

1 Q111. WHAT IS THE EQUIVALENT AVAILABILITY FACTOR FOR ETI'S UNITS
2 DURING THE SAME PERIOD?

3 A. Schedule H-12.3a contains the monthly and composite Equivalent Availability
4 Factor ("EAF") for each of ETI's units during the Test Year. EAF represents
5 the percentage of time that a unit is available for full load operation during a
6 specific period of time. A larger number indicates a unit is available for a
7 greater percentage during the specified time period. Planned and unplanned
8 outages and derates reduce a unit's EAF. Exhibit BG-9 shows ETI's EAF for
9 2017 through the Test Year and compares ETI's EAF to the plants in the NERC
10 for 2017 through 2020, which is the most recently available industry data. As
11 shown, the EAF for ETI's fleet, as a whole, during this time period is slightly
12 below the industry average due largely to more planned maintenance during the
13 period analyzed.

14

15 Q112. WHAT ARE YOUR CONCLUSIONS REGARDING ETI'S UNIT
16 AVAILABILITY DURING THE TEST YEAR?

17 A. The SOF, FOR, and EAF trends for ETI's fleet are comparable with those of other
18 utilities. The Company performed reasonable on-line and outage maintenance to
19 ensure that units were available for dispatch. When forced outages did occur, the
20 Company took reasonable steps to quickly restore the units to operation. Overall,
21 ETI achieved a reasonable level of unit availability during the Test Year that is
22 comparable to other utilities.

VII. PLANT EFFICIENCY

Q113. PLEASE EXPLAIN THE CONCEPT OF HEAT RATE AND HOW IT MEASURES UNIT EFFICIENCY.

A. Unit heat rate measures the thermal performance, or efficiency, of a generating unit and is defined as the amount of energy required to produce one unit of electrical energy, or kilowatt-hour (“kWh”). The lower the heat rate, the less fuel required to produce a specific amount of electricity. It is common practice to use the term “net unit heat rate” for describing the performance of a steam power plant. Net unit heat rate is defined as the amount of energy input in British Thermal Units (“Btu”) needed to produce one kWh of electricity delivered to the transmission system. A Btu is a measure of the heat content of fuel or energy sources and represents the amount of heat required to raise the temperature of one pound of water one degree Fahrenheit at standard temperature and pressure conditions. All references to heat rate in my testimony are considered to be net heat rates.

Q114. PLEASE DEFINE ANY OTHER TERMS THAT YOU USE IN DISCUSSING HEAT RATE.

A. I also use the term “average actual heat rate” in this section of my testimony. The average actual heat rate of a unit achieved over a specific time period is calculated by dividing the total heat input (Btus) by the total net generation (kWhs) during that period of time. The average actual heat rate for gas plants is calculated from monthly fuel invoice usage data and measured monthly net electrical outputs.

1 The average actual heat rate for coal units is calculated from the fuel burn rates
2 and coal heat content routinely measured at the plant and the measured net
3 monthly electrical output. Average actual heat rates are normally higher than test
4 heat rates due to the fact that test heat rates are carefully measured at steady-state
5 conditions, while average actual heat rates are measured under a variety of
6 loading and transient conditions.

7

8 Q115. WHAT HEAT RATE DATA HAVE YOU PROVIDED?

9 A. Average actual monthly heat rates for each ETI unit during the Test Year are
10 provided in Schedule H-12.3a. In addition, Exhibits BG-10 and BG-11 provide
11 heat rate data for ETI's gas and coal units, as discussed below.

12

13 Q116. WHAT FACTORS SIGNIFICANTLY AFFECT A GENERATING UNIT'S
14 HEAT RATE?

15 A. A number of unit specific factors can significantly affect heat rate. Examples of
16 such factors include unit design (e.g., boiler type, type of cooling system, etc.),
17 fuel type, composition and quality of fuel, the dispatch of the unit, age of the unit,
18 and the effects of normal wear. These factors must be considered when analyzing
19 unit heat rate data.

20

21 A. **Gas Unit Heat Rates**

22 Q117. HOW DID ETI'S GAS UNITS PERFORM DURING THE TEST YEAR?

23 A. Exhibit BG-10 presents the average heat rates for ETI's gas units for the years

1 2017 through the Test Year.

2

3 Q118. HOW DOES THE AVERAGE HEAT RATE FOR ETI'S GAS UNITS
4 COMPARE TO THE INDUSTRY?

5 A. ETI has compared its average gas unit heat rates to the heat rates of the gas units
6 in NERC regions. Exhibit BG-10 demonstrates that ETI's gas unit heat rates are
7 slightly below (better than) the NERC four-year industry average. During the
8 Test Year, ETI's heat rates have reduced significantly due to the more efficient
9 CCGT plants (MCPS and Hardin County) that have been added to the Company's
10 fleet.

11

12 **B. Coal Unit Heat Rates**

13 Q119. HOW HAVE ETI'S COAL UNITS PERFORMED IN TERMS OF HEAT
14 RATE?

15 A. Exhibit BG-11 presents the average heat rate for ETI coal units for the year 2017
16 through the Test Year.

17

18 Q120. HOW DOES THE AVERAGE HEAT RATE OF ETI'S COAL PLANTS
19 COMPARE TO THE INDUSTRY DURING THAT SAME PERIOD?

20 A. Comparing subbituminous coal burning plants in NERC regions, ETI's composite
21 heat rate is slightly above the industry average for the years 2017 through 2020,
22 as well as the Test Year. This is a result of Nelson 6 heat rate. Comparing
23 Nelson 6 to the industry average may produce misleading results because the

1 industry data represents the average heat rate for units with a variety of
2 differences in design, operation and other factors that can affect heat rates. One
3 example of a difference is that the output of Nelson 6 is slightly lower than other
4 coal units in the fleet. In general, larger output coal units have a lower heat rate.

5
6 Q121. BASED UPON YOUR ANALYSIS, HAVE NELSON UNIT 6 AND BIG
7 CAJUN II, UNIT 3 OPERATED EFFICIENTLY?

8 A. Yes. My analysis indicates that the heat rates for Nelson Unit 6 and Big Cajun II,
9 Unit 3 have been reasonably maintained.

10
11 **C. Employee Safety**

12 Q122. PLEASE DESCRIBE HOW THE SAFETY RECORD OF ETI-OPERATED
13 PLANTS COMPARES WITH THE INDUSTRY.

14 A. Three industry measures for safety are the Total Recordable Incident Rate
15 (“TRIR”) (previously known as the Recordable Accident Index (“RAI”)) Lost
16 Workday Incident Rate (“LWDI”) and Days Away, Job Restriction or Transfer
17 Rate (“DART”). TRIR is defined as the number of recordable injury and illness
18 incidents per 200,000 employee hours worked. LWDI Rate is defined as the
19 number of lost workday incidents per 200,000 employee hours worked. Lost
20 workday incidents are classified as lost-time accidents only. DART Rate is
21 defined as the number of days away from work, job restriction or transfer
22 incidents per 200,000 employee hours worked. A work-related injury or illness
23 must be recorded if it meets one or more of the general recording criteria

1 according to OSHA 29 CFR 1904.7. Recordable accident incidents include those
2 accidents that OSHA defines as recordable in its regulations. Exhibit BG-12
3 indicates how the annual safety record (TRIR, LWDI & DART) at ETI operated
4 plants (Sabine Plant, Lewis Creek Plant, and Montgomery County Power Station
5 only) compares with the electric utility industry rates determined by the
6 U.S. Department of Labor, Bureau of Labor Statistics (BLS). ETI's Test Year
7 safety performance was the best of the most recent five years, which is indicative
8 of Power Generation's prioritization of safety.
9

10 Q123. HAVE ANY ETI-OWNED PLANTS ACHIEVED OFFICIAL RECOGNITION
11 FROM OSHA ON THEIR SAFETY PERFORMANCE?

12 A. Yes. Nelson Unit 6 (August 2003 - 2021) and the Sabine plant (August 2005 &
13 2017) have earned from OSHA the Voluntary Protection Program ("VPP") Star
14 status. In addition, Power Generation and SPO Headquarters was ESL's first
15 corporate office to be certified a VPP Star site (April 2007) by OSHA. The VPP
16 Star designation is OSHA's official recognition of the outstanding efforts of
17 employers and employees who have achieved exemplary occupational safety and
18 health. The VPP Star recognizes businesses that go above and beyond the
19 minimum requirements for protecting employees' health and safety. The Sabine
20 plant has achieved the Region VI VPP "Star of Excellence Award" each year
21 since 2017. The Nelson plant also achieved "Star of Excellence Award" in
22 August of 2021.

1 **VIII. ADDITION OF HARDIN COUNTY TO ETI'S GENERATION FLEET**

2 Q124. PLEASE PROVIDE A BRIEF OVERVIEW OF HARDIN COUNTY.

3 A. The Hardin County facility is comprised of two combustion turbine generation
4 units totaling approximately 151 megawatts located near the City of Kountze in
5 Hardin County, Texas. The Hardin facility provides ETI with incremental
6 capacity to help address its overall capacity needs and specifically its peaking and
7 reserve capacity needs. In Docket No. 50790,⁶ the Commission found that ETI's
8 acquisition of the Hardin County facility from ETEC was in the public interest.

9

10 Q125. WAS THE HARDIN COUNTY FACILITY ACQUIRED PURSUANT TO THE
11 TERMS OF THE ASSET PURCHASE AGREEMENT REVIEWED IN
12 DOCKET NO. 50790?

13 A. Yes.

14

15 Q126. WHEN DID THE HARDIN COUNTY FACILITY BEGIN PROVIDING
16 SERVICE TO ETI CUSTOMERS?

17 A. ETI placed the Hardin County facility in service on June 5, 2021 and began
18 providing service to ETI's customers on that date.

⁶ Docket No. 50790, Order at Finding of Fact No. 77 (April 7, 2021).

1 Q127. PLEASE EXPLAIN THE STEPS ETI TOOK TO APPROPRIATELY
2 EXECUTE THE HARDIN ASSET PURCHASE AGREEMENT AND ENSURE
3 THE COMPANY'S AND ITS CUSTOMERS' INTERESTS WERE
4 PROTECTED CONSISTENT WITH THE TERMS OF THAT AGREEMENT.

5 A. Prior to engaging in negotiations regarding the acquisition for the Hardin facility,
6 ETI sent a list of diligence questions to ETEC. The list of questions included
7 subject areas in the following: plant equipment descriptions, equipment ratings,
8 operations and maintenance practices, environmental assessment, transmission,
9 employment, safety, accounting, fuel supply, NERC/CIP compliance, insurance,
10 real estate, intellectual property, information technology and telecom. The list of
11 questions, and provided responses, is aimed at identifying potential risks or fatal
12 flaws that would prevent the acquisition or require Seller mitigation and inclusion
13 into the final agreement between the Parties. ETI also conducted numerous site
14 visits to the Facility. Within the Asset Purchase Agreement there are conditions
15 which must be satisfied in order for ETI to close and purchase the facility. These
16 closing conditions include, among other things, regulatory approval, satisfaction
17 the facility to pass performance test requirements, insurable title, interconnection
18 service, no material adverse effect, no condemnation, and credit support. The
19 credit support is required to be in place at the time of the closing to support
20 potential Buyer claims against the Seller representations and warranties which are
21 made as of the Closing. Fundamental Seller Representations survive for the
22 statute of limitation, plus 30 days, and all other representations and warranties
23 under the Asset Purchase Agreement survive for 18 months.

1 **IX. CONCLUSION**

2 Q128. ARE ETI'S TEST YEAR NON-FUEL O&M AND CAPITAL EXPENDITURES
3 CLOSED TO PLANT SINCE THE TEST YEAR IN THE COMPANY'S LAST
4 RATE CASE FOR ITS GENERATING PLANTS REASONABLE AND
5 NECESSARY?

6 A. Yes. The O&M for ETI's power plants incurred during the Test Year and capital
7 expenditures closed to plant since the Test Year in the Company's last rate case
8 were reasonable and necessary. These amounts were incurred to operate and
9 maintain each of ETI's power plants in a safe, economical, and reliable manner.
10 Power Generation's budgeting and cost monitoring processes are effective in
11 controlling costs. Overall, ETI continues to rank among the most cost-efficient
12 power plant operators in the U.S. This conclusion is based on my cost
13 comparisons with industry data, which indicate that ETI's production non-fuel
14 O&M \$/kW installed capacity and the EOCs' (consolidated view) production
15 non-fuel O&M \$/kW installed capacity rank favorably compared to the industry.

16
17 Q129. WHAT OVERALL CONCLUSIONS DO YOU DRAW FROM YOUR
18 SUPPORTING EVIDENCE REGARDING THE CLASSES OF AFFILIATE
19 SERVICES THAT YOU SPONSOR?

20 A. Based upon the evidence presented in this filing, I conclude that the products and
21 services provided under the affiliate classes I sponsor are necessary, that the
22 respective class costs are reasonable, and that the products and services are
23 delivered to ETI at costs no greater than that charged to ETI's other affiliates for

1 the same or similar services and at costs that reflect the actual cost of such
2 products and services. In addition, these services are not duplicated within ETI or
3 any other ESL organization.

4

5 Q130. WHAT DO YOU CONCLUDE ABOUT THE PERFORMANCE OF ETI'S
6 FOSSIL POWER PLANTS DURING THE TEST YEAR?

7 A. ETI operated its generating units in a reasonable, efficient, and reliable manner
8 during the Test Year.

9

10 Q131. WHAT DO YOU CONCLUDE REGARDING THE ADDITION OF HARDIN
11 COUNTY?

12 A. The Hardin County facility was acquired pursuant to the terms of the asset
13 purchase agreement reviewed in Docket No. 50790. In executing that asset
14 purchase agreement, ETI ensured that the interests of the Company and its
15 customers were protected. The Hardin County facility began providing service to
16 ETI's customers on June 5, 2021.

17

18 Q132. DOES THIS CONCLUDE YOUR DIRECT TESTIMONY?

19 A. Yes, it does.

AFFIDAVIT OF BEVERLEY GALE

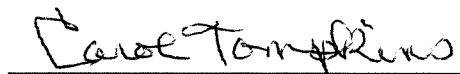
THE STATE OF TEXAS)
)
COUNTY OF MONTGOMERY)

This day, Beverley Gale the affiant, appeared in person before me, a notary public, who knows the affiant to be the person whose signature appears below. The affiant stated under oath:

My name is Beverley Gale. I am of legal age and a resident of the State of Texas. The foregoing testimony and exhibits offered by me are true and correct, and the opinions stated therein are, to the best of my knowledge and belief, accurate, true and correct.

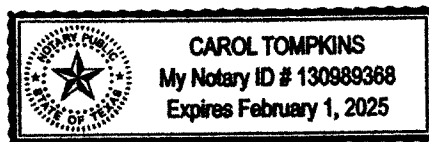

Beverley Gale

SUBSCRIBED AND SWORN TO BEFORE ME, notary public, on this the 9th day of
June 2022.


Notary Public, State of Texas

My Commission expires:

February 01, 2025



Entergy Power Generation Organization Chart

ESL Exec. Vice President & Chief
Operating Officer

ESL Vice President Power Generation

ESL Vice President Louisiana
Plants

Entergy Louisiana

Acadia
Calcasieu Plant
Little Gypsy Plant
J. Wayne Leonard Plant
Lake Charles Plant
Louisiana Station 2 Plant
Nelson Plant
Ninemile Point Plant
Ninemile 6 Plant
Ouachita Plant
Perryville Plant
Sterlington Plant
Waterford 1&2 Plant
Washington Parish

Entergy New Orleans LLC

New Orleans Power Station
New Orleans Solar Station
Paterson Solar Plant

ESL Vice President Mississippi
Plants

Entergy Mississippi LLC

Attala Plant
Baxter Wilson Plant
Brookhaven Solar Plant
Choctaw Plant
Desoto Solar Plant
Gerald Andrus Plant
Hinds Plant
Hinds Solar Plant

ESL Vice President Texas Plants

Entergy Texas Inc.

Big Cajun 2
Hardin County Plant
Montgomery County Plant
Lewis Creek Plant
Sabine Plant
Spindletop Gas Storage Plant

ESL Vice President Arkansas
Plants

Entergy Arkansas LLC

Carpenter Dam
Hot Springs Plant
Independence Plant
Lake Catherine Plant
Rommel Dam
Union Power Plant
Union Water Facility
White Bluff Plant

ESL Vice President Operations
Support Power Generation

Director of Fleet
Maintenance

OPS Support SPM

Fleet Chemistry
Manager

Risk & Compliance
Manager

Fleet Training Manager

Commercial Excellence

Decommission/Demolition
Superintendent

Business Support
Manager

Chief Dam Safety
Engineer

Director of
Environmental
Support/Safety

Power Generation
Entergy Texas, Inc.
Fossil Generating Unit Information
Effective January 1, 2021 through December 31, 2021

Plant	Unit	*Net Maximum Demonstrated Capacity		Primary Fuel Type	Year of Operation	Location	Owners	Comments
		MW						
		ETI Owned	ETI Operated					
Hardin	1	79	0	Gas	2021	Kountze, TX	100% ETI	Hardin is two units totalling 157 MW maintained and operated by Ethos, a third party vendor. ETI took over ownership of these units in June of 2021
	2	78	0	Gas	2021	Hardin, County	100% ETI	
Lewis Creek	1	255	255	Gas	1970	Willis, TX	100% ETI	
	2	255	255	Gas	1971	Montgomery, County	100% ETI	
Montgomery	1	899	972	Gas	2021	Willis, TX Montgomery, County	92.44% - ETI (899 MW) 7.56% - East Texas Electric Cooperative (73 MW)	Montgomery is a 972 MW unit operated and maintained by Entergy Texas, Inc.
	6	156	0	Coal	1982	Westlake, LA Calcasieu Parish	40.25% - ELL (211 MW) 29.75% - ETI (156 MW) 10.90% - EAM Nelson Holdings (57 MW) 10.00% - Sam Rayburn G&T (52MW) 9.10% - East Texas Electric Cooperative (48 MW)	Nelson 6 is a 524 MW unit operated and maintained by Entergy Louisiana L.L.C.
Sabine	1	213	213	Gas	1962	Bridge City, TX Orange County	100% ETI	Sabine 2 permanently retired effective 10/1/2016
	2	N/A	N/A	Gas	1962		100% ETI	
	3	415	415	Gas	1966		100% ETI	
	4	536	536	Gas	1974		100% ETI	
	5	479	479	Gas	1979		100% ETI	
Big Cajun II	3	99	0	Coal	1983	New Roads, LA Pointe Coupee Parish	24.15% - ELL (135 MW) 17.85% - ETI (99 MW) 58.00% - CLECO Cajun LLC (323 MW)	557 MW unit maintained and operated by CLECO Cajun LLC.
	3,464		3,125					

*MW winter capacity from GADRS at the end of 2021

2018 Non-Fuel O&M \$/kW Installed
Ranked by Operator Parent Co.

Criteria: Company Nameplate Capacity >= 800 MW -- Non Nuclear Units
Source: S&P Global as of 3/15/2022

Rank	Operator Parent Co Name	Name Plate Capacity MW	Net Generation MWh	Total Non-Fuel O&M \$	Calculated NF O&M \$/MWh	Calculated NF O&M \$/kW
1	LS Power Capital, LP.	1,150	6,94,617	4,444,690	6.40	8.86
2	Mitsubishi Corporation	2,073	2,086,820	14,907,294	7.14	7.19
3	Tenaska Energy, Inc.	4,603	7,693,020	40,010,698	5.20	8.69
4	Northern Star Generation LLC	826	1,798,983	8,181,477	4.55	9.90
5	Morgan Stanley	1,187	1,714,896	12,180,174	7.10	10.26
6	Starwood Energy Group Global, LLC	1,803	5,511,284	19,899,066	3.61	11.04
7	LS Power Group	9,338	23,141,339	113,906,501	4.92	11.46
8	Public Service Enterprise Group Incorporated	8,030	19,436,376	99,417,177	5.12	12.38
9	Panda Energy International, Inc.	1,615	8,513,943	20,512,485	2.41	12.70
10	Public Sector Pension Investment Board	1,408	1,908,301	17,893,683	9.38	12.71
11	The Carlyle Group Inc.	4,341	11,964,837	55,969,399	4.68	12.89
12	Constellation Energy Corporation	12,442	23,256,111	162,072,386	6.97	13.03
13	State of California	2,075	4,994,874	28,498,180	5.71	13.74
14	Siemens Aktiengesellschaft	3,071	9,213,964	42,641,121	4.63	13.88
15	ACE REIT, Inc.	1,153	4,159,649	16,029,595	3.85	13.90
16	Rockland Capital, LP	1,070	2,273,737	15,632,041	6.86	14.61
17	J-Power USA Generation, L.P.	940	3,566,210	13,868,254	3.89	14.76
18	NextEra Energy, Inc.	38,945	131,000,387	575,890,967	4.40	14.79
19	Argo Partners LP	2,045	9,178,294	30,361,745	3.31	14.82
20	City of Jacksonville, Florida	4,299	9,029,686	63,887,865	7.08	14.86
21	IDACORP, Inc.	2,561	10,089,852	38,368,871	3.80	14.98
22	Ministry of Finance (Denmark)	828	2,063,057	12,581,453	6.10	15.19
23	ITOCHU Corporation	39,424	94,692,657	607,069,538	6.41	15.40
24	Capital Power Corporation	537	2,985,467	14,777,365	4.95	15.45
25	Eaelon Corporation	1,059	5,116,781	16,422,230	3.21	15.50
26	City Of Seattle	2,007	6,409,721	31,900,288	4.98	15.89
27	OGX Energy Corp.	8,952	23,710,217	143,327,846	6.04	16.01
28	Entergy Corporation	23,544	75,828,405	378,265,449	4.99	16.07
29	IF US Holding 2 GP LLC	2,558	4,802,080	41,493,756	8.64	16.22
30	Occidental Petroleum Corporation	1,859	9,816,737	31,343,480	3.18	16.81
31	Global Infrastructure GP III, LP	4,213	7,884,210	71,893,564	9.16	17.09
32	U.S. Department of Defense	21,832	78,638,483	375,222,866	4.77	17.19
33	Invenery LLC	6,550	19,154,434	113,271,135	5.91	17.29
34	Chelan County Washington	1,988	9,283,644	34,457,160	3.71	17.33
35	Ameren Corporation	10,229	32,573,139	179,345,960	5.51	17.55
36	General Electric Company	2,162	5,306,192	39,111,946	7.37	18.09
37	TTWF LP	922	4,506,737	16,705,594	3.71	18.12
38	United States	44,185	125,717,296	802,356,399	6.38	18.16
39	GenOn Holdings, Inc.	13,287	8,316,651	245,219,708	29.49	18.46
40	John Wood Group PLC	1,049	3,759,040	20,045,552	5.33	19.11
41	BP p.l.c.	2,297	7,739,845	45,120,698	6.11	19.65
42	Alliant Energy Corporation	7,809	26,654,110	154,880,396	5.80	19.81
43	State of New York	5,400	28,321,233	107,660,982	3.80	19.94
44	GMERS Administration Corporation	3,164	11,607,774	63,186,569	5.44	19.97
45	National Grid plc	4,078	5,014,778	82,051,938	16.36	20.12
46	CVS Energy Corporation	7,710	18,188,820	155,737,555	8.56	20.20
47	Canada Pension Plan Investment Board	1,719	5,335,504	34,745,401	6.56	20.21
48	Dominion Energy, Inc.	25,840	69,016,153	547,534,550	7.94	20.42
49	Dow Inc.	3,175	15,169,612	65,503,977	4.32	20.63
50	RWE Aktiengesellschaft	3,825	11,565,765	79,788,162	6.90	20.86
51	Enersa Incorporated	5,792	19,726,918	121,394,461	6.15	20.96
52	EDP - Energias de Portugal, S.A.	5,335	14,768,583	112,543,247	7.62	21.09
53	France	7,465	23,532,383	159,971,860	6.68	21.43
54	Vistra Corp.	40,302	144,709,305	871,506,529	6.02	21.62
55	Iberdrola, S.A.	7,323	19,871,966	159,996,479	8.03	21.80
56	Duke Energy Corporation	53,198	138,982,201	1,160,218,703	7.30	21.81
57	CPN Management, LP	21,384	69,243,555	475,205,359	6.86	22.22
58	Ares Management Corporation	1,299	5,141,289	28,896,344	5.62	22.24
59	Riverstone Holdings CO, L.P.	11,112	19,461,539	257,594,524	13.36	22.32
60	Capital Dynamics Holding AG	1,781	3,853,488	41,382,876	10.74	23.24
61	NRG Energy, Inc.	21,458	53,988,321	502,659,215	9.31	23.42
62	Energy Trading Innovations LLC	2,827	2,385,455	66,274,428	27.78	23.44
63	Xcel Energy Inc.	19,669	65,877,284	467,278,212	7.09	23.76
64	Marathon Petroleum Corporation	1,590	8,772,930	38,571,128	4.66	24.26
65	Algonquin Power & Utilities Corp.	2,074	6,444,423	50,591,070	7.85	24.39
66	Evergy, Inc.	13,265	33,215,732	326,356,871	9.83	24.60
67	Sempra	1,251	3,692,324	31,684,171	8.58	25.33
68	DTE Energy Company	9,797	33,850,743	249,367,562	7.37	25.45
69	ACHR, LP	15,034	66,777,004	387,000,643	5.80	25.74
70	Bleco Power, LLC	1,845	2,038,091	47,706,064	23.41	26.01
71	Accion, S.A.	1,024	3,165,479	26,762,310	8.45	26.12
72	Berkshire Hathaway Inc.	33,651	113,500,311	895,530,916	7.89	26.61
73	State of Texas	4,028	16,642,649	108,876,565	6.54	27.03
74	City of Orlando	1,605	6,180,472	45,109,083	7.30	28.11
75	Pager Holdings LLC	2,712	6,847,508	76,312,059	12.72	28.36
76	PPL Corporation	9,532	36,608,436	273,324,366	7.47	28.67
77	The AES Corporation	10,434	22,301,886	305,987,749	13.72	29.33
78	The Southern Company	44,414	166,117,562	1,313,243,579	7.91	29.57
79	Enel S.p.A.	3,492	12,840,349	103,345,639	8.05	29.59
80	Cleco Partners LP	8,151	21,393,437	247,195,897	11.55	30.33
81	FirstEnergy Corp.	3,204	19,265,867	99,939,375	5.19	31.19
82	State of South Carolina	5,173	16,515,585	161,365,996	9.77	31.19
83	Hawaiian Electric Industries, Inc.	1,819	5,233,427	56,888,522	10.87	31.28
84	Black Hills Corporation	1,403	4,790,140	44,947,846	9.38	32.04
85	State of Nebraska	5,087	21,539,636	170,834,098	7.93	33.58
86	ALLETE, Inc.	2,660	10,733,798	51,239,892	8.50	34.30
87	Consolidated Edison, Inc.	3,258	8,755,710	114,682,698	13.10	35.20
88	American Electric Power Company, Inc.	26,585	89,772,545	956,012,544	10.65	35.96
89	Energy Harbor Corp.	6,609	14,870,252	238,486,827	16.04	36.08
90	PG&E Corporation	5,323	15,198,048	193,299,155	12.72	36.31
91	Edison International	2,547	5,859,043	92,929,571	15.86	36.49
92	Province of Ontario	1,133	3,309,784	42,007,115	12.69	37.00
93	TransAlta Corporation	1,513	5,524,344	50,039,027	10.33	37.71
94	Alcoa Corporation	886	4,336,582	33,808,181	7.80	38.16
95	Mountain State Energy Holdings LLC	808	5,224,706	31,853,211	6.10	39.45
96	Brookfield Renewable Partners L.P.	2,693	9,570,750	109,124,950	11.40	40.52
97	EMCOR Group, Inc.	1,429	7,708,433	58,018,269	7.53	40.59
98	NSource Inc.	4,021	11,579,274	177,857,709	14.86	41.26
99	Pinnacle West Capital Corporation	6,623	19,473,432	297,800,252	15.29	44.97
100	Otter Tail Corporation	1,302	6,502,323	62,752,754	9.65	48.19
101	CenterPoint Energy, Inc.	1,290	4,543,047	63,373,881	13.95	49.12
102	PNM Resources, Inc.	1,624	6,329,303	84,009,795	13.27	51.78
103	Ohio Valley Electric Corporation	1,304	6,389,305	68,267,855	10.72	52.96
104	Fortis Inc.	2,826	11,633,587	155,277,819	13.35	54.95
105	EQT AB (publ)	2,155	9,934,901	132,414,461	13.33	61.46
106	WEC Energy Group, Inc.	9,909	33,261,062	691,816,311	20.80	69.81
107	Macquarie Group Limited	987	5,018,107	94,694,294	18.87	95.90
108	Ormat Technologies, Inc.	1,009	3,689,499	186,101,471	50.98	186.42

2019 Non-Fuel O&M \$/kW Installed
Ranked by Operator Parent Co.

Criteria: Company Nameplate Capacity >= 800 MW -- Non Nuclear Units
Source: S&P Global as of 3/15/2022

