

Stage V and beyond

Marinized Euro VI DAF Paccar engines for IWW Stage V

P. van der Heijden

Euro VI DAF – Paccar engines for IWW Stage V

DANUBE Transnational Programme | Know-How transfer event – Sept 29 2020

Content

- Emission Legislation – Equivalency – Argumentation
- Development process towards IWW Stage V
- Benefits Euro 6 DAF Paccar engine platform



STAGE V EMISSION STANDARDS

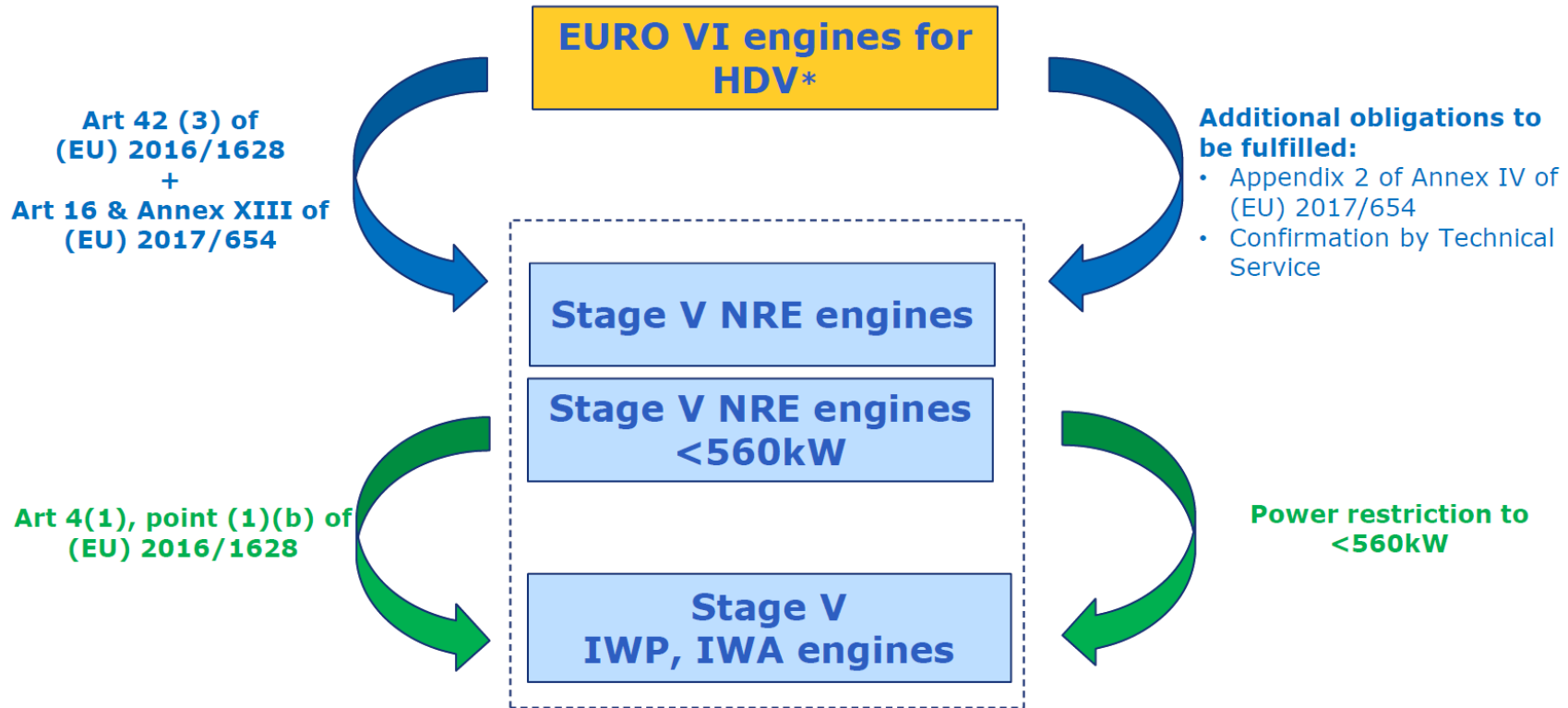
EU emission standards for heavy-duty CI (diesel) and PI engines: Transient testing

