



**KNORR-BREMSE**

# Shaping the Future of Sustainable Transportation

Capital Markets Day (November 29, 2021)

Knorr-Bremse AG

# Agenda

Time (CET)	Presentation	Speaker
2:00pm	Welcome and Introduction	Andreas Spitzauer, Head of Investor Relations
~2:05pm	Shaping the Future of Sustainable Transportation	Dr. Jan Mrosik, CEO
~2:35pm	Financial Strategy	Frank Weber, CFO
~3:00pm	Q&A Session I	Executive Board
~3:30pm	Rail Vehicle Systems	Dr. Jürgen Wilder, Member of the Executive Board
~4:00pm	Commercial Vehicle Systems	Dr. Jan Mrosik, CEO
~4:30pm	Q&A Session II	Executive Board
~5:15pm	Key Takeaways	Dr. Jan Mrosik, CEO

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**KNORR-BREMSE**

# Shaping the Future of Sustainable Transportation

Dr. Jan Mrosik, CEO of Knorr-Bremse AG

# Key takeaways



**KB is in excellent shape** – We outperform even in challenging times

**KB capitalizes on favorable megatrends**

**Sustainability is core** of KB's markets, products and organization

**KB continues profitable growth path** through **technology leadership**

**KB drives operational excellence** to create **shareholder value**



**KB**  
continues  
its  
**successful**  
**strategy**

# Reflections after the first 11 months



# Global market & innovation leader in systems for rail & truck



## Market leadership

**A global market leader**

~**50% market share**<sup>1</sup> in RVS brakes

~**23% market share**<sup>1</sup> in CVS brakes



## Market outperformance

Track record of **above industry growth: 10% historic revenue CAGR**<sup>2</sup>



## Innovation edge

**Shaping industry trends** by focusing on **safety** and **mission critical** applications



## High safety requirements

**Key supplier** with global core technology know-how and capabilities  
Clearly ahead in global **homologation** processes



## Resilience

**37% aftermarket share**<sup>1</sup>

Well-balanced **portfolio**  
**Cost-efficient** operations



## Profitability

**Ø EBIT margin** of ~**16%**<sup>3</sup>  
Focus on **attractive** rail and truck **end markets**

1) In 2020 2) 1989-2019 3) 2015-2019

# Global market & innovation leader in systems for rail & truck



## Market leadership

**A global market leader**

~50% market share<sup>1</sup> in RVS brakes

~23% market share<sup>1</sup> in CVS brakes



## High safety requirements

**Key supplier** with global core technology know-how and capabilities

Clearly ahead in global **homologation** processes



## Market outperformance

Track record of **above industry growth: 10% historic revenue**



## Sustainability is part of our DNA

Our technologies are the **foundation for sustainable and safe transportation**

**37% aftermarket share<sup>1</sup>**

Well-balanced **portfolio**

**Cost-efficient** operations



## Innovation edge

**Shaping industry trends** by focusing on **safety** and **mission critical** applications



## Profitability

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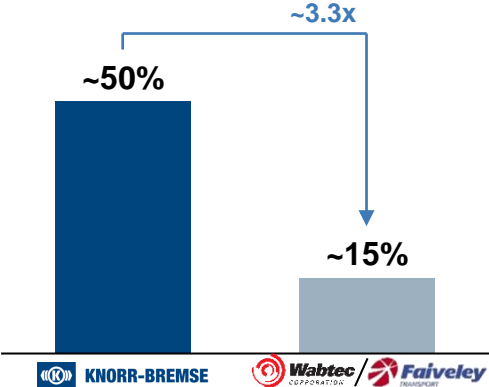
# KB has maintained and expanded its market leading positions



### Market positions key product groups<sup>1</sup>

- Brake systems
- Entrance systems
- HVAC systems<sup>2</sup>

### Global brakes market shares<sup>1</sup>



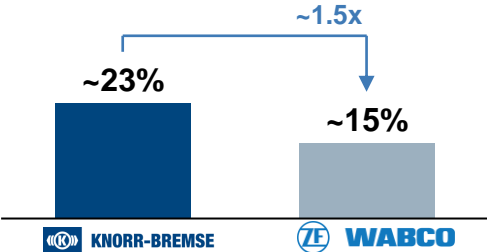
Example global market leader for brakes<sup>1</sup>



### Market positions key product groups<sup>3</sup>

- Brake systems & vehicle dynamics<sup>4</sup>
- Energy supply & distribution<sup>5</sup>
- Fuel efficiency<sup>6</sup>

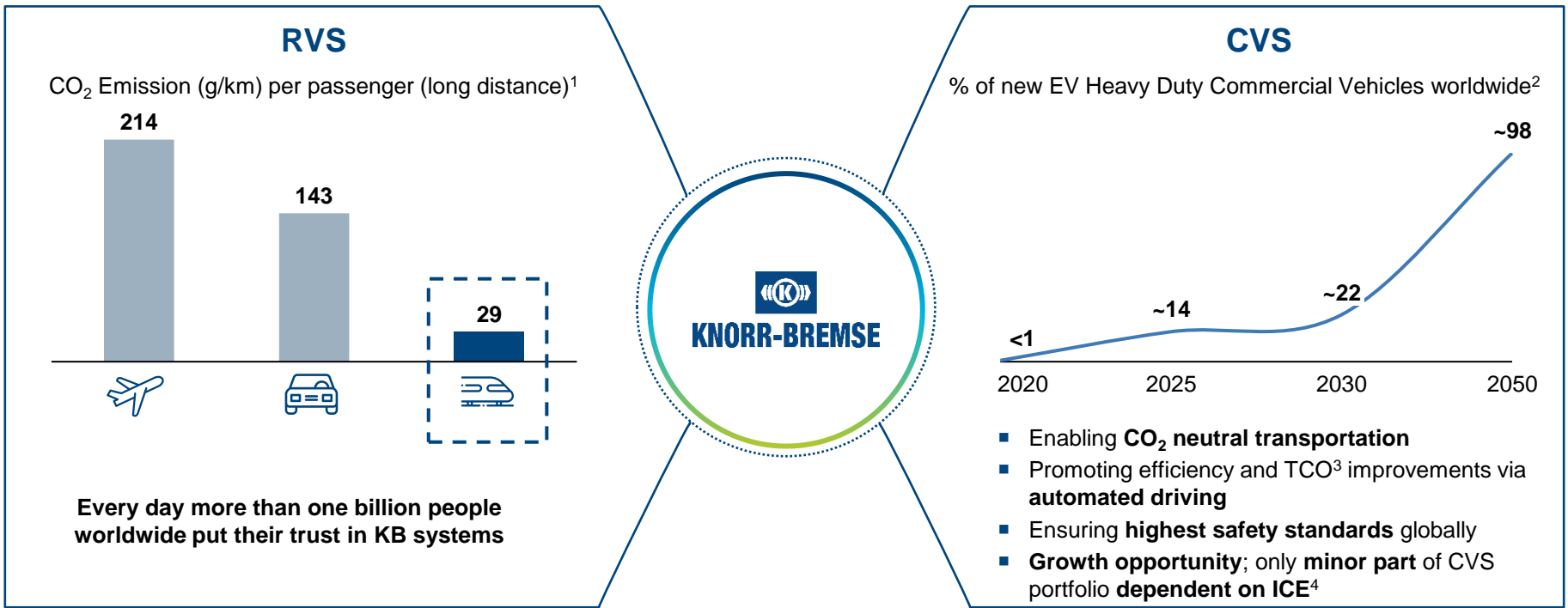
### Global brakes market shares<sup>3</sup>



Example global market leader for brake systems & vehicle dynamics<sup>4</sup>

1) 2020 estimates for OE and aftersales without labor; Wabtec includes Faiveley; For competitor, an estimate was used; Market shares rounded to the nearest multiple of 5% 2) Heating Ventilation Air Conditioning  
 3) For 2020 global addressable Truck, Bus and Trailer OE market, excl. aftermarket 4) Air disc brake, valves / pedal unit, actuators, foundation drum brake, steering, brake control (ABS, EBS, ESP), ADAS, ELC, others 5) Compressors, air treatment 6) Vibration dampers, engine air control, transmission – gear and clutch actuation/ control; Source: internal market research

# KB is an indispensable part of sustainable & safe transportation



1) 2019, reference for Germany, Sources: <https://www.allianz-pro-schiene.de/themen/umwelt/daten-fakten/> (accessed on September 8, 2021), based on Umweltbundesamt 2) EV incl. BEV & FCEV (HD only), study by McKinsey & Company Inc., published in Handelsblatt on September 16, 2020 3) Total Cost of Ownership 4) Internal Combustion Engine

# Innovation is the basis of KB's technology leadership and long-term success



## True Scale:

~3,800 R&D employees  
Thereof 740 software engineers  
5 global R&D centers (3 co-located)



**Agile R&D methods** implemented



**Extensive partnership network & collaboration** with tech players



**In-house incubator**



## Pioneering innovations (examples)

### RVS



Digital automatic coupler for freight (DAC)



Reproducible braking distance



LIFEDrive sliding doors

### CVS



Electric power steering



Electronic parking brake



eCompressor

**Long-term R&D ratio: 6 – 7 %**

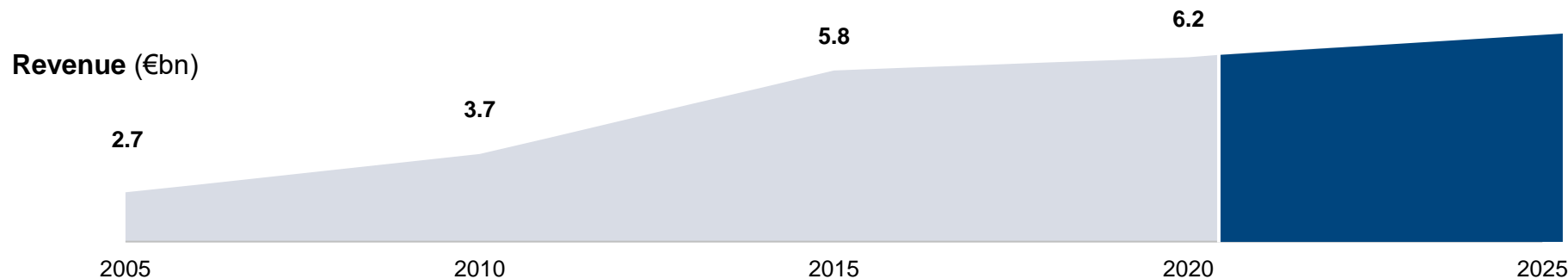
# KB's successful path continues



Revenue CAGR	~0.2% <sup>1</sup>	~8.8% <sup>1</sup>	~4.5% <sup>2</sup>
Ø EBIT margin	~9% <sup>1</sup>	~12% <sup>1</sup>	~16% <sup>2</sup>

Mastering external challenges

Focusing on profitability and continued investments



1) HGB 2) IFRS

# KB's successful path is driven by four megatrends

Megatrends

Urbanization



Sustainability



Digitalization



Mobility



Key influencing factors

Automation








Logistics



Societal changes and global trends fundamentally transform the economic environment

# Positive trends will drive market growth and overcompensate headwinds





-  **Long-term growth** supported by **megatrends** and governmental initiatives
-  **Aftermarket** as continuous **growth driver** (incl. China)
-  **New technologies** to improve **availability, lifecycle costs, and capacity**
-  **OE China business** with **headwinds and opportunities**
-  **OE market recovery slower** than initially expected

  
**+ ~4% p.a.**  
*Market (OE+AM)  
 CAGR 2020-2025e*

1) Normalized CAGR excl-Covid from 2021 onwards of ~3%; Source: internal market research



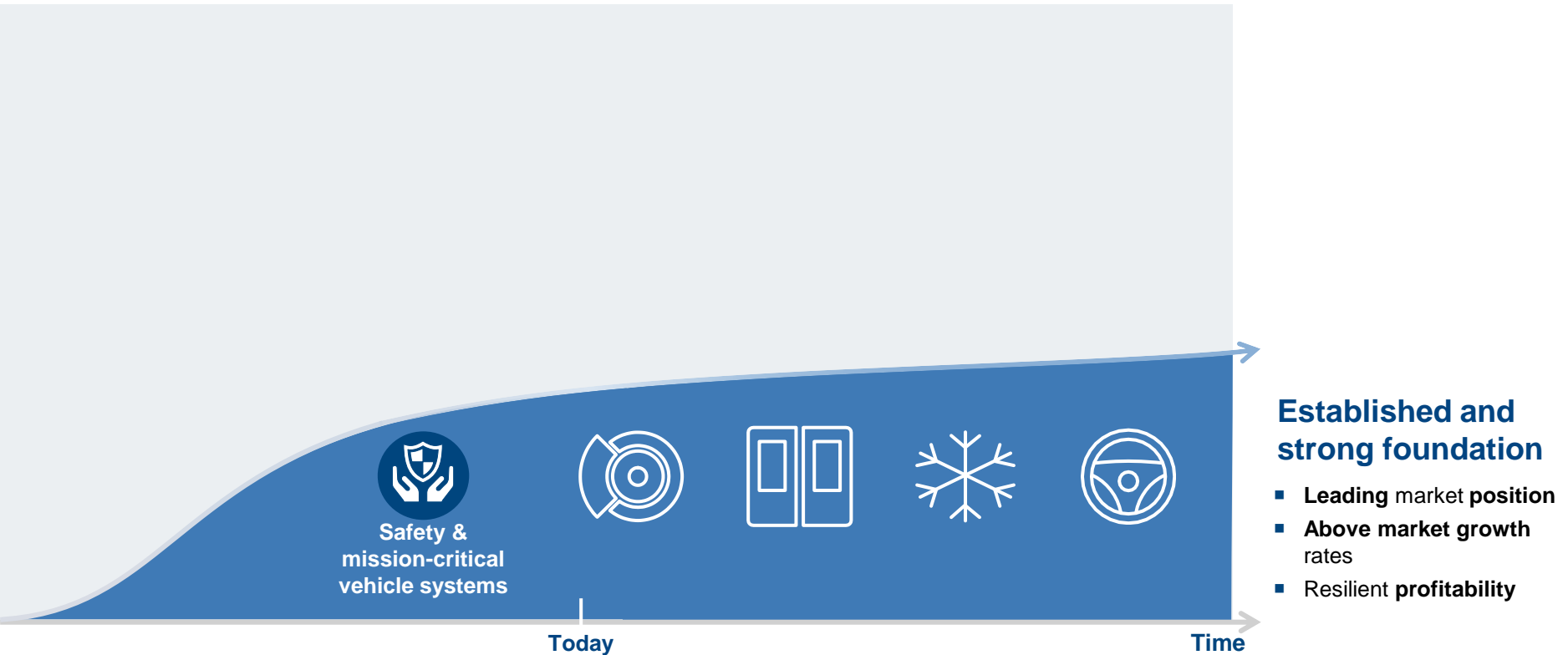
-  **Content per vehicle growth** through **regulation** and **new technology**
-  Shift to **higher technology standards** in **emerging markets**
-  **Increase of installed base** as basis for **aftermarket growth**
-  **Limited growth** of truck production rate
-  Changing **Tier-1 supplier landscape**
-  **Supply shortages a challenge** for the **truck market**

  
**~0% TPR p.a.** → *CVS relevant market CAGR* **+ ~6% p.a.** 2020-2025e<sup>1</sup>  
*CAGR 2020-2025e* **+ ~3% p.a.** 2021-2025e

