STATE OF IOWA

BEFORE THE IOWA UTILITIES BOARD

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

DIRECT TESTIMONY OF

DEVI GLICK

ON BEHALF OF ENVIRONMENTAL INTERVENORS

July 29, 2022

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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 Please describe Synapse Energy Economics.

A Synapse is a research and consulting firm specializing in energy and environmental issues, including electric generation, transmission and distribution system reliability, ratemaking and rate design, electric industry restructuring and market power, electricity market prices, stranded costs, efficiency, renewable energy, environmental quality, and nuclear power.

Synapse's clients include state consumer advocates, public utilities commission staff, attorneys general, environmental organizations, federal government agencies, and utilities.

Q Please summarize your work experience and educational background.

A At Synapse, I conduct economic analysis and write testimony and publications that focus on a variety of issues related to electric utilities. These issues include power plant economics, electric system dispatch, integrated resource planning, environmental compliance technologies and strategies, and valuation of distributed energy resources. I have submitted expert testimony before state utility regulators in more than a dozen states.

In the course of my work, I develop in-house models and perform analysis using industry-standard electricity power system models. I am proficient in the use of spreadsheet analysis tools, as well as optimization and electric dispatch models. I

have directly run EnCompass and PLEXOS and have reviewed inputs and outputs for several other models.

Before joining Synapse, I worked at Rocky Mountain Institute, focusing on a wide range of energy and electricity issues. I have a master's degree in public policy and a master's degree in environmental science from the University of Michigan, as well as a bachelor's degree in environmental studies from Middlebury College. I have more than 10 years of professional experience as a consultant, researcher, and analyst. A copy of my current resume is attached as Glick Direct Exhibit 1.

Q On whose behalf are you testifying in this case?

A I am testifying on behalf of the Environmental Intervenors.

Q Have you testified previously before the Iowa Utilities Board?

A No. But I did write an expert report that the Environmental Intervenors filed in docket SPU-2021-0003.

Q What is the purpose of your testimony in this proceeding?

A In this proceeding, I review MidAmerican Energy Company's (MidAmerican or the Company) goal in designing the Wind PRIME portfolio. I evaluate the reasonableness and sufficiency of the Company's overall resource addition analysis that the Company used to select the Wind PRIME portfolio. I provide an overview of standard best practices in resource planning and procurement that utilities use in evaluating a reasonable, cost-effective portfolio of resource additions within the context of their existing generation fleets. I review the assertions that MidAmerican made about the benefits of Wind PRIME and the impacts MidAmerican assumes the resource additions will have on its existing

generation. I also discuss MidAmerican's proposal to study carbon capture and sequestration (CCS), small modular nuclear reactors (SMR) and battery storage and place the cost of the studies into rates. Finally, I provide my recommendations to the Iowa Utilities Board (Board).

Q How is your testimony structured?

A In Section 1, I summarize my findings and recommendations for the Board.

In Section 2, I summarize MidAmerican's application and proposed advanced ratemaking principles for the Wind PRIME project.

In Section 3, I explain the Company's process for designing the Wind PRIME project. I review the analysis that MidAmerican presented to support its Wind PRIME application. I explain how the Company's analytical methodology deviates from best practices typically used by utilities when planning for or procuring resource additions. Then I present Synapse's analysis—filed in SPU-2021-0003—as an example of the type of resource addition mix MidAmerican might have identified as reasonable and cost-effective had it employed standard quantitative utility resource expansion planning modeling methodologies. This analysis, though limited by the lack of access to MidAmerican-specific data such as load, indicates that Iowa ratepayers may be better served by a combination of solar PV, battery storage, wind, and retirement of its existing coal plants.

In Section 4, I summarize assertions that MidAmerican made about the Wind PRIME project, discuss concerning assumptions the Company relied on in its modeling, and outline my overall concerns with the Company's application and its assumption that [redacted] throughout the study period.

In Section 5, I explain why MidAmerican should not be allowed to pursue the CCS, SMR, and battery storage studies and put the study costs into rates.

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

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

1. FINDINGS AND RECOMMENDATIONS

Q Please summarize your findings.

A My primary findings are:

1. MidAmerican designed the Wind PRIME project to maximize tax credits and market revenues for MidAmerican, not to ensure reasonable and prudent system costs for Iowa ratepayers. In other words, MidAmerican approached Wind PRIME as an independent power producer or a merchant generator would, rather than a utility with an obligation to serve, and reduce risk, for ratepayers.

2. MidAmerican did not develop its proposal to build 2,042 MW of new wind generation and 50 MW of new solar photovoltaics (PV), and then to [redacted], by assessing its system needs or using industry-standard energy modeling. This modeling would have helped to assess the most reasonable and cost-effective portfolio for meeting its customers energy and capacity needs. Instead, MidAmerican developed its proposal based on which resources could come online in time to capture expiring tax credits and justified its proposal after-the-fact with an incomplete analysis that evaluates Wind PRIME from a limited energy revenue maximization perspective. This analysis omits critical quantitative components, including quantification of avoidable fixed and capital costs for existing and new generation, an evaluation of meeting

long-term resource adequacy to ensure system reliability, and the value of resource diversity.

3. MidAmerican expects Wind PRIME to [redacted]. This will [redacted] the plants' revenue and economics, while also increasing fixed and sustaining capital costs associated with those units due to increased unit cycling. Nonetheless, MidAmerican's modeling shows it plans [redacted]. Because Wind PRIME relies on [redacted], this docket offers the Board an opportunity to review the reasonableness of MidAmerican's assumption that it will [redacted] continue to pass the associated cost on to ratepayers.

4. MidAmerican's proposal to build a wind-coal resource system does not meet the purpose of improving resource diversity and ensuring a reliable and resilient grid. MidAmerican should have evaluated whether other more diverse portfolios of renewable resource additions would more reasonably and cost-effectively meet system needs.

5. MidAmerican asserts that one of the primary justifications for the Wind PRIME project is customer demand for carbon-free electricity. Wind PRIME is projected to [redacted], thereby reducing MidAmerican's total carbon emissions; but the same would be true of any alternative portfolio of renewable projects that reduces utilization of existing fossil resources. An alternative portfolio that includes storage and greater amounts of solar PV would better position MidAmerican for even greater reductions in carbon emissions by supplying clean firm capacity that allows for the retirement of Company's existing coal fleet.

6. While immediately adding 2,000 MW of wind may represent a reasonable and cost-effective addition for meeting MidAmerican's system needs. MidAmerican has not yet provided the quantitative analysis needed to demonstrate this.

7. Synapse's study in SPU-2021-0003, the generation planning docket, demonstrates the type of analysis utilities typically use to evaluate resource addition decisions. This study's results suggest that

MidAmerican could dramatically improve the benefit-cost ratio of Wind PRIME by immediately adding more energy efficiency, solar PV and battery storage to its system and retiring some of its existing legacy power plants.

8. MidAmerican's request that its ratepayers pay for it to investigate CCS at Walter Scott Energy Center Unit 4 and Louisa, as well as SMRs, is risky for customers. As far as I am aware, it is not the kind of expenditure that any public utilities commission in the nation has pre-approved.

Q Please summarize your recommendations.

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

1. The Board should require MidAmerican to update its application with resource capacity expansion planning modeling, using Aurora or EnCompass, to evaluate whether Wind PRIME represents a cost-effective and reasonable set of resource additions for meeting MidAmerican's system needs. The modeling must explicitly allow for retirement of coal plants, if so indicated by the economic analysis. Using the same methodology, MidAmerican should evaluate whether the Wind PRIME portfolio should be modified by allowing the model to select a cost-effective mix of additional solar, storage, solar-battery hybrids, efficiency, demand response, and retirement of thermal generation.

2. The Board should deny MidAmerican's request for approval of the Technology Study Costs ratemaking principle and specifically not allow MidAmerican to place the cost of the CCS and SMR studies into rate base and thus earn a rate of return on the cost of the studies.

2. SUMMARY OF MIDAMERICAN'S PROPOSED RESOURCE ADDITIONS AND HOW THOSE ADDITIONS IMPACT ITS SYSTEM.

Q What is MidAmerican proposing in this docket?

A MidAmerican is seeking approval for advanced ratemaking principles (Application) for the Wind PRIME project (Wind PRIME or the Project). The

Company's application has many elements, but at the core it seeks pre-approval for 2,042 MW of new wind generation capacity and 50 MW of new solar PV generation capacity. The Company also seeks approval for the costs to conduct a Technology Study of CCS, energy storage, and SMRs, regardless of whether it decides to move forward with construction of any of these technologies.

Because the Company is only seeking pre-approval for the proposed wind and solar PV resources, MidAmerican asserts that Wind PRIME won't impact customer rates until a later date when it does seek approval to place the assets into rate base. But the Company acknowledges that the Project does put customers at risk if electricity market prices are lower than forecasted, or if the project does not operate as expected.[1]

Q What does MidAmerican's existing resource portfolio look like?

