Sustainable business forum.

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THE #SWITCHTOELECTRIC

Dr. François SAVOYE - Vice President Electromobility Solution Offer

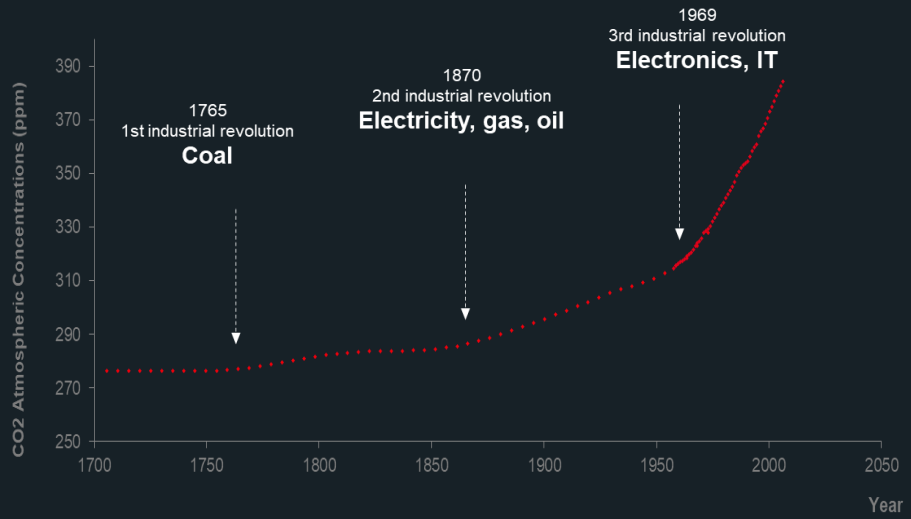
renault-trucks.com

RENAULT TRUCKS

OUR INDUSTRY CHALLENGES: GLOBAL WARMING & AIR QUALITY

Human activity

PRODUCES TOO MUCH CO_2



E.U. TO SUE 20 STATES

for repeated air pollution events

AN EUROPEAN NEW FRAME FOR CLIMATE NEUTRALITY

EU LEGISLATION: STRONG PRESSURE ON CO_2 EMISSIONS

2019

Legislation 1st step:
declaration & monitoring
From 16 T

Reference year

Unique EU CO_2 evaluation tool - VECTO

New vehicles assessed individually

2025

Legislation 2nd step:
CO_2 limit

CO_2 → -15%

Super credit for ZEV

Penalty:
€4,250 /gCO_2/t /km /vehicle

2030

Legislation 3rd step:
strengthened limit

CO_2 → -30%

Super credit for ZEV

Penalty:
€6,200 /gCO_2/t /km /vehicle

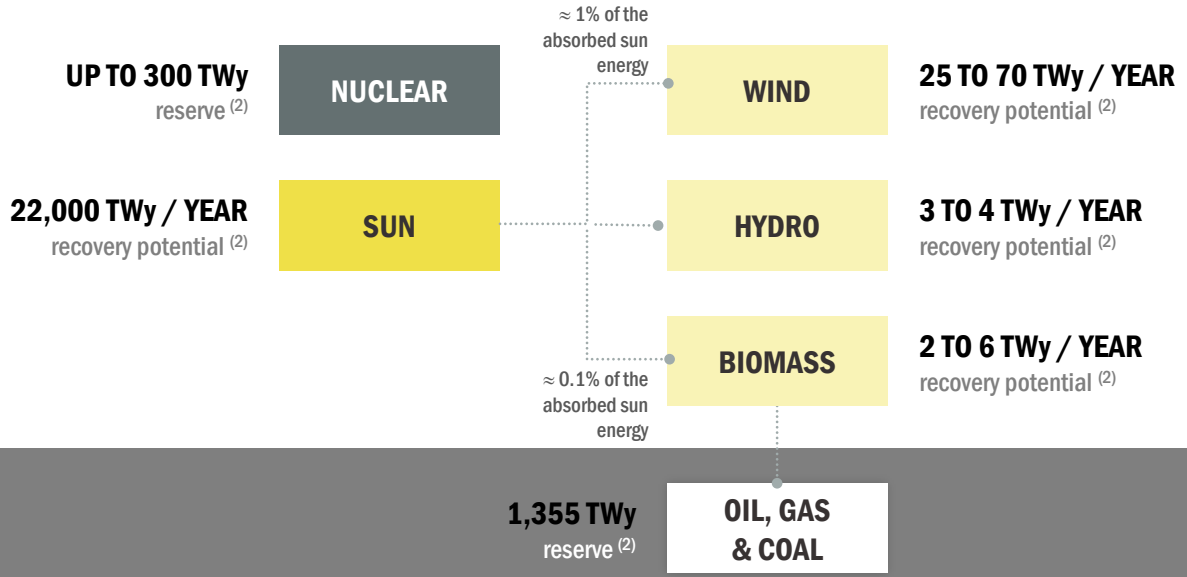
MAIN DECARBONATION OPTIONS

- Solar and wind energy potential covers more than 1,000 times today's world energy need
- Hydro and biomass energy potential is limited
- Nuclear fission energy benefits from significant uranium reserves
- There is 75 years of fossil energy reserve we won't be able to use as such

WORLD TOTAL ENERGY SUPPLY: 18 TWy / YEAR (1)

(1) 2017 value in IEA Wolrd Energy Outlook 2019

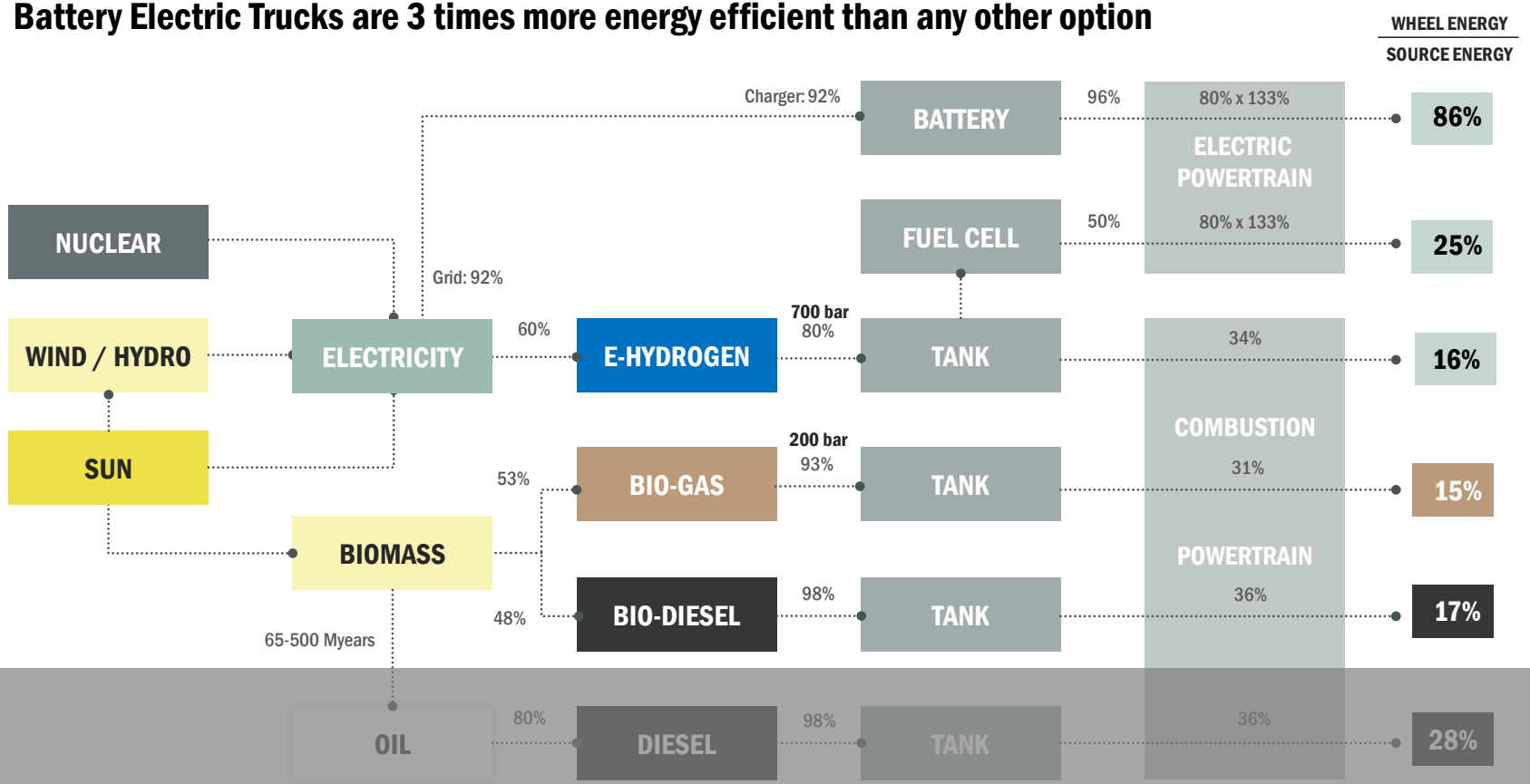
(2) Perez and al., "A fundamental look at energy reserves for the planet", International Energy Agency SHC Program, 2009



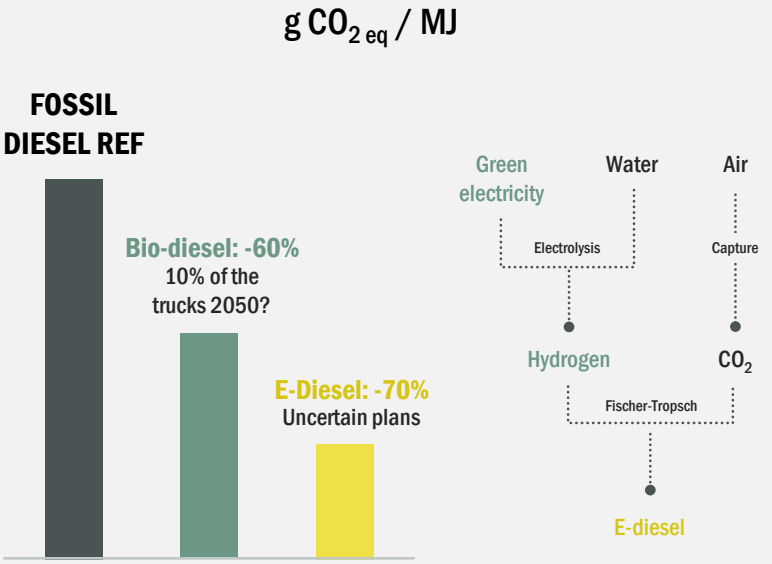
MAIN DECARBONATION OPTIONS FOR TRUCKS

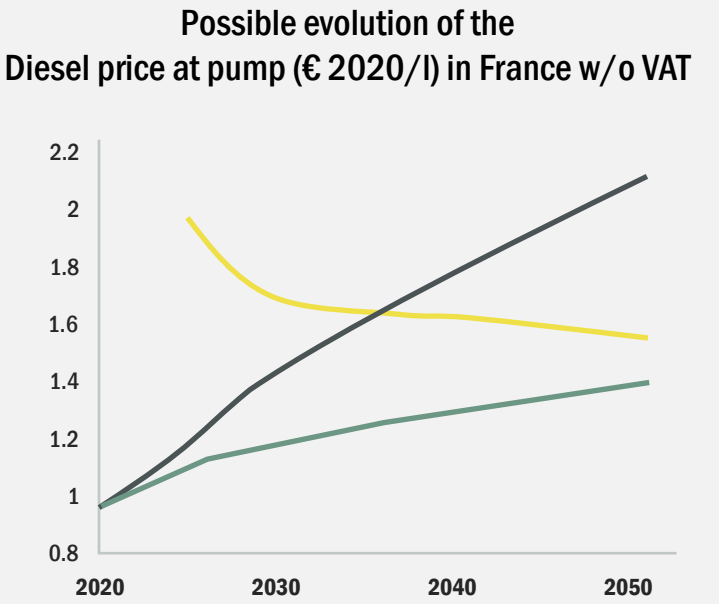
For a 16 tons urban distribution truck in 2025

