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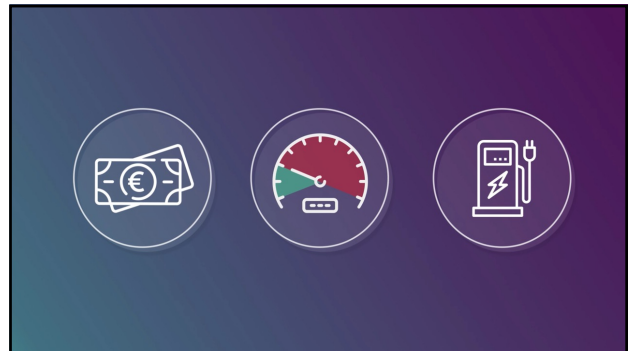
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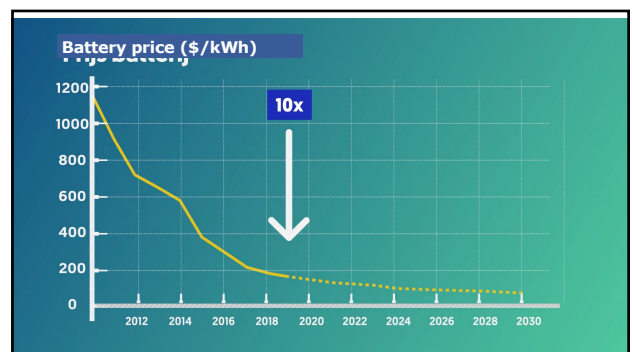
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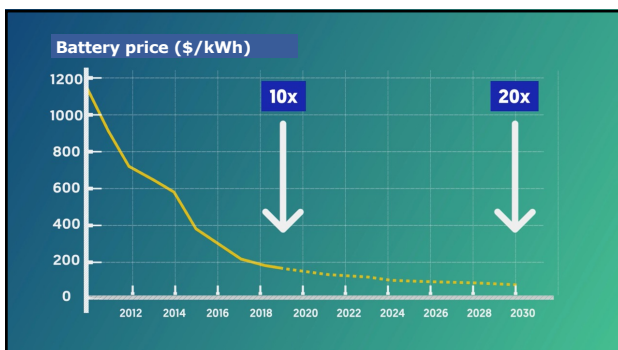
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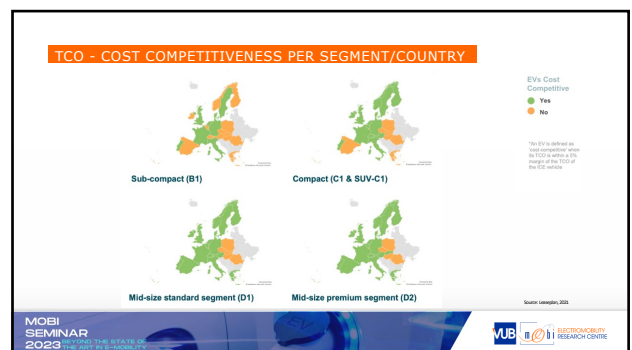
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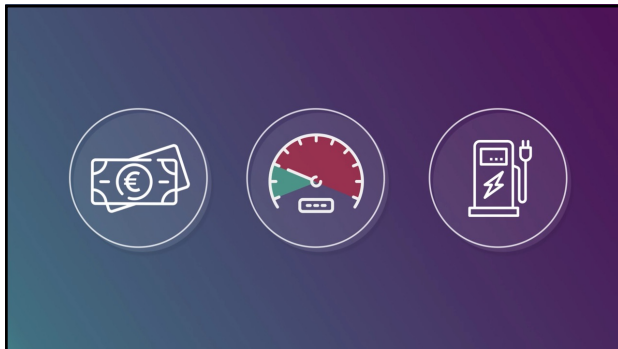
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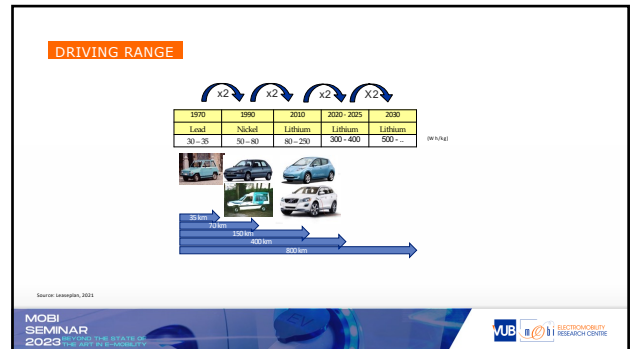
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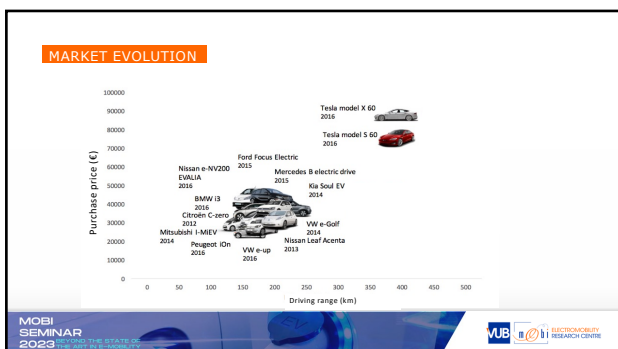
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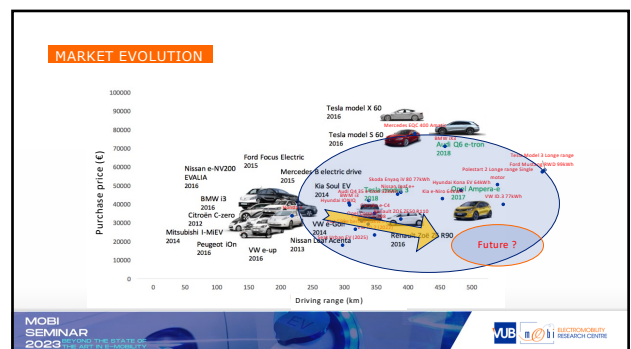
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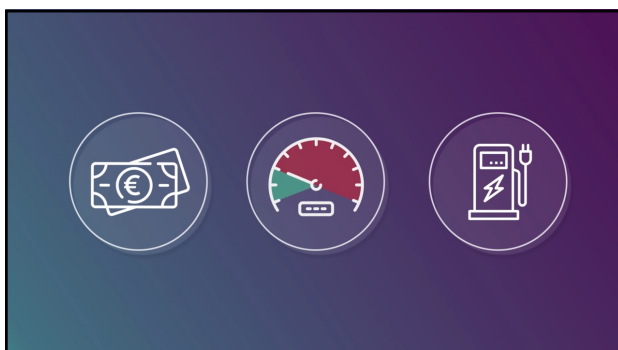
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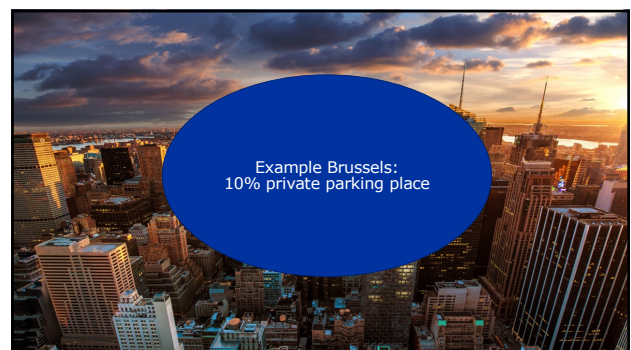
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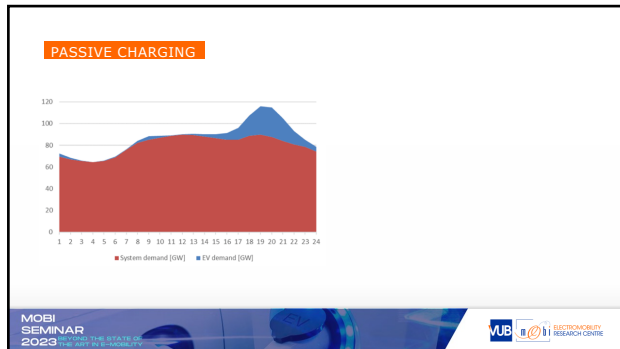
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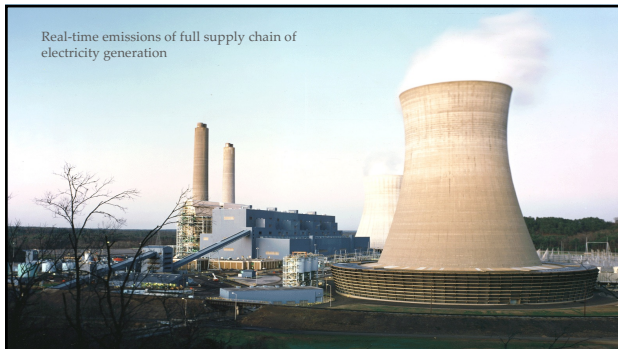
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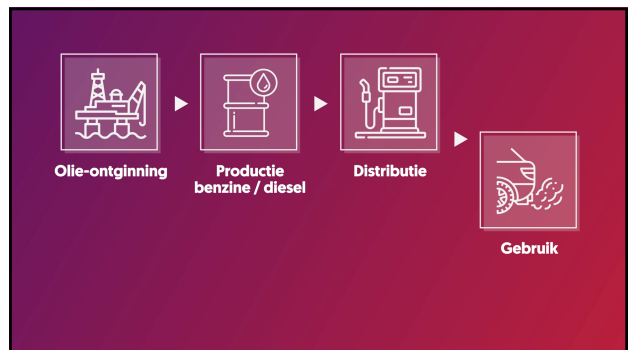
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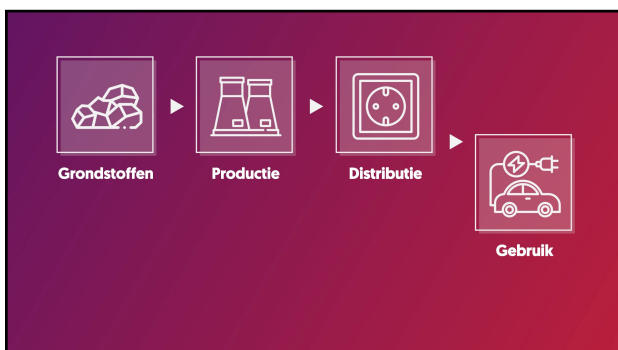
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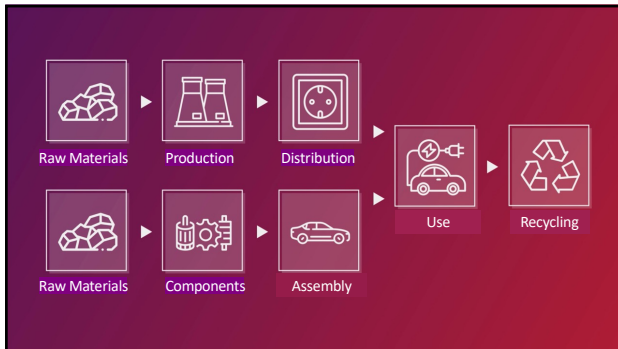
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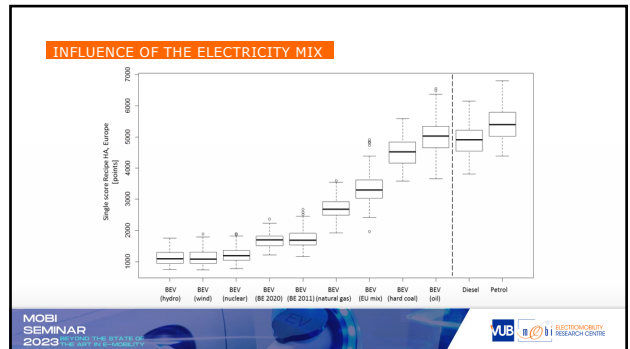
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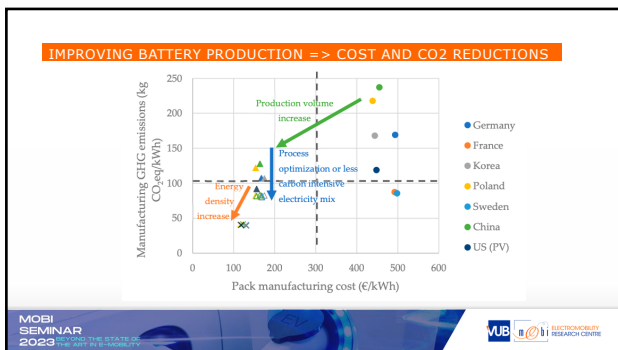
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PROGRAM	
• 9.30 Welcome Prof. Joost Van Merb - Head of MOBI	• 11.20 Smart charging and V2G cloud solutions Dr. Cedric De Cauwer - ENEC
• 9.40 Setting the scene Prof. Joost Van Merb - Head of MOBI	• 11.30 Supporting the development of sustainable energy communities Prof. Thierry Coosemans - Head of ENEC
• 9.50 Keynote speaker: Jiel HUYCK Head of department asset planning and grid development Fluorbus Is our distribution grid ready for the future?	• 11.40 The sustainability of electric vehicles and communities Prof. Maarten Meertens - Head of ENEC
• 10.20 Next generation propulsion systems for electric vehicles Dr. Mohamed El-Bayoumy - EPONERS Prof. Omar Hegazy - Head of EPONERS	• 11.50 Autonomous Vehicles Prof. Guy Rombaut - ERM group
• 10.30 Solid state batteries & manufacturing Prof. Mathieu Bercowski - Head of BC	• 12.00 Where can light play a role in EV/AV communication and how disruptive could it be? Jan Coosemans - MERLIN
• 10.40 Pause	• 12.10 The total cost for logistics providers (TCO) Stefan Saling - ERM team Prof. Lennard Van der Vliet - ERM team
• 11.10 Future and Modular DC charging enabling V2X Features Dr. Thomas Geary - EPONERS	• 12.30 Wrap-up Prof. Thierry Coosemans - Deputy Director MOBI
	• 12.35 Walking lunch