Rank	Operator Parent Co Name	Name Plate Capacity MW	Net Generation MWh	Total Non-Fuel O&M \$	Calculated NF O&M \$/MWh	Calculated NF O&M \$/kW
1	LS Power Capital, LP	1,150	3,76,501	4,242,004	11.27	8.69
2	Mitsubishi Corporation	2,088	4,950,015	17,052,692	3.44	8.17
3	Northern Star Generation LLC	826	9,200,014	7,557,068		8.15
4	Tenaska Energy, Inc.	4,605	12,618,100	48,998,643	3.88	10.64
5	Morgan Stanley	1,187	1,600,257	12,987,908	8.12	10.94
6	Starwood Energy Group Global, LLC	1,803	6,204,478	20,627,856	3.32	11.44
7	LS Power Group	9,985	23,374,446	116,952,927	5.00	11.71
8	Panda Energy International, Inc.	1,615	7,162,370	19,359,614	2.70	11.99
9	Public Service Enterprises Group Incorporated	8,154	23,025,132	100,593,894	4.36	12.39
10	Public Sector Pension Investment Board	1,408	1,732,155	17,444,005	10.07	12.39
11	Constellation Energy Corporation	12,650	22,658,946	158,023,726	6.97	12.49
12	The Carlyle Group Inc.	4,341	10,376,720	54,390,759	5.24	12.53
13	Rockland Capital, LP	1,070	2,474,110	13,727,909	5.55	12.83
14	ACE REIT, Inc.	1,133	4,771,993	15,813,491	3.35	13.72
15	NextEra Energy, Inc.	33,672	138,499,712	569,461,696	4.11	14.35
16	IDACORP, Inc.	2,561	10,407,519	36,922,478	3.55	14.42
17	J-Power USA Generation, L.P.	940	3,993,421	13,847,216	3.47	14.74
18	ITOCHU Corporation	41,467	102,323,585	621,009,598	6.07	14.98
19	Argo Partners LP	2,049	9,417,064	30,745,826	3.26	15.01
20	City Of Seattle	2,007	5,334,992	30,239,178	5.67	15.06
21	State of California	2,075	6,686,647	32,752,901	4.50	15.79
22	Chelan County Washington	1,988	7,605,021	31,800,531	4.18	15.99
23	Siemens Aktiengesellschaft	3,071	14,290,474	49,343,472	3.45	16.07
24	Exelon Corporation	1,049	5,764,185	17,335,323	3.01	16.59
25	Capital Power Corporation	937	3,807,119	15,827,585	4.16	16.59
26	U.S. Department of Defense	21,832	75,106,331	368,392,107	4.90	16.87
27	Entergy Corporation	22,843	70,837,901	393,550,968	5.56	17.23
28	Ameren Corporation	10,217	26,343,585	178,519,556	6.78	17.47
29	IF US Holding 2 GP LLC	2,746	6,176,864	48,039,092	7.78	17.49
30	OGE Energy Corp.	8,952	21,110,462	156,813,992	7.46	17.52
31	Occidental Petroleum Corporation	1,859	10,653,401	32,600,019	3.06	17.54
32	United States	43,194	118,126,147	766,421,252	6.49	17.74
33	Enersa Incorporated	6,070	19,426,456	108,480,556	5.58	17.87
34	TTWF LP	915	5,129,734	16,554,786	3.23	18.10
35	Alliant Energy Corporation	7,688	26,261,154	141,065,300	5.37	18.35
36	Global Infrastructure GP III, LP	4,354	7,324,821	89,274,175	11.97	18.13
37	Invernergy LLC	6,550	20,535,517	175,520,155	6.00	19.16
38	GenOn Holdings, Inc.	12,047	4,825,867	233,013,354	48.28	19.34
39	Riverstone Holdings-D, L.P.	10,875	12,771,082	212,314,128	16.62	19.52
40	CMS Energy Corporation	7,632	19,507,378	149,507,663	7.66	19.59
41	Energy, Inc.	11,529	29,777,722	230,374,236	7.79	19.98
42	National Grid plc	4,296	4,279,064	86,397,072	20.33	20.25
43	John Wood Group Plc	1,049	4,829,351	21,254,935	4.40	20.26
44	OMERS Administration Corporation	3,240	12,630,804	66,102,173	5.23	20.40
45	State of New York	5,400	28,346,144	110,809,358	3.91	20.52
46	General Electric Company	2,168	5,505,540	44,846,757	8.15	20.69
47	City of Jacksonville, Florida	2,941	8,301,380	60,103,340	7.94	20.71
48	Ares Management Corporation	1,301	6,611,624	26,972,475	4.08	20.74
49	Xcel Energy Inc.	20,281	66,539,236	430,680,620	6.47	21.24
50	Dow Inc.	3,175	15,553,907	68,774,573	4.42	21.66
51	Cleco Partners LP	8,202	19,290,863	179,230,073	9.29	21.85
52	Vistra Corp.	35,824	135,510,051	789,719,738	5.81	22.04
53	BP p.l.c.	2,297	7,781,401	51,186,413	5.58	22.22
54	Energy Trading Innovations LLC	2,829	1,421,400	63,582,795	44.73	22.48
55	Duke Energy Corporation	52,556	148,080,666	1,190,870,002	8.04	22.66
56	CPN Management, LP	22,144	76,583,902	507,044,668	6.62	22.90
57	Ministry of Finance (Denmark)	1,049	3,254,979	24,145,774	6.85	23.02
58	Iberdrola, S.A.	8,243	20,775,809	190,393,271	9.16	23.10
59	NRG Energy, Inc.	21,338	50,425,782	494,178,481	9.80	23.12
60	Algonquin Power & Utilities Corp.	2,084	6,274,350	48,588,849	7.74	23.31
61	Canada Pension Plan Investment Board	1,940	5,829,239	45,921,963	7.88	23.67
62	France	7,896	23,059,508	187,419,297	8.13	23.74
63	ACIP, LP	15,034	64,288,260	361,245,487	5.62	24.03
64	DTE Energy Company	9,396	30,236,292	239,937,558	7.92	24.13
65	Marathon Petroleum Corporation	1,590	8,356,962	38,941,134	4.66	24.49
66	Energy Harbor Corp.	6,609	9,576,650	163,037,685	17.02	24.67
67	RWE Aktiengesellschaft	3,835	11,904,893	95,308,792	8.01	24.85
68	EDP - Energias de Portugal, S.A.	5,335	15,616,408	133,399,530	8.54	25.00
69	State of Texas	4,028	16,384,322	101,777,146	6.18	25.14
70	Bloco Power, LLC	1,845	1,960,891	47,893,793	24.41	25.90
71	City of Orlando	1,605	6,181,750	41,907,435	6.78	26.11
72	Capital Dynamics Holding AG	1,876	4,340,998	51,075,601	11.77	27.23
73	Berkshire Hathaway Inc.	34,299	110,125,331	936,288,735	8.50	27.30
74	Puget Holdings LLC	2,712	7,451,755	74,496,761	10.00	27.47
75	FirstEnergy Corp.	9,204	19,535,231	88,700,069	4.53	27.68
76	State of South Carolina	5,176	14,981,779	145,376,062	9.70	28.09
77	The AES Corporation	10,609	23,867,753	298,471,230	12.51	28.13
78	PPL Corporation	9,535	34,258,499	276,556,360	8.07	29.01
79	Acciona, S.A.	1,024	3,114,026	29,881,935	9.60	29.17
80	Hawaiian Electric Industries, Inc.	1,839	5,384,289	54,861,364	10.19	29.83
81	The Southern Company	44,478	161,446,148	1,342,104,426	8.31	30.17
82	Sempra	1,251	2,577,978	38,268,591	14.84	30.59
83	Enel S.p.A.	4,294	15,492,479	133,044,706	8.59	30.98
84	ALLETE, Inc.	2,634	8,290,554	82,870,115	10.00	31.46
85	State of Nebraska	5,087	19,006,719	163,259,201	8.59	32.09
86	PG&E Corporation	5,322	18,239,987	174,060,069	9.51	32.71
87	American Electric Power Company, Inc.	26,597	79,440,565	869,939,431	10.95	32.71
88	Pinnacle West Capital Corporation	7,427	21,344,741	248,200,532	11.63	33.42
89	TransAlta Corporation	1,631	7,324,750	56,169,468	7.67	34.43
90	Mountain State Energy Holdings LLC	808	5,264,653	28,074,121	5.33	34.77
91	Black Hills Corporation	1,458	4,862,885	50,849,029	10.46	34.87
92	Dominion Energy, Inc.	27,189	68,965,085	908,180,596	14.04	35.62
93	Province of Ontario	1,137	3,199,869	41,271,791	12.90	36.29
94	EMCOR Group, Inc.	1,429	7,054,142	52,581,062	7.45	36.79
95	Edison International	2,547	7,526,858	93,827,176	12.47	36.84
96	Alcoa Corporation	886	4,214,527	33,604,318	7.97	37.98
97	Consolidated Edison, Inc.	3,268	9,316,826	125,865,195	13.66	38.51
98	Brookfield Renewable Partners LP	2,701	9,710,361	108,713,470	11.14	40.07
99	Engle SA	849	2,626,423	37,904,218	14.43	44.62
100	Otter Tail Corporation	1,302	5,495,931	59,310,589	10.79	45.55
101	NiSource Inc.	3,417	10,329,418	162,555,567	15.74	47.57
102	PNM Resources, Inc.	1,644	6,252,333	79,584,016	12.73	48.42
103	Fordis Inc.	2,320	9,897,641	143,057,556	14.45	49.00
104	CenterPoint Energy, Inc.	1,237	4,075,162	63,200,103	15.51	51.08
105	Ohio Valley Electric Corporation	1,304	5,722,979	68,043,472	11.89	52.19
106	EQT AB (publ)	2,333	10,196,599	128,199,871	12.57	54.96
107	WEC Energy Group, Inc.	8,833	32,145,181	667,963,935	20.78	75.62
108	Macquarie Group Limited	937	4,768,362	93,874,275	19.69	98.12
109	Ormat Technologies, Inc.	980	3,955,322	212,381,979	53.16	216.67

2020 Non-Fuel O&M \$/kW Installed
Ranked by Operator Parent Co.

Criteria: Company Nameplate Capacity >= 800 MW – Non Nuclear Units
Source: S&P Global as of 3/15/2022

Rank	Operator Parent Co Name	Name Plate Capacity MW	Net Generation MWh	Total Non-Fuel O&M \$	Calculated NF O&M \$/MWh	Calculated NF O&M \$/KW
1	LS Power Capital, L.P.	1,150	4,76,100	4,494,984	9.44	8.91
2	Mitsubishi Corporation	2,145	5,631,713	17,607,076	3.13	8.21
3	Tenaska Energy, Inc.	5,105	13,991,721	52,325,526	3.74	10.25
4	Panda Energy International, Inc.	1,615	7,657,461	17,647,663	2.30	10.93
5	Morgan Stanley	1,187	1,351,921	13,260,004	9.81	11.17
6	Starwood Energy Group Global, LLC	1,753	6,899,704	19,660,129	2.87	11.22
7	Constellation Energy Corporation	12,499	20,150,824	147,895,599	7.34	11.83
8	Public Service Enterprise Group Incorporated	8,154	22,516,782	96,795,287	4.34	11.87
9	LS Power Group	9,865	25,021,865	120,174,342	4.80	12.04
10	Public Sector Pension Investment Board	1,408	1,538,201	17,533,102	11.40	12.45
11	ACE REIT, Inc.	1,153	5,602,149	15,027,122	2.68	13.03
12	The Carlyle Group Inc.	4,341	11,384,083	57,320,889	5.04	13.21
13	Rockland Capital, LP	926	2,154,527	12,293,528	5.71	13.27
14	State of California	2,190	4,929,627	30,436,734	6.17	13.90
15	IDACORP, Inc.	2,564	9,073,043	35,834,359	3.95	13.98
16	J-Power USA Generation, L. P.	940	3,700,213	13,170,905	3.56	14.02
17	Entergy Corporation	24,106	68,054,851	350,424,592	5.15	14.54
18	Argo Partners LP	2,049	10,465,532	30,488,598	2.91	14.88
19	ITOCHU Corporation	42,504	114,660,530	634,599,348	5.53	14.93
20	Ameren Corporation	10,617	28,496,905	158,968,765	5.38	14.97
21	OGE Energy Corp.	8,962	21,121,268	136,582,960	6.47	15.24
22	Siemens Aktiengesellschaft	3,073	14,763,994	47,052,696	3.19	15.31
23	NextEra Energy, Inc.	44,112	145,776,326	678,029,030	4.53	15.37
24	Alliant Energy Corporation	9,095	26,201,890	140,936,497	5.38	15.50
25	City Of Seattle	2,007	6,006,202	32,009,902	5.33	15.95
26	Exelon Corporation	1,043	5,796,740	16,712,812	2.88	16.02
27	Capital Power Corporation	957	2,995,664	15,496,126	5.17	16.20
28	Emera Incorporated	6,220	18,550,602	104,352,679	5.63	16.78
29	United States	43,198	119,707,566	737,949,840	6.16	17.08
30	U.S. Department of Defense	21,892	77,039,062	381,583,150	4.95	17.48
31	Chelan County Washington	1,988	8,774,131	34,851,717	3.97	17.59
32	IF US Holding 2 GP LLC	2,746	6,813,908	48,376,578	7.10	17.61
33	Occidental Petroleum Corporation	1,876	10,561,584	33,642,338	3.19	17.93
34	Ares Management Corporation	1,179	5,777,091	21,603,766	3.74	18.32
35	TTWF LP	915	3,637,439	16,767,019	4.61	18.93
36	Bloent Power, LLC	1,522	1,818,090	27,917,416	15.36	18.94
37	GenOn Holdings, Inc.	12,047	5,898,618	23,421,725	37.88	18.95
38	Evergy, Inc.	11,529	26,274,535	214,295,528	8.16	18.99
39	Algonquin Power & Utilities Corp.	2,427	5,856,023	45,450,539	7.76	18.72
40	Invenity LLC	7,027	20,839,114	132,590,864	6.36	18.87
41	Global Infrastructure GP III, LP	5,119	8,344,435	37,498,317	11.68	19.05
42	CMS Energy Corporation	7,748	18,047,494	153,337,431	8.37	19.79
43	Riverstone Holdings-D, L.P.	10,818	8,922,058	216,399,750	24.25	20.00
44	OMERS Administration Corporation	3,440	13,417,445	69,489,452	5.18	20.20
45	Energy Trading Innovations LLC	2,827	860,591	57,261,751	66.54	20.26
46	Engle SA	2,431	4,700,175	49,574,453	10.55	20.39
47	Xcel Energy Inc.	21,511	58,947,320	443,408,905	7.53	20.61
48	General Electric Company	2,168	5,129,115	44,880,163	8.75	20.71
49	Vistra Corp.	32,949	120,468,552	683,086,609	5.67	20.78
50	City of Jacksonville, Florida	2,941	10,607,421	61,238,954	5.77	20.82
51	John Wood Group PLC	1,049	4,156,220	22,143,098	5.33	21.10
52	Duke Energy Corporation	53,428	141,522,965	1,133,277,060	8.01	21.21
53	State of New York	5,400	29,297,644	115,431,855	3.94	21.38
54	National Grid plc	4,288	6,188,031	91,695,011	14.82	21.38
55	BP p.l.c.	2,297	7,771,701	50,207,473	6.46	21.86
56	Ministry of Finance (Denmark)	1,722	5,559,130	37,662,710	6.77	21.87
57	NRG Energy, Inc.	21,306	38,747,371	469,147,908	12.11	22.02
58	Dominion Energy, Inc.	25,672	73,933,588	568,668,945	7.80	22.15
59	Dow Inc.	3,175	15,883,373	71,993,867	4.53	22.67
60	CPN Management, LP	22,144	83,324,720	502,156,076	6.03	22.68
61	Canada Pension Plan Investment Board	1,940	5,959,296	44,324,048	7.44	22.85
62	DTE Energy Company	9,859	24,137,400	230,254,156	9.54	23.95
63	France	8,267	25,404,409	193,188,421	7.60	23.97
64	ACOP, L.P.	15,034	56,574,250	332,641,574	6.23	23.98
65	Cleco Partners LP	8,202	16,737,270	193,086,767	11.54	23.94
66	RWE Aktiengesellschaft	4,234	11,985,615	100,255,430	8.36	23.68
67	EDP - Energias de Portugal, S.A.	5,815	15,874,670	140,399,150	8.84	24.15
68	Iberdrola, S.A.	8,386	22,530,524	206,262,683	9.15	24.60
69	Marathon Petroleum Corporation	1,590	8,031,564	39,389,695	4.90	24.77
70	State of Texas	4,028	16,097,470	101,102,043	6.28	25.10
71	Hawaiian Electric Industries, Inc.	1,839	4,872,738	46,218,290	9.49	25.13
72	The AES Corporation	11,033	24,755,899	278,368,374	11.24	25.23
73	The Southern Company	42,566	144,377,646	1,093,559,878	7.57	25.69
74	City of Orlando	1,605	5,790,530	41,351,350	7.18	25.89
75	Berkshire Hathaway Inc.	35,342	106,398,140	925,624,694	8.64	26.13
76	Puget Holdings LLC	2,712	7,961,897	72,231,823	9.07	26.63
77	Acciona, S.A.	1,169	2,820,422	31,972,916	11.34	27.34
78	Enel S.p.A.	5,460	17,122,198	150,265,745	8.78	27.52
79	Energy Harbor Corp.	3,868	9,679,692	107,704,256	11.13	27.84
80	Capital Dynamics Holding AG	1,913	4,483,676	54,095,262	12.06	28.28
81	ALLETE, Inc.	9,019	8,754,088	85,967,576	9.82	28.48
82	State of South Carolina	5,176	14,297,563	148,784,492	10.41	28.75
83	PPL Corporation	9,248	31,880,942	266,822,813	8.37	28.85
84	Sempra	1,251	3,136,571	36,295,269	11.57	29.01
85	American Electric Power Company, Inc.	25,605	64,424,362	797,465,976	12.38	31.15
86	State of Nebraska	5,084	18,072,718	160,488,901	8.88	31.56
87	Black Hills Corporation	1,511	5,235,771	48,300,875	9.23	31.97
88	Otter Tail Corporation	1,452	4,800,830	47,949,523	9.99	33.02
89	FirstEnergy Corp.	3,204	15,933,647	110,277,362	6.91	34.42
90	TransAlta Corporation	1,631	5,673,816	56,313,540	9.93	34.52
91	Consolidated Edison, Inc.	3,441	9,853,107	121,957,513	12.38	35.49
92	Mountain State Energy Holdings LLC	808	4,945,857	29,001,774	5.86	35.92
93	Province of Ontario	1,137	3,121,619	41,648,384	13.34	36.62
94	EMCOR Group, Inc.	1,429	6,649,299	52,613,719	7.91	36.81
95	Alcoa Corporation	823	4,718,034	32,594,901	6.91	39.61
96	Pinnacle West Capital Corporation	7,200	22,168,231	286,651,805	12.93	39.81
97	PG&E Corporation	5,322	13,602,557	212,134,020	13.59	39.86
98	Brookfield Renewable Partners LP.	2,698	8,022,815	111,110,484	13.85	41.18
99	PNM Resources, Inc.	1,644	6,120,237	67,938,015	11.10	41.34
100	Edison International	2,539	5,275,142	105,653,818	20.03	41.61
101	NiSource Inc.	3,417	7,610,327	143,579,805	18.87	42.01
102	EQT AB (publ)	2,532	10,554,519	112,444,147	10.65	44.42
103	Fortis Inc.	2,795	9,337,940	179,446,394	13.86	46.30
104	Ohio Valley Electric Corporation	1,304	4,375,314	63,548,940	14.52	48.74
105	CenterPoint Energy, Inc.	1,126	3,206,282	59,576,884	18.58	52.90
106	WEC Energy Group, Inc.	8,532	32,208,406	674,109,308	20.93	79.01
107	Macquarie Group Limited	896	4,412,839	79,075,076	17.92	88.29
108	Ormat Technologies, Inc.	1,028	4,067,807	219,515,678	53.96	213.58

**2018 Non-Fuel O&M \$/kW Installed
Ranked by Operator Co.**

Criteria: Company Nameplate Capacity >= 800 MW -- Non Nuclear Units
Source: S&P Global as of 3/15/2022

Rank	Operator Name	Name Plate Capacity MW	Net Generation MWh	Total Non-Fuel O&M \$	Calculated NF O&M \$/MWh	Calculated NF O&M \$/kW
1	Tenaska Operations, Inc.	1,134	145,905	3,728,221	25.55	3.29
2	Riverside Generating Co LLC	1,150	694,617	4,444,690	6.40	3.86
3	Tenaska Georgia Partners, L.P.	1,099	92,227	4,344,465	47.11	3.95
4	NRG Marsh Landing LLC	828	219,407	3,523,000	16.06	4.25
5	Diamond Generating Corporation	1,099	642,651	5,090,073	7.92	4.63
6	Rolling Hills Generating, LLC	978	790,934	4,619,375	5.84	4.73
7	RA Generation, LLC	1,570	992,065	7,807,606	7.87	4.97
8	NRG Oswego Harbor Power Operations Inc	1,804	41,725	11,329,350	271.52	6.28
9	The Silverfern Group, Inc.	985	2,084,851	6,304,938	3.02	6.40
10	Wolverine Power Supply Cooperative, Inc.	1,008	1,110,598	7,655,019	6.89	7.60
11	Florida Power & Light Company	24,873	92,493,892	193,781,168	2.10	7.79
12	NextEra Energy, Inc.	1,683	1,815,214	13,451,681	7.41	7.99
13	Constellation Power Source Generation LLC	994	353,812	8,176,541	23.11	8.23
14	Oglethorpe Power Corporation	5,438	10,558,516	49,459,379	4.68	9.09
15	DGC Operations LLC	920	1,384,880	8,550,571	6.17	9.30
16	NRG California South LP	2,910	192,257	27,281,985	141.90	9.38
17	Nevada Power Company	5,169	15,006,904	51,802,791	3.45	10.02
18	Consolidated Asset Management Services, LLC	2,251	6,823,032	22,725,683	3.33	10.10
19	Dynegy -Moss Landing LLC	1,398	4,178,782	14,810,463	3.54	10.59
20	PSEG Fossil LLC	5,974	13,844,106	63,426,232	4.58	10.62
21	Siemens Energy, Inc.	2,022	6,505,585	21,848,892	3.36	10.81
22	The Carlyle Group Inc.	2,968	10,980,600	32,562,055	2.97	10.97
23	NRG Energy, Inc.	2,221	1,611,995	25,124,498	15.59	11.31
24	USCE - Savannah District	1,410	1,817,367	16,050,490	8.83	11.38
25	Exelon Power	6,727	9,692,185	77,304,889	7.98	11.49
26	WGP Acquisition LLC	1,374	5,759,520	15,880,460	2.76	11.55
27	EthosEnergy	3,317	12,488,684	38,581,195	3.09	11.63
28	Old Dominion Electric Cooperative	2,162	4,887,878	25,427,288	5.20	11.76
29	Southern Power Company	8,593	34,200,833	101,230,455	2.96	11.78
30	Dynegy Inc.	1,333	3,755,308	16,171,451	4.31	12.13
31	NRG Cottonwood Tenant LLC	1,434	7,170,723	17,486,923	2.44	12.20
32	Seminole Electric Cooperative Inc.	853	3,637,057	10,454,518	2.87	12.25
33	Banpu Public Company Limited	1,606	5,472,304	19,975,910	3.65	12.44
34	Jade Power Generation Holdings, LLC	1,346	2,418,663	16,936,924	7.00	12.59
35	Aspen Generating, LLC	907	4,493,414	11,472,911	2.55	12.65
36	H2O Power Limited Partnership	1,406	1,906,658	17,839,910	9.36	12.69
37	Panda Power Funds, LP	1,615	8,513,943	20,512,485	2.41	12.70
38	Kiowa Power Partners, LLC	1,370	5,485,625	17,587,967	3.21	12.84
39	Constellation Energy Nuclear Group, LLC	3,776	10,585,131	49,281,311	4.66	13.05
40	LS Power Development, LLC	1,469	5,366,802	19,218,136	3.58	13.08
41	California Department of Water Resources	1,474	2,693,527	19,353,742	7.19	13.13
42	Delta Energy Center LLC	944	3,081,664	12,498,369	4.06	13.25
43	Rise Light & Power	2,551	3,337,961	34,018,963	10.19	13.34
44	NRG REMA , LLC	1,898	579,423	25,510,992	44.03	13.44
45	Tenaska Alabama Partners LP	939	1,882,859	12,744,700	6.77	13.57
46	Odessa-Ector Power Partners, L.P.	1,153	7,420,294	15,645,442	2.11	13.57
47	Morgan Energy Center, LLC	900	4,532,851	12,226,329	2.70	13.58
48	Channel Energy Center, LP	924	4,142,358	12,610,028	3.04	13.65
49	Calpine Central, L.P.	933	4,294,527	12,750,195	2.97	13.67
50	Austin Energy	1,635	2,734,806	22,487,784	8.22	13.76
51	Entergy Texas, Inc.	2,609	6,437,777	36,014,600	5.59	13.81
52	Calpine Corp-Magic Valley	801	3,271,743	11,082,677	3.39	13.84
53	Conectiv Bethlehem LLC	1,153	4,159,649	16,029,595	3.85	13.90
54	Brazos Electric Power Cooperative, Inc.	1,884	4,053,737	26,189,800	6.46	13.90
55	CER Generation, LLC	823	4,376,115	11,451,760	2.62	13.92
56	Astoria Generating Company LP	1,697	1,164,381	23,776,182	20.42	14.01
57	Entergy Louisiana, LLC	9,148	24,874,368	128,252,566	5.16	14.02

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Source: S&P Global as of 3/15/2022

Rank	Operator Name	Name Plate Capacity MW	Net Generation MWh	Total Non-Fuel O&M \$	Calculated NF O&M \$/MWh	Calculated NF O&M \$/kW
58	Texgen Power, LLC	2,457	3,625,782	34,477,204	9.51	14.03
59	Occidental Chemical Corporation	938	5,289,832	13,313,192	2.52	14.19
60	Tenaska Gateway Partners Ltd	940	2,905,428	13,392,051	4.61	14.25
61	Dynegy Kendall Energy, LLC	1,256	5,857,928	17,902,466	3.06	14.25
62	NRG Bowline LLC	1,242	473,118	17,707,035	37.43	14.26
63	TNA Merchant Projects, Inc	1,240	2,712,761	17,702,683	6.53	14.28
64	New Covert Generating Company LLC	1,176	6,785,423	16,866,697	2.49	14.34
65	PSEG Power New York LLC	893	5,142,115	12,851,159	2.50	14.39
66	Argo Infrastructure Partners LP	1,494	6,113,782	21,529,180	3.52	14.41
67	WorleyParsons	918	5,347,392	13,247,643	2.48	14.43
68	Deer Park Energy Center LLC	1,176	6,891,970	17,066,700	2.48	14.51
69	La Frontera Holdings, LLC	3,007	17,706,672	43,712,421	2.47	14.54
70	Invenergy LLC	1,853	5,807,419	27,151,554	4.68	14.65
71	Tenaska Virginia Partners, L.P.	1,011	5,771,750	14,823,070	2.57	14.66
72	Freestone Power Generation LP	1,036	6,394,911	15,240,995	2.38	14.71
73	Tenaska Frontier Partners, Ltd.	940	3,566,210	13,868,254	3.89	14.76
74	JEA	4,299	9,029,686	63,887,865	7.08	14.86
75	CCI Roseton LLC	1,242	516,508	18,475,818	35.77	14.88
76	Wood Group GTS	853	2,787,013	12,707,150	4.56	14.90
77	Marcus Hook Energy, L.P	836	4,132,590	12,488,164	3.02	14.94
78	Idaho Power Company	2,561	10,089,852	38,368,871	3.80	14.98
79	Entergy Mississippi, LLC	4,425	12,389,324	67,755,746	5.47	15.31
80	NAES Corporation	39,424	94,692,657	607,069,538	6.41	15.40
81	Avista Corporation	1,280	4,568,954	19,739,447	4.32	15.42
82	Dynegy Power, LLC	1,814	9,348,152	27,999,604	3.00	15.43
83	Duke Energy Florida, LLC	12,921	37,205,534	200,654,527	5.39	15.53
84	Calpine Bosque Energy Center, LLC	807	4,184,857	12,544,977	3.00	15.55
85	AES Alamitos, LLC	1,922	958,300	29,917,917	31.22	15.57
86	Midland Cogeneration Venture Limited Partnership	1,854	7,896,076	29,207,699	3.70	15.76
87	Cooperative Energy	2,209	5,136,040	35,011,506	6.82	15.85
88	The City of Seattle—City Light Department	2,007	6,409,721	31,900,288	4.98	15.89
89	South Houston Green Power, LLC	1,052	4,572,434	16,737,259	3.66	15.91
90	Starwood Energy Group Global, LLC	2,278	9,818,305	36,449,760	3.71	16.00
91	Oklahoma Gas and Electric Company	8,952	23,710,217	143,327,846	6.04	16.01
92	Lake Road Generating Company, LP	840	5,211,758	13,477,823	2.59	16.05
93	AES Redondo Beach, L.L.C.	1,316	274,507	21,208,438	77.26	16.11
94	U.S. Bureau Of Reclamation	14,689	40,917,686	237,277,308	5.80	16.15
95	Onward Energy	2,558	4,802,080	41,493,756	8.64	16.22
96	Arkansas Electric Cooperative Corp.	2,175	3,384,347	35,684,768	10.54	16.41
97	USCE - Little Rock District	1,089	2,331,995	18,005,503	7.72	16.53
98	Tallahassee City of	970	2,832,410	16,084,388	5.68	16.58
99	Interstate Power and Light Company	3,636	12,343,531	60,938,276	4.94	16.76
100	NRG Cabrillo Power Operations Incorporated	890	299,121	14,917,291	49.87	16.77
101	Colorado Energy Management LLC	867	1,349,745	14,544,613	10.78	16.77
102	USCE - Mobile District	1,186	2,289,462	19,894,407	8.69	16.78
103	Duke Energy Carolinas, LLC	16,623	44,888,798	281,358,455	6.27	16.93
104	USCE - North Pacific Division	13,111	53,610,263	223,489,795	4.17	17.05
105	USCE - Missouri River District	2,540	11,405,592	43,636,880	3.83	17.18
106	NRG Arthur Kill Operations, Inc.	896	989,784	15,417,356	15.58	17.22
107	Public Utility District No. 1 of Chelan County	1,988	9,283,644	34,457,160	3.71	17.33
108	Calpine Mid-Atlantic Generation LLC	2,044	3,074,233	35,618,045	11.59	17.42
109	NRG Chalk Point, LLC	2,647	1,454,986	46,340,177	31.85	17.51
110	Union Electric Company	10,228	32,572,811	179,527,185	5.51	17.55
111	Invenergy Services LLC	5,143	15,521,874	90,407,059	5.82	17.58
112	NextEra Energy Resources, LLC	2,304	5,139,198	41,202,301	8.02	17.88
113	Grant County Public Utility District	2,173	10,125,688	38,867,604	3.84	17.88
114	Platte River Power Authority	800	1,870,849	14,464,901	7.73	18.07

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Rank	Operator Name	Name Plate Capacity MW	Net Generation MWh	Total Non-Fuel O&M \$	Calculated NF O&M \$/MWh	Calculated NF O&M \$/kW
115	The Dow Chemical Company	2,628	12,323,057	47,642,520	3.87	18.13
116	Grand River Dam Authority	1,712	3,353,515	31,427,710	9.37	18.36
117	Evergy Missouri West, Inc.	1,830	1,083,370	34,057,780	31.44	18.61
118	Los Angeles Department of Water and Power, Califc	7,628	16,261,529	144,806,848	8.90	18.98
119	Pattern Energy Group Inc.	845	2,063,597	16,054,009	7.78	18.99
120	Tennessee Valley Authority	29,444	84,764,856	563,743,759	6.65	19.15
121	Ethos Energy Group Limited	1,353	5,521,821	25,992,321	4.71	19.21
122	Southwestern Public Service Company	4,744	14,797,224	91,308,548	6.17	19.25
123	Brookfield Renewable Partners L.P.	885	1,983,436	17,132,737	8.64	19.36
124	Dominion Energy South Carolina, Inc.	4,490	14,584,519	88,032,152	6.04	19.61
125	Consumers Energy Company	7,608	17,921,882	149,969,324	8.37	19.71
126	Helix Generation, LLC	1,418	7,015,135	28,104,621	4.01	19.82
127	Entergy Arkansas, LLC	7,360	32,125,419	146,211,405	4.55	19.86
128	Power Authority of the State of New York	5,400	28,321,233	107,660,982	3.80	19.94
129	PSEG Power Connecticut LLC	1,060	364,994	21,219,128	58.14	20.02
130	National Grid Generation, LLC	3,945	4,672,529	78,996,460	16.91	20.02
131	Hawaiian Electric Company, Inc.	1,258	3,496,406	25,326,238	7.24	20.14
132	Duke Energy Progress, LLC	10,773	33,645,354	217,726,826	6.47	20.21
133	Sacramento Municipal Utility District	1,203	2,617,116	24,351,007	9.30	20.24
134	Clearway Energy Operating LLC	948	2,208,578	19,311,938	8.74	20.37
135	Calpine Corporation	4,630	13,276,181	94,526,200	7.12	20.42
136	Apex Clean Energy, Inc.	1,314	4,324,739	26,832,995	6.20	20.42
137	BP Wind Energy North America Inc.	1,537	4,481,773	31,416,497	7.01	20.44
138	Virginia Electric and Power Company	20,560	48,882,243	422,755,568	8.65	20.56
139	Vestas Wind Systems A/S	930	3,095,677	19,143,367	6.18	20.59
140	E.ON Climate & Renewables North America Inc.	3,710	11,198,687	77,078,971	6.88	20.78
141	Tampa Electric Company	5,792	19,726,918	121,394,461	6.15	20.96
142	Talen Generation LLC	5,193	5,179,694	109,224,268	21.09	21.03
143	Luminant Generation Company LLC	12,634	28,382,108	266,975,253	9.41	21.13
144	EDF Renewables Services	6,495	21,278,655	137,348,038	6.45	21.15
145	USCE - Nashville District	932	3,609,369	19,827,855	5.49	21.28
146	Dynegy Power America, Inc.	2,356	9,389,571	50,776,884	5.41	21.55
147	Public Service Company of Oklahoma	4,782	10,196,550	103,258,799	10.13	21.59
148	Duke Energy Renewables, Inc.	1,593	4,906,886	34,522,995	7.04	21.68
149	GE Energy	1,003	3,330,088	21,834,531	6.56	21.78
150	FPL Energy Wyman LLC	846	156,386	18,648,000	119.24	22.04
151	Salt River Project Agricultural Improvement and Pov	11,111	38,770,027	248,086,748	6.40	22.33
152	Clearway Energy, Inc.	1,057	2,541,623	23,867,552	9.39	22.59
153	Avangrid Renewables LLC	5,254	13,282,669	121,141,398	9.12	23.06
154	Sustainable Power Group, LLC	844	1,810,358	19,537,044	10.79	23.15
155	City Public Service of San Antonio	6,152	19,843,510	145,802,306	7.35	23.70
156	City Utilities of Springfield	1,087	2,771,366	25,820,347	9.32	23.76
157	Talen Energy Supply, LLC	1,606	1,743,304	38,842,195	22.28	24.18
158	Wisconsin Power and Light Company	3,498	11,470,630	84,673,388	7.38	24.20
159	DTE Electric Company	9,374	31,930,531	226,947,863	7.11	24.21
160	Wisconsin Public Service Corporation	1,869	5,951,944	45,481,854	7.64	24.33
161	Empire District Electric Company	1,599	4,981,215	38,901,422	7.81	24.34
162	PowerSouth Energy Cooperative	1,876	5,661,081	45,845,742	8.10	24.44
163	Sunflower Electric Power Corporation, Inc.	1,108	1,547,607	27,657,877	17.87	24.96
164	Great River Energy	2,874	9,832,841	72,198,955	7.34	25.12
165	MidAmerican Energy Company	10,134	33,084,919	254,544,220	7.69	25.12
166	Dairyland Power Co-op	1,387	4,114,974	34,897,608	8.48	25.17
167	Northern States Power Company	7,414	23,733,859	186,651,307	7.86	25.18
168	Ihi Power Services Corp.	919	1,302,266	23,187,224	17.81	25.23
169	Public Service Company of Colorado	7,059	25,841,438	178,193,779	6.90	25.24
170	El Paso Electric Company	1,933	5,041,205	48,999,135	9.72	25.34
171	Cleco Power LLC	5,131	16,552,538	131,760,203	7.96	25.68

