Karlsruher Institut für Technologie

IFKM

Are low carbon reFuels a solution?

An assessment of reFuels

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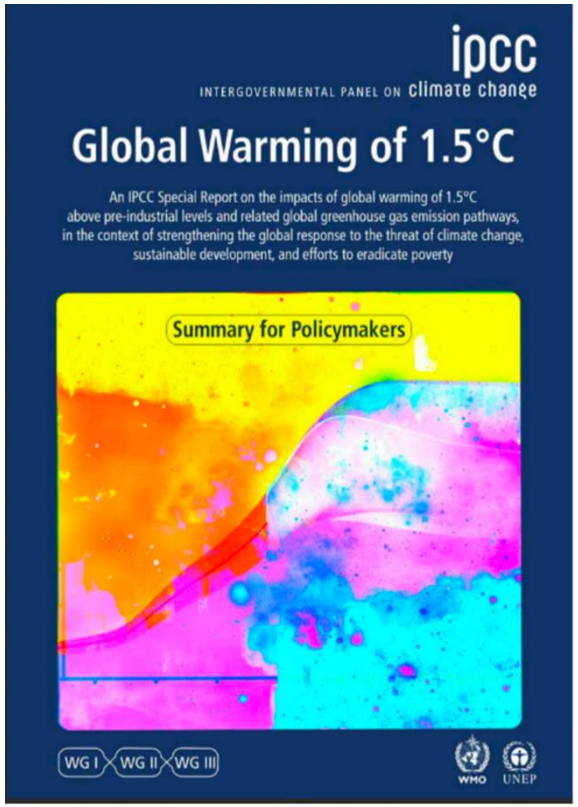
EU Expert Talk
June 1st, 2021

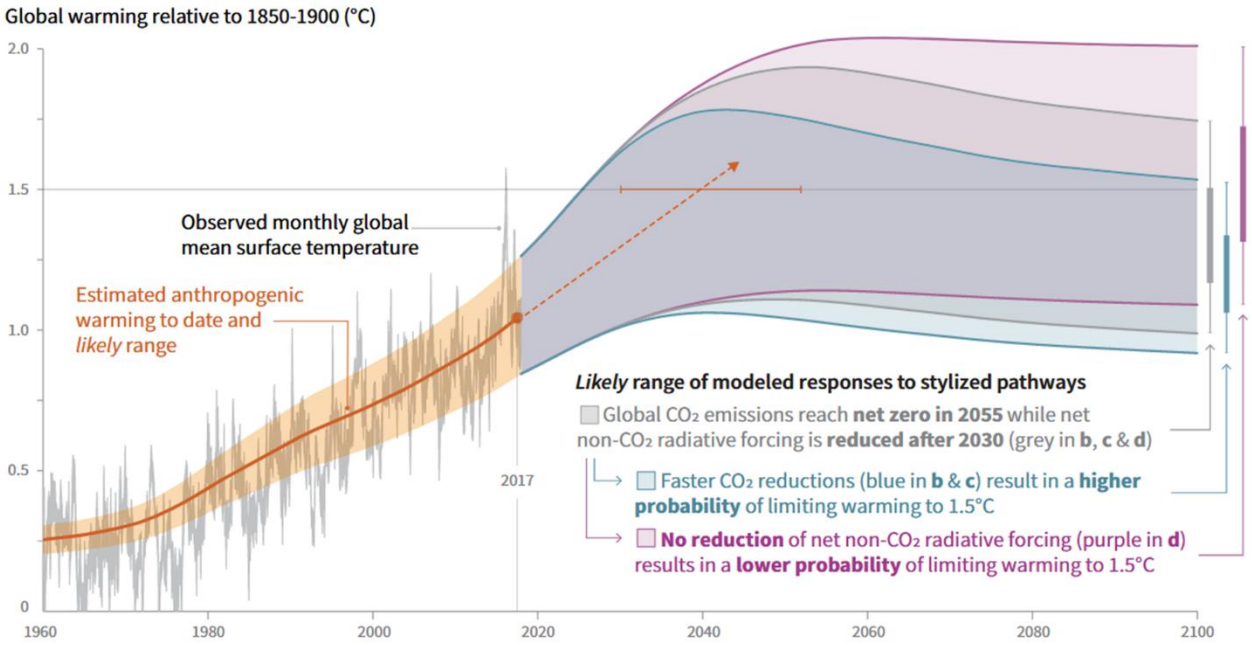
Quelle: https://www.starobserver.org/image/1812/Earthrise1_Apollo8AndersWeigang_2048.jpg, NASA, Apollo 8, Bill Anders, Processing: Jim Weigang

