STATE OF IOWA

BEFORE THE IOWA UTILITIES BOARD

IN RE:	)	DOCKET NO. RPU-2022-0001
MIDAMERICAN ENERGY COMPANY	)	

PUBLIC VERSION

SUPPLEMENTAL DIRECT AND REBUTTAL TESTIMONY OF DEVI GLICK

ON BEHALF OF ENVIRONMENTAL INTERVENORS

November 21, 2022

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1. INTRODUCTION AND PURPOSE OF TESTIMONY

Q Please state your name and occupation.

A My name is Devi Glick. I am a Senior Principal at Synapse Energy Economics, Inc. ("Synapse"). My business address is 485 Massachusetts Avenue, Suite 3, Cambridge, Massachusetts 02139.

Q On whose behalf are you testifying in this case?

A I am testifying on behalf of the Environmental Intervenors.

Q Are you the same Devi Glick that filed direct testimony in this docket?

A Yes.

Q What is the purpose of your supplemental direct and rebuttal testimony?

A In this supplemental direct and rebuttal testimony, I respond to MidAmerican Energy Company's (MidAmerican) claims about the need to move forward with Wind PRIME as originally proposed, taking into account updates to the United States tax code under the Inflation Reduction Act (IRA) of 2022. I review the reasonableness and sufficiency of MidAmerican's IRA updates to its Wind PRIME application. I reiterate the importance of requiring MidAmerican to evaluate the economics of its coal plants inclusive of the avoidable costs to MidAmerican's ratepayers if the Company were to retire the aging units and replace them with alternatives. I present new modeling analysis completed by Energy Futures Group in collaboration with Synapse that compares MidAmerican's current proposed course of action to an alternative reasonable set of resource additions. I explain how our analysis supports approval of part of Wind PRIME – specifically 50 MW of solar and roughly one third of the

proposed wind. Finally, I review the flaws in MidAmerican's original application and updated proposal and the Company's defense of the sufficiency of its analysis to support moving forward with the full Wind PRIME project.

Q How is your testimony structured?

A In Section 2, I summarize my findings and recommendations for the Iowa Utilities Board ("Board").

In Section 3, I discuss how MidAmerican has repeated the errors I identified in my direct testimony and has still failed to justify its Wind PRIME portfolio in its updated application. I explain that the Company should have used capacity expansion modeling to evaluate alternative supply options to demonstrate the reasonableness of the Wind PRIME portfolio. I also explain the updated pricing assumptions MidAmerican should have used in its analysis given the passage of the IRA.

In Section 4, I discuss how MidAmerican's failure to evaluate a reasonable alternative resource portfolio for Wind PRIME results in the Company's continued reliance on its aging and expensive coal fleet, resulting in higher customer costs. I outline the avoidable costs incurred by this continued reliance on uneconomic coal plants. I summarize the results of MidAmerican's two most recent studies on the economics of its coal plants. I explain how the depreciation schedules of the coal plants are tied to the revenue sharing mechanism and the taxes and revenue from Wind PRIME. I also address why it is important for MidAmerican to address optimal coal retirement decisions when making decisions regarding new resource additions. Finally, I discuss how the Company could better use the revenue sharing mechanism to pay for sunk coal plant costs and how MidAmerican should link coal plant depreciation schedules to retirement and removal from rate base.

In Section 5, I discuss new modeling by Energy Futures Group done in collaboration with Synapse that presents a quantitative approach to assessing the Company's application and evaluates whether MidAmerican's Wind PRIME proposal is a reasonable set of resource additions for ratepayers, inclusive of IRA provisions. This modeling demonstrates that only parts of Wind PRIME should be approved, and that alternative resource decisions—namely, increased supply diversity through additions of battery storage and solar and retirements of coal units—would provide a lower-cost portfolio for customers.

In Section 6, I discuss how some of MidAmerican's claims in rebuttal testimony around the benefits of the Wind PRIME portfolio, both originally and after the passage of the IRA, are misleading and unsupported.

Q What documents do you rely upon for your analysis, findings, and observations?

A My analysis relies primarily upon the rebuttal testimony, workpapers, exhibits, and new discovery responses of MidAmerican's witnesses. I also rely on public information from other Board proceedings and other publicly available documents.

2. FINDINGS AND RECOMMENDATIONS

Q Please summarize your findings.

A My primary findings are:

1. MidAmerican failed to justify moving forward with Wind PRIME by demonstrating, in both its original and updated application, that its proposal to add 2,042 megawatts (MW) of new wind generation and 50 MW of new solar photovoltaics (PV) is reasonable when compared with other feasible supply options.

2. MidAmerican failed to quantitatively assess how the change in comparative economics of clean energy resources resulting from passage of the IRA impacts what mix of resource additions are in customers' best interests. Instead, MidAmerican kept the Wind PRIME resource portfolio unchanged and updated only its calculations of the impact of the IRA on Wind PRIME's net revenues.

3. MidAmerican's Wind PRIME portfolio was not developed using the kind of analysis needed to demonstrate that the portfolio represents a reasonable set of resource additions to serve MidAmerican's Iowa ratepayers. A quantitative alternatives analysis is needed to evaluate the resources proposed in Wind PRIME in the context of the utility's existing resource mix - inclusive of all operations and maintenance (O&M) and sustaining capital expenditure (capex) costs required to maintain its existing resources (especially avoidable capex and O&M costs at its aging legacy fossil units) - and to demonstrate that the project is reasonable compared to alternative supply option.

4. MidAmerican asserts that Wind PRIME can be constructed at no net-cost to customers. But that claim is based on MidAmerican inappropriately crediting the project with "net system benefits," which represents [redacted] of the total value MidAmerican attributes to the project (tax credits and capacity sales account for the remainder). Net system benefits are tied mainly to lower market prices expected with Wind PRIME, but the Company itself has admitted that the projects in Wind PRIME will likely be built regardless of whether MidAmerican or another party builds them. Therefore, the lower market prices and resulting net benefits will be realized regardless.

5. MidAmerican cites customers' desire for affordable and reliable carbon free electricity to support the Wind PRIME project. But by assessing the project's value based on energy generation and production tax credit revenues, MidAmerican is not positioning the utility to create a reliable, carbon-free electricity system. The Company is creating a wind-heavy energy system that is dependent on coal for meeting capacity needs, rather than integrating more solar and battery storage resources that exhibit complementary output patterns.

6. Energy Futures Group's modeling shows that a balanced portfolio that adds new solar, wind, and battery storage resources, and retires MidAmerican's existing coal plants by 2035, costs over $120 million less and provides more round-the-clock clean energy than the Company's Wind PRIME portfolio. This lower cost portfolio would substantially improve the utility's ability to phase out its carbon-intensive resources, thus avoiding substantial operations and maintenance (O&M) and capital expenditures (capex) costs. It will also allow MidAmerican to meet customer expectations for truly carbon-free electricity.

7. MidAmerican has not evaluated the substantial capex and O&M - $[redacted] (if MidAmerican's estimates are accurate) and $2.99 billion (if the costs instead are more in line with standard industry estimates) – it can avoid at its aging and uneconomic coal plants by responsibly planning for their phased retirement. By failing to evaluate the economics of its existing coal plants, and continuing to operate the units, the sustaining capital costs incurred at each add significantly to the undepreciated balance of each plant over time.

8. The undepreciated balances of MidAmerican's coal plants are currently paid off through a revenue sharing mechanism that is not structured to allow the oldest and least economic plants to have their undepreciated balances paid off first. In the eyes of a utility, an undepreciated plant balance may present a barrier to retirement.

9. MidAmerican's load and resource data shows that Company can retire one uneconomic coal plant immediately and will not need to procure replacement capacity until [redacted] at the earliest, and more likely [redacted].

Q Please summarize your recommendations.

A Based on my findings, I offer the following recommendations:

1. The Board should not make a finding that the Wind PRIME portfolio in its entirety is reasonable compared to feasible alternatives based on the modeling and analysis the Company has currently provided.

2. Based on the results of our modeling, we recommend that the Board issue an order modifying the Wind PRIME application to approve only the 50 MW of solar and roughly one third of the wind and instructing MidAmerican to conduct an RFP for the 500 MW of battery storage the Company will need in 2025.

3. Based on the results of our modeling, we recommend that the Board find that Neal 3 is uneconomic and should be immediately retired.

4. The Board should also order MidAmerican to undertake an economic analysis of all its remaining coal units to ensure MidAmerican is not recovering costs from customers that are not reasonable and in ratepayer's best interest. It should do this regardless of whether it approves Wind PRIME. This modeling should be conducted using capacity expansion modeling and should assess whether the Company's coal units should be retired and replaced with additional solar, storage, efficiency, and demand response. It should be carried out with Board oversight and stakeholder participation in a contested case proceeding, and it should be informed by a robust all-source RFP process.

5. The Board should direct MidAmerican to modify the revenue sharing ratemaking principle to consider not just financing but also resource economics and avoided costs in determining the order to pays off its undepreciated plant balances. This will enable MidAmerican to fully depreciate and retire its most uneconomic plants and avoid unnecessary O&M and capex costs at those plants. Based on my analysis, I recommend re-ordering the coal plants in the following order in the depreciation schedule: (1) Neal 3, (2) Louisa, (3) Ottumwa, (4) Neal 4, (5) WSEC 3.

    i. As a first step, we propose that MidAmerican identify retirement dates and modify the revenue sharing principles for two units – Louisa and Neal 3 - to link complete depreciation of its coal units to retirement and removal from rate base. These units appear to be the best candidates for near-term retirement based on the results of the Energy Futures Group modeling.

3. MIDAMERICAN HAS FAILED TO JUSTIFY THE WIND PRIME PORTFOLIO USING APPROPRIATE QUANTITATIVE ANALYSIS IN BOTH ITS ORIGINAL APPLICATION AND IN ITS UPDATED APPLICATION.

Q Does MidAmerican's updated application address the major concerns you outlined in your direct testimony, mainly that the Wind PRIME proposal is designed to maximize energy market revenue and tax credits, rather than to demonstrate that the resources proposed are reasonable compared to feasible supply alternatives?

A No. The Wind PRIME project is still designed to maximize market energy revenue and production tax credits (PTC). As discussed further below, MidAmerican has not conducted the type of quantitative resource analysis in either its original or updated application that is generally expected of a rate-regulated public utility to demonstrate that the resources in Wind PRIME are reasonable relative to other supply options. MidAmerican's approach with Wind PRIME might be reasonable for a merchant utility, but it is not a reasonable approach for a rate-regulated utility with captive ratepayers.

Q What is MidAmerican proposing in its updated application?

A MidAmerican is proposing the same portfolio of resources in Wind PRIME as it did in its original application. Only the timing of resource additions has changed from its original application, along with the Company's calculation of the tax credits. Initially, the Company proposed building [redacted] of wind and 50 MW of solar PV in 2023, with an additional [redacted] wind in 2024.[1] Now, the Company proposes building [redacted] of wind in 2023 and [redacted] of wind

[1] Confidential Direct Testimony of MidAmerican Witness Jablonski, Pg. 27.

and 50 MW of solar PV in 2024. This change in timing was spurred by changes in site availability, development delays, and price increases for solar materials.[2]

Q Why has MidAmerican updated its application?

A MidAmerican Witness Specketer presented financial analysis that the Company updated to capture the increase in PTC revenue the Company would earn on the Wind PRIME project following passage of the IRA of 2022. Witness Specketer confirms that "all other model inputs and assumption for Wind PRIME are the same as reflected in [his] direct testimony."[3] This means that MidAmerican did not update its core modeling or analysis to re-consider its proposed resource mix with the substantial changes brought by the IRA.

Q How does the IRA affect the Wind PRIME proposal?

A The IRA increases the value of clean energy tax credits, extends the expiration date of those credits, and increases the types of clean energy projects that can qualify for those credits. These credits are available not just to the resources in Wind PRIME, but also to alternatives such as specifically battery storage and additional solar PV.

