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Direct Testimony and Schedules
Bixuan Sun

Before the Minnesota Public Utilities Commission
State of Minnesota

In the Matter of the Petition of the City of Slayton for the Determination of Compensation for City Acquisition of Xcel Energy Electric Service Territory

MPUC Docket No. E002, PT-7157/SA-25-129
CAH Docket No. 22-2500-40870

Direct Testimony of Bixuan Sun

November 21, 2025

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Schedules

I. INTRODUCTION

Q. PLEASE STATE YOUR NAME AND OCCUPATION.

A. My name is Bixuan Sun. I am Director of Resource Planning and Bidding for Xcel Energy Services Inc., the service company for Xcel Energy Inc. and its operating company subsidiaries.

Q. PLEASE SUMMARIZE YOUR QUALIFICATIONS AND EXPERIENCE.

A. As Director of Resource Planning and Bidding, I am responsible for the development of resource plans and acquisitions for the five-state integrated Upper Midwest system. This includes assisting the Company in making reasonable and prudent acquisition decisions for electric generation resources. Prior to joining Xcel Energy, I was a post-doctoral researcher at the University of Minnesota. I received a Ph.D. in Applied Economics in 2018 from the University of Minnesota. My statement of qualifications is included as Exhibit___(BS-1), Schedule 1.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS PROCEEDING?

A. I provide testimony in support of Company witness Lisa R. Peterson's testimony on issues related to planning horizons for system planning and markets operated by the Midcontinent Independent System Operator (MISO).

Q. PLEASE PROVIDE A SUMMARY OF YOUR TESTIMONY.

A. First, I examine the various planning horizons that the Company uses for system planning and provide a recommendation on the appropriate planning

horizon to be used by Company witness Peterson in the lost revenue calculation. Second, I analyze whether fixed production costs are avoidable.

II. PLANNING HORIZONS

Q. HOW ARE THE PLANNING HORIZONS FOR XCEL ENERGY RELEVANT TO THIS CASE?

A. One of the factors in determining just compensation is lost revenues, which is explained in more detail by Company witness Peterson. The time period that a utility uses for planning is relevant to the time period that should be used to determine lost revenues.

Q. WHAT IS XCEL ENERGY'S PLANNING HORIZON?

A. The Company has several different planning horizons that are relevant. First, some of the Company's largest investments are in its generation resources. Generation resources are planned on long time horizons. As part of the process of planning for generation resources, the Commission requires the Company to file Integrated Resource Plans (IRP).[1]

Q. WHAT GENERATION PROJECTS ARE SELECTED AS PART OF THE COMMISSION'S IRP PROCESS?

A. In IRPs, the Commission provides direction on what generation resources Xcel Energy should obtain. Those resources include power plants like wind and solar

[1] Minn. R. 7843.0100, subp. 6 ("'Forecast period' means the first 15 calendar years following the year the proposed resource plan is filed.").

farms and traditional generators like natural gas power plants. The Commission also makes decisions related to the continuation of our nuclear power plants.

Q. WHAT IS THE TIME HORIZON FOR IRPS?

A. The time horizon for IRPs is related to the time period used for economic modeling of resource options. The core function of an IRP is using EnCompass, a sophisticated modeling software, to evaluate alternate resource plans with different parameters. The different alternatives, referred to as "runs," are used to determine the optimal resource mix for the future. The time horizon for these modeling runs is typically 30-years.

This 30-year modeling horizon is a regulatory requirement. Xcel Energy's generation fleet does not just serve customers in Minnesota, but also the entire Upper Midwest region which includes service territories in Minnesota, North Dakota, South Dakota, Wisconsin, and Michigan. The Public Service Commission of Wisconsin (PSCW) requires that capacity expansion modeling be conducted using a 30-year evaluation period.[2] Because Xcel Energy operates an integrated Upper Midwest system for resource planning, the PSCW's 30-year planning requirement applies to all states in the Upper Midwest region, including Minnesota.

Q. WHAT IS XCEL ENERGY'S PLANNING HORIZON RELATED TO GENERATION UNITS?

[2] Application Filing Requirements, Wisconsin Public Service Commission at 19, *available at* https://psc.wi.gov/Pages/ServiceType/Energy/FilingRequirements.aspx (accessed on November 10, 2025).