## Moving forward – KB's strategic priorities

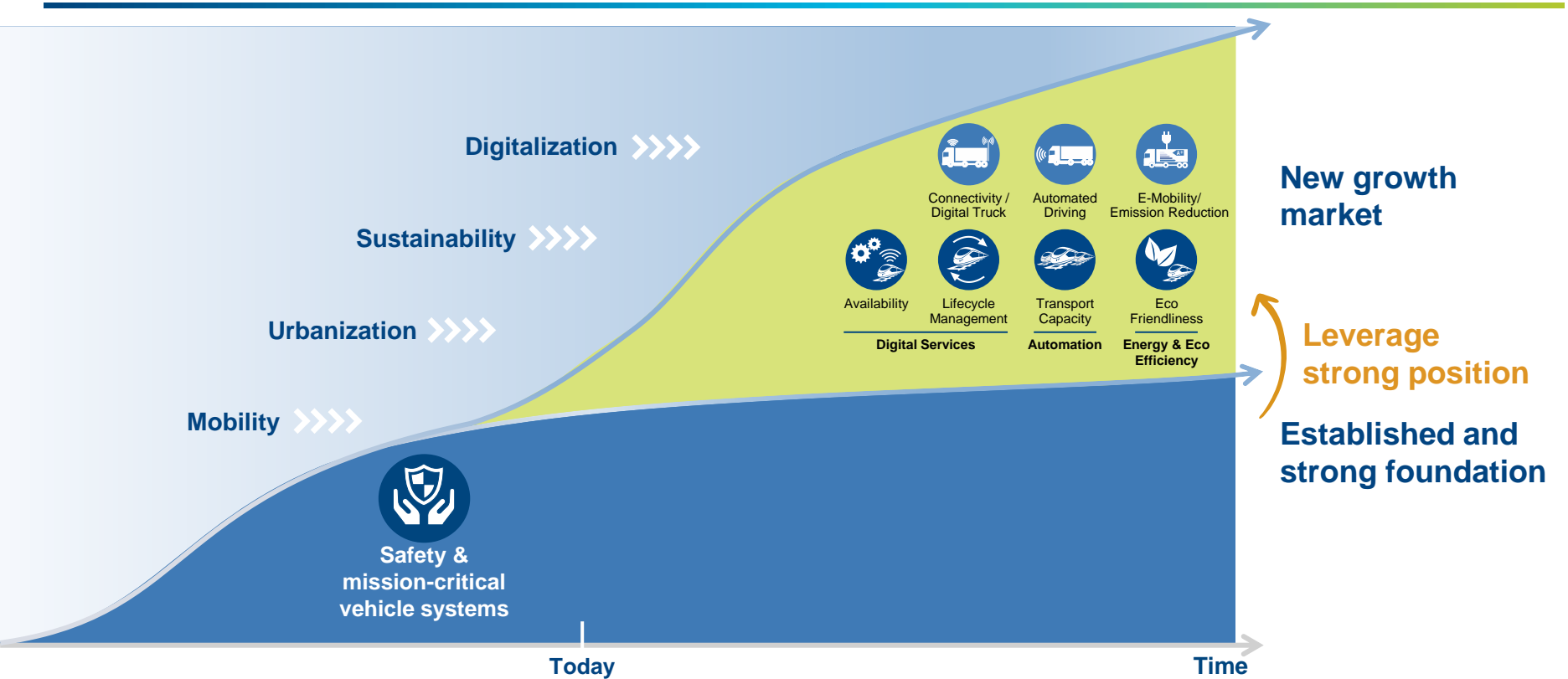
- 1 Systematically **develop base portfolio**
- 2 **Focus on attractive segments** for future outperformance in **rail** and **truck**
- 3 Drive **innovation & digitalization**
- 4 **Clear M&A** strategy
- 5 **Operational excellence**
- 6 **ESG** and **sustainability**
- 7 **Strong financial performance**

# KB will continue to grow its core business further ...

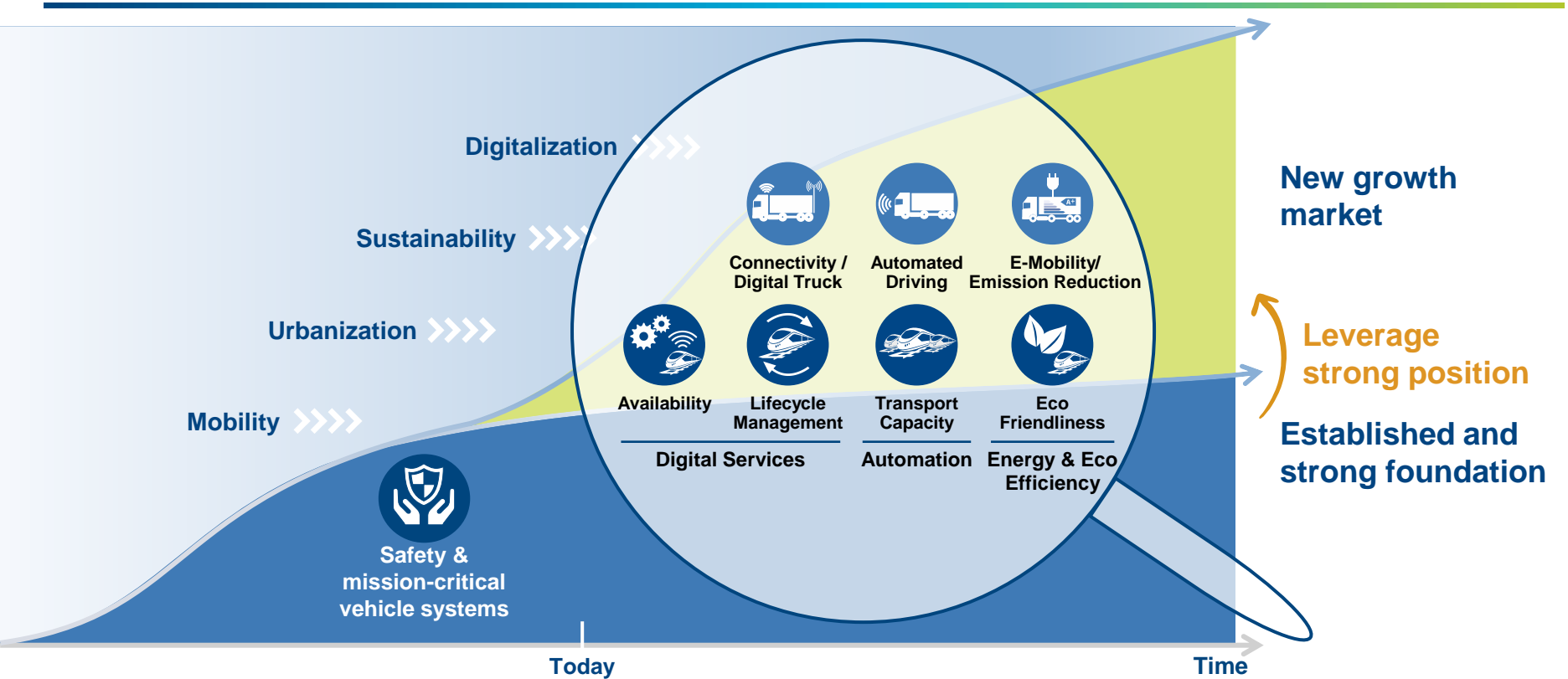




# ... and will also develop new levers of growth



# ... and will also develop new levers of growth



# KB continues to systematically develop its portfolio of mission critical products and digital solutions

## Mechanical products

## Mechatronic products

## Smart & digital products

— Strong basis —



Pneumatic brake system



Air disc brake



Electronically controlled pneumatic brake



ABS & EBS













Smart brake control (Cube Control)



GSBC & rGSBC

# Build new business in RVS

	Digital Services	Automation	Energy & Eco Efficiency	
Industry trends	 <p>Availability</p>	 <p>Lifecycle Management</p>	 <p>Transport Capacity</p>	 <p>Eco Friendliness</p>
Applications (examples)	Condition-based/ predictive maintenance	Aftermarket	Automation	Energy savings / metering
RVS solutions (examples)	<p>European train operator use case</p>  <p>HVAC monitoring &amp; energy saving</p> <p>Investment into Railnova</p>	 <p>RailServices portfolio for optimized LCC<sup>1</sup></p>	 <p>Increased train density</p>  <p>Environment sensing</p>	 <p>Driver advisory system</p>  <p>Smart metering</p>

1) Lifecycle costs 2) Reproducible Braking Distance

# Build new business in CVS

## Digital Services

## Automation

## Energy & Eco Efficiency

Industry trends



Connectivity/  
Digital Truck



Automated Driving



E-Mobility/  
Emission Reduction

Applications (examples)

Driver safety management

ADAS

HAD actuation & motion control

Electrification

CVS solutions (examples)



Collecting safety data and video for coaching & evaluation



ADAS offering with strong partners



Combining steering, braking, and motion control

**eCUBATOR** 

INNOVATE OUR PRODUCTS FOR THE E-MOBILITY AGE.

CVS strongly positioned to innovate products for the E-Mobility age (BEV and FCEV)

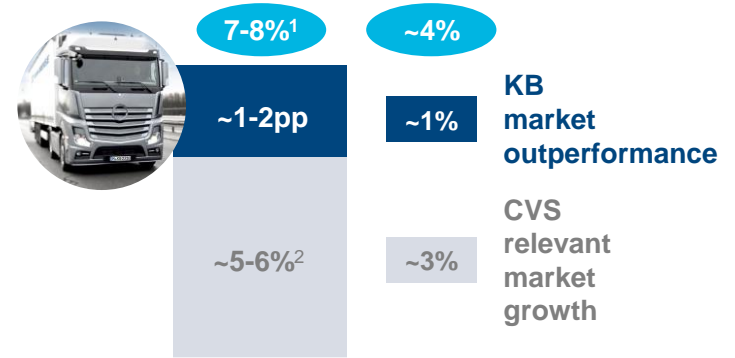
*Only minor part of CVS portfolio affected by electrification*

# KB Group with its resilient and diversified business outperforms the markets



RVS Revenue CAGR 2020 – 2025e

- Systematically **develop market share** in **every region** and across **all product groups**
- **Drive growth** in **aftermarket business** by leveraging KB's large **installed base** and new **service offering**
- **Innovate solutions** for **eco friendliness, efficiency** and **capacity increase**



CVS Revenue CAGR 2020 – 2025e

- **Gain market share** with particular focus on **growth markets**, e.g., North America and Asia
- Drive **content per vehicle growth** to continue with **above market performance** globally
- Develop **new portfolio** beyond safety **fostering our technology leadership**

1) Normalized CAGR excl.Covid ~4% 2) Normalized CAGR excl-Covid from 2021 onwards of ~3%; Source: internal market research

# KB drives digitalization in two dimensions



## Digital products and services

### Solution portfolio

- From mechatronic to smart & connected products
- New capabilities (e.g., analytics) and platforms for new products and services
- Build digital business models

&



## Internal digitalization

### Inhouse operations

- Standardized end-to-end processes
- Digitalization

## Product enhancement with digital technology

*Solution  
Examples*

### **Condition Monitoring**

*Remotely monitor condition  
of KB products*

## Digital business models

### **Predictive Maintenance**

*Optimize operations and maintenance  
process together with customers*

# Clear M&A strategy

## Priorities



Pursue **attractive and selective segments** in **rail** and **truck** for **future outperformance**



Focus on **bolt-on** acquisitions in **rail** and **truck**, **no focus** on **third pillar**



Strengthen our core business **with new capabilities**



Continue active **portfolio management** along stringent strategic and financial criteria



## Strategic Principles

### Markets & Segments

- Highly **attractive growth segments** with strong **entry barriers**
- **Technological differentiation**

### Business Model

- **Leading** market position and/or leading technology
- **Sustainable** competitive advantage
- **Resilient** business model

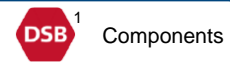
### Synergies

- **Best owner** principle
- Tangible and realistic **synergies**
- Easy to integrate with high **cultural fit**

## Latest investments (2021)

EVAC TRAIN

AutoBrains.



1) Subject to merger control approval



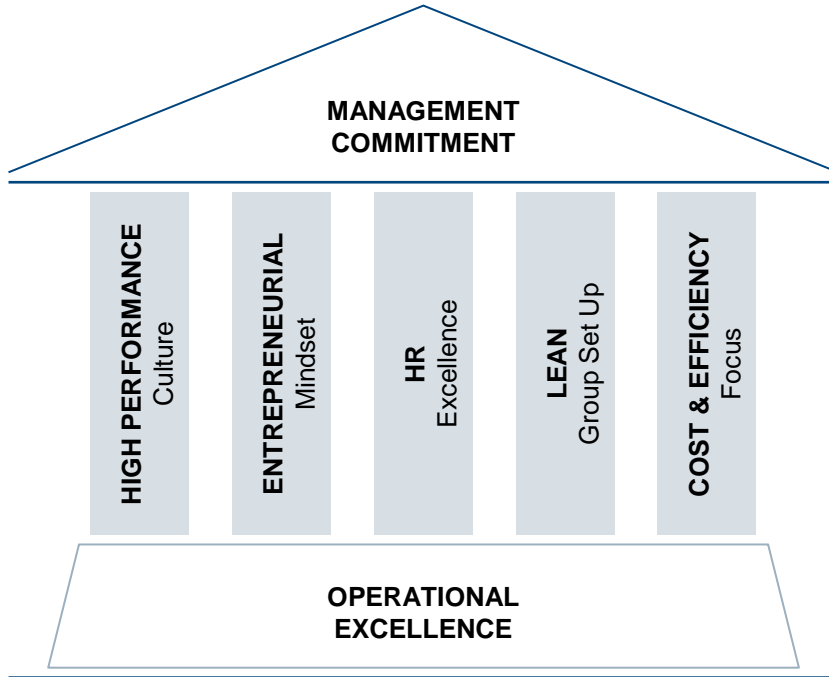
Acquisitions / JV



Start-up Investments (minority)



# Focus on operational excellence



**Global platforms**



**Process digitalization and standardization**



**Footprint optimization**



**Continued “local for local” set-up and value chain**



**Cost improvements**

# KB's strong commitment to ESG and sustainability

## KB: Shaping the Future of Sustainable Transportation



### Environmental



2030 Climate strategy and renewable energy target

### Social



Social projects and employee volunteering with Knorr-Bremse Global Care e.V.

### Governance



ESG targets as part of management incentive

# Ambitions for 2025



**Favorable mega trends** in truck and rail fully intact



Focus on **two-pillar strategy** in rail and truck



**Capture market share** through innovation



Profitable **growth & strong ROCE**

## 2025e

Revenues<sup>1</sup>

**€ 8.1 – 8.6bn**

EBIT margin (ROS)<sup>1</sup>

**14.0 – 16.0%**

1) Operating margin shown; based on market expectations mirrored in other CMD presentation parts

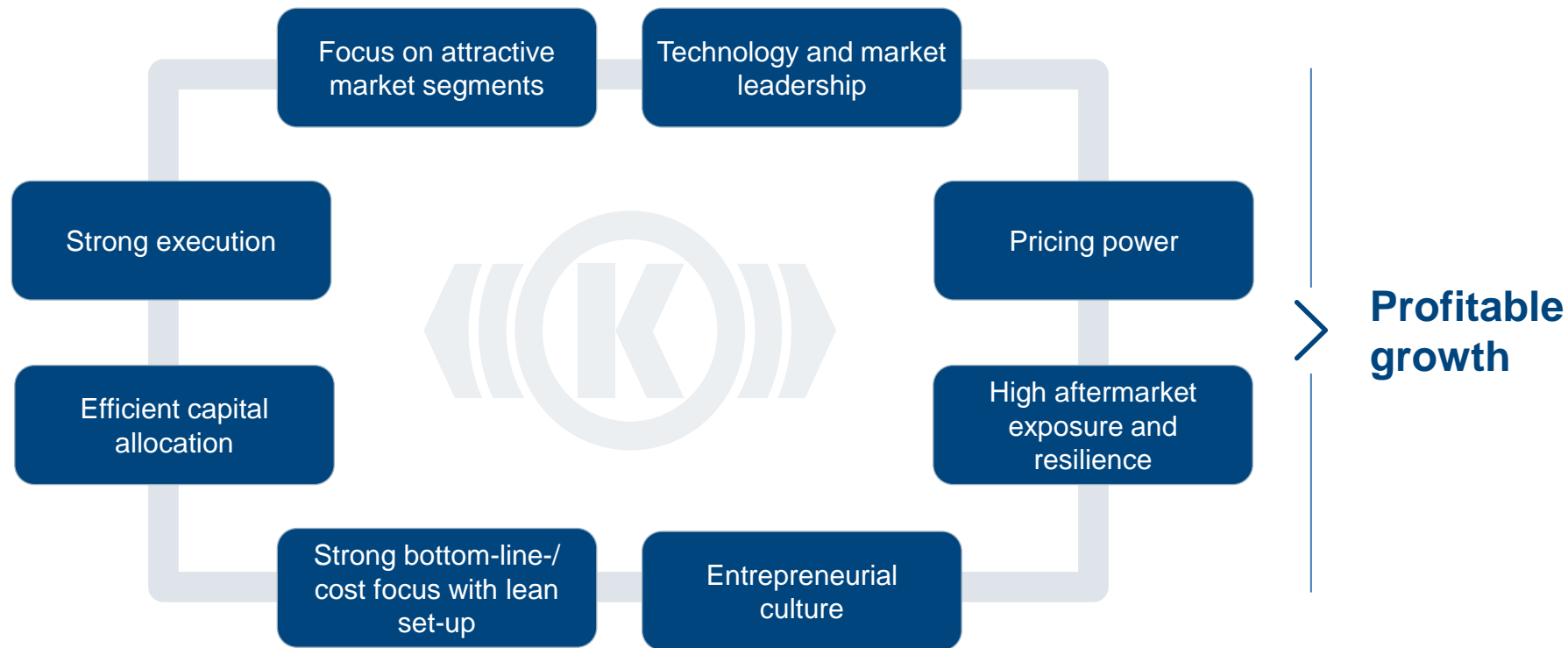


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# Financial Strategy

Frank Weber, CFO of Knorr-Bremse AG

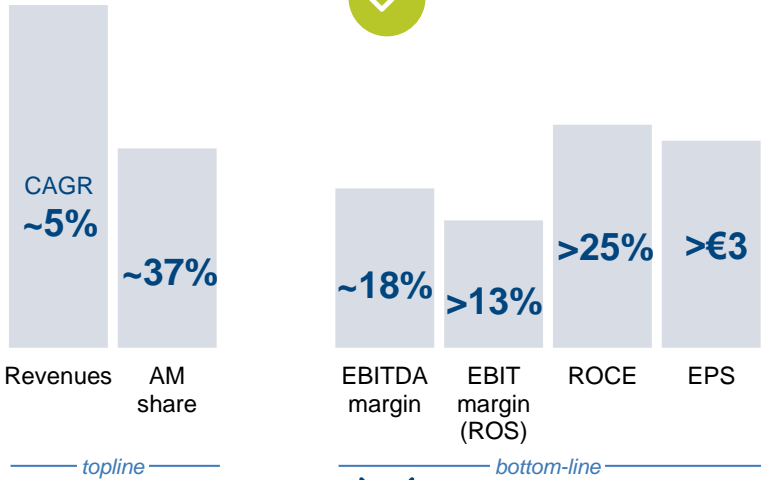
## Success factors for future profitable growth fully intact



