

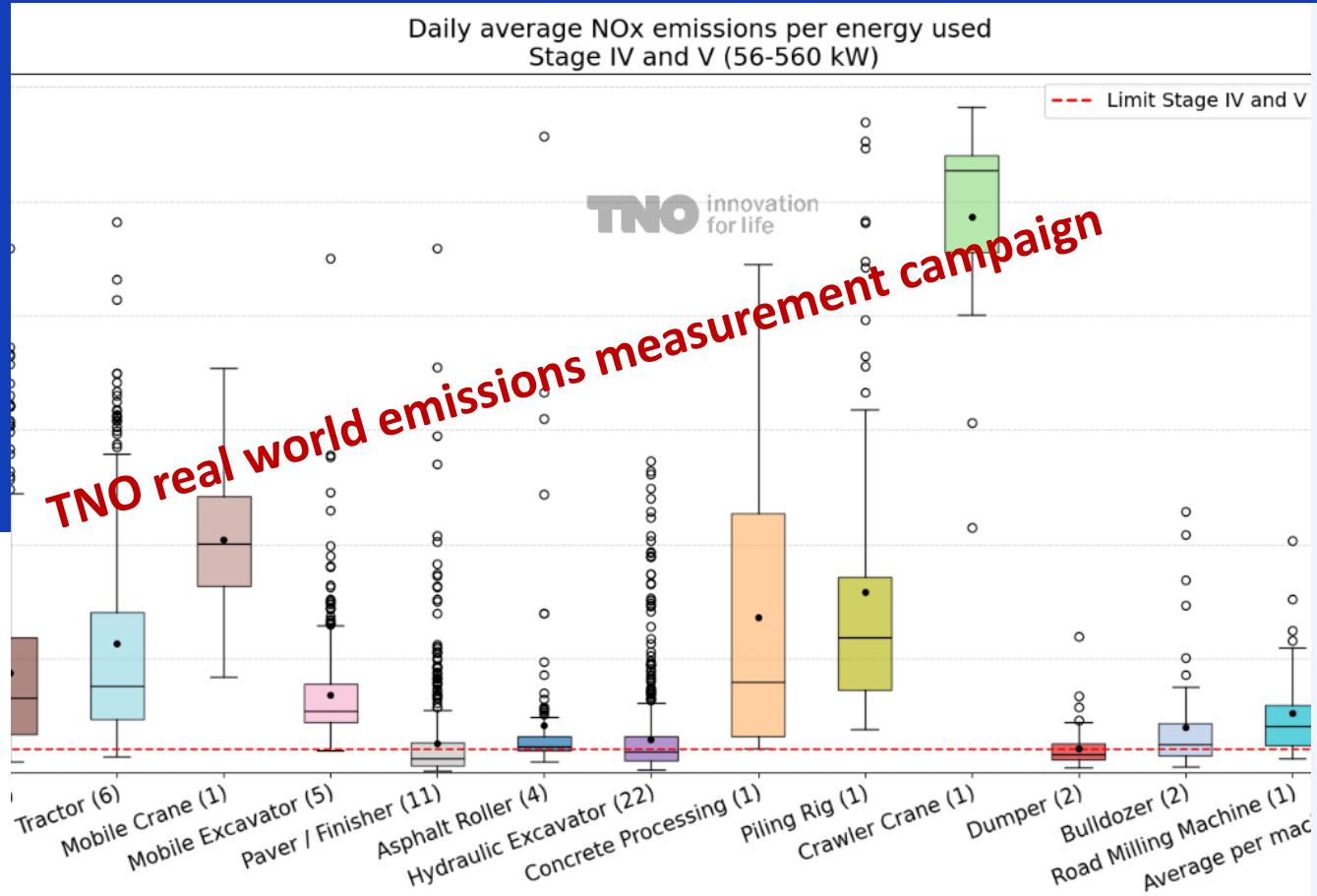
Urgency Stage VI

Cuelenaere, R.F.A. (Rob) | AECC event

29 October 2026



Agenda

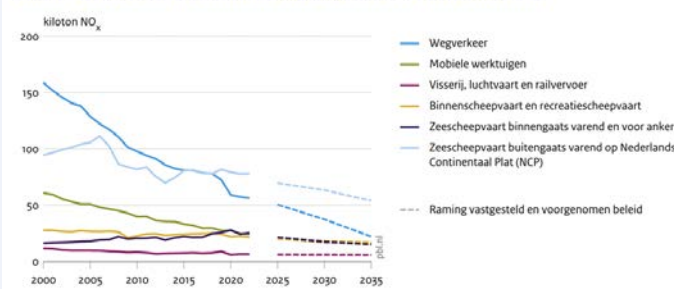


1. Total emissions NRMM
2. NRMM and Low emission zones
3. Power bin hopping
4. Real world emissions
5. Stage VI elements

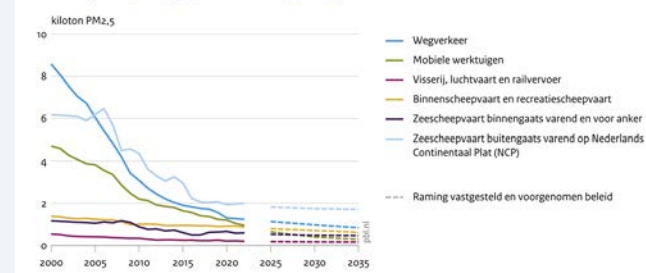
NOX and PM2.5 emissions

