Environmental Life Cycle Assessment of DME produced from biomass

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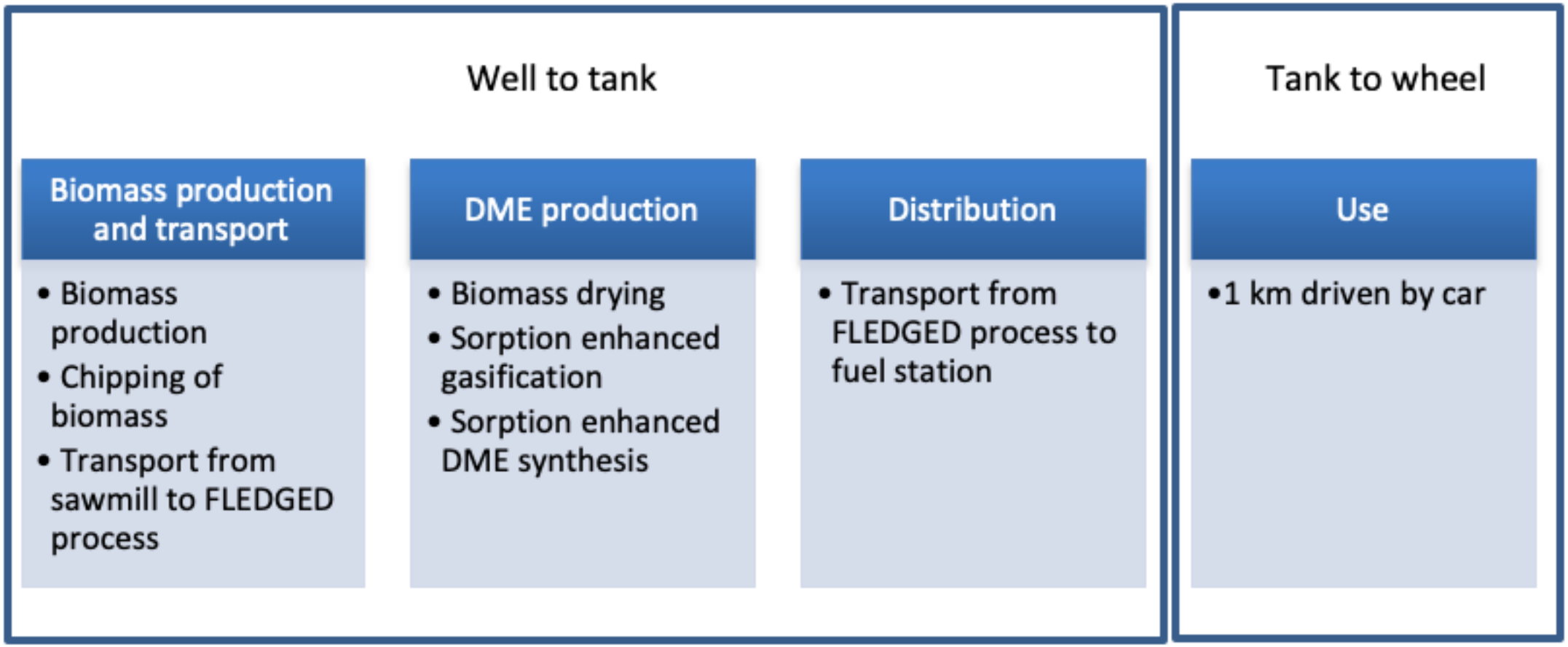
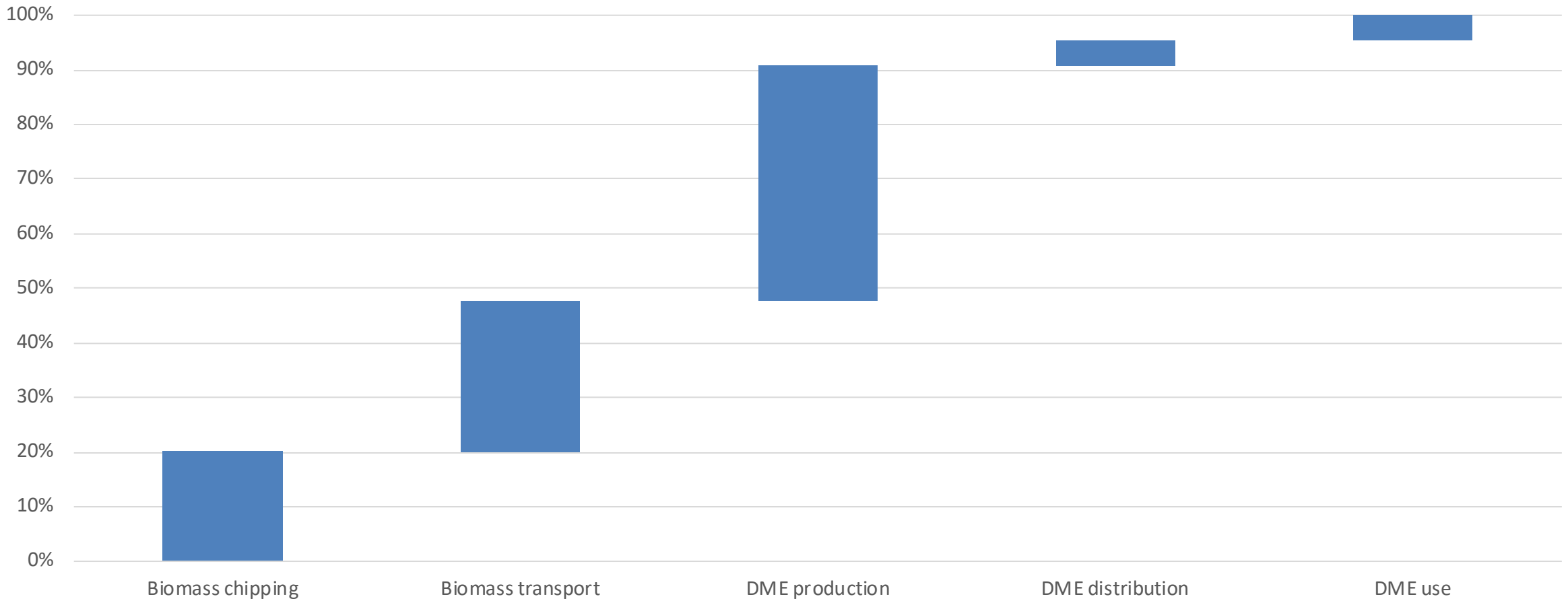
Life Cycle Assessment



