Montana Public Service Commission
Docket No. 2024.05.053
Electric and Natural Gas Rate Review

DIRECT TESTIMONY

OF JONATHAN R. SHAFER

ON BEHALF OF NORTHWESTERN ENERGY

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<u>Witness Information</u>

Q. Please identify yourself, your employer, and your job title.

A. My name is Jonathan R. Shafer. I am Manager of System Innovation for NorthWestern Corporation d/b/a/ NorthWestern Energy's ("NorthWestern") Asset Management Innovation Department.

Q. Please provide a description of your relevant employment experience and other professional qualifications.

A. Management of the Montana Meter Upgrade Project ("Meter Project") has been one of my primary responsibilities for the last three years, including establishing contractual commitments, reviewing monthly budgets and forecasts, escalating project-related issues, assessing technical coverage commitments to ensure read rates were being met, and resolving challenges during project deployment. Prior to that, I managed the South Dakota Meter Upgrade Project for three years. My specific involvement included the development of the South Dakota meter upgrade Request for Proposals ("RFP") and performing the same duties as I currently perform related to the Montana Meter Project.

In addition to managing NorthWestern's meter upgrade projects, I have been a part of various NorthWestern project teams that include the LED Lighting

Project, Bozeman Solar Pilot Project, Beck Hill Microgrid, and Yellowstone National Park Microgrids.

I have a Bachelor's degree in Electrical Engineering from Montana State University in addition to a Master of Business Administration from the University of Montana, and I have been involved in renewable energy and utility technology for over 15 years.

Purpose of Testimony

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

A. The purpose of my testimony is to present an economic analysis of the expected benefits of Advanced Metering Infrastructure ("AMI") compared to the undepreciated investment of the existing metering infrastructure, specifically Automated Meter Reading ("AMR") as required by the Montana Public Service Commission ("Commission") in Final Order No. 7860y in NorthWestern's 2022 Montana Rate Review, Docket No. 2022.07.078. My testimony also discusses the reasoning for moving to AMI technology including the analysis of the benefits.

Technology Background

Q. How has NorthWestern's metering technology changed over time?

A. Over the course of time, NorthWestern's metering infrastructure has transitioned from manual meter reading using mechanical meters and natural gas meters with dials to AMR. AMR technology uses Radio Frequency ("RF") equipment called Encoder Receiver Transmitters ("ERT"), which can be read by a handheld device or a more powerful mobile reader installed in a vehicle, creating efficiencies in the meter reading process. This ERT technology was able to be retrofitted to existing mechanical meters and natural gas meters, fitting between the dials and the physical natural gas meters. Starting in 2000, manufacturers began integrating ERTs into digital electrical meters.

NorthWestern's predecessor, The Montana Power Company ("Montana Power"), began transitioning to the ERT technology in 1997. Since digital meters were not yet available, Montana Power made substantial investments to replace aging mechanical meters with new mechanical meters that had integrated ERTs. By 2008, NorthWestern had stopped purchasing mechanical meters. Overall, the AMR advancements resulted in addressing asset life concerns as well as ensuring a smooth transition to newer, more efficient and accurate meter reading technology.

AMR technology, as originally deployed, is only effective for non-demand customers because electric demand customers require a manual demand reset when NorthWestern reads their meter.

Today, utilities have or are transitioning to AMI, offering real-time data transmission, improved grid management, and better customer experience.

Q. When is the right time to do a technology upgrade?

A. The optimal time to consider a technology upgrade is when a significant number of assets are nearing the end of their useful life and significant advancements in technology provide benefits, which are favorable to the ongoing operating, maintenance, and replacement costs of continuing with the existing technology. This timing avoids making large investments in outdated technology, which limits future benefits.

Q. Please explain the timeline for the Montana Meter Project.

A. Starting in 2015, approximately 15 years after the initiation of the AMR deployment, NorthWestern began estimating the life span for the ERT technology. Collaborating with our vendor, NorthWestern conducted studies indicating an approximate average asset life of 20 years. Following these studies, NorthWestern focused on an AMI deployment in South Dakota starting in 2017. At that time, the entire South Dakota metering system relied on manual meter readers. This upgrade allowed NorthWestern to evaluate the benefits of AMI technology while continuing to monitor asset life in Montana. After the successful deployment of AMI in South Dakota, NorthWestern commenced the Montana Meter Project to address asset life issues using technology that provides additional benefits over AMR for NorthWestern's customers.

