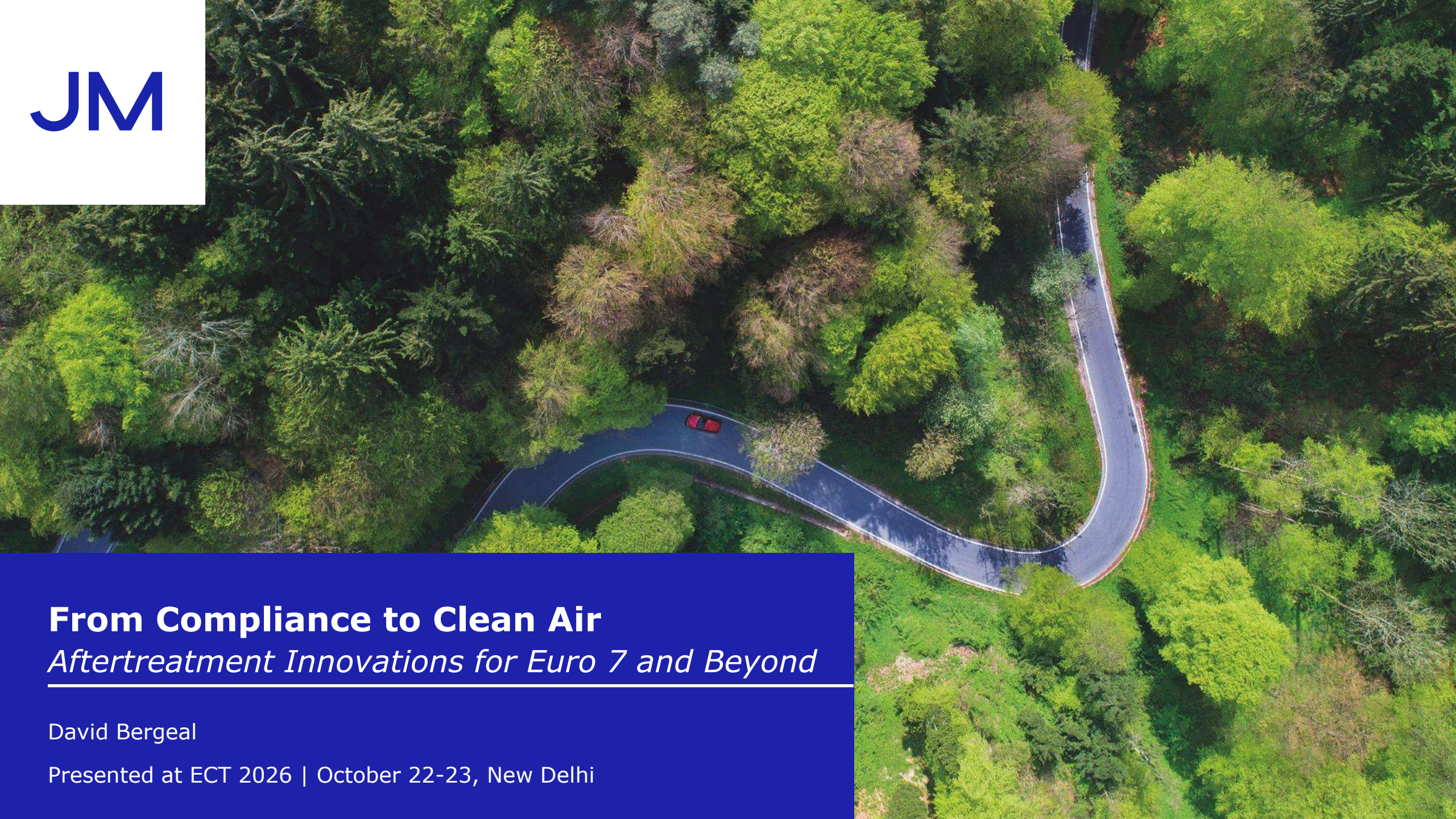


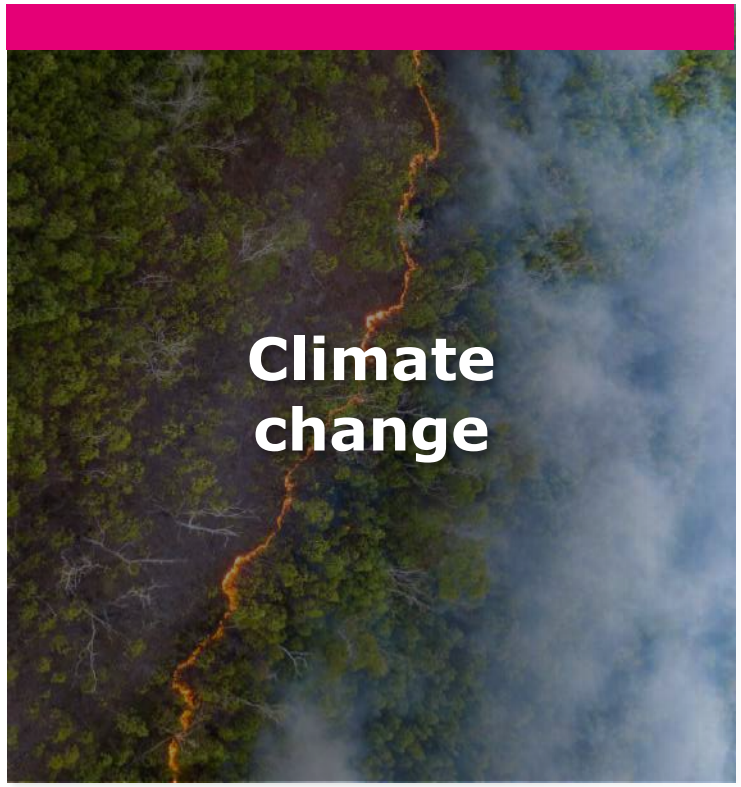
From Compliance to Clean Air

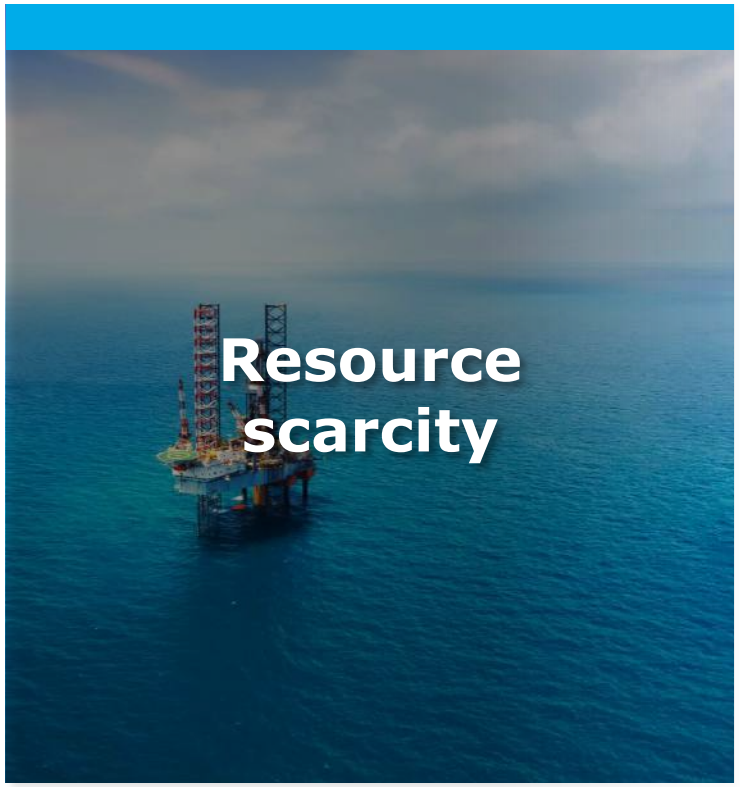
Aftertreatment Innovations for Euro 7 and Beyond

