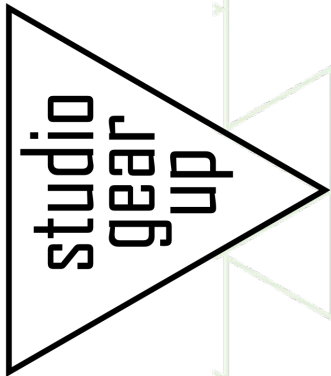


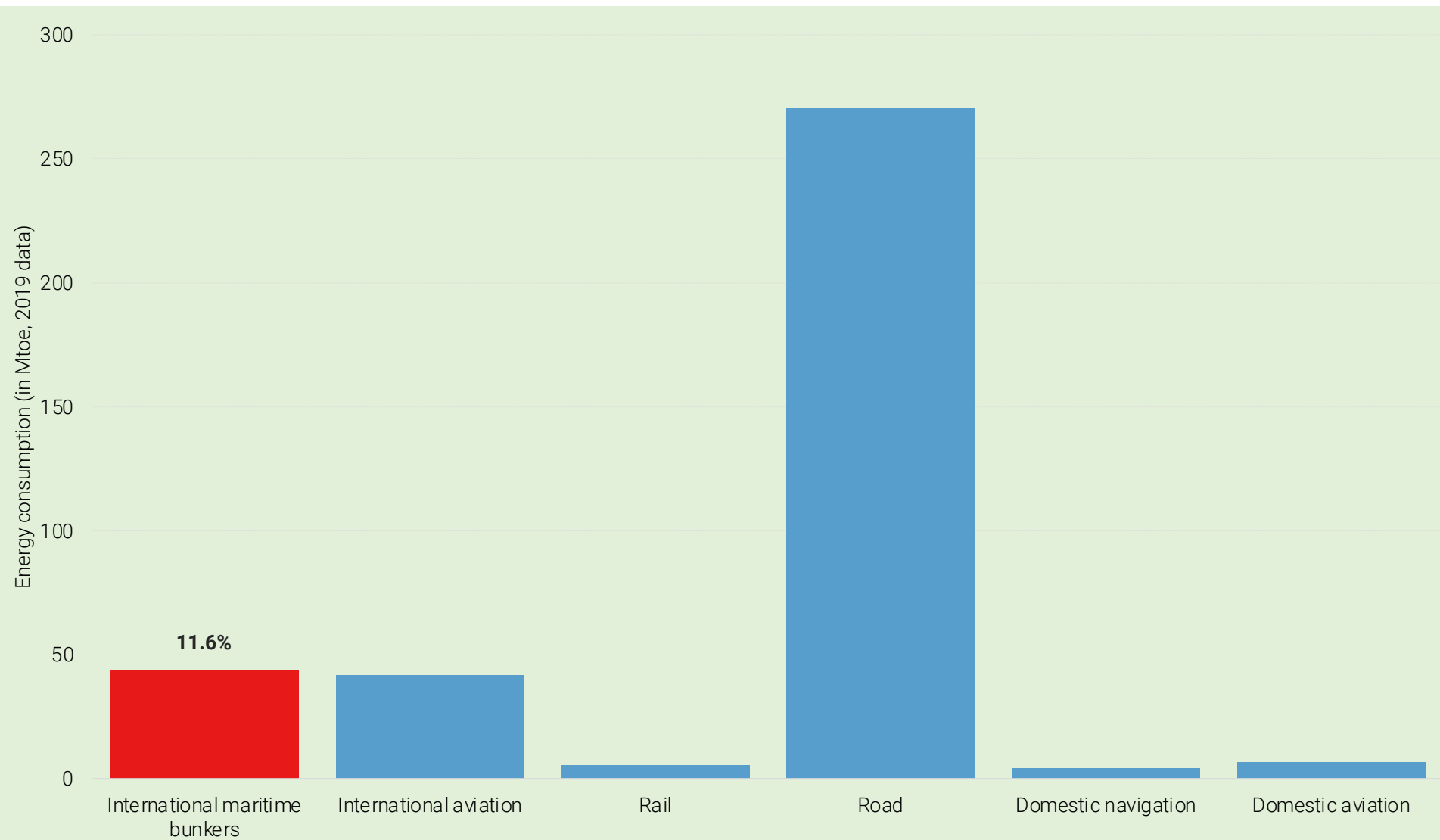
Strategic implications of carbon intensity regulation