AMR Asset Life

Q. Please describe what type of metering equipment is needed to serve customers.

A. The equipment needed for electric metering installations depends on the customer's service size, which relates to their rate class and meter type. For small residential and commercial customers, only the meter itself is installed in the meter socket, with no additional equipment required. Therefore, the meter is considered the entire asset for these customers. Larger customers, including some irrigation customers, need additional equipment like test switches and current transformers ("CTs") to ensure accurate readings by reducing the current flowing through the meter; for these meters, the meters are only a portion of the plant. For industrial and substation customers, installations also include potential transformers ("PTs"). This equipment can be very expensive, so the individual meter is only a small part of the capital installation. Additionally, these customers have specialized meters that communicate usage information back to the customer.

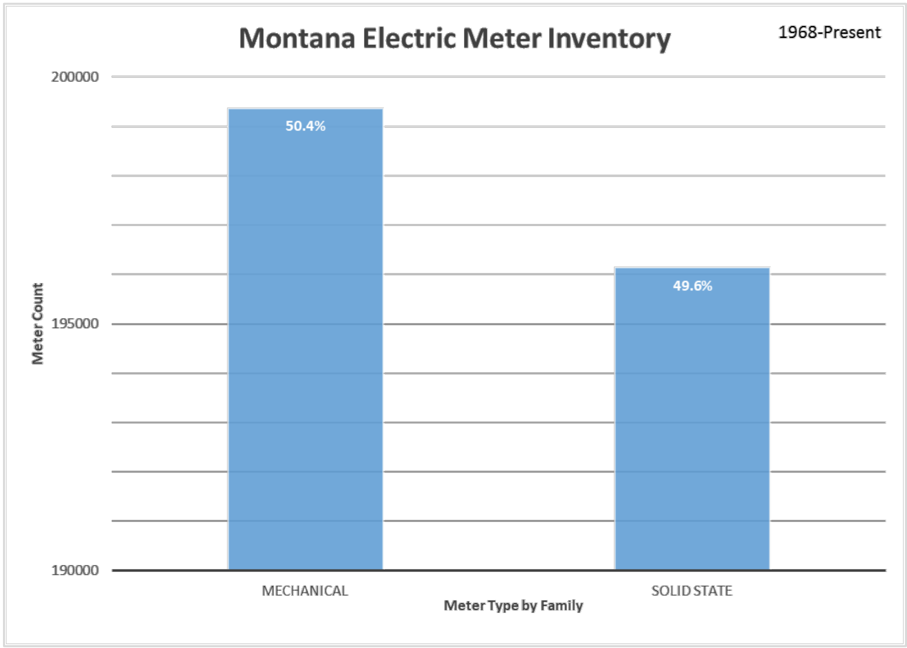
Much like electric, the natural gas meter size depends on the usage. However, excluding the large high, end natural gas metering, the majority of customers have equipment that includes the physical meter, a dial, which can be used for manual reads, and an ERT for AMR. ERTs are positioned between the meter and the reading dial. ERTs are battery-operated devices that transmit meter reads via RF to a mobile device. ERTs are installed on the majority of NorthWestern's natural gas meters.

