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TO: Interested Parties

FROM: Therese Harris, Director, Infrastructure Division

DATE: November 3, 2023

RE: Project No. 38578 - Avoided Cost of Capacity 2024 Program Year

Avoided Cost of Capacity for the 2024 Program Year

As shown below in the United States Department of Energy's Energy Information Administration's (EIA) Cost and Performance Characteristics of New Central Station Electricity Generating Technologies associated with EIA's Annual Energy Outlook 2023, the base overnight cost of a combustion turbine— industrial frame is \$867 per kilowatt (kW). Further the total overnight cost of a combustion turbine— industrial frame is \$764 per kilowatt (kW) in the Texas Reliability Entity or Electric Reliability Council of Texas (ERCOT) region. Because this amount is between \$700 and \$1,000 per kW, the avoided cost of capacity is \$100 per kW-year for the 2024 program year under 16 Texas Administrative Code (TAC) § 25.181(d)(2)(A)(ii).

Table 1. Cost and performance characteristics of new central station electricity generating technologies

Technology	First available year ^a	Size (MW)	Lead time (years)	Base overnight cost ^a (2022\$/kW)	Technological optimism factor ^a	Total overnight cost ^{a,c} (2022\$/kW)	Variable O&M ^a (2022\$/MWh)	Fixed O&M (2022\$/kW)	Heat rate ^d (Btu/kWh)
Ultra-supercritical coal (USC)	2026	650	4	\$4,507	1.00	\$4,507	\$5.06	\$45.68	8,638
USC with 30% carbon capture and sequestration (CCS)	2026	650	4	\$5,577	1.01	\$5,633	\$7.97	\$61.11	9,751
USC with 90% CCS	2026	650	4	\$7,176	1.02	\$7,319	\$12.35	\$67.02	12,507
Combined-cycle—single-shaft	2025	418	3	\$1,330	1.00	\$1,330	\$2.87	\$15.87	6,431
Combined-cycle—multi-shaft	2025	1,083	3	\$1,176	1.00	\$1,176	\$2.10	\$13.73	6,370
Combined-cycle with 90% CCS	2025	377	3	\$3,019	1.04	\$3,140	\$6.57	\$31.06	7,124
Internal combustion engine	2024	21	2	\$2,240	1.00	\$2,240	\$6.40	\$39.57	8,295
Combustion turbine— aeroderivative ^b	2024	105	2	\$1,428	1.00	\$1,428	\$5.29	\$18.35	9,124
Combustion turbine—industrial frame	2024	237	2	\$867	1.00	\$867	\$5.06	\$7.88	9,905
Fuel cells	2025	10	3	\$6,771	1.08	\$7,291	\$0.66	\$34.65	6,469
Nuclear—light water reactor	2028	2,156	6	\$7,406	1.05	\$7,777	\$2.67	\$136.91	10,447
Nuclear—small modular reactor	2028	600	6	\$7,590	1.10	\$8,349	\$3.38	\$106.92	10,447
Distributed generation—base	2025	2	3	\$1,915	1.00	\$1,915	\$9.69	\$21.79	8,912
Distributed generation—peak	2024	1	2	\$2,300	1.00	\$2,300	\$9.69	\$21.79	9,894
Battery storage	2023	50	1	\$1,270	1.00	\$1,270	\$0.00	\$45.76	NA
Biomass	2026	50	4	\$4,996	1.00	\$4,998	\$5.44	\$141.50	13,500
Geothermal ^{f-l}	2026	50	4	\$3,403	1.00	\$3,403	\$1.31	\$153.98	8,881
Conventional hydropower ^g	2026	100	4	\$3,421	1.00	\$3,421	\$1.57	\$47.06	NA
Wind ^e	2025	200	3	\$2,098	1.00	\$2,098	\$0.00	\$29.64	NA
Wind offshore ^e	2026	400	4	\$5,338	1.25	\$6,672	\$0.00	\$123.81	NA
Solar thermal ^h	2025	115	3	\$8,732	1.00	\$8,732	\$0.00	\$96.10	NA
Solar photovoltaic (PV) with tracking ^{h, i, k}	2024	150	2	\$1,448	1.00	\$1,448	\$0.00	\$17.16	NA
Solar PV with storage ^{l, h}	2024	150	2	\$1,808	1.00	\$1,808	\$0.00	\$32.42	NA

Data source: Sargent & Lundy, Cost and Performance Estimates for New Utility-Scale Electric Power Generating Technologies, December 2019; Hydroelectric: Oak Ridge National Lab, An Assessment of Energy Potential at Non-Powered Dams in the United States, 2012, and Idaho National Engineering and Environmental Laboratory, Estimation of Economic Parameters of U.S. Hydropower Resources, 2003; Geothermal: National Renewable Energy Laboratory, Updated U.S. Geothermal Supply Curve, 2010.

Note: MW=megawatt, kW=kilowatt, MWh=megawatthour, kWyr=kilowattyear, kWh=kilowatthour; Btu=British thermal unit; O&M=operations and maintenance.

