FEV CONSULTING

MUNICH, 16TH APRIL 2021

ALEXANDER NASE

PREPARED FOR

VVB

FACHKREIS BO/IT

SOFTWARE-DEFINED VEHICLE – TRENDS AND CHALLENGES IN THE AUTOMOTIVE INDUSTRY –

IMPULSE PRESENTATION

The FEV Group – Your engineering and consulting partner

GLOBAL REACH – ONE FACE TO THE CUSTOMER

850 M€
Revenue expected in 2020

~200
Patent applications per year

42+
Subsidiaries on four continents

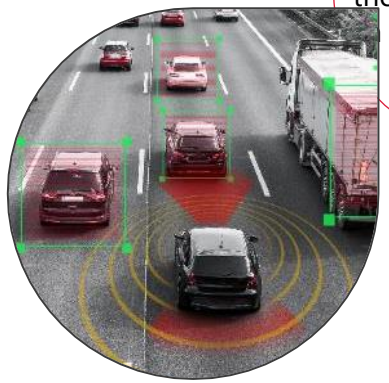
6,700
Employees globally

>70%
Academics

100+
Consultants around the globe specialized mobility and high-tech products

>40
Years of experience

>50
Different nations



Source: FEV

For 40+ years the FEV Group works on the forefront of mobility technology, driven by the passion and enthusiasm of our engineers

FEV CONSULTING

Turning innovation into reality

BMW i8 – Battery and Hybrid vehicle development

Vehicle APPs

1st dedicated Electric Vehicle for Car Sharing

Autonomous People Mover

FEV Breeze! – Fuel Cell Range Extender

1st Hybrid Lamborghini

DHL Electric Transporter

Air Taxi Service / SkyCab

Mobile Fast Charging Solutions

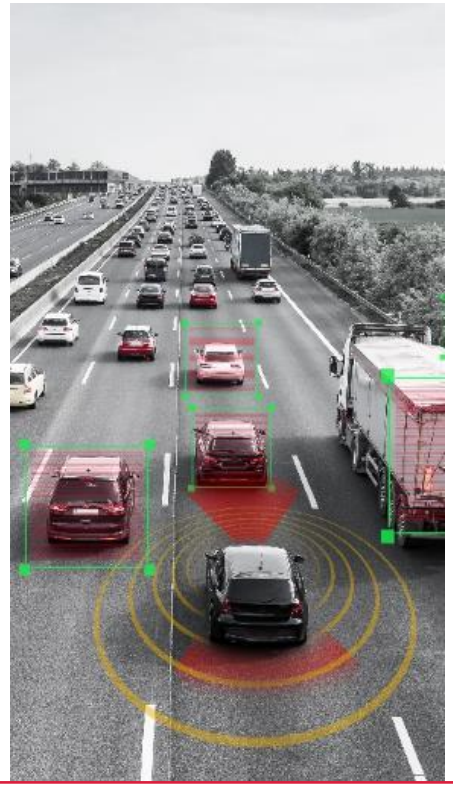
Source: FEV

Your engineering and consulting partner for the development of mobility services and solutions tailored for your needs and requirements

FEV CONSULTING

Vehicle Development

Powertrain Development & Electrification



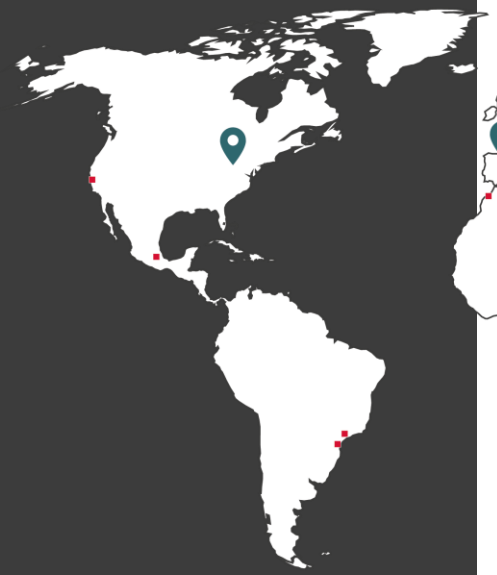
Intelligent Mobility & Software

Consulting

TECHNOLOGY & STRATEGY

Software & Testing Solutions

FACTS & FIGURES
FEV CONSULTING



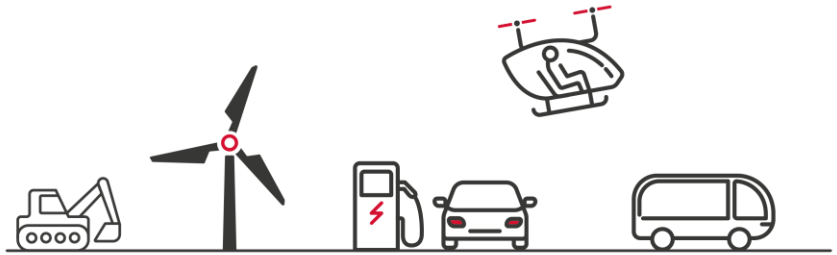
FEV CONSULTING OFFICES IN

AACHEN
BEIJING
BILBAO
COLOGNE
DETROIT
DUBAI
MUNICH
TOKYO

WORLDWIDE **40+**
FEV GROUP OFFICES
IN EUROPE, NORTH AMERICA, SOUTH AMERICA AND ASIA

100+
CONSULTANTS
AROUND THE GLOBE

FOUNDED IN
2011



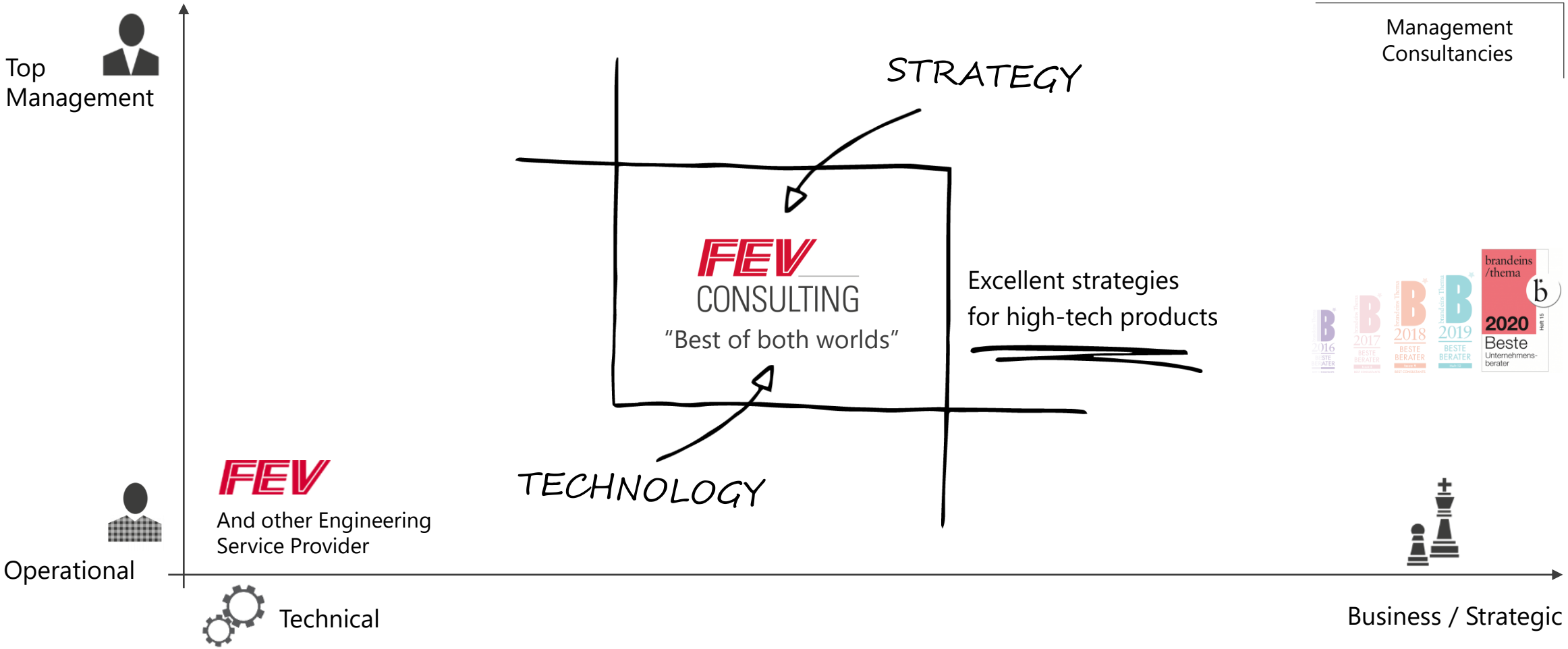
INDUSTRIES

500+
PROJECTS
IN 30 COUNTRIES

Automotive & Commercial Vehicles
Industrial, Off-Highway & Marine
Rail & Aerospace
Clean Energy & Power Generation
Highly Engineered Products

FEV Consulting offers solutions to top management issues in a technology-strategic environment paired with strong FEV engineering collaboration

POSITIONING OF FEV CONSULTING



Source: FEV

FEV Consulting offers consulting and advisory services to the automotive and other high-tech driven industries across four key pillars

PORTFOLIO OF SERVICES

1 BUSINESS STRATEGIES

- Market & Customer Studies
- Growth Strategies
- (Digital) Transformation
- Due Diligence & M&A

2 ADVANCED TECHNOLOGIES

- Technology Roadmapping
- Powertrain & Vehicle Technologies
- Zero CO_2 Concepts
- Electrification and H_2 Strategies

3 SMART MOBILITY

- Connected & Automated Vehicles
- Urban Air Mobility
- Smart City Concepts
- ITS & Cloud Services

4 COST ENGINEERING & OPERATIONS

- Cost Engineering & Benchmarking
- Procurement & Supply Chain
- Process Optimization
- Production Planning

FEV CONSULTING

FUTURE OF MOBILITY

KEY TRENDS AND CHALLENGES IN THE AUTOMOTIVE INDUSTRY

Global mega trends such as climate change, urbanization and digitalization are driving the introduction of new technologies in the automotive industry

MACRO ECONOMIC

GLOBAL MEGA TRENDS

SUSTAINABILITY

URBANIZATION & SMART CITIES

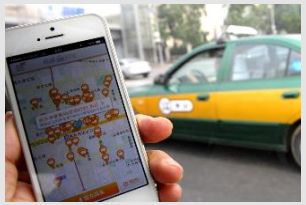
CONNECTIVITY / DIGITALIZATION

Focus of this presentation

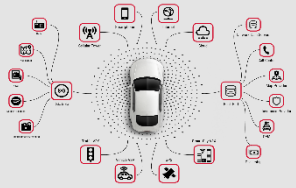
AUTOMOTIVE

GENERAL INDUSTRY TRENDS

ZERO EMISSIONS & E-MOBILITY



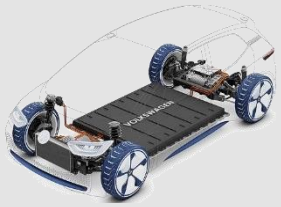
MULTIMODAL TRANSPORT & LOGISTICS



VEHICLE CONNECTIVITY

VEHICLE AUTOMATION

SPECIFIC TECHNOLOGY TRENDS



ELECTRIFICATION & FUEL CELL

SHUTTLES & ROBO TAXIS

V2X COMMUNICATION

SOFTWARE-DEFINED VEHICLE ARCHITECTURE

NEW BUSINESS OPPORTUNITIES AND BUSINESS MODELS

Source: Bosch, Toyota, Apple, CleanTechnica, Nissan, FEV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CONSULTING
ZERO EMISSIONS
& ELECTRIFICATION