Battery Electric Trucks are 3 times more energy efficient than any other option



DIESEL FOR TRUCKS - ENERGY OPTIONS



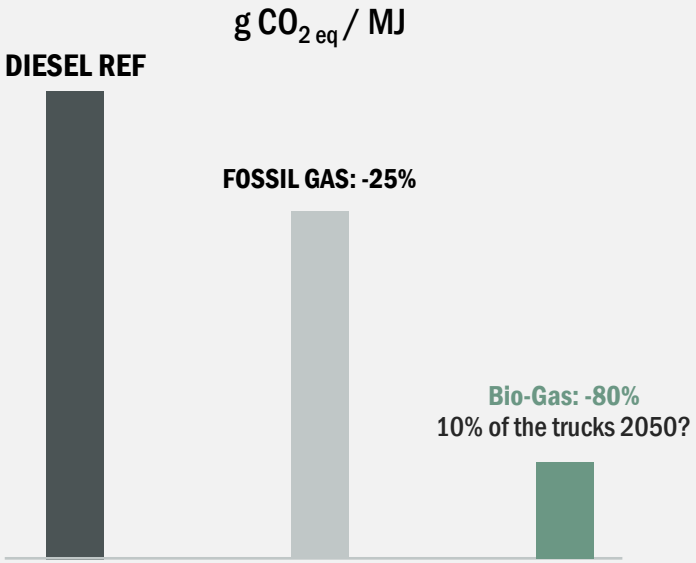


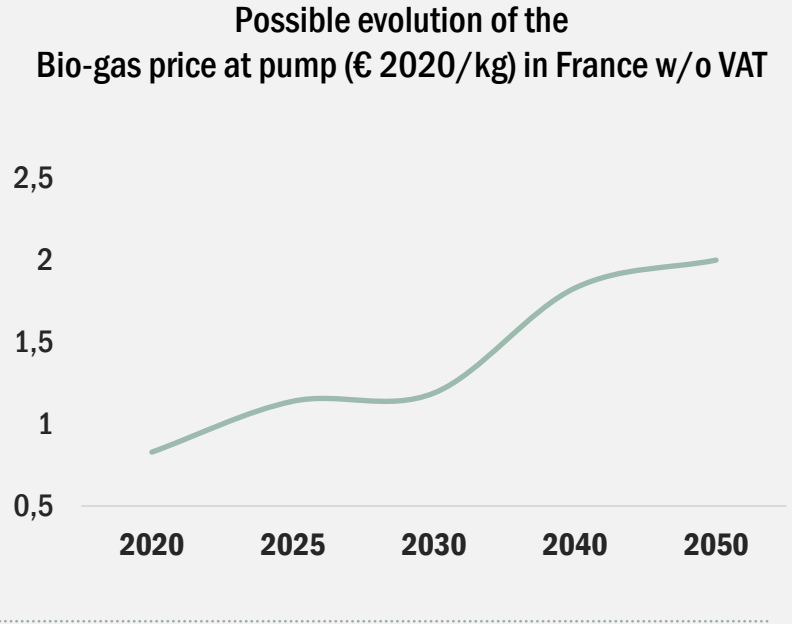
Diesel price will likely increase due to the up-coming Emission Trading System

Bio-diesel quantity is limited by the biomass quantity and the competition with the other users (food, ships, aviation....). It will likely **not feed more than 10% of the trucks in 2050**

Plans for mass production of **e-diesel are uncertain**

GAS FOR TRUCKS - ENERGY OPTIONS





Fossil gas cannot be used to reach carbon neutrality. **The French gas grid remains very carbonated,** as it contains 99.5% of fossil gas today, at least 95% in 2030

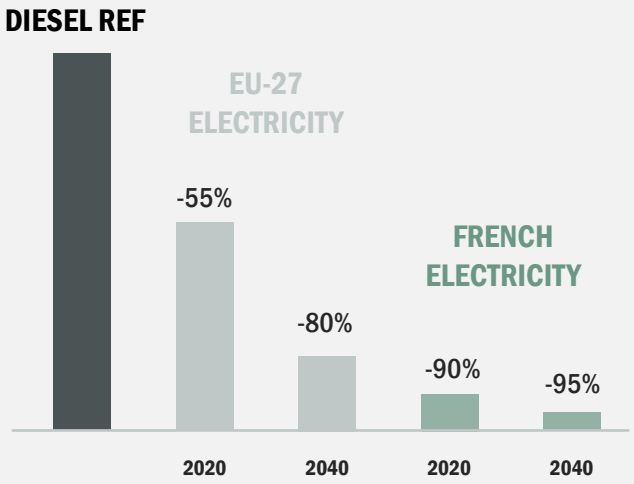
Bio-gas quantity is limited by the biomass quantity, and the competition with the other users. It will likely **not feed more than 10%of the trucks in 2050**

Bio-gas price at pump, subsidies at 50% today and not taxed, **will likely increase**

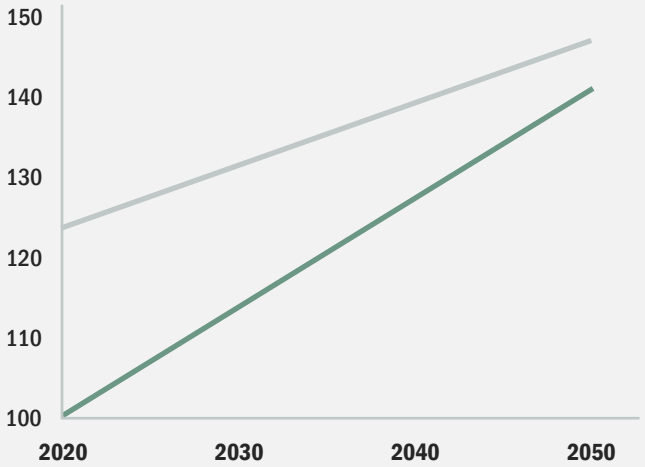
GRID ELECTRICITY FOR TRUCKS

For a 16 tons urban distribution truck in 2025

g $CO_{2\ eq}$ / km Well-to-Wheel



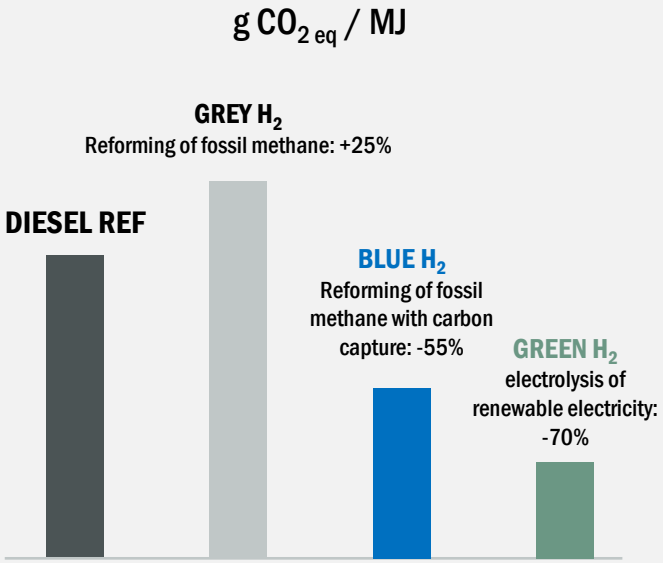
Possible evolution of the Electricity price at plug (€ 2020/kWh) w/o VAT

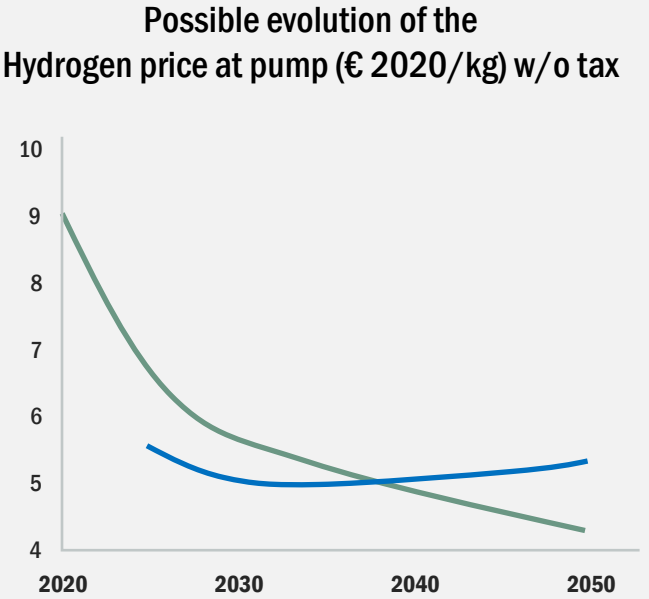


European Electricity Is getting decarbonated

Price at plug is likely to increase slightly

HYDROGEN FOR TRUCKS – ENERGY OPTIONS





Hydrogen production in Europe will remain in majority grey until next decade, and trucks will compete with the industry to get green or blue hydrogen

Hydrogen price at pump might fall down to 5 €/kg in next decade

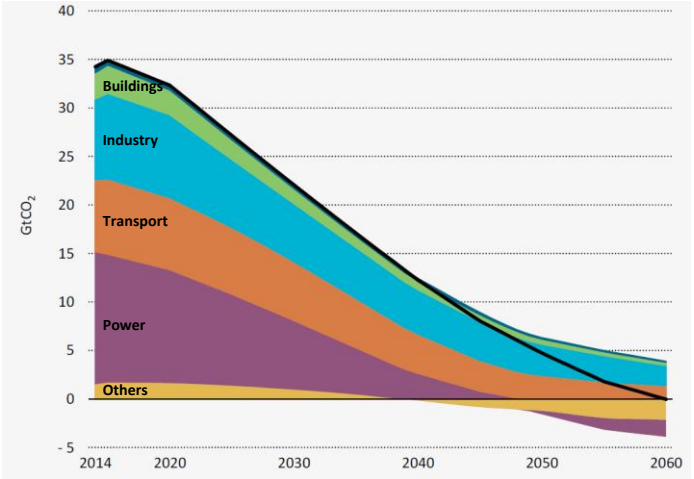
SCIENCE BASED TARGET INITIATIVE

- The worldwide Science Based Target Initiative is about **voluntary and public CO_2 emission reduction commitment** from companies towards market and investors
- The targets are said "**science based**", because they are scaled from the simulation for each industry sector done in 2017 by the International Energy Agency (IEA)
- Companies can choose the IEA 2017 "below 2°C" scenario, or the "1.5°C" scenario
- The **Volvo Group** is in the process of setting its targets to comply with the "1.5 °C" scenario
- Yearly reporting. Failure to reach targets may affect investors' and customers' perception and Volvo Group reputation

