COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

ELECTRONIC APPLICATION OF GREEN RIVER VALLEY WATER DISTRICT FOR A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY TO INSTALL THE AMI PROJECT PURSUANT TO THE PROVISIONS OF KRS 278.020 AND KAR 5:001.	**))))))))**	**CASE NO. 2026-00092**

SUPPLEMENTAL RESPONSE OF

GREEN RIVER VALLEY WATER DISTRICT

TO

COMMISSION STAFF'S FIRST REQUEST FOR INFORMATION

DATED JUNE 26, 2026

Filed August 13, 2026

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SUPPLEMENTAL RESPONSE OF GREEN RIVER VALLEY WATER DISTRICT TO COMMISSION STAFF'S FIRST REQUEST FOR INFORMATION, ITEMS 7, 8, & 21

Green River Valley Water District submits its Supplemental Response to Commission Staff's First Request for Information, Items 7, 8, and 21.

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Counsel for Green River Valley Water District

CERTIFICATE OF SERVICE

In accordance with the Commission's Order of July 22, 2021 in Case No. 2020-00085 (Electronic Emergency Docket Related to the Novel Coronavirus COVID-19), this is to certify that the electronic filing has been transmitted to the Commission on August 13, 2026; and that there are currently no parties in this proceeding that the Commission has excused from participation by electronic means.

/s/Tina C. Frederick
Tina C. Frederick

GREEN RIVER VALLEY WATER DISTRICT

Case No. 2026-00092
Supplemental Response to Commission Staff's First Request for Information

Question Nos. 7, 8, and 21

Responding Witnesses: Andrew Tucker, General Manager

Q 1-7. **Explain in detail why Green River Valley District selected Kamstrup customer water meters, Kamstrup AMI receivers and Kamstrup Leak Detector and AMI Standard software subscriptions. Provide any supporting documentation including bid sheets, bid evaluations and requests for proposals.**

A 1-7. This supplemental response is being submitted to provide some specific details concerning some of the products Green River Valley District considered prior to deciding to conduct a Pilot Project test of Kamstrup's AMI system and software. In the District's original response to this request, I explained that between the summer of 2022, when I became the General Manager of Green River Valley District, and the fall of 2023 I approached other water utilities and inquired about their experiences with AMI metering technology. This was part of the process I used to educate myself about the options available so that I could advise the District's Board of Commissioners. I also reviewed the offerings of several companies and spoke with representatives of distributers at conferences and seminars. The District did not issue a Request for Proposals or develop a formal matrix with which to evaluate equipment and technology options, but I did have criteria that I wanted a metering system to meet. Because transitioning to AMI technology is a significant financial investment, I wanted to choose the option that would benefit the District the most long-term. I was specifically looking for a metering option that would help address water loss. I also wanted to identify an option that was (1) reasonably priced, (2) available from a local distributer, and (3) was being used by other utilities that were satisfied with the product's performance, the service offered by the distributer and manufacturer, and the availability of components.

I investigated AMI options offered by Neptune, Sensus, Itron, and Kamstrup. All of these metering systems are available through in-state distributers, and all offer a version of AMI technology. Because the District has experienced difficulty in receiving service from Badger since its marketing plan changed and it no longer partners with a Kentucky distributer, I was hesitant to recommend that the District invest a significant amount of money in purchasing an AMI system from Badger, but I did investigate Badger's AMI offerings as well because the District has historically used Badger mechanical manual-read meters.

Before making a recommendation to the District's Board of Commissioners about which brand of AMI technology the District should utilize on a trial basis, I discussed my review of AMI options with the District's consulting engineer who agreed that the District should try to get as much "bang for its buck" as it could. The Kamstrup meters paired with Kamstrup's Leak Detector software was the most appealing alternative. Utilizing this system, the District can do more than improve its measurement of the water sold to customers and eliminate nearly all travel to read meters. The Kamstrup system allows the District's customer meters to be used as system monitoring devices to help combat system leaks, meter tampering, water theft, and backflow. Attached to these supplemental responses as **Exhibit SR-1** is an Engineering Analysis & Technical Assessment of the Kamstrup AMI System that Green River Valley District proposes to deploy systemwide. The report was prepared by Lee Mudd, P.E. of Monarch Engineering, Inc. ("Monarch"). Monarch provides consulting engineering services to Green River Valley District.

Q 1-8. **State whether Green River Valley District considered any other manufacturer for AMI meters, receivers, or software. If not, explain why not.**

A 1-8. In the District's original response to this request, I emphasized that the answer to this question depends upon which step of the decision process is under review and also stated that if the Kamstrup Pilot Project had not been successful, the District would have considered other metering options. I did not provide the names of the other brands of meters that I investigated in my search for a suitable product to test on a Pilot basis. I have provided that information in the supplemental response to Item 7 above. It was not practical to test all of the available options in the field. I recommended that the District conduct its AMI Pilot Project using Kamstrup's system and its Leak Detector software because of the **potential** to use this system to monitor the District's distribution system as well as meter customer usage. The District was pleased to learn that Kamstrup's system performed extremely well in the difficult terrain in which it was installed.

Q 1-21. **Refer to the Application, page 20, Item 43. Explain in further detail why Green River Valley District does not believe it is reasonable or proper use of its resources to invest in manual-read meters.**

A 1-21. Please see **Exhibit SR-1**, Section II, "Existing Metering System & Operational Challenges" at 1-3 for an in-depth discussion of the operational limitations of continuing to use manual-read meters.

SWORN CERTIFICATION AND VERIFICATION

COMMONWEALTH OF KENTUCKY)
) SS:
COUNTY OF HART)

The undersigned, John Bunnell, being duly sworn, deposes, states, and certifies that he, as the Chairman of the Board of Commissioners of Green River Valley Water District, has supervised the preparation of this Supplemental Response to Staff's First Request for Information in Kentucky Public Service Commission Case No. 2026-00092; as required by 807 KAR 5:001, Section 4(12)(d)(2)(b), and that the Response is true and accurate to the best of his knowledge, information, and belief formed after a reasonable inquiry.

John Bunnell
John Bunnell, Chairman
Green River Valley Water District

Subscribed, sworn to, and acknowledged before me, a Notary Public in and for said County and State, this 13th day of August 2026.

TINA BUSH
NOTARY
ID #KYNP69867
MY COMMISSION EXPIRES 05/09/2027
PUBLIC
STATE AT LARGE, KENTUCKY

Tina Bush
Notary Public
My Commission Expires: 05/09/27
Notary ID: KYNP69867

VERIFICATION

COMMONWEALTH OF KENTUCKY)
) SS:
COUNTY OF HART)

The undersigned, Andrew Tucker, being duly sworn, deposes and states: that he is the Manager of Green River Valley Water District in Horse Cave, Kentucky; that he has personal knowledge of the matters set forth in the responses for which he is identified as the witness in Green River Valley Water District's Response to Staff's First Request for Information in Kentucky Public Service Commission Case No. 2026-00092; and the information contained therein is true and correct to the best of his information, knowledge, and belief.

Andrew Tucker, Manager
Green River Valley Water District

Subscribed, sworn to, and acknowledged before me, a Notary Public in and for said County and State, this 13 day of August 2026.

Notary Public

My Commission Expires: 06-20-28

Notary ID: KYNP 89791

Exhibit SR-1

Engineering Analysis & Technical Assessment

Engineering Analysis & Technical Assessment of the Selected Advanced Metering Infrastructure (AMI) System

Prepared For:

Green River Valley Water District

In support of the Application for a Certificate of Public Convenience and Necessity

Kentucky Public Service Commission
Case No. 2026-00092

AUGUST 2026

Monarch Engineering, Inc.

STATE OF KENTUCKY
JAMES LEE
MUDD JR.
28693
LICENSED
PROFESSIONAL ENGINEER

8-10-26

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ENGINEERING ANALYSIS & TECHNICAL ASSESSMENT OF THE SELECTED ADVANCED METERING INFRASTRUCTURE (AMI) SYSTEM

PREPARED FOR:

GREEN RIVER VALLEY WATER DISTRICT

I. Purpose & Scope

This report has been prepared by Monarch Engineering, Inc. on behalf of Green River Valley Water District ("District" or "GRVWD") to document the engineering analysis and technical assessment underlying the District's selected Advanced Metering Infrastructure ("AMI") system. The purpose of the report is to explain why the District selected the Kamstrup flowIQ® 2200 ultrasonic customer meter, Kamstrup AMI receivers, and Kamstrup Leak Detector and AMI software subscriptions, and why it is in the best interest of the District and its customers to deploy AMI before all existing customer meters reach the end of their nominal service lives or full depreciation periods.

The report is intended to stand as a technical justification for the District's AMI Project. It explains the District's operating conditions, the performance of its pilot installation, the features and benefits of the selected system, and the reasons the District concluded that early deployment of AMI is the most prudent and customer-beneficial course of action.

II. Existing Metering System & Operational Challenges

The District has historically relied upon manual-read mechanical meters throughout its distribution system. While this approach has been widely used in the utility industry for many years, it has become increasingly difficult to justify in a modern water utility that is seeking to improve billing accuracy, reduce water loss, and operate efficiently over a broad and geographically diverse service area.

Manual-read meters require District personnel to physically travel to each meter location in order to obtain a reading. This means the District must maintain a regular meter-reading route, devote employee time to that function each month, and use utility vehicles to access widely dispersed customer locations. In practical terms, meter reading is not simply a clerical task. It is a recurring field operation that consumes labor, fuel, vehicle time, and administrative effort. For a rural utility with a large number of customers and a wide service area, those recurring costs are significant.

The District has reported that it must assign four maintenance employees to meter reading duties in order to complete its monthly reading cycle within approximately 20 days. That staffing commitment is substantial. It means that a meaningful portion of the District's field workforce is devoted each month to a task that provides only a single snapshot of water usage and does not itself improve the condition of the distribution system. Those employees and vehicles are then less available for leak response, main repair, service line work, tap installations, customer service calls, emergency response, and other maintenance functions that are directly tied to system reliability.