A MidAmerican relies on fossil resources and wind for the majority of its capacity and generation, as shown in Table 1 and Figure 1.[2] Specifically, the Company owns six coal units, Neal North, Neal South, Water Scott 3, Walter Scott 4, Louisa, and Ottumwa, that provide a total of 2,698 MW of generation capacity The Company also has 1,300 MW natural gas and oil resources, 456 MW of nuclear in the Company's share of Quad City, 6,833 MW of wind generation, and 44 MW of solar PV. Of this installed capacity, [redacted] are considered accreditable (Table 2), which is the term used in MISO for firm capacity after accounting for forced outage rates and intermittency. Coal accounts for [redacted]

[1] MidAmerican Witness Specketer, pages 39-40.
[2] EI Glick Direct Exhibit 29 – Confidential and EI Glick Direct Exhibit 28 - Confidential (using MidAmerican Hammer Direct Exhibit 2 – CONFIDENTIAL)

MW of firm capacity, gas for [redacted] MW, oil for [redacted] MW, nuclear for [redacted] MW, wind for [redacted] MW, solar for [redacted] MW, and other resources for [redacted] MW.[3]

Table 1. MidAmerican resource table 2020

Resource Type	Installed Capacity Summer (MW)
Conventional Steam Coal	2,698
Natural Gas Fired Generators	1,375
Petroleum Liquids	56
Nuclear	455
Onshore Wind Turbine	6833
Battery Storage	1
Solar PV	44
Conventional Hydroelectric	3
Total	**11,464**

Source: U.S. Energy Information Administration Form EIA-860, 2020.[4]

Table 2. CONFIDENTIAL MidAmerican accreditable capacity, end of year 2022

Resource Type	Accreditable Capacity (MW)
Coal	[redacted]
Gas	[redacted]
Oil	[redacted]
Nuclear	[redacted]
Wind	[redacted]
Solar PV	[redacted]
Conventional Hydroelectric	[redacted]
Biogas	[redacted]
Total	[redacted]

Source: Confidential Direct Testimony of Company Witness Hammer, Table 2, Page 11.

[3] Hammer Direct Testimony, Table 2, page 11.

[4] EI Glick Direct Exhibit 29 – Confidential.

Figure 1. CONFIDENTIAL MidAmerican installed capacity by resource, 2021–2022

Source: EI Glick Direct Exhibit 28 - Confidential (Calculated based on Facebook, Google DR 4b, attachment "DR 04b Confidential ICAP UCAP.xlsx.", attached as Glick Direct Exhibit 3).

Figure 2. CONFIDENTIAL MidAmerican projected generation 2022

Source: EI Glick Direct Exhibit 26 – Confidential (Calculated based on Facebook, Google DR 61a, attachment "Tech Customer DR 61a - Confidential Attachment Net System Benefit", attached as Glick Direct Exhibit 4).

Q How does MidAmerican meet its internal energy load?

A MidAmerican meets its internal load through a combination of its fossil resources, nuclear generation, wind resources, and market imports, as shown in Figure 3 below. Without Wind PRIME, the Company is projected to remain a net energy exporter through the early 2030s.

Figure 3. CONFIDENTIAL MidAmerican generation and load, reference case without Wind PRIME

Source: EI Glick Direct Exhibit 26 - Confidential (Calculated using Glick Direct Exhibit 4, Direct Response to Tech Customer 61a, Confidential Attachment "Net System Benefit.")

Q What resources is MidAmerican proposing to add as part of Wind PRIME?

A MidAmerican is proposing to add 2,042 MW of new wind generation and 50 MW of solar PV (nameplate). Otherwise, [redacted][5]

[5] See, for example, Glick Direct Exhibit 5, MidAmerican Response to Tech Data Request-12 Confidential Attachment "Wind Prime Reference Price"; Glick Direct Exhibit 6, MidAmerican Response to Environmental Intervenors Data Request 25; Guyer Direct Exhibit 2, MidAmerican Response to IBEC Data Request 1 with Confidential Attachment.

Q What will MidAmerican's system look like after the addition of the proposed Wind PRIME project?

A With the proposed Wind PRIME project shown in Figure 4, the Company is expected to increase to both increase its export of wind energy and [redacted].

Figure 4. CONFIDENTIAL MidAmerican generation and load, Reference Case with Wind PRIME

Source: EI Glick Direct Exhibit 26 - Confidential (Calculated using Glick Direct Exhibit 4, Direct Response to Tech Customer 61a, Confidential Attachment "Net System Benefit.").

Figure 5. CONFIDENTIAL MidAmerican generation and load, Reference Gas No Carbon Adder Case With Wind Prime

Source: EI Glick Direct Exhibit 27 - Confidential (Calculated using Glick Direct Exhibit 5, Direct Response to Tech Customer 12, Confidential Attachment "Reference Gas No Carbon Sensitivity")

3. MIDAMERICAN DID NOT USE STANDARD UTILITY PRACTICES TO SELECT OR EVALUATE WHETHER THE WIND PRIME PORTFOLIO IS COST-EFFECTIVE COMPARED TO OTHER SUPPLY OPTIONS, AS SYNAPSE DID TO SUPPORT ITS ANALYSIS IN DOCKET SPU-2021-0003, SO IT CANNOT BE DETERMINED FROM MIDAMERICAN'S APPLICATION WHETHER WIND PRIME SHOULD BE APPROVED.

i. MidAmerican relied on a piecemeal and insufficient five-part modeling process to justify the project, with all analysis conducted after the Wind PRIME portfolio had been selected.

Q MidAmerican presents many pieces of analysis in its application. Did any of the analysis it presents precede the development of the Wind PRIME portfolio?

A No. MidAmerican Company witnesses Hammer and Specketer describe at least half a dozen pieces of analysis and evaluation frameworks that they claim justifies

the Wind PRIME project. But the reality is that the Company selected the Wind PRIME resource portfolio totally outside of any analytical process, then conducted half a dozen analytical exercises that the Company claims justifies the decision (and filled hundreds of pages of testimony and dozens of workpapers detailing these after-the-fact analyses). The Company presents zero pieces of analysis in its application that preceded the development of the Wind PRIME portfolio.

Q Describe the process that MidAmerican used to select Wind PRIME and calculate the purported net benefits associated with the project.

A The Company does not clearly explain its process in any single place. For the sake of clarity, I have assigned numbers to each step and will explain how the pieces of the Company's analysis fit together. First, I will summarize the whole process and then explain each step in detail.

First, as step (1), MidAmerican selected the quantity of wind and solar PV in the Wind PRIME portfolio based on which resources were far along in the MISO interconnection queue. Next, in step (2) the Company took this predetermined quantity of solar PV and wind and modeled the entire Eastern Interconnect with and without Wind PRIME solely to develop a 20-year electricity market price forecast. In step (3) MidAmerican then fed the market price forecast into a highly engineered, four-part (i-iv) piecemeal analysis to calculate the net energy revenue impacts to the Company from Wind PRIME. Next, in step (4), the Company calculated the stand-alone revenue requirement of the Wind PRIME project. Finally, in step (5) the Company calculated a present value, levelized "total net system benefits" from the Project, inclusive of the PTC, ITC, capacity credits, and net system benefits to determine the total impact of the Project on customers.

Q Explain step (1), the selection process MidAmerican used to determine the quantity of wind and solar PV to include in Wind PRIME.

A MidAmerican appears to have approached this project with the goal of building wind and solar PV to capture expiring tax credits and maximize energy market revenues. The Company started out by assessing the quantity of solar PV and wind that was currently far enough along in the interconnection queue to be brought online in time to capture the investment tax credit (ITC) and production tax credit (PTC).[6] Wind can operate at a higher capacity factor than solar PV, and in turn earn higher energy market revenues; therefore, it is not surprising that MidAmerican relied more heavily on wind than solar PV for Wind PRIME.

Q Is this a reasonable approach for a regulated monopoly utility with captive ratepayers?

A No. It might be reasonable for a merchant generation developer to focus on maximizing energy market revenues and monetizing tax credits; but it is not reasonable for an investor-owned utility that has been granted a monopoly for directly serving ratepayers. Such a utility has an obligation to meet short- and long-term resource planning and resource adequacy needs at reasonable cost. MidAmerican's approach leaves out consideration of short- and long-term resource planning goals, costs, and ratepayer impacts. The most concerning of those neglected considerations are the avoidable fixed costs associated with maintaining the Company's existing coal plants.

[6] Glick Direct Exhibit 7, MidAmerican Response to OCA Data Request 14.

Q Explain how MidAmerican developed the energy market prices it used in step (2) of its analysis.

A MidAmerican used Aurora to model the entire Eastern Interconnect with and without Wind PRIME to develop market price forecasts. The Company developed market prices for three difference scenarios: (1) Reference case, which includes a carbon dioxide (CO_2) price dispatch adder; (2) a Reference Case No-CO_2 price forecast sensitivity, and (3) a low-gas and no-CO_2 price forecast.[7] These market price forecasts were used as an input into the next stage of analysis and can be found in Hammer Confidential Exhibit 3.[8,9]

Q Explain the four-part revenue modeling that the Company carried out in step (3) of the analysis.

A The revenue modeling MidAmerican conducted next had one narrow purpose: to calculate the change in market costs and revenues MidAmerican expects to see with Wind PRIME added to its system. This analysis was not intended to capture, and indeed did not capture, the change in MidAmerican's total system costs, change in total revenue requirement, or ratepayer impact of the Wind PRIME project.

MidAmerican carried out its revenue modeling in four distinct parts (i-iv), rather than as one integrated analysis (as outlined in detail below). The first two steps (i) and (ii) measured the decrease in market revenue expected at MidAmerican's

[7] Hammer Direct Testimony, pages 60-61.