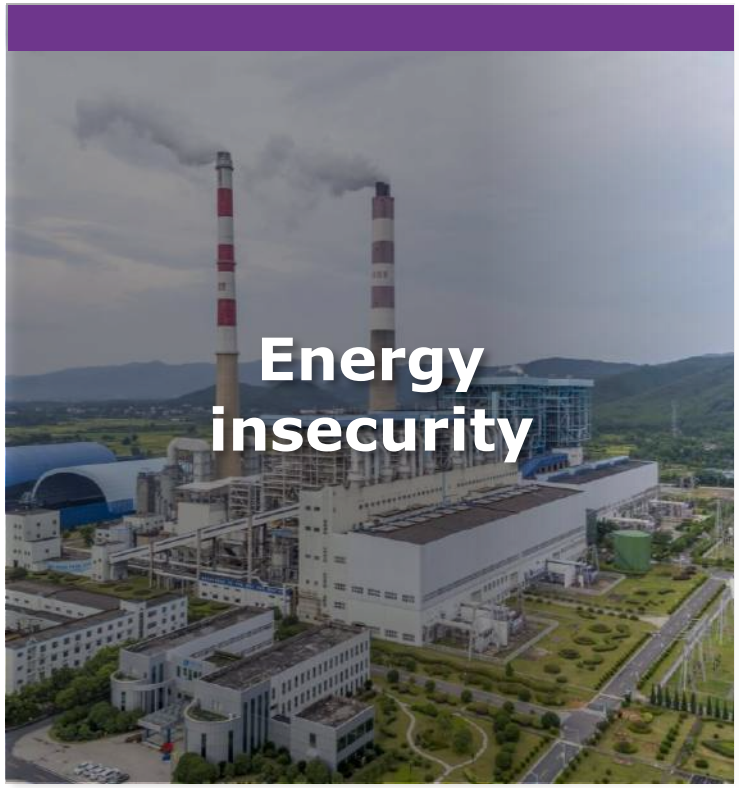
David Bergeal

Presented at ECT 2026 | October 22-23, New Delhi

The world is facing some of its biggest challenges yet

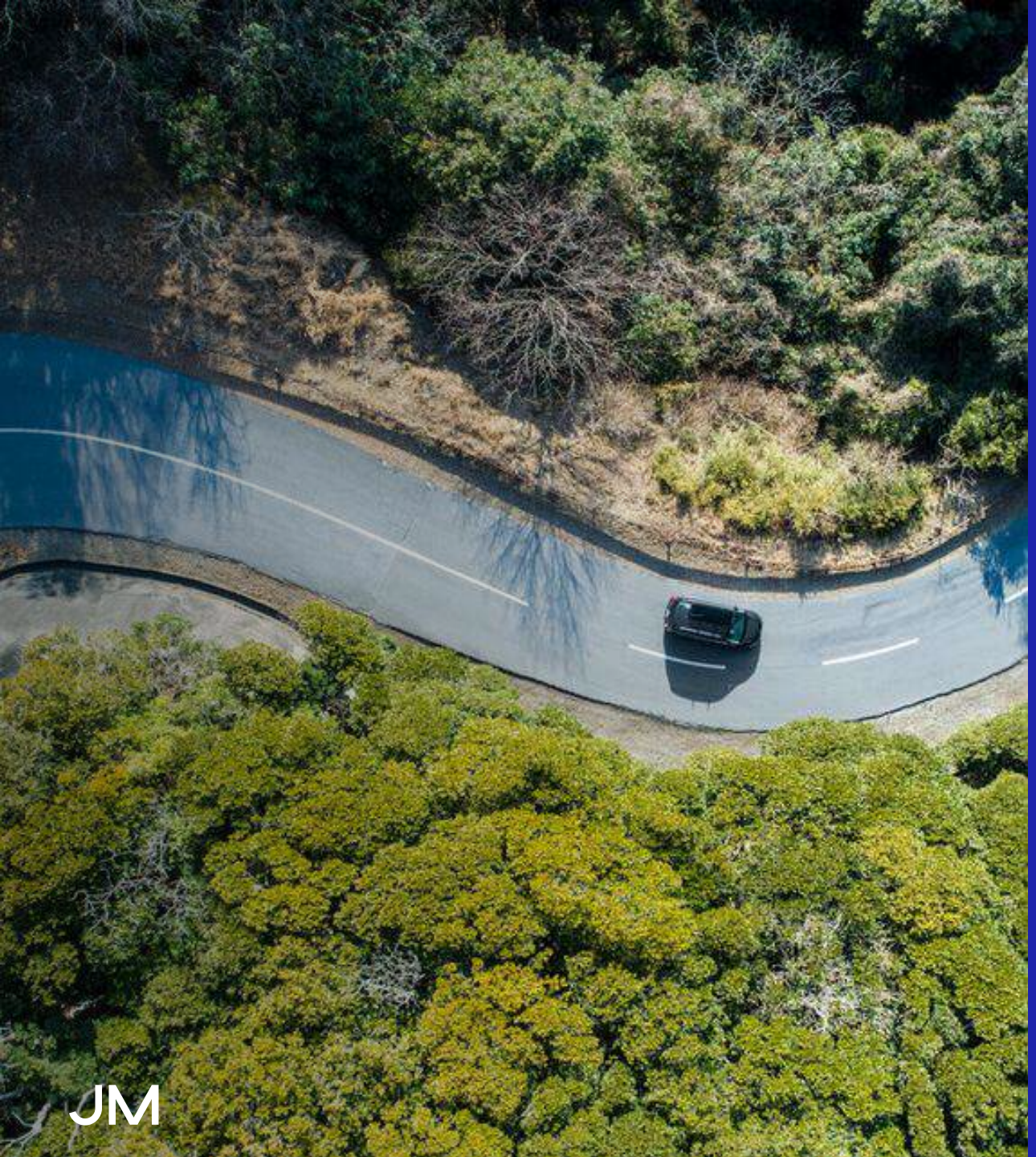






JM's technologies and solutions tackle these challenges head on.

JM



We’re a world leader in platinum group metals (PGMs)

Our globally renowned customers rely on our scientific expertise, quality and trust in **applying, refining and recycling** metals that matter, for a healthier and more resilient world.

Our technologies and solutions help them:

- Reduce harmful emissions
- Power modern society
- Decarbonise
- Achieve their sustainability goals

Utilising the powerful, unmatched properties of PGMs

- ✓ **High circularity**
- ✓ **Highly active catalysts**
- ✓ **Unmatched stability and durability**
- ✓ **Extremely effective in small amounts**

78	46	45	44	77
Pt	Pd	Rh	Ru	Ir
Platinum	Palladium	Rhodium	Ruthenium	Iridium

Technologies and solutions supporting a healthier world

Emission control solutions

Helping deliver **cleaner air** across the globe for 50 years

- **20 million tonnes of pollutants** stopped by our catalysts each year
- **Light and heavy duty** mobile, coupled with **fixed** emission controls

Enabling clean energy

Market leader in components for **hydrogen** fuel cells and production

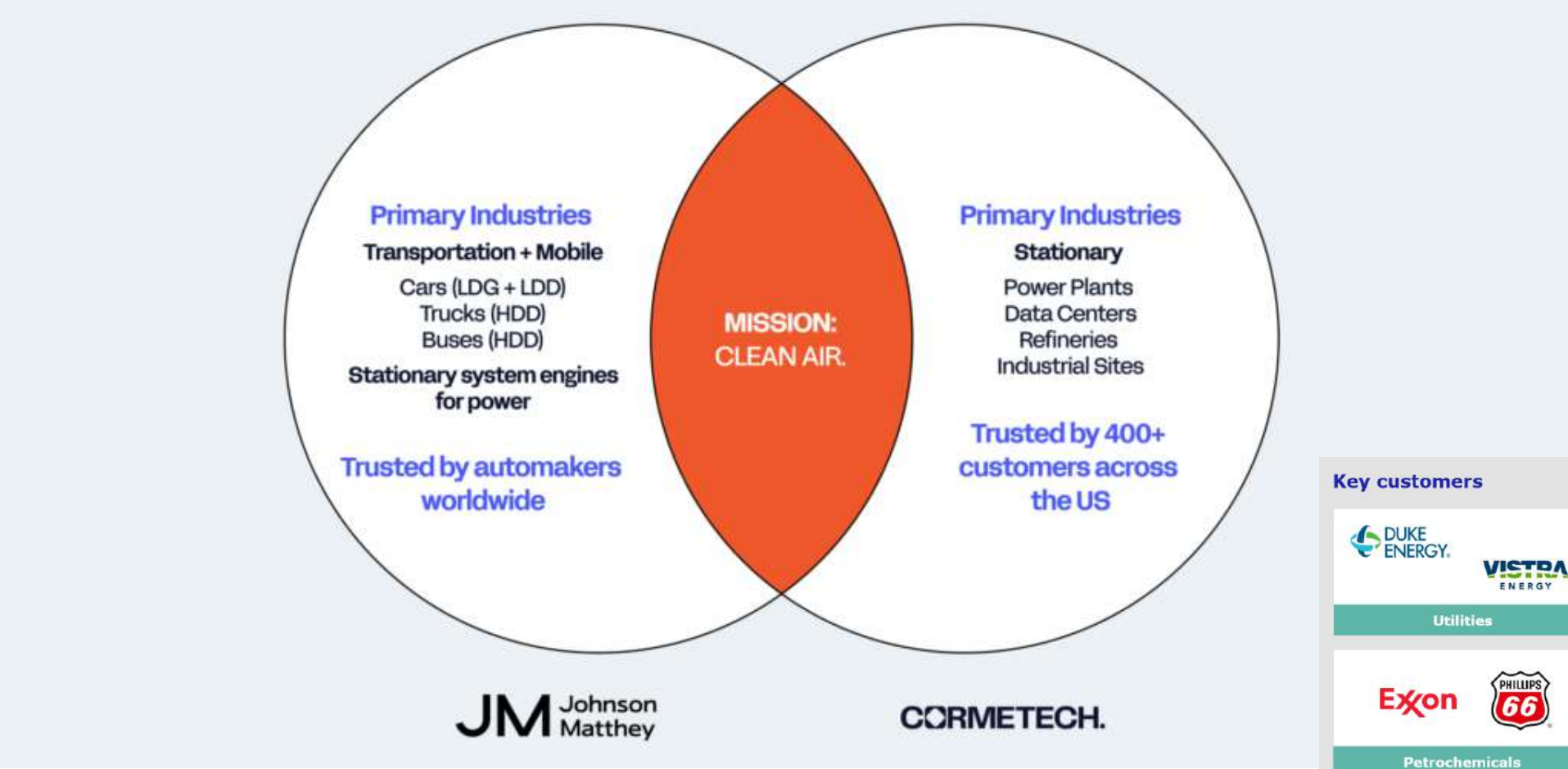
- Enabling **zero emission trucks and buses** powered by hydrogen
- Supplying performance-defining components for **electrolytic hydrogen** production
- **>20 years' experience** in fuel cell components

Creating a truly circular economy

Embedding circularity as the world's **largest recycler** of PGMs

- Refining metal to high purity e.g. platinum to a minimum **purity of 99.95%**
- Reducing the carbon footprint of our products – recycled metal has up to a **95% lower** carbon footprint than mined metal

JM and Cormetech: complementary capabilities
Global leader in stationary emissions control



Key customers

DUKE ENERGY. VISTRA ENERGY	MIRATECH MITSUBISHI HEAVY INDUSTRIES
Utilities	Industrial
Exxon PHILLIPS 66	Microsoft X1
Petrochemicals	Data centres[4]

The acquisition adds a leading SCR catalyst portfolio for stationary emissions control, including the rapidly growing data centre market.