A. Xcel Energy's planning horizon for generation resources is at least 30 years for modeling purpose.

Q. WHAT IS THE PLANNING HORIZON FOR THE COMPANY'S DISTRIBUTION ASSETS?

A. Xcel Energy is required by Commission Order to file Integrated Distribution Plans (IDP) using a 10-year planning horizon and a 10-year Long-Term Plan.[3]

Q. WHAT IS THE PLANNING HORIZON FOR TRANSMISSION ASSETS?

A. The Company engages in long-term transmission system planning in accordance with MISO requirements and processes. MISO's Long-Range Transmission Planning (LRTP) process uses a 20-year time horizon to evaluate what transmission projects are needed to serve the region.[4]

Q. WHAT IS THE OVERALL SYSTEM-WIDE PLANNING HORIZON?

A. Our planning horizon for all components of the Xcel Energy generation, transmission and distribution system is between ten and thirty years. The Company's largest investments, which are in generation and transmission, have 20- to 30-year planning horizons.

III. PRODUCTION COSTS

Q. WHAT IS THE PURPOSE OF THIS SECTION OF YOUR TESTIMONY?

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[3] *In the Matter of Xcel Energy's 2023 Integrated Distribution Plan*, Docket No. E002/M-23-452, Minnesota Integrated Distribution Planning Requirements at 2 (Sept. 16, 2024).

[4] Future Planning Scenarios, MISO, www.misoenergy.org/planning/futures-development/ ("MISO can't predict the future, but it can make educated projections about what the electric system will look like in the coming years. To do that, MISO works with stakeholders to create forecasted scenarios which we call 'Futures.' . . . Futures capture a range of potential system conditions over a 20-year planning horizon").

A. As explained by Company witness Peterson, determining just compensation involves identifying the utility's lost revenues. Xcel Energy's methodology for determining lost revenues includes evaluating whether certain categories of expenses are avoidable, meaning that the lost revenue can be recovered in a different way. In this section of my Direct Testimony, I explain why fixed production costs are not avoidable.

Q. HOW DOES THE COMPANY SELECT RESOURCES THAT CONTRIBUTE TO PRODUCTION COSTS?

A. The generation resources that contribute to production costs are selected in IRPs, as I discussed above. At the time of an IRP, Xcel Energy develops plans based on the customers the Company is obligated to serve at that time and how the Company expects customer demands to change over time. In Xcel Energy's most recent IRP and every IRP the Company has filed with the Commission, Slayton was included as a customer because Slayton is located in the exclusive service territory assigned to Xcel Energy. Therefore, the IRP model runs and resulting resource plans include Slayton's demand and energy needs as part of the load forecast used to develop long-term generation plans.

Q. CAN THE COMPANY MODIFY OR GET RID OF ITS GENERATION RESOURCES WHEN CUSTOMERS EXIT THE SYSTEM?

A. No. As I discuss above, the Company conducts Integrated Resource Planning to identify the optimal set of generation resources to meet the needs of all customers, including Slayton customers. Once resources are selected, they are constructed by the Company or procured through long-term contracts with independent power producers.

Q. WHAT WOULD BE THE IMPACT ON FIXED PRODUCTION COSTS IF SLAYTON LEFT XCEL ENERGY'S SYSTEM?

A. The Company does not anticipate any changes to its generation portfolio, or any material impacts on fixed production cost. However, if Slayton customers leave Xcel Energy's system, there could be a cost impact on other customers because Slayton customers would no longer be paying their share of the fixed production costs or their share of long-term contracts with independent power producers.

Q. IF SLAYTON LEFT XCEL ENERGY'S SYSTEM, WOULD THE COMPANY HAVE ANY OTHER WAY TO RECOVER THE FIXED PRODUCTION COSTS ASSOCIATED WITH THE COMPANY'S GENERATION RESOURCES?