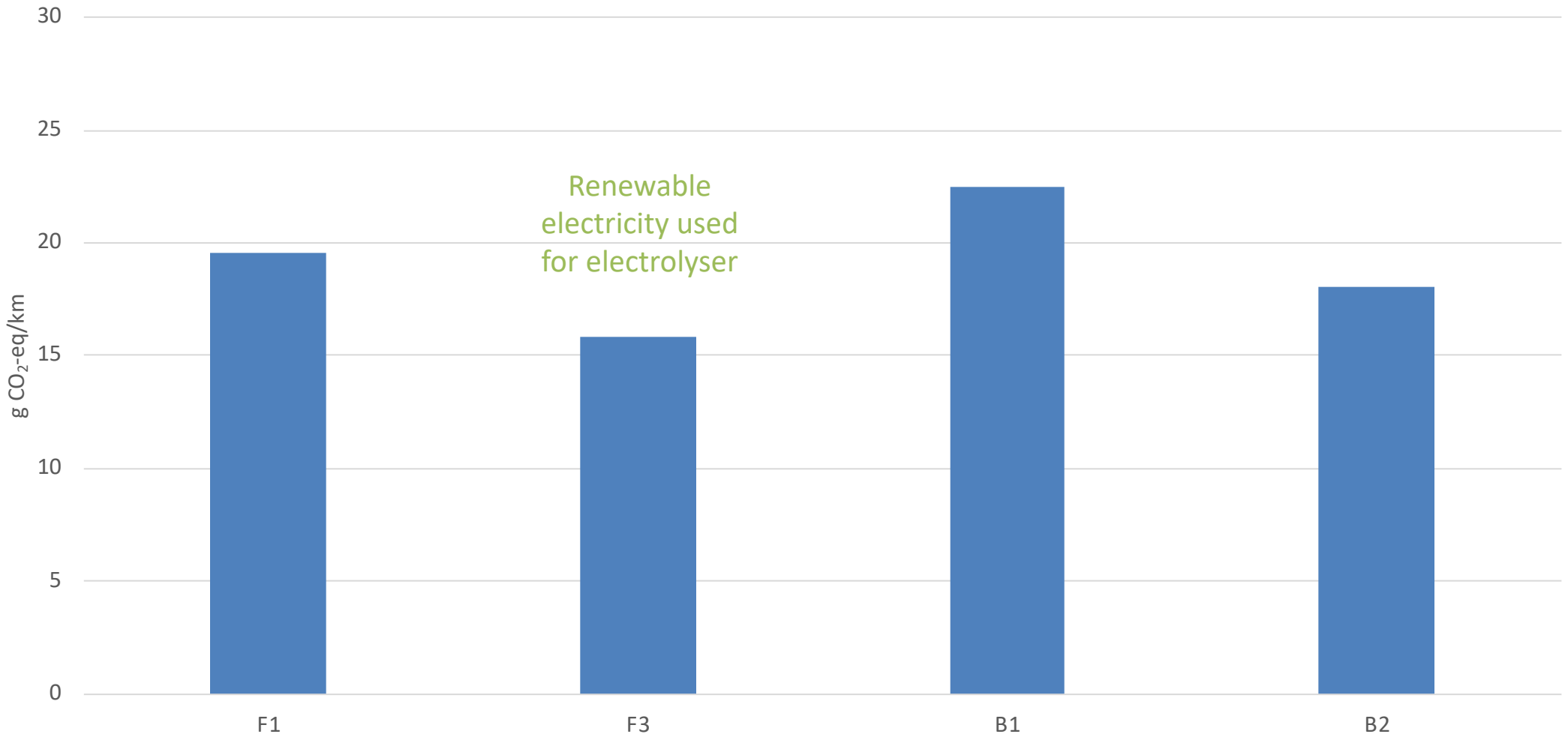
Scenarios

- **F1 - baseline case**, where the novel SEG and SEDMES process units are integrated in a biomass to DME plant
- **F2 - CCS case**, in which the sorbent regeneration in SEG is performed using pure oxygen from an air separation unit, hence producing a CO_2-rich stream that can be stored or utilized after purification.
- **F3 - Hydrogen case**, which includes an electrolysis system able to provide hydrogen when renewable electricity price is sufficiently low. This case involves a reduction of the amount of CO_2 separated in SEG.
- **B1 – Benchmark case,** with **indirect** biomass gasification and indirect DME synthesis
- **B2 – Benchmark case,** with **direct** biomass gasification and indirect DME synthesis