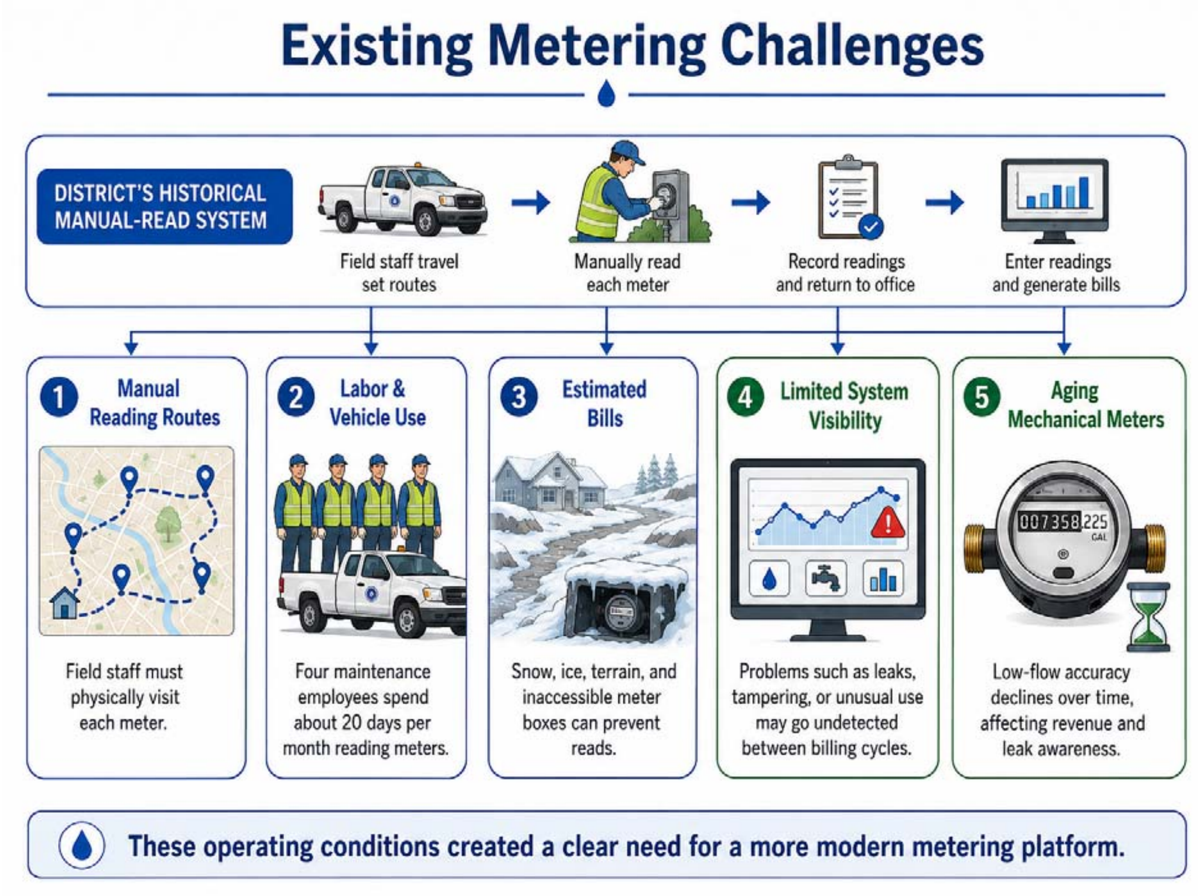
Manual-read meters also create unavoidable operational limitations. When weather conditions, ice, snow, landscaping, terrain, or other obstructions prevent access to a meter, the meter cannot be read and an estimated bill must be issued. Estimated billing is sometimes necessary, but it is not ideal for either the utility or its customers. Customers may question the accuracy of an estimated bill, especially if the estimate is materially different from prior usage or if it is followed by a later "catch-up" bill. This can create confusion, increase customer complaints, and reduce confidence in the District's billing process. A utility that relies heavily on estimated bills is also less able to identify problems in real time because it is only seeing usage data once each billing period.

Another major limitation of manual-read meters is their inability to provide continuous system visibility. A manual-read meter generally tells the utility how much water passed through the meter over a billing period, but it does not alert the District to abnormal usage patterns between reads. That means small continuous leaks, customer-side plumbing failures, tampering, reverse flow, meter removal, or other unusual conditions may go undetected for extended periods. In a system where water loss is already a concern, that is a significant operational disadvantage. It forces the District to react after a problem has become obvious, rather than allowing the District to identify and address the issue when it first begins.

The age of the meter fleet also matters. The District has a substantial number of customer meters that are already approaching or exceeding the point where replacement becomes prudent. Mechanical meters tend to lose accuracy over time, particularly at low flow rates. As a result, older meters may under-register actual use, which can affect revenue collection and reduce the District's ability to identify small leaks at customer properties. The District has appropriately recognized that continuing to invest in aging manual-read meters does not provide the same long-term value as transitioning to a more advanced metering platform that can improve accuracy and reveal system conditions more effectively.

The District's operating conditions further support the need for a different approach. Green River Valley Water District serves a rural system with varied terrain, widely dispersed meter locations, and areas where manual access can be difficult. Those conditions make traditional meter reading more burdensome and make leak detection more challenging. In such an environment, a technology that can automatically collect meter data and provide actionable alerts is not merely convenient; it is a practical and substantial operational improvement.

For these reasons, the District concluded that its existing manual-read metering method is no longer the best long-term solution. The District's experience with aging meters, estimated billing, labor-intensive reading routes, and limited system visibility demonstrated a clear need for a more modern approach. The selected AMI system addresses those concerns by reducing the burden of manual reading, improving billing accuracy, strengthening leak detection, and providing better information for managing the distribution system.



III. <u>AMI Pilot Project & Field Validation</u>

<u>Purpose of the Pilot Project</u>

Before committing to systemwide AMI deployment, GRVWD prudently elected to test the technology in the field. The purpose of the pilot project was not simply to install a small number of meters for demonstration purposes. Rather, the District sought to answer a practical engineering question: could the selected AMI system perform reliably in one of the most difficult portions of the District's service area and provide meaningful operational value under actual working conditions?

That question was especially important because AMI systems depend upon reliable data collection from meters to receivers. In a utility with varied topography, scattered customer locations, and areas with hills, hollows, and other geographic challenges, radio communication reliability is not something that should be assumed. The District therefore selected an area that would provide a meaningful test of both meter performance and communications performance. The pilot area in the southeastern portion of the distribution system was well suited for that purpose because it presented conditions that were more challenging than many other portions of the system. If the selected technology could perform there, it was reasonable to conclude that it could also perform in the remainder of the District's service area.

The pilot project also served a second important purpose. It allowed the District to evaluate the value of the AMI platform beyond meter reading alone. The District wanted to see whether the system could help identify leaks, reveal unusual consumption, improve billing accuracy, and provide useful system information that would justify broader deployment. In other words, the pilot was intended to determine whether AMI technology would be a practical operational tool rather than merely a modernized reading method.

Basis for Selecting Kamstrup for the Pilot Project

Green River Valley Water District did not select Kamstrup for the pilot project casually or based on a single feature. The District's decision was the result of a practical evaluation of available options, industry feedback, vendor capability, and the specific operational needs of the District's system. Several factors led the District to believe Kamstrup was the best manufacturer to test first.

One important factor was the District's relationship with the supplier, Core & Main, and its confidence in the support structure available to the District. The District was interested not only in the equipment itself, but also in whether the vendor could provide the level of technical assistance, training, and follow-through needed for a successful transition to new metering technology. In a system as large and geographically varied as GRVWD's, the quality of the manufacturer and vendor support is nearly as important as the product itself. The District's longstanding relationship with Core & Main gave the District confidence that the company could provide the guidance, installation support, and technical responsiveness necessary for a pilot project and possible future expansion.

Another important reason for selecting Kamstrup was the product's leak detection capability. The District's water loss concerns made leak detection a central objective of the pilot project, not merely an optional feature. Kamstrup's Leak Detector software offered a more advanced operational tool than a standard remote-reading platform because it provided the District with the ability to identify unusual flow conditions, investigate potential leaks, and receive alerts that could help locate problem areas more quickly. That functionality was particularly appealing because it directly supported the District's water loss reduction goals. Rather than relying solely on monthly readings and manual investigation, the District wanted a system that could act as an active monitoring tool and provide meaningful operational intelligence.

The District was also influenced by favorable feedback from other utilities already using Kamstrup products. Prior to the pilot, District management spoke with managers from other Kentucky utilities that had installed Kamstrup AMR or AMI equipment. Those utilities reported positive experiences with the product, the quality of the meters, the performance of the communications system, and the level of support they received from the manufacturer. The District also learned that the meters carried a strong warranty and that other utilities were satisfied with both the hardware and software platforms. That type of peer feedback is particularly valuable in the utility industry because it reflects actual field experience rather than marketing claims alone.

Scope of the Pilot Installation

The pilot project consisted of the installation of 300 Kamstrup AMI customer meters in the selected remote area. Those meters were installed by District personnel, which helped keep the pilot economical and also gave District staff direct experience with the equipment. The pilot was structured to be large enough to provide useful operating information, but small enough to minimize risk before a broader capital commitment was made.

The District later determined that an additional data collector was necessary to reliably capture data from meters located at the lowest elevation in the Sulphur Well area. This was an important lesson from the pilot. It showed that AMI deployment in a rural system is not simply a matter of replacing meters; communications placement and signal coverage must be evaluated and, where necessary, adjusted to fit the terrain. The District responded appropriately by purchasing and installing the additional collector on the Anderson-Perkins water storage tank. That practical response improved the system's performance and confirmed that the communications network could be adapted to the field conditions present in the District's service area.

The pilot also required mobile network connectivity for the collectors, including SIM card service. Those ongoing communications needs were part of the District's early evaluation of what it would take to support the technology in a real operating environment. By experiencing those requirements during the pilot stage, the District gained a more accurate understanding of the system's practical needs before expanding it districtwide.

Pilot Performance and Operational Results

The most important outcome of the pilot project was its successful field performance. The District found that the meters and receivers operated reliably and that data was consistently collected from the pilot area. That is a critical finding because AMI systems are only useful if meter data can be transmitted and received with sufficient consistency to support billing and operational review. The pilot confirmed that the selected system could do exactly that, even in terrain that initially raised concerns about signal strength and communication reliability.

The pilot also gave the District immediate operational benefits. The District began receiving useful alerts and reports that could be used to identify potential leaks, unusual flow patterns, and other issues requiring attention. That allowed District personnel to move from a reactive posture to a more proactive one. Instead of waiting for a leak to become visible or for an unusually high bill to reveal a problem after the fact, the District could begin investigating abnormal conditions sooner. This is one of the most important practical advantages of the selected AMI technology, especially in a rural system where leaks may be hidden in remote areas or difficult terrain.

The pilot also demonstrated a billing benefit. The District's review of pilot-area billing records showed that revenue per active account increased after AMI deployment. That result is significant because it suggests that the selected meters are more accurately registering actual water use, including low-volume flows that older mechanical meters may fail to capture as effectively. In a water utility, improved registration of actual usage is not an artificial revenue increase; it is a correction toward billing accuracy. That is beneficial to the utility and, just as importantly, it supports fair and consistent billing.

The District's reported reduction in water loss after the pilot also supports the value of the system. Water loss reduction is a particularly important objective for a utility with an aging meter fleet and a service area that includes remote and difficult-to-access locations. When the District can more quickly identify leaks, tampering, unusual usage, and possible system anomalies, it can respond sooner and reduce the volume of treated water that is lost before being sold. Even a small improvement in the speed of detection can have substantial meaningful benefits over time.

Staff Training and Operational Familiarity

Another important benefit of the pilot was that it gave District staff direct exposure to the selected technology. The District was able to work with the Kamstrup technical support team, receive guidance on proper collector placement, and learn how the hardware and software systems performed in day-to-day operations. That type of hands-on experience is especially valuable because it reduced uncertainty and will allow the District to transition to broader deployment with greater confidence.