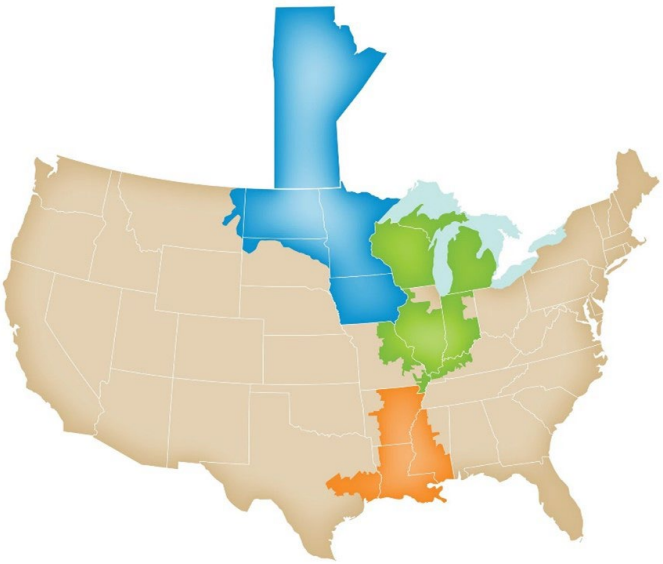
A. No. The only other potential source of revenue that could be used to recover the fixed production costs of Xcel Energy's generation resources is through the wholesale energy and capacity markets operated by MISO. I have analyzed the potential for additional MISO market sales revenue and conclude that the potential revenue would only offset a small fraction of the retail sales revenues lost from Slayton's departure. In other words, the potential MISO wholesale revenue will not recover Slayton's share of the Company's generation resource costs.

Q. WHAT IS MISO?

A. MISO is a regional transmission operator (RTO), meaning that MISO manages the energy grid in its region. MISO ensures that the right amount of electricity is generated to meet demand and manages the flow of electricity through the

transmission system. The MISO region includes 15 states and one Canadian province, as shown in Figure 1 below. MISO also operates several markets for electricity.

Figure 1
MISO Region[5]



Q. WHAT ARE THE MISO MARKETS?

A. MISO operates a variety of wholesale electricity markets including the day-ahead and real-time energy markets, the capacity market, and various ancillary services markets. In the capacity market, utilities and other load serving entities (LSE) bid their generation resources into the capacity market through MISO's annual Planning Resource Auction (PRA) typically held in late April of each year. Depending on the amount of capacity bids that clear the auction, and their

[5] Map from Federal Energy Regulatory Commission website: https://www.ferc.gov/participation-midcontinent-independent-system-operator-miso-processes.

relative capacity, utilities both pay and are paid based on the MISO auction clearing price.

The MISO energy and operating reserve market provides utilities and other LSEs with the ability to meet load and reserve requirements through buying or selling energy in the day-ahead or real-time market. Each day, registered MISO market participants submit offers to buy or sell energy in the day-ahead and real-time markets. The day-ahead market clears energy bids for each hour of the next operating day, based on hourly energy requirements established by MISO's forecasting models. The real-time market clears bids every five minutes during the operating day based on MISO's continuous assessment of real-time operating conditions. In addition to energy, MISO's ancillary services market includes several operating reserve products. These ancillary service help ensure reliability and address system flexibility needs.

Q. HOW MUCH DOES SLAYTON CONTRIBUTE TO XCEL ENERGY'S FIXED PRODUCTION COSTS?

A. Based on Company witness Peterson's calculation of lost revenues, customers in Slayton currently contribute approximately $700,000 related to fixed production costs.

Q. CAN THE COMPANY OBTAIN ADDITIONAL REVENUE FROM THE MISO MARKET IF SLAYTON EXITS THE SYSTEM?

A. The Company performed an analysis to determine whether additional revenue could be obtained from the MISO markets after Slayton leaves the NSP system. The Company concluded that potential MISO wholesale market revenue would

be marginal (if any) and would not offset the amount that Slayton customers currently contribute to fixed production costs through retail sales. This analysis is provided in Exhibit___(BS-1), Schedule 2.

Q. PLEASE DESCRIBE THE MISO MARKET ANALYSIS YOU PERFORMED.

A. The Company evaluated potential revenue from both MISO energy and capacity markets.

Q. HOW DID YOU ANALYZE POTENTIAL REVENUE FROM MISO ENERGY MARKETS?

A. The Company evaluated whether the energy (kilowatt-hour or kWh) consumed by Slayton customers would have resulted in MISO revenue from the energy market and determined that it would not. If Slayton customers leave the NSP system, the Company would most likely not operate generating units at the levels when Slayton was in the NSP system to sell their output into the MISO day-ahead or real-time energy market. Instead, the units would not be run as much and reduce their output rather than maintaining the level of output when Slayton's load is included in the NSP system. This is consistent with other assumptions made in the lost revenue calculation, described by Company witness Peterson. Specifically, I understand that the lost revenue calculation assumes that Slayton's exit would result in reduced fuel consumption – that assumption is based on the understanding that less fuel will be consumed because generating units would reduce their output due to the incremental decrease in customer load. The same assumption, when applied to fixed production costs, indicates that when Slayton leaves the NSP system, the Company's generation units would not be operated solely to sell their output to earn revenues from the MISO wholesale energy markets. If fuel costs are treated

as avoidable because plants will run less after Slayton exits the system, it must follow that those plants will not produce energy that could be sold into the MISO market.

