

# Elektromobilität im Rahmen der Energiewende *Electric mobility in the light of the transition of the energy system*

Essen, May 28<sup>th</sup>, 2018  
Dr. Reinhold Achatz

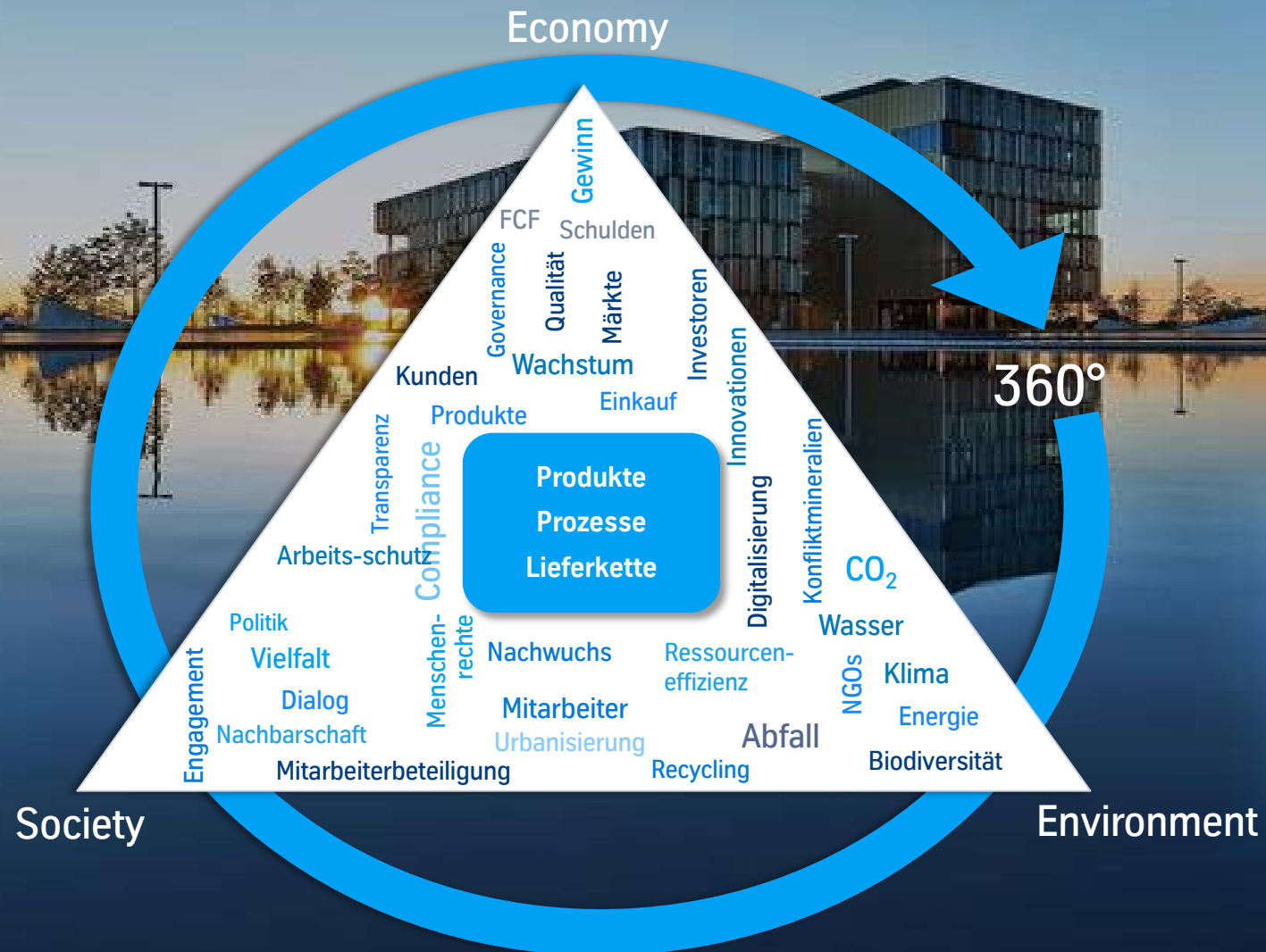


thyssenkrupp

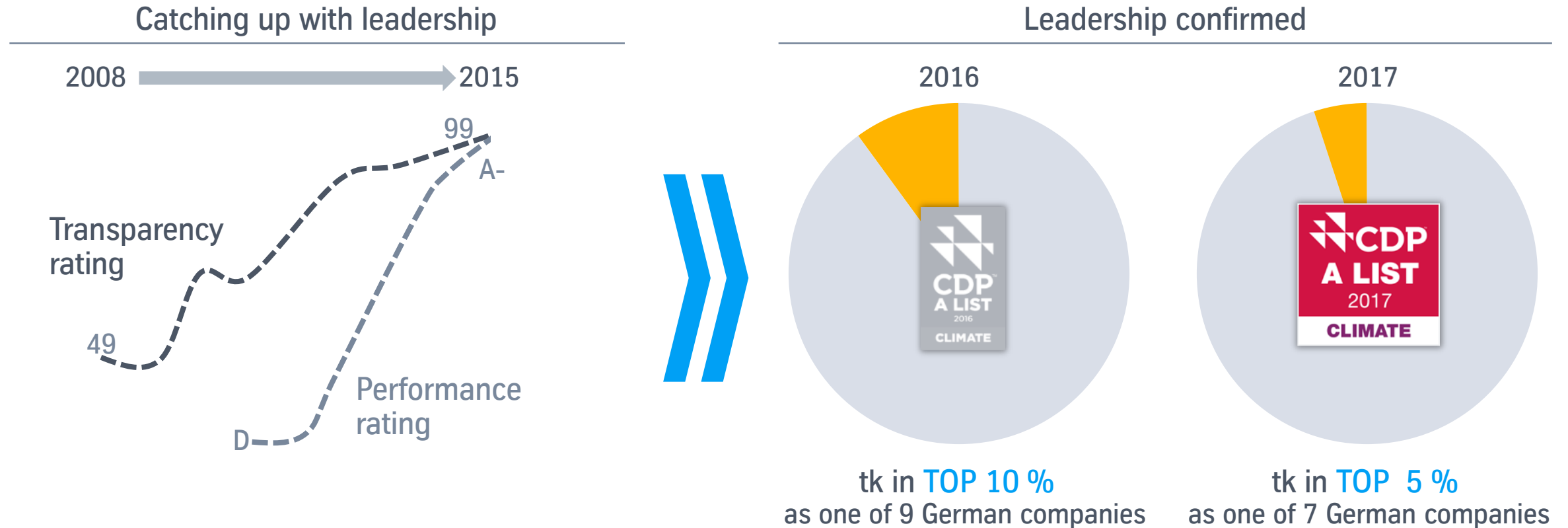
engineering.tomorrow.together.



# Sustainability is a key element of thyssenkrupp's strategy



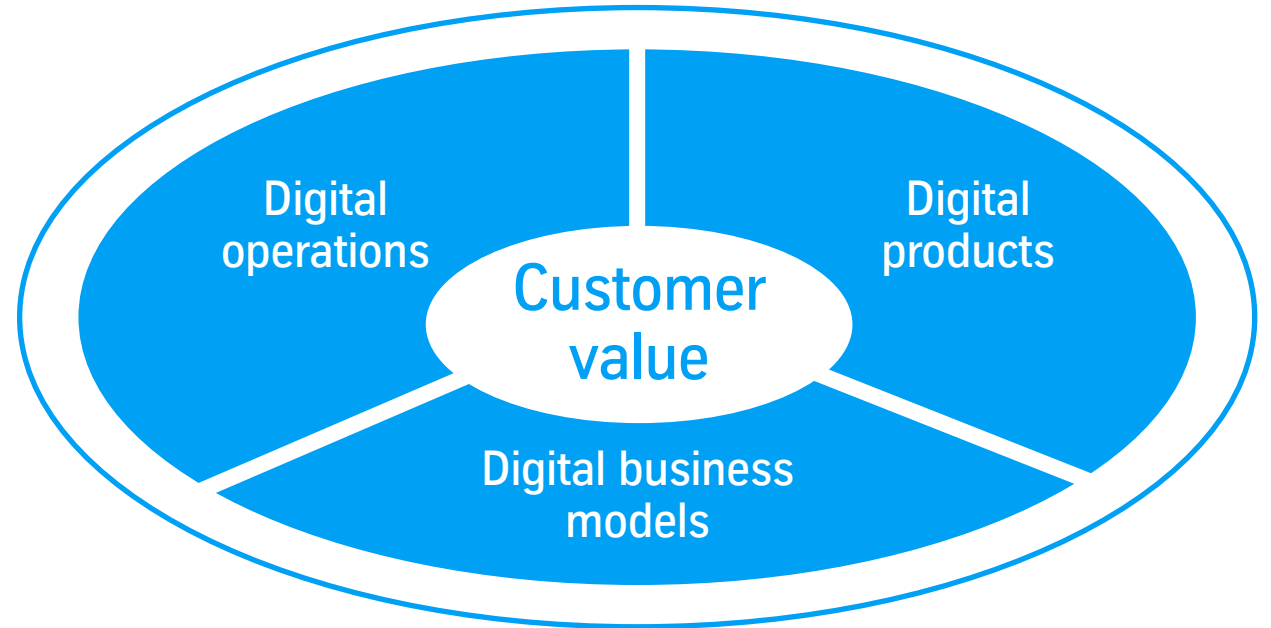
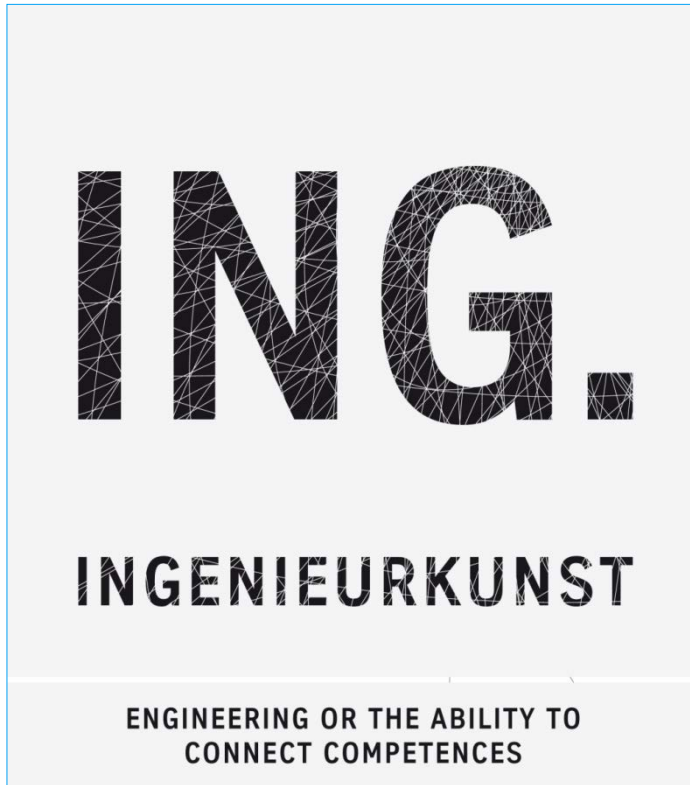
# CDP – thyssenkrupp is recognized as a world leader in climate protection for the 2nd time in a row



The CDP rates more than 2,400 companies on behalf of >800 institutional investors



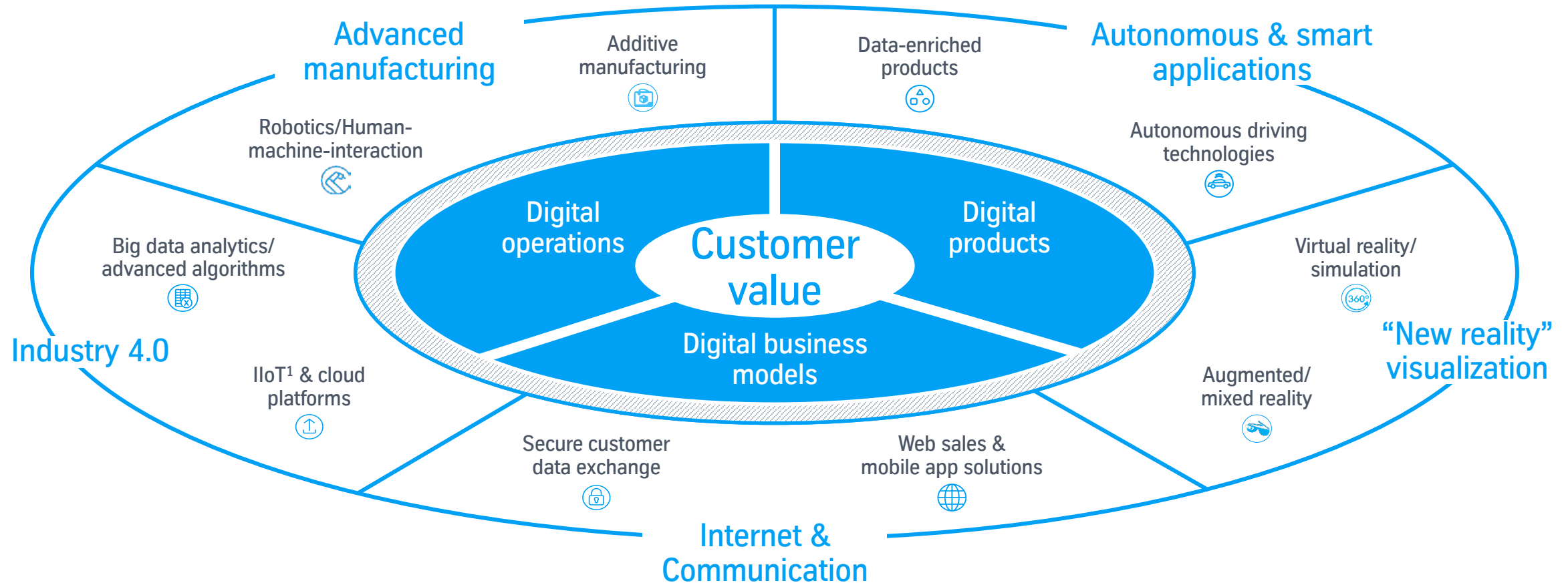
# Combining Engineering Expertise with Digital Transformation to drive our competitiveness



Past: Industry focused on productivity  
Future: Digital connection of value chains will be decisive



# Digital Transformation creates greater internal efficiencies, new smarter products and new business opportunities



1. Industrial Internet of Things







Augmented reality

**MATERIALS 4 ME**  
Metals. Plastics. Online.

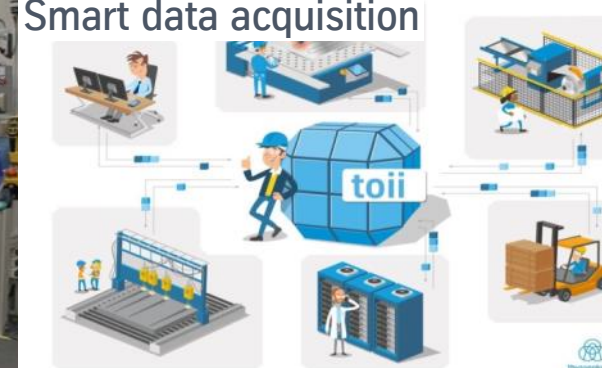
What we offer

Quality metals & plastics despatched same day.

Internet business

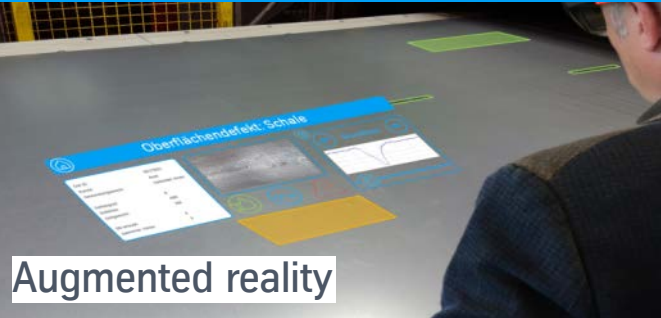


Human robot collaboration

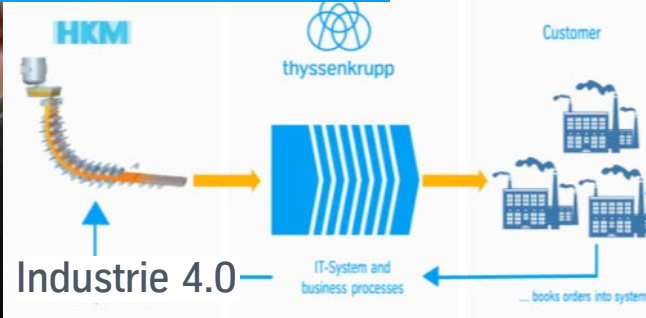


Smart data acquisition

# Broad portfolio of digital use cases



Augmented reality



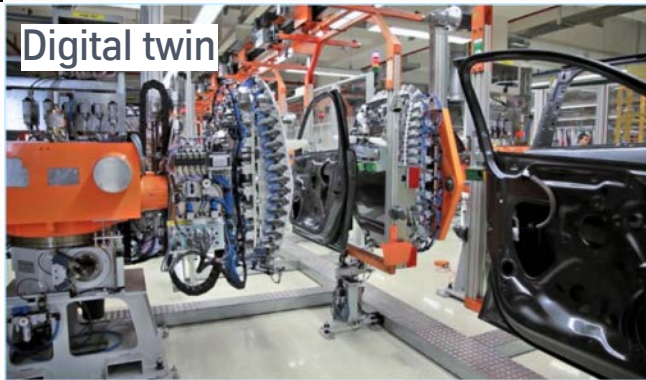
Virtual reality



Mechatronic system



Predictive maintenance



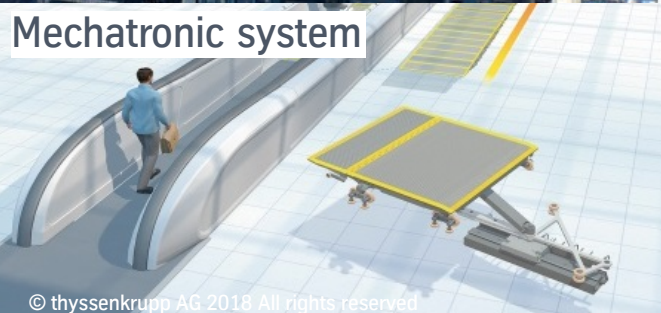
Digital twin



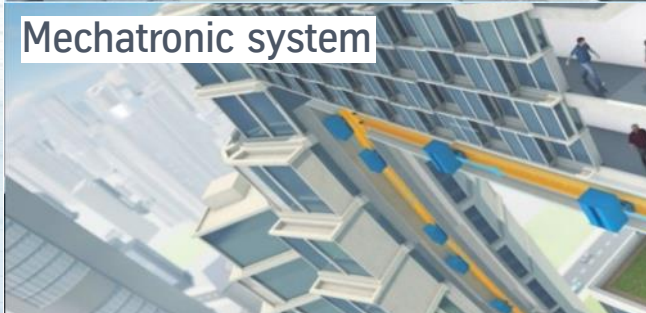
Human robot collaboration



Predictive maintenance



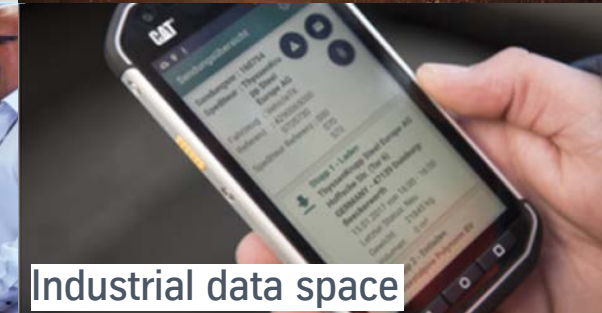
Mechatronic system



Mechatronic system



Open innovation

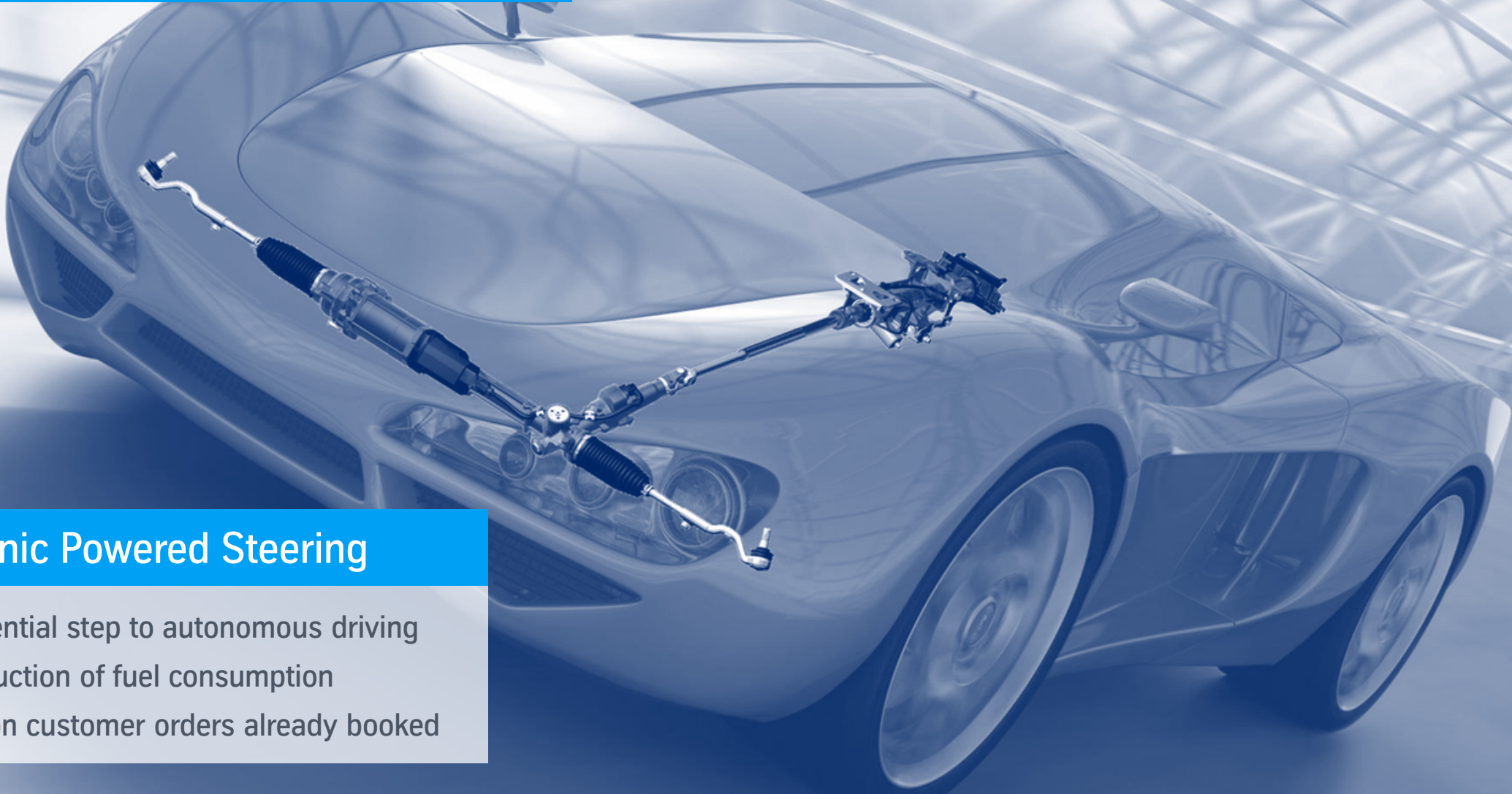


Industrial data space



From leadership for steering columns to state-of-the-art electrical steering systems

Example: Components Technology



## Electronic Powered Steering

- Essential step to autonomous driving
- Reduction of fuel consumption
- €8 bn customer orders already booked



# Next generation digitalized steering technology already under development

## Example: Components Technology



### Drive-by-wire



### Autonomous driving

## Digitalized chassis technology

- 400+ software engineers in Hungary
- Enables highly automated driving and totally new car architectures / interior concepts
- Reduces hardware variants and complexity, e.g. left/right hand drive
- Superior motion control



MULTI



ACCEL



Elevator  
Technology



ModLens



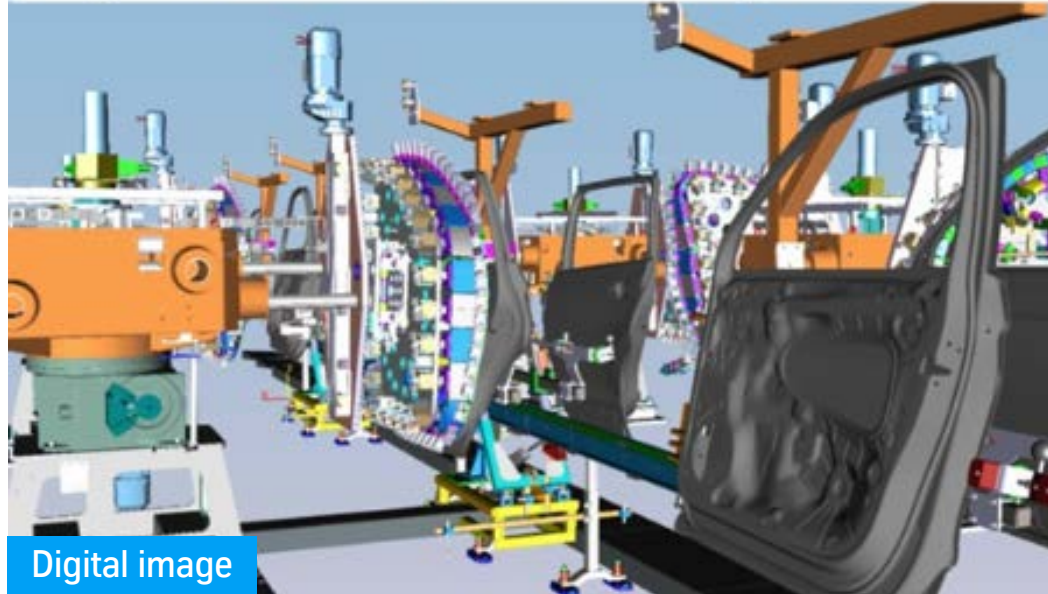
HoloLinc



# Digital Twin - Next efficiency level for plant engineering, automation and aftermarkets business

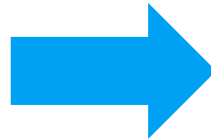
Example: Industrial Solutions, System Engineering

Car door assembly line – Digital Twin



Digital image

- Secure timely order fulfillment
- Shorter commissioning times
- Simultaneous real life test
- Higher customer retention
- Flexible adjustment of equipment to changes in car model cycles



Car door assembly line – real



Meets the customer requirement for

→ efficiency

→ flexibility

→ high quality



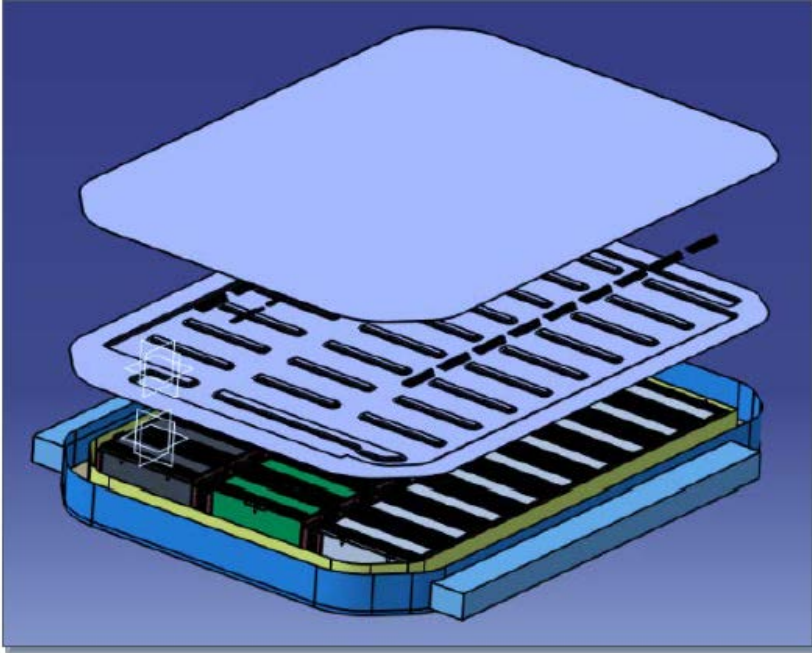


## New integrated drive concept

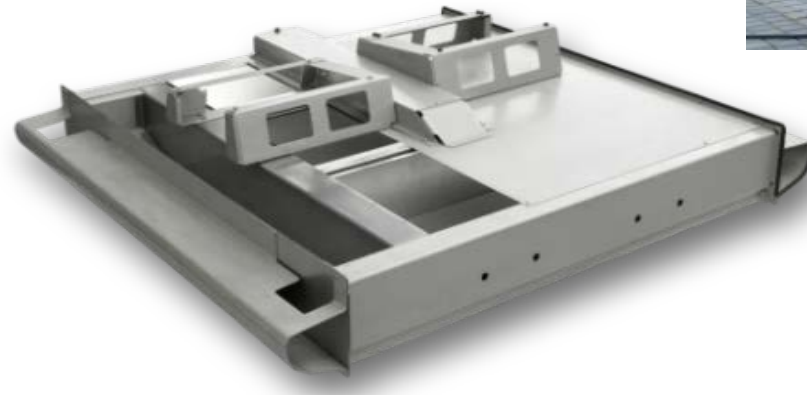


# Electric Car: integration of large-scale battery systems

## Protection and cooling



- Protection and cooling:  
Battery box with integrated  
cooling system made of steel



- StreetScooter floor structure:  
Cost efficient lightweight structure with  
high crash safety made of steel



Sources: tk Steel Europe; StreetScooter/Deutsche Post DHL Group





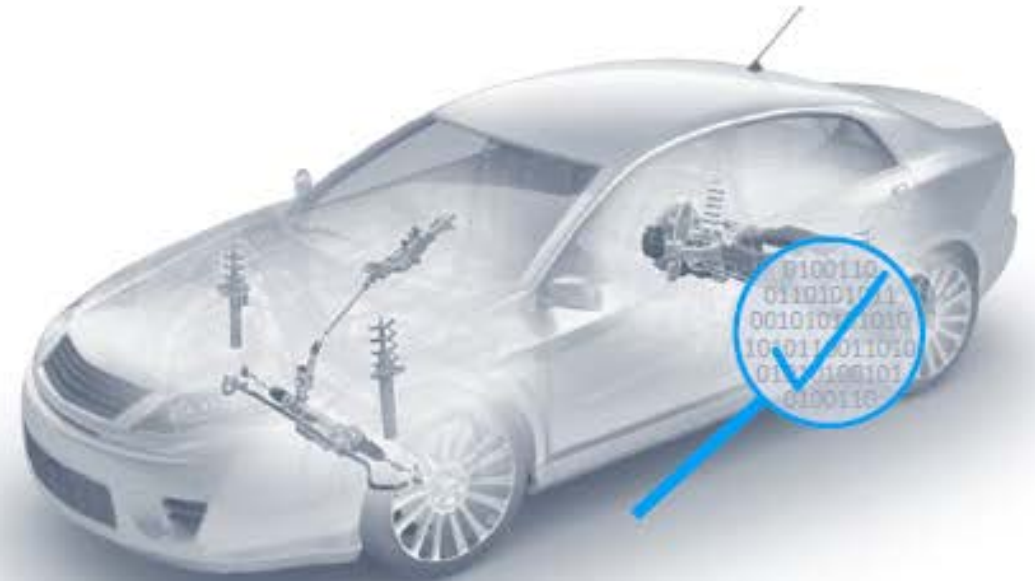
A large, dark, glossy carbon fiber wheel is mounted on a testing machine. The wheel has a complex, multi-spoke design. In the background, there is a desk with a printer, papers, and some tools. The scene is set in a laboratory or office environment.

thyssenkrupp Carbon Components GmbH, Dresden, established 2012

## Carbon wheel

- Worldwide first serial CFRP-Wheels with braiding technology
- Market Potential up to 4.4 mn wheels p.a
- Unique lightweight ratio and damping properties
- Fully tested and approved by German OEMs
- Market entry with German sports car OEM and German motorbike OEM in progress

# carValoo - the fitness tracker for vehicles!



**monitoring** every meter

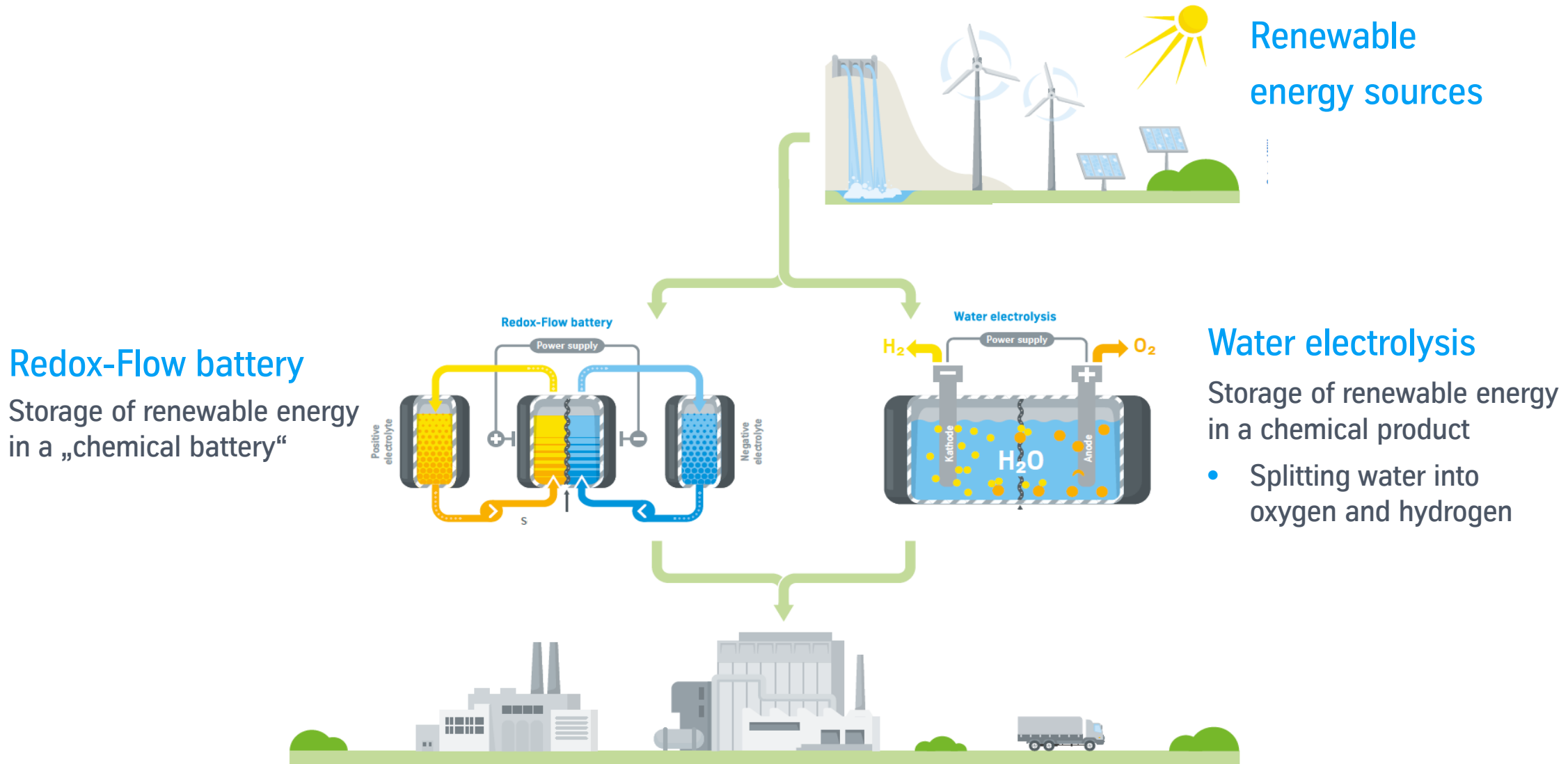
and **analyzing** car **data** in **real-time**

with an **easily retrofittable** system



# Development of technologies supporting Greenhouse Gas neutrality

Storage is precondition for the extensive use of power from renewable sources and grid stability





# Green H<sub>2</sub> through water electrolysis - New dimensions for renewable energy integration

## Example: Industrial Solutions

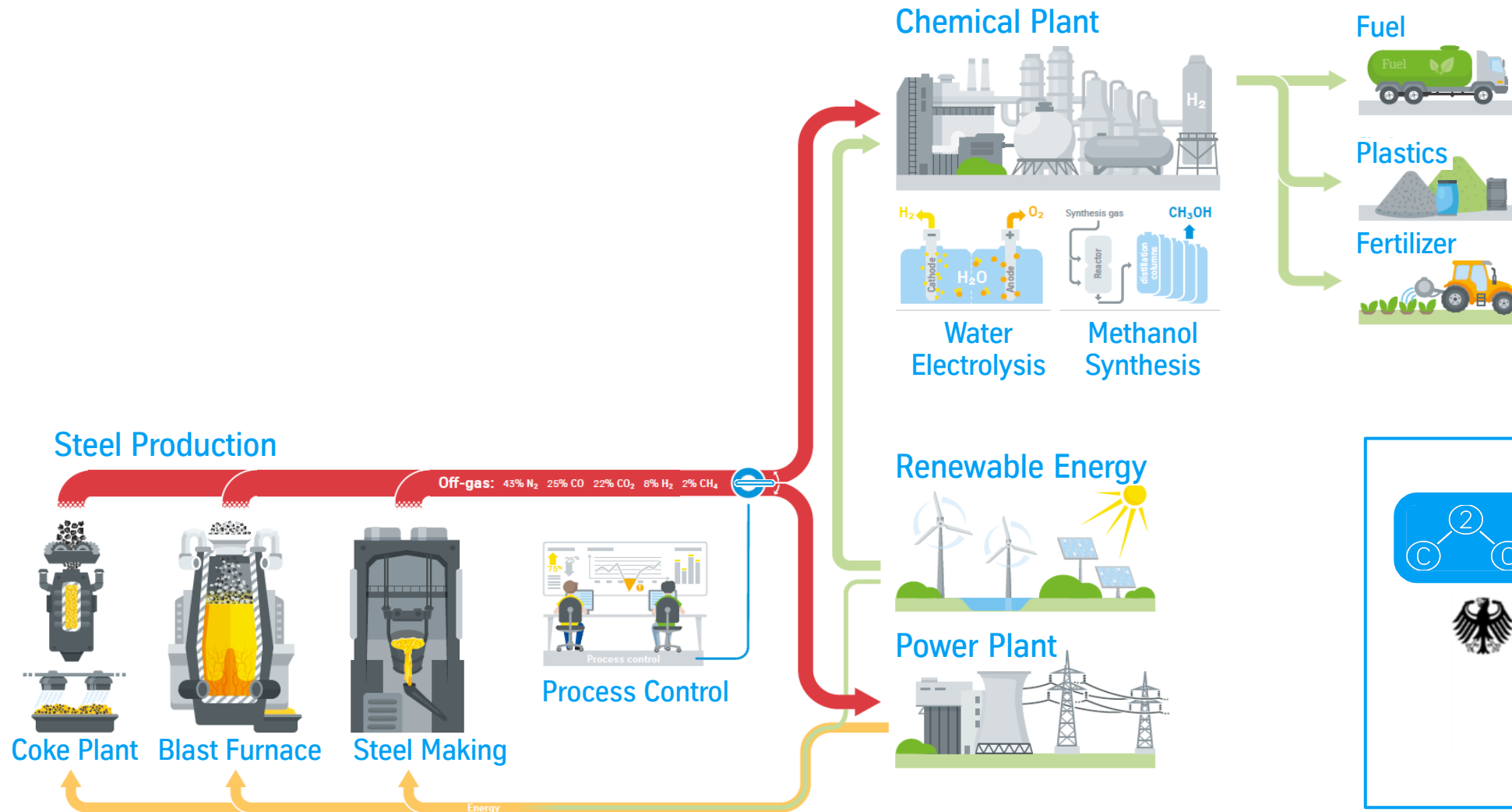
### Water Electrolysis by thyssenkrupp

- Market potential 2017-23 for water electrolysis systems >€1.0 bn  
(Source: own assessment)
- Proven technology, scale economies
- Design for plants larger than 100 MW
- Target applications
  - Power-to-Gas (H<sub>2</sub>/ energy storage),
  - Power-to-X (e.g. methanol/ fuel, ammonia)



# Carbon2Chem – Recycling of top gases from steel production through cross-industry collaboration

Replacement of fossil fuels (oil and gas) for the production of artificial fuels, plastics and fertilizer



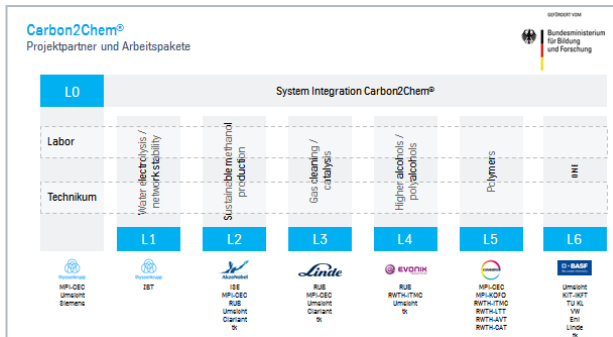
# Implementation of Carbon2Chem®

Form idea to economical implementation

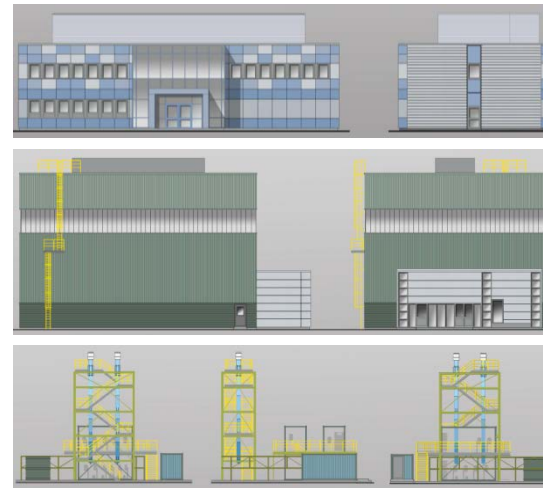
Research in Carbon2Chem®

Carbon2Chem® pilot plant

Commercial implementation



Research and  
feasibility



„Proof of Concept“



Supporting greenhouse  
gas neutrality







Thank you  
for your attention!

engineering.tomorrow.together.



thyssenkrupp