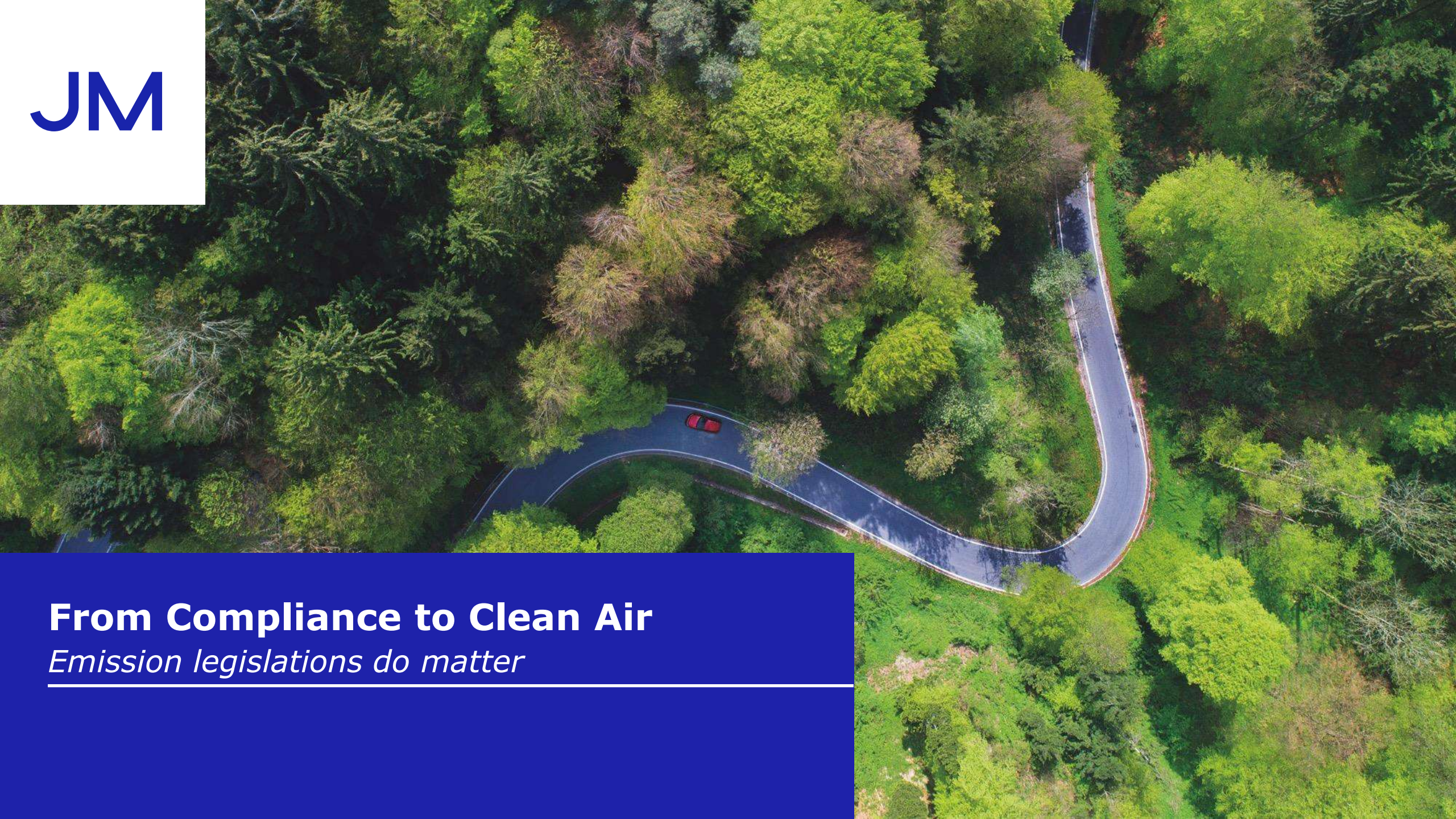
Our 3rd Century Refinery (3CR)

Redefining PGM refining: coming in 2027

World-leading technology that **increases capacity and flexibility**, allowing us to handle a greater range of complex feeds and manage peak flows effectively

Drastic **reduction in environmental impact**, with reduced hazardous waste and energy use

Step change in safety, with better ways of working, putting our people's safety first



From Compliance to Clean Air

Emission legislations do matter

From Compliance to Clean Air

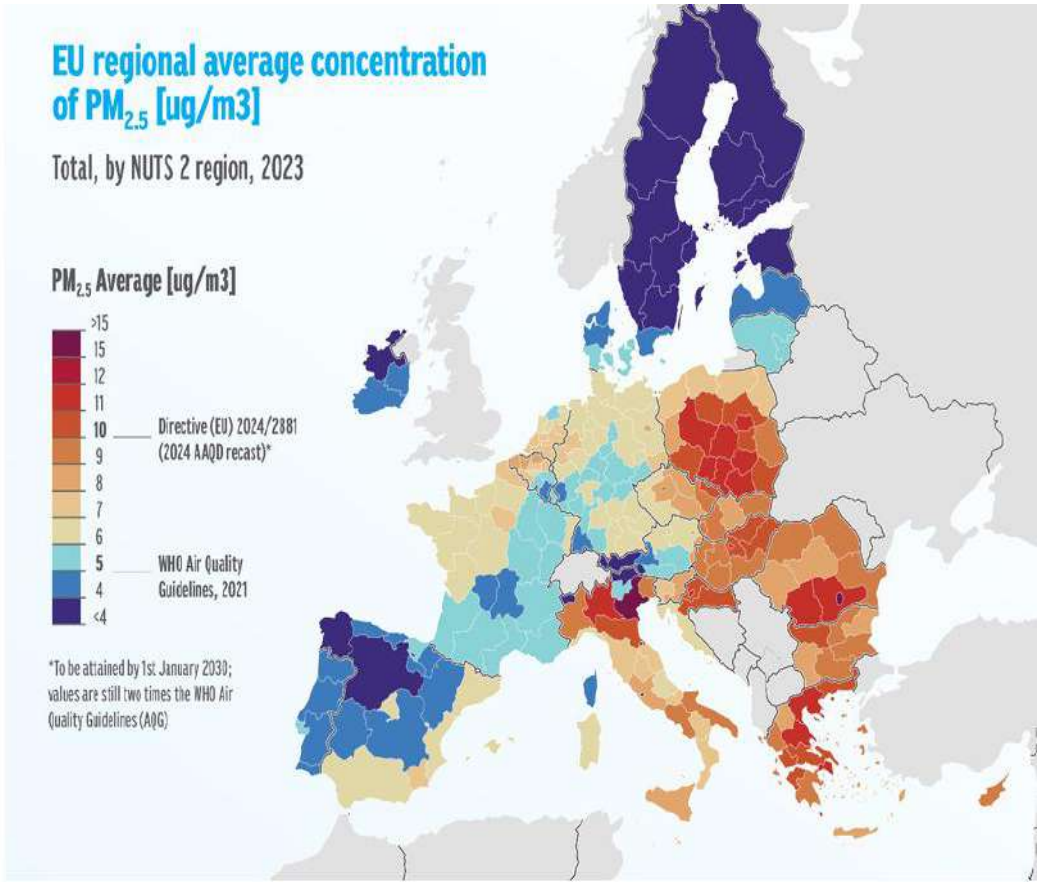
Sectors and activities contributing to emissions of the 5 main air pollutants regulated
EU 2024 – published July 2026

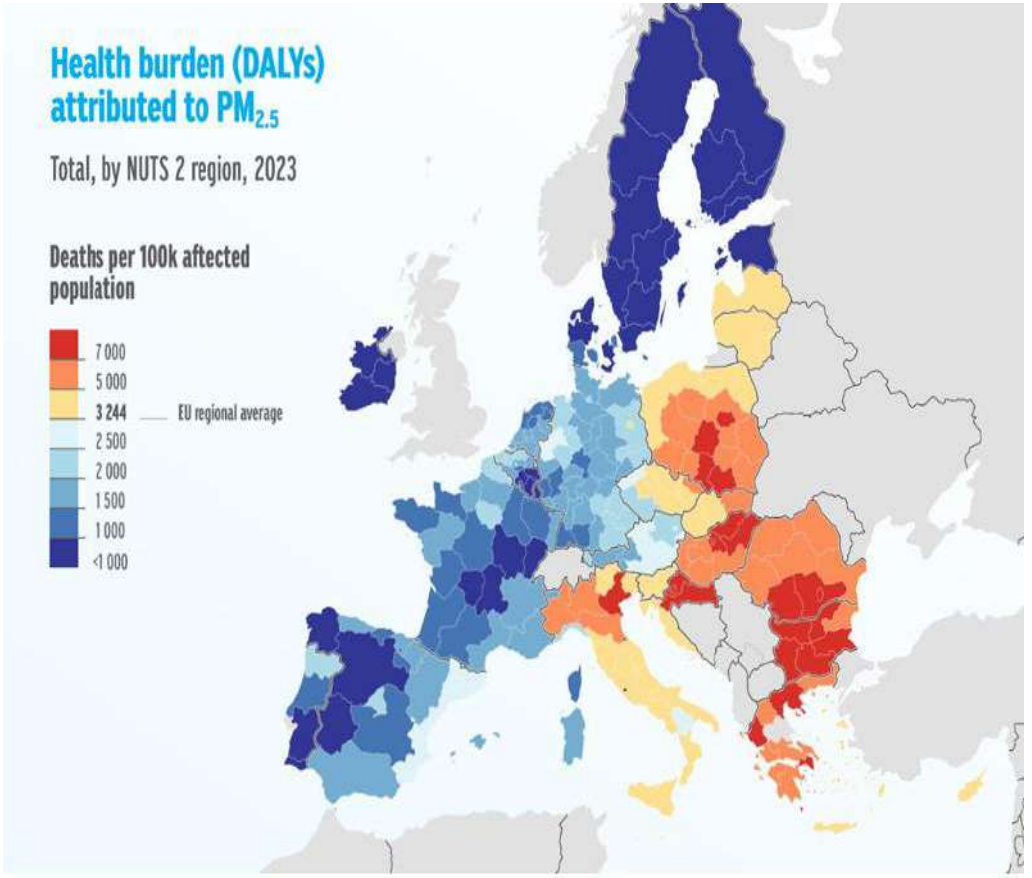
- **Transport is still a main contributor to:**
  - **NOx**
  - **Organic Volatiles**
  - **Particles PM2.5**