The European Green Deal is a roadmap with actions for making the EU's economy sustainable, aiming to become climate-neutral by 2050

EUROPEAN GREEN DEAL

Transforming the EU's economy for a sustainable future

€1 trillion
investment over the next decade

55-60%[1] reduction
greenhouse gas emissions by 2030

90% reduction
greenhouse gas emissions in transport by 2050

- The European Green Deal is a set of policy initiatives promoted by the European Commission with the aim of making EU climate neutral in 2050
- To achieve that the European Green Deal plans to
  - Attract €1 trillion worth of public and private investment over the next decade
  - Increase EU 2030 climate target to at least 55% to 60% in a responsible way
- The Commission's proposed in March 2020 the first European Climate Law which aims to write into law the goal set out
- **Investment of 1 trillion € is planned to come from**:
  - ~500 billion € from EU budget, through programs that contribute to climate and environmental projects
  - 114 billion € in co-financing by EU countries
  - ~300 billion € worth of private and public investment through InvestEU and ETS funds
  - ~100 billion € should be attracted using the Just Transition Mechanism

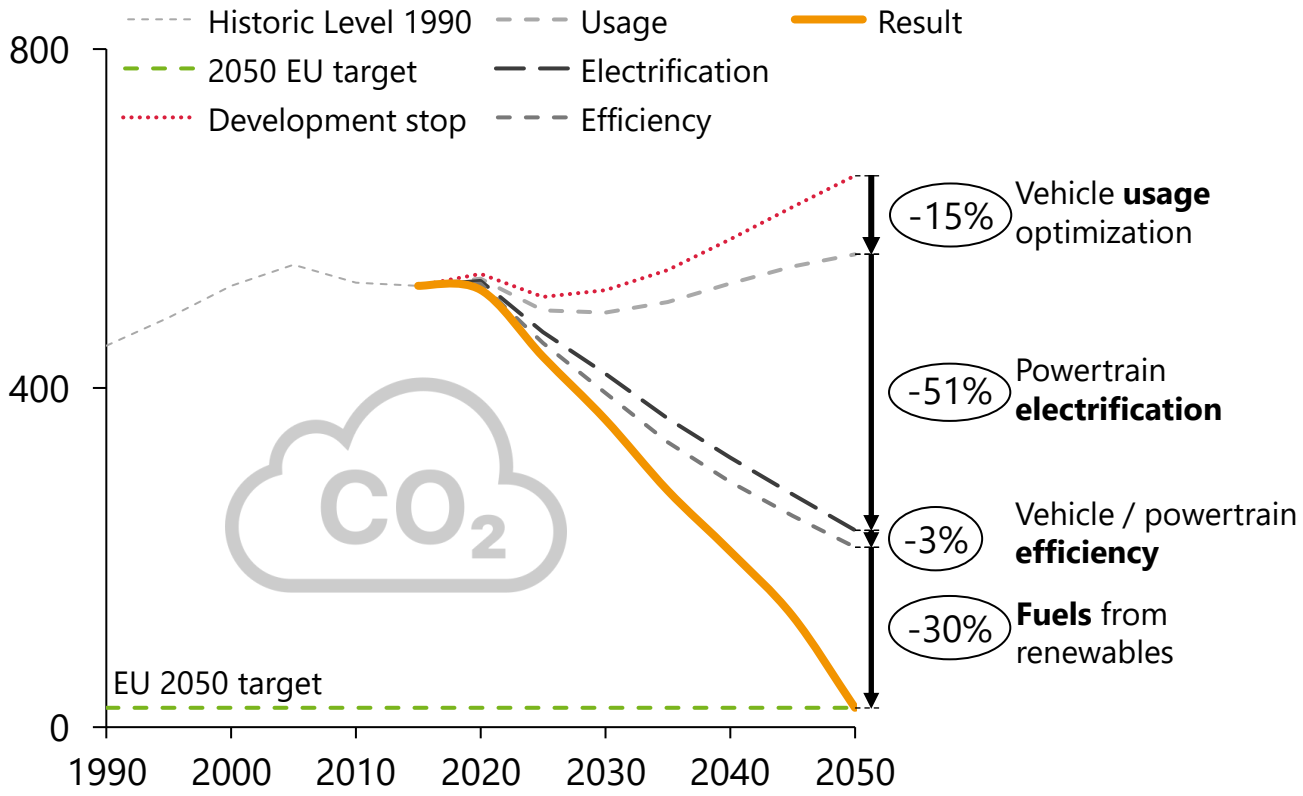
1) Still a proposal (not defined yet)
Source: European Commission

To achieve the EU CO_2 targets for the in-use vehicle fleet, renewable energy is required; amount of e-fuels strongly depends on the degree of electrification

PASSENGER CAR ELECTRIFICATION SCENARIOS – CO_2 EMISSIONS OF IN-USE FLEET

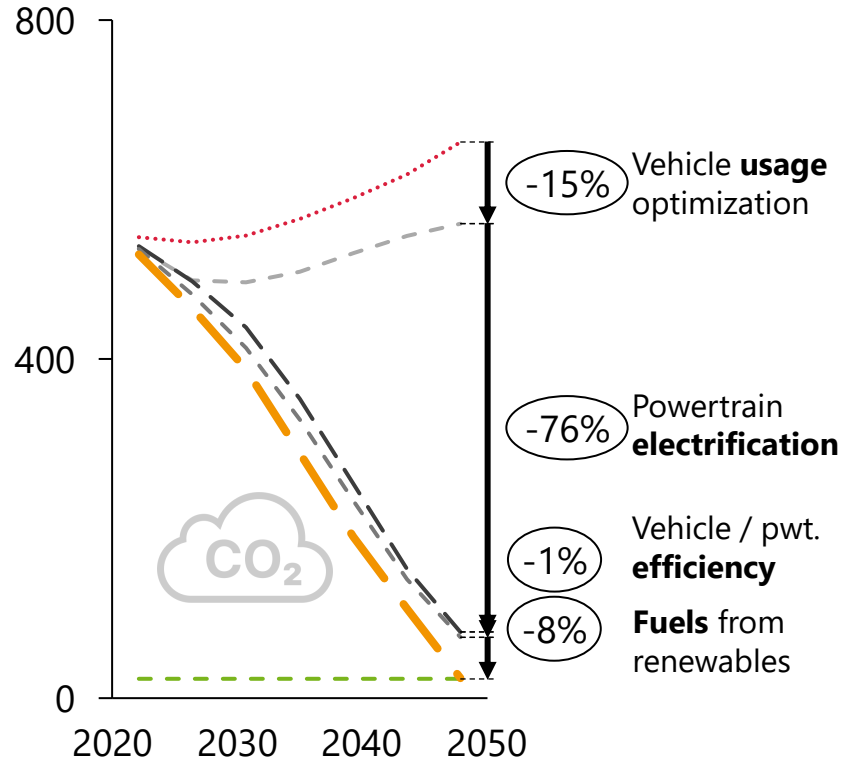
"ELECTRIFICATION + RENEWABLE FUELS" SCENARIO

CO_2 emissions in million tons



"ACCELERATED ELECTRIFICATION" SCENARIO

CO_2 emissions in million tons

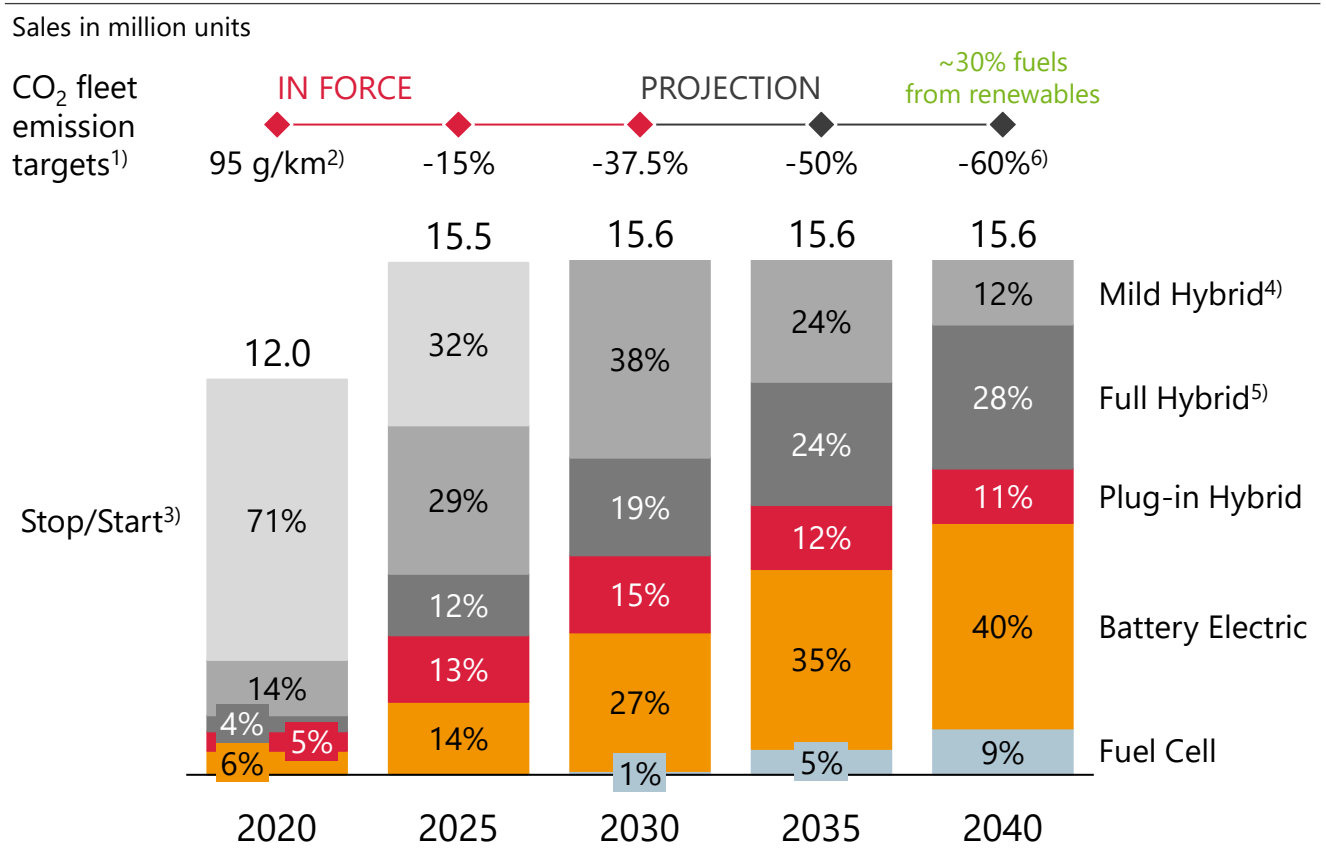


Note: Graph displays the extended tank-to-wheel emissions for passenger cars. The extended tank-to-wheel considers the CO_2 emissions created when converting the energy carrier to kinetic energy and a subtract of carbon sinks that are realized during the production of the energy carrier.
Source: FEV