Mobile machinery ready to overtake road traffic

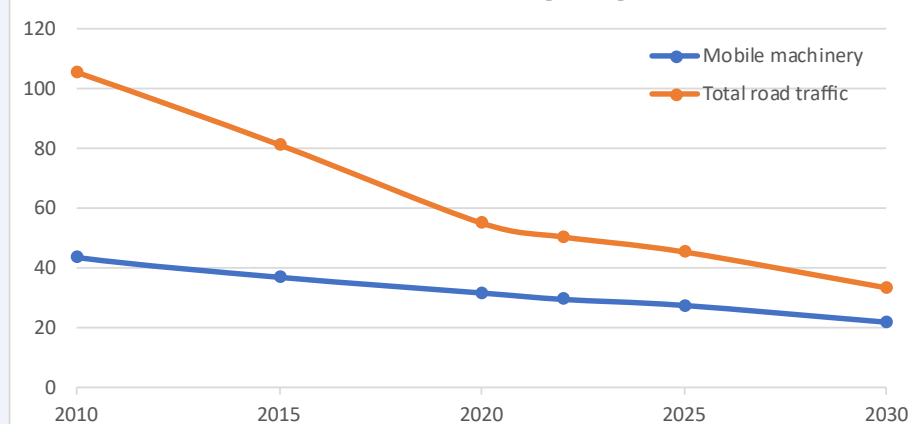
Emissie stikstofoxiden op Nederlands grondgebied door sector mobiliteit



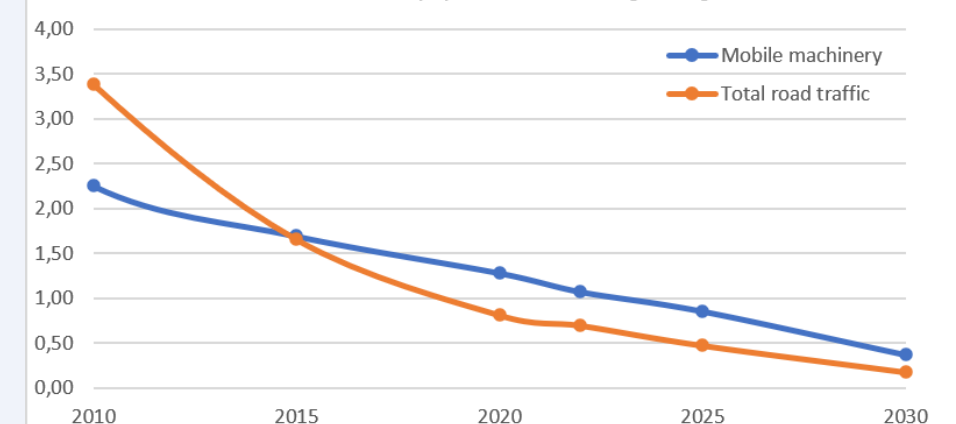
Figuur 4-5

Emissie fijnstof (PM_{2,5}) op Nederlands grondgebied door sector mobiliteit

NOx emissions [kton]



PM2.5 tailpipe emissions [kton]