2018: IPCC report „Global warming of 1.5°C “



https://www.ipcc.ch/site/assets/uploads/sites/2/2019/05/SR15_SPM_version_report_LR.pdf

A.1 **Human activities are estimated to have caused approximately 1.0°C of global warming[5] above pre-industrial levels, with a *likely* range of 0.8°C to 1.2°C. Global warming is *likely* to reach 1.5°C between 2030 and 2052 if it continues to increase at the current rate. (*high confidence*) (Figure SPM.1) {1.2}**



Summary of IPCC: A remaining CO_2-budget of 420 Gt CO_2 has a 66% probability of limiting 1.5°C warming.

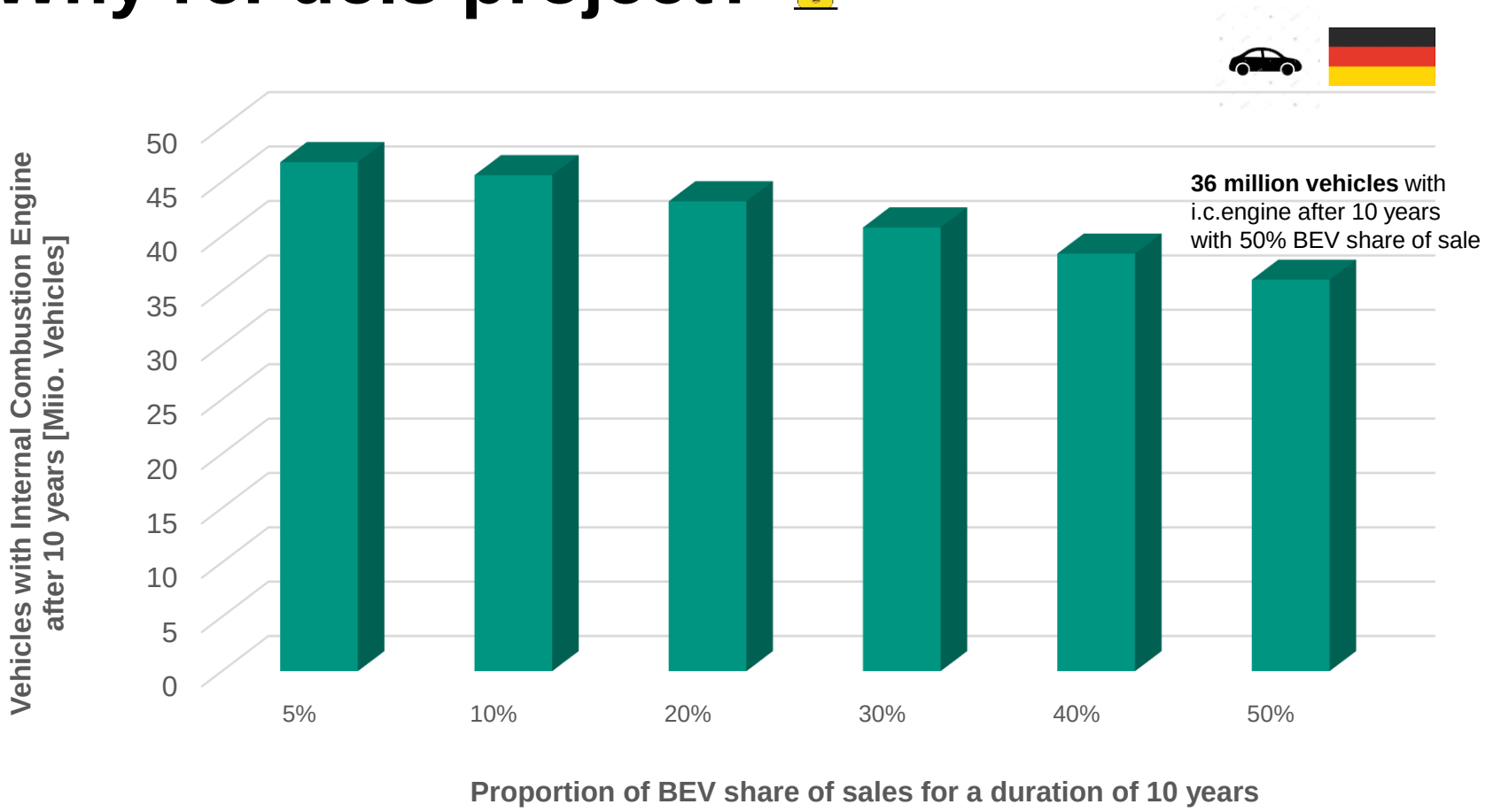
Project reFuels

Additional Information

- Industry partners and Baden-Württemberg invested 20.Mio € into refuels project.
- Ministry of transport of Baden-Württemberg is initiating political partner of refuels project.
- Project start was 1/2019.
- The first phase ends in 2021.
- More than 20 industry partners are involved with an unique contribution by automobile as well as mineral oil industry

The reFuels project is combining basic academic research questions with major environmental, industry as well as society issues.

