The Economic Cost of a DOE Mandate for the Craig Unit 1 Coal-Burning Generator to Continue Operating

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This report analyzes the cost of a U.S. Department of Energy (DOE) mandate that Unit 1 at the Craig coal-burning power plant in Colorado remain available and operate beyond its December 31, 2025, retirement date.

Our analysis predicts that a DOE order that requires Craig Unit 1 to remain available and operate for 90 days would cost at least $20 Million. That equates to approximately $85 Million per year. If DOE's order effectively requires Unit 1 to operate in must-run status, these costs would likely increase to around $150 Million per year. The costs, and similar costs associated with renewals each 90 days, would likely be passed on to ratepayers.

Our analysis also indicates that Craig Unit 1 is usually an uneconomic source of electricity. Specifically, the cost of generating electricity from Craig Unit 1 is higher than nearby power prices more than 90% of the time. Key reasons that Craig Unit 1 is uneconomic are its high fuel cost and low efficiency.

1 Introduction to Craig Unit 1.

Craig Unit 1 generates electricity by burning coal. It has a nameplate generating capacity of 446.4 megawatts (MW). Unit 1 entered service in 1980. At 45 years old, the unit is beyond the typical economic design life of a coal-burning generator (30–40 years) and near the end of the generator's typical operational life (40–50 years).[1] Craig Unit 1 is scheduled to retire on December 31, 2025.

Craig Power Plant in Colorado

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2 The Costs to Comply with a DOE Mandate Are Substantial.

We calculate a likely cost of at least $20 Million for Craig Unit 1 to comply with a DOE order to remain available and operate over 90 days. Our calculation is based on the following two categories of costs:

- **Fuel Costs:** These are the costs to purchase and transport coal to Unit 1. These are variable costs, because they vary depending on how much power is generated by Unit 1.
- **Other Operations and Maintenance (O&M) Costs:** These are the non-fuel costs associated with Craig Unit 1 being available to generate power and actually generating power. These include variable costs associated with producing electricity (such as wear-and-tear and costs for resources like water that are consumed to produce electricity) and fixed costs that are incurred regardless of how much electricity the unit produces (such as regular maintenance and overhead costs).

To estimate the variable costs associated with a DOE mandate, we must assume a level of output from Craig Unit 1. To be conservative, we use Unit 1's average output from 2022 through 2024. If DOE mandates that Unit 1 be placed in a "must-run" status that requires it to operate continuously when it is available, the variable costs would roughly double, as calculated below.

Our cost estimate is primarily based on recent data collected by the Federal Energy Regulatory Commission (FERC).[2] The data show that operating Craig Unit 1 cost over $80 million in 2024 alone. Over the period 2022–2024, operating Craig Unit 1 cost nearly $85 million per year. The FERC data show fuel costs account for roughly two-thirds of this cost (67.4%), while the remainder is comprised of O&M costs, as shown in the table below.

AVERAGE ANNUAL COST OF CRAIG UNIT 1 FROM 2022–2024

	Fuel Cost	$57.1 Million
+	O&M Cost	$27.6 Million
=	Total Cost	$84.7 Million

The $84.7 Million annual cost translates to a 90-day cost of $20.9 Million. This is calculated as $84.7 Million × (90/365) ≈ $20.9 Million.

Craig's fuel costs are high due to its above average cost of fuel and its low efficiency. Data from the DOE Energy Information Administration (EIA) show the plant's fuel cost averaged $3.33/million British thermal units (MMBtu) over the September 2024–August 2025 timeframe,[3] significantly higher than the nationwide average for coal plants of $2.53/MMBtu in 2024.[4] EIA data also show the plant averaged an 11,676 Btu/kilowatt-hour (kWh) heat rate over the last 12 months (which corresponds to an efficiency of around 29% in converting the energy in fuel into electricity), also significantly worse than the national average for coal plants of 10,777 Btu/kWh in 2024 (which corresponds to an efficiency of around 32% in converting the energy in fuel into

electricity).[5] As a result, the Craig plant spent $38.84 on fuel for each megawatt-hour (MWh) produced over the last 12 months.