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172	Midwest Generation EME, LLC	5,147	7,724,298	132,948,201	17.21	25.83
173	East Kentucky Power Cooperative, Inc.	3,034	8,835,949	78,599,671	8.90	25.91
174	Sierra Pacific Power Company	1,836	6,312,613	47,708,070	7.56	25.99
175	NextEra Energy Partners, LP	4,105	14,512,206	106,876,521	7.36	26.04
176	Louisville Gas and Electric Company	5,489	22,647,768	143,254,668	6.33	26.10
177	Consolidated Edison Development, Inc.	1,301	2,983,742	34,154,017	11.45	26.26
178	Vistra Corp.	5,554	32,169,293	146,634,884	4.56	26.40
179	Colorado Springs City of	1,139	4,803,114	30,199,019	6.29	26.52
180	Southwestern Electric Power Company	5,778	20,444,035	153,834,247	7.52	26.62
181	Morgantown Steam, LLC	2,481	2,864,804	66,520,945	23.22	26.81
182	Lower Colorado River Authority	4,028	16,642,649	108,876,565	6.54	27.03
183	Associated Electric Cooperative Inc.	4,816	22,358,685	131,046,085	5.86	27.21
184	Allegheny Energy Supply Company, LLC	2,052	13,251,012	56,039,961	4.23	27.31
185	Portland General Electric Company	4,491	14,160,564	122,875,771	8.68	27.36
186	Evergy Kansas Central, Inc.	4,559	14,843,698	124,785,944	8.41	27.37
187	First Solar, Inc.	1,163	2,756,242	31,986,396	11.61	27.50
188	Evergy Metro, Inc.	5,744	16,790,274	158,094,461	9.42	27.52
189	8point3 Energy Partners LP	906	2,163,927	24,970,532	11.54	27.57
190	BHE Solar, LLC	998	2,491,731	27,594,683	11.07	27.66
191	Western Farmers Electric Cooperative	1,394	3,522,050	38,581,971	10.95	27.68
192	Castleton Commodities International LLC	1,268	1,387,688	35,141,880	25.32	27.71
193	AES Wind Generation, LLC	889	2,414,340	24,939,527	10.33	28.05
194	Orlando Utilities Commission	1,605	6,180,472	45,109,083	7.30	28.11
195	Puget Sound Energy, Inc.	2,712	6,047,508	76,912,059	12.72	28.36
196	TerraForm Power, Inc.	916	2,067,919	26,237,706	12.69	28.65
197	Lakeland City of	1,074	3,886,293	30,861,613	7.94	28.74
198	NRG Texas Power LLC	7,657	27,083,628	221,748,356	8.19	28.96
199	Georgia Power Company	18,102	61,639,724	525,795,788	8.53	29.05
200	Kingfisher Development Co.	2,531	3,539,694	73,930,145	20.89	29.21
201	NRG Power Midwest LP.	2,096	2,749,844	61,671,302	22.43	29.42
202	Springfield City of - (IL)	806	2,386,447	24,229,526	10.15	30.07
203	Arclight Capital Partners, LLC	11,017	56,948,189	334,626,912	5.88	30.37
204	NRG Energy Services LLC	2,756	9,553,185	83,734,793	8.77	30.39
205	Omaha Public Power District	2,848	11,071,624	88,219,484	7.97	30.98
206	PacifiCorp	11,775	49,211,372	366,446,988	7.45	31.12
207	South Carolina Public Service Authority	5,173	16,515,585	161,365,996	9.77	31.19
208	Big Rivers Electric Corporation	1,290	5,300,526	41,239,698	7.78	31.96
209	Kentucky Utilities Company	4,043	13,960,668	130,069,698	9.32	32.17
210	Tri-State Generation & Transmission Association, Inc	2,646	8,342,886	85,459,942	10.24	32.30
211	Enel Green Power North America, Inc.	2,071	7,868,005	68,416,735	8.70	33.03
212	Basin Electric Power Cooperative	5,331	25,918,178	180,984,960	6.98	33.95
213	Mississippi Power Company	4,309	16,693,816	147,463,337	8.83	34.22
214	Energy Harbor Generation	5,241	7,848,924	182,303,022	23.23	34.78
215	Appalachian Power Company	5,966	20,605,122	210,522,393	10.22	35.29
216	Kincaid Generation LLC	1,319	4,798,673	46,630,407	9.72	35.35
217	Minnesota Power Enterprises, Inc.	2,111	9,589,558	75,800,543	7.90	35.91
218	Pacific Gas and Electric Company	5,323	15,198,048	193,299,155	12.72	36.31
219	Southern California Edison Company	2,547	5,859,043	92,929,571	15.86	36.49
220	Nebraska Public Power District	2,239	10,468,012	82,614,614	7.89	36.90
221	Archer-Daniels-Midland Company	991	3,710,383	37,597,570	10.13	37.92
222	Homer City Generation, L.P.	2,012	5,130,945	76,420,241	14.89	37.98
223	Monongahela Power Company	1,152	6,014,055	43,893,614	7.30	38.10
224	TransAlta Centralia Generation LLC	1,461	5,370,662	55,858,199	10.40	38.24
225	Raven Power Generation Holdings LLC	1,370	4,732,171	52,590,176	11.11	38.38
226	AEP Generation Resources Inc.	3,610	14,155,847	139,653,480	9.87	38.69
227	Longview Power LLC	808	5,224,706	31,853,211	6.10	39.45
228	Duke Energy Indiana, LLC	8,230	30,887,221	325,414,269	10.54	39.54

**2018 Non-Fuel O&M \$/kW Installed
Ranked by Operator Co.**

Criteria: Company Nameplate Capacity >= 800 MW -- Non Nuclear Units
Source: S&P Global as of 3/15/2022

Rank	Operator Name	Name Plate Capacity MW	Net Generation MWh	Total Non-Fuel O&M \$	Calculated NF O&M \$/MWh	Calculated NF O&M \$/kW
229	Duke Energy Kentucky, Inc.	1,351	2,916,245	53,561,337	18.37	39.66
230	Hoosier Energy Rural Electric Coop Inc.	1,123	5,962,886	44,643,797	7.49	39.76
231	Kentucky Power Company	1,913	6,128,095	76,081,350	12.42	39.77
232	Dynegy Midwest Generation, Inc.	2,688	11,387,092	107,843,255	9.47	40.11
233	AGC Division of APG Inc	823	4,336,582	33,115,900	7.64	40.25
234	Illinois Power Generating Company	2,723	13,357,897	109,824,830	8.22	40.34
235	Alabama Power Company	13,230	53,196,371	533,744,609	10.03	40.34
236	MOR PPM Inc	1,429	7,708,433	58,018,269	7.53	40.59
237	Illinois Power Resources Generating, LLC	1,085	5,716,668	44,541,323	7.79	41.04
238	Pleasants Corporation	1,368	7,021,328	56,183,805	8.00	41.07
239	AES Indiana	4,184	13,119,371	174,598,292	13.31	41.73
240	Louisiana Generating LLC	2,604	4,737,785	113,928,645	24.05	43.75
241	Northern Indiana Public Service Company	4,021	11,979,274	177,957,709	14.86	44.26
242	Arizona Public Service Company	6,623	19,473,432	297,800,252	15.29	44.97
243	Talen Montana, LLC	2,363	12,656,682	107,311,286	8.48	45.41
244	Otter Tail Power Company	1,302	6,502,323	62,752,754	9.65	48.19
245	Gulf Power Company	1,811	7,367,989	87,960,017	11.94	48.58
246	Southern Indiana Gas and Electric Company	1,244	4,364,653	61,744,022	14.15	49.64
247	Public Service Company of New Mexico	1,624	6,329,303	84,009,795	13.27	51.75
248	Indiana-Kentucky Electric Corporation	1,304	6,369,305	68,267,855	10.72	52.36
249	Northern California Power Agency	900	2,597,577	48,849,174	18.81	54.28
250	Consolidated Edison Company of New York, Inc.	819	2,956,300	47,127,321	15.94	57.53
251	International Paper Company	883	4,136,591	52,017,208	12.57	58.90
252	Tucson Electric Power Company	2,554	11,434,531	150,786,873	13.19	59.04
253	Ohio Valley Electric Corporation	1,087	5,801,085	69,560,622	11.99	64.02
254	Wisconsin Electric Power Company	7,309	23,315,422	628,291,764	26.95	85.96
255	Indiana Michigan Power Company	2,637	12,030,004	241,492,922	20.07	91.57
256	Prairie State Generating Company, LLC	1,766	11,532,418	180,734,169	15.67	102.34
257	Geysers Power Co LLC	1,241	5,113,475	148,520,171	29.04	119.68

**2019 Non-Fuel O&M \$/kW Installed
Ranked by Operator Co.**

Criteria: Company Nameplate Capacity >= 800 MW -- Non Nuclear Units
Source: S&P Global as of 3/15/2022

Rank	Operator Name	Name Plate Capacity MW	Net Generation MWh	Total Non-Fuel O&M \$	Calculated NF O&M \$/MWh	Calculated NF O&M \$/kW
1	Riverside Generating Co LLC	1150	376501	4242003.669	11.27	3.69
2	Tenaska Georgia Partners, L.P.	1099.2	127139	4311813.16	33.91	3.92
3	NRG Marsh Landing LLC	828	63231	3419705.668	54.08	4.13
4	The Silverfern Group, Inc.	985	425156	4400310.426	10.35	4.47
5	Rolling Hills Generating, LLC	977.5	572940	4505463.448	7.86	4.61
6	Diamond Generating Corporation	1099.4	720162	5067719.275	7.04	4.61
7	RA Generation, LLC	1570.2	868354	7754852.022	8.93	4.94
8	NRG Oswego Harbor Power Operations Inc	1803.6	16813	9068813.892	539.39	5.03
9	Constellation Power Source Generation LLC	994.1	294879	5286754.664	17.93	5.32
10	Florida Power & Light Company	23982.4	95882035	154540782.5	1.61	6.44
11	Evergy Missouri West, Inc.	1306.2	262000	8449164.956	32.25	6.47
12	NextEra Energy, Inc.	1682.7	1781449	13780421.75	7.74	8.19
13	Oglethorpe Power Corporation	5438.4	12467101	50498073.05	4.05	9.29
14	Wolverine Power Supply Cooperative, Inc.	1007.8	683452	9872082.588	14.44	9.80
15	Consolidated Asset Management Services, LLC	2251.1	6747328	22221701.08	3.29	9.87
16	Talen Energy Supply, LLC	1606.3	1268744	16390824.2	12.92	10.20
17	Dynegy -Moss Landing LLC	1398	5220833	14901938.31	2.85	10.66
18	Exelon Power	6726.5	6273081	72339015.96	11.53	10.75
19	Nevada Power Company	5169	14738101	56086423.51	3.81	10.85
20	The Carlyle Group Inc.	2968.2	9448876	32245672.01	3.41	10.86
21	DGC Operations LLC	919.7	4134367	10074023.48	2.44	10.95
22	PSEG Fossil LLC	5521.5	16296223	60598758.08	3.72	10.98
23	AES Redondo Beach, L.L.C.	1316.4	195943	14493015.6	73.97	11.01
24	WGP Acquisition LLC	1374.4	4933816	15537301.01	3.15	11.30
25	Tenaska Operations, Inc.	1134	5161329	12847501.77	2.49	11.33
26	USCE - Savannah District	1409.9	2338834	16472615.46	7.04	11.68
27	Banpu Public Company Limited	1606.4	4638514	18774668.85	4.05	11.69
28	Southern Power Company	8692.7	33395891	101659955.4	3.04	11.69
29	Siemens Energy, Inc.	2022	11480355	23990742.14	2.09	11.86
30	Panda Power Funds, LP	1615.2	7162270	19359613.58	2.70	11.99
31	Jade Power Generation Holdings, LLC	1345.8	1922121	16245323.65	8.45	12.07
32	Dynegy Inc.	1333	4029542	16196465.2	4.02	12.15
33	EthosEnergy	3316.8	17650376	40357223.15	2.29	12.17
34	NRG Cottonwood Tenant LLC	1433.6	7246613	17464761.91	2.41	12.18
35	NRG Energy, Inc.	2220.7	2601971	27403566.92	10.53	12.34
36	H2O Power Limited Partnership	1405.9	1730385	17388995.31	10.05	12.37
37	Cooperative Energy	1793	5613223	22798658.04	4.06	12.72
38	Kiowa Power Partners, LLC	1370	5500881	17694168.05	3.22	12.92
39	NRG REMA , LLC	1897.7	282065	24537587.73	86.99	12.93
40	Tenaska Alabama Partners LP	939.4	1723985	12329833.68	7.15	13.13
41	LS Power Development, LLC	1468.9	6961569	19311532.95	2.77	13.15
42	Seminole Electric Cooperative Inc.	853.3	3749101	11245022.64	3.00	13.18
43	Morgan Energy Center, LLC	900	3121340	11899659.14	3.81	13.22
44	Delta Energy Center LLC	943.5	3533557	12484815.69	3.53	13.23
45	Constellation Energy Nuclear Group, LLC	3776.3	13119102	50027991.35	3.81	13.25
46	Brazos Electric Power Cooperative, Inc.	1883.6	4461760	25143517.05	5.64	13.35
47	Rise Light & Power	2551	2298704	34367029.92	14.95	13.47
48	Aspen Generating, LLC	906.8	5191555	12228405.25	2.36	13.49
49	Austin Energy	1634.5	2236870	22278492.32	9.96	13.63
50	Entergy Louisiana, LLC	9296.3	26551132	127075838.9	4.79	13.67
51	Channel Energy Center, LP	923.8	4176244	12669001.7	3.03	13.71
52	Conectiv Bethlehem LLC	1153	4721993	15813490.57	3.35	13.72
53	Calpine Corp-Magic Valley	801	2850038	10995644.45	3.86	13.73
54	Calpine Central, L.P.	932.9	4721930	12900845.83	2.73	13.83
55	Astoria Generating Company LP	1697	701896	23628468.1	33.66	13.92
56	Texgen Power, LLC	2456.7	4923676	34242969.54	6.95	13.94
57	NRG California South LP	1670	164383	23310607.03	141.81	13.96

**2019 Non-Fuel O&M \$/kW Installed
Ranked by Operator Co.**

Criteria: Company Nameplate Capacity >= 800 MW -- Non Nuclear Units
Source: S&P Global as of 3/15/2022

Rank	Operator Name	Name Plate Capacity MW	Net Generation MWh	Total Non-Fuel O&M \$	Calculated NF O&M \$/MWh	Calculated NF O&M \$/kW
58	CER Generation, LLC	822.8	5035173	11670979.17	2.32	14.18
59	Dynegy Kendall Energy, LLC	1256	6605374	17851490.74	2.70	14.21
60	New Covert Generating Company LLC	1176	7405770	16767190.93	2.26	14.26
61	Tenaska Gateway Partners Ltd	939.6	3903757	13447723.15	3.44	14.31
62	Odessa-Ector Power Partners, L.P.	1152.8	7366950	16563261.19	2.25	14.37
63	La Frontera Holdings, LLC	3006.8	17531006	43288362.26	2.47	14.40
64	Idaho Power Company	2560.6	10407519	36922477.72	3.55	14.42
65	Tenaska Virginia Partners, L.P.	1011.4	5938030	14590344.19	2.46	14.43
66	Deer Park Energy Center LLC	1176	6809470	16997494.76	2.50	14.45
67	Occidental Chemical Corporation	937.9	5773776	13605263.52	2.36	14.51
68	NRG Bowline LLC	1242	286744	18038567.63	62.91	14.52
69	WorleyParsons	918.3	5536983	13343285.43	2.41	14.53
70	Argo Infrastructure Partners LP	1494	6446637	21731052.03	3.37	14.55
71	TNA Merchant Projects, Inc	1239.7	4346109	18038204.59	4.15	14.55
72	Tenaska Frontier Partners, Ltd.	939.7	3993421	13847215.91	3.47	14.74
73	PSEG Power New York LLC	893.1	4544459	13307449.96	2.93	14.90
74	Dynegy Power, LLC	1814.1	8711011	27133323.33	3.11	14.96
75	NAES Corporation	41466.7	102323585	621009598.5	6.07	14.98
76	CCI Roseton LLC	1242	143675	18672442.95	129.96	15.03
77	PSEG Power Connecticut LLC	1636.4	2095755	24632792.05	11.75	15.05
78	The City of Seattle—City Light Department	2007.4	5334992	30233178.32	5.67	15.06
79	Freestone Power Generation LP	1036	7381531	15632538.29	2.12	15.09
80	Avista Corporation	1279.9	4100821	19346536	4.72	15.12
81	Midland Cogeneration Venture Limited Partnership	1853.8	8853024	28785007.07	3.25	15.53
82	Dominion Energy South Carolina, Inc.	4489.6	12821212	69822388.63	5.45	15.55
83	Wood Group GTS	853	3873564	13336897.75	3.44	15.64
84	Calpine Bosque Energy Center, LLC	807	4256899	12692633.61	2.98	15.73
85	Arkansas Electric Cooperative Corp.	2174.7	3045309	34233291.25	11.24	15.74
86	U.S. Bureau Of Reclamation	14688.7	36687692	231242839.3	6.30	15.74
87	Marcus Hook Energy, L.P	836.1	4470434	13193663.44	2.95	15.78
88	Duke Energy Florida, LLC	12076.4	38685494	192411217	4.97	15.93
89	Starwood Energy Group Global, LLC	2277.5	9738837	36319814.33	3.73	15.95
90	NRG Chalk Point, LLC	2647	496023	42296894.54	85.27	15.98
91	AES Alamos, LLC	1922	581118	30727390.18	52.88	15.99
92	Public Utility District No. 1 of Chelan County	1988.2	7605021	31800531.07	4.18	15.99
93	California Department of Water Resources	1474.2	4577585	23613165.19	5.16	16.02
94	USCE - North Pacific Division	13111.4	45072089	210336571.5	4.67	16.04
95	Invenegy LLC	2710.4	13551042	43545429.53	3.21	16.07
96	Tallahassee City of	955.2	2908136	15462551.24	5.32	16.19
97	Lake Road Generating Company, LP	840	5322170	13605631.6	2.56	16.20
98	Calpine Mid-Atlantic Generation LLC	2044.4	1616068	33664502.81	20.83	16.47
99	South Houston Green Power, LLC	1052.1	4637298	17590262.66	3.79	16.72
100	USCE - Mobile District	1185.7	2458788	19901564.56	8.09	16.78
101	Grand River Dam Authority	1712	3678841	28774096.23	7.82	16.81
102	Grant County Public Utility District	2173.4	8288398	36636009.91	4.42	16.86
103	NRG Arthur Kill Operations, Inc.	895.5	903336	15307704.41	16.95	17.09
104	Interstate Power and Light Company	3865.8	13847268	66247281	4.78	17.14
105	FPL Energy Wyman LLC	846	5942	14673051	2469.38	17.34
106	Union Electric Company	10215.7	26343263	178500341.2	6.78	17.47
107	Onward Energy	2746.4	6176864	48039092.49	7.78	17.49
108	Oklahoma Gas and Electric Company	8952	21010462	156813951.6	7.46	17.52
109	Southwestern Public Service Company	5221.5	14574249	92259329	6.33	17.67
110	Entergy Texas, Inc.	2608.6	5883409	46295087.17	7.87	17.75
111	Tampa Electric Company	6070.3	19426456	108480556.3	5.58	17.87
112	Los Angeles Department of Water and Power, Califc	7623.3	15420345	136435609.2	8.85	17.90
113	USCE - Little Rock District	1089.2	3778976	19646976.92	5.20	18.04
114	Colorado Energy Management LLC	867.2	1533508	15805792.46	10.31	18.23

**2019 Non-Fuel O&M \$/kW Installed
Ranked by Operator Co.**

Criteria: Company Nameplate Capacity >= 800 MW -- Non Nuclear Units
Source: S&P Global as of 3/15/2022

Rank	Operator Name	Name Plate Capacity MW	Net Generation MWh	Total Non-Fuel O&M \$	Calculated NF O&M \$/MWh	Calculated NF O&M \$/kW
115	Hawaiian Electric Company, Inc.	1277.7	3493652	23622468.27	6.76	18.49
116	Duke Energy Carolinas, LLC	16596.5	43019954	310216149	7.21	18.69
117	Tennessee Valley Authority	28454.3	81408163	534031449.9	6.56	18.77
118	USCE - Missouri River District	2539.8	12934741	47692900.77	3.69	18.78
119	Calpine Corporation	5519.3	20529533	104630776.4	5.10	18.96
120	The Dow Chemical Company	2627.5	12659662	49882728.4	3.94	18.98
121	Consumers Energy Company	7530.1	19211949	143709873.7	7.48	19.08
122	Talen Generation LLC	5185.3	4065694	99093977.81	24.37	19.11
123	Platte River Power Authority	800.4	2037519	15359691.67	7.54	19.19
124	Invenergy Services LLC	5142.7	17256027	99231204.87	5.75	19.30
125	Old Dominion Electric Cooperative	2162	4548043	42241548.77	9.29	19.54
126	Duke Energy Progress, LLC	10705.9	31534740	212787200.5	6.75	19.88
127	Entergy Arkansas, LLC	7360.3	26860258	146683171	5.46	19.93
128	Ethos Energy Group Limited	1353.3	5170098	27413151.29	5.30	20.26
129	Evergy Kansas Central, Inc.	4476.5	11396101	90971817	7.98	20.32
130	Public Service Company of Oklahoma	4782.4	9072228	97438785.09	10.74	20.37
131	Power Authority of the State of New York	5399.9	28346144	110809358.4	3.91	20.52
132	Entergy Mississippi, LLC	3576.3	11541595	73465022.88	6.37	20.54
133	USCE - Nashville District	931.6	3455537	19184890	5.55	20.59
134	National Grid Generation, LLC	3945.4	3886660	81463819.36	20.96	20.65
135	JEA	2941	8301380	60910340.03	7.34	20.71
136	Dynegy Power America, Inc.	2356.4	8762618	49012193.28	5.59	20.80
137	Helix Generation, LLC	1418	6384397	29615048.48	4.64	20.89
138	City Public Service of San Antonio	6156.8	16430521	128923018.7	7.85	20.94
139	Great River Energy	2874.4	8500298	60343347.65	7.10	20.99
140	EDF Renewables Inc.	1061.9	1976421	22516663.25	11.39	21.20
141	Cleco Power LLC	5181.6	15798964	110205170	6.98	21.27
142	Northern States Power Company	7448.3	23734268	159261527.1	6.71	21.38
143	Sacramento Municipal Utility District	1202.9	3484992	25733868.77	7.38	21.39
144	Energy Harbor Generation	5241.2	4611477	112241983.7	24.34	21.42
145	NextEra Energy Resources, LLC	3155.96	8440243	68069457.29	8.06	21.57
146	Wisconsin Power and Light Company	3147.3	8371298	68582271	8.19	21.79
147	Duke Energy Renewables, Inc.	1803.95	4674878	40349929.9	8.63	22.37
148	City Utilities of Springfield	1086.5	2027288	24375012.47	12.02	22.43
149	Brookfield Renewable Partners L.P.	885	1578538	19875847.76	12.59	22.46
150	Empire District Electric Company	1598.5	4904363	36263549	7.39	22.69
151	El Paso Electric Company	1933.4	5201814	44521568.72	8.56	23.03
152	DTE Electric Company	9323.1	28353703	215972690.8	7.62	23.17
153	East Kentucky Power Cooperative, Inc.	3033.8	6516647	70506402.73	10.82	23.24
154	Pattern Energy Group Inc.	845.24	2307586	19802079.89	8.58	23.43
155	First Solar, Inc.	1470.8	2965082	34496583.94	11.63	23.45
156	Apex Clean Energy, Inc.	1476.9	4353099	34733276.12	7.98	23.52
157	Avangrid Renewables LLC	5948.25	12902295	141036017.9	10.93	23.71
158	Clearway Energy Operating LLC	948	2069513	22541831.16	10.89	23.78
159	BP Wind Energy North America Inc.	1537	4475066	36769603.22	8.22	23.92
160	EDF Renewables Services	6522.2	20229360	156099706.6	7.72	23.93
161	Public Service Company of Colorado	7057.9	26784847	170002611.6	6.35	24.09
162	Evergy Metro, Inc.	5368.3	17615831	129701364	7.36	24.16
163	Vestas Wind Systems A/S	1087.7	3845212	26410247.12	6.87	24.28
164	Salt River Project Agricultural Improvement and Pov	11111	37761727	271236755.6	7.18	24.41
165	Vistra Corp.	5554.3	30488803	137548758.3	4.51	24.76
166	Wisconsin Public Service Corporation	1638.2	4845186	40577178	8.37	24.77
167	E.ON Climate & Renewables North America Inc.	3709.8	11515507	92259794.91	8.01	24.87
168	GE Energy	1007.9	3371074	25301455.26	7.51	25.10
169	Lower Colorado River Authority	4028.1	16384922	101277145.9	6.18	25.14
170	MidAmerican Energy Company	10873.4	28512744	273876702.9	9.61	25.19
171	Clearway Energy, Inc.	1180.5	2473961	30323599.52	12.26	25.69

**2019 Non-Fuel O&M \$/kW Installed
Ranked by Operator Co.**

Criteria: Company Nameplate Capacity >= 800 MW -- Non Nuclear Units
Source: S&P Global as of 3/15/2022

Rank	Operator Name	Name Plate Capacity MW	Net Generation MWh	Total Non-Fuel O&M \$	Calculated NF O&M \$/MWh	Calculated NF O&M \$/kW
172	Sustainable Power Group, LLC	950.4	2103095	24413640.8	11.61	25.69
173	Associated Electric Cooperative Inc.	4816	22983238	123817039.7	5.39	25.71
174	PowerSouth Energy Cooperative	1876.2	5190613	48399185.21	9.32	25.80
175	Midwest Generation EME, LLC	5146.9	5662927	133226342	23.53	25.88
176	Louisiana Generating LLC	2604.2	3407291	67551952.85	19.83	25.94
177	Monongahela Power Company	1152	6701026	29900065	4.46	25.95
178	Southwestern Electric Power Company	5778	17582584	150057656.7	8.53	25.97
179	Orlando Utilities Commission	1604.8	6181750	41907434.9	6.78	26.11
180	Morgantown Steam, LLC	2481	1942326	65188783.04	33.56	26.28
181	Castleton Commodities International LLC	1268.2	823612	33371829.22	40.52	26.31
182	Luminant Generation Company LLC	8214.9	26613969	216654058	8.14	26.37
183	Sunflower Electric Power Corporation, Inc.	1108.1	1676499	29266384.04	17.46	26.41
184	NRG Texas Power LLC	7656.5	25149474	202948800	8.07	26.51
185	Dairyland Power Co-op	1386.6	3308444	37143257.11	11.23	26.79
186	Western Farmers Electric Cooperative	1393.9	1688388	37795017.49	22.39	27.11
187	Sierra Pacific Power Company	1835.9	6589046	49981658.09	7.59	27.22
188	Puget Sound Energy, Inc.	2712.1	7451755	74496760.62	10.00	27.47
189	ArcLight Capital Partners, LLC	11017.3	54926949	305797719.3	5.57	27.76
190	Louisville Gas and Electric Company	5488.8	22555646	152505459.5	6.76	27.78
191	South Carolina Public Service Authority	5176	14981779	145376062	9.70	28.09
192	8point3 Energy Partners LP	905.6	2069074	25486949.02	12.32	28.14
193	NRG Power Midwest LP.	2095.9	1652957	59413439.37	35.94	28.35
194	BHE Solar, LLC	997.8	2413224	28434320.84	11.78	28.50
195	Allegheny Energy Supply Company, LLC	2052	12894205	58799998	4.56	28.65
196	AEP Generation Resources Inc.	3609.7	11950930	103875726.2	8.69	28.78
197	NextEra Energy Partners, LP	4105	14283726	118195770.1	8.27	28.79
198	Consolidated Edison Development, Inc.	1310.6	3591333	37971868.08	10.57	28.97
199	Omaha Public Power District	2847.7	8976690	83673812.05	9.32	29.38
200	TerraForm Power, Inc.	921.9	1747784	27619719.84	15.80	29.96
201	Portland General Electric Company	4487.42	16416939	135044382.4	8.23	30.09
202	Lakeland City of	1074	3295986	32728646.75	9.93	30.47
203	Springfield City of - (IL)	805.9	1865733	24681456.14	13.23	30.63
204	Georgia Power Company	18108.82	57025140	555106166.6	9.73	30.65
205	Kentucky Utilities Company	4043.2	11700073	123994168	10.60	30.67
206	Colorado Springs City of	1138.9	4726386	35016812.45	7.41	30.75
207	AES Wind Generation, LLC	889	2351514	27413949.8	11.66	30.84
208	Dynegy Midwest Generation, Inc.	2688.4	8710463	83521018.93	9.59	31.07
209	Big Rivers Electric Corporation	1290.2	4974189	40386291.22	8.12	31.30
210	PacifiCorp	11775.26	47951969	370705468.1	7.73	31.48
211	Mississippi Power Company	4200.5	18610111	133312062.9	7.16	31.74
212	Pacific Gas and Electric Company	5321.82	18299987	174060069.3	9.51	32.71
213	Appalachian Power Company	5966	19863883	195157741	9.82	32.71
214	Enel Green Power North America, Inc.	2873.5	10671385	94381905.75	8.84	32.85
215	Minnesota Power Enterprises, Inc.	1960.8	7152899	64929719.42	9.08	33.11
216	Gulf Power Company	1810.7	6651816	60114130.61	9.04	33.20
217	Arizona Public Service Company	7426.9	21344741	248200531.7	11.63	33.42
218	Kincaid Generation LLC	1319	3114921	44116272.19	14.16	33.45
219	Longview Power LLC	807.5	5264653	28074121.26	5.33	34.77
220	Raven Power Generation Holdings LLC	1370.2	2231445	47892831.66	21.46	34.95
221	NRG Energy Services LLC	2755.5	10012809	96754636.13	9.66	35.11
222	Nebraska Public Power District	2239.1	10030029	79585388.98	7.93	35.54
223	Homer City Generation, L.P.	2012	6827882	73316711.64	10.74	36.44
224	Hoosier Energy Rural Electric Coop Inc.	1119.2	4686672	40857912.98	8.72	36.51
225	MOR PPM Inc	1429.2	7054142	52581062.04	7.45	36.79
226	Southern California Edison Company	2546.92	7526858	93827175.97	12.47	36.84
227	TransAlta Centralia Generation LLC	1460.8	7157224	54205847.44	7.57	37.11
228	Duke Energy Kentucky, Inc.	1350.5	3315252	50145414.23	15.13	37.13