[8] Hammer Exhibit 3 has annual market prices for the three scenarios with and three without Wind PRIME. Glick Direct Exhibit 8, MidAmerican response to Tech Customers DR 60c – Confidential Attachment Hourly Electric Prices has the hourly market prices for the three scenarios with and without Wind PRIME.

[9] Glick Direct Exhibit 9, MidAmerican Response to Environmental Intervenors Data Request 34.

existing generation with the addition of Wind PRIME. This decrease in revenue is expected because the addition of Wind PRIME (an increase in energy supply) leads to an overall decrease in market energy prices received by existing generation. The third step (iii) measured the decrease in costs MidAmerican will pay to buy energy from the market to serve MidAmerican's load—that is, the net difference between buying and selling all of its energy into and from MISO, with and without Wind PRIME. The final step (iv) measured market revenue from the Wind PRIME resources. Specifically:

i. Decrease in revenue for existing thermal generation: Starting with the energy market price forecasts[10] developed in the step (2) MidAmerican again used the Aurora model to develop hourly unit output (MWh), production cost, and revenue forecasts for its existing fossil units with and without Wind PRIME.[11] The difference between the cases with and without Wind PRIME was said to reflect the impact of Wind PRIME (and lower market prices) on revenue earned by the Company's existing fossil generators.[12]

ii. Decrease in revenue for existing wind and solar generation: MidAmerican used the calculated off-peak market prices[13] with and without Wind PRIME from step (2) and applied them to the forecasted

[10] Glick Direct Exhibit 8, MidAmerican response to Tech Customers DR 60c – Confidential Attachment Hourly Electric Prices.

[11] Glick Direct Exhibit 5, MidAmerican response to Tech DR 12 Confidential Attachments "Wind Prime Reference Price" and "Reference Price".

[12] Hammer Direct Testimony, pages 65-66.

[13] Glick Direct Exhibit 8, MidAmerican response to Tech Customers DR 60c – Confidential Attachment Hourly Electric Prices.

annual energy production (MWh) of its existing wind farms,[14] plus an adjustment factor, to estimate the expected revenue stream for its existing wind farms.[15] For existing solar PV, MidAmerican applied hourly electricity market prices[16] with and without Wind PRIME from step (2) to hourly forecasted solar generation (MWh). The difference between the cases with and without Wind PRIME was said to reflect the impact of Wind PRIME (and lower market prices) on revenue earned by the Company's existing solar PV[17] and wind. These calculations were done outside of Aurora.[18]

iii. Decrease in cost to serve MidAmerican load: MidAmerican calculated the cost to serve its retail load with and without Wind PRIME by applying the calculated market prices[19] from step (2) to MidAmerican's hourly retail energy requirement (MWh) with and without the Project. The cost to serve its internal load will change because MidAmerican sells all of the energy it generates into MISO

[14] Glick Direct Exhibit 5, MidAmerican response to Tech DR 12 Confidential Attachments "Wind Prime Reference Price" and "Reference Price".

[15] As stated on page 68 of the Direct Testimony of Company Witness Hammer, the adjustment factor is intended to account for the "effects of day-ahead / real-time energy market forecast uncertainty in MISO settlements of revenue, differences in zonal congestion where wind farms are located at various locations across the MidAmerican system, on-peak/off-peak price effects, and the seasonality of on-peak/off-peak price effects on annual wind revenues."

[16] Glick Direct Exhibit 8, MidAmerican response to Tech Customers DR 60c – Confidential Attachment Hourly Electric Prices.

[17] Glick Direct Exhibit 5, MidAmerican response to Tech DR 12 Confidential Attachments "Wind Prime Reference Price" and "Reference Price".

[18] Hammer Direct Testimony, page 66.

[19] Glick Direct Exhibit 8, MidAmerican response to Tech Customers DR 60c – Confidential Attachment Hourly Electric Prices.

and then buys back from MISO all the energy it needs to meet all of its customers' energy needs. Because Wind PRIME results in lower hourly electricity market prices, MidAmerican can meet its internal load at a lower cost with Wind PRIME than without it.[20] These calculations were done outside of Aurora.[21]

iv. New Wind PRIME energy market revenues: MidAmerican calculated new Wind PRIME solar revenues by applying its forecasted hourly electricity market prices[22] to hourly forecasted solar energy production.[23] The Company calculated wind revenues using two different methodologies: [redacted].[24,25]

The reduction in market revenues expected from existing generation (i) and (ii) was netted out from the sum of the additional revenue expected from Wind PRIME (iv) and the reduction in load costs (iii) to find the expected net revenue impact of Wind PRIME. The equation below summarizes this step.

[20] Glick Direct Exhibit 10, MidAmerican response to IBEC DR 22 – Confidential Attachment Load Cost Wind PRIME All Scenarios.
[21] Hammer Direct Testimony, page 66.
[22] Glick Direct Exhibit 8, MidAmerican response to Tech Customers DR 60c – Confidential Attachment Hourly Electric Prices.
[23] Hammer Direct Exhibit 1 Confidential.
[24] Hammer Direct Testimony, page 67.
[25] Hammer Direct Exhibit 1 Confidential.

Net expected revenue from Wind PRIME = *Revenue from Wind PRIME projects + reduction in load cost – reduced market revenue from existing generation*

Q Explain the stand-alone revenue requirement calculations the Company completed in step (4) of the analysis.

A The revenue requirement for Wind PRIME represents the cost that customers would normally be responsible for in electric rates. This value is calculated for each year of the Project's life and expressed as a levelized present value ($/kWh). The revenue requirement includes a return on capital costs, the projected fixed and variable operating costs, depreciation, and requirement income taxes. This is a stand-alone revenue requirement and does not include the PTC, ITC, or other capacity credits and benefits.[26]

Q Explain the total net system benefits analysis the Company completed as step (5) of the analysis.

A For the final step of the analysis, the Company calculated a present value, levelized "total net system benefits" from the Project. This includes all costs to customers, including the stand-alone revenue requirement, and all benefits, including the PTC, ITC, capacity credits, and net system benefits. Each component is expressed as a levelized present value, and then converted to $/kWh.[27]

[26] Direct Testimony of Company Witness Specketer, pages 19-20.
[27] *Id*, page 20.

Q How do the nine planning criteria that Company Witness Hammer introduces on page 2 of his direct testimony fit into the Company's net benefit analysis?

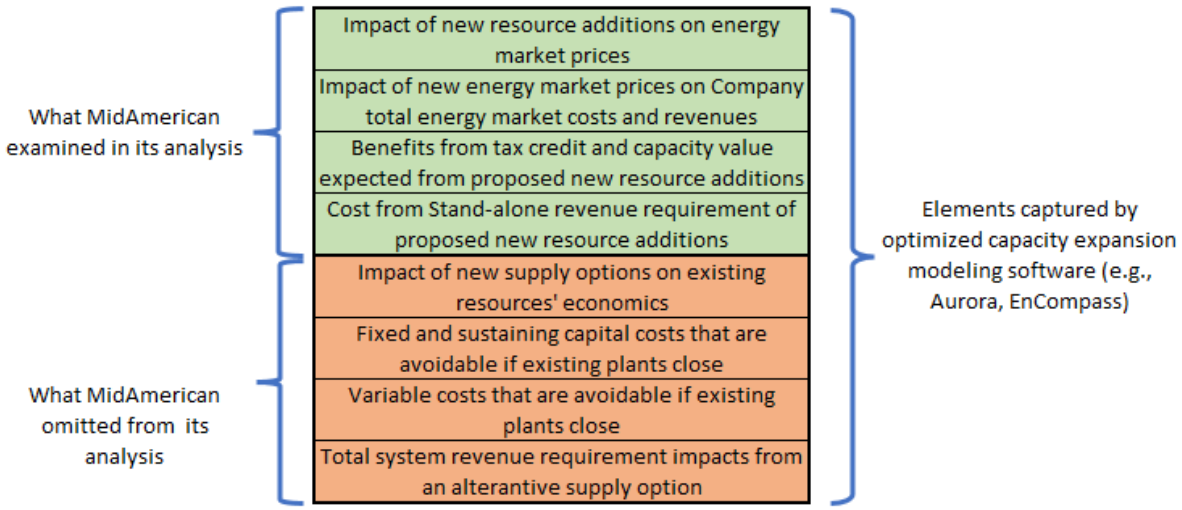
A They do not. The nine-step analytical process described in Mr. Hammer's Direct Testimony is entirely qualitative. These criteria were also used to justify the Project after the fact and do not feed into the net benefits analysis.

Q Do you have any concerns with quantitative analysis described above?

A Yes. I am concerned that MidAmerican is taking a myopic view that focuses on maximizing short-term market revenues, and not on developing a low cost, reliable system for ratepayers over the long term. The Company's analysis submitted as part of this case intended to answer the question, *what is the change in the Company's market revenue with Wind PRIME* rather than, *is Wind PRIME a reasonable and cost-effective set of resource supply additions to meet MidAmerican's long-term electric supply needs.*

The Company's application was missing critical pieces of analysis that should have been conducted prior to the project's selection, and the analysis that the Company did conduct after the fact had flaws that limits its utility. In Figure 6 below I compare the costs and benefits that MidAmerican examined in its analysis with costs and benefits evaluated by standard utility modeling that are critically missing from MidAmerican's modeling and net benefit analysis.

