Magic green fuels
Why synthetic fuels in cars will not solve Europe's pollution problems

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Claims of the e-petrol/e-diesel lobby:

**E-fuel Alliance:** ‘e-fuels emit significantly less nitrogen oxide and particulate matter than conventional fuels’

**VDMA (Germany):** ‘the combustion of e-fuels is very clean and can be brought down to a level close to zero with exhaust gas aftertreatment technology available’.

But are these claims really true?
Testing of pollution from e-fuels

Mercedes A 180 petrol 6d-temp

All test work conducted by IFP Energies Nouvelles based in France

Baseline emissions:
E10 official fuel

3 different e-fuels tested:
1. 100% e-fuel: 100% paraffinic
2. 100% e-fuel: 90% paraffinic, 10% aromatic
3. 90% e-fuel 1 + 10% ethanol

E-fuels match E228 EU petrol fuel specification as closely as possible to guarantee existing fleet compatibility

17,000km at start of testing
The tests

All tests conducted in the lab

Each fuel was tested:
- 2x on the official WLTC cycle
- 2x on an RDE lab cycle

All results shown are the average of each test
E-petrol had no impact on NOx emissions

The toxic pollution at the heart of the dieselgate scandal

- NOx emissions *stayed the same with all e-fuels* (difference of 1 mg/km within test to test variability)

Suggests no impact on NOx emissions with use of e-petrol

E-petrol increased carbon monoxide emissions

- Increased for all e-petrols
  - WLTC 2.4-2.6 times
  - RDE 1.2-1.5 times
- Largest increase when engine first switched on

Use of e-petrol in cars may increase carbon monoxide emissions

Increase appear to be due to the exhaust emission control system- could probably be solved for new cars tailored for e-petrol but could be a problem for the existing fleet.

Source: IPPEN (2021)
E-petrol somewhat reduced hydrocarbon emissions

- Emissions decreased during WLTC test -23 to -40%
- Due to low emissions on RDE no impact observed
- Formaldehyde and aldehyde emissions decreased during cold start period but levels generally very low on rest of test

Data suggests there may be some decrease in hydrocarbon emissions with e-petrol use

Source: IPPEN [2021].
Regulated particle number (PN) emissions reduced

All solid particles larger than 23nm

- Large reduction in PN emission with e-petrol
- WLTC - 97 to -98%
- RDE -82 to -87%
- Likely due to low aromatic content of the e-petrol tested

Suggests there could be a substantial reduction in particle number emissions with e-petrol

Source: IPREN [2021].
Unregulated particle number (PN) emissions

All solid particles larger than 10nm

- Similar reduction as for regulated particles
- WLTC - 97
- RDE -81 to -86%
- When 10-23 nm particles were included in measurement number of particles ~doubled

Despite reductions at least 2.2 billion particles emitted for every kilometer driven so particles are not eliminated

E-petrol increased ammonia emissions

- Emissions generally low on WLTC
- RDE emissions for e-fuel 2+3 increased by 1.7-2.2 times on the RDE

Suggests there could be an increase in ammonia emissions with e-petrol use—bad for PM2.5 pollution

E-petrol and e-diesel are not climate neutral

While synthetic petrol or diesel is generally considered GHG neutral when additional renewable electricity is used for production...

T&E’s testing of e-petrol and CONCAWE’s testing of e-diesel has shown that burning these fuels in an ICE produces the more potent greenhouse gases methane and nitrous oxide.

An average petrol car would emit the equivalent of 7-9 kg of CO₂ and a diesel car 24 kg of CO₂ a year running on e-fuels

While emissions from individual vehicles are small if all new diesel and petrol cars sold in 2020 ran on e-fuels the emissions of those greenhouse gases would be equal to putting an additional 50,000 ICE cars on the road.

Therefore synthetic fuels in road transport are not climate neutral
Summary of results

- The e-petrol tested had no impact on NOx and increased carbon monoxide and ammonia emissions. There was a substantial decrease in particle number and some decrease in hydrocarbon pollution.

- Overall due to an increase in some pollutants and decrease in others the e-petrol makes no real difference to air quality compared to fossil petrol.

- Using synthetic petrol or diesel in ICE cars produces emissions of the more potent greenhouse gases methane and nitrous oxide.
Green myth busted.
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No clean burning: E-petrol will do little to reduce toxic pollution (beyond particles)

Not fully climate neutral: claims rely on 100% green H2 & Direct Air Capture (DAC). Additional GHG (methane & N2O) emissions ignored

Not a solution for existing fleet: E-petrol in 2nd hand cars will be EUR 10,000 more expensive than a 2nd hand battery electric car in 2030 (even new BEV will be cheaper).

Not optimal or available: Using e-petrol technology will require x5 more renewable electricity; its availability is close to zero vs 18% plug-in sales in 2021

No amount of “green” technology - renewables or DAC - can make burning clean. No amount of magic can overcome the basic laws of thermodynamics

BEV is the best zero emission solution for cars.
Recommendations

1. No credits for e-fuels in car, van or truck CO2 standards

2. Strict Euro 7 standard should apply to all tech, including synthetic fuels

3. No dedicated national targets or financial support for e-petrol/e-diesel use in road transport
Thank you for listening! Now it’s time for the Q+A