

Supplementary Material

1 SUPPLEMENTARY FIGURES

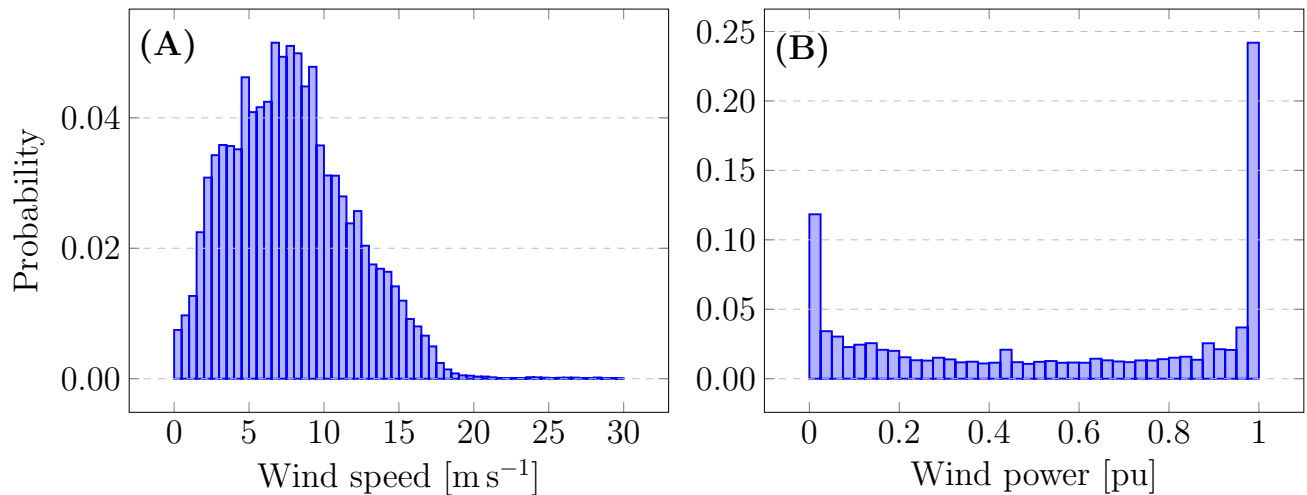


Figure S1. Probability density functions for the MET-Norway dataset of the (A) wind speed and (B) wind power.

2 RESULTS OF THE PARAMETRIC ANALYSIS

This section presents the complete set of results obtained in the parametric analysis described in section 3.2 of the paper.

Table S1. Results of the parametric analysis for different maximum sizes of the H_2 storage. Designs based on the LM2500 GT.

INPUTS													
GT number	2	2	2	2	2	2	2	2	2	2	2	2	1
Max. GT load	95 %	95 %	95 %	95 %	95 %	95 %	95 %	95 %	95 %	95 %	95 %	95 %	95 %
Min. GT load	40 %	40 %	40 %	40 %	40 %	40 %	40 %	40 %	40 %	40 %	40 %	40 %	40 %
Wind farm size [MW]	12	12	12	12	18	18	18	18	24	24	24	24	24
Max. EL stacks [MW]	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max. FC stacks [MW]	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Max. storage [kg]	5000	50000	-	-	5000	50000	-	-	5000	50000	-	-	-
OUTPUTS													
Size H2 storage [kg]	5034	50049	175340	3002807	5038	50022	81549	2044167	25245	50300	50300	50300	1611754
Size EL stacks [MW]	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Size FC stacks [MW]	3.6	3.6	3.6	12.0	3.6	3.6	3.6	12.0	3.6	3.6	3.6	3.6	12.0
CO2 emissions [Mt]	2.53	2.51	2.50	2.39	2.28	2.27	2.27	2.21	2.10	2.09	2.09	2.09	2.04

Table S2. Results of the parametric analysis for different maximum sizes of the H_2 storage. Designs based on the LM6000 GT.

INPUTS									
GT number	1	1	1	1	1	1	1	1	1
Max. GT load	95 %	95 %	95 %	95 %	95 %	95 %	95 %	95 %	95 %
Min. GT load	40 %	40 %	40 %	40 %	40 %	40 %	40 %	40 %	40 %
Wind farm size [MW]	12	12	12	18	18	18	24	24	24
Max. EL stacks [MW]	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max. FC stacks [MW]	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Max. storage [kg]	5000	50000	-	5000	50000	-	5000	50000	-
OUTPUTS									
Size H2 storage [kg]	11435	9876	9876	8337	7449	7449	6327	6221	6221
Size EL stacks [MW]	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Size FC stacks [MW]	1.1	1.1	1.1	3.6	3.6	3.6	3.6	3.6	3.6
CO2 emissions [Mt]	2.45	2.45	2.45	2.32	2.32	2.32	2.24	2.24	2.24

Table S3. Results of the parametric analysis for different maximum sizes of the electrolyser stack. Designs based on the LM2500 GT.

