

Supercritical Direct-Methane-to-Methanol Coupled with Gas-to-Wire for Low-Emission Offshore Processing of CO₂-Rich Natural Gas: Techno-Economic and Thermodynamic Analyses

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SUPPLEMENTARY MATERIALS

Table S1. Data for FCI calculation.

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Equipment Simulation TAG	Equipment Type	Capacity Parameter Value	Capacity Correlation Limit	FCI/Eq Correlation Prediction (MMUSD)	FCI/Eq Scale-up Correction (MMUSD)	Qty	Onshore FCI/Eq (MMUSD)	Offshore FCI Factor	Offshore FCI/Eq (MMUSD)
K-FC1	Compressor	1830 kW	3000 kW	2.87	2.87	1	2.87	2	5.73
K-FC2	Compressor	1917 kW	3000 kW	2.96	2.96	1	2.96	2	5.92
K-FC3	Compressor	1900 kW	3000 kW	2.94	2.94	1	2.94	2	5.88
K-FC4	Compressor	1907 kW	3000 kW	2.95	2.95	1	2.95	2	5.90
K-FC5	Compressor	1905 kW	3000 kW	2.94	2.94	1	2.94	2	5.88
K-FC6	Compressor	13461 kW	3000 kW	3.99	9.82	1	9.82	2	19.63
K-FC7	Compressor	11473 kW	3000 kW	3.99	8.92	1	8.92	2	17.84
K-FC1	Compressor	13761 kW	3000 kW	3.99	9.95	1	9.95	2	19.89
K-FC2	Compressor	12755 kW	3000 kW	3.99	9.50	1	9.50	2	19.01
K-FC3	Compressor	12297 kW	3000 kW	3.99	9.30	1	9.30	2	18.60
K-FC4	Compressor	11649 kW	3000 kW	3.99	9.00	1	9.00	2	18.00
K-SC	Compressor	9125 kW	3000 kW	3.99	7.77	1	7.77	2	15.55
HE-FC1	Heat Exch.	182 m ²	1000 m ²	0.24	0.24	1	0.24	1	0.24
HE-FC2	Heat Exch.	208 m ²	1000 m ²	0.25	0.25	1	0.25	1	0.25
HE-FC3	Heat Exch.	197 m ²	1000 m ²	0.26	0.26	1	0.26	1	0.26
HE-FC4	Heat Exch.	95 m ²	1000 m ²	0.21	0.21	1	0.21	1	0.21
HE-FC5	Heat Exch.	104 m ²	1000 m ²	0.24	0.24	1	0.24	1	0.24
HE-FC6	Heat Exch.	1172 m ²	1000 m ²	0.71	0.78	1	0.78	1	0.78
HE-FC7	Heat Exch.	1458 m ²	1000 m ²	0.77	0.96	1	0.96	1	0.96
HE-DR1	Heat Exch.	7 m ²	1000 m ²	0.15	0.15	1	0.15	1	0.15
HE-DR2	Heat Exch.	66 m ²	1000 m ²	0.17	0.17	1	0.17	1	0.17
HE-DR3	Heat Exch.	307 m ²	1000 m ²	0.38	0.38	1	0.38	1	0.38
HE-DR4	Heat Exch.	16 m ²	1000 m ²	0.16	0.16	1	0.16	1	0.16
HE-MWS1	Heat Exch.	1567 m ²	1000 m ²	0.61	0.80	1	0.80	1	0.80
HE-MWS2	Heat Exch.	29 m ²	1000 m ²	0.14	0.14	1	0.14	1	0.14
HE-MWS3	Heat Exch.	25 m ²	1000 m ²	0.13	0.13	1	0.13	1	0.13
HE-MWS4	Heat Exch.	1635 m ²	1000 m ²	0.61	0.82	1	0.82	1	0.82
HE-RC	Heat Exch.	3760 m ²	1000 m ²	0.61	1.36	4	5.43	1	5.43
HE-PCC	Heat Exch.	50404 m ²	1000 m ²	0.61	6.45	1	6.45	1	6.45