Source: European Environment Agency - Air pollution in Europe — 2026 reporting status under the National Emission Reduction Commitments Directive

From Compliance to Clean Air

Health effects of fine particles *Published August 2026*



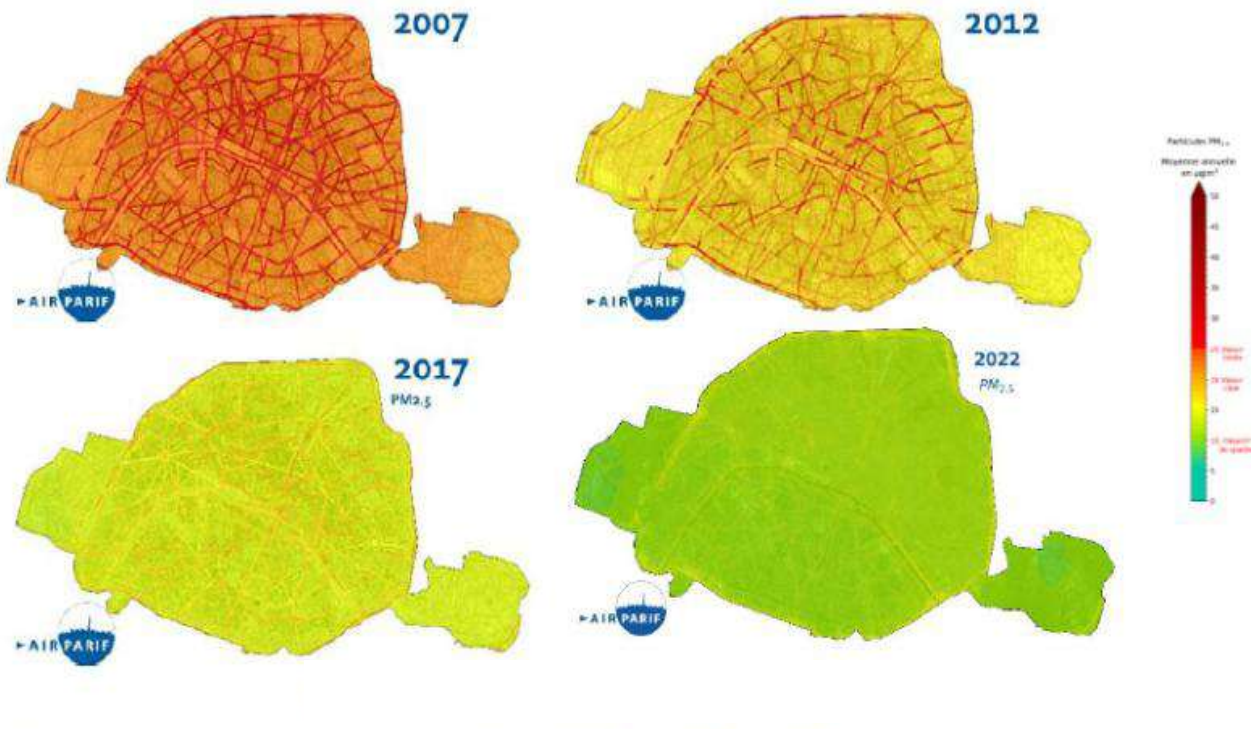


Source: Health effects of fine particles - Assessing the health burden of fine particles and options for stronger EU action

European Parliament - Policy Department for Transformation, Innovation and Health Directorate-General for Economy, Transformation and Industry - August 2026

From Compliance to Clean Air – $PM_{2.5}$

Tangible improvements are possible…



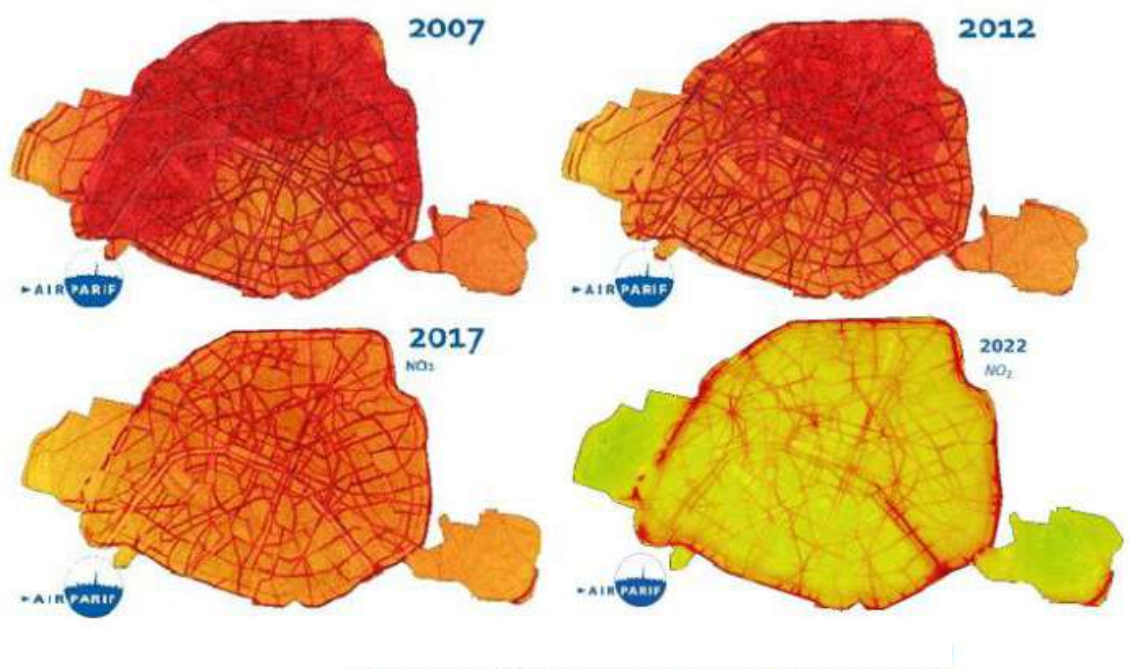
Average PM2.5 concentration change from 2007 to 2022 – Paris

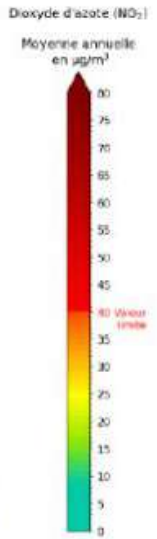
Source:airparif

- Successive emission legislations have step by step substantially contributed to improve air quality
- Data from Euro 4 to Euro 6, including implementation of DPF, SCRF and GPF

From Compliance to Clean Air – NO_2

Tangible improvements are possible…





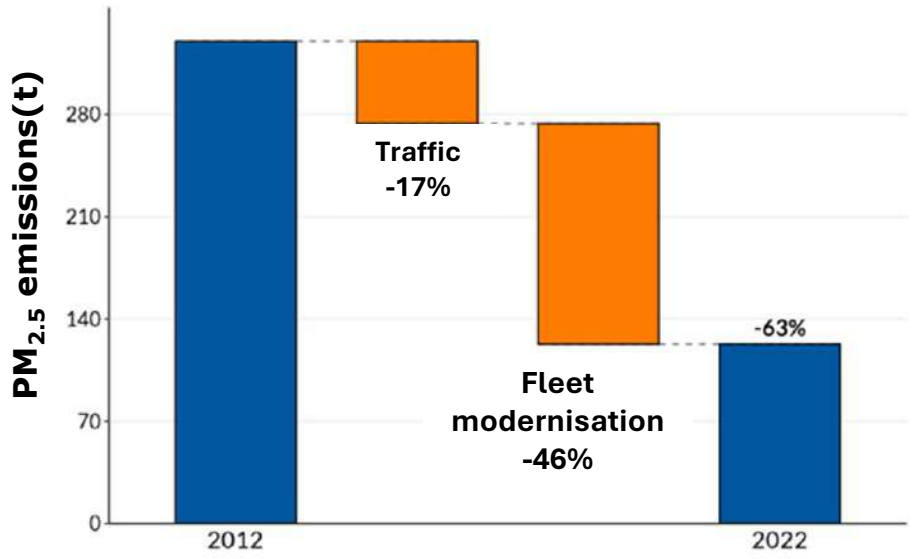
- Successive emission legislations have step by step substantially contributed to improve air quality
- Data from Euro 4 to Euro 6, including implementation of Nox traps, SCRF and SCR
- NOx Emissions can still be further lowered
- Eu7 – missed opportunities for tighter urban Emissions reduction?