Focus on low full life cycle emissions
may help industry



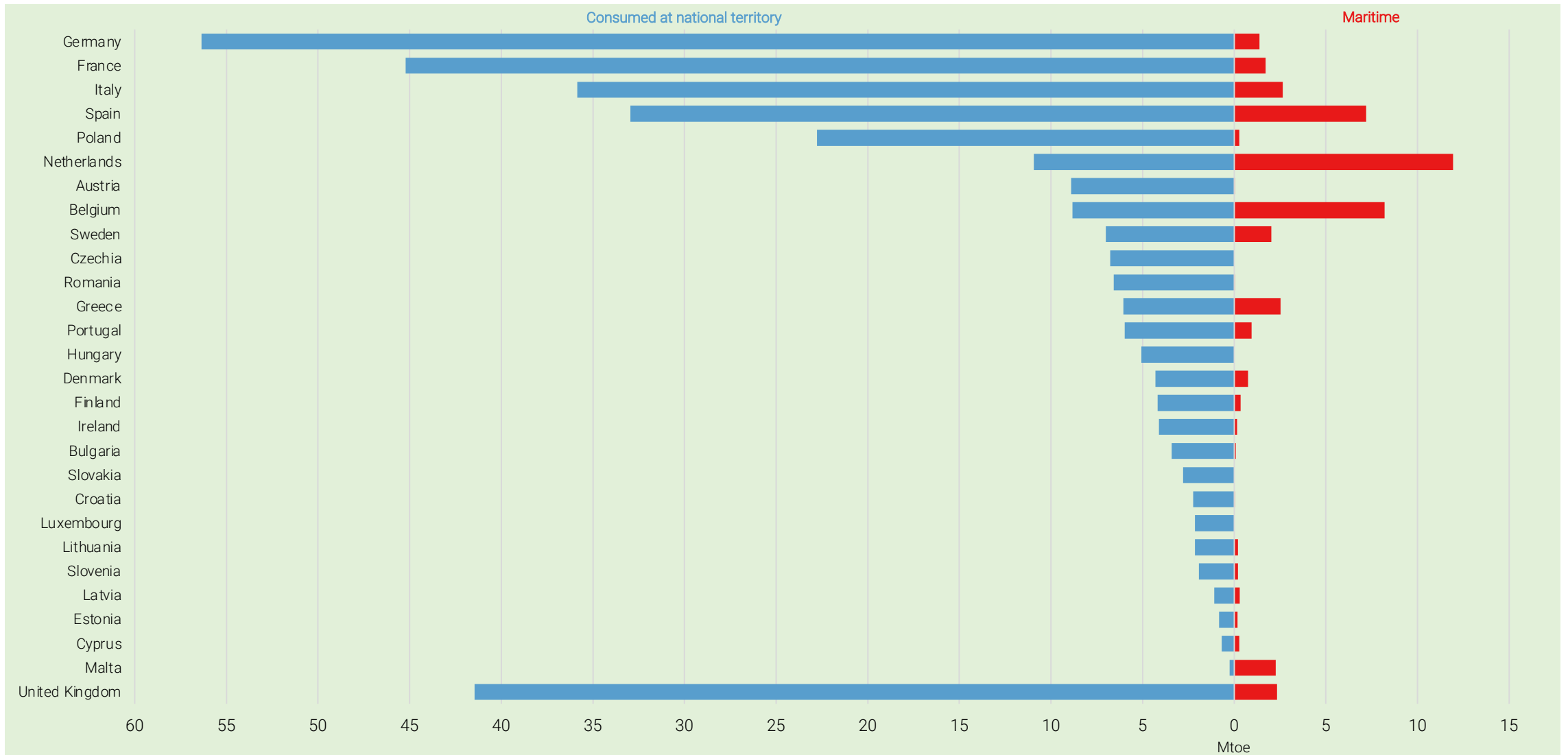
Eric van den Heuvel – Partner studio Gear Up
Argus Green Marine Fuels Conference
24th May 2023

EU27 total transport sector: energy consumption in maritime sector is relatively moderate



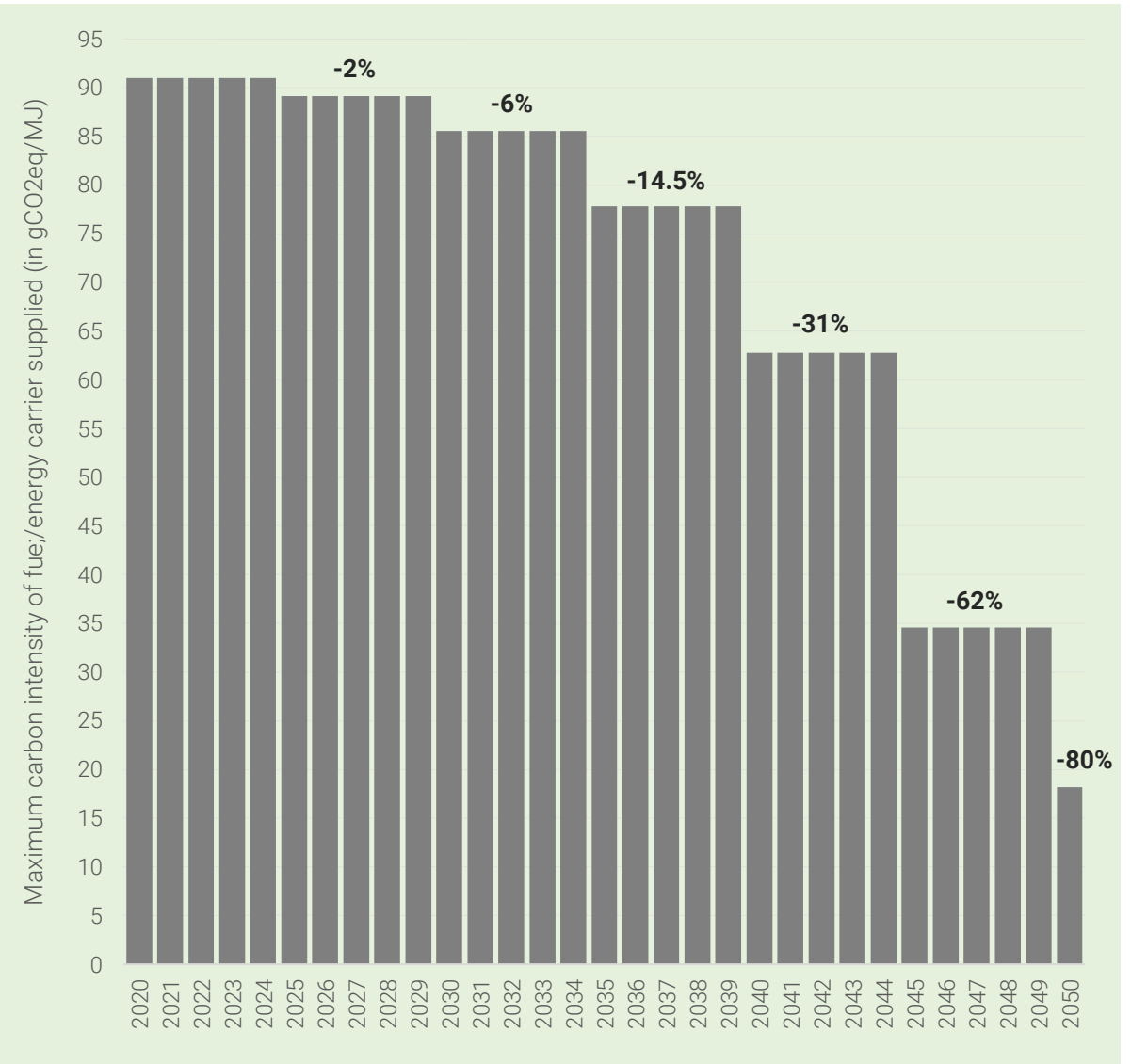
Source: Eurostat Energy Balance Database, 2019 data

