AECC Demonstration Projects and AECC Position on Euro 7

AGVES meeting • 26 November 2020

AECC
ASSOCIATION FOR EMISSIONS CONTROL BY CATALYST

Association for Emissions Control by Catalyst (AECC AISBL)

AECC members : European Emissions Control companies

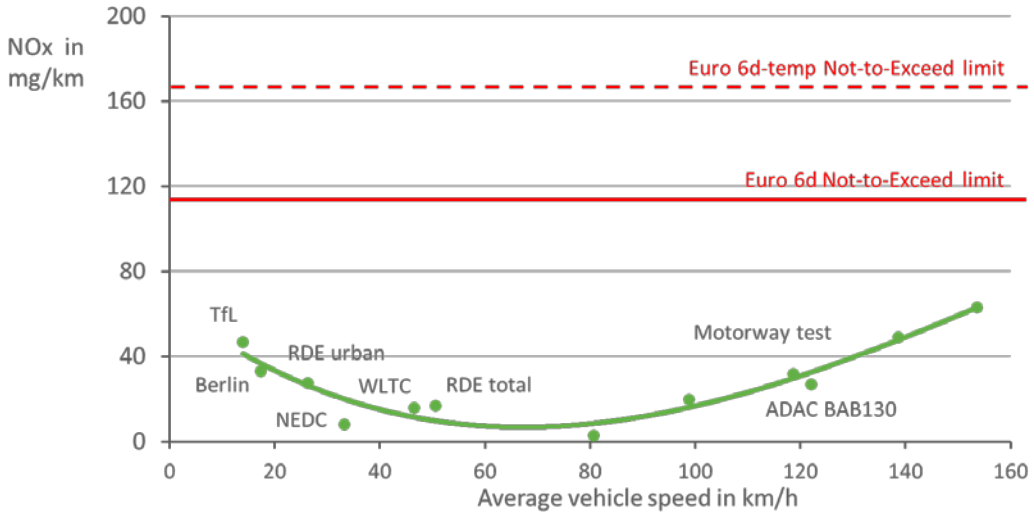
- Exhaust emissions control technologies for original equipment, retrofit and aftermarket for all new cars, commercial vehicles, motorcycles, and non-road mobile machinery
  - AECC is # 78711786419-61 in EU Transparency Register and has consultative status with the UN Economic and Social Council (ECOSOC)

Agenda

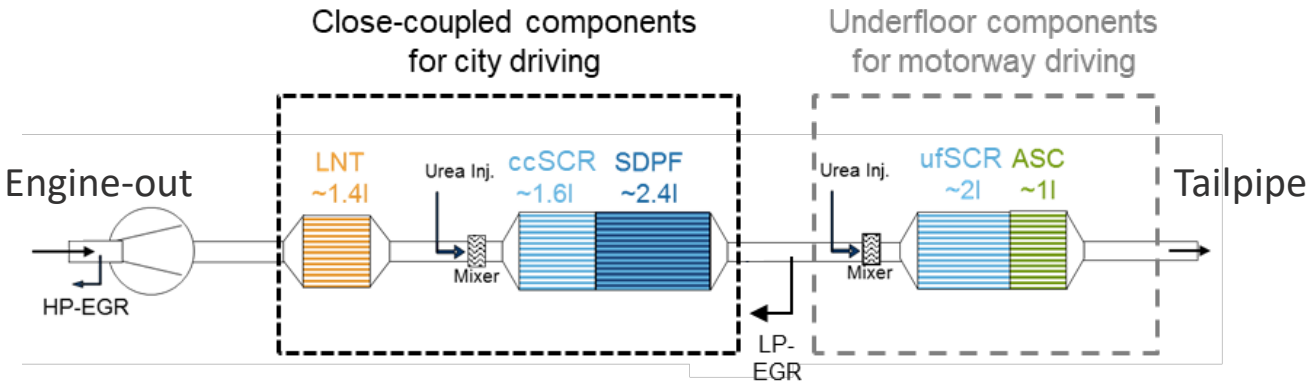
- AECC demonstration projects
  - Light-duty diesel
  - Light-duty gasoline
  - Heavy-duty diesel
- AECC position on Euro 7/VII
- Conclusion and outlook

Ultra-low NOx emissions diesel demonstrator

- Objective is to demonstrate ultra-low NOx emissions over wide range of driving conditions for various fuels



- Emission control system based on combination of available components: LNT + dual-SCR supported by 48V mild-hybrid

