ROAD MAP TO DECARBONISE THE REFRIGERATED FOOD TRANSPORT SECTOR BY 2050

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ENOUGH
EUROPEAN FOOD CHAIN SUPPLY TO REDUCE GHG EMISSIONS BY 2050

To contribute to the overall climate neutrality objective for 2050, the GHGs of the transport sector in the EU must be reduced by 90% compared to the baseline of 1990. In this work, 29 different technologies/strategies were reviewed that refrigerated transport vehicles could apply to reduce carbon emissions and energy consumption. Only technologies with a high technology readiness level (TRL) were considered.

Modelling of impacts from 2020 through to 2050

Six different vehicle types were considered, with associated varied delivery missions. Baseline distances, speed, journey duration, number of stops and refrigerant in the transport refrigeration unit (TRU) were varied across the missions.
The vehicle missions considered were:

- Long haul medium temperature (MT)
- Long haul low temperature (LT)
- Regional transport MT
- Regional transport LT
- Last mile multi-temperature (MT and LT)
- Last mile frozen thermal energy system (TES) (LT)

The technologies modelled were combined as follows:

- Better door curtains and TRU insulation with a R744 TRU.
- Better door curtains and TRU insulation with a R290 TRU.
- Better door curtains and TRU insulation with electrified R744 TRU.
- Better door curtains and TRU insulation with electrified R290 TRU

Predicted impact on CO2e emissions reduction

Vehicle missions were predicted across 6 locations (the UK, France, Lithuania, Norway, Italy, and Poland).

Impact of technologies

Better insulation had far more impact on long haul and regional vehicles as there were no door openings. Local delivery vehicles benefitted more from better door curtains and reduced infiltration as they had regular stops.

Changing to a low GWP natural refrigerant benefitted all vehicles with an operational refrigeration system on board. R290 TRUs performed slightly better than R744 in almost all countries and vehicle missions.

Impact of electrical grid decarbonisation.

Countries with low grid carbon factors benefitted the most from the electrification of the TRU. Grid carbon factors will likely remain low or decrease in all countries moving forward, except for Poland. Poland has much higher grid carbon emission factors and so looked less likely to be able to decarbonise the TRU by 2050.

Roadmap

This roadmap recommends 6 priority areas for refrigerated vehicle manufacturers to focus on.

Opportunity 1
Don't wait, early interventions will reduce cumulative global warming

Opportunity 2
Electrify the vehicle TRU

Opportunity 3
Apply low GWP natural refrigerants

Opportunity 4
Consider better insulation for long haul vehicles

Opportunity 5
Consider better door protection for last mile delivery vehicles

Opportunity 6
Assess benefits of technologies according to specific location and vehicle type

Decarbonisation of the electrical grid will have a huge impact on carbon emissions from vehicles once they are fully (motive engine as well as TRU) electrified in most European counties. Nevertheless, it is essential to use other technologies to reduce carbon emissions in the short term as the grid decarbonises.

Find out more about this work: https://enough-emissions.eu/publications/

ENOUGH webpage: https://enough-emissions.eu/
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