European Automobile Manufacturers Association

WLTP-06-08e

Analysis of WLTP Utility Factor Distributions

ACEA EV Group
IG WLTP Meeting, Vienna
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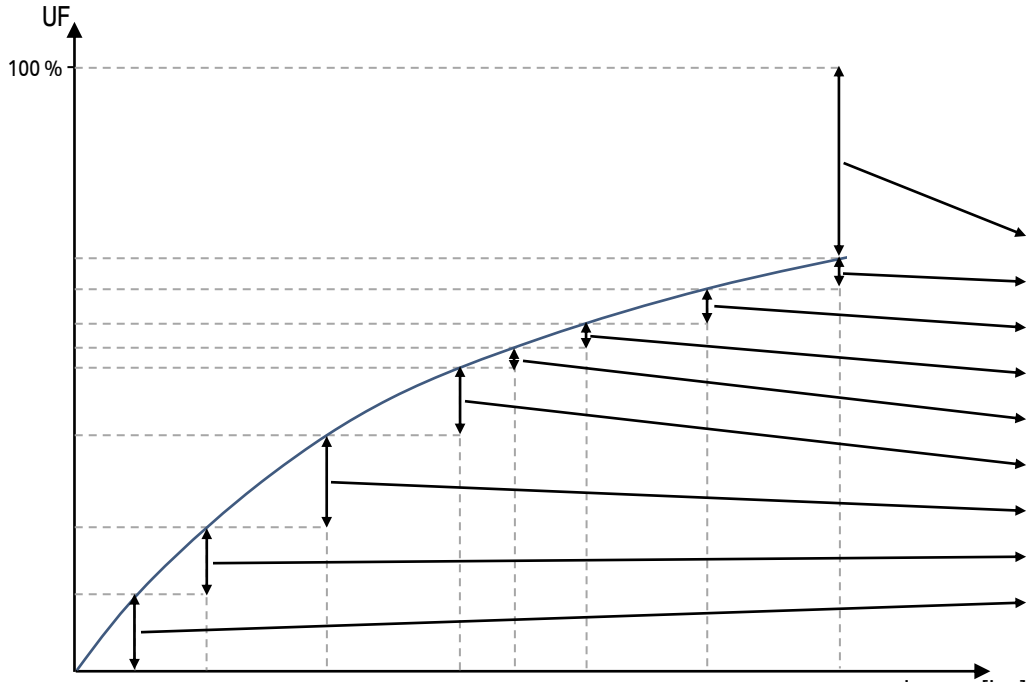
Basics and usage of the Utility Factor in WLTP according to GTR 1A.



distance[km]	3.1	4.8	7.2	8.2	3.1	4.8	7.2	8.2
phase	1	2	3	4	1	2	3	4
WLTC	1				2			

phase	emission [g/km]	weight [%]	weighted emission [g/km]
CS	150	35	53
2-4	140	5	7
2-3	124	5	6
2-2	100	4	4
2-1	0	3	0
1-4	0	10	0
1-3	0	14	0
1-2	0	11	0
1-1	0	13	0

total:	70

A sequential UF weights the CO_2 of each CD-cycle phase with the CO_2 of the CS-cycle.

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Annex 8 -Appendix 5

Utility factor (UF) for OVC-HEVs

1. Utility Factor (UF) are ratios based on driver statistics and the ranges achieved in charge-depleting mode and charge-sustaining modes for OVC-HEVs and are used for weighting emissions, CO_2 emissions and fuel consumptions.

