

# Average Clean Energy Factor Compared to Natural Gas Power Plant Heat Rate- 2017

## Sabreez's Clean Energy Factor (CEF)



Wind Number + Solar Boost = Clean Energy Factor (CEF)

$$\left( \frac{\text{Wind Power Resources}}{\text{Thermal Resources}} \times 100 \right) + \left( \frac{\text{Solar Power Resources}}{\text{Thermal Resources}} \times C \right) = \text{Clean Energy Factor (CEF)}$$

Where:

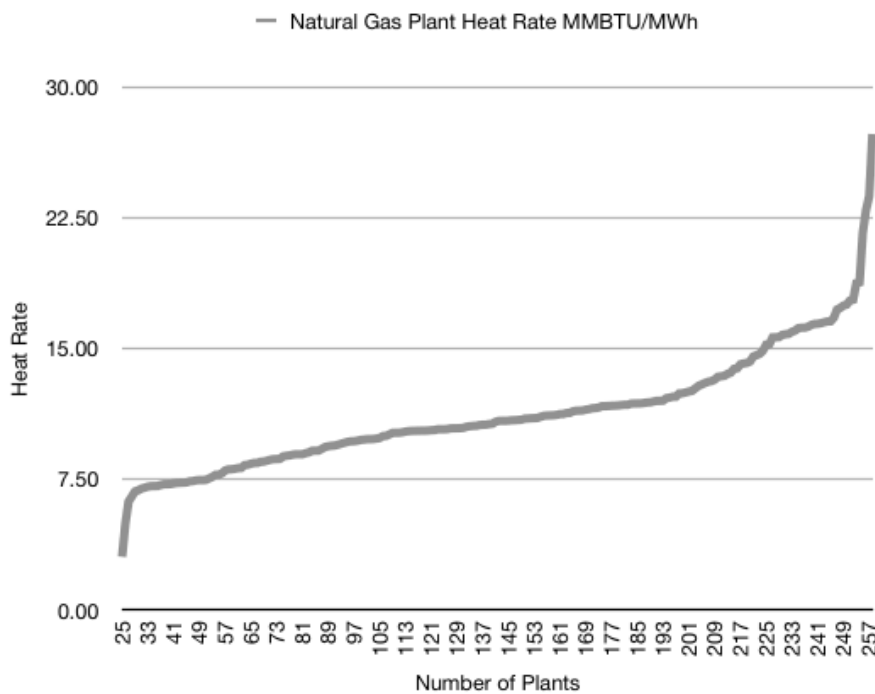
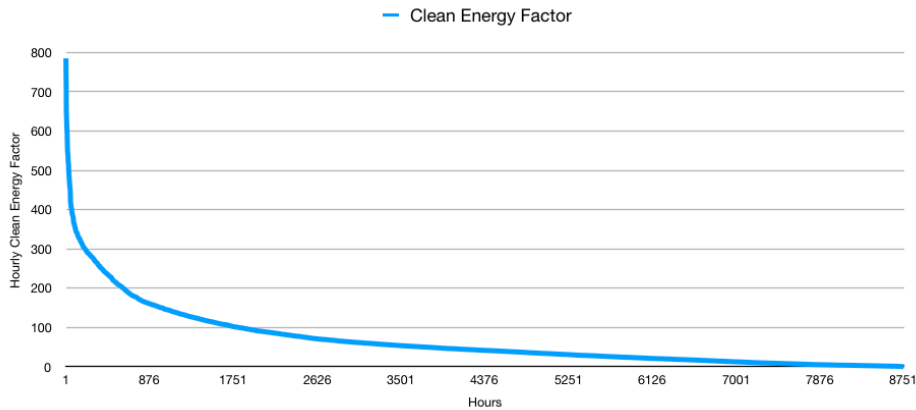
Clean Energy Factor (CEF) is a Measure of Clean Energy Resources Relative to Power from Fossil Fuel Burning Plants