As seen in Table 1, the ITC and PTC values have increased for projects placed into service in the next few years. Beyond what is depicted in Table 1, additional ITC and PTC tiers have been added that entitle projects to an additional 10 percent tax credit adder if they meet domestic content criteria and another 10 percent adder if they are located in an energy community. The maximum ITC and PTC credits available, therefore, are 50 percent—notably larger than when the Wind PRIME portfolio was developed.

[2] Confidential Rebuttal Testimony of MidAmerican Witness Jablonski, Pg. 11-12.

[3] Rebuttal Testimony of MidAmerican witness Specketer, Pg. 11.

Table 1. Clean energy tax credits before and after the IRA[4]

	Tax credit	Quantity	Eligible energy types	Tax credit level for projects that began construction in:		
				2022	2023	2024
Pre-IRA	**PTC**	2.5 cents/kWh, adjusted for inflation	Wind	0%	0%	0%
	ITC	Percentage of total investment	Wind	26%	22%	10%
			Solar	26%	22%	10%
Post-IRA	**PTC**	2.5 cents/kWh, adjusted for inflation	Solar, Wind, Storage	100%	100%	100%
	ITC	Percentage of total investment	Solar, Wind, Storage	30%†	30%	30%

Note: wind projects that began construction in 2021, prior to the IRA, were eligible for a 60 percent PTC. At the time, solar projects beginning construction in 2021 were eligible for a 26 percent ITC.
† The 30% tax credit level assumes that prevailing wage and apprenticeship requirements are met.

Further, when MidAmerican filed its original Wind PRIME proposal, the PTC was unavailable for projects beginning construction after December 31, 2021, and the ITC was in the process of phasing out. MidAmerican noted that the phase out of the tax credits made the Wind PRIME project urgent.[5] Now that the ITC and PTC have been extended, there is no longer a pressing need to start projects as soon as possible or risk losing tax credit revenues.

Q What other IRA provisions could impact the Wind PRIME portfolio?

A The IRA offers additional tax credits for solar, wind, or battery storage projects located in energy communities. Any census tract where a coal mine or coal-fired

[4] Congressional Research Service, The Energy Credit or Energy Investment Tax Credit. (2021). Available at https://crsreports.congress.gov/product/pdf/IF/IF10479; Congressional Research Service, Energy Tax Provisions: Overview and Budgetary Cost. (2021). Available at https://crsreports.congress.gov/product/pdf/R/R46865; Inflation Reduction Act of 2022, 117th congress. Available at https://www.democrats.senate.gov/imo/media/doc/inflation_reduction_act_of_2022.pdf.

[5] Direct Testimony of MidAmerican Witness Fehr, Pgs. 6-7.

power plant has closed since 2009 is defined as an energy community (as well as the census tracts directly adjacent).

Q What are the main implications of the IRA changes?

A The IRA benefits wind by extending the existing ITC and PTC tax credits. But it is even more impactful and transformative for solar PV, which now qualifies for both the ITC and PTC, and for battery storage, which is now eligible for the ITC. At the time of MidAmerican's initial filing, solar PV could not access the PTC and battery storage was not eligible for the ITC.[6] As I discuss below, given this change, it is concerning that the Company did not evaluate whether it should not include more solar and any battery storage in the Wind PRIME portfolio.

Q Explain the analysis and updates that you believe MidAmerican should include in an updated application.

A MidAmerican never conducted any quantitative resource capacity expansion modeling analysis to evaluate whether the resources in Wind PRIME were reasonable relative to alternative sources of supply. So, we are not asking MidAmerican to re-do its resource selection analysis; we are asking the Company to do the analysis it never did to support its original application. As my previous testimony advised prior to the bill's passage, the IRA's implications for energy planning are significant. Now that the landmark bill has become law, new and extended tax credits for wind, solar, and battery storage make it even more important that the Company provides updated analysis.

In doing this analysis, the Company should update its resource cost assumptions and evaluate whether, with the updated cost assumptions, the resources included

[6] H.R. 5376 – 117th Congress (2021-2022): Inflation Reduction Act of 2022. Available at https://www.democrats.senate.gov/imo/media/doc/inflation_reduction_act_of_2022.pdf.

in its proposed Wind PRIME portfolio are reasonable when compared with alternatives. This includes examining whether it would be in ratepayers' interest to add more solar PV and battery storage resources to its system, rather than more wind. In conducting the analysis, MidAmerican should examine not only the base-level PTC and ITC assumptions, but also the 10 percent PTC adder available for clean energy projects located in energy communities. [redacted].[7]

As part of this analysis, the Company should update its market prices for the eastern interconnect to reflect the downward pressure that the IRA will have on the MISO energy market prices. Specifically, as the IRA lowers the cost to build zero marginal cost renewables, more clean energy resources will be deployed on the grid. As MidAmerican itself has shown with the impact of Wind PRIME on market prices, the introduction of more renewables on the grid is likely to lower market prices over the long term. This will benefit customers through lower electricity prices but will also reduce the revenue that MidAmerican's existing assets – including both coal and existing wind – can be expected to generate. The Company acknowledged it did not update its market prices.[8] These updated market price forecasts are needed to evaluate the net revenues the proposed projects would generate with greater accuracy.

Q Have other utilities updated or conducted resource planning to address the IRA?

A Yes. For example, in Michigan, DTE recently filed an Integrated Resource Plan that incorporated the benefits of the IRA. That plan included 4,400 MW of solar,

[7] Glick Direct Exhibit 32, Confidential MidAmerican Response to EI DR 166 (c).

[8] Glick Direct Exhibit 32, Confidential MidAmerican Response to EI DR 152 (a).

1,000 MW of wind and 760 MW of battery storage in the next decade. In addition, the plan moved the retirement of four coal units from 2040 up to 2028 and 2035.[9] This is consistent with the type of results we would expect to see if MidAmerican did actual quantitative analysis to inform its resource additions.

Q Briefly explain the modeling that MidAmerican used to select Wind PRIME in its original application.

A As I discussed in my direct testimony, the qualitative analysis MidAmerican used to support its Wind PRIME application was somewhat arbitrary and subjective and is inconsistent with best practices used throughout the utility industry for selecting resource additions. MidAmerican did not utilize industry best-practices to quantitatively examine its resource additions from a resource adequacy perspective or to justify the decision to invest so heavily in wind over solar PV. Instead, the Company appears to have selected the Wind PRIME resource portfolio outside of any apparent analytical process, selecting a portfolio that favored wind over solar PV because wind resources deliver higher PTC revenues. The Company then applied Company Witness Hammer applied a "nine-factor analysis" framework (created by the Company) after the fact to justify the decision. But a regulated public utility should not be approaching new resource addition decisions solely from the perspective of maximizing tax or energy revenues. A utility acting the best interest of its ratepayers should consider other resource attributes and values in making addition decisions; this is what capacity expansion modeling is designed to do.

Company Witness Specketer presented several pieces of financial analysis that supposedly demonstrated the value of Wind PRIME. These analyses covered

[9] Ethan Howland, "DTE Electric proposes $9B spend on 5.4 GW renewables, 760 MW storage, coal-to-gas power plant switch." Utility Dive, November 4, 2022. Available at utilitydive.com/news/dte-energy-resource-plan-irp-solar-coal-michigan-psc/635781/.

MidAmerican's projections of Wind PRIME's project economics, net system benefits, revenue requirements, and impact on revenue sharing. But the Company did not present any analyses preceding the development of the Wind PRIME portfolio to demonstrate that it compared its proposal to other reasonable resource additions.

The only analyses MidAmerican provided that predate the Wind PRIME filing were the "Zero Emissions Study," which [redacted] and the Siemens study, [redacted]. I will discuss these studies in more detail in section 4 below.

Q Did MidAmerican address any of these concerns in its updated application?

A No. In the updated application, the company upholds its previous, qualitative nine-factor analysis but still does not demonstrate that the selected amount of new wind and solar PV in the Wind PRIME portfolio represents a cost-effective or reasonable portfolio of resource additions compared to any other available renewable options.[10]

If MidAmerican had used quantitative analysis in its original application to demonstrate the reasonableness of the Wind PRIME portfolio, it could have easily updated its modeling once the IRA passed to evaluate whether the additional tax credits made its original portfolio more or less reasonable and economic compared with alternatives. But the absence of any quantitative resource planning analysis in either its original or updated application means that it is unknowable based on the Company's analysis whether there are alternative resource portfolios that are more economic or reasonable than Wind PRIME, inclusive of the IRA impacts. This is why Synapse, in collaboration with Energy Futures Group,

[10] Rebuttal Testimony of MidAmerican Witness Hammer, Pg. 2.

conducted our own updated analysis to evaluate whether Wind PRIME is reasonable compared to alternatives, inclusive of IRA impacts. I present the results of this analysis in Section 5 below.

Q The IRA improved the economics of Wind PRIME, so why is it still critical to evaluate the resources in Wind PRIME relative to alternatives?

A With the ITC and PTC increased and extended, Wind PRIME may well still achieve its intended goal—maximizing tax credit revenue—but that does not mean that the IRA renders the Wind PRIME proposal reasonable when compared to other feasible alternative sources of supply. On the flip side of maximizing revenues and tax credits is minimizing total resource portfolio costs to customers, and there is no evidence that this portfolio does that (or that it even achieves reasonable costs compared to alternatives). As I explained in my initial testimony, approaching resource additions from the perspective of maximizing energy revenues neglects key planning obligations, mainly minimizing costs, minimizing risk, and ensuring long-term resource adequacy. And as I will discuss below, coal resource studies performed recently for MidAmerican also indicate the need to incorporate quantitative resource planning into MidAmerican's portfolio development.

Q How does MidAmerican defend the lack of resource planning modeling in its Wind PRIME application?

A Witness Hammer argues that conducting capacity expansion modeling is not required or even useful;[11] I emphatically disagree. Capacity expansion modeling is required to demonstrate that the resource portfolio that MidAmerican is proposing ensures resource adequacy and meets system constraints at reasonable

[11] Rebuttal Testimony of MidAmerican Witness Hammer, pg. 2.

cost when compared with alternative resource options and portfolios. MidAmerican never conducted this analysis in its original application. Nor did it determine how the IRA tax changes would affect the reasonableness of the resources included in Wind PRIME compared to alternatives. In the absence of any updated analysis, the resource mix included in Wind PRIME remains unchanged, as does MidAmerican's plan to maintain its current coal fleet as part of Wind PRIME. The Company's assumption that it will rely on its aging coal plants to support the wind in Wind PRIME is a critical and serious issue that the Company glosses over in its application. I discuss this in detail in the next section.

4. MIDAMERICAN'S ANALYSIS OF THE BENEFITS OF THE WIND PRIME PORTFOLIO RELIES ON MIDAMERICAN'S AGING COAL RESOURCES FOR CAPACITY, OVERLOOKING THE SIGNIFICANT COSTS THAT COULD BE AVOIDED BY TRANSITIONING AWAY FROM THOSE RESOURCES AND REPLACING THEM WITH ALTERNATIVES.

Q How are the coal plants relevant to Wind PRIME planning and approval?

A The Company proposes the Wind PRIME portfolio based on maximizing energy revenues and tax credits, and otherwise assumes that it can continue relying heavily on its aging coal plants to meet the capacity needs of its system. Specifically, MidAmerican assumes its coal plants will remain online through their planned retirement dates as part of Wind PRIME. But the Company provides no analysis as part of its application to support the reasonableness of this assumption or to evaluate the costs of maintaining its aging coal plants relative to alternative supply options. The Company did, however, provide two studies from 2019 and 2020 that evaluated retirement and replacement of its coal plants with alternatives. I will summarize the findings from these studies below.

Second, the tax credits and energy revenues from Wind PRIME will increase the revenue sharing available to MidAmerican. Revenue sharing is one tool that MidAmerican uses to pay down the undepreciated balance of its coal generation assets. But the order in which MidAmerican currently pays down its coal plants' undepreciated balances does not prioritize paying off first the plants that are the costliest to operate and maintain – that is, the plants that have the highest variable operations costs and fixed O&M costs, and require the largest sustaining capital expenditures. And the longer the Company's costly coal plants stay online, the more avoidable O&M and capex costs they will incur.