2. Each Contracting Party may develop its own UFs.

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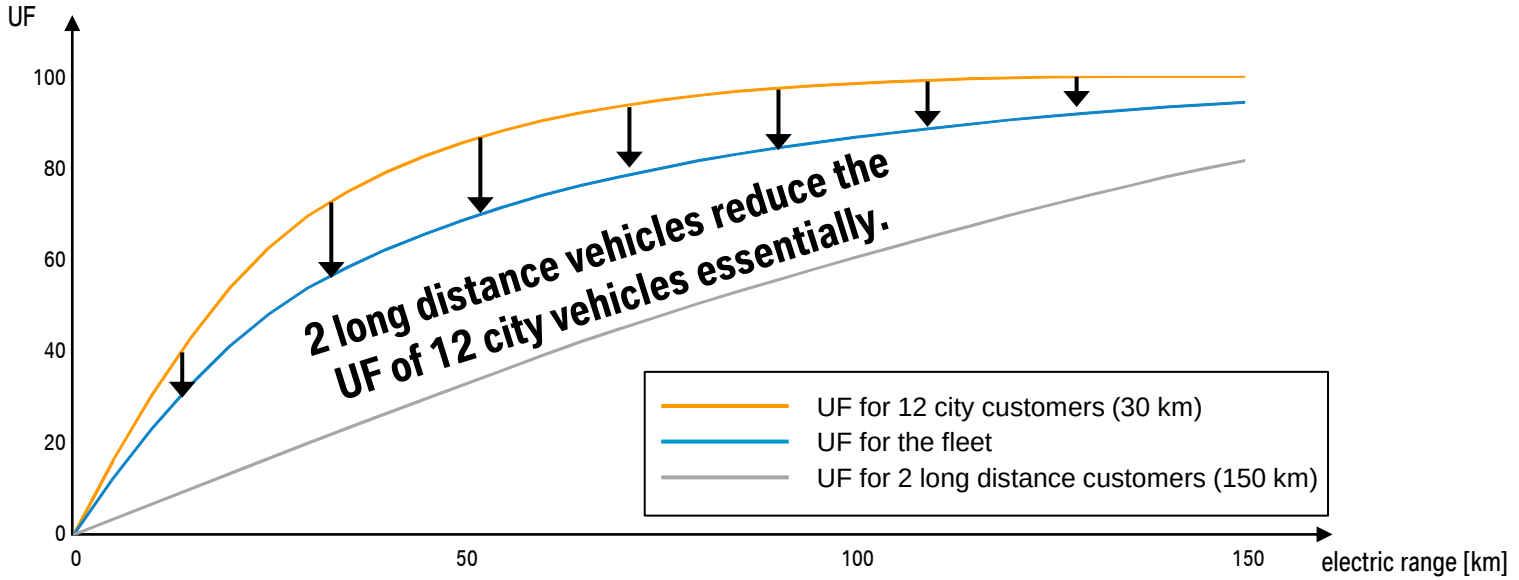
impact of long distance vehicles