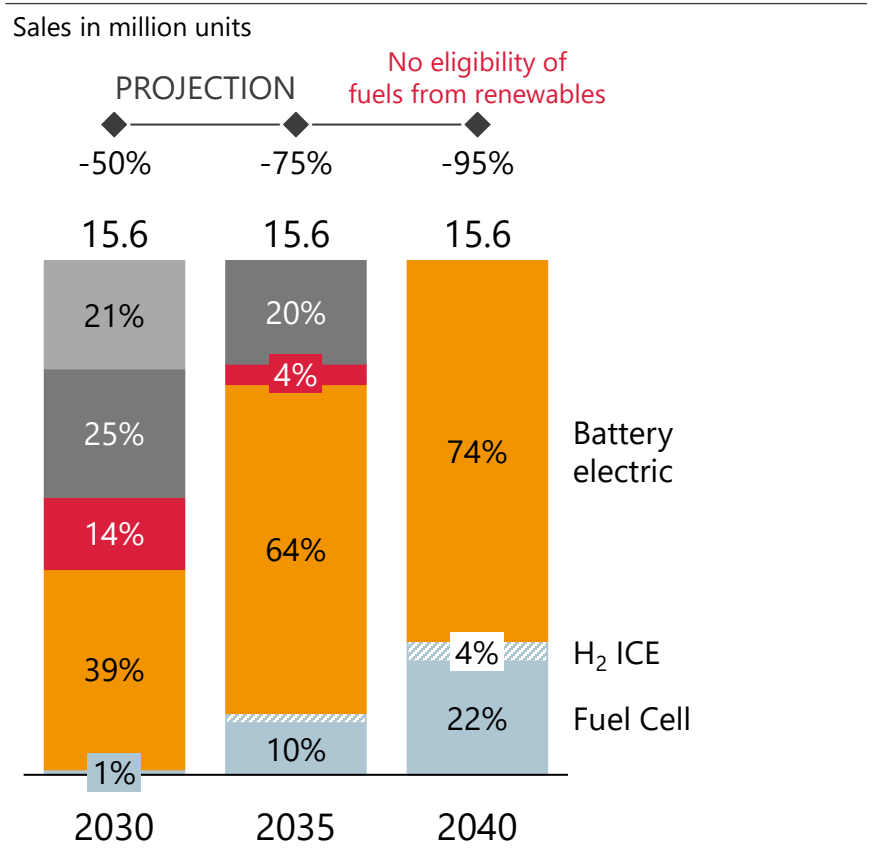
In Europe, a shift to zero-emission vehicles is expected; Even the “accelerated electrification” scenario could become reality driven by the EU Green Deal

PASSENGER CAR ELECTRIFICATION SCENARIOS – VEHICLE SALES FORECAST

“ELECTRIFICATION + RENEWABLE FUELS” SCENARIO



“ACCELERATED ELECTRIFICATION” SCENARIO



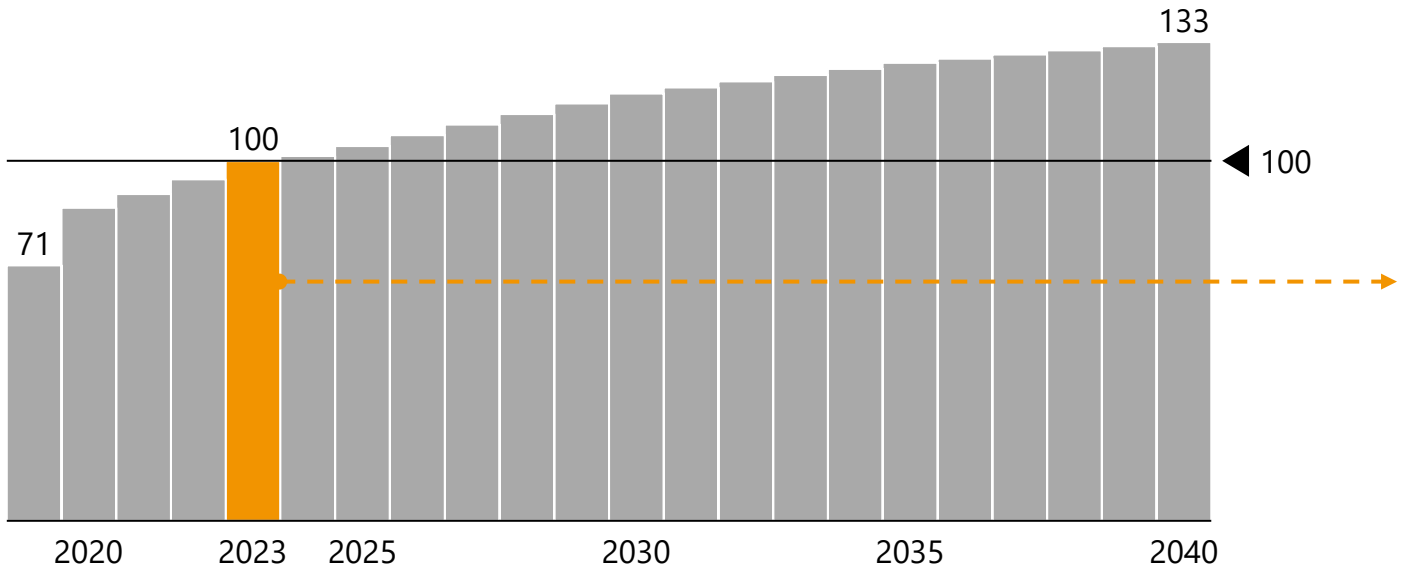
1) 2021 target according NEDC; 2025 and 2030 targets and projection in reference to 2021 WLTP CO_2 emission; 2035+ target projection are **tailpipe** emissions values
2) In 2020 target must be achieved by 95% least emitting vehicles within each automaker’s fleet, 100% compliance for 2021
3) Stop/Start and 12 V energy management; 4) 12 V and 48 V mild hybrids; 5) Includes 48 V hybrids with full hybrid functionalities
6) This projection accomplishes 95% of CO_2 emission reduction within vehicle stock in 2050 by using 238 TWh of PtL (e-fuels) in 2040 and 602 TWh in 2050 respectively
Source: FEV

By 2023 FEV expects boundary conditions for the European passenger car market, in which an electric vehicle will be competitive

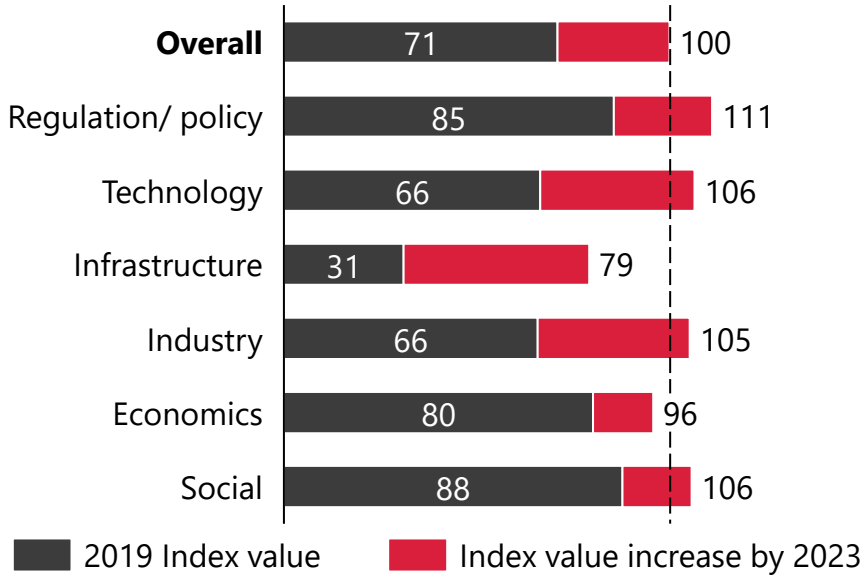
ZEV INDEX FORECAST – EUROPE – PASSENGER CAR – BASE SCENARIO – BEV

BEV

ZEV INDEX DEVELOPMENT (OVERALL MARKET)



2023 ZEV INDEX BY DIMENSION[1)]



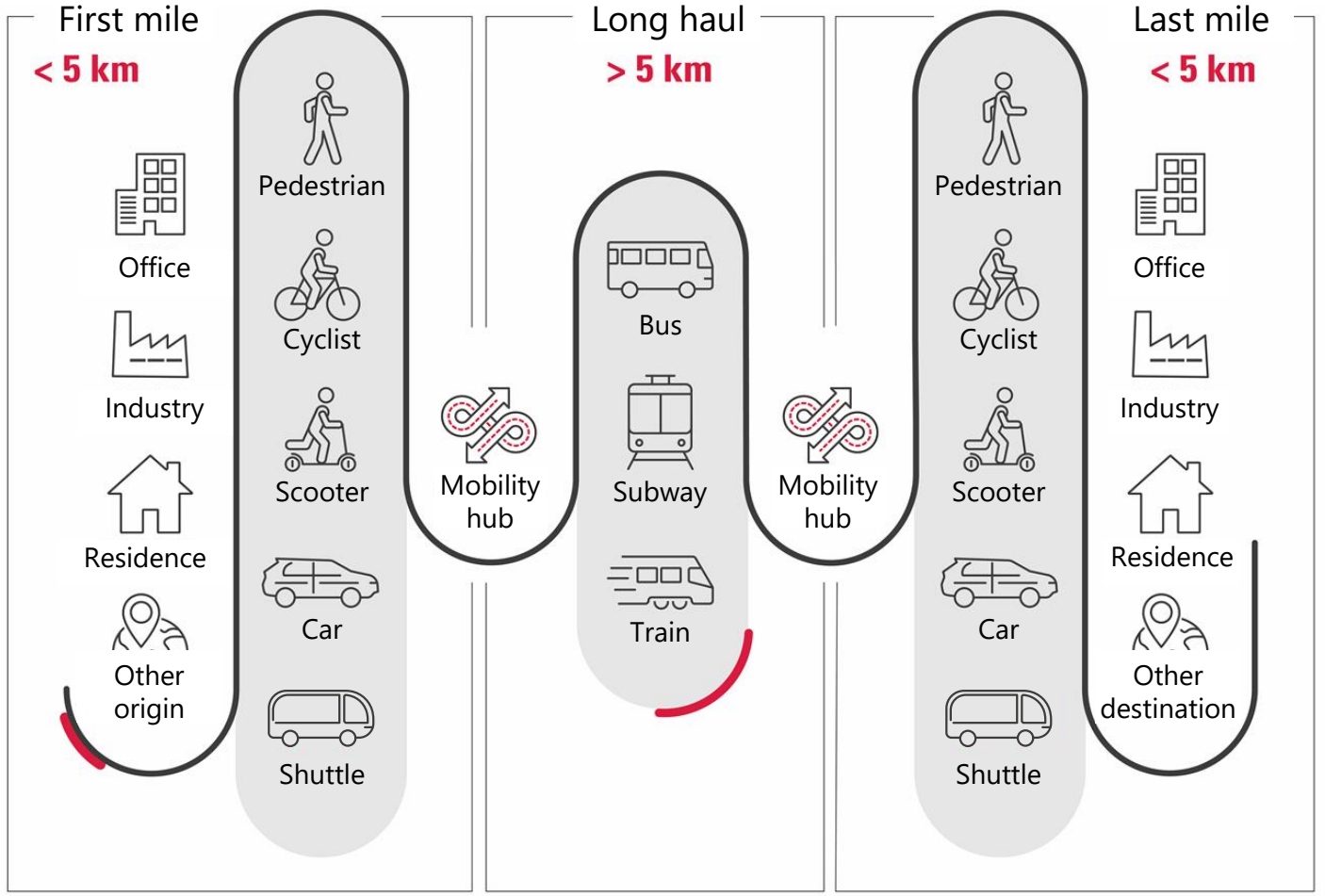
Some dimensions will drive the BEV competitiveness, while others are expected to lag behind

