

UCC #3

Pollutant Emission Reduction

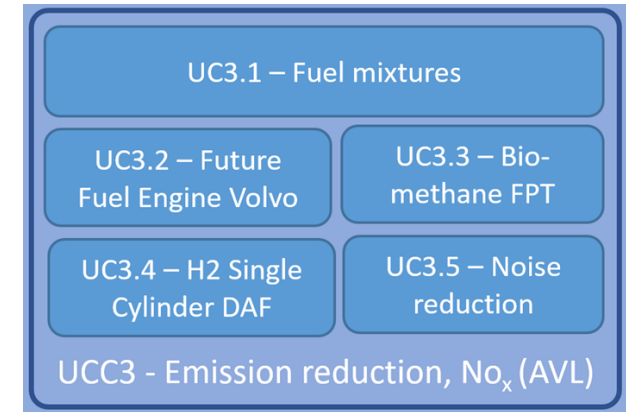
LONGRUN Advisory Board Meeting
21st of November 2022

Georg Kaufmann
AVL List GmbH



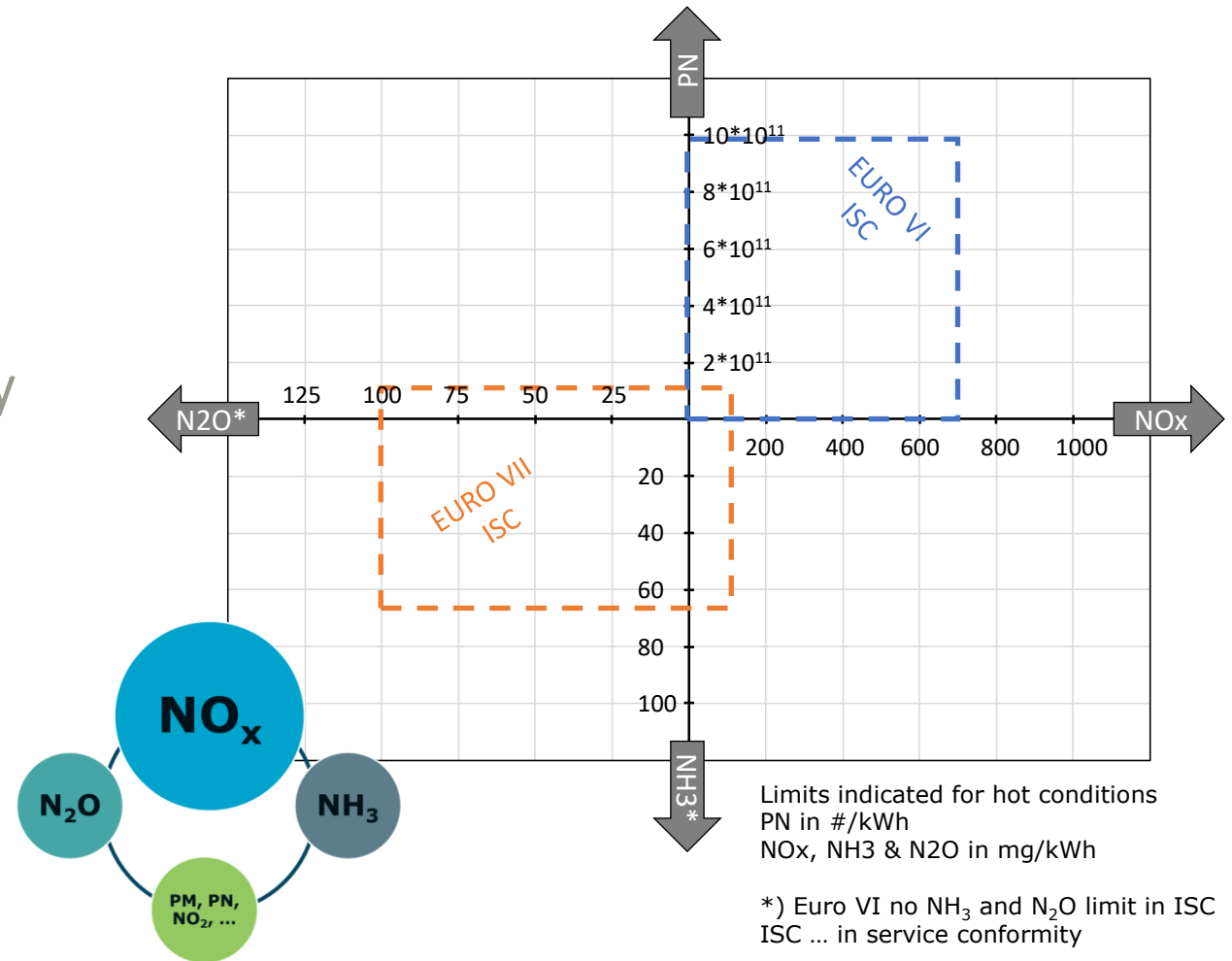
Overview of Use Cases

- UC3.1: Fuel mixtures (IFPEN, FEV, NESTE, SHELL)
Engine-out emission reduction supported by fuel mixtures
- UC3.2: VOLVO future fuel engine (VOLVO, AVL, UMIC, CHALM, MTC)
Tailpipe emissions with diesel/- blends & optimized aftertreatment
- UC3.3: FPT Bio-methane engine (FPT, AVL, IVECO, TOTAL)
Tailpipe emissions with bio-methane, new TWC & PF gaseous
- UC3.4: Single cylinder H2 engine (FEV, RWTH, DAF, IFPEN)
Engine-out NOx emission reduction with 1-cyl H₂ engine to <70% of EU VI level
- UC3.5: **Noise reduction** when driving in full electric mode (IDIADA, FORD, VDL)
Noise reduction when driving fully electric (evaluation to zero impact mobility in cities)



EURO VII Legislation

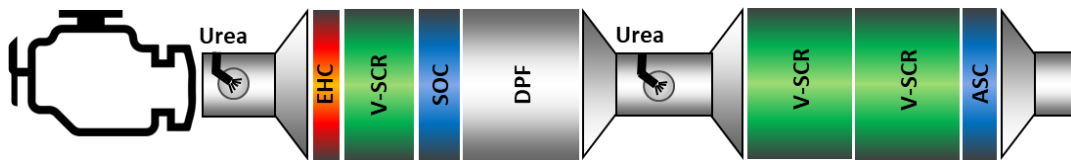
- Development targets for LONGRUN are EURO VII.
 - As first EURO VII limits have been proposed by CLOVE in early 2021, initially contracted LONGRUN emission targets were considerably lowered.
- EURO VII details were released on 09th of November 2022.
 - New pollutant limits introduced in RDE (N₂O, NH₃, PN₁₀).
 - Significant reduction of cold start emissions.



