



V2G – An Economic Game Changer in E-Mobility?

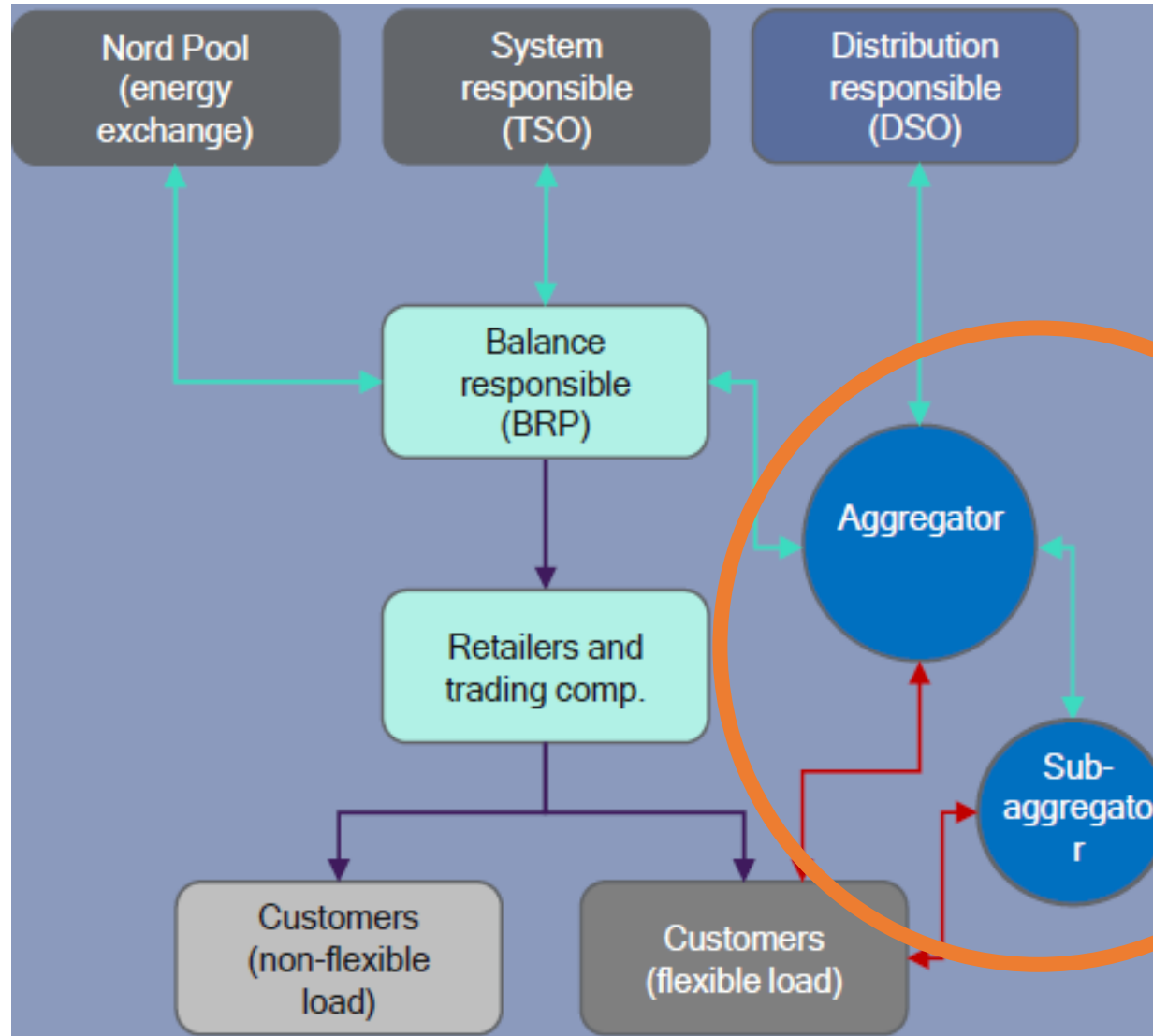
EVS30 – 10th of October 2017