- European manufacturers will heavily invest into e-mobility in the upcoming years and roll-out a significant number of electrified vehicles
- A general acceptance of electric vehicles is already established and is expected to increase across the majority of population (index "social")
- Very stringent CO_2 fleet emission targets for 2025 and 2030 have been stipulated; also target achievement in 2021 requires electrification
- Charging infrastructure build-up is gaining momentum, but will take several years resulting in low index value in this dimension

1) Each dimension is weighted individually for the calculation of the overall ZEV Index
Source: FEV

MULTIMODAL TRANSPORT & LOGISTICS

The future of mobility: – multi-modal – needs seamless integration transportation modes

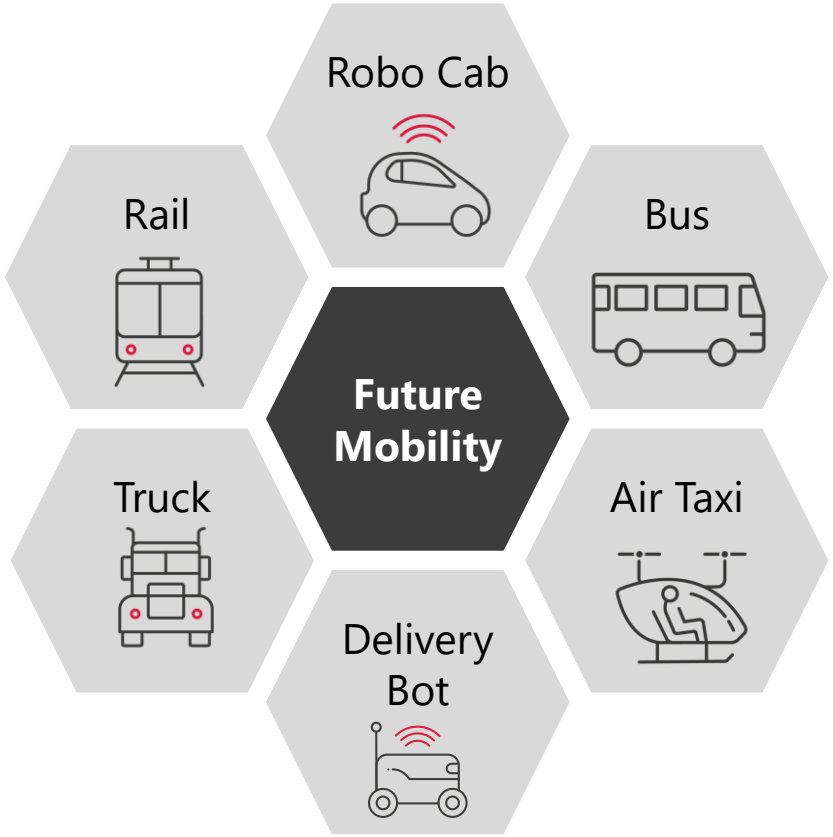


Source: FEV

The focus of autonomous driving Level 4 has been shifting towards commercial applications since the business case is more attractive

LANDSCAPE OF FUTURE TRANSPORTATION

FUTURE MOBILITY SOLUTIONS



COMMERCIAL AD LEVEL 4 APPLICATIONS

TRUCK: 35% TCO reduction potential

BUS: 60% TCO reduction potential

- Dedicated, controllable area *(e.g. urban area, hub2hub)*
- Smaller production volumes
- Flexible operation, extended service hours
- Labor and indirect cost reduction

Source: FEV; Picture Sources: Daimler; Waymo; Navya; Starship Robots

Urban Air Mobility (UAM) gained traction in the recent years – is it the next "big thing"?

SELECTED ANNOUNCEMENTS BY CITIES, OPERATORS AND MANUFACTURERS

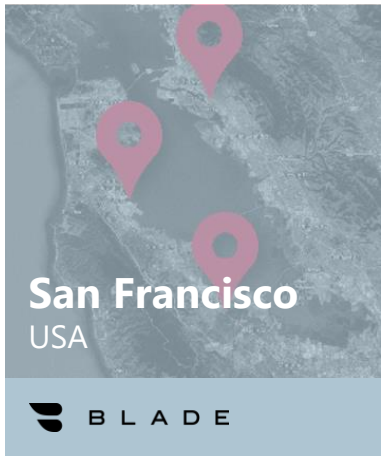
Aviation start-up Lilium to go public through SPAC deal with ex-GM executive
cnbc.com (Mar 31, 2021)

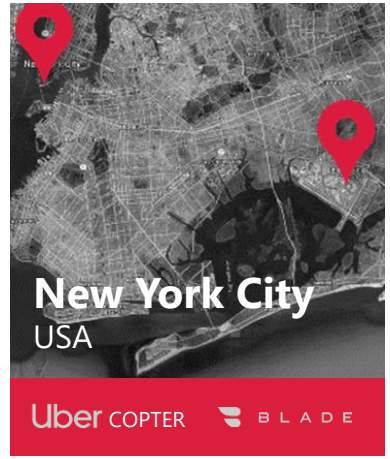
Joby Aviation raises $1.6 billion in SPAC merger at $6.6 billion valuation
evtol.com (Feb 24, 2021)

Singapore Set to Have Flying Electric Taxi Service by 2023
Bloomberg (Dec 9, 2020)

Uber to Launch 'Flying Taxis' in LA and Dallas-Fort Worth by 2023
Commercial Observer (Jun 17, 2019)

Paris planning flying taxis by 2024
CNN (Jun 24, 2019)





Source: FEV

eVTOL[1] technology has significant advantages compared to helicopters and is a game changer making UAM attractive for large scale application

ADVANTAGES OF NEW EVTOL[1] AIRCRAFT CONCEPTS

CONVENTIONAL HELICOPTER

- Safety constraints limit ops[2] above populated areas
- Very high aircraft costs and cost for operation
- High noise hinders operations availability (service hours & -area)
- High energy consumption not appropriate today anymore
- Up to 2 pilots for commercial operation

FUTURE eVTOL

- Safety objectives equal to commercial aviation[3]
- Costs reduced almost by half
- Significantly reduced noise
- Significantly reduced energy consumption
- Highly automated design

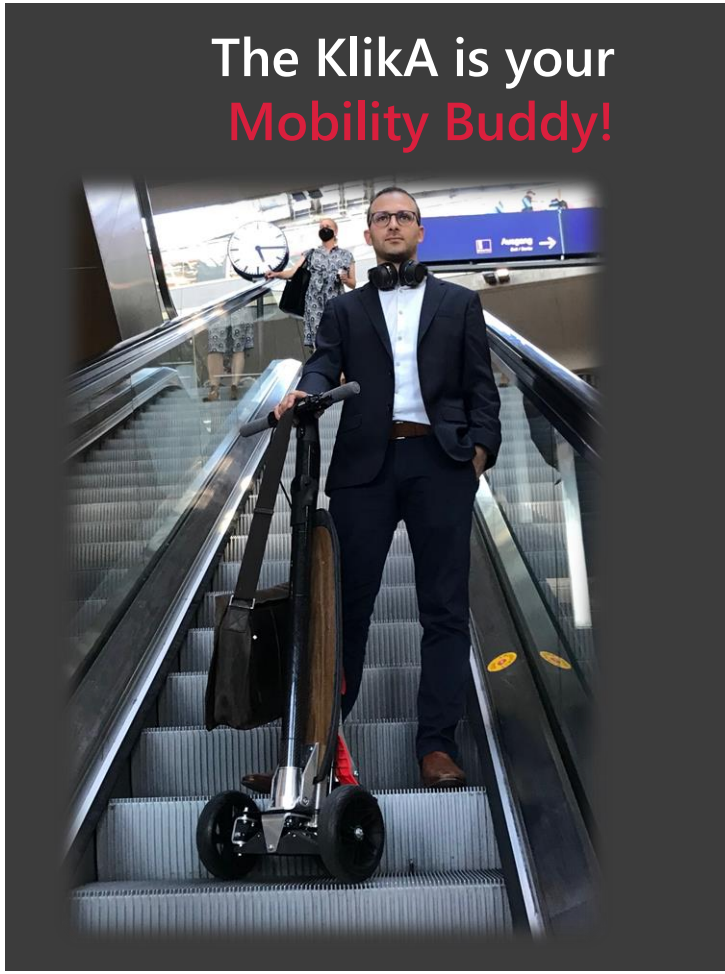
1) eVTOL: electrical Vertical Take-Off and Landing 2) Ops: Operations; Safety Objective referring to Function Development Assurance Levels (FDAL): 10-7 for class II rotorcraft 3) Safety objective 10-9 e.g. SC-VTOL by EASA
Source: FEV

Seamless combination of different transport modes will become increasingly important – micromobility solutions will be a key enabler

KLIKA – YOUR MOBILITY BUDDY FOR INTERMODAL AND SUSTAINABLE COMMUTING

» CASE EXAMPLE

SAVE Cost ✓ Time ✓ Environment ✓



Source: KlikA is property of Mubea – developed by FEV

Vehicle automation is a strong trend; by 2030 level 4 automation will be reached which enables to drive fully automatic in selected areas or situations

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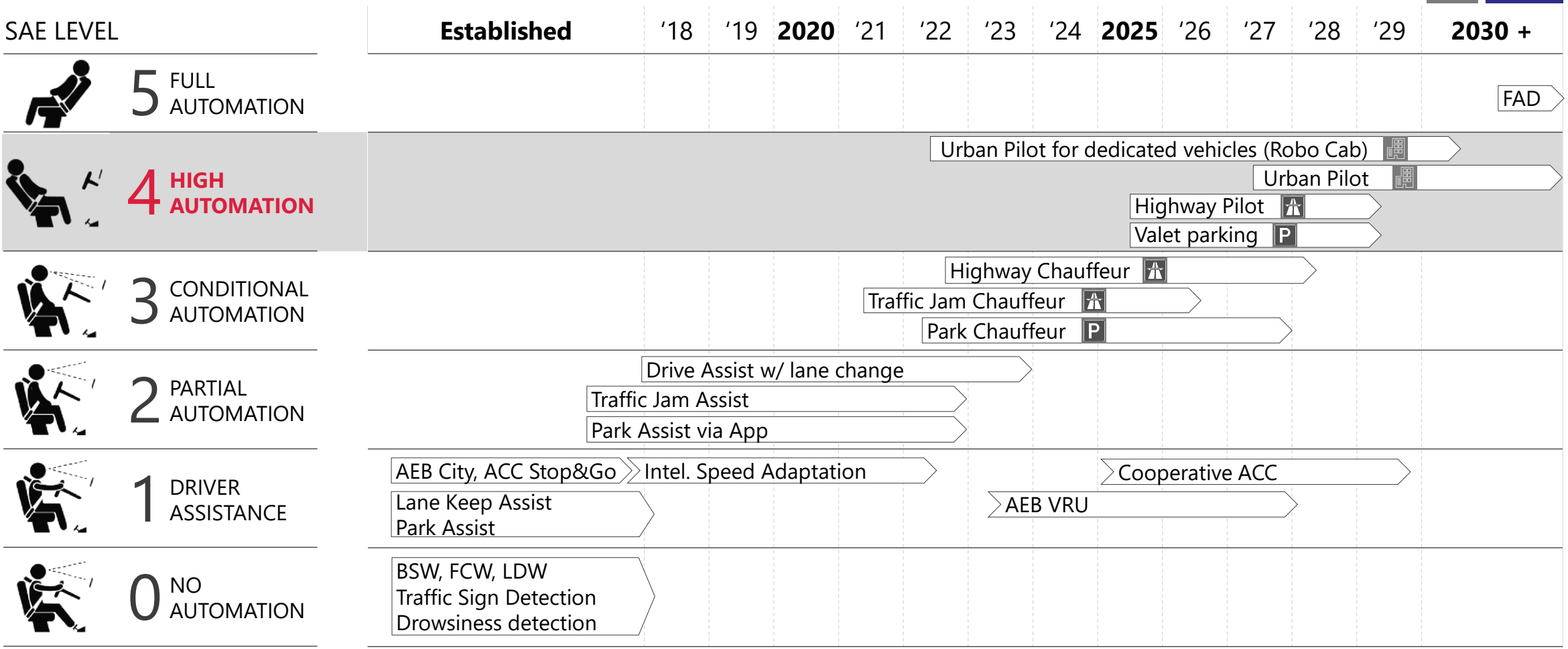
ADAS/AD ROADMAP – PASSENGER CARS / GLOBAL