Wind Power Resources= Regional Wind Power Resources

Thermal Resources= Regional Natural Gas + Coal Power Resources

Solar Power Resources= Regional Solar Power Resources

C= Constant Based on Current Regional Solar Development Relative to Wind Development

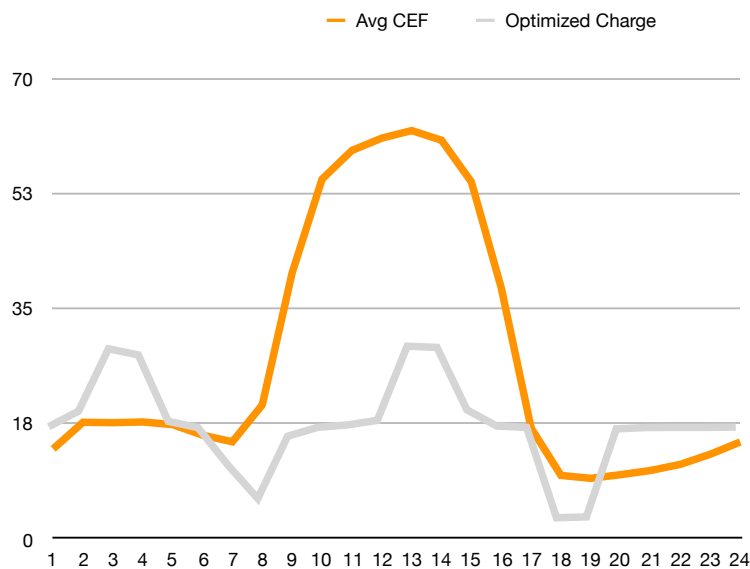


# Average Clean Energy Factor Compared to Optimal Charge/Discharge for data from 2017

January

Hour	CEF	days	Avg CEF	Optimized Discharge	Optimized Charge
1	424	31	14	-10	10
2	549	31	18	-236	236
3	548	31	18	-1135	1135
4	551	31	18	-1047	1047
5	538	31	17	-88	88
6	489	31	16	4	-4
7	457	31	15	544	-544
8	631	31	20	1027	-1027
9	1253	31	40	127	-127
10	1694	31	55	0	0
11	1829	31	59	-36	36
12	1888	31	61	-102	102
13	1923	31	62	-1172	1172
14	1878	31	61	-1155	1155
15	1682	31	54	-254	254
16	1182	31	38	-20	20
17	522	31	17	0	0
18	299	31	10	1304	-1304
19	285	31	9	1292	-1292
20	303	31	10	21	-21
21	322	31	10	2	-2
22	351	31	11	0	0
23	399	31	13	0	0
24	457	31	15	-4	4

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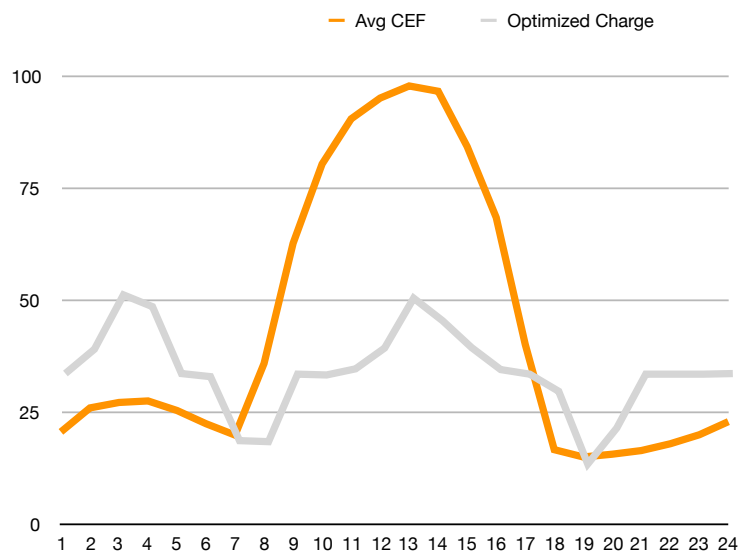