Aftertreatment System Solutions

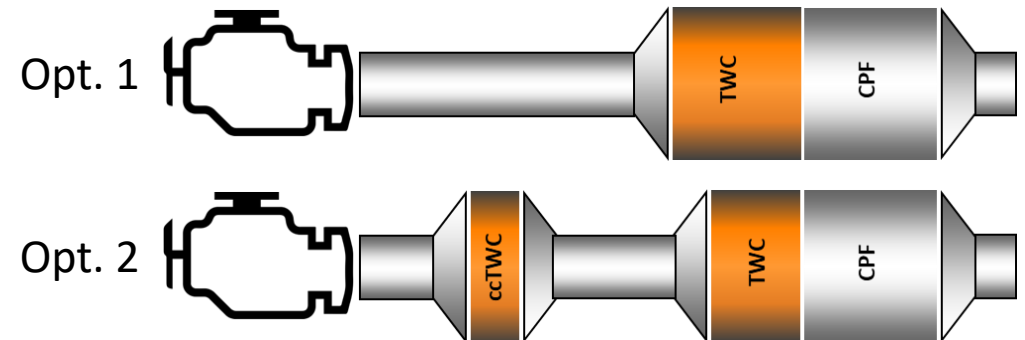
Diesel/HVO Engine (UC3.2)

- EATS layout was carried out by systematic pre-selection followed by detailed specification through simulation.
- Following layout shows highest emission reduction potential:
 - 2 SCR stages (2 urea injectors)
 - V-SCR technology (N2O)
 - Electrical heater for fastest catalyst heat-up
- Step-by-step system build-up and testing is ongoing at Volvo.



SI Gas Engine (UC3.3)

- Definition of system configurations by simulation.
- Two EATS options to be tested:
 - Option 1: standard EATS with TWC + CPF (reference system)
 - Option 2: advanced EATS extended by ccTWC → improvement of cold start performance.
- System testing is planned in Q2 2023.



Fleet Model Development

- A fleet model depicting the European HD Truck and Bus fleet is available at TU Graz.
- Pollutant emission reduction potential achieved in UCC #3 will be integrated into this fleet model.
- Impact of “LONGRUN technology” can be clearly highlighted.
 - Different phase-in scenarios, shares of fuel types etc. can be considered.
- Fleet model can also be expanded to include results of other UCCs (BTE improvement, hybridization, energy savings...).

Prediction of overall NOx Emissions from European Heavy-Duty Trucks & Buses