Q. What were the results of NorthWestern's analysis of asset life for its meters?

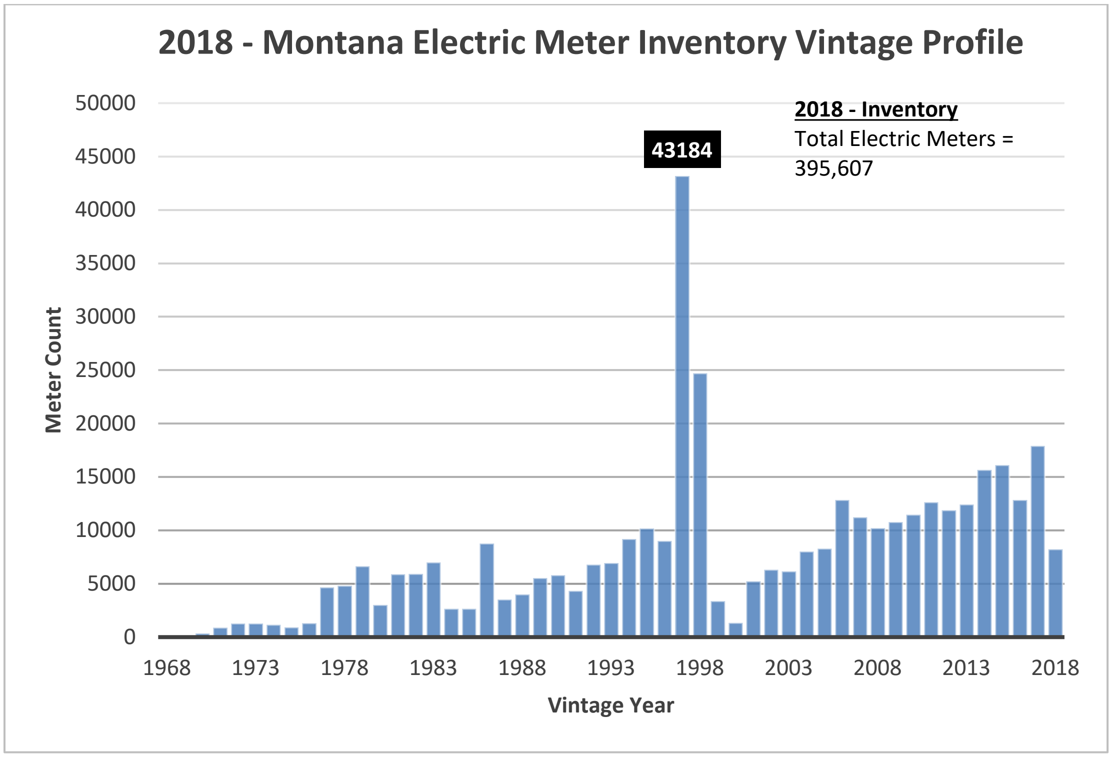
A. NorthWestern analyzed the asset life of electric meters and the ERTs included on natural gas meters prior to the project in 2018.[1] The chart below represents the analysis performed in 2018, prior to the AMI project. At that time, NorthWestern had 395,607 electric meters in its inventory,[2] which

[1] NorthWestern analyzed the asset life of these meters and ERTs again in 2021. The results in 2021 were very similar to the 2018 analysis.
[2] The 2021 analysis looked only at installed meters rather than all meters in inventory, which totaled 390,698 electric meters.

consisted of 50.4% mechanical meters and 49.6% digital solid state meters as shown in the chart below.



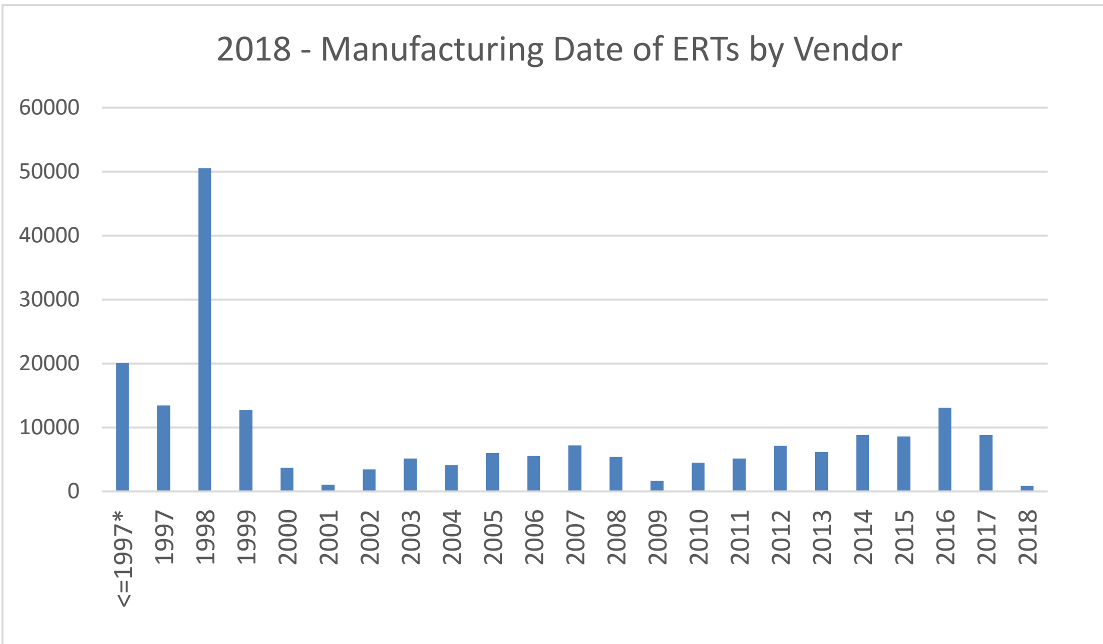
The manufacturer’s recommended design life for digital AMR meters and ERT technology is 20 years. In 2018, approximately 42.4% of NorthWestern’s electric meters were older than 20 years and in 2021, at the start of the AMI project, this number had increased to 50%. NorthWestern purchased and installed a significant portion of these meters between 1997 and 1999 as part of the AMR upgrade project discussed above.



