Technische Hochschule Rosenheim
Technical University of Applied Sciences

Interreg Alpine Space
E-MOTICON
EUROPEAN REGIONAL DEVELOPMENT FUND

e-MOTICON

e-MObility Transnational strategy for an Interoperable COmmunity and Networking in the Alpine Space.

March 26, 2019

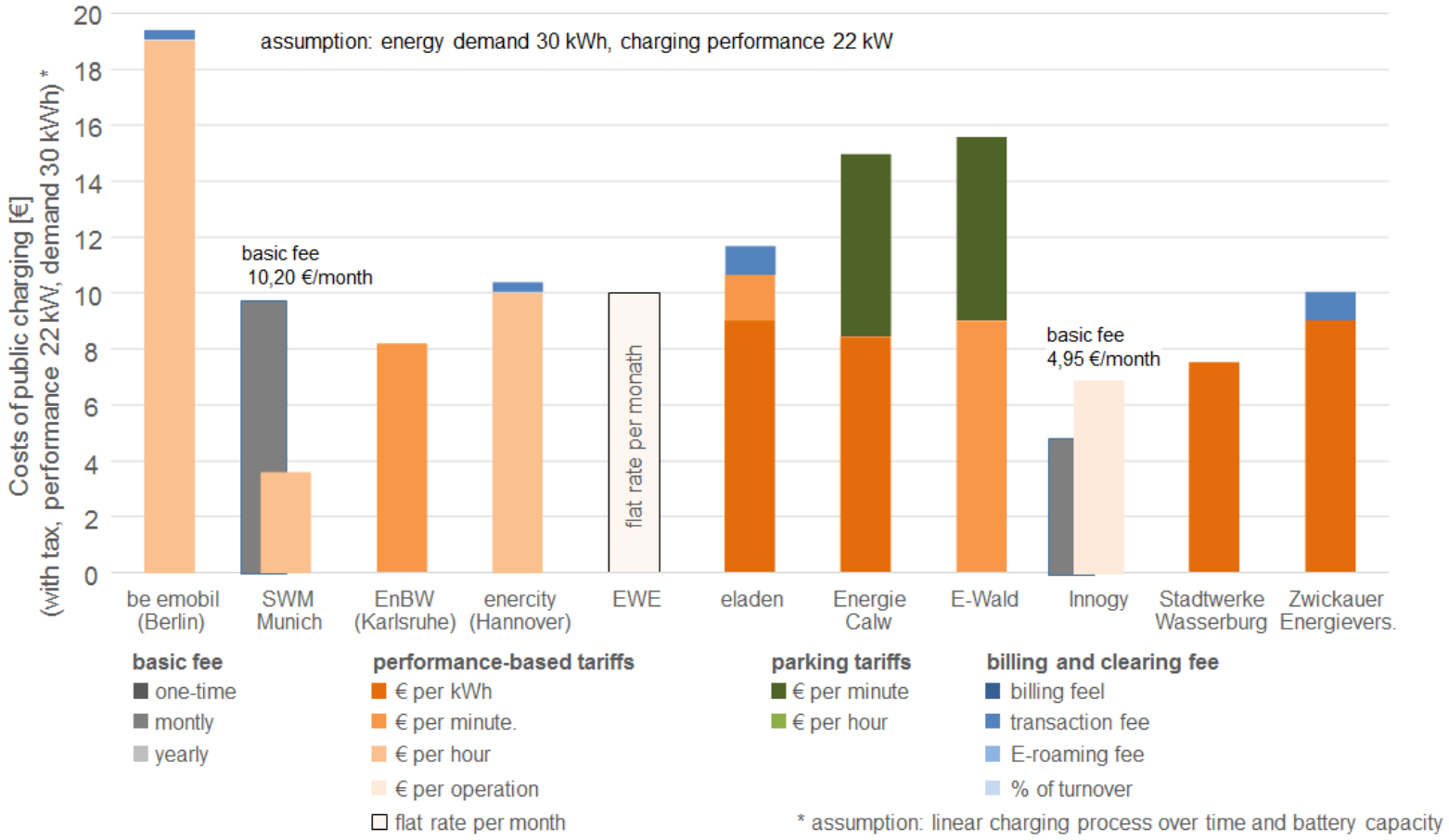
European Regional Development Fund

Public charging infrastructure - value added or lost investment for your business?