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PROGRAM	
• 12.35 Lunch break Walking Lunch Data poster session	• 13.30 Lab Tours
• 15.30 End	

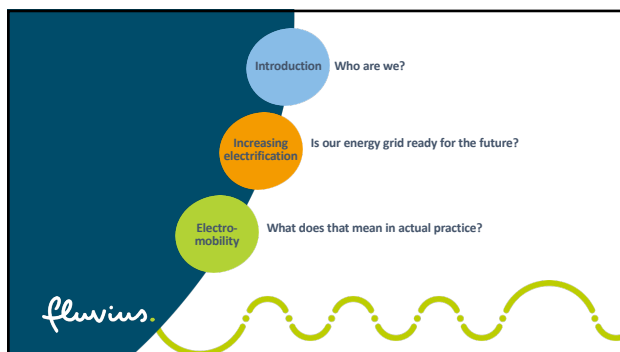
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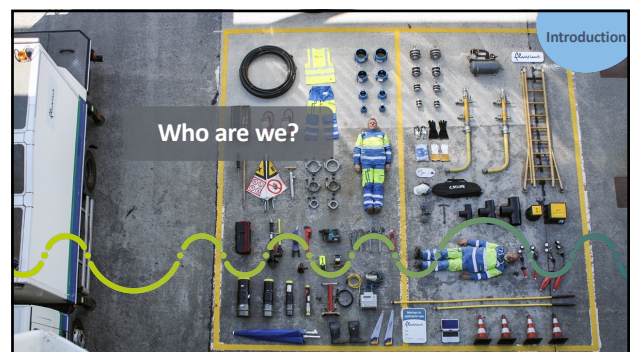
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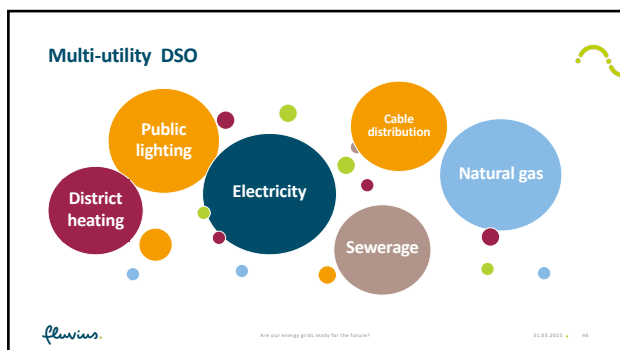
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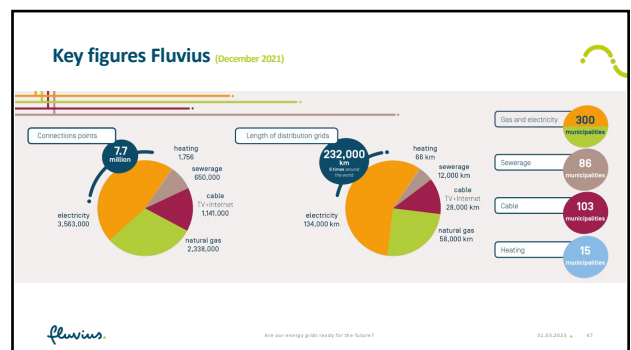
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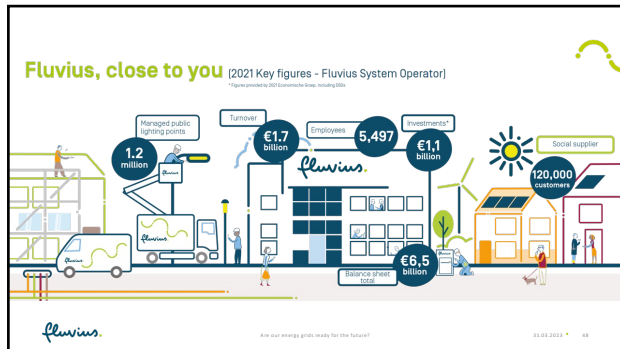
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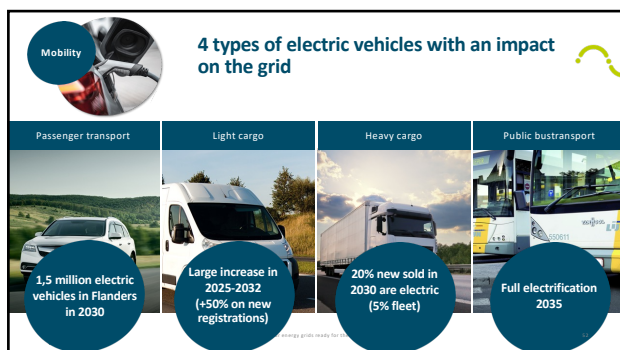
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HCV - typical uses

Transport applications: Fluvius electric annual consumption if all heavy trucks are battery-electric powered

Transport application	EV fleet (Trucks with 4-6, 8, 10)	# Working days	km/day	Avg. e-consum. kWh/vehicle	Total E/year	Total e-consumption kWh/year
1 Urban distribution (multiple stops)	0.000	200	100	200	200.000.000	200.000.000
2 Distribution intensity (all, some stops)	25.000	200	200	220	1.100.000.000	1.100.000.000
3 Distribution intensity (all, some stops)	25.000	200	400	220	2.200.000.000	2.200.000.000
4 Transport long distance (distribution)	25.000	200	700	220	3.850.000.000	3.850.000.000
5 Public administration (garbage, green waste, ...)	4.000	200	70	220	616.000.000	616.000.000
6 Distribution center and site transport	0.000	200	100	200	200.000.000	200.000.000
TOTAL/average	50.000	200	340	200	6.000.000.000	6.000.000.000

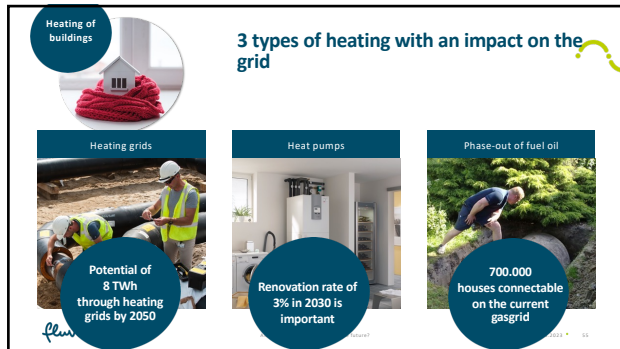
Source: Febic Kenniscentrum

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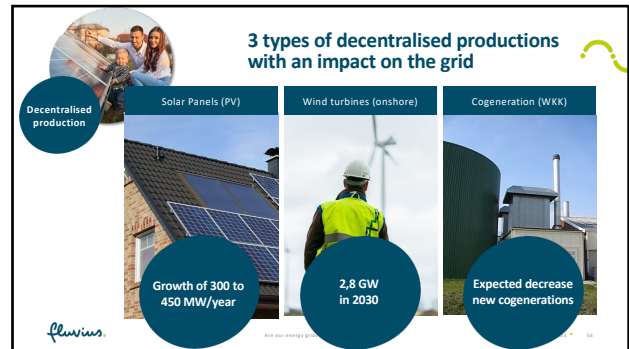
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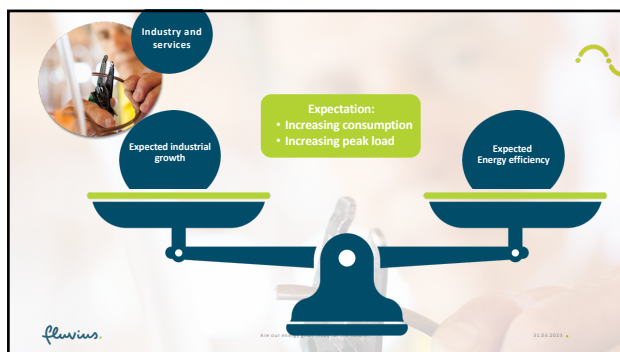
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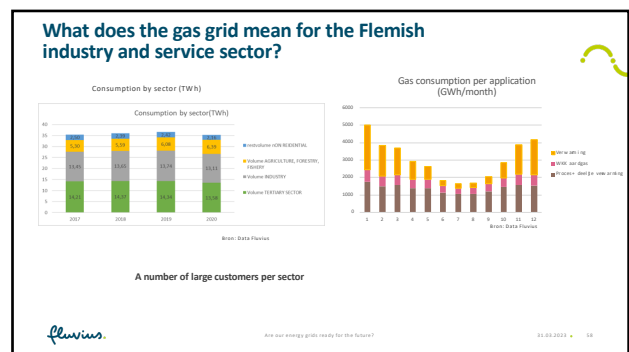
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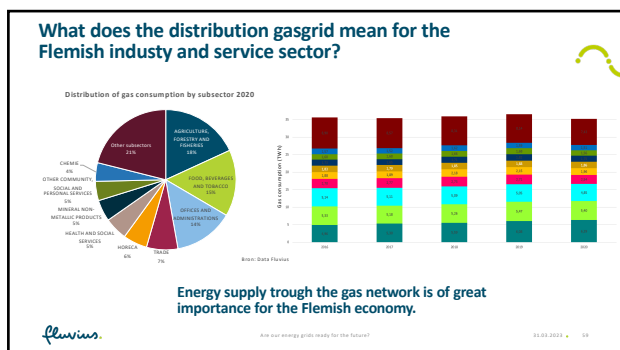
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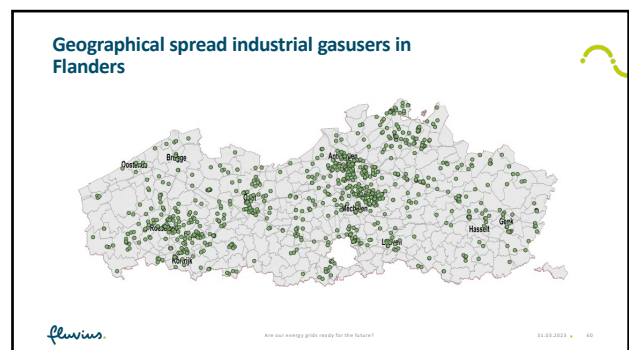
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Energy storage