Stage	Date	Test	CO	NMHC	CH ₄ ^a	NOx	PM ^b	PN
			g/kWh					
Euro III	1999.10 <i>EEV only</i>	ETC	3.0	0.40	0.65	2.0	0.02	
	2000.10		5.45	0.78	1.6	5.0	0.16 ^c	
Euro IV	2005.10		4.0	0.55	1.1	3.5	0.03	
Euro V	2008.10		4.0	0.55	1.1	2.0	0.03	
Euro VI	2013.01	WHTC	4.0	0.16 ^d	0.5	0.46	0.01	6.0×10 ^{11e}

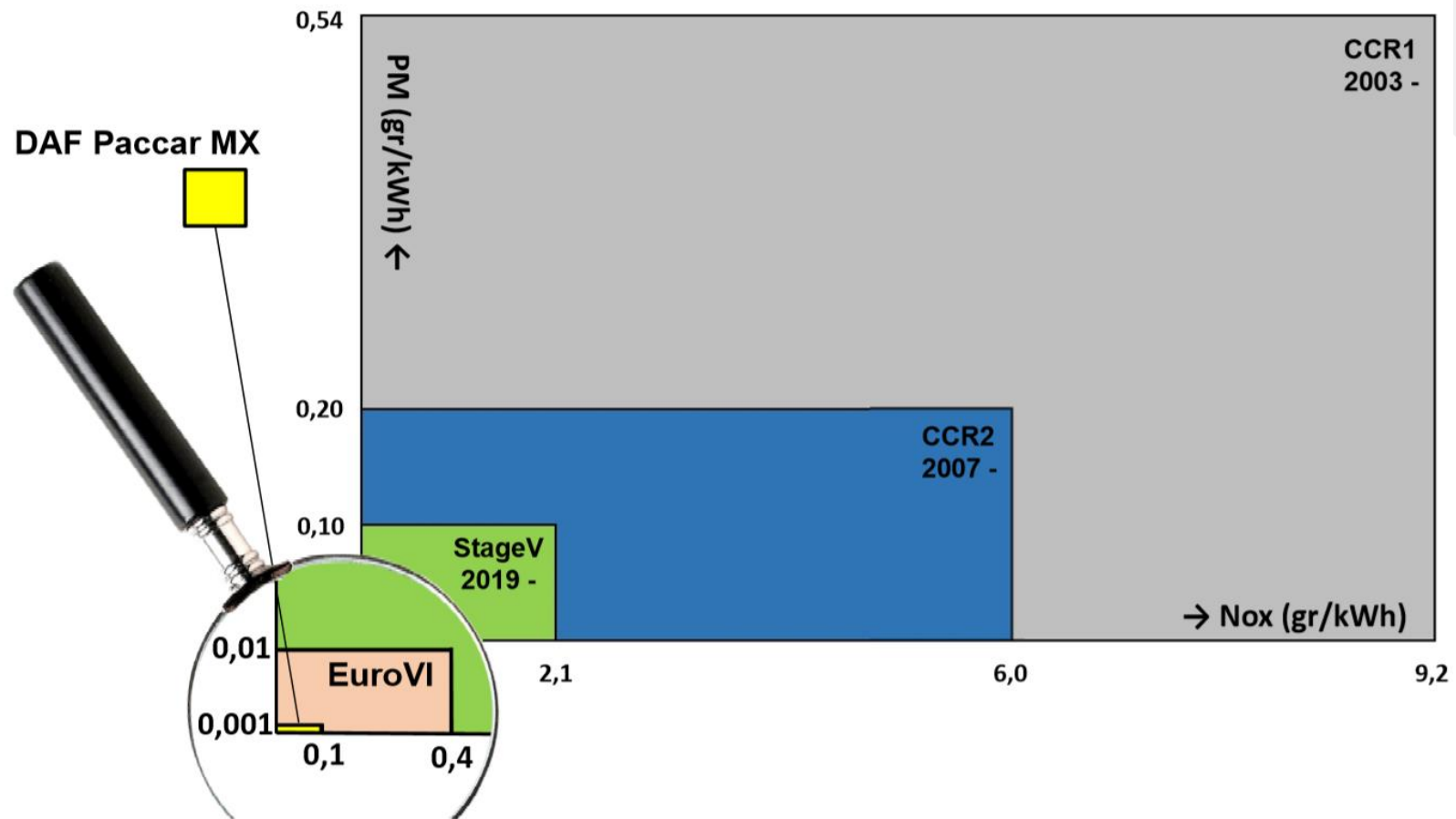
^a for gas engines only (Euro III-V: NG only; Euro VI: NG + LPG)
^b not applicable for gas fueled engines at the Euro III-IV stages
^c PM = 0.21 g/kWh for engines < 0.75 dm³ swept volume per cylinder and a rated power speed > 3000 min⁻¹
^d THC for diesel (CI) engines
^e PN limit for PI engines applies for Euro VI-B and later [4374]