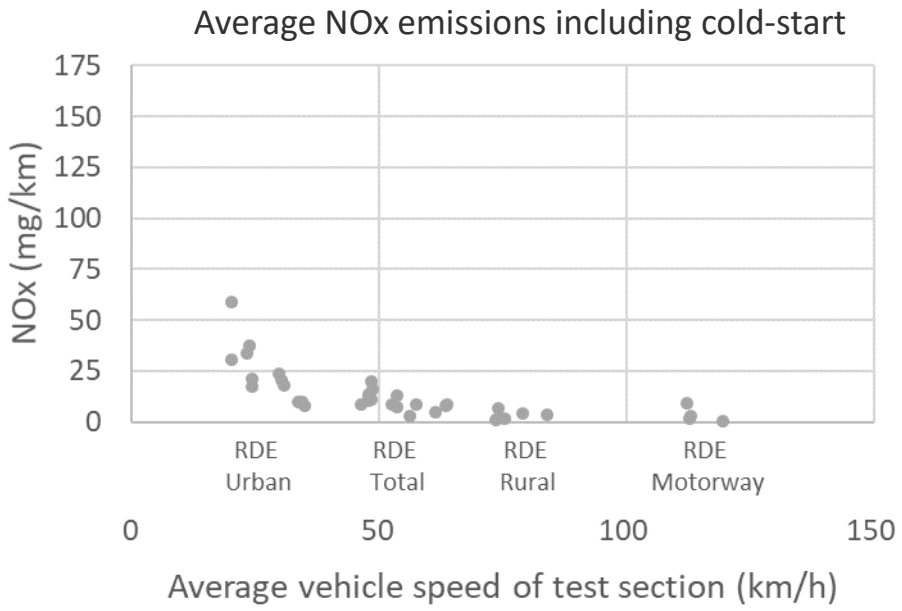


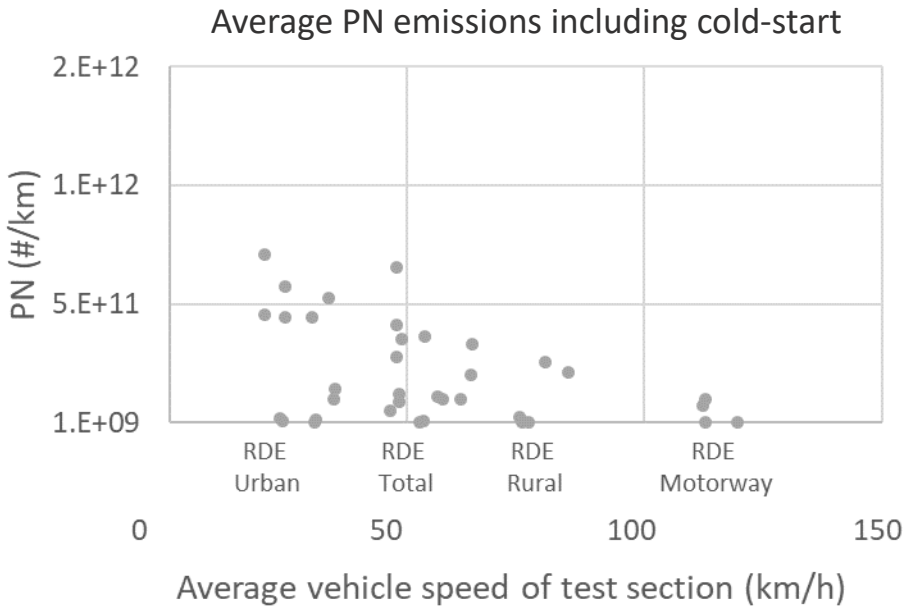
Note: hydrothermal aged components used

1) *J. Demuynck, et al.; "Integrated Diesel System Achieving Ultra-Low Urban and Motorway NOx Emissions on the Road", 40th Vienna Motor Symposium, 2019*
https://www.aecc.eu/wp-content/uploads/2019/04/190516-AECC-IAV-IPA-Integrated-Diesel-System-achieving-Ultra-Low-NOx-on-the-road-Vienna-Symposium.pdf
2) Joint MTZ publication with Bosch, Vitesco, FEV and IAV https://www.aecc.eu/wp-content/uploads/2020/09/200901-modern-diesel-MTZ.pdf
3) Videos of instantaneous conversion performance available at www.youtube.com/channel/UCbPS9op5ztLqrv6zlMH_IcQ

LD gasoline demonstrator background

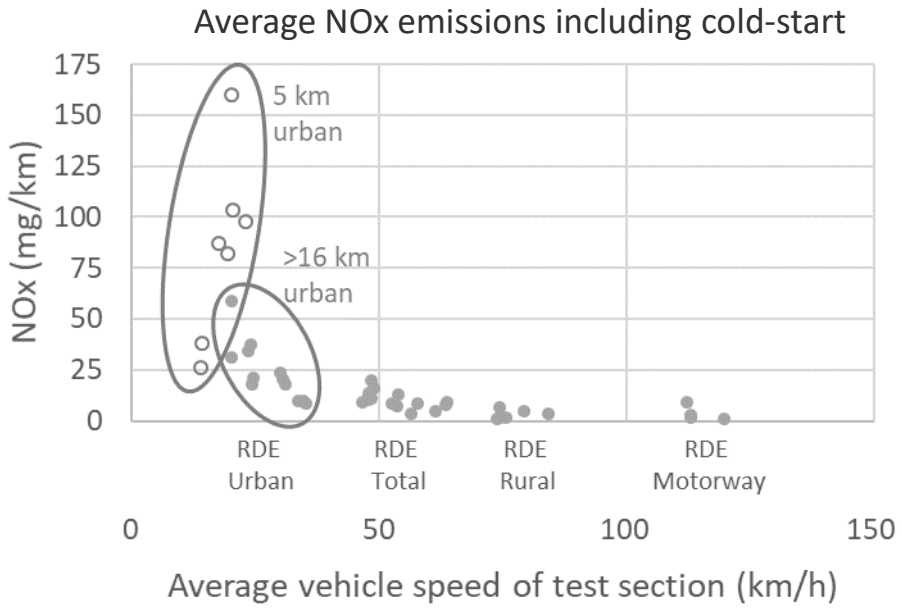
- Publicly available Euro 6d-TEMP PEMS data from global RDE database investigated
- Shows low pollutant emissions for moderate range of Euro 6 RDE boundary conditions (e.g. fresh system and ~20°C ambient temperature)