In the same 2018 analysis, NorthWestern worked with its vendor to identify all ERTs in NorthWestern's natural gas plant inventory by looking up their serial number at the manufacturing plant. Through this analysis, NorthWestern identified 202,790[3] natural gas ERTs, of which 114,074 or approximately 56% were expected to reach their 20-year design life by the end of 2024 as

[3] At the start of the project in 2021, there were an estimated 208,249 AMR natural gas ERTs installed in the field. NorthWestern started purchasing AMR ERTs that were capable of AMI through software configuration in 2019, so these new module do not need to be replaced.

identified in the chart below.[4] This identifies a critical period for strategic planning and decision-making in asset management, especially as the ERTs are battery-operated devices. Based on the following chart, similar to the electric meters, NorthWestern installed a significant quantity of these assets between 1997 and 1999 as part of a technology improvement project to implement AMR efficiencies for reading natural gas meters.



Q. Please provide the net book value of the electric meter plant account prior to deployment of the Montana Meter Project.

A. Electric meter assets are recorded in FERC Account 370. The net plant value of FERC Account 370 as of December 31, 2020 was $22,574,618. This value

[4] The modules in the chart "2018 – Manufacturing Date of ERTs by Vendor" listed as "<=1997*" are included in the 114,074 total. These ERTs are assumed to be manufactured in 1997 or before, prior to the vendor recording all historical manufacturing dates by serial number.

includes AMR equipment as well as additional equipment necessary for metering, such as CTs, PTs, test switches, and other small hardware. It is important to note that the AMI project does not replace the entirety of this plant balance.

Q. What percent of the electric meter plant balance did NorthWestern expect to replace with the AMI technology?

A. The portion of electric meter plant that NorthWestern expected to replace during the AMI project varies by meter type. For self-contained meters, which are commonly used by residential and lighting customers, the Montana Meter Project is expected to replace 100% of the equipment since the only equipment utilized for these installations is the meter. These meters represent approximately 81.05% of the total meter population. Although these meters represent a very large portion of the meter population, they only represent approximately 40% meter plant as they are the least expensive meters and have no additional metering equipment.

In the case of an AMR to AMI change out for more complex setups, which are commonly used by GS-1 Secondary, GS-1 Primary, and some of the Irrigation customers, only the meter is replaced, leaving the existing supporting hardware, such as CTs, PTs, test switches, and other hardware, in place. These meters represent approximately 18.83% of the total meter population and make up approximately 50% of the metering plant.

Large GS-2 customers are served using an MV90 metering system, which already supports interval data. Therefore, NorthWestern did not need to replace the MV90 meters and associated equipment as part of the AMI project. These meters represent approximately 0.03% of the total meter population, but install costs include the costly metering equipment, and represent about 4.75% of the meter plant.

The table below summarizes the percentage of the electric plant, by customer class that NorthWestern would replace with AMI meters. Column A shows the customer class, column B shows the percentage of meters each customer class represents of the total. Column C shows how much of the plant balance in FERC Account 370 NorthWestern estimates to relate to each customer class. Column D shows the portion of the plant balance expected to be replaced in the AMI project. Column E shows the portion of the account balance which is expected to be replaced by the AMI project.

Summary Table of AMI Meter Equipment Replacement				
Column A	Column B	Column C	Column D	Column E
Rate Class	% of Meters Population	% Plant Allocation based on Metering & Other Hardware Cost	% of Plant Replaced By AMI	Total % of Metering Equipment Replaced By AMI
Residential	81.05%	39.76%	100.00%	39.76%
GS1 - Secondary	17.71%	48.30%	31.26%	15.10%
GS1 - Primary	0.05%	1.59%	4.79%	0.08%
GS - 2 Sub	0.02%	3.21%	0.00%	0.00%
GS - 2 Tran	0.01%	1.55%	0.00%	0.00%
Irrigation	1.07%	5.55%	24.08%	1.34%
Lighting	0.10%	0.05%	100.00%	0.05%
	100.00%	100.00%		56.32%