About maritime fuel volumes: only a few Member States matter... (2019)



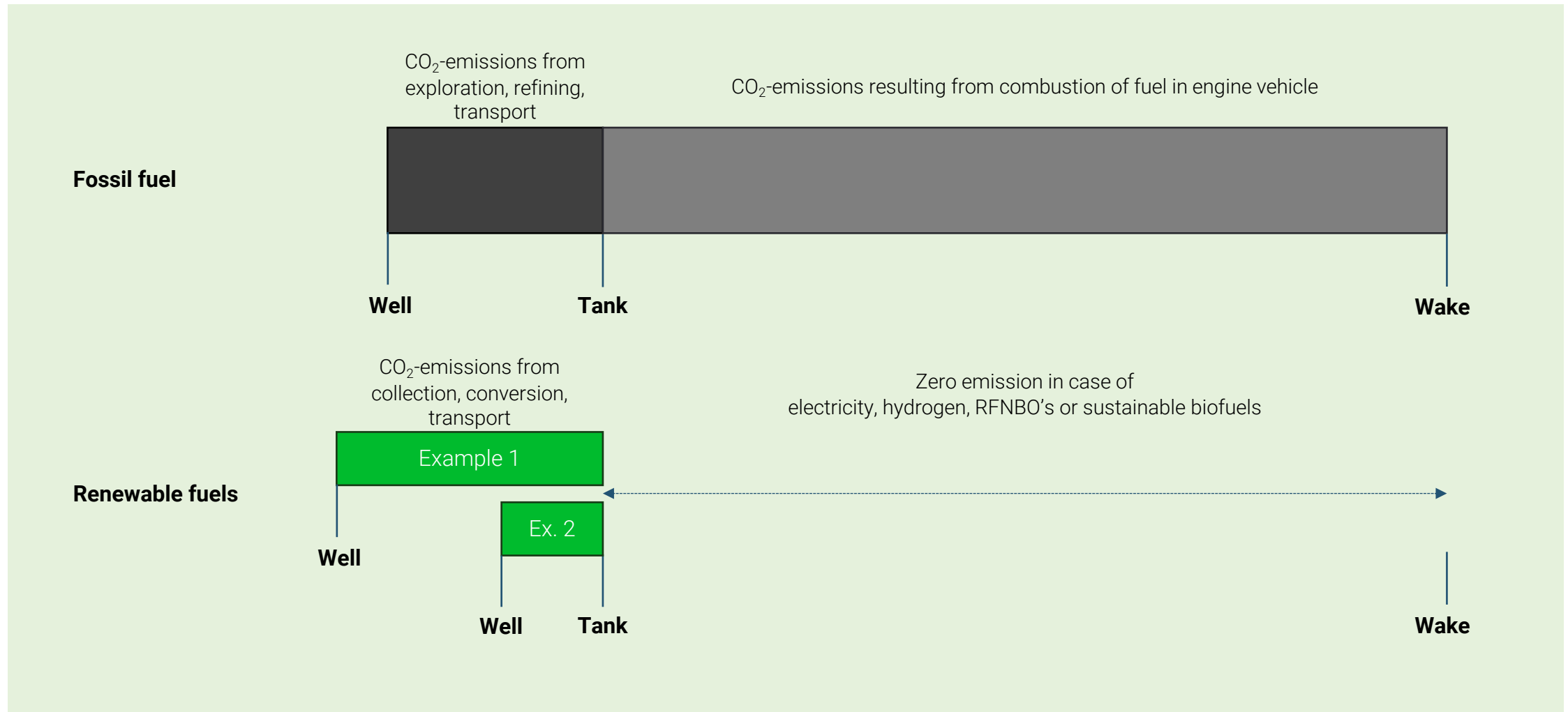
FuelEU Maritime sets a path up to 2050 for on reduction of carbon intensity of energy

- FuelEU Maritime steers on gradually further reducing carbon intensity of energy used in sector
- That already implies a full life cycle approach, which is combination of:
 - Well to tank emissions
 - Tank to wake emission
- Focus on full life cycle approach boosts efficiency performance