**2019 Non-Fuel O&M \$/kW Installed
Ranked by Operator Co.**

Criteria: Company Nameplate Capacity >= 800 MW -- Non Nuclear Units
Source: S&P Global as of 3/15/2022

Rank	Operator Name	Name Plate Capacity MW	Net Generation MWh	Total Non-Fuel O&M \$	Calculated NF O&M \$/MWh	Calculated NF O&M \$/kW
229	Pleasants Corporation	1368	4965173	50795700.83	10.23	37.13
230	Tri-State Generation & Transmission Association, Inc	2646.1	9132585	99687838.98	10.92	37.67
231	Kentucky Power Company	1913.1	6103601	72706961	11.91	38.00
232	AES Indiana	4183.5	14938261	162920943.1	10.91	38.94
233	Illinois Power Generating Company	2722.6	10296255	106161579.4	10.31	38.99
234	Alabama Power Company	13230.1	51563513	525637879.3	10.19	39.73
235	AGC Division of APG Inc	822.8	4214527	32896114.17	7.81	39.98
236	Archer-Daniels-Midland Company	991.4	3443693	40112250.45	11.65	40.46
237	Duke Energy Indiana, LLC	8059.6	22103885	331478639.3	15.00	41.13
238	Virginia Electric and Power Company	20821.81	49487222	870762742.9	17.60	41.82
239	Illinois Power Resources Generating, LLC	1085.3	5453752	45518558.77	8.35	41.94
240	Talen Montana, LLC	2363.4	13407682	107145861	7.99	45.34
241	Otter Tail Power Company	1302.14	5495931	59310582.8	10.79	45.55
242	Northern Indiana Public Service Company	3417.4	10329418	162555566.9	15.74	47.57
243	Public Service Company of New Mexico	1643.5	6252333	79584016.29	12.73	48.42
244	Southern Indiana Gas and Electric Company	1190.7	3856697	61416699.2	15.92	51.58
245	International Paper Company	945.1	4207633	48819477.84	11.60	51.66
246	Indiana-Kentucky Electric Corporation	1303.8	5722979	68043472	11.89	52.19
247	Tucson Electric Power Company	2647.9	9668728	138374162.9	14.31	52.26
248	Northern California Power Agency	900	2789257	49937029.09	17.90	55.49
249	Ohio Valley Electric Corporation	1086.5	5515010	69384373	12.58	63.86
250	Consolidated Edison Company of New York, Inc.	819.2	2819850	54866238.01	19.46	66.98
251	Basin Electric Power Cooperative	5330.5	24151940	370427990.1	15.34	69.49
252	Indiana Michigan Power Company	2637.3	8271174	219082850	26.49	83.07
253	Prairie State Generating Company, LLC	1766	12053090	172439782	14.31	97.64
254	Wisconsin Electric Power Company	6073.5	21171466	604126530.5	28.53	99.47
255	Geysers Power Co LLC	1241	4701507	170967034.7	36.36	137.77

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Rank	Operator Name	Name Plate Capacity MW	Net Generation MWh	Total Non-Fuel O&M \$	Calculated NF O&M \$/MWh	Calculated NF O&M \$/kW
1	NRG Oswego Harbor Power Operations Inc	1803.6	22540	6484213.381	287.68	3.60
2	Riverside Generating Co LLC	1150	476100	4494984.433	9.44	3.91
3	Tenaska Georgia Partners, L.P.	1099.2	74103	4528929.254	61.12	4.12
4	NRG Marsh Landing LLC	828	265306	3702369.804	13.96	4.47
5	The Silverfern Group, Inc.	985	294337	4563665.431	15.50	4.63
6	Rolling Hills Generating, LLC	977.5	267125	4592870.449	17.19	4.70
7	Diamond Generating Corporation	1099.4	746908	5310662.181	7.11	4.83
8	Constellation Power Source Generation LLC	840.6	204945	4117944.2	20.09	4.90
9	RA Generation, LLC	1570.2	981031	8163029.89	8.32	5.20
10	Talen Energy Supply, LLC	1606.3	964035	11930254.88	12.38	7.43
11	Florida Power & Light Company	24950.9	99128317	187061650.1	1.89	7.50
12	NextEra Energy, Inc.	1732.1	2276167	14100752.17	6.19	8.14
13	Ethos Energy Power Plant Services LLC	1258.2	3835743	10881932.68	2.84	8.65
14	Oglethorpe Power Corporation	5438.4	13005686	49110180.84	3.78	9.03
15	Consolidated Asset Management Services, LLC	2251.1	5619481	20516003.73	3.65	9.11
16	Evergy Missouri West, Inc.	1306.2	217904	12624611.92	57.94	9.67
17	Exelon Power	6726.5	5461017	65230241.32	11.94	9.70
18	Dynegy -Moss Landing LLC	1398	5223032	14086361.35	2.70	10.08
19	DGC Operations LLC	919.7	4741581	9278517.496	1.96	10.09
20	The Carlyle Group Inc.	2968.2	11724253	30518916.87	2.60	10.28
21	Tenaska Operations, Inc.	1134	6270337	11674728.43	1.86	10.30
22	PSEG Fossil LLC	5521.5	13656500	57595533.54	4.22	10.43
23	Banpu Public Company Limited	1606.4	5433243	16794036.95	3.09	10.45
24	Siemens Energy, Inc.	2022	11833541	21480620.05	1.82	10.62
25	Panda Power Funds, LP	1615.2	7657461	17647662.9	2.30	10.93
26	Nevada Power Company	5169	14842730	56707979.7	3.82	10.97
27	Austin Energy	1634.5	2284820	17963978.31	7.86	10.99
28	NRG Cottonwood Tenant LLC	1433.6	6163166	15962650.09	2.59	11.13
29	WGP Acquisition LLC	1374.4	5442588	15535886.33	2.85	11.30
30	EthosEnergy	3316.8	16703793	37979351.68	2.27	11.45
31	Jade Power Generation Holdings, LLC	1345.8	1354890	15506736.93	11.45	11.52
32	Southern Power Company	9028.8	33256154	104093322.1	3.13	11.53
33	Kiowa Power Partners, LLC	1370	5128258	16275769.29	3.17	11.88
34	Wolverine Power Supply Cooperative, Inc.	984.8	1193829	11888338.72	9.96	12.07
35	Constellation Energy Nuclear Group, LLC	3776.3	11482280	45601688.9	3.97	12.08
36	NRG Energy, Inc.	2220.7	2343595	27023413.55	11.53	12.17
37	USCE - Savannah District	1409.9	2597893	17394072.43	6.70	12.34
38	Dynegy Inc.	1333	4044362	16515207.57	4.08	12.39
39	Brazos Electric Power Cooperative, Inc.	1883.6	3484879	23391272.16	6.71	12.42
40	H2O Power Limited Partnership	1405.9	1536141	17476826.79	11.38	12.43
41	LS Power Development, LLC	1468.9	7754437	18317881.51	2.36	12.47
42	Tenaska Alabama Partners LP	939.4	1825393	11764575.03	6.44	12.52
43	Entergy Louisiana, LLC	10629.9	29449752	133302699.7	4.53	12.54
44	Morgan Energy Center, LLC	900	2848326	11301586.53	3.97	12.56
45	ENGIE North America Inc.	977.55	1573012	12406314.23	7.89	12.69
46	Delta Energy Center LLC	943.5	3860213	12059210.69	3.12	12.78
47	Cooperative Energy	1815.7	6022059	23212613.76	3.85	12.78
48	Conectiv Bethlehem LLC	1153	5602149	15027122.13	2.68	13.03
49	Tenaska Virginia Partners, L.P.	1011.4	4533164	13313858.76	2.94	13.16
50	Rise Light & Power	2551	2078237	33587415.03	16.16	13.17
51	CER Generation, LLC	822.8	5074658	10862581.43	2.14	13.20
52	New Covert Generating Company LLC	1176	7200741	15584344.96	2.16	13.25
53	La Frontera Holdings, LLC	3006.8	17372885	39915069.8	2.30	13.27
54	Calpine Central, L.P.	932.9	4782829	12393091.15	2.59	13.28
55	California Department of Water Resources	1589.3	2106936	21216123.59	10.07	13.35
56	Channel Energy Center, LP	923.8	4585578	12336561.39	2.69	13.35
57	Seminole Electric Cooperative Inc.	853.3	4402714	11408000.38	2.59	13.37

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58	Dynegy Kendall Energy, LLC	1256	7271182	16841893.39	2.32	13.41
59	Odessa-Ector Power Partners, L.P.	1152.8	6761970	15480276.91	2.29	13.43
60	Calpine Corp-Magic Valley	801	3214481	10780673.66	3.35	13.46
61	Texgen Power, LLC	2456.7	4791666	33336691.62	6.96	13.57
62	Deer Park Energy Center LLC	1176	7385212	16043785.62	2.17	13.64
63	Astoria Generating Company LP	1697	783937	23277771.57	29.69	13.72
64	Tenaska Gateway Partners Ltd	939.6	4095570	12912175.86	3.15	13.74
65	NRG California South LP	1670	730991	23001180.5	31.47	13.77
66	Aspen Generating, LLC	906.8	5374272	12509726.86	2.33	13.80
67	Occidental Chemical Corporation	937.9	5545213	12987166.68	2.34	13.85
68	WorleyParsons	918.3	5126494	12730787.28	2.48	13.86
69	Invenergy LLC	3059.3	13237753	42719325.82	3.23	13.96
70	Idaho Power Company	2563.8	9073043	35834358.96	3.95	13.98
71	Hawaiian Electric Company, Inc.	1277.7	3265707	17890001.68	5.48	14.00
72	Tenaska Frontier Partners, Ltd.	939.7	3700213	13170904.54	3.56	14.02
73	NRG REMA , LLC	1897.7	1374706	26766363.44	19.47	14.10
74	TNA Merchant Projects, Inc	1239.7	3361058	17521295.51	5.21	14.13
75	Freestone Power Generation LP	1036	6859912	14659500.35	2.14	14.15
76	PSEG Power New York LLC	893.1	4975715	12647315.71	2.54	14.16
77	NRG Bowline LLC	1242	660492	17825999.51	26.99	14.35
78	Dynegy Power, LLC	1814.1	8137426	26164900.76	3.22	14.42
79	Duke Energy Progress, LLC	11293.9	28654879	162997492.1	5.69	14.43
80	Argo Infrastructure Partners LP	1494	8031079	21702054.03	2.70	14.53
81	CCI Roseton LLC	1242	108682	18045009.97	166.03	14.53
82	Wisconsin Power and Light Company	4022.7	10336363	58448876.91	5.65	14.53
83	Midland Cogeneration Venture Limited Partnership	1853.8	9472409	26982085.43	2.85	14.56
84	Avista Corporation	1279.9	4136461	18702118	4.52	14.61
85	Entergy Texas, Inc.	2608.6	7405175	38887349.24	5.25	14.91
86	NAES Corporation	42500.4	114658525	634521076.3	5.53	14.93
87	Union Electric Company	10615.7	28496607	158949157.2	5.58	14.97
88	PSEG Power Connecticut LLC	1636.4	3597931	24543413.37	6.82	15.00
89	Duke Energy Florida, LLC	12072.6	40288219	182677775.7	4.53	15.13
90	Marcus Hook Energy, L.P	836.1	5189530	12697155.48	2.45	15.19
91	Calpine Bosque Energy Center, LLC	807	4413761	12285016.29	2.78	15.22
92	NRG Chalk Point, LLC	2647	365748	40303786.32	110.20	15.23
93	Oklahoma Gas and Electric Company	8962	21121268	136582960.4	6.47	15.24
94	Dominion Energy South Carolina, Inc.	4489.6	11338911	68546779.42	6.05	15.27
95	Lake Road Generating Company, LP	840	5594590	13081787.13	2.34	15.57
96	Starwood Energy Group Global, LLC	2211.5	10472607	34445117.09	3.29	15.58
97	Old Dominion Electric Cooperative	2162	3952101	33845885.77	8.56	15.65
98	Arkansas Electric Cooperative Corp.	2174.7	3335133	34108368.68	10.23	15.68
99	Southwestern Public Service Company	5743.5	14053751	90092263.67	6.41	15.69
100	Salt River Project Agricultural Improvement and Pov	8701.7	31650117	136568619.2	4.31	15.69
101	The City of Seattle—City Light Department	2007.4	6006202	32009902.29	5.33	15.95
102	Grand River Dam Authority	1712	3439064	27367334.43	7.96	15.99
103	Wood Group GTS	853	3321523	13795479.48	4.15	16.17
104	Calpine Mid-Atlantic Generation LLC	2044.4	1876705	33091857.99	17.63	16.19
105	Entergy Arkansas, LLC	7360.3	18334518	119629909	6.52	16.25
106	AES Alamos, LLC	1115	544278	18304137.25	33.63	16.42
107	Tallahassee City of	961.8	2669699	15855262.19	5.94	16.48
108	U.S. Bureau Of Reclamation	14688.7	39342574	242663416	6.17	16.52
109	Entergy Mississippi, LLC	3376.7	12791260	56550946.75	4.42	16.75
110	Tampa Electric Company	6219.6	18550602	104352678.9	5.63	16.78
111	USCE - Missouri River District	2539.8	10075554	42951284.96	4.26	16.91
112	NRG Arthur Kill Operations, Inc.	895.5	870379	15153416.1	17.41	16.92
113	USCE - North Pacific Division	13111.4	48674010	222633586.4	4.57	16.98
114	Duke Energy Carolinas, LLC	16621.5	38217549	284442028.2	7.44	17.11

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115	Tennessee Valley Authority	28454.3	80334603	494147571.6	6.15	17.37
116	Interstate Power and Light Company	4397.8	13203187	76445463.5	5.79	17.38
117	AES Redondo Beach, L.L.C.	821.4	307081	14288705.89	46.53	17.40
118	Empire District Electric Company	1747.9	4364536	30447352.85	6.98	17.42
119	Calpine Corporation	5519.3	20425340	96403319.06	4.72	17.47
120	USCE - Mobile District	1185.7	2730593	20763119.52	7.60	17.51
121	Public Utility District No. 1 of Chelan County	1988.2	8774131	34851717.26	3.97	17.53
122	South Houston Green Power, LLC	1052.1	4384383	18454037.07	4.21	17.54
123	Onward Energy	2746.4	6813908	48376577.81	7.10	17.61
124	Los Angeles Department of Water and Power, Califc	7628.2	14177057	135651081.7	9.57	17.78
125	EDF Renewables Inc.	1436.9	2800990	25848476.23	9.23	17.99
126	Grant County Public Utility District	2191.6	9966037	40644868.81	4.08	18.55
127	USCE - Little Rock District	1089.2	3838355	20263068.44	5.28	18.60
128	Platte River Power Authority	800.4	2032320	14907056.43	7.33	18.62
129	Invenergy Services LLC	5392.7	16436091	100623237.9	6.12	18.66
130	Evergy Kansas Central, Inc.	4476.5	10525780	84932683	8.07	18.97
131	Dynegy Power America, Inc.	2356.4	6434774	45577268.19	7.08	19.34
132	Consumers Energy Company	7646.5	17848703	148790805.7	8.34	19.46
133	NextEra Energy Resources, LLC	5252.56	12334753	102416019.5	8.30	19.50
134	Public Service Company of Oklahoma	4729.4	6048778	94289489.44	15.59	19.94
135	The Dow Chemical Company	2627.5	12985774	52493908.01	4.04	19.98
136	Colorado Energy Management LLC	867.2	1672504	17517828.58	10.47	20.20
137	Lakeland City of	1074	2718762	21866621.89	8.04	20.36
138	JEA	2941	10607421	61238953.84	5.77	20.82
139	Wisconsin Public Service Corporation	1788.2	4647574	37244584	8.01	20.83
140	EDP Renewables North America LLC	1065.5	2912453	22193389.32	7.62	20.83
141	City Public Service of San Antonio	6156.8	14534804	128685482.8	8.85	20.90
142	Ørsted	1107.2	3268279	23157085.41	7.09	20.91
143	Great River Energy	2826.4	8519650	59446951.5	6.98	21.03
144	Sacramento Municipal Utility District	1205.6	1956895	25403986.5	12.98	21.07
145	National Grid Generation, LLC	3945.4	5101382	83744495.13	16.42	21.23
146	Evergy Metro, Inc.	5368.3	15405686	114153847	7.41	21.26
147	Northern States Power Company	7556.9	19563770	161115255.6	8.24	21.32
148	Power Authority of the State of New York	5399.9	29297644	115431854.8	3.94	21.38
149	City Utilities of Springfield	1086.5	1815966	23236682.59	12.80	21.39
150	Midwest Generation EME, LLC	5146.9	2776302	110659943.4	39.86	21.50
151	Ethos Energy Group Limited	1353.3	4490218	29165133.98	6.50	21.55
152	Cleco Power LLC	5181.6	15343410	112505726	7.33	21.71
153	Brookfield Renewable Partners L.P.	885	1921272	19371849.8	10.08	21.89
154	Duke Energy Renewables, Inc.	2063.95	4578236	45325315.46	9.90	21.96
155	Helix Generation, LLC	1418	6451761	31142589.29	4.83	21.96
156	USCE - Nashville District	931.6	4128270	20589143.91	4.99	22.10
157	ALLETE Clean Energy, Inc.	899.8	1781280	19968497.72	11.21	22.19
158	Pattern Energy Group Inc.	845.24	2230496	18937123.42	8.49	22.40
159	Castleton Commodities International LLC	1268.2	288890	28514053.45	98.70	22.48
160	Talen Generation LLC	5168.1	2373296	116337740.2	49.02	22.51
161	Sustainable Power Group, LLC	1417.98	2847805	32072150.72	11.26	22.62
162	DTE Electric Company	9348.4	22007717	212500222.9	9.66	22.73
163	Apex Clean Energy, Inc.	1476.9	4785450	33794171.11	7.06	22.88
164	Sunflower Electric Power Corporation, Inc.	1108.1	1476942	25375554.86	17.18	22.90
165	Energy Harbor Generation	2500.1	4797478	57588151	12.00	23.03
166	BP Wind Energy North America Inc.	1537	4463142	35523452.03	7.96	23.11
167	East Kentucky Power Cooperative, Inc.	3033.8	7864095	70559426.5	8.97	23.26
168	MidAmerican Energy Company	11465.9	27561487	266808664.6	9.68	23.27
169	Western Farmers Electric Cooperative	1393.9	919855	32598452.72	35.44	23.39
170	Sierra Pacific Power Company	1835.9	6182470	43129778.35	6.98	23.49
171	Clearway Energy Operating LLC	948	2012387	22297597.45	11.08	23.52

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Source: S&P Global as of 3/15/2022

Rank	Operator Name	Name Plate Capacity MW	Net Generation MWh	Total Non-Fuel O&M \$	Calculated NF O&M \$/MWh	Calculated NF O&M \$/kW
172	E.ON Climate & Renewables North America Inc.	4109.4	11612689	96875573.03	8.34	23.57
173	PowerSouth Energy Cooperative	1876.2	4857203	44239610.08	9.11	23.58
174	Public Service Company of Colorado	7557.9	22740580	178438439.5	7.85	23.61
175	Southwestern Electric Power Company	5704	15246097	134839603.1	8.84	23.64
176	Virginia Electric and Power Company	19136.41	55027681	460075774.4	8.36	24.04
177	Vestas Wind Systems A/S	1087.7	4193328	26249843.09	6.26	24.13
178	Morgantown Steam, LLC	2481	1305824	60057707.76	45.99	24.21
179	EDF Renewables Services	6518.2	21728145	158088712.6	7.28	24.25
180	GE Energy	1007.9	3017440	24571332.57	8.14	24.38
181	Georgia Power Company	17026.72	46247537	415787686.1	8.99	24.42
182	Portland General Electric Company	4567.02	15231836	111829275.9	7.34	24.49
183	Vistra Corp.	5554.3	31669998	136609732.4	4.31	24.60
184	Dairyland Power Co-op	1386.6	2894987	34563219.62	11.94	24.93
185	Lower Colorado River Authority	4028.1	16097470	101102042.8	6.28	25.10
186	First Solar, Inc.	1749.8	3665226	44341229.12	12.10	25.34
187	Associated Electric Cooperative Inc.	4816	20544294	122193599	5.95	25.37
188	Orlando Utilities Commission	1604.8	5790530	41551349.84	7.18	25.89
189	Avangrid Renewables LLC	6098.25	15275181	158046986.7	10.35	25.92
190	NRG Texas Power LLC	7656.5	18403063	199263509.9	10.83	26.03
191	NRG Power Midwest LP.	2095.9	1458791	55187062.82	37.83	26.33
192	Clearway Energy, Inc.	1599.4	3399033	42291757.48	12.44	26.44
193	Puget Sound Energy, Inc.	2712.1	7961897	72231822.59	9.07	26.63
194	Luminant Generation Company LLC	8214.9	27615667	221613494.5	8.02	26.98
195	Gulf Power Company	1885.2	6267288	51279264.61	8.18	27.20
196	ArcLight Capital Partners, LLC	11017.3	47265047	299990102.9	6.35	27.23
197	Louisville Gas and Electric Company	5472.5	20526531	149315931.5	7.27	27.28
198	Springfield City of - (IL)	805.9	785329	22281723.2	28.37	27.65
199	El Paso Electric Company	1933.4	4803153	54712518	11.39	28.30
200	Colorado Springs City of	1138.9	4543261	32350336.07	7.12	28.40
201	NextEra Energy Partners, LP	4105	14524686	117525622	8.09	28.63
202	South Carolina Public Service Authority	5176	14297563	148784491.8	10.41	28.75
203	8point3 Energy Partners LP	905.6	2096287	26073148.85	12.44	28.79
204	Enel Green Power North America, Inc.	3773.6	12028858	109120209.9	9.07	28.92
205	Omaha Public Power District	2847.7	9654997	82894525.17	8.59	29.11
206	BHE Solar, LLC	997.8	2369176	29088310.22	12.28	29.15
207	AES Wind Generation, LLC	889	2032728	26408329.24	12.99	29.71
208	Consolidated Edison Development, Inc.	1349.2	3670288	40289379.7	10.98	29.86
209	PacifiCorp	12226.16	46163427	366669863.3	7.94	29.99
210	Appalachian Power Company	5966	17516846	180184580	10.29	30.20
211	Raven Power Generation Holdings LLC	1370.2	951052	41436195.7	43.57	30.24
212	Louisiana Generating LLC	2604.2	1338670	79047012.2	59.05	30.35
213	Minnesota Power Enterprises, Inc.	1960.8	6621953	60213457.54	9.09	30.71
214	Allegheny Energy Supply Company, LLC	2052	10879715	63160002	5.81	30.78
215	Big Rivers Electric Corporation	1194.2	3431820	36806423.55	10.73	30.82
216	Kincaid Generation LLC	1319	1475564	40914677.21	27.73	31.02
217	Mississippi Power Company	4200.5	18561417	130710272	7.04	31.12
218	Kentucky Power Company	1913.1	4524358	59572037	13.17	31.14
219	Kentucky Utilities Company	3750.1	11317741	116917213.1	10.33	31.18
220	AES Indiana	4183.5	13063204	136819389.3	10.47	32.70
221	Otter Tail Power Company	1452.14	4800830	47949523.13	9.99	33.02
222	TerraForm Power, Inc.	920.4	1895725	30885341.48	16.29	33.56
223	Homer City Generation, L.P.	2012	2979035	68583271.99	23.02	34.09
224	Duke Energy Kentucky, Inc.	1350.5	2340114	46269391.82	19.77	34.26
225	Alabama Power Company	12063.4	45410405	413588863	9.11	34.28
226	Hoosier Energy Rural Electric Coop Inc.	1119.2	2665911	38503865.99	14.44	34.40
227	Nebraska Public Power District	2236.7	8417721	77594375.37	9.22	34.69
228	AEP Generation Resources Inc.	2721.9	10134267	94877611.26	9.36	34.86

**2020 Non-Fuel O&M \$/kW Installed
Ranked by Operator Co.**

Criteria: Company Nameplate Capacity >= 800 MW -- Non Nuclear Units
Source: S&P Global as of 3/15/2022

Rank	Operator Name	Name Plate Capacity MW	Net Generation MWh	Total Non-Fuel O&M \$	Calculated NF O&M \$/MWh	Calculated NF O&M \$/kW
229	TransAlta Centralia Generation LLC	1460.8	5153513	52250583.17	10.14	35.77
230	Longview Power LLC	807.5	4949857	29001774.25	5.86	35.92
231	Dynegy Midwest Generation, Inc.	1259.6	4060737	45935059.51	11.31	36.47
232	Pleasants Corporation	1368	4882214	50116105.01	10.27	36.63
233	MOR PPM Inc	1429.2	6649299	52613718.87	7.91	36.81
234	NRG Energy Services LLC	2755.5	7939366	101843390.2	12.83	36.96
235	Archer-Daniels-Midland Company	991.4	3099735	38037997.95	12.27	38.37
236	Illinois Power Generating Company	1717.2	6740966	66041686.78	9.80	38.46
237	FPL Energy Wyman LLC	846	10567	32648361	3089.65	38.59
238	Tri-State Generation & Transmission Association, Inc	2532.3	8174829	98601001.28	12.06	38.94
239	AGC Division of APG Inc	822.8	4718034	32594900.56	6.91	39.61
240	Arizona Public Service Company	7199.7	22168231	286651804.9	12.93	39.81
241	Pacific Gas and Electric Company	5321.82	13602957	212124019.7	15.59	39.86
242	Monongahela Power Company	1152	5073932	47117360	9.29	40.90
243	Public Service Company of New Mexico	1643.5	6120237	67938015.24	11.10	41.34
244	Southern California Edison Company	2538.92	5275142	105653817.8	20.03	41.61
245	Northern Indiana Public Service Company	3417.4	7610327	143579805.2	18.87	42.01
246	International Paper Company	920.1	4253909	39421010.96	9.27	42.84
247	Duke Energy Indiana, LLC	8061.2	22270386	353200073.3	15.86	43.81
248	Talen Montana, LLC	2363.4	7935170	106698042	13.45	45.15
249	Indiana-Kentucky Electric Corporation	1303.8	4375314	63548940	14.52	48.74
250	Tucson Electric Power Company	2524.3	9073320	125083131.1	13.79	49.55
251	Southern Indiana Gas and Electric Company	1079.7	3005432	57656181.92	19.18	53.40
252	Basin Electric Power Cooperative	5330.5	22426973	294365590.8	13.13	55.22
253	Northern California Power Agency	900	1803277	50392350.35	27.94	55.99
254	Consolidated Edison Company of New York, Inc.	802.9	3122034	45196793.54	14.48	56.29
255	Ohio Valley Electric Corporation	1086.5	4651760	63981538	13.75	58.89
256	Indiana Michigan Power Company	2637.3	4149532	201579674	48.58	76.43
257	Prairie State Generating Company, LLC	1766	11308063	175096779	15.48	99.15
258	Wisconsin Electric Power Company	5622.1	20976755	612899143.9	29.22	109.02
259	Geysers Power Co LLC	1241	5038002	176000086.2	34.93	141.82
260	Ormat Nevada, Inc.	813	3373015	175036780	51.89	215.30

2018 Non-Fuel O&M \$/kW Installed
Ranked by Operator Co.
NERC: MRO

Criteria: Company Nameplate Capacity >= 600 MW -- Non Nuclear Units
Source: S&P Global as of 3/15/2022

Rank	Operator Name	Name Plate Capacity MW	Net Generation MWh	Total Non-Fuel O&M \$	Calculated NF O&M \$/MWh	Calculated NF O&M \$/KW
1	Evergy Kansas South, Inc.	756.9	303429	8548345	28.17	11.29
2	Onward Energy	641.1	911508	8410521.069	9.23	13.12
3	WGP Acquisition LLC	925.4	5582118	12261577.58	2.20	13.25
4	Argo Infrastructure Partners LP	1214	4976693	16226986.95	3.26	13.37
5	Riverside Energy Center LLC	674.9	2839949	9070732	3.19	13.44
6	Entergy Texas, Inc.	2,609	6,437,777	36,014,600	5.59	13.81
7	Oklahoma Gas and Electric Company	8952	23710217	143327845.7	6.04	16.01
8	NAES Corporation	2040.9	7838806	32676702.35	4.17	16.01
9	USCE - Little Rock District	1089.2	2331995	18005503.08	7.72	16.53
10	USCE - Missouri River District	2360.1	10165727	39294651.69	3.87	16.65
11	NextEra Energy Resources, LLC	1697	4097821	28325531.89	6.91	16.69
12	Interstate Power and Light Company	3636	12343531	60938275.75	4.94	16.76
13	Public Service Company of Oklahoma	4062.4	6876494	70747324.25	10.29	17.42
14	Grand River Dam Authority	1712	3353515	31427709.73	9.37	18.36
15	Invenergy Services LLC	1232.2	3419981	22935626.31	6.71	18.61
16	Southwestern Public Service Company	4743.5	14797224	91308548	6.17	19.25
17	NRG Energy Services LLC	1031	2937001	20606815	7.02	19.99
18	Enel Green Power North America, Inc.	1871.1	7306972	39508169.28	5.41	21.11
19	Kansas City City of	725.5	1005478	15730270.3	15.64	21.68
20	EDF Renewables Services	2478.5	8772897	54108095.27	6.17	21.83
21	NextEra Energy Partners, LP	2158.7	8745867	47287202.72	5.41	21.91
22	Fox Energy Company, LLC	618.8	3644879	13645669	3.74	22.05
23	Evergy Missouri West, Inc.	1523.8	1019295	33682839.91	33.05	22.10
24	USCE - Tulsa District	608.8	1639536	13538059.57	8.26	22.24
25	City Utilities of Springfield	1086.5	2771366	25820346.9	9.32	23.76
26	Avangrid Renewables LLC	1557.3	4218831	37057601.67	8.78	23.80
27	Wisconsin Public Service Corporation	1869.4	5951944	45481854	7.64	24.33
28	Empire District Electric Company	1598.5	4981215	38901422	7.81	24.34
29	Sunflower Electric Power Corporation, Inc.	1108.1	1547607	27657877.26	17.87	24.96
30	Great River Energy	2874.4	9832841	72198954.92	7.34	25.12
31	MidAmerican Energy Company	10133.6	33084919	254544220	7.69	25.12
32	Dairyland Power Co-op	1386.6	4114974	34897608.38	8.48	25.17
33	Northern States Power Company	7413.9	23733859	186651307.2	7.86	25.18
34	Southwestern Electric Power Company	5778	20444035	153834247	7.52	26.62
35	Wisconsin Power and Light Company	3127.3	11234304	83711060	7.45	26.77
36	Evergy Kansas Central, Inc.	4558.5	14843698	124785944.3	8.41	27.37
37	Evergy Metro, Inc.	5744.3	16790274	158094461	9.42	27.52
38	Western Farmers Electric Cooperative	1393.9	3522050	38581970.66	10.95	27.68
39	Basin Electric Power Cooperative	3069.3	12247966	86504623.42	7.06	28.18
40	Omaha Public Power District	2847.7	11071624	88219483.72	7.97	30.98
41	Minnesota Power Enterprises, Inc.	2110.8	9589558	75800542.8	7.90	35.91
42	Nebraska Public Power District	2239.1	10468012	82614613.98	7.89	36.90
43	Minnkota Power Cooperative, Inc.	734	4908951	31566429.11	6.43	43.01
44	Otter Tail Power Company	1302.14	6502323	62752753.63	9.65	48.19