# FINANCIAL STATUS QUO

## KB's outstanding financial excellence today proven in multiple dimensions

### P&L



**Market outperformance and high resilience**

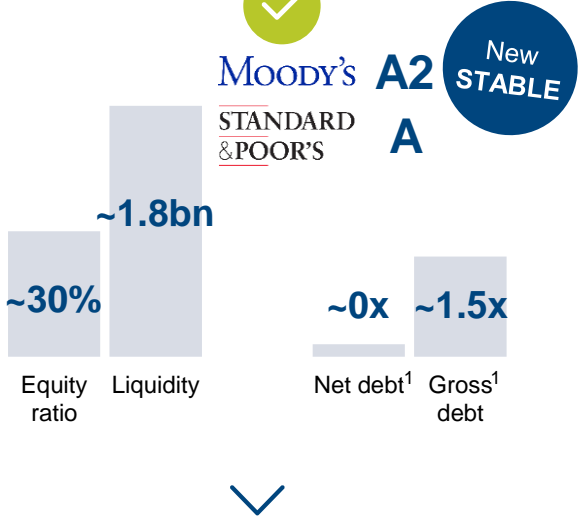
**Superior profitability and shareholder value**

### Free cashflow



**Strong cash conversion**

### Balance sheet



**Rock-solid and highly resilient balance sheet**

Note: P&L figures 2020/2021 and balance sheet figures as of Sept 30, 2021; CAGR 2015-2019      1) Leverage, in relation to annualized EBITDA

# FINANCE AGENDA

## Clear priorities to lift finance excellence to the next level

1



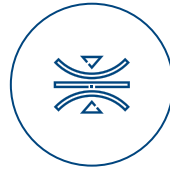
**Continuation  
of profitable  
growth**

2



**Further  
enhance cash  
generation**

3



**Financial policy of  
resilience and  
robustness**

4



**Efficient capital  
allocation and M&A  
strategy**

5



**Fostering ESG  
and benefitting  
from global  
sustainability  
push**

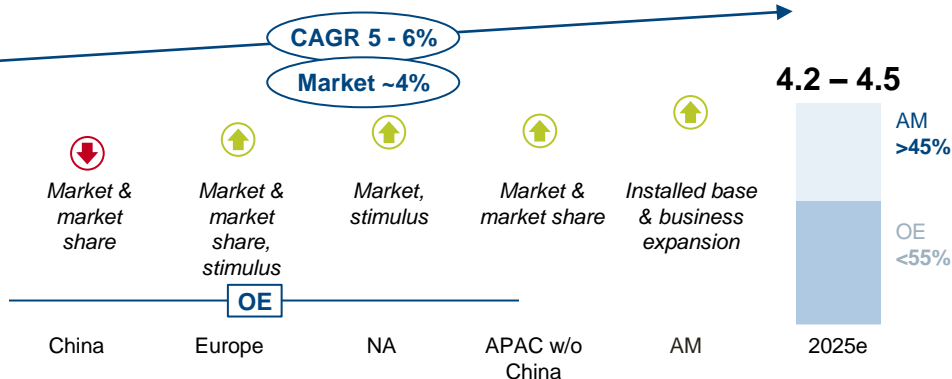
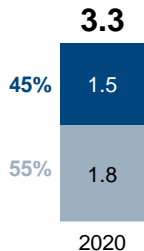
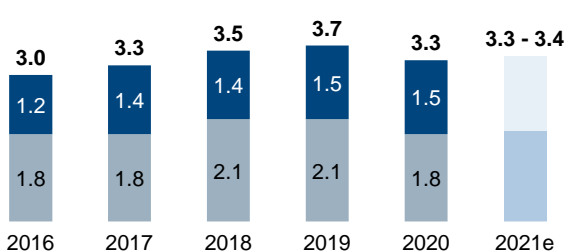


# PROFITABLE GROWTH RVS

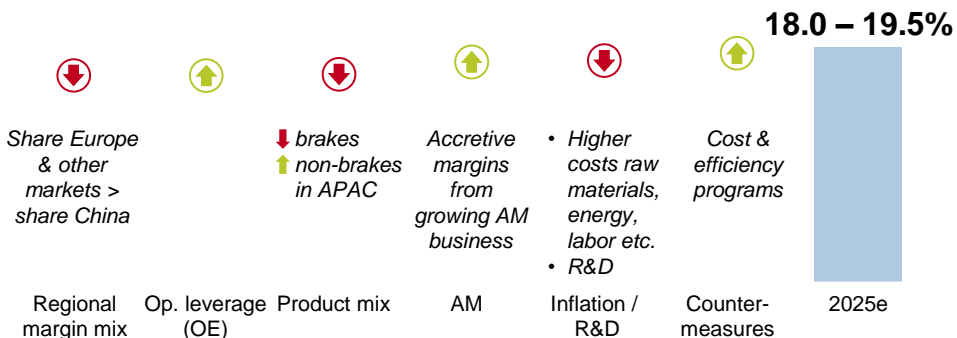
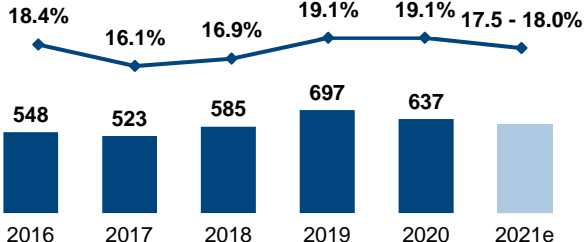
## Aftermarket and Europe as main growth drivers, profitability to improve from 2021 levels



Revenues (€bn)



Profitability / EBIT margin (ROS) (€m)



Note: Operating margins shown 2021 and 2025; 2016 & 2017 sales split acc. to German GAAP (HGB)

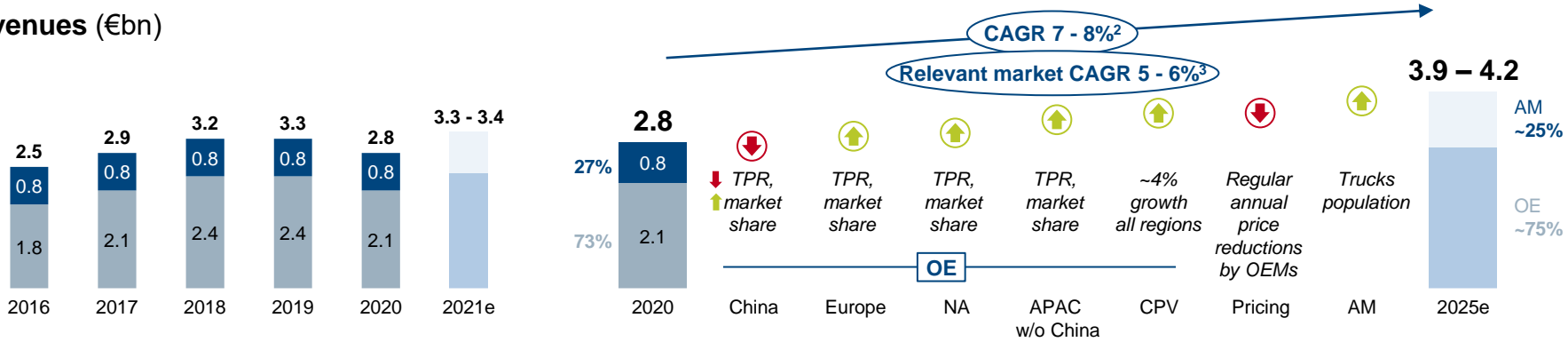


# PROFITABLE GROWTH CVS

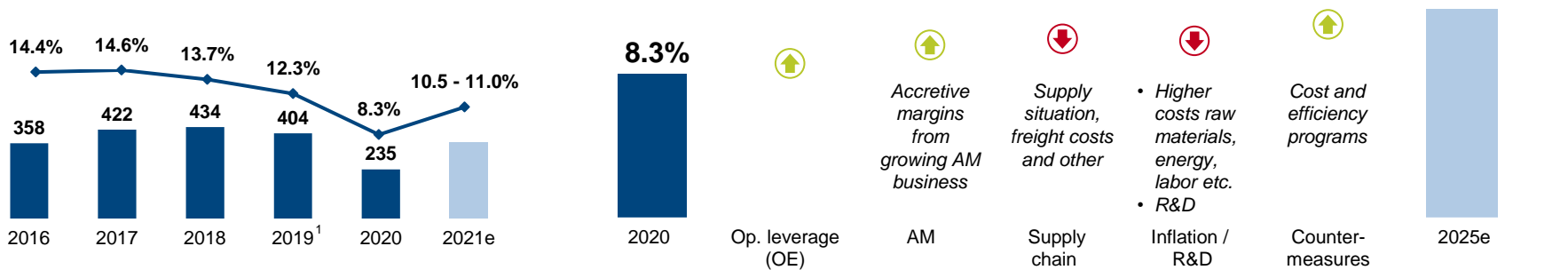
## Content per vehicle and aftermarket as key growth drivers supporting significant profitability increase



### Revenues (€bn)

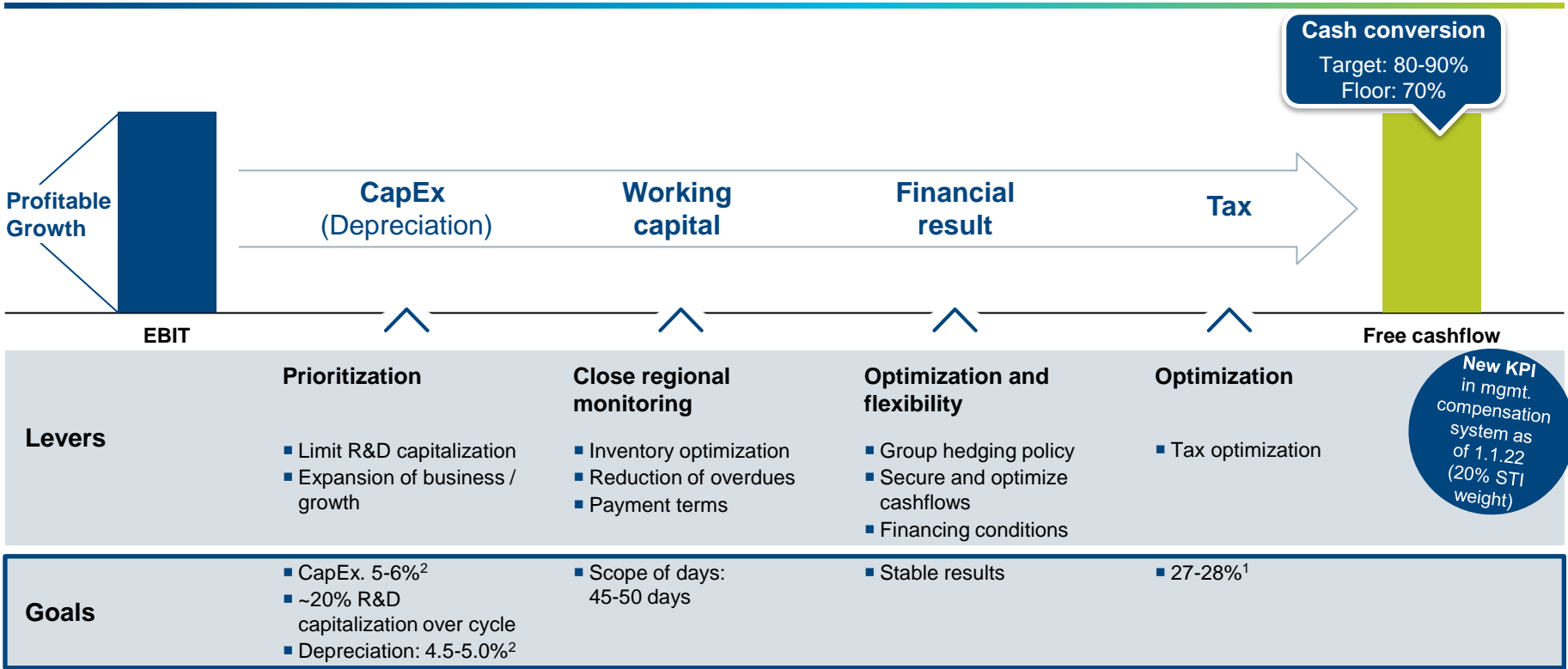


### Profitability / EBIT margin (ROS) (€m)



Note: Operating margins shown 2021 and 2025; assumed TPRs see CVS chapter; 2016 & 2017 sales split acc. to German GAAP (HGB) 1) Operating, reported EBIT € 374m (11.4%)  
 2) Normalized CAGR excl. Covid ~4% 3) TPR + CPV market





## Effective levers implemented to further improve cashflow generation



1) Based on current tax country rates, 2025 target 2) Of revenues

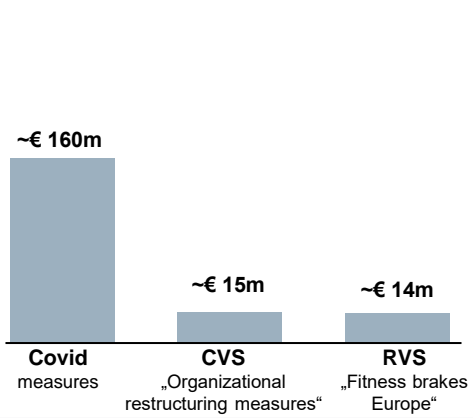
## Necessary cost measures initiated taken to counteract market challenges