^a The first year that a new unit could become operational.

Table 2. Total overnight capital costs of new electricity generating technologies by region

2022 dollars per kilowatt

Technology	1 TRE	2 FRCC	3 MISW	4 MISC	5 MISE	6 MISS	7 ISNE	8 NYCW	9 NYUP	10 PJME	11 PJMW	12 PJMC	13 PJMD
USC	\$4,188	\$4,311	\$4,711	\$4,835	\$4,892	\$4,334	\$5,222	NA	\$5,104	\$5,269	\$4,495	\$5,664	\$4,851
USC with 30% CCS	\$5,281	\$5,421	\$5,852	\$6,011	\$6,058	\$5,456	\$6,463	NA	\$6,334	\$6,504	\$5,632	\$6,914	\$6,055
USC with 90% CCS	\$6,907	\$7,083	\$7,558	\$7,812	\$7,820	\$7,152	\$8,281	NA	\$8,068	\$8,294	\$7,292	\$8,831	\$7,750
CC—single-shaft	\$1,200	\$1,225	\$1,366	\$1,379	\$1,414	\$1,236	\$1,594	\$2,116	\$1,599	\$1,597	\$1,324	\$1,600	\$1,524
CC—multi-shaft	\$1,045	\$1,072	\$1,215	\$1,236	\$1,268	\$1,084	\$1,393	\$1,909	\$1,370	\$1,401	\$1,147	\$1,469	\$1,295
CC with 90% CCS	\$2,945	\$2,972	\$3,175	\$3,182	\$3,231	\$2,999	\$3,334	\$3,776	\$3,258	\$3,307	\$3,041	\$3,447	\$3,168
ICE	\$2,106	\$2,152	\$2,300	\$2,391	\$2,365	\$2,182	\$2,451	\$3,073	\$2,359	\$2,452	\$2,197	\$2,673	\$2,282
CT— aeroderivative	\$1,263	\$1,289	\$1,494	\$1,498	\$1,543	\$1,316	\$1,607	\$2,057	\$1,551	\$1,598	\$1,370	\$1,755	\$1,454
CT—industrial frame	\$764	\$781	\$907	\$911	\$939	\$798	\$978	\$1,262	\$942	\$973	\$830	\$1,072	\$883
Fuel cells	\$6,996	\$7,105	\$7,430	\$7,750	\$7,603	\$7,224	\$7,887	\$9,285	\$7,567	\$7,819	\$7,204	\$8,337	\$7,425
Nuclear—light water reactor	\$7,341	\$7,499	\$7,917	\$8,637	\$8,330	\$7,744	\$8,809	NA	\$8,219	\$8,608	\$7,608	\$9,465	\$7,918
Nuclear—small modular reactor	\$7,779	\$7,962	\$8,674	\$9,044	\$9,041	\$8,061	\$9,338	NA	\$8,894	\$9,357	\$8,160	\$10,440	\$8,474
Distributed generation—base	\$1,729	\$1,764	\$1,967	\$1,986	\$2,036	\$1,779	\$2,296	\$3,047	\$2,302	\$2,300	\$1,907	\$2,304	\$2,195
Distributed generation—peak	\$2,034	\$2,076	\$2,405	\$2,412	\$2,485	\$2,119	\$2,587	\$3,312	\$2,497	\$2,573	\$2,206	\$2,827	\$2,341
Battery storage	\$1,270	\$1,273	\$1,255	\$1,316	\$1,273	\$1,300	\$1,309	\$1,304	\$1,275	\$1,278	\$1,267	\$1,283	\$1,278
Biomass	\$4,637	\$4,764	\$5,157	\$5,329	\$5,340	\$4,802	\$5,933	\$8,054	\$5,952	\$6,056	\$5,093	\$6,067	\$5,804
Geothermal	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Conventional hydropower	\$4,992	\$6,098	\$2,426	\$1,612	\$3,283	\$4,858	\$2,248	NA	\$4,599	\$4,777	\$4,164	NA	\$4,226
Wind	\$3,059	NA	\$1,723	\$1,566	\$1,875	\$1,566	\$2,075	NA	\$2,531	\$2,075	\$1,566	\$2,281	\$2,161
Wind offshore	\$6,517	\$7,819	\$7,714	NA	\$7,989	NA	\$7,783	\$6,714	\$8,139	\$7,461	\$6,100	\$8,834	\$6,950
Solar thermal	\$8,424	\$8,551	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Solar PV with tracking	\$1,422	\$1,395	\$1,443	\$1,497	\$1,480	\$1,407	\$1,494	\$1,758	\$1,480	\$1,524	\$1,440	\$1,571	\$1,436
Solar PV with storage	\$1,751	\$1,769	\$1,822	\$1,880	\$1,854	\$1,787	\$1,892	\$2,150	\$1,858	\$1,896	\$1,780	\$1,971	\$1,842

https://www.eia.gov/outlooks/aeo/assumptions/pdf/elec_cost_perf.pdf