Q. What is the net book value of the electric metering equipment being replaced by AMI?

A. Again, as of December 2020, prior to the AMI project implementation, the net book value of the electric meter plant in FERC Account 370 was $22,574,618. For this analysis, the estimated percentage of plant replaced by the AMI project, as calculated above, was used to derive a net book value for the electric metering equipment being replaced by AMI of $12,714,055 ($22,574,618 x 56.32% Total). Additionally, NorthWestern estimated meter removal costs to be 10% of the installation labor, or approximately $1,673,634. These removal costs are added to the meter cost and bring the estimated undepreciated investment in electric metering equipment to be replaced during the Montana Meter Project to $14,333,479. Additionally, there is no cost for the recycling of AMR electric meters as the recycling value is directly offset by the transportation cost, resulting in a no-cost recycling agreement. NorthWestern details this calculation in the table below.

Electric Meter Plant - December 2020		
Net Book Value	$	22,574,618
Total % of Metering Equipment Replaced By AMI		56.32%
Total Estimated Meter Plant Equipment Replaced By AMI	$	12,714,055
Additional Cost of Meter Removal	$	1,673,634
Recycling Cost for Meters		-
Total Estimated Meter Plant Impact Due to AMI	$	14,387,689

Q. Please provide the net book value of the natural gas meter plant account prior to deployment.

A. Natural gas meter assets are recorded in FERC Account 381. The net plant value of this account as of December 31, 2020 was $48,650,875. This value includes the cost of the natural gas meters and the ERTs. Like with the electric meters, it is important to note that the AMI project does not replace the entirety of this plant balance.

Q. What portion of the natural gas meter plant balance did NorthWestern expect to replace with AMI technology?

A. For the natural gas meter plant, the Montana Meter Project only replaces the natural gas ERT module, while the rest of the equipment, including the meter, remains in place. For this analysis, NorthWestern estimates the undepreciated natural gas ERT at $51.28 per natural gas module. Therefore, the total estimated undepreciated value of $11,458,969 is captured in the following table.

Gas Meter Plant - December 2020					
Net Book Value				$	48,650,875
Total Estimated Gas Equipment Replaced By AMI					
Average Estimated Undepreciated Cost of Gas AMR ERT					51.28
Total Counts of Gas Equipment Replaced By AMI					202,790
	Total Estimated Gas Equipment Replaced By AMI			$	10,399,071
Additional Cost of Meter Removal					755,713
Recycling Cost for Meters					304,185
Total Estimated Meter Plant Impact Due to AMI				$	11,458,969

Q. Did NorthWestern consider a staged implementation of AMI technology to extend AMR asset life?

A. Yes. For electric, NorthWestern did consider multiple hybrid approaches that included installing a fixed AMR network to read existing ERTs combined with drive-by meter reading and partial AMI deployment. While this would extend asset life for AMR meters, it also presented numerous drawbacks, including:

1. Limited AMI-enabled benefits to only a portion of customers, creating service inequity and potentially increasing customer confusion and call volumes.
2. Suboptimal cost efficiencies compared to a full-scale deployment for operational benefits as well as volume pricing discounts and installation efficiencies.
3. Communication challenges in covering NorthWestern's Montana service territory effectively, particularly in areas with complex geographical features like canyons and mountainous terrain.
4. Potential technology mismatches and the need for significant additional investment in communication infrastructure to ensure robust network performance or, a switch in network technology requiring a point-to-point solution, where the meter communicates directly to the tower.

For the natural gas asset strategy, NorthWestern switched to installing AMI natural gas ERTs in mobile mode since the South Dakota project in 2019. This allowed us to continue our normal process of reading with AMR equipment and the continuation of ERT replacement upon failure on the existing AMR platform. Unfortunately, AMI electric meters cannot be read in mobile mode, and require the installation of an AMI network.