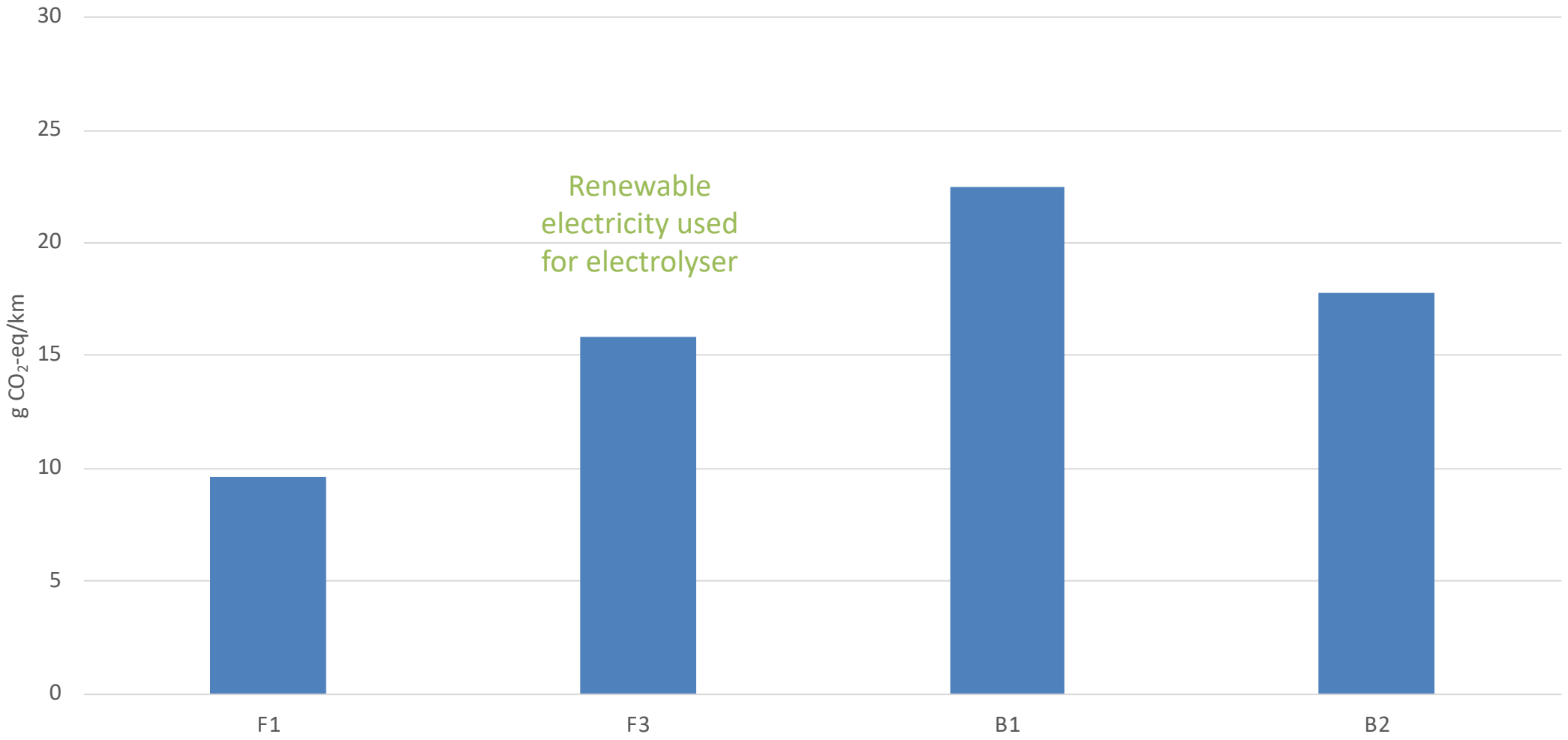
Climate change impact – Baseline case environmental hotspot