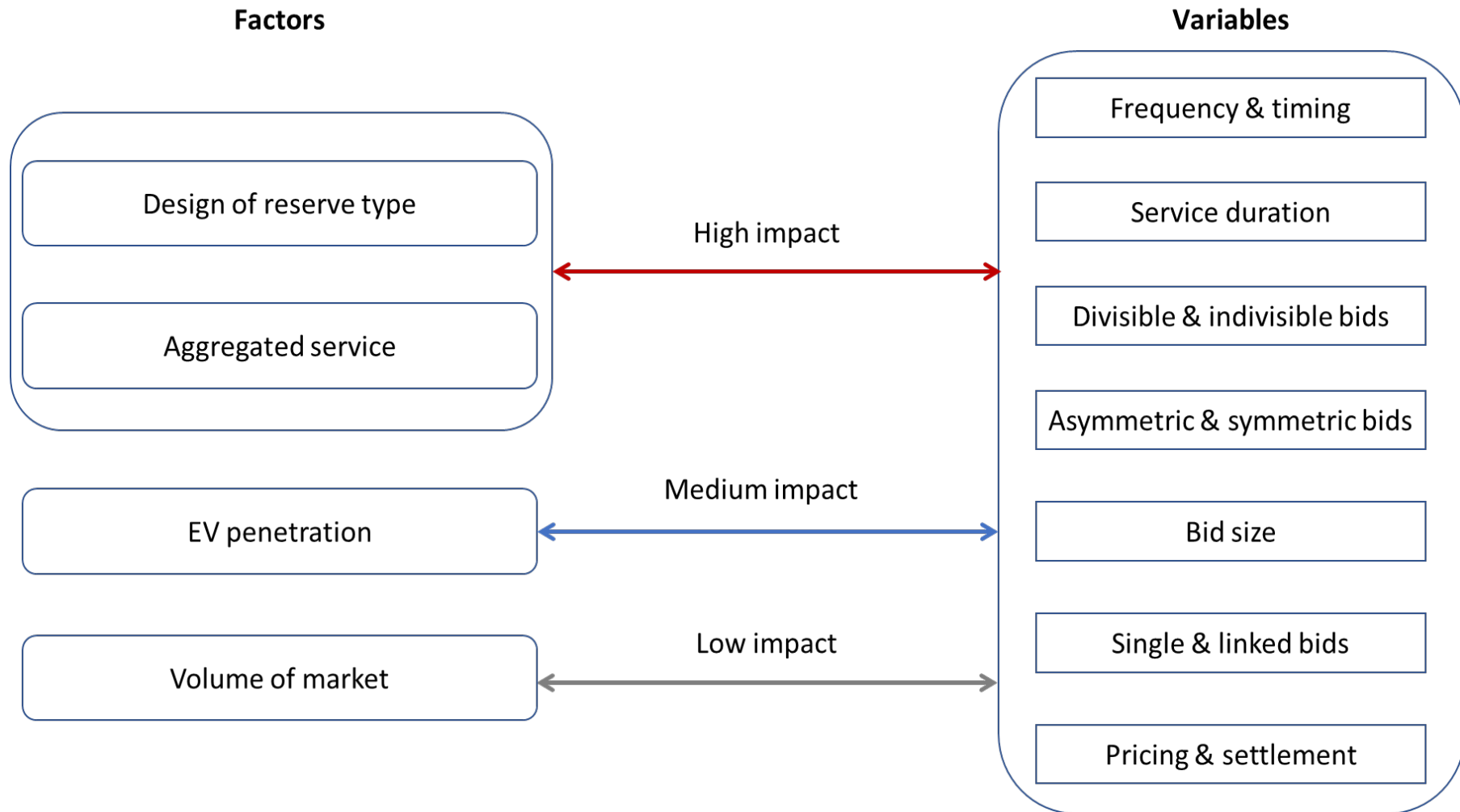


# Vehicle-2-Grid market structure

# The Balancing