MidAmerican's analysis in support of the Wind PRIME project neglects a significant category of costs on which the project relies: the substantial avoidable O&M and capex costs necessary to maintaining its coal plants, [redacted]

i. MidAmerican's analysis in support of the Wind PRIME project neglects the substantial avoidable O&M and capex costs necessary to maintain its coal plants, [redacted]

Q How much coal capacity does MidAmerican plan to rely on as part of Wind PRIME?

A As discussed on pages 12–13 of my direct testimony, coal accounts for just under half of MidAmerican's firm capacity. The Company made no changes to the retirement dates of its coal fleet (shown in Table 2 below) as part of its updated application, and still plans to rely on most units through at least [redacted].[12]

[12] *See* Glick Exhibit 4, Confidential Direct Response to Tech Customer 61a, Confidential Attachment "Net System Benefit."

Table 2. Confidential MidAmerican Coal Plant Ages at Retirement

Coal Plant	ICAP (MW)	MidAmerican Share (MW)	Commission Year	Retirement Year	Age at Retirement
Neal 3	[redacted]	[redacted]	1975	[redacted]	[redacted]
Neal 4	[redacted]	[redacted]	1979	[redacted]	[redacted]
Ottumwa	[redacted]	[redacted]	1981	[redacted]	[redacted]
Louisa	[redacted]	[redacted]	1983	[redacted]	[redacted]
Walter Scott 3	[redacted]	[redacted]	1978	[redacted]	[redacted]
Walter Scott 4	[redacted]	[redacted]	2007	[redacted]	[redacted]

Source: Installed capacities and MidAmerican share from Glick Exhibit 23, Confidential MidAmerican Response to EI DR. 31; retirement years from Glick Exhibit 32, Confidential MidAmerican Response to EI DR. 47C.

Q Does MidAmerican need the capacity from all its coal plants to meet load?

A No. MidAmerican's own load and resource data, presented in Table 3 of Company Witness Hammer's direct testimony, shows that MidAmerican has a capacity surplus until at least [redacted]. This means MidAmerican can retire one of its uneconomic coal units without a capacity shortfall until [redacted] at the earliest, and more likely [redacted].

Q Why does MidAmerican's preservation of this retirement schedule in its updated application concern you?

A Generally, coal plants are expensive to operate and are trending toward earlier retirement in the United States while renewable costs are falling. Between 2016 and 2020, around 11 GW of coal retired each year in the United States. Although the levels dropped to 4.6 GW in 2021, an additional 12.7 GW of coal generation

is scheduled to retire in 2022.[13] Looking beyond 2022, S&P Global Market Intelligence reports that 51 GW of coal power is scheduled to retire between 2022 and 2027, with an additional 23 GW of retirements coming in 2028.[14]

Coal plants like MidAmerican's require substantial spending on O&M and sustaining capital costs to continue to operate, which can be costly and tends to increase as plants age. Just the costs to continue to maintain coal plants increasingly exceed the cost of building and operating new clean energy resources such as wind, solar and battery storage. These costs are entirely avoidable if the coal plants retire.

Q Which costs are avoidable, and did MidAmerican include these in its analysis?

A There are two main categories of potentially *avoidable* costs associated with operating MidAmerican's aging coal fleet: fixed O&M and sustaining capital expenditures. As discussed above, MidAmerican has not considered the benefits of a resource portfolio that avoids these forward-going operating costs at its coal plants and therefore did not include any of these avoidable costs in its Wind PRIME analysis.

[13] U.S. Energy Information Administration, *Coal Will Account for 85% of U.S. Electric Generating Capacity Retirements in 2022* (January 11, 2022), available at https://bit.ly/3MPZ4KE.

[14] Darren Sweeney et al., *More than 23 GW of* Coal *Capacity to Retire in 2028 as Plant Closures Accelerate*," S&P Global Market Intelligence (February 2022), available at https://bit.ly/3vzVpKL.

Q How much does MidAmerican project it will cost to maintain its coal fleet on a forward-going basis, and do those cost projections seem reasonable?

A Even though the Company did not consider these costs in its Wind PRIME analysis, it still prepares cost projections for other system planning purposes. And based on these cost projections, the Company appears to be substantially underestimating the magnitude of fixed O&M and sustaining capital costs required to maintain its coal units, relative to industry standards and historical data (which was available only for sustaining capital expenditures).

MidAmerican's expectation of future fixed O&M costs at its coal plants are substantially lower than industry estimates produced by Sargent & Lundy for the U.S. Energy Information Administration (EIA) for units of similar sizes and ages. I present this comparison in Glick Exhibit 33, Appendix A of my testimony, Table A1(average annual spend $/kW) and Table A2 (lifetime NPV). This is concerning because it means that the fixed O&M costs MidAmerican is using for other confidential internal planning purposes—and which it should be using in assessing the value of its Wind PRIME proposal—appear to be systematically understated.

Similarly, it appears that MidAmerican also may be underestimating the required sustaining capital expenditures at five of its six coal units. As shown in Appendix A, Table A3 (average annual spend $/kW) and Table A4 (lifetime NPV), the difference in projected capital costs between the Company's projections and Sargent and Lundy's estimates for life-extending capital investments at coal plants of similar age and size amounts to tens to hundreds of millions of dollars over the lifetime of each plant.

Q What does this work out to on a total cost basis?

A As shown in Table 3, I estimate, based on publicly available industry estimates of the costs to maintain coal units of similar size and age to MidAmerican's, that the Company could spend as much as $1.66 billion on fixed O&M and $1.32 billion on capex costs for a total of $2.99 billion over the remaining life of its coal fleet. And this is not even considering fuel and other variable costs incurred to operate the plans. But MidAmerican projects it will spend only [redacted] in fixed O&M costs and [redacted] on capex for a total of only [redacted]. The Company's projections are [redacted] what I would expect based on industry averages.

Table 3: Confidential Cost comparison of total forward going fixed O&M and capex spending at MidAmerican's coal fleet ($2021 Million)

Coal Plant	Total fixed O&M	Total sustaining capex	Total cost
Sargent and Lundy report based on plant size, age, and flue gas desulfurization status	$1,666	$1,326	$2,992
Average of 2022 to scheduled retirement year	[redacted]	[redacted]	[redacted]

Source: Glick Exhibit 32, Confidential MidAmerican Response to EI DR. 47C; Sargent and Lundy, "Generating Unit Annual Capital and Life Extension Costs Analysis" (2019). Available at https://www.eia.gov/analysis/studies/powerplants/generationcost/pdf/full_report.pdf. Public direct testimony of Paul Chernick, RPU-2018-0003, August 3, 2018. Accessible at https://wcc.efs.iowa.gov/cs/idcplg?IdcService=GET_FILE&dDocName=1776607&allowInterrupt=1&noSaveAs=1&RevisionSelectionMethod=LatestReleasede. Glick Exhibit 34, DG Confidential Workpaper 1.

This difference shows the risk of locking in reliance on coal plants: the potential for substantially higher costs than MidAmerican has estimated. But regardless of whether it is $2.99 billion, [redacted], or somewhere in between, these are costs that MidAmerican is not considering in its evaluation of the Wind PRIME proposal. This is true even though MidAmerican's focus on maximizing energy revenues from its wind buildout creates dependency on the coal plants for meeting capacity needs.

Q Did MidAmerican's updated proposal examine any resource portfolios that quantify the benefits of facilitating the retirement of its most expensive coal plants?

A No. As I have stated, MidAmerican's updated application does not examine whether adding Wind PRIME would enable any early coal retirements despite the potential that they may soon be fully depreciated and the magnitude of the avoidable costs. This is particularly concerning given that even before the IRA passed, MidAmerican's analysis showed that the undepreciated balances at its coal plants [redacted].[15]

Q What do you conclude regarding MidAmerican's lack of planning around a reasonable retirement plan for its coal fleet?

A I do not expect or recommend that MidAmerican retire 100 percent of its coal fleet in short order; the transition will take time. But MidAmerican needs to plan for the transition and to better understand the steps it should take now to facilitate this transition, as other utilities around the country are doing. This should include analyzing, through capacity expansion modeling, which resource additions will position the utility to retire its uneconomic coal plants. MidAmerican's omission of additional analysis of an optimal coal plant retirement schedule deviates from standard regulated utility practice and fails to demonstrate that Wind PRIME is a reasonable portfolio of additions relative to alternatives.

ii. MidAmerican conducted two studies between 2019 and 2021 that evaluated the economics of retiring its coal fleet and replacing the units with alternative

[15] Glick Exhibit 24, MidAmerican Response to EI DR 35, Confidential Attachment.

supply options; the results [redacted] ***the need for MidAmerican to*** [redacted]

Q Has MidAmerican conducted other recent economic analysis of its coal fleet and its fleet's role in the Company's long-term resource plan?

A Yes. MidAmerican conducted two studies recently that evaluated retirement of its existing coal units. The first was a Zero Emissions Study conducted internally by MidAmerican in March 2019.[16] The Zero Emissions Study [redacted] The second was a study conducted by Siemens in February 2020.[17] The Confidential Siemens study [redacted]

Neither study robustly evaluated retirement relative to replacement with alternatives. But the findings and recommendations from the studies do nonetheless support the need for MidAmerican to regularly conduct robust resource replacement analysis.

Q What was the scope of the Zero Emissions Study?

A [redacted]

[16] Confidential Zero Emissions Study (ZES), MidAmerican Energy Company. March 1, 2019 (filed with the Board October 20, 2022).

[17] Coal Plant Economics Assessment, prepared by Siemens for MidAmerican Energy Company (Siemens Study). February 2020 (filed with the Board October 20, 2022).

[redacted]

Q Do you have any concerns with the Zero Emissions Study that the Company should correct in future retirement analyses?

A Yes. [redacted].

[18] Confidential ZES, Pg. 6.

[19] Id. Pg. 7.

[20] Id. Pg. 3.

[21] Id. Pg. 7.

[22] Change in load expense represents the change in cost to serve the Company's load based on the change in market prices with Wind PRIME. This is calculated by summing up the hourly cost to serve MidAmerican load first with market prices that do not include Wind PRIME and then with market prices that include Wind PRIME. The difference in total costs represents the change in load expense.

[redacted]

Q What were the key conclusions of MidAmerican's Zero Emissions Study?

A Despite its flaws, the Zero Emissions Study had several conclusions regarding the timing of coal plant retirements, and the optimal replacement resources:

[redacted] This is significant because this study preceded the development of the Wind PRIME portfolio,[redacted]

[redacted] This

[23] Confidential ZES, Pg. 2.

[24] Id. Pg. 14.

[25] Id.

[26] Id.

is significant in showing the beneficial complementarity output patterns of solar PV and wind, both diurnally and seasonally.

[redacted]

Q What was the scope of the Siemens Study?

A The Siemens study [redacted][28]

Q Do you have any concerns with the Siemens Study that the Company should correct in future retirement analyses?

A Yes. The Siemens study did not include or consider any replacement resources. Instead, [redacted]

[27] Id. Pg. 13. [redacted]

[28] Confidential Siemens Study, Pg. 4.

[redacted][29] Because the analysis considered no replacement resources, it is useful for screening purposes, but not for evaluating alternatives.

Q What were the key conclusions of the Siemens study?

A [redacted]

[29] Id. Pg. 7.

[30] Id. Pg. 10.

[31] Id. Pg. 39.

[32] Id.

[redacted]

Q Did MidAmerican present any evidence that it used the results of the Zero Emissions Study or the Siemens Study as a comparison of a feasible alternative to the Wind PRIME proposal?

A No. These studies are not mentioned anywhere in its application. MidAmerican only acknowledged the existence of the studies and specified what they were after it lost a motion to compel filed by Environmental Intervenors.[33] MidAmerican only provided these studies after Environmental Intervenors filed another motion to compel with the Board.[34]

Q What did these studies reveal about MidAmerican's coal plants?

A Despite their substantial deficiencies, both studies concluded that [redacted] and that the Company should conduct follow-up analysis. Specifically, the internal studies suggest that MidAmerican should: [redacted]

Q What did the studies recommend for next steps?