SCIENCE BASED TARGETS

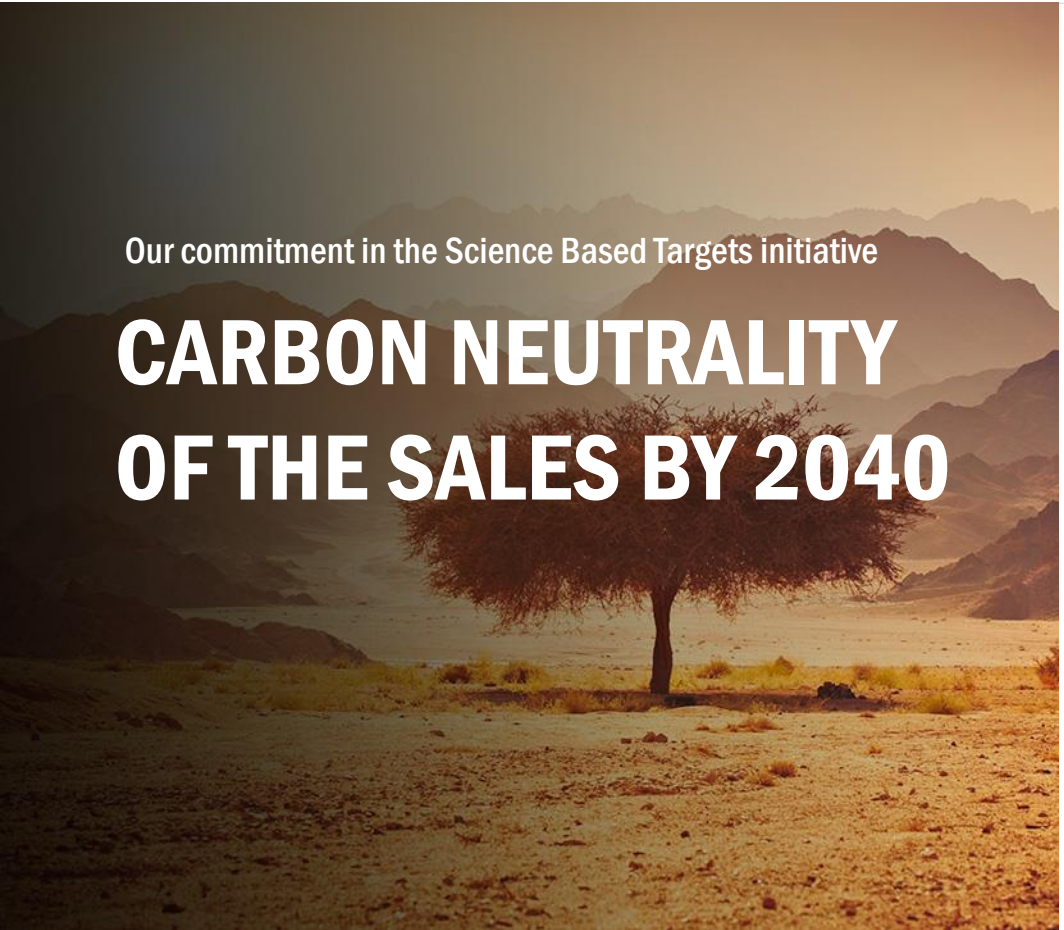
DRIVING AMBITIOUS CORPORATE CLIMATE ACTION

CDP DISCLOSURE INSIGHT ACTION · United Nations Global Compact · WORLD RESOURCES INSTITUTE · WWF

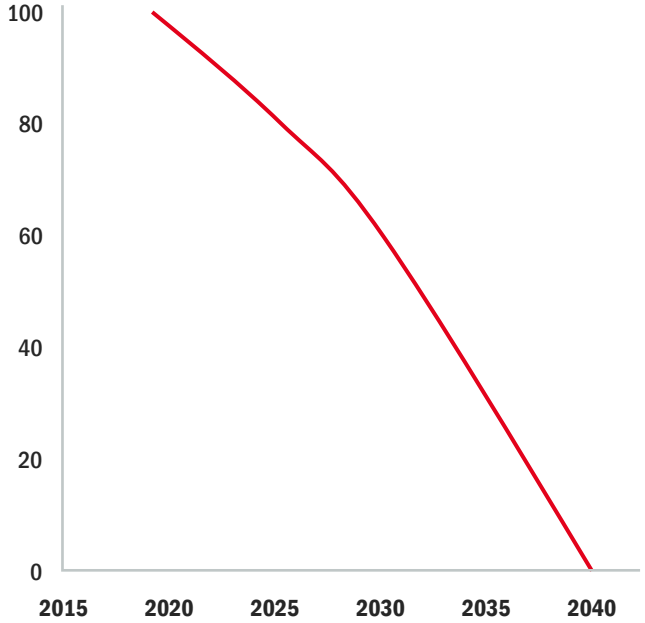


"Below 2°C" scenario, IEA, "Energy Technology Perspectives 2017"

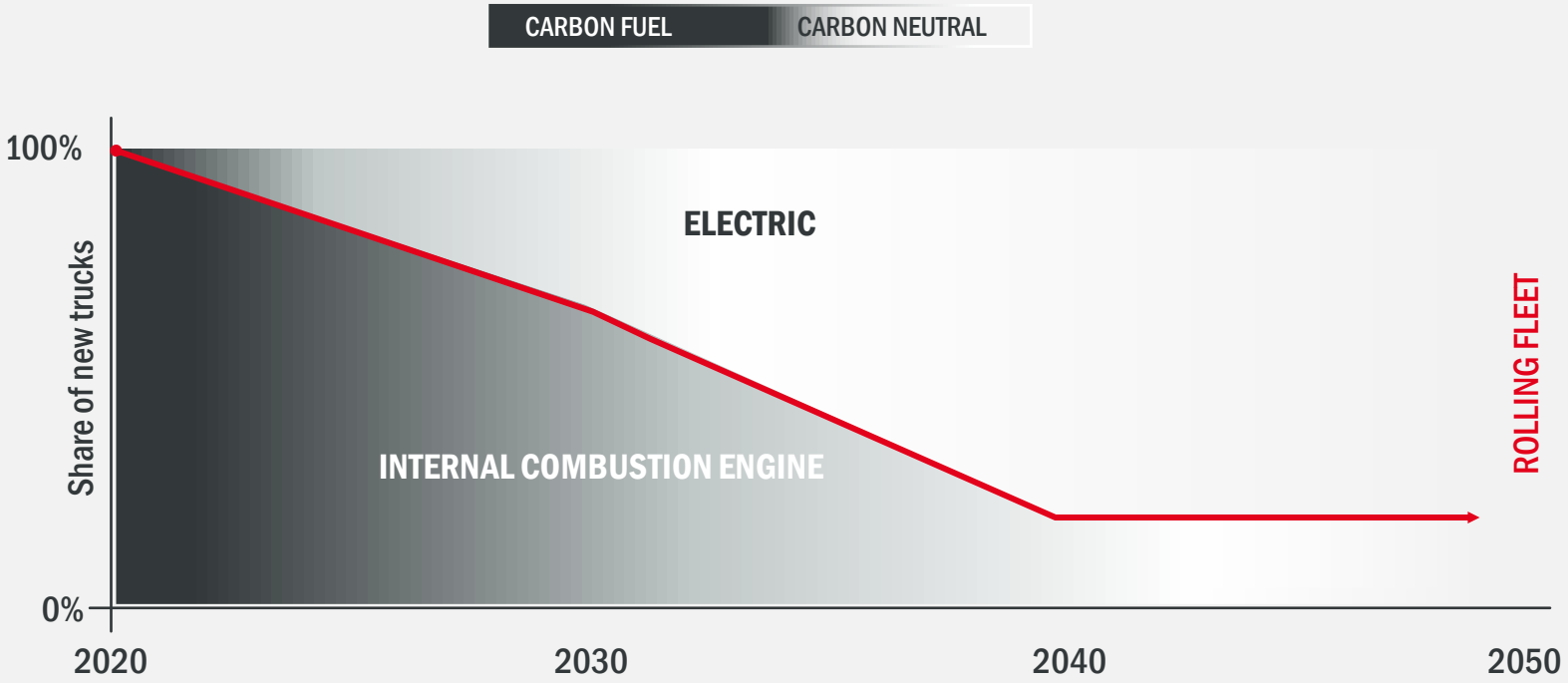
DECARBONATION URGENCY



Carbon intensity of the fleet sold each year in $kgCO_2eq/vkm$, base 100 in 2019

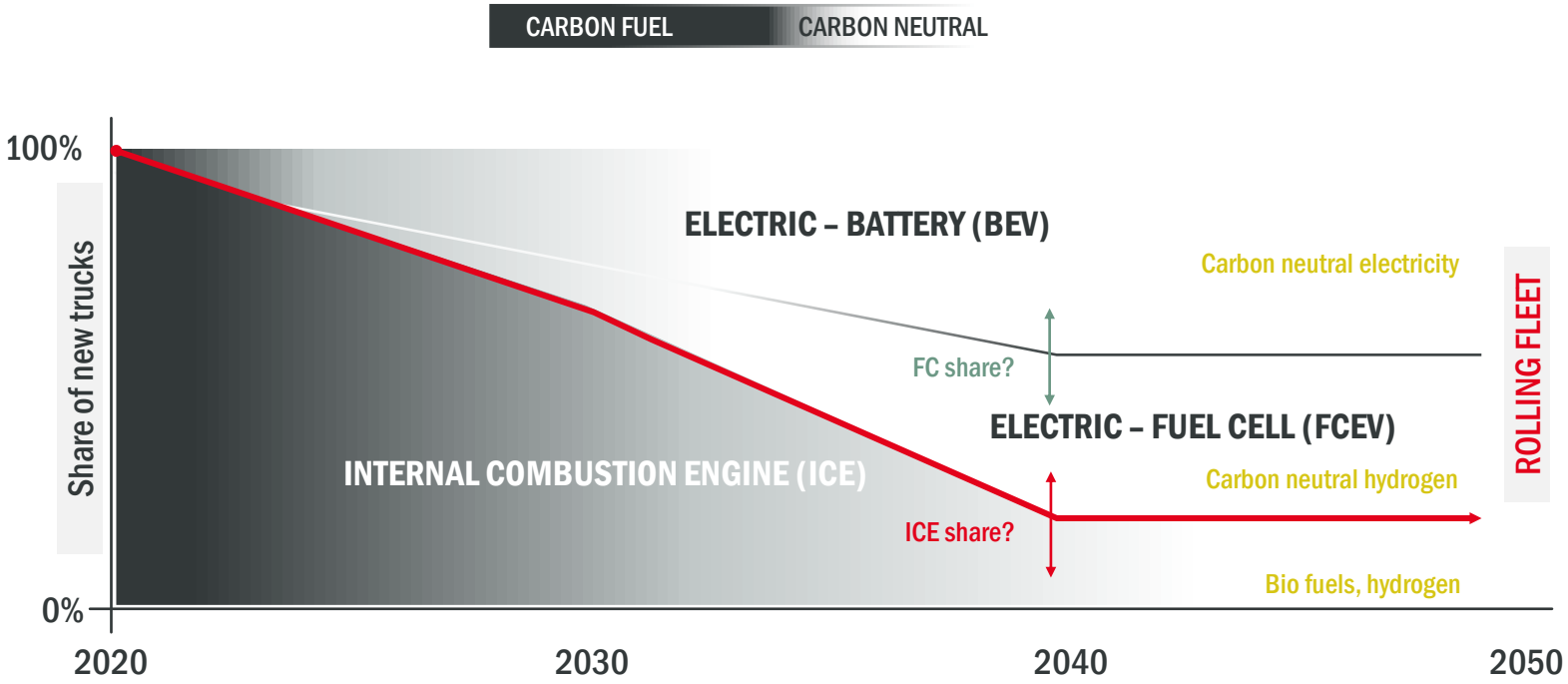


OUR STRATEGY : 100% FOSSIL FREE VEHICLES FROM 2040



OUR STRATEGY : 100% FOSSIL FREE VEHICLES FROM 2040

BEV: Battery Electric Vehicle
HEV: Hybrid Electric Vehicle
FCEV: Fuel Cell Electric Vehicle