market



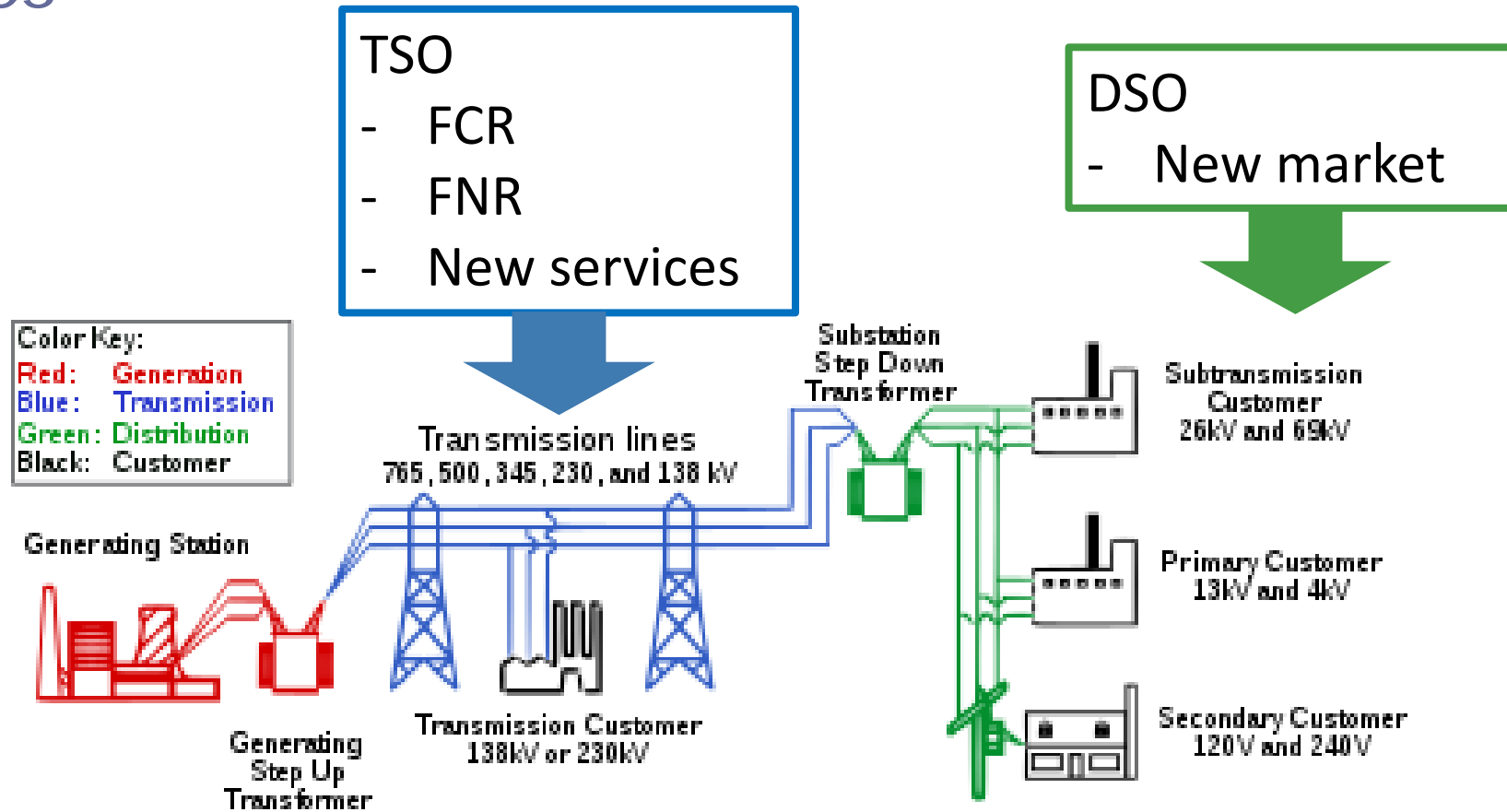
# Grid Variables and factors for FCR





Is it viable?