Average NO_2 concentration change from 2007 to 2022 - Paris

Source:airparif

From Compliance to Clean Air

Tangible improvements are possible. However, they take time to materialise

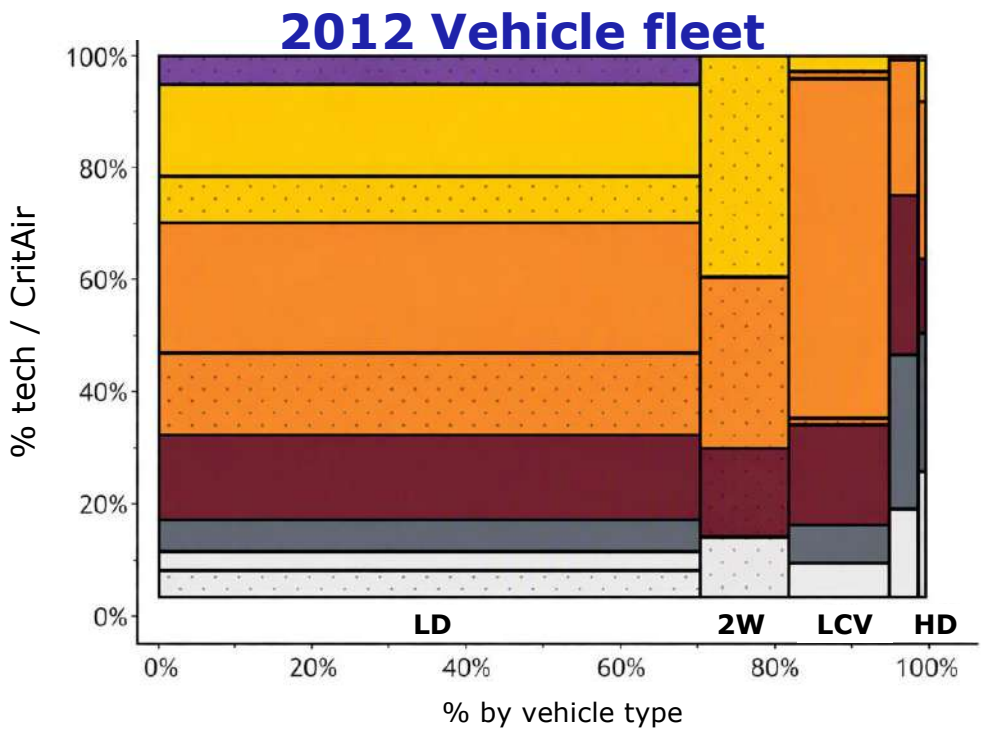


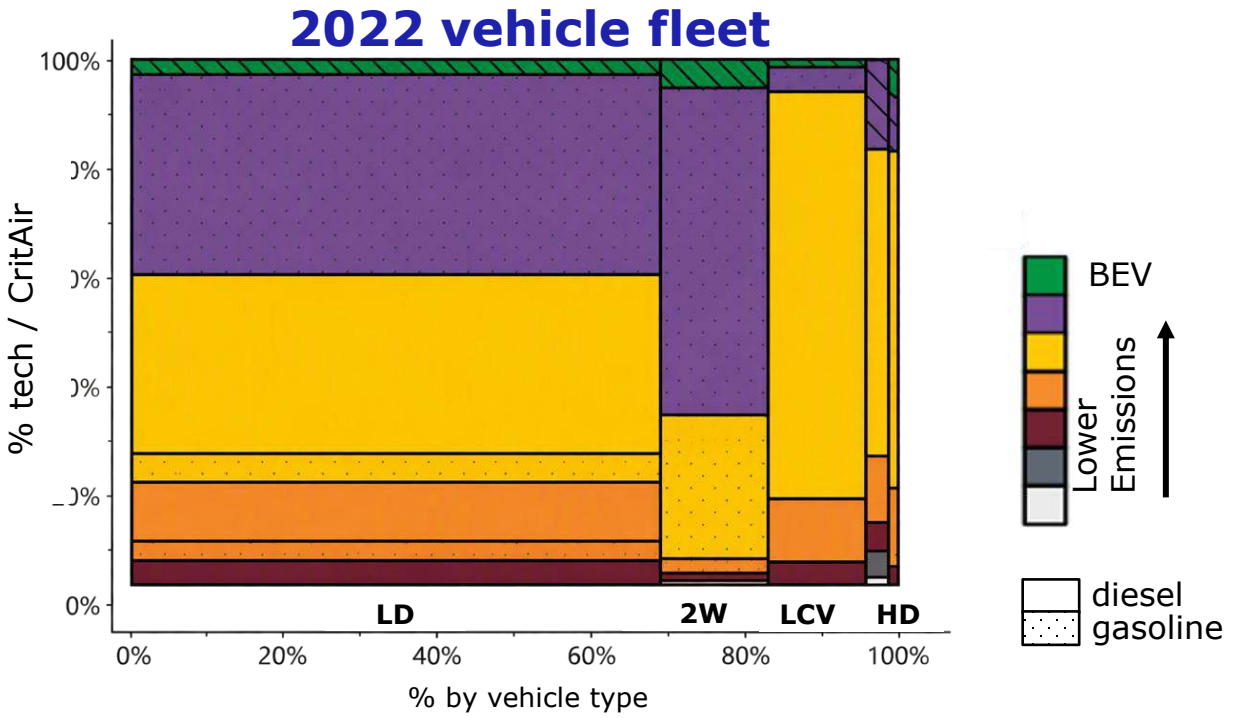
- Road-traffic $PM_{2.5}$ emissions fell by 63%, with fleet modernisation accounting for 46% and reduced traffic for 17% of the baseline
- It takes time for lower-emissions vehicles to have an impact on fleet emissions and air quality

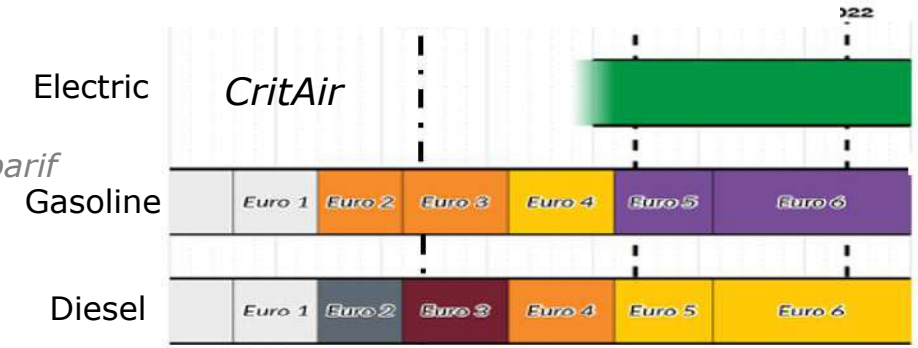
Source:airparif

From Compliance to Clean Air - NOx

Tangible improvements are possible. However, they take time to materialise







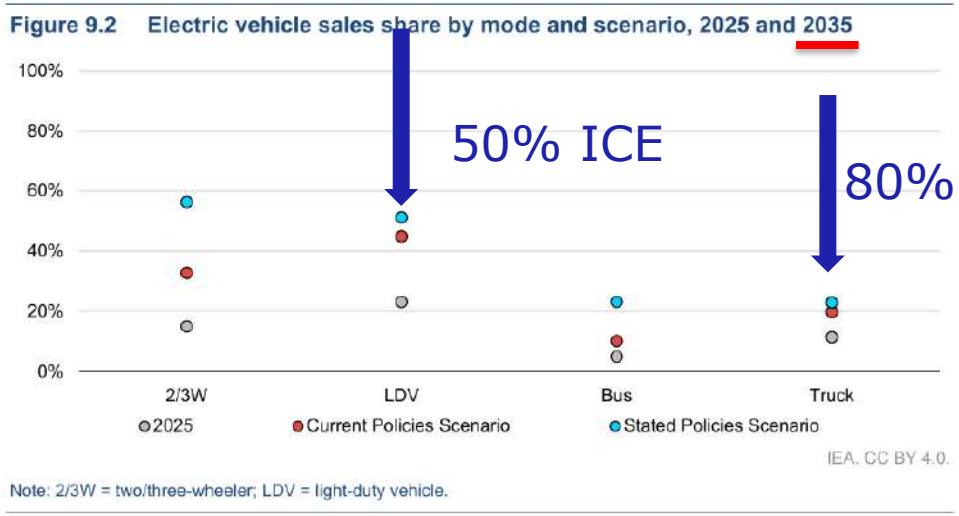
Source:airparif

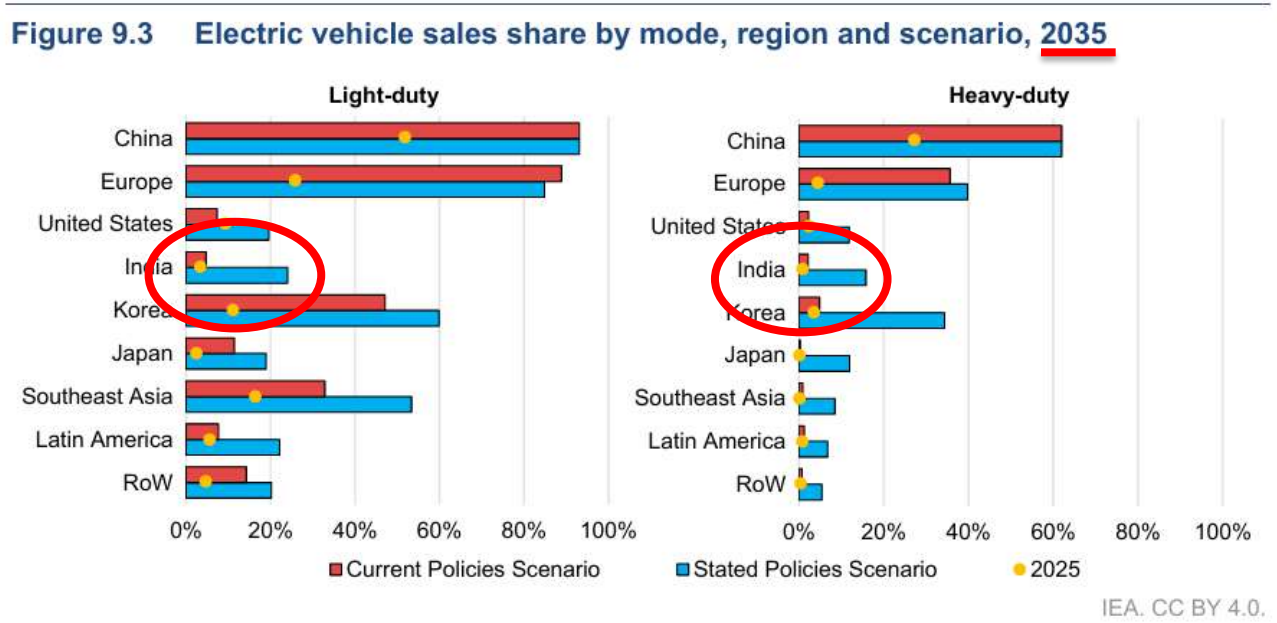
BEV contribution to air quality will take time to have a significant impact

From Compliance to Clean Air

Stringent Emissions control for ICE-equipped vehicles is required now and in the future.