# Average Clean Energy Factor Compared to Optimal Charge/Discharge for data from 2017

February

Hour	CEF	days	Avg CEF	Optimized Discharge	Optimized Charge
1	577	28	21	-10	10
2	727	28	26	-371	371
3	761	28	27	-1178	1178
4	770	28	28	-1003	1003
5	710	28	25	-9	9
6	628	28	22	37	-37
7	557	28	20	988	-988
8	1005	28	36	1003	-1003
9	1756	28	63	0	0
10	2252	28	80	12	-12
11	2535	28	91	-79	79
12	2665	28	95	-388	388
13	2741	28	98	-1129	1129
14	2707	28	97	-793	793
15	2361	28	84	-394	394
16	1917	28	68	-68	68
17	1124	28	40	0	0
18	465	28	17	255	-255
19	420	28	15	1335	-1335
20	437	28	16	801	-801
21	460	28	16	0	0
22	503	28	18	0	0
23	559	28	20	0	0
24	641	28	23	-9	9

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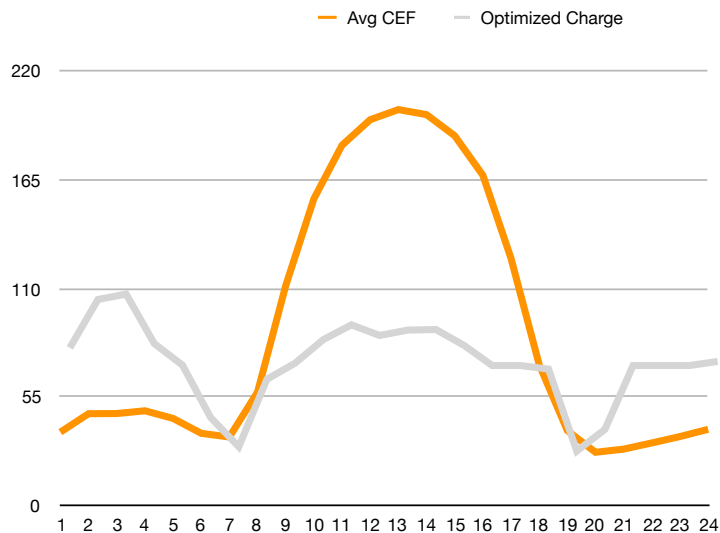


Average Clean Energy Factor Compared to Optimal Charge/Discharge for data from 2017

March

Hour	CEF	days	Avg CEF	Optimized Discharge	Optimized Charge
1	1157	31	37	-309	309
2	1447	31	47	-1156	1156
3	1449	31	47	-1250	1250
4	1493	31	48	-384	384
5	1373	31	44	-7	7
6	1139	31	37	909	-909
7	1081	31	35	1421	-1421
8	1786	31	58	240	-240
9	3456	31	111	-42	42
10	4821	31	156	-453	453
11	5662	31	183	-712	712
12	6062	31	196	-526	526
13	6221	31	201	-620	620
14	6142	31	198	-630	630
15	5810	31	187	-352	352
16	5191	31	167	0	0
17	3886	31	125	0	0
18	2217	31	72	63	-63
19	1182	31	38	1497	-1497
20	841	31	27	1117	-1117
21	891	31	29	0	0
22	988	31	32	0	0
23	1088	31	35	0	0
24	1202	31	39	-71	71