HE-MEA	Heat Exch.	16910 m ²	1000 m ²	0.61	3.35	1	3.35	1	3.35
HE-FC1	Heat Exch.	2909 m ²	1000 m ²	0.61	1.16	1	1.16	1	1.16
HE-FC2	Heat Exch.	2128 m ²	1000 m ²	0.61	0.97	1	0.97	1	0.97
HE-FC3	Heat Exch.	2014 m ²	1000 m ²	0.63	0.96	1	0.96	1	0.96
HE-FC4	Heat Exch.	1534 m ²	1000 m ²	0.68	0.88	1	0.88	1	0.88
HE-TEG1	Heat Exch.	88 m ²	1000 m ²	0.20	0.20	1	0.20	1	0.20
HE-TEG2	Heat Exch.	14 m ²	1000 m ²	0.12	0.12	1	0.12	1	0.12
HE-SGU	Heat Exch.	13 m ²	1000 m ²	0.14	0.14	1	0.14	1	0.14
HE-SC1	Heat Exch.	2186 m ²	1000 m ²	0.77	1.23	1	1.23	1	1.23
HE-SC2	Heat Exch.	1508 m ²	1000 m ²	0.77	0.98	1	0.98	1	0.98
Cd-MWS1	Condenser	2 m ²	1000 m ²	0.12	0.12	1	0.12	1	0.12
Cd-MWS2	Condenser	1058 m ²	1000 m ²	0.61	0.63	1	0.63	1	0.63
Cd-MWS3	Condenser	582 m ²	1000 m ²	0.43	0.43	1	0.43	1	0.43
Cd-PCC	Condenser	29273 m ²	1000 m ²	0.61	4.65	1	4.65	1	4.65
Cd-TEG	Condenser	67 m ²	1000 m ²	0.17	0.17	1	0.17	1	0.17
Rb-MWS1	Reboiler	162 m ²	1000 m ²	0.78	0.78	1	0.78	1	0.78
Rb-MWS2	Reboiler	247 m ²	1000 m ²	0.78	0.78	1	0.78	1	0.78
Rb-MWS3	Reboiler	93 m ²	1000 m ²	0.72	0.72	1	0.72	1	0.72
Rb-PCC	Reboiler	8765 m ²	1000 m ²	0.78	2.88	1	2.88	1	2.88
Rb-TEG	Reboiler	14 m ²	1000 m ²	0.19	0.19	1	0.19	1	0.19
PT-1	Plate Exch.	14866 m ²	1000 m ²	0.77	3.87	1	3.87	1	3.87
PT-2	Plate Exch.	9322 m ²	1000 m ²	0.61	2.34	4	9.37	1	9.37
PT-3	Plate Exch.	158029 m ²	1000 m ²	0.61	12.80	1	12.80	1	12.80
HECE	Heat Exch.	5 m ²	1000 m ²	0.12	0.12	1	0.12	1	0.12
HRSG	Heat Exch.	6446 m ²	1000 m ²	0.62	1.91	4	7.62	1	7.62
P-FC1	Pump	11.3 kW	300.0 kW	0.04	0.04	1	0.04	2	0.08
P-FC2	Pump	45.5 kW	300.0 kW	0.08	0.08	1	0.08	2	0.17
P-FC3	Pump	182.3 kW	300.0 kW	0.30	0.30	1	0.30	2	0.59
P-FC4	Pump	710.8 kW	300.0 kW	0.50	0.83	1	0.83	2	1.67
P-MWS1	Pump	0.091 kW	300.0 kW	0.02	0.02	1	0.02	2	0.05
P-MWS2	Pump	0.054 kW	300.0 kW	0.02	0.02	1	0.02	2	0.05
P-MWS3	Pump	2.0 kW	300.0 kW	0.03	0.03	1	0.03	2	0.05
P-RC	Pump	11.1 kW	300.0 kW	0.05	0.05	4	0.19	2	0.38
P-PCC1	Pump	110.6 kW	300.0 kW	0.13	0.13	1	0.13	2	0.27
P-PCC2	Pump	0.015 kW	300.0 kW	0.02	0.02	1	0.02	2	0.05