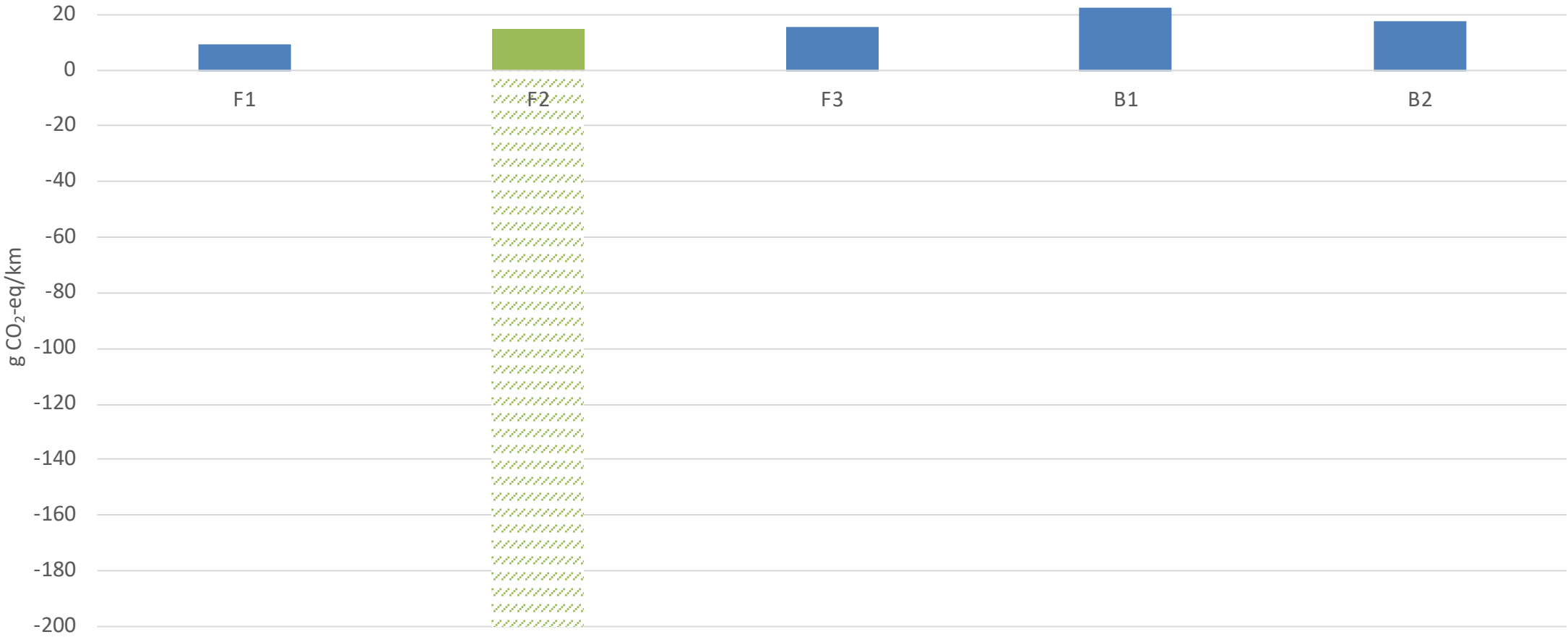
Climate change impact - Scenarios