INPUTS		2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
GT number		2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Max. GT load		95 %	95 %	95 %	95 %	95 %	95 %	95 %	95 %	95 %	95 %	95 %	95 %	95 %	95 %	95 %
Min. GT load		40 %	40 %	40 %	40 %	40 %	40 %	40 %	40 %	40 %	40 %	40 %	40 %	40 %	40 %	40 %
Wind farm size [MW]		12	12	12	12	18	18	18	18	12	12	24	24	24	24	24
Max. EL stacks [MW]		7.0	6.0	5.0	5.0	7.0	6.0	6.0	5.0	2.5	2.5	7.0	6.0	5.0	5.0	2.5
Max. FC stacks [MW]		3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Max. storage [kg]		50000	50000	50000	50000	50000	50000	50000	50000	50000	50000	50000	50000	50000	50000	50000
OUTPUTS																
Size H2 storage [kg]		50004	50049	50042	-	50037	50022	50022	50030	50005	50298	50300	50288	50002		
Size EL stacks [MW]		7.0	6.0	5.0	-	5.2	6.0	6.0	5.0	2.5	7.0	6.0	5.0	2.5		
Size FC stacks [MW]		3.6	3.6	3.6	-	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6		
CO2 emissions [Mt]		2.51	2.51	2.51	-	2.27	2.27	2.27	2.28	2.28	2.10	2.09	2.09	2.10		

Table S4. Results of the parametric analysis for different maximum sizes of the electrolyser stack. Designs based on the LM6000 GT.

INPUTS												
GT number	1	1	1	1	1	1	1	1	1	1	1	1
Max. GT load	95 %	95 %	95 %	95 %	95 %	95 %	95 %	95 %	95 %	95 %	95 %	95 %
Min. GT load	40 %	40 %	40 %	40 %	40 %	40 %	40 %	40 %	40 %	40 %	40 %	40 %
Wind farm size [MW]	12	12	12	12	18	18	12	24	24	24	24	24
Max. EL stacks [MW]	7.0	6.0	5.0	4.0	7.0	6.0	5.0	4.0	7.0	6.0	5.0	4.0
Max. FC stacks [MW]	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Max. storage [kg]	50000	50000	50000	50000	50000	50000	50000	50000	50000	50000	50000	50000
OUTPUTS												
Size H2 storage [kg]	9912	9876	10008	9904	7245	7449	8009	7705	6336	6221	6645	6320
Size EL stacks [MW]	7.0	6.0	4.0	5.0	7.0	6.0	4.0	5.0	7.0	6.0	4.0	5.0
Size FC stacks [MW]	1.1	1.1	1.1	1.1	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
CO2 emissions [Mt]	2.45	2.45	2.45	2.45	2.32	2.32	2.32	2.32	2.24	2.24	2.25	2.25

Table S5. Results of the parametric analysis for different maximum sizes of the fuel cell stack. Designs based on the LM6000 GT.

INPUTS		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
GT number		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Max. GT load		95 %	95 %	95 %	95 %	95 %	95 %	95 %	95 %	95 %	95 %	95 %	95 %	95 %	95 %	95 %	95 %	95 %	95 %	95 %
Min. GT load		40 %	40 %	40 %	40 %	40 %	40 %	40 %	40 %	40 %	40 %	40 %	40 %	40 %	40 %	40 %	40 %	40 %	40 %	40 %
Wind farm size [MW]		12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Max. EL stacks [MW]		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max. FC stacks [MW]		6.0	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Max. storage [kg]		50000	50000	50000	50000	50000	50000	50000	50000	50000	50000	50000	50000	50000	50000	50000	50000	50000	50000	50000
OUTPUTS																				
Size H2 storage [kg]		9876	9876	9876	9876	9876	9876	9876	9876	9876	9876	9876	9876	9876	9876	9876	9876	9876	9876	9876
Size EL stacks [MW]		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Size FC stacks [MW]		1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
CO2 emissions [Mt]		2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.45