

Supplementary Information

**Greener production of dimethyl carbonate by Power-to-Fuel  
concept: A comparative techno-economic analysis**

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**Table S1** Specific energy consumption of each process.

	Oxidative carbonylation	Direct urea methanolysis	Indirect urea methanolysis via EC	Indirect urea methanolysis via PC
Electrolysis	65.11	56.07	56.25	57.57
CO <sub>2</sub> capture	4.61	4.21	4.23	4.32
LP steam	1.88	3.17	-0.08	3.30
MP steam	3.61	9.72	12.85	9.22
HP steam	0.00	0.00	3.02	4.44
Operating electricity	1.98	0.91	0.92	0.94
Total (MJ/l <sub>DE</sub> )	<b>77.18</b>	<b>74.09</b>	<b>77.18</b>	<b>79.79</b>

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**Table S2** Utility consumption of each section.

	Oxidative carbonylation	Direct urea methanolysis	Indirect urea methanolysis via EC	Indirect urea methanolysis via PC
	H <sub>2</sub> and CO <sub>2</sub> compression: 6796 kW	H <sub>2</sub> and CO <sub>2</sub> compression: 6796 kW	H <sub>2</sub> and CO <sub>2</sub> compression: 6796 kW	H <sub>2</sub> and CO <sub>2</sub> compression: 6796 kW
MS	LP steam: 22809 kW	LP steam: 22809 kW	LP steam: 22809 kW	LP steam: 22809 kW
RWGS and CO <sub>2</sub> scrubbing	Operating electricity: 13735 kW	0	0	0
		CO <sub>2</sub> compression: 1137 kW	CO <sub>2</sub> compression: 1137 kW	CO <sub>2</sub> compression: 1137 kW
Urea synthesis	0	LP steam: -19726 kW	LP steam: - 19726 kW	LP steam: -19726 kW
		MP steam: 44678 kW	MP steam: 44678 kW	MP steam: 44678 kW
	Pump: 62 kW		Pump: 37 kW	
DMC synthesis	LP steam: -88639 kW	Pump: 56 kW	LP steam: -	Pump: 45 kW
	MP steam: 31344 kW	MP steam: 40157 kW	17913 kW	MP steam: 12066 kW
			MP steam: 24846 kW	
DMC separation	LP steam: 82155 kW	LP steam: 24561 kW	LP steam: 14095 kW	LP steam: 24935 kW
			HP steam: 26297 kW	HP steam: 37749 kW
EC/PC synthesis	0	0	MP steam: 42229 kW	

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**Table S3** Fixed capital investment of each section.

	Oxidative carbonylation	Direct urea methanolysis	Indirect urea methanolysis via EC	Indirect urea methanolysis via PC
MS	46,859,504	46,859,504	46,859,504	46,859,504
RWGS	11,186,529	0	0	0
CO <sub>2</sub> scrubbing	3,404,959	0	0	0
Urea synthesis	0	33,017,603	33,017,603	33,017,603
DMC synthesis	7,644,800	3,289,256	2,388,429.8	2,636,363.6
DMC separation	18,105,500	6,307,603	8,621,818.2	8,630,578.5
EC/PC synthesis	0	0	1,368,264.5	1,370,743.8
WC	15,388,463.2	15,789,524	16280404	16,326,140
<b>Total (€)</b>	<b>102,589,754.9</b>	<b>105,263,490.5</b>	<b>108,536,023</b>	<b>108,840,933</b>

**Table S4** Cost of manufacturing of each process.

	Oxidative carbonylation	Direct urea methanolysis	Indirect urea methanolysis via EC	Indirect urea methanolysis via PC
H <sub>2</sub>	1.748	1.504	1.511	1.468
O <sub>2</sub>	0.033	0	0	0
CO <sub>2</sub>	0.246	0.245	0.246	0.240
Steam	0.084	0.185	0.260	0.396
Electricity	0.054	0.0248	0.025	0
Cooling water	0.085	0.0815	0.091	0.135
Labor	0.006	0.0058	0.006	0.006
Depreciation	0.029	0.0307	0.032	0.038
OPEX	0.120	0.118	0.123	0.135
Total (€/l <sub>DE</sub> )	<b>2.41</b>	<b>2.19</b>	<b>2.29</b>	<b>2.42</b>