Supplementary Materials: Techno-Economic and Life Cycle Impacts Analysis of Direct Methanation of Glycerol to Bio-Synthetic Natural Gas at a Biodiesel Refinery

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Table S1. The following table shows the potential environmental impacts of 1 kg of bio-SNG-based steam (at 10 atm) under different allocation criteria.

Environmental Category	Unidad	Mass Allocation Criteria	Energy Allocation Criteria	Economic Allocation Criteria	No Allocation
ADP	kg Sb $_{eq}$	4.39×10^{-7}	1.69×10^{-7}	3.47×10^{-8}	2.07×10^{-9}
ADP-FF	MJ	2.08	0.847	0.229	7.89×10^{-2}
GWP	kg CO_2 $_{eq}$	0.213	8.57×10^{-2}	2.20×10^{-2}	6.59×10^{-3}
ODP	kg CFC-11 $_{eq}$	2.33×10^{-8}	9.34×10^{-9}	2.37×10^{-9}	6.77×10^{-10}
HTP	kg 1,4-DB $_{eq}$	3.48×10^{-2}	1.50×10^{-2}	5.09×10^{-3}	2.69×10^{-3}
FWAEP	kg 1,4-DB $_{eq}$	3.29×10^{-2}	1.47×10^{-2}	5.64×10^{-3}	3.43×10^{-3}
MAEP	kg 1,4-DB $_{eq}$	1.11×10^{2}	49.6	18.7	11.2
TEP	kg 1,4-DB $_{eq}$	2.61×10^{-4}	1.05×10^{-4}	2.68×10^{-5}	7.83×10^{-6}
POP	kg C_2H_4 $_{eq}$	1.33×10^{-4}	5.25×10^{-5}	1.22×10^{-5}	2.43×10^{-6}
AP	kg SO_2 $_{eq}$	8.66×10^{-4}	3.47×10^{-4}	8.84×10^{-5}	2.56×10^{-5}
EP	kg PO_4 $_{eq}$	3.91×10^{-4}	1.64×10^{-4}	4.99×10^{-5}	2.23×10^{-5}

Table S2. The following table shows the modules used to undertake the calculations regarding the environmental impact assessment using the Simapro v8.4 software.

Parameter	Module
Crude glycerine	Glycerine {GLO}| market for (US) | Alloc Def, U [a]
Water	Tap water {RoW}| market for | Alloc Def, U
Electricity (medium voltage)	Electricity, medium voltage {US}| market group for | Alloc Def, U
Air	Assumed to be taken as it is from nature

[a] This module was adapted to the present work. The transport stages involved in this module were excluded and also, the module corresponding to the main raw material (glycerin from esterification of soybean oil), was also changed to reflect the different allocation criteria. The name of that module is glycerin {US}\| esterification of soybean oil \| Alloc Def, U and the requirements of phosphoric acid were excluded.