Z.E. RANGE, CORNERSTONE OF OUR STRATEGY

For a carbon-neutral transport in 2050

10%

of electric vehicles
in 2025 sales

35%

of electric vehicles
in 2030 sales

100%

Fossil-free rolling fleet
in 2050

Paris Agreement

OUR APPROACH TO REACH AMBITIOUS TARGETS

- Close partnership with customers
- Co-construction of the right electric mobility solution adapted to customer needs and usages
- Project approach involving all stakeholders (transporter / retailer / manufacturer / public authorities)

TODAY RENAULT TRUCKS GLOBAL ELECTRIC LINE-UP

GVWR
3.1 – 26t

RANGE
up to 400km

ELECTRIC TRUCKS SALES
since 2010

MADE IN FRANCE
Batilly & Blainville-sur-Orne

A COMPLETE ELECTRIC OFFER

Vehicle

- Support from Renault Trucks people to define the best solution
- Tailor-made for productivity and uptime
- Volvo group common modular plateform
- Serial production
- Used trucks offer

Energy

- Application optimisation for range, life-length and weight
- Strategic partnerships
- Charging solutions
- Second life and recycling

Repair & Maintenance

- Service network density 24/7
- Listening and availability of Renault Trucks people
- Service and uptime contracts
- Connected solutions
- Trained and experienced staff

Financing & Insurance

- Purchasing, rental, financing for the vehicle and the infrastructures
- Customer knowledge

EQUIPMENT AS A SERVICE

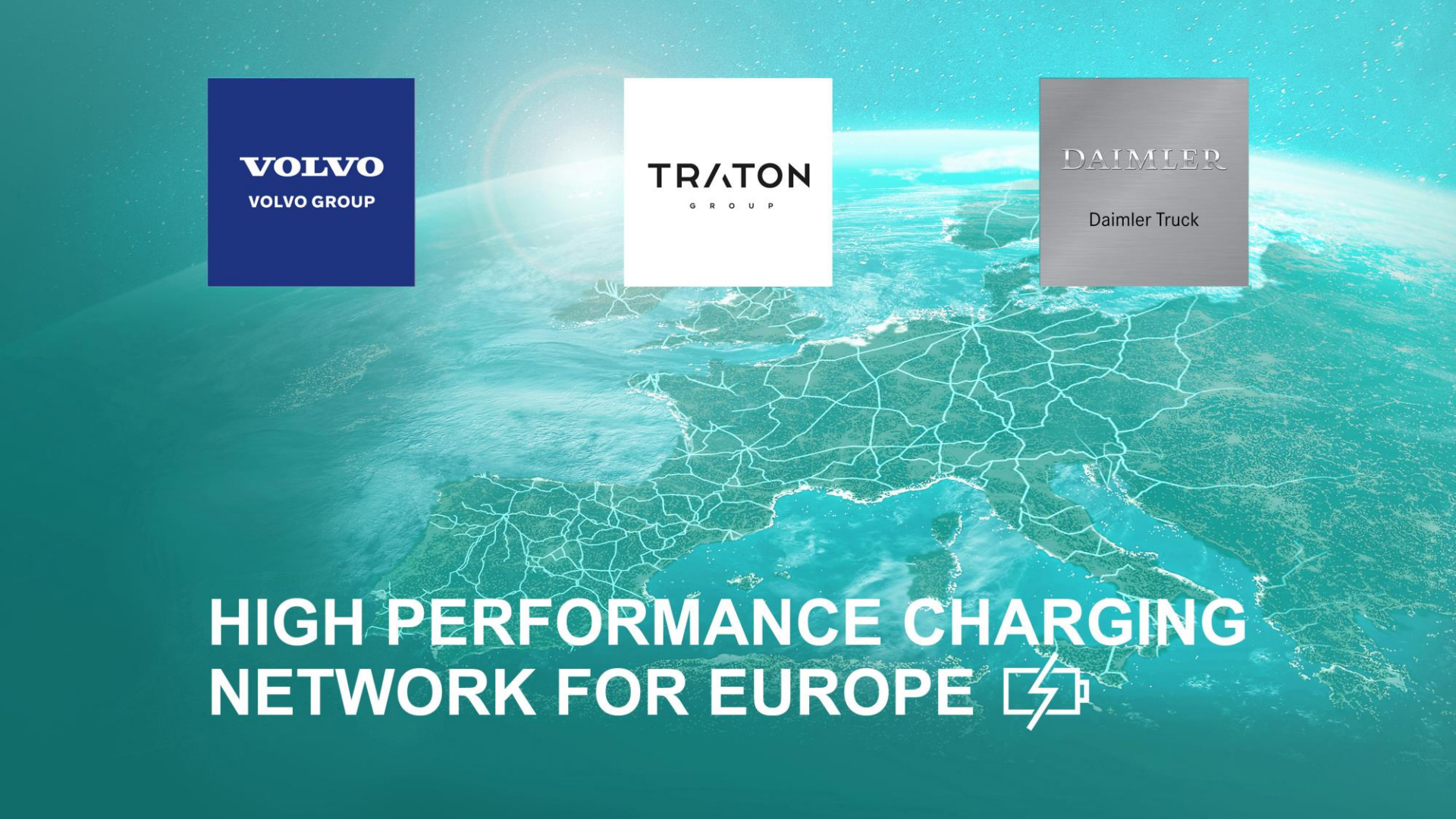
- ✔ Uptime
- ✔ Cost/km
- ✔ Safe
- ✔ Productive
- ✔ CO_2 free
- ✔ Peace of mind

PARTNERSHIPS FOR A CO_2-NEUTRAL TRANSPORTATION

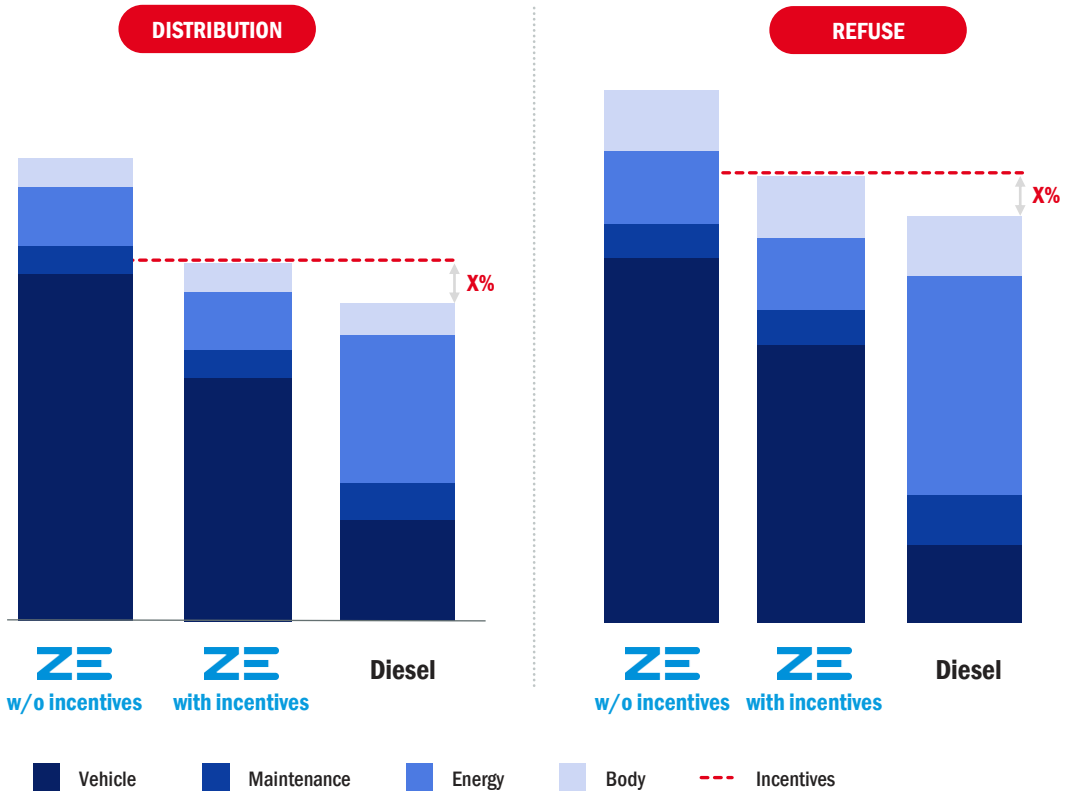
VOLVO GROUP	DAIMLER	SAMSUNG	ISUZU	RENAULT
VOLVO ENERGY	FUEL CELLS	BATTERIES	URBAN MOBILITY	

✓ Technology leadership

✓ Economy of scale


VOLVO
VOLVO GROUP
TRATON
GROUP
DAIMLER
Daimler Truck
HIGH PERFORMANCE CHARGING
NETWORK FOR EUROPE

TCO DISTRIBUTION & REFUSE (EXAMPLE)