The District found the system to be user-friendly and practical. That matters because an AMI system is only as useful as the utility's ability to interpret and use the data it produces. A technically sophisticated system that is difficult to operate or understand may not deliver its full value. The pilot suggested that the selected software could be incorporated into the District's regular operations without creating an undue training burden or requiring major changes in workflow.

The pilot also demonstrated that the District and the vendor could work together effectively to troubleshoot and refine the system. The addition of the extra data collector is a good example. Rather than treating that need as a failure, the District viewed it as a normal part of commissioning a radio communications-based technology in a rural service environment. That approach reflects sound utility judgment. It shows that the District was not seeking a perfect laboratory test; it was evaluating a real-world tool under real-world conditions.

Lessons Learned From the Pilot

The pilot project provided several important lessons that support full deployment of the selected AMI system.

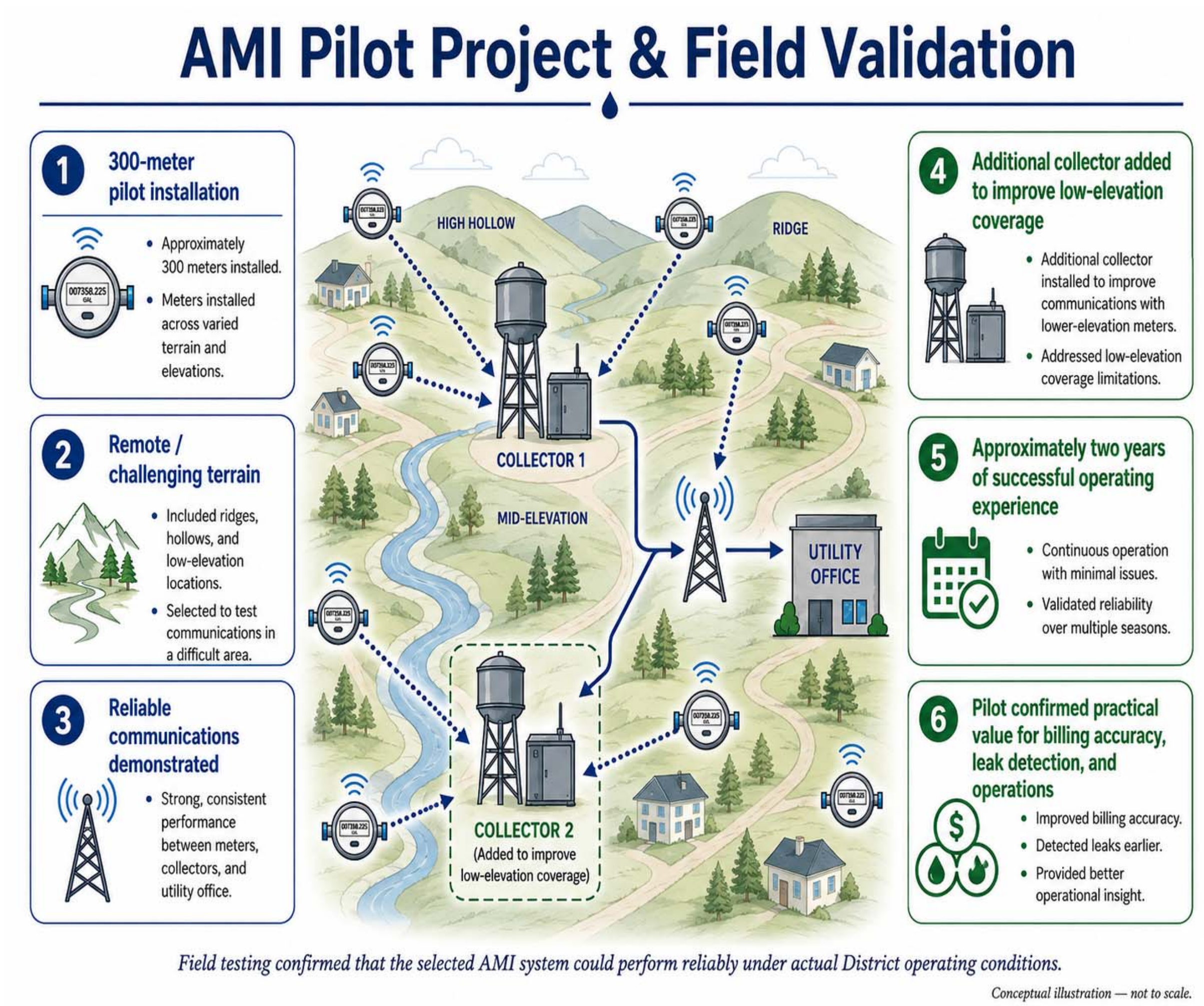
1.) Established that AMI can operate reliably in difficult terrain within the District's service area. That is a highly persuasive result because it addresses the most obvious operational concern about a radio-based communications system.

2.) Confirmed that the Kamstrup system has practical water-loss and billing benefits. The pilot showed that the District can receive useful alerts, identify unusual conditions, and improve revenue collection through better measurement of actual consumption.

3.) Demonstrated that the communications network can be expanded and adjusted to fit the District’s service area. The need for an additional collector did not undermine the technology; rather, it demonstrated that the system can be tailored to the District’s geography.

4.) Provided District personnel confidence in the system and familiarity with the equipment and software. That experience reduces the implementation risk for the broader rollout.

5.) Confirmed that AMI is not simply a more convenient way to read meters. It is a better operating platform for a utility that is concerned with water loss, billing accuracy, and efficient deployment of field resources.



Conclusion

The pilot project is vitally important because it provides the foundation for the District’s decision to move forward with systemwide AMI deployment. A utility should not commit to a broad technology conversion without first confirming that the technology performs as expected in the field. GRVWD did exactly that. It tested the selected system in a difficult area, observed its performance over an extended period, and determined that the system was dependable, useful, and worth expanding.

The District's decision to proceed from the pilot to full deployment was therefore not speculative or premature. It was based on actual field experience, measurable results, and practical operational observations. That makes the pilot project one of the strongest parts of the District's overall case for AMI deployment.

The successful pilot also supports the District's conclusion that AMI should be deployed now rather than delayed until all existing meters reach the end of their full depreciation periods. The pilot showed that the selected technology is ready, reliable, and beneficial. Where a tested system is already producing improved billing performance and better operational insight, delaying deployment would postpone benefits to both the District and its customers.

IV. <u>Technical Evaluation of the Selected Kamstrup AMI System</u>

The selected Kamstrup AMI system is well suited to GRVWD's operating conditions because it combines accurate ultrasonic measurement, advanced leak detection, dependable communications, and scalable software support in a single integrated platform. The District's evaluation of the system focused on the practical needs of a rural water utility with a large number of customer accounts, a geographically diverse service area, and a growing concern about water loss. The selected system addresses each of those needs in a meaningful way.

<u>Ultrasonic Metering Technology</u>

The foundation of the selected system is the Kamstrup flowIQ® 2200 ultrasonic meter. Unlike traditional mechanical meters, the flowIQ® 2200 does not depend upon a rotating internal measuring element subject to wear, friction, or degradation over time. Instead, it uses ultrasonic measurement principles to determine flow. This difference is important because it affects long-term accuracy, maintenance requirements, and the meter's ability to measure low flows reliably.

Mechanical meters can perform adequately for a period of time, but their accuracy often diminishes as they age, especially at lower flow ranges. That is a serious issue for a utility that must monitor small leaks, intermittent usage, and low-volume customer demand. If a meter does not accurately register low flows, the utility may lose revenue and the customer may not receive timely notice of a problem. An ultrasonic meter is better suited to address those concerns because it maintains more consistent performance over a longer service life.

For GRVWD, that means the Kamstrup meter supports both utility objectives and customer interests. It records usage more accurately, helps reduce under-registration, and improves the District's ability to identify when water is passing through a meter in a way that suggests a leak or abnormal consumption pattern. That is especially valuable in a system where a substantial portion of the meter fleet is aging and where water loss has become an increasing concern.

Low-Flow Accuracy and Revenue Protection

One of the most important technical advantages of the selected Kamstrup meter is its low-flow performance. Low-flow accuracy matters because many of the most costly and most difficult-to-detect problems in a water distribution system occur at low and continuous flow rates. Examples include toilet leaks, dripping fixtures, service line seepage, unauthorized usage, and minor internal plumbing failures that persist over long periods without being noticed.

Traditional mechanical meters frequently struggle to measure these flows accurately once they age. That can cause a utility to under-bill actual usage, and it can also delay the customer's awareness of a leak. The selected Kamstrup meter improves both problems. It provides more reliable low-flow registration, which helps the District capture legitimate water sales and improves the likelihood that customers will be alerted before a minor leak becomes a major bill.

This feature is particularly important in a rural utility setting because customers may not have easy access to frequent in-home monitoring, and small leaks can remain unnoticed for months. The selected system gives the District a better opportunity to identify those conditions early and address them before they become expensive for the customer or damaging to the system.

Leak Detection Capability

A major reason the District selected the Kamstrup platform is the integrated Leak Detector software. This software adds a layer of operational intelligence that goes well beyond conventional remote meter reading. Instead of merely capturing usage data, the system can help identify unusual conditions that may indicate a leak, tampering, reverse flow, or other abnormal activity.

This capability is especially valuable because it supports proactive system management. Rather than waiting for a customer complaint, a visible break, or a large bill to reveal a problem, the District can use the software's alerts and reports to investigate issues earlier. That reduces the amount of water lost before the problem is found and can shorten the time between the beginning of a leak and the District's response.

The leak detection capability is also useful because it helps the District distinguish between customer-side and system-side issues. A leak on the customer side may be invisible from the outside and can continue for a long time without detection. With Leak Detector software, the District has a better chance of identifying abnormal conditions and notifying the customer before the loss becomes severe. That is a practical customer-service benefit because it can prevent unexpectedly large bills caused by hidden plumbing problems.

In addition, the District's experience in the pilot project showed that the leak detection tools were not theoretical. They produced actionable information that the District could use in the field. That real-world performance gives the software far more credibility than a simple vendor claim or brochure description.

Integrated Acoustic Leak Detection

A significant technical advantage of the selected Kamstrup AMI system is the integration of acoustic leak detection capabilities within the customer meters and the associated Kamstrup Leak Detector software. This capability was an important factor in the District's evaluation because it provides functionality beyond traditional meter reading and directly supports the District's objective of reducing water loss.

The Kamstrup meters continuously monitor acoustic conditions within the water system. When abnormal or sustained noise levels are detected, the Leak Detector software identifies the meter as a potential leak location and provides information that allows District personnel to investigate the condition. This gives the District an additional tool for locating leaks that may otherwise be extremely difficult to identify, particularly leaks occurring underground, in remote areas, or where escaping water does not produce an obvious surface indication.