Our estimate of Craig Unit 1's O&M costs is likely conservative. Our analysis uses recent costs, which are lower than future O&M costs because the plant owners have likely been foregoing maintenance in recent years in anticipation of the unit's retirement in December 2025. The foregone maintenance would have decreased the O&M costs over the last several years.

Foregone maintenance would also mean future expenditures will be even higher than the long-term average to make up for that underinvestment and to repair or replace equipment with deferred maintenance as it fails. Foregone maintenance reduces the economic and reliability value of the unit because it makes the unit more prone to failure, and more likely to need to go on outage to fix broken parts or maintain the unit. Sargent and Lundy developed a dataset for DOE's Energy Information Administration in 2019 that estimates coal plants' need for sustaining capital expenditures and increasing O&M costs over time.[6] The Sargent and Lundy report documents a significant increase in capital expenditure as coal plants reach an age of 40–50 years, and even higher O&M and capital expenditure costs at plants like Craig that operate at a low capacity factor.

3 Craig Unit 1 Is Usually an Uneconomic Source of Electricity.

To determine the exact extent to which Craig Unit 1 is an uneconomic source of electricity, the best source would be the dispatch methodologies and parameters used by the operators of Craig Unit 1. However, much of this type of information is kept confidential.

To gauge Craig Unit 1's uneconomic nature, we evaluated market prices at the closest market location to Craig. This location, the Rangely pricing node, is part of the Western Energy Imbalance Market. It is less than 100 miles from Craig. While Craig itself does not operate in a regional electricity market, these nearby prices are a strong indicator of the marginal cost and thus marginal value of producing electricity.

A. Market Prices Are Usually Inadequate to Cover Craig Unit 1's Fuel Costs.

Prices at Rangely averaged $22.71 per MWh for all 5-minute intervals over the period September 2024–August 2025. That is significantly lower than Craig's fuel cost of $38.84 per MWh. This means that, on average, the marginal value of power from Craig Unit 1 is $16.13 per MWh *lower* than just the cost of supplying fuel to Craig Unit 1 to produce that power. The calculation is shown below.

AVERAGE MARKET PRICES AND CRAIG UNIT 1'S FUEL COSTS

	Average Market Price	$22.71 per MWh
–	Fuel Cost	$38.84 per MWh
=	**Marginal Value or Loss**	**-$16.13 per MWh**

We did not simply look at the average Rangely price. Prices at Rangely are constantly fluctuating, so we also examined the extent to which the prices were below the Craig Unit 1 fuel cost during each 5-minute interval from September 2024–August 2025. Our analysis demonstrates that prices were inadequate to cover Craig Unit 1's fuel cost alone in 84.2% of the intervals. This is depicted by the intersection of the curved line and the "Fuel" horizontal line in Figure 1 below. The curved line in the figure shows prices in all 105,120 5-minute intervals in a year, sorted from lowest to highest.[a]

B. Craig Unit 1 Is Even More Uneconomic When Considering Its Fuel Costs Along with Other Variable Costs.

Adding Craig Unit 1's other costs shows that the unit is even more uneconomic compared to the market price.

To derive Craig Unit 1's other variable costs, we need to make an assumption regarding the share of the total Operations and Maintenance costs reported to FERC that are variable costs versus the share that are fixed costs. As further discussed in the Methodological Appendix, we use data from DOE's National Energy Technology Laboratory and Wall Street investment firm Lazard. We estimate that Craig Unit 1's O&M costs are 61.125% fixed and 38.875% variable.

Our analysis indicates that Craig Unit 1's non-fuel variable costs are $5.38 per MWh. Adding that figure to Craig Unit 1's fuel cost, we derive an estimated variable cost of $44.22 per MWh. ($5.38 + $38.84 = $44.22.) This means that, compared to the Rangely market price indication of marginal value, Craig Unit 1's marginal value is even lower than when solely looking at fuel costs, as shown in the calculation below.