Figure 6. Costs and benefits to consider when evaluating new supply options



Q Does MidAmerican's analysis demonstrate that Wind PRIME is a reasonable cost portfolio?

A No. If MidAmerican wanted to demonstrate that Wind PRIME was a reasonable cost option, it would have included in its application modeling of the utility's entire system both with and without the proposed resource additions and it would have allowed the model to select a cost-effective supply portfolio that can supply the energy and capacity the system needs. If the Company found that the proposed Project has a lower revenue requirement than other optimized portfolios, while meeting all other system needs and goals and under reasonable assumptions about future conditions, then the Company could conclude that it is likely prudent to proceed with the Project. But the Company conducted no such analysis to

compare Wind PRIME to other resource alternatives or evaluate the feasibility of other supply options.[28]

But MidAmerican's analysis was not intended to evaluate reasonable portfolios of resource additions that could serve its Iowa ratepayers, and in fact, the Company never claimed that this portfolio represented an optimal portfolio for Iowa ratepayers. MidAmerican claimed that it is not required to find the reasonable portfolio under Iowa law or to show that Wind PRIME is "superior in every regard to any other alternative in order to receive ratemaking principles from the Iowa utility Board."

Q Iowa repealed its integrated resource plan (IRP) statute. Does that mean MidAmerican does not have to demonstrate that its proposed resource additions are cost-effective compared to alternatives?

A No, it is not reasonable for MidAmerican to ignore standard utility planning practices, and to focus purely on maximizing energy revenues rather than on ensuring its system reasonably meets customers' energy and capacity needs. MidAmerican may not be required to publish an IRP, but it is still a rate-regulated utility granted a regulated monopoly over a service territory. As such, it continues to have an obligation to provide electricity at reasonable rates. MidAmerican must show that its proposed additions are reasonable[29]—which suggests that, at the very least, the costs and benefits should be compared to at least one other

[28] See, for example, Glick Direct Exhibit 11, MidAmerican Response to Environmental Intervenors Data Request 13.a.ii; Glick Direct Exhibit 12, MidAmerican Response to Environmental Intervenors Data Request 22; Glick Direct Exhibit 7, MidAmerican Response to OCA Data Request 13; Glick Direct Exhibit 16, MidAmerican Response to Environmental Intervenors Data Request 43.

[29] *Id*.

reasonable set of potential resource additions using standard utility modeling tools discussed below. MidAmerican has carried out no such analysis.

Because the Company is not required to submit an IRP, absent a change in state law, a new resource addition is the only chance the Board has to request system modeling from the utility to ensure the reasonableness of MidAmerican's resource mix. It is not unreasonable for the Board to expect this. In Texas, for example, utilities are not required to submit IRPs, but it is still common practice for utilities to provide resource planning modeling as part of their applications for new resources. Entergy Texas, for example, recently filed for approval of a new Gas Plant in Orange County, Texas. Even though there were shortcomings in the Company's analysis, it did at least test multiple portfolios before deciding on the proposed gas plant.[30]

ii. Standard utility practice for evaluating new supply options involve the use of economic modeling, competitive procurement, and evaluation of multiple scenario and sensitivities.

Q Explain how MidAmerican's analysis differs from standard utility practice used throughout the industry.

A MidAmerican's modeling methodology deviates from standard utility practice in three ways: (1) it does not utilize capacity expansion and production cost modeling that incorporates all system costs and revenues; (2) it does not include an all-source request for proposal or information (RFP or RFI) to ensure new resource costs are accurately modeled; and (3) it does not examine alternative portfolios.

[30] Public Utility Commission of Texas Docket No. 52487.

Q Explain your concerns with the lack of capacity expansion modeling.

A Optimized capacity expansion modeling tools, such as EnCompass and Aurora, allow utilities to examine tradeoffs between potential supply additions to ensure selected portfolios are able to meet load requirement. The utility inputs key data on (1) the cost and operational constraints of a utility's existing resource portfolio, (2) its system needs, including load, firm capacity, and other grid services, and (3) the cost and operational characteristics of new resource options. The model then outputs an optimal resource mix, comprised of new and existing resources, that can meet the required system needs at the lowest cost. The utility can test sensitivities, such as lower or high gas prices, and develop entirely new scenarios that test, for example, different resource options or compliance with specific company goals or environmental regulations.

Q Does capacity expansion modeling address system reliability?

A Yes, optimized capacity expansion models are designed to develop portfolios that meet resource adequacy needs. This means that under a reasonable range of assumptions about the future, the model will build a portfolio that can reliably provide the energy, capacity, and grid services that a utility needs to meet customer demand with a reasonable reserve margin.

Neither Witness Specketer nor Witness Hammer's testimony included any evaluation of system reliability or long-term resource adequacy. Hammer spends several pages discussing reliability but does not provide any compelling evidence that Wind PRIME benefits system reliability. The only support he provides for keeping the existing coal plants online is the statement "existing and new

dispatchable resources will continue to be an important part of the resource mix."[31]

Q Do other Berkshire Hathaway rate-regulated monopoly utilities use capacity expansion modeling to demonstrate the reasonableness of proposed resource additions?

A Yes. Optimized capacity expansion modeling is the foundation of resource planning throughout the utility industry. MidAmerican has the technical capability to do this through Aurora modeling, and other Berkshire Hathaway companies do so on a routine basis. Pacificorp, for example, which is the largest grid owner/operator in the West and serves approximately 20 percent more customers than MidAmerican,[32] uses optimized capacity expansion modeling to develop a preferred portfolio every two years in its IRP process.[33] As part of that process, Pacificorp also examines the implications of alternative portfolios, which examine "a wide range of potential coal retirement dates, options to convert to gas or to retrofit for carbon capture utilization and sequestration for certain coal units, and other planning uncertainties."

Berkshire Hathaway's Nevada Energy, which has about 20 percent fewer customers than MidAmerican, likewise includes optimized modeling to deliver the lowest-cost, least-risk plan for serving customers.[34] Even Northern

[31] Direct Testimony of Hammer, page 38.

[32] Berkshire Hathaway. "Our Business". Accessed July 28, 2022. Accessible at https://brkenergy.com/our-businesses/.

[33] Pacificorp. "2021 integrated Resource Plan Update". March 31, 2022. Accessible at https://www.pacificorp.com/content/dam/pcorp/documents/en/pacificorp/energy/integrated-resource-plan/2021_IRP_Update.pdf.

[34] Nevada Power Company. "Application seeking approval to add 1,001 MW of renewable power purchase agreements and 100 MW of energy storage capacity, among

Powergrid—through which Berkshire Hathaway serves 3.9 million homes in Europe—has studied and published seven scenarios describing future energy pathways considered as part of its business planning process.[35]

Q Is it possible that MidAmerican has conducted traditional resource planning modeling but just not provided it to intervenors or the Board?

A Yes. In its privilege log provided as a supplemental response to Environmental Intervenors IR 20(c), as a result of the Board's order in response to Environmental Intervenors' Motion to Compel, MidAmerican describes studies that may have included the kind of analysis that I believe was required to support MidAmerican's application in this docket.[36] Because parties and the Board do not have access to those studies, there is no way to know whether those studies support MidAmerican's proposed resource additions.

Q Explain your concern with MidAmerican's selection of resources from the MISO queue and failure to issue an RFP or RFI to test market conditions.

A As I explained above, MidAmerican selected the Wind PRIME additions by looking at resources in the MISO queue and determining which projects to propose purchasing based on their historical experience with wind projects.[37] The

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other items, as part of their joint 2019-2038 integrated resource plan". Accessible at https://www.nvenergy.com/publish/content/dam/nvenergy/brochures_arch/about-nvenergy/rates-regulatory/recent-regulatory-filings/nve/irp/NVE-18-06003-IRP-VOL4.pdf#:~.

[35] Northern Powergrid. "Annex 4.1 Scenarios and Investment Planning". 2022. Accessible at https://ed2plan.northernpowergrid.com/sites/default/files/document-library/Scenarios_and_investment_planning.pdf.

[36] Glick Direct Exhibit 14.

[37] Glick Direct Exhibit 7, MidAmerican Response to OCA Data Request 14.

Company did not issue an all-source RFP or RFI to test the market and determine what developer or projects were available.[38]

Without an RFP or RFI, or any other market or resource cost information, MidAmerican has no real data on what the market might be able to provide, and at what cost. Real, accurate resource cost data is a critical input to evaluating resource portfolios. While there are national databases for resource cost forecasts, such as the National Renewable Energy Laboratory's *Advanced Technology Baseline*,[39] Lazard *Levelized Cost of Energy* studies,[40] or private industry databases, many utilities will also "test the market" to ascertain the reasonableness of their cost assumptions, and whether there are factors unique to their location and circumstances that impact cost.

These RFP processes, when done properly, can sometimes have surprising results. For example, a utility planning department may assume that utility-scale solar-storage hybrids are not technically mature or economically available; but when the utility issues an all-source RFP, they may get thousands of megawatts of hybrids offered at low cost. This was the case with Northern Indiana Public Service Company when it issued an RFP in 2020.[41]

Another downside of foregoing all-source RFPs is the lack of oversight and transparency. Specifically, with an all-source RFP, utilities often retain

[38] Glick Direct Exhibit 11, MidAmerican Response to Environmental Intervenors Data Request 13a.iv.

