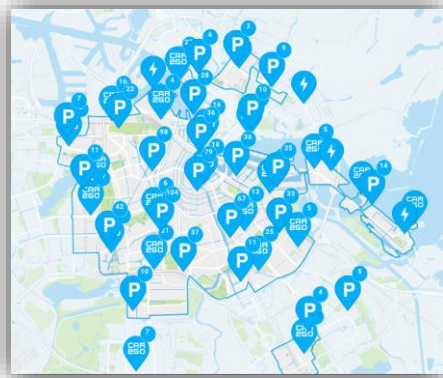


Source:
Sprei et al,
2017

Charging of electric free-floating car sharing

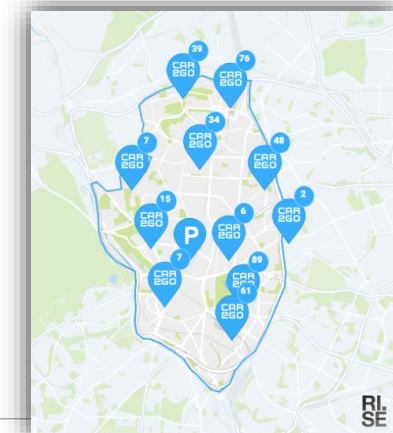
Amsterdam

- ⚙ **Operators:** Car2Go
- ⚙ **Start:** November 2011
- ⚙ **Number of cars:** 330
- ⚙ **Car types:** Only EV
- ⚙ **Average utilization rate:** 8%



Madrid

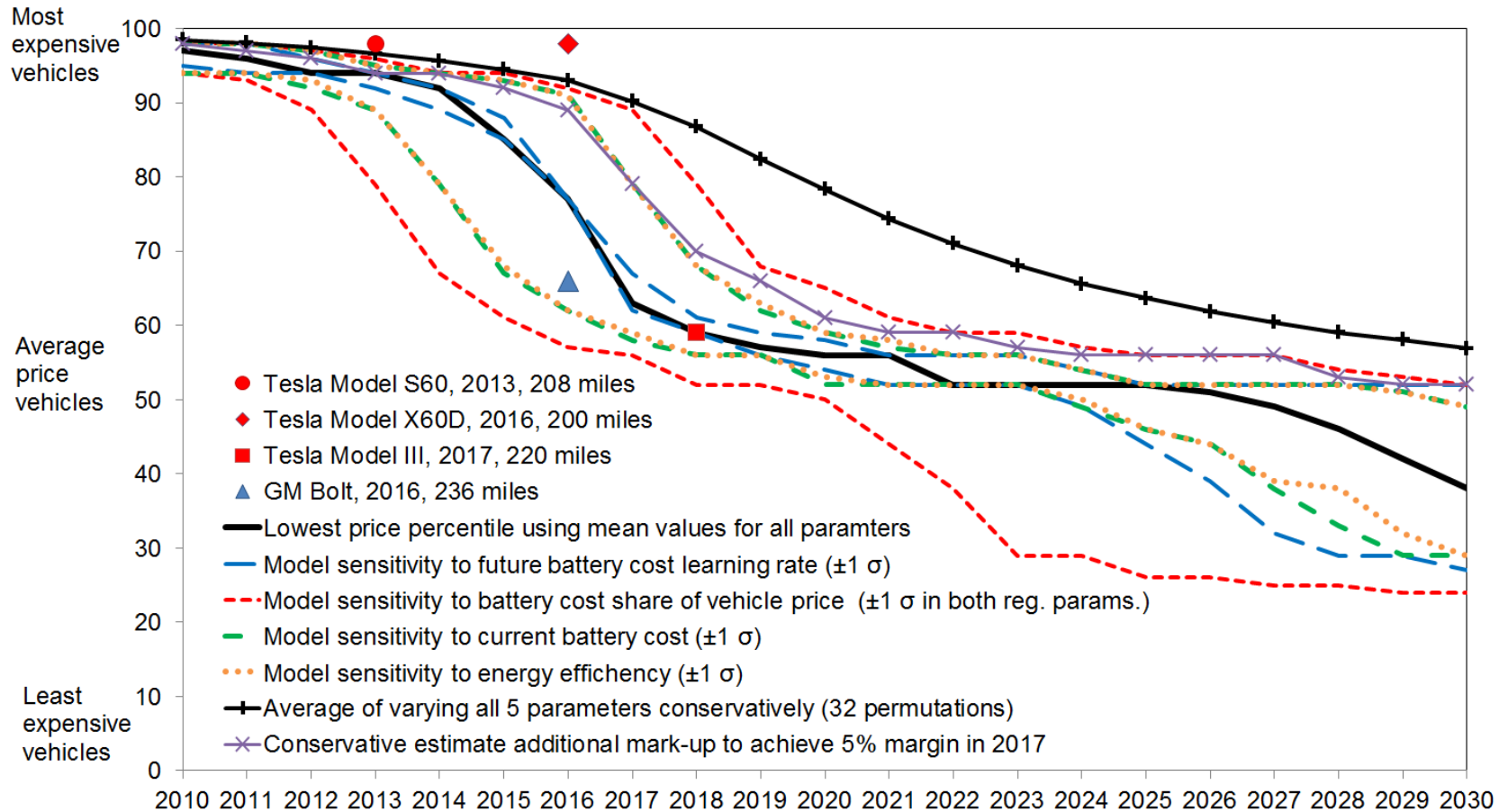
- ⚙ **Operators:** Car2Go, EMOV
- ⚙ **Start:** November 2015
- ⚙ **Number of cars:** 500
- ⚙ **Car types:** Only EV
- ⚙ **Average utilization rate:** 17% (excl. charging trips)