2 customer with average daily traveled miles of 150 km

12 customers with average daily traveled miles of 30 km



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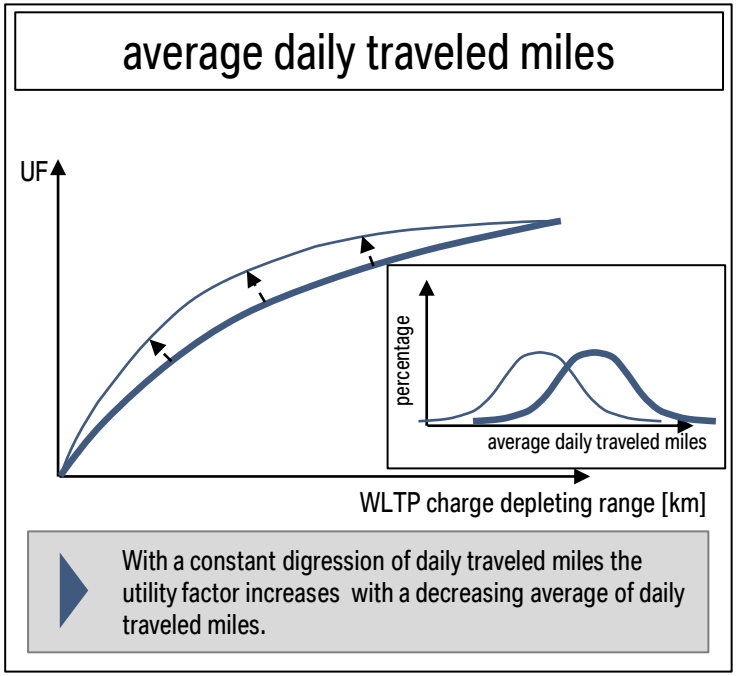
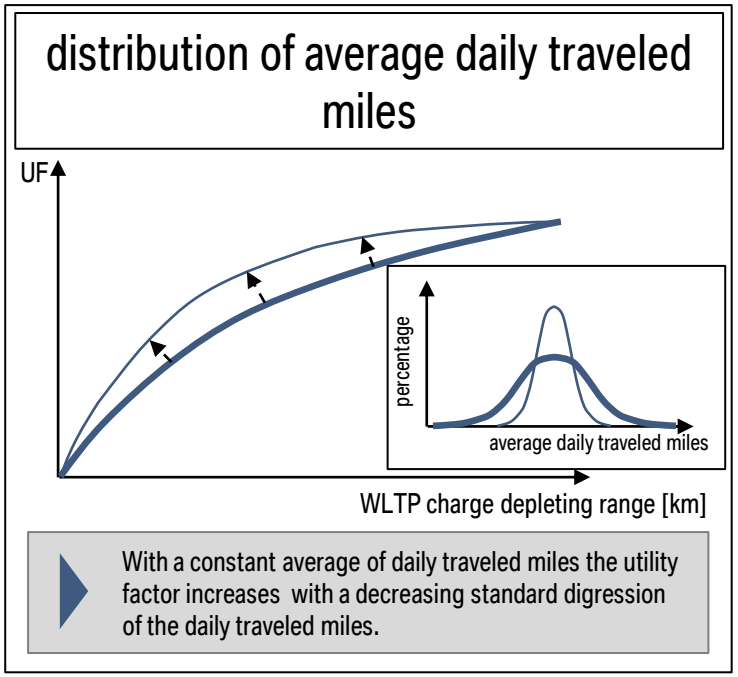
Main database influences on the utility factor





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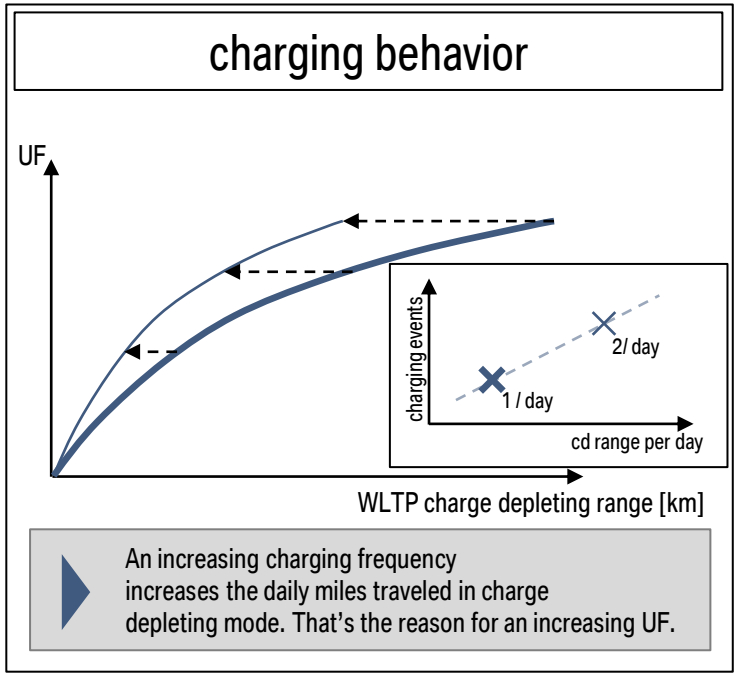
Main database influences on the utility factor



- Up to now it is not possible to validate the future OVC-HEV customers charging behavior. According to SAE J2841 the assumption of **one charging event per day** (overnight charge) is used for the following analysis.
- Chevrolet Volt data in the EV project currently show a charging frequency 1.4 in US.