- Home batteries:**
 - Close to 50.000 (oct 2022)
 - Today only focus on self-consumption
 - Premium till 2024, but amount falls: slower growth
- Electric vehicles:**
 - Car battery capacity > home battery offers possibilities
- Large batteries:**
 - Questions about feasibility (European funding) in ports in combination with industrial sites

➔ Batteries only have an impact on Investment Plan if peak production is also captured and grids are spared

➔ Important not only to commit on self consumption

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Local challenges

- Data centers in the Brussels region
- 230V grids in historic city centres and around Brussels
- Voltage problems on the low-voltage grid in rural areas

% 230V-net

0% - 10%
10% - 20%
20% - 40%
40% - 60%
60% - 80%
80% - 100%

% insufficient funding ratio

0% - 1%
1% - 2%
2% - 4%
4% - 6%
6% - 8%

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Mobility

Energy storage

Heating of buildings

Local challenges

What is the joint impact on the distribution networks towards 2032 and finally 2050?

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Low voltage: current state

Current share of networks that could potentially congestion (% by municipality)

%congestion/municipality

0 - 10
10 - 20
20 - 30
30 - 40
40 - 50
50 - 60
60 - 70
70 - 80
80 - 90
90 - 100

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Low voltage: situation in mid-term scenario in 2032

Current share of networks that could potentially congestion (% by municipality)

%congestion/municipality

0 - 10
10 - 20
20 - 30
30 - 40
40 - 50
50 - 60
60 - 70
70 - 80
80 - 90
90 - 100

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No regret action plan

Strengthen 40% of low voltage cables (30.000 km) with modification of 750.000 home connections (21%)

Strengthen 13% of medium-voltage cables

Strengthen 1 in 3 distribution cabins

It is important to be ready for energy transition in the short term (towards 2032)

No over-investment in view of 2050, even with slower transition and plenty of mitigation measures

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Electricity investments: our main actions

- 1 The standard connection for households is evolving from 9,2 to 17,3 kVA
- 2 Low-voltage grids with insufficient performance are modified more quickly
- 3 We are accelerating 400V next to 230V if necessary for electric vehicles
- 4 We are committed to the further digitization of the electricity grid (cabins, smart meter)
- 5 We maximize use of synergy with other utilities to reduce costs

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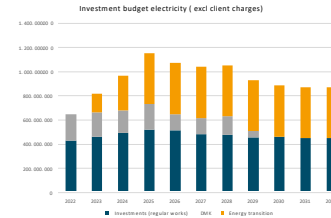
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Additional investment in the electricity grids

Regular investments until 2032
7 billion €

Additional investments in energy transition until 2032
4 billion €

3 billion low voltage
1 billion medium voltage



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Additional investment in the electricity grids



Importance of mitigating measures towards 2050

- Smart meter, capacity tariff, flexibility services...
- Estimated final investment cost in 2050:
 - 6 billion € with mitigating measures
 - Much higher without mitigating measures
- Focus on further development of support measures!

Also need for additional investments in transmission network (TSO)

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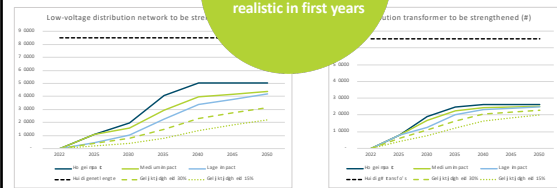
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Impact?

Load spread
= important

Large impact less realistic in first years



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Capacity tariff from 1 January 2023

- Change for **all customers in Flanders** from 1 January 2023 except for customers with social rate
- Customers on low voltage (Small Consumption Measurement clients)
 - Families and small businesses
 - Today: grid fee charged in EUR/kWh (~ how much you use)
 - From January 2023:
 - Minimum contribution (2,5kW) + Charge in EUR/kWh (i.e. how heavily you load the grid (smart meter))
 - Different tariff for classic and smart meter connections
- Non-low voltage customers (Large Consumption Measurement)
 - Large companies
 - Today: grid fee already largely charged in capacity tariff (EUR/kWh)
 - From January 2023: capacity term weighs even more heavily and will be calculated differently (introduction of power put at disposal nomination)

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Determine access power



- Access power must be entered before 1 January 2023
- mijn.fluvius.be/netkosten
- If not, the annual peak will be set as access power. (highest last 12 months)

Action by customer:

- Appropriate permissions (federal platform management access administrators) or authorization from the supply contract holder
- Customer must 'predict' power for future
- Advice through suppliers or energy service provider

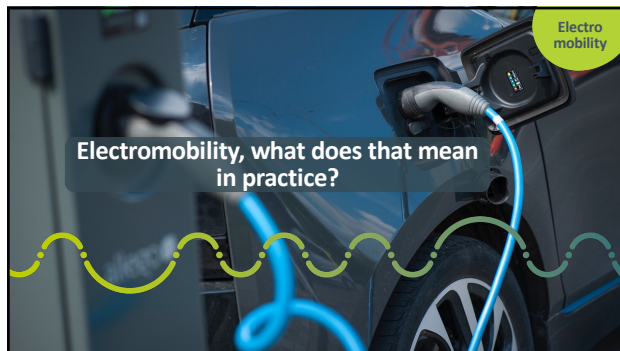
Het capaciteitsstarf voor grootverbruikers met inrichtingen 1 Fluvius

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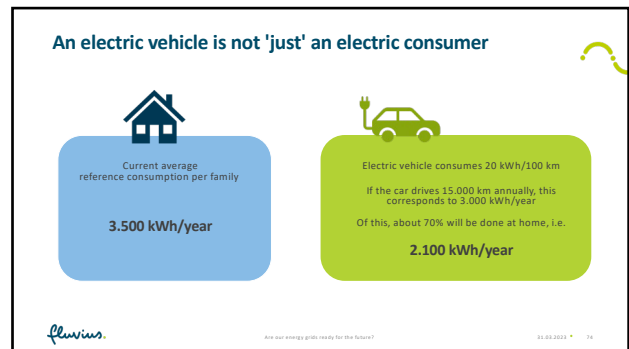
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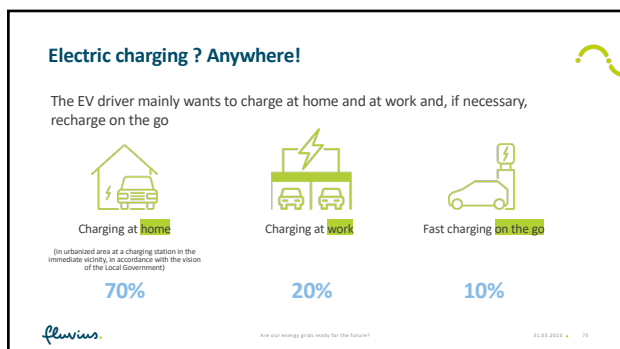
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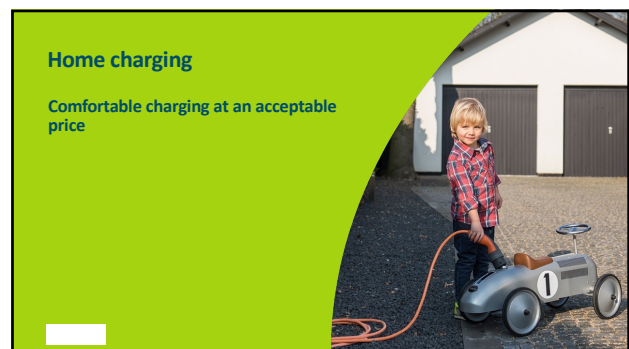
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Home charging, an overview

Comfortable loading speed for any profile

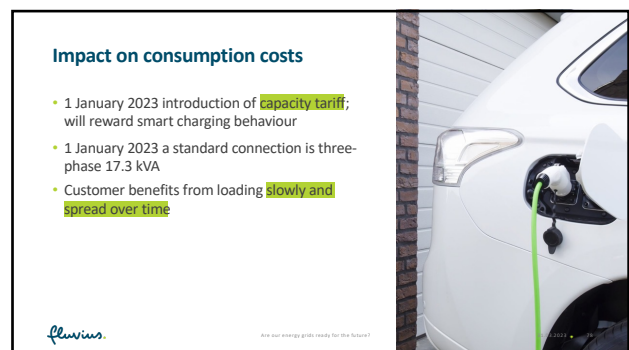
	Socket ⁽¹⁾ single-phase - 10A	Charging point ⁽²⁾ single-phase - 16A	Charging point ⁽²⁾ three-phase - 16A
Power and charging speed	2,3 kW max. 10 km/u	3,7 kW max. 15 km/u	11 kW max. 50 km/u
Type PHEV	✓	✓	✓
Type BEV	✓	✓	✓

applicable with standard home connection 9,2 kW three-phase connection with possible increase

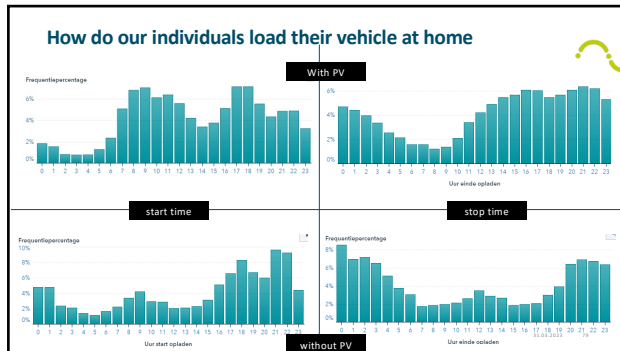
⁽¹⁾ via a charging cable, the charging speed is limited to 10 A - 2,3 kW for safety
⁽²⁾ via a charging point, the charging speed varies from faster at the beginning to slower at the end (at 80% charged)