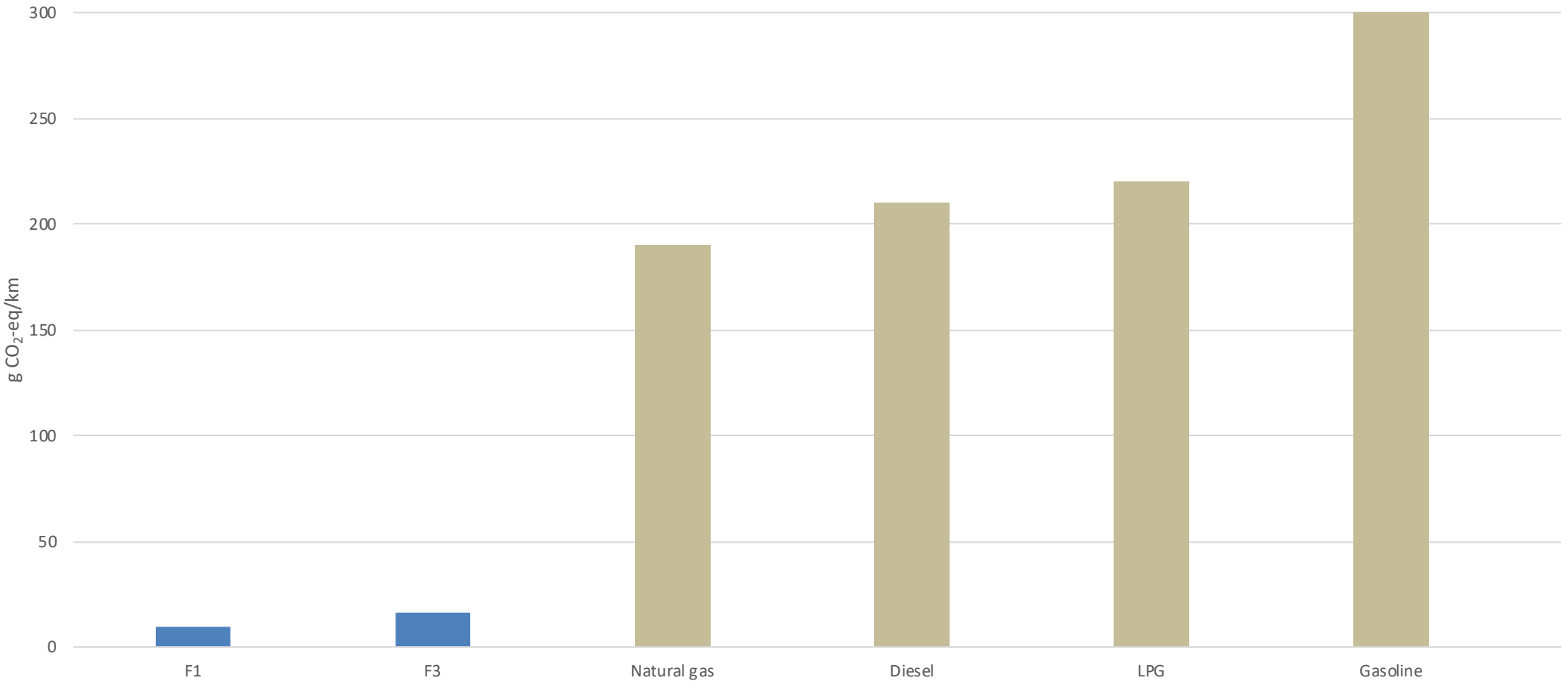
Climate change impact - Electricity surplus fed into the grid