A Both studies [redacted]. Specifically, the Siemens study concluded that [redacted]

[33] Order Granting in Part and Denying in Part Environmental Intervenors' Motion to Compel (filed July 13, 2022); EI DR 20 Attachment (filed July 21, 2022).

[34] Motion to Compel (filed Sept. 2, 2022).

[redacted]

The Zero Emissions Study noted that a key area for future study would be [redacted] This is consistent with what I recommended in my direct testimony and why Synapse and Energy Futures Group conducted our own analysis that I will discuss in Section 5.

iii. MidAmerican should use revenue sharing to pay off the undepreciated balances of uneconomic coal units first.

Q Please explain this revenue sharing mechanism in more detail.

A The Board approved the revenue sharing mechanism in the 2013 rate proceeding (the mechanisms was then modified by the Rate Mitigation ratemaking principle approved in Wind XII).[37] MidAmerican uses revenue sharing in place of rate cases to pay down the undepreciated balances of its existing generators. Revenue sharing from prior wind projects has already accelerated the depreciation of its coal plants substantially.[38]

[35] Confidential Siemens, Pg. 12.

[36] Confidential ZES, Pg. 15.

[37] Rebuttal Testimony of MidAmerican Witness Specketer, Pg. 19.

[38] Glick Confidential Exhibit 24, MidAmerican Confidential Response to EI DR 35, a, b, c; Glick Confidential Exhibit 32, Confidential Response to EI DR 174.

Q How does the IRA change the Company's revenue sharing projections?

Q As shown in Table 4 below, prior to the passage of the IRA, MidAmerican projected that Wind PRIME would substantially reduce revenue sharing. This would in turn reduce the rate at which MidAmerican could pay down the undepreciated value of its coal plants. This clearly shows that the Company's original intention for the project was to maximize tax credits and energy market revenues for itself, not to deliver increased revenue sharing to ratepayers.

But MidAmerican and its ratepayers fortuitously benefit from passage of the IRA. The Company now expects Wind PRIME will increase revenue sharing by [redacted] on an NPV basis relative to before the IRA.[39]

Table 4: Confidential Wind PRIME revenue sharing pre and post IRA (2022–2030) ($2021 Million)

Revenue sharing	NPV Revenue sharing	NPV Delta from without Wind PRIME
Without Wind PRIME	[redacted]	[redacted]
With Wind PRIME (pre-IRA)	[redacted]	[redacted]
With Wind PRIME (post IRA)	[redacted]	[redacted]

Source: Calculated based on Confidential Table 9, Direct Testimony of Company Witness Specketer; Confidential Table 6, Rebuttal testimony of Company Witness Specketer; Glick Exhibit 35, DG Confidential Workpaper 2.

As shown in Table 5 below, this dramatic change has the potential to accelerate the depreciation rates of MidAmerican's coal plants,[40] potentially hastening the removal of what MidAmerican perceives as a key barrier to their retirement.

[39] Confidential Rebuttal Testimony of MidAmerican Witness Specketer, Pg. 11.

[40] Glick Confidential Exhibit 32, MidAmerican Response to EI DR 174, Confidential Attachment.

Table 5: Confidential Year each coal unit is full depreciated

Unit	Pre-Wind PRIME	With Wind PRIME, post IRA
Walter Scott 4	[redacted]	[redacted]
Ottumwa	[redacted]	[redacted]
Louisa	[redacted]	[redacted]
Neal 4	[redacted]	[redacted]
Neal 3	[redacted]	[redacted]
Walter Scott 3	[redacted]	[redacted]

Source: Glick Exhibit 24, MidAmerican Response to EI 35, Confidential Attachment; MidAmerican Response to EI 174, Confidential Attachment; Glick Direct Exhibit 41, DG Confidential Workpaper 8.

Q Is the existence of undepreciated book value of the coal plants an economic barrier to retirement?

A No. Current undepreciated balances on the coal plants are what are known in economics as "sunk costs"–that is, they are costs that must be paid regardless, and so should not be considered in forward-looking decision-making. Economical retirement choices should reflect only the going-forward costs of operating the coal plants, including fuel, O&M, and any required capital expenditures, compared to alternatives providing an equivalent amount of energy and capacity. Regardless of how MidAmerican pays downs the undepreciated balances, or how fast they pay those down, or through which mechanisms (including the revenue sharing mechanism), MidAmerican's ratepayers will still be better off if uneconomic coal plants are retired as early as indicated based on an appropriate economic-driven capacity expansion analysis (or similar analytical exercise). Such an analytical exercise would account for the value ratepayers receive from MidAmerican investment in less expensive sources of energy and capacity and avoidance of the uneconomic costs of coal plant operation.

While undepreciated balances should not rationally be considered in making retirement decisions, utilities often express concern that the undepreciated balances on retired generators will be considered no longer "used and useful" and

therefore will be disallowed from recovery. Undepreciated balances thus can become a barrier to utilities supporting coal retirement in a regulatory context.

Q Can you explain how the revenue sharing mechanism is currently structured?

A The structure prioritizes the allocation of revenue sharing dollars to each coal plant according to which plant has the highest return on equity (ROE)—in other words, based upon which has the highest interest rate.[41] This allocation methodology does not take into account which plants are the costliest to maintain and therefore have the largest avoidable costs in the form of O&M and sustaining capital costs.

The current prioritization would make sense if the balances on each plant were static, and the operating costs were lower than alternatives, but crucially they are not. As an example, if a trucking company has financed two trucks and the interest rate on one truck is higher, it would appear rational for the company to pay off the truck with the higher rate first. But if the truck with the lower interest rate had significantly worse fuel efficiency and required more frequent and costly regular maintenance and repairs and more cost effectively could be replaced with a newer more efficient model, it would change the overall calculus about which truck to pay down first.

Q What would result in the best outcome for ratepayers?

A The best outcome for ratepayers involves a two-step process, separately addressing sunk costs and going-forward operating costs. MidAmerican should first retire those plants that are uneconomic (based on an analysis of going-

[41] The current order of accelerated depreciation is listed in the Board's Wind XII decision. Docket No. RPU-2018-0003, "Final Order and Decision" (filed Dec. 4, 2018) at 25-26.

forward costs) and replace their energy and capacity with less expensive resources. Next, MidAmerican can reorder the pay-off schedule to pay down undepreciated plant balances based on financing considerations and the funds available from the revenue sharing mechanism.

Q If the IRA increases revenue sharing and enables the project to be built at "no net cost," explain why that isn't sufficient justification for this project.

A Just because Wind PRIME produces large energy market revenues and PTC value does not mean it is a reasonable portfolio. Just as important as revenue maximization is cost minimization (or, at least, demonstrating that the costs are reasonably lower than other feasible alternatives). By committing $4 billion[42] to the Wind PRIME project, MidAmerican may be making it more challenging to commit shareholder and ratepayer dollars to a different set of resource additions that would (1) achieve greater cost savings to customers and (2) better position the utility to advance towards the goal it says customers are demanding: true carbon-free electricity.

The Company incurs high costs to maintain its aging coal units; these costs are avoidable if a plant retires and is replaced by lower cost resources such as solar PV and battery storage. These potential avoided costs are significant, as discussed further below; but they are completely neglected by MidAmerican's myopic financial analysis, which focuses narrowly on maximizing energy revenue from new resource additions.

Additionally, MidAmerican bases the value of the project on the assumption that (1) the wind projects generate at the projected capacity factors; (2) market prices stay at the high levels projected; and (3) a carbon price is instituted. Company witness Specketer admitted as much in direct testimony, stating that "customer

[42] Direct Testimony of Company Witness Brown, Pg. 3.

bear the risk that electricity market prices are lower than forecasted (although they would enjoy the benefits of market prices that are higher than forecasted), and that Wind PRIME will not operate as modeled."[43] He also admitted that customers will bear the risk of a rate increase in the future if the Project does not perform as expected or if electricity market prices do not materialize as forecasted.[44] Effectively, MidAmerican is acting like an investor merchant generator, using ratepayers as a backstop and guarantor if the economics of its investment do not pan out.

Q Can you briefly explain what MidAmerican means when it says it can build Wind PRIME at "no net cost."

A The Company means that, according to its own calculations, the projected benefits form the project exceed its projected costs. As shown in Table 6 below, MidAmerican assigns five categories of credit and benefits to the Wind PRIME project: ITC, PTC, renewable energy credits, capacity sales and net system benefits.[45] "Net system benefits" represent the largest portion of Wind PRIME benefits and make up [redacted] of the value MidAmerican attributes to Wind PRIME.

[43] Direct Testimony of Company Witness Specketer, Pg. 39.

[44] Direct Testimony of Company Witness Specketer, Pg. 42.

[45] Specketer Confidential Rebuttal Exhibits 1-4.

Table 6: Confidential Wind PRIME credits and benefits based on Specketer Rebuttal Exhibit 4

Credits and Benefits ($/kWh)	2023 Wind	2024 Wind	2023 Solar 50MW	Total	Percent of total credits & benefits
Total cost					
Investment tax credit					
Production tax credit					
REC credit					
Capacity sales					
Net system benefits (change in net off-system purchases & fuel costs)					

Source: Calculated based on Specketer Rebuttal Exhibit 4; Glick Direct Exhibit 36, DG Confidential Workpaper 3.

As shown in Table 7 below, net system benefits[46] reflect the impact of lower market prices expected to result from Wind PRIME on (1) energy market revenues and variable costs from MidAmerican's existing resources and (2) MidAmerican's "load expense," that is the cost to serve MidAmerican's load based on MISO location marginal pricing (LMP).[47] MidAmerican forecasts that revenues from its existing fossil units will fall with lower market prices under Wind PRIME (although revenues from its existing renewables are expected to rise over the long term). But load expenses are also expected to decrease, and that reduction is expected to be around three times as large as the decrease in revenues from the Company's existing plants. The difference between the reduction in load expense and the reduction in energy market revenues for MidAmerican's existing resources is the net system benefits. These are benefits that will flow to customers regardless of who owns the Wind PRIME projects.

[46] Glick Direct Confidential Exhibit 4, MidAmerican Response to Tech Customer DR 61a, Confidential Attachment.

[47] Specketer Confidential Rebuttal Exhibits 1-4.

Table 7: Confidential Net system benefits from Wind PRIME (2022-2041)

Net System benefits from Wind PRIME	**NPV ($000)**
Decrease (increase) in generating revenues	
Existing fossil units	[redacted]
Existing wind	[redacted]
Existing solar	[redacted]
Total change in generating revenues	[redacted]
Decrease (increase) in expenses/ costs	
Change in variable operation costs existing fossil units	[redacted]
Change in load expense	[redacted]
Total change in system expense/costs	[redacted]
Net System benefits (costs)	[redacted]

Source: MidAmerican Response to Tech Customers 61a, Confidential Attachment; Glick Direct Exhibit 36 DG Confidential Workpaper 4.

Q Is it true that MidAmerican's customers will not benefit from Wind PRIME unless they own it?

A No. The implication that MidAmerican's ratepayers will not benefit if another entity builds the projects is false. MidAmerican acknowledges that the wind resources proposed in Wind PRIME will likely be built regardless of whether MidAmerican builds them or another party does.[48] It is true that the direct tax credits will not be passed on to MidAmerican ratepayers if the developers are "out of state entities or customers of other utilities."[49] But the expected decrease in market prices and corresponding decrease in net system benefits discussed above, including the change in load expense, should happen regardless of whether MidAmerican or another party owns the projects currently proposed in Wind PRIME. **That means that [redacted] the value that MidAmerican is currently attributing to Wind PRIME will be realized *regardless* of whether**

[48] *See*, Rebuttal Testimony of Company Witness Hammer, Pg. 14; Rebuttal Testimony of Company Witness Fehr, Pgs. 7-8; Direct Testimony of Company Witness Brown, Pg. 11.

[49] Rebuttal Testimony of Company Witness Hammer, Pg. 14.

MidAmerican or another entity builds the projects. The category of net system benefits should therefore be excluded from the Company's calculations.