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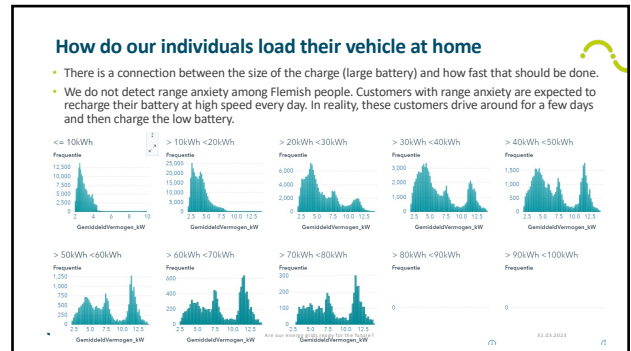
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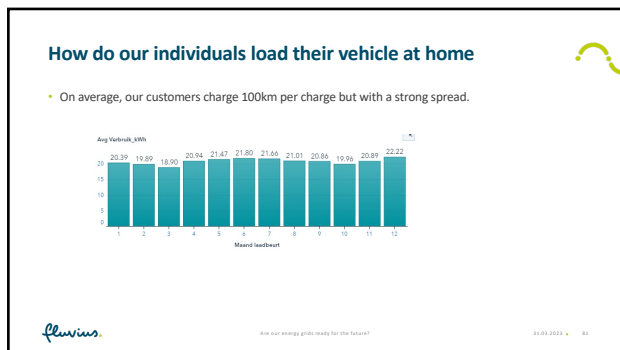
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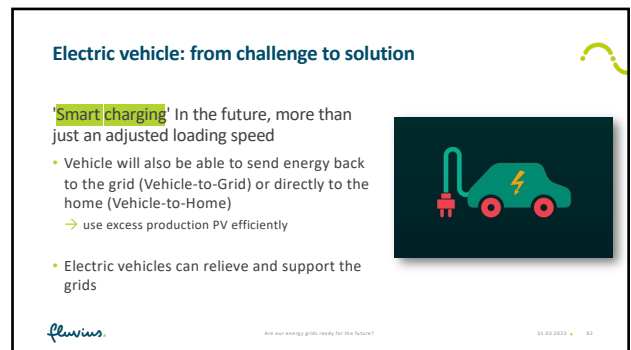
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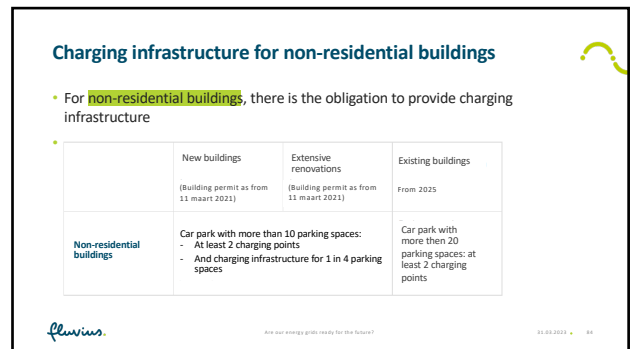
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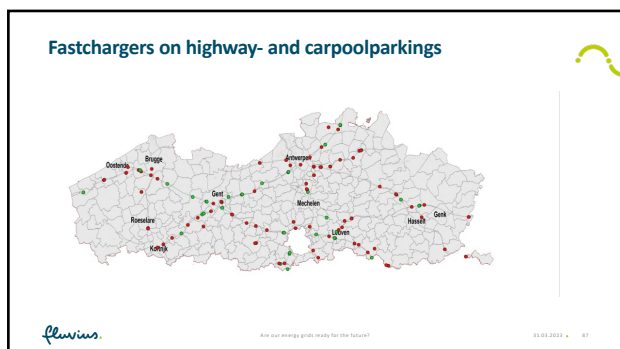
Focus on (re)charging on the go

- Mainly **fast chargers** as a supplement to charging at home/work and to cover longer distances: 50 kW – 150 kW ... - 350 kW - ...?
- Government ambition:
 - (ultra)fast chargers every 25km on major traffic axes
 - 400 public fast charging points** in Flanders

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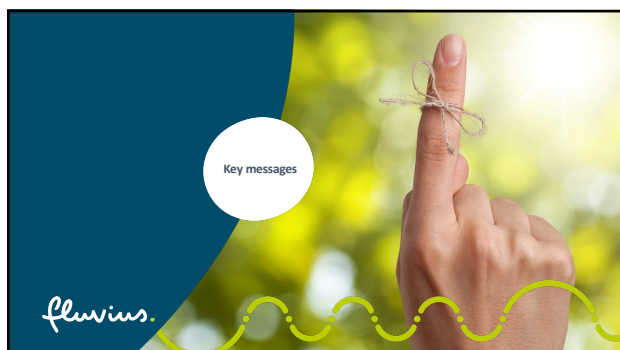
Role Fluvius as a link in this chain

- Connect any charging point with the necessary power
- Supporting market players
- 'QuickScan' available power at desired charging location
- Efficiency gains by bundling projects, e.g. in the same industrial estate
 - systematic consultation with major players, e.g. greening public transport De Lijn
 - ...

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NEXT GENERATION PROPULSION SYSTEMS FOR ELECTRIC VEHICLES

Dr. Mohamed El Baghdadi – EPOWERS
& Prof. Omar Hegazy – Head of EPOWERS

VUB **Electromobility RESEARCH CENTRE**

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NEXT GENERATION PROPULSION SYSTEMS FOR ELECTRIC VEHICLES

AGENDA



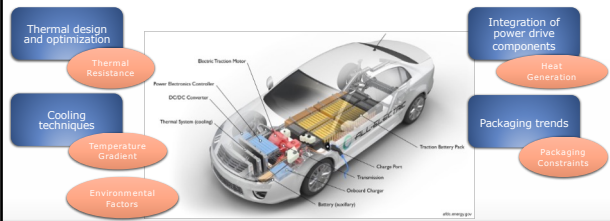
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AUTOMOTIVE R&D TRENDS AND CHALLENGES

ELECTROMECHANICAL-ELECTRONIC-THERMAL



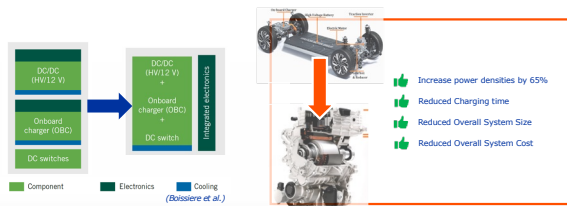
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INTEGRATION TRENDS

INTEGRATION APPROACHES IN POWER ELECTRONICS AND E-DRIVES



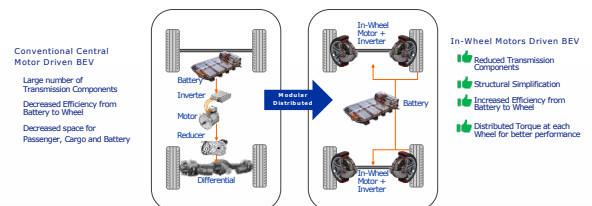
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IN-WHEEL MOTOR POWERTRAINS FOR BETTER PERFORMANCE AND EFFICIENCY

CONVENTIONAL BEV VS IN-WHEEL MOTOR DRIVEN BEV



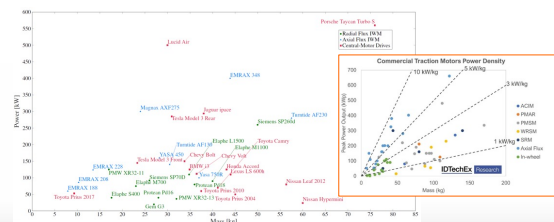
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IN-WHEEL MOTOR POWERTRAINS FOR BETTER PERFORMANCE AND EFFICIENCY

POWER MASS TREND COMPARISON: IN-WHEEL MOTORS VS CONVENTIONAL MOTORS

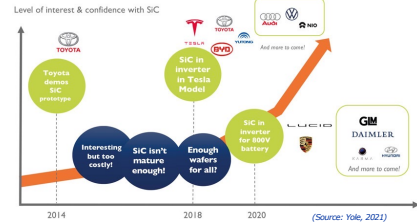


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HIGH VOLTAGE EV PLATFORMS

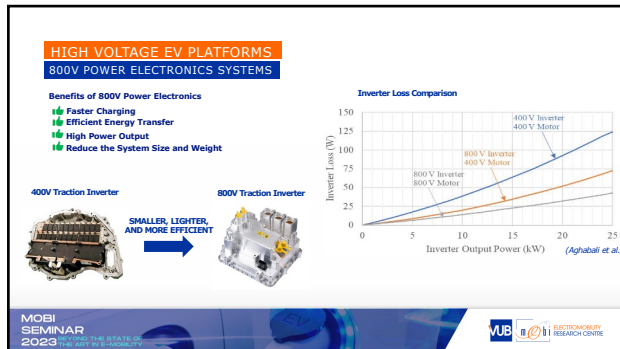
HIGH POWER 800V SYSTEMS



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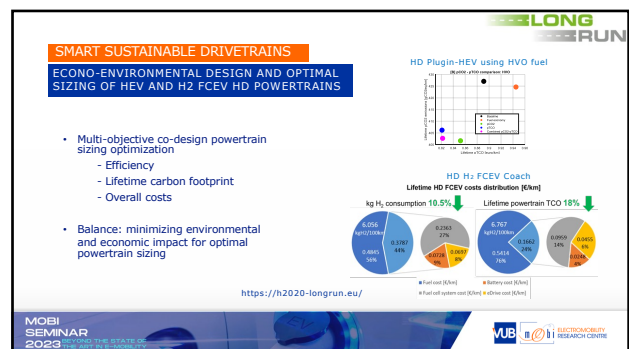
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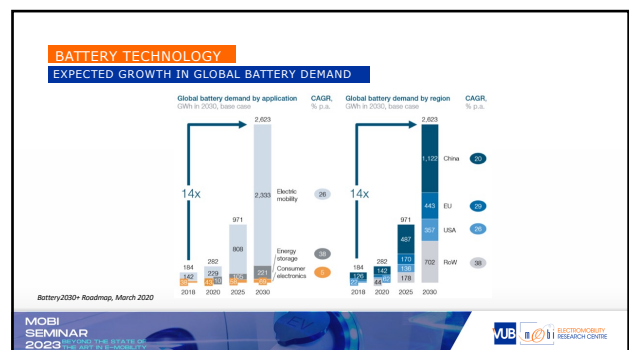
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WHAT ARE WE DOING?

RUNNING RESEARCH ACTIONS

NOVEL MATERIALS <ul style="list-style-type: none"> Solid State batteries for Mobility Applications Less Cobalt for Stationary Batteries 	LONGER LIFETIME <ul style="list-style-type: none"> Sensor Integration Self Healing Properties
FAST CHARGING <ul style="list-style-type: none"> Novel Cooling Systems Real Time Cloud Computing Smart Charging 	SECOND LIFE <ul style="list-style-type: none"> Second life battery used for industrial or commercial buildings and sites Integrate and use smartly 2nd life batteries in a grid application

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WHAT ELSE CAN WE DO?

STARTING SOON...