[39] National Renewable Energy Laboratory, Annual Technology Baseline Report. Accessible at https://atb.nrel.gov/.

[40] Lazard's Levelized Cost of Energy Analysis. Accessible at https://www.lazard.com/perspective/levelized-cost-of-energy-levelized-cost-of-storage-and-levelized-cost-of-hydrogen/.

[41] "NIPSCO's 2019 Request for Proposals Results," Charles River Associates. February 18, 2020. Accessed at https://www.nipsco.com/docs/librariesprovider11/rates-and-tariffs/irp/post-submission-documents/nipsco-request-for-proposal-results.pdf?sfvrsn=2

independent monitors to make sure the selection process occurs fairly. In this case, there was almost no oversight over resource selection. RFPs often are also open to power purchase agreements, which often can save ratepayers substantial amounts of money.

Q Explain your concern with the lack of scenario and portfolio evaluation.

A MidAmerican only considered a single resource portfolio and none of the analysis it provided supported the portfolio's selection over other feasible alternative sources of supply.[42] The Company also conducted no studies on how different supply options would interact on its system, and the relative benefits of combining resource with different characteristics (such as wind and solar PV).

This once again means that the Company provided no assurance that Wind PRIME is a reasonable alternative and can better meet system energy and firm capacity needs compared to other long-term sources of supply that included consideration of a more diverse resource portfolio and retirement of existing fossil resources. An affirmative board decision also affirms the Company's selection of a resource portfolio that builds out energy resources (such as Wind PRIME) without also building out firm capacity resources that will enable the retirement of its aging coal fleet.

[42] See, for example, Glick Direct Exhibit 11, MidAmerican Response to Environmental Intervenors Data Request 13.a.ii; Glick Direct Exhibit 12, MidAmerican Response to Environmental Intervenors Data Request 22; Glick Direct Exhibit 7, MidAmerican Response to OCA Data Request 14; Glick Direct Exhibit 13, MidAmerican Response to Environmental Intervenors Data Request 43.

Q Do you have any other concerns with the modeling MidAmerican performed?

A Yes. MISO has announced that it is moving to a seasonal capacity construct where resources are assigned a separate capacity value for the summer and winter. This was not reflected in MidAmerican's modeling. Additionally, the extension of the Quad City nuclear unit beyond 2032 was announced recently and is not reflected in MidAmerican's modeling.[43]

iii. Synapse's fleet analysis modeling signals at a high level that use of standard utility quantitative modeling practices might have led MidAmerican to propose a different and far more cost-effective set of resource additions.

Q Explain the modeling that Synapse conducted for docket SPU-2021-0003.

A Synapse conducted optimized capacity expansion and production cost modeling with multiple scenarios and sensitivities, attached as Glick Direct Exhibit 2, Synapse Report. This is the type of modeling we expected MidAmerican would do in this docket, and it was, in fact, what the Board requested in SPU-2021-0003.

Q What modeling tools did you use?

A We used the EnCompass capacity optimization and dispatch model, developed by Anchor Power Solutions, for our modeling. EnCompass was released in 2016 and numerous major utilities have transitioned to the model since that time. Those utilities include Xcel Energy (Colorado, Minnesota, and New Mexico), Minnesota Power, Otter Tail Power, Public Service Company of New Mexico, Duke Energy, and Tennessee Valley Authority, among others.

[43] Glick Direct Exhibit 15, MidAmerican Response to Environmental Intervenors Data Request 46.

Q Explain how you set up the model.

A We modeled the load for the entire state of Iowa because MidAmerican did not provide load data for its system in the SPU-2021-0003 docket. The purpose of our analysis was to (a) evaluate the cost to retire MidAmerican's coal fleet by 2030 and replace the energy and capacity with renewables, battery storage, and energy efficiency, and (b) determine whether retiring and replacing MidAmerican's coal fleet with clean energy is a lower-cost option for Iowa ratepayers than continuing to operate the plants through their currently planned retirement dates.[44]

Our results show a representative clean energy portfolio that is cost-effective for the region. Because the only change we made to the system was removal of MidAmerican's coal plants, the Synapse modeling results provide a reasonable representation of cost-effective resource additions for the region.

Q Please summarize the results of Synapse's modeling.

A Using the EnCompass capacity expansion model, we found that retiring MidAmerican's coal fleet by 2030 and replacing it with a combination of renewables (2,060 MW of solar PV and 2,000 MW of wind), battery storage (740 MW), and energy efficiency would reduce Iowa regional costs $1.2 billion over the next two decades compared to MidAmerican's current plans to operate its coal fleet indefinitely. Unlike in the Wind PRIME portfolio, where the Company is focusing almost exclusively on wind, the Synapse analysis found that a diverse portfolio with low or zero marginal cost solar PV and wind, as well as firm battery storage and energy efficiency, would be the lowest cost option for MidAmerican's system.[45]

[44] Glick Direct Exhibit 2, Glick, D. et al., A Clean Energy Future for MidAmerican and Iowa. Synapse Energy Economics, December 15, 2021.
[45] *Id*.

The cost savings we found in the clean energy scenario relative to the business-as-usual scenario were driven by reduced fuel costs, reduced fixed costs, and reduced capital costs required to maintain the coal units (costs which are all sizable for aging coal plants). These cost savings more than offset the decrease in export revenues and increase in power purchase agreement costs for new renewables we found in the clean energy scenario relative to the business-as-usual scenario.

Q Explain the simplifying assumptions you made and why.

A MidAmerican did not provide company-specific data regarding its generating assets or its system as a whole, so we had to rely on public data for the majority of our inputs. We used public data filed by MidAmerican on its FERC Form 1 where available. We carefully scrutinized our public inputs to ensure they were robust and representative of MidAmerican's system and resources.

We also modeled MISO Zone 3, which includes the entire state of Iowa, rather than just MidAmerican's footprint because this was the closest topology for which we had load data. Once again, the Company did not provide data on load (annual or hourly) or peak demand for its footprint as part of docket SPU-2021-0003, and there was no public data available from MidAmerican on projected load and peak demand because the Company does not publish resource plans. We extrapolated our results down to MidAmerican from the state of Iowa.

Q Explain how Synapse's modeling would need to be updated based on MidAmerican's Wind PRIME portfolio.

A To evaluate whether Wind PRIME constitutes a cost-effective set of resource additions for customers, we would need to update the topology to reflect just MidAmerican's load and footprint, add the wind and solar PV in the Wind PRIME project to the model, and update any unit-specific cost and operational assumptions for the Company's existing resources. This is the modeling

MidAmerican should have conducted in order to support its proposed resource additions in this docket.

4. MIDAMERICAN INCLUDES IN ITS APPLICATION A SERIES OF CONCERNING CLAIMS, RELIES ON ASSUMPTIONS IN ITS MODELING THAT ARE NOT SUFFICIENTLY EXPLAINED AND JUSTIFIED, AND DOES NOT ADDRESS CRITICAL CONCERNS AND SHORTCOMINGS OF THE PROPOSED SUPPLY MIX.

i. MidAmerican made a series of claims about the benefits of the Wind PRIME project as part of its application that are concerning and misleading.

Q Please summarize the claims that MidAmerican made in its testimony that you find concerning.

A The claims are summarized as follows. I will address them one at a time below.

1. Wind PRIME will allow MidAmerican to serve 111 percent of customer energy needs with renewables. This will allow MidAmerican to meet its historic 100 percent renewable energy vision.[46]
2. Wind PRIME will result in decreased revenue from existing thermal generators (mainly the Company's coal units), which will be offset by lower production costs.[47] Wind PRIME will also reduce dependence on fossil fuels, the transportation of those fuels, and customer exposure to more price-volatile fuels and potential fuel transportation costs.[48]

[46] Direct testimony of Witness Brown, page 3.
[47] Direct testimony of Witness Hammer, page 66.
[48] Direct testimony of Witness Hammer, page 25.

3. Wind PRIME will reduce the carbon intensity of MidAmerican's operations.[49]
4. Wind PRIME offers continued "positioning for compliance with current and future environmental regulations" including providing "assistance with potential limits on greenhouse gas ("GHG") emissions from existing fossil-fueled electric generating resources."[50]
5. Wind PRIME should be approved now because (a) it is not economically viable without the benefit of PTCs,[51] (b) now is the "final opportunity" for customers to capture benefits of the PTC and ITC,[52] and (c) "it is very uncertain" whether Congress will extend the PTC again.[53]
6. Wind PRIME will enhance fuel and resource diversity.

Q Respond to the claim that Wind PRIME will allow MidAmerican to serve 111 percent of customer energy needs with renewables, fulfilling its historic 100 percent renewable energy vision.[54]

A It may be technically correct that Wind PRIME will enable MidAmerican to generate the equivalent of 111 percent of its retail customers' annual energy needs with renewables, but MidAmerican cannot meet 100 percent of its round-the-clock customer demand with renewables.[55] To meet demand, during some hours in the day MidAmerican will still rely on its existing fossil units or else buy

[49] Direct testimony of Witness Brown, page 19.
[50] Direct testimony of Witness Hammer, page 23.
[51] Direct Testimony of Witness Specketer, page 11.
[52] Direct Testimony of Witness Brown, page 5
[53] *Id*, page 26.
[54] *Id*, page 3.
[55] Glick Direct Exhibit 16, MidAmerican Response to Environmental Intervenors Data Request 67.

electricity from the market. And depending on the scenario, [redacted] percent to [redacted] of the generation MidAmerican plans to sell to MISO from 2022 to 2040 will still be from its fossil units, [redacted] of which will be coal.[56] To ignore this fossil generation and herald the arrival of a historic, "100 percent-renewable" milestone is an obvious, deliberate misrepresentation of the fact that MidAmerican is continuing to rely on its coal capacity for a [redacted] portion of its customers capacity and energy needs.