» 02/2020



ADAS = Advanced Driver Assistance Systems, AD = Automated Driving, BSW = Blind Spot Warning, LDW = Lane Departure Warning, FCW = Front Collusion Warning, AEB = Autonomous Emergency Braking, ACC = Adaptive Cruise Control, FAD = Fully Automated Driving

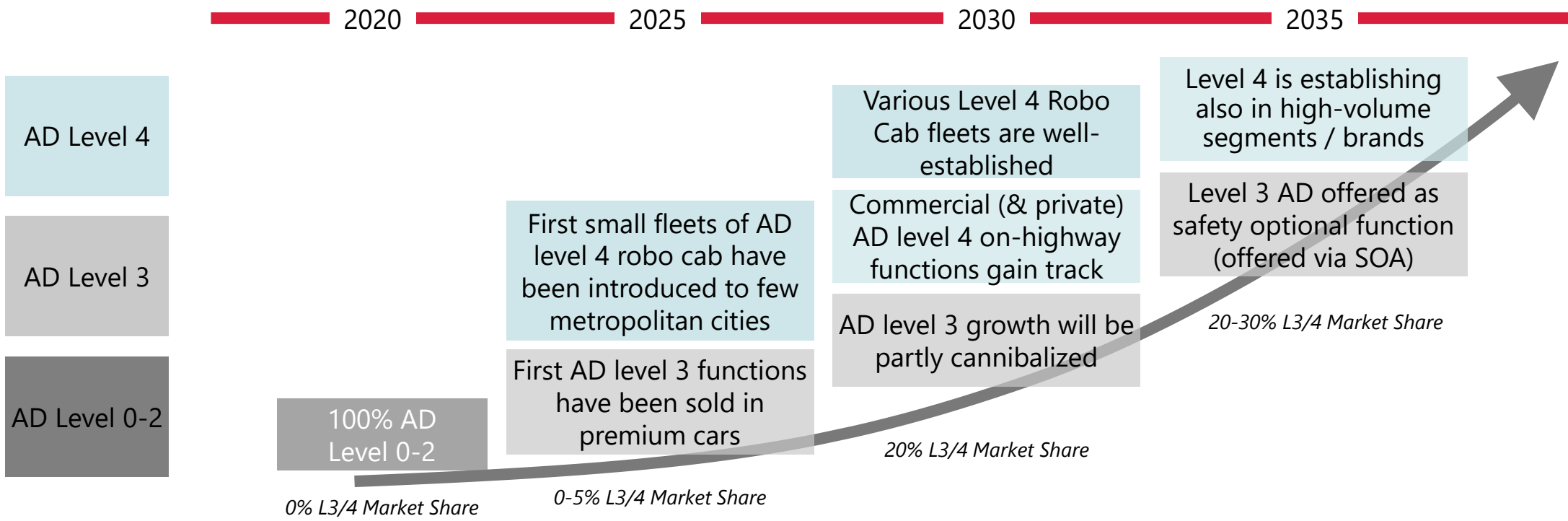
P ODD: (Selected) Parking areas ODD: (Selected) Highway roads ODD: (Selected) urban areas

Source: FEV

Level 3 automated driving will be brought into the market by first premium applications, whereas level 4 AD will gain track by first commercial fleets

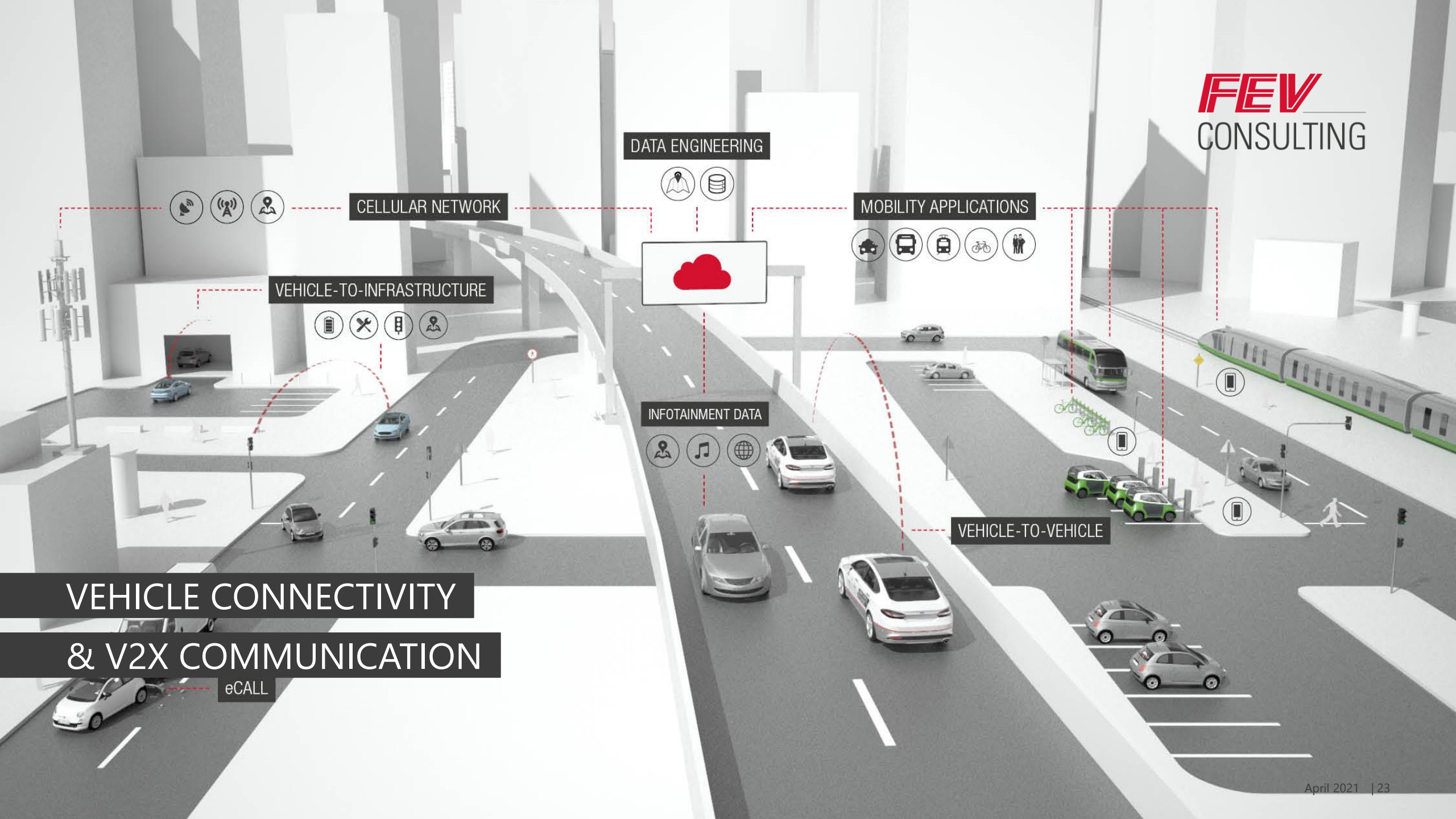
ADAS / AD MARKET SCENARIO – EVOLVEMENT OF AD LEVEL 3&4

» ILLUSTRATIVE



- In 2025, eventually first level 4 AD systems will be developed by OEM, but still sold as level 3 due to missing level 4 regulations
- By 2030, cannibalization of level 3 functions will take place as AD level 4 functions are ready and costs not significantly higher
- By 2035, there will be still many customers „happy" with level 2 AD functions in their new bought vehicle

ADAS = Advanced Driver Assistance Systems, AD = Automated Driving SoA=Software over the Air
Source: FEV



VEHICLE CONNECTIVITY & V2X COMMUNICATION

The future of mobility is connected and provides attractive business opportunities; > 500 mn connected vehicles by 2025

CONNECTED VEHICLES – 2025 METRICS

CONNECTED VEHICLES

>500 mn units

connected vehicles are expected in operation globally by 2025

2020 → 15% CAGR → 2025

CONNECTED BIG DATA

>300 Exa[1)] bytes

of data per month expected to be generated globally by 2025

2020 → 200% CAGR → 2025

CONNECTED MOBILITY REVENUE

>350 Bn USD

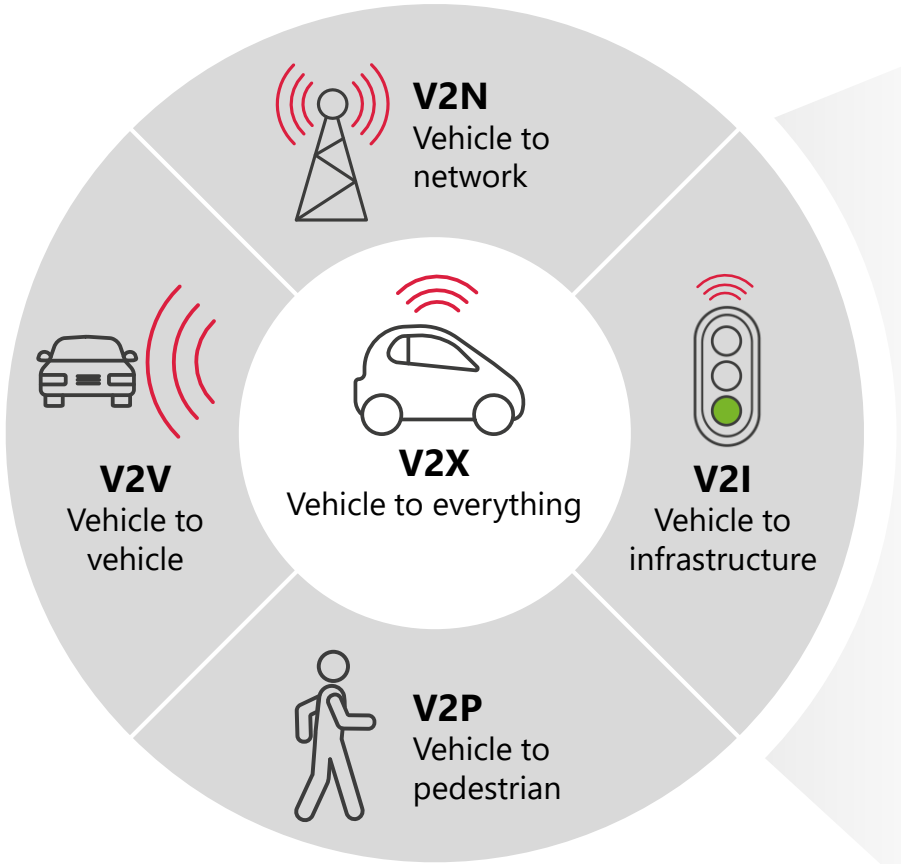
expected revenue from products & services in the area of connected mobility globally by 2025

2020 → 13% CAGR → 2025

1) 1 Exa = 10^6 Tera;
Source: FEV

Vehicle-to-everything communication can be used for use-cases related to safety, vehicle management, and traffic efficiency

V2X USE CASE CATEGORIES



Communication between a vehicle and any entity that may affect, or may be affected by, the vehicle

V2X USE CASE CATEGORIES

SAFETY

e.g.
- Emergency vehicle warning
- Traffic light speed advisory

TRAFFIC CONTROL

e.g.
- Emergency & transit priority
- Speed harmonization

VEHICLE MANAGEMENT

e.g.
- HD map collection & sharing
- Automated parking

USER CONVENIENCE

e.g.
- Toll collect
- Infotainment

Source: FEV

To become part of the V2X ecosystem, insurance companies must answer multiple key questions depending on the use case & associated business model

RELEVANT V2X USE CASES FOR INSURANCE COMPANIES

- LOCAL WEATHER IMPACT WARNING
- USAGE BASED INSURANCE
- SMART PARKING
- ROAD CONDITION WARNING
- VEHICLE HEALTH MONITORING
- STOLEN VEHICLE ALERT
- ABNORMAL VEHICLE WARNING
- VULNERABLE ROAD USER

» NOT EXHAUSTIVE

Which V2X use cases can be employed to reduce property damage?