Category	Net Power	Date	CO	HC ^a	NOx	PM	PN
	kW		g/kWh				1/kWh
IWP/IWA-v/c-1	19 ≤ P < 75	2019	5.00		4.70 ^b	0.30	-
IWP/IWA-v/c-2	75 ≤ P < 130	2019	5.00		5.40 ^b	0.14	-
IWP/IWA-v/c-3	130 ≤ P < 300	2019	3.50	1.00	2.10	0.10	-
IWP/IWA-v/c-4	P ≥ 300	2020	3.50	0.19	1.80	0.015	1×10 ¹²

Use of Euro VI engines for IWT vessels

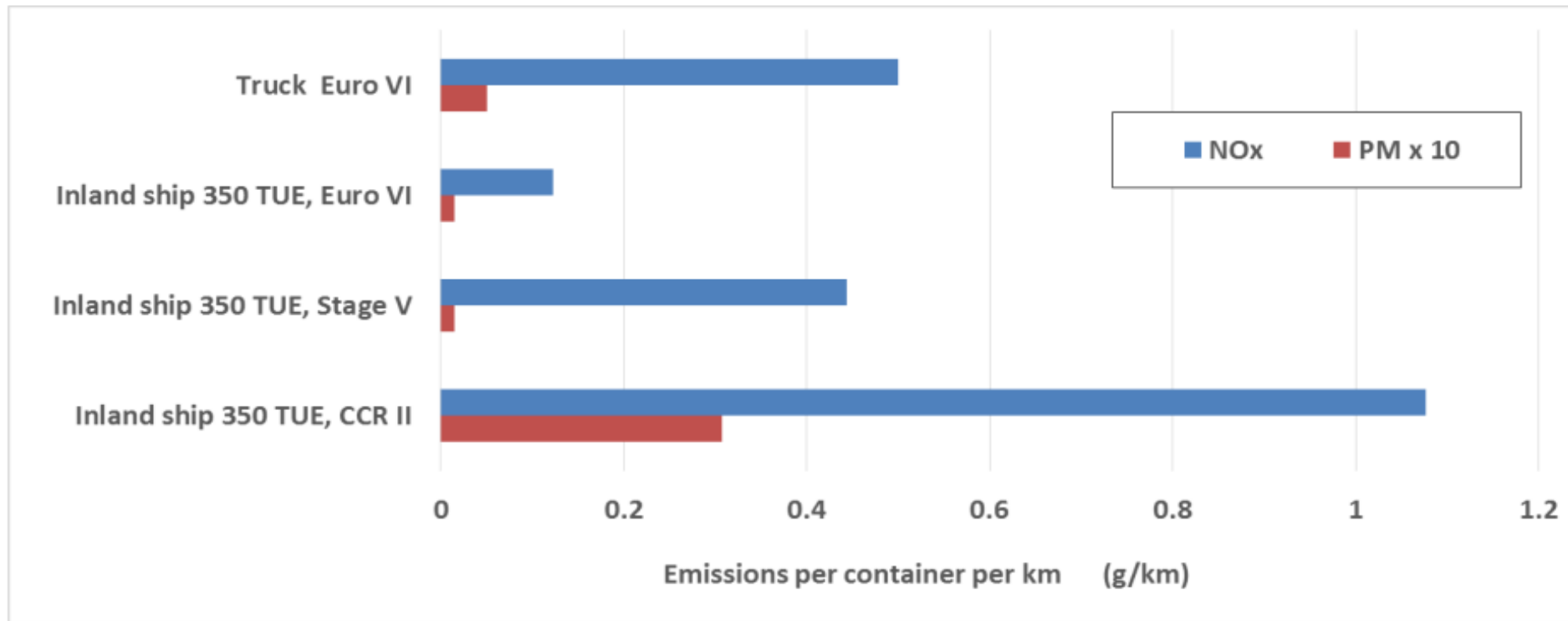