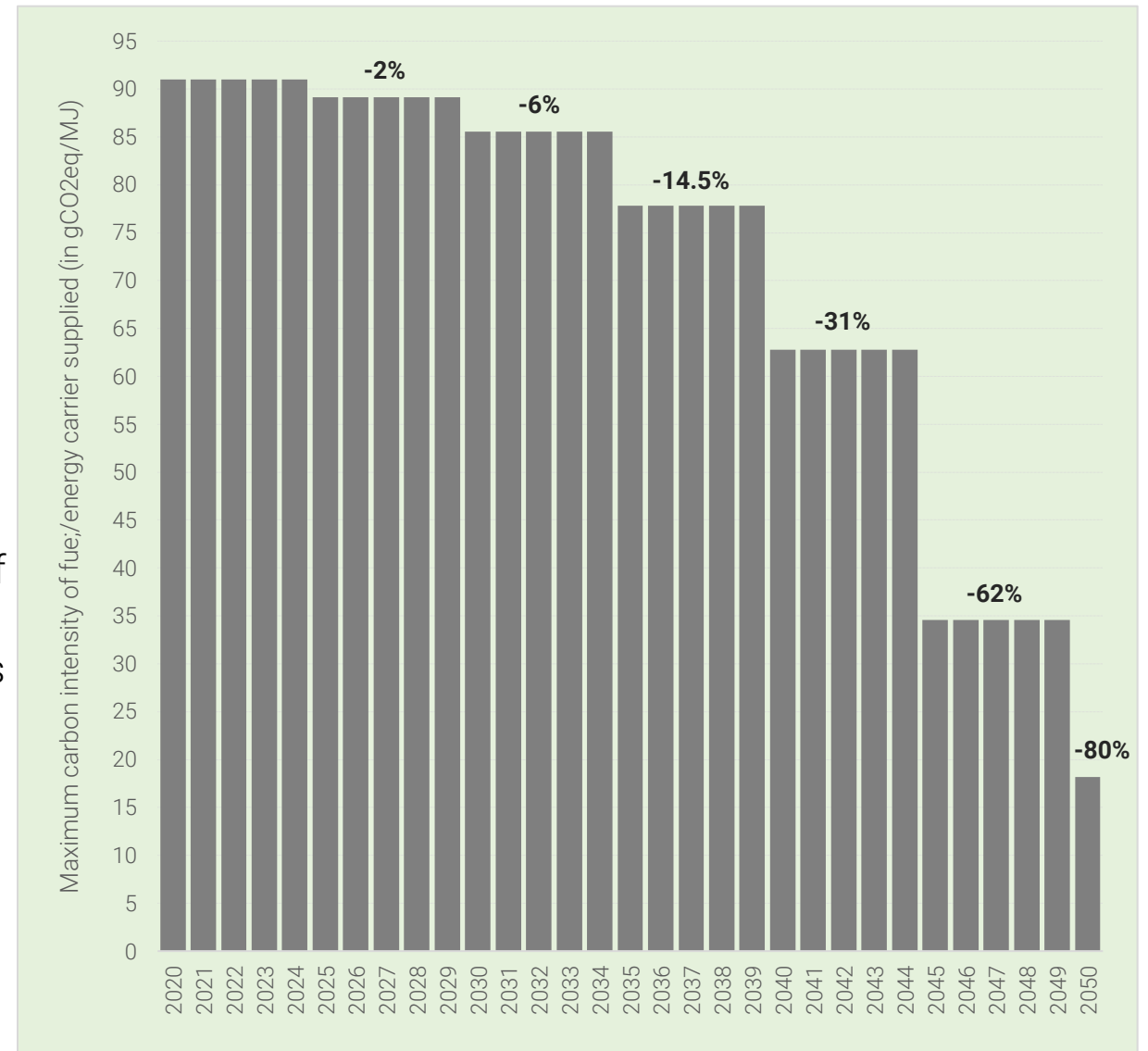
Source: Fuel EU Maritime agreed percentages for carbon intensity reduction. Reference value of 90,98 gCO₂eq/MJ taken from HCSS, CE Delft, 2023, Decarbonising maritime bunkering in the Netherlands and the embargo on Russian oil.