KEY TAKE AWAYS

TRANSITION HAS STARTED, AND WILL ACCELERATE

AN OPPORTUNITY FOR THE SOCIETY

PARTNERSHIP IS THE NEW LEADERSHIP

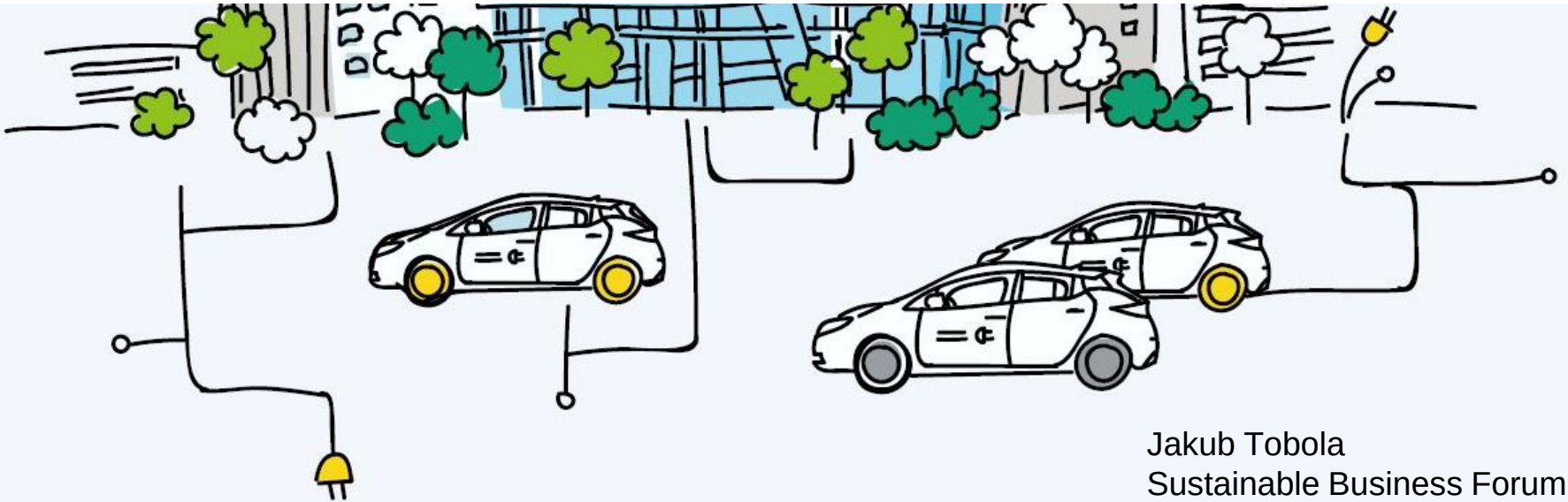
THANK YOU

renault-trucks.com

RENAULT TRUCKS

Electric mobility challenge

by Veolia

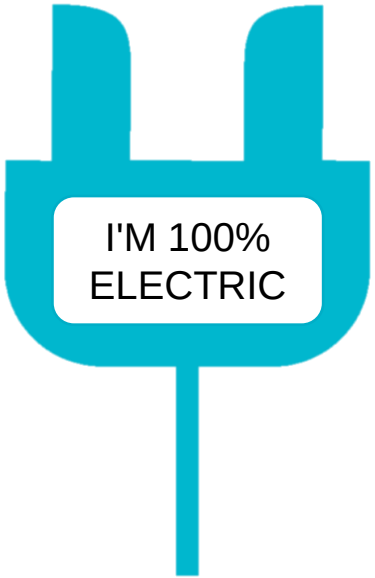


Jakub Tobola
Sustainable Business Forum

Electromobility: facts and figures

01 The **electric car market is booming**: in 2018, the global fleet exceeded 5.1 million vehicles and is expected to reach 130 million by 2030.

02 This trend stems from the desire to reduce diesel and petrol cars in favour of more environmentally friendly electric cars.



03 The number of electric vehicles in the Czech Republic is growing - currently over 2,200 (a 66% year-on-year increase).

04 100,000 electric vehicles are expected to drive on Czech roads by 2025.

Electric vehicle recharging stations only have growth potential!

Our offer of electric vehicle recharging stations

- from Fast charge station (50 kW minimum) till to Wallboxe
- support for the ecological form of transport
- improving the air in the city
- stations for all types of objects
- timeless design

Case Study – Retail park Bucharova

The smart shopping center was opened at the end of 2018 in Prague 13.

Our photovoltaic power plant on the roof of the entire shopping center covers about one third of the electricity needs. In case of surplus, the electricity accumulates in the 150KW battery storage and can be used later. The entire system is controlled by an intelligent unit that controls energy flows according to capacity and price.

As part of our solution, we have further designed and implemented a local distribution networks (LDN) - a transformer station, and an intelligent electric vehicle charging station (50+22 kW), which is controlled by the free capacity of the LDN system.

Good Practice – Circular economy for electric vehicle batteries

Groupe Renault, Veolia and Solvay have teamed up to create a circular economy for electric vehicle battery materials in Europe.

Groupe Renault brings its experience in the circular economy and battery life cycle management.

Solvay its experience in chemistry and metals extraction

Veolia its 10 years of experience in dismantling and recycling lithium-ion batteries via a hydrometallurgical process.

In a closed circuit, strategic materials will be extracted and transformed into high purity materials to be reused in new batteries.

A COMPANY OF ENGIE

EQUANS
EMPOWERING TRANSITIONS

E-mobility Infrastructure

EQUANS – a specialist in multi technical services present in 17 countries

EQUANS CZ - a key player in Electrical Installation and Technical FM

Provide innovative and reliable solutions to customers and create long term value.

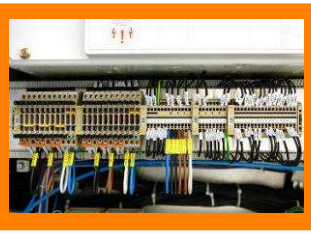
Electrical installation HV

- 110/22kV substations
- Cable networks including cable fixtures up to 110 kV
- Manufacturing of concrete transformer stations
- 180 employees



Electrical installation LV

- Low voltage installations for Utilities, Industry and Building
- Industrial automation and BMS
- LV Switchboard production
- 100 employees

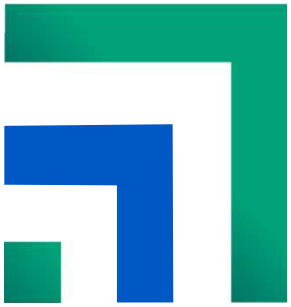



TFM

- Complex technical facility management for industry, retail, logistics and office parks
- 220 employees


Note: additional 80 employees in shared support functions

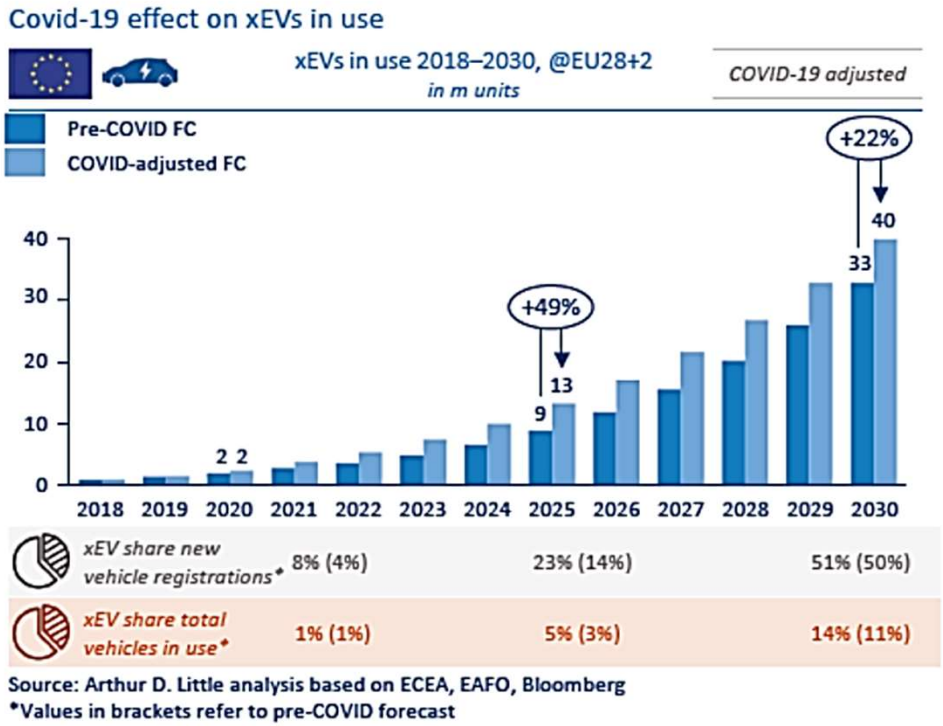
EV infrastructure challenges



Key messages

- E- mobility is growing **fast**
- To charge many vehicles and/or to charge fast **need for strong infrastructure**
- This might be complex and needs to be **anticipated**

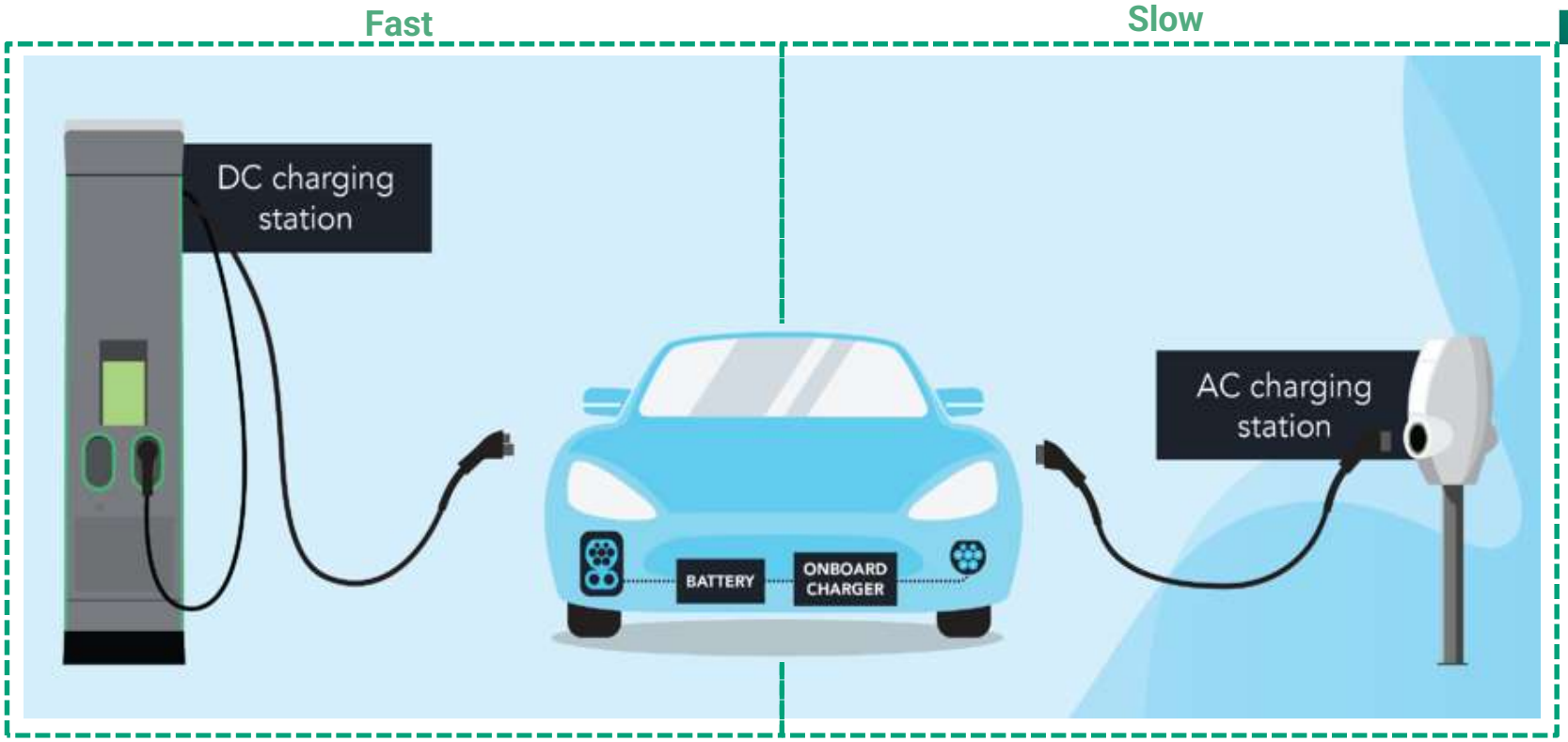
EV Market facts & figures



Source: Arthur D. Little analysis based on ECEA, EAFO, Bloomberg
*Values in brackets refer to pre-COVID forecast

First take-away:
There will be more and more cars that need electrical power.