Why reFuels project?



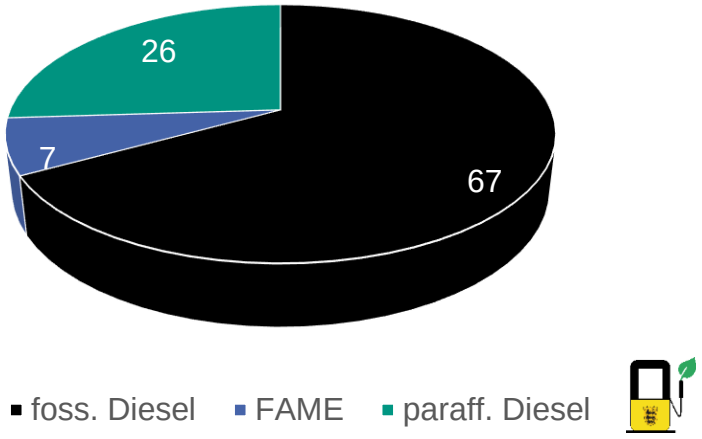
Boundary conditions and analysis

- The KBA Data from 2009 to 2019 act as reverence for the next decade.
- PHEV as well as HEV are also vehicles with internal combustion engine.
- Even with a 50% BEV share of sales in Germany, there would be more than one million new vehicles per year with internal combustion engine.
- BEV are a part of the solution, but not the only solution.

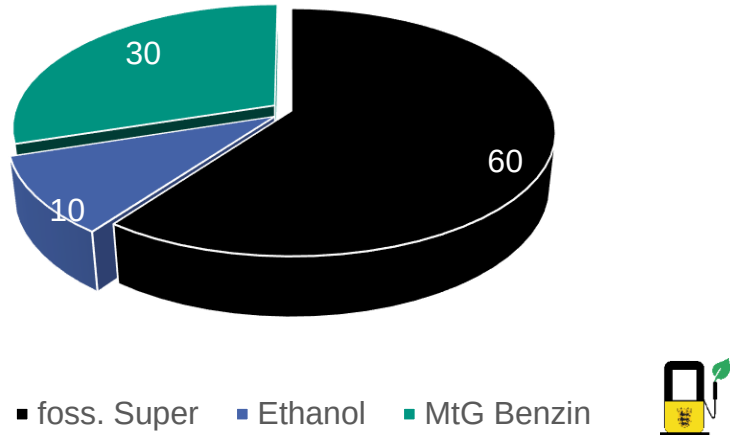
It is completely independent from political decisions and market response: most of total fleet vehicles will have an internal combustion engine in the year 2030.

reFuels recommendation for 2030

Diesel Fuel R33 according to todays specification (EN590)