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Available Databases for Europe

In addition to WLTP database (EU-only), the FIAT ECODRIVE database was analysed.

WLTP database

- 158 of 158 vehicles
- individual daily traveled miles: 58 km
- fleet daily traveled miles: 49 km
- milage: ~0,38 Mio. km
- driving days: 7811

→ exclude N1- class vehicles (not representative for OVH-HEV customers – to be confirmed by COM)
→ delete drives with implausible dates
→ recalculation of driving days

- 132 of 158 vehicles
- individual daily traveled miles: 46 km
- fleet daily traveled miles: 47 km
- milage: ~0,34 Mio. km
- driving days: 7343

FIAT ECODRIVE database

- 1275 of 1275 vehicles
- individual daily traveled miles: 40 km
- fleet daily traveled miles: 37 km
- milage: ~1,8 Mio. km
- driving days: 49043

→ delete drives with implausible dates
→ recalculation of driving days

- 1275 of 1275 vehicles
- individual daily traveled miles: 39 km
- fleet daily traveled miles: 36 km
- milage: ~1,8 Mio. km
- driving days: 49769

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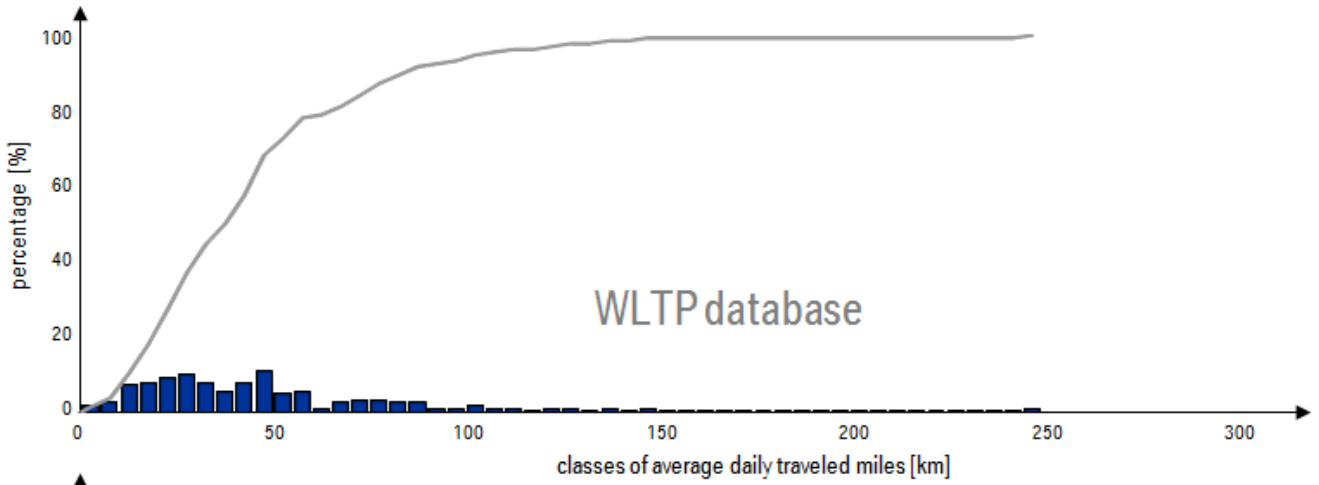
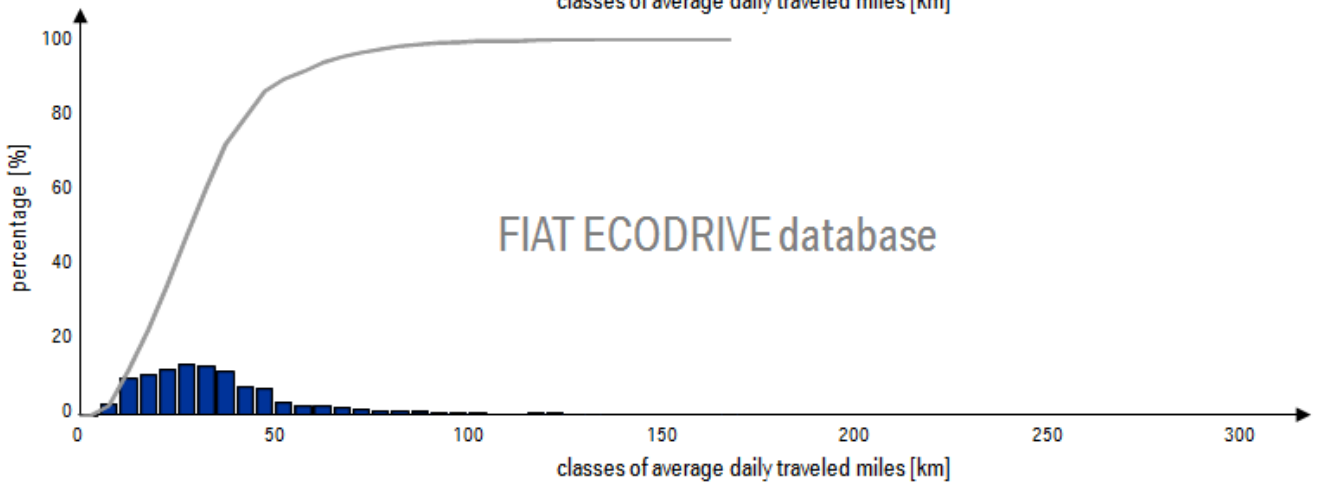
Distribution of daily traveled miles (European Data)