Q. HOW DID YOU ANALYZE POTENTIAL REVENUE FROM MISO CAPACITY MARKETS?

A. The analysis combines the amount of billing units from Slayton customers since MISO planning year 2021/2022 with MISO PRA results over the same period (PY21/22 to PY25/26). The Company combined Slayton's demand billing units (kW) with the Company's net revenue from the MISO PRA results to estimate the amount of PRA net revenue attributable to Slayton based on their share of the Company's total planning reserve margin requirements (PRMR).

Q. WHAT WERE THE RESULTS OF THIS ANALYSIS?

A. The Company's calculations indicate that if Slayton's load had not been part of the NSP system beginning in the MISO 2021/2022 planning year, the Company could have received approximately **[PROTECTED DATA BEGINS PROTECTED DATA ENDS]** in net revenue from the annual MISO capacity auction over the five-year period covering MISO planning years 2021/2022 to 2025/2026. This is approximately **[PROTECTED DATA BEGINS PROTECTED DATA ENDS]** per planning year. These estimated net capacity auction revenues are negligible and do not appropriately compensate the Company for the lost retail sales revenues allocated to recovering fixed production costs, as described by Company witness Peterson.

Q. IS IT POSSIBLE TO PREDICT HOW MUCH REVENUE WILL BE INCREASED IN FUTURE YEARS?

A. No. The amounts can fluctuate significantly from year-to-year as shown in Exhibit___(BS-1), Schedule 2. The Company's analysis indicates that in the 2021/22 planning year, the Company would have received just **[PROTECTED DATA BEGINS PROTECTED DATA ENDS]** in net capacity auction revenue if Slayton's load had not been on the NSP system and could have received **[PROTECTED DATA BEGINS PROTECTED DATA ENDS]** in the next planning year due to auction clearing prices increasing from $5.00 per MW-day to $236.66 per MW-day the following year. There is no dependable method to accurately predict the amount of net capacity auction revenue that the Company could realize in any future planning year, as it is highly dependent on customer demands and the actions of other utilities across the entire MISO region. Finally, MISO implemented the Reliability-Based Demand Curve (RBDC) mechanism for the first time in the 2025/2026 planning year capacity auction. The RBDC influences the amount of capacity cleared during each season and also impacts each utilities' PRMR in a manner that cannot be known prior to the auction being held. The RBDC adds another layer of complexity and year-over-year volatility to the MISO capacity market that makes forecasting net auction revenue very difficult.

Q. IF MISO CAPACITY AUCTION REVENUES WERE TO INCREASE SIGNIFICANTLY IN THE FUTURE, WOULD IT OFFSET LOST REVENUES FROM SLAYTON CUSTOMERS?

A. No. The most recent capacity auction for the 2025/2026 planning year included an extremely high clearing price of $666.50 per MW-day during the summer season. Even given this extremely high auction clearing price, the net revenue

attributable to Slayton based on their share of NSP's total PRMR is estimated to be only **[PROTECTED DATA BEGINS PROTECTED DATA ENDS]**. This represents only approximately 2 percent of the lost revenues related to fixed production costs estimated by Company witness Peterson.[6]

The $666.50 auction clearing price was for the summer season only, and the clearing prices in other seasons will likely be much lower. However, even if the 2025/2026 capacity auction clearing price had been $666.50 per MW-day in every season, the share of NSP's net revenue allocated to Slayton is estimated to be approximately **[PROTECTED DATA BEGINS PROTECTED DATA ENDS]**, which is a small fraction of retail sales revenue collected to recover Slayton's share of fixed production costs.