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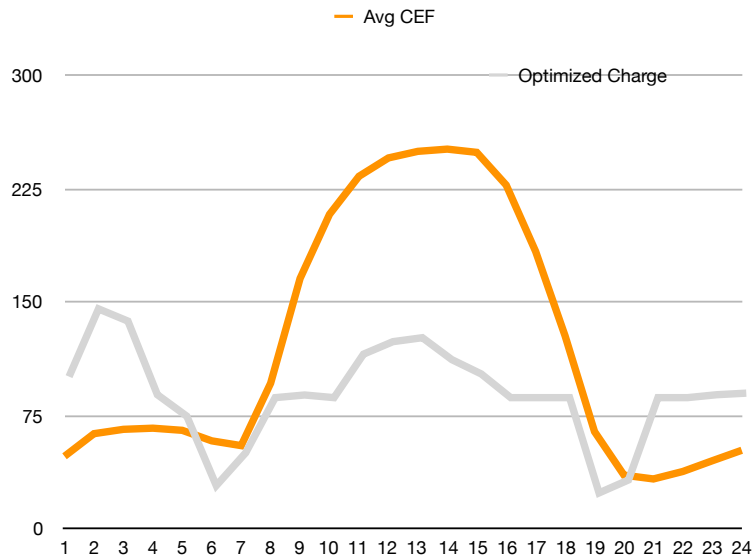


Average Clean Energy Factor Compared to Optimal Charge/Discharge for data from 2017

April

Hour	CEF	days	Avg CEF	Optimized Discharge	Optimized Charge
1	1444	30	48	-308	308
2	1892	30	63	-1300	1300
3	1978	30	66	-1121	1121
4	2001	30	67	-43	43
5	1958	30	65	272	-272
6	1750	30	58	1288	-1288
7	1655	30	55	807	-807
8	2892	30	96	0	0
9	4968	30	166	-39	39
10	6238	30	208	0	0
11	6992	30	233	-637	637
12	7356	30	245	-820	820
13	7486	30	250	-878	878
14	7530	30	251	-557	557
15	7466	30	249	-347	347
16	6818	30	227	0	0
17	5503	30	183	0	0
18	3831	30	128	0	0
19	1933	30	64	1395	-1395
20	1070	30	36	1205	-1205
21	995	30	33	0	0
22	1143	30	38	0	0
23	1355	30	45	-43	43
24	1563	30	52	-66	66

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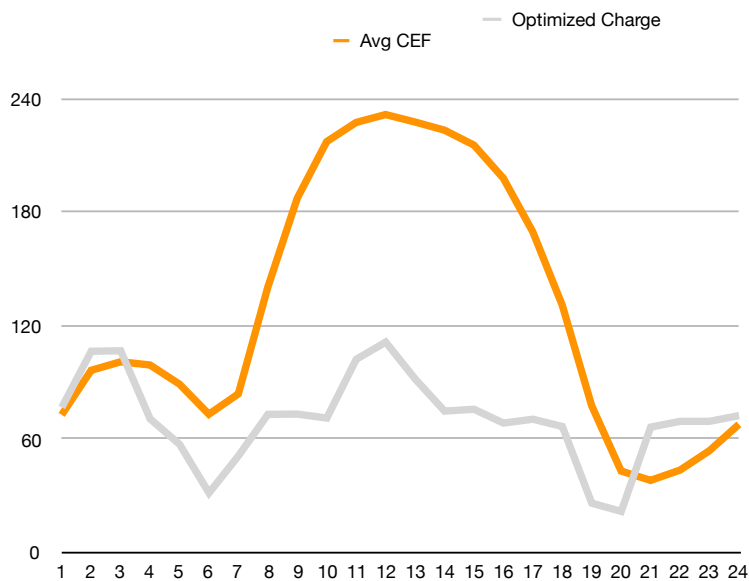


Average Clean Energy Factor Compared to Optimal Charge/Discharge for data from 2017

May

Hour	CEF	days	Avg CEF	Optimized Discharge	Optimized Charge
1	2260	31	73	-203	203
2	2990	31	96	-1026	1026
3	3129	31	101	-1033	1033
4	3077	31	99	-36	36
5	2763	31	89	337	-337
6	2270	31	73	1049	-1049
7	2604	31	84	505	-505
8	4351	31	140	-102	102
9	5808	31	187	-106	106
10	6736	31	217	-48	48
11	7050	31	227	-908	908
12	7179	31	232	-1160	1160
13	7057	31	228	-621	621
14	6923	31	223	-150	150
15	6679	31	215	-177	177
16	6136	31	198	26	-26
17	5258	31	170	-31	31
18	4056	31	131	76	-76
19	2409	31	78	1199	-1199
20	1339	31	43	1319	-1319
21	1187	31	38	85	-85
22	1355	31	44	0	0
23	1673	31	54	0	0
24	2104	31	68	-84	84