Sandra Krommes, e-MOTICON Final Event, March 26, 2019 in Milan

Price models and tariffs of public charging infrastructure in Germany

Cost of public charging are almost equal to fuel costs



- price models and charging tariffs vary from flat rate to price models with several variables
- Energy tariffs spread from 0,30 – 0,40 € per kWh
- public charging costs up to 6-8 € per 100 km** (only kWh based tariffs)

The gap between purchase and selling price of energy is almost between 0,10-0,20 € per kWh.

** real driving consumption: 20 kWh/100 km

Beginning April 1, 2019, the energy tariffs have to be based on kWh (sold energy amount) to increase transparency and adequate energy billing.

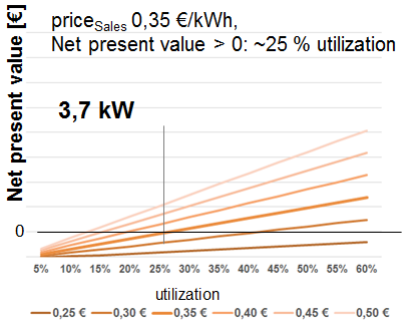
European Regional Development Fund

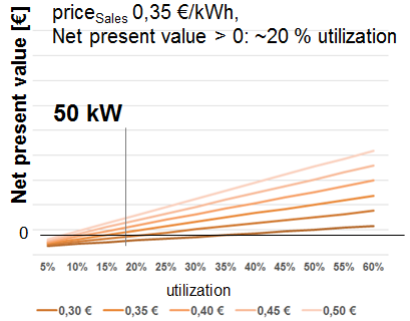
Business case of public charging infrastructure in Germany

The business case quickly becomes positive as number of EV increases

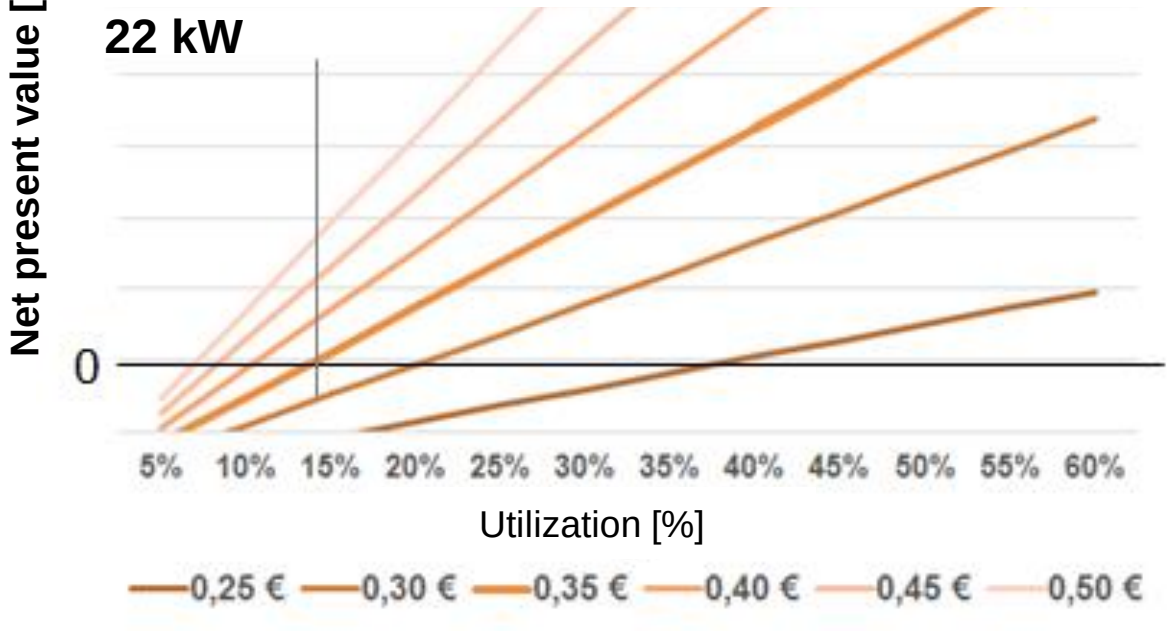
Net present value of public charging infrastructure depending on utilization