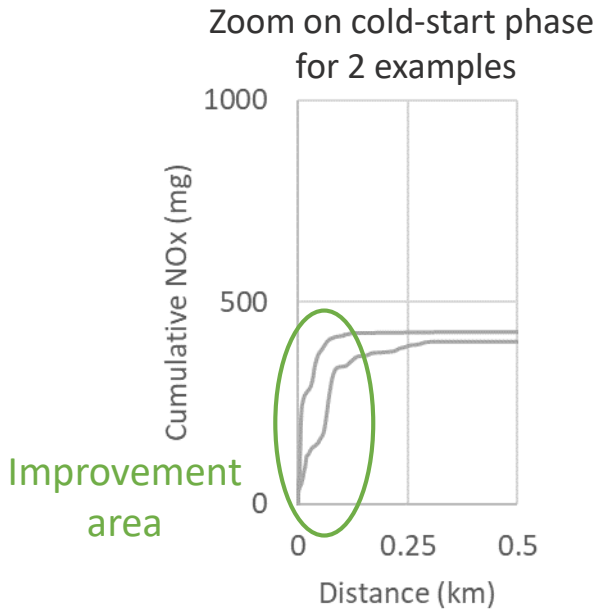




LD gasoline demonstrator objective

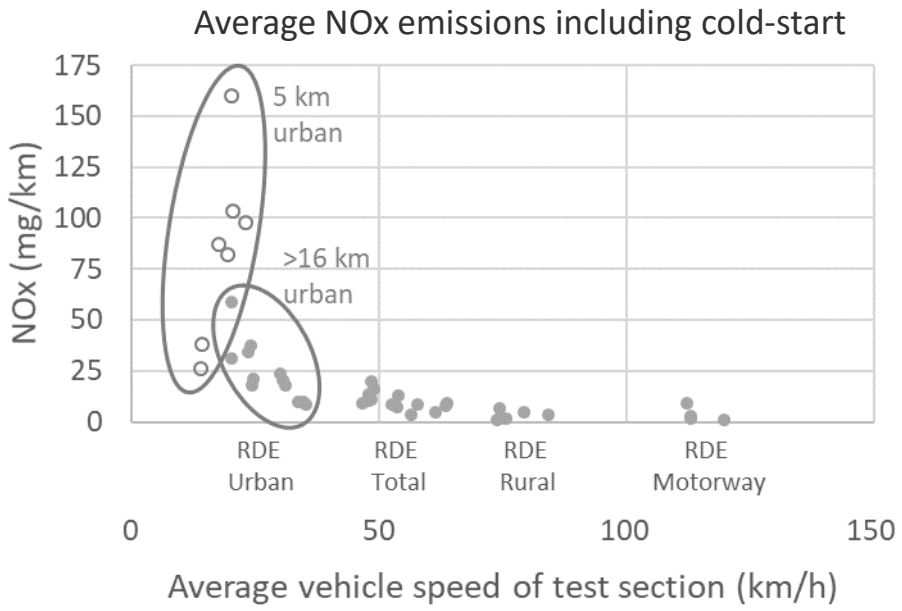
- Investigate reduction of pollutant emissions for areas of improvement
  - Focus on cold-start emissions
    - Impact depends on averaging distance, illustrated for NOx

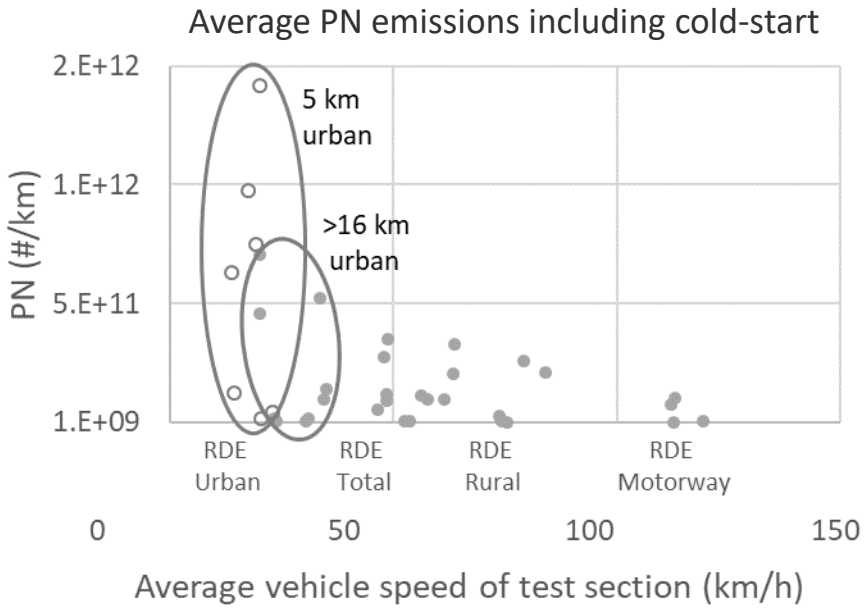




LD gasoline demonstrator objective

- Investigate reduction of pollutant emissions for areas of improvement
  - Focus on cold-start emissions
    - Impact depends on averaging distance, illustrated for NOx and PN
    - Variation of ambient temperature and driving dynamics will be explored