The theoretical maximum clearing price for the 2025/2026 planning year is $1,399.67, four times the Cost of New Entry (CONE).[7] Even at this maximum point, the revenue from Slayton's share of NSP's total PRMR is only estimated to be approximately **[PROTECTED DATA BEGINS PROTECTED DATA ENDS]**. In other words, in order to offset the lost revenues related to fixed production costs of approximately $700,000, the clearing price would need to increase by more than 1000 percent above the highest theoretical maximum price.[8]

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[6] Revenue from Slayton's share of NSP's total PRMR would have been the highest in the 2022/2023 planning year, when the clearing price was set to $236.66 per MW-day for the entire planning year. Recent policy changes to the MISO resource adequacy construct included implementation of different clearing prices for each season and it is unlikely that a single clearing price will be set for an entire planning year.
[7] Cost of New Entry (CONE) represents the cost of building a new power plant.
[8] Historical clearing prices are included in Exhibit___(BS-1), Schedule 2.

Q. SHOULD SLAYTON BE EXCUSED FROM PAYING ITS SHARE OF THE COMPANY'S FIXED PRODUCTION COSTS BECAUSE ITS DEMAND AND ENERGY USAGE IS SMALL WHEN COMPARED TO THE REST OF THE COMPANY'S SYSTEM?

A. No. If Slayton leaves Xcel Energy's Upper Midwest system, fixed production costs incurred by the Company to serve the customers in Slayton will not be eliminated. If Slayton does not pay their share of these costs under retail electricity tariffs, these costs will be shifted to Xcel Energy's other retail customers. This would not be fair to Xcel Energy's other retail customers, even if the costs are relatively small on a system-wide basis.

IV. CONCLUSION

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes, it does.

Bixuan Sun, Ph.D.

bixuan.sun@xcelenergy.com
414 Nicollet Mall, 6th floor, Minneapolis, MN 55401

EXPERIENCE

Xcel Energy

Director of Resource Planning and Bidding Oct 2024 - Present

Responsible for developing and directing the systems, processes and personnel required to prepare effective and prudent long-term system plans for Xcel's Upper Midwest service territory. Also responsible for developing and directing the systems, processes and personnel required to conduct effective and fair power solicitation processes to procure needed power and energy to meet native load demand and energy requirements and achieve cost reductions in the Xcel supply portfolios.

Senior Resource Planning Analyst Sept 2023 – Oct 2024
Resource Planning Analyst II Aug 2022 – Sept 2023
Resource Planning Analyst I May 2020 – Aug 2022

Develop and model long-term resource expansion plans to meet electric system growth; perform generation expansion and production cost studies for resource solicitations and resource plan development.

University of Minnesota

Post-Doctoral Researcher October 2018 – May 2020

Collaborated with researchers at Harvard Kennedy School and University of Cambridge on research that examines driving factors of innovation in energy technologies. Published at top international academic journals.

Charles River Associates

Consultant April 2020 – May 2020

Developed and coded an optimization model in GAMS that computes the optimal dispatch schedules for energy storage resources participating in the wholesale electricity markets and evaluates the resulting revenue streams. Wrote a white paper on the model.

Hamline University
Adjunct Professor June 2019 – December 2019
Developed the instruction materials for the course "MSBA 8170 Advanced Statistics and Machine Learning I". Taught the course in the MS Business Analytics program at Hamline University, including giving weekly lectures and computer lab sessions.

EDUCATION

Ph.D. in Applied Economics, University of Minnesota
2018

M.S. in Applied Economics, University of Minnesota
2015

B.A. in Economics, University of Minnesota – Morris; Shanghai University
2013

SELECTED PUBLICATIONS

Kolesnikov, S., Goldstein, A. P., **Sun, B.**, Chan, G., Narayanamurti, V., & Anadon, L. D. (2024). A framework and methodology for analyzing technology spillover processes with an application in solar photovoltaics. Technovation, 134, 103048.

Sun, B., & Sankar, A. (2022). The changing effectiveness of financial incentives: Theory and evidence from residential solar rebate programs in California. Energy Policy, 162, 112804.

Sun, B., Kolesnikov, S., Goldstein, A., & Chan, G. (2021). A dynamic approach for identifying technological breakthroughs with an application in solar photovoltaics. Technological Forecasting and Social Change, 165, 120534.

Konidena, R., **Sun, B.**, & Bhandari, V. (2020). Missing discourse on microgrids–The importance of transmission and distribution infrastructure. The Electricity Journal, 33(4), 106727.

Sun, B., & Apland, J. (2019). Operational planning of public transit with economic and environmental goals: application to the Minneapolis–St. Paul bus system. Public Transport, 11(2), 237-267.

Sun, B., Eryilmaz, D., & Konidena, R. Transparency in Long-Term Electric Demand Forecast: A Perspective on Regional Load Forecasting. IEEE Smart Grid Newsletter, August 2019.