# Grid services

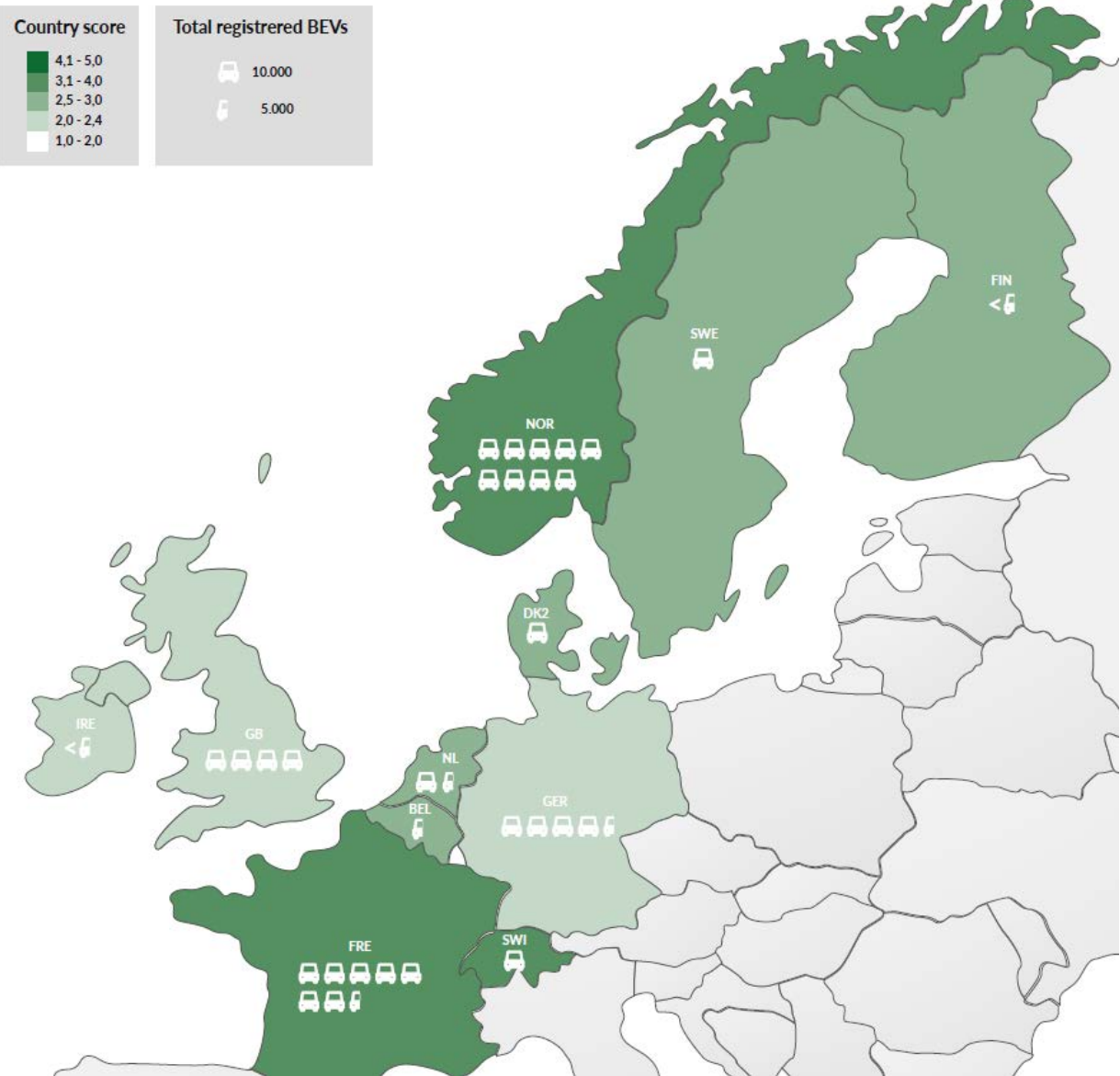


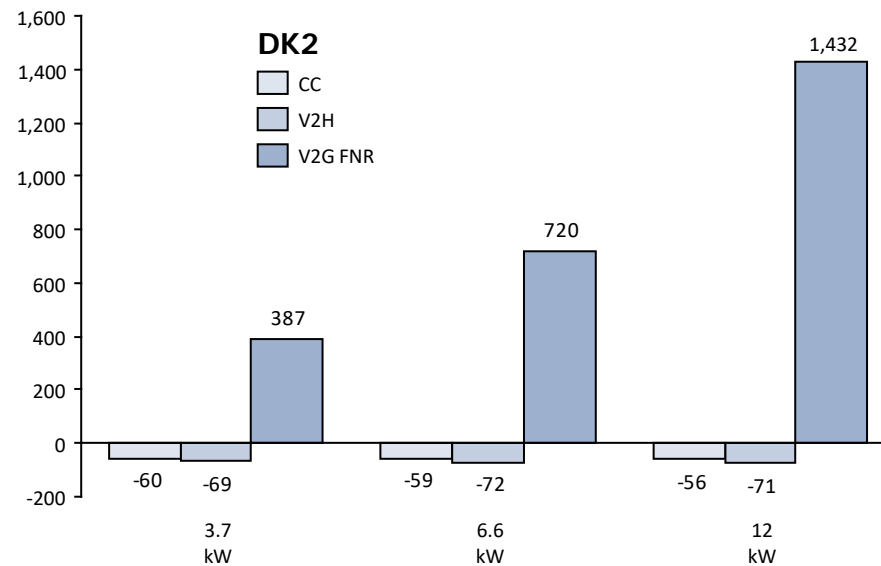
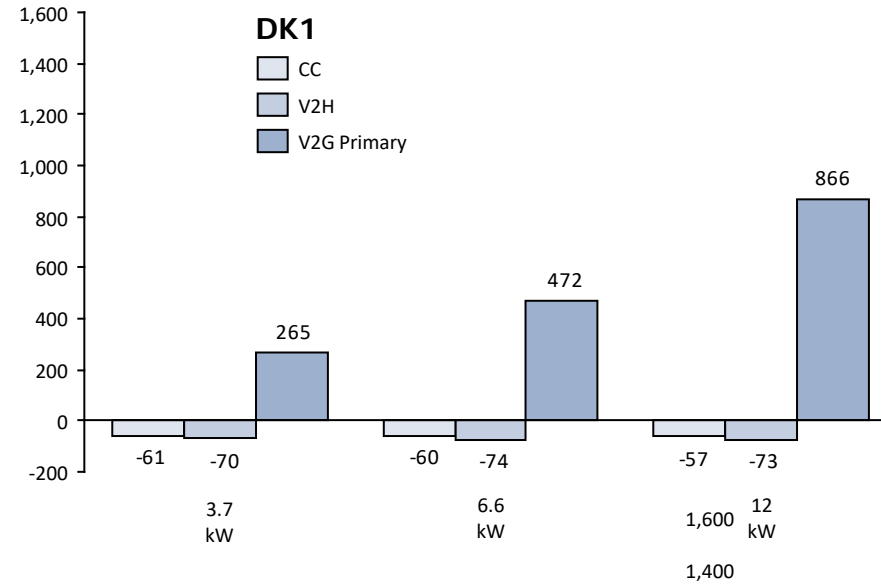
# TSO Market designs

TSO response across examined European markets

Variables	DK2 – Energinet.dk	GER – 50Hertz Transmission GmbH	BEL- Elia	GB – National Grid	NOR - Statnett	NL - TenneT	FIN - FINGRID	FRE - RTE	IRE – Eirgrid	SWI – Swissgrid	SWE – Svenska Kraftnät
Auction frequency	Daily	Weekly	Weekly	Daily	Daily	Weekly	Daily	Weekly	Daily	Weekly	Daily
Lead Time	6 hours	144 hours	1,5 week	1 hour	6 hours	144 hours	6 hours	144 hours	1 year	144 hours	6 hours
Product duration	1-6 hours	168 hours	168 hours	1-9999 min	1 hour	168 hours	1 hour	168	N/A	168 hours	1 hour
Linked bids possible	Yes – 6 hours	No	Yes	No	No	No	No	No	No	No	Yes