The District has already observed the value of this capability through its AMI Pilot Project. The system has generated reports identifying meters with elevated noise levels and other unusual conditions, allowing District personnel to direct their investigation to specific locations rather than relying solely on customer complaints, visual observations, or systemwide water-loss calculations. This experience was particularly significant because the Pilot Project was intentionally located in a geographically challenging portion of the District's service area.

From an engineering standpoint, this capability materially increases the value of the selected AMI system. The District is not simply replacing an aging meter fleet with remotely readable meters; it is establishing a network of monitoring points throughout the distribution system that can provide continuous information concerning system and customer conditions. The combination of accurate ultrasonic measurement, automated communications, and acoustic leak detection represents a principal technical advantage of the Kamstrup system and a significant reason the selected system represents a long-term improvement over conventional metering technology and competing AMI systems.

Fixed-Base Communications and Utility Control

The selected Kamstrup AMI system uses a fixed-base radio communications structure rather than a purely cellular model. That is an important distinction for a utility with a broad and somewhat challenging service area. A fixed-base network allows the District to collect meter data automatically through receivers placed at strategic locations, such as storage tanks or other elevated points, without requiring monthly drive-by reads or depending entirely on commercial cellular service for each meter.

The fixed-base approach provides several benefits. First, it nearly eliminates the staff time required for meter reading. Second, it gives the District a communications network that it owns or controls rather than one that depends primarily on an outside carrier's service coverage. Third, it allows the District to build a system that can be expanded and optimized for its terrain and service area. In a rural environment with hills, hollows, and scattered meter locations, that flexibility is a significant advantage.

The District's pilot project confirmed that the fixed-base network could perform well in difficult terrain. That confirmation is important because it demonstrates that the communications architecture is not just suitable in theory. It works in the field under real conditions. The fact that the District was able to collect data reliably from a remote and challenging area supports the conclusion that the selected network is appropriate for broader deployment.

Software Functionality and Operational Value

The selected Kamstrup system is valuable not only because of the meter and communications hardware, but also because of the software environment that supports it. The AMI Standard package and the Leak Detector package together give the District the ability to move from simple meter reading to true meter data management.

The AMI Standard software supports routine meter data collection, account monitoring, and review of usage information. The Leak Detector software adds a more advanced layer of analytical value by helping identify unusual conditions that may require District action. Together, these tools improve the District's ability to understand what is happening in the system, when it is happening, and where attention may be needed.

This software-based visibility is one of the strongest reasons the District selected the Kamstrup system. The District is not simply replacing a monthly meter read with a remote read. It is gaining a system that can support water loss reduction, customer billing support, and operational decision-making on an ongoing basis. That type of intelligence is especially useful in a system where a meaningful portion of the labor force is currently devoted to meter reading and where the District is seeking to redeploy that labor toward higher-value work.

Reliability in Real-World Field Conditions

The pilot project demonstrated that the selected system could perform reliably in one of the District's most difficult operating areas. That field performance is critically important because the District's service area includes terrain and locations that would challenge a less robust system. A metering platform can appear excellent in a controlled setting but still fail to deliver practical value if it cannot function consistently in the field. The District's pilot experience helped eliminate that uncertainty.

The successful field performance of the system also builds confidence in future deployment. The District has already confirmed that the meters communicate properly, the receivers capture the data, and the software provides actionable information. That reduces implementation risk and supports a broader rollout with a much higher degree of confidence than would have existed without the pilot.

Support, Training, and Industry Confidence

Another important aspect of the District's evaluation was support quality. The District did not evaluate the Kamstrup system in isolation. It also considered the availability of support, training, and implementation assistance. The District's experience during the pilot showed that Kamstrup and its representatives could provide the support necessary to help the District install, configure, and use the system effectively.

The District also gained confidence from discussions with other utilities using Kamstrup products. Positive feedback from other water systems is valuable because it reflects actual operating experience rather than marketing claims. Utilities that have already used the product can speak to issues such as reliability, service, software usability, warranty support, and the overall quality of the equipment. That type of industry feedback helped the District conclude that Kamstrup was a sound choice for pilot testing and ultimately for systemwide deployment.

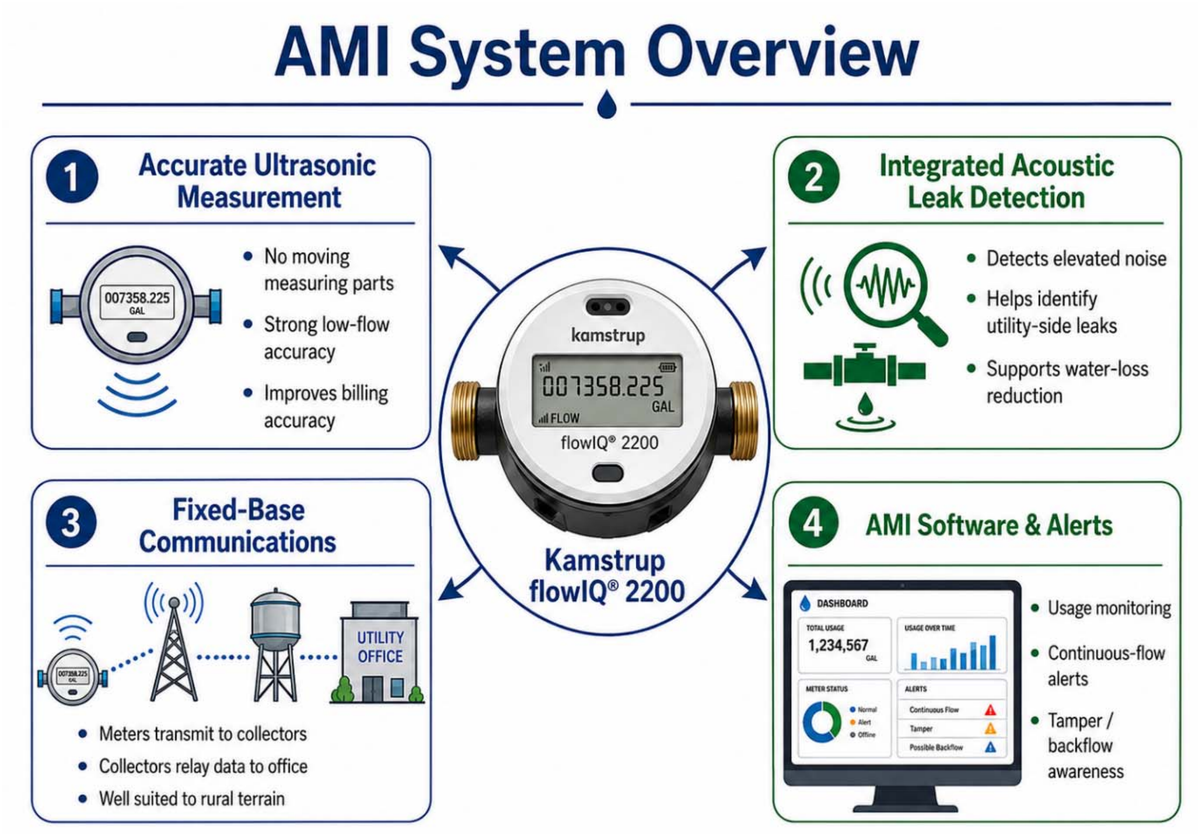


Figure: *Selected AMI platform and principal operational benefits.*

<u>Overall Technical Assessment</u>

Overall, the Kamstrup system provides a well-balanced combination of accuracy, communications reliability, leak detection capability, and operational value. It is not merely a modern reading system. It is a comprehensive metering and monitoring platform that helps the District address the key issues facing its distribution system: aging meters, water loss, billing accuracy, labor demands, and customer service.

The selected system also supports long-term utility management by improving data collection, enhancing leak detection, reducing manual labor, and creating a scalable communications platform. Those are not short-term conveniences; they are long-term operational improvements that can change the way the District manages its system. By improving the District's ability to efficiently operate and maintain its system, reduce water loss, identify problems before they become more costly, and make better use of existing resources, the selected AMI system will provide lasting operational and financial benefits that ultimately serve the interests of all District customers.

Furthermore, the system is technically superior to continued reliance on manual-read meters because it provides better measurement, better information, and better operational control. It is also superior to simpler AMI approaches that do not provide the same level of leak detection and system insight. For that reason, the District's selection of Kamstrup is well supported by engineering judgment and by the results of the District's own pilot experience.

V. Comparison with Other AMI Technologies

GRVWD did not conduct a formal competitive evaluation or scoring process involving multiple AMI manufacturers prior to selecting Kamstrup for the Pilot Project. However, the District did consider other available meter brands, AMR technologies, and AMI systems as part of its broader investigation into alternatives to its existing manual-read mechanical meters. Through discussions with other utilities, review of available products and technologies, participation in industry demonstrations and educational events, and consideration of supplier availability and support, the District became increasingly interested in the Kamstrup platform. The District's interest was further strengthened by favorable reports from utilities already using Kamstrup products, its relationship with the local supplier, and the integrated acoustic leak detection capabilities offered by the Kamstrup system. Based on these considerations, the District determined that Kamstrup was the most appropriate technology to evaluate through the Pilot Project. The subsequent success of the Pilot Project confirmed that decision and provided the District with the confidence necessary to proceed toward broader deployment.

Nevertheless, it is appropriate as part of this engineering assessment to consider how the selected Kamstrup system compares with other leading AMI technologies currently available to water utilities. Such a comparison provides an additional means of determining whether the District's selected technology remains a sound choice when evaluated against established competing systems.

For purposes of this assessment, the Kamstrup system has been compared directly with two of the principal competing AMI platforms encountered within the water utility industry in the surrounding region: **Neptune Cellular AMI** and **Badger Fixed Base AMI**. Both Neptune Technology Group, Inc. (Neptune) and Badger Meter, Inc. (Badger) are established manufacturers that offer capable ultrasonic water meters, AMI communications equipment, and utility data-management software. Accordingly, each represents a reasonable benchmark against which to evaluate the District's selected system.

This comparison is not intended to suggest that the Neptune or Badger systems are technically deficient. Either platform could provide a substantial improvement over the District's existing manual-read mechanical meters. Instead, the appropriate engineering question is whether either competing platform offers a combination of capabilities that would provide a greater overall benefit to Green River Valley than the Kamstrup system already successfully demonstrated within the District's service area.

Principal Evaluation Criteria

The comparison of the three AMI technologies focuses upon characteristics that are particularly important to GRVWD, including:

- accuracy and low-flow measurement;
- absence of mechanical measuring components subject to wear;
- communications architecture and reliability;
- dependence upon third-party communications infrastructure;
- customer-side leak identification;
- distribution-system leak detection;
- integration of acoustic leak detection into the AMI platform;
- software and data analytics;
- scalability;
- long-term operating considerations;
- compatibility with the District's rural and geographically varied service area;
- availability and responsiveness of training, technical support, and ongoing service; and
- demonstrated performance under actual District operating conditions.