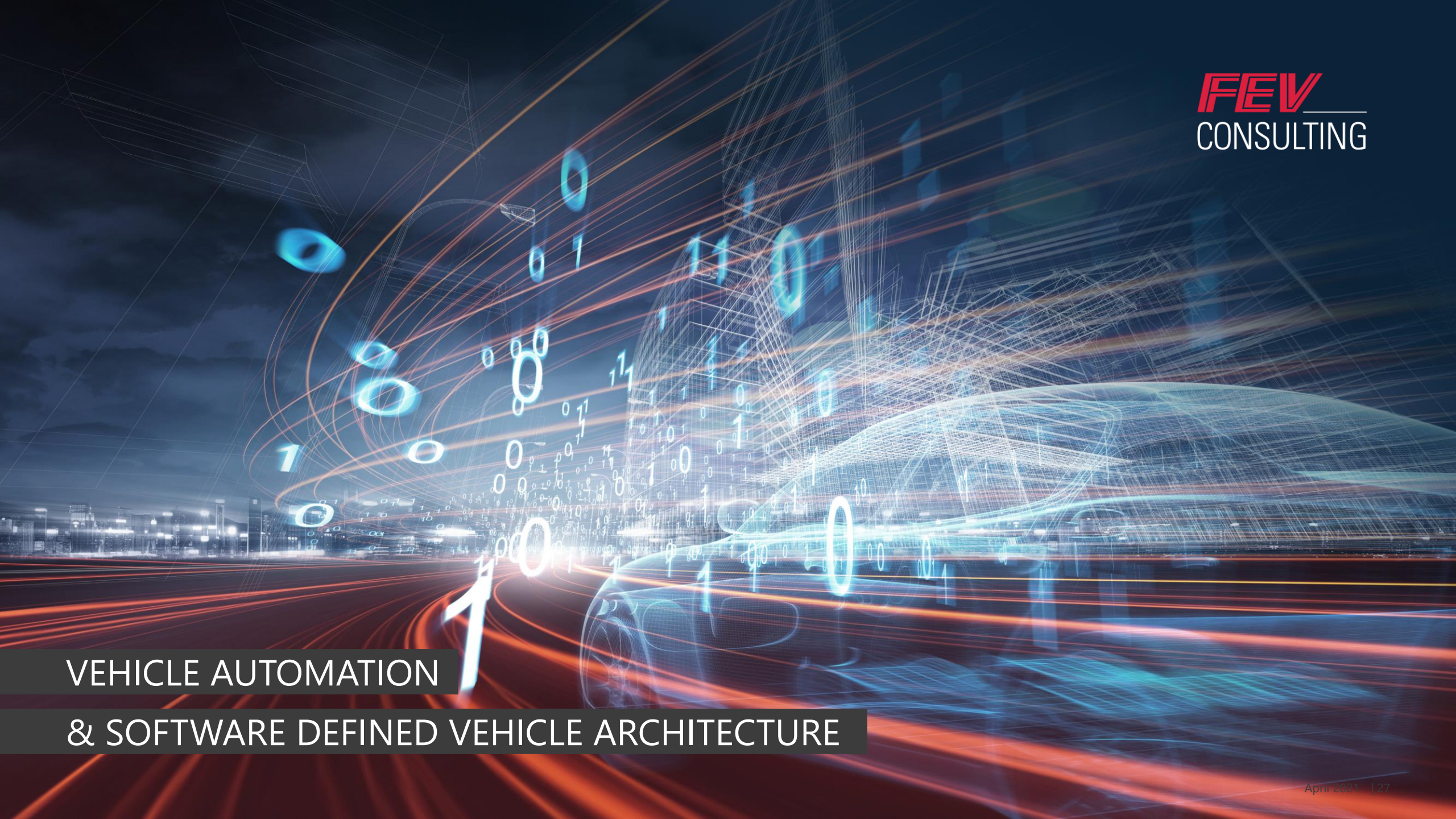
Which use cases generate data most relevant to insurance companies?

How can insurance companies monetize V2X use cases?

What kind of assets can be insured?

What could the partnership model look like for selected use cases?

Source: FEV



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VEHICLE AUTOMATION & SOFTWARE DEFINED VEHICLE ARCHITECTURE

To bring an increased amount of AD features onto the roads, four current and near-term challenges have to be addressed by OEMs as well as suppliers

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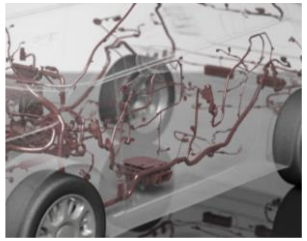
CURRENT & NEAR-TERM CHALLENGES FOR AD

» NOT EXHAUSTIVE

TOPIC		KEY CHALLENGES	TRENDS / HOT TOPICS
1 SENSOR SET		▪ Reliable sensor set required ▪ Different sensor set approaches by OEMs ▪ Cost pressure for sensor-set configuration	▪ Level 3 vs. level 4 sensor-set configurations ▪ Camera- vs lidar- vs radar-centric approach ▪ Next gen. sensors (e.g. scanning vs solid state lidar) and low-cost announcements (e.g. Luminar & Bosch)
2 EE ARCHITECTURE		▪ High-volume data handling (data rates) ▪ Computing power (controller performance) ▪ Fail operational and redundancy concepts	▪ Vehicle centralized, software driven E/E architecture ▪ Domain centralization as intermediate step ▪ Vehicle cloud computing (functions in cloud) ▪ Ethernet Backbone
3 SAFETY & SECURITY		▪ Risk by connectivity & automation features ▪ Type approval relevance of cybersecurity (by UNECE R 155 regulation)	▪ Compliance to FuSy, SOTIF & Cyber Security norms (ISO26262, ISO21448, ISO/SAE 21434) ▪ Security by design and security by life-cycle ▪ Cybersecurity Management System
4 AD TESTING & VALIDATION		▪ No testing & validation standards and frameworks (yet) existing (homologation, liability and local validation) ▪ Testing of AD SW, incl. Artificial Intelligence	▪ ADS regulatory framework developments ▪ Scenario-based AD development ▪ Virtual validation framework

Source: FEV

IT systems changed significantly towards scalable and flexible architectures within the last decades and Automotive E/E needs to follow same approach

» GROWN ARCHITECTURE

- Doesn't scale for variety of HW variants
- Time-consuming and costly maintenance

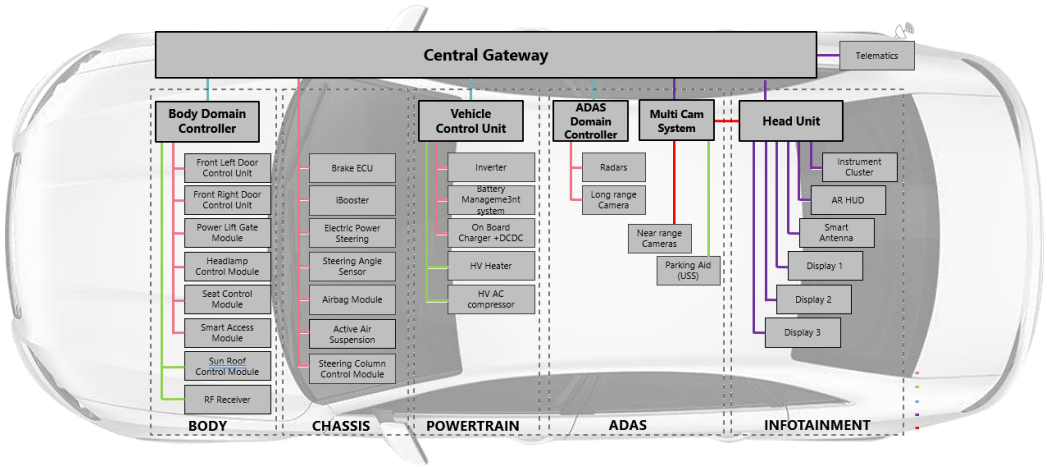
» SCALABLE ARCHITECTURE

- Standard high-performance compute power
- Flexible and reconfigurable

Source: Porsche Consulting – Revolutionizing Automotive Development for the Digital Future, 2019.

Today's E/E architecture is main bottle neck in vehicle development: New generation E/E architecture (EEA) needed!

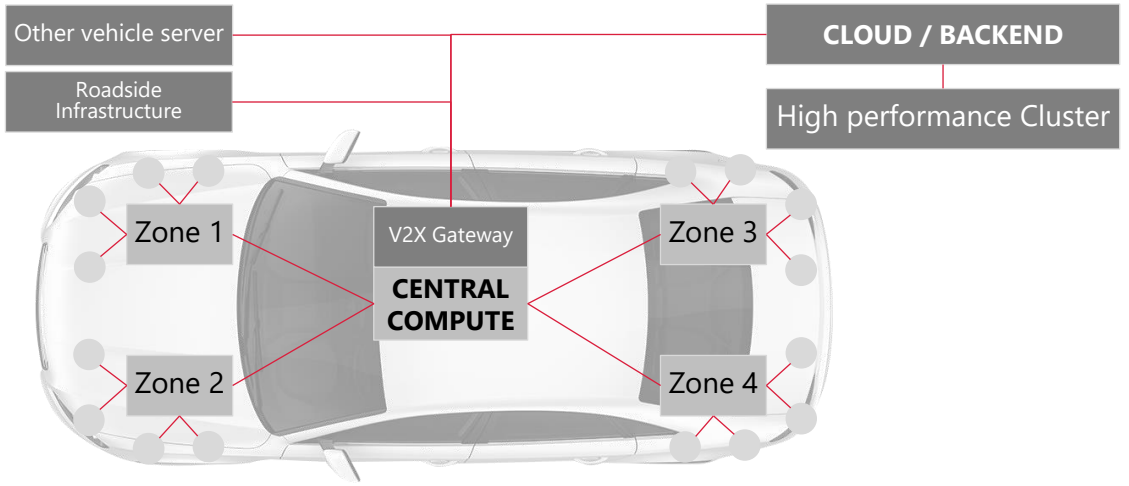
» GROWN ARCHITECTURE



- Component-oriented: fixed SW per HW unit
- Benefit: Economy of scales for stable components

- **Challenges: Complexity, time-to-market**, scalability, variant handling
- Solutions: "Automotive style SW", Proprietary standards

» SCALABLE ARCHITECTURE



- Service oriented: SW defines feature, HW stable
- Benefit: **time to market**, FOTA/SOTA (function/software over the air), economy of scale in reusable software, few HW suppliers
- Challenges: interfaces, HW development & network, virtualization, Autosar, Safety/Security/Privacy
- Solutions: **IT technology**, IT firm collab., open standards

Image source vehicle: https://www.pngfind.com/mpng/bboJwo_car-top-png-white-car-top-png-transparent/; Rest & content: FEV

A centralized, software-driven E/E architecture becomes necessary to provide sufficient flexibility, computing power, and redundancy for high automation

(R)EVOLUTION OF THE E/E ARCHITECTURE

FUTURE VISION

Vehicle centralized E/E arch.