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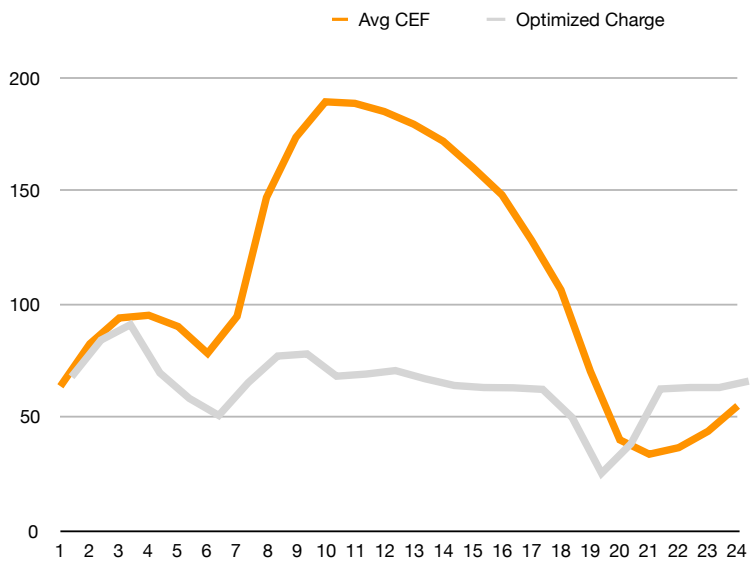


# Average Clean Energy Factor Compared to Optimal Charge/Discharge for data from 2017

June

Hour	CEF	days	Avg CEF	Optimized Discharge	Optimized Charge
1	1916	30	64	-157	157
2	2477	30	83	-695	695
3	2818	30	94	-921	921
4	2854	30	95	-214	214
5	2705	30	90	159	-159
6	2351	30	78	409	-409
7	2839	30	95	-71	71
8	4411	30	147	-461	461
9	5205	30	174	-492	492
10	5674	30	189	-166	166
11	5653	30	188	-197	197
12	5545	30	185	-248	248
13	5378	30	179	-129	129
14	5153	30	172	-30	30
15	4810	30	160	0	0
16	4443	30	148	4	-4
17	3845	30	128	27	-27
18	3189	30	106	438	-438
19	2114	30	70	1255	-1255
20	1208	30	40	823	-823
21	1019	30	34	21	-21
22	1105	30	37	0	0
23	1322	30	44	0	0
24	1656	30	55	-94	94

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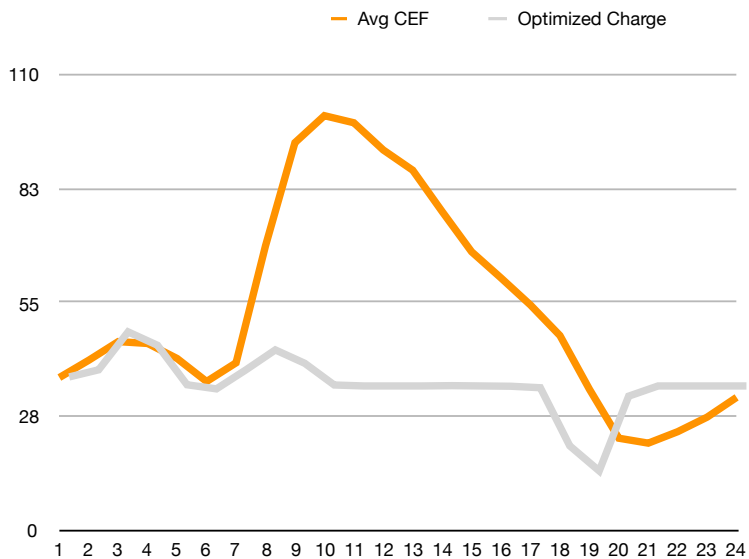