Sun, B. (2018). Heterogeneous direct rebound effect: Theory and evidence from the Energy Star program. Energy Economics, 69, 335-349.

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Table 1-1: NSP PRA Net Revenue & Slayton Allocation of Net Revenue

Line #	MISO Planning Year	MISO Season	MISO Season Dates	NSP PRMR (MW)	PRA ACP ($/MW-day)	Net PRA Revenue	Slayton Billed Demand (kW)	Slayton Share of PRMR (%)	Share of Net Revenue	Slayton Retail Revenue
				[PROTECTED DATA BEGINS						
1	PY21/22	Summer	6/1-8/31		$5.00			0.04%		
2	PY21/22	Fall	9/1-11/30		$5.00			0.04%		
3	PY21/22	Winter	12/1-2/28		$5.00			0.03%		
4	PY21/22	Spring	3/1-5/31		$5.00			0.03%		
5	**PY21/22**	**Total/Avg**						**0.04%**		
6	PY22/23	Summer	6/1-8/31		$236.66			0.04%		
7	PY22/23	Fall	9/1-11/30		$236.66			0.04%		
8	PY22/23	Winter	12/1-2/28		$236.66			0.03%		
9	PY22/23	Spring	3/1-5/31		$236.66			0.03%		
10	**PY22/23**	**Total/Avg**						**0.04%**		
11	PY23/24	Summer	6/1-8/31		$10.00			0.04%		
12	PY23/24	Fall	9/1-11/30		$15.00			0.04%		
13	PY23/24	Winter	12/1-2/28		$2.00			0.04%		
14	PY23/24	Spring	3/1-5/31		$10.00			0.04%		
15	**PY23/24**	**Total/Avg**						**0.04%**		
16	PY24/25	Summer	6/1-8/31		$30.00			0.04%		
17	PY24/25	Fall	9/1-11/30		$15.00			0.05%		
18	PY24/25	Winter	12/1-2/28		$0.75			0.04%		
19	PY24/25	Spring	3/1-5/31		$34.10			0.04%		
20	**PY24/25**	**Total/Avg**						**0.04%**		
21	PY25/26	Summer	6/1-8/31		$666.50			0.04%		
22	PY25/26	Fall	9/1-11/30		$91.60			*0.03%*		
23	PY25/26	Winter	12/1-2/28		$33.20			*0.04%*		
24	PY25/26	Spring	3/1-5/31		$69.88			*0.04%*		
25	**PY25/26**	**Total/Avg**						**0.04%**		
26	**PY21/22 to PY25/27**									

Table 1-2: Theoretical PY2025/2026 PRA Net Revenue with ACP of $66.50/MW-day in All Seasons

28	PY25/26	Summer	6/1-8/31		$666.50			0.04%		
29	PY25/26	Fall	9/1-11/30		$666.50			0.03%		
30	PY25/26	Winter	12/1-2/28		$666.50			0.04%		
31	PY25/26	Spring	3/1-5/31		$666.50			0.04%		
32	**PY25/26**	**Total/Avg**						**0.04%**		

Table 1-3: Theoretical 2025/2026 PRA Net Revenue with ACP at Seasonal Limit of 4x CONE

34	PY25/26	Summer	6/1-8/31		$1,399.67			0.04%		
35	PY25/26	Fall	9/1-11/30		$1,399.67			0.03%		
36	PY25/26	Winter	12/1-2/28		$1,399.67			0.04%		
37	PY25/26	Spring	3/1-5/31		$1,399.67			0.04%		
38	**PY25/26**	**Total/Avg**						**0.04%**		

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Notes

1) PY23/24 is the first year that MISO implementation seasonal capacity auction clearing prices (ACP) while PY21/22-PY22/23 have a single ACP applied to all seasons

2) PY25/26 NSP PRA net revenue includes MISO settlement adjustments issued in September 2025 afer an error was found in the auction software

3) Slayton billed demand (kW) and retail sales revenue values are based on actual historical data through July 31, 2025 while PY25/26 billed demand and share of net revenue are based on seasonal averages from PY21/22 to PY24/25

4) Slayton billed demand (kW) and retail sales revenue values for PY25/26 (fall, winter and spring) are based on seasonal averages from PY21/22 to PY24/25

5) PY25/26 Summary above includes MISO invoice adjustments issued in September 2025 (see rows 49-59 below)