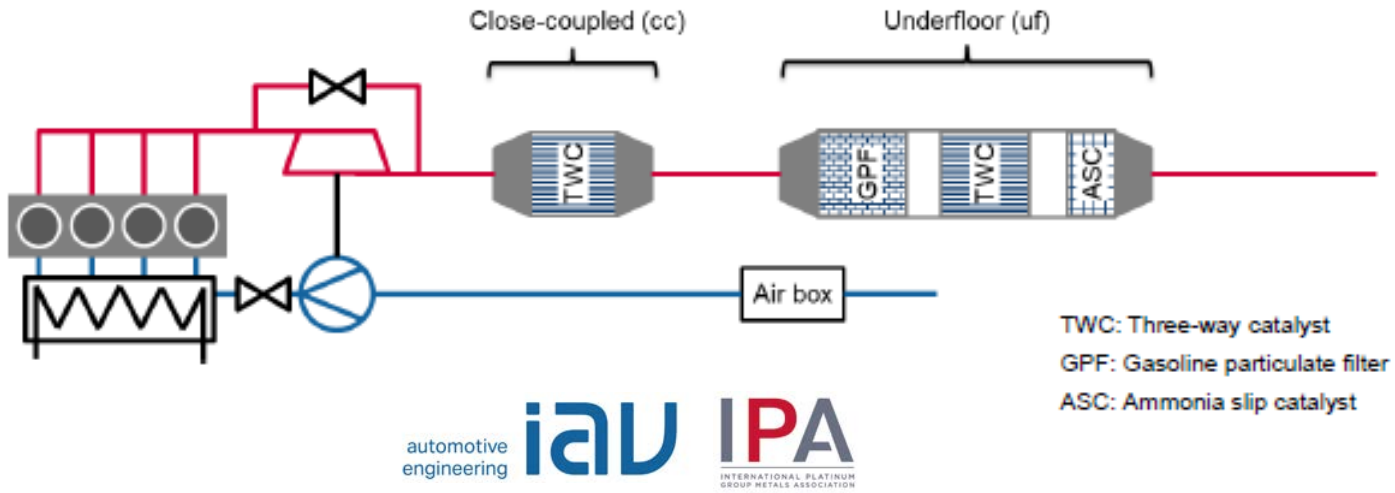


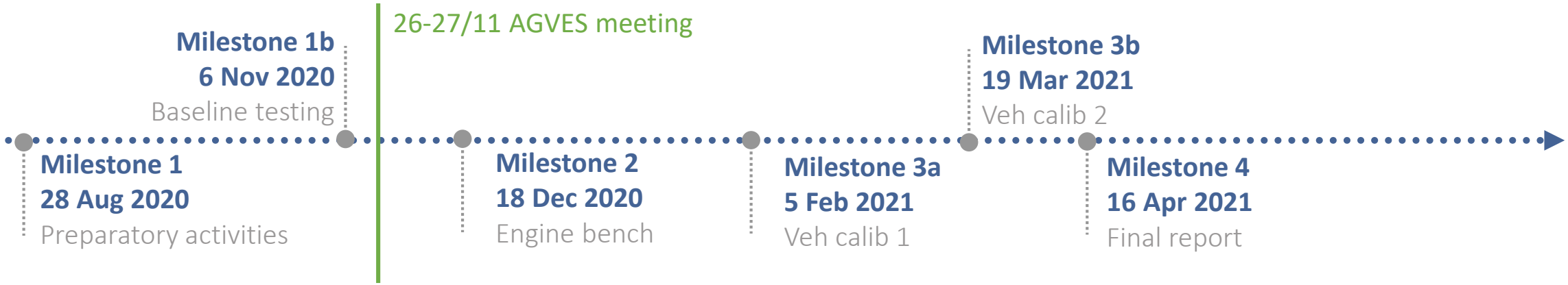
LD gasoline demonstrator objective

- Investigate reduction of pollutant emissions for areas of improvement
  - Focus on cold-start emissions
    - Impact depends on averaging distance, illustrated for NOx and PN
    - Variation of ambient temperature and driving dynamics will be explored
  - Measure currently non-regulated pollutants
    - NH_3
    - N_2O
    - PN_{10}
  - Minimise the impact on CO_2 emissions

LD gasoline demonstrator concept and schedule

- Demonstrator concept
  - Euro 6d C-segment base vehicle
  - 4 cyl GDI with 48V mild-hybrid
  - ccTWC, ufGPF+TWC+ASC
  - Advanced lambda sensors and control
- Schedule and status