Source:
Sprei et al,
2017

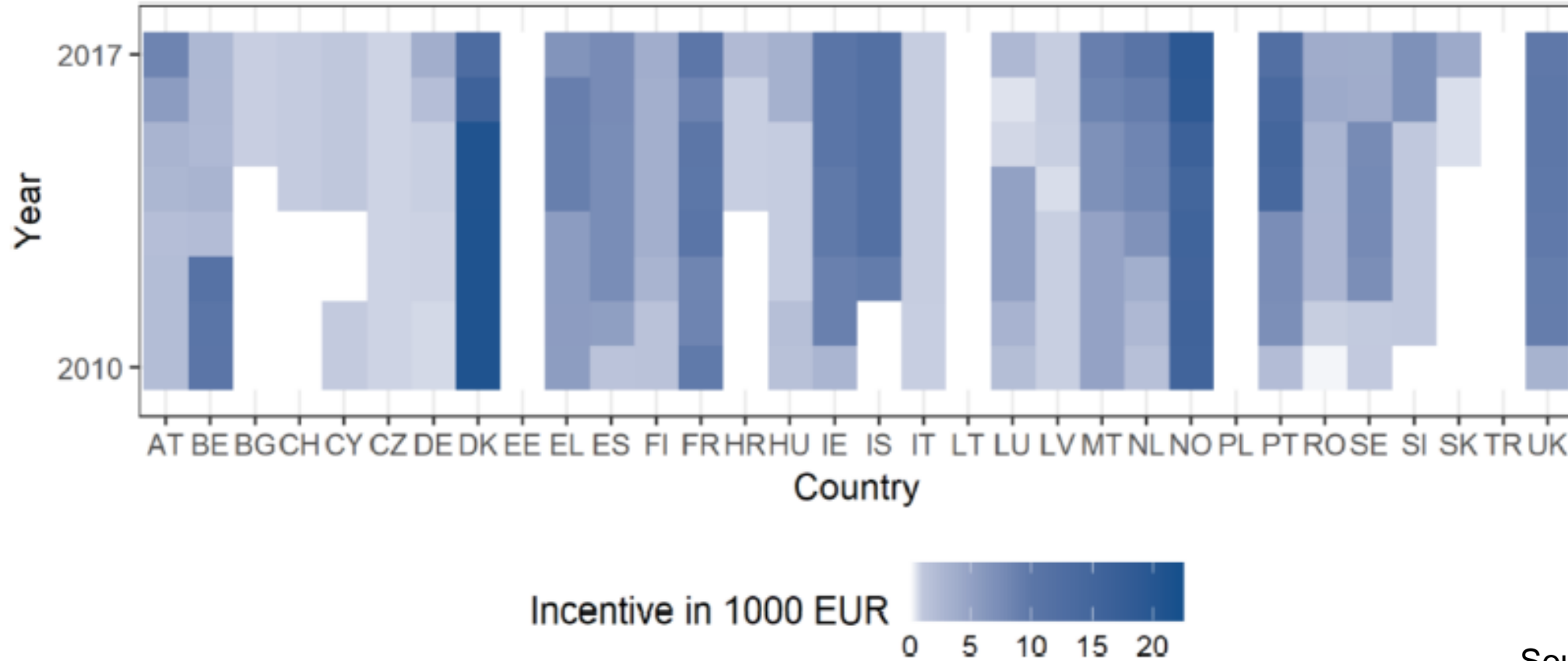
When will cost for a 200 mile range come down to average prices?

Lowest price percentile in which a 200 mile range BEV can be produced



Source: Nykvist et al, under review

Incentives In European countries



Source: Münzel, 2018

Summing up

- ⊗ Electrification of the transport sector is a key strategy to mitigate GHG emissions
- ⊗ Driving patterns are important and it's important to understand different user cases
- ⊗ PHEV will also play an important role
- ⊗ Electrification and shared mobility are a feasible combination
- ⊗ Prices are coming down but incentives and other support schemes are still needed

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Extra slides