BATTERY MANUFACTURING <ul style="list-style-type: none"> Machinery with intelligent control processes to minimize costs, scrap and energy consumption 	SMART FUNCTIONALITIES <ul style="list-style-type: none"> Embedding sensors and self-healing functionalities to detect degradation and repair 	BATTERY 2030+ <ul style="list-style-type: none"> Inventing the sustainable batteries of the future.
BATTERY MODELLING <ul style="list-style-type: none"> Next generation batteries through the use of battery digital twins 	BATTERY TESTING <ul style="list-style-type: none"> Novel battery testing techniques to minimize the time to market 	

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BATMACHINE

Objectives:

- Develop new battery cell manufacturing machinery, with priority on minimising energy;
- Implement intelligent control processes and Industry 4.0 to enable the site integration and optimisation;
- Cost and energy optimisation of the battery manufacturing process
- Implement ecological standards in the design phase;
- Develop a horizontal integration procedure of the European supply chain for battery process equipment;
- Intensify a deeper collaboration between equipment companies, industrial-scale manufacturing, and supply chain sectors

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PHOENIX

Objectives:

- Materials with self-healing functionalities that are triggered by external stimuli
- Sensors to detect healable degradation mechanisms
- Triggering devices to activate self-healing mechanisms
- Proof of concept of coupling sensors and self-healing agents via BMS
- Detection of the critical degradation processes during cell electrochemical or chemical ageing
- Assessment of environmental sustainability
- Adaptable approach to battery cells mass production processes

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NEMO

Objectives:

- Demonstration of improved sensor signal acquisition and increased computational resources for BMS;
- Validation of improvements stemming from an automatic model update on SoC estimation
- Validation of improved lifetime modelling via advanced SoI and RUL algorithms
- Demonstration of battery lifetime extension via SoI-balancing at the cell level
- Validation of early failure detection via cell pressure and core temperature estimation under load
- Demonstrating data management performance and providing FAIR data for the research community

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THOR

Objectives:

- Develop a highly predictive performance model at cell, module and pack level;
- Develop a high-fidelity physics-based ageing model at cell, module and pack level;
- Develop a 2D model, at cell, module and pack level, capable of anticipating thermal (heat release) and toxic (gas emissions) hazards consecutive to thermal runaway of a battery;
- Build a multi-scale real-time Digital Twin at cell, module and pack scale, with a user-friendly graphical user interface;
- Generate smart design of experiments (DoE) and methodologies to support identification of the most influential parameters for each model;

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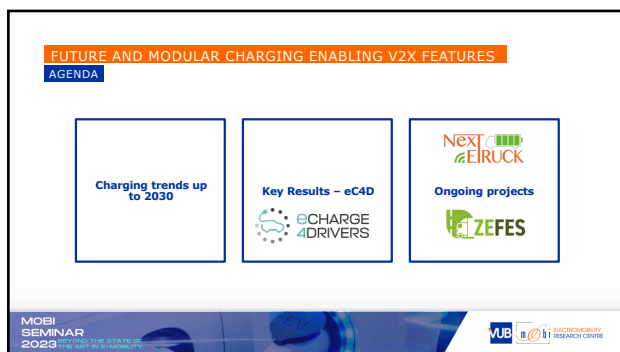
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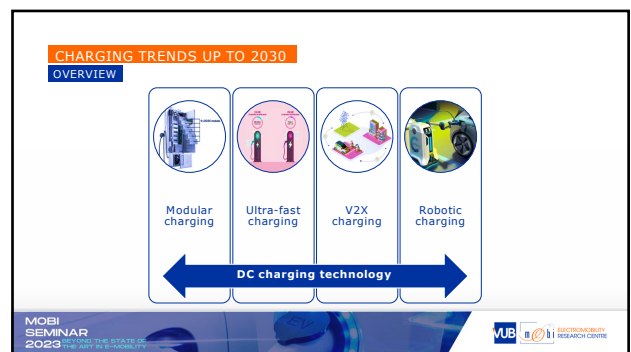
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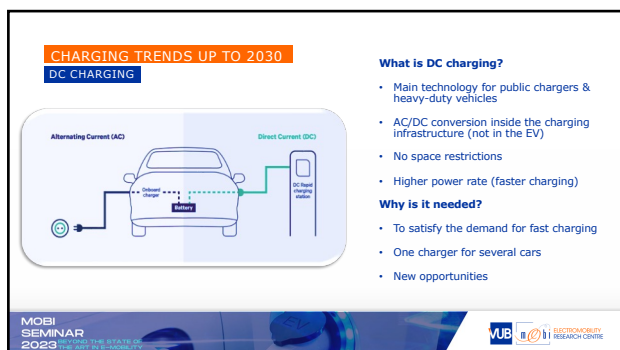
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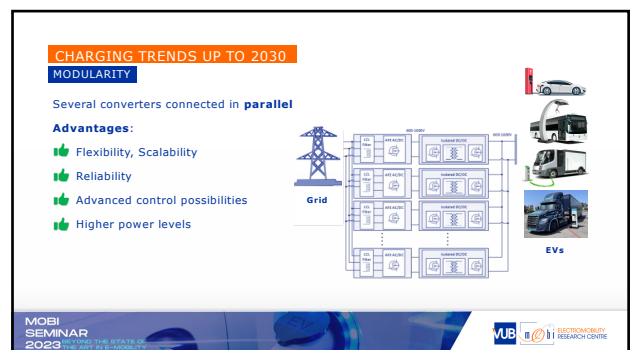
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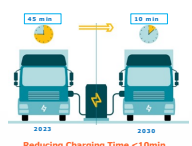


114

CHARGING TRENDS UP TO 2030

FAST CHARGING - MCS

- DC chargers are used for fast charging
- Fast chargers are modular
- Charging efficiency is critical
- High power density with WBG switches



Fast chargers > 50 kW
Ultra-fast chargers > 450 kW
Megawatt charging systems (MCS) > 1 MW

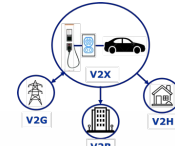
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CHARGING TRENDS UP TO 2030

VEHICLE-TO-X

- EV battery is used as a **buffer**
- Application for **home (V2H)**, **building (V2B)**, **grid (V2G)**, etc.
- Barriers** to widespread adoption:
 - Modifications in infrastructures incl. communication
 - User acceptance
 - Battery lifetime
 - Standards and regulations




- Smart charging management enabled
- Reduced TCO up to 15%
- Extra support to the grid
- Increased self-consumption

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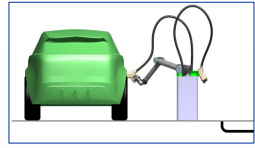
116

CHARGING TRENDS UP TO 2030

ROBOTIC CHARGING



- Novel **robotic-arm** solution for 100 kW DC-fast charge
 - Automatic human interference detection
- 97% efficiency enabled by modular SiC converters
- Intelligent control enabling up to 20% increase in lifetime
- Saving end-to-end charging process time

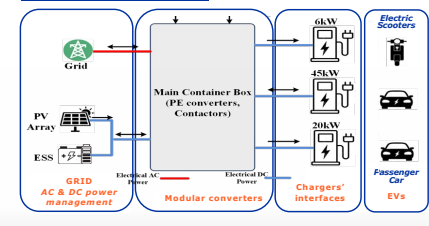


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KEY RESULTS

ECHARGE4DRIVERS - LAYOUT



- V2G technology
- Smart charging management
- Active power sharing

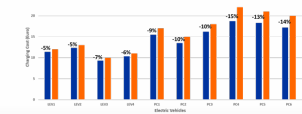
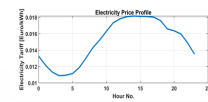
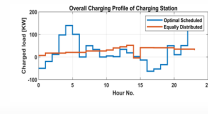
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KEY RESULTS

ECHARGE4DRIVERS - SMART CHARGING

- Electricity price as main objective
- Constraints on grid connection, battery buffer capacity, user requirements
- V2G operation when prices are high






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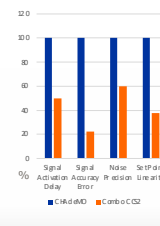
119

KEY RESULTS

ECHARGE4DRIVERS - V2G TESTING



- V2G using Combo CCS Type 2 Connector
- ISO15118.2 V2G communication protocol validated
- V2G Performance Analysis



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ONGOING PROJECTS - MCS
NEXTETRUCK & ZEFES

1 July 2022 – 31 December 2025
<https://nextetruck.eu/>

1 January 2023 – 30 June 2026

Flexible **ultra-fast charging** concepts for **electric trucks with SiC devices**

- A centralized power converter (AC/DC) **up to 1 MVA**
- **Multiple outputs** for charging multiple vehicles at the same time
- Maximum output **up to 350 kW**
- Minimized charging **time** and reduced **TCO** for the operator

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SMART CHARGING AND V2G SOLUTIONS

Dr. Cedric De Cauwer – EVERGI

VUB ELECTROMOBILITY RESEARCH CENTRE

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IMMINENT CHALLENGE
EV TRANSITION

How to go from here

to here

What is the main problem?

Many charger stations are installed in public places.

What will be the impact?

What will be the cost?

Can I organize smart charging?

Optimize energy consumption.

Self-organize charging events.

What are the challenges?

Link peak charging to demand?

With the existing infrastructure?

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WHY SMART CHARGING?
IMPACT OF CHARGING

Average daily power consumption

Power (kW)

Time of the day (h)

Office + PV
Office + PV + Etn

1. Increased consumption
2. Higher peak consumption (cf. capacity-based tariffs)
3. Self-consumption not guaranteed
4. Affects grid connection needs

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SMART CHARGING
USER ATTITUDES

- Low State-of-Charge (SoC) threshold biggest trigger (82% agreement)
- **Charging based on basis of next trip** (73% agreement)
- Routine behaviour divided (50-50% split agreement-disagreement)
- Distance to home and emergencies are most important determinants for desired SoC
- Indication of respondents' **consciousness of battery life**
- Presence of fast charger is important for about half the respondents
- High level of agreement with **financial incentives for smart charging**
- **Difficult & technical subject** to understand for drivers

N = 120

EV Type Distribution

BEV PHEV BEV-REX

90% 7% 3%

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SMART CHARGING
HOW WE ARE DOING IT

Smart charging = controlling the time and speed of (dis-)charging in a **conscious** way to achieve **objectives other than charging the vehicle**.

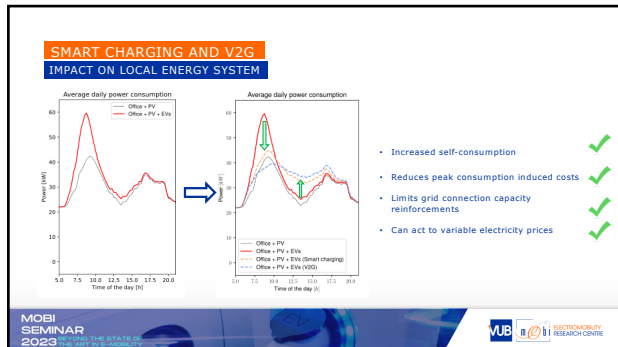
Conscious = considering:

- Charging need of **individual driver(s)**
- Local **consumption and production**
- Charging needs of the **full parking**
- **Energy cost**
- **Vehicle characteristics**
- **Predictive** Vs. reactive

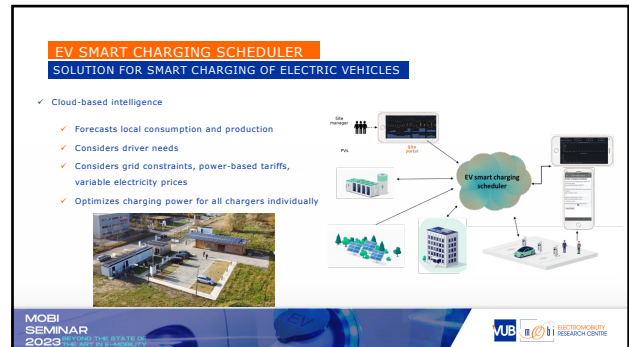
Charging model
PV & load forecast
Energy cost
Charging events
Charging power output