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Different kinds of Utility Factors according to SAE J2841

database		max. assumed electric range of the vehicle (40 km)	calculation		
				Individual UF	Fleet UF
vehicle	daily miles traveled	elec. range	cs range	IUF_i	IUF	FUF
1 gasoline	50	40	10	83%	63%	56%
	30	30	0			
	60	40	20			
	35	35	0			
2 diesel	80	40	40	43%		
	90	40	50			
	80	40	40			
	120	40	80			

First a distance weighted Individual UF for each vehicle is calculated (IUF_i).

The arithmetic average that includes all vehicles IUF_i ends up in the IUF.

Each vehicle IUF_i has the same weight.

The ratio of the totalized electric ranges and the totalized daily miles traveled.

No arithmetic average means, that high daily traveled distances have a higher weight.

- The Fleet UF can only be used if the database represents a vehicle fleet of customers of plug-in hybrid vehicles.
- If the database consists of conventional vehicles of various kind, the Individual UF method should be applied.

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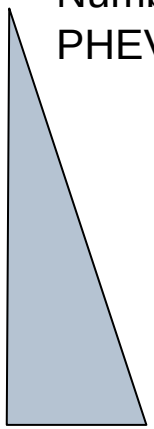
2 Step Approach for Europe:

2014

Determination of Utility Factor from heterogeneous database; charging frequency 1.0