Q Respond to MidAmerican's claim that Wind PRIME will result in decreased revenue at the Company's existing fossil generators (mainly its coal units), which will be offset by lower production costs,[57] and that the Project will reduce dependence on fossil fuels, the transportation of those fuels, and customer exposure to more price-volatile fuels and potential fuel transportation costs.[58]

A It is true that Wind PRIME will reduce the number of megawatt-hours generated by fossil fuels and therefore reduce exposure to fuel costs and associated fuel transportation costs. That is a good thing. But the same would be true of any other renewable or really any other carbon-free resource MidAmerican adds to its system and reduces market prices. And reducing output from MidAmerican's coal plants does not reduce the units' marginal costs; it just proportionally reduces the variable fuel and variable operations and maintenance costs incurred. These claims just distract from the fact that, while MidAmerican may decrease how

[56] Glick Direct Exhibit 5, MidAmerican Response to Tech Data Request 12 with Confidential Attachments "Wind Prime Reference Gas No Carbon Sensitivity" and "Wind Prime Reference Price"; EI Glick Direct Exhibit 27 – Confidential.

[57] Direct testimony of Witness Hammer, page 66.

[58] *Id*, page 25.

much it uses its coal plants, it [redacted].[59]

As discussed above, Wind PRIME is projected to increase the supply of energy, which will decrease market prices.[60] Lower market prices will drive down the capacity factor of thermal generation. MidAmerican's modeling shows this effect as [redacted]. Figure 7 below shows the reference case without Wind PRIME, where the coal plants are assumed to [redacted]. In contrast, Figure 8 below shows [redacted] as soon as Wind PRIME comes online.

[59] See, for Example, Glick Direct Exhibit 5, MidAmerican Response to Tech Data Request-12 Confidential Attachment "Wind Prime Reference Price"; Glick Direct Exhibit 6, MidAmerican Response to Environmental Intervenors Data Request 25; Guyer Direct Exhibit 2, MidAmerican Response to IBEC Data Request 1, IBEC DR 1 Confidential Attachment.

[60] Glick Direct Exhibit 17, MidAmerican Response to Environmental Intervenors Data Request 10; Glick Direct Exhibit 18, MidAmerican Response to Tech Customers Data Request 20.

Figure 7. CONFIDENTIAL Reference case, carbon adder, no Wind PRIME

Source: Glick Direct Ex. 5, MidAmerican Response to Tech Data Request 12, Confidential Attachment "Wind Prime Reference Price."

Figure 8. CONFIDENTIAL Reference case, carbon adder, with Wind PRIME

Source: Glick Direct Ex. 5, MidAmerican Response to Tech Data Request 12, Confidential Attachment "Wind Prime Reference Price."

Witness Hammer acknowledges that Wind PRIME will result in less revenue for coal units[61]—which reduces the monies available to cover fixed costs and sustaining capital costs. What he fails to acknowledge is what it means for the plants' short- and long-term economics. MidAmerican analysis shows that [redacted].[62] But the fixed and sustaining capital costs necessary to maintain the plants will remain the same, if not increase, as the plants' utilization falls and cycling increases. And these fixed and sustaining capital costs, which are substantial for aging coal plants, are all avoidable if the coal plants retire. Yet these avoidable costs are absent from MidAmerican's analysis.

As discussed above, there are other resources, notably battery storage, that can also meet capacity and reliability standards, and at a lower cost. But MidAmerican failed to consider any alternatives and instead is relying on declining market revenues to cover increasing and avoidable fixed and variable unit costs with which ratepayers will be saddled.

Q Respond to the claim that Wind PRIME will reduce the carbon intensity of MidAmerican's system.

A This claim is misleading and attributes to Wind PRIME a reduction in CO_2 emissions[63] that may or may not materialize and is largely driven by factors independent of the Project.

As discussed above, MidAmerican assumes that [redacted] during the study period. Wind PRIME is expected to decrease market prices which in turn reduces the

[61] Direct testimony of Witness Hammer, page 66.

[62] Glick Direct Exhibit 5, MidAmerican response to Tech DR-12 Confidential Attachment "Wind Prime Reference Price".

[63] Glick Direct Exhibit 19, MidAmerican response to Confidential Tech DR 6a

generation, and associated emissions, from the Company's coal fleet. But if MidAmerican had [redacted], the avoidable emissions attributed to Wind PRIME, as proposed, would be much lower.

The Company's modeling shows that it expects Wind PRIME to reduce locational marginal prices (LMP) in Iowa, and thus generation from MidAmerican's coal plants. Effectively, MidAmerican attributes much of the emissions reduction of Wind PRIME to the displacement of its own coal plants. But if those coal plants were removed from the reference case (i.e. without Wind PRIME) because they were uneconomic (even in the absence of Wind PRIME), then Wind PRIME would have – in MidAmerican's assessment – a much smaller carbon emissions reduction benefit.

Q Would Wind PRIME, or really any clean energy projects, still have a carbon emission benefit even if MidAmerican were to retire its coal plants economically?

A Yes. In the near term, new clean energy displaces existing marginal fossil generation, and may lead to other fossil generation phasing out because the opportunity for energy market revenue falls. These benefits may occur on MidAmerican's system, or elsewhere in MISO. Over the long term, new clean energy may preclude new fossil generation, or compete with new renewables elsewhere. But as discussed elsewhere in testimony, there are also risks to locking in a resource mix that may not match system needs.

Q Respond to the claim that Wind Prime offers continued "positioning for compliance with current and future environmental regulations" including

providing "assistance with potential limits on greenhouse gas ("GHG") emissions from existing fossil-fueled electric generating resources."[64]

A Wind PRIME would indeed make it easier to comply with some environmental regulations, particularly those that limit GHG emissions, when compared to a fossil fuel alternative. But the same could be said of any clean energy portfolio. And any cost-effective portfolio with a combination of firm battery storage and carbon-free solar PV and wind would better enable the retirement of MidAmerican's coal plants. Such a portfolio would better position MidAmerican for compliance with environmental regulations by providing both energy and capacity. As discussed above, because MidAmerican did not assess capacity benefits in its Aurora analysis, [redacted].

Additionally, and perhaps more importantly, Wind PRIME does not lessen the potential financial impact of current or future environmental regulations on coal plants. MidAmerican's coal plants will be obligated to comply with all future environmental regulations, regardless of whether Wind PRIME is approved. And with that, the Company's (and ratepayers) obligation to pay sustaining capital expenditures relating to environmental compliance will continue to apply. Indeed, if Wind PRIME [redacted],[65] the cost per MWh of environmental compliance will increase for MidAmerican's coal units.

[64] Direct testimony of Witness Hammer, page 23.

[65] Glick Direct Exhibit 5, MidAmerican Response to Tech DR 12 Confidential Attachment "Wind Prime Reference Price".

Q Respond to the claim that Wind PRIME should be approved now because (a) it is not economically viable without the benefit of PTCs,[66] (b) now is the "final opportunity" for customers to capture benefits of the PTC and ITC,[67] and (c) "it is very uncertain" whether Congress will extend the PTC again.[68]

A I applaud MidAmerican's desire and effort to build clean energy generation that takes advantage of cost-reducing incentives. But adding a massive quantity of wind to a system that relies on aging fossil resources for nearly all its firm capacity does not ensure a transition to a sustainable future. MidAmerican should match its resource additions to facilitate this transition.

MidAmerican knows very well that now is not the last moment to develop wind and solar. As Witness Hammer testifies, "Wind-based generation is mature, economically viable, and in sufficient supply in Iowa to satisfy the needs of MidAmerican and its customers."[69] As he further notes, "Wind and solar generation compare favorably with more traditional forms of generation (i.e., largely coal-, oil- and natural gas-fueled generation) particularly when evaluated in terms of future variability in fuel-related costs and more stringent carbon and other emissions policies."[70] Witness Brown reinforces the point that renewable energy is the direction of the future.[71] These elements will not change if the wind and solar tax credits expire.

It's true that without the PTC, Wind PRIME as it currently stands may no longer be economically viable. But the implication that moving forward with Wind PRIME is automatically the least-cost and therefore best scenario for ratepayers is

[66] Direct Testimony of Witness Specketer, page 11.
[67] Direct Testimony of Witness Brown, page 5
[68] *Id*, page 26.
[69] Direct Testimony of Witness Hammer, page 59.
[70] *Id*, page 33.
[71] Direct Testimony of Witness Brown, pages 6-7.

unsupported. A full evaluation of what MidAmerican's system needs, and what is a reasonable cost manner to meet those needs, is required. Otherwise, MidAmerican will end up with a surplus of wind generation, but minimal new firm capacity required to retire its existing coal plants and meet its capacity obligations.