@ i = 8%, life time 6 year, $price_{purchase}$ 0,20 €/kWh, billing fee: (3,7-22 kW): 0,50 €, (50 kW): 1 €





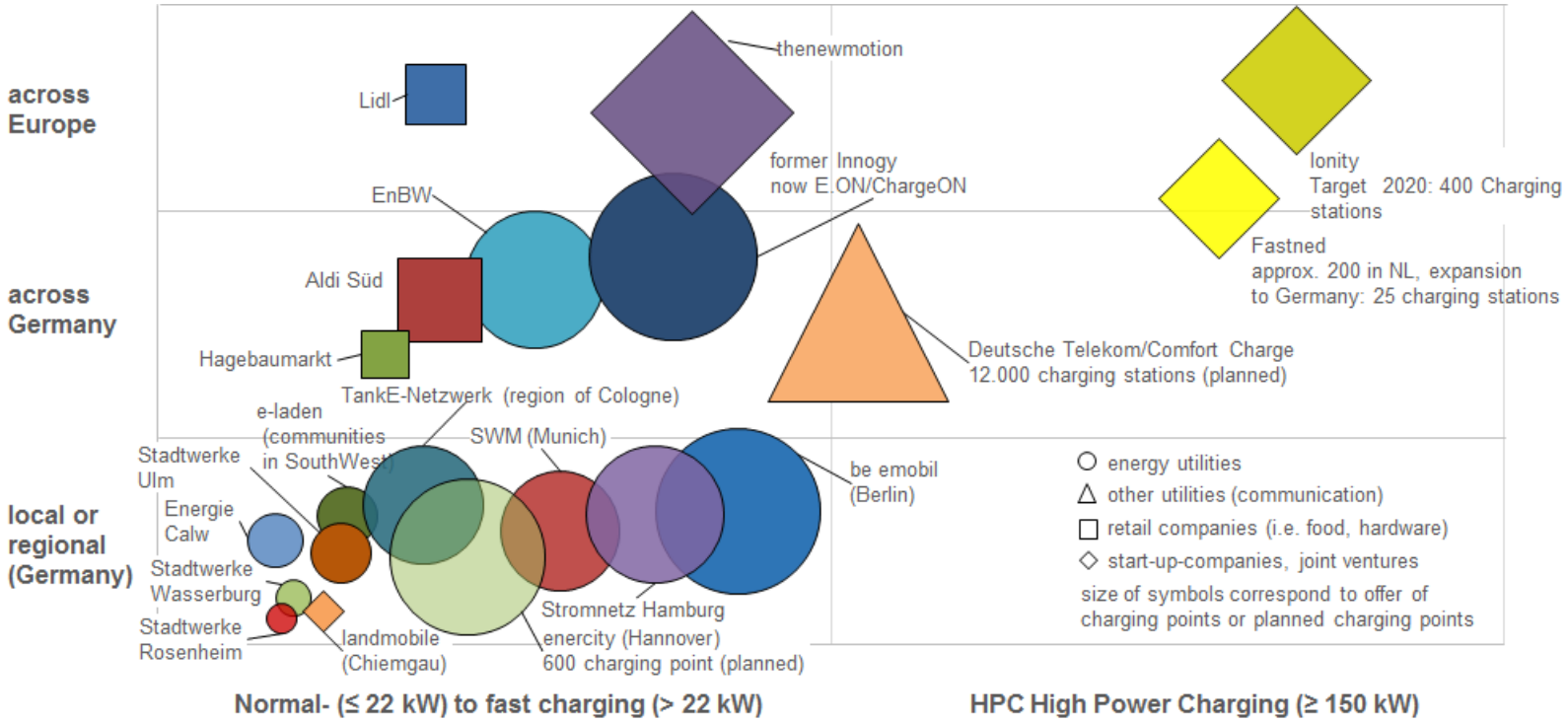
price$_{Sales}$ 0,35 €/kWh,
Net present value > 0: ~15 % utilization



- Recently, the utilization rates of public charging infrastructure is low.
- However, depending on the charging performance the business case turns positive at utilization rate of 15 – 25 %.