Initial meter cost is important, but it should not be the sole basis for comparing AMI systems. A modern AMI system is expected to remain in service for many years. Accordingly, the District must consider not only the cost of acquiring the meter, but also the communications infrastructure, software, ongoing operating requirements, information provided to utility personnel, and the extent to which the system assists the District in reducing water loss and improving customer service.

Kamstrup flowIQ® 2200 Fixed-Base AMI

The system selected by GRVWD is centered upon the Kamstrup flowIQ® 2200 ultrasonic meter, Kamstrup fixed-base data collectors, AMI Standard software including the READy Manager platform, and Leak Detector software.

The flowIQ® 2200 is a solid-state ultrasonic water meter with no moving measuring components. In addition to accurately measuring customer consumption, the meter incorporates acoustic leak detection using the meter's ultrasonic sensors. Kamstrup states that the flowIQ® 2200 can monitor acoustic conditions both downstream and upstream of the customer meter, including conditions associated with leaks in service connections and nearby distribution mains. The acoustic information collected by the meters is then analyzed and displayed through the Leak Detector software, including a map-based presentation that assists the utility in identifying areas where elevated acoustic noise indicates a potential leak.

The integration of acoustic sensing directly into the customer meter is an important characteristic of the selected system. The same meter installed for customer billing becomes an acoustic monitoring point within the distribution system. Kamstrup describes the concept as creating a network of monitoring points without requiring separate acoustic sensors, batteries, or a second installation at each meter location.

The communications architecture selected by GRVWD uses strategically located fixed-base collectors. Meter information is transmitted by radio to the collectors and then communicated back to the District's information system. The collectors themselves require backhaul communications, and the District presently uses cellular SIM service for that purpose. The important distinction is that an individual cellular communication subscription is not required at each customer meter. Instead, thousands of meter locations can communicate through a much smaller number of strategically located collectors.

This architecture has already been demonstrated within GRVWD's service territory. During the Pilot Project, the District successfully communicated with meters located in one of the more geographically challenging portions of its service area. Where an additional collector was needed to improve coverage at lower elevations, the District was able to add that collector and achieve reliable communications. That actual field experience materially reduces the implementation uncertainty associated with broader deployment.

Neptune Cellular AMI

For comparison purposes, a representative Neptune Cellular AMI system would include a Neptune MACH 10® ultrasonic customer meter, an R900® Cellular Endpoint, and the Neptune® 360™ data-management platform.

The Neptune MACH 10 is also an ultrasonic meter and therefore shares several basic advantages with the Kamstrup flowIQ® 2200. It has no moving measuring components and is designed to provide accurate measurement over a broad range of flows. The MACH 10 is therefore a credible modern alternative to conventional mechanical metering.

Neptune's Cellular AMI architecture differs significantly, however, in the manner in which meter information is communicated. The R900 Cellular Endpoint collects meter information and communicates through an LTE-M cellular network directly to Neptune 360. Neptune identifies the ability to deploy AMI without constructing a traditional fixed-radio collector network as one of the principal benefits of this architecture. The endpoint currently utilizes supported commercial cellular networks and their roaming partners for AMI communications.

This approach has advantages. It reduces the need to locate and construct a fixed network of radio collectors, can simplify initial deployment in areas with strong cellular service, and permits AMI to be installed incrementally.

For GRVWD, however, the cellular architecture presents different long-term considerations. An individual cellular endpoint is associated with each meter location, meaning that system communications depend upon third-party cellular coverage across the District's entire service area. Green River Valley contains rural areas, hills, hollows, and remote meter locations. While modern cellular networks provide broad coverage, the District does not own or control the underlying commercial network.

By comparison, the selected Kamstrup system concentrates the external backhaul requirement at a relatively small number of collector locations rather than at each individual meter. This permits the District to strategically locate and adjust its own fixed-base radio network based upon actual terrain and coverage conditions.

There is also an important distinction in leak detection capability.

Neptune Cellular AMI can provide valuable information concerning customer usage, continuous flow, reverse flow, and conditions that may indicate a customer-side leak. Neptune specifically identifies leak detection and continuous-flow information among the operational data available from its cellular AMI system.

However, this form of leak detection primarily relies upon water consumption recorded through the customer meter. For example, continuous water passing through the meter can indicate a leaking toilet, customer service-line leak downstream of the meter, or another plumbing problem. That is useful information and can provide substantial customer benefit.

It is not, however, equivalent to the acoustic leak detection incorporated into the Kamstrup flowIQ® 2200.

A distribution-main leak or utility-side service leak can occur before the water passes through the customer meter. Consequently, the lost water may never appear as customer consumption. The Kamstrup system addresses this limitation by using acoustic information collected at the meter to listen for conditions associated with leakage in nearby service connections and distribution piping.

For GRVWD, whose objectives include reducing real water loss from the distribution system, this distinction is significant. Neptune provides a capable AMI and customer-consumption monitoring platform, but the Kamstrup system provides an additional layer of distribution-system information that directly supports the District's water-loss reduction efforts.

<u>Badger Fixed Base AMI</u>

A representative Badger Fixed Base AMI system would consist of Badger E-Series® ultrasonic meters, ORION® Fixed Network endpoints and gateways, and the BEACON® Software as a Service platform.

The Badger E-Series is a modern solid-state ultrasonic meter. Like the Kamstrup and Neptune meters, it contains no moving measuring components and provides improved low-flow measurement compared with traditional mechanical meters. Badger's current E-Series products provide consumption and flow information, reverse-flow indication, alarms, and, on certain configurations, pressure and temperature information.

Badger's ORION Fixed Network architecture is, from a communications standpoint, more directly comparable to the selected Kamstrup system than Neptune Cellular AMI. ORION fixed-network endpoints transmit meter readings and status information through network gateway transceivers to the BEACON software platform. Badger identifies the fixed-network endpoint as a means of collecting meter data and delivering that information through gateway infrastructure to BEACON.

Accordingly, both Kamstrup and Badger offer an architecture in which customer meters communicate through a strategically designed fixed network rather than requiring a dedicated cellular AMI connection at every meter.

Badger also provides sophisticated meter-data analytics. The E-Series, ORION, and BEACON platform can provide utilities with interval consumption information and can assist in identifying continuous usage and other customer consumption conditions that may indicate leakage. In that respect, Badger provides many of the customer-side benefits expected from a modern AMI platform.

The significant distinction is acoustic leak detection. The Badger E-Series/ORION/BEACON AMI system does not incorporate acoustic leak detection into the customer water meter or the normal AMI meter-reading platform. Badger Meter does offer acoustic leak detection technology through its PIPEMINDER product line; however, PIPEMINDER is a separate distribution-system monitoring platform consisting of dedicated monitoring equipment and associated software.

Accordingly, for purposes of comparing the AMI systems alone, the Badger Fixed Base AMI does not provide the same integrated acoustic leak detection capability as the selected Kamstrup system. This distinction is important. If GRVWD selected a standard Badger E-Series/ORION/BEACON AMI system and also desired systemwide acoustic leak monitoring, the District would need to deploy a separate acoustic monitoring technology at selected locations. The customer meter itself would not inherently serve as an acoustic monitoring point.

With the selected Kamstrup system, acoustic sensing is incorporated directly into the flowIQ® meter. As the District installs its customer meters, it is simultaneously deploying additional acoustic monitoring points. The AMI meter replacement project and the acoustic leak-detection network are therefore part of the same installation rather than two separate technology deployments.

<u>Comparison of Communications Architecture</u>

The communications approaches can be summarized as follows.

Neptune Cellular AMI places cellular communications at the individual meter endpoint. This minimizes utility-owned fixed-network infrastructure and can simplify deployment, but it also places greater reliance upon commercial cellular networks throughout the customer service territory.

Badger Fixed Base AMI uses ORION endpoints communicating through network gateway transceivers to the BEACON platform. The architecture requires appropriately located fixed-network infrastructure but provides the utility with a network designed specifically to collect meter information.

Kamstrup Fixed Base AMI similar to Badger Fixed-Base AMI, uses strategically located collectors to receive information from customer meters. Those collectors may use cellular service for backhaul communications to the District, but the individual customer meters do not individually require a cellular connection.

The Kamstrup communications architecture has an additional advantage that cannot be established from specifications alone: the District has already demonstrated that it works.

The Pilot Project was deliberately placed in an area with challenging topography because the District wanted to determine whether radio communications would be dependable under unfavorable field conditions. The District learned that an additional collector was necessary to reliably serve the lowest elevations in a portion of the pilot area, installed that collector, and thereafter achieved satisfactory coverage. The pilot therefore gave the District practical information concerning collector placement and confirmed that the network could be adapted to the District's terrain.

Neither a Neptune Cellular system nor a Badger Fixed Base system has been similarly demonstrated within the District's service area. This does not mean those systems would fail; it means their performance under the District's particular conditions has not been established. Moving to another technology would therefore introduce an implementation risk that does not exist to the same degree as the selected Kamstrup platform.

<u>Comparison of Leak Detection Capabilities</u>

All three AMI platforms can provide useful information for identifying customer-side water loss. Detailed interval data can reveal continuous consumption that may indicate a leaking toilet, plumbing fixture, customer service line, or other problems downstream of the meter.

The distinction is whether the AMI platform can also provide information concerning leakage that does **not** pass through the customer meter.

The Neptune system can identify conditions such as continuous flow and abnormal customer consumption. This can be highly beneficial for customer-side leak notification, but it does not provide an acoustic sensor within the customer meter for monitoring surrounding distribution piping.

The Badger E-Series/ORION/BEACON system likewise provides advanced meter information and customer usage analytics, but acoustic leak detection is not integrated into that AMI platform. Badger provides acoustic distribution-system monitoring through the separate PIPEMINDER technology.

The Kamstrup flowIQ® 2200 is materially different in this respect. Acoustic sensing is incorporated into the customer meter itself. The Leak Detector software receives and analyzes the acoustic noise information generated by those meters and provides a map-based means of identifying meters and areas exhibiting elevated noise conditions consistent with a possible leak. Kamstrup specifically identifies service connections and distribution mains as applications for this technology.

This effectively allows the District to obtain two separate benefits from the same meter installation: 1.) accurate measurement and AMI data for billing and customer usage management; and 2.) a distributed acoustic monitoring network for assisting with the identification of real water loss.

For a District actively attempting to reduce non-revenue water, this integration represents one of the most significant technical advantages of the selected Kamstrup platform.

Manufacturer and Vendor Support

The availability and responsiveness of manufacturer and vendor support is a key consideration when evaluating an AMI system. Conversion from conventional manual-read meters to AMI involves more than purchasing meters. Successful implementation requires assistance with network design, collector installation, communications, software configuration, staff training, troubleshooting, warranty administration, and ongoing technical support. For a utility undertaking a systemwide technology conversion, the quality and accessibility of this support can have a direct impact on implementation risk and long-term system performance.

GRVWD's experience with Kamstrup and its distributor, Core & Main, has been very favorable in this regard. During the Pilot Project, Kamstrup personnel installed the initial data collector, trained District employees in proper collector installation, assisted with obtaining the necessary FCC licenses, provided software training, and responded to questions as the District began operating the system. When the District determined that an additional collector was necessary to improve communications with meters located at lower elevations, District personnel were able to install the additional equipment using the training previously provided. The District has found that the software platform can be readily incorporated into its operations and has received responsive technical assistance when needed.