Average Clean Energy Factor Compared to Optimal Charge/Discharge for data from 2017

July

Hour	CEF	days	Avg CEF	Optimized Discharge	Optimized Charge
1	1143	31	37	-151	151
2	1273	31	41	-270	270
3	1412	31	46	-905	905
4	1398	31	45	-680	680
5	1285	31	41	-20	20
6	1113	31	36	49	-49
7	1253	31	40	-269	269
8	2131	31	69	-603	603
9	2906	31	94	-379	379
10	3109	31	100	-16	16
11	3055	31	99	0	0
12	2851	31	92	0	0
13	2699	31	87	0	0
14	2389	31	77	-5	5
15	2087	31	67	0	0
16	1890	31	61	5	-5
17	1687	31	54	30	-30
18	1458	31	47	1003	-1003
19	1055	31	34	1422	-1422
20	687	31	22	171	-171
21	650	31	21	0	0
22	736	31	24	0	0
23	845	31	27	0	0
24	994	31	32	0	0

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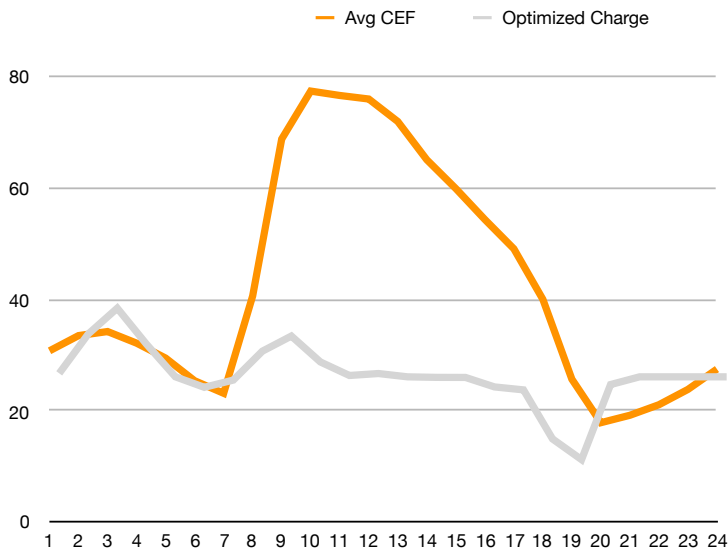


Average Clean Energy Factor Compared to Optimal Charge/Discharge for data from 2017

August

Hour	CEF	days	Avg CEF	Optimized Discharge	Optimized Charge
1	953	31	31	-52	52
2	1038	31	33	-637	637
3	1060	31	34	-1020	1020
4	996	31	32	-489	489
5	913	31	29	-1	1
6	788	31	25	156	-156
7	718	31	23	48	-48
8	1257	31	41	-381	381
9	2127	31	69	-606	606
10	2392	31	77	-221	221
11	2368	31	76	-20	20
12	2348	31	76	-49	49
13	2224	31	72	0	0
14	2012	31	65	8	-8
15	1852	31	60	9	-9
16	1681	31	54	150	-150
17	1519	31	49	194	-194
18	1239	31	40	923	-923
19	796	31	26	1230	-1230
20	555	31	18	115	-115
21	596	31	19	0	0
22	655	31	21	0	0
23	739	31	24	0	0
24	852	31	27	0	0