### Market Environment

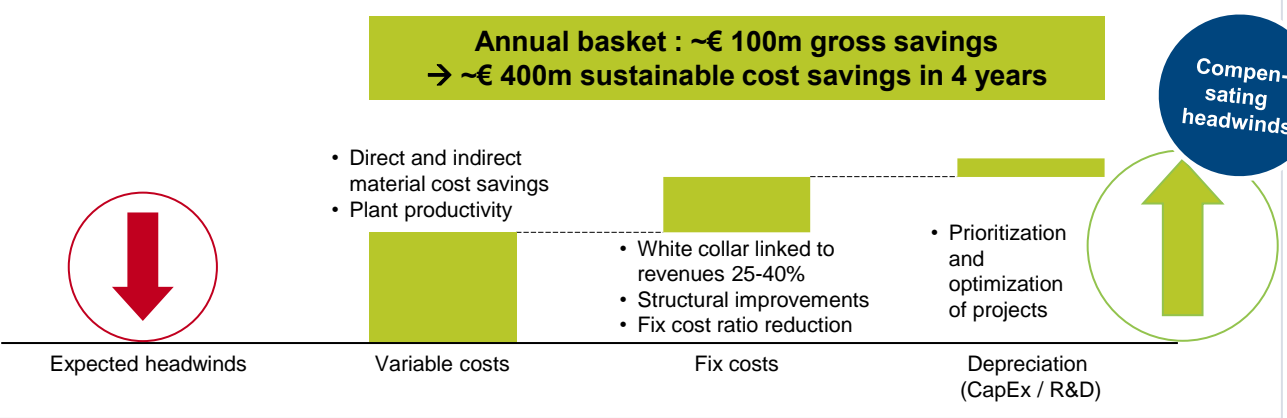
<p><b>Rail</b> </p> <ul style="list-style-type: none"> <li>China flattish</li> <li>Project postponements</li> <li>Growing other regions</li> </ul>	<p><b>Truck</b> </p> <ul style="list-style-type: none"> <li>Flat TPR (EU, NA, China)</li> <li>CPV in the market</li> <li>Regular annual price reductions</li> </ul>	<p><b>Supply chain</b> </p> <ul style="list-style-type: none"> <li>Semiconductor shortage and tightness of other components</li> <li>Freight costs, extra costs</li> <li>Broker parts prices</li> </ul>	<p><b>Inflation</b> </p> <ul style="list-style-type: none"> <li>Increasing raw material and energy costs</li> <li>Higher labor costs</li> </ul>
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### Proactive Response

#### 1 | Measures from the past



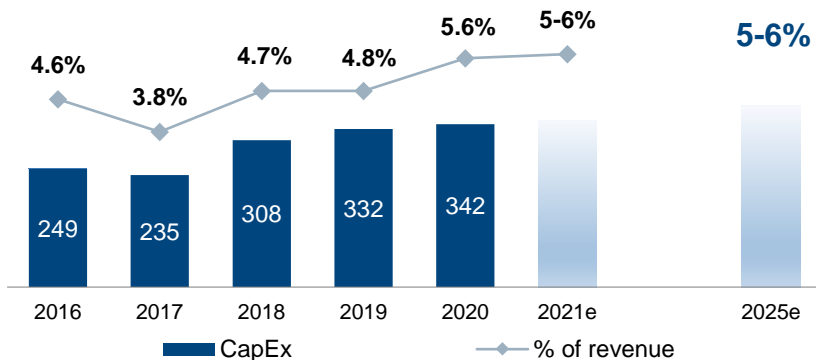
#### 2 | Continuous measures going forward (no restructuring costs related)



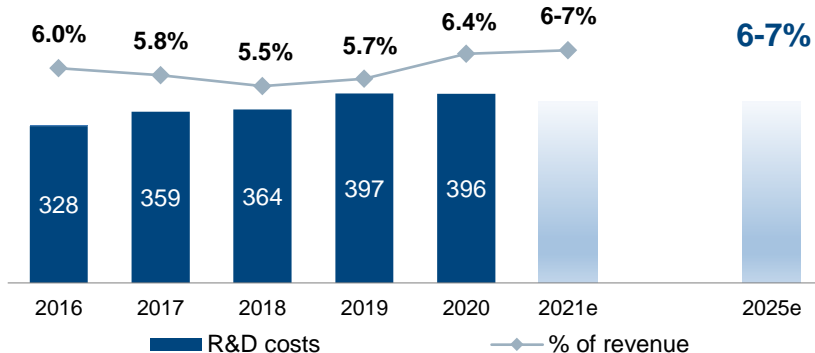
Note: Cost measures not all sustainable, partly one-offs

## Continuous investment into innovation and state-of-the-art industrial setup

### CapEx (€m)



### R&D (€m)



- Capacity to secure growth
- Focused capital employed
- Implementation of S4 Hana



- Innovation as basis of KB's financial success
- R&D + technology portfolio to increase
- Global set-up of R&D hubs with close contact to customers
- Sophisticated products and technological systems

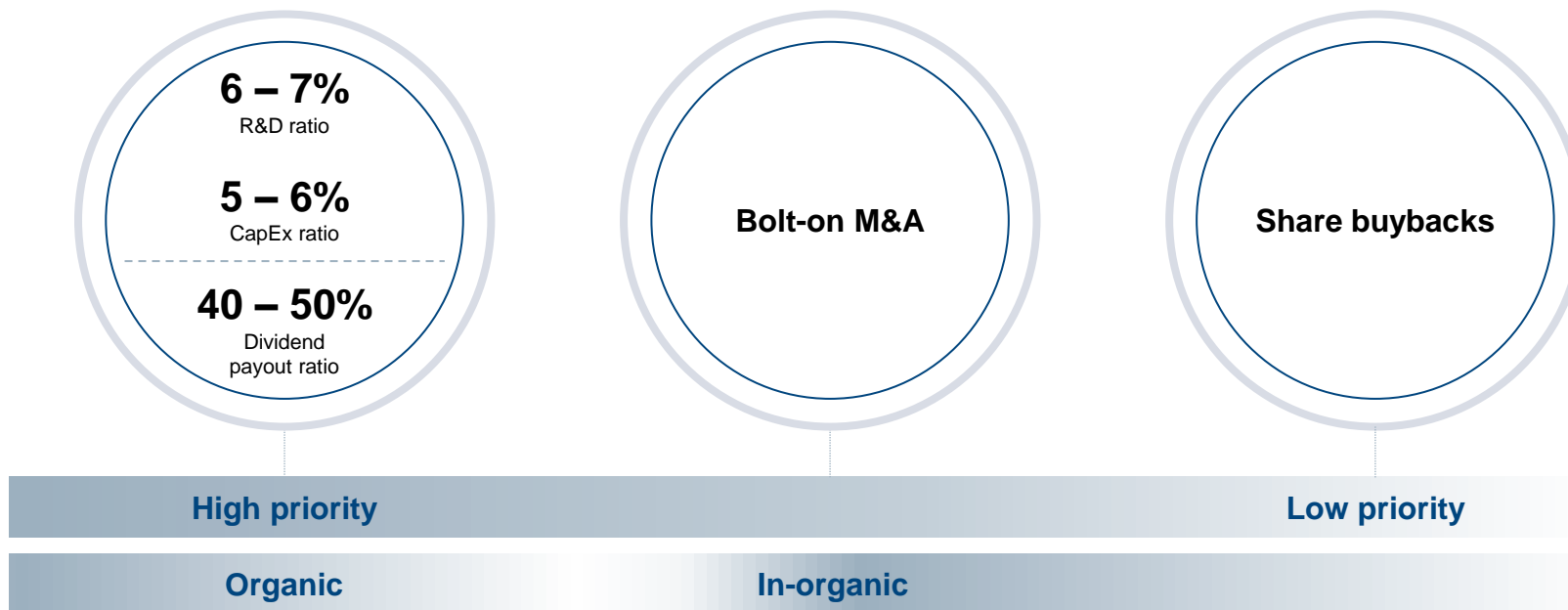
CapEx, R&D with Financial Discipline

Technology Leadership

Market Share, Pricing Power and Margins

Profitable Growth

## Clear framework with focus on organic growth and bolt-on M&A



# FINANCIAL PRINCIPLES FOR IN-ORGANIC GROWTH

## Clear financial aspirations defined as M&A guardrails

### Priorities



Attractive segments



Bolt-on acquisitions



Strengthen core business



Active portfolio management



### Financial principles for larger transactions

**Value accretive** for KB

Strong **cash generation**

High **profitability (ROS + ROCE)**

High **aftermarket** revenue base

**Asset-light** business model

**Portfolio management**, if needed

**Start-ups** with **clear plan for strong financial profile** /  
accretive **cooperation potential**

**Stringent post merger integration** to ensure deliverables

What we actively seek for

## High ESG commitment embedded in newly defined strategy and remuneration



		Future objectives	
<b>E</b> Environmental	<b>Climate strategy</b>	<ul style="list-style-type: none"> <li>Carbon neutrality (incl. off-setting) at KB sites by 12/21</li> <li>Triple own photovoltaic capacity by 2030</li> <li>Extend to Scope 3 target setting</li> </ul>	
	<b>Circular economy</b>	<ul style="list-style-type: none"> <li>Higher share from remanufactured/ recycled products (currently: ~10% of revenues)</li> </ul>	
<b>S</b> Social	<b>Diversity</b>	<ul style="list-style-type: none"> <li>Improve gender balance in global workforce and mgmt. (current share of women: 13% in mgmt., 20% overall)</li> </ul>	
	<b>Safety at work</b>	<ul style="list-style-type: none"> <li>Workplace accidents &lt;1 per 200,000 hours worked</li> </ul>	
	<b>Social projects</b>	<ul style="list-style-type: none"> <li>Global Care: Strengthen strategic partnerships</li> <li>Local Care: Increase employee engagement</li> </ul>	
<b>G</b> Governance	<b>Compliance</b>	<ul style="list-style-type: none"> <li>Global anti-corruption training for high-risk employee groups; certification of CMS design and effectiveness; strengthen Human Rights processes</li> </ul>	
	<b>Mgmt. remuneration</b>	<ul style="list-style-type: none"> <li>Stringent cascading of ESG targets</li> </ul>	

New KPI in mgmt. compensation system as of 1.1.22 (20% STI weight)



# SHORT-TERM OUTLOOK

## Profitable growth despite continued supply chain constraints and inflation

		Guidance FY21e	First indication FY22e	Assumptions
<b>Revenues</b> (€bn)	<b>Group</b>	<b>6.6 – 6.8</b>	 <b>Slight to solid</b>	<ul style="list-style-type: none"> <li>Stable economic environment in important markets</li> <li>No major FX changes FY22 vs. FY21</li> <li>No additional major negative impact from Covid pandemic</li> <li>Continued slow recovery in rail</li> <li>Supply chain constraints and increased inflation</li> <li>Further investments in R&amp;D</li> </ul>
	RVS	3.3 – 3.4		
	CVS	3.3 – 3.4		
<b>Op. EBIT margin</b> (ROS)	<b>Group</b>	<b>13.0 – 13.5%</b>	 <b>Slight</b>	
	RVS	17.5 – 18.0%		
	CVS	10.5 – 11.0%		

**Guidance 2022**  
**24.02.22**  
(Annual Press Conf.)

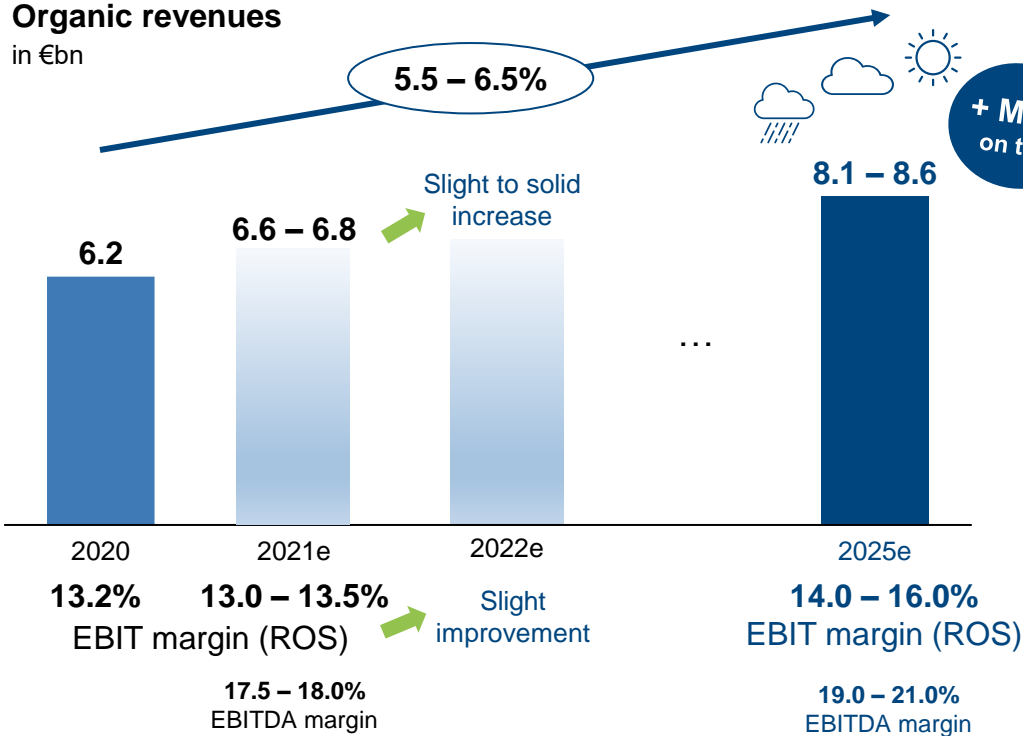


# MID-TERM OUTLOOK

## Signals set for continued profitable growth of KB towards 2025

### Organic revenues

in €bn



	Revenue CAGR	EBIT margin (ROS)
RVS	5 – 6%	18.0 – 19.5%
CVS	7 – 8%	12.0 – 13.5%
Group	ROCE ≥30%	CCR over cycle 80 – 90%

Note: Operating margins shown 2021 and 2025; based on market expectations mirrored in other CMD presentation parts



**KNORR-BREMSE**

# Rail Vehicle Systems

Dr. Jürgen Wilder, Member of the Executive Board of Knorr-Bremse AG



# RVS capital market guidance fulfilled until Covid with persistent strength



## Market leadership

**Global #1 market leader** across products and regions (e.g. ~50% market share in brake systems)



## Strong growth profile

RVS with **long track record of outperforming underlying markets**



## Technology innovation

- **Strong technology innovator** shaping industry standards
- Continuation of **R&D investments**



## High barriers to entry

- **Safety-critical products** with significant homologation barriers
- RVS only supplier certified for all standards and norms globally



## Resilience

- **Expansion of business** through customer-region-product mix
- **Strong aftermarket** (~45% revenue share)



## Profitability

**Outstanding profit margins** with track record of margin expansion and disciplined cost management (EBIT margin ~19%)

Notes: Based on 2020 figures

# Megatrends and related initiatives supportive for the rail industry and RVS

## Supporting trends & programs

- Climate related regulations
- 2021 Year of Rail
- Green deal
- Societal change

### Urbanization



### Sustainability



### Digitalization



### Mobility



## Financial support programs

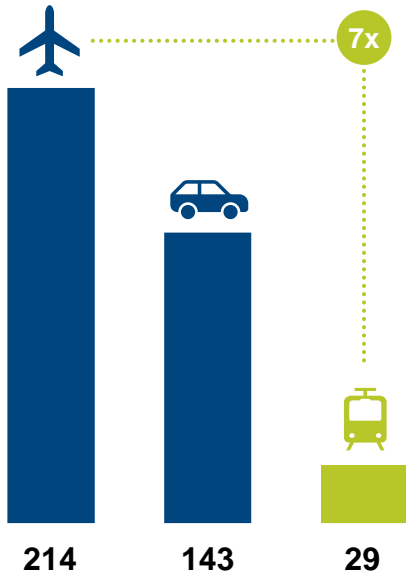
- Stimulus programs > € 100bn
- Covid compensation > € 40bn
- Shift2Rail / ERJU<sup>1</sup> > € 900m

1) Europe's Rail Joint Undertaking

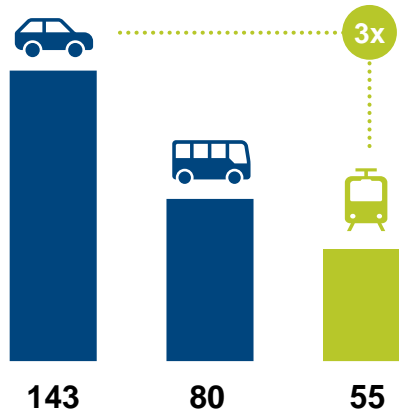
# CO<sub>2</sub> emission targets not achievable in transportation without rail

## Greenhouse gas emissions from transport<sup>1</sup>

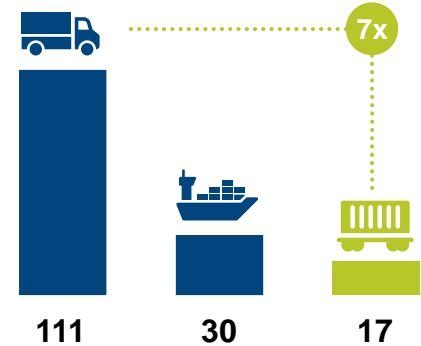
Passenger transport – long distance  
[in g/pkm]



Passenger transport – local transport  
[in g/pkm]