BS VII legislation will drive down emissions and improve air quality for the years to come



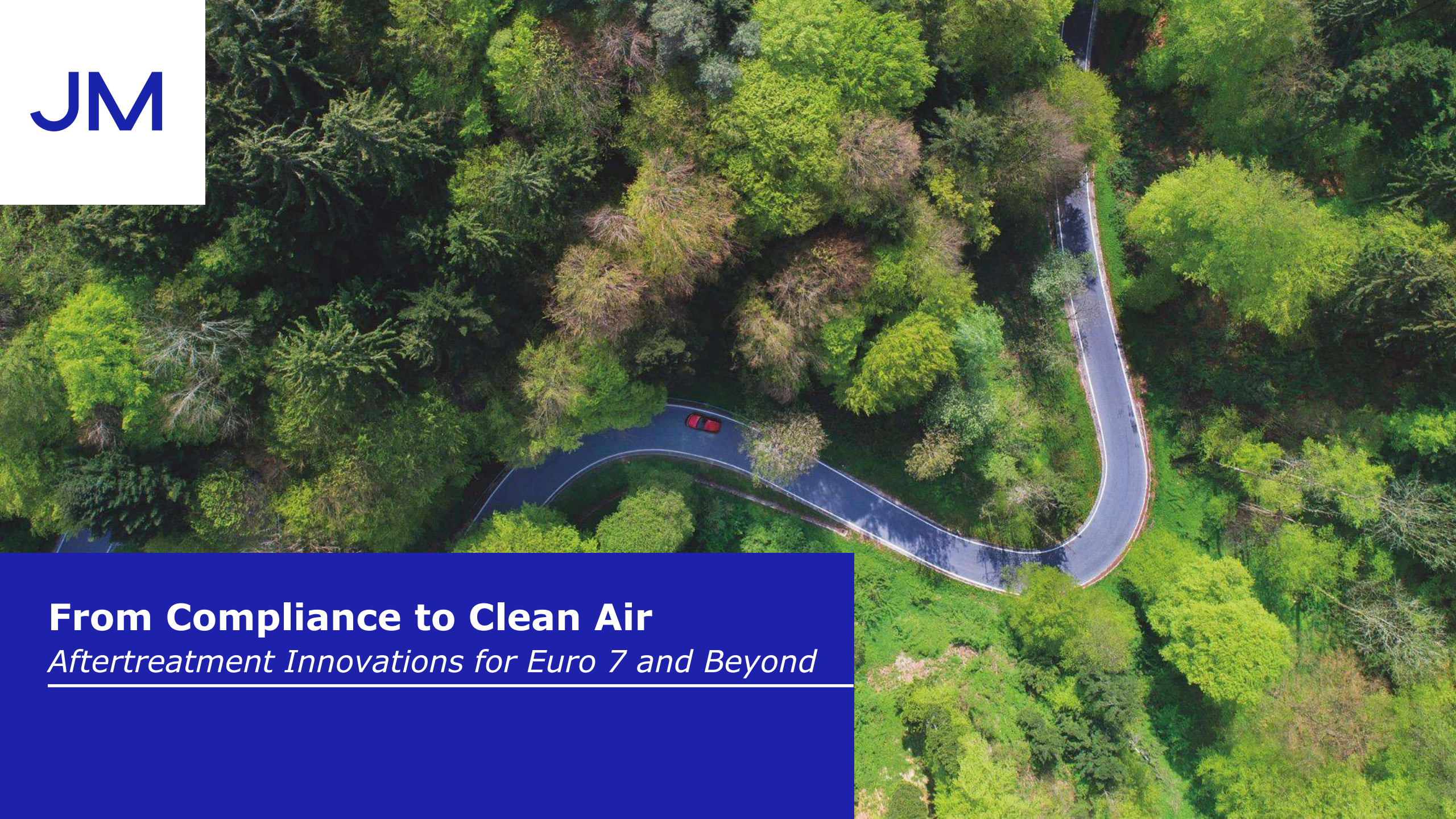


Source: IEA Global EV Outlook 2026

From Compliance to Clean Air - NOx

Tangible improvements are possible…

- Successive Emission legislations have been effective at reducing air pollution
- Fleet renewal takes time, so stringent emissions control remains important during the transition to BEV.
- BS VII will contribute to air quality improvement for a long period of time
- Will we still have to evolve emissions legislation to reduce urban pollution further?



From Compliance to Clean Air

Aftertreatment Innovations for Euro 7 and Beyond

BS VII | Euro 7 HD Emission limits

Comparison of EU VI, Eu7 HD , NS VII

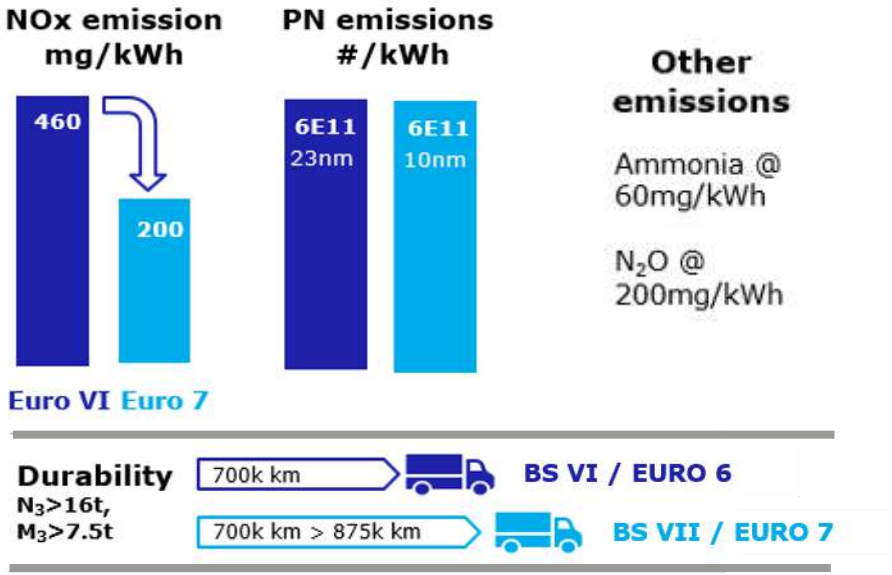
	Heavy Duty >3.5ton			
Emissions	**EUVI**	**BS VII / EU7 HD**	**BS VII / EU7 RDE**	**NS VII ?**
NOx mg.kWh^{-1}	**460**	**200**	**260**	**140** ***460*** *Cold WHTC NOx*
PM mg.kWh^{-1}	**10**	**8**	**-**	**10**
PN #.kWh^{-1}	**$6x10^{11}$** PN23	**$6x10^{11}$** PN10	**$9x10^{11}$** PN10	**$6x10^{11}$** PN10
CO mg.kWh-1	**4000**	**1500**	**1950**	**670**
NH_3 mg.kWh-1	**10** ppm Avg.	**60**	**85**	**65**
CH_4 mg.kWh-1		**500**	**650**	**400**
N_2O mg.kWh-1		**200**	**260**	**195**
Main lifetime km/yr	**700k / 7**	**700k / 12**		
Add. lifetime km/yr		**875k / 15**		