Domain independent vehicle centralized approach with central vehicle brain(s) and neural network (zones): logical centralization and physical distribution

TOMORROW

(Cross) Domain centralized E/E arch.

Increasing cross domain and **central vehicle functions, incl. connectivity**. **Increasing computing power and SW updates over the air**

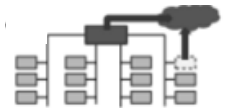
TODAY

Distributed E/E arch.

Mostly encapsulated E/E architecture structure

We are moving here

Vehicle Cloud Computing

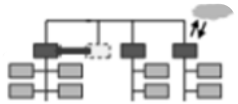


VISION
Vehicle functions in the cloud

Vehicle Computer & Zone ECUs

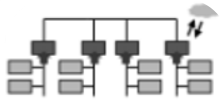
Zone Oriented Architecture and Vehicle Computer

Domain Fusion



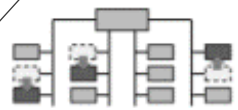
Central Cross Domain ECUs

Centralization



Central Domain ECUs

Integration



Functional Integration

Modular

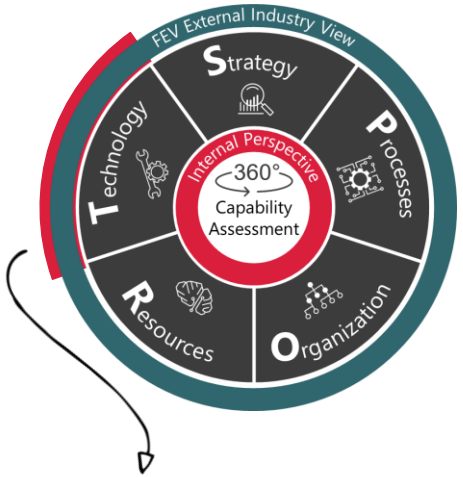
Each function has its own ECU

Increasing functions

* For selected vehicle functions
Source: Elektronik-Systeme im Automobil, München, 10.-12.02 2016, Zerfowski, Bosch

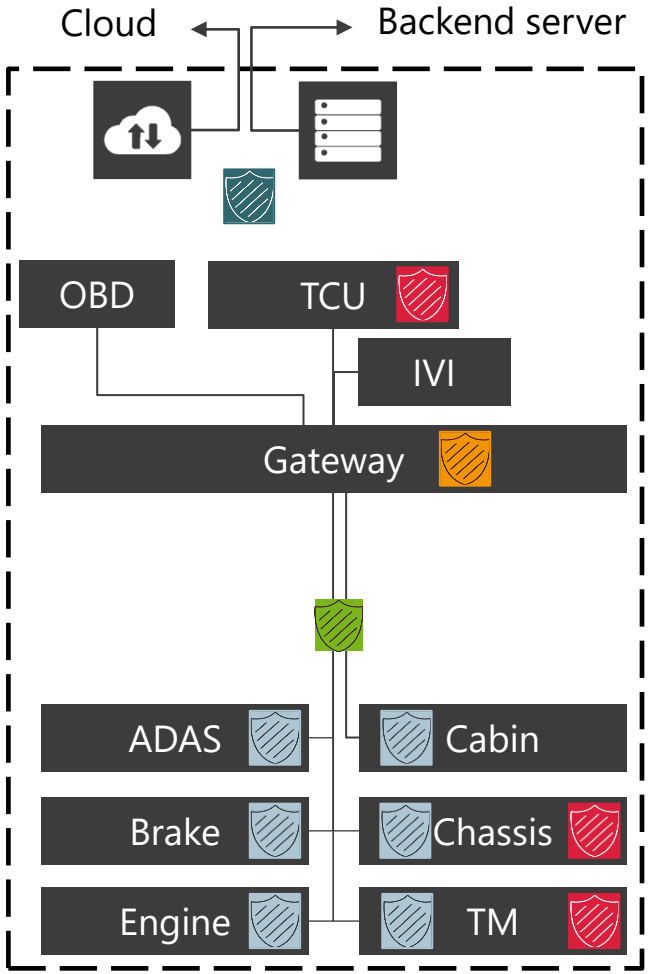
With ISO 21434 and UNECE R 155 entering into force, cybersecurity becomes a business-critical competence that goes beyond technical implementation

FEV SPORT FRAMEWORK – CYBERSECURITY CAPABILITY ASSESSMENT



TECHNOLOGY DIMENSIONS

- Full System
- Backend
- Interface
- Gateway
- Network
- ECUs



UNECE

Cybersecurity becomes mandatory aspect of type approval (UNECE WP.29 R 155)

- For new whole vehicle types from 07/2022
- Requires organizational readiness

ISO

Final publication of cyber security norm expected for Q2 2021 (ISO/SAE 21434)

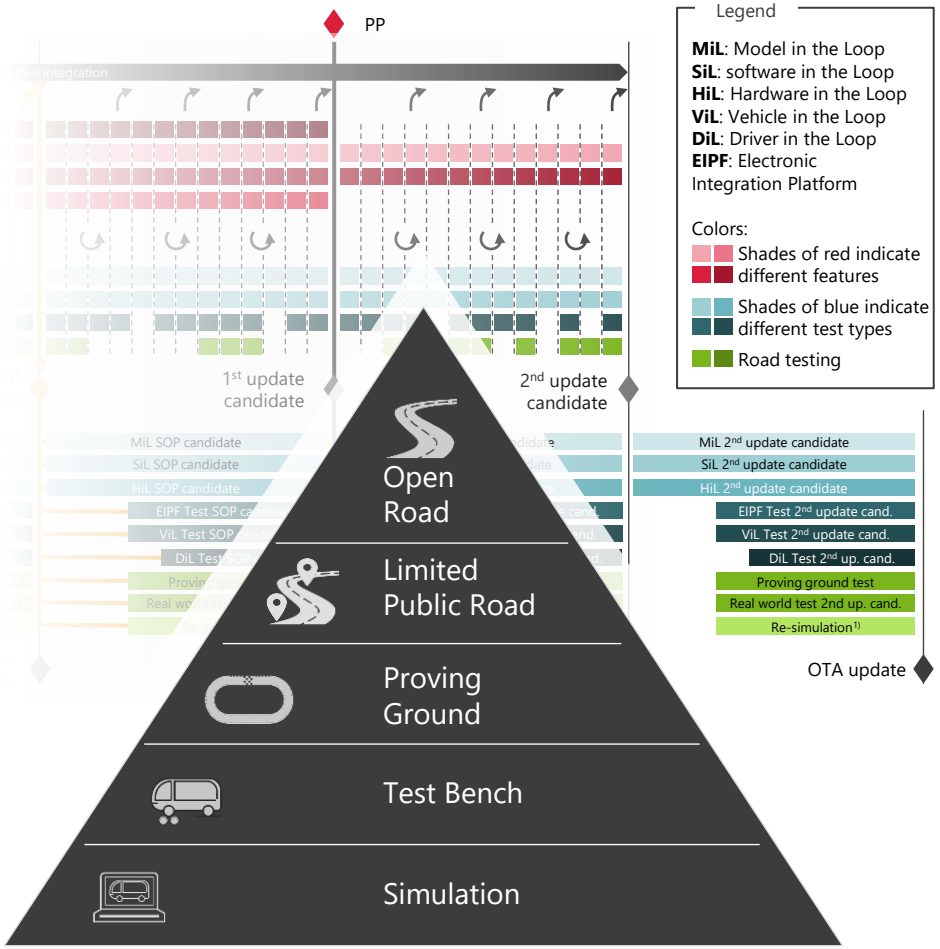
- Cybersecurity standard along the entire product lifecycle

» Cybersecurity Management system (CSMS) holistically over entire product life cycle including technical and organizational aspects required

Note: OBD = On-board diagnostics; TCU = Telematic control unit; IVI = In-vehicle infotainment; ADAS = Advanced Driver Assistance Systems; TM = Tire pressure monitoring
Source: FEV

Testing, validating, and benchmarking of AD technology is a key challenge when trying to balance high product quality & reducing unnecessary efforts

LEVELS OF VEHICLE TESTING AND VALIDATION



- Testing, validating, and benchmarking of AD technology can be conducted by various methods
- Iterative agile testing loops in parallel to classic product validation
- Potential to obtain sufficient data by
  - High degree of simulation / virtual validation (x-in-Loop)
  - Scenario-based development
  - Intelligent data collection
- Consideration of criteria beyond pure homologation aspects to fulfill mobility promise

» A comprehensive testing portfolio is key to ensure highly reliable and safe automated driving systems

Source: FEV

FEV preprocessed and evaluated logged data of (autonomous) driving scenarios for an OEM

CASE STUDY – ADAS DATA LOGGER DEVELOPMENT

WORK SCOPE

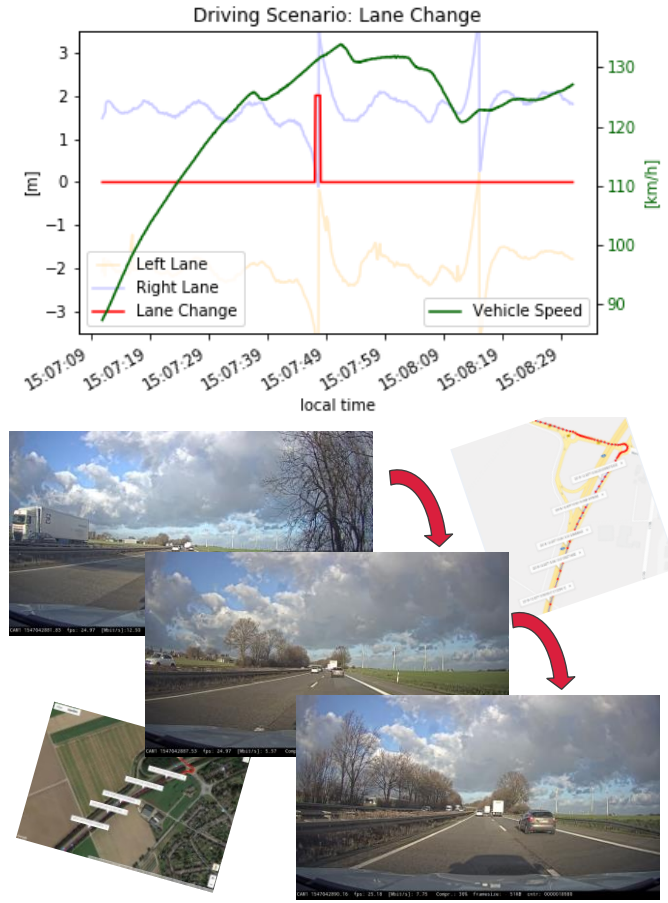
- Transmitting data from logger to cloud storage
- Preprocessing of data in the cloud
  - Data formatting, filtering, type conversion, resampling etc.
  - Additional signal calculation, scripting etc.
- Data evaluation and event detection
- Synchronization of CAN- and video-data