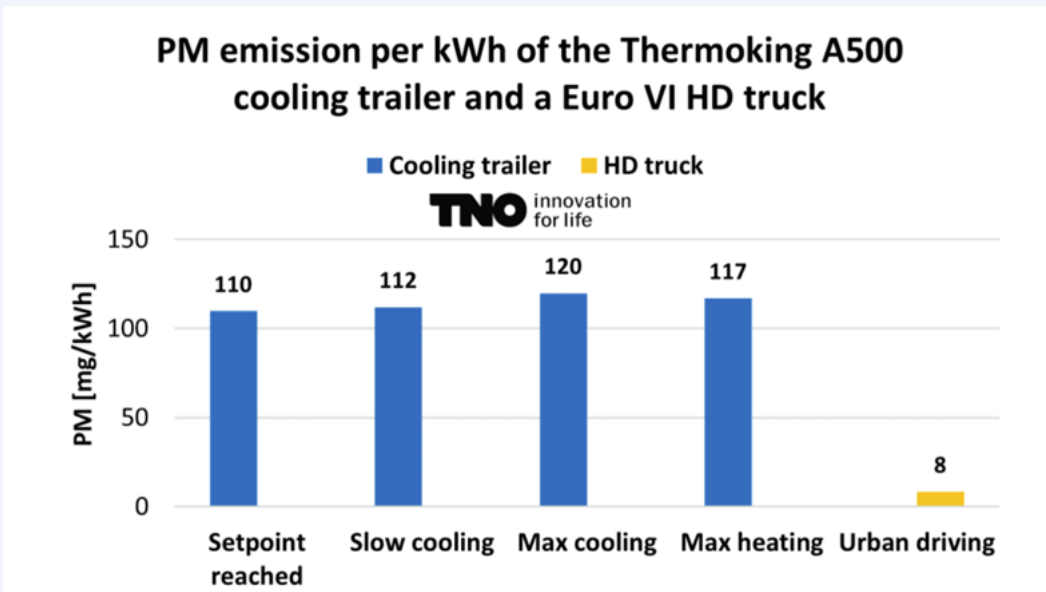


Road traffic used to dominate NOx and PM2.5 emissions of transport sector. NRMM is coming closer or overtook.

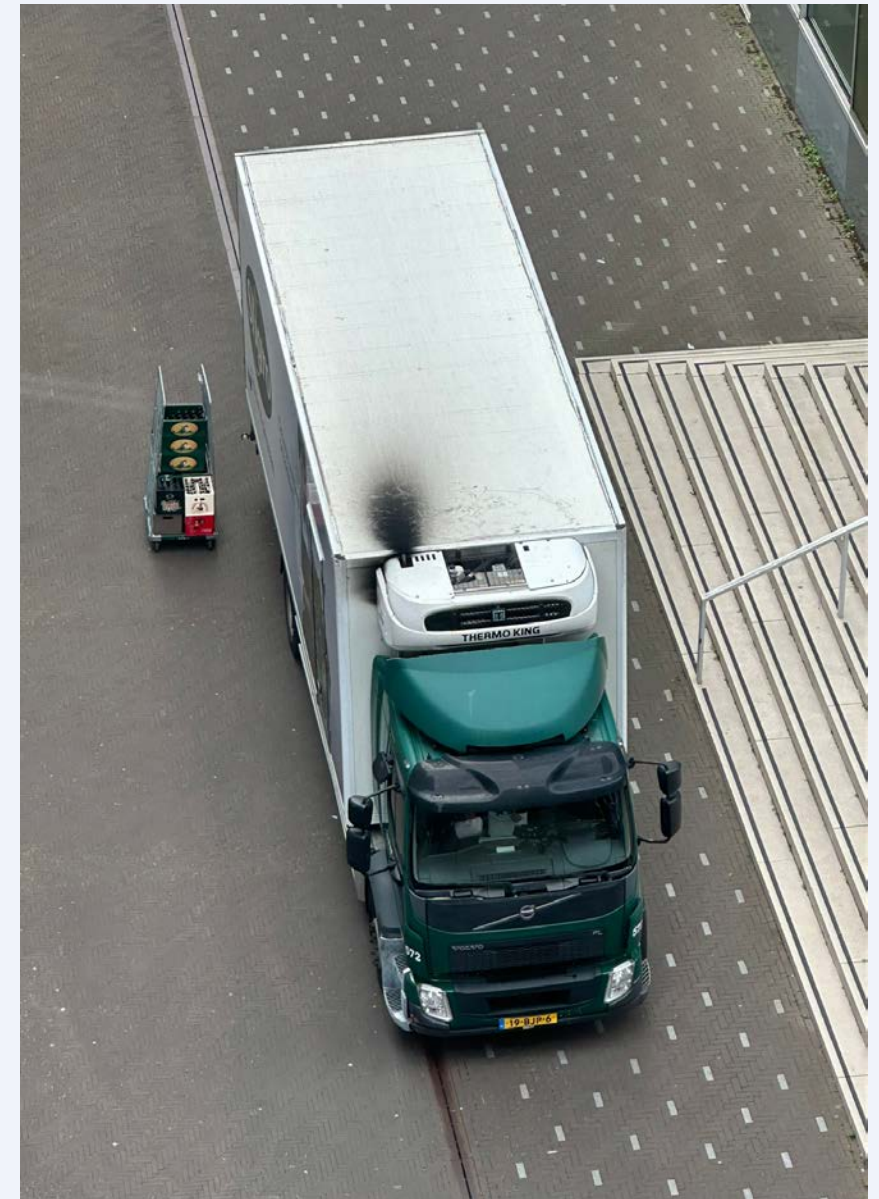
NRMM = 250.000 engines. Road traffic = 12.5 million vehicles.