Engagement in the market of public charging infrastructure in Germany

Different market participants increase their commitment in the market



> Small- to medium-sized energy utilities are locally present;

> large energy or other utilities enlarge their business footprints;

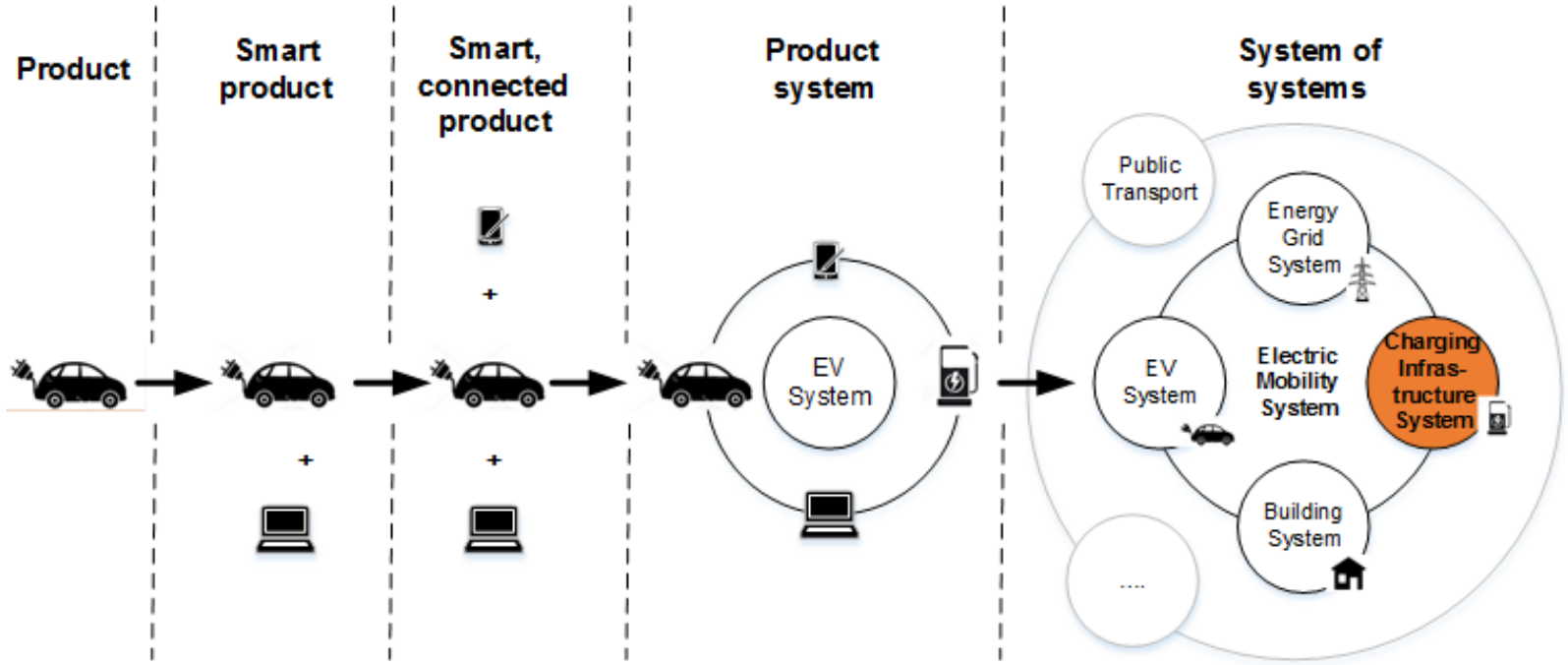
> start-up companies, joint-ventures and equity investments roll-up the market with (fast) charging solutions and pan-european networks.

Currently, companies strengthen the market presence and secure the best possible locations.