MOTIVATION

- Cluster computing for event detection in CAN-data
- Identifying predefined scenarios from CAN-data
- Confirm detected events via logged video data and GPS-data

ACHIEVEMENTS

- Data preparation for optimized evaluation procedure on cluster
- Validation of logged data from different devices and implemented, automated event detection



Source: FEV

Proving grounds will play a key role for insurance companies in order to be able to recreate complex accident scenarios involving automated vehicles

RECREATION OF TRAFFIC SCENARIOS

Self-Driving Uber Car Kills Pedestrian in Arizona, Where Robots Roam

The New York Times, March 19, 2018

Uber self-driving crash 'mostly caused by human error'

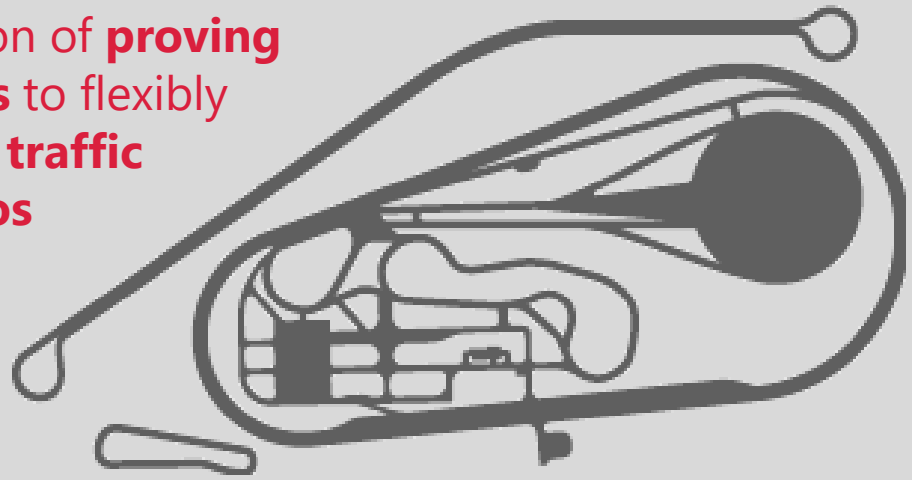
BBC, November 20, 2019

Uber's self-driving operator charged over fatal crash

BBC, September 16, 2020

How can complex accident scenarios involving automated vehicles be evaluated in the future?

Utilization of **proving grounds** to flexibly recreate **traffic scenarios**



Source: BBC; New York Times; FEV

Global mega trends such as climate change, urbanization and digitalization are driving the introduction of new technologies in the automotive industry

FEV CONSULTING

MACRO ECONOMIC

GLOBAL MEGA TRENDS

SUSTAINABILITY

URBANIZATION & SMART CITIES

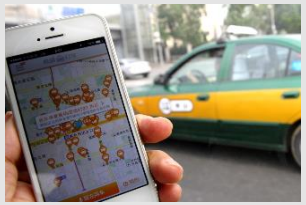
CONNECTIVITY / DIGITALIZATION

Focus of this presentation

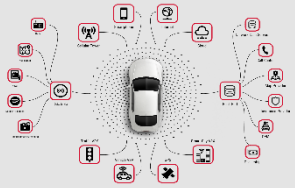
AUTOMOTIVE

GENERAL INDUSTRY TRENDS

ZERO EMISSIONS & E-MOBILITY



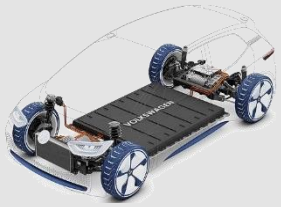
MULTIMODAL TRANSPORT & LOGISTICS



VEHICLE CONNECTIVITY

VEHICLE AUTOMATION

SPECIFIC TECHNOLOGY TRENDS



ELECTRIFICATION & FUEL CELL

SHUTTLES & ROBO TAXIS

V2X COMMUNICATION

SOFTWARE-DEFINED VEHICLE ARCHITECTURE

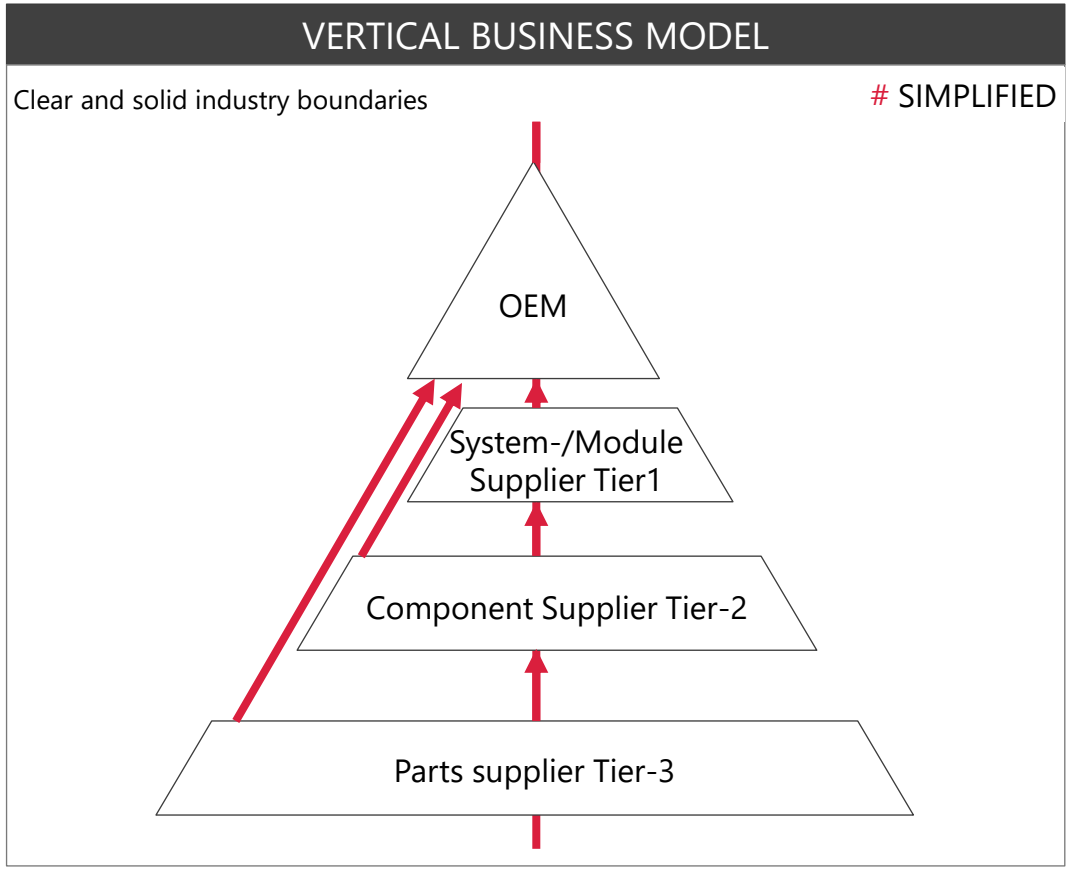
NEW BUSINESS OPPORTUNITIES AND BUSINESS MODELS

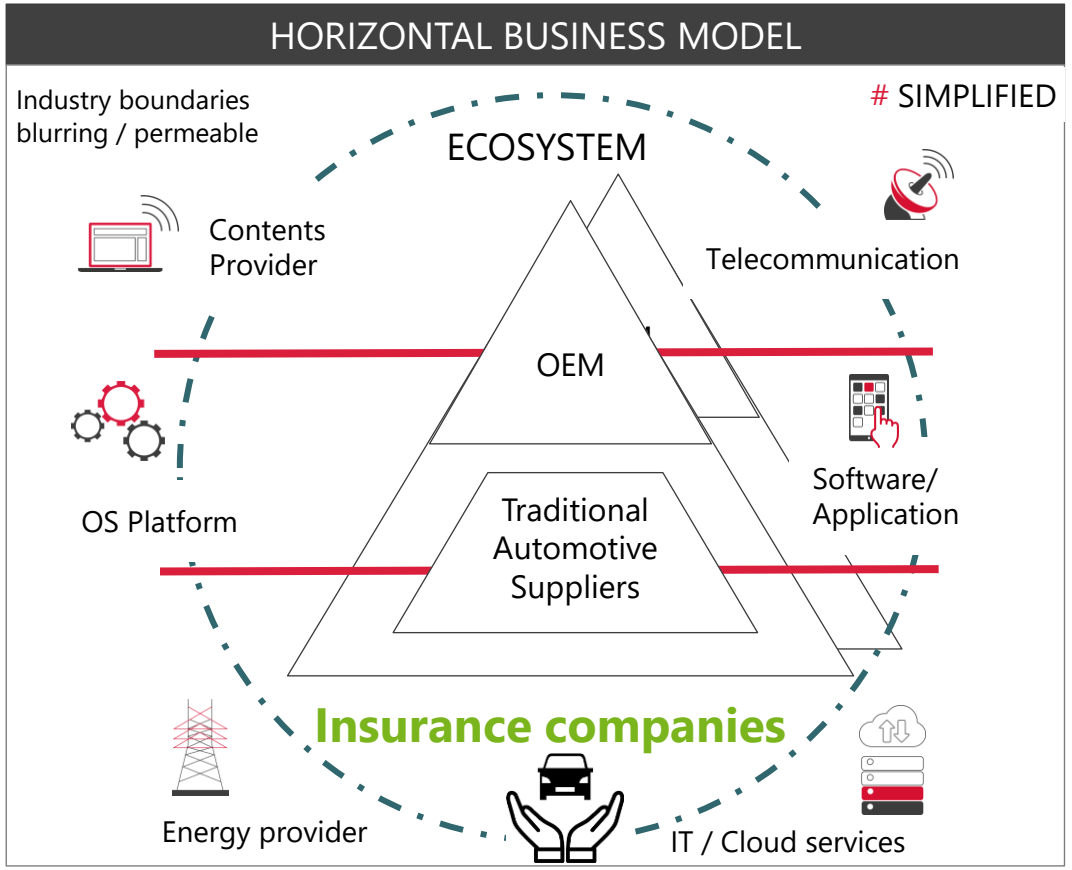
Source: Bosch, Toyota, Apple, CleanTechnica, Nissan, FEV

The Automotive industry is currently undergoing change in their business model setup – what new role can insurance companies play?

FEV CONSULTING

EXEMPLARY DELIVERABLE PHASE 0 – AUTOMOTIVE VALUE CHAIN





» Mainly Product/HW focused

» Service & Mobility Solution focused

Source: FEV

KEY TAKE AWAYS

The automotive industry is being disrupted by

- **Electrification**
- **Connectivity**
- **Automation**
- **New mobility solutions**

… and needs to adapt its business models

SOME IMPLICATIONS FOR INSURANCE COMPANIES:

ZERO EMISSIONS & E-MOBILITY

Increased lifetime and second product lifecycle resulting from sustainability approach might impact business models of insurance companies

MULTIMODAL TRANSPORT & LOLOGISTICS

The future of transportation will be multi-modal – new modes of transportation (e.g. eVTOL, scooters etc.) will require tailored insurance products

VEHICLE CONNECTIVITY & V2X COMMUNICATION

A variety of V2X use cases is just emerging – selected ones offer great potential for insurance companies to engage in new business models (e.g. PPP)

VEHICLE AUTOMATION & SOFTWARE DEFINED VEHICLE ARCHITECTURE

The recreation of safety critical traffic scenarios plays a crucial role in the testing & validation of automated vehicles – proving grounds will become increasingly important to serve this purpose

Source: FEV

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