NextHyLights

Supporting Action to Prepare Large-Scale Hydrogen Vehicle Demonstration in Europe

NEXTHYLIGHTS

Input for MAIP / AIP development
WP6 - Environmental impact assessment

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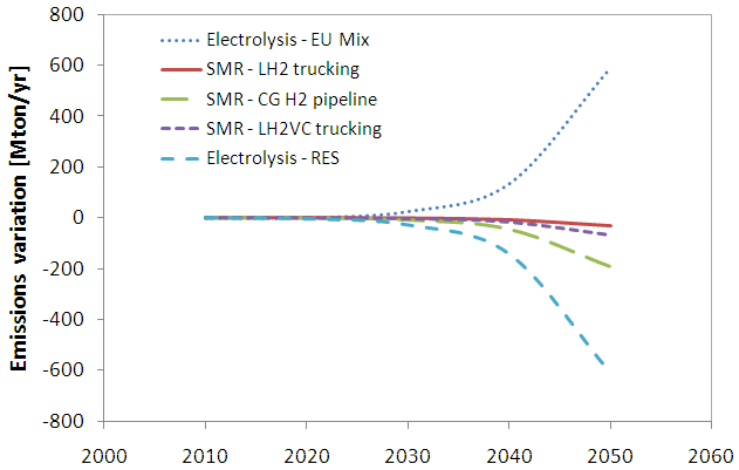
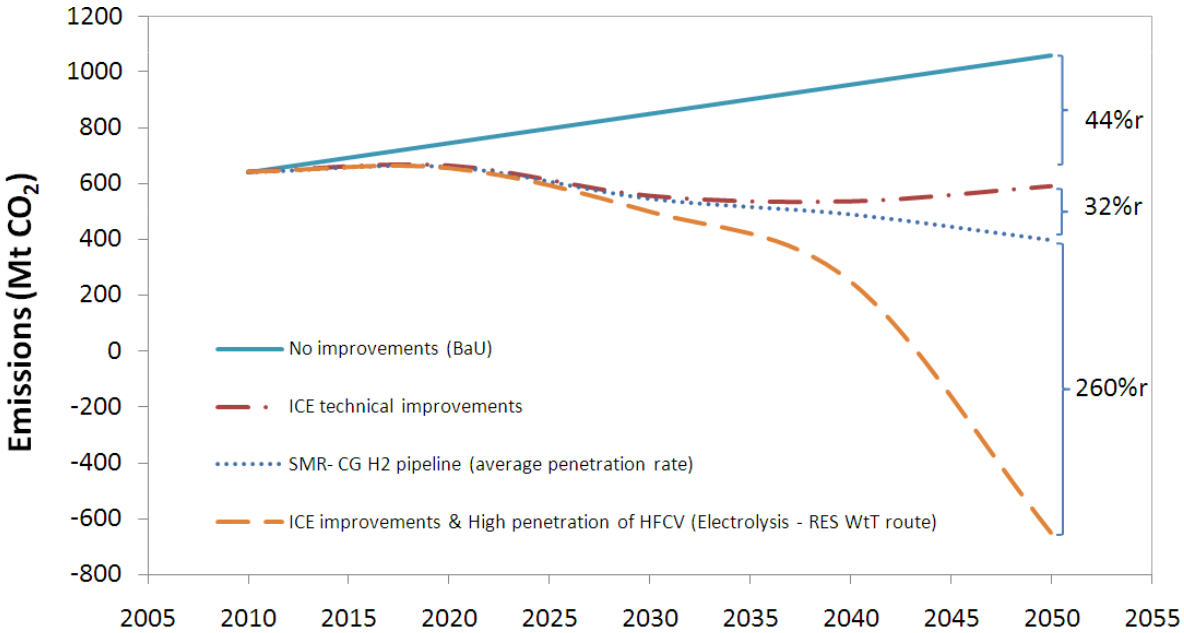
Emissions variation per Hydrogen WtT route (high FCV penetration)



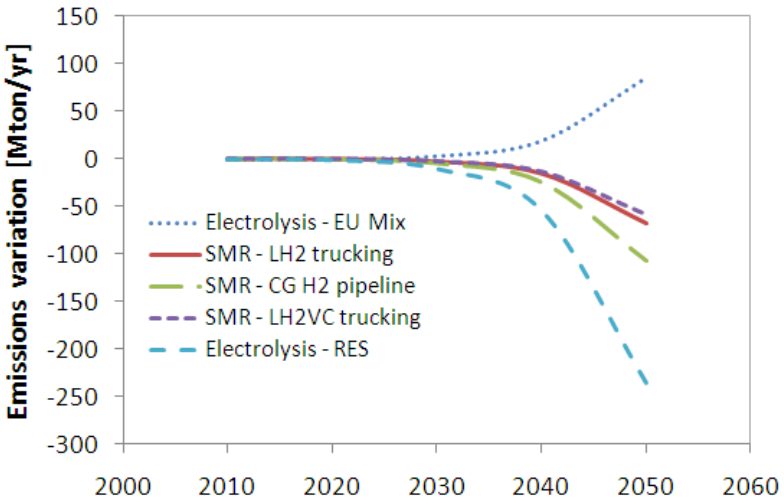
- Up to 2020, marginal carbon emission reductions expected from FCV
- Beyond 2020, emission reductions can be achieved via SMR pathways (from 2030:CCS)
- Highest abatement potential: Electrolysis/RES

European emissions

- Fast increase on ICE vehicle efficiency
- High deployment of FCVs
- (Hyways penetration rates)