Climate change impact – Scenario F2 with CCS

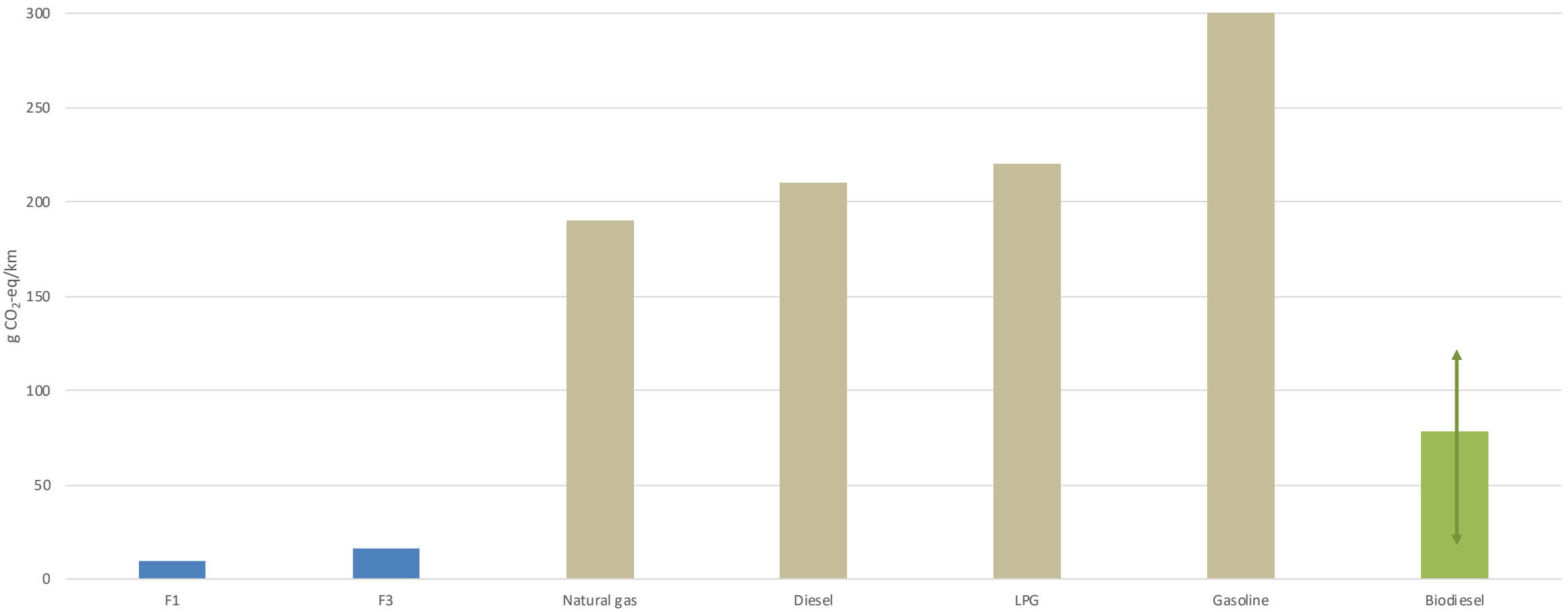


Climate change impact – Comparison with other fuels



Source: LCI database ecoinvent

Climate change impact – Comparison with other fuels



Source: LCI database ecoinvent

Conclusions

- In terms of climate change impact DME produced with the FLEDGED technology (F1, F2 and F3) is much more advantageous than fossil fuels and biodiesel.
- It also performs better than DME produced with the benchmark configurations (B1 and B2). This last advantage is valid only if the electricity surplus generated is fed into the grid avoiding the production of electric energy, otherwise the impact of all the configuration assessed is very similar.
- Other than electricity surplus generation, other key parameters influencing the environmental performance are the transport of biomass and the use of auxiliary materials needed for DME production (e.g. inert gases and sorbents). To further reduce the environmental impact is therefore suggested to use locally sourced biomass and to increase the efficiency in the production of DME.
- Carbon capture (F2) is an interesting solution to be carbon-positive (i.e. to capture more CO_2 than that emitted), but only provided that CO_2 is stored and not emitted again into the atmosphere.

Thank you

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