AC vs. DC Charging



EQUANS

Charging technologies

Standard charge

7-22kW

WallBox

AC 7 / 22kW

Access

AC 7 / 22kW

Fast charge

50kW

QuickCharger

AC 43kW
DC 50kW

Satellite

AC 43kW
DC 50kW

High power charge

modular 50kW – 350kW

Power Unit

DC 175kW

Satellite High Power

DC 175kW

Satellite HP Cooled

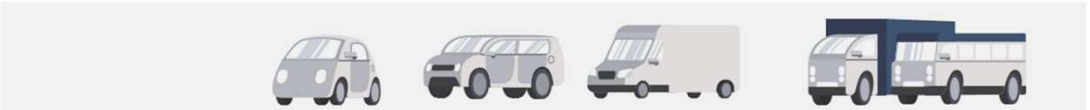
DC 350kW

EQUANS

Charging time with fast chargers

With a wall box (~11kW) charging time counts in hours

That is 475 horse powers



TYPE OF EV	CITY EV	LARGE EV	CARGO VAN	TRUCK AND BUSSES	
Average battery size	50 kWh	100 kWh	75 kWh	200 kWh	300 kWh
Power output per charging port	Average time to charge the battery from 20% to 80% SoC*				
50 kW	53 min	1 h 48 min	1 h 20 min	3 h 35 min	5 h 23 min
90 kW	30 min	1 h	45 min	2 h	3 h
120 kW	22 min	44 min	33 min	1 h 30 min	2 h 14 min
150 kW	18 min	36 min	27 min	1 h 12 min	1 h 48 min
180 kW	15 min	30 min	22 min	1 h	1 h 30 min
210 kW	12 min	24 min	19 min	51 min	1 h 16 min
240 kW	11 min	22 min	16 min	44 min	1 h 7 min
270 kW	9 min	19 min	14 min	39 min	59 min
300 kW	8 min	17 min	13 min	35 min	53 min
330 kW	8 min	16 min	12 min	32 min	48 min
350 kW	7 min	15 min	11 min	30 min	46 min

*For illustrative purposes only and does not reflect actual charging times

Charging time under 1 hour Charging time under 30 min Charging time under 15 min

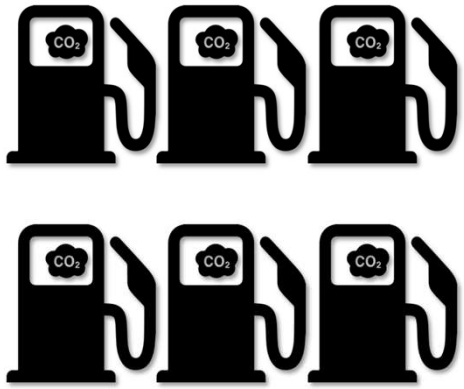
Second take-away: To charge fast (or a lot of vehicles) you need massive power.

EQUANS

Paradigm shift

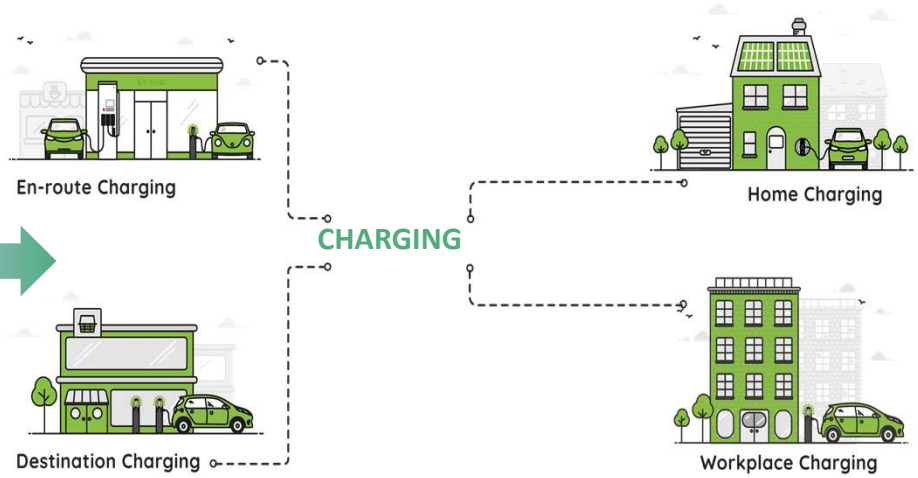
Old habit

From *detouring* to the petrol station...

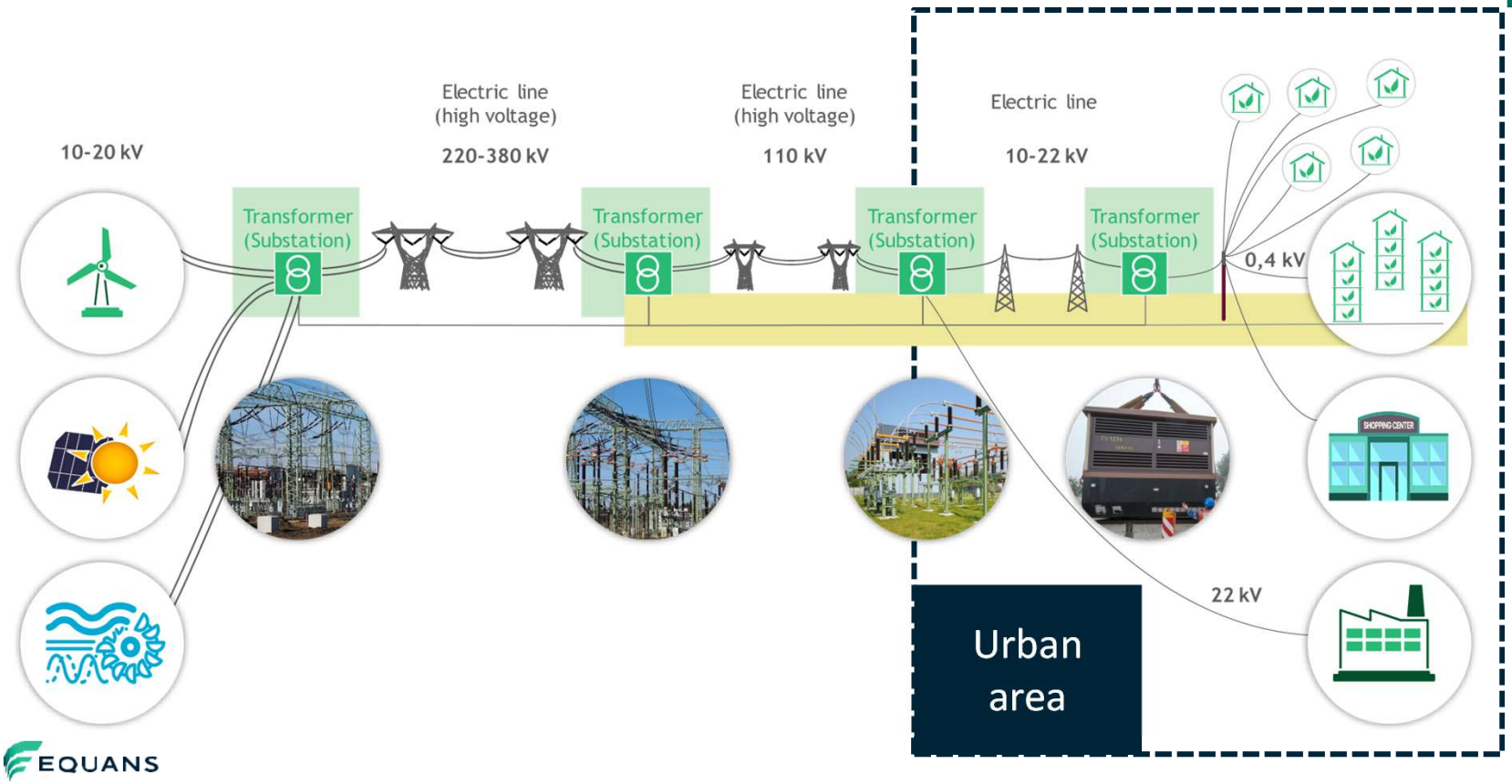


New habit

...to charging wherever to park.



Electrical grid



EQUANS

Example

- Logistics company looking for 1 fast charger (150kW) and 10 slow (11kW)
  - Power needed (assumption everything needs to run at the same time)
    - **1x150 + 10x11 =260kW**
    - 22/0,4kV transformer in your neighborhood usually deliver 630kVA (~kW) but should run at 60-70% of their max => **500kW**
    - There will not be enough free capacity, as neighbors may have the same need

    ⇨ Install 22/0,4kV transformer on purpose (can be built by the distribution company). Need for:
      - Design
      - Permitting
      - Third party authorizations (to lay the cable across land, roads, ….)
      - Agreement with grid operator

Third take-away:
It can be complex, sometimes bureaucratic and it takes time.

Conclusion

- The trend is here
- To electrify your operations there will be a significant need for electrical power
- In order to be ready start now:
  - Analyze the need / utilization
  - Look at the available current infrastructure vs. what will be needed in the future
  - Build the plan

Contact

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SCHNEIDER ELECTRIC

ELECTROMOBILITY

CHARGING INFRASTRUCTURE

MICROGRID

MICROGRID Olomouc

Contact: Martin Kavan, tel. 602 359 025

martin.kavan@eternalelectric.cz

SCHNEIDER ELECTRIC

Schneider Electric is leading the Digital Transformation of Energy Management and Automation in:

- Homes
- Buildings
- Data Centers
- Infrastructure
- Industries

With global presence in over 100 countries, Schneider is the undisputable leader in Power Management – Medium Voltage, Low Voltage and Secure Power, and in Automation Systems. We provide integrated efficiency solutions, combining energy, automation and software.

In our global Ecosystem, we collaborate with the largest Partner, Integrator and Developer Community on our Open Platform to deliver real-time control and operational efficiency.

We believe that great people and partners make Schneider a great company and that our commitment to Innovation, Diversity and Sustainability ensures that Life Is On everywhere, for everyone and at every moment.

https://www.se.com/ww/en/work/products/medium-voltage-switchgear-and-energy-automation/news/2018/ecostruxure-microgrid-and-building-solution-for-lidl.jsp

Life Is On Schneider Electric

ELECTROMOBILITY - CHANGE OF VEHICLE DRIVE

Electromobility - is not just a change in vehicle propulsion, but above all :

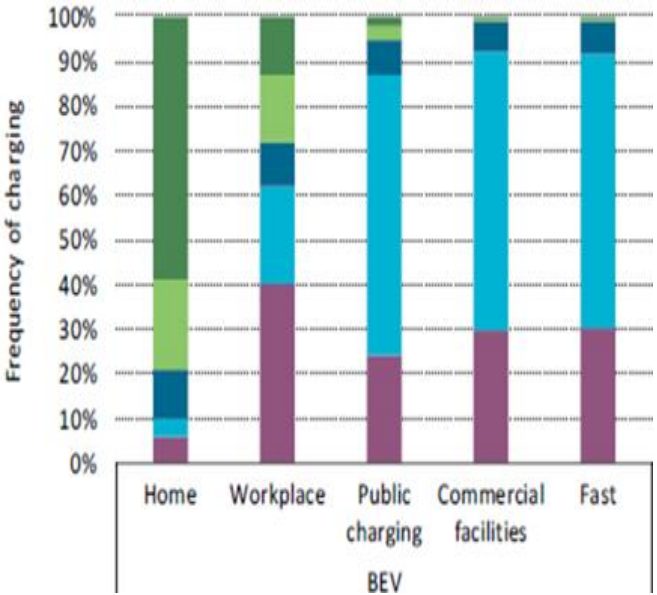
- creation of charging infrastructure
- change in the method of electricity production
- use and management of electricity

Criteria that influence the choice of Electric Vehicle:

- range in different climatic conditions
- type of route - urban / suburban / motorway
- where will I charge (charging infrastructure)
- speed and type of AC / DC charging

ELECTROMOBILITY – CHARGING INFRASTRUCTURE

Charging habits for sample of EV user



Source: IEA elaboration based on results from Figenbaum and Kolbenstvedt (2016).