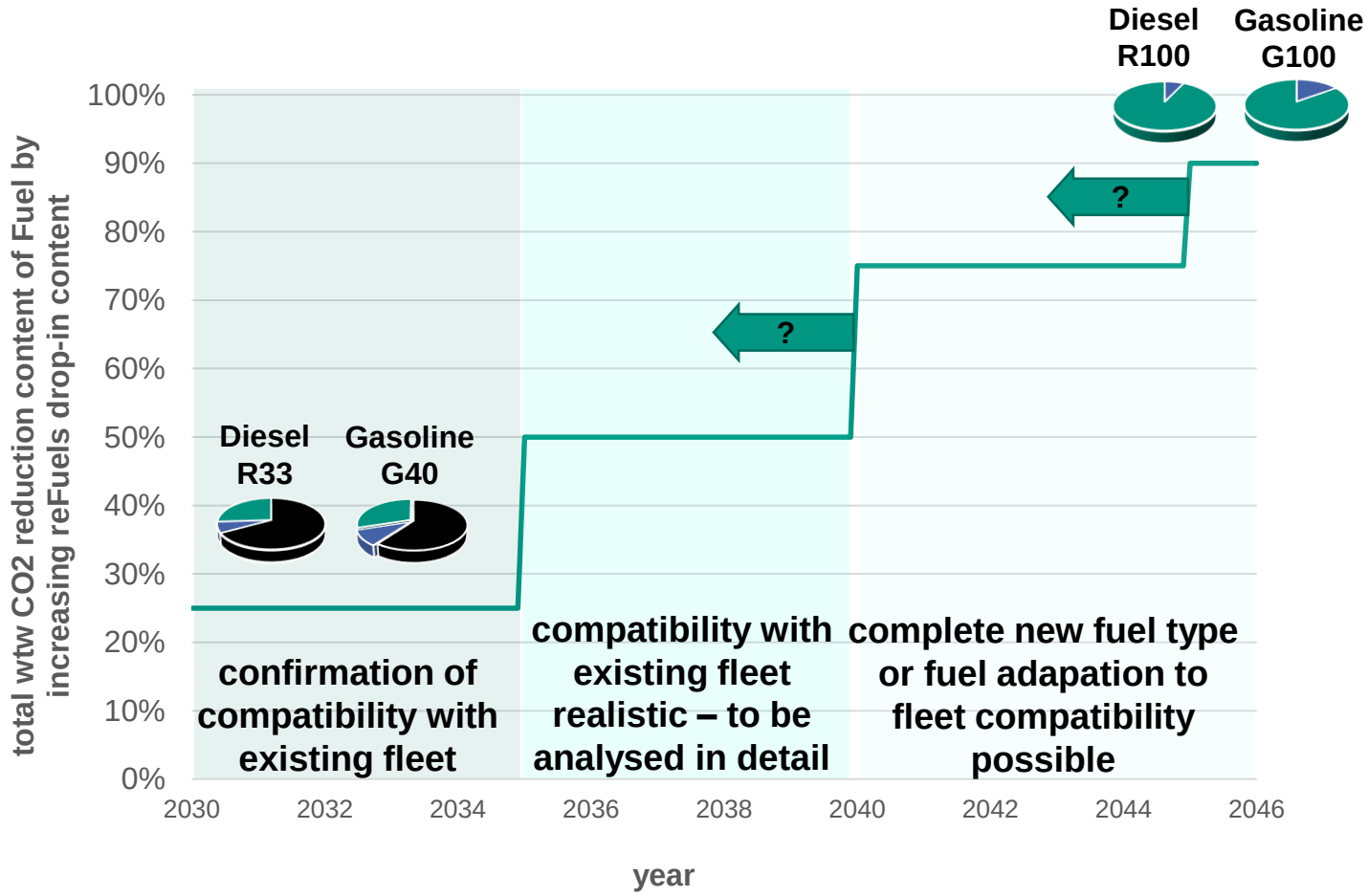


Gasoline Fuel G40 according to todays specification (EN228)



A fuel CO_2-reduction potential of 25% can be realized within todays fleet compatible fuel specification. MTG or paraffinic diesel refuel can be produced via different routes (bioFuel, eFuel).