5. ENERGY FUTURES GROUP'S MODELING SHOWS THAT A MORE BALANCED PORTFOLIO OF RESOURCE ADDITIONS WHICH INCLUDES MORE SOLAR AND BATTERY STORAGE RESOURCES, AND RETIRES UNECONOMIC COAL PLANTS, IS LOWER COST AND PROVIDES MORE ROUND-THE-CLOCK CLEAN ENERGY THAN THE COMPANY'S WIND PRIME PORTFOLIO AS CURRENTLY PROPOSED.

Q Explain the modeling you have performed for this docket.

A Energy Futures Group, in collaboration with Synapse, performed capacity expansion and production cost modeling using MidAmerican's own data, obtained through discovery. We also supplemented that data with publicly available data where necessary. Our goals were to compare MidAmerican's proposed plan of action—adding Wind PRIME and continuing to run its coal units until at least 2039—to a reasonable and feasible set of alternatives. This includes clean energy resource additions combined with retirement of certain uneconomic coal units. We sought to determine whether an alternative set of additions would result in greater cost savings to customers.

Full details on the modeling methodology are presented in the Direct Testimony of Environmental Intervenors Witness Chelsea Hotaling.

i. MidAmerican's dismissal of industry standard capacity expansion modeling is concerning and unfounded

Q Has MidAmerican performed capacity expansion modeling for this docket?

A No. MidAmerican claims that capacity expansion modeling isn't necessary or sufficient.[50] Specifically, MidAmerican asserts that: "Capacity optimization software oversimplifies many complex issues and is not capable of considering some issues or uncertainty in the future"[51] around the energy transition and broader regional forces. But I disagree with the Company's assessment. Capacity expansion modeling is an industry standard resource planning tool. When you feed the results of the capacity expansion plan into the production cost models, the model simulates the operation of a portfolio on a chronological 8,760-hour basis in each year of the planning period specified in the model. The fact that a model makes simplifying assumptions is not reason to discount it, but rather to test multiple scenarios and sensitivities to better understand risks and uncertainties.

Q What type of analysis does the Company recommend instead?

A The Company prefers its nine-factor analysis, stating that: "Resource optimization software can provide some insight into such questions, but such software will need to be augmented by other analyses, such as the nine-factor analysis."[52] But this nine-factor qualitative analysis oversimplifies many complex issues to a far greater degree and is only as capable of considering uncertainty as the person performing it. The nine-factor analysis analyzes the relative benefits of a pre-selected quantity of a certain resource. Resource optimization software, on the

[50] Id. Pg. 2.

[51] Id. Pg. 13.

[52] Id. Pg. 16.

other hand, uses mathematical algorithms to determine the optimal resource quantity to examine.

Q What are MidAmerican's specific concerns about the ability for capacity expansion modeling to capture the energy transition and broader regional forces?

A MidAmerican states that "Any value derived from modeling for an optimal resource mix is limited at best because modeling cannot currently capture the operational complexities created by industry-wide transition to renewable resources, MISO's increased focus on year-round resource adequacy, and the need for dispatchable units to provide ramping and balancing functions."[53] This is generally not correct; utilities and regional transmission operators (RTO) nationwide use modeling that respects resource adequacy requirements and dispatchability (ramp rate parameters and inclusion of operating reserve requirements are inherent parts of such modeling exercises). While it is true that there are many complexities and uncertainties in the industry right now, these can be assessed by conducting sensitivities and risk assessment. And these same market uncertainties behind MidAmerican's claim that optimal resource modeling is limited in value also affect MidAmerican's energy price forecasts modeling, which it relied on for its analysis of the projected benefits from Wind PRIME. Finally, as discussed above, [redacted].

[53] Rebuttal Testimony of Company Witness Brown, Pg. 10.

ii. Energy Futures Group's modeling improves upon Synapse's prior modeling by using Company-specific data and updated assumptions

Q Please explain how this modeling differs from the Synapse modeling referenced in your initial direct testimony.

A This new Energy Futures Group modeling differs in several key respects from the Synapse modeling I attached to my initial direct testimony. These relate mainly to data availability, changes in the market, and new resources considered.

First, this new modeling focuses on MidAmerican's service territory alone and relies on confidential, company-specific data. The previous Synapse modeling was developed without the use of confidential data from MidAmerican, which was unavailable at the time. Using MidAmerican's data on resources' fixed costs, sustaining capital costs, load, energy prices, carbon price, heat rates, and other inputs allows us to perform the type of modeling we expect of a rate-regulated public utility like MidAmerican.

Second, there have been a lot of changes in the markets over the last year since we conducted the Synapse modeling. Capacity market prices in MISO's "spot" planning resource auction jumped from $5/MW-day in the 2021/2022 auction to $233.66/MW-day in the 2022/2023 auction.[54] There have been considerable volatility and price increases in the natural gas market (driven partially by the war in Ukraine), resulting in high energy market prices at least in the near term. The Covid 19 pandemic has caused supply chain challenges and near-term inflation that the economy has still not recovered from. And most significant is the recent passage of the IRA. The IRA provides substantial tax credit extension and new tax credits for new solar PV, wind, and battery storage projects which were not

[54] 2022/2023 Planning Resource Auction (PRA) Results, Pg. 15. Available at https://cdn.misoenergy.org/2022%20PRA%20Results624053.pdf.

available at the time we conducted the prior analysis. These tax credits more than counter the near-term impacts of inflation and supply chain delays, all of which we incorporated into our updated modeling.

Third, MidAmerican had not proposed Wind PRIME at the time we conducted our modeling, so we did not model the Wind PRIME portfolio in the original Synapse analysis.

iii. Modeling methodology

Q Please describe the methods and software you used to model alternative portfolios for MidAmerican.

A Our modeling was performed using EnCompass, an optimized capacity expansion and production cost model developed by Anchor Power Solutions, to simulate resource choice impacts in MidAmerican's service territory.

Q Is EnCompass a widely accepted industry model?

A Yes. EnCompass is an industry-standard model used to develop the least-cost portfolio capable of meeting system constraints. Released in 2016, EnCompass is now used by major utilities such as Xcel Energy (Colorado, Minnesota, and New Mexico), Minnesota Power, Otter Tail Power, Public Service New Mexico, Duke Energy, and Tennessee Valley Authority, among others. It is similar to Aurora, a model I understand parties may have more familiarity with.

Q Please describe your role in this modeling.

A I supported Chelsea Hotaling at Energy Futures Group through the entire modeling process. I assisted in the selection of inputs data, development of

modeling assumptions, design of scenarios and sensitivities, and review of modeling results.

Q What scenarios did you model?

A We modeled the two scenarios described in Table 8 – the MidAmerican Preferred Plan and the Environmental Intervenors Preferred Plan. We also tested each scenario under a low load sensitivity. For a detailed list of all assumptions in each scenario beyond what I discuss here, see the Direct testimony of Chelsea Hotaling – in particular, Table 2.

Table 8. Scenarios Modeled by Energy Futures Group

Scenario Name	Coal plant retirement dates	Wind PRIME Projects	Replacement Resources
MidAmerican Preferred Plan	Plants retire on dates given by MidAmerican	All Projects	Model may economically add new clean energy resources to meet load starting in 2030
Environmental Intervenor Preferred Plan	Optimized Economic Retirement of Louisa, Neal 3, and Ottumwa in 2025; retires Neal 4 in 2028, WSEC3 in 2031, WSEC 4 in 2034.	Roughly one third of Wind PRIME wind and 50 MW of solar.[55]	Model may economically add new clean energy resources to meet load starting in 2025

[55] [redacted]

The MidAmerican Preferred Plan represents MidAmerican's plans as currently proposed in its updated Wind PRIME application. It includes the updated Wind PRIME project ([redacted] of wind in 2023 and [redacted] of wind and 50 MW of solar PV in 2024[56]), continued operation of its coal plants until [redacted] for Neal 3, [redacted] for Louisa, Ottumwa, Walter Scott 3 and Neal 4, and [redacted] for Walter Scott 4,[57] and new resource additions starting in 2030. We modeled this scenario to provide a baseline set of data on portfolio cost (net present value revenue requirement or NPVRR) and greenhouse gas emissions that we could compare to alternative portfolios. We allowed the model to build new resources starting in 2030 [redacted].[58] MidAmerican filled unmet energy and capacity needs in its model with energy and capacity market purchases.[59] We maintained MidAmerican's retirement dates for all other existing resources, with the exception of Quad Cities, which Constellation announced it will relicense,[60] [redacted]

The Environmental Intervenor Preferred Plan represents a reasonable alternative portfolio. We preserve around one third of the wind proposed in Wind PRIME and the solar PV. We preserved the solar PV because the Company currently has minimal solar resource deployed on its system, therefore this project adds to MidAmerican's resource diversity. [redacted]

[56] Confidential Rebuttal Testimony of Company Witness Jablonski, Pg. 11-12.

[57] Guyer Exhibit 2, MidAmerican Response to IBEC DR 01, Confidential Attachment.

[58] Confidential Direct Testimony of Company Witness Hammer, Pg. 18, Table 3.

[59] This is seen in Specketer Confidential Rebuttal Exhibits 1-4.

[60] Glick Exhibit 32, MidAmerican Response to Tech Customer DR 5.

[61] Guyer Exhibit 2, MidAmerican Response to IBEC DR 01, Confidential Attachment.

[redacted] The model was allowed to determine economically when to retire some of the coal and when to add new clean energy resources, starting in 2025. The purpose of this scenario is to compare the greenhouse gas impacts and costs of a reasonable alternative resource portfolio to MidAmerican's current portfolio. All other resource assumptions were unchanged from MidAmerican Preferred Plan.

Q Please explain the low load sensitivity that you test for all scenarios.

A The lower load sensitivity captures the impact of two potential forces: the addition of incremental cost-effective energy efficiency measures that decrease load, and the possibility that new commercial/industrial demand does not materialize to the extent that MidAmerican currently projects[62] based on the potential defection of large energy users that want to buy power from the open market.[63] We retained the same retirement dates for the coal plants as in the base scenario and reoptimized the new resource additions in both the MidAmerican Preferred Plan and Environmental Intervenors Preferred Plan under the low load sensitivity. Details of our forecast are discussed in the testimony of Chelsea Hotaling.

Q What new resources did you allow the model to select?

A We allowed the model to select from new wind, solar PV, 4-hour battery storage, and 10-hour battery storage resources. We also offered a clean firm resource

[62] Glick Exhibit 32, MidAmerican Response to Tech Customer DR 04a-Confidential Attachment 2022_2031 Electricity Forecasts, page 19.

[63] Donnelle Eller, "Big Iowa energy users say they want to buy power on open market, bypassing current providers." Des Moines Register, September 30, 2022. Available at https://www.desmoinesregister.com/story/money/business/2022/09/30/big-iowa-energy-users-exploring-purchase-power-open-market/69528170007/.

starting in 2030 as a proxy for long duration storage. To reflect the passage of the IRA, we modeled all new wind and solar PV resources as qualifying for 100 percent of the PTC (stepping down after 2033), and battery storage as qualifying for 30 percent of the ITC. This matched MidAmerican's assumptions for the tax credits that the wind and solar PV in Wind PRIME would qualify for following passage of the IRA.

Q How did you model MidAmerican's interactions with the MISO market?

A We relied on MidAmerican's energy market price forecast with Wind PRIME for both our MidAmerican Preferred Plan and Environmental Intervenors Preferred Plan.[64] We utilized this forecast for both scenarios based on the Company's acknowledgment that even if it didn't own Wind PRIME, the projects were likely to be built in Iowa regardless.[65] I believe it more accurately represents future market prices with an increasing penetration of renewables. We developed hourly import and export limits based on MISO Zone 3 import and export limits from the 2022/2023 MISO Planning Resource Auction (PRA) results. We limited capacity purchases to 100 MW, priced at CONE, and sales to 50 MW, priced based on MidAmerican's price assumptions.[66]

[64] Glick Exhibit 32, MidAmerican Response to Tech Customer DR 11, Confidential Attachment.