2019 Non-Fuel O&M \$/kW Installed
Ranked by Operator Co.
NERC: MRO

Criteria: Company Nameplate Capacity >= 600 MW -- Non Nuclear Units
Source: S&P Global as of 3/15/2022

Rank	Operator Name	Name Plate Capacity MW	Net Generation MWh	Total Non-Fuel O&M \$	Calculated NF O&M \$/MWh	Calculated NF O&M \$/KW
1	Evergy Missouri West, Inc.	1,000	135,883	7,893,378	58.09	7.89
2	Riverside Energy Center LLC	675	4,042,588	6,255,748	1.55	9.27
3	WGP Acquisition LLC	925	4,798,556	12,166,903	2.54	13.15
4	Argo Infrastructure Partners LP	1,214	5,358,288	16,103,919	3.01	13.27
5	Onward Energy	830	2,492,448	11,633,859	4.67	14.02
6	NAES Corporation	2,041	8,001,136	31,030,619	3.88	15.20
7	Grand River Dam Authority	1,712	3,678,841	28,774,096	7.82	16.81
8	Fox Energy Company, LLC	619	4,311,102	10,414,276	2.42	16.83
9	Madison Gas and Electric Company	617	797,401	10,450,399	13.11	16.93
10	Interstate Power and Light Company	3,866	13,847,268	66,247,281	4.78	17.14
11	Oklahoma Gas and Electric Company	8,952	21,010,462	156,813,952	7.46	17.52
12	Public Service Company of Oklahoma	4,062	6,470,305	71,437,604	11.04	17.59
13	Southwestern Public Service Company	5,222	14,574,249	92,259,329	6.33	17.67
14	Entergy Texas, Inc.	2,609	5,883,409	46,295,087	7.87	17.75
15	USCE - Little Rock District	1,089	3,778,976	19,646,977	5.20	18.04
16	USCE - Missouri River District	2,360	11,729,427	43,319,769	3.69	18.36
17	Kansas City City of	726	1,066,416	14,611,899	13.70	20.14
18	Evergy Kansas Central, Inc.	4,477	11,396,101	90,971,817	7.98	20.32
19	Great River Energy	2,874	8,500,298	60,343,348	7.10	20.99
20	Invenergy Services LLC	1,232	3,402,442	26,150,707	7.69	21.22
21	Northern States Power Company	7,448	23,734,268	159,261,527	6.71	21.38
22	USCE - Tulsa District	609	2,617,414	13,531,466	5.17	22.23
23	City Utilities of Springfield	1,087	2,027,288	24,375,012	12.02	22.43
24	Empire District Electric Company	1,599	4,904,363	36,263,549	7.39	22.69
25	Evergy Metro, Inc.	5,368	17,615,831	129,701,364	7.36	24.16
26	NextEra Energy Resources, LLC	1,862	6,535,029	45,256,195	6.93	24.31
27	Enel Green Power North America, Inc.	2,489	9,541,715	60,565,947	6.35	24.34
28	Wisconsin Power and Light Company	2,776	8,071,707	67,584,102	8.37	24.34
29	Wisconsin Public Service Corporation	1,638	4,845,186	40,577,178	8.37	24.77
30	Avangrid Renewables LLC	1,654	3,949,102	41,368,649	10.48	25.01
31	NextEra Energy Partners, LP	2,159	8,807,922	54,230,073	6.16	25.12
32	MidAmerican Energy Company	10,873	28,512,744	273,876,703	9.61	25.19
33	EDF Renewables Services	2,479	8,447,598	63,648,368	7.53	25.68
34	Southwestern Electric Power Company	5,778	17,582,584	150,057,657	8.53	25.97
35	Sunflower Electric Power Corporation, Inc.	1,108	1,676,499	29,266,384	17.46	26.41
36	Dairyland Power Co-op	1,387	3,308,444	37,143,257	11.23	26.79
37	Western Farmers Electric Cooperative	1,394	1,688,388	37,795,017	22.39	27.11
38	NRG Energy Services LLC	1,031	4,177,235	29,098,048	6.97	28.22
39	Omaha Public Power District	2,848	8,976,690	83,673,812	9.32	29.38
40	Minnesota Power Enterprises, Inc.	1,961	7,152,899	64,929,719	9.08	33.11
41	Nebraska Public Power District	2,239	10,030,029	79,585,389	7.93	35.54
42	Minnkota Power Cooperative, Inc.	734	4,705,187	30,483,753	6.48	41.53
43	Otter Tail Power Company	1,302	5,495,931	59,310,583	10.79	45.55
44	Basin Electric Power Cooperative	3,069	12,553,737	195,559,172	15.58	63.71

2020 Non-Fuel O&M \$/kW Installed
Ranked by Operator Co.
NERC: MRO

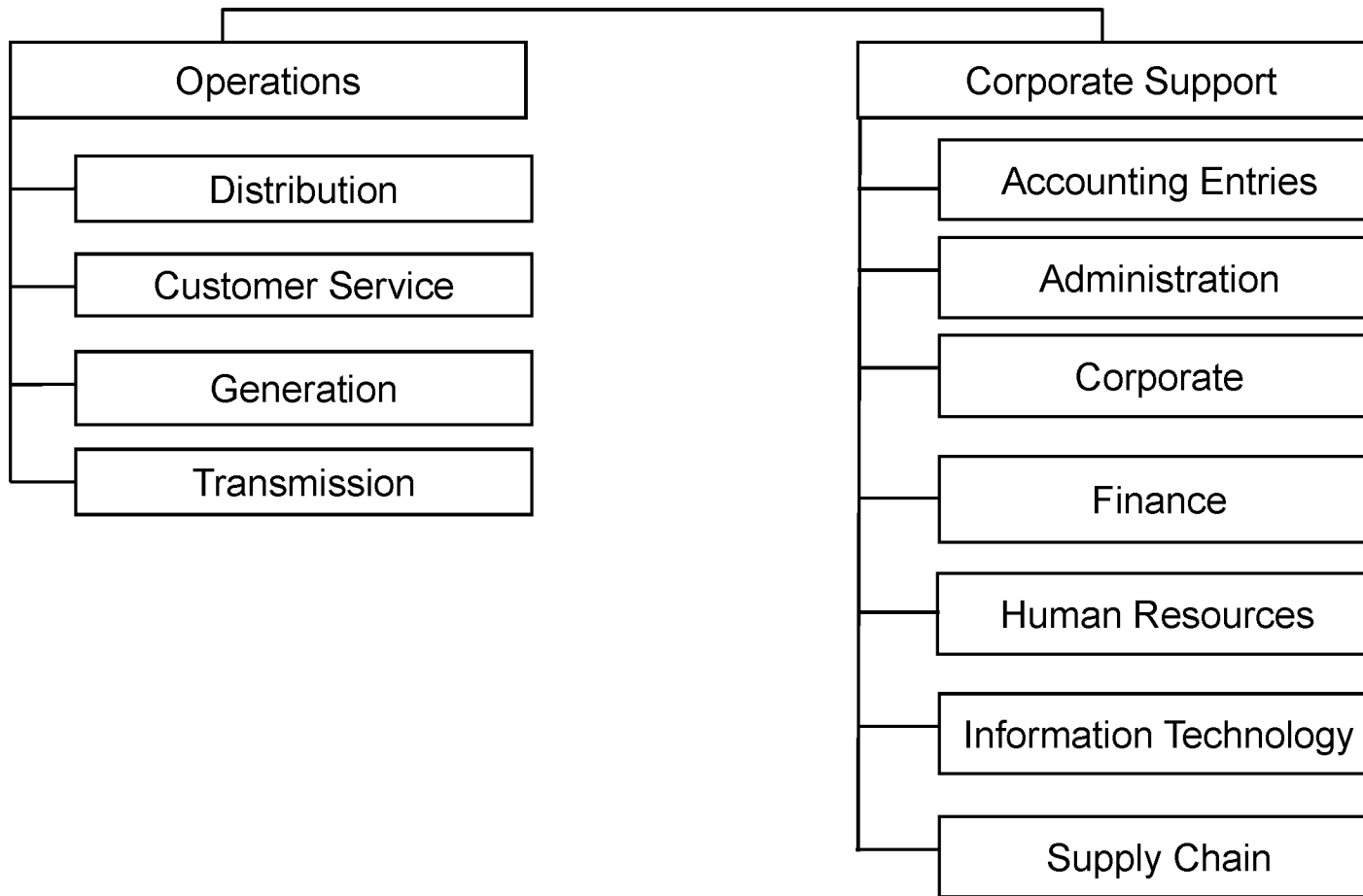
Criteria: Company Nameplate Capacity >= 600 MW -- Non Nuclear Units
Source: S&P Global as of 3/15/2022

Rank	Operator Name	Name Plate Capacity MW	Net Generation MWh	Total Non-Fuel O&M \$	Calculated NF O&M \$/MWh	Calculated NF O&M \$/kW
1	Riverside Energy Center LLC	675	2,662,340	6,042,157	2.27	8.95
2	Evergy Missouri West, Inc.	1,000	101,262	12,241,614	120.89	12.24
3	Argo Infrastructure Partners LP	1,214	6,334,760	15,397,643	2.43	12.68
4	WGP Acquisition LLC	925	5,268,912	12,097,042	2.30	13.07
5	Onward Energy	830	3,294,308	11,578,201	3.51	13.95
6	Entergy Texas, Inc.	2,609	7,405,175	38,887,349	5.25	14.91
7	NAES Corporation	2,041	7,144,037	30,568,890	4.28	14.98
8	Oklahoma Gas and Electric Company	8,962	21,121,268	136,582,960	6.47	15.24
9	Southwestern Public Service Company	5,744	14,053,751	90,092,264	6.41	15.69
10	Wisconsin Power and Light Company	3,652	9,923,467	57,750,684	5.82	15.81
11	Fox Energy Company, LLC	619	4,474,657	9,793,843	2.19	15.83
12	Grand River Dam Authority	1,712	3,439,064	27,367,334	7.96	15.99
13	USCE - Missouri River District	2,360	8,969,899	38,681,078	4.31	16.39
14	Madison Gas and Electric Company	631	829,323	10,536,400	12.70	16.69
15	Public Service Company of Oklahoma	4,009	4,945,151	68,747,980	13.90	17.15
16	Interstate Power and Light Company	4,398	13,203,187	76,445,463	5.79	17.38
17	Empire District Electric Company	1,748	4,364,536	30,447,353	6.98	17.42
18	USCE - Little Rock District	1,089	3,838,355	20,263,068	5.28	18.60
19	Evergy Kansas Central, Inc.	4,477	10,525,780	84,932,683	8.07	18.97
20	Invenergy Services LLC	1,232	3,563,290	25,241,156	7.08	20.48
21	Wisconsin Public Service Corporation	1,788	4,647,574	37,244,584	8.01	20.83
22	Great River Energy	2,826	8,519,650	59,446,952	6.98	21.03
23	Evergy Metro, Inc.	5,368	15,405,686	114,153,847	7.41	21.26
24	Northern States Power Company	7,557	19,563,770	161,115,256	8.24	21.32
25	City Utilities of Springfield	1,087	1,815,966	23,236,683	12.80	21.39
26	ALLETE Clean Energy, Inc.	719	1,279,643	15,548,464	12.15	21.62
27	NextEra Energy Resources, LLC	2,363	7,525,094	52,342,289	6.96	22.15
28	USCE - Tulsa District	609	2,153,315	13,681,046	6.35	22.47
29	Sunflower Electric Power Corporation, Inc.	1,108	1,476,942	25,375,555	17.18	22.90
30	MidAmerican Energy Company	11,466	27,561,487	266,808,665	9.68	23.27
31	Enel Green Power North America, Inc.	2,489	9,802,905	58,048,618	5.92	23.33
32	Western Farmers Electric Cooperative	1,394	919,855	32,598,453	35.44	23.39
33	Southwestern Electric Power Company	5,704	15,246,097	134,839,603	8.84	23.64
34	NextEra Energy Partners, LP	2,159	8,875,138	52,904,768	5.96	24.51
35	Dairyland Power Co-op	1,387	2,894,987	34,563,220	11.94	24.93
36	EDF Renewables Services	2,475	8,957,846	64,148,066	7.16	25.92
37	Avangrid Renewables LLC	1,654	4,227,752	44,997,584	10.64	27.21
38	Omaha Public Power District	2,848	9,654,997	82,894,525	8.59	29.11
39	NRG Energy Services LLC	1,031	3,135,730	31,360,482	10.00	30.42
40	Minnesota Power Enterprises, Inc.	1,961	6,621,953	60,213,458	9.09	30.71
41	Otter Tail Power Company	1,452	4,800,830	47,949,523	9.99	33.02
42	Nebraska Public Power District	2,237	8,417,721	77,594,375	9.22	34.69
43	Minnkota Power Cooperative, Inc.	734	4,667,523	30,222,240	6.48	41.17
44	Basin Electric Power Cooperative	3,069	11,202,270	172,985,907	15.44	56.36

See Native Excel file Gale Direct_Exhibit BG-4.

This exhibit contains voluminous information that is being provided electronically.

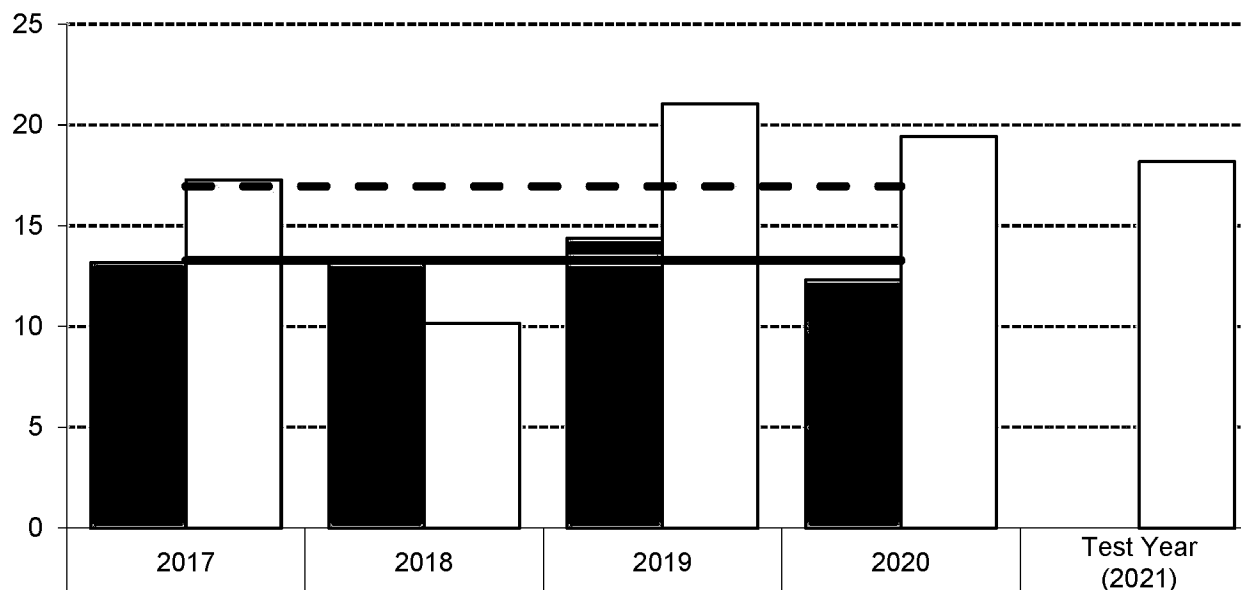
Families and Functions



Entergy Texas, Inc. Scheduled Outage Factor (SOF) Industry Comparison All Fossil Fuels 100 - 600 MW

Percent

ETI
Lewis Creek 1 & 2
Nelson 6
Sabine 1, 3, 4, & 5
Big Cajun II, Unit 3
Montgomery County
Hardin 1 & 2



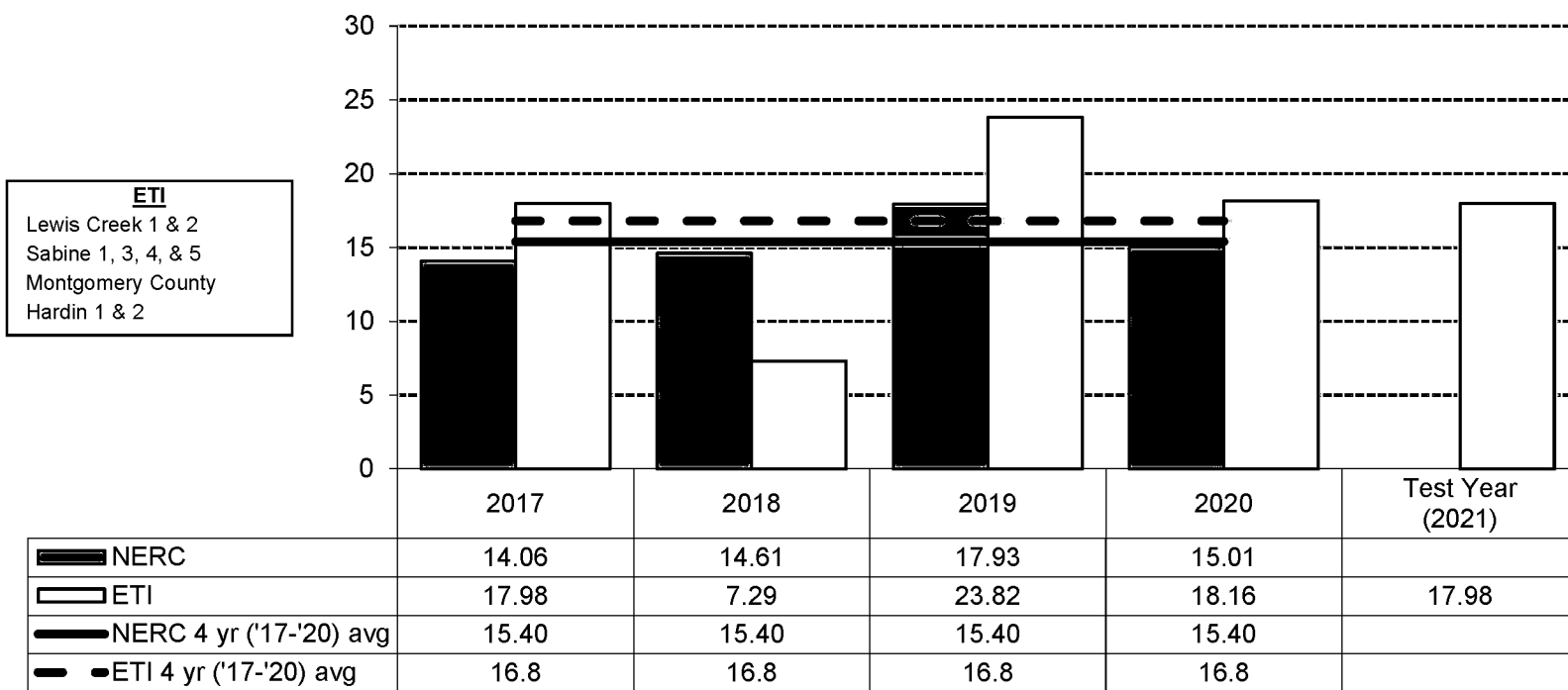
Note: Industry data for 2021 is not yet available. ETI Test Year includes the addition of the Montgomery County and Hardin 1 & 2 units.

Source: NERC – NERC GADS Statistical Brochure; Criteria: All Fossil Fuels 100 – 600 MW units.

SOF = [(Scheduled Outage Hours x NMC) / (Period Hours X NMC)] x 100(%). Scheduled Outage Hours = Sum of Planned and Maintenance Outage hours plus any Scheduled Outage Extension hours associated with those outages. NMC = Net Maximum Capacity.

Entergy Texas, Inc. Scheduled Outage Factor (SOF) Industry Comparison Gas Fired Units 100 - 600 MW

Percent



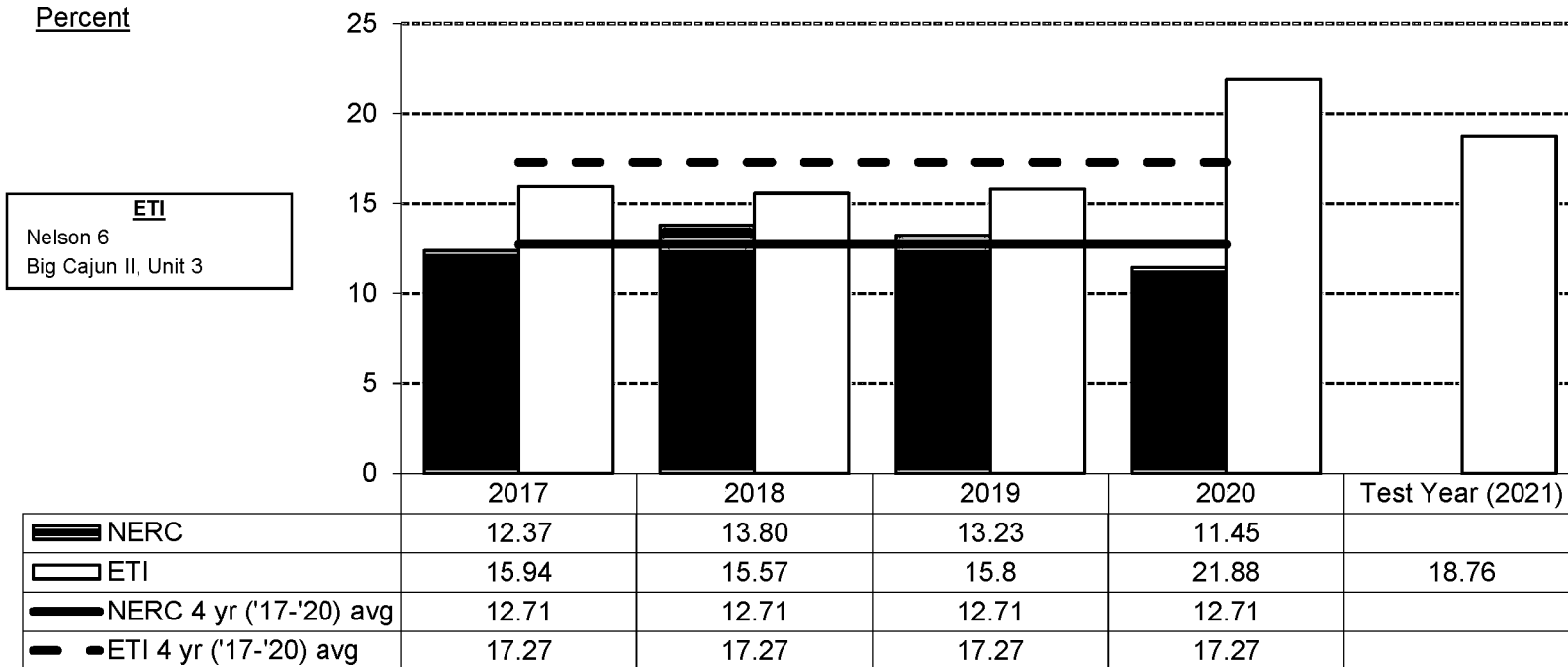
Note: Industry data for 2021 is not yet available. ETI Test Year includes the addition of Montgomery County and Hardin 1 & 2 units.

Source: NERC – NERC GADS Statistical Brochure; Criteria: Gas 100 - 600 MW units.

SOF = [(Scheduled Outage Hours x NMC) / (Period Hours X NMC)] x 100(%). Scheduled Outage Hours = Sum of Planned and Maintenance Outage hours plus any Scheduled Outage Extension hours associated with those outages. NMC = Net Maximum Capacity.

Entergy Texas, Inc. Scheduled Outage Factor (SOF) Industry Comparison Coal Fired Units 400 - 600 MW

Percent

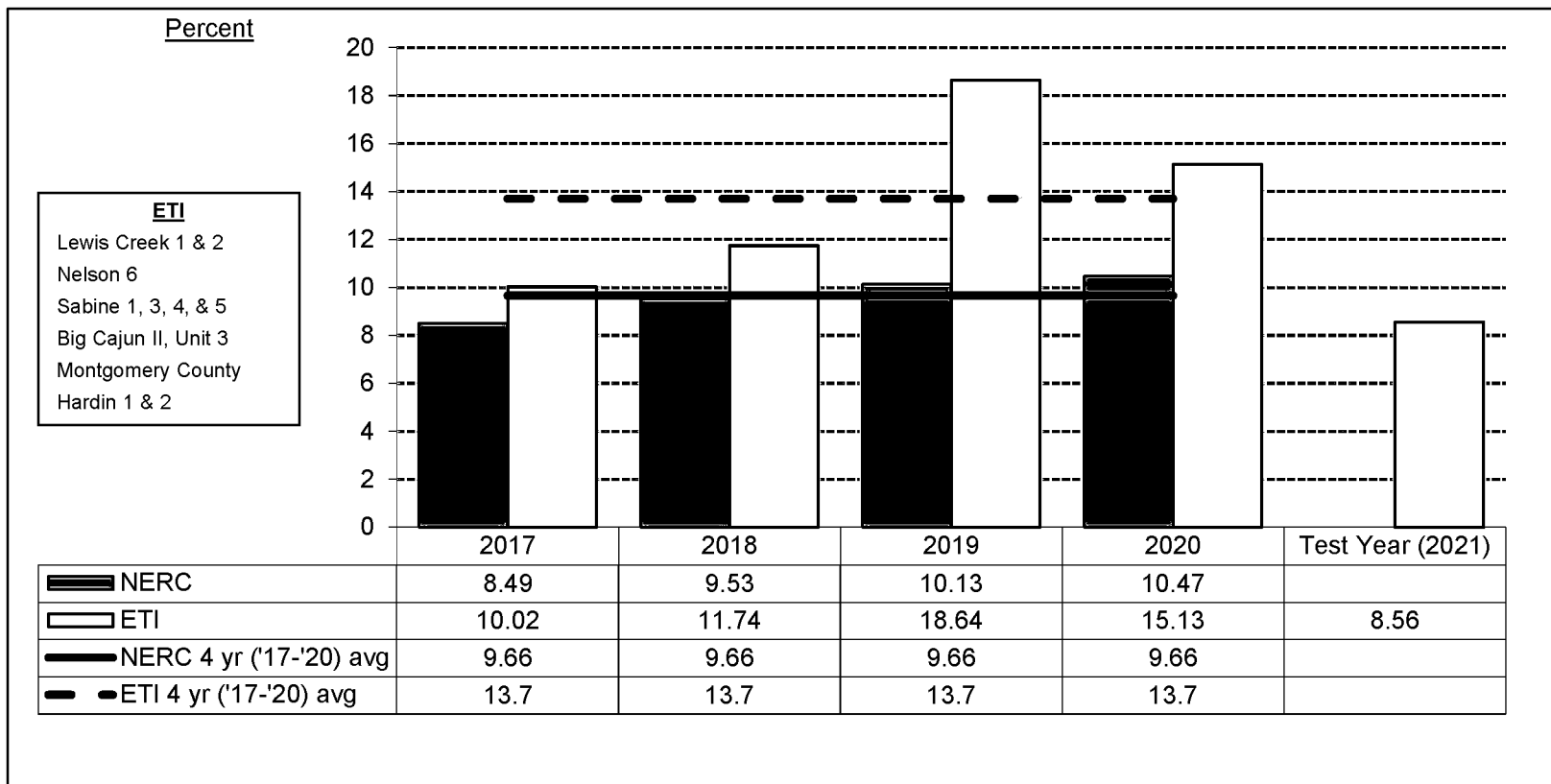


Note: Industry data for 2021 is not yet available.

Source: NERC – NERC GADS Statistical Brochure; Criteria: Coal 400-600 MW units.

SOF = [(Scheduled Outage Hours x NMC) / (Period Hours X NMC)] x 100(%). Scheduled Outage Hours = Sum of Planned and Maintenance Outage hours plus any Scheduled Outage Extension hours associated with those outages. NMC = Net Maximum Capacity.

Entergy Texas, Inc. Fossil Forced Outage Rate (FOR) Industry Comparison All Fossil Fuels 100 - 600 MW

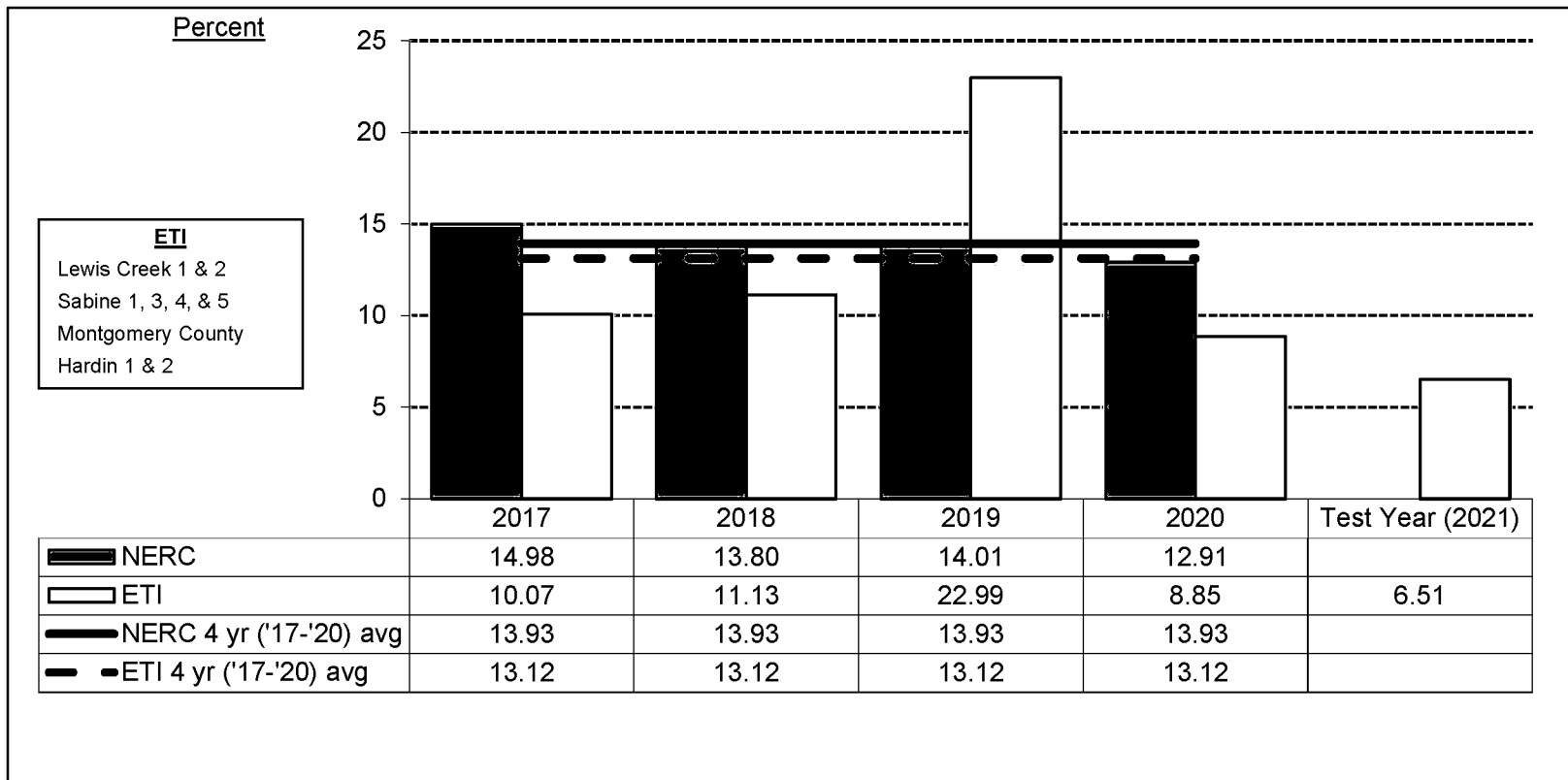


Note: Industry data for 2021 is not yet available. ETI Test Year includes the addition of the Montgomery County and Hardin 1 & 2 units.