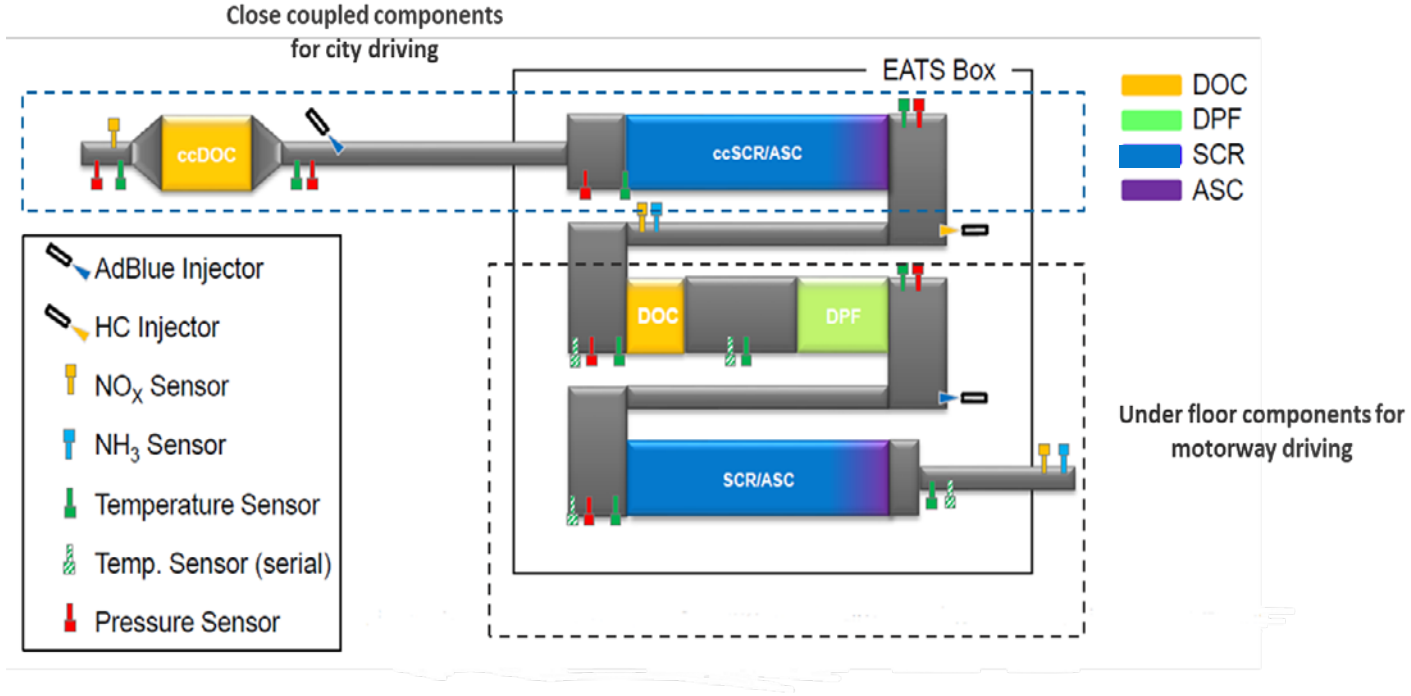


HD Diesel demonstrator objective

- Objective is to investigate improved urban performance with minimal impact on CO_2 emissions
  - Implementation of emissions control technology to address high emissions operation such as cold start, city start & delivery operation
  - Total catalyst and filter volume of appropriate size to cope with engine pollutant emissions flow
- Focus on on-road vehicle measurements
  - All calibration will be performed on the road
  - PEMS testing will be used to verify and complement results
    - Tests will be run using an In-service conformity designed route
    - Real world operation trips will also be conducted
    - Different payloads will be considered
    - Critical conditions will be studied
  - Both regulated and unregulated pollutants will be measured (N_2O, NH_3 and PN_{10})

HD Diesel demonstrator concept and schedule

- Demonstrator concept
  - Long-haul truck
  - Euro VI-C powertrain
  - 390hp, 12.8 l engine
  - Modified emission control system ccDOC + ccSCR, DOC+DPF+SCR



Automotive Grade Urea Sector Group

- Status
  - SCR calibration work ongoing

26-27/11 AGVES meeting

Milestone 1
15 Oct 2020
Vehicle Build-up

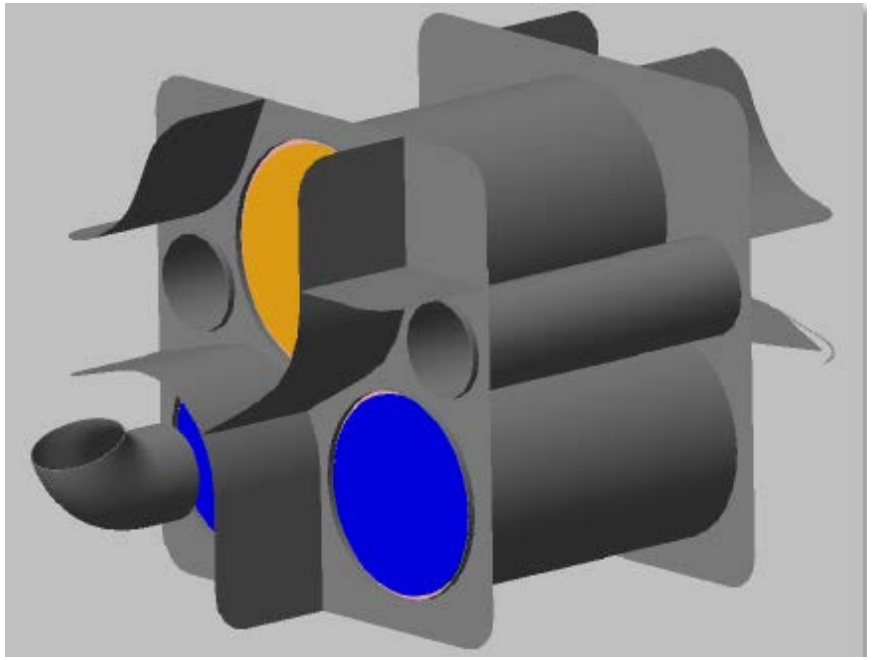
Milestone 2
18 Nov 2020
Calib Loop 1

Milestone 3
27 Nov 2020
Calib Loop 2

Milestone 4
05 Feb 2021
Calib Loop 3

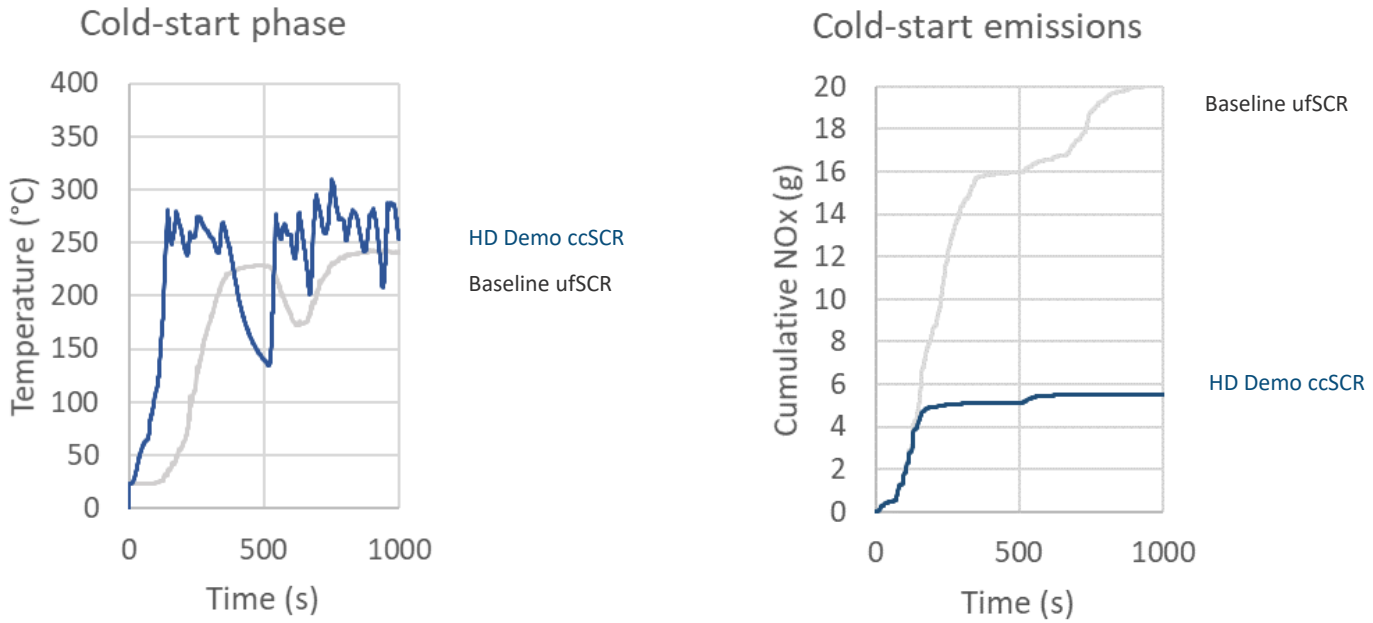
Milestone 5
26 Feb 2021
PEMS testing results