The difference between Well-to-Wheel and Tank to Wheel emission reduction



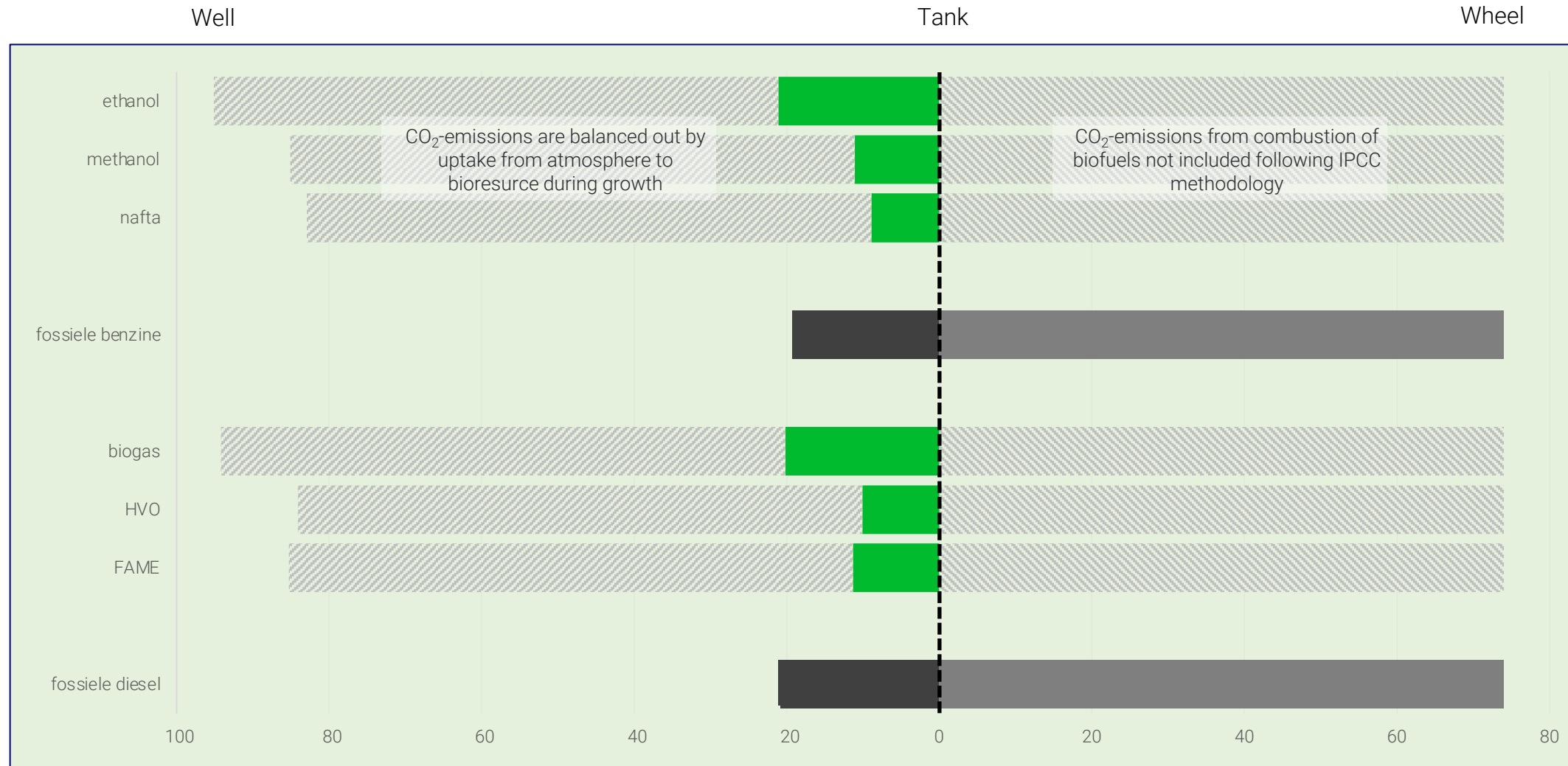
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 - Combustion emissions are of importance in case of fossil based carbon
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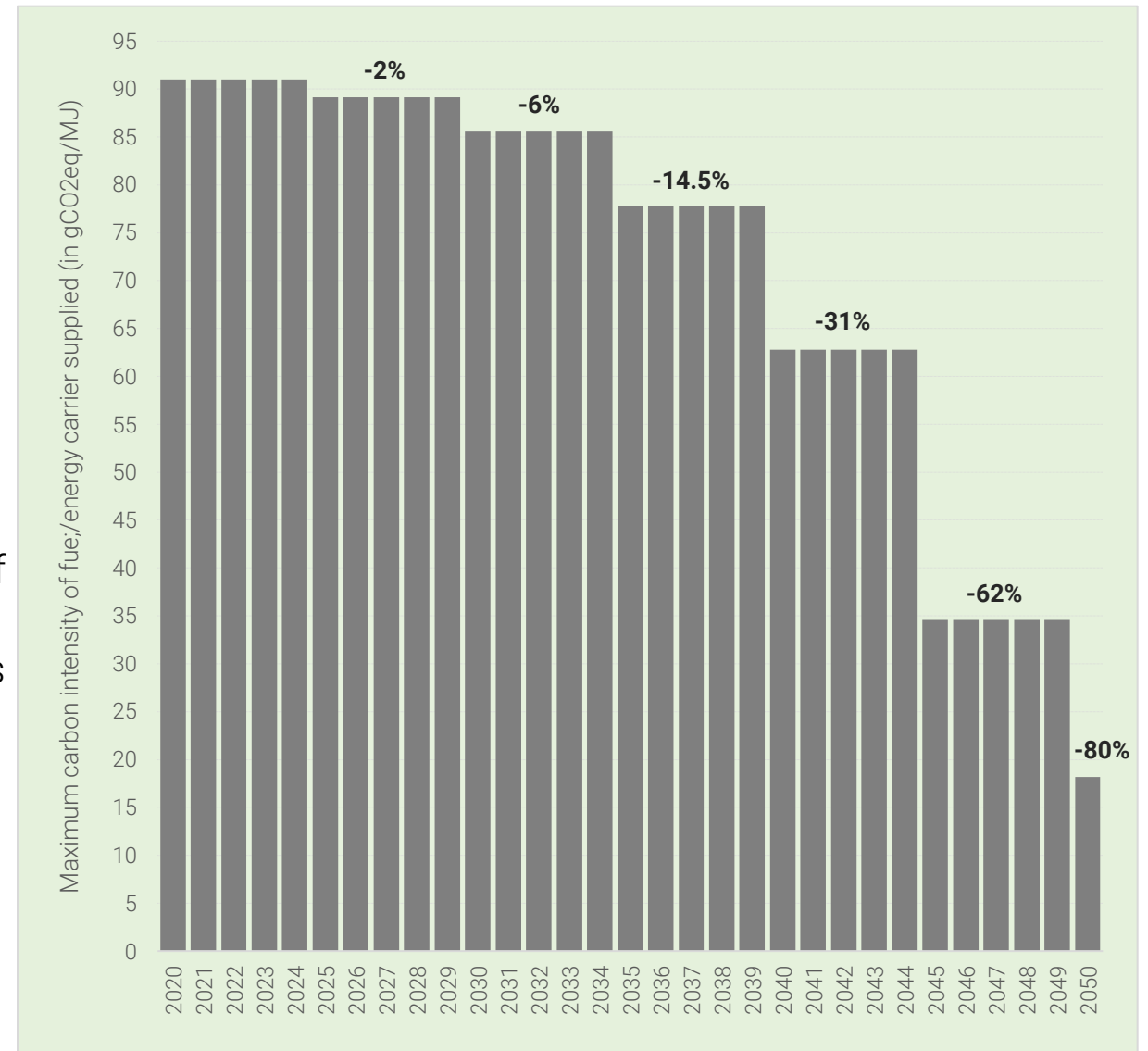
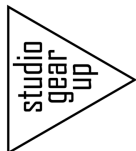
Well-to-Wheel and Tank-to-Wheel emissions of some biofuels compared to fossil