[65] *See*, Rebuttal Testimony of Company Witness Hammer, Pg. 14; Rebuttal Testimony of Company Witness Fehr, Pgs. 7-8; Direct Testimony of Company Witness Brown, Pg. 11.

[66] Glick Exhibit 32, MidAmerican Response to OCA DR 8a, AEO Attachment.

Q How did this modeling take into account the MISO seasonal construct?

A Given the uncertainty in what the final MISO seasonal resource adequacy construct will look like, we modeled MidAmerican with a single summer reserve margin. MidAmerican's system is currently summer peaking.[67] We relied on MidAmerica's own assumptions on firm capacity contribution for its clean energy resources.[68] As discussed in greater depth in witness Hotaling' s testimony, this was the most reasonable approach given the current status of the MISO planning process. Moreover, solar is expected to have the greatest change in capacity value, and the model is selecting mostly battery storage in the near term. This should allow MISO sufficient time to finalize its new capacity construct before MidAmerican has to make decisions about larger additions of solar PV.

iv. Modeling results

Q What were the results of this modeling?

In the Environmental Intervenors Preferred Plan, all coal is retired by 2034. Specifically, the model found it was economic to retire Louisa, Ottumwa, and Neal 3 in the first year it was allowed to do so, which is 2025. The Plan also includes retirement of Neal 4 in 2028, Water Scott 3 in 2031, and Walter Scott 4 in 2034. As shown in Table 9 below, [redacted] Our finding that Louisa, Ottumwa and Neal 3 are the most uneconomic and therefore retire first [redacted]

[67] Glick Exhibit 10, MidAmerican Response to IBEC DR 22, Confidential Attachment.

[68] Direct Testimony of Company Witness Hammer, Pg. 18, Table 3.

Table 9: Confidential Retirement dates for MidAmerican's coal units

Unit	MidAmerican Preferred Plan retirement date	Environmental Intervenors Preferred Plan optimal retirement date
Louisa	[redacted]	12/31/2025
Ottumwa	[redacted]	12/31/2025
Neal 3	[redacted]	12/31/2025
Neal 4	[redacted]	12/31/2028
Walter Scott 3	[redacted]	12/31/2031
Water Scott 4	[redacted]	12/31/2034

Source: Guyer Exhibit 2, MidAmerican Response to IBEC DR 01, Confidential Attachment.

The model also economically adds a mixture of 4-hour battery storage starting in 2025 (which it maxes out at our annual build limit of 500 MW in the first two years its allowed), Solar PV starting in 2030, and wind in 2033. This is in addition to roughly one third of the Wind PRIME wind and the 50 MW Wind PRIME solar project. Table 10 below shows the total resource additions and coal plant retirements in the Environmental Intervenors Preferred Plan.

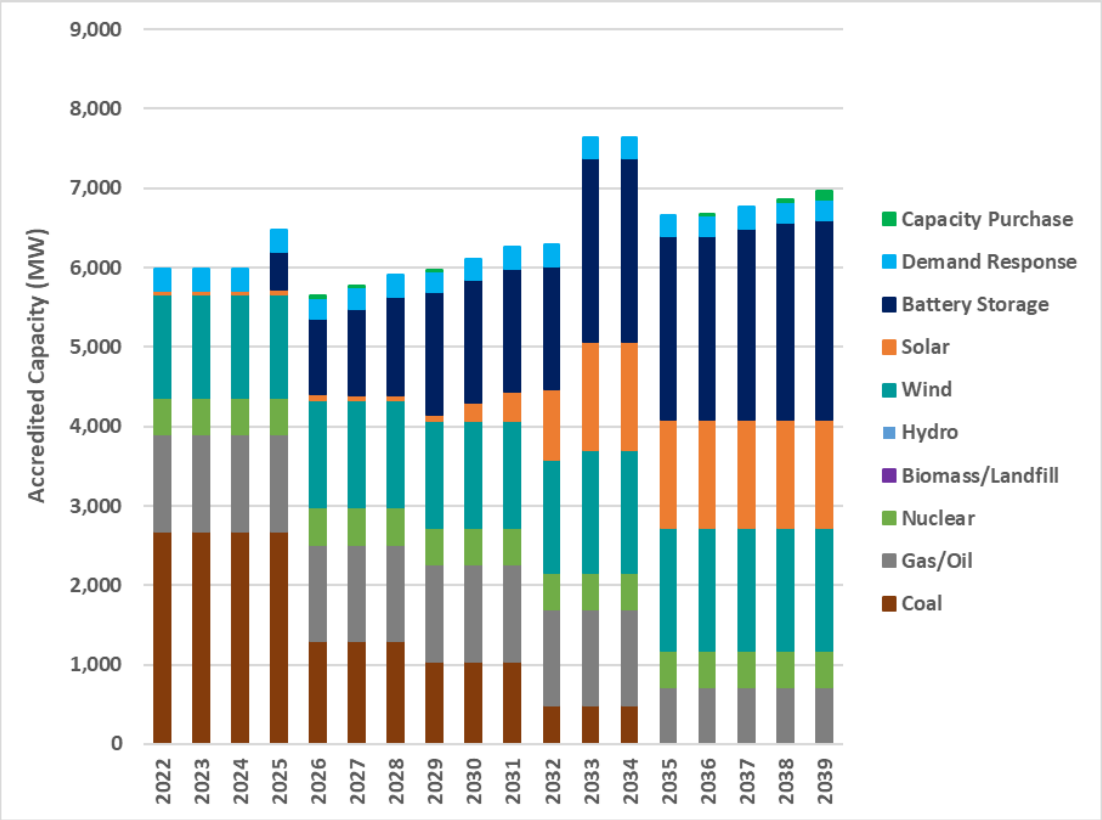
Table 10: Environmental Intervenors Preferred expansion and retirement plan (MW)

Year	4-Hr Battery Storage	Solar PV	Wind	Capacity Purchase	Coal retired
2025	500	0	0	0	(1,393)
2026	500	0	0	19	0
2027	140	0	0	0	0
2028	160	0	0	0	(261)
2029	329	0	0	0	0
2030	0	450	0	0	0
2031	0	400	0	0	(558)
2032	0	1500	0	0	0
2033	805	1350	750	0	0
2034	0	0	0	0	(488)
2035	0	0	0	0	0
2036	0	0	0	0	0
2037	106	0	0	0	0
2038	74	0	0	30	0
2039	31	0	0	100	0
Total	**2645**	**3700**	**750**	**149**	**(-2700)**

Source: Direct testimony of Chelsea Hotaling at pg. 21.

Figure 1 below shows the change in total resource mix for MidAmerican's system under the Environmental Intervenors Preferred Plan. This shows the retirement of the Company's coal over the next decade, and the replacement of that capacity with battery storage, solar PV and eventually wind. The Company already relies on a substantial quantity of wind, but it is the incremental build out of battery storage and solar PV and retirement of coal that is most pronounced relative to the Company's current resource portfolio.

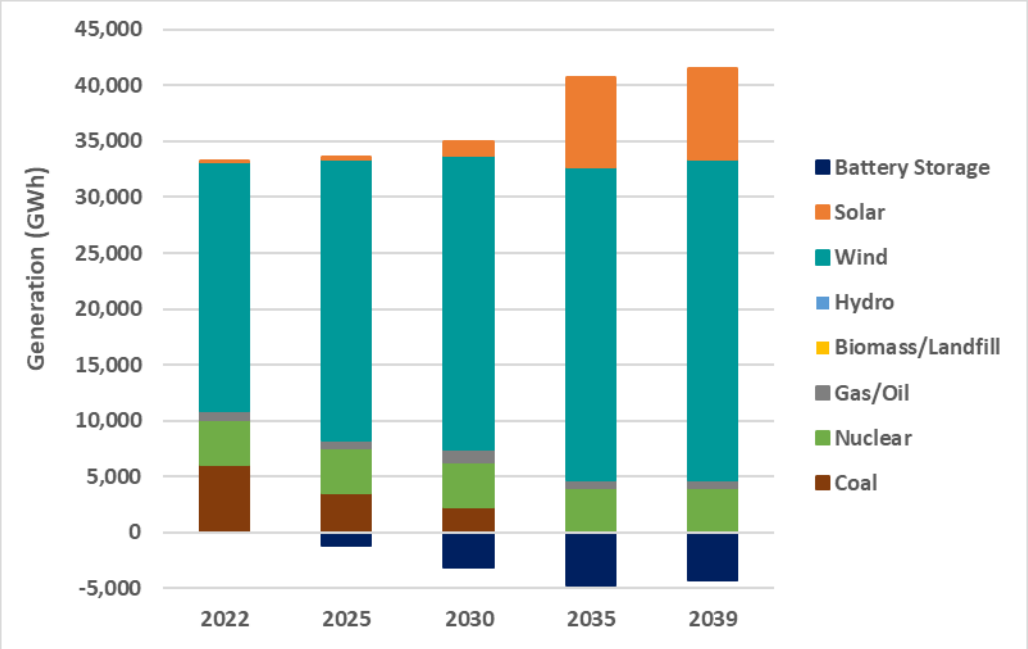
Figure 1: Environmental Intervenors Preferred Plan - Changes in total resource firm capacity (MW)



Source: Direct testimony of Chelsea Hotaling at pg. 19.

Figure 2 shows the projected generation mix for the Environmental Intervenors Preferred Plan. MidAmerican currently relies on wind for most of its generation and this trend is expected to continue to throughout the study period. But our modeling shows it is also economic to add a large quantity of solar PV to MidAmerican's system, especially after the model retires the last of MidAmerican's coal fleet in the 2030s. Throughout the study period, the model also builds and deploys a large quantity of battery storage. Battery storage provides substantial value to MidAmerican's system by managing curtailments of solar PV and wind (as I will discuss more below).

Figure 2: Environmental Intervenors Preferred Plan generation (GWh)



Source: Direct testimony of Chelsea Hotaling at pg. 20.

Q How did your results change under the low load sensitivity?

A Under the low load sensitivity, the model needed less capacity and therefore built out 200 MW less battery storage, 600 MW less solar PV and 650 MW less wind and made fewer capacity purchases (146 MW).

Q How do the results from the Environmental Intervenor Preferred Plan differ from what you found in the MidAmerican Preferred Plan?

A In the MidAmerican Preferred Plan, the model adds battery storage as soon as it is allowed in 2030. Based on preliminary unconstrained modeling runs we found that the model wanted to add battery storage immediately (in the 2020s) to reduce wind curtailments. But in our final runs we limited new resource builds [redacted] to avoid any perception that we were allowing the model to overbuild in the MidAmerican Preferred Plan to artificially inflate the plan costs. The model also adds solar PV

in the 2030s, but otherwise MidAmerican's resource mix looks much like it does today, with the addition of the Wind PRIME project (see the testimony of Chelsea Hotaling for additional results from the MidAmerican Preferred Plan). Under the low load sensitivity, the model adds slightly less batter storage (51 MW) and no new solar PV. MidAmerican does not actually plan to build these resources, but we needed to allow the model to address MidAmerican's forecasted capacity shortfall to create an "apples to apples" cost comparison between the plans.

Table 11: MidAmerican Preferred Plan Encompass Expansion Plan (MW)

Year	4-HR Battery Storage	Solar PV	Wind	Coal Retired
2030	125	0	0	0
2031	125	0	0	0
2032	125	0	0	0
2033	125	950	0	0
2034	250	0	0	0
2035	551	0	0	(558)
2036	0	0	0	0
2037	0	0	0	0
2038	0	0	0	0
2039	0	0	0	0

Source: Direct testimony of Chelsea Hotaling at pg. 21.

Q How do curtailment levels compare across the two plans?

A As shown in Figure 3 below, curtailments are very high under MidAmerican's Preferred Plan, and are projected to rise even more once Wind PRIME comes online. This is due, in part, to the absence of battery storage in MidAmerican's resource portfolio to store excess wind generation. Curtailment levels don't fall until the mid-2030s when battery storage resources are deployed. These battery storage resources are not ones that MidAmerican has indicated it plans to build, but rather are resources that the EnCompass model selected to reduce curtailments and fill projected load growth.