HDD demonstrator vehicle build up



HD demonstrator simulated data

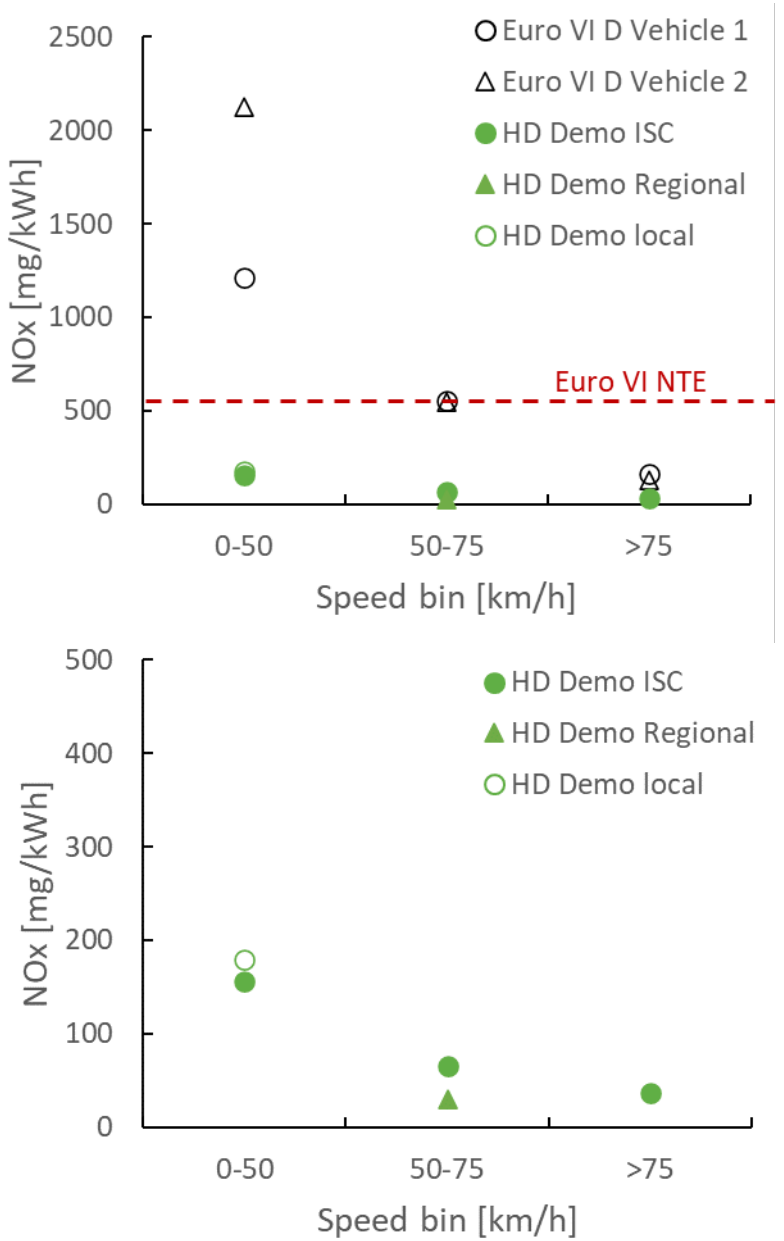
- The cold-start emissions are contained by adding an SCR system in close-coupled position
  - Earlier heat-up compared to underfloor position
  - NH_3 supply with dual-dosing operation



*Simulated performance for ISC route at ~20°C and 100% payload

HD demonstrator simulated data

- HD demonstrator vehicle concept simulation is compared to tested Euro VI vehicles shown in AGVES meeting on 9 July 2020
- This shows the potential of the emission control system for lowering tailpipe NOx emissions
- Reduction of NOx emissions will be investigated for
  - Cold-start phase
  - Urban driving conditions
  - Different payloads



Simulated HD demo vehicle results for different routes at ~20°C and 100% payload
Euro VI D data was presented by AECC in AGVES meeting of 9 July 2020