Source: NERC – NERC GADS Statistical Brochure; Criteria: All Fossil Fuels 100 – 600 MW units.

FOR = $\{[(\text{Forced Outage Hours} \times \text{NMC}) / ((\text{Forced Outage Hours} + \text{Service Hours}) \times \text{NMC})]\} \times 100 (\%)$. NMC = Net Maximum Capacity

Entergy Texas, Inc. Fossil Forced Outage Rate (FOR) Industry Comparison Gas Fired Units 100 - 600 MW

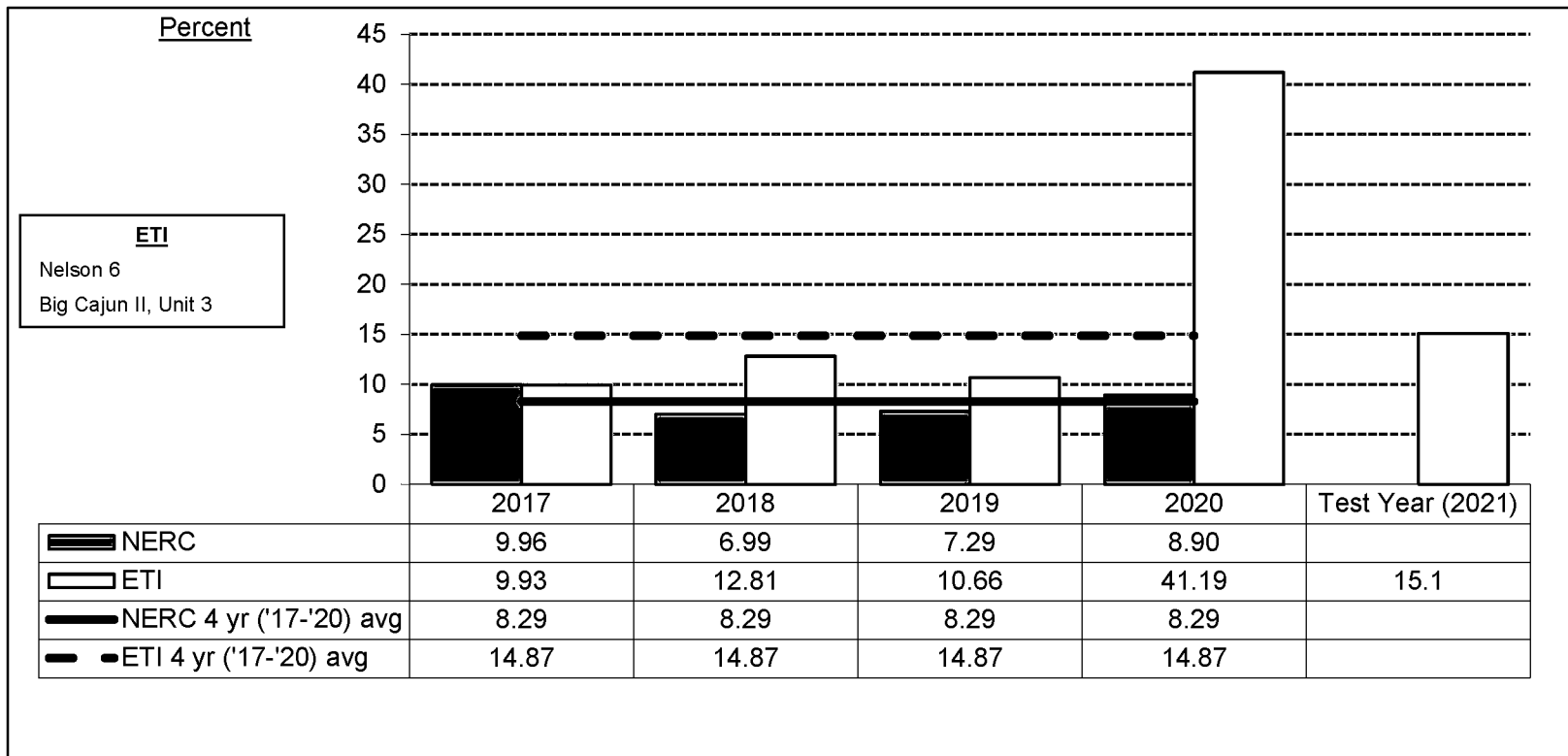


Note: Industry data for 2021 is not yet available. ETI Test Year includes the addition of the Montgomery County and Hardin 1 & 2 units.

Source: NERC – NERC GADS Statistical Brochure; Criteria: Gas 100 - 600 MW units.

FOR = $\{[(\text{Forced Outage Hours} \times \text{NMC}) / ((\text{Forced Outage Hours} + \text{Service Hours}) \times \text{NMC})]\} \times 100 (\%)$. NMC = Net Maximum Capacity

Entergy Texas, Inc. Fossil Forced Outage Rate (FOR) Industry Comparisons Coal Fired Units 400 - 600 MW

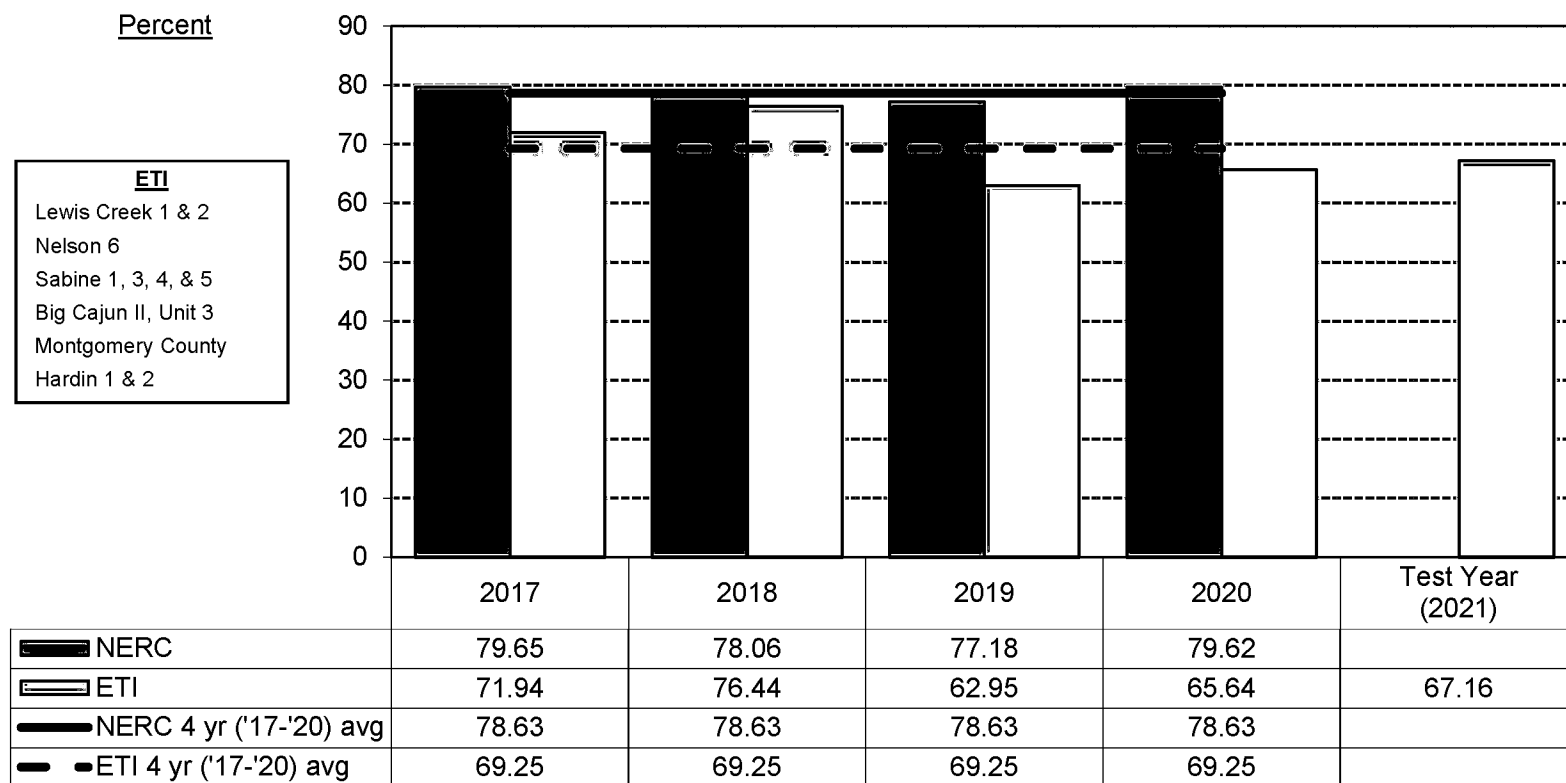


Note: Industry data for 2021 is not yet available.

Source: NERC – NERC GADS Statistical Brochure; Criteria: Coal 400-600 MW units.

FOR = $\{[(\text{Forced Outage Hours} \times \text{NMC}) / ((\text{Forced Outage Hours} + \text{Service Hours}) \times \text{NMC})]\} \times 100 (\%)$. NMC = Net Maximum Capacity

Entergy Texas, Inc. Fossil Equivalent Availability Factor (EAF) Industry Comparison All Fossil Fuels 100 - 600 MW



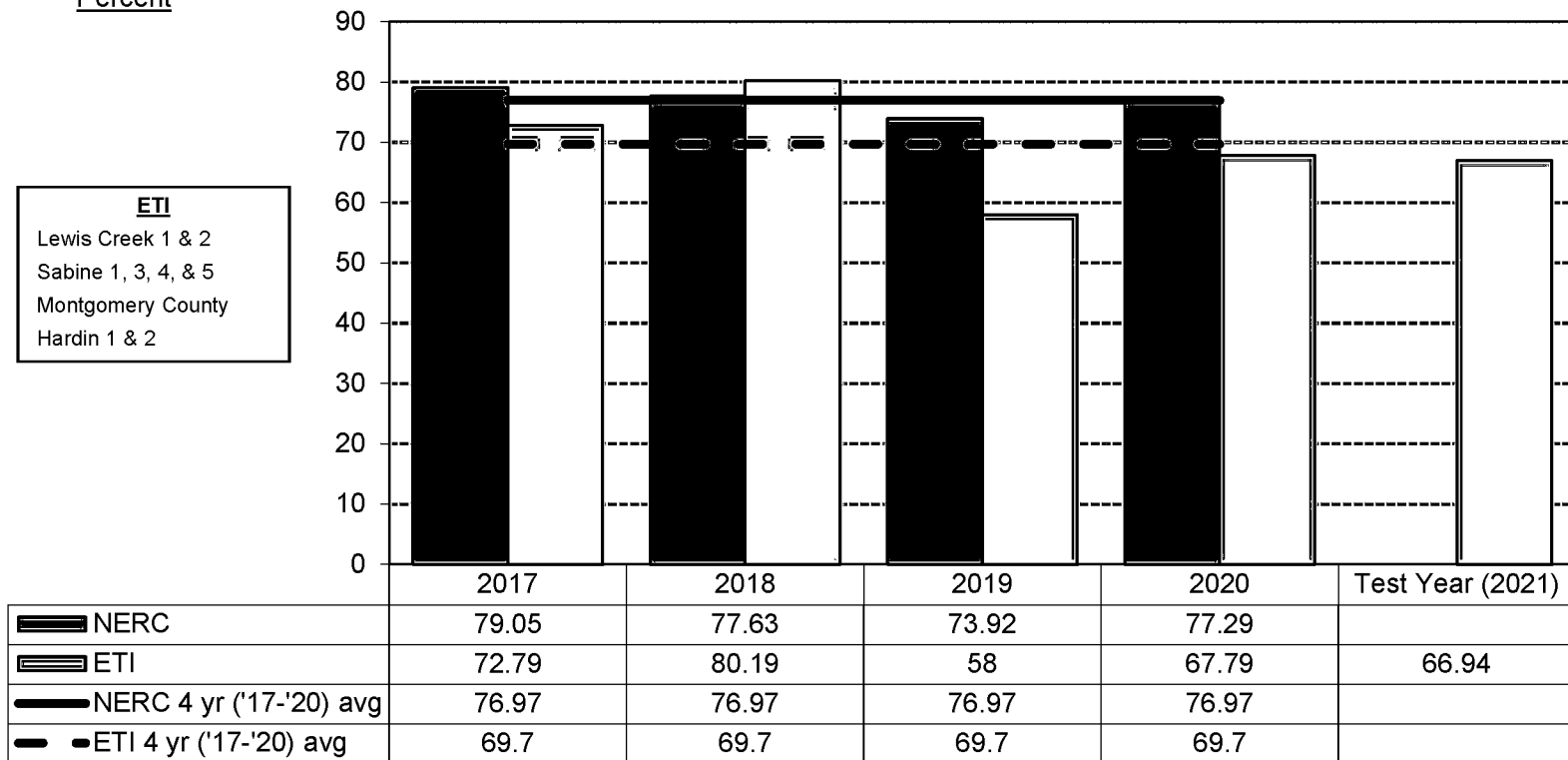
Note: Industry data for 2021 is not yet available. ETI Test Year includes the addition of the Montgomery County and Hardin 1 & 2 units.

Source: NERC – NERC GADS Statistical Brochure; Criteria: All Fossil Fuels 100 – 600 MW units.

EAF = $\frac{\{(Available\ Hours \times NMC) - [(Equivalent\ Unplanned\ Derated\ Hours + Equivalent\ Planned\ Derated\ Hours + Equivalent\ Seasonal\ Derated\ Hours) \times NMC]\}}{(Period\ Hours \times NMC)} \times 100\ (\%)$
NMC = Net Maximum Capacity

Entergy Texas, Inc. Fossil Equivalent Availability Factor (EAF) Industry Comparison Gas Fired Units 100 - 600 MW

Percent



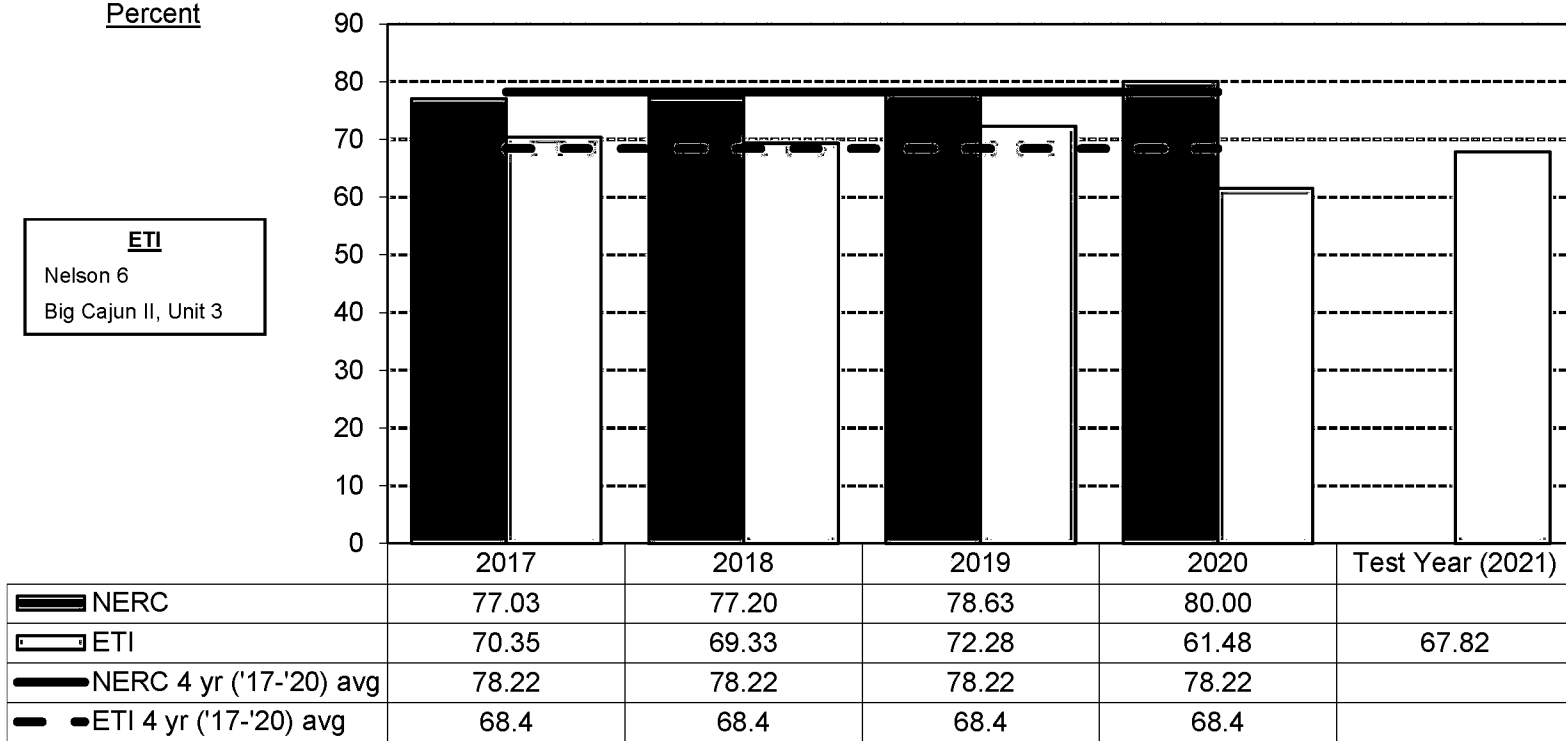
Note: Industry data for 2021 is not yet available. ETI Test Year includes the addition of the Montgomery County and Hardin 1 & 2 units.

Source: NERC – NERC GADS Statistical Brochure; Criteria: Gas 100 - 600 MW units.

EAF = $\{[(\text{Available Hours} \times \text{NMC}) - ((\text{Equivalent Unplanned Derated Hours} + \text{Equivalent Planned Derated Hours} + \text{Equivalent Seasonal Derated Hours}) \times \text{NMC})] / (\text{Period Hours} \times \text{NMC})\} \times 100 (\%)$
NMC = Net Maximum Capacity

Entergy Texas, Inc. Fossil Equivalent Availability Factor (EAF) Industry Comparison Coal Fired Units 400 - 600 MW

Percent

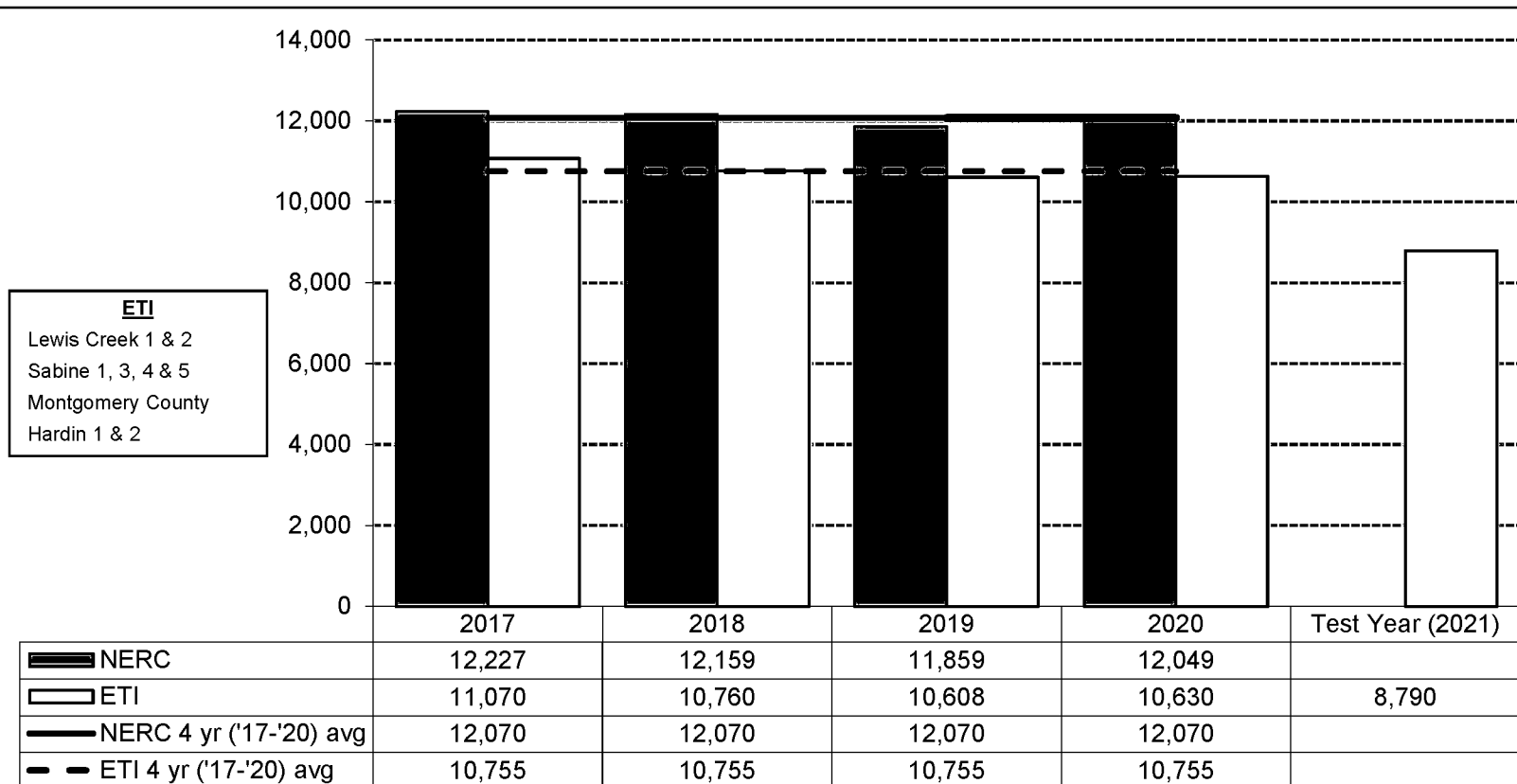


Note: Industry data for 2021 is not yet available.

Source: NERC – NERC GADS Statistical Brochure; Criteria: Coal 400-600 MW units.

EAF = $\frac{\{(Available\ Hours \times NMC) - [(Equivalent\ Unplanned\ Derated\ Hours + Equivalent\ Planned\ Derated\ Hours + Equivalent\ Seasonal\ Derated\ Hours) \times NMC]\}}{(Period\ Hours \times NMC)} \times 100\ (\%)$
 NMC = Net Maximum Capacity

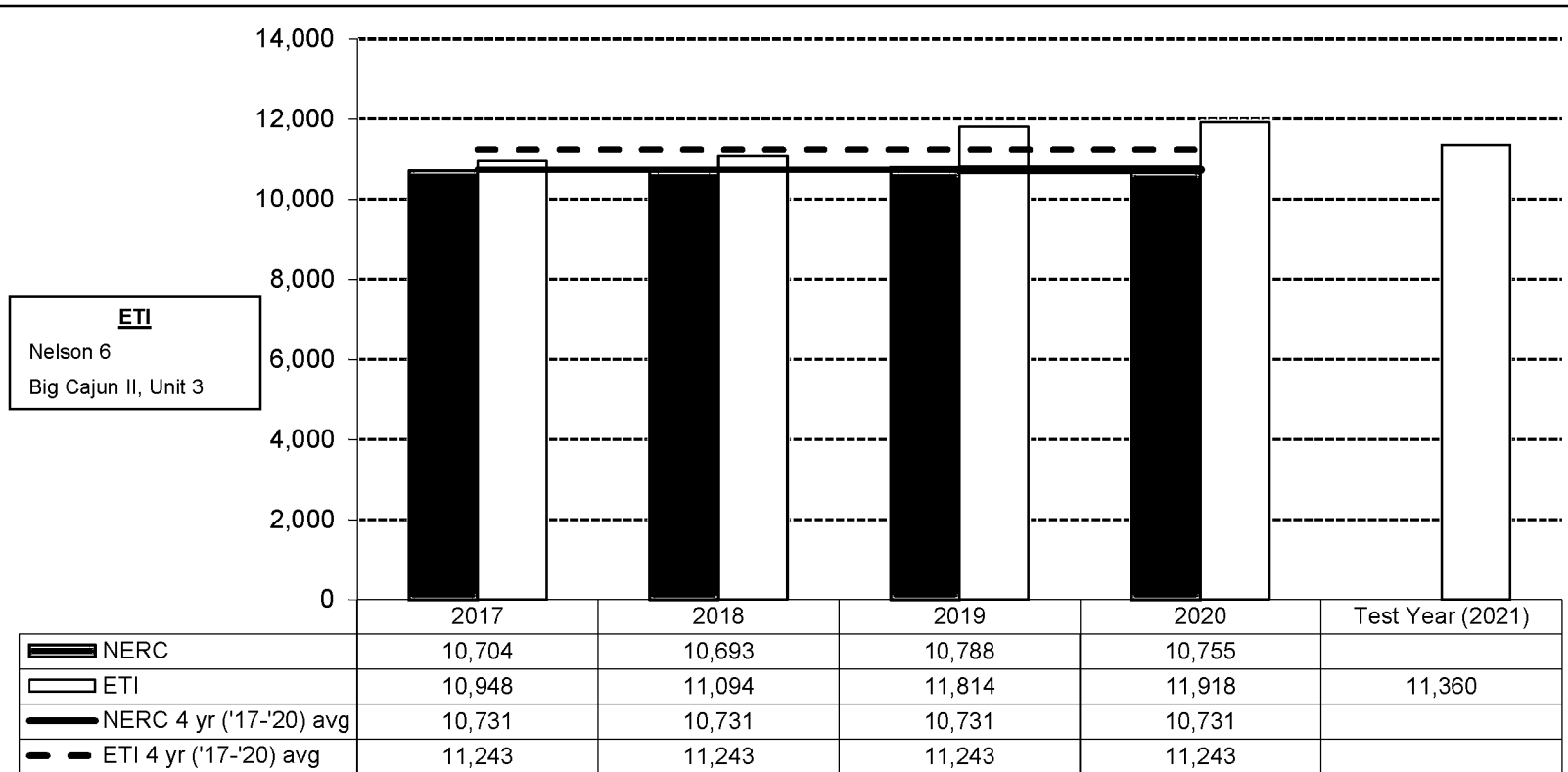
Entergy Texas, Inc. Gas Units Average Actual Heat Rate (Btu/kWh) Industry Comparison



Note: Industry data for 2021 is not yet available. ETI Test Year includes the addition Montgomery County and Hardin 1 & 2 units.

Data Source: NERC – S&P Global as of 2/10/22. ETI (Lewis Creek, Sabine, Montgomery County, Hardin)

Entergy Texas, Inc. **Coal Units Average Actual Heat Rate (Btu/kWh)** **Industry Comparison – Subbituminous coal**



Note: Industry data for 2021 is not yet available.

Data Source: NERC – S&P Global as of 2/10/22. ETI (Nelson 6, Big Cajun II, Unit 3)

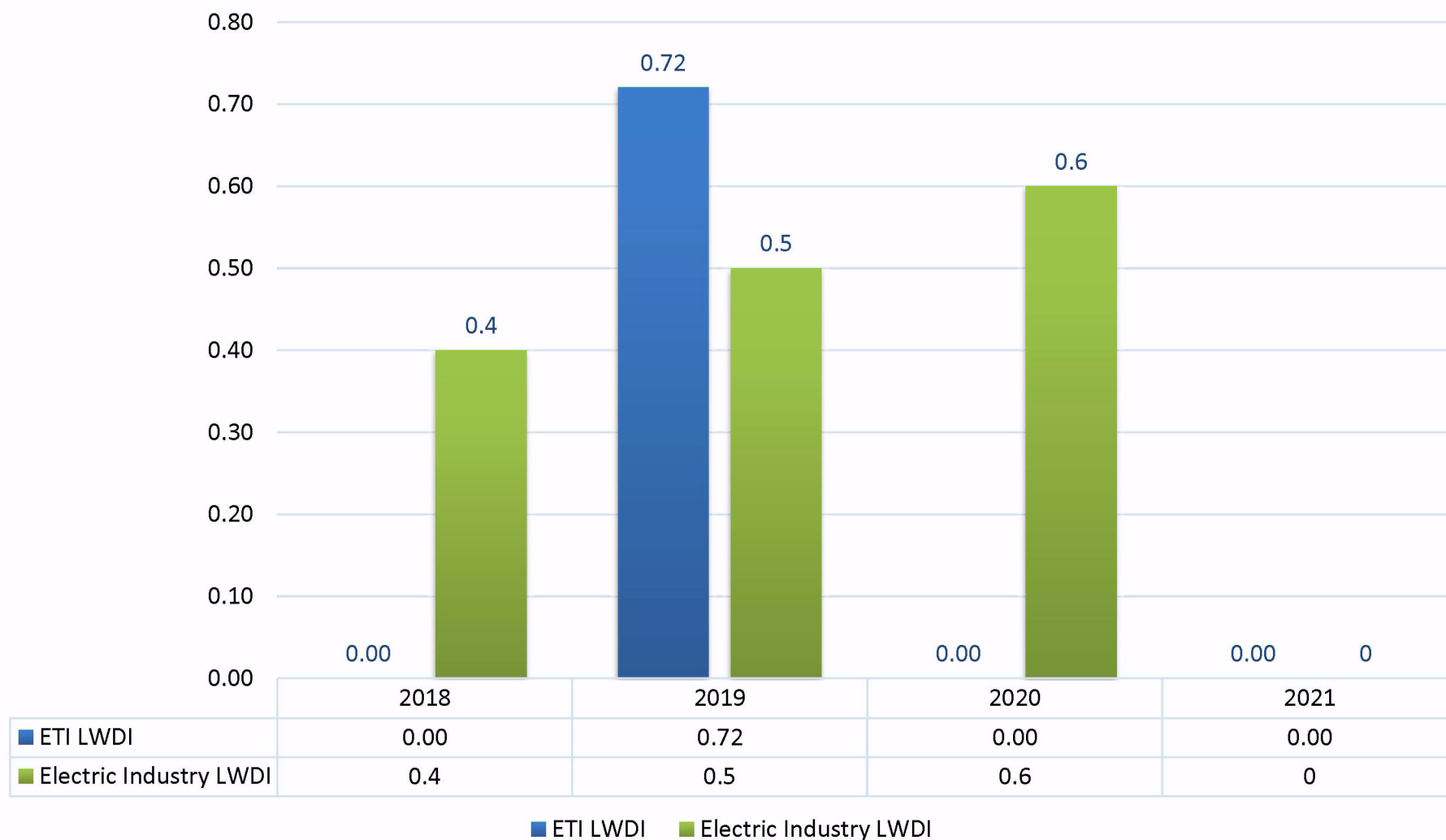
Entergy Texas, Inc. Total Recordable Injury Rate (TRIR) Comparison



*Source of Electric Industry TRIR: U.S. Department of Labor, Bureau of Labor Statistics, Fossil fuel electric power generation (2021 rate has not yet been published by BLS)

**ETI rates include Sabine Plant, Lewis Creek Plant, and Montgomery County Power Station only

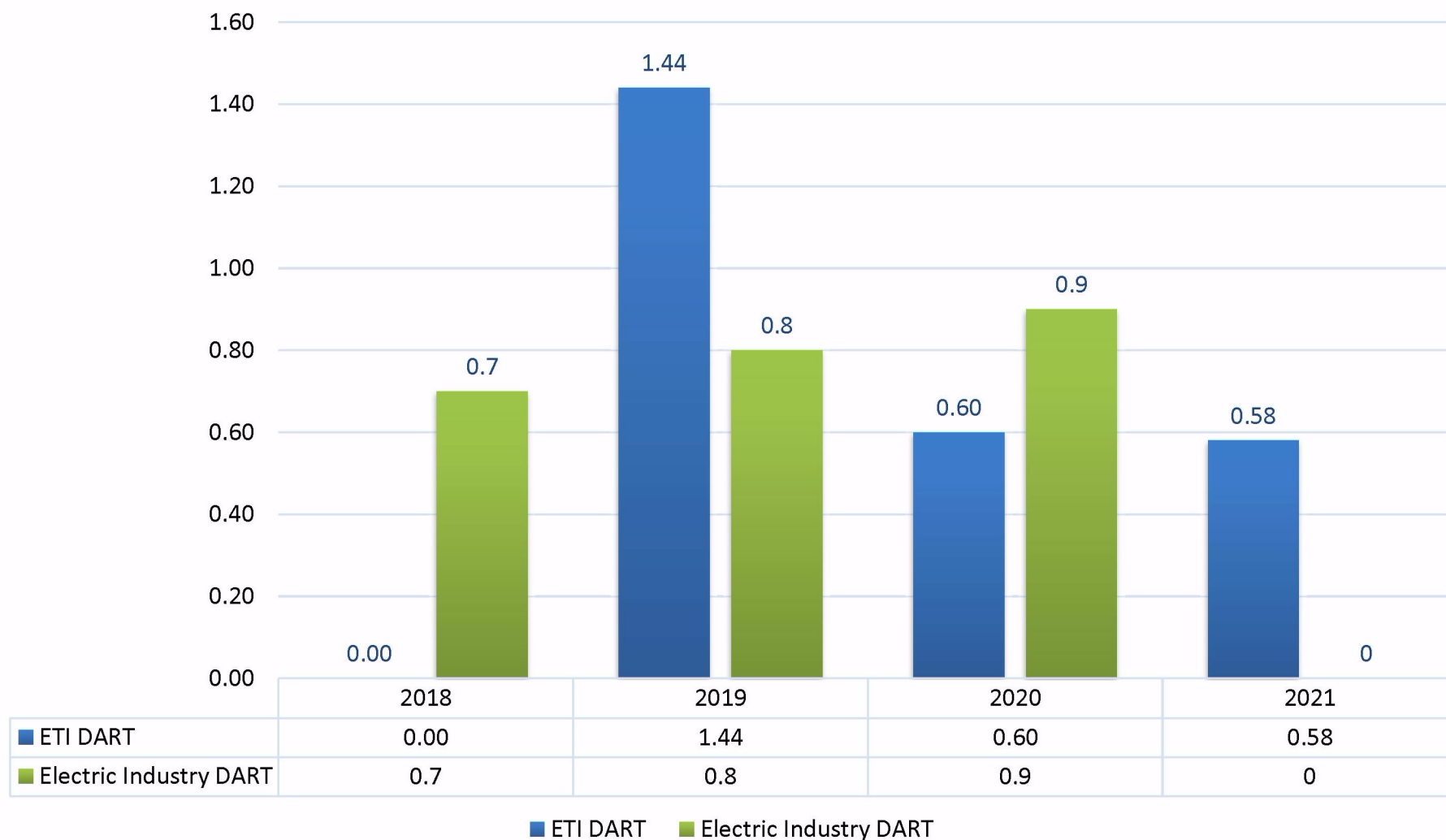
Entergy Texas, Inc. Lost Work Day Incident (LWDI) Rate Comparison



*Source of Electric Industry LWDI: U.S. Department of Labor, Bureau of Labor Statistics, Fossil fuel electric power generation (2021 rate has not yet been published by BLS)

**ETI rates include Sabine Plant, Lewis Creek Plant, and Montgomery County Power Station only

Entergy Texas, Inc. Days Away/Restriction/Transfer (DART) Rate Comparison



*Source of Electric Industry DART: U.S. Department of Labor, Bureau of Labor Statistics, Fossil fuel electric power generation (2021 rate has not yet been published by BLS)

**ETI rates include Sabine Plant, Lewis Creek Plant, and Montgomery County Power Station only

See Native Excel file Gale Direct_Exhibits BG-A through D.