In the Environmental Intervenors Preferred Plan, curtailments are much lower across the study period. This is because the model builds out battery storage immediately to manage curtailment and also builds out new wind and solar PV resources in a more incremental fashion over the next decades in the Environmental Intervenors Preferred Portfolio. Our modeling shows that this approach results in substantially lower levels of curtailment than under MidAmerican's current plan and will provide substantial benefit to MidAmerican's system.

Figure 3: Confidential Comparison of Annual levels of Curtailment (GWh)

Source: Direct testimony of Chelsea Hotaling at pg. 26; Exhibit 37, DG Confidential Workpaper 5.

Q How do the coal units perform under the MidAmerican Preferred Plan?

A MidAmerican's coal units continue to operate through at least [redacted], but as shown in Figure 4 below, our modeling finds that their capacity factors [redacted] over time. Specifically, the projected capacity factors the coal units are expected to [redacted]

[redacted] as the Wind PRIME projects come online. After 2026, no unit operates [redacted], and the fleet average capacity drops to [redacted] percent between 2026 and the end of the study period in 2039.

Figure 4: Confidential projected capacity factors for coal units in MidAmerican Preferred Plan

[redacted]

Source: Developed based on data from the workpapers of Chelsea Hotaling; Exhibit 37, DG Confidential Workpaper 5.

Q Is it reasonable for MidAmerican to expect its coal units can operate at such low utilization?

A No. These results are very concerning. With such low utilization, MidAmerican is relying on its old coal plants to act as load-following super-peakers. Coal plants are intended to operate as baseload units – that is, to always be online, and to ramp slowly up and down, as needed to meet demand. Coal units are not intended to be regularly switched on and off as peaking resources. They are costly and time intensive to start up, shut down, and ramp up and down, and doing so increases the wear-and-tear on the units.

Additionally, coal units require large expenditures on fixed and capital costs to stay online. But as utilization falls, the units have less revenues to cover the same (or even higher) costs. Coal plants are also a poor choice to back-up wind resources – they do not respond quickly to changing resource output, and they are expensive when utilized so minimally. MidAmerican should not rely on them on simply because they are already there – instead the Company should evaluate the economics of continued reliance on these units, as their utilization falls, relative to alternatives.

Q Environmental Intervenors' Preferred Plan includes retiring 1,393 MW of coal in 2025. Are you claiming that your modeling shows that is it possible to retire 1,393 by 2025?

A No. Our modeling shows that it is most economic for MidAmerican to retire Louisa, Ottumwa, and Neal 3 as soon as possible, and replace the energy and capacity with alternatives (specifically, battery storage and market energy). Our modeling didn't contemplate the feasibility of retiring the units on that timeline, but it did show that for each year the plants stay online, the company is incurring unnecessary costs for ratepayers. 2025 was the soonest retirement date allowed, which is why that is the date selected by the model, but any near-term retirement will benefit MidAmerican ratepayers. This is in part because MidAmerican's currently has a [redacted]. The Company's own load and resource data[69] shows that the Company can retire one uneconomic coal plant immediately and will not need to procure replacement capacity until [redacted] at the earliest, and more likely [redacted].

[69] Direct Testimony of Company Witness Hammer, Pg. 18, Table 3.

Q How did the costs compare between MidAmerican's and the Environmental Intervenors Preferred Plan?

A The Environmental Intervenors Preferred Plan has a lower Net Present Value Revenue Requirement (NPVRR) (i.e., lower total cost) than the MidAmerican Preferred Plan by $121 million in the base load sensitivity, and by $157 million in the low load sensitivity, as shown in Table 12 below. This higher cost difference under the low load sensitivity means that if MidAmerican's aggressively high load growth projections do not materialize, the Company will be even better off with coal retirements and a clean energy portfolio of resources.

Table 12: NPV Results under base load and low load sensitivity 2022-2039 ($000)

Plan	Total NPV	Delta
Base load		
Environmental Intervenor	$4,851,288	-$121,020
MidAmerican Preferred	$4,972,308	
Low load sensitivity		
Environmental Intervenor	$4,213,221	-$157,415
MidAmerican Preferred	$4,370,635	

Source: Direct testimony of Chelsea Hotaling at pg. 29.

Figure 5 below shows the change in projected spending at the Company's existing coal unit and on new resources in each scenario. Our modeling shows that spending on fuel, O&M, capital costs, as well as carbon costs at the Company's existing coal fleet is expected to fall by over $1 billion in the Environmental Intervenor Preferred Plan as compared to MidAmerican's Preferred Plan. At the same time, spending on new battery storage, solar PV and wind resources, including in Wind PRIME, is expected to increase by just over three quarters of a billion dollars in the Environmental Intervenors Preferred Plan relative to the MidAmerican Preferred Plan. The remainder of the delta between scenarios is attributed mostly to change in sales and purchases revenues between scenarios (not shown here).

Figure 5: AEO Confidential NPV broken down by cost category ($000)

Source: Developed based on data from the workpapers of Chelsea Hotaling; Exhibit 40, DG AEO Confidential Workpaper 7.

Q How did CO_2 emissions compare between MidAmerican's and the Environmental Intervenors Preferred Plan?

A As shown in Figure 6 below, the Environmental Intervenors Preferred Plan has lower annual emissions than the MidAmerican Preferred Plan starting in 2026 as the coal plants begin to retire. Emissions levels in the Environmental Intervenor Plan plateau in the late 2020s, and then fall again in the early 2030s as even more as coal units are retired. After 2035, when MidAmerican's last coal unit is retired, emissions flatten out right above zero.

In the MidAmerican Preferred Plan, emissions levels decline when Wind PRIME comes online in 2023 and 2024, but then gradually rise back up through the early

2030s. MidAmerican has no planned resource additions beyond 2030, so we show no emissions projections for the MidAmerican Preferred Plan beyond 2030.[70]

Figure 6: Confidential CO_2 emission reduction relative to 2005 levels

Source: Exhibit 37, DG Confidential Workpaper 5.

Over the study period (2022–2039), the Environmental Intervenors Preferred Plan emits 25 million less tons of CO_2 than the MidAmerican Preferred Plan.

Q Please summarize your findings.

A We found that a combination of solar PV, wind, and 4-hour batter storage provides a more reasonable, lower cost and lower emissions generation portfolio than the Company's exiting plan to build out Wind PRIME and continue relying

[70] These results are all based on the assumption that the Company operates all its unit economically, rather than utilizing a must-run status to keep them online even at times when its uneconomic to do so. This means that our emissions projections for the MidAmerican Preferred Plan are a sort of best-case scenario projection. If MidAmerican operates any of its units with a must-run status moving forward, emissions levels will be larger than projected here.

on its existing coal units for another two decades at least. Further, the Environmental Intervenors Preferred portfolio is robust against lower load projections and delivers additional incremental value over the MidAmerican Preferred Portfolio if the Company's aggressive load forecast does not materialize.

6. MIDAMERICAN'S CLAIMS AROUND THE BENEFITS OF THE WIND PRIME PORTFOLIO, BOTH ORIGINALLY AND AFTER THE PASSAGE OF THE IRA, ARE MISLEADING AND UNSUPPORTED

Q What claims does MidAmerican make about the timeline of the updated Wind PRIME portfolio?

A MidAmerican claims that the Wind PRIME project should be built with the same urgency as before, if not a higher urgency, despite extended tax credits. Specifically, MidAmerican claims that: the IRA is increasing competition for renewable sites and increasing costs; developers have higher leverage due to increasing competition; and the sooner it builds the project, the more quickly customers realize the benefits.[71] These claims distract from the fact that MidAmerican has not demonstrated that the project is reasonable relative to alternatives.

[71] Rebuttal Testimony of Company Witness Brown, Pg. 3; Rebuttal Testimony of Company Witness Fehr Pg. 18; Rebuttal Testimony of Company Witness Jablonski, Pg. 3.

Q What claims does MidAmerican make about the resource diversity benefits of Wind PRIME?

A MidAmerican claims that the resource diversity impacts of Wind PRIME should be viewed within the context of MISO's entire system, not just MidAmerican's system.[72] Specifically, the company states: "While there is a significant amount of wind energy in Iowa, broader regional market considerations are a critical frame of reference. MidAmerican participates in a regional MISO market where it receives benefits related to weather diversity and broader access to economic energy for both purchases and sales."[73] I agree with the Company that broader market considerations are important and that the Company benefits from participation in the MISO market. But market participation and reliance are only one part of MidAmerican's supply mix. And it is not reasonable to accept the premise that the diversity of its resource mix is irrelevant because the Company is part of a larger market. MidAmerican has an obligation to ensure its own resource mix is reasonable relative to alternatives. Adding more wind without explicitly considering the benefits of complementary additions of solar PV and battery energy storage, and coal plant retirements to MidAmerican's system does not ensure the system is reasonable, reliable, or low cost; rather it perpetuates MidAmerican's reliance on a wind-coal system.

Q Why are you concerned about MidAmerican creating a wind-and coal-heavy system?

A As I discussed above, coal plants are costly to operate and maintain. Moreover, they are relatively inflexible as they cannot quickly respond to changing system conditions (i.e., turn on and off, or ramp up and down quickly), and they are

[72] Rebuttal Testimony of Company Witness Hammer, Pg. 9.

[73] Id.

subject to both coal supply shortages and coal price uncertainty. Wind resource output is generally highest at night and in the winter, and lowest during the summer and daytime. Adding more wind to the system will increase output during the times when the Company already has ample wind output. It will also increase reliance on old legacy fossil units, which cannot ramp up or down quickly in response to either wind output changes or market changes, during times when wind output is lowest. If instead the Company considered solar PV and battery storage as complements to wind and – in total- as replacements for coal, it would mitigate some of these concerns.

The generation profile of solar PV complements the output of wind, with high summer and daytime output; and battery storage can store excess generation for times when wind and solar output is lower. This will produce a more reasonable, reliable, and lower cost system than the one MidAmerican is proposing. [redacted]

Q How did MidAmerican respond to your criticisms that the Company did not consider additional solar PV in Wind PRIME?

A MidAmerican's primary justification is that "the accredited capacity benefits for solar are limited in winter months and are likely to decrease in all seasons as solar penetration levels increase."[75] Company witness Hammer also points out that solar PV capacity accreditation declines with increasing penetration.[76]

[74] Confidential ZES, Pg. 14.

[75] Rebuttal Testimony of Company Witness Hammer, Pg. 3-4.

[76] Id. Pg. 16-19.

Q How do you respond to the Company's concerns about low capacity accreditation for solar PV in winter?

A This is an interesting criticism given that MidAmerican itself states, "Wind PRIME is primarily about providing affordable emission-free energy, rather than providing high levels of accredited capacity value."[77] Mr. Hammer is correct in adding that "various resource types will be required as the energy transition continues to add more emission-free resources. Some resources will have higher capacity accreditation values […], and some will have lower capacity accreditation values."[78] Likewise, solar can "provide other benefits in diversifying the timing of renewable energy."[79]

This can be clearly seen in a comparison of the wind generation shapes and solar generation shapes provided by the Company. During early July, for example, when MidAmerican's wind resources typically have very low capacity factors, solar resources have a much more reliable generation shape with high daytime capacity factors.[80] The diversity benefits of solar cannot be viewed in light of accreditable capacity alone, given that an important energy balancing need in a wind-heavy system occurs in the summer, when solar tends to perform best. MidAmerican cannot rigorously examine those benefits to maximize the benefits of solar through its nine-factor analysis. This requires capacity expansion modeling. MidAmerican acknowledged both the [redacted]

[77] Id. Pg. 4.

[78] Id.