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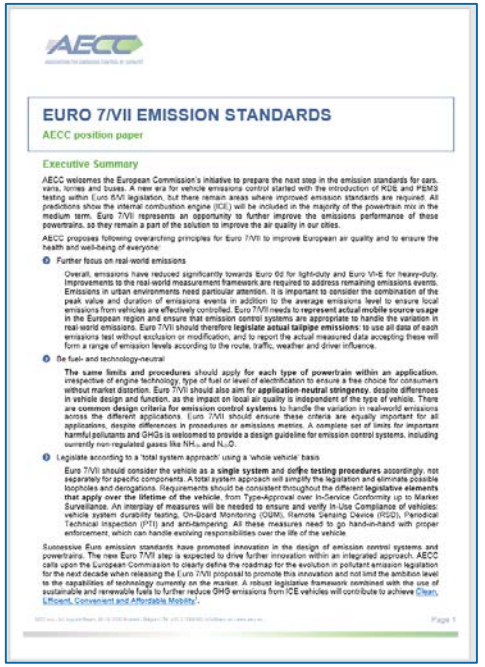
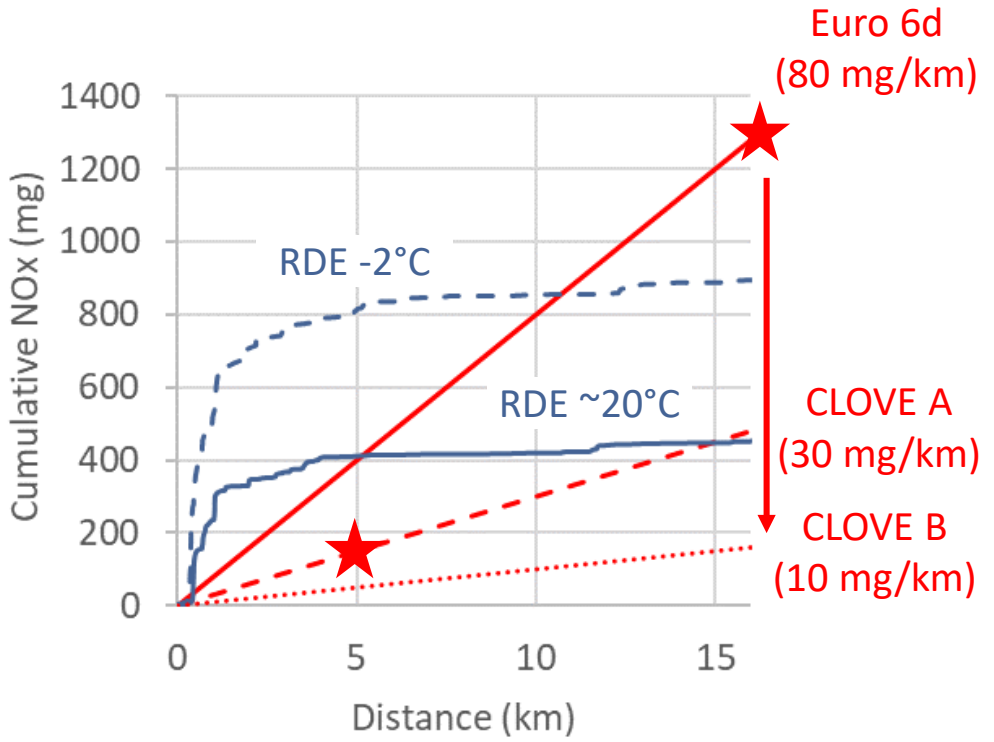
AECC position on Euro 7/VII


EURO 7/VII EMISSION STANDARDS
AECC position paper
Executive Summary

- AECC position on Euro 7/VII was published on 9 July 2020
  www.aecc.eu/wp-content/uploads/2020/07/200709-AECC-position-on-Euro-7.pdf
  - Further focus on air quality and real-world emissions
  - Be fuel- and technology-neutral
  - Legislate according to a 'total system approach' using a 'whole vehicle basis'
- Additional AECC Euro 7/VII position elements under preparation following CLOVE presentation of 27 October 2020
  - CLOVE scenarios are very challenging package due to combination of test conditions and limit values
  - CLOVE scenarios are derived from simulation of future technologies and this should be validated
  - The evaluation of combined test conditions and timing are missing in the CLOVE technology assessment
  - Time is needed to further develop technologies and significant innovation steps are needed
  - Initial CLOVE scenarios are not adequate for introduction in one single step in a short timeframe

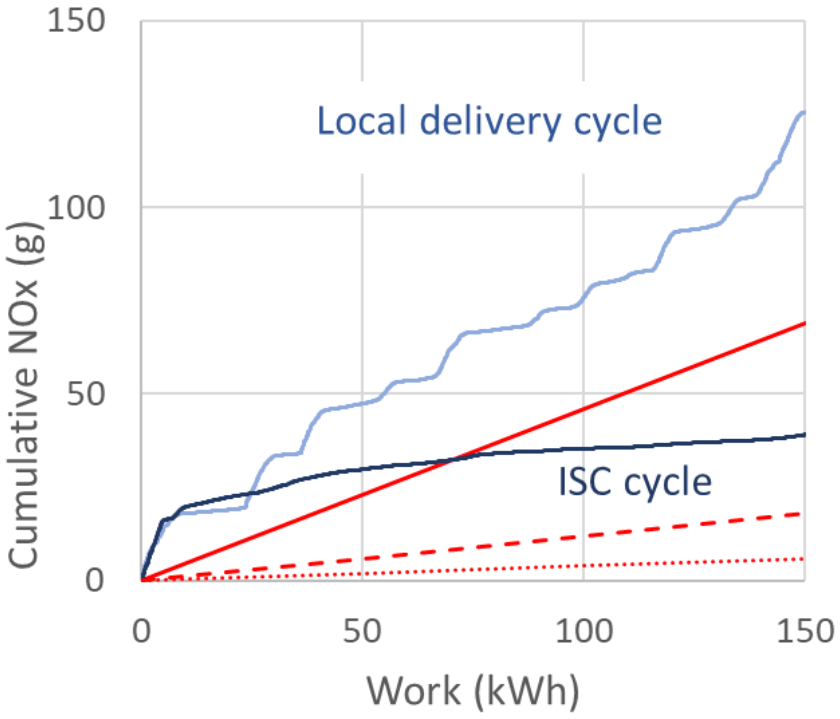
AECC consideration for LD

- Limit reduction to be analysed in relation to the extension of test conditions, for example the reduced minimum test distance
  - Illustration with AECC diesel demo data
  - Cold-start peak increases towards boundary conditions for example low ambient temperature effect tested
  - CLOVE scenario A requires reduction in cold start emissions by factor of 8.5
    - Limit is reduced by factor of 2.67
    - Minimum test distance is reduced by factor of 3.2
  - Requirements for all gaseous and particulate pollutants to be investigated for combination of boundary conditions