This experience is significant because it provides the District with direct evidence regarding the level of support available for the selected system. As the District proceeds from a 300-meter pilot installation to systemwide deployment, access to personnel already familiar with the District, its system, and the equipment being installed reduces implementation uncertainty and provides a practical resource for resolving issues that may arise during deployment.

Vendor availability was also a factor in the District's decision to investigate alternatives to the meter products it had historically used. The District had previously relied heavily upon Badger mechanical meters and had been able to obtain those products through a local supplier. Following changes in Badger's distribution arrangements, the District was no longer able to purchase its preferred Badger meters from that local source and instead was required to obtain them through an out-of-state third-party distributor. At approximately the same time, increases in the cost of brass were also increasing the cost of conventional mechanical meters. As a result, obtaining the District's traditional meter product became more complicated and time consuming at the same time its cost was increasing.

This experience does not indicate that Badger Meter lacks technical or manufacturer support. Rather, it demonstrates that product availability, distributor accessibility, and responsiveness are practical considerations in addition to the technical capabilities of the equipment itself. For GRVWD, the change in the Badger distribution arrangement reduced one of the advantages the District had historically associated with remaining with that product line and contributed to the District's decision to investigate alternative metering technologies.

Neptune also maintains an established manufacturer and distributor support network for its AMI products. However, GRVWD has not deployed a Neptune AMI system and therefore does not have comparable firsthand experience with Neptune training, implementation assistance, or ongoing technical support. Accordingly, no negative conclusion regarding Neptune support is appropriate. The relevant distinction is that the availability and responsiveness of Kamstrup and Core & Main support have already been demonstrated through the District's Pilot Project and subsequent operation of the system.

When comparing systems from the District's perspective, demonstrated support carries value. GRVWD has already worked through installation, collector placement, software implementation, FCC licensing, employee training, and routine operation with the selected Kamstrup platform. The District therefore enters systemwide deployment with an established understanding of where technical assistance is available and how responsive that assistance has been. Changing to another AMI platform would require the District to establish a new support relationship, retrain personnel, and gain experience with a different hardware and software environment.

For these reasons, the availability and responsiveness of training, technical support, implementation assistance, and ongoing service provide additional support for continuing with the selected Kamstrup system.

Direct Technical Comparison

When the three systems are compared side by side, the differences become more evident.

The table below demonstrates that the primary distinction is not basic meter accuracy. All three manufacturers offer modern ultrasonic metering technology, and all three platforms can provide significant improvements over conventional manual-read meters.

Neptune Cellular AMI offers a practical remote-reading solution but relies upon commercial cellular service at individual meter endpoints and does not provide the same utility-controlled communications environment. Badger Fixed Base AMI offers utility-controlled communications and would likely provide a workable AMI platform, but it does not offer the same demonstrated pilot performance and integrated leak-detection value that the District obtained from Kamstrup. The selected Kamstrup system provides the most complete balance of meter accuracy, communications reliability, operational intelligence, vendor support, and long-term value.

The principal distinctions among the three systems are summarized below:

Evaluation Factor	**Kamstrup Fixed Base AMI**	**Neptune Cellular AMI**	**Badger Fixed Base AMI**
Representative Residential Meter	***flowIQ® 2200***	*MACH 10®*	*E-Series®*
Meter Technology	***Ultrasonic***	*Ultrasonic*	*Ultrasonic*
Moving Measuring Components	***None***	*None*	*None*
Enhanced Low-Flow Measurement	***Yes***	*Yes*	*Yes*
Primary Meter Communication	***Fixed-base radio***	*Individual cellular endpoint*	*Fixed-base radio*
Cellular Connection Req'd at Each Meter	***No***	*Yes*	*No*
Fixed-Network Collectors/Gateways	***Yes***	*No*	*Yes*
Customer-Side Continuous-Use Detection	***Yes***	*Yes*	*Yes*
Customer Usage Analytics	***Yes***	*Yes*	*Yes*
Acoustic Sensor Integrated into Customer Meter	***Yes***	*No*	*No*
Acoustic Distribution-System Leak Detection Integrated into AMI Platform	***Yes***	*No*	*No*
Customer Meter Functions as Acoustic Monitoring Point	***Yes***	*No*	*No*
Separate Equipment Required for Distribution Acoustic Monitoring	***No***	*Separate technology required*	*Separate technology required*
Field Tested within GRVWD	***Yes***	*No*	*No*

Evaluation Factor	Kamstrup Fixed Base AMI	Neptune Cellular AMI	Badger Fixed Base AMI
Demonstrated AMI Performance in Challenging District Terrain	***Yes***	*Not demonstrated*	*Not demonstrated*
Local/Accessible Distribution & Technical Support	***Established through Core & Main; Very Strong***	*Unknown*	*Out-of-state distribution; reduced responsiveness*
District Staff Familiarity and Operating Experience	***Approximately 24 months***	*None*	*No comparable AMI experience*
Alignment with District Water-Loss Objectives	***Very Strong***	*Strong*	*Strong*

Overall Engineering Assessment

Neptune Cellular AMI and Badger Fixed Base AMI are both technically capable systems and represent legitimate alternatives within the water utility industry. Each offers modern ultrasonic metering technology, automated meter reading, detailed consumption information, and functionality that would provide a substantial improvement over GRVWD's existing manual-read mechanical meter system. However, when the competing systems are evaluated in the context of the District's specific operating conditions and objectives, neither presents a technical or operational advantage sufficient to justify moving away from the Kamstrup system already selected and successfully demonstrated by the District.

The principal advantage of the Neptune Cellular AMI approach is its ability to communicate through commercial cellular networks without requiring the utility to construct a traditional fixed-base radio network throughout its service territory. For some utilities, particularly those with consistently strong cellular coverage, that may provide a simplified path to AMI deployment. For GRVWD, however, this advantage must be balanced against the District's rural and geographically varied service area and the long-term reliance upon third-party cellular communications at individual meter locations. By comparison, the selected Kamstrup system allows the District to strategically establish and adjust its fixed-base radio network to account for actual field conditions, while requiring cellular or other backhaul communications only at a comparatively small number of collector locations.

The District has already demonstrated the suitability of this communications architecture through the Pilot Project. The pilot was intentionally located in a geographically challenging portion of the service area, and the District confirmed that meter data could be reliably transmitted and collected. When an additional collector was determined to be necessary to improve coverage at lower elevations, the District was able to install that collector and achieve satisfactory communications. This field experience is especially important because radiofrequency performance cannot be evaluated solely from manufacturer specifications. Terrain, elevation, meter-pit conditions, vegetation, and other site-specific factors affect actual system performance. The District has already confirmed that the selected Kamstrup communications system can be adapted to and function reliably within its service territory.

The Badger Fixed Base AMI system provides a communications architecture more comparable to Kamstrup and offers capable ultrasonic meters and advanced meter-data analytics. However, an important distinction exists in the area of acoustic leak detection. The Badger E-Series/ORION/BEACON AMI system does not incorporate acoustic leak detection into the customer meter or normal AMI meter-reading platform. Badger offers acoustic distribution-system monitoring through a separate standalone technology platform. Consequently, obtaining comparable acoustic monitoring capability would require the deployment and operation of additional equipment beyond the standard Badger AMI system.

The selected Kamstrup system takes a materially different approach. Acoustic sensing is incorporated directly into the flowIQ® 2200 customer meter and is utilized in conjunction with the Leak Detector software. As the District installs AMI meters for billing and consumption measurement, it is simultaneously expanding the number of acoustic monitoring points throughout the distribution system. The District therefore gains a distributed leak-detection network as an inherent part of the meter replacement project rather than through the later installation of a separate monitoring system.

This integration is particularly valuable to Green River Valley because water-loss reduction is one of the principal objectives of the AMI Project. Customer-side continuous-use monitoring is important, but it addresses only one component of water loss. Leaks occurring in utility-side service lines, distribution mains, and other portions of the system may occur before water ever passes through a customer meter. Such losses can be particularly difficult to identify in remote areas or where escaping water does not become visible at the surface. The acoustic monitoring capability of the selected Kamstrup system provides the District with a dynamic tool for identifying and narrowing the location of these types of leaks. From an engineering perspective, this capability materially increases the operational value of the meter network.

Another important consideration is that the selected system is no longer an untested technology for Green River Valley. The District has approximately two years of direct operating experience with the Kamstrup meters, collectors, and software. District personnel have installed meters, assisted with collector installation, operated the software, reviewed leak reports, responded to system alerts, and confirmed that the equipment performs reliably under actual operating conditions. This experience materially reduces the technical and implementation risk associated with systemwide deployment.

The availability and responsiveness of manufacturer and vendor support further reduce that implementation risk. During the Pilot Project, Kamstrup and Core & Main provided assistance with collector installation, staff training, FCC licensing, software implementation, and technical questions arising during operation. District employees received instruction that allowed them to install the additional collector required in the Pilot Project and have developed familiarity with the hardware and software environment. The District therefore enters broader deployment with demonstrated access to training, technical assistance, implementation support, and ongoing service.

This consideration is not merely administrative. An AMI conversion of this scale requires coordinated support over an extended period. Meter installation, communications troubleshooting, collector placement, software configuration, staff training, warranty administration, and future system expansion all depend upon timely technical assistance. The District's experience to date demonstrates that the support structure for the selected Kamstrup system is both available and responsive.

Product availability and distributor accessibility are also legitimate long-term considerations. The District had historically relied upon Badger mechanical meters and was able to obtain those products through a local supplier. When changes in Badger's distribution arrangements required the District to obtain its preferred meters through an out-of-state distributor, acquiring those products became more complex and time consuming.

This experience should not be interpreted as a criticism of the technical quality of Badger's AMI products. Rather, it illustrates that a utility must consider more than meter specifications alone. Reliable product availability, distributor accessibility, responsiveness, technical support, training, and ongoing service all affect the practical long-term value of a metering platform.

Similarly, GRVWD has not operated a Neptune AMI system and therefore has no basis to conclude that Neptune's manufacturer or vendor support would be inadequate. However, the District also does not have the benefit of demonstrated experience with Neptune's support network. Transitioning to a different platform at this point would require the District to establish a new supplier and support relationship, implement different software, retrain employees, and develop familiarity with hardware and communications equipment that have not been tested within the District's system.

Accordingly, selecting another AMI platform at this stage would involve more than simply substituting one meter manufacturer for another. It would mean abandoning a system that has already been successfully tested, establishing a new communications and software platform, retraining personnel, developing new vendor and technical-support relationships, and accepting additional implementation uncertainty without a demonstrated corresponding benefit to the District or its customers.

The comparison also demonstrates that the primary distinction among the three systems is not basic meter accuracy. Kamstrup, Neptune, and Badger all offer modern ultrasonic metering technologies capable of providing significant improvements over conventional mechanical meters. The more meaningful comparison is the overall system configuration and the value it provides to the District. The selected Kamstrup platform combines accurate ultrasonic metering, fixed-base AMI communications, customer-consumption monitoring, integrated acoustic leak detection, proven communications performance, established staff familiarity, and demonstrated manufacturer and vendor support within a single coordinated system.

Based upon this comparative engineering assessment, the Kamstrup system remains the most appropriate AMI solution for Green River Valley Water District. Neptune Cellular AMI and Badger Fixed Base AMI are credible competing technologies, but neither offers a combination of features or demonstrated benefits that would justify changing course after the successful Kamstrup Pilot Project. The selected system directly addresses the District's priorities of improving billing accuracy, reducing water loss, enhancing customer service, reducing manual meter-reading requirements, and improving long-term distribution-system management.

For these reasons, Monarch Engineering, Inc. concludes that continuing with the selected Kamstrup AMI system represents the most technically sound, operationally prudent, and lowest-risk path for Green River Valley Water District. The District's decision to build upon the successful Pilot Project and proceed with systemwide deployment is supported by the demonstrated performance of the technology, its integrated leak-detection capabilities, the availability and responsiveness of technical support, and its overall alignment with the District's long-term operational needs and the interests of its customers.

Comparison of Leading AMI Technologies

Evaluation Factor	Kamstrup Fixed-Base AMI	Neptune Cellular AMI	Badger Fixed-Base AMI
1 Meter Technology	Ultrasonic (moving-part free)	Ultrasonic (moving-part free)	Ultrasonic (moving-part free)
2 Communication Architecture	Utility-controlled fixed-base radio network (meters → collectors → backhaul → applications)	Individual cellular endpoint at each meter (meter → cellular → cloud)	Utility-controlled fixed-base radio network (meters → collectors/gateways → backhaul → applications)
3 Cellular Connection Required at Each Meter	✓ No	✗ Yes	✓ No
4 Customer-Side Leak / Continuous-Use Alerts	✓ Yes	✓ Yes	✓ Yes
5 Integrated Acoustic Leak Detection within AMI Platform	✓ Yes	✗ No	✗ No
6 Utility-Controlled Fixed Network	✓ Yes	✗ No (uses commercial cellular networks)	✓ Yes
7 Field Tested within GRVWD	✓ Yes (pilot and operating experience)	✗ No	✗ No
8 Training, Support, and Implementation Experience	Demonstrated through Core & Main and pilot support	Not demonstrated by District	Out-of-state distribution; District reports reduced responsiveness
9 Overall Relevance to GRVWD Objectives	Strong alignment with water-loss reduction and field-tested performance	Capable alternative, but not field tested by GRVWD	Capable alternative, but no integrated acoustic leak detection in the AMI platform

Comparison is qualitative and based on the District's operating priorities; it is not a formal numerical scoring matrix.

All three platforms represent meaningful improvements over manual-read mechanical meters; however, the selected Kamstrup system remains the best fit for the District's demonstrated operating needs.

VI. Basis for Accelerated AMI Deployment

GRVWD has determined that it is in the best interest of the District and its customers to proceed with systemwide AMI deployment before every existing customer meter reaches the end of its nominal service life or is fully depreciated. This decision is based on the District's current meter replacement needs, the successful performance of the AMI Pilot Project, the measurable operational and customer benefits provided by the selected technology, and the long-term cost of delaying conversion to AMI.

The District does not view the remaining book life of an individual meter as the sole factor that should determine when that meter is replaced. Depreciation is an accounting mechanism used to allocate the cost of an asset over an estimated useful life; it does not necessarily establish the point at which continued operation of that asset represents the most efficient or prudent course of action. Likewise, a meter may remain physically capable of registering water even though newer technology can provide substantially greater operational and customer benefits. The appropriate consideration is whether continued use of the existing meters provides greater overall value than replacing them as part of a coordinated AMI deployment.

Meter Replacement Cycle Alignment

A substantial portion of the District's existing 5/8 x 3/4-inch meter fleet is already at or approaching the age at which the District has historically replaced mechanical meters. Approximately 4,464 meters are already 10 years old or older. An additional 11 meters will reach 10 years of age in 2027 and 736 more will reach that age in 2028. As a result, the District must address a significant portion of its existing meter fleet in the near term regardless of whether AMI is deployed.

The District could remove and test the aging meters and return those that satisfy applicable accuracy requirements to service. However, this alternative would require District personnel to travel throughout the service area, remove the meters, transport them for testing, perform the required accuracy testing, reinstall meters that pass, and replace those that fail. The District estimates that testing each meter requires approximately one hour. If approximately 5,000 meters were instead sent to an outside testing facility at approximately $50 per meter, the testing expense alone would approach $250,000, exclusive of District labor associated with removal and reinstallation.

The District has historically replaced its older mechanical meters rather than conducting large-scale testing because aging mechanical meters become increasingly less dependable at accurately registering low flows. Continuing that practice with new manual-read mechanical meters would require the District to make a substantial investment in a technology that would continue to carry the same basic operational limitations for many years.

The current meter replacement cycle therefore creates a logical and financially responsible opportunity to transition to AMI.

Route-Level Deployment Efficiency

A gradual meter-by-meter transition based solely on the age of each individual meter would create significant operational inefficiencies within the District's existing meter-reading routes. Individual routes would contain a mixture of manual-read and AMI meters, requiring District personnel to continue physically traveling the route to read the remaining manual meters even after a substantial portion of the route had been converted to AMI.

This would greatly reduce the operational value of the conversion. The District would incur the cost of installing AMI meters and communications infrastructure but would still be required to devote personnel, vehicles, fuel, and time to reading the remaining manual meters located along the same route. Meaningful reductions in meter-reading labor can only occur when sufficiently large portions of a route are converted so that the manual-reading requirement can be substantially reduced or eliminated.

An alternative approach of removing serviceable older meters from a route being converted to AMI and reinstalling those meters elsewhere would be even less practical. Such an approach would require District personnel to remove a functioning meter, transport and inventory it, travel to another customer location, remove the existing meter at that location, reinstall the relocated meter, and maintain records of the meter transfer. The District would essentially be performing two meter changes in order to extend the use of one existing meter, while also moving older manual-read technology from one portion of the system to another.

This process would create additional labor, vehicle use, customer service interruptions, inventory management, and administrative work without improving the District's metering system. It would also perpetuate the manual-reading requirements and operational limitations that the AMI Project is intended to eliminate.

For these reasons, the District believes that converting meters on a coordinated route or geographic-area basis is considerably more efficient than attempting to preserve the remaining service life of individual meters. Completing a route or defined area allows the District to obtain the full operational value of AMI deployment, simplify meter-reading procedures, reduce unnecessary meter handling and relocation, and move more efficiently toward a uniform systemwide metering platform.

Demonstrated Benefits of AMI

Early deployment is further justified because the selected AMI technology has already been tested successfully within the District's own system.

The 300-meter Pilot Project was intentionally located in a geographically challenging area. The District wanted to determine whether the communications network would function reliably in an area characterized by hills, hollows, and difficult meter-reading conditions before committing substantial resources to broader deployment. The Pilot Project demonstrated that the selected technology could be successfully implemented and operated under those conditions.

The District has approximately two years of operating experience with the Pilot Project and has experienced no significant problems with the meters or communications network. The District also gained direct experience with the Leak Detector software, communications equipment, and data-management platform.

Accordingly, the District is not proposing to accelerate replacement in order to deploy an untested technology. It is proposing to expand a technology that has already demonstrated reliable operation and practical value within the District's service territory.

<u>Customer Advantages & Associated Equity</u>

Waiting until each existing meter individually reaches the end of its nominal service life would also delay benefits that customers can receive immediately.

AMI provides more reliable and timely meter readings and reduces the need for estimated bills caused by snow, ice, inaccessible meter boxes, or other field conditions. This improves billing consistency and reduces the customer confusion and dissatisfaction that can occur when estimated bills are followed by later adjustment or "catch up" bills.

AMI also gives the District the ability to identify unusual or continuous consumption much sooner than under a monthly manual-read system. A leaking toilet, plumbing fixture, or customer service line can continue for weeks before being discovered under traditional meter-reading practices. By that time, the customer may have accumulated a substantial and unexpected bill.

With AMI, District personnel can identify unusual consumption and contact customers earlier, giving them an opportunity to investigate and correct the problem before significant additional water is consumed. The District therefore considers AMI not only a utility operating tool but also a meaningful customer-service improvement.

Delaying deployment would postpone these advantages for a significant portion of the District's customer base and would create an inequitable result in which some customers receive the improved accuracy, leak detection, and service benefits of AMI while others are required to wait solely because their existing meters have not yet reached replacement age.

<u>Accelerated Water Loss Reduction</u>

The District also considers AMI an important component of its ongoing efforts to control water loss. The selected system provides several tools that assist in identifying water that might otherwise remain unaccounted for, including improved low-flow meter registration, customer continuous-use alerts, tamper detection, unauthorized-use detection, and acoustic leak detection.

The District has previously identified more than 6 million gallons of water lost through unauthorized use at inactive accounts. Under a fully deployed AMI system, unexpected flow through an inactive meter can be identified much sooner, allowing the District to investigate the condition before substantial additional losses occur.

The acoustic capabilities of the Kamstrup flowIQ® 2200 and Leak Detector software provide an additional benefit by helping the District identify possible utility-side service-line and distribution-main leaks that may never appear as customer consumption. These types of leaks can be particularly difficult to locate in rural areas where water may discharge underground, into drainage features, or into waterways without becoming readily visible.

Each year that systemwide deployment is delayed is another year in which the District does not have the benefit of these monitoring capabilities across the majority of its service territory.

Revenue Accuracy

The District's Pilot Project also demonstrated an improvement in revenue per active account following AMI deployment. During the 17 months preceding AMI deployment in the Pilot Area, the District received an average of approximately $49.26 per active customer account per month. During the 17 months following deployment, revenue averaged approximately $57.70 per active account per month, an increase of approximately $8.44 per active account per month.

The District attributes a meaningful portion of this improvement to the more accurate measurement of actual water consumption, particularly at lower flow rates that aging mechanical meters may not register as effectively.

This distinction is important. Improved revenue resulting from accurate meter registration is not an additional charge imposed upon customers. It represents more accurate measurement of water actually delivered and consumed under the District's existing rates.

Based on the District's existing customer base, even a portion of the improvement experienced in the Pilot Area could provide meaningful additional annual revenue. Those revenues improve the District's financial position, support system maintenance, and reduce future pressure for rate increases. Waiting to deploy AMI for the full system would also delay this benefit.

Efficient Use of Personnel

The District currently devotes four maintenance employees to meter reading activities during an approximately 20-day reading cycle each month. This represents a substantial commitment of field personnel to a repetitive activity that can be substantially automated.

The District does not intend to lay off employees as a result of AMI deployment. Instead, AMI will allow existing employees to devote more time to higher-value activities such as leak investigation and repair, customer service calls, installation of new services, valve and hydrant maintenance, line maintenance, emergency response, and other operational needs.

Over time, the District also anticipates reducing staffing requirements through normal attrition and reducing vehicle requirements over time. At a minimum, broader AMI deployment should reduce or eliminate the need to increase maintenance staffing solely to accommodate meter reading as the system grows.

Early deployment therefore allows the District to begin realizing operational efficiencies sooner. Delaying AMI would require the District to continue dedicating substantial labor and vehicle resources to manual meter reading even though technology has already been proven capable of performing that function more efficiently.

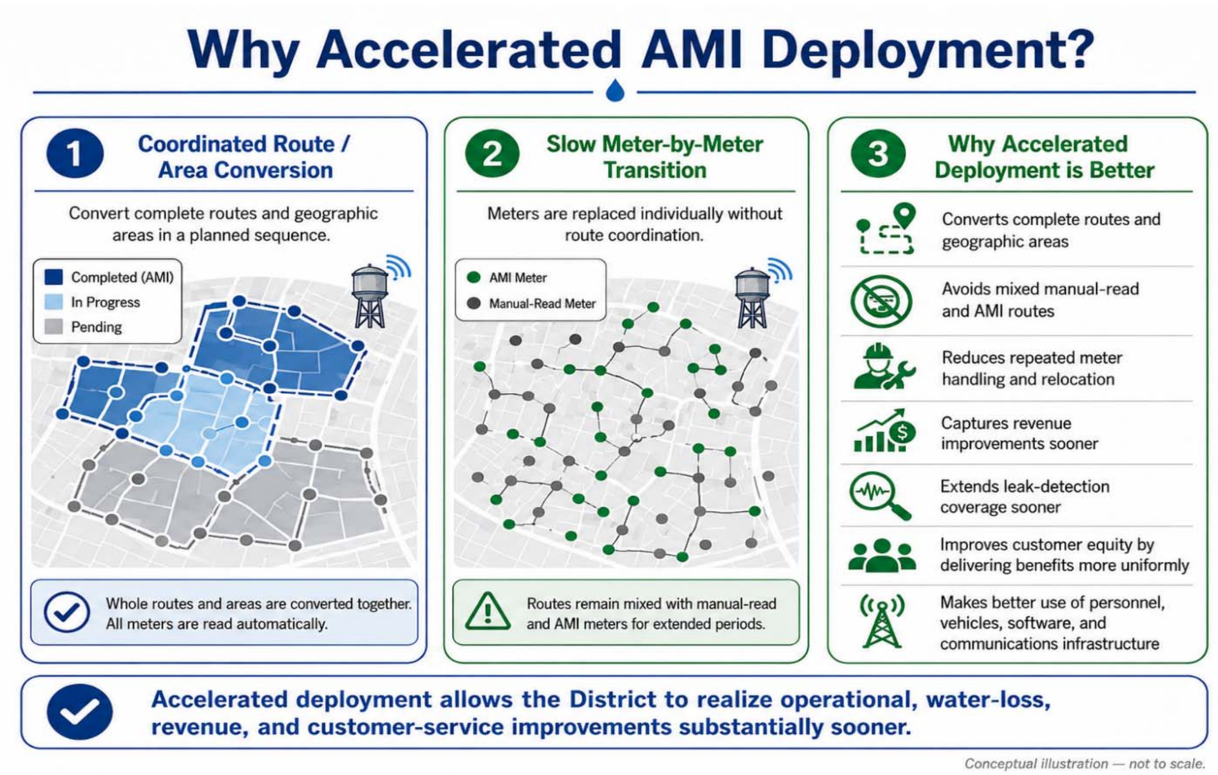
Depreciation vs. Operational Value

The District recognizes that some existing meters proposed for replacement have not reached the end of their accounting depreciation lives. However, the existence of remaining book value should not, by itself, dictate continued use of an asset when replacement provides greater overall economic and operational value.

The District has no outstanding debt associated with its current customer meters, is not proposing a rate increase as a result of the AMI Project, and plans to finance the initial phase through short-term financing rather than long-term debt. The selected Kamstrup meters also carry a 20-year manufacturer warranty, and the District proposes a corresponding 20-year depreciation life for the new meters.

Accordingly, the proposed replacement is not a short-term expenditure that will need to be repeated in the near future. It represents a long-term transition to a metering platform expected to serve the District for approximately two decades while providing substantially greater capabilities throughout that period.

From an engineering and utility-management perspective, retaining an existing asset solely to exhaust its remaining depreciation life can create a false economy if doing so delays measurable operational savings, water-loss reductions, improved billing accuracy, and customer benefits that exceed the value of continuing to use the older asset.



Engineering Conclusion

Based upon the considerations presented above, it is apparent that accelerated, coordinated deployment of AMI is more prudent and beneficial than extending the transition over many years based solely upon the age, remaining service life, or depreciation status of individual meters.

A substantial portion of the District's existing meter fleet already requires replacement or testing, creating an appropriate opportunity to transition to AMI. The successful Pilot Project has demonstrated that the technology is reliable, and that its operational and customer-service advantages are available today. Delaying broader deployment would therefore postpone benefits that the District has already demonstrated can be achieved.

A prolonged meter-by-meter conversion would also significantly reduce the efficiency of the transition. Routes containing both manual-read and AMI meters would continue to require personnel and vehicles to physically travel those routes to obtain the remaining manual readings. Alternatively, removing functioning manual-read meters from routes being converted to AMI and reinstalling those meters elsewhere merely to preserve their remaining service lives would result in additional meter changes, labor, vehicle use, customer service interruptions, inventory management, and recordkeeping without providing a corresponding operational benefit.

Coordinated deployment allows the District to convert complete routes and geographic areas, progressively eliminate manual meter-reading requirements, standardize its metering platform, and make more efficient use of its personnel and vehicles. It also enables the District to more fully utilize the communications infrastructure, software, staff training, and other resources required to operate the AMI system.

Accelerated deployment is particularly important to the District's water-loss reduction efforts. Each additional Kamstrup flowIQ® 2200 meter adds another acoustic monitoring point within the distribution system. Expanding the system over a coordinated period therefore creates a much more useful acoustic monitoring network and allows the District to extend leak-detection capabilities throughout its service area sooner than would occur under an individual end-of-life replacement approach.

The District will also realize improved revenue capture sooner as more aging mechanical meters are replaced with accurate ultrasonic meters. Likewise, customers will receive the advantages of improved meter-reading accuracy, reduced estimated billing, earlier leak notification, and improved customer service more uniformly across the system. Delaying deployment based solely upon individual meter age would create an inequitable result in which some customers receive these improvements while others are required to wait years simply because their existing meters have not yet reached replacement age.

The remaining useful or depreciable life of some existing meters is therefore only one consideration in determining appropriate replacement timing. It should be weighed against the operational inefficiencies of maintaining parallel metering technologies and the measurable advantages that can be realized through broader AMI deployment.

For these reasons, Monarch Engineering, Inc. concludes that proceeding with coordinated, accelerated AMI deployment represents the more efficient and prudent use of District resources. This approach allows GRVWD to realize the operational, water-loss, revenue, and customer-service improvements associated with AMI substantially sooner while avoiding the inefficiencies inherent in a prolonged, meter-by-meter transition.

VII. Summary & Conclusions

This report has evaluated GRVWD's existing metering practices, the results of its AMI Pilot Project, the technical characteristics of the selected Kamstrup system, representative competing AMI technologies, and the engineering basis for proceeding with accelerated systemwide deployment. Based upon that analysis, Monarch Engineering, Inc. concludes that the proposed AMI Project is technically sound, operationally justified, and represents a prudent long-term improvement to the District's metering and distribution-system management capabilities.

The District's existing manual-read mechanical meter system requires a substantial recurring commitment of personnel and vehicles, provides only periodic consumption information, can result in estimated billing when meters are inaccessible, and offers limited ability to identify abnormal usage or leaks between monthly readings. These limitations are compounded by an aging meter fleet in which a significant number of meters are already at or approaching the District's normal replacement age. Transitioning to AMI directly addresses these operational limitations while providing capabilities that conventional manual-read meters cannot provide.

Importantly, the District did not commit to systemwide deployment based solely upon manufacturer representations. The Pilot Project provided approximately two years of direct operating experience with the Kamstrup meters, communications equipment, and software in a geographically challenging portion of the District's service area. The Pilot Project demonstrated reliable communications, provided District personnel with practical operating experience, produced useful leak and abnormal-use information, and showed improved revenue per active account following installation. This field validation materially reduces the technical and implementation risk associated with broader deployment.

The selected Kamstrup platform also provides a strong combination of features that align with the District's specific operating priorities. The flowIQ® 2200 provides ultrasonic measurement with enhanced low-flow performance and no moving measuring components; the fixed-base communications architecture can be configured around the District's rural terrain; and the integrated acoustic leak-detection capability allows each installed customer meter to also function as a monitoring point for potential leakage in nearby service connections and distribution piping. The District's favorable experience with manufacturer and vendor training, implementation assistance, and technical support further supports continued deployment of the selected platform.

The comparison with Neptune Cellular AMI and Badger Fixed Base AMI confirms that both are capable modern metering systems, but neither presents a technical or operational advantage sufficient to justify abandoning the Kamstrup system already successfully demonstrated by the District. Kamstrup provides the District with a field-tested communications architecture, integrated acoustic leak detection, established staff familiarity, and demonstrated support within a single coordinated platform. From an engineering perspective, continuing with the selected system therefore represents the lower-risk and better-aligned course of action for GRVWD.

The timing of deployment is equally important. Waiting until every existing meter individually reaches the end of its nominal service life or depreciation period would prolong manual meter-reading requirements, create inefficient routes containing mixed metering technologies, delay water-loss and revenue improvements, and result in customers receiving different levels of metering and leak-detection capability for an extended period. Attempting to preserve the remaining life of individual meters by removing them from converted routes and reinstalling them elsewhere would create additional labor, vehicle use, customer interruptions, inventory management, and recordkeeping without providing a corresponding improvement to the system. Coordinated deployment by route and geographic area is therefore substantially more efficient than a prolonged meter-by-meter conversion.

Taken as a whole, the proposed AMI Project is more than a meter replacement program. It is a long-term operational improvement that will provide the District with more accurate consumption measurement, earlier identification of customer-side and distribution-system leaks, improved revenue capture, reduced dependence upon manual meter reading, more efficient use of field personnel, and substantially better information for managing the water system. These improvements directly support the District's objectives of controlling water loss, maintaining accurate and equitable billing, improving customer service, and using its existing personnel resources more efficiently.

Accordingly, Monarch Engineering, Inc. concludes that Green River Valley Water District's selection of the Kamstrup AMI system and its proposed coordinated systemwide deployment are supported by sound engineering judgment, demonstrated field performance, and the long-term operational needs of the District. From an engineering and utility-management standpoint, proceeding with the AMI Project as proposed represents a prudent investment and is in the best interest of the District and its customers.