Low emission zones

- Cities implement low and zero emission zones for road vehicles
- Mobile machinery and refrigerated cooling units not included!
- NL call for action at GRPE-89 (9June 2023):
“... cooling units <19kW have excessive PM and NOx emissions compared to new diesel trucks ...” <https://unece.org/sites/default/files/2023-05/GRPE-89-13e.pdf>

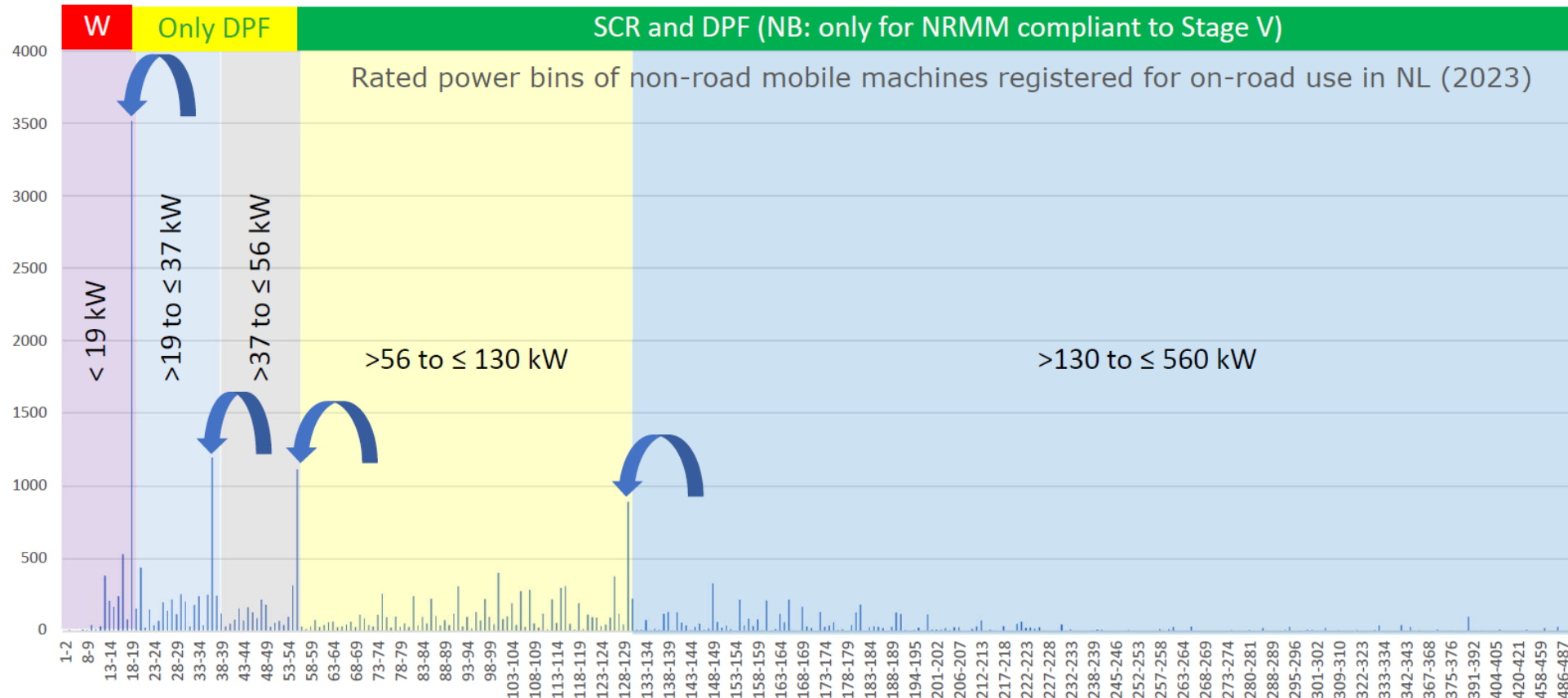


<https://publications.tno.nl/publication/34644858/clW3VvgS/TNO-2025-R11254.pdf>



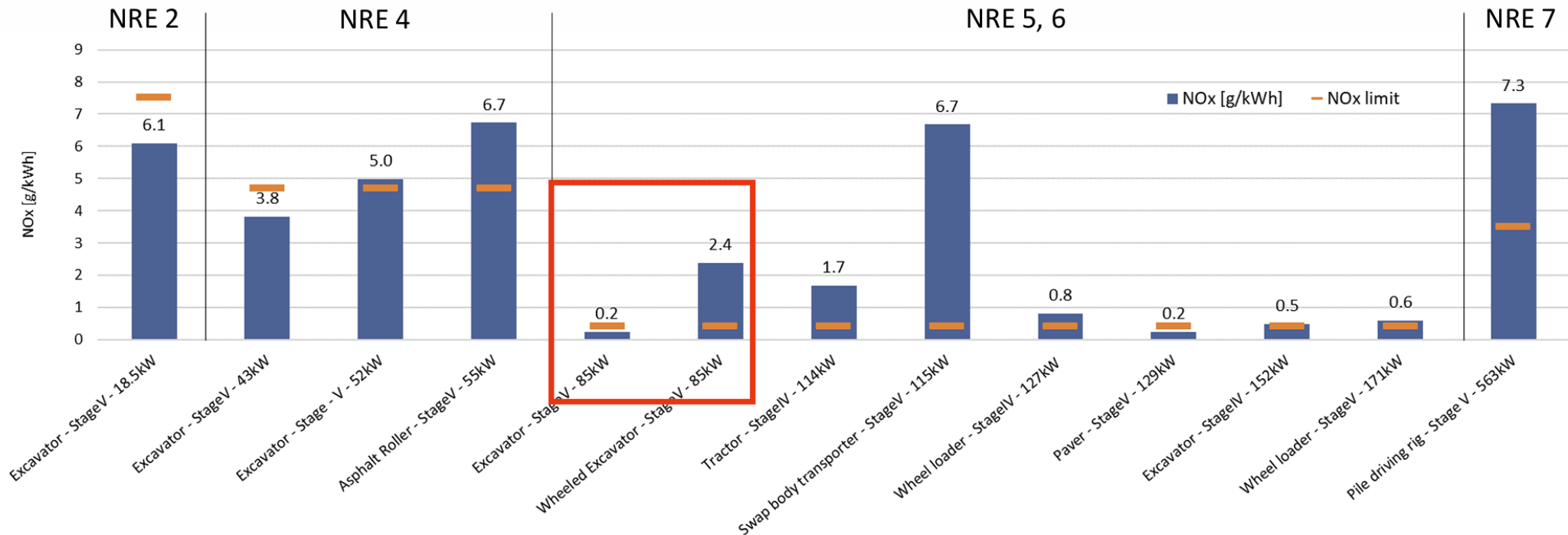
Power bin hopping

- Shift to less stringent power bins visible in registrations



An issue?