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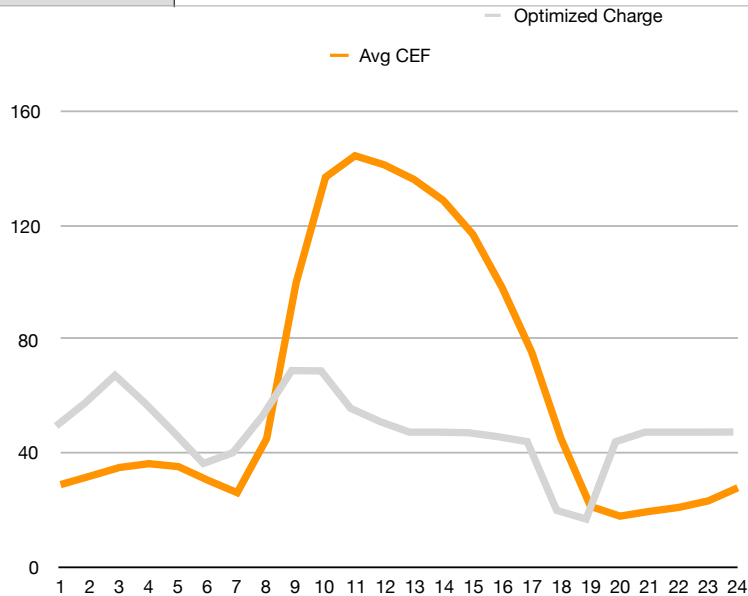


Average Clean Energy Factor Compared to Optimal Charge/Discharge for data from 2017

September

Hour	CEF	days	Avg CEF	Optimized Discharge	Optimized Charge
1	864	30	29	-83	83
2	953	30	32	-400	400
3	1045	30	35	-767	767
4	1085	30	36	-399	399
5	1054	30	35	4	-4
6	911	30	30	423	-423
7	779	30	26	278	-278
8	1350	30	45	-215	215
9	2997	30	100	-831	831
10	4114	30	137	-827	827
11	4340	30	145	-322	322
12	4243	30	141	-143	143
13	4089	30	136	0	0
14	3867	30	129	0	0
15	3511	30	117	8	-8
16	2944	30	98	61	-61
17	2265	30	75	128	-128
18	1348	30	45	1056	-1056
19	634	30	21	1173	-1173
20	531	30	18	129	-129
21	581	30	19	0	0
22	623	30	21	0	0
23	692	30	23	0	0
24	831	30	28	-2	2

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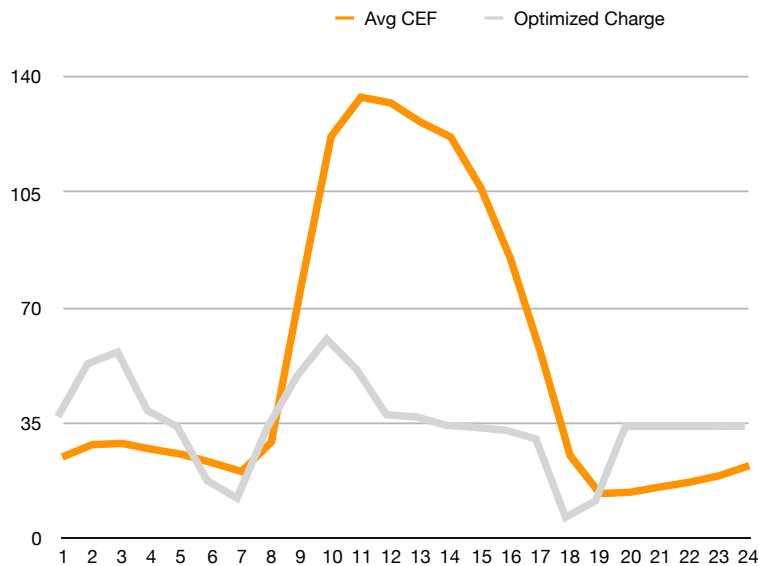


Average Clean Energy Factor Compared to Optimal Charge/Discharge for data from 2017