Emission limits are fuel neutral | NSVII not finalized yet

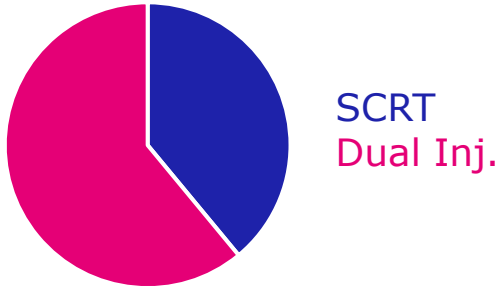
JM

BS VII | Euro 7 HD Emission limits and ATS architecture

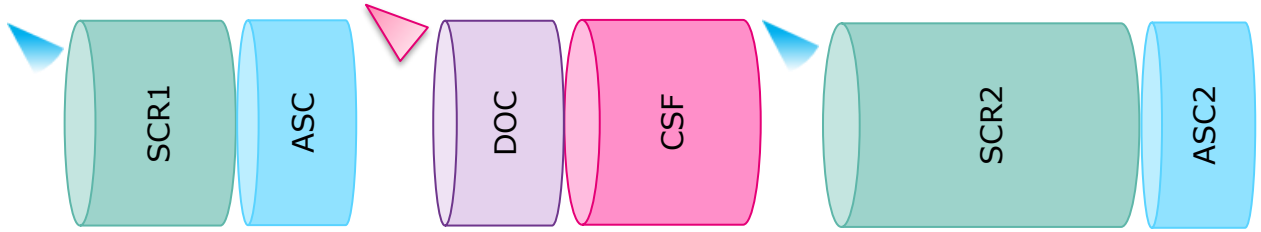
BS VII / Eu 7 HD Emission limits



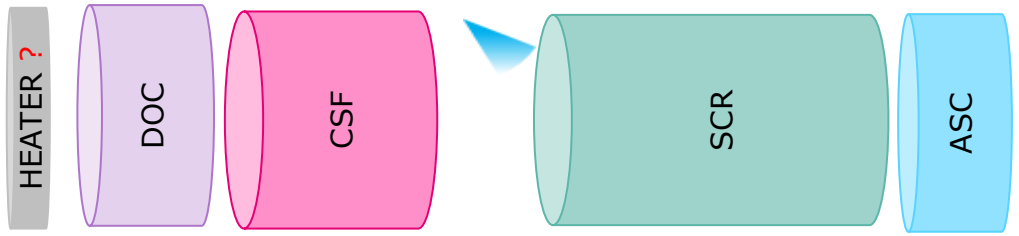
System configuration |Europe



Dual Injection



SCRT®



- CSF - Enhanced Filtration Coating (EFC) for PN_{10}
- Electrical Heater for Temp management
  - Before DOC or SCR

In Eu7 HDD is majority dual injection

No part of this presentation can be shared with any other party without written consent of Johnson Matthey (© Johnson Matthey 2026).

SCR Technologies Trade-off

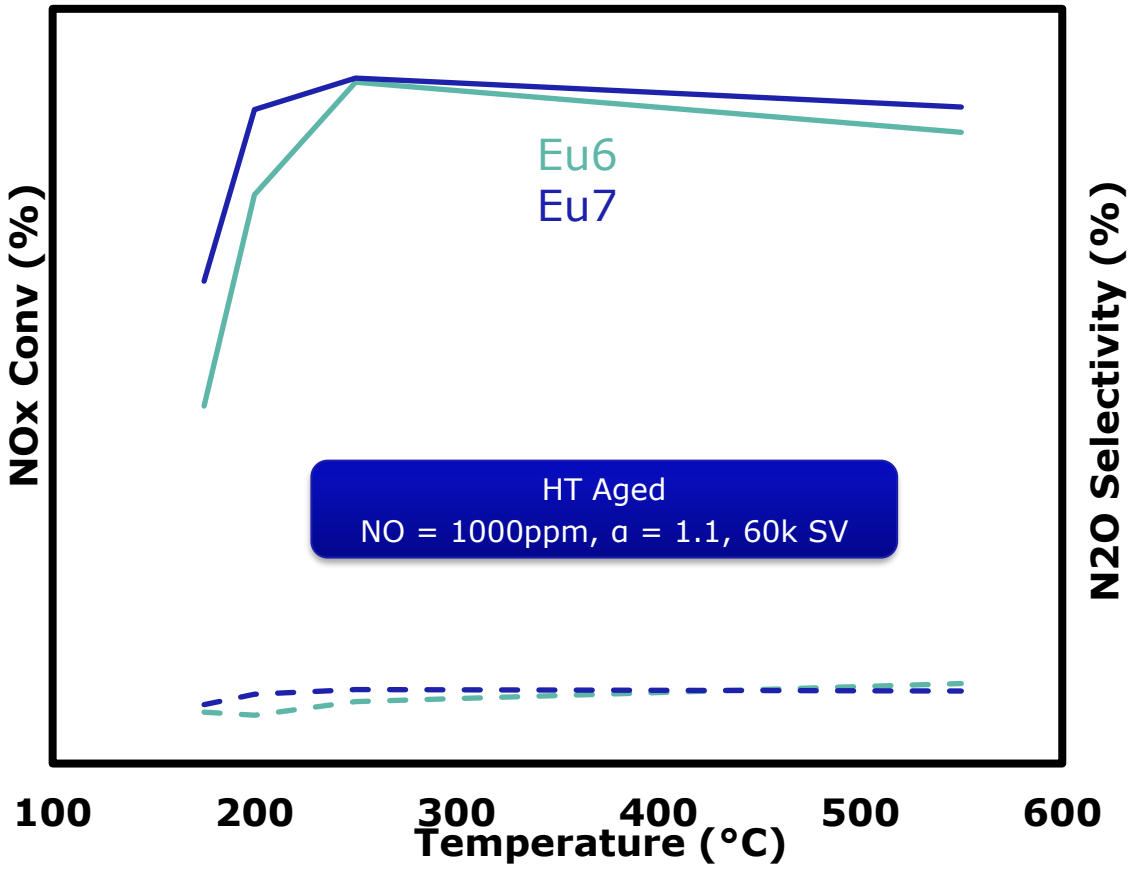
All the existing SCR technologies have advantages and some limitation

Catalyst Technology	NOx Conv	NO_2 Dependence	N_2O Selectivity	Sulfation	HC exposure tolerance	Exotherm
CuSCR *Low N2O CuSCR*				Need DeSOx		
VSCR						
FeSCR						

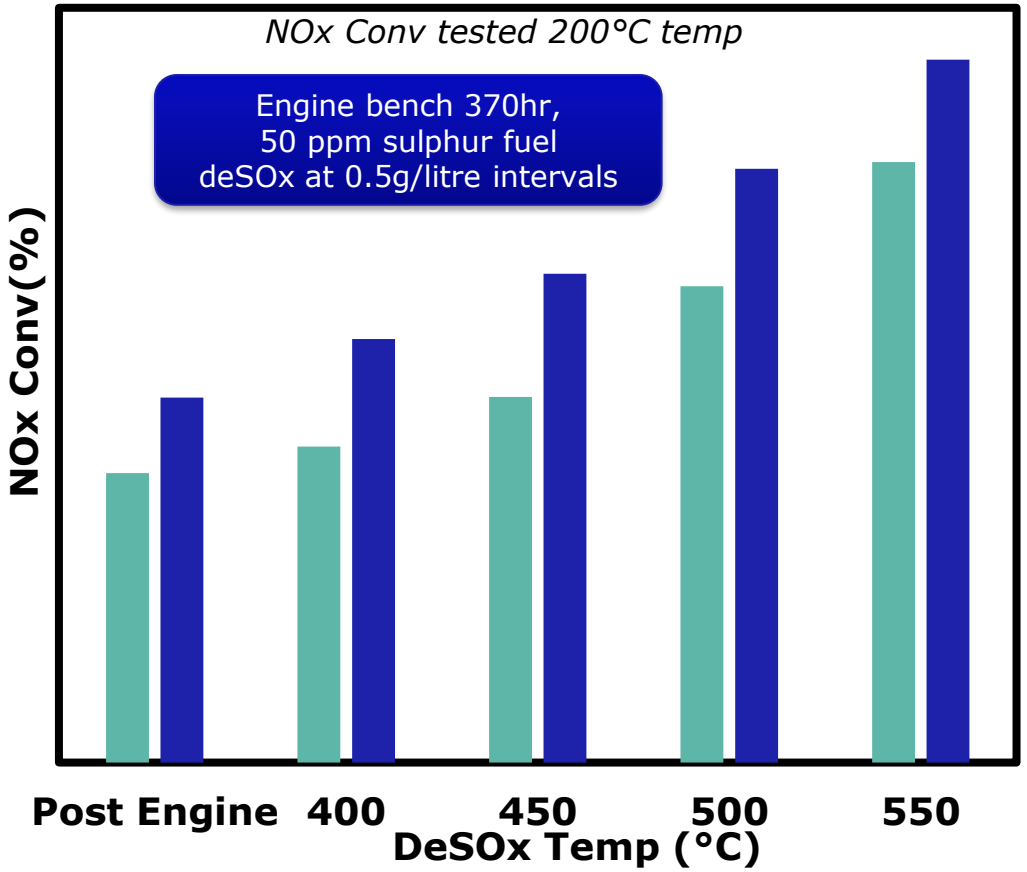
No part of this presentation can be shared with any other party without written consent of Johnson Matthey (© Johnson Matthey 2026).