NOx – PM | Euro VI – Stage V – CCR1 – CCR2



Comparison Modalities

Emissions per container per km



Why the Equivalence route Euro VI to IWW stage V ?

Advantages: **No** additional development efforts on:

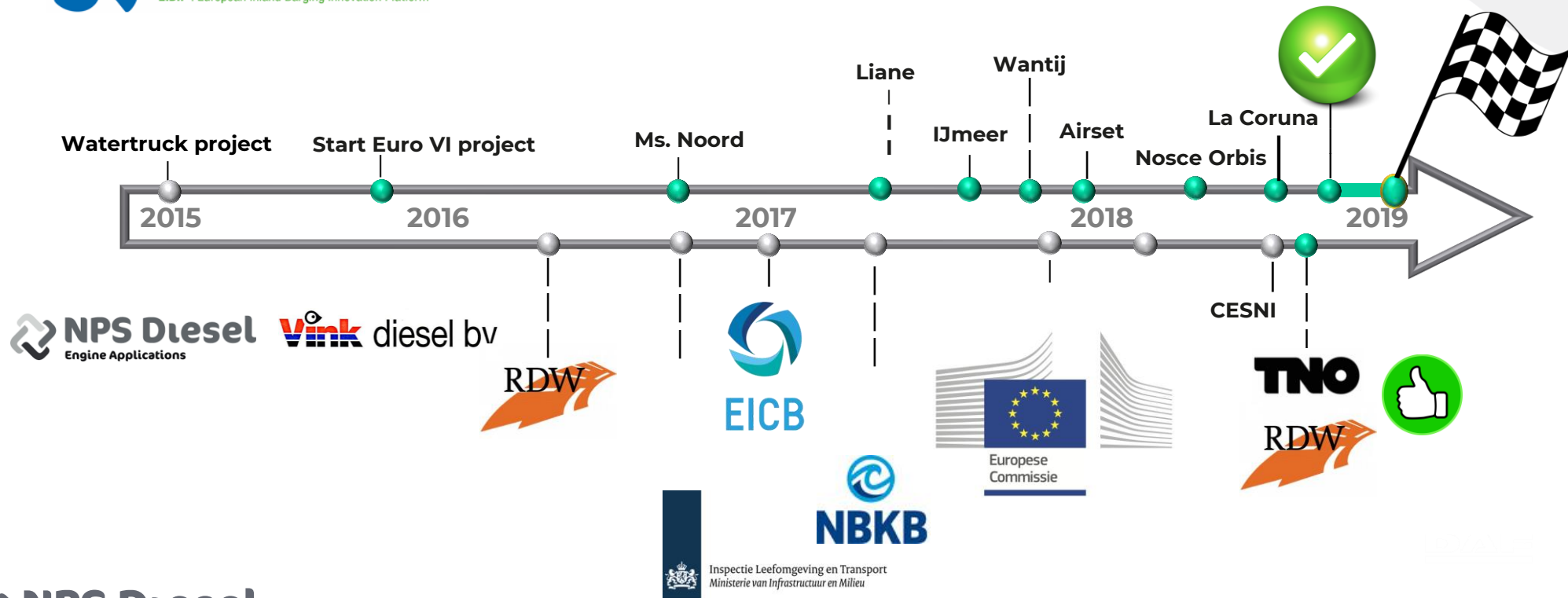
- In Use Compliance (IUC)
- Emission durability testing
- NOx and Pm control diagnostics
- Conformity of production (COP) - ISO9001 quality system