reFuels beyond 2030

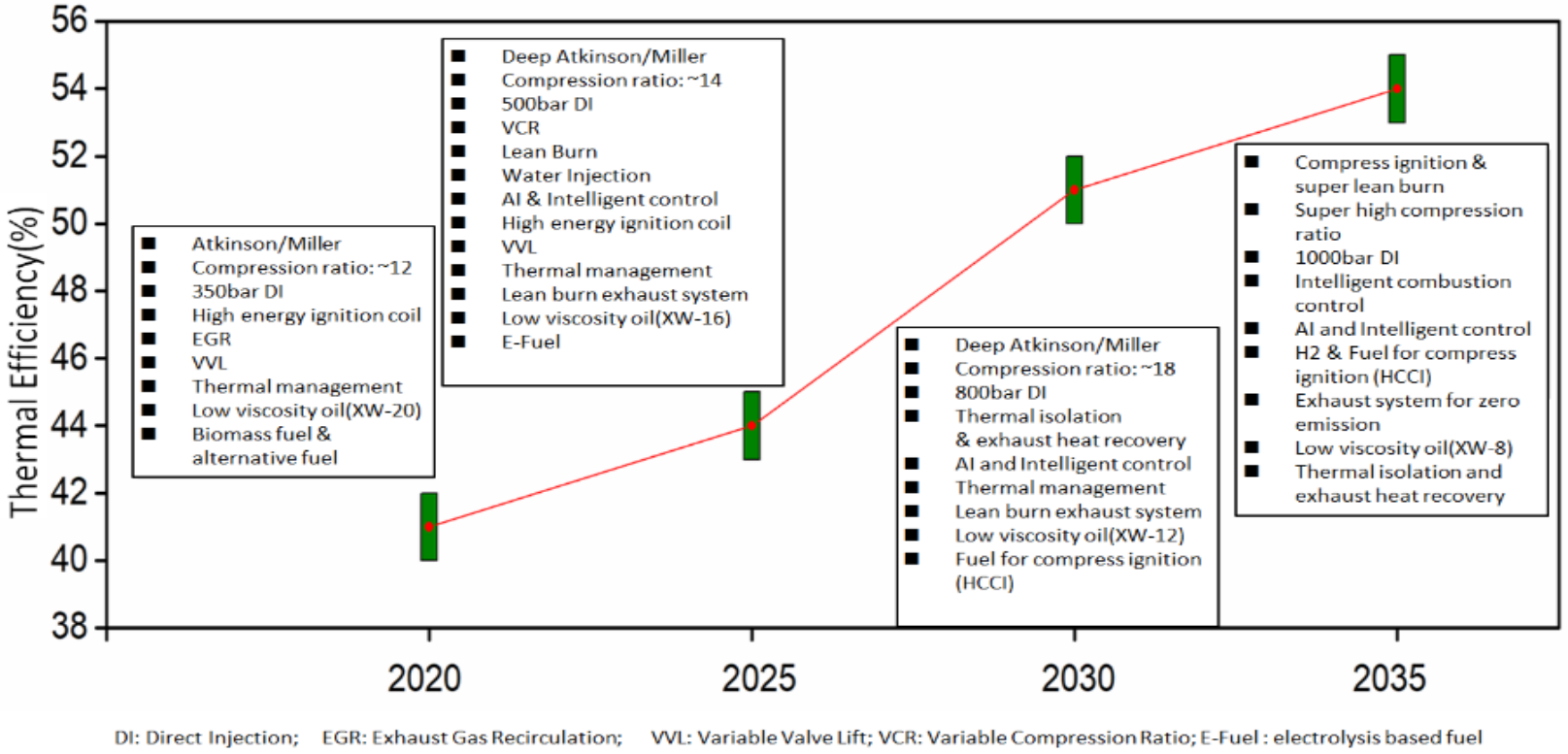


Information

- Compatibility of Gasoline reFuel seems to be more challenging than diesel to enable fleet compatibility according to EN228/EN590.
- However, a compatibility with EN228/EN590 up to 50% CO_2 reduction potential by increased reFuels blending rate is realistic.
- **A mid-term >90% CO_2-reduction by fuels within the next 25 years together with additional technology development enables a reduction of CO_2-footprint of traffic sector by >95%.**

Even todays technology can be compatible with 100% refuel content. A mid-term 100% fleet compatible substitution of fossil fuels by reFuels is necessary. A step-by-step increase of the drop-in rate is recommended.

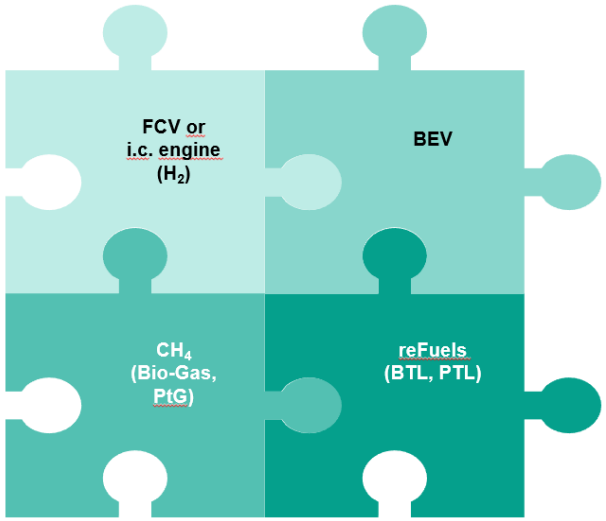
China



DI: Direct Injection; EGR: Exhaust Gas Recirculation; VVL: Variable Valve Lift; VCR: Variable Compression Ratio; E-Fuel : electrolysis based fuel

Information

- China has published a long term strategy with internal combustion engine technology.
- There is not only one solution for the future:



China is following the refuels path.

Thank you for your attention

Quelle: https://www.starobserver.org/image/1812/Earthrise1_Apollo8AndersWeigang_2048.jpg, NASA, Apollo 8, Bill Anders, Processing: Jim Weigang