Divisible/Indivisible bids	Indivisible	Divisible	Divisible	Divisible	Indivisible	Indivisible	Indivisible	Divisible	Divisible	Indivisible	Indivisible
Maximum bid	No maximum	No maximum	No maximum	No maximum	No maximum	No maximum	No maximum	No maximum	No maximum	No maximum	No maximum
Exclusive bids	No	No	Yes	N/A	No	No	No	No	N/A	No	No
Bid Symmetry	Symmetric	Symmetric	Symmetric/Asymmetric	N/A	Symmetric	Symmetric	Symmetric	Symmetric/Asymmetric	Symmetric/Asymmetric	Symmetric	Symmetric
Combined auction	Yes	Yes	Yes	N/A	Yes	Yes	Yes	Yes	N/A	Yes	Yes
Minimum bid size	0,3 MW	1 MW	1 MW	N/A	1 MW	1 MW	1 MW	1 MW	1 MW	1 MW	0,3 MW
Payment type	Pay-as-bid	Pay-as-bid	Pay-as-bid	Pay-as-bid	Marginal pricing	Pay-as-bid	Marginal pricing	Pay-as-bid	Regulated price	Pay-as-bid	Pay-as-bid
Design score	3,5	3	2	1,5	3	2,5	3	2,5	1,5	2,5	3