Eu7 CuSCR show better low temp activity

Improved low temp NOx performance

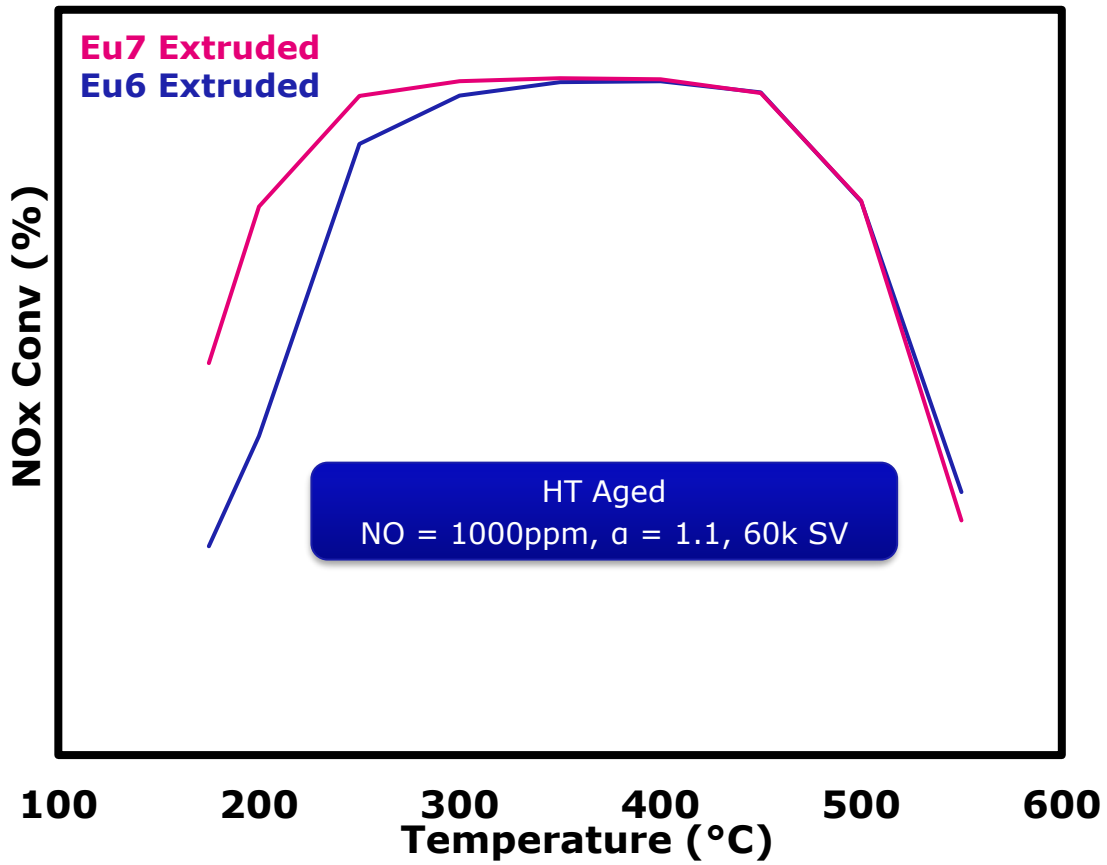


Eu7 SCR shows lower sulfation effect and good recovery compared with Eu6 SCR



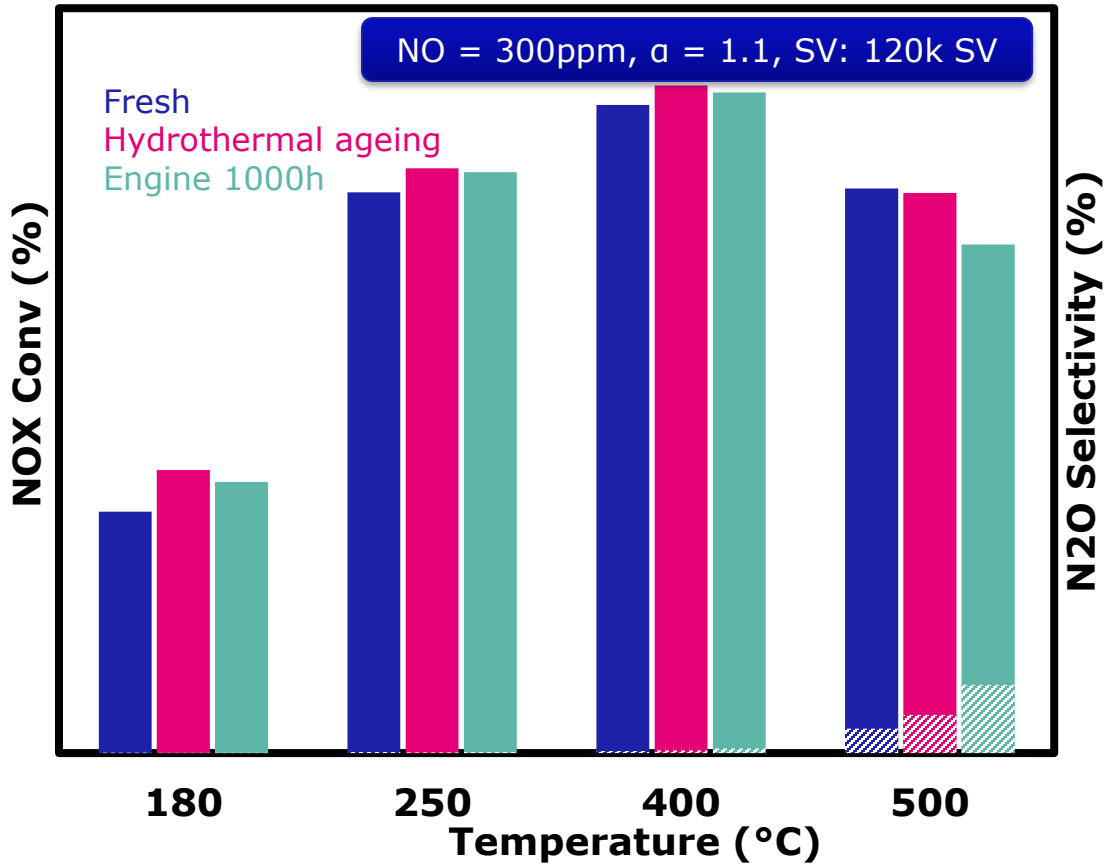
No part of this presentation can be shared with any other party without written consent of Johnson Matthey (© Johnson Matthey 2026).

Eu7/BVII Extruded VSCR has better low temperature performance compared to Eu6/BV VI and excellent stability



Very Good low temp activity, while maintain high temp activity

Eu7 extruded



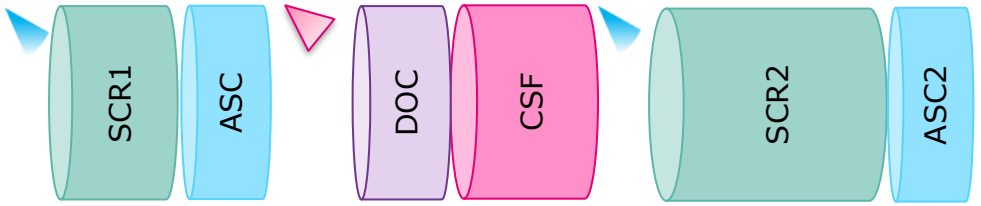
Very good stability at 580°C, only small impact on N_2O

No part of this presentation can be shared with any other party without written consent of Johnson Matthey (© Johnson Matthey 2026).

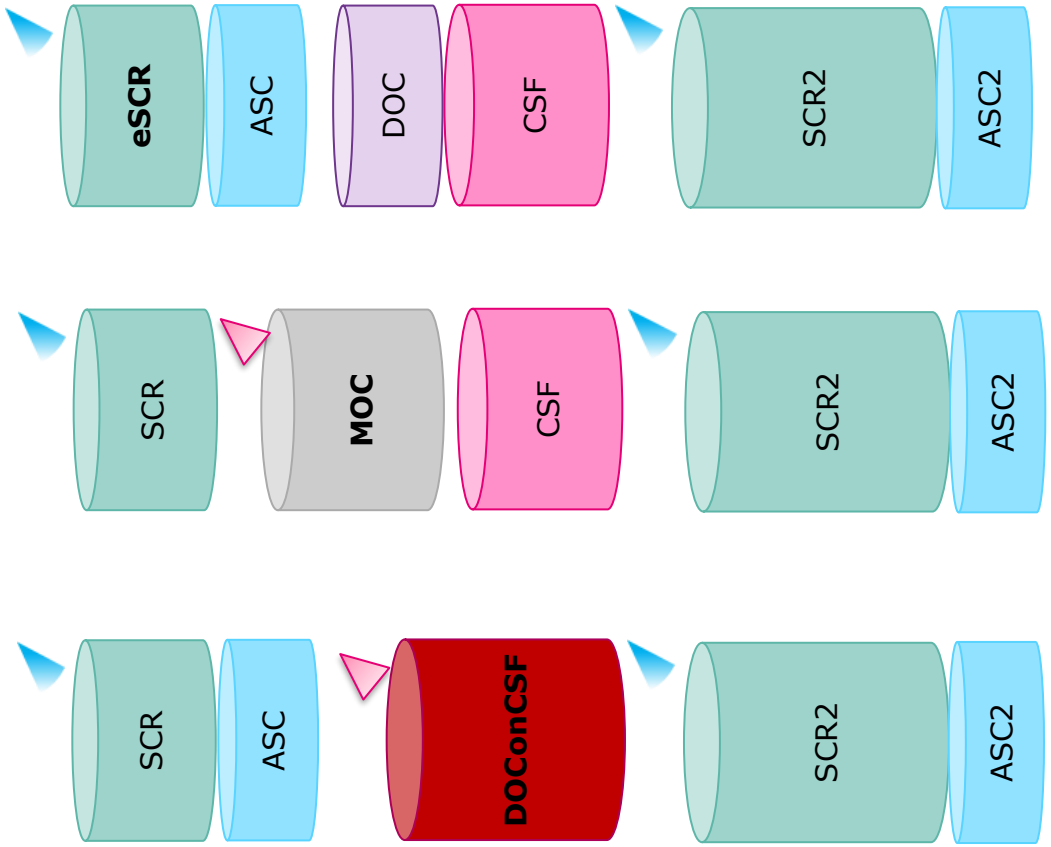
Aftertreatment Innovations for Euro 7/ BS VII and Beyond

Multifunction catalysts for improved performance and compactness

BASELINE EU7



System innovation BEYOND EU7 / BS VII



Ongoing Catalyst Development Focus

PGM $ saving

System optimisation

Improve SCR NOx LO & N_2O

From Compliance to Clean Air: key takeaways

- **Emissions standards deliver meaningful benefits**
  Cleaner vehicles and fleet renewal have contributed to improved air quality

- **Electrification and emissions control both contribute to improvement**
  Stringent control of combustion-vehicle emissions remains important throughout the transition

- **Catalyst and system innovation enable further progress beyond EU 7 & BS VII**
  Improved low-temperature performance and multifunction catalyst concepts offer opportunities for cleaner, more compact aftertreatment

Our purpose

Metals that matter, for a healthier world