Real world emissions NRMM

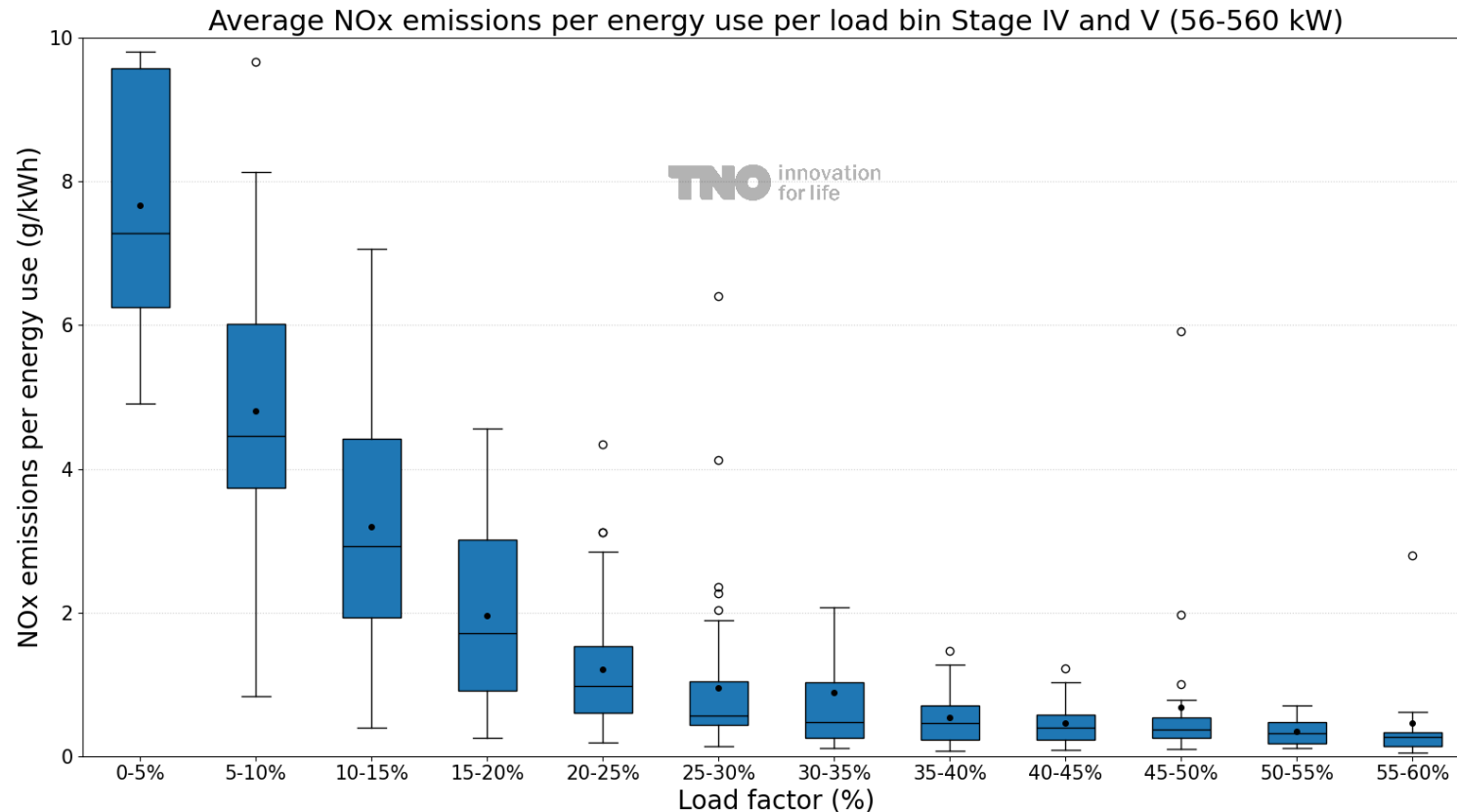


2 messages:

- ❑ Higher emissions outside 56 – 560 kW power range
- ❑ Real world emissions strongly depend on application

<https://www.aecc.eu/wp-content/uploads/2023/09/230803-TNO-AECC-Emissions-Stage-V-NRMM-TAPSE-2023.pdf>