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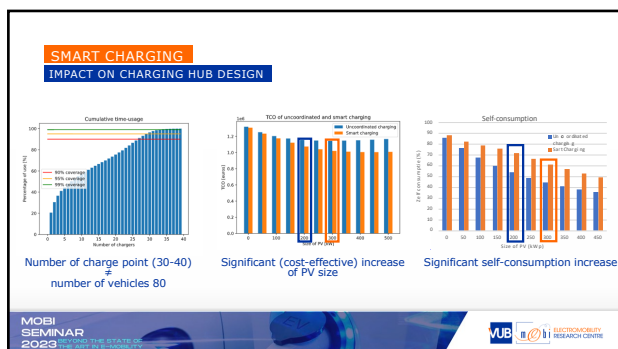
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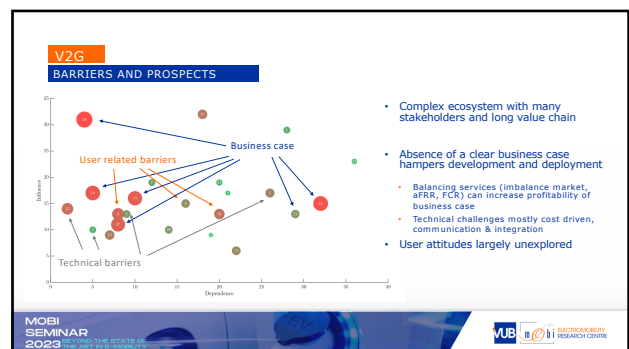
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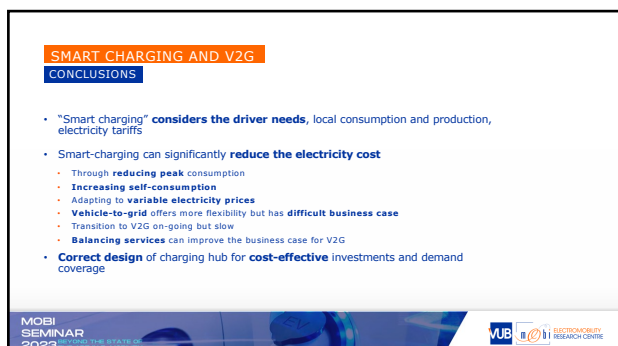
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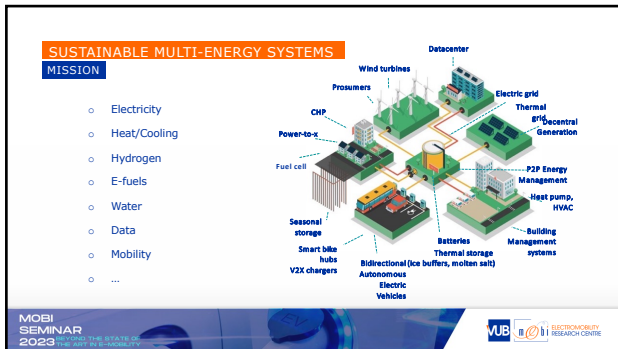
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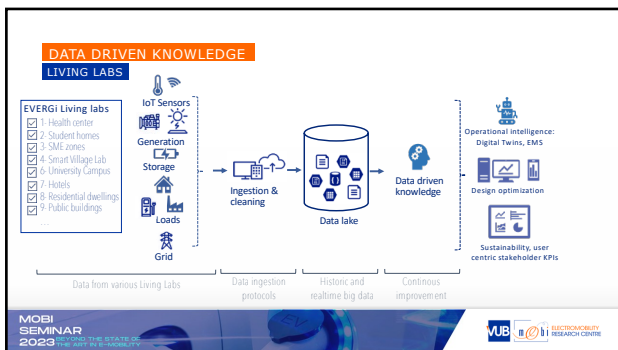
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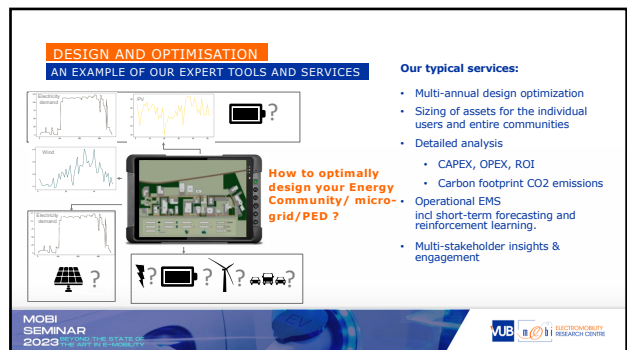
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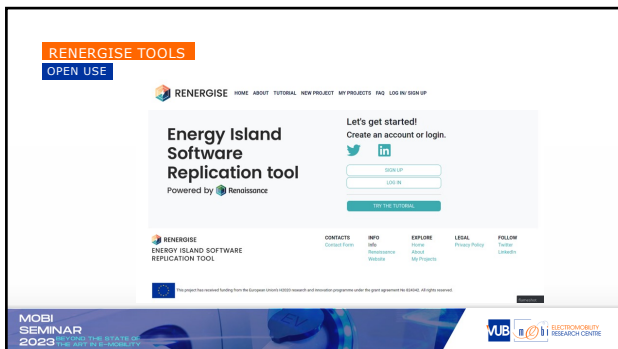
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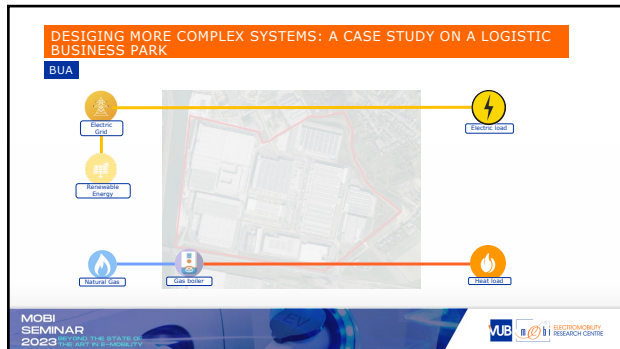
RENERGISE TOOLS

OPEN USE

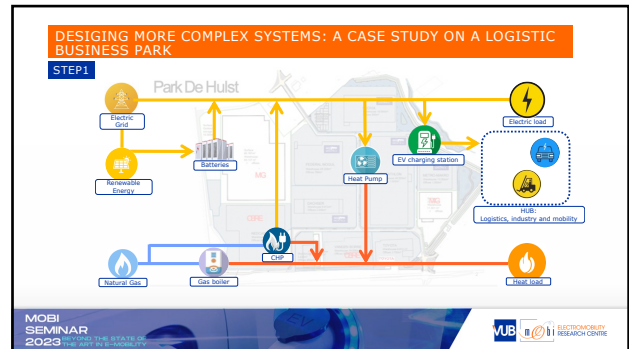
Individual buildings – current electricity prices						Individual buildings – Higher electricity prices					
MWh	kWh	kWp	kWp	% savings	% avoided	MWh	kWh	kWp	kWp	% savings	% avoided
2232	0	1607	-	23.6	34.6	2006	0	2985	-	34.1	41.2

Energy community – current electricity prices						Energy community – higher electricity prices					
MWh	kWh	kWp	kWp	% savings	% avoided	MWh	kWh	kWp	kWp	% savings	% avoided
973	0	1211	822	45.9	71.5	596	60	1820	1375	65.6	82.5

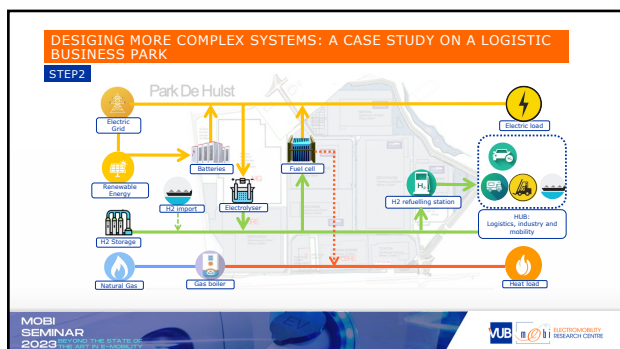
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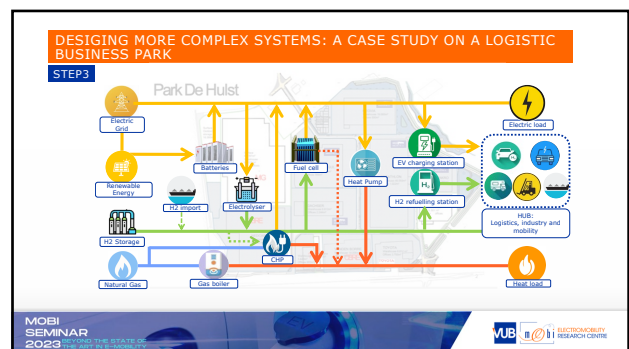
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Prof. Dr. ir. Thierry Coosemans
Director of MOBI - Electromobility research centre
EVERGI Research Team

"Sustaining the Energy Transition"

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 @MOBI Electromobility Research Centre
 mobi.research.vub.be

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THE SUSTAINABILITY OF ELECTRIC VEHICLES AND COMMUNITIES

Prof. Maarten Messagie - EVERGI

VUB ELECTROMOBILITY RESEARCH CENTRE

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WE CAN HELP YOU TO BECOME A SUSTAINABLE ORGANISATION
SUSTAINABILITY SOFTWARE PLATFORM

Analyst
Your data
Our life cycle databases

Life Cycle Sustainability Platform

Environmental
Economic
Social

Our typical sustainability services

- Micro: Products, services & processes, services
- Meso: Organizations
- Macro: Regions

> Ecodesign
> Sustainable transition pathways

Used for 15 years to guide industry

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FROM 2023 BY ELECTROMOBILITY RESEARCH CENTRE

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GOOD OR BAD TURNS ON THE PATHWAY TO NEUTRALITY
UNCOMFORTABLE QUESTIONS

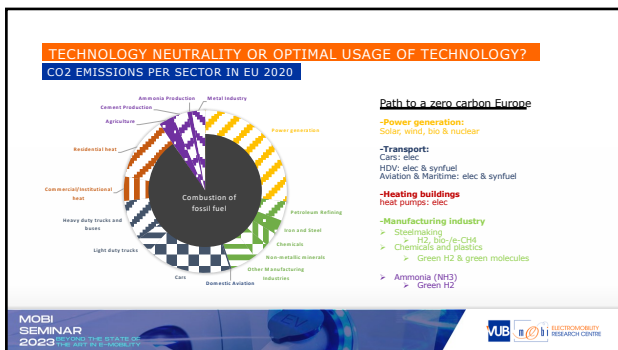
What is the systemic view on a climate neutral Europe?

Do we have enough critical materials?

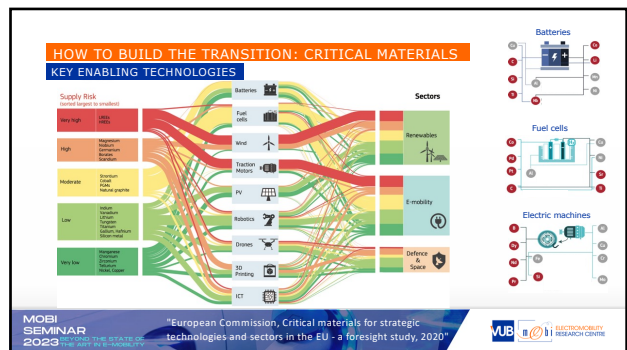
Are we shifting the burden to social impacts by trying to solve climate change?