Furthermore, with the support of Democratic Senator Joe Manchin, Senate Democrats recently unveiled a budget reconciliation bill that modifies and extends tax credits for wind, solar, geothermal, and energy storage.[72] The bill has wide support, and at the time of writing this testimony is expected to be considered by the Senate the first week of August. Such a bill, if signed into law, has profound implications for renewable energy economics nationwide.

Q Respond to the claim that Wind PRIME enhances fuel and resource diversity.

A The Company's claims around increased fuel diversity are framed around MISO's entire footprint, not MidAmerican's footprint.[73] MISO Zone 3, which encompasses MidAmerican's footprint and most of the state of Iowa, and MidAmerican service territory itself, already has a high penetration of wind resources. The state of Iowa is second to only Texas in total nameplate capacity of wind installed (as of the end of 2020)[74] and wind accounted for the majority of

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

[73] Direct Testimony of Company Witness Hammer, page 10.

[74] *Id*, page 26.

electric generation by MidAmerican over the past few years.[75] Adding more wind will therefore not increase resource diversity but instead further concentrate it in wind resources. While it is true that additional wind and solar generation reduce dependence on coal-fired generation, this is not the same thing as resource diversity.[76] And the Company never sufficiently justifies its decision to include so little solar in the Wind PRIME portfolio.[77]

If MidAmerican was serious about resource diversity, it would be considering more solar PV, energy efficiency, battery storage, and other firm peaking resources. A diverse resource portfolio can better meet system needs and also increase system reliability. The combination of wind and solar, for example, decreases the probability of not serving load during periods of high risk.[78]

Q What else is noteworthy about Texas' current wind and solar portfolio?

A While Texas leads the nation in installed wind, two years ago it had just 2,700 MW of utility-scale solar PV resources.[79] This summer, Texas has more than 11,000 MW of utility-scale solar PV resources in place,[80] allowing it to weather extreme temperatures in significant part due to the true diversity of its wind-plus-

[75] See, e.g., MidAmerican Energy Company. "MidAmerican renewable energy mix exceeded 88% in 2021." 2022. Accessible at: https://www.midamericanenergy.com/newsroom/2022-88-pct-renewable-energy#:~

[76] Direct Testimony of Company Witness Hammer, pages 42-43.

[77] Glick Direct Exhibit 23, MidAmerican Response to Environmental Intervenors Data Request 28.

[78] Direct Testimony of Company Witness Hammer, page 25.

[79] ERCOT, "Solar One-Pager, June 2020." Accessible at https://www.ercot.com/files/docs/2020/06/18/Solar_One_Pager_June_2020_.pdf.

[80] Seasonal Assessment of Resource Adequacy for the ERCOT Region (SARA) Summer 2022, May 16, 2022. Accessible at: https://www.ercot.com/files/docs/2022/05/16/SARA_Summer2022.xlsx.

solar resource base. Wind and solar are complementary resources in summer peaking regions such as Texas and Iowa. Wind production patterns usually show declining output during midday, as solar production steadily increases, and increasing output during the later afternoon and evening, as solar output declines towards and after sunset. MidAmerican's Wind PRIME portfolio, at just 50 MW of solar PV, exhibits a wind: solar installed capacity ratio of roughly 40:1. Texas currently has a utility-scale wind-to-solar diversity ratio of just over 3-to-1.81. If MidAmerican were truly interested in developing a diverse portfolio of resources, it would likely involve wind-to-solar ratios closer to 3-to-1 than 40-to-1.

ii. MidAmerican relies on several assumptions in its modeling that have outstanding impacts on the results.

Q Given that MidAmerican did not quantitatively evaluate whether the Wind PRIME projects are reasonable additions from a reliability standpoint, do you agree with MidAmerican's assumptions about [redacted] to integrate its wind generation?

A No. MidAmerican assumed without justification in its net revenue analysis (presented in Specketer Confidential Exhibit 4) that [redacted].[82] MidAmerican does not need [redacted] and conducted no analysis to evaluate how much firm capacity it actually needs and whether it can obtain that capacity from other resources at a lower cost. The Company wasn't transparent in its testimony that it relied on the

[81] ERCOT, Seasonal Assessment of Resource Adequacy, May 16, 2022. Installed wind (nameplate) is 35,194 MW. Installed solar PV (utility-scale) is 11,342 MW. 35,194/11,342=3.1
https://www.ercot.com/files/docs/2022/05/16/SARA_Summer2022.xlsx

[82] Glick Direct Exhibit 5, MidAmerican response to Tech DR-12 Confidential Attachment "Wind Prime Reference Price".

assumption that [redacted]; the Company refused to answer questions about it in discovery until compelled to by the Board.

Coal plants, especially aging ones, have their own reliability challenges with unforced outage rates and maintenance needs that rise as the plants age. Additionally, steam units like coal do a poor job of ramping up and down quickly, which is what the system needs as the penetration of renewables increases. There are other resources, such as battery storage, which can provide capacity, reliability, and support intermittent renewables at a lower cost. Battery storage can ramp up and down quickly, does not rely on potentially volatile fuel costs, and does not have the high maintenance costs that come with an aging coal plant.

Q Respond to MidAmerican's use of a CO_2 price in its reference case, and the associated benefits this assumption attributes to Wind PRIME in the Company's analysis.

A The Company includes in its reference case a CO_2 price adder.[83] The Company then includes the costs of a CO_2 price in its analysis of the benefits of Wind PRIME. Putting aside the likelihood of federal carbon regulations, this is a prudent assumption because carbon adders are reasonable proxies for new environmental regulations or energy and financial policies that act to either increase the operating of carbon-emitting generation or reduce the cost of clean generation.[84] Carbon adders are used in utility commission cases elsewhere to account for this risk and also are considered in base cases elsewhere, for instance, in Minnesota. The fact that MidAmerican and many other utilities include the

[83] Direct Testimony of Company Witness Hammer, page 64.

[84] Specifically, while few US jurisdictions have imposed a direct price on carbon, regulations on other emissions and effluent, renewable portfolio standards, financial barriers to the deployment of new fossil infrastructure, and policies to accelerate clean energy have acted similarly to carbon prices, creating both operational and investment differentials between carbon-intensive resources and clean energy.

CO_2 adders in reference cases suggests that MidAmerica, and many other utilities, agree (or at least the Commissions agree) that it is a reasonably likely risk, that the imposition of other energy and environmental policies will continue to impose a notional cost on carbon.

While it is prudent for the Company to evaluate a reference case with a CO_2 price, it isn't reasonable to do so in the context of limited analysis that ignores the rest of MidAmerican's system and fails to evaluate the impact of such a price on the economics of alternative supply options.

Q How is MidAmerican's failure to assess the impacts of a carbon price on its existing fleet harmful to ratepayers in this case?

A As discussed above, the decrease in carbon intensity attributed to Wind PRIME is based on MidAmerican's assumption [redacted], and therefore will be displaced (if indirectly) by Wind PRIME. With the imposition of a carbon price, the amount of fossil generation displaced by Wind PRIME increases relative to a baseline without a carbon price. Similarly, a [redacted] of MidAmerican's assessment of net system benefits associated with Wind PRIME are based in the assumption that Wind PRIME will not only displace the Company's own coal plants, but in doing so will save the Company (and customers) tangible carbon costs. In fact, MidAmerican's calculations show that it is banking on over [redacted] (net present value, 2022-2041) in carbon price benefit to support Wind PRIME.[85]

And while it is reasonable to assess a CO_2 price on a going forward basis, and even attribute value to the imposition of a future CO_2 price, doing so myopically

[85] Author's calculation from Glick Direct Exhibit 4, Tech Customer DR 61a. Differential between CO2 emissions cost using Mr. Specketer's present value deflators (see Specketer Direct Exhibit 2 – Confidential, tab Analysis line 45).

is incorrect. The presence of a CO_2 price should itself drive the design of the Company's future system (i.e., what resources are built and retired), not just change the dispatch pattern and dispatch costs of a set portfolio. Put another way, if MidAmerican believes that there will be a carbon price (or other policies that will drive up the cost of coal plants) in the future, that assumption should also be driving which resource additions are selected in the first place, not just used to calculate the change in system dispatch and dispatch costs of a pre-chosen supply option assuming a CO_2 price is present. Failure to do so will lock ratepayers into a costly and suboptimal resource portfolio that does not meet long-term supply needs.

Figure 9 shows expected coal plant generation with and without the CO_2 price, and with and without Wind PRIME. [redacted]. Again, this is a reasonable expectation, given the likelihood of additional environmental compliance costs at those plants. [redacted]. The addition of both Wind PRIME and a CO_2 price [redacted]

Figure 9. CONFIDENTIAL MidAmerican coal generation across different scenarios

Source: EI Glick Direct Exhibit 27 – Confidential (Calculated from Glick Direct Exhibit 5, Direct Response to Tech Customer 12, Confidential Attachments "Reference Gas No Carbon Sensitivity", "Wind Prime Reference Gas No Carbon Sensitivity", "Reference Price", "Wind Prime Reference Price")

iii. MidAmerican does not sufficiently address critical shortcomings and challenges to the system that will result from the Wind PRIME project.

Q What will Wind PRIME actually do to MidAmerican's system?

A Wind PRIME will create a wind- and coal-heavy system that MidAmerican ratepayers will be locked into for the next few decades. Because ratepayers will potentially be responsible for $4 billion in capital costs for the Project,[86] it may sour customer appetite for pursuing the additional resources—mainly solar and storage—that will be needed to enable retirement of the coal generation. At the same time, MidAmerican's modeling shows that

[86] Direct Testimony of Company Witness Brown, page 3.