CHARGING INFRASTRUCTURE

- must meet the needs of electric cars
- depends on the available sources of electricity

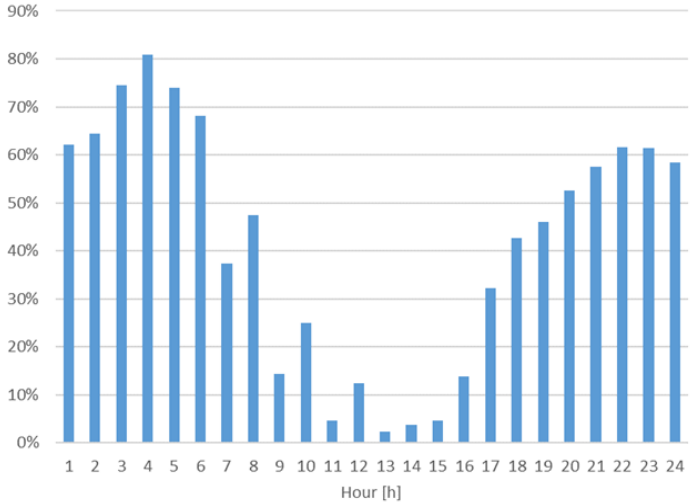
Vehicles are charging:

- home
- work place
- comercial facilities
- public charging station

Life Is On Schneider Electric

ELECTROMOBILITY – CHARGING INFRASTRUCTURE - home

Time of day when the EV is charged at home



Source: IEA elaboration based on results from Figenbaum and Kolbenstvedt (2016).

Up to 60% of electric cars are charged daily at home

For charging, low power is enough due to the charging time:

Wallbox to power - 11kW

Plug in for EV - 3.6 kW

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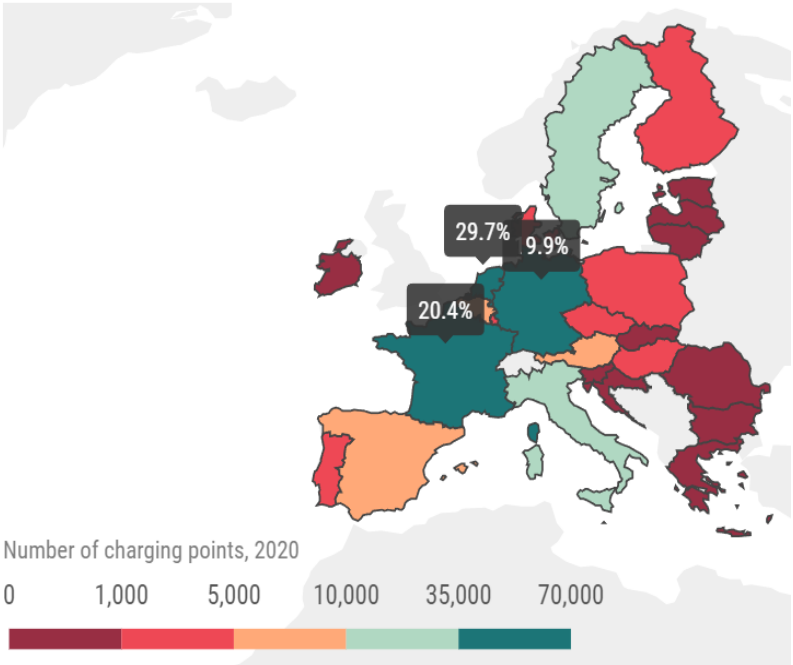
ELECTROMOBILITY – CHARGING INFRASTRUCTURE - public

Distribution of electric car charging points across the EU

70% of all charging points are located in just 3 countries



Source: IEA elaboration based on results from Figenbaum and Kolbenstvedt (2016).

Of the **225,000** charging points available in the European Union

1,200 - Czech Republic

Coverage in the Czech Republic is still very low compared to Western countries

66 700 - The Netherlands
45 800 - France
44 600 - Germany

Together, these three countries cover 23% of the EU's total surface area, but account for 70% of all ECV charging points in the EU.

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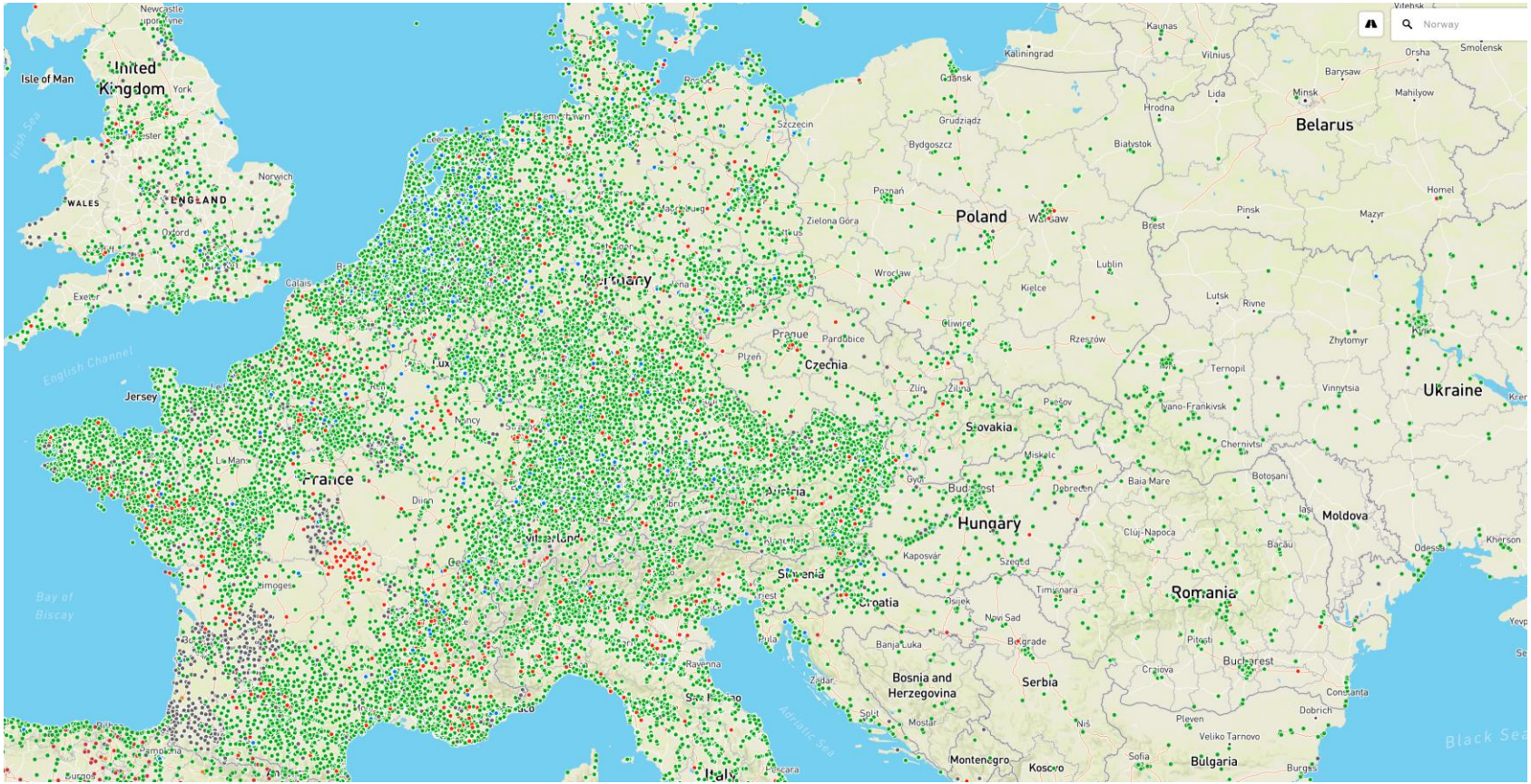
Coverage of public charging stations in Europe



https://www.electromaps.com/en/map?qsearch=norwa

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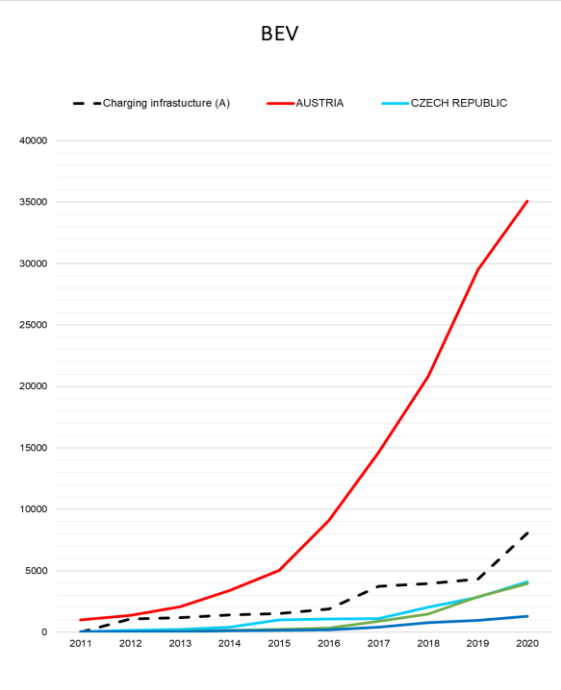
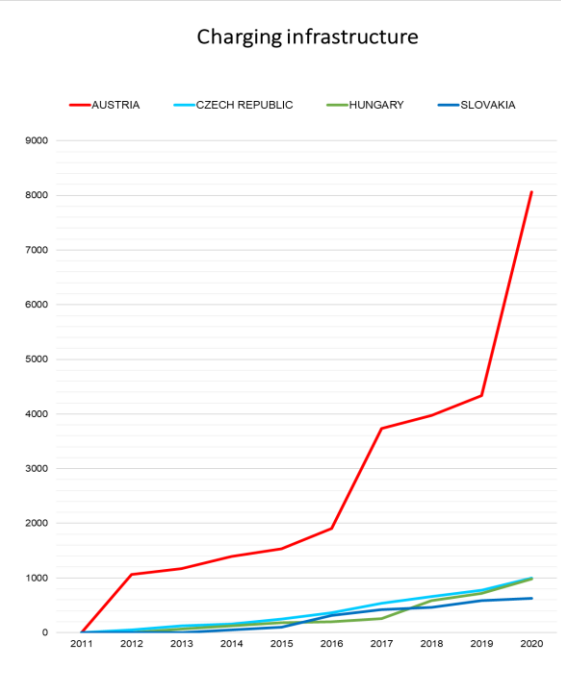
ELECTROMOBILITY – CHARGING INFRASTRUCTURE





The small sales of BEV cars in CZ, H and SK copies the Austria development and now is at the turning point in which was Austria in 2015.
In Austria, the development of infrastructure began earlier around 2012, and since 2015 a sharp increase in the number of BEV and PHEV cars has followed.

Source: IEA elaboration based on results from Figenbaum and Kolbenstvedt (2016).