Additional benefit: Mass produced engine: low cost / high reliability

The road towards IWW Stage V



Stage V IWW



Engine

Manufacturer	Manufacturer's designation	Approval No	Owner of the type approval	Date of approval	Phase / Test standard	State	Competent authorities	Technical services	Installation permitted	Use permitted	If approval withdrawn, date of withdrawal
DAF / PACCAR	MX-11 240 H1	e4*595/2009*627/2014C*0020*04 REV 02	DAF Trucks NV	17/01/2020	Stage V - Marinised Euro VI	NL	RDW	TNO Powertrains Test Centre	✓	✓	
DAF / PACCAR	MX-11 / H2	e4*595/2009*2016/1718C*0075*03	DAF Trucks NV	06/07/2020	Stage V - Marinised Euro VI	NL	RDW	TNO Powertrains Test Centre	✓	✓	
DAF / PACCAR	MX-11 / H3	e4*595/2009*2018/932D*0106*01	DAF Trucks NV	06/07/2020	Stage V - Marinised Euro VI	NL	RDW	TNO Powertrains Test Centre	✓	✓	
DAF / PACCAR	MX-13 / H2	e4*595/2009*2017/1347C*0077*02	DAF Trucks NV	06/07/2020	Stage V - Marinised Euro VI	NL	RDW	TNO Powertrains Test Centre	✓	✓	
DAF / PACCAR	MX-13 / H3	e4*595/2009*2018/932D*0108*01	DAF Trucks NV	06/07/2020	Stage V - Marinised Euro VI	NL	RDW	TNO Powertrains Test Centre	✓	✓	