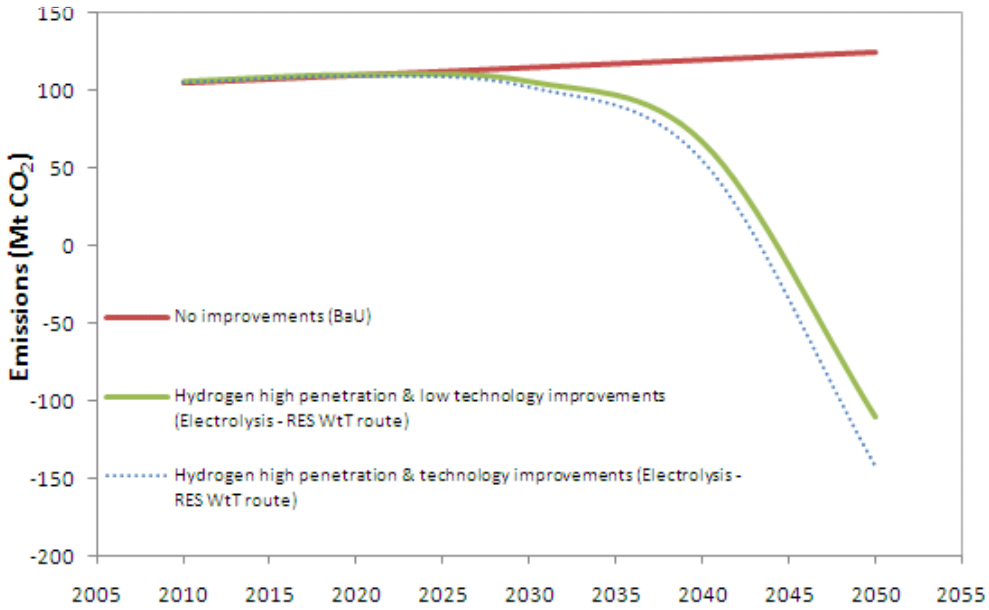
Results - Buses



- Up to 2025, no sensible carbon emissions reductions foreseen
- Beyond 2025:
- SMR-CG H_2 and electrolysis-RES highest carbon abatement potential
- Diesel-hydrid buses contribute reduce carbon emissions (BUT not NOx and PM)

European emissions:

- No increase on ICE bus efficiency
- High penetration rate of HFC buses (low carbon hydrogen production)



Air quality and noise - results

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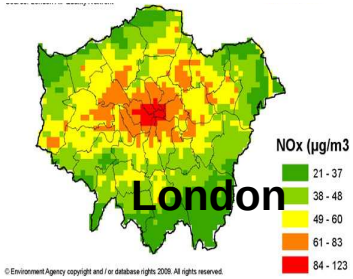
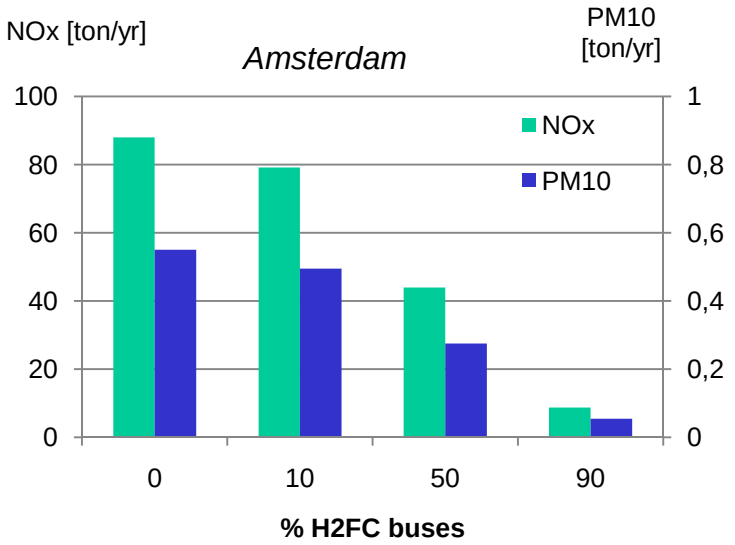
- Road transport is a key factor in EU air pollution.
  Transport in NL emits ~2/3 of all NOx, and ~1/3 of all PM10



- Substituting diesel by hydrogen buses most effective in city centers:
  (1) dense population, large numbers exposed,
  (2) limited dilution of exhaust gases, due to limited wind and “street canyons”

- Deployment of hydrogen buses, replacing 2025 (EEV emission standard) buses, will substantially improve air quality
- Deployment of hydrogen buses in the centre of Amsterdam equals 10% reduction of all traffic emissions



NOISE:
Road transport is largest EU noise source

- ➢ As hydrogen vehicles have no sensible engine noise, they will prove EU quality of life and health

Conclusions – carbon emissions & air quality

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- Demonstration projects for passenger vehicles produce hydrogen mainly via SMR. Marginal emission reductions are to be expected before 2020. Beyond 2020, non-fossil methane and/or sufficient implementation of CCS technologies in SMR plants can strongly contribute to emission reductions up to 60% compared with business-as-usual.

- Current demonstration projects for buses mainly produce hydrogen via the SMR process. Beyond 2020 carbon dioxide emissions may sensibly decrease even if hydrogen is produced by SMR. Hydrogen production via electrolysis from renewable energy sources entails the highest carbon abatement potential in the long term.

- Substituting diesel by hydrogen buses is most effective in city centers, because of (1) dense population and (2) limited dilution of exhaust gases.

- Deployment of hydrogen buses, replacing ‘EEV’ 2025 city buses, will improve air quality. The maximum possible reductions assuming a complete replacement by hydrogen buses are 90 tons NOx and 0.6 ton PM10.

- Road transport is largest EU noise source; hydrogen fuel cell vehicles will improve quality of life and health.