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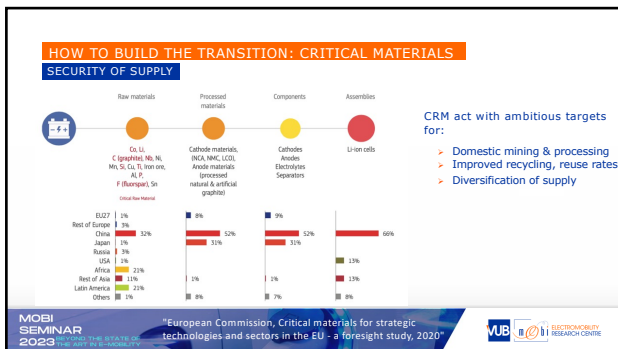
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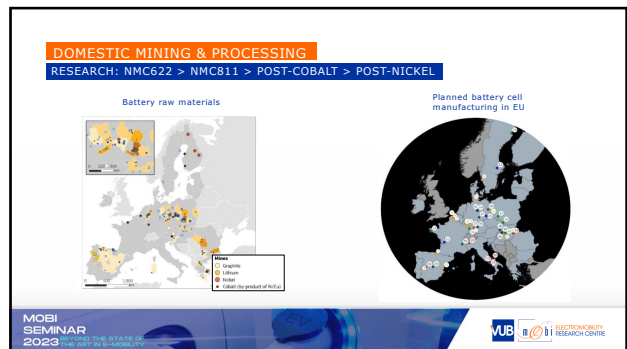
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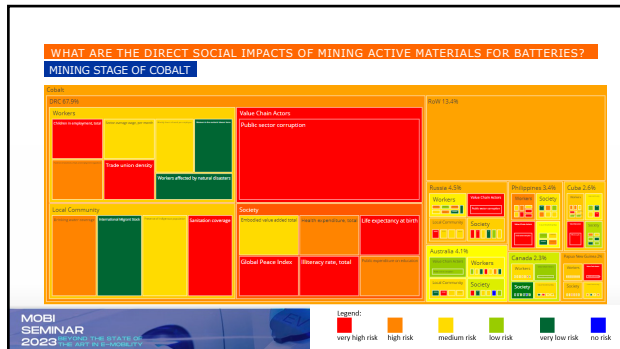
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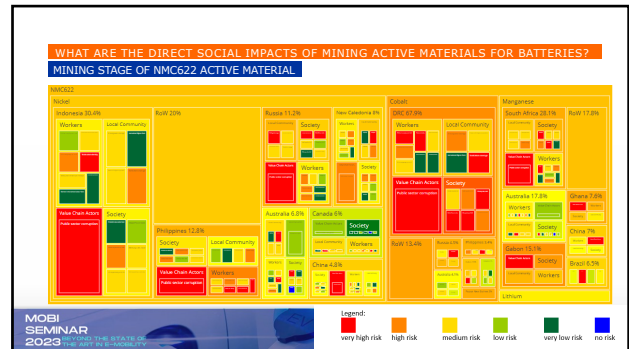
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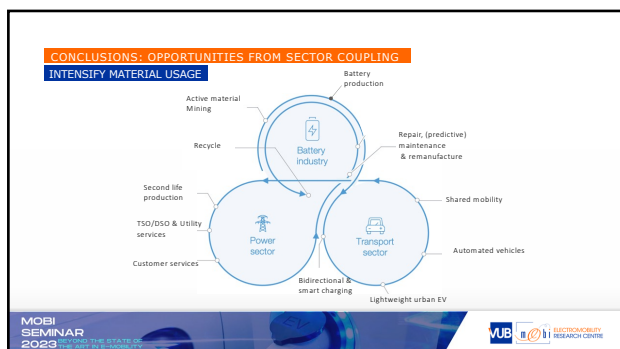
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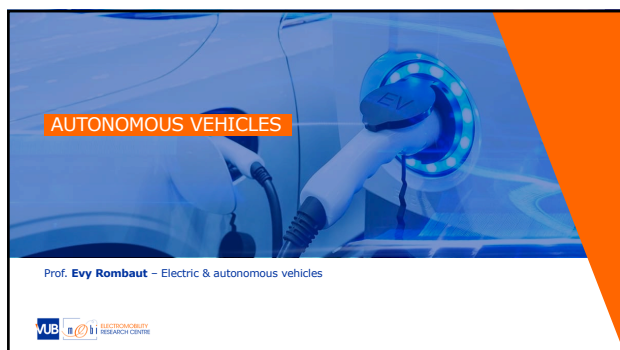
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Prof. Dr. Maarten Messagie
Director of EVERGI Research group

Sustainable transitions
maarten.messagie@vub.be
www.evergi.be

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EV/AB LAB
WHAT WE DO ?

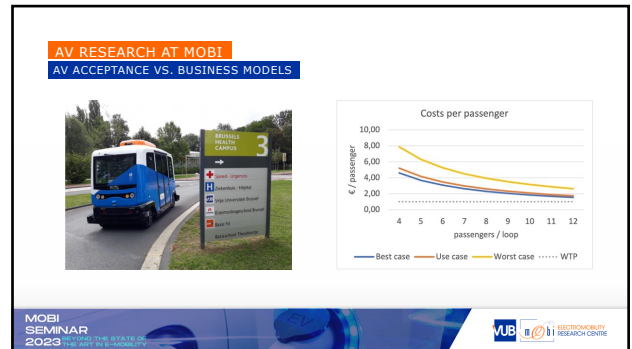
- Regional – national – international research
- European funded projects – H2020
- Advisory and project management for the e-mobility transition

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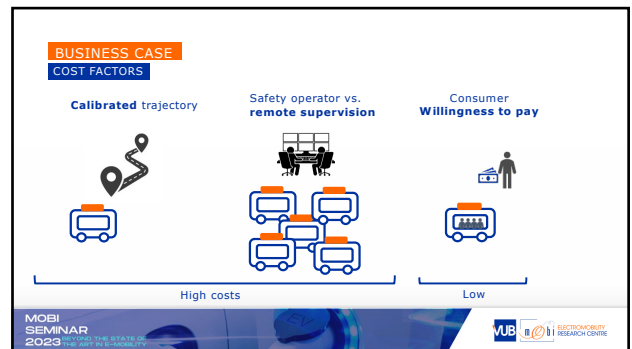
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FUTURE PERSPECTIVES
AUTONOMOUS SHUTTLES IN EUROPE

Public services
(first last/mile, robo-taxi, ...)



Private services
(industrial, tourism, ...)



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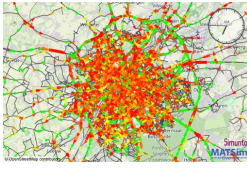
USERS VS SUPPLIER
WHERE DO THEY MEET?

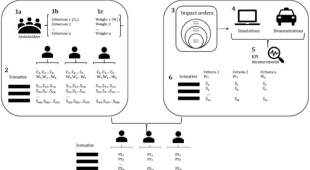
Need to have	Nice to have
Technological advancements	Increased user exposure
Substantial investments (private terrain) or subsidies (public terrain)	Awareness creation for mode shift
Mobility need	Seamless mode switch/MaaS
Inclusive booking system (elderly)	

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AV RESEARCH AT MOBI
SIMULATION MODELS AND IMPACT ASSESSMENT





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TRAFFIC MODEL FOR BRUSSELS
SAV IMPACT

- Impact of replacing **private cars** in Brussels with **shared autonomous vehicles** on congestion
- Next simulation step: combine with trips **outside Brussels** and **park and ride** facilities
 - P locations?
 - SAV strategy?



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EV/AV LAB

















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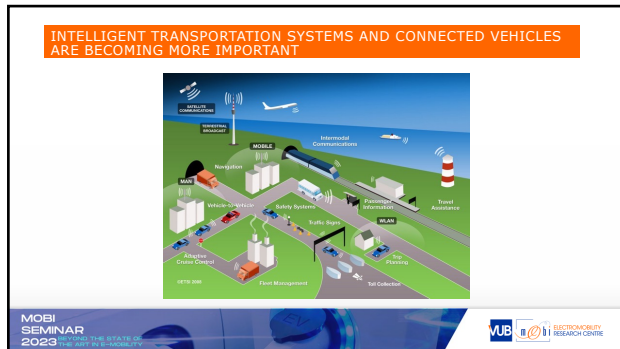
WHERE CAN LIGHT PLAY A ROLE IN EV/AV COMMUNICATION AND HOW DISRUPTIVE COULD IT BE?