Last updated: 24.07.2020

Features IWW Stage V DAF Paccar engine platform

DAF- Paccar Euro VI engines

known for



Low environmental impact



Low fuel consumption



Low operational costs



High Return on Investment



High availability

PACCAR MX-11 & MX-13 ENGINES

MX-11
10.8 litre
200 – 330 kW

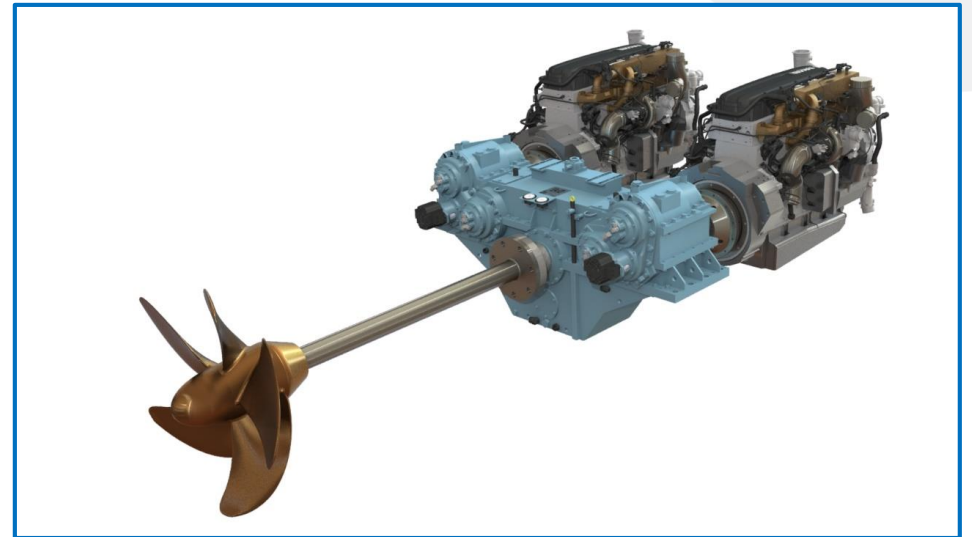
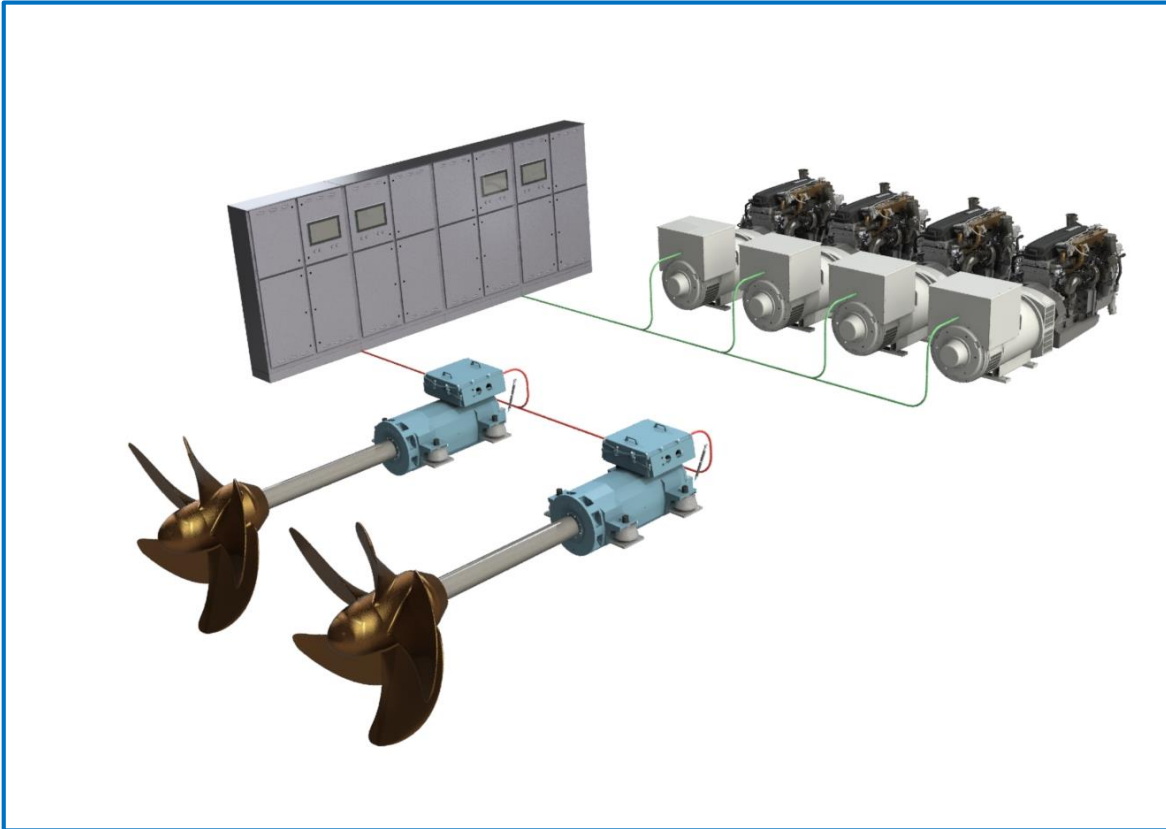
MX-13
12.9 litre
315 – 390 kW