AECC consideration for HD

- Moving to wide on-road testing is a significant innovation step
- Limit reduction to be analysed in relation to the extension of test conditions
  - Illustration with simulation results for impact of driving conditions (ISC vs local delivery route)
  - Local delivery contains multiple stop-go conditions, resulting in several emission events
  - Reduction factor of CLOVE scenario A not yet known due to pending definition of minimum trip duration
  - Requirements for all gaseous and particulate pollutants to be investigated for combination of boundary conditions



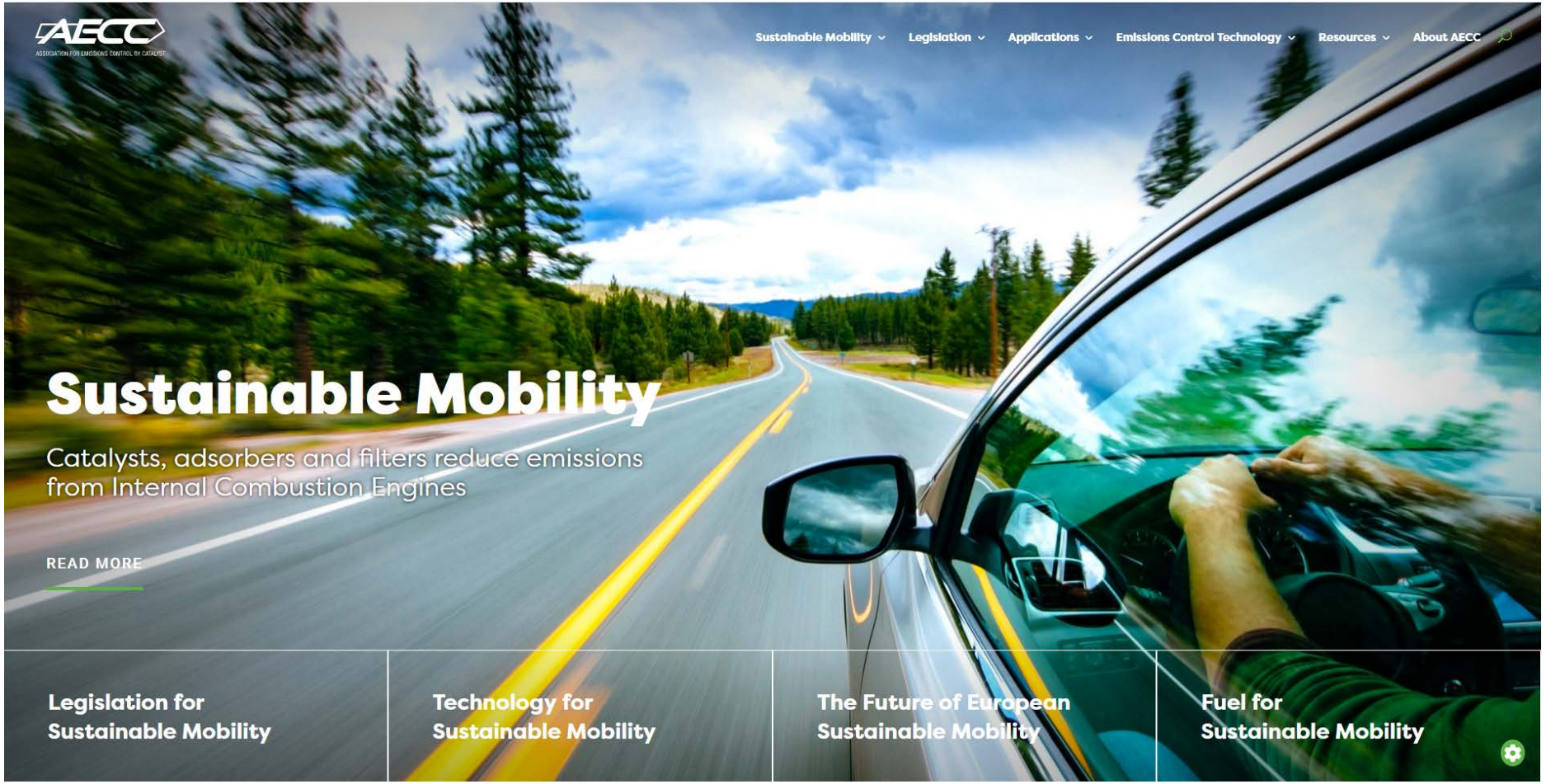
Simulated baseline ufSCR results for different routes at ~20°C & 100% payload

Conclusion and outlook

- AECC position on Euro 7/VII was published in July 2020 and additional AECC Euro 7/VII position elements are under preparation
  - CLOVE scenarios are very challenging package due to combination of test conditions and limit values
  - CLOVE scenarios are derived from simulation of future technologies and this should be validated
  - The evaluation of combined test conditions and timing are missing in the CLOVE technology assessment
  - Time is needed to further develop technologies and significant innovation steps are needed
  - Initial CLOVE scenarios are not adequate for introduction in one single step in a short timeframe
- AECC demonstrates that technologies are available to effectively control vehicle emissions under real-world operation and provides input to the Euro 7 process with test projects data for light-duty diesel, light-duty gasoline and heavy-duty diesel
- AECC will continue to assess and comment on Euro 7/VII introduction scenarios

Euro 7 ready material at www.aecc.eu

New AECC website was launched on 18 November



THANK YOU !

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