DOCKET NO. 53719

APPLICATION OF ENTERGY	§	PUBLIC UTILITY COMMISSION
TEXAS, INC. FOR AUTHORITY TO	§	
CHANGE RATES	§	OF TEXAS

DIRECT TESTIMONY

OF

GARY C. DICKENS

ON BEHALF OF

ENTERGY TEXAS, INC.

JULY 2022

ENTERGY TEXAS, INC.
DIRECT TESTIMONY OF GARY C. DICKENS
2022 RATE CASE

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1 **I. INTRODUCTION AND PURPOSE**

2 Q1. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

3 A. My name is Gary C. Dickens. My business address is 2107 Research Forest,
4 Lake Front North, The Woodlands, Texas 77380.

6 Q2. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?

7 A. I am employed by Entergy Services, LLC (“ESL”), the service company for the
8 Entergy Operating Companies (“EOCs”),¹ as Vice President, Capital Projects.
9 Before taking that position in May 2021, I served as Vice President,
10 Project/Construction Management, New Generation Program Execution. In that
11 role I was responsible for the owner’s oversight during the development, design,
12 engineering, and procurement phases of the Montgomery County Power Station
13 (“MCPS” or the “Project”) that was market-tested in the 2015 Request for
14 Proposals for Long-Term Combined-Cycle Gas Turbine Capacity and Energy
15 Resources and Limited-Term Capacity and Energy Resources for Entergy Texas,
16 Inc. (the “2015 RFP”) and approved by the Public Utility Commission of Texas
17 (“Commission”) in 2017,² and was generally responsible for the continuing
18 development, construction, start-up, and commissioning of MCPS. Those project
19 development responsibilities included coordinating the activities of the Project

¹ The five EOCs are Entergy Texas, Inc.; Entergy Arkansas, LLC (“EAL”); Entergy Louisiana, LLC (“ELL”); Entergy Mississippi, LLC (“EML”); and Entergy New Orleans, LLC (“ENO”).

² Docket No. 46416, Order (July 28, 2017).

1 Team to obtain all permits and contracts necessary after the transition from the
2 development phase to execution of the project.

3

4 Q3. ON WHOSE BEHALF ARE YOU TESTIFYING?

5 A. I am testifying on behalf of Entergy Texas, Inc. (“ETI” or the “Company”).

6

7 Q4. PLEASE DESCRIBE YOUR PROFESSIONAL EXPERIENCE AND
8 EDUCATIONAL BACKGROUND.

9 A. I have worked in the energy industry since 1991, primarily with the development,
10 design, construction, operation, and maintenance of industrial and utility power
11 generation facilities. My initial entry into the industry was in operations, with the
12 position of shift engineer and then into a management role as plant operations
13 manager through a division of the Finnish utility, IVO Generation Services,
14 engaged in the design, building, ownership, operation and maintenance of
15 combined-cycle combustion turbine (“CCCT”) power projects. I joined Entergy
16 Corporation in 1998 as the Operations Manager providing operations and
17 commissioning oversight of Entergy’s Saltend 1,200 MW Combined Heat and
18 Power project in England. I also completed the commissioning of the 800 MW
19 Damhead Creek CCCT project in England as commissioning manager, seconded
20 to the engineering, procurement, and construction (“EPC”) contractor’s team.
21 During the transition from overseas development, I relocated to the United States
22 for Entergy in the role of director of commissioning for EntergyShaw LLC,
23 completing the following EPC projects: Crete Energy 320 MW combustion

1 turbine ("CT"), Warren County 320 MW CT, and Harrison County 550 MW
2 CCCT projects.

3 I transferred to Entergy Services Inc. ("ESI") (now ESL) and represented
4 fossil operations in the due-diligence and acquisition team for the 830 MW CCCT
5 Perryville plant, 480 MW CCCT Attala plant, and the 320 MW CT Calcasieu
6 plant. In 2007, I joined an EPC Contractor as a Senior Project Manager on power
7 proposals and contract development for the United States and Central South
8 America regions. In 2012, I returned to ESI as Director, Capital Projects to handle
9 the construction of Ninemile 6. Following completion of that project, I became
10 Vice President, Project/Construction Management, New Generation Program
11 Execution. During my tenure in this position, in addition to MCPS, I have also
12 overseen the construction of the J. Wayne Leonard Power Station and Lake
13 Charles Power Station. In May 2021, I accepted my current position as Vice
14 President, Capital Projects.

15 I am a graduate of the British Royal Naval School of Engineering
16 (Mechanical). I served fifteen years in fleet engineering on conventional powered
17 and gas turbine powered ships.

18
19 Q5. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS PROCEEDING?

20 A. The purpose of my testimony is to address the additions of MCPS to the ETI
21 generation fleet, the reasonableness of the Company's execution of the
22 construction plans, costs, and the benefits this plant provides to ETI's customers.

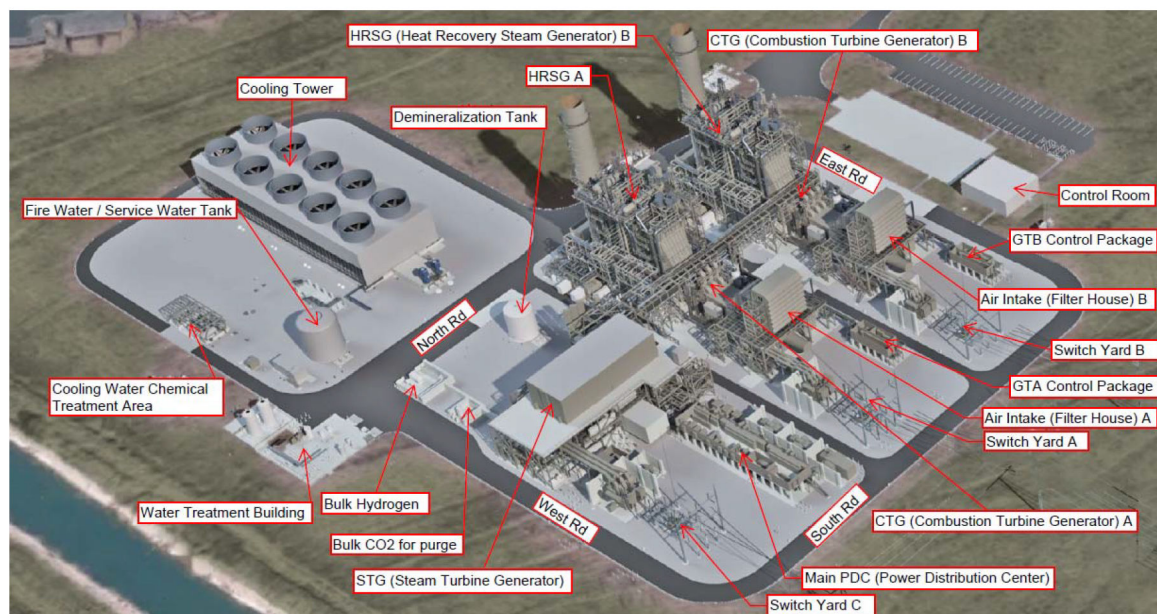
II. ADDITION OF MCPS TO ETI'S GENERATION FLEET

A. Description of MCPS

Q6. PLEASE PROVIDE A BRIEF OVERVIEW OF MCPS.

A. MCPS is a 993 MW (nameplate) power station that uses new technology to provide ETI and its customers a cleaner and more efficient source of power. The MCPS CCCT facility consists of two Mitsubishi Hitachi Power Systems ("MHPS") 501 GAC-series combustion turbines, two Nooter Eriksen heat recovery steam generators ("HRSGs") with duct firing, one Toshiba steam turbine generator in a 2x1 combined cycle configuration, and other balance of plant equipment, including a cooling tower for closed-cycle cooling operations. The plant is located near Willis, Texas adjacent to the Lewis Creek generation facility. Figure 1 below illustrates the layout and major components of the facility.

Figure 1: MCPS Site Configuration



1 The Commission approved a Certificate of Convenience and Necessity
2 (“CCN”) for the Project on July 28, 2017 in Docket No. 46416. Construction of
3 MCPS began in 2018, and the plant officially reached commercial operation well
4 ahead of its originally scheduled June 2021 completion date. The construction
5 phase of the Project proceeded expeditiously notwithstanding several considerable
6 external challenges ETI was required to address and mitigate. Ultimately, MCPS
7 was placed in service on January 1, 2021, roughly five months ahead of schedule
8 and under-budget. This early in-service date allowed MCPS to contribute to
9 ETI’s ability to reliably serve its customers during the February 2021 Winter
10 Storm Uri. Unquestionably, ETI’s ability to bring this critical unit online
11 significantly ahead of schedule benefited customers both in terms of added
12 reliability in ETI’s Western Region and additional fuel cost savings.
13 Furthermore, ETI’s ability to bring the project in under budget provided
14 incremental net benefits to ETI customers relative to the estimated cost evaluated
15 in Docket No. 46416.

16
17 Q7. PLEASE DESCRIBE THE ADVANTAGES OF CCCT TECHNOLOGY.

18 A. Entergy’s System Planning and Operations (“SPO”) group has identified CCCT
19 technology as the current basic building block to meet the incremental capacity
20 and energy needs of ETI and the rest of the Entergy System and to reduce reliance
21 on aging gas-fired units. Operating combustion turbine generators in a combined
22 cycle configuration for power generation is a proven process that offers high
23 efficiency in converting fuel to electrical power, provides flexible load-following

automatic generation control (“AGC”) capability, and has the capability to cycle off-line and provide relatively short re-start optionality.

The CCCT is able to achieve full power operation within a few hours of starting, thus providing flexibility for dispatch and allowing the CCCT to shutdown overnight and re-start the next morning to meet peak-load requirements. Further, because CCCT technology uses natural gas, which has a *de minimis* sulfur content, it does not produce significant sulfur dioxide emissions. CCCT technology is considered throughout the industry as the best available technology for limiting greenhouse gas emissions when combusting fossil fuels for electrical generation. Additionally, the Company evaluated control technology performance and costs and selected a variety of controls that will meet best available control technology (“BACT”) standards for all affected pollutants (including greenhouse gas pollutants).

B. Initiation

Q8. HOW WAS THE MCPS PROJECT INITIATED?

A. MCPS was first identified as a self-build proposal that was submitted in response to 2015 ETI RFP for power generating resources. MCPS was selected in a competitive, independently monitored RFP that addressed the supply needs of ETI. The MCPS project had the lowest total supply cost of all the proposals submitted in the RFP, and it adds necessary, reasonably priced long-term capacity in an area that needed and continues to need new generation.

1 The primary objective of the 2015 ETI RFP process was to solicit
2 competitive proposals for generating resources to meet customers' needs at a
3 reasonable cost. In the RFP, ETI market-tested the MCPS self-build option
4 against competitive suppliers on an anonymous basis to identify the alternative
5 that met ETI's long-term need at the lowest reasonable supply cost.³ In Docket
6 No. 46416, the Commission found MCPS was necessary for the service,
7 accommodation, convenience, or safety of the public.

8

9 Q9. PLEASE EXPLAIN WHY THE SELF-BUILD COMMERCIAL TEAM
10 PROPOSED THE MHPS 501 GAC COMBUSTION TURBINES AS THE
11 PREFERRED TECHNOLOGY FOR MCPS.

12 A. Entergy's SPO organization, in consultation with ETI, decided to pursue
13 advanced gas turbine technology due to its significantly lower cost per unit of
14 output, decreased heat rate compared to other technologies, and operational
15 flexibility for the needs of customers in the 2015 ETI RFP. The air cooled,
16 MHPS 501 GAC was selected as the basis of the reference plant design after
17 consideration of factors including: equipment operational history, vendor
18 performance, equipment pricing, and operational performance. Advanced gas
19 turbines have a higher output per dollar of installed cost and a lower heat rate than
20 other machines (such as F-class machines). Air-cooling of turbine combustors, as
21 compared to steam-cooled versions, are able to accomplish improved performance

³ See Docket No. 46416, Direct Testimony of Stuart Barrett.

1 without significant reductions in operational flexibility or increases in
2 maintenance cost.

3 The selection of the gas turbine to serve as the basis for MCPS was
4 relatively straightforward and built upon the selection for two similar projects that
5 ESL was developing for ELL. During the development phase for this trio of
6 projects, the performance and schedule of potential advanced gas turbines was
7 evaluated. The self-build commercial team selected the MHPS 501 GAC based
8 on the fact that the gas turbine was commercially proven with multiple machines
9 in operation at the time it was selected and MHPS's positive service history on
10 past Entergy affiliate projects.

11
12 **C. Planning**

13 Q10. WAS THE MCPS PROJECT ORGANIZED TO PROMOTE REASONABLE
14 AND PRUDENT PLANNING AND MANAGEMENT?

15 A. Yes, it was.

16
17 Q11. HOW DID THE COMPANY MANAGE THE MCPS PROJECT?

18 A. Given the magnitude of the MCPS Project and the Company's existing
19 infrastructure for construction and project management, the Company determined
20 that it would be appropriate to use an EPC contractor in conjunction with the
21 Company's management team.

1 Q12. WHAT IS AN EPC CONTRACTOR?

2 A. EPC often refers to an agreement structure under which a utility contracts with a
3 single firm for the provision of engineering, procurement, and construction
4 services for a large project. EPC is also used to describe the contractor that
5 performs that function under an agreement for the ultimate project owner.

6

7 Q13. WHAT PROJECT MANAGEMENT APPROACH DID THE COMPANY
8 FOLLOW FOR MCPS?

9 A. The project management approach followed Entergy's Project Delivery System
10 ("PDS") Policy, Standards, and Guidelines in support of driving consistency and
11 certainty in project delivery outcomes. The PDS provides a framework to ensure
12 Entergy's business units consistently and effectively develop and implement
13 capital projects. The PDS establishes a Stage Gate Process ("SGP") approach as a
14 single and comprehensive framework for project development, planning, and
15 execution. The SGP provides a roadmap of key deliverables and decisions to be
16 completed sequentially to promote consistent, reliable, and high-quality project
17 outcomes. Additionally, the SGP also prescribes a continuous systematic
18 evaluation of the project organization, scope, and maturity of project management
19 deliverables that helps ensure projects are successfully executed. This occurs
20 through a series of independent Gate Reviews/Assessment and Approvals.

1 Q14. WHY DID THE COMPANY CHOOSE TO USE AN EPC CONTRACTOR?

2 A. A large construction project like MCPS is a substantial undertaking, and the
3 Company does not have the in-house capability necessary to execute the
4 engineering, procurement, and construction for such a project. The use of an EPC
5 contractor who can perform all these functions under a single contract is cost-
6 effective and common within the power industry for such projects.

7

8 Q15. WHAT EPC CONTRACTING STRATEGY WAS USED?

9 A. The Company was able to negotiate a fixed-price (with certain exceptions), fixed-
10 schedule form of contract with Chicago Bridge & Iron ("CB&I") that reflects a
11 detailed scope of work.

12

13 Q16. WHY DID THE COMPANY ELECT TO USE A FIXED-PRICE FORM OF EPC
14 CONTRACT?

15 A. The Company designed its EPC strategy to yield the lowest reasonable cost with
16 an adequate level of risk mitigation. The Company, working with CB&I, was
17 able to develop a site plan that would accommodate a standard combined-cycle
18 design and minimize the site retrofit scope.

19

20 Q17. HOW WAS CB&I SELECTED AS THE EPC CONTRACTOR?

21 A. CB&I was selected for a suite of three nearly identical projects that includes the
22 St. Charles Power Station (later named the J. Wayne Leonard Power Station), the
23 Lake Charles Power Station, and MCPS. This arrangement provided cost savings,

1 risk reduction, and beneficial experience and learnings that were applied across all
2 three projects. The suite of EPC contracts was single sourced to CB&I based
3 mainly on its strength of performance on Entergy's previous Ninemile 6
4 generating station project, commercially reasonable pricing, and knowledge of the
5 EOCs' processes gleaned from prior projects, namely the Ninemile 6 project,
6 which was completed under budget and ahead of schedule. During the course of
7 the Ninemile 6 project, CB&I and Entergy developed a pricing structure that
8 defined how direct costs incurred by CB&I would be marked-up by CB&I to
9 determine the final price. For MCPS, CB&I proposed that the same pricing
10 structure be applied but with a reduction in the fee portion of the pricing structure.

11 As an additional check on the pricing under the suite of EPC agreements,
12 ESL's Supply Chain organization worked closely with the self-build commercial
13 team to ensure the competitiveness of CB&I's pricing through market
14 benchmarking and the solicitation and evaluation of an EPC estimate from a
15 competing firm, Black & Veatch. These two independent estimates plus the
16 benchmark data gave ESL a level of confidence that CB&I's EPC costs were
17 competitive with market alternatives.

18 It should also be noted that the decision to pursue negotiations with CB&I
19 was also supported by management's favorable assessment of CB&I's expertise
20 in the management of CCCT construction projects and experience in the regional
21 construction market.

1 Q18. WHAT ACTIVITIES DID CB&I PERFORM AS THE EPC CONTRACTOR?

2 A. Under the fixed price EPC contract structure, CB&I acted as an independent
3 contractor with respect to the engineering, procurement, and construction services
4 defined in the scope of work. CB&I also procured the combustion turbines,
5 HRSGs, and steam turbine from the OEMs. Firm, fixed prices for this equipment
6 were included in CB&I's fixed price and were subject to escalation only at the
7 rates specified in the EPC agreement. CB&I provided a "wrap" (i.e., guarantee)
8 of the commitments on schedule and performance for the entire Project, providing
9 for risk mitigation if there were delays or performance shortfalls. CB&I's
10 procurement of this equipment allowed it full coordination and scheduling of the
11 OEMs in order to meet the fixed schedule provided in the agreement.

12

13 Q19. DID CB&I PERFORM ANY WORK OUTSIDE OF THE DEFINED EPC
14 SCOPE?

15 A. Yes. At the request of ETI, CB&I performed various tasks that were outside the
16 original scope of work in the EPC, but which were determined by ETI to be
17 necessary or important for the safety or performance of the Project. This
18 additional work and the associated cost were agreed to by ETI and CB&I through
19 issuance of change orders and properly included in the overall project cost.

20

21 Q20. PLEASE DESCRIBE THE CHANGE ORDER PROCESS.

22 A. The Project Manager, Controls Manager, and Project Analyst, with support from
23 the Project Team, managed Change Control in general conformance with

1 PMM 1130 – The Entergy Project Change Management Procedure. All change
2 requests were documented and tracked through disposition and required approval
3 of the Executive Steering Committee. Approved change requests were posted to
4 the Project Management Information Site and became part of the official record.
5 Change Orders under the EPC Agreement conformed to the provisions of
6 Section 5 (Change Orders) in the agreement. Approved Change Orders were
7 communicated to the EPC Contractor by the Entergy Contract Manager using the
8 forms and processes identified in the EPC Agreement.

9
10 Q21. PLEASE DESCRIBE THE CHANGE ORDERS THAT WERE AGREED TO
11 BY ETI AND CB&I.

12 A. Eight change orders were agreed to and executed between ETI and CB&I for the
13 Project. Change orders include multiple line items, including debits for additional
14 work and credits for work not needed.

15 Change Order one (CO-001) cost \$1,274,261 and was approved in
16 March 2019. This Change Order represented four credits for work not required,
17 two contract language adjustments and nineteen debits for additional work for
18 plant modifications to improve the overall operations and maintenance of the
19 facility. One such improvement was the removal of water treatment equipment
20 that is not required due to the clean water source at the Lewis Creek Reservoir for
21 MCPS cooling water.

22 Change Order two (CO-002) cost \$2,549,937, was approved in late
23 September 2019, and represented three credits for work not required and 12 debits

1 for additional work for plant modifications to improve the overall operations and
2 maintenance of the facility, including modifications to the Combustion Turbine
3 cooling air system for low load emissions compliance and the refurbishment of
4 the Lake Conroe Pumping Station.

5 Change Order three (CO-003) cost approximately \$12.81 million and
6 represented the First Amendment to the MCPS EPC Agreement by the execution
7 of a Memorandum of Understanding (“MOU”) dated December 13, 2019. The
8 MOU addressed true-ups/adjustments to the contract price for escalation in craft
9 labor wage rates, the Project Cash Flow Ceiling, ad valorem tariffs, and various
10 agreements between the parties to improve collaboration and transparency into the
11 CB&I procurement process and project accounting.

12 Change Order four (CO-004) cost \$1,175,369, was approved in May 2020,
13 and represented one credit and eleven debits for work required, including
14 enhancements to storm water run-off facilities and Dynamic Disturbance
15 equipment (for NERC PRC-002 compliance).

16 Change Order five (CO-005) cost \$310,073, was approved October 2020,
17 and represented three credits and seven debits for work required which included
18 temporary process water containment during commissioning, valve upgrades for
19 optimal operation and maintenance requirements and operator training.

20 Change Order six (CO-006) cost \$14,959,919, was approved late
21 January 2021, and included the early completion bonus specified under the EPC
22 agreement based on the December 12, 2020 Substantial Completion achieved by

1 CB&I, and the purchase of commissioning spare parts that if not used would
2 move to the plant inventory upon completion of the project.

3 Change Order seven (CO-007) cost \$950,287, was approved in
4 August 2021, and included two credits and various plant winterization
5 improvements and a remote braking system for the cooling tower fans.

6 Change Order eight (CO-008) cost \$297,000, was approved
7 February 2022, and represented eight credits for warranty work performed by
8 Entergy charged back to CB&I and additional winterization efforts to improve
9 plant reliability during the coldest winter months.

10

11 Q22. EXPLAIN THE INFORMATION FLOW BETWEEN CB&I AND THE
12 COMPANY DURING THE MCPS PROJECT.

13 A. CB&I organized regular monthly reports that were delivered in a meeting where
14 all senior staff from both parties attended, which provided an up-to-date account
15 of all activities regarding the MCPS project. In addition, weekly meetings were
16 held between both construction teams to work through new and existing
17 construction related issues, which included the Engineering teams from both
18 parties who attended via teleconference. Meeting minutes were noted and
19 distributed shortly after.

20 Project oversight involves the systematic evaluation of the completeness
21 and quality of the project's business case, project management, and technical
22 deliverables as the Project progressed through the seven-stage gate process.
23 Assurance was performed through rigorous stage gate reviews, independent

1 project assessments, and reporting to ensure that projects were not only compliant
2 with the Project Delivery Standard but that the project was well positioned to be
3 successfully delivered.

4 The ETI Project Team developed a monthly report format to provide
5 management with clear visibility into project status and key leading performance
6 indicators, including safety performance, quality, budget, and schedule. The
7 information provided in these monthly reports allowed the management structure
8 to generally observe progress on the Project and identify and address issues with
9 the potential to materially affect Project quality, cost, or schedule. Monthly
10 Project reports were compiled using information from the monthly EPC
11 Contractor report, information gathered from the Project Performance
12 Management (“PPM”) committee and other meetings from the collective
13 engineering groups and site teams. Meeting notes and monthly reports were
14 consolidated into presentations that were reviewed with the Committee monthly.

15
16 Q23. HOW DID THE ORGANIZATIONAL STRUCTURES AND TOOLS YOU
17 JUST DESCRIBED SUPPORT THE REASONABLE AND PRUDENT
18 MANAGEMENT OF THE CONSTRUCTION OF MCPS?

19 A. The organizational structure and reporting processes provided the basis for
20 making prudent decisions in the execution of the MCPS project. The oversight
21 structure for the Project involved a tiered approach to address strategic,
22 governance, controls, tactical, and operational levels of project delivery:

- The Project Team Organization

ETI organized an experienced Project Team to provide tactical direction and oversight at an operational level, primarily through the Project Director, his direct reports, and matrixed and contracted site experts. Operational level actions are the day-to-day activities accomplished by the groups and individuals assigned or contracted to the Project, either directly or through functional matrix assignment. Key attributes of this team included manager-level personnel to oversee the areas of project management, design, engineering, procurement, construction, site integration, and project controls.

- Project Performance Management Committee (“PPMC”)

Project execution and performance were monitored and managed by the Project Director and a matrixed team of subject matter experts assigned to the PPMC. The PPMC discussed progress and issues facing the Project.

- Portfolio Performance Management Team (“PPMT”)

The PPMT within the Capital Projects (“CP”) group was instrumental to the successful planning and execution of the MCPS Project and support of the Project team. This team was led by the Director of Portfolio Performance Management and provided for structured reviews in the areas of schedule, cost control, governance, and execution and ensured that lessons learned from the Project were applied to other CCCT build projects in the current portfolio.

- Executive Steering Committee (“ESC”) for the Project

The ESC provided strategic direction and oversight for the Project, including monitoring and providing direction relating to Project performance, key risks, value drivers that would affect the Project risk profile, and provided guidance to the Project Team. The ESC acted as liaison between the Project Director and other executive groups and committees and was composed of the following key executives, and proxies, whose organizations were directly supporting the successful completion of the Project as listed below:

- President and CEO of ETI as Project Sponsor
- Director, Operations Finance Business Partners
- Vice President, Capital Projects
- Vice President, SPO
- Vice President, Regulatory Services
- Vice President, Power Generation
- Vice President, Regulatory and Public Affairs
- Associate General Counsel – Regulatory

D. Project Execution – Construction

Q24. WHEN DID CONSTRUCTION ON THE MCPS PROJECT BEGIN?

A. Construction began August 1, 2018.

1 Q25. THROUGH PROJECT COMPLETION, WAS CONSTRUCTION
2 PERFORMED AND EXECUTED AS PLANNED?

3 A. Yes, although the project was completed early.
4

5 Q26. DOES MCPS, AS BUILT DIFFER FROM THE SELF-BUILD PROPOSAL
6 PRESENTED AND APPROVED IN THE CCN CASE IN DOCKET NO. 46416?

7 A. The plant does not differ from the self-build proposal mentioned above except for
8 the following adjustments, which were made to increase reliability or efficiency:

- 9 • the closed cooling water system was designed to use a mixture of
10 demineralized water and polypropylene glycol; for this project the glycol
11 was replaced with a corrosion inhibitor and additional freeze protection
12 installed on the system.
- 13 • the potable water system is taken from city water, which became available
14 to the project during construction, and which eliminated the need for a
15 treatment facility to clean up the make-up water supply.
- 16 • a water softener was deemed not required for the GTG evaporative cooler
17 because the water quality of the make-up water was adequate, and the
18 plant is able to mix the water supply with demineralized water if
19 necessary.
- 20 • TCA pumps for the GTG cooling air system were replaced with up-rated
21 boiler feedwater pumps because this was determined to be more reliable
22 than the previously scoped TCA pumps due to historical poor performance
23 on existing projects.

1 Q27. ARE THE CHANGES TO MCPS FROM THE DESIGN SUBMITTED IN THE
2 CCN CASE IN DOCKET NO. 46416 YOU HAVE DISCUSSED A RESULT OF
3 IMPRUDENT PLANNING OR MANAGEMENT?

4 A. No. Changes were made either as a result of lessons learned from the previous
5 two projects or circumstances unique to the specific location of MCPS. All
6 changes were made to ensure improved reliability and/or regulatory control.

7

8 **E. Cost Comparison**

9 Q28. WHAT RESOURCES WERE USED TO DEVELOP THE OVERALL COST
10 ESTIMATE FOR MCPS?

11 A. The following resources were used to develop the MCPS Project's two major cost
12 components:

13 **1) EPC agreement costs:** CB&I, at the request of ESL, provided a cost
14 estimate based on preliminary engineering that used the Ninemile 6 and
15 St. Charles Power Station projects as guides for the design basis. CB&I's
16 EPC estimate formed the basis of the EPC costs contained in the self-build
17 proposal.

