Exhibit No:	**___**
Issue:	**Ultrasonic Meters**
Witness:	**James Rieske**
Type of Exhibit:	**Rebuttal Testimony**
Sponsoring Party:	**Spire Missouri Inc.**
Case No.:	**GR-2021-0108**
Testimony Date:	**June 17, 2021**

SPIRE MISSOURI INC.

CASE NO. GR-2021-0108

REBUTTAL TESTIMONY

OF

JAMES RIESKE

JUNE 17, 2021

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REBUTTAL TESTIMONY OF JAMES RIESKE

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is James Andrew Rieske, and my business address is 700 Market Street, Saint Louis, MO 63101.

Q. WHAT IS YOUR PRESENT POSITION?

A. I am currently Director, Measurement for Spire Missouri Inc. ("Spire").

Q. PLEASE STATE HOW LONG YOU HAVE HELD YOUR POSITION AND BRIEFLY DESCRIBE YOUR RESPONSIBILITIES.

A. I have been the Director, Measurement for Spire since June 2018. In this role I am responsible for the customer metering used to serve Spire customers in all regions. This includes the administration of all programs that purchase, maintain, test, and retire all customer metering.

Q. WHAT WAS YOUR PROFESSIONAL EXPERIENCE PRIOR TO ASSUMING YOUR CURRENT POSITION?

A. I joined Spire in January 1990 in our Engineering Department. I served various roles in the Engineering Department for three years. The next year was spent working as a Field Supervisor in our Instrumentation and Control Department. For the next 14 years I worked in Gas Safety Compliance where I spent the last six years managing all the day-to-day compliance programs. For the next five years I led the project to deploy Asset Management and Field Data Collection Systems of Spire's Enterprise Resource Planning software for all of the Missouri Regions. In 2015, I took over the management of Spire's Asset Management Systems and the business processes that maintained all asset data.

Q. WHAT IS YOUR EDUCATIONAL BACKGROUND?

A. I have my Bachelor of Science in Mechanical Engineering from the University of Missouri, Columbia.

Q. HAVE YOU PREVIOUSLY FILED TESTIMONY BEFORE THE MISSOURI PUBLIC SERVICE COMMISSION ("COMMISSION")?

A. No, I have not.

I. PURPOSE OF TESTIMONY

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. The purpose of my rebuttal testimony is to respond to the recommendation of Staff of the Commission ("Staff") and the Office of the Public Counsel ("OPC") that the Company's investments in advanced ultrasonic metering reading technology ("AMI") be disallowed in rates and rate base.

Q. PLEASE LIST THE SCHEDULES YOU ARE SPONSORING.

A. I am sponsoring Schedule JAR-R1 which are AMI presentation slides, JAR-R2 which is Itron's end of life announcement for the I-250 gas meters, and JAR-R3 which is the Intelis Spec Sheet for the AMI meters.

II. ULTRASONIC METERING (AMI) TECHNOLOGY

Q. WHEN YOU TALK ABOUT AMI TECHNOLOGY AT SPIRE, TO WHAT ARE YOU REFERRING?

A. I am referring to ultrasonic meters, which I describe in more detail below. Spire is currently in Phase I of our AMI program which focuses on the installation of ultrasonic meters at customers' premises.

Q. WHAT SPECIFIC DEVICES ARE YOU REFERRING TO?

A. Spire began using the Itron Intelis Gas Meter in June 2020. The Intelis meter is a 250 CFH gas meter that uses ultrasonic measurement technology instead of the mechanical diaphragm measurement technology for residential customers. This meter is currently being installed in automatic meter reader ("AMR") mode which allows it to operate within Spire's existing van read meter reading technology. The meter firmware mode can be changed to allow it to operate in AMI mode on a two-way RF network. Spire's gas utilities began using the Intelis meter in Spire Missouri West and Spire Gulf in June 2020. In September 2020, the Intelis meter was introduced in Spire Alabama.

Q. HOW MANY OF THESE DEVICES HAS SPIRE ALREADY INSTALLED?

A. Spire has installed 64,563 Itron Intelis Gas Meters as of June 2, 2021

Q. HAVE YOU REVIEWED THE SECTION OF STAFF'S REPORT FILED ON MAY 12, 2021 PERTAINING TO THE TREATMENT OF AMI INVESTMENTS?

A. Yes, I have.

Q. HAVE YOU ALSO REVIEWED THE SECTION OF OPC WITNESS GEOFF MARKE PERTAINING TO THE TREATMENT OF AMI INVESTMENTS?

A. Yes, I have.

Q. PLEASE SUMMARIZE THE POSITION OF STAFF AND OPC REGARDING RECOVERY OF AMI INVESTMENTS.

A. Staff recommends excluding the amount recorded for smart meters while Staff continues to investigate the decision to install the smarter meters and justification of the cost. Staff indicates the smart meters have not been shown to be "used and useful." OPC's position is that (1) AMI investments made by Spire are not prudent or necessary to provide safe and reliable service, (2) that no benefits would inure to customers from AMI technology

without an accompanying network, (3) that AMI investments lead to stranded costs for diaphragm meters that are not fully depreciated, (4) that diaphragm meter technology is not obsolete, (5) that AMI investments are not cost effective, (6) that AMI investments do not deliver benefits comparable to electric AMI investment, such as time of use rates, and (7) Spire's sole motivation in investing in AMI is to build out rate base and increase its own profitability.

Q. DO YOU AGREE WITH THESE ARGUMENTS AGAINST AMI?

A. No, I do not. Investment in AMI technology (ultrasonic meters) delivers immediate and substantial benefits to customers, regardless of whether new ultrasonic meters are connected to a wireless network. Moreover, the gas safety benefits of this technology are incredibly cost effective when compared to other devices that offer similar safety benefits. Finally, the Company's installation strategy minimizes the potential for stranded assets by focusing on diaphragm meters that are already scheduled for replacement.

Q. WHAT ARE THE BENEFITS OF AMI DEVICES THAT ARE UNRELATED TO ANY NETWORK?

A. While ultrasonic meters have many benefits, there are four key benefits of these devices that are not at all dependent on any network: (1) customer safety, (2) employee safety, (3) increased accuracy, and (4) reliability.

Q. WHAT ARE THE CUSTOMER SAFETY BENEFITS OF AMI?

A. One of the most common causes of natural gas explosions are large leaks or open fuel runs on the customer's side of the meter. We commonly encounter these situations due to copper theft or where unused, uncapped fuel runs are mistakenly valved on. The results of these

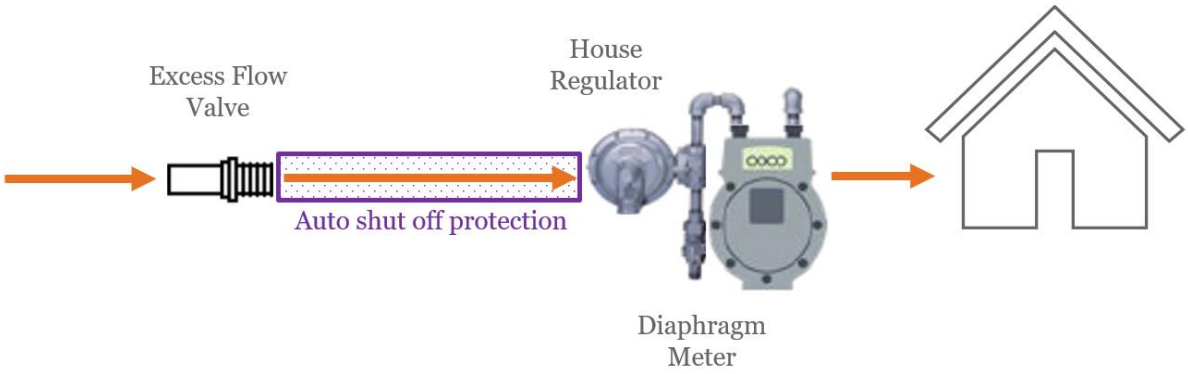
situations can be catastrophic. Ultrasonic meters can easily prevent these explosions from occurring.

Q. HOW CAN ULTRASONIC METERS PREVENT THESE EXPLOSIONS?

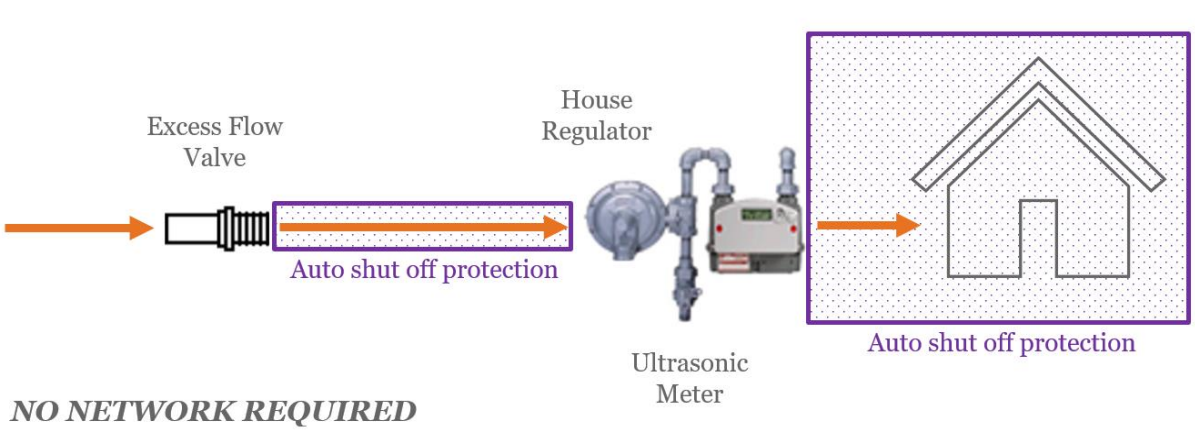
A. Each ultrasonic meter comes factory equipped with an automatic internal shut-off valve built in. When the meter detects a flow rate of 500 cubic feet per hour on the customer side of the meter for a period of approximately ten seconds, the shut-off valve on the meter automatically closes, stopping the flow of gas to the customer premises. This stops the building from filling with natural gas and creating the conditions for a potential explosion.

Q. HOW DOES THIS PROTECTION DIFFER FROM THAT OFFERED BY AN EXCESS FLOW VALVE ("EFV")?

A. EFVs are an effective safety measure to stop the migration of natural gas from a broken service line. However, EFVs only operate on a premises service line up to the meter. They do not detect or prevent breaks or leaks downstream of the meter, which is a far more common cause of natural gas explosions. The diagraph below illustrates the safety protection offered by EFV:



The following diagram illustrates the safety protections offered by EFV and Ultrasonic meter:



Q. HOW DOES THE COST OF AN EFV COMPARE TO THE COST OF AMI?

A. For the past several years, the Commission's safety regulations have required natural gas utilities to install EFVs on all newly installed service lines.[1] However, the vast majority of the service lines in the Company's service territory were installed prior to the implementation of this regulation and remain unprotected by an EFV. The Company's tariff permits any customer with an unprotected service line to request that the Company install an EFV on the customer's service line. The proposed tariff specifies a customer cost of $1,500 for this service—a cost that approximates the Company's cost to install an EFV on a legacy service line.[2] Given this high cost, very few customers have elected to have an EFV installed on their unprotected service line. By contrast, an ultrasonic meter only costs about $25 more than a comparable diaphragm meter when purchased new. And, as discussed below, the Company is only installing ultrasonic meters when it is already at a customer premises for another purpose or the existing meter is already scheduled for

[1] 20 CSR 4240-40.030 8 (O) and (P)
[2] P.S.C. MO. No.9 Sheet No 18

replacement. Therefore, there is very little marginal cost associated with installing an ultrasonic meter. This cost is orders of magnitude less than installation of an EFV, yet it delivers substantially greater customer safety benefits. This is also a safety benefit that Spire has never had a device capable of providing until the ultrasonic meter.

Q. ARE THERE ANY OTHER CUSTOMER SAFETY BENEFITS ASSOCIATED WITH THE AUTOMATIC SHUT-OFF VALVE ON AN ULTRASONIC METER?

A. Yes. Each ultrasonic meter also contains a factory-installed temperature sensor. The sensor is linked to the automatic shut-off valve, which will activate when the temperature sensor detects an external temperature of 176 degrees Fahrenheit or greater.

Q. WHAT IS THE PURPOSE OF THE TEMPERATURE SENSOR?

A. The sensor is designed to activate when it detects heat from a fire or explosion. This prevents natural gas from acting as a continued fuel source in a structure fire, regardless of whether it was originally caused by the ignition of natural gas. This detection has the benefit of reducing the overall severity and duration of a fire, which is a safety benefit to both customers and first responders.

Q. ARE THERE ANY OTHER CUSTOMER SAFETY BENEFITS OF ULTRASONIC METERS?

A. Yes. Within the next year, the Company intends to begin installing Itron Series 400 ultrasonic meters at customer premises that are served by a low-pressure (utilization pressure) natural gas distribution system. The Series 400 contain an additional feature of the automatic shut-off valve. These devices have a flow rate sensor on the customer outlet side of the meter, as discussed above, and a pressure sensor on the inlet side of the meter. On these devices, when the meter detects over-pressurization on the inlet side, the shut-off

valve will automatically activate, preventing over-pressurized gas from reaching the customer premises.

Q. WOULD THIS TECHNOLOGY PREVENT A NATURAL GAS DISASTER LIKE THE MERRIMACK VALLEY, MASSACHUSETTS INCIDENT?

A. Yes. Spire operates low pressure (utilization pressure) natural gas distribution systems similar to those involved in the Merrimack Valley explosions.[3] These systems deliver gas at a pressure that does not require a pressure regulator prior to gas entering the customer system. In the Merrimack Valley incident, a district regulator station over-pressured the distribution system and delivered gas at pressures in excess of what the customer systems could handle. In the event of a pressure regulating failure or error, as occurred there, the ultrasonic meters downstream of the impacted regulating device would activate, stopping the flow of natural gas to those premises.

Q. IS IT YOUR OPINION THAT THE INSTALLATION OF ULTRASONIC METERS IN SPIRE'S SERVICE TERRITORY WILL SAVE LIVES?

A. Yes, absolutely.

Q. DO ANY OF THE CUSTOMER SAFETY BENEFITS YOU'VE DESCRIBED REQUIRE THE PRESENCE OF A NETWORK TO FULLY FUNCTION?

A. No.

Q. DID STAFF OR OPC DISCUSS ANY OF THESE CUSTOMER SAFETY BENEFITS IN THEIR DIRECT TESTIMONY?

[3] Merrimack Valley was a series of deadly explosions and fires on the Columbia NiSource system, caused by an accidental overpressure of a low pressure distribution system. For more information, please see the NTSB report at https://www.ntsb.gov/investigations/AccidentReports/Pages/PLD18MR003-preliminary-report.aspx

A. No. Staff and OPC did not discuss any of the customer safety benefits of ultrasonic meters.

Q. WHAT ARE THE SAFETY BENEFITS OF ULTRASONIC METERS TO SPIRE EMPLOYEES?

A. In addition to all the customer safety benefits, there are also safety benefits for our employees in the field who respond to emergencies. The principal benefit of ultrasonic meters for these employees is near-field remote shut-off.

Q. WHAT IS NEAR-FIELD REMOTE SHUT-OFF?

A. The shut-off valves contained within the ultrasonic meters can either be activated automatically, as discussed above, or via a signal from a handheld device or network. This device is similar to a remote control you might use for a television, and enables a field technician to shut down a meter from up to 1,000 feet away by simply pushing a button on the handheld device.

Q. WHAT IS THE SAFETY BENEFIT OF THE ABILITY TO SHUT-OFF A METER REMOTELY FROM HUNDREDS OF FEET AWAY?

A. Our field service technicians frequently encounter structures that are loaded with natural gas due to a customer fuel run leak or break, or attempted arson. There may also be times when structures load with natural gas due to migration from a broken main or service pipe. The only way to make these situations "gas safe" is to remove the supply of natural gas and ventilate the structure. Traditionally, this has required our service technicians to approach the structure on foot to manually turn the riser valve to the off position in order to ensure that the meter is no longer the source of the loading gas. The situation is even more dire in the case of inside meter sets, which at times require our field service technicians to physically enter into gas-loaded structures in order to manually isolate the

meter set, typically in the basement. Both of these scenarios put our employees directly in harm's way of a potential explosion.

Q. HAS THE COMPANY EVER EXPERIENCED AN EMPLOYEE FATALITY AS A RESULT OF SUCH CIRCUMSTANCES?

A. Yes, unfortunately.

Q. COULD THAT DANGER BE AVOIDED BY USING THE NEAR-FIELD REMOTE SHUT-OFF CAPABILITY OF AN ULTRASONIC METER?

A. Yes.

Q. CAN THE NEAR-FIELD REMOTE SHUT-OFF CAPABILITY ASSIST IN OTHER WAYS?

A. Yes. In 2013, there was a serious natural gas explosion at our Alabama affiliate, which resulted in a National Transportation Safety Board investigation.[4] In that instance, an uncontrolled riser fire following the explosion prevented rescue personnel from reaching victims trapped in the rubble of a collapsed building for several hours. Ultimately, a service technician was required to approach the riser fire on foot and manually operate the shut-off valve, allowing rescue operations to begin.

Q. COULD AN ULTRASONIC METER WITH NEAR-FIELD REMOTE SHUT-OFF CAPABILITY HAVE STOPPED THE RISER FIRE IN THAT INSTANCE?

A. Potentially, yes.

Q. DO ANY OF THE EMPLOYEE SAFETY BENEFITS YOU'VE DESCRIBED REQUIRE THE PRESENCE OF A NETWORK TO FULLY FUNCTION?

[4] For more information, please see the NTSB Report for additional information. https://www.ntsb.gov/investigations/AccidentReports/Pages/PAB1601.aspx

A. No.

Q. DID STAFF OR OPC DISCUSS ANY OF THESE EMPLOYEE SAFETY BENEFITS IN THEIR DIRECT TESTIMONY?

A. No, they did not.

Q. ARE THERE ANY CUSTOMER BILLING BENEFITS OF ULTRASONIC METERS?

A. Yes, absolutely. Ultrasonic meters are twenty times more accurate than traditional diaphragm meters. An ultrasonic meter is delivered with accuracy to +/- 0.1% versus the accuracy of +/- 2.0% in diaphragm meter technology. Spire has performed numerous accuracy tests on ultrasonic meters during the technology evaluations.

Q. WHAT DOES THAT MEAN OVER THE SERVICE LIFE OF A METER?

A. Traditional diaphragm meters rely on mechanical, moving parts to measure the flow of natural gas through a series of chambers. Not only is this method of measurement relatively imprecise, but it is also subject to significant degradation of accuracy over the service life of the meter due to the wear of moving mechanical parts and/or the presence of moisture. This degradation of accuracy is the sole reason the current Missouri Gas Safety Regulations require the removal and accuracy testing of diaphragm meters beginning at 10 years of service.[5] In contrast, ultrasonic meters do not rely on any mechanical parts to approximate the volume of natural gas moving through them. This means that there are no moving parts which wear, and no degradation of device accuracy over the meter's service life. Overall, installation of ultrasonic meters will result in much more accurate customer bills, and will essentially eliminate variation due to device wear.

[5] 20 CSR 4240-10.030(19).

Q. DO THE ACCURACY BENEFITS YOU'VE DESCRIBED REQUIRE THE PRESENCE OF A NETWORK TO FULLY FUNCTION?

A. No. These benefits are inherent to the design and construction of the device.

Q. DID STAFF OR OPC DISCUSS ANY OF THE ACCURACY OR BILLING BENEFITS OF ULTRASONIC METERS IN THEIR DIRECT TESTIMONY?

A. No, Staff and OPC did not discuss the accuracy or billing benefits of ultrasonic meters.

Q. DO ULTRASONIC METERS PROVIDE ANY RELIABILITY BENEFITS?

A. Yes. A diaphragm meter registers usage through a mechanical, gear based index. This mechanical movement is attached to the network module when setup for AMR meter reading. Spire responds to thousands of mechanical failures of the meter index and/or module connection each year. When the index breaks the meter stops registering usage and requires the Company to send a technician. These events are very intrusive for Spire's customers. The ultrasonic meter registers gas electronically and does not rely on any mechanical movements. This will greatly improve the reliability of the meter equipment.

Q. DO ULTRASONIC METERS PROVIDE ANY AVAILABILITY BENEFITS?

A. Without question. For the reasons I've stated above, and others, diaphragm meters are an obsolete technology. In fact, we were notified by letter in the summer of 2020 that our primary meter supplier, Itron Inc., will discontinue manufacturing any residential or small commercial diaphragm meters by the end of calendar year 2021.

Q. DO YOU HAVE A COPY OF THAT LETTER?

A. Yes, a true and correct copy of that letter is attached to my testimony as Schedule JAR-R2.

Q. WILL OTHER MANUFACTURERS CONTINUE TO OFFER RESIDENTIAL AND SMALL COMMERCIAL DIAPHRAGM METERS?

A. Probably not. We are already experiencing significant difficulty in sourcing these products. Spire reasonably expects that the use of diaphragm meters within the industry will continue to decline. The metal components in a diaphragm meter are increasing in cost and a primary remaining manufacturer is already selling them at a greater per unit cost than the cost of an ultrasonic meter. In exploring technology Spire found that the ultrasonic meter is already the standard technology in Europe and has been in use for nearly 20 years. It is Spire's belief it will also become the technology standard in North America.

Q. WHAT IS THE LIKELY RESULT IF THE COMMISSION DENIES RECOVERY OF THE COST OF ULTRASONIC METERS?

A. We will probably be forced to continue to try to locate new diaphragm meters from small, unproven manufacturers. We will also have to try to extend the service lives of our existing stock of diaphragm meters through rebuilds at our meter shop. This is costly and inefficient in the short term. In the long term, we will eventually run out of meters and be unable to effectively measure usage for residential and small commercial customers.

Q. COULD THE COMPANY BEGIN MANUFACTURING ITS OWN DIAPHRAGM METERS INSTEAD OF TRANSITIONING TO ULTRASONIC METERS?

A. I suppose we could, at great expense to customers. In that scenario, our customers would not receive any of the safety and other benefits described above.

Q. ARE THERE ADDITIONAL CUSTOMER BENEFITS THAT COULD BE REALIZED BY COUPLING ULTRASONIC METERS WITH A WIRELESS NETWORK?

A. Yes. Eventually, the Company plans to implement a wireless network to continually monitor usage data provided by the ultrasonic meters. This will allow customers to access

detailed daily and hourly natural gas usage information. Access to this data is key to the ability of customers and the Company to perform much more refined energy usage and efficiency analysis, allowing customers to take control of their usage and save money. Additionally, the more frequent data will allow the Company to identify potential metering anomalies much more quickly and respond more proactively. The current monthly reads often require several months of a pattern before an issue is identified. Even when identified, the lack of a detailed history makes it very difficult to diagnose, which results in unnecessary trips to customer premises to investigate.

Q. WOULD ACCESS TO THIS GRANULAR DATA BE BENEFICIAL TO THE COMPANY AS WELL?

A. Yes. Collecting anonymized, big data sets from our customers will help the Company in many ways, unlocking the ability to deploy artificial intelligence to analyze system-wide usage patterns. For example, analysis of these large data sets will allow the Company to much more accurately model customer load profiles, as well as peak day and peak hour demand requirements.

Q. WOULD A NETWORK PROVIDE ANY ADDITIONAL SAFETY BