



## Railways get even greener, smarter and off-rails

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# Growing environmental concerns while rapid advancement of green technologies

## Multiplication of "diesel ban"



- XX Ban of diesel cars
- XX Ban of all internal-combustion cars
- XX Ban of sales of new ICE cars, use of existing cars allowed
- XX Objective to run on 100% renewable energy

## Continued investment in hydrogen

Hydrogen Council: ~\$10bn investment (2017)



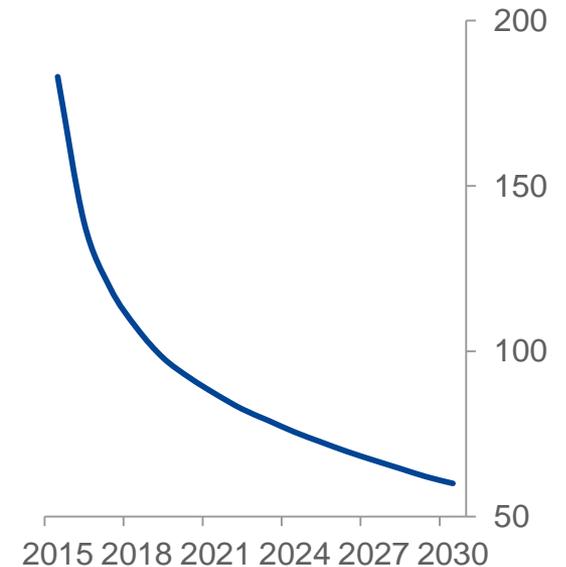
## H2 mobility Germany: ~€350m investment (2015)

Build up to 400 hydrogen refuelling stations by 2023



## Increased availability of green technologies

Li-ion battery cell cost development, USD/kWh; 2016 - 2030



Source: Corporate websites, 2025-2040 Mobility trends – Alstom 2025 Launch Days Roland Berger

# Our ambition

**Be the leading global innovative player  
for a sustainable and smart mobility**

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# Hydrogen trains: now a reality



In commercial service in Germany  
Deployment/tests in France, UK,

# Diesel replaced by hydrogen and fuel cell technology

- Electric drive system
  - Primary energy by fuel cells
  - Intermediate storage by li-ion batteries...
    - ...for additional acceleration
    - ...for the recovery of braking energy
- Combined propulsion and energy storage system**

Notice anything weird about these trams ?





Rio de Janeiro Orleans  
Reims Sydney





Dubai Bordeaux



Angers Tours





No catenary, yet they are still electric



We are extending Electric ground power supply to roads

# Electric roads

## Future: greener road freight transport

### Electric road is a good solution for:

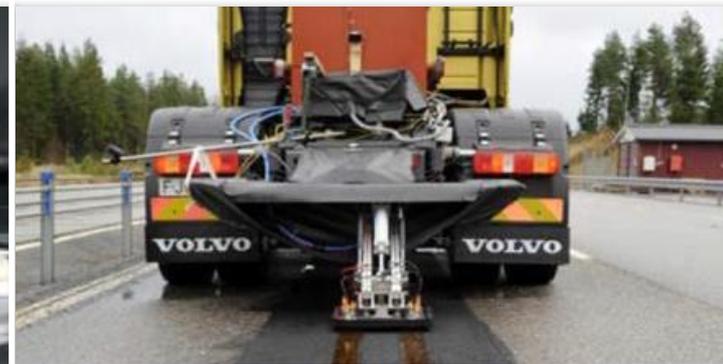
- Reduction of **CO<sub>2</sub>** emissions
- Reduction of other **air pollutants** (NO<sub>x</sub>, PM)



CONDUCTIVE FROM ABOVE



INDUCTIVE FROM THE GROUND



CONDUCTIVE FROM THE GROUND

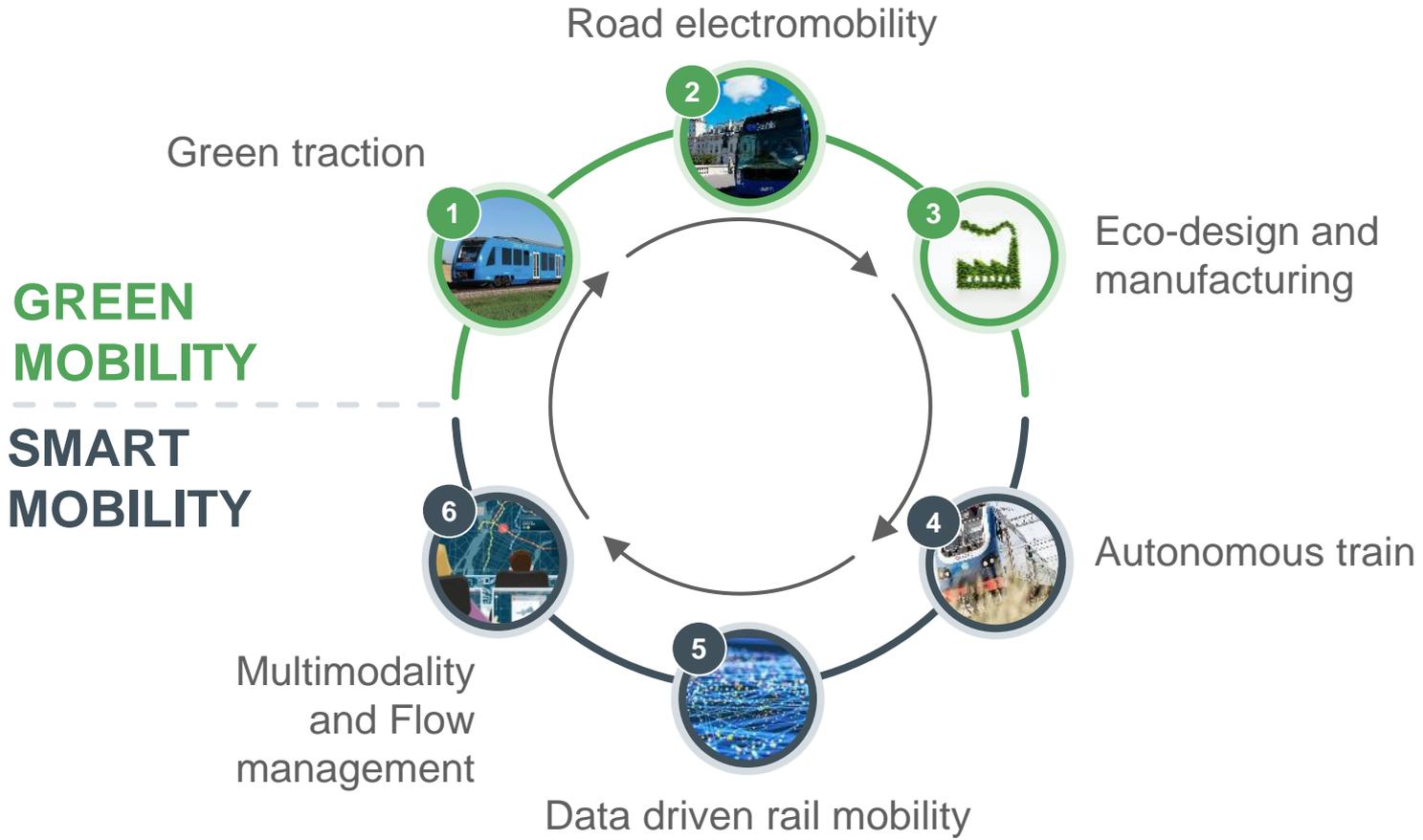
# Leveraging our electric know-how “off-the-rails”



# Mastria: Multimodal flow management system



# Not just delivering green products, but being green ourselves





Thank you

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