Values for biofuels: average numbers taken from 2022 Netherlands Emission Authority report on annual obligation for year 2021

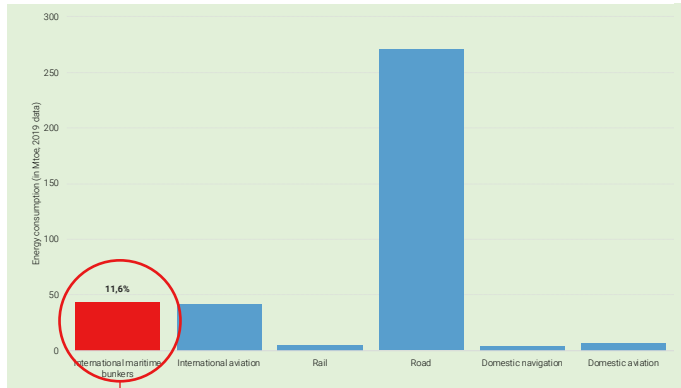
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 - In case of sustainable sourced biogenic based fuels and energy carriers these emissions are already compensated in the carbon take up at growth phase and IPCC-reported in carbon stock change when harvested.
- FuelEU Maritime starts off slowly with reduction of carbon intensity. That may suggest that lower carbon fossil can be a strategic sound choice – but it is not



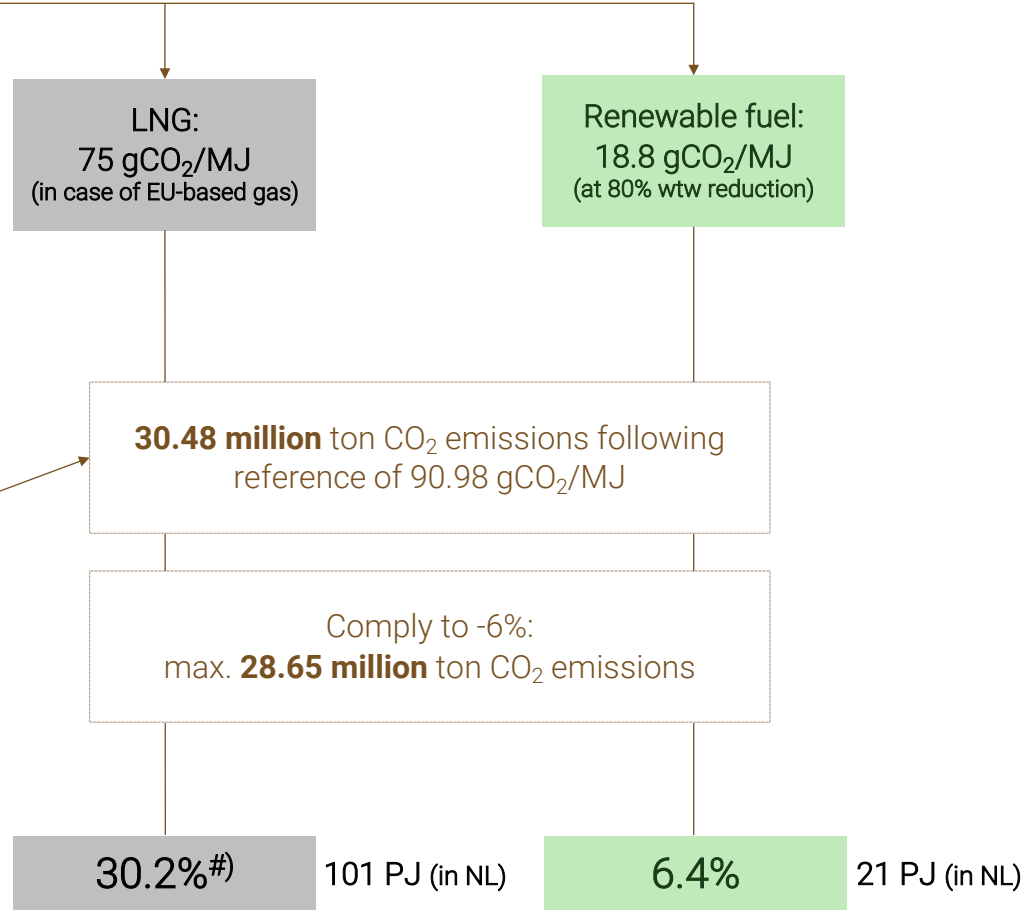
Source: Fuel EU Maritime agreed percentages for carbon intensity reduction. Reference value of 90,98 gCO₂eq/MJ (2019-reference) taken from HCSS, CE Delft, 2023, Decarbonising maritime bunkering in the Netherlands and the embargo on Russian oil.