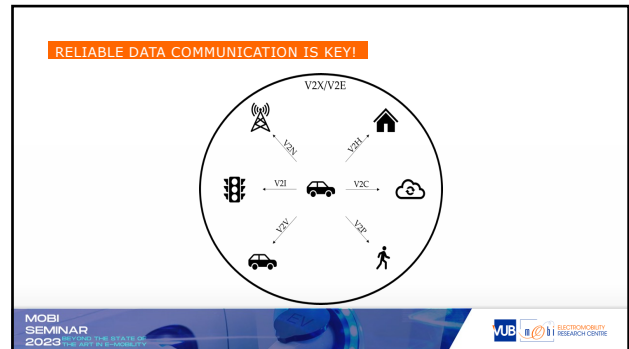
Jan Coosemans - MERLIN

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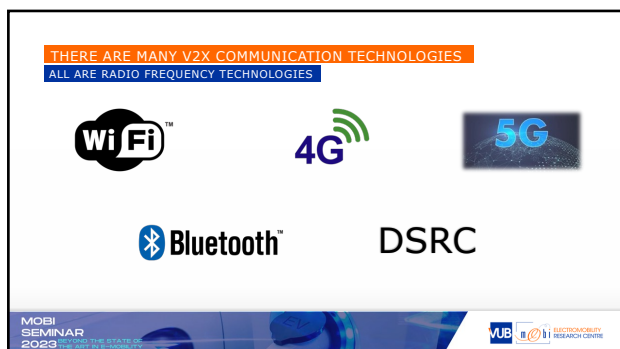
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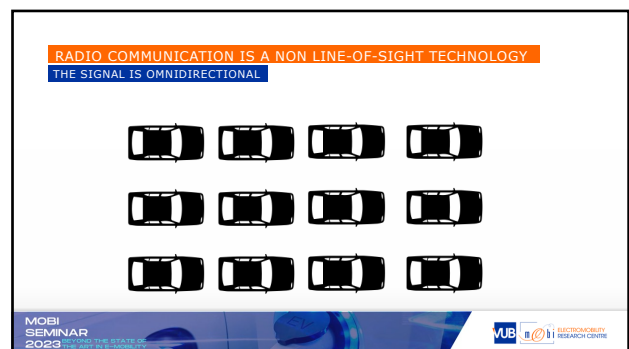
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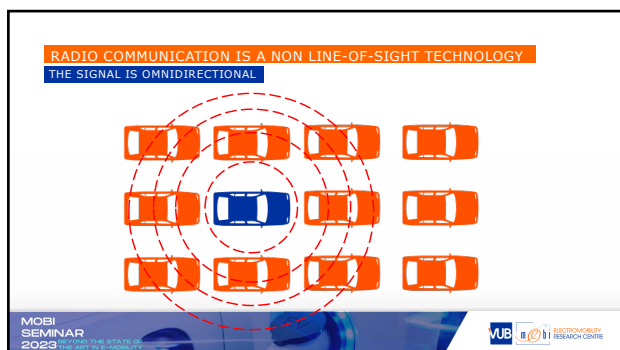
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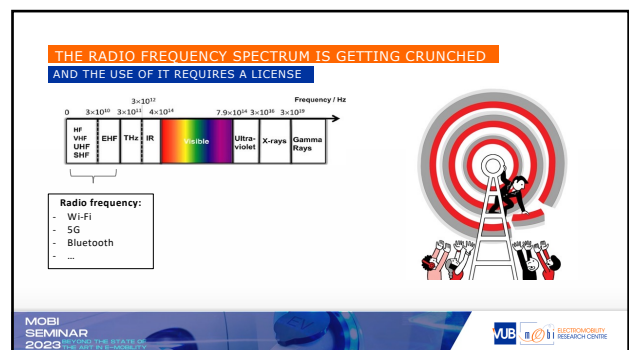
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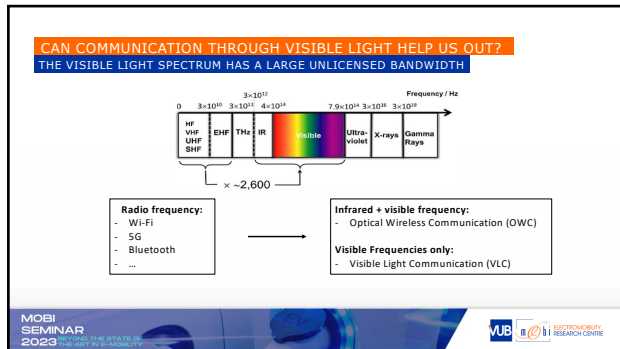
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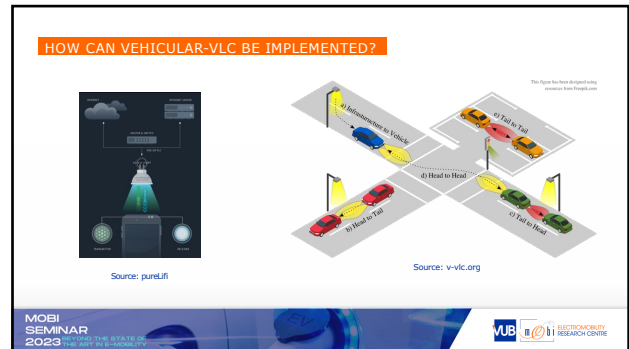
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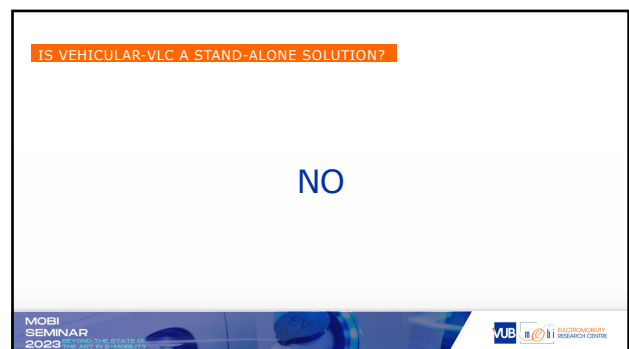
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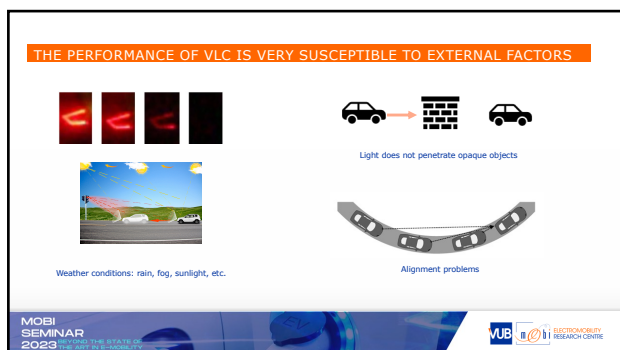
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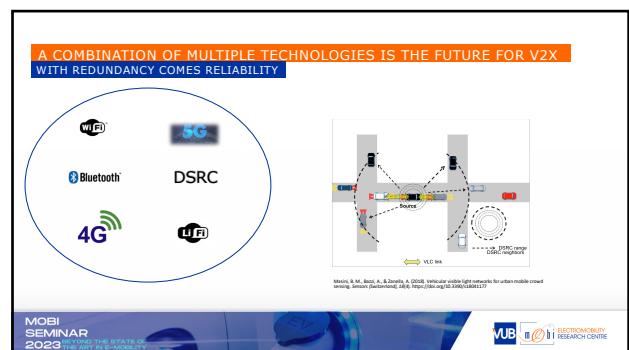
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DO WE HAVE ANY CONCRETE APPLICATIONS OF VEHICULAR VLC?
LOCATION BASED AND TRAFFIC INFORMATION

Vehicle to Vehicle Communication

Location and traffic safety info

Cibran, A.-M.; Dorian, M.; Pappa, V. Noise Adaptive Visible Light Communications Receiver for Automotive Applications: A Step Toward Self-Awareness. *Sensors* 2020, 20, 3764. <https://doi.org/10.3390/s20123764>

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DO WE HAVE ANY CONCRETE APPLICATIONS OF VEHICULAR VLC?
PLATOONING

Driving direction

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COMMUNICATION BETWEEN ELECTRIC VEHICLES AND THE GRID
LIGHT IS NOT SUSCEPTIBLE TO ELECTROMAGNETIC INTERFERENCE

Grid

V2G Unit

Electric Vehicle

Data

source: <https://www.cleartech.com/ev-charging-software-and-grid-services>

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KEY MESSAGE

Vehicular-VLC has the **potential to significantly improve** future intelligent transportation systems.

However, in most cases, it will **not be a stand-alone solution** and will require **redundant communication paths** through other V2X technologies.

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ir. **Jan Coosemans**
PhD researcher at MOBI - Electromobility research centre
MERLIN Research Team

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Mobi.research.vub.be

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THE TOTAL COST FOR LOGISTICS PROVIDERS (TCO)

Stefan Sallinger - Electric & Autonomous Vehicles
Prof. Lieselot Vanhaverbeke - Head of Electric & Autonomous Vehicles

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THE CONTEXT

TRUCKS ACCOUNT FOR NEARLY ONE THIRD OF GHG EMISSIONS FROM ROAD TRANSPORT IN THE EU

The GHG emissions of trucks can be significantly reduced if their traditional diesel combustion engines were replaced with electric engines.

Acquisition price of electric trucks is significantly higher than that of diesel trucks, due to the cost of the electric batteries.

Truck segment of road transport is particularly challenging to decarbonize due to technical and economic concerns.

28%

of emissions from road transport heavy trucks and busses

> x 3

higher purchase cost for an electric vehicle

> x 10-100

higher cost for charging infrastructure

(Remarks: Those numbers are only subject to specific configurations and situations and are used for indicative purposes only)

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Barriers for EV adoption

- Purchase price**: Significant higher investment cost with uncertain residual value
- Limited driving range and charging time**: Daily distance of min. 200km → min. battery 290 kWh; Charging time of a 290kWh battery* with a 22kW charger → >12h
- Charging infrastructure availability**: Mainly relying on own, private depot charging infrastructure today (and required investment cost).

*based on 60%

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TCO TOOL WITH A HOLISTIC APPROACH

A BRAND AGNOSTIC APPROACH TO CALCULATE ALL RELEVANT COSTS & IMPACTS

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Fig. 1: Global application of the platform to various use cases
 The calculator will be the first parameter to drive your business

1 Application (economics)

2 General parameters

3 More advanced info/parameters

4 Results Comparison TCO vs CO2

5 Battery optimisation

6 Export results to pdf & xls

Intermediary results TCO & CO2 shown in real time

VLAIO

Tool developed as part of the project VLAIO during 2022/2023*

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FUNCTIONALITIES OF THE TOOL #1/6

GENERAL PARAMETERS

Select the values for the following parameters that best correspond to your situation. Default values are proposed based on a set of common applications.

Overnight / Overload time of energy demand 0

Annual mileage (in kilometers) default 12,000

The evaluated daily electricity

Fuel cost (€/lit) default 0.15

Electricity cost (€/kWh) default 0.20

☒ Green electricity

The tool calculates the CO2 emissions based on the average of the electricity production in Germany. The average of the German average in 2019 is 484.2 g CO2/kWh. The average of the electricity production in Germany in 2019 is 484.2 g CO2/kWh.

Parameters that are generic and can be adjusted by users who have little knowledge or simply want a quick estimation of TCO and emissions impact.

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Brand-agnostic tool means:
 it all starts with the user need
 (what/ how much do I need to transport).

From this on, the vehicle size is suggested
 and default values on purchasing price and
 operational costs calculated.

Comparison between battery electric and
 diesel vehicle.

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FUNCTIONALITIES OF THE TOOL #3/6

SCENARIO PARAMETERS

Scenario Information

Scenario name: 1

Scenario description: 1

Details on vehicle usage

Vehicle type: 1

Vehicle capacity: 100

Estimated on-distance per / operating day: 70

Estimated on-distance per / operating day: 100

Type of daily operation and recharging

Type of daily operation: 1

Type of recharging: 1

Scenario description

Scenario description: 1

Scenario to be studied

Scenario to be studied: 1

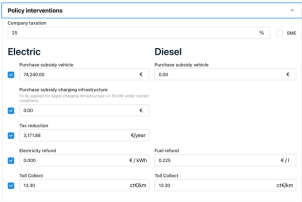
Scenario to be studied: 1

Scenario	Type of daily operation	Type of recharging	Vehicle type	Vehicle capacity
Scenario 1	1	1	1	100
Scenario 2	1	1	1	100

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FUNCTIONALITIES OF THE TOOL #4/6

POLICY INTERVENTIONS PARAMETERS



An important element in the transition are policy intervention to stimulate the purchase of an electric truck.

Possibility to simulate individually the effect of each element.

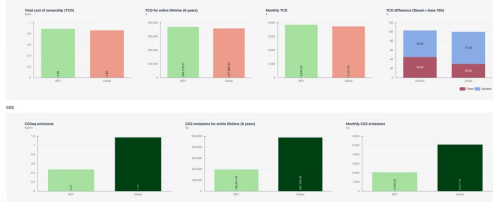
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FUNCTIONALITIES OF THE TOOL #5/6

RESULTS IN EURO AND CO2 EMISSIONS

The results are presented in charts and tables, both, for the TCO and CO2 impact calculations.



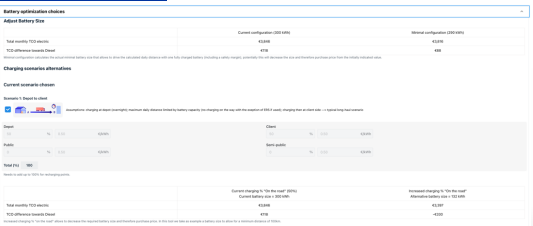
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FUNCTIONALITIES OF THE TOOL #6/6

SCENARIO'S TO OPTIMIZE

To finalize, the tool stimulates reflections on how to optimize the TCO.



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WRAP-UP



Prof. Thierry Coosemans - EVERGI

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FUN TO DRIVE AND... ☺


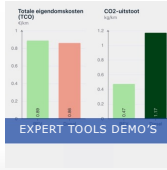



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PROGRAM

- 12.35 Lunch break, Walking Lunch, Poster presentation
- 13.30 Lab Tours
- 15.30 End

POSTER PRESENTATIONS

EXPERT TOOLS DEMO'S

LAB TOURS

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EXPERT TOOLS DEMO'S

TCO TOOL
Stefan Sallinger
Multi-purpose room

DESIGN HUB TOOL
Cedric De Cauwer
Red room

TCO & LCA
Dominik Huber
Black room

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EXPERT TOOLS DEMO'S

Design Hub test

TCO Tool

LCA & TCO Test

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LAB VISITS

Group 1 ●

Group 2 ●

Group 3 ●

Group 4 ●

Group 5 ●

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LAB VISITS

	Group 1	Group 2	Group 3	Group 4	Group 5
13u40	Pablo Lopez-Rodriguez	Jiaohong He	Michael Hassan	Ganesh Murthy	Farzad Hosseiniabadi
14u00	BIC-proto	Microgrid	EV	Microgrid	BIC-test
14u20	PERL	EV	PERL		BIC-test
14u40	BIC-test	BIC-test	BIC-test		BIC-proto
15u00	Microgrid	BIC-test	BIC-test		EV
	EV	BIC-proto			PERL

- Battery prototyping lab (BIC-proto) - Burak Dermenci
- Power Electronics Reliability Lab (PERL) - Sajith Chakraborty
- Battery Test Lab (BIC-test) - Sazzad Hosen
- DC and AC Microgrid Lab (Microgrid) - Boud Verbrugge
- Electric Vehicle powertrain Lab (EV) - Mo El Baghdadi

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