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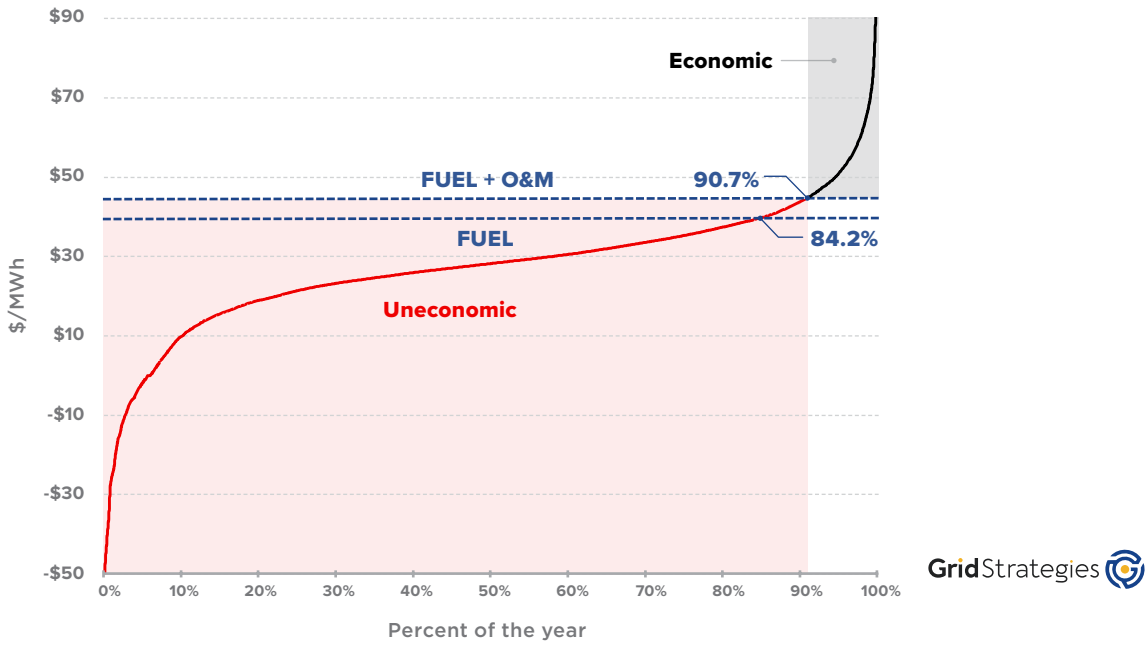
a To make the chart more readable, the y-axis is truncated so 0.4% of time periods are not shown. Those outlier pricing intervals were below negative $50/MWh or above $100/MWh.

AVERAGE MARKET PRICES AND CRAIG UNIT 1'S VARIABLE COSTS

	Average Market Price	$22.71 per MWh
–	Fuel Cost	$38.84 per MWh
–	Non-Fuel Variable Cost	$5.38 per MWh
=	**Marginal Value or Loss**	**-$21.51 per MWh**

When considering the total variable cost of $44.22/MWh against the fluctuating prices at Rangely from September 2024–August 2025, we see that prices were inadequate to cover Craig Unit 1's variable costs in 90.7% of hours. In the chart below, this is depicted by the intersection of the "Fuel + O&M" horizontal line with the curved line showing market prices.

FIGURE 1. Craig Unit 1 is Almost Always Uneconomic Relative to Regional Power Prices



As noted above, electricity prices at a nearby market node are a good indicator of the marginal value of electricity from Craig. These prices indicate that Craig 1's cost of producing electricity is almost always higher than the value of that electricity, and thus it would not be economic for Craig 1 to generate electricity during those hours. Even these estimates of Craig Unit 1's poor competitiveness are conservative. To begin producing electricity, coal units typically take a day or more and incur tens of thousands of dollars in fuel and maintenance costs. Of the few price intervals in which the market price exceeded Craig Unit 1's variable cost, many lasted only a few hours or less, too short for a coal plant to profitably start up and then shut down. (New and more flexible resources like batteries could profitably generate during those periods, however.)