In 2030 carbon intensity should be 6% lower : a NL-case of using LNG versus renewable fuels to comply

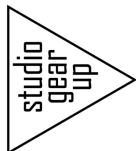


1/3rd of fuels bunkered in NL: 12 Mtoe (500 PJ)

2/3rd eligible under FuelEU Maritime*): 8 Mtoe (335 PJ)



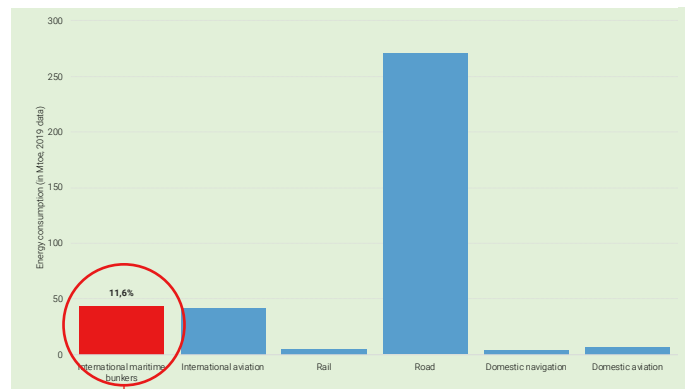
Share of fuel to comply to 2030 -6% target:



*) estimate of volume intra-european and extra-european travels.

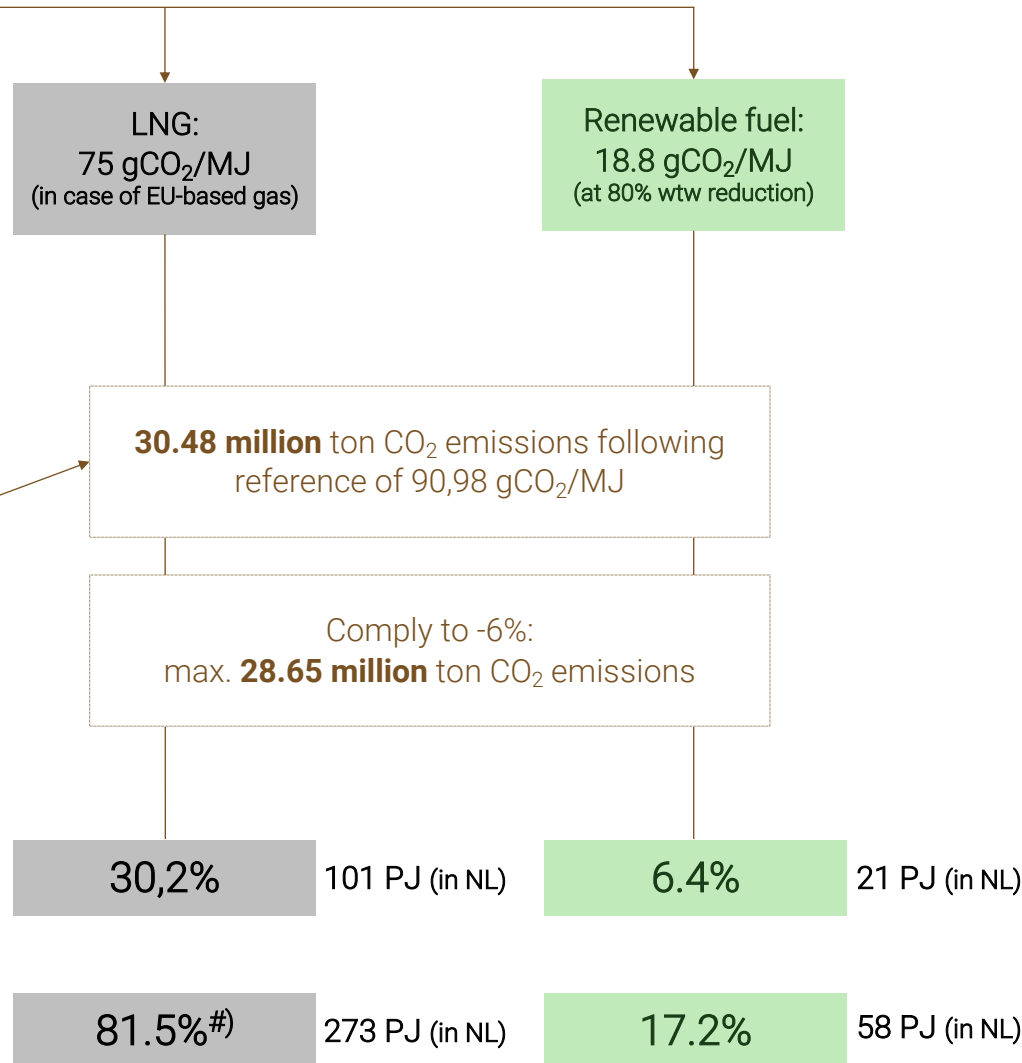
#) LNG share in 2019 was 4%, resulting in the 90.98 gCO₂/MJ reference number. Total share of LNG in 2030 thus would be 4+30.2=34.2% to comply to FuelEU Maritime

In 2030 carbon intensity should be 6% lower : a NL-case of using LNG versus renewable fuels to comply



1/3rd of fuels bunkered in NL:
12 Mtoe (500 PJ)

2/3rd eligible under FuelEu Maritime*):
8 Mtoe (335 PJ)



Share of fuel to comply to 2030 -6% target:

30,2%

101 PJ (in NL)

6.4%

21 PJ (in NL)

Share of fuel to comply to 2035 -14.5% target:

81.5%#)