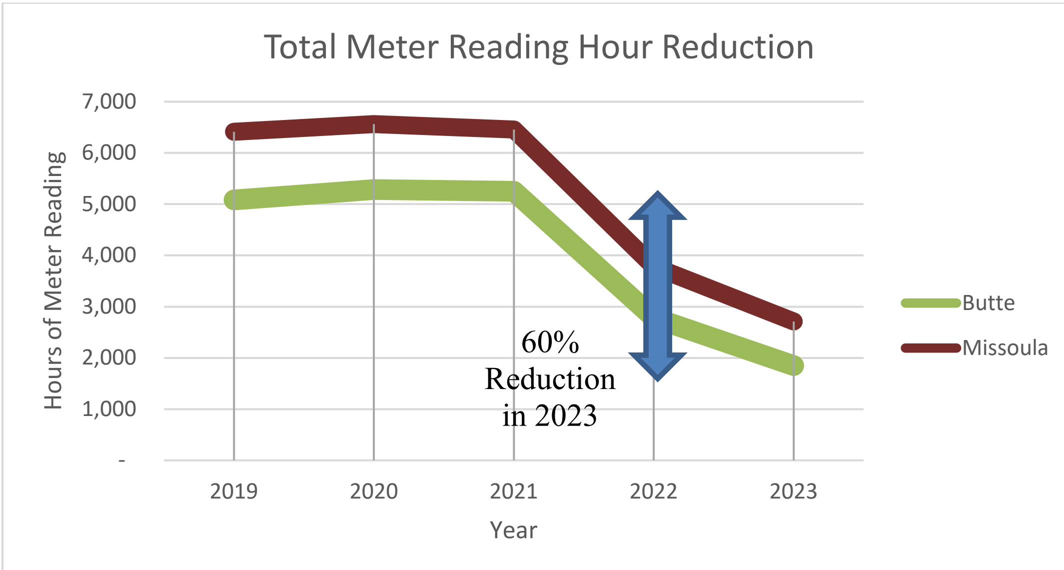
AMI Benefits Analysis

Q. What are the benefits of NorthWestern's full AMI deployment?

A. The full AMI deployment offers quantifiable benefits from reduced meter reading hours and reduced field service order hours; however, AMI also includes non-quantifiable benefits such as improved reliability and outage restoration times, cost efficiency from fixed priced contracting and efficient deployment, as well as customer care efficiency improvements.

Q. Please describe the benefits of reduced meter reading hours.

A. AMI provides a fixed communications network, which can significantly reduce the labor required for meter reading. Currently, meter readers have two main tasks: 1) manually reading electric demand meters, which require a physical demand reset, and the associated natural gas manual meter read at the same location, and 2) using AMR for drive-by routes that read electric and natural gas meters equipped with ERT devices. Montana AMI networks were fully deployed in Missoula and Butte in 2022. This deployment has already led to a 60% reduction in meter reading labor in one year. NorthWestern anticipates further reductions in labor as the AMI network expands and NorthWestern evaluates opportunities for meter reading optimization.



Overall, NorthWestern expects AMI to reduce meter reading hours in electric and combo areas (electric and natural gas service) by at least 65% of at the end of deployment and by at least 80% by 2028. The delay in full savings to 2028 is to allow NorthWestern to work with customers on a case-by-case basis to convert difficult to access meters. Additionally, the 2028 timeframe allows for a transition period to complete route optimizations as fewer meters will need to be read with AMR or manually. Over a span of 15 years, NorthWestern expects this to result in a total annual savings up of 33,671 labor hours per year. Based on existing meter readers demographics, NorthWestern anticipates these employees to transition to other work assignments or may be of retirement age by the time of full deployment. The value of this work over 15 years totals a net present value of $11,595,349.

Q. Please describe the benefits of reduced field service order hours.

A. Field service orders represent dispatch orders where NorthWestern has had to send an employee to a location to complete a task. These field service orders include work such as connects or disconnects, off-cycle reads, field investigations and emergency service disconnects. AMI enables communication that helps utilities avoid costs associated with manual processes like these through communication channels that eliminate the need for an employee to be dispatched.

To assess the impact of AMI on field service labor hours, NorthWestern conducted an analysis comparing work orders in Missoula and Butte from 2019, before the AMI project began, to those in 2023, after the project's completion in those communities. The analysis categorized work orders into five groups with savings as follows:

1. Fieldwork moved to the back office: This includes work orders for connects and disconnects, which can now be managed remotely due to AMI. The fieldwork to manage connects and disconnects ranges from approximately 45 minutes to 2 hours to complete a service order.

Through the communication capability of AMI, these work orders can now be processed in as little as five minutes.

In 2023, there were 3,113 work orders for connect and disconnect services observed in Missoula. These orders have shown a slight year-over-year increase. However, by improving efficiency through back office work, the fieldwork required was reduced by 2,323 work hours in the Missoula division.

Similarly, the Butte division handled 3,163 connect and disconnect orders. Through the efficiency brought by AMI, approximately 2,420 work hours were saved.