P-PPC3	Pump	1.6 kW	300.0 kW	0.03	0.03	1	0.03	2	0.05
P-PCC4	Pump	242.3 kW	300.0 kW	0.24	0.24	1	0.24	2	0.47
P-TEG1	Pump	5.4 kW	300.0 kW	0.04	0.04	1	0.04	2	0.09
P-TEG2	Pump	0.0001 kW	300.0 kW	0.02	0.02	1	0.02	2	0.05
P-SC	Pump	3714.8	300.0 kW	0.50	2.25	1	2.25	2	4.50
MWSC-1	Column	36.5 m³	520.0 m³	0.16	0.16	1	0.16	1	0.16
MWSC-2	Column	118.9 m³	520.0 m³	0.83	0.83	1	0.83	1	0.83
MWSC-3	Column	71.7 m³	520.0 m³	0.65	0.65	1	0.65	1	0.65
PCC Absorber	Column	665.0 m³	520.0 m³	4.66	5.40	1	5.40	1	5.40
PCC Stripper	Column	1952.6 m³	520.0 m³	4.22	9.34	1	9.34	1	9.34
TEG Absorber	Column	73.5 m³	520.0 m³	3.98	3.98	1	3.98	1	3.98
TEG Stripper	Column	11.0 m³	520.0 m³	0.18	0.18	1	0.18	1	0.18
V-FC1	Vessel	418.3 m³	520.0 m³	2.73	2.73	1	2.73	1	2.73
V-FC2	Vessel	196.7 m³	520.0 m³	2.05	2.05	1	2.05	1	2.05
V-FC3	Vessel	88.2 m³	520.0 m³	1.66	1.66	1	1.66	1	1.66
V-FC4	Vessel	35.5 m³	520.0 m³	1.47	1.47	1	1.47	1	1.47
V-FC1	Vessel	14.4 m³	520.0 m³	0.15	0.15	1	0.15	1	0.15
V-FC2	Vessel	5.5 m³	520.0 m³	0.09	0.09	1	0.09	1	0.09
V-FC3	Vessel	2.3 m³	520.0 m³	0.08	0.08	1	0.08	1	0.08
V-FC4	Vessel	1.0 m³	520.0 m³	0.10	0.10	1	0.10	1	0.10
V-FC5	Vessel	0.7 m³	520.0 m³	0.22	0.22	1	0.22	1	0.22
V-FC6	Vessel	19.8 m³	520.0 m³	1.22	1.22	1	1.22	1	1.22
V-DR1	Vessel	18.6 m³	520.0 m³	3.98	3.98	1	3.98	1	3.98
V-DR2	Vessel	17.8 m³	520.0 m³	0.44	0.44	1	0.44	1	0.44
V-EGR	Vessel	4311.2 m³	520.0 m³	2.38	8.48	4	33.92	1	33.92
VT1	Vessel	3.4 m³	520.0 m³	0.11	0.11	1	0.11	1	0.11
DMTM Reactor	Reactor	810.5 m³	520.0 m³	152.46	198.98	1	198.98	1	198.98
LECC	Heat Exch.	0.4 m³	520.0 m³	0.03	0.03	1	0.03	1	0.03
EXP-DR	Expander	11597 kW	4000 kW	3.28	6.21	1	6.21	2	12.43
EXP-RC	Expander	3089 kW	4000 kW	3.13	3.13	4	12.51	2	25.02
GT	Gas-Turbine			15.93	15.93	16	254.88	2	509.76
HVDC Cable	HVDC Cable								244.39
Rig Hull	Rig hull								246.00