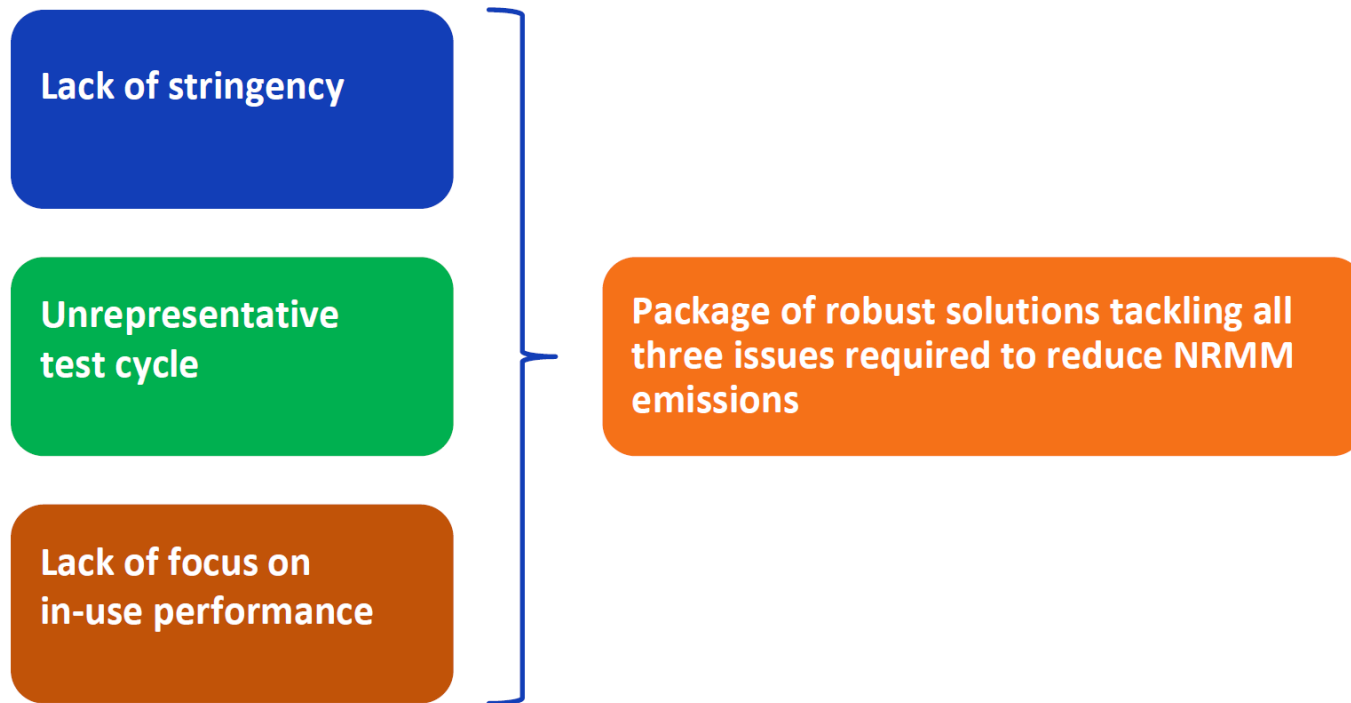
Real world emissions NRMM



“...Stage-IV and -V engines between 56 and 560 kW have SCR to lower NO_x-emissions. The real-world effectiveness of SCR strongly depends on exhaust temperature. This directly relates to engine load. Machines with high shares of low-load operation, such as cranes, frequently operate below the required temperature range. Emissions are therefore higher. Machines that operate more continuously at moderate loads, such as hydraulic excavators, rollers and pavers, show more stable and lower NO_x-emissions. ...”

<https://www.government.nl/documents/2026/05/19/research-into-the-required-improvements-for-future-nrmm-emission-standards>

Elements for Stage VI



“... current Stage V emission requirements leave substantial room for improvement. Improvements necessary to upgrade NRMM emission standards from Stage V towards a potential Stage VI include:

- 1. Removing differences in NO_x- and PM/PN limits between engine power classes, [... NH₃...];*
 - 2. Ensuring that low-load operating conditions are adequately covered in the test procedure;*
 - 3. Introducing in-use emission performance monitoring and checking, including anti-manipulation provisions*
- ...”*

<https://www.government.nl/documents/2026/05/19/research-into-the-required-improvements-for-future-nrmm-emission-standards>

Stage VI

AECC event

Thank you for your attention

29 October 2026 | Urgency Stage VI