The preceding costs would also increase dramatically if DOE were to mandate that Craig Unit 1 run continuously when it is available. Craig 1 operated at a 41.5% capacity factor (actual generation divided by theoretical maximum generation if the plant constantly ran at full output)

over the last 12 months.[7] This is below the national average capacity factor for coal plants of 46.86% over that time period,[8] reflecting Craig 1's inability to economically compete with other generation sources. If Craig 1's capacity factor doubled due to a DOE must-run mandate, its fuel costs would similarly increase, likely going from the $57.1 Million average over the last three years to more than $100 Million per year. The variable O&M costs of around $8.7 Million would also roughly double, bringing total annual costs from around $85 Million to around $150 Million ($84.7M+$57.1M+$8.7M=$150.5M).

More fundamentally, a federal mandate overriding the economic decision to retire Craig Unit 1 made by all five co-owners of the unit, and endorsed by their state utility regulators or other governance bodies, is inherently likely to increase ratepayer costs. Those utilities and their regulators are best equipped to determine the optimal mix of generation resources to serve ratepayers, and they have the best information about the cost of operating Craig 1 going forward, including detailed non-public information regarding its condition and future maintenance and investment needs.

Conclusion

This report demonstrates that a federal mandate forcing the uneconomic Craig 1 coal unit to continue operating would impose large costs. The costs are likely to exceed $20 Million for each 90-day period of such mandates, or approximately $85 Million annually. And there is good reason to believe this is a conservative estimate, including because of the use of recent data that likely underestimates the going-forward cost of operating Craig Unit 1. The owners and operators of Craig Unit 1 decided to retire Craig Unit 1 due to its uneconomic nature.

The large costs to comply with a DOE mandate are likely to be passed on to ratepayers. The costs can be avoided by the unit retiring on schedule, according to the plan developed by the unit's owners and operators and approved by state regulators.

Methodological Appendix

Data from DOE EIA Form 923 Page 5 show Craig's quantity and price of coal expenditures per month, which indicate the plant's fuel cost averaged $3.33/million British thermal units (MMBtu) over the September 2024–August 2025 timeframe. Craig's fuel consumption and electricity generation data from Form 923 Page 1 were used to calculate the average heat rate over that time period of 11,676 Btu/kWh, which was multiplied by the average fuel cost to find the $38.84/MWh fuel cost.

FERC Form 1 total fuel cost and total O&M cost for Craig Units 1 and 2 are available for 2022–2024 for co-owners PacifiCorp, Public Service Company of Colorado, and Tri-State. Because those three utilities respectively own 19%, 9.7%, and 24% of Craig Units 1 and 2, the sum of average annual costs for those three utilities were weighted by their annual generation reported on Form 1 and then scaled up to cover the remaining plant owners. Costs were then assumed to be evenly split between Craig 1 and 2.

FERC Form 1 group cost data for Craig Units 1 and 2 together, while EIA Form 923 reports heat rates and fuel prices for the entire three-unit plant, not at the unit level. We assumed the non-fuel operations and maintenance costs reported on Form 1 were incurred evenly between Craig 1 and 2.

Because Form 1 does not break down total O&M costs into fixed and variable costs, we reviewed analyses from DOE's National Energy Technology Laboratory (NETL) and Wall Street investment firm Lazard.[9] Lazard reports variable O&M costs of $3.20–$7.20/MWh and fixed O&M costs of $21.70–$33.80/kW-year for existing coal generators, while NETL's 2015 report shows variable costs of $8.47/MWh and fixed costs of $73.62/kW-year. Averaging the NETL costs and the low and high estimates from Lazard indicates O&M costs are 61.125% fixed and 38.875% variable, which we used for our central cost estimate.

Our analysis also explored a low estimate in which fixed and variable O&M costs are evenly split 50/50, and an alternative case in which costs are 70% fixed and 30% variable. The results for these scenarios are presented in Table 2 below, and show the plant is only economic about 8–10% of the time. **In our central cost estimate, Craig Unit 1 is uneconomic 90.7% of the time.** The right-most column shows results for the case presented at the beginning of the report, in which all O&M costs are assumed to be fixed and only the $33.84/MWh fuel costs are factored into variable costs.

RATEPAYER NET COSTS OF CRAIG 1 UNDER DIFFERENT ASSUMPTIONS FOR FIXED VS. VARIABLE O&M COSTS

Fixed vs variable split	50/50	**61.125/38.875**	70/30	100/0
Profitable hours	8.0%	**9.3%**	10.4%	15.8%
Annual fixed O&M cost	$13.2 M	**$16.2 M**	$18.5 M	$26.4 M

To calculate Craig Unit 1's 45.1% capacity factor over the last 12 months, Unit 1's gross hourly generation data was downloaded from EPA. EPA reports that Craig 1 averaged 209 MW of gross generation, before accounting for parasitic losses and other plant consumption that reduce net generation provided to the power grid. EIA reports net generation by plant, but does not report unit-specific net generation. EIA net generation from all three Craig units over the last year is 88.7% of the EPA gross generation for all three units. To estimate net generation from Craig 1, the EPA gross generation was multiplied by 0.887, yielding average net generation of 185.43 MW, which corresponds to a 45.1% capacity factor for the 446.4 MW unit.

Endnotes

1 Bill Powers Declaration, DOE Order No. 202-25-3, at 15 (June 15, 2025), available at PDF page 37 at https://www.energy.gov/documents/202-25-9-motion-intervene-and-request-rehearing-and-stay-pio-exhibits-1-20.

2 2022-2024 FERC Form 1 filings from Public Service Company of Colorado, https://investors.xcelenergy.com/financials/ferc-form-1-filings/default.aspx; PacifiCorp, https://apps.puc.state.or.us/edockets/docket.asp?DocketID=17653; and Tri-State, https://elibrary.ferc.gov/eLibrary/filelist?accession_number=20250418-8013, https://elibrary.ferc.gov/eLibrary/filelist?accession_number=20240416-8049, and https://elibrary.ferc.gov/eLibrary/filelist?accession_number=20230417-8071.

3 EIA, *Form EIA-923 detailed data with previous form data*, Page 5, data for August 2025 year to date (released October 2025) and 2024 (released September 2025), available at https://www.eia.gov/electricity/data/eia923/.

4 M. Snook, US EIA says coal generation share to shrink to an all-time low in 2024, (August 2024) available at https://www.spglobal.com/energy/en/news-research/latest-news/coal/080624-us-eia-says-coal-generation-share-to-shrink-to-an-all-time-low-in-2024.

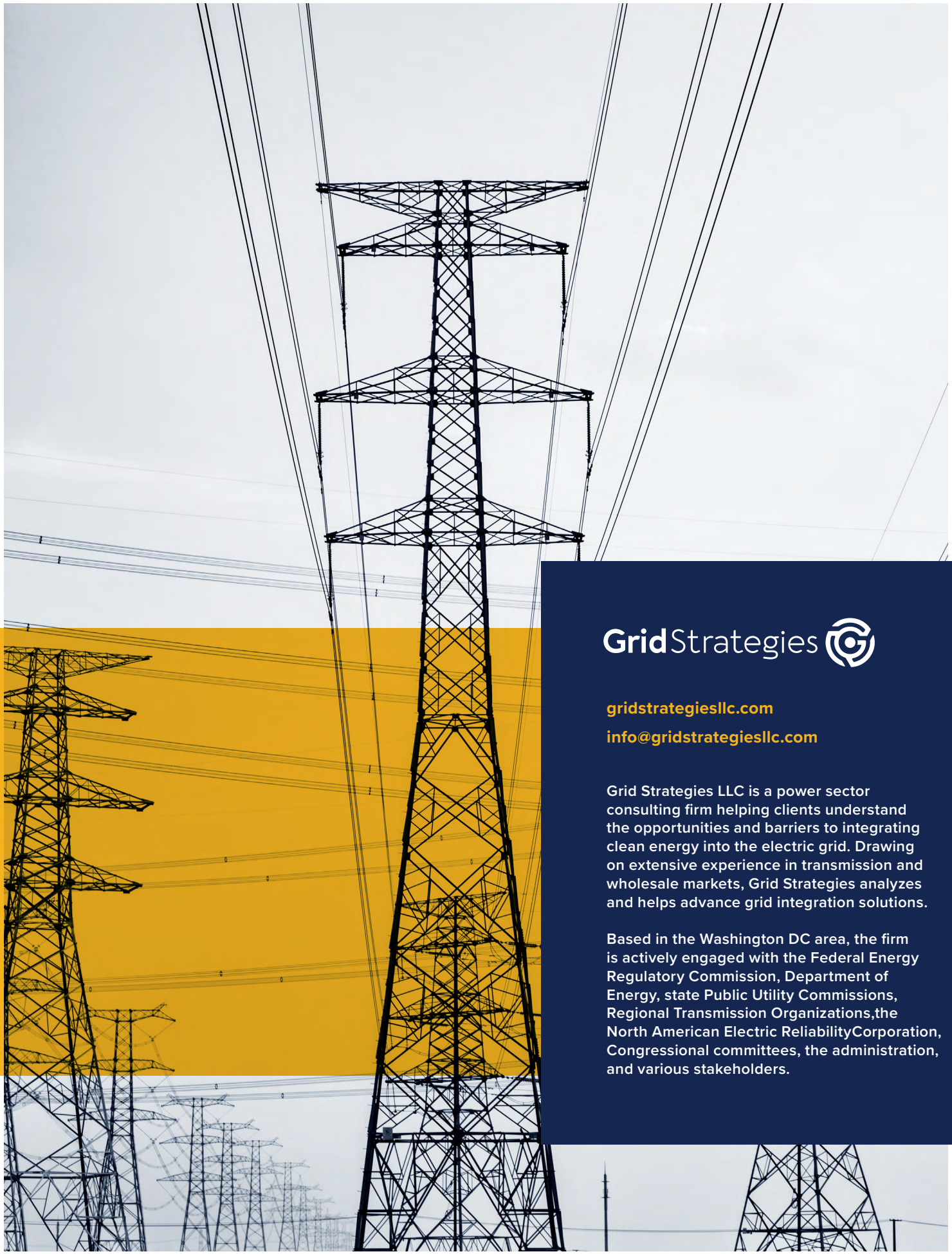
5 EIA, *Table 8.1. Average Operating Heat Rate for Selected Energy Sources, 2014 through 2024 (Btu per Kilowatthour)*, available at https://www.eia.gov/electricity/annual/html/epa_08_01.html.

6 EIA, *Generating Unit Annual Capital and Life Extension Costs Analysis* at pages 29, 62 (December 2019) available at https://www.eia.gov/analysis/studies/powerplants/generationcost/pdf/full_report.pdf.

7 Unit-specific gross generation data for Craig downloaded from EPA, *Clean Air Markets Program Data*, https://campd.epa.gov/data/custom-data-download. See Methodological Appendix for more detail on the capacity factor calculation.

8 EIA, *Electric Power Monthly: Table 6.07.A. Capacity Factors for Utility Scale Generators Primarily Using Fossil Fuels*, https://www.eia.gov/electricity/monthly/epm_table_grapher.php?t=epmt_6_07_a.

9 E. Grol et al., *Impact of Load Following on the Economics of Existing Coal-Fired Power Plant Operations*, (June 2015) available at https://www.osti.gov/servlets/purl/1513827, at 14; Lazard, LCOE+, (June 2025) available at https://www.lazard.com/media/5tlbhyla/lazards-lcoeplus-june-2025-_vf.pdf, at 38.



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