18 **2) Costs outside of the EPC agreement:** The self-build commercial team
19 developed these costs using internal subject matter experts and third-party
20 providers (i.e., Sargent & Lundy as owner's engineer and other technical
21 consulting firms).

1 Q29. WHAT COST ESTIMATE WAS PRESENTED TO THE COMMISSION AT
2 THE TIME OF THE CCN PROCEEDING?

3 A. The MCPS capital cost estimate presented to the Commission was approximately
4 \$937.3 million. This amount included \$826.3 million associated with the
5 generation portion of the Project and \$111.0 million in estimated transmission
6 interconnection and system upgrade costs. A summary of the components of that
7 cost estimate is shown below:

8 **Table 1 MCPS Capital Cost Estimate (Millions)**

	Total \$
EPC Contract	602.8
Other Vendors	49.9
Entergy Labor	23.0
Other Expenses	5.1
Total Direct Cost	680.9
AFUDC	103.8
Other Indirect Costs	9.8
Total Indirect Cost	113.7
Contingency	31.8
Generation Project Cost	826.3
Transmission Project Cost	111.0
Total Project Cost	937.3

1 Q30. WHAT PROCESSES WERE IN PLACE TO CONTROL AND MANAGE
2 PROJECT COSTS?

3 A. The fixed-price structure and well-defined scope of work of the EPC contract
4 were the principal mitigation tools to minimize cost risks. The Company
5 developed mitigation plans and included a contingency in the project cost
6 estimate to mitigate risks. The project schedule was developed by optimizing the
7 sequence of activities to produce the shortest practical schedule at the lowest
8 reasonable cost.

9 Further, under the terms of the agreement with CB&I, CB&I agreed to
10 assume productivity risk associated with craft labor (i.e., man-hour estimates).
11 CB&I also agreed to assume subcontractors' craft labor wage escalation risk as
12 well as engineering and project management labor.

13

14 Q31. DO THESE COST CONTROLS REFLECT REASONABLE AND PRUDENT
15 PLANNING AND MANAGEMENT?

16 A. Yes. These cost controls ensured that changes to project scope, which ultimately
17 affects cost, were thoroughly evaluated before execution.

18

19 Q32. IN DOCKET NO. 46416, ETI AGREED TO AND THE COMMISSION
20 ORDERED A COST CAP. DID ETI EXCEED THAT COST CAP?

21 A. No. In fact, the MCPS project came in under-budget, under the cost cap, and
22 ahead of schedule.

1 Q33. PLEASE PROVIDE AN EXPLANATION OF THE DIFFERENCES BETWEEN
2 THE FINAL COST OF MCPS AND THE ESTIMATE PROVIDED IN THE
3 CCN CASE.

4 A. Completing such a large and complex project within cost estimates is a challenge
5 in itself. Further, as discussed later in this testimony, the MCPS project faced
6 challenges not normally faced in the construction of a power plant. In spite of the
7 challenges faced, the MCPS project was completed ahead of schedule and below
8 budget and the cost cap established by the Commission in Docket No. 46416. For
9 MCPS, actual spend through December 2021 was \$842.8 million, which when
10 compared to the CCN estimate of \$937.3 million, represented a \$94.5 million
11 favorable variance. While this favorable variance includes a \$59.3 million
12 contribution by East Texas Electric Cooperative, Inc. (“ETEC”) for its 7.56%
13 ownership share of the plant⁴ that was not contemplated at the time the
14 Commission granted the CCN, without considering this contribution, the MCPS
15 project still came in under-budget. The primary differences were as follows:

- 16 • (\$31.2 million): Reduction of Accumulated Funds Used During
17 Construction (“AFUDC”) due to early in-service date of Project.
- 18 • (\$31.8 million): Project Contingency not used.
- 19 • (\$11.2 million): Reduction of labor and pipeline reservations fees due to
20 early in-service date of Project.

21 These underruns were offset by \$39.0 million related to EPC change orders
22 related to EPC amendments and early completion bonus, additional transmission

⁴ ETEC’s acquisition of a portion of MCPS was approved by the Commission in Docket No. 50790.

1 costs (accelerated construction schedule, additional matting rental to support
2 construction, transmission outage schedule changes, and additional construction
3 oversight resulting from schedule impacts from multiple named storms and severe
4 weather events), as well as higher capital suspense rates.

5
6 **F. Obstacles Overcome**

7 Q34. DID ETI EXPERIENCE ANY SIGNIFICANT OBSTACLES THAT HAD TO
8 BE ADDRESSED AND MITIGATED IN ORDER TO BRING MCPS ONLINE
9 EARLY AND UNDER-BUDGET FOR THE BENEFIT OF CUSTOMERS?

10 A. Yes. Apart from challenges that might be expected to arise during the execution
11 of a large and complex, multi-year project, ETI encountered extraordinary
12 obstacles that had to be overcome in order to complete MCPS, much less bring
13 the project in service ahead of schedule and under-budget. These obstacles
14 included the bankruptcy of the parent company of the EPC contractor, the onset of
15 the COVID-19 pandemic, and a historic 2020 tropical storm season. First, during
16 the construction of this significant capital project, the parent company of CB&I,
17 McDermott International, went through a bankruptcy that threatened CB&I's
18 ability to complete the project and keep the resources necessary to do so dedicated
19 to this specific project. Second, the onset of the global COVID-19 pandemic
20 introduced considerable complexities and certain costs associated with the
21 completion of this complex project. Third, under the constraints of this global
22 pandemic, Entergy successfully responded to seven storms in 2020. Despite the
23 challenges of the 2020 storm season, including Hurricane Laura in September of

1 2020, and the COVID-19 protocols in place at the time, ETI continued to make
2 progress building MCPS and completed the project ahead of schedule and under
3 budget. It should be noted that ETI secured these accomplishments for the benefit
4 of customers while achieving a top decile Total Recordable Incident Rate
5 (“TRIR”) for the Project for the benefit of those building MCPS.

6
7 Q35. PLEASE EXPLAIN THE CIRCUMSTANCES SURROUNDING
8 MCDERMOTT INTERNATIONAL’S BANKRUPTCY AND WHAT STEPS
9 ETI TOOK TO PRUDENTLY MANAGE THE EFFECTS OF THIS
10 POTENTIALLY DISRUPTIVE EVENT.

11 A. Faced with what was the eventual bankruptcy of McDermott, ETI proactively
12 worked with CB&I to mitigate potential disruption to completion of the Project
13 and better position the Project to be completed within schedule and cost
14 commitments. Among the actions taken by ETI was to strengthen its visibility
15 over the Project, including productivity information, man-hour and manpower
16 reports, and participation in internal project meetings and reviews. CB&I agreed
17 to an employee retention program that was transparent to ETI. Further, ETI
18 coordinated with CB&I to address concerns of subcontractors and vendors on the
19 project to avoid disruptions, including the ability for ETI to directly pay those
20 subcontractors and vendors or assume the subcontracts, if such a need were to
21 arise. This approach led to the ability to finish ahead of schedule and have MCPS
22 available for reliability support during Winter Storm Uri.

1 Q36. PLEASE EXPLAIN HOW THE ONSET OF THE COVID-19 PANDEMIC
2 IMPACTED THE EXECUTION OF THIS PROJECT.

3 A. Many new procedures were put in place to ensure the health of all people on the
4 project site; this was recognized by all as a necessity and proved to be successful.
5 Inevitably there were impacts to the project costs (\$485,000) as a result of the
6 additional work to maintain clean conditions throughout the project site during the
7 peak of activities, and these costs were managed through the EPC change order
8 process.
9

10 Q37. PLEASE EXPLAIN HOW THE STORMS EXPERIENCED IN 2020
11 IMPACTED THE PROJECT.

12 A. During the storms of 2020, Lake Charles power station in Louisiana received
13 damage to the cooling tower, and as a result of this, we designed a remote braking
14 system for the cooling tower at MCPS, which allows the tower fans to be stopped
15 and immobilized safely from the control room. It also allows us to operate the
16 tower at higher wind speeds because our operators no longer need to access the
17 operating platform in high winds.
18

19 **III. CONCLUSION**

20 Q38. WHAT DO YOU CONCLUDE REGARDING THE PRUDENCE OF THE
21 ADDITION OF MCPS TO ETI'S GENERATION FLEET?

22 A. As I noted above, completing such a large and complex project within cost
23 estimates is a challenge in itself. Further, the MCPS project faced challenges not

1 normally faced in the construction of a power plant. In spite of the challenges
2 faced, the MCPS project was completed ahead of schedule and below budget and
3 the cost cap established by the Commission in Docket No. 46416. Apart from
4 challenges that might be expected to arise during the execution of a large and
5 complex, multi-year project ETI encountered extraordinary obstacles that had to
6 be overcome in order to complete MCPS. These obstacles included the
7 bankruptcy of the parent company of the EPC contractor, the onset of the
8 COVID-19 pandemic, and a historic 2020 tropical storm season. Despite these
9 challenges, ETI continued to make progress building MCPS and completed the
10 project ahead of schedule and under budget and achieved a top decile TRIR
11 during construction of MCPS. Based on the facts discussed in this testimony, I
12 have demonstrated that ETI's management of the MCPS Project was
13 commercially reasonable and prudent.

14

15 Q39. DOES THIS CONCLUDE YOUR DIRECT TESTIMONY?

16 A. Yes, it does.

AFFIDAVIT OF GARY C. DICKENS

THE STATE OF TEXAS)
)
COUNTY OF MONTGOMERY)

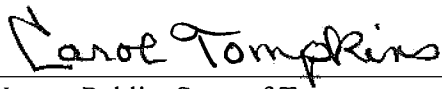
This day, Gary C. Dickens the affiant, appeared in person before me, a notary public, who knows the affiant to be the person whose signature appears below. The affiant stated under oath:

My name is Gary C. Dickens. I am of legal age and a resident of the State of Texas. The foregoing testimony and exhibits offered by me are true and correct, and the opinions stated therein are, to the best of my knowledge and belief, accurate, true and correct.



Gary C. Dickens

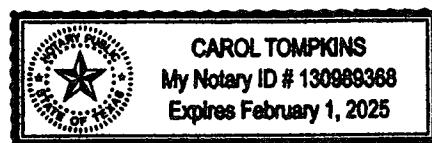
SUBSCRIBED AND SWORN TO BEFORE ME, notary public, on this the 30th
day of June 2022.



Notary Public, State of Texas

My Commission expires:

February 1, 2025



This workpaper contains information that is highly sensitive and voluminous and will be provided under the terms of the Protective Order (Confidentiality Disclosure Agreement) entered in this case.

DOCKET NO. 53719

APPLICATION OF ENTERGY	§	PUBLIC UTILITY COMMISSION
TEXAS, INC. FOR AUTHORITY TO	§	
CHANGE RATES	§	OF TEXAS

DIRECT TESTIMONY

OF

KHAMSUNE VONGKHAMCHANH

ON BEHALF OF

ENTERGY TEXAS, INC.

JULY 2022

ENTERGY TEXAS, INC.
DIRECT TESTIMONY OF KHAM SUNE VONGKHAMCHANH
2022 RATE CASE

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EXHIBITS

Exhibit KV-1	List of Prior Testimonies
Exhibit KV-2	Transmission Services Overview
Exhibit KV-3	Transmission Function Dollars Closed to Plant from January 1, 2018 to December 31, 2021
Exhibit KV-4	Utilities Considered for ETI's Benchmarking Analysis
Exhibit KV-5	Benchmarking Analysis of ETI's Transmission O&M Expenses Per Transmission Line Mile
Exhibit KV-6	Benchmarking Analysis of ETI's Transmission O&M Expenses as a Percentage of ETI's Total Transmission Assets
Exhibit KV-7	Transmission Planning & Strategy Group of Affiliate Services
Exhibit KV-8	Transmission Engineering & Construction Group of Affiliate Services
Exhibit KV-9	Transmission Operations Group of Affiliate Services
Exhibit KV-10	Transmission Asset Management Group of Affiliate Services
Exhibit KV-11	Transmission Operations Class Predominant Billing Methods
Exhibit KV-12	Process Flow Diagram for Transmission & Distribution System Demand Loss Analysis
Exhibit KV-13	Process Flow Diagram for Transmission & Distribution System Energy Loss Analysis
Exhibit KV-A	Affiliate Billings by Class and Department
Exhibit KV-B	Affiliate Billings by Class and Project
Exhibit KV-C	Affiliate Billings by Class, Department, and Project
Exhibit KV-D	Pro Forma Adjustments to Affiliate Billings

I. INTRODUCTION

Q1. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is Khamsune “Kham” Vongkhamchanh. My business address is
639 Loyola Avenue, New Orleans, Louisiana 70113.

Q2. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?

A. I am the Senior Manager, Transmission Policy and Regulatory Support for
Entergy Services, LLC (“ESL”), the service company for the five Entergy
Operating Companies (“EOCs”),¹ including Entergy Texas, Inc. (“ETI” or the
“Company”).

Q3. ON WHOSE BEHALF ARE YOU FILING THIS DIRECT TESTIMONY?

A. I am testifying on behalf of ETI.

A. Qualifications

Q4. PLEASE BRIEFLY DESCRIBE YOUR EDUCATIONAL AND
PROFESSIONAL QUALIFICATIONS.

A. I received a Bachelor of Science degree in Electrical Engineering in June of 1993
and a Master of Science degree in Electrical Engineering in December of 1994
from the Georgia Institute of Technology. I also received a Master of Business

¹ ESL (formerly, Entergy Services, Inc.) is an affiliate of the Entergy Operating Companies that provides engineering, planning, accounting, legal, technical, regulatory, and other administrative support services to each of the EOCs, which are Entergy Arkansas, LLC (“EAL”); Entergy Louisiana, LLC (“ELL”); Entergy Mississippi, LLC (“EML”); Entergy New Orleans, LLC (“ENO”); and Entergy Texas, Inc. (“ETI”).

1 Administration from Tulane University in August 2009. I joined Entergy
2 Services, Inc. in January of 1995. From 1995 to 2007, I held several engineering
3 and transmission planning positions with responsibilities including (i) distribution
4 line design, substation design, and system protection and control design,
5 (ii) engineering field support for substation project installation, checkout, and
6 commissioning of new facilities, (iii) design, construction, interconnection, and
7 maintenance assistance to customers wanting to obtain transmission services, and
8 (iv) oversight and performance of power flow studies on the transmission system.

9 In April 2007, I was named Manager, Transmission Regulatory Support
10 (“TRS”) supporting the Transmission Operations department. In that capacity, I
11 provided regulatory support in connection with transmission-related planning and
12 operating issues associated with the Transmission Functional Organization
13 (“Transmission Organization”) and in support of the EOCs.² TRS provided
14 regulatory support such as fulfilling requests for information, providing testimony
15 support, and supporting various industry and regulatory filings. In August 2009, I
16 was assigned to oversee the Transmission Policy department in addition to the
17 TRS responsibilities. This department developed and evaluated transmission
18 policy and regulatory compliance recommendations on behalf of the EOCs and
19 other business units.

20 Beginning June 2014, I accepted my current position of Senior Manager,

² The Transmission Function is comprised of both EOC personnel and ESL personnel within ESL’s Transmission Organization. Collectively, I will refer to all personnel carrying out the Transmission Function as the Transmission Organization.

1 Transmission Policy and Regulatory Support (successor department to TRS).
2 This department retained the responsibilities as described for the TRS
3 Department, but also took on added responsibilities including oversight of the
4 Transmission Organization's procedures and records coordination. Most recently,
5 I now also have oversight of transmission settlements.

6

7 Q5. WHAT ARE YOUR RESPONSIBILITIES AS SENIOR MANAGER,
8 TRANSMISSION POLICY AND REGULATORY SUPPORT?

9 A. I oversee a department of analysts, policy consultants, and transmission regulatory
10 affairs coordinators who perform a myriad of activities in support of the
11 Transmission Organization, other business units, and the EOCs.³

12

13 Q6. ARE YOU FAMILIAR WITH GENERALLY ACCEPTED TRANSMISSION
14 PLANNING AND OPERATING STANDARDS USED BY THE ELECTRIC
15 UTILITY INDUSTRY?

16 A. Yes. I am familiar with the generally accepted transmission planning and
17 operating standards used by electric utilities that address planning and operating
18 transmission systems.

³ Effective May 2022, the Distributions Operations and Transmission Organization groups were combined into the new Power Delivery Organization. The engineering, project management, and construction departments within those respective groups have been moved into the Capital Projects Organization. Also, the training departments within those respective groups were moved into the Operations and Development Organization.

1 Q7. HAVE YOU TESTIFIED BEFORE?

2 A. Yes. I have provided a list of the proceedings in which I have submitted
3 testimony in Exhibit KV-1.
4

5 **B. Purpose of Testimony**

6 Q8. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

7 A. I sponsor the overall costs of ETI's Transmission Function in this rate case.
8 Those costs include (1) transmission-related capital investment ETI seeks to
9 include in base rates (including capital additions included in ETI's transmission
10 cost recovery factor ("TCRF") since the last base rate case); and (2) transmission-
11 related operation and maintenance ("O&M") expenses ETI seeks in base rates.
12 The transmission-related capital investment is comprised of ETI's capital costs
13 closed to plant in service during the period January 1, 2018⁴ through December
14 31, 2021.⁵ The transmission-related O&M is comprised of ETI's own expenses
15 and affiliate expenses incurred during the 12 months ending December 31, 2021
16 (the "Test Year").

17 I demonstrate that the transmission-related capital investment, including
18 associated capitalized affiliate charges, is used and useful and the costs are
19 reasonable and necessary and prudently incurred; and, I demonstrate the
20 reasonableness and necessity of the transmission-related O&M expenses,

⁴ January 1, 2018 is the next date following the end of the test year in ETI's last base rate case (Docket No. 48371).

⁵ The 12 months ending December 31, 2021 are the historical test year for this proceeding (the "Test Year").

1 including that charges from ETI affiliates are no higher than the charge by that
2 affiliate to any other entity for the same or similar service, and the costs
3 reasonably approximate the affiliate's cost to provide the service.

4 Finally, I sponsor the demand and energy loss factors for the ETI
5 transmission and distribution systems. The Transmission Organization calculates
6 the system line loss factors for inclusion in Rate Filing Package Schedule O-6.3,
7 which enables the Regulatory Services Department⁶ to develop allocation factors
8 for use in the cost-of-service study.

9
10 Q9. WHY ARE YOU THE APPROPRIATE PERSON TO SPONSOR THIS
11 TESTIMONY?

12 A. As Senior Manager, Transmission Policy and Regulatory Support, I have
13 management responsibility for a variety of activities performed in support of
14 ETI's Transmission Function. I work very closely with the management of the
15 departments within the Transmission Organization. Throughout the course of my
16 career, I have been involved in various aspects of the engineering processes
17 related to the Transmission Function, and I am familiar with generally accepted
18 standards and practices for transmission planning and operations used by the
19 electric utility industry.

⁶ Regulatory Services provides ETI with advice, analysis, filings, and interpretation of rate tariffs, from a team with regulatory expertise and institutional, industry knowledge.

1 Q10. WHAT EXHIBITS DO YOU SPONSOR IN YOUR DIRECT TESTIMONY?

2 A. I sponsor the exhibits listed after the Table of Contents at the beginning of my
3 direct testimony.

4

5 Q11. WHAT SCHEDULES DO YOU SPONSOR IN ETI'S RATE FILING
6 PACKAGE?

7 A. I sponsor or cosponsor the following schedules in the Rate Filing Package:

H-12.5a	Line Losses & System's Own Use
H-13.1b	Circuit Breaker Operations
H-13.1e	Quality of Service Improvements
H-13.2	IE-24 Reports (Form 417R) – DOE
H-14.1a	Available Capacity Wheeling
H-14.1b	Planned Capacity Wheeling
H-14.2	Wheeling Information for Test Year
O-6.1	Unadjusted kWh Sales by Month of Test Year
O-6.2	Adjusted kWh Sales Data
O-6.3	System Line Loss Calculations

8 Q12. PLEASE GENERALLY DESCRIBE THE H SCHEDULES YOU SPONSOR
9 OR COSPONSOR.

10 A. Rate Filing Package Schedule H consists of dynamic engineering schedules. I
11 provide the line losses and system's own use data in Schedule H-12.5a; the
12 description of the primary causes for circuit breaker operations in
13 Schedule H-13.1b; the description of specific programs and activities undertaken
14 by ETI to improve quality of service in Schedule H-13.1e; and the copies of form

1 IE-24 Reports (Form 417R) filed with the Department of Energy during the Test
2 Year in Schedule H-13.2.

3

4 Q13. WHY DO SCHEDULES H-14.1a, H-14.1b, AND H-14.2 CONTAIN NO DATA
5 RELATED TO QUALIFYING FACILITY WHEELING?

6 A. The Rate Filing Package instructions direct that Schedules H-14.1a and H-14.1b
7 include “summaries from Qualifying Facilities (QFs) under Substantive Rule
8 23.66 for transmission Wheeling data from the utility’s company-wide
9 transmission system by month for the test year.”⁷ Schedule H-14.2 likewise
10 relates to company-wide transmission wheeling data. Because the EOCs
11 participate in the Midcontinent Independent System Operator (“MISO”) regional
12 transmission organization (“RTO”), the MISO Open Access Transmission,
13 Energy and Operating Reserve Markets Tariff (the “MISO Tariff”) governs the
14 wheeling of power across the ETI footprint. As such, MISO acts as the
15 Transmission Service Provider. Because MISO conducts wheeling at a MISO-
16 wide level, statistics for available capacity and planned capacity for wheeling for
17 only ETI have no meaning. Thus, these schedules reflect that there were no actual
18 or planned wheeling transactions for QFs during the Test Year.

19

20 Q14. PLEASE GENERALLY DESCRIBE THE O SCHEDULES YOU SPONSOR.

21 A. Rate Filing Package Schedule O consists of key ETI operating statistics. In

⁷ *Electric Utility Rate Filing Package for Generating Utilities* at Sch. H-14.1a & 1b instructions, Public Utility Commission of Texas (Sept. 9, 1992).

1 Schedule O-6.1, I provide ETI's total unadjusted kilowatt hour ("kWh") sales by
2 month of the Test Year. In Schedule O-6.2, I present the same information as in
3 Schedule O-6.1, but use adjusted kWh sales. And in Schedule O-6.3, I provide
4 ETI's system line loss calculations.

5
6 Q15. WHY ARE YOU THE APPROPRIATE PERSON TO SPONSOR OR
7 COSPONSOR THESE SCHEDULES?

8 A. I am the appropriate person to sponsor or cosponsor these schedules because these
9 schedules correspond to transmission-related matters.

10
11 **II. ETI TRANSMISSION SYSTEM**

12 **A. Description**

13 Q16. PLEASE PROVIDE A HIGH-LEVEL OVERVIEW OF ENTERGY'S
14 TRANSMISSION SYSTEM.

15 A. The combined transmission systems of the EOCs comprise the Entergy
16 transmission system. The entire Entergy transmission system was integrated into
17 the MISO RTO in December 2013.

18
19 Q17. PLEASE DESCRIBE ETI'S TRANSMISSION SYSTEM SPECIFICALLY.

20 A. The ETI Transmission System⁸ spans 27 counties in southeast Texas. It primarily
21 serves local area load from local and system generation, though certain

⁸ I use the phrase "ETI Transmission System" to refer to the electric transmission facilities of Entergy Texas, Inc.

1 emergency conditions or other unusual events sometimes require providing or
2 receiving mutual support to/from non-Entergy neighboring systems.

3 The ETI Transmission System is generally planned, designed, and
4 operated to withstand the unplanned outage of any single component of the
5 system. It includes transmission lines and substations operating at voltages of
6 500 kiloVolts (“kV”), 345 kV, 230 kV, 138 kV, and 69 kV.

7

8 Q18. IS THE ETI TRANSMISSION SYSTEM INTERCONNECTED WITH OTHER
9 TRANSMISSION SYSTEMS?

10 A. Yes. The ETI Transmission System is interconnected with ELL, Cleco
11 Corporation, East Texas Electric Cooperative, and American Electric Power.

12

13 Q19. PLEASE EXPLAIN.

14 A. The ETI Transmission System is interconnected with other transmission systems
15 primarily to promote system reliability. The interconnection of transmission
16 systems also provides access to other power suppliers, some of which may, at
17 certain times, provide more economic sources of power than is available on-
18 system.

19

20 Q20. GENERALLY SPEAKING, WHO OPERATES THE ETI TRANSMISSION
21 SYSTEM AND HOW?

22 A. The generation and transmission functions performed on behalf of ETI were
23 functionally unbundled in compliance with Federal Energy Regulatory

1 Commission (“FERC”) Order Nos. 888, 889, and related orders. A staff of ESL
2 system operators located in Little Rock, Arkansas and Jackson, Mississippi—in
3 conjunction with MISO staff in Little Rock, Arkansas and Carmel, Indiana—
4 operate the combined Entergy transmission system, which includes the ETI
5 Transmission System. A staff of generation dispatchers within the Energy
6 Management Organization (“EMO”) located in The Woodlands, Texas⁹
7 dispatches Entergy’s generation fleet, which includes ETI’s generation fleet. The
8 EMO uses the Generation Management System (“GMS”) for generation control.
9 Separately, ESL transmission personnel in Little Rock, Arkansas and Jackson,
10 Mississippi use the GMS for transmission functions. The generation and
11 transmission functions of the GMS are separate and distinct such that the EMO
12 does not have access to transmission information in conformance with FERC
13 Order Nos. 717, 888, 889, 2004, and related orders.

14 On any given day, energy flows on the combined Entergy transmission
15 system include energy generated and consumed within the Entergy Balancing
16 Authority Area (“EBAA”),¹⁰ energy imported into the EBAA, energy exported
17 from the EBAA, and energy that is transmitted across the EBAA. All energy
18 flows that cross the combined Entergy transmission system, including the ETI

⁹ The EMO is a department within Entergy’s System Planning Organization. Please see Andrew Dornier’s direct testimony for a more detailed discussion of that organization.

¹⁰ A Balancing Authority integrates resource plans ahead of time and maintains in real time the balance of electricity resources and electricity demand in real time. MISO is the Balancing Authority for the combined Entergy system. MISO utilizes Local Balancing Authorities (“LBAs”), which assume certain responsibilities relating to the implementation of the MISO Tariff pursuant to the MISO Amended Balancing Authority Agreement. EBAA is a LBA area administered by ESL.

1 Transmission System, are scheduled hourly with the MISO RTO dispatchers in
2 Carmel, Indiana by other utilities connected to the combined system and by other
3 wholesale market participants. Energy flows are scheduled in accordance with
4 FERC-approved pro forma tariffs that define the service provided and the
5 curtailment priority in the event that curtailment is required for system reliability
6 and security. The ETI Transmission System is operated consistent with the
7 policies and guidelines of appropriate regulatory agencies, including this
8 Commission, and reliability organizations to meet customer needs.

9
10 **B. Organization of ETI's Transmission Function**

11 Q21. WHO IS RESPONSIBLE INTERNALLY FOR THE ACTIVITIES OF ETI'S
12 TRANSMISSION FUNCTION?

13 A. The Transmission Organization, in coordination with MISO in certain areas as
14 described herein, is primarily responsible for the planning, design, operation,
15 maintenance management, and construction management of the ETI Transmission
16 System. Additionally, the Capital Projects Organization¹¹ assists the
17 Transmission Organization in the construction management of ETI transmission
18 projects generally costing over \$20 million.

¹¹ The Capital Projects Organization is responsible for the management and oversight of new transmission projects generally over \$20 million for ETI. The organization secures resources to form a project team and monitor team progress and performance throughout the entire life-cycle of a project. The organization also requests resources from various departments and from project teams to start development of project plans to execute the solution identified by system planning. Lastly, the Capital Projects Organization directs the efforts of subject matter experts to ensure that projects are completed on time, are within budget, and perform as intended.

1 Q22. HOW IS THE TRANSMISSION ORGANIZATION STRUCTURED TO
2 PERFORM THESE ACTIVITIES?

3 A. The Transmission Organization consists of both Operating Company, including
4 ETI, and ESL personnel organized into six major departments: (1) Planning and
5 Strategy,¹² (2) Engineering, (3) Project Management & Construction,
6 (4) Operations, (5) Asset Management, and (6) Transmission Customer Services.
7 Exhibit KV-2 shows the organizational structure and services provided by each of
8 these departments.

9
10 Q23. PLEASE PROVIDE MORE DETAIL ABOUT THE SIX DEPARTMENTS
11 THAT MAKE UP THE TRANSMISSION ORGANIZATION AND THE
12 SPECIFIC SERVICES THEY PROVIDE.

13 A. The Planning and Strategy Department is responsible for ensuring that the ETI
14 Transmission System is designed to meet reliability and firm transmission service
15 commitments in accordance with all applicable regulations and standards. The
16 Transmission Planning group identifies system upgrades to ensure that existing
17 load and future load growth can be served reliably and is responsible for
18 transmission project development. The Asset Management Strategy group is
19 responsible for developing projects and programs for transmission line and
20 substation assets, providing technical support, and tracking transmission system
21 performance. The Transmission Policy and Regulatory Support group is

¹² The Planning and Strategy Department includes three groups: Transmission Planning, Asset Management Strategy, and Transmission Policy & Regulatory Support.

1 responsible for: (1) development and management of transmission policy;
2 (2) coordination of the Transmission Organization's participation in the MISO
3 stakeholder process; and (3) implementing and monitoring programs, procedures,
4 and controls to ensure ETI is in compliance with FERC regulations governing
5 standards of conduct, Sarbanes-Oxley Act ("SOX") regulations, records retention,
6 electric reliability organization ("ERO") requirements and standards, and other
7 transmission regulatory compliance programs.

8 The Engineering Department is responsible for providing transmission line
9 and substation design engineering and related services for ETI. Such services
10 include engineering design basis, relay settings, and configuration management.

11 The Project Management and Construction Department manages
12 transmission line and substation capital additions for ETI. Services include
13 project and construction management, project controls, and right-of-way
14 procurement. Operating Company personnel within this department perform
15 construction operations coordination.

16 The Operations Department is responsible for: (1) monitoring the
17 transmission grid to ensure voltage and system flows are within limits;
18 (2) performing real-time and day-ahead contingency analyses to predict and
19 prepare for altered system states; (3) switching operations to support planned
20 maintenance outages and respond to unplanned system conditions; and (4) short-
21 range planning, including system modeling, outage coordination, and day-ahead
22 security analysis.

23 The Asset Management Department is responsible for: (1) transmission

1 maintenance management, (2) transmission maintenance support including
2 coordination of transmission maintenance activities, (3) safety and skills training,
3 and (4) risk controls. In addition, Operating Company personnel assigned to the
4 Asset Management Department work on construction projects in order to more
5 effectively utilize the EOCs' resources.

6 The Transmission Customer Services Department is responsible for
7 wholesale customer coordination, facilitating generator interconnections in
8 concert with other Transmission Departments and MISO, and coordinating with
9 the ETI's Industrial Accounts organization to support large industrial customers.

10 Finally, personnel from each of these departments support outage response
11 services, which include the management and coordination of ETI's response to
12 major outages caused by weather conditions or other unexpected occurrences.

13
14 Q24. HOW ARE THESE ACTIVITIES DIVIDED AMONG ETI AND ESL
15 PERSONNEL?

16 A. ETI personnel within the Transmission Organization are responsible for local
17 activities, which include various aspects of maintenance and construction, as well
18 as review and approval of proposed transmission projects identified by ESL
19 planning engineers. The costs associated with these activities and third-party
20 contractors are ETI's own expenses. ESL employees within the Transmission
21 Organization are responsible for the remaining transmission activities described
22 above and shown in Exhibit KV-2. The costs associated with these activities are
23 affiliate expenses.