These efficiency improvements demonstrate the potential for further reducing fieldwork hours by continuing to streamline operations and leveraging advanced technologies.

2. Fieldwork increased due to AMI: Although the goal of AMI is to reduce manual fieldwork, there are instances where field verification of meter communications is necessary. Moreover, following the installation of new meters, there may be an increase in customer inquiries and requests for meter checks, particularly from electric customers. NorthWestern anticipates a temporary increase in work orders

immediately after an area is newly equipped with AMI, followed by a decrease as both the customer and workforce gains experience with the new equipment.

The work added 607 work hours due to AMI implementation between Butte and Missoula in 2023. However, this represents a 50% reduction compared to the previous year after AMI was deployed.

3. Fieldwork reduced due to new assets: Mass replacement of metering assets decreases the failure rate of field assets, as many issues are resolved during the deployment phase itself. This proactive approach reduces the maintenance labor required for equipment change-outs, such as failing ERTs. In Butte and Missoula, this has led to a significant reduction in service order hours. Butte alone observed a reduction of 3,351 hours of work.

4. Fieldwork reduced due to information from AMI meters: AMI meters provide data three times a day, offering detailed information that reduces the need for billing re-reads and helps address issues like high usage discrepancies. This data-driven approach significantly cuts down on the number of fieldwork orders required, particularly for move-

in and move-out readings. In Butte and Missoula, the total estimated reduction in fieldwork hours is 2,485 hours in 2023 compared to 2019.

5. Future potential to reduce fieldwork: Although currently excluded from this analysis, there are additional future work orders that AMI technology could help streamline, significantly reducing fieldwork order time. These work orders include disconnections for move-outs with no account owners, reducing unaccounted energy, as well as issues related to voltage, flickering, and transformer problems. NorthWestern has introduced an AMI portal tool for internal employees, allowing them to remotely interrogate meters and access live information from the meter. This tool can provide quick evaluations of customer situations and assist in determining the best resolution, further reducing the need for on-site visits.

As of 2023, NorthWestern overall has already shifted approximately 9,973 hours from the field within Butte and Missoula Divisions as seen in the table below. There are approximately 175,459 endpoints installed in Butte and Missoula, and, therefore, the normalized time saved is 3.41 minutes per customer meter as seen in the table. The average of 3.41 minutes saved per customer meter is a combination of back office efficiency, an overall reduction of work orders due to remote capabilities, and a new asset plant requiring less maintenance. When this number is extrapolated out across the entire system at the AMI deployment rate, it results in a net present value of $24,025,532 over a 15-year evaluation.

Total Hours Reduced from Service Orders to Date.

	E	G	Total
Butte			
BackOffice Total	2,420	-	2,420
Increase Total*	(205)	(73)	(278)
Project Total	251	962	1,213
Reduction Total	512	1,582	2,093
Butte Total Hours Saved	2,977	2,471	5,449
Missoula			
BackOffice Total	2,323	-	2,323
Increase Total*	(272)	(58)	(329)
Project Total	414	1,724	2,138
Reduction Total	121	271	392
Missoula Total Hours Saved	2,586	1,938	4,524
Total Butte and Missoula Annual Hours Saved	5,563	4,409	9,973
# of meters installed in Butte and Missoula	108,295	67,164	175,459
Total Hours Reduced per Meter to Date	**3.08**	**3.94**	**3.41**

*Increase labor due to meter and network mitigation. Expect to reduce as divisions get completed

Q. What analysis has NorthWestern conducted regarding the value of AMI deployment?

A. NorthWestern conducted analysis that examined the benefits of a full deployment to reduced meter reading labor and reduced meter-related field service orders. The savings are captured over 15 years using a 6.92% discount rate. The savings in the chart below is a representation of the value of the labor shifted to other work in the company, not necessarily a direct reduction in overall operating costs. These savings are compared to the total estimated undepreciated plant retirement prior to the AMI project.