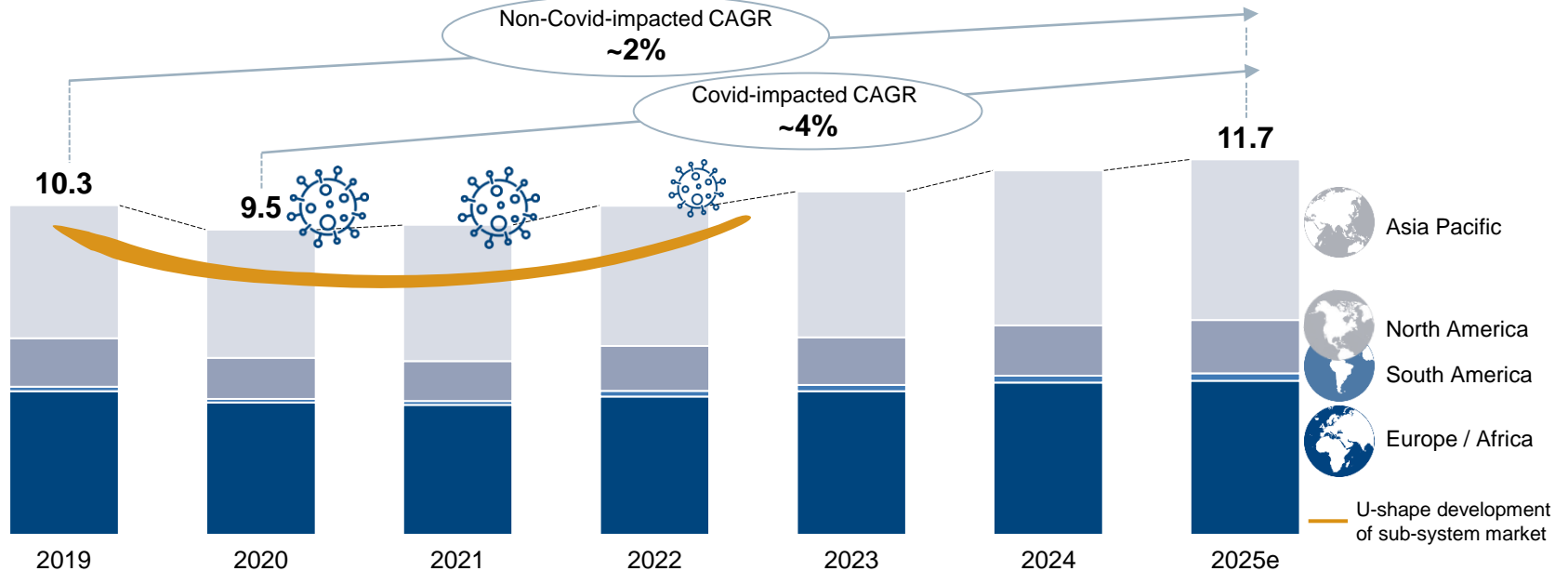
Freight transport  
[in g/tkm]



1) 2019, reference for Germany, Sources: <https://www.allianz-pro-schiene.de/themen/umwelt/daten-fakten/> (accessed on September 8, 2021), based on Umweltbundesamt

# Long-term growth in global rail will continue, despite Covid U-shape

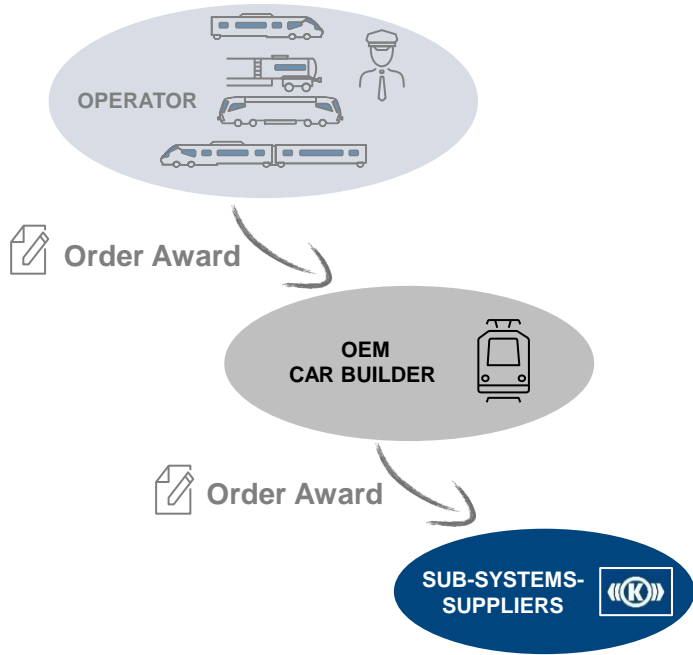
Development of relevant sub-systems market volume<sup>1</sup> (OE + RS in €bn)



1) Big Five - Brakes, Doors, HVAC, Power Electrics, TCMS; Source: Knorr-Bremse information and internal market research

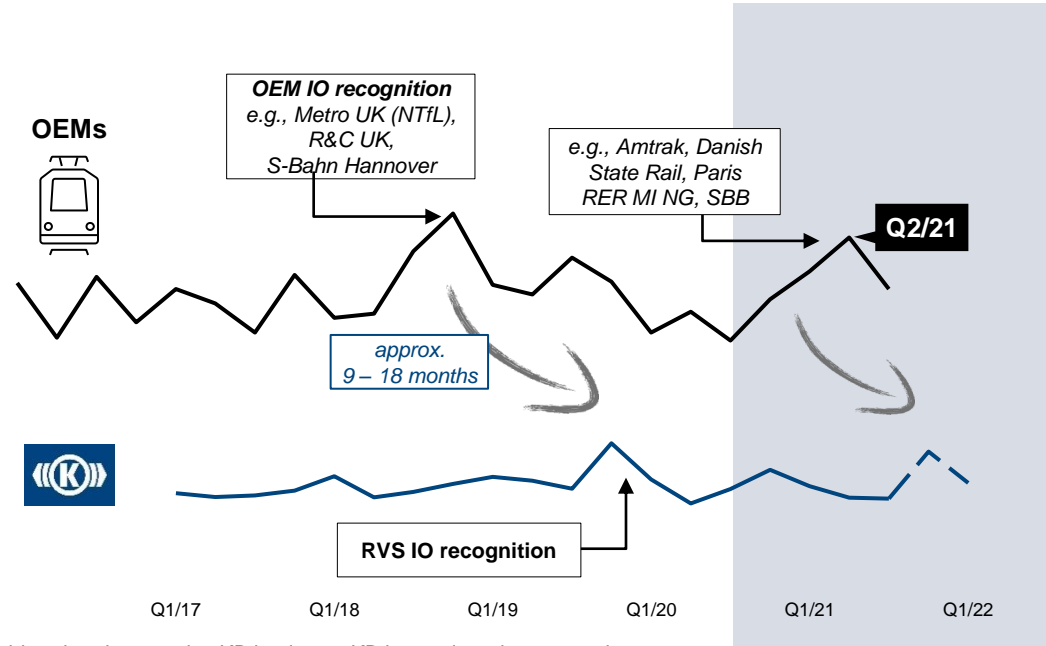
# 9 – 18 months time shift between OEMs order intake and recognition at sub-systems suppliers

Time →



Incoming orders<sup>1</sup> – selective & illustrative

— OEMs — Knorr-Bremse



1) Source: OEM reporting, only OEMs with publication of financial figures rail considered and respective KB business; KB internal market research

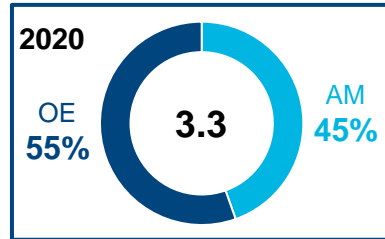
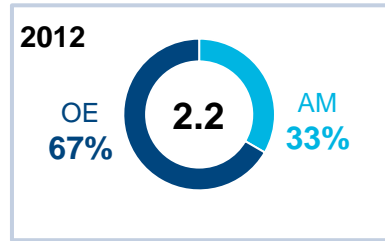
# KB will continue to grow its core business further





# RVS grew within each business unit, despite Covid impact, AM outperformed

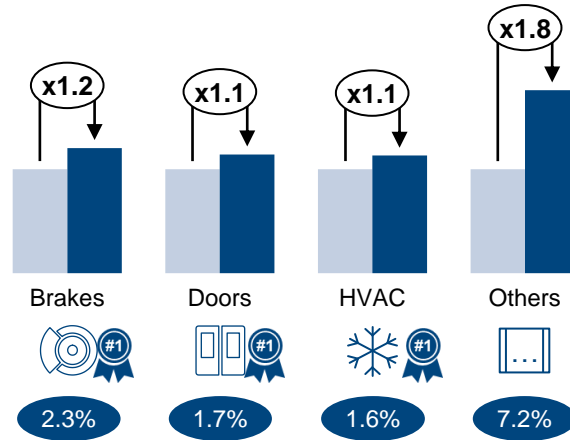
## Revenue development in €bn



[Index 100 = 2012]

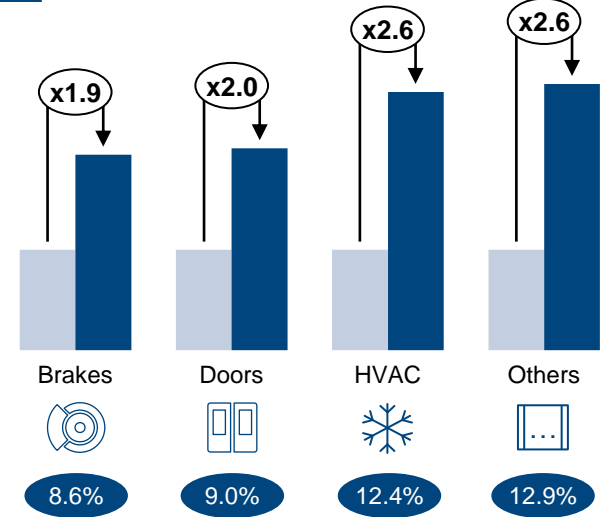
2012 2020 CAGR 2012-2020

### KNORR-BREMSE (OE)



Constant increase in the installed base...

### RAILSERVICES (AM)

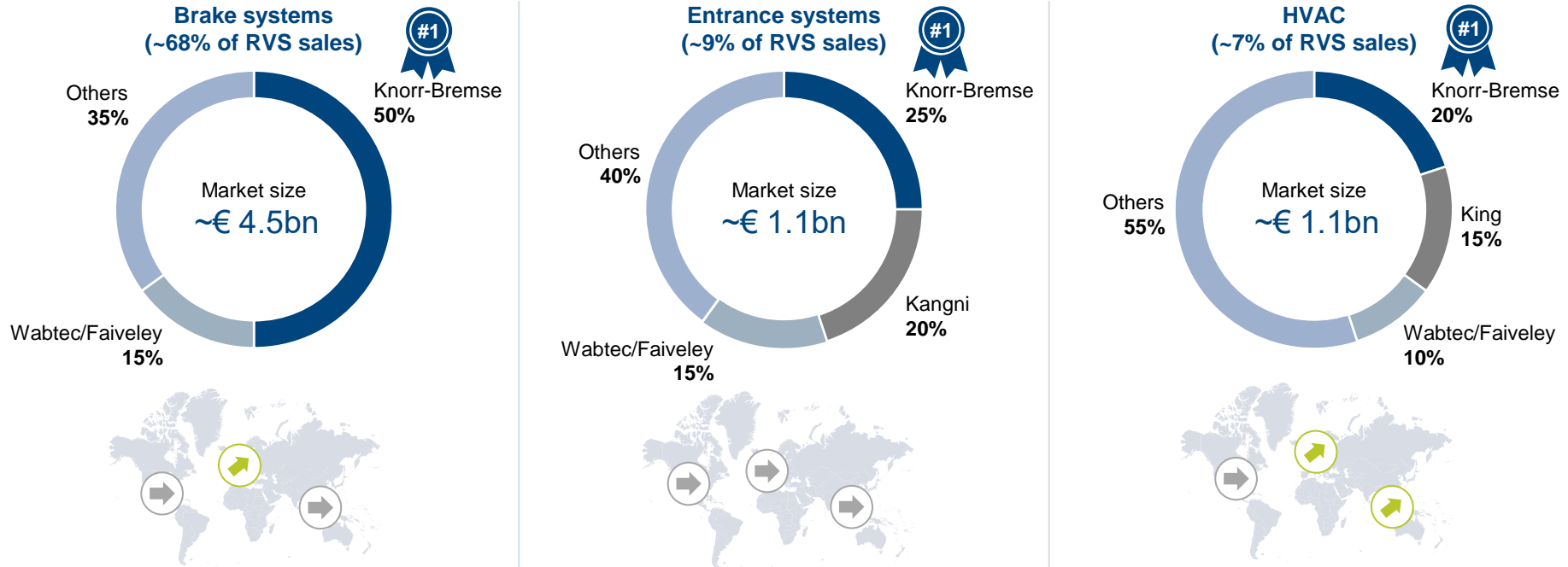


... drives the profitable Aftermarket



# RVS holds global #1 position across key product categories

## Global market share 2020<sup>1</sup> (% of sales)



Notes: Based on German GAAP (HGB); Market share estimates are rounded to the nearest multiple of 5%; For competitors, a price estimate was used; 1) Market share estimates for OE and AM without labor. Source: Knorr-Bremse information and internal market research

# Aftermarket business will continue to be an important growth engine



## Opportunities



Use installed fleet



Modernization



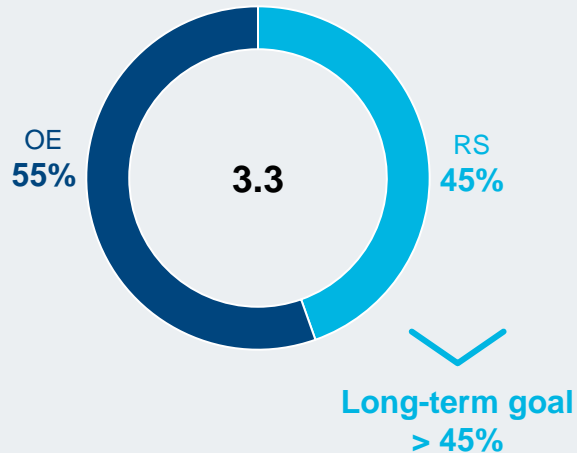
New service models & digital solutions



## Challenges

- Competition by OEMs, focussing more on service
- Insourcing and lifecycle costs optimization, incl. stretching overhaul cycles

## Revenue split 2020 in €bn



# Ridership strongly impacted by Covid, but fleet utilization at high level

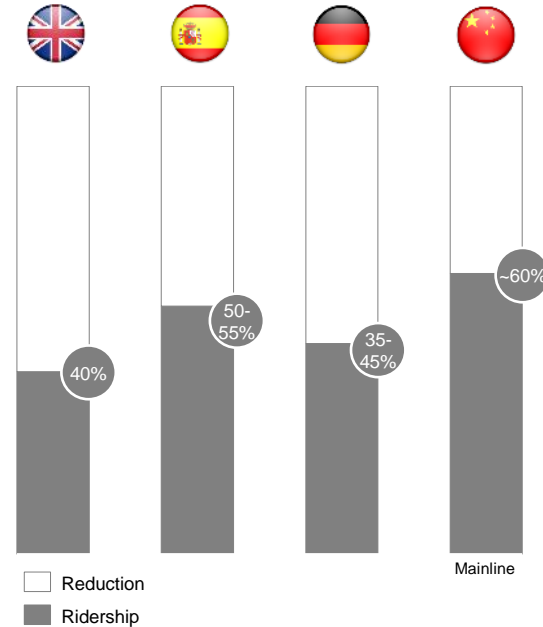
BEFORE Covid



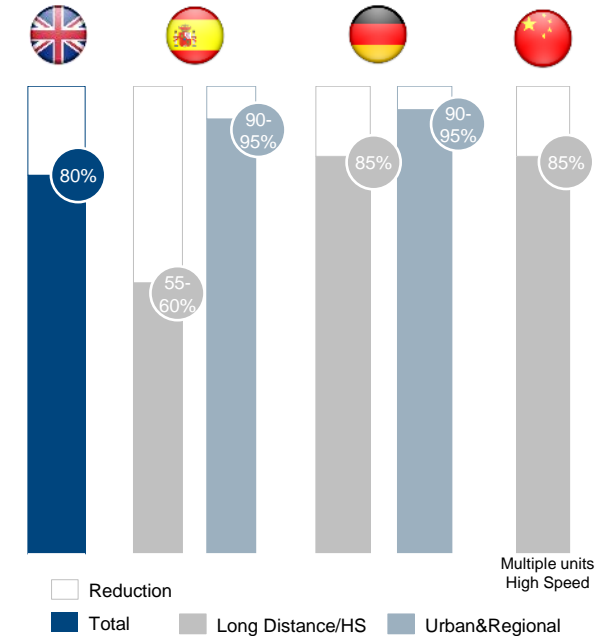
DURING Covid



## Ridership



## Fleet utilization



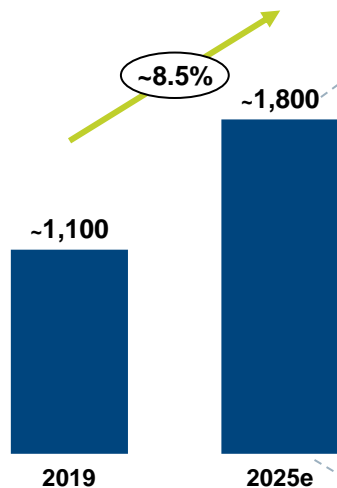
Source: M-Brain & SCI market news, Eurostat, official operator data, KB internal market research and estimations

# Future growth will come from markets in Europe, Asia and North America

## Market development OE

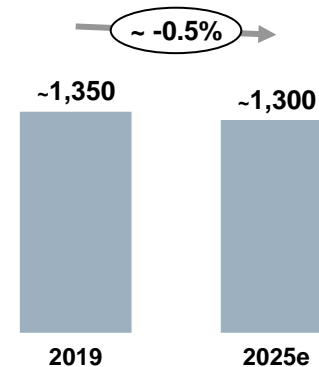
in €m, CAGR in %<sup>1</sup>

### Selected biggest growth markets



	CAGR '19-'25	Market position
North America & Mexico MT	~11%	
Austria	~27%	
France	~6%	
Russia & CIS (High Grade)	~4%	
Scandinavia	~10%	
Spain & Portugal	~26%	
India (High Grade)	~5%	
South East Asia, HK, TW	~14%	
Selected biggest growth markets	~9%	
RoW <sup>2</sup>	~3%	

China<sup>3</sup>



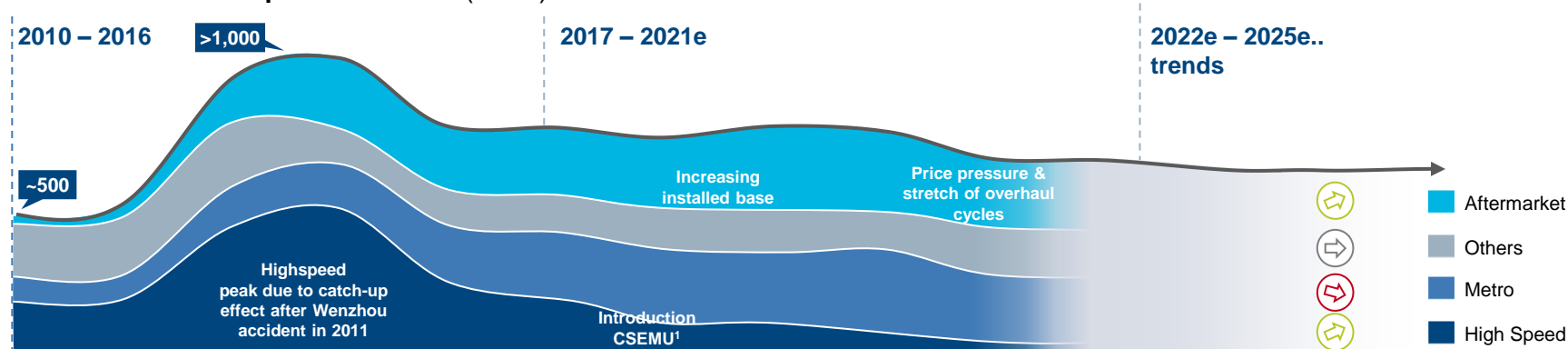
1) Brakes, Doors, HVAC, rounded to the nearest 50 2) Rest of World w/o selected biggest growth markets & w/o China 3) High Grade only, w/o conventional market

Source: KB internal market research; Values recognize FX rates



# China business faces challenges, but will continue to contribute to KB success

## RVS revenue development in China (in €m)



- Within 15-years from zero to **biggest High Speed fleet** in the world
- **Central decision making**, attracting **best-in-class technology** to fulfill ambitious plans
- **RVS significant market share for brake systems in High Speed**



- Control of key technologies through **Chinese Autonomous & Controllable Policy**
- New **CSEMU<sup>1</sup>** with Chinese owned technology
- **RVS delivering components and modules**



- Biggest metro market in the world (start 1970s)
- More **decentral / local decision** making focusing on best solution
- **RVS significant contribution with brake systems**



- Market volume on high level with no further increase



- Introduction of Standard Metro with increased Chinese localized technology



- Decentralized decision making
- Focus on cost & performance

**RVS contribution with all sub-systems**

1) CSEMU (China Standard Electric Multiple Unit)



# Clear strategy in place for business development in China



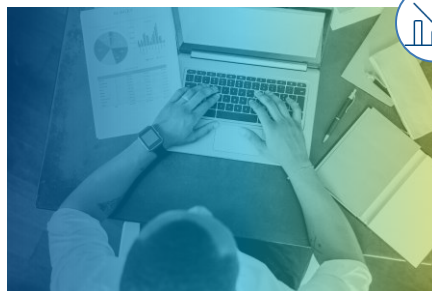
Seize opportunities in **High Speed** to re-strengthen position **through partnership and innovative technology**



**Secure Aftermarket** business through expansion of service center footprint



Strengthen **Metro** business through **innovative technologies** and a **localized footprint**



Efficiency program put in place to **safeguard profitability**

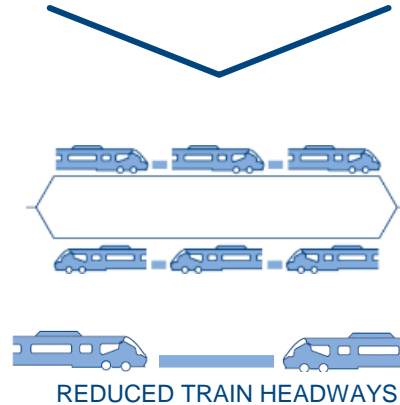
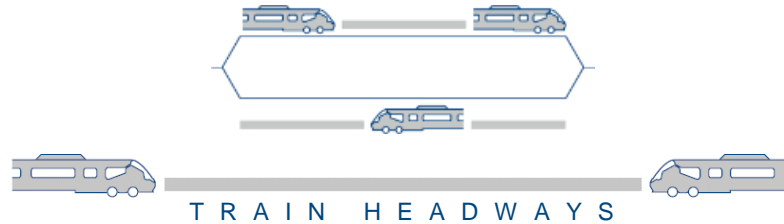
# RVS will further grow from new industry trends







# Reproducible Braking Distance (RBD) to increase transport capacity



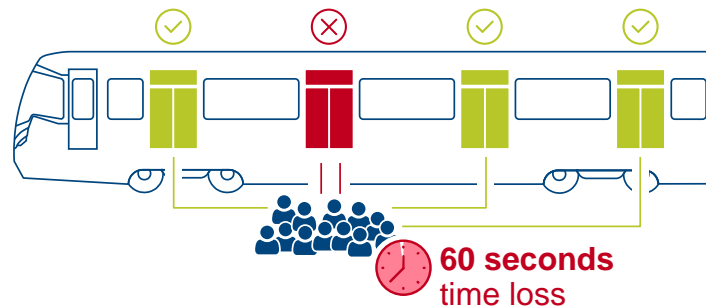
Knorr-  
Bremse  
solution

Field trials / pilot applications

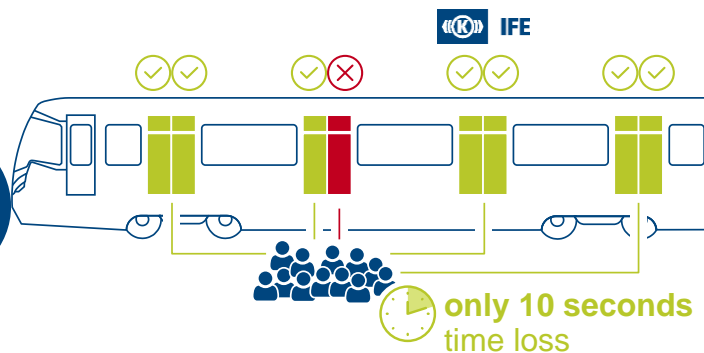
- **Deceleration Control:**  
NEWAG Demonstrator, 1 year test in passenger service – ongoing
- **Adhesion Management and WheelGrip Adapt:**  
Function testing @ advanced TrainLab VT605, tests start May 2022



## For increasing transport capacity IFE LIFEDrive optimizes passenger flow



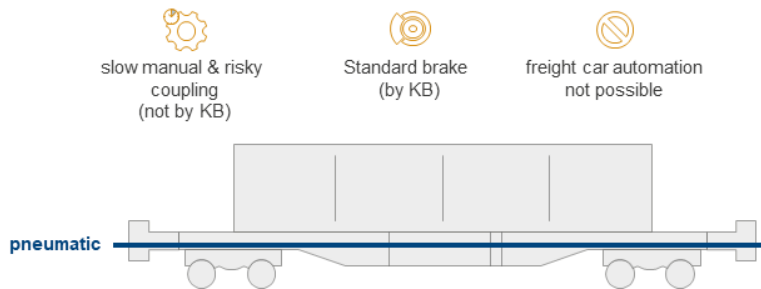
Knorr-  
Bremse  
solution



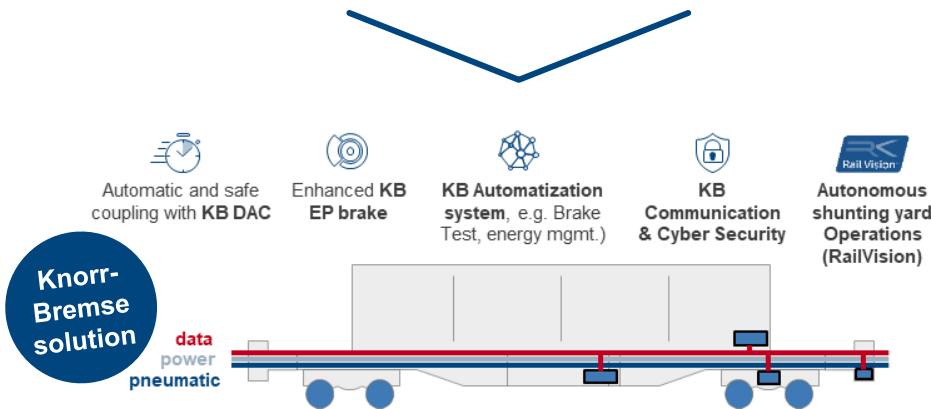
IFE LIFEDrive for mass  
transit sliding door  
applications in case of  
door failure



# RVS supports the freight train evolution to the digital freight train

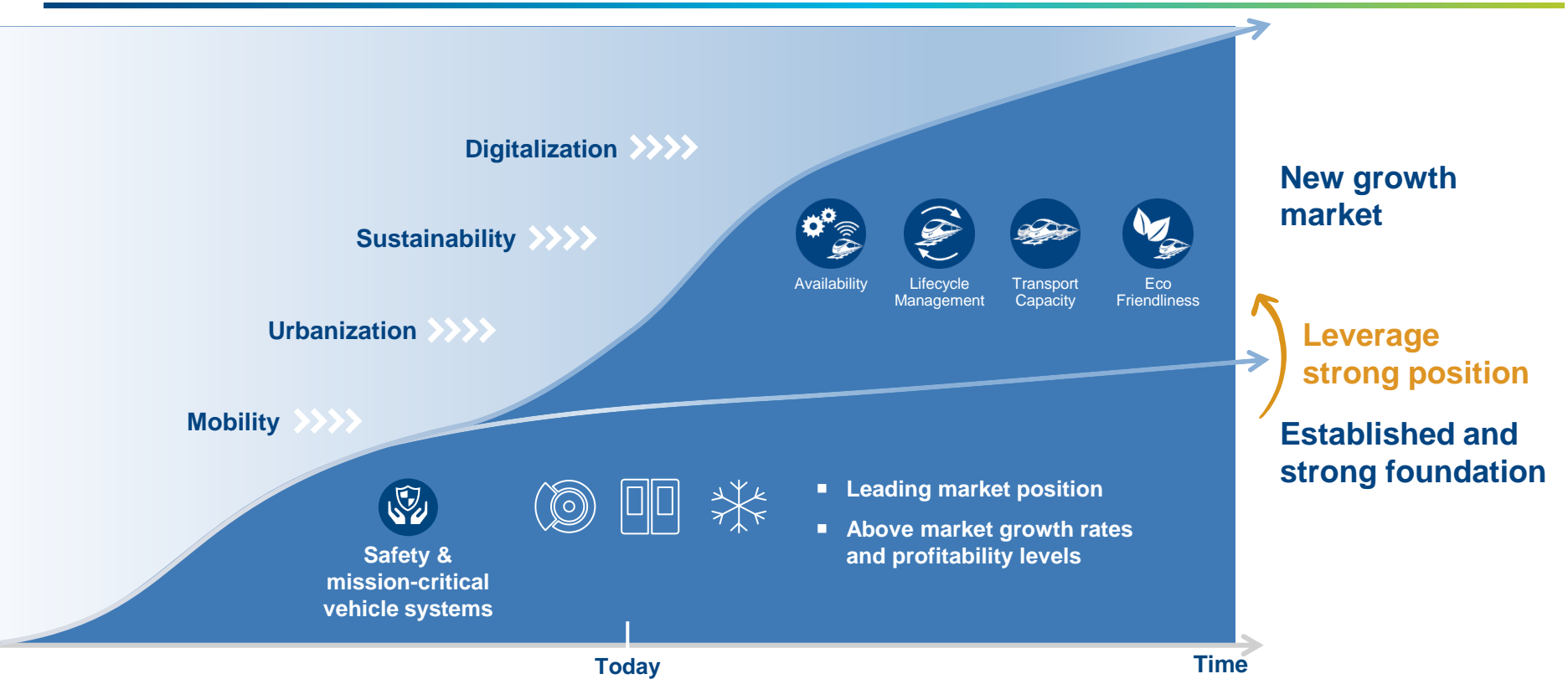


Low tech, manual, unpowered freight car not able to compete as mean of transport



Efficient Digital Freight Trains & cars with several RVS solutions on board

# Clear RVS focus on new industry trends and growing the core business further



# Key takeaways



**RVS #1** market position in key markets  
stable market share in Brakes and market share opportunities in  
Doors, HVAC and other products



Dense service network & new service models offer **Aftermarket  
growth opportunities**



**RVS quality, service and technology leadership** maximize  
eco-friendliness, efficiency and capacity in partnerships across the  
rail business



**RVS confirms  
mid-term guidance  
and is well  
prepared and  
positioned for  
the future**



**KNORR-BREMSE**

# Commercial Vehicle Systems

Dr. Jan Mrosik, CEO of Knorr-Bremse AG





# CVS is market and technology leader with a robust business model and continuously outperforms markets



## Market leadership

**A global market leader** increasing market share (~25% for brake systems & vehicle dynamics)



## Strong growth profile

Continuously **outperforming markets with rising content per vehicle** (7% sales CAGR vs. ~3% TPR growth between 2012-2019)



## Technology innovation

**Technology leader** with continuous significant **investment in innovation and R&D**



## High safety requirements

**Global key supplier** with **system know-how** and **vehicle dynamics capabilities**



## Resilience

**Strong aftermarket share** (~26% revenue share), **cost efficiency**, regional **diversification** as well as track record in **strong cost management execution**



## Profitability

**Technology differentiation, superior products, systems approach, scale advantage** and consequent **cost management** (operating EBIT margin ~12%)

Notes: Based on 2019 figures, market share shown for 2021e

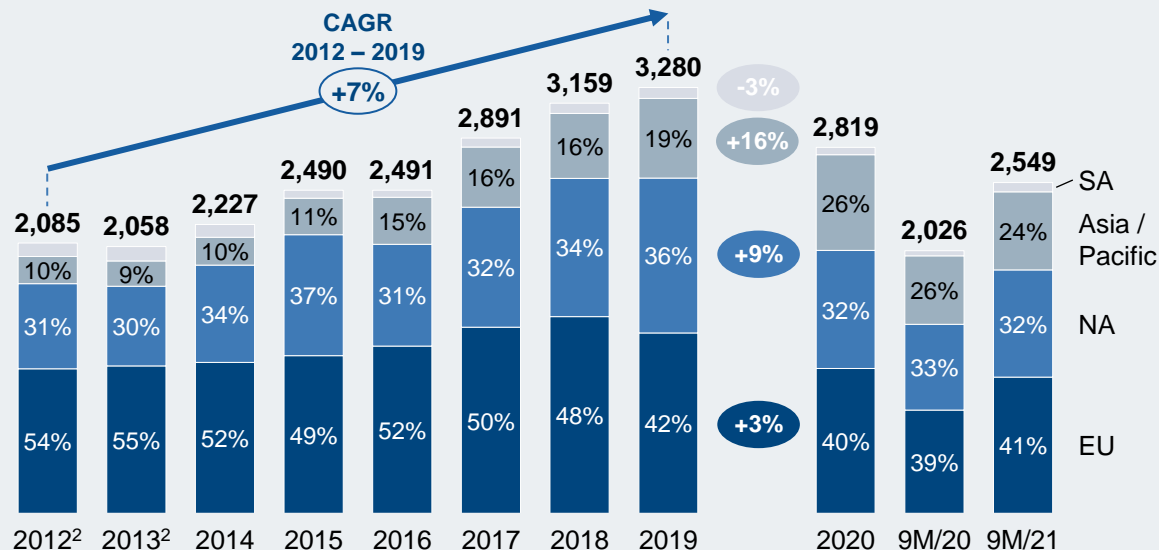
# CVS strongly outperforms the market – with revenue growth beating market growth

## Revenue by region<sup>1</sup>

in €m

Pre-Covid

Covid influence



1) Region = domicile of entity

2) Based on German GAAP

## 2012-2019

Market outperformance with 7% CAGR vs. 3% TPR growth in the same time frame

## FY19

Strong performance and growth

## FY20

Sharp decrease in volume due to Covid pandemic

## 9M/21

V-shaped recovery started, but is set back by semiconductor and raw material shortages

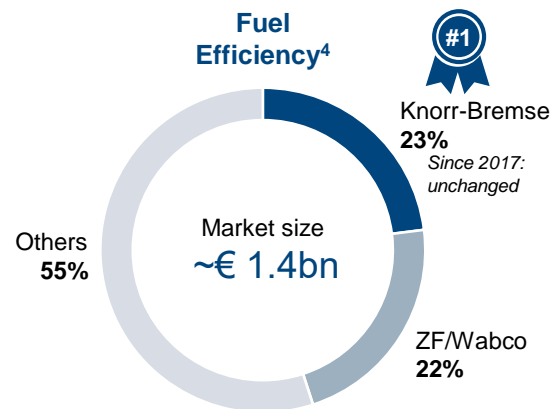
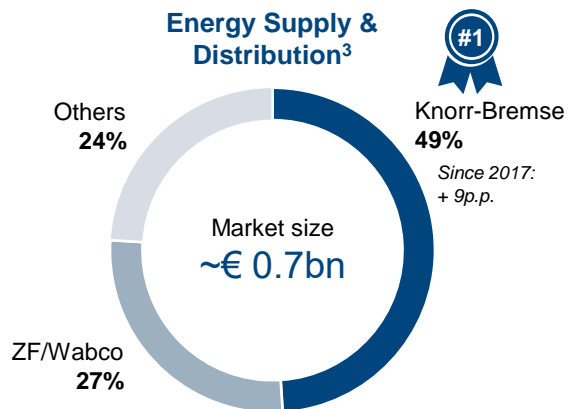
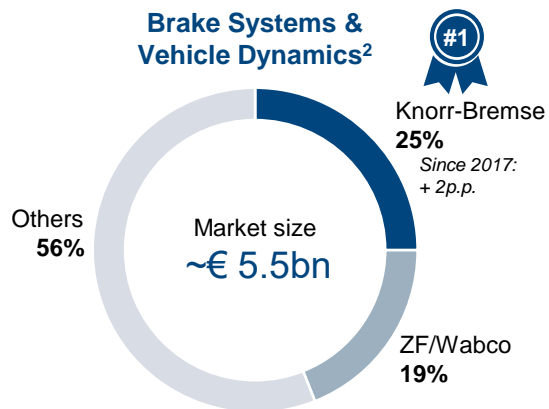
## 2021-2025 expectation

Market outperformance with ~4% CAGR driven by content per vehicle vs. flat TPR in the same time frame



# CVS is market leader in all major product fields

## Global market share 2021<sup>1</sup> (% of revenues)



1) 2021 estimated addressable Truck, Bus and Trailer OE market, incl. "Brake Systems & Vehicle Dynamics (incl. Automated Driving)", "Energy Supply & Distribution" and "Fuel Efficiency"; excl. aftermarket; Knorr-Bremse data 2) Air Disc Brake, Valves / Pedal Unit, Actuators, Foundation Drum Brake, Steering, ABS, EBS, ESP, DAS, ELC; incl. segment Others 3) Compressors, Air Treatment 4) Vibration Dampers, Engine Air Control, Transmission – Gear and clutch actuation

# CVS proved resilient during Covid pandemic

While truck production decreased globally in Q1/20 CVS could rely on:



## Regional diversification in revenues and production

- Strong market position in China balanced market decrease in other regions
- Diversified production footprint beneficial during lockdowns



## Strong aftermarket

- Stable aftermarket revenue share of 25-30% mitigated revenue decrease through truck production decrease during the crisis
- Strong dealer network and increasing aftermarket market volume



## Countermeasures

- Cost adaption program quickly and strictly installed in early 2020

➤ Positive EBIT margin during crisis

➤ Fast recovery of demand in H2/20 well managed

➤ Market share gains

# Strong management execution during material shortages led to solid H1/21 results for CVS

## Current supply challenges



Semiconductor shortage



Raw material tightness



Freight market crisis



Further local crises<sup>1</sup>

## Today

### Situation

- V-shaped **recovery of customer demand** since Q4/20
- Current supply challenges create **disbalance: demand > supply**
- **In-bound delivery times to KB** prolonged globally
- Net cost burden expected in FY21: **€ ~60m**

### Counter-measures

- **Task force with ~200 employees** set up
- **Close collaboration with suppliers and customers**
- **Short-term pass-through for price increases in place**

## Mid-Term: 2022ff.

- **Tight supply situation** is expected to last **well into 2022, further shortages expected**, e.g. aluminum
- **Long-term elevated price levels for certain components** due to sustained bottlenecks expected

- **Review of product designs** (e.g. semiconductor platforms, alternative electronic components)
- **Review of sourcing strategies** (e.g. increase dual sourcing)
- **Pass-through mechanism for material price increases**

1) e.g. flooding in Germany, Malaysian Covid-outbreaks, current power cut offs in China

# CVS leveraging potentials in Chinese market



Chinese market is maturing with higher content per vehicle, longer vehicle lifetime and a changing end-customer structure

Selected examples for technology shifts driving content per vehicle:

Current

Manual Transmission > Automated Manual Transmission



Mid-term

Drum Brake > Air Disk Brake



## CVS in China

6 locations<sup>1</sup>, 4 plants and >1,700 employees.

	2015		2020
Revenues in €m	140	CAGR 29%	490
Market share <sup>2</sup>	14%	Rise by 10p.p.	24%

## Measures for further growth in China

- Technologies first **launched in Europe** are now brought to the Chinese market
- Advanced technologies creating **barriers to entry**
- Strong partnerships with Chinese top OEMs** and further **cooperations with key industry players**
- Strengthen **local R&D capability**
- Expansion of local footprints** and **strengthening of local supply chain**

1) Controllable legal entities 2) Market share in China OE HDT+MDT+Bus market, excluding FDB business

# Industry trends in the global commercial vehicles market

## Megatrends

Urbanization

Sustainability

Digitalization

Mobility

## Industry Trends



Traffic Safety



Emission Reduction  
& E-Mobility



Automated Driving



Connectivity

**Advanced safety systems**  
and reduction of  
human error risk

**Battery-electric or fuel cell vehicles**  
>20% of new  
commercial vehicles  
sold in 2030

**Autonomous trucks**  
>15% share  
by 2030

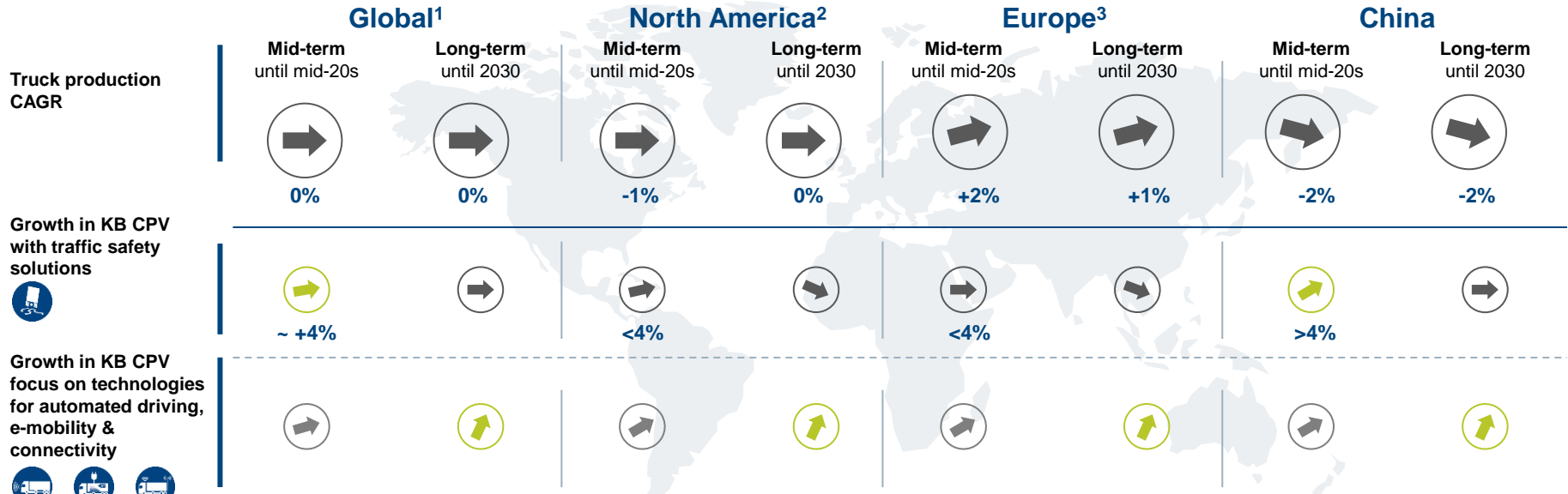
**Connected vehicles**  
enabling improved  
operations & predictive  
maintenance

# CVS growth opportunities driven by higher CPV despite limited volume growth

**Truck production is flat and does not contribute to growth**

Growth driver will be the current content per vehicle (CPV) with **traffic safety technologies until mid 2020s**

In the long run, CPV must be driven by technologies for **new trends automated driving, e-mobility and connectivity**

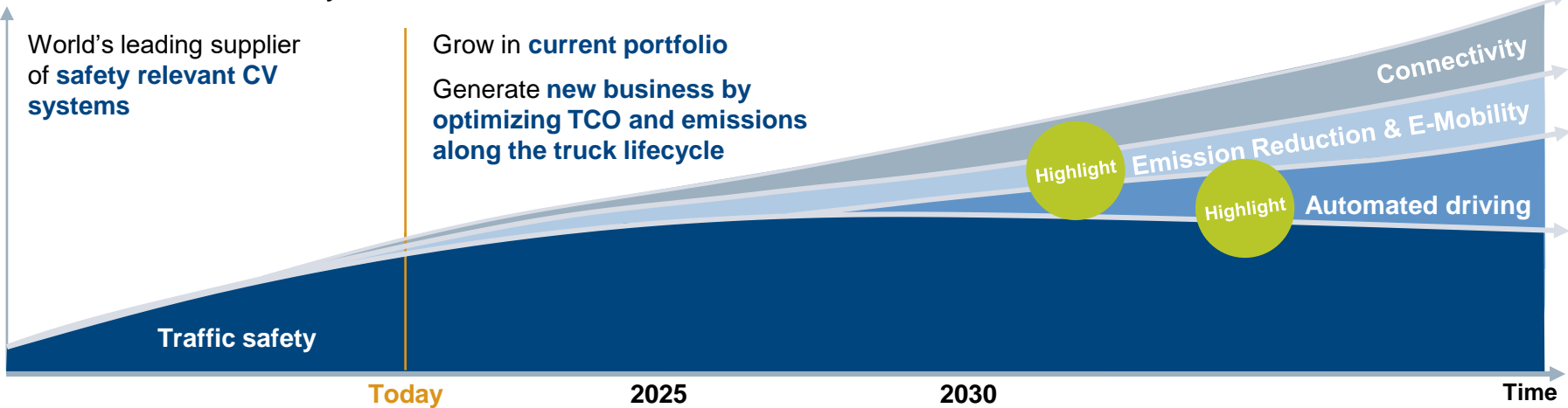


1) Incl. Turkey & Korea 2) Class 6 – 8 3) West & East Europe

# New growth areas for CVS

## Illustrative growth potential

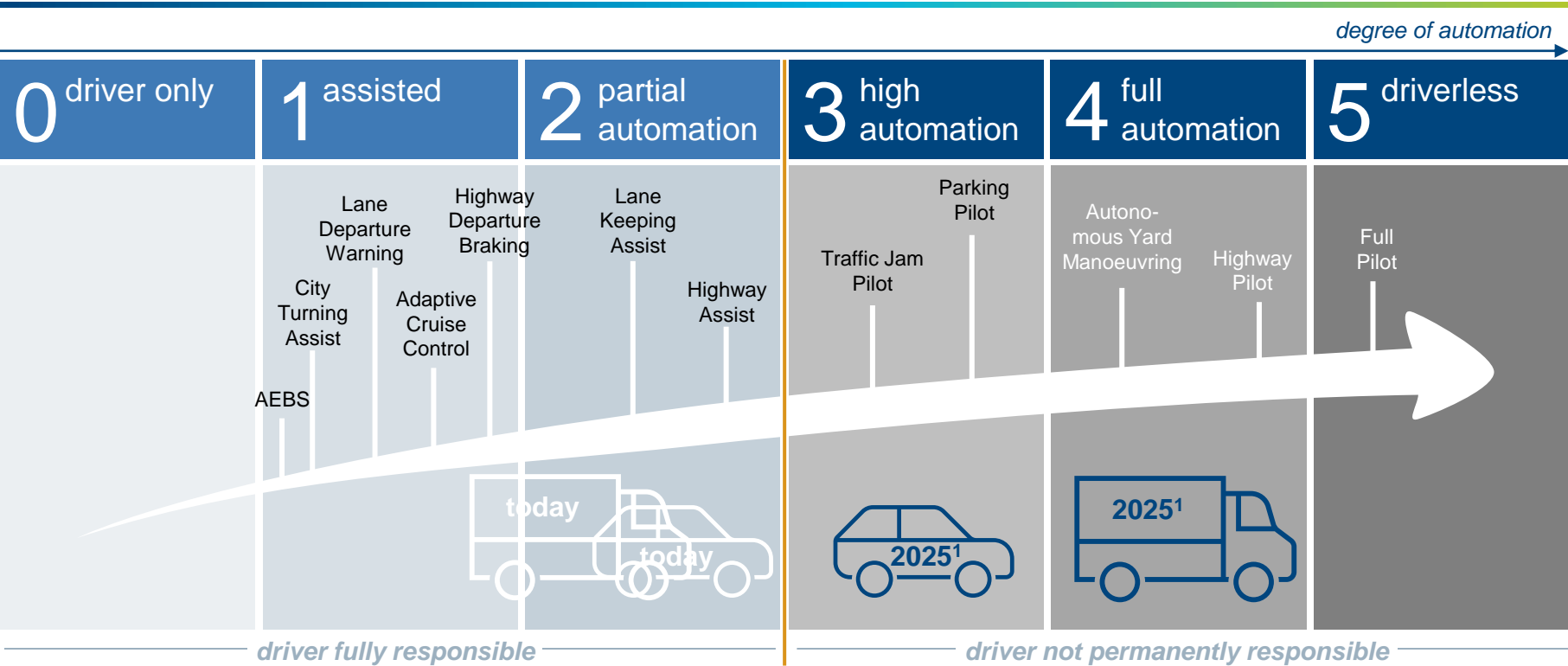
### Growth contribution of industry trends



Current CVS portfolio with focus on traffic safety perfectly fits market demands

In the future however, CVS will gain more content per vehicle growth with solutions for Automated Driving, Emission Reduction & E-Mobility and Connectivity

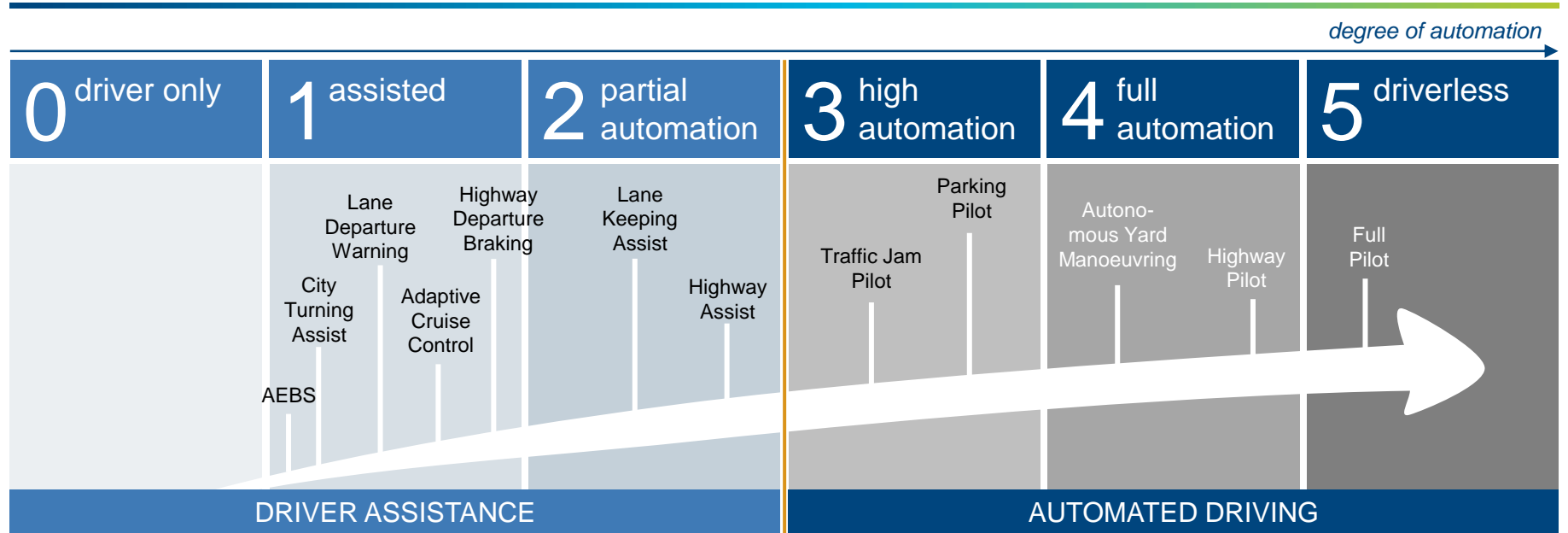
# Automated driving functions will hit the roads in trucks earlier than in passenger cars



1) 2025 first applications expected to be applied in public traffic



# CVS offers both driver assistance and automated driving solutions



**CVS as a system supplier**

- Braking
- Steering
- Sensors
- Level 1 and 2 functions

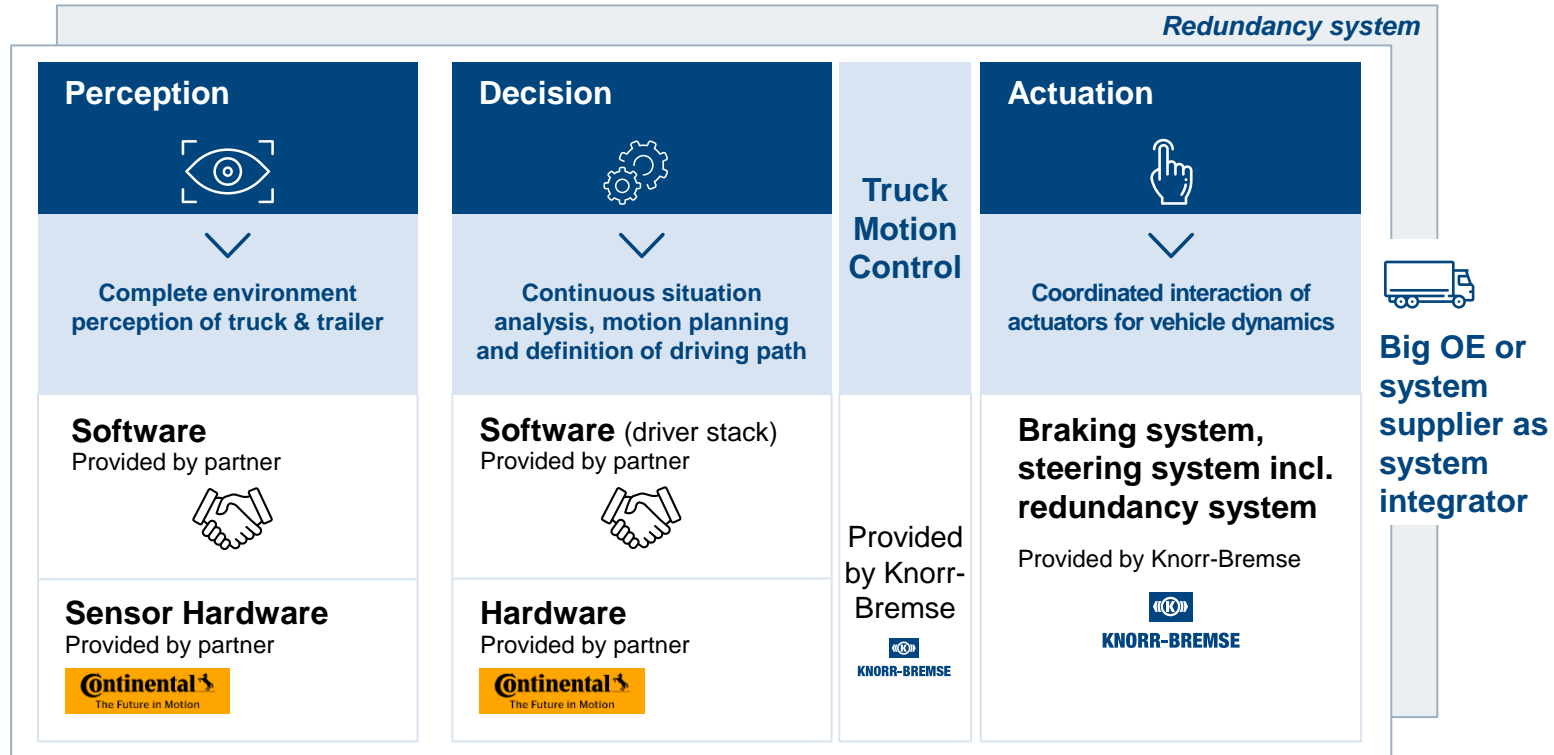


**CVS as vehicle dynamics supplier in consortium/partnership approach**

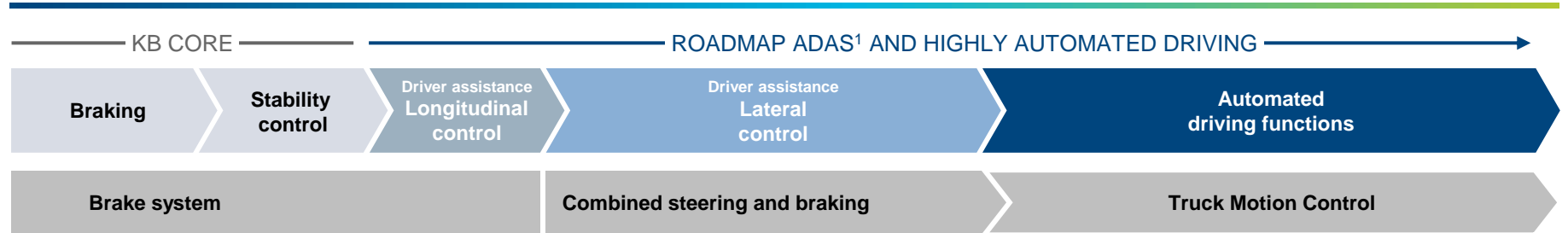
- Braking
- Steering
- Vehicle dynamics
- Related redundancy



# CVS offers automated driving solutions in a partnership approach - Actuation, Truck Motion Control and Redundancy are CVS' core competencies



# Truck Motion Control combines braking, steering and vehicle dynamics



→ **Successful M&A strategy**  
 → **KB global #2 steering supplier**

 2016	 2020
CV steering business of <b>HITACHI</b> Inspire the Next Hitachi Automotive Systems 2018	JV with  2019

KB driving steering innovation and vehicle content growth

- Base steering gear
- Torque overlay steering (TOS) for ADAS<sup>1</sup> functions and Automated Driving
- Electric Power Steering

**Brake control**

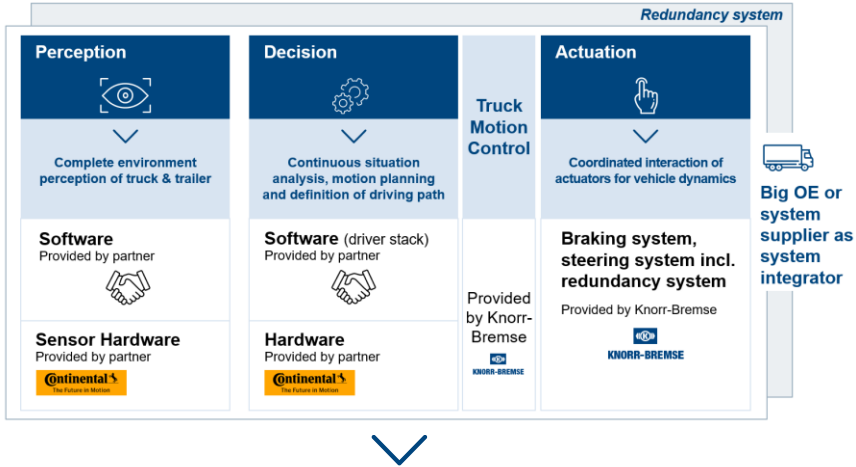
**Steering**

**CV system competence**

**Combined competencies enable Truck Motion Control for safe vehicle control under all conditions**

1) ADAS = Advanced Driver Assistance Systems

# Different offerings for automated driving in a partnership approach



## CVS fosters system competency and future content per vehicle increase potential

- General requirement for redundant Electric/Electronics architecture **increases content per vehicle** → redundancy ensures the safe vehicle movement even in case of the failure of a system relevant component
- The addition of **torque overlay steering** to CVS' portfolio adds content to the vehicle, more advanced steering solutions at higher price further increase content per vehicle

### Stand-alone KB offering:

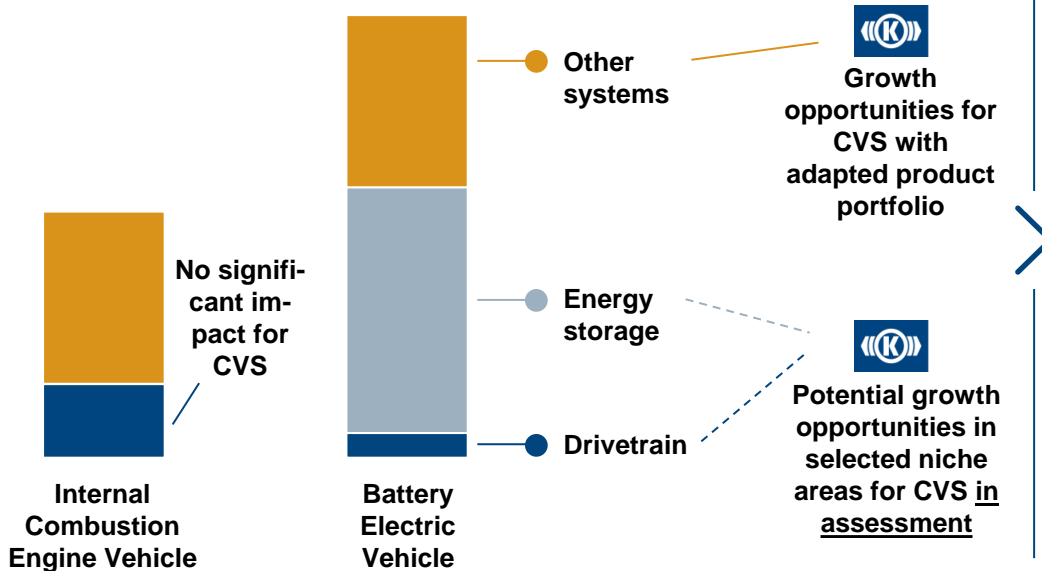
- Actuation, Truck Motion Control and Redundancy supplied by CVS

### In partnership as a consortium:

- System with actuation, TMC, perception & hardware for the decision layer together with Continental as sensors and hardware partner
- Complete system including driver stack in collaboration with an AI partner in addition to the sensors and hardware partner

# CVS will benefit from transition of integrated combustion engine trucks towards electrified trucks

## Value structure of a truck Illustrative

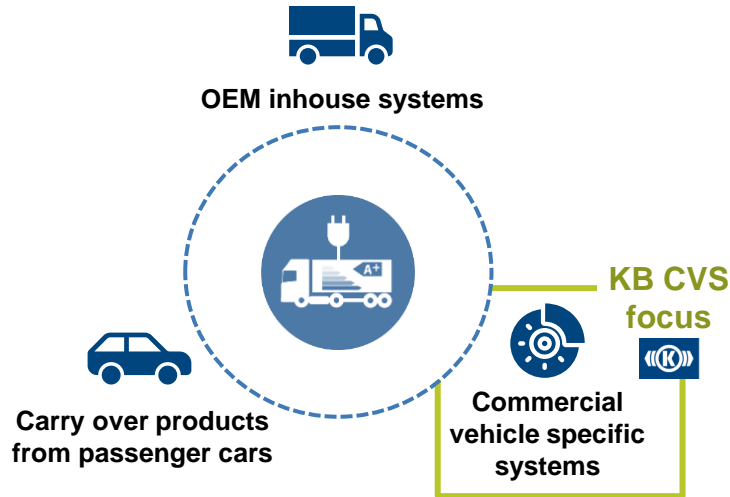


## Impact for CVS

- Shift from ICE to EV vehicles offers **first mover advantage**
- More complex Electrics/Electronics architecture in electric vehicles **increases content per vehicle**
- KB products in „other systems“ and in energy storage offer **growth potential for CVS**
- Value reduction in drivetrain **does not affect CVS significantly**
- Potential content per vehicle increase via **electric vehicle adapted products** and **completely new product fields**

# CVS has founded an internal incubation unit for e-mobility solutions

## Defining our role in the environment of the e-mobility ecosystem for commercial vehicles



## Internal incubation unit set up for solutions for e-mobility



- Adaptation of existing product portfolio towards EV
- Definition of new product fields
- First product concepts already transferred to CVS business units
- 52 patents applications have been generated out of the CVS e-Cubator until today

# CVS is offering a broad product portfolio for electric trucks

## EV adapted portfolio

SELECTED  
EXAMPLES

### eCompressor


- Electric screw compressor
- Mid air demand eCompressor (rotary vane)
- Low air demand compressor for future EV requirements





### EV brake control & vehicle dynamics

optimized and scalable holistic EV motion control, including energy recuperation



 on the market

 market launch soon

 in development

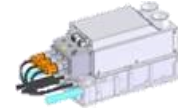
## New EV product fields

SELECTED  
EXAMPLES

### Redundant power management system




### EV brake resistor



### Opportunities in fuel cell electric vehicles in assessment



 in assessment

# Key takeaways



Increase of **content per vehicle** in all markets mitigating TPR stagnation



**Market share** increases in growth markets



Fostering of **technological leadership** through consequent invest in R&D



**Resilience and operational excellence**



Targeted **cost optimization programs** to protect margins



Excellent **customer relationships**



Strong focus on managing **supply chain and logistics**

**CVS is market leader and well prepared for the future**





**KNORR-BREMSE**

# Key takeaways

Dr. Jan Mrosik, CEO of Knorr-Bremse AG



# Key takeaways



**KB** is in **excellent shape** – We outperform even in challenging times

**KB capitalizes** on **favorable megatrends**

**Sustainability** is **core** of KB's markets, products and organization

**KB** continues **profitable growth path** through **technology leadership**

**KB** drives **operational excellence** to create **shareholder value**



**KB**  
continues  
its  
**successful**  
**strategy**