# Best FCR market for V2G





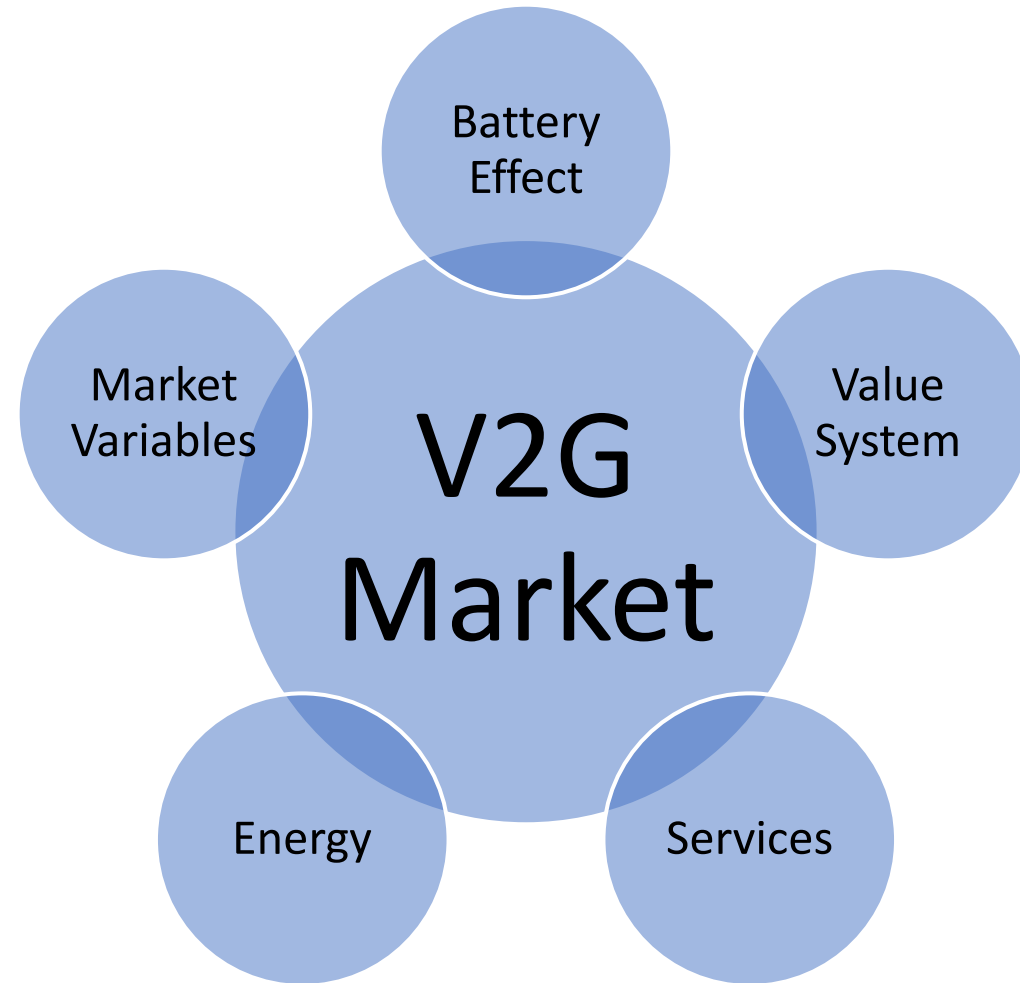
### ANNUAL EARNINGS/SAVINGS

Annual savings of **controlled charging** and **V2H** are generally around 60 EUR independent of whether it is in DK1 and DK2, or whether charging speed increases.

**V2G** is highly affected by charging speed and earnings in DK2 are much higher. This rather large difference in potential earnings is explained by the average hourly prices during the day. A bigger variance in DK2 makes the night hours significantly more attractive than the day hours, which is not the case in DK1.

The **V2G** potential earnings of 1.432 EUR yearly in DK2 for private users, is the best identified business case in the study.

# V2G Market Factors





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