e.g. 2020

Update of Utility Factor by customer study with respective charging frequency



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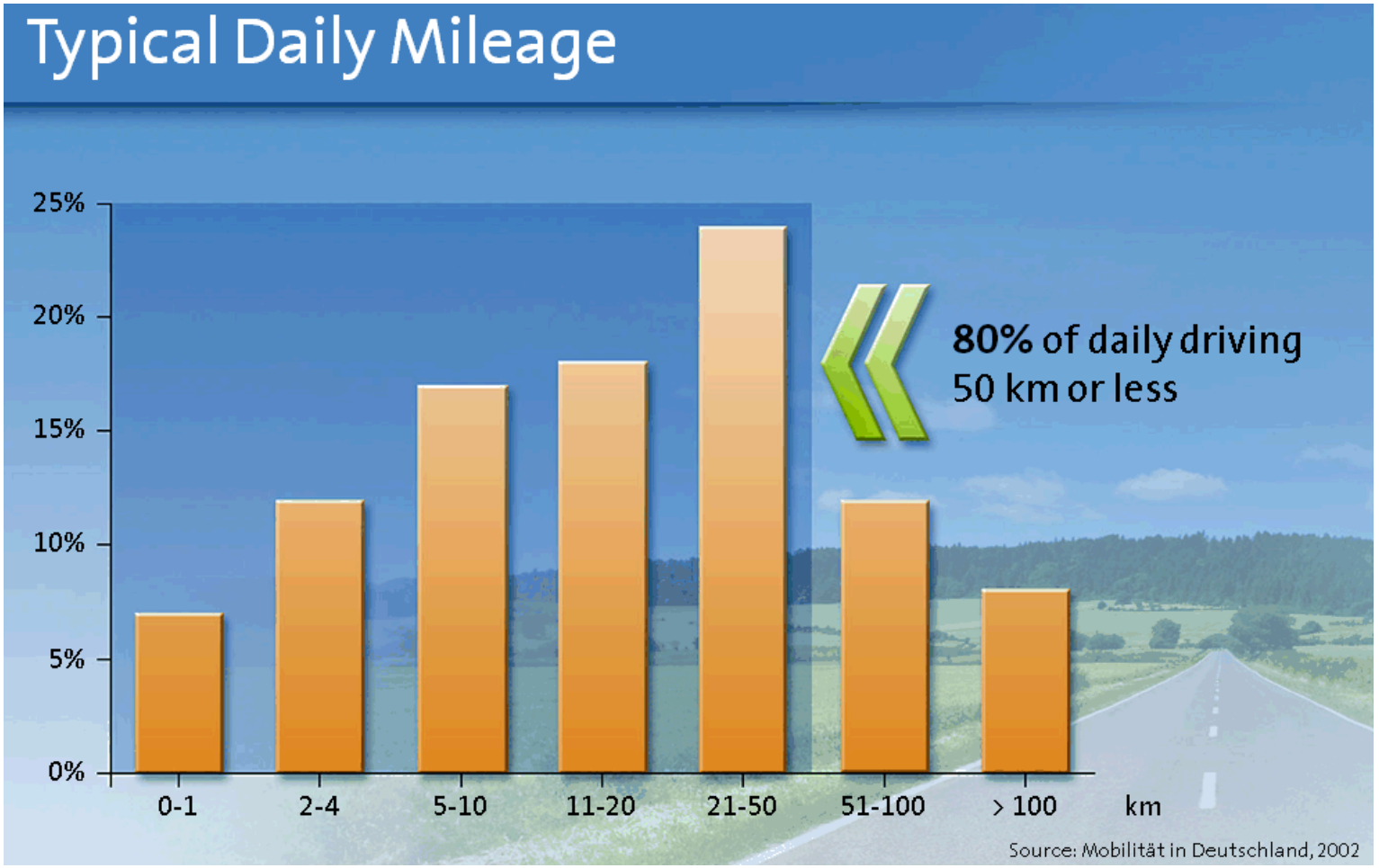
Additional German statistics used for robustness check:



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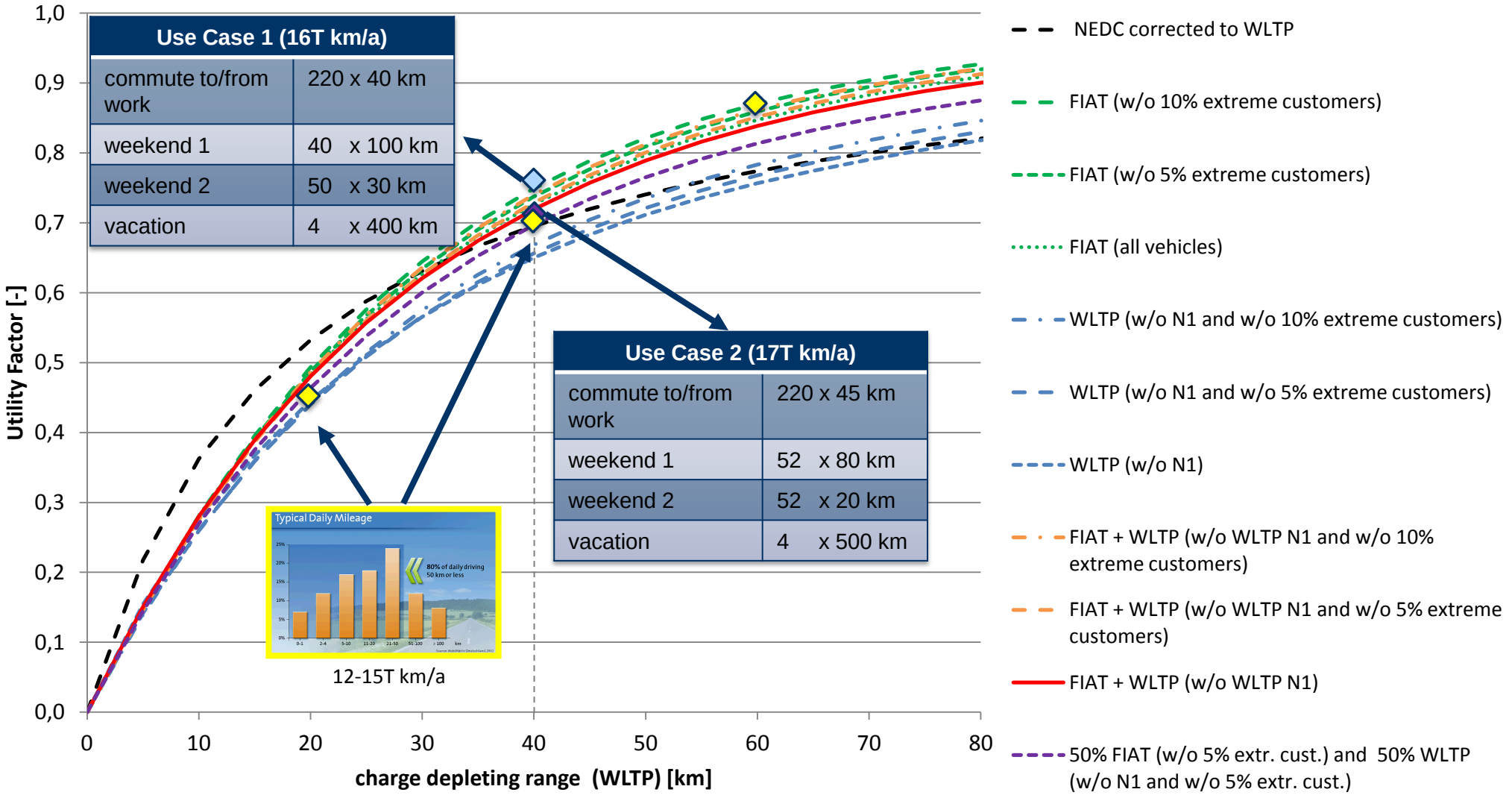