October

Hour	CEF	days	Avg CEF	Optimized Discharge	Optimized Charge
1	762	31	25	-140	140
2	879	31	28	-905	905
3	890	31	29	-1074	1074
4	835	31	27	-229	229
5	788	31	25	3	-3
6	710	31	23	782	-782
7	626	31	20	1035	-1035
8	903	31	29	28	-28
9	2374	31	77	-725	725
10	3783	31	122	-1260	1260
11	4152	31	134	-825	825
12	4097	31	132	-169	169
13	3916	31	126	-137	137
14	3777	31	122	-17	17
15	3305	31	107	15	-15
16	2634	31	85	56	-56
17	1758	31	57	179	-179
18	776	31	25	1311	-1311
19	418	31	13	1074	-1074
20	431	31	14	0	0
21	480	31	15	0	0
22	525	31	17	0	0
23	587	31	19	0	0
24	681	31	22	-3	3

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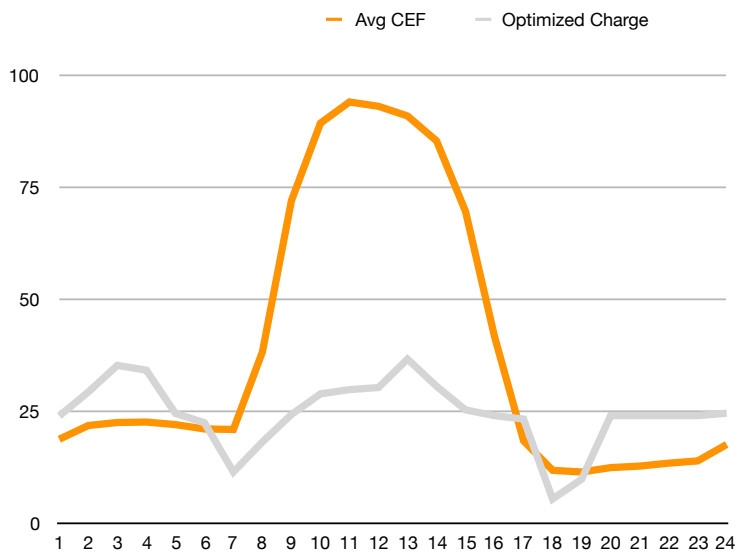


Average Clean Energy Factor Compared to Optimal Charge/Discharge for data from 2017

November

Hour	CEF	days	Avg CEF	Optimized Discharge	Optimized Charge
1	568	30	19	5	-5
2	660	30	22	-402	402
3	680	30	23	-854	854
4	683	30	23	-772	772
5	666	30	22	-38	38
6	637	30	21	119	-119
7	634	30	21	956	-956
8	1153	30	38	446	-446
9	2167	30	72	-20	20
10	2687	30	90	-370	370
11	2828	30	94	-442	442
12	2799	30	93	-478	478
13	2735	30	91	-961	961
14	2568	30	86	-500	500
15	2095	30	70	-97	97
16	1255	30	42	0	0
17	558	30	19	58	-58
18	360	30	12	1415	-1415
19	349	30	12	1080	-1080
20	378	30	13	0	0
21	388	30	13	0	0
22	408	30	14	0	0
23	423	30	14	0	0
24	533	30	18	-42	42

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Average Clean Energy Factor Compared to Optimal Charge/Discharge for data from 2017

December

Hour	CEF	days	Avg CEF	Optimized Discharge	Optimized Charge
1	364	31	12	-25	25
2	379	31	12	-307	307
3	396	31	13	-1006	1006
4	372	31	12	-887	887
5	407	31	13	-29	29
6	423	31	14	0	0
7	383	31	12	930	-930
8	654	31	21	923	-923
9	1669	31	54	0	0
10	2448	31	79	0	0
11	2683	31	87	-62	62
12	2698	31	87	-678	678
13	2698	31	87	-1385	1385
14	2577	31	83	-1024	1024
15	2127	31	69	-64	64
16	1137	31	37	0	0
17	326	31	11	0	0
18	222	31	7	1346	-1346
19	220	31	7	1248	-1248
20	233	31	8	38	-38
21	257	31	8	0	0
22	279	31	9	0	0
23	316	31	10	0	0
24	358	31	12	-9	9
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