This analysis makes no claim to completeness. It describes selected market participants in the field of public charging.

Public charging infrastructure: added value or lost investment for your business?

Pick the low hanging fruits … and be part of tomorrows ecosystem of e-mobility



Source: Krommes; Schmidt, Business model analysis of electric mobility products and services, IJATM, 17 (2017) 3, 316-338

> The value chain of the mobility sector transforms from the upstream to the downstream value chain.

> Electric vehicles path the way to an ecosystem of electric mobility products and services.

> Public charging generates customer leads and loyalty and enables for further business opportunities.

The crucial question is which role do you want to play in this new value chain?

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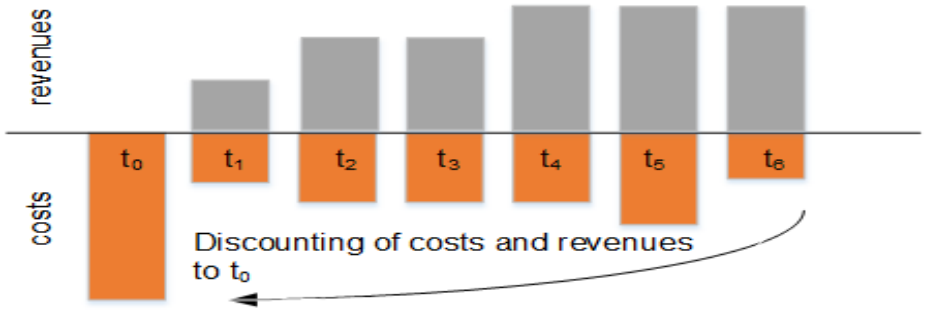
Business case of public charging infrastructure in Germany

Cost and revenue model of public charging infrastructure

Method: net present value method @ i = 8%, assumed lifetime 6 years

- **invest costs (CAPEX) (planning, approval, hardware, grid connection, contruction)**
- **Operating costs (OPEX) (maintenance, servicing, repair, contract/partner management, billing, hotline)**
- **revenues (Δ energy purchase and sales price, billing fee)**



Anzahl Ladesäulen			300	
Anzahl Ladepunkte			390	
Alternativzinssatz			8%	
Verteilung der Lade-SÄULEN nach Leistung				
	3,7 kW	**22 kW**	**50 kW**	
	200	90	10	Stück
	66,7%	30,0%	3,3%	% an Gesamthardware
	6	6	6	Jahre (Lebensdauer)
Verteilung der Lade-PUNKTE nach Leistung				
	3,7 kW	**22 kW**	**50 kW**	
	200	180	10	Stück
	51,3%	46,2%	2,6%	%
Auslastung / Kosten der Ladepunkte				
	3,7 kW	**22 kW**	**50 kW**	
	30	15	10	% - Auslastung
	7,2	3,6	2,4	Stunden/Tag
	8	2	0,6	Ladezeit/Ladevorgang
	3,7	11	50	Ladeleistung in KW
	26,6	39,6	120,0	Übertragene Energie in KWh
	0,90	1,80	4,00	Ladevorgänge/Tag
	0,20 €	0,20 €	0,20 €	€ / kWh (Einkaufspreis)
	0,35 €	0,35 €	0,45 €	€ / kWh (Verkaufspreis)
	0,00 €	0,50 €	1,00 €	€/Laden (Pauschalgebühren)
Gesamtinvestitionen				
	3,7 kW	**22 kW**	**50 kW**	
	462.000 €	850.500 €	367.500 €	
Summe:	**1.680.000 €**			