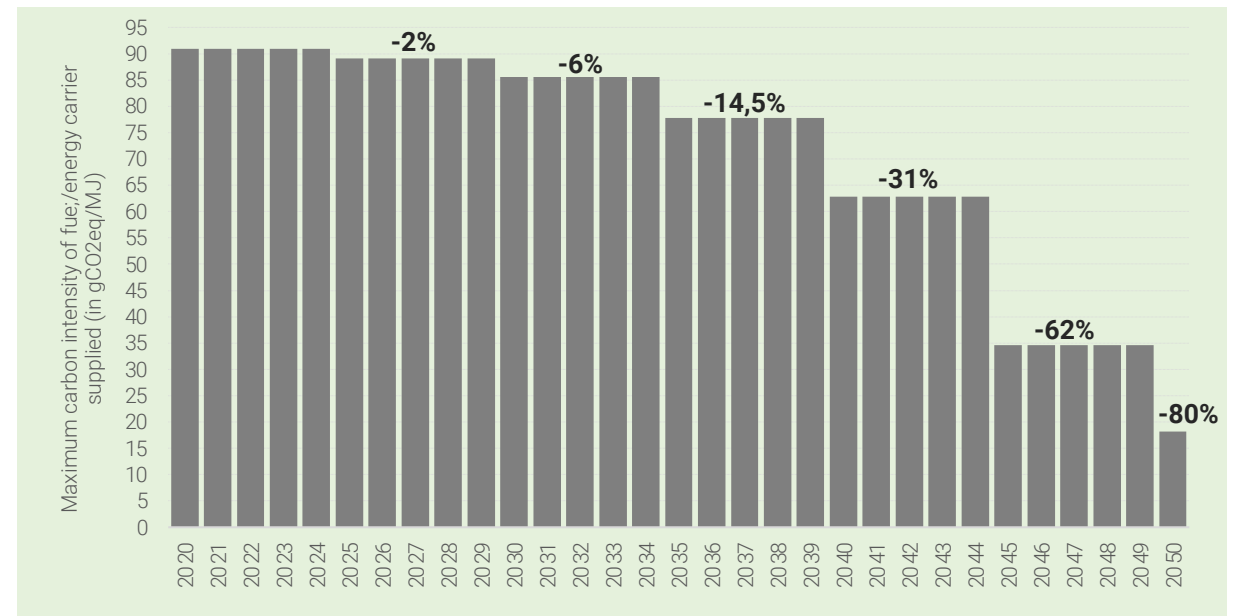
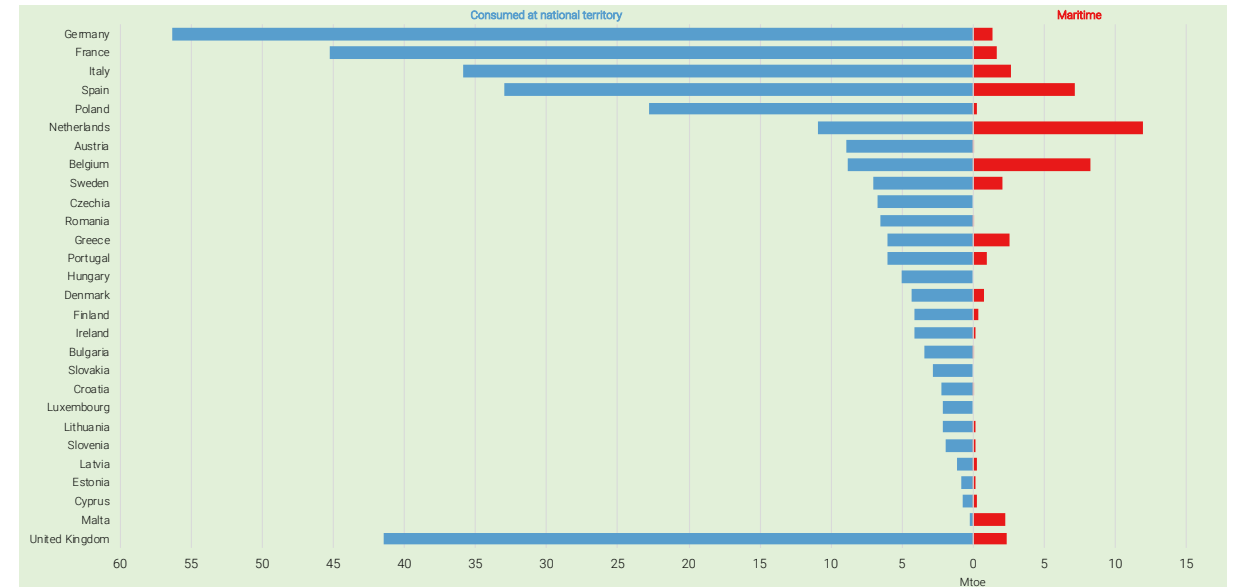
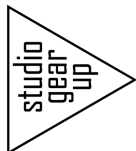
273 PJ (in NL)

17.2%

58 PJ (in NL)

To conclude:

- FuelEU Maritime steers on gradually further reducing carbon intensity of energy used in sector
- Full life cycle approach covers best the path towards lower carbon intensity and climate neutrality, in a technology agnostic manner
- FuelEU Maritime takes off only moderately – it secures competitiveness towards other maritime regions – but obligated parties may be tempted to stick to lower carbon fossil fuels
- LNG case shows high number of adapted ships needed, that may come obsolete over time
- Early shift to renewable carbon fuels with lowest overall carbon intensity that fit in existing vessel engines provides 'smooth' compliance, while allowing the introduction of new fuel/energy carrier – engine vessels in the longer run when carbon intensity starts to drop more rapidly
- The Netherlands maritime sector now already over-complies to FuelEU Maritime Regulation due to opt-in under RED – NL Maritime fuel suppliers and sector learn, take pole position, and set the direction



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