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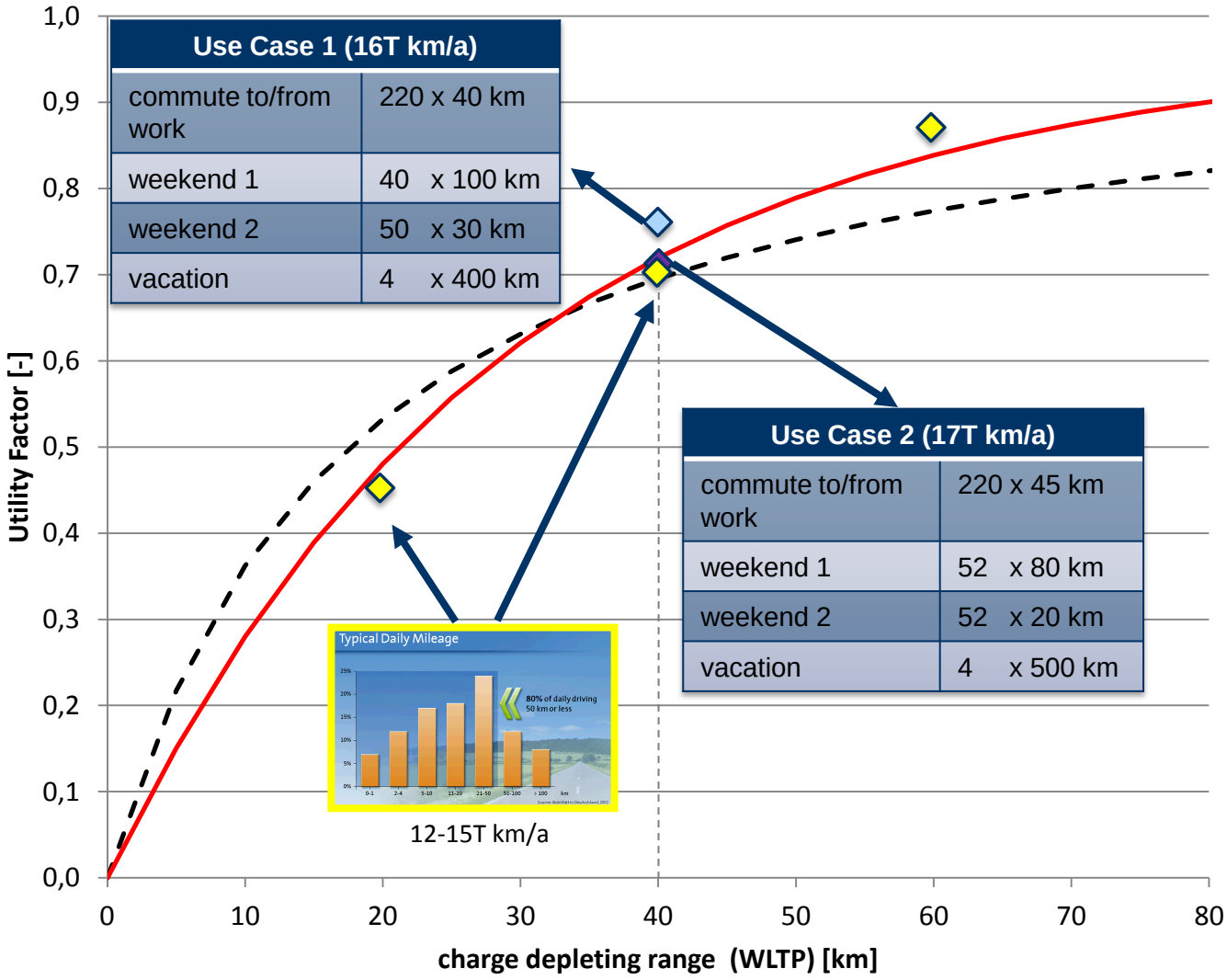

EU-WLTP (1712/2013):

Fiat+WLTP Curve suggested as new UF Factor Curve for Europe

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WLTP phase 1B Utility Factor Recommendations
- Each contracting party shall develop its own Utility Factor based on regional driving data.
- Method for the determination of Utility Factor (based on SAE J2841) could be specified in GTR 1B, depending on the available data base.
- In case data for OVC HEV customers exist, ACEA E-Lab proposes to include the recharging behavior in the methodology to determine the Utility Factor function by considering recharging at non operation times.
- ACEA E-Lab proposes to investigate real world statistical driving and recharging behavior data for OVC HEV.