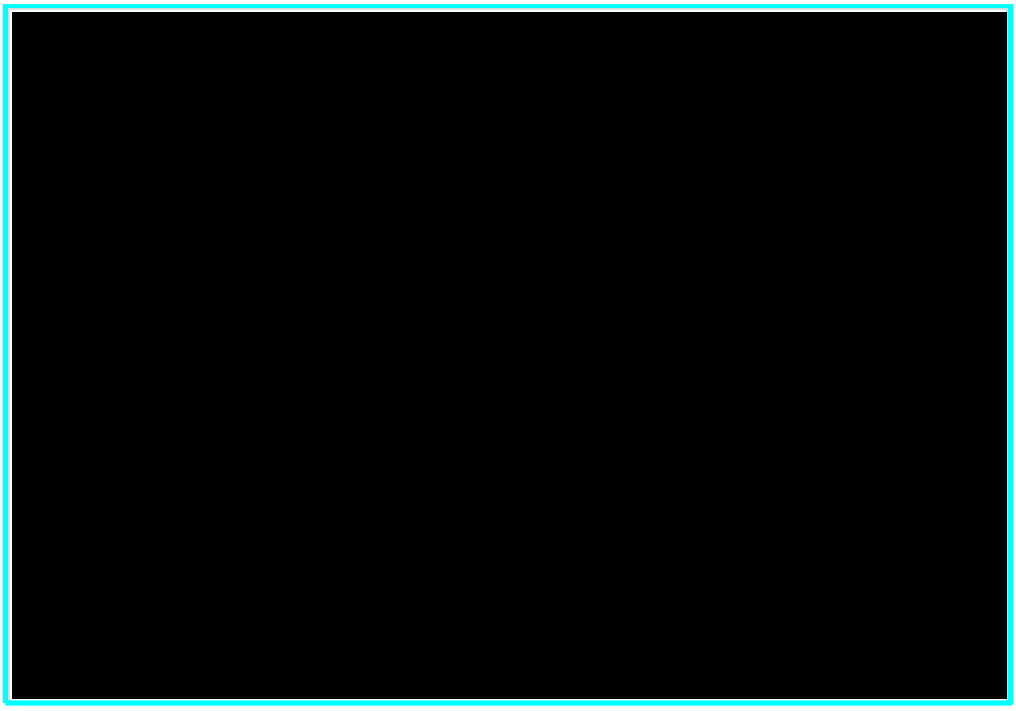
[79] Id. Pg. 16.

[80] Glick Exhibit 32, MidAmerican Response to EI DR 170a, Confidential AEO Attachment; MidAmerican Response to EI DR 51, Confidential AEO Attachment.

[redacted]

[redacted]

Figure 7: Confidential AEO Wind PRIME wind and solar PV generation profiles for representative summer week



Source: Glick Direct Exhibit 32, Confidential MidAmerican response to EI DR 51-Attachment-Confidential AEO.

Q How does MidAmerican defend the need to maintain its existing thermal resources, specifically its coal plants, as part of Wind PRIME?

A MidAmerican cites reliability needs[82] and specifically cites two studies to make the point that MidAmerican's system needs more than just renewables: (1) a MISO RIIA study that makes a case for balancing resources, including

[81] Confidential ZES, Pgs. 14-15.

[82] Rebuttal Testimony of Company Witness Hammer, Pg. 7.

conventional dispatchable resources;[83] and (2) a North American Reliability Corporation (NERC) State of Reliability report that emphasizes the need for balancing resources "for reliable integration of the growing fleet of variable renewable energy resources."[84]

The Company goes on to claim that because Wind PRIME does not include the retirement of any of its thermal assets, "there is no evidence that the Project will reduce MidAmerican's ability to meet customers' reliability requirements."[85] But adding 2,042 MW of wind to the system to capture tax credits and ignoring how those new resources will interact with the Company's existing resources is not a reasonable way to plan a system.

Q How do you respond to MidAmerican's claims that it needs its existing resource for reliability reasons?

A MidAmerican's coal plants themselves cannot be assumed to be reliable, particularly if MidAmerican intends to run them more and more as peaking plants and less as baseload resources. Aging, coal-fired, steam generating units are not good at balancing wind and renewables. As Hammer himself notes when he quotes NERC, natural gas units—not coal units—are currently acting to balance renewables, at least until they are supplanted by storage technologies.[86]

[83] Id. Pg. 8-9. MISO RIIA study available at https://cdn.misoenergy.org/RIIA%20Summary%20Report520051.pdf

[84] Rebuttal Testimony of Company Witness Hammer, Pg. 7-8; NERC State of Reliability report, available at https://www.nerc.com/pa/RAPA/PA/Performance%20Analysis%20DL/NERC_SOR_2022.pdf

[85] Rebuttal Testimony of Company Witness Hammer, Pg. 9.

[86] Id. Pg. 7.

Coal plants take a long time to turn on and off and have long minimum up times and minimum down times.[87] In a high-renewable grid, units with these characteristics struggle to respond to changing market prices and changing demand throughout the day. Thus, they become a liability. As MidAmerican's modeling shows, its coal plants' capacity factors will [redacted] with the addition of Wind PRIME,[88] and they will be required to run during very specific market conditions to be economic and provide benefits to the grid. This is a uniquely difficult task for old steam coal units to perform.

As MidAmerican's historical operations show, its coal plants have [redacted] forced outage rates (Table 13). They also experience expensive, extended outages for environmental retrofits, including a large 2022 scheduled outage at Louisa, Walter Scott 3, and Ottumwa for ash pond retirements and wastewater treatment facilities.[89] Indeed, if MidAmerican expects to run a group of decades-old coal plants more variably and with increased ramping, these forced outage rates will only go up, as will O&M costs. Likewise, the risk of future environmental regulations between today and 2040 nearly guarantees additional scheduled outages for environmental retrofits and maintenance.

[87] Glick Exhibit 23, MidAmerican Response to EI DR 31, Confidential Attachment.

[88] Glick Exhibit 32, MidAmerican Response to Tech Customer DR 12, Confidential Attachment Wind Prime Reference Price.

[89] Glick Exhibit 32, MidAmerican Response to EI DR 159.

Table 13. Confidential Historical and Projected Forced Outage Rates

Coal Unit	Historical Forced Outage Rates (FOR)					Projected Future FOR
	2017	2018	2019	2020	2021	
Walter Scott 3	[redacted]					
Walter Scott 4						
Louisa						
Neal 3						
Neal 4						
Ottumwa						

Source: Glick Direct Exhibit 32, MidAmerican Confidential Response to EI DR 53 a and b; Glick Direct Exhibit 23, Confidential MidAmerican Response to EI DR 31, Confidential Attachment.

Q Did MidAmerican evaluate whether it would be reasonable to include other firm resource alternatives, such as battery storage, in developing the Wind PRIME portfolio?

A No. While the Company asserts the need to study battery storage as part of the Technology Study, MidAmerican failed to quantitatively evaluate whether battery storage would be a reasonable resource addition. MidAmerican did not correct this error even after storage became eligible for additional tax credits under the IRA.[90]

Battery storage can now replace coal as a firm capacity resource and is in many ways better suited to the short-term grid balancing capabilities that a wind-heavy portfolio calls for. As MidAmerican witness Fehr notes, "for certain energy storage technologies, most notably lithium-ion batteries, the performance characteristics of the technology are well known. It is also true that the technology is commonly deployed as a grid-scale generation resource in areas with high

[90] Rebuttal Testimony of Company Witness Fehr, Pg. 14.

levels of solar generation."[91] Put another way, battery storage can balance the integration of high penetration of renewables and stabilize the grid.[92]

Battery storage is already performing this role across the United States; installed battery storage capacity more than tripled in 2021, growing from 1,438 MW in 2020 to 4,631 MW.[93] Much, much more is in interconnection queues. According to a 2022 report by Lawrence Berkeley National Lab, more than 420,000 MW of storage capacity were in interconnection queues nationwide in 2021.[94] Of that, about half was "hybrid" storage paired with a specific type of generation. In Iowa along, there is 2,800 MW of active battery storage projects active in the MISO interconnection queue.[95]

Witness Fehr rightly notes that it is more common for battery storage to be paired with solar than with wind;[96] but as of 2021, wind plus storage projects in interconnection queues totaled 14 GW—nearly 8 percent of all wind capacity in

[91] Id. Pg. 13-14.

[92] Mike Ferry, "Op-Ed: California's giant new batteries kept lights on during the heat wave." Los Angeles Times, September 13, 2022. Available at https://www.latimes.com/opinion/story/2022-09-13/california-electric-grid-batteries-heat-wave-september-2022.

[93] U.S. Energy Information Administration, *Battery storage capacity more than tripled in 2021 as reported applications expanded beyond ancillary services."* July 6, 2022. Available at https://www.eia.gov/electricity/mo2nthly/update/archive/june2022/.

[94] Lawrence Berkeley National Laboratory, *Queued Up: Characteristics of Power Plants Seeking Transmission interconnection As of the End of 2021.* April 2022. Available at https://emp.lbl.gov/sites/default/files/queued_up_2021_04-13-2022.pdf.

[95] MISO GI Interactive Queue, accessed 11/9/2022. Available at https://www.misoenergy.org/planning/generator-interconnection/GI_Queue/gi-interactive-queue/. See Exhibit 39, DG Public Workpaper 6.

[96] Rebuttal Testimony of Company Witness Fehr, Pg. 13-14.

queues nationwide queue.[97] Incidentally, 8 percent is also the fraction of proposed hybrid wind that was in MISO's interconnection queue.[98] Also, while it might be true that 4-houry lithium-ion battery storage is better suited to pair with solar, long-duration battery storage is well suited to pair with wind.

Q Do you have any closing thoughts?

A Wind PRIME is not about decarbonization. As the company states, "providing 27/7 [sic] carbon-free electricity is not a stated goal of [W]ind [PRIME]."[99] Wind PRIME's purpose is to maximize revenues for MidAmerican, not to minimize costs for ratepayers. Approving Wind PRIME as-is creates a wind-coal system that does not provide 100 percent clean energy and instead keeps five coal units running for 20 years or more, despite their advanced age, high costs, poor suitability for a high-renewable grid, and the presence of cheaper alternatives. According to the Company's own modeling, Wind PRIME will [redacted] reduce utilization of the Company's aging coal plants. Specifically, MidAmerican expects generation levels at its coal plants to drop [redacted].[101] This is concerning because it means the Company will be paying high fixed maintenance and capital

[97] Lawrence Berkeley National Laboratory, *Queued Up: Characteristics of Power Plants Seeking Transmission Interconnection As of the End of 2021*. April 2022. Page 18, available here https://emp.lbl.gov/sites/default/files/queued_up_2021_04-13-2022.pdf.

[98] According to the Lawrence Berkeley National Laboratory study referenced above, "hybrid" wind is nearly all "wind+storage," though it also includes wind+solar and wind+solar+storage.

[99] Glick Exhibit 32, MidAmerican Response to EI DR 68 a.

[100] Glick Exhibit 32, MidAmerican Response to Tech Customer DR 12, Confidential Attachments Reference Price and Wind Prime Reference Price.

[101] Glick Exhibit 4, MidAmerican Response to Tech Customers DR 61(a), Confidential Attachment.

costs to maintain plants that are minimally utilized and earn low energy market revenues.

But there is an upside - thanks to new tax credits, MidAmerican projects the undepreciated balance of the plants will be paid off faster. So even though Wind PRIME (1) does currently rely on coal plants that are expected to become even more uneconomic over time, and (2) does not plan for replacement of the coal units, Wind PRIME is projected to make the coal plants easier to retire. Now MidAmerican just has to take the steps to examine and plan for the early retirement of its legacy fossil resources replacement with new resources to ensure that the Company's portfolio creates the most value for ratepayers.

Q Does this conclude your testimony?

A Yes.

AFFADAVIT OF DEVI GLICK

STATE OF ILLINOIS) ss.
COUNTY OF COOK)

I, Devi Glick, being first duly sworn on oath, state that I am the same Devi Glick identified in the testimony being filed with this affidavit, that I have caused the testimony to be prepared and am familiar with its contents, and that the testimony is true and correct to the best of my knowledge and belief as of the date of this affidavit.

/s/ Devi Glick
Devi Glick

State of Illinois County of Cook
Subscribed and sworn before me the 18th day of November, 2022.

/s/ Heather Vogel
Notary Public in and for the
State of Illinois