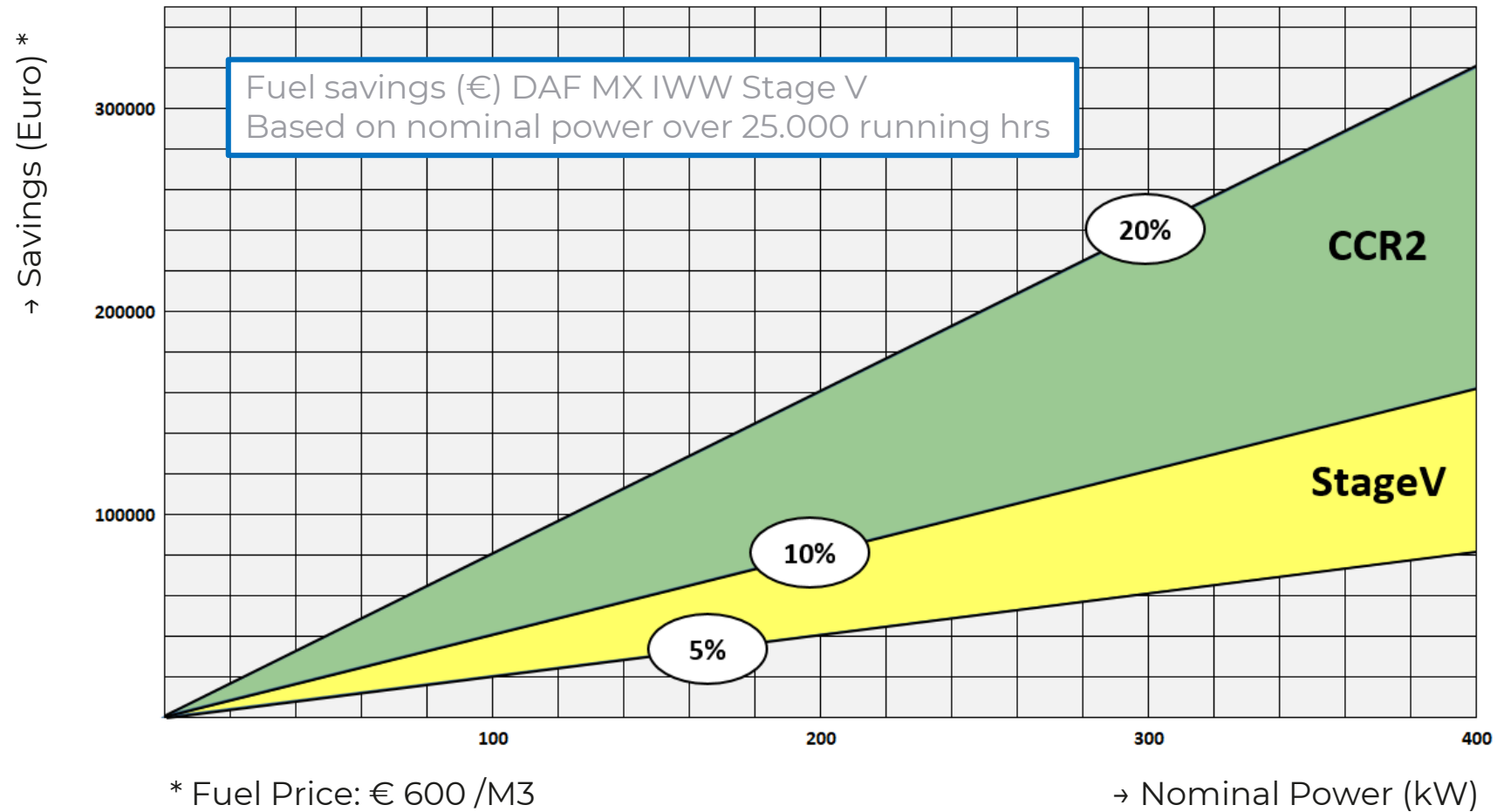
Certified for sustainable fuels

- B30
- HVO, GTL

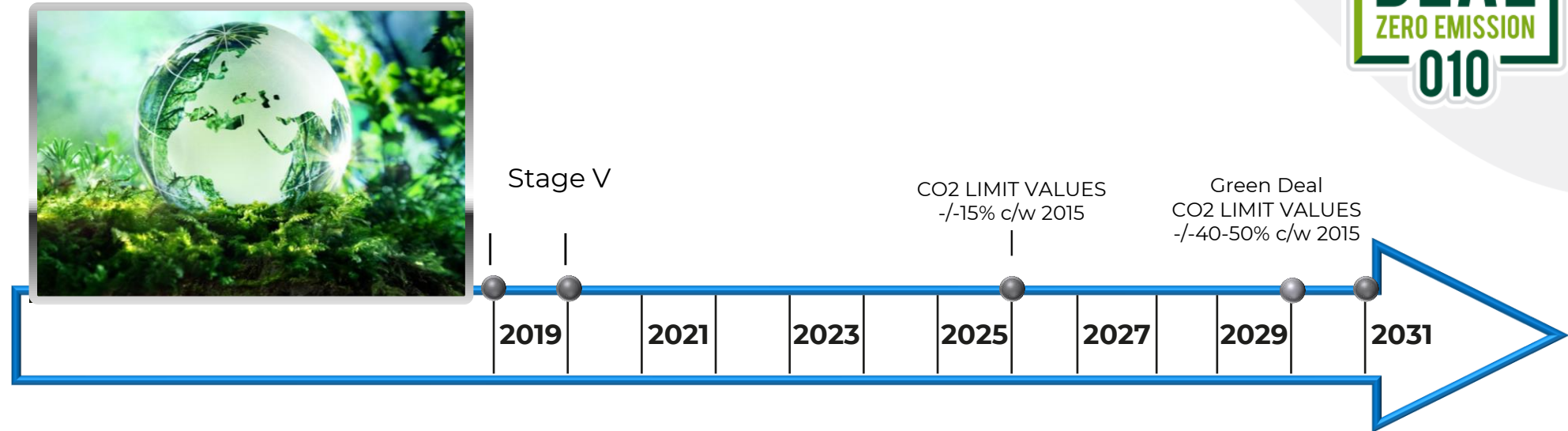
Examples modular set up



DAF Paccar engine IWW Stage V | Fuel savings



Global Warming | CO2 reduction path



- MX engine fuel savings > 16% compared to CCR2
- CO2 reducing 90% by using HVO





Zulu 2020
Genset
2 x MX11 300 kW



July 2018
3.000 hrs

1 x MX11 – 390 kVA
2 x MX11 – 290 kW
2 x MX11 – 240 kW



1 x MX13-390 kW
Propulsion
November 2019
1.500 hrs