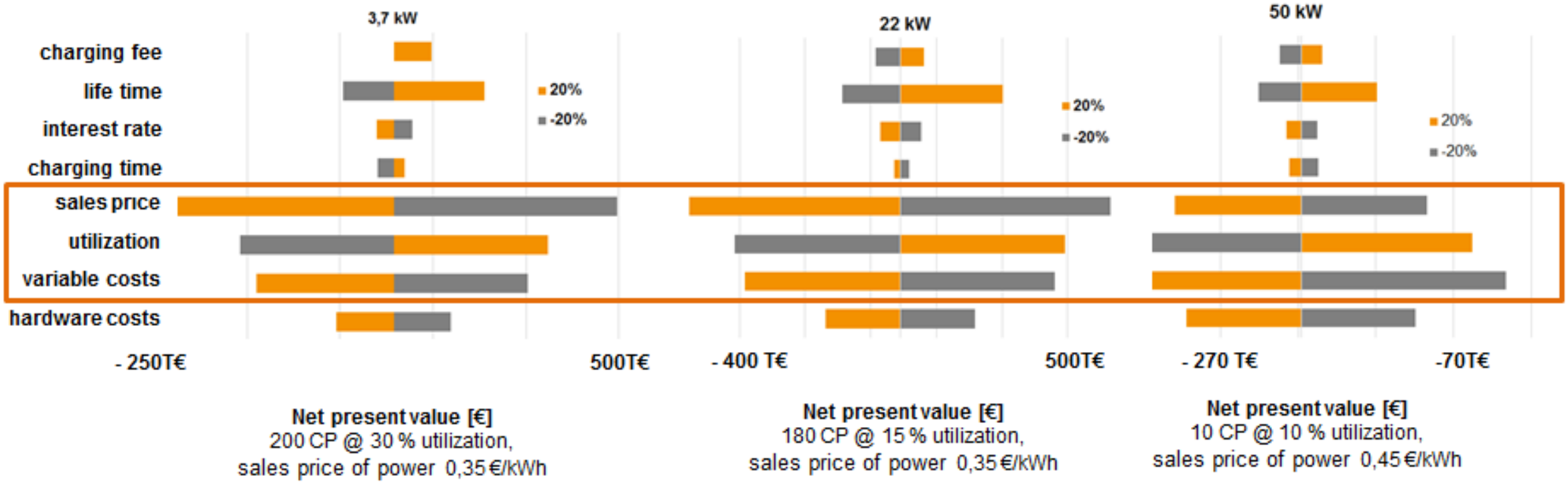
		3,7 kW	**22 kW**	**50 kW**
Investitionskosten (CAPEX) netto				
Hardware		700 €	4.000 €	25.000 €
Anzahl Ladepunkte		1	2	1
+ Anschluss (0-2000€ bei 3,7kW)		500 €	2.000 €	5.000 €
+ Montage		500 €	2.000 €	3.500 €
+ Genehmigung		500 €	1.000 €	1.500 €
+ Puffer	5%	110 €	450 €	1.750 €
- Förderung	0%	0 €	0 €	0 €
Summe		**2.310 €**	**9.450 €**	**36.750 €**
Kosten variabel (OPEX)				
Anschluss (Back-end)		84 €	168 €	84 €
+ Wartung	10%	231 €	945 €	3.675 €
+ Service (Störungen z.b.)		100 €	100 €	100 €
+ Hotline (24/7)		50 €	50 €	50 €
+ Instandhaltung	10%	231 €	945 €	3.675 €
+ Vertragsmanagement / Abrechnung		115 €	460 €	511 €
+ Investitionskosten umgelegt p.a.		385 €	1.575 €	6.125 €
Summe (€/p.a.)		**1.196 €**	**4.243 €**	**14.220 €**
Erlöse p.a.				
Strom (Verkauf)		3.403 €	10.118 €	19.710 €
- Strom (Einkauf)		1.945 €	5.782 €	8.760 €
+ Pauschalgebühren		0 €	657 €	1.460 €
Summe (€/p.a.)		**1.459 €**	**4.993 €**	**12.410 €**

Business case of public charging infrastructure in Germany

Cost and revenue model of public charging infrastructure

Sensitivity analysis

@ i = 8%, life time 6 years, price$_{purchase}$ 0,20 €/kWh, fee (3,7-22 kW): 0,50 €/charging process, (50 kW): 1 €/process



Fast charging public infrastructure

Dutch start-up promises a profit of 6 % p.a. for its bond

Süddeutsche Zeitung, October 16, 2018 (full-page ad)

Due to the market demand, the issue volume of the bonds has been increased to 10 million € in total.