15 Year NPV Value of Savings of Full AMI Deployment	FTEs		NPV.
Meter Reading Reduction	16.19	$	11,595,349
Service Order Reduction	14.90	$	24,025,532
	31.73	$	35,620,881
Total Estimated Undepreciated Plant - 2020			
Electric Plant Undepreciated total Due to AMI		$	14,387,689
Gas Plant Undepreciated total Due to AMI			11,458,969
Total Plant Undepreciated total Due to AMI		$	25,846,658
	Total Project Value (NPV - Depreciation)	$	9,774,223

As seen in the chart above, NorthWestern has observed an estimated net benefits of approximately $9,774,223 million over 15 years. These benefits are based on the estimated value of labor for AMI operational benefits over 15 years net the overall value of the undepreciated asset plant replaced by AMI. Additionally, near-term, future, and customer benefits that NorthWestern has not quantified have been excluded from the analysis of direct impacts presented above. This exclusion is due to the difficulty in quantifying these benefits. However, these unquantifiable benefits are described in further sections below.

Q. Please describe how AMI outage notifications help with reliability and outage restoration times.

A. AMI’s real-time outage alarms and the ability to "ping" meters to verify power status reduce unnecessary field dispatches and enhance service restoration efficiency.

In 2023, NorthWestern implemented AMI outage alarms within its Distribution Operation Control Center (“DOCC”), initially rolling out the AMI Outage Alarms in Missoula in September 2023, followed by Butte in November 2023, and Bozeman in February 2024. The system in the DOCC leverages Power Outage Notifications to identify outages and link them to specific protective devices such as transformers, fuses, and reclosers. This integration helps field personnel quickly pinpoint which device may have been triggered, facilitating faster dispatch, diagnosis, and repair of outages.

Moreover, distribution operators now have the capability to "ping" meters to check their power status. This advancement helps the DOCC coordinate with the field to determine which customers are out of power. Additionally, each meter retains a history of power restoration times, allowing NorthWestern to use AMI data to enhance and verify manual outage management processes.

The power outage notifications also enable proactive customer notifications, informing them of outages before they need to call in. This not only reduces the number of customer calls to the call center but also helps ease customer concerns. By giving customers timely updates on power restoration, it improves communication and greatly enhances overall customer experience.

Q. Are there other non-quantifiable benefits of AMI meters?

A. Yes. The investment in a full AMI deployment provides numerous benefits, both in the near term and in the future.

In the near term, AMI deployment can enhance the customer experience through timely and accurate outage and bill notifications, and 24/7 customer reconnect capabilities. It can also improve power quality through early detection of issues and real-time voltage verification, leading to improved system reliability and operational efficiency. Additionally, real-time monitoring can help in the early detection of potentially hazardous conditions, such as high temperatures in meter sockets, leading to safety enhancements.

In the future, AMI deployment can support innovative rate structures, allowing utilities to introduce flexible pricing models that encourage energy use during off-peak hours. This can aid in grid load management and reduce costs. AMI data can also support targeted energy efficiency programs and Demand Side Management ("DSM"), optimizing energy use and improving grid performance. Furthermore, detailed interval data from AMI can help manage the integration of renewable resources and Electric Vehicles, ensuring stable grid operations and efficient energy distribution. AMI can also enhance forecasting accuracy, allowing utilities to better predict and meet energy demand, ultimately improving operational efficiency and reliability. Finally, AMI can enhance the customer experience through real-time bill predictions, notifications, and alarms, providing customers with timely information about their energy usage and helping them manage costs more effectively.

Overall, the investment in a full AMI deployment provides not only immediate operational efficiencies and cost savings but also sets a robust foundation for future innovations in utility rate structuring, DSM, energy efficiency programs, and enhanced customer experience. This strategic approach supports NorthWestern's commitment to improving service delivery and customer satisfaction while addressing the evolving energy landscape.

Conclusion

Q. Please summarize your testimony.

A. My testimony outlines the benefits of a full AMI deployment for NorthWestern customers. The AMI system offers quantifiable benefits such as reduced meter reading hours and reduced field service order hours. Additionally, there are non-quantifiable benefits such as improved customer experience, improved reliability and restoration insight, power quality, and safety.

NorthWestern considered alternative strategies, such as continued investment in AMR technology and a hybrid approach, but NorthWestern deemed these options suboptimal. The financial analysis indicates that the total net project value, considering the benefits currently observed versus the undepreciated metering plant due to AMI, is approximately $9,774,223. Overall, the investment in a full AMI deployment provides immediate operational efficiencies, cost savings, and sets a foundation for future innovations in utility rate structuring, DSM, and energy efficiency programs.

Q. Does this conclude your direct testimony?

A. Yes, it does.

Verification

This Direct Testimony of Jonathan R. Shafer is true and accurate to the best of my knowledge, information, and belief.

/s/ Jonathan R. Shafer
Jonathan R. Shafer