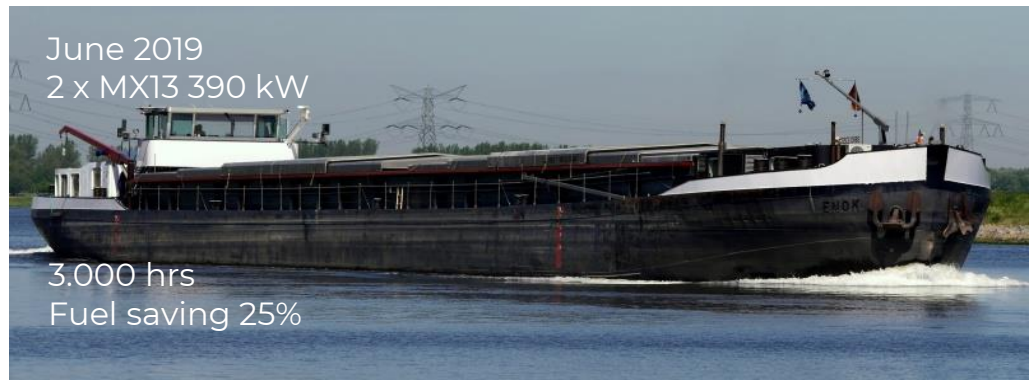
May 2018
2 x MX13 355 kW

6.500 hrs
Fuel saving 17%



April 2018
1 x MX11 300 kW

6.000 hrs
Fuel saving 12%



June 2019
2 x MX13 390 kW

3.000 hrs
Fuel saving 25%

DAF- Paccar IWW Stage V



Stage V +



Available technique



Low Fuel consumption



Low enviromental impact



High Return on Investment



Thank You !

Acknowledgement:  **Vink** diesel bv

Contact

De Hammen 1
5371 MK Ravenstein
The Netherlands

+31 (0)486 201 600
info@npsdiesel.com
www.npsdiesel.com