[redacted][87], while fixed and sustaining capital costs for these plants will likely increase. This means less energy market revenue to cover increasing costs.

Q Is Wind PRIME able to provide the firm capacity MidAmerican needs to retire its existing fossil resources?

A No, Wind PRIME itself cannot provide the firm capacity that MidAmerican will need to replace its coal fleet. But by investing so much in Wind PRIME, the Company risks precluding consideration of other supply options that could provide the firm capacity necessary to retire its costly and aging coal fleet.

Q Does a coal- and wind-heavy system improve the day-to-day flexibility of MidAmerican's system?

A No. While the coal plants may be dispatchable, they are not ideal for creating a flexible system that can integrate growing amounts of renewable energy on the system. Nuclear generation is the least flexible because it cannot ramp up or down to follow market prices. Coal plants are also inflexible: they require lengthy commitment periods to be brought online, and they exhibit relatively lower ramping rates[88] or dispatch maneuverability compared to other resources. Solar and wind can be curtailed in seconds, while battery storage can discharge in milliseconds.[89] MidAmerican's failure to consider more battery storage and solar

[87] EI Glick Direct Exhibit 30 - Confidential (Calculated based on MidAmerican Response to Tech Data Request 61a, Confidential Attachment Net System Benefits (Glick Direct Exhibit 4)).

[88] Glick Direct Exhibit 24, MidAmerican Response to Environmental Intervenors DR 31, Confidential Attachment.

[89] See, e.g., National Renewable Energy Laboratory. "Grid-scale Battery Storage." 2019. Accessible at https://www.nrel.gov/docs/fy19osti/74426.pdf; National Renewable Energy Laboratory. "Wind and Solar Energy Curtailment: Experience and Practices in the United States." 2014. Accessible at https://www.nrel.gov/docs/fy14osti/60983.pdf.

as part of the development of its application is therefore problematic from a flexibility and optionality standpoint.

Q How is Wind PRIME expected to impact the economics of MidAmerican's existing fossil units?

A The less the coal plants run, the higher the per-unit production cost associated with those coal plants, because the capital and fixed operations and maintenance costs need to be recovered through sales from fewer megawatt-hours of generation. This is not something accounted for in MidAmerican's analysis because [redacted]

MidAmerican's own modeling runs also reveal the costs associated with its plans [redacted]. As discussed above, a carbon adder or low market prices will drive down dispatch of MidAmerican's coal plants [redacted], further eroding their economics in the near future. It is very unlikely that plants running at [redacted] are recovering their fixed costs. These are costs ratepayers will be saddled with as long as MidAmerican continues to rely on its coal fleet with no plans for replacing its capacity.

Q How will this ultimately impact MidAmerican's ratepayers?

A It may make it harder to retire the coal plants. Coal plants are problematic in that they lock ratepayers into paying for stranded assets. These are assets that become liabilities, meaning they are uneconomic before their undepreciated balances have been paid off by ratepayers. This makes it challenging for utilities to retire coal plants and replace them with alternative resource options. A growing number of

coal plants in the United States have become uneconomic stranded assets,[90] which has led to conversations in public utilities around the country on how to remove those plants from service. The Company should be planning its resource supply additions with consideration of how well the projects position MidAmerican to retire uneconomic coal plants with [redacted] undepreciated balances[91] that are at risk of, or have already become, stranded assets. Prior wind advanced ratemaking principles approvals have operated to accelerate paying off the undepreciated balances on MidAmerican's coal plants.[92] Mr. Specketer's testimony shows that when Wind PRIME is added, the revenue sharing benefits to customers, which includes paying off the undepreciated balances on the coal units, are [redacted].[93] In other words, under MidAmerican's proposed revenue sharing principles in this proceeding, customers are at [redacted] risk that they will be stuck paying for MidAmerican's coal units after they are no longer economic sources of electricity and capacity.

Q What are your conclusions about the Wind PRIME project based on the materials and analysis MidAmerican included in its application?

A At this point in time, based on just MidAmerican's analysis and without the additional analysis I recommend above, it is unclear whether Wind PRIME represents a cost-effective portfolio of resource additions and whether it will actually drive a large reduction in CO_2 emissions.

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[90] See, e.g., Christian Fong, Sam Mardell. "Securitization in Action: How US States are shaping an Equitable Coal Transition." March 4, 2021. Accessible at https://rmi.org/securitization-in-action-how-us-states-are-shaping-an-equitable-coal-transition/; https://rmi.org/wp-content/uploads/2021/03/rmi_how_to_retire_early.pdf.

[91] Glick Direct Exhibit 25, MidAmerican Supplemental Response to Environmental Intervenors Data Request 35, and Schedule EI DR 35-Coal Unit Depreciation Schedule-(Confidential).

[92] *Id.*

[93] See Specketer Direct Confidential, at Confidential Table 9.

5. MIDAMERICAN SHOULD NOT PURSUE THE CCS, SMR, AND STORAGE STUDIES AND SHOULD NOT PLACE THE STUDY COSTS INTO RATES.

Q What is MidAmerican requesting regarding the Technology Study Costs?

A MidAmerican is requesting that the costs associated with studying CCS, SMRs, and battery storage be turned into a regulatory asset and rolled into rates, regardless of whether the Company decides to pursue any of these technologies.

Q Do you have any concerns with this request?

A Yes. First, CCS and SMRs are speculative and unnecessary. I am not aware of any other instances where CCS investigatory pilots have been preapproved for recovery from customers outside of Iowa (nor is the Company).[94] If MidAmerican wants to look at this, the Company should bear the risk—not its customers. If the Company studies the technologies and then decides not to move forward with them, those technologies do not meet the definition of used and useful and therefore should not be allowed to go into rates.

Q Please explain your specific concerns with CCS.

A I have a number of concerns with CCS. First, CCS is being used at only two plants in the United States and already has been shut down at one of the plants based on the cost.[95] Second, MidAmerican itself admits that it knows of no other

[94] Glick Direct Exhibit 22, MidAmerican Response to Environmental Intervenors Data Request 15.

[95] Groom, Nichola. "Problems plagued U.S. CO2 capture project before shutdown: document." Reuters, August 6, 2020. Accessed at https://www.reuters.com/article/us-usa-energy-carbon-capture/problems-plagued-u-s-co2-capture-project-before-shutdown-document-idUSKCN2523K8.

investor-owned utilities that have proposed to recover the costs associated with CCS pilots or with the installation of a CCS project at a coal-fired generation facility.[96] Third, the Company appears to have selected Walter Scott Unit 4 as the cite for the study without evaluating plant or project economics.[97]

Q Please explain your explicit concerns with battery storage studies.

A Battery storage is not a new and unexplored technology. There are over 4.6 GW of utility-scale battery storage projects installed on the U.S. electricity system as of the end of 2021,[98] and the quantity is projected to increase exponentially.[99]

Pacificorp alone, one of Berkshire Hathaway's other energy companies, has plans to build out 6,181 MW of storage resources. Through 2040, the company's 2021 IRP includes 4,781 MW of storage co-located with solar resources, 1,400 MW of standalone battery and 500 MW of pumped hydro. The Northern Indiana Public Service Company has three, four-hour duration battery projects that will come online by 2023, totaling 165 MW. Additionally, utilities are also contracting for long-duration battery projects, albeit at a smaller scale. Great River Energy in Minnesota, for example, recently announced that it has partnered with Form Energy to deploy a 1 MW pilot long-duration battery system that can dispatch energy for 150 hours.

[96] Glick Direct Exhibit 21, MidAmerican Response to Environmental Intervenors Request 14.

[97] Glick Direct Exhibit 14, MidAmerican Response to Environmental Intervenors Data Request 20.

[98] Battery systems on the U.S. power grid are increasingly used to respond to price, July 27, 2022. Accessed at https://www.eia.gov/todayinenergy/detail.php?id=53199, July 27, 2022.

[99] Large-scale battery storage cumulative power capacity, 2015-2023. Accessed at https://www.eia.gov/analysis/studies/electricity/batterystorage/images/figure_es4_2021.png.

There is no reason why MidAmerican should be studying battery storage as if it is an experimental technology. MidAmerican should be analyzing whether battery storage should be added to its portfolio now through capacity expansion modeling and issue an RFI or RFP to test the market.

Q Please re-state your recommendations.

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

1. The Board should require MidAmerican to update its application with resource capacity expansion planning modeling, using Aurora or EnCompass, to evaluate whether Wind PRIME represents a cost-effective and reasonable set of resource additions for meeting MidAmerican's system needs. The modeling must explicitly allow for retirement of coal plants, if so indicated by the economic analysis. Using the same methodology, MidAmerican should evaluate whether the Wind PRIME portfolio should be modified by allowing the model to select a cost-effective mix of additional solar, storage, solar-battery hybrids, efficiency, demand response, and retirement of thermal generation.

2. The Board should deny MidAmerican's request for approval of the Technology Study Costs ratemaking principle and specifically not allow MidAmerican to place the cost of the CCS and SMR studies into rate base and thus earn a rate of return on the cost of the studies.

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 29th day of July, 2022.

/s/ Elizabeth Prakel
Notary Public in and for the
State of Illinois