ELECTROMOBILITY – CHARGING INFRASTRUCTURE- workplace

For COMPANY

For large fleets of dozens of electric vehicles, it is already necessary to adapt the infrastructure

- an available source of electricity
- time utilization of vehicles

These two parameters will determine the further development of the use of electric cars

One of the ways to meet these parameters is to use the consumption management of buildings and technologies in combination with its own production of electricity and its storage **– MICROGRID**

Charging private cars of employees

- Possible employee benefit
- the need to transport employees to work

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ELECTROMOBILITY – CHARGING INFRASTRUCTURE- comercial

https://www.purepower.com/blog/solar-carport-design-optimization2

Commercial charging:

- Offices
- Schools
- Car Park
- Shopping center

Shopping centers

- Free client benefit for the duration of the purchase
  (AC - Billa, Kaufland, DC / AC - Lidl)

Necessary management of:

- charging infrastructure
- technology (air conditioning, heating, freezers)
- energy sources

One of the ways to meet these is to use the management of consumption of buildings and technologies in combination with own production of electricity and its storage - MICROGRID

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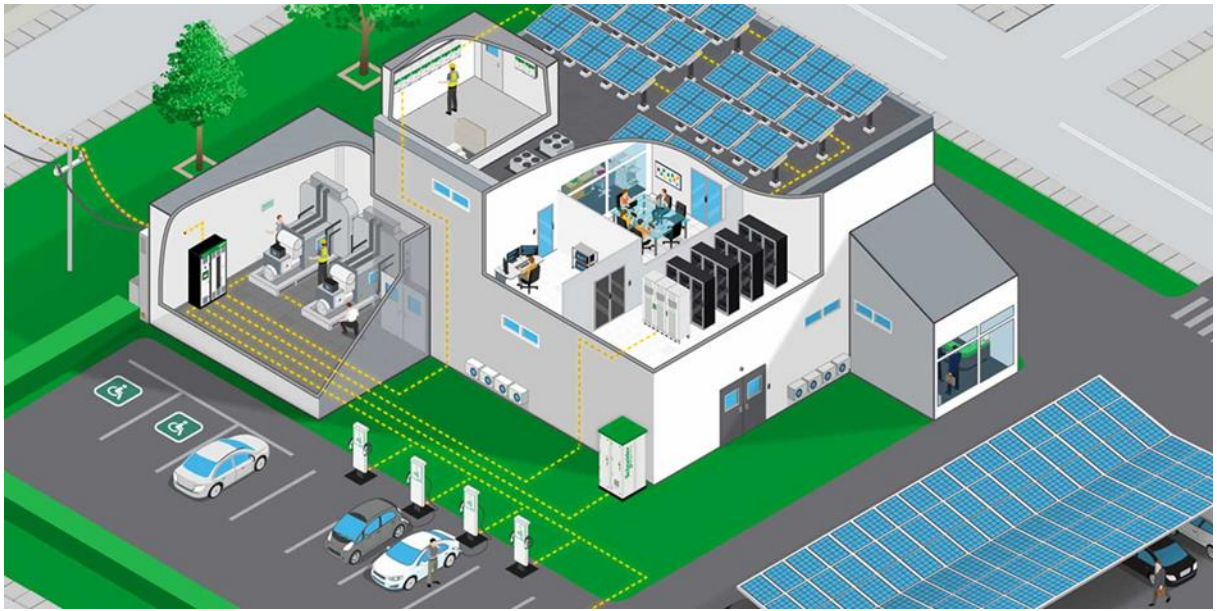
MICROGRID - management of consumption of buildings and technologies, own production of electricity and use of other available resources

A MICROGRID is a self-contained electrical network that allows you to generate your own electricity on-site and use it when you need it most.

A MICROGRID is thus a type of distributed energy resource. You can operate microgrids while connected to the utility grid or in disconnected “island” mode.

When the grid goes down or electricity prices peak, microgrids respond.



https://www.youtube.com/watch?v=kDYT_CGr_8M
https://www.se.com/us/en/work/solutions/microgrids/

How does MICROGRID work?

A microgrid co-locates electricity generation and consumption. Unlike the utility grid, which generates electricity in a centralized power plant and then distributes it along hundreds of miles of transmission lines, a **microgrid generates electricity on-site**.

For electricity generation, microgrids typically use some combination of renewables such as solar panels ,wind power plant etc.

Microgrids can incorporate **battery** systems to store electricity and deploy it during outages or when grid demand spikes.

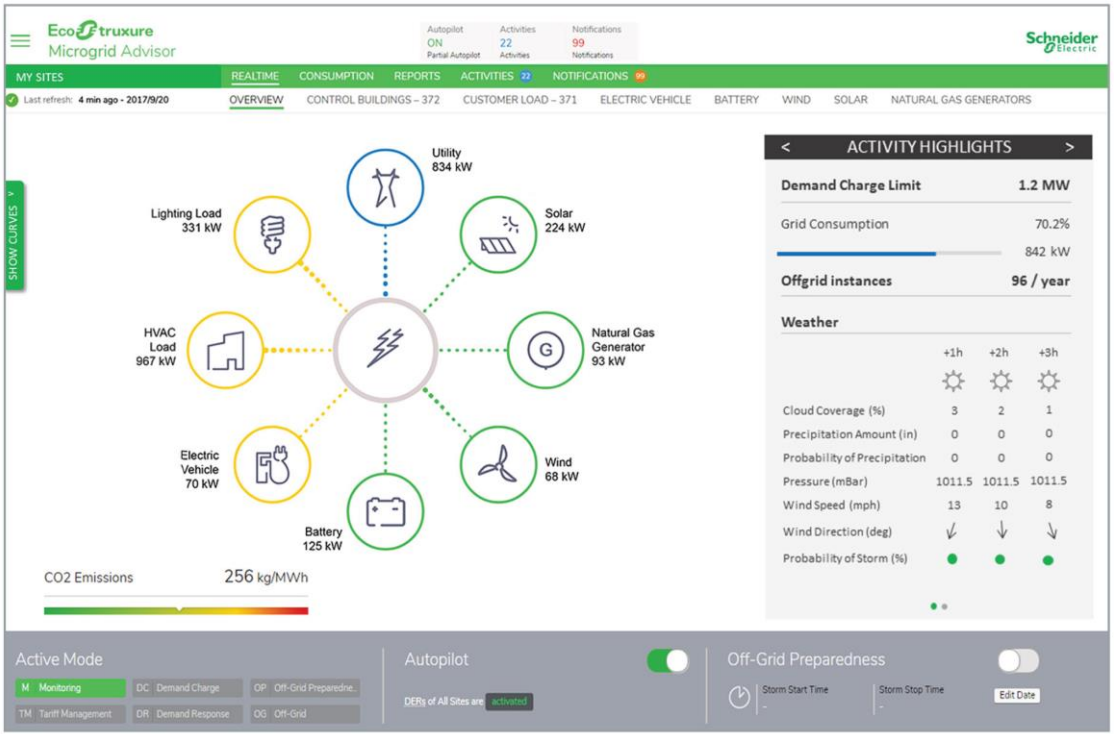
Intelligent software controls can automatically switch the facility between the utility grid and the microgrid based on factors such as power reliability and cost efficiency.

There are three main benefits of microgrids:

Keep your facility's power on during grid outages
Store electricity and sell it back to the grid during peak demand
Integrate on-site renewables such as wind and solar

https://www.youtube.com/watch?v=72RhPRZY01E&t=4s
https://www.se.com/us/en/work/solutions/microgrids/

Access real-time DER system operation



The cloud-based software platform enables you to monitor your :

- power consumption
- production
- energy usage by date

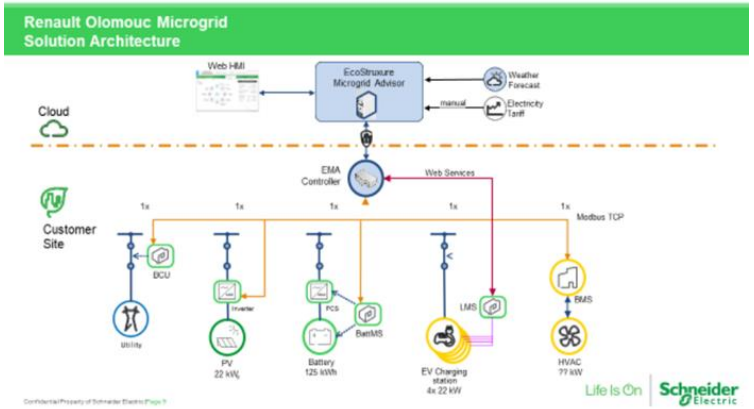
Export the data into an Excel™ file for a deeper analysis. Custom configurations and web services can be developed based upon your specific requirements.

AUTOPILOT - selects the best system settings based on its own analysis of system operation

Pilot project – Auto Kubíček Olomouc – car dealer

Type: car dealer
Location: Olomouc , Czech republic
Size: 19,8 kWp with the possibility of expansion
25 kWh battery with the possibility of expansion

Completed: 2021- 2025 1 STAGE – (MICROGRID)



Customer pain point

•**Preparation for eletromobility- increasing numbers of charging stations**
•Customer willingness to better integrate renewable energy

Solution

•First smart grid-ready energy storage and management system installed in car dealer, including EMA (EcoStruxure Microgrid Advisor)

Scope

•Management of DER including: energy storage, PV, HVAC, EV charging stations
•Connection with EV fleet management software for having EV participating into Demand Response
•Riding through blackout by using the energy produced on-site

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Electric

Pilot project - Auto Kubíček Olomouc

Due to the financial and technological demands, the project will be divided into STAGES.

1 - STAGE 09 - 10 2021 MICROGRID

- installation of PV
- installation of MICROGRID
- trial operation

2 - STAGE 11 2021 - 02 2022 INFRASTRUCTURE – charging stations

- preparation of infrastructure for charging stations interior
- installation of the CANALIS system
- preparation of infrastructure of outdoor charging stations, excavation work

3 - STAGE 03 - 04 2022 INSTALATION – charging stations

- installation of outdoor charging stations
- connection to CPMS – charging point managment system

4 - STAGE 05 2022

5 - STAGE 2022 – 2025 USE AND CONSTRUCTION OF OTHER PARTS OF THE PROJECT

- Optimization of operation and possible expansion of the PV plant / battery storage

Construction

TYRE WAREHOUSE	approx. 80 PV panels 40 kWp
PV CARPORT	approx. 100 PV panels 50 kWp, including 10 charging stations

The STAGES are chosen so that there is enough time to prepare everything, at the same time it would be appropriate to shorten all stages due to the potential of the market, everything depends on the amount of investment.

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companies cooperating on the project MICROGRID OLOMOUC

SCHNEIDER ELECTRIC - producer of MICROGRID
- producer of charge stations

ELKOV - one of the largest wholesale of electrical materials in Czech Republic
- deliveries of the MICROGRID system and photovoltaics and coordination of the project

EICERO - installation of MICROGRID, comprehensive service of photovoltaic power plants
- project realization

VŠB TUO - center for Energy and Environmental Technologies
- technical support

SMART EV - solutions for charging electric vehicles
- installation and control and management of charging stations

NANO ENERGIES - first and largest provider of energy from renewable resources in the Czech Republic
- provider of energy from renewable resources

AUTONAPŮL - first member of carsharing association in the Czech Republic
- provider of carsharing EV

ETERNAL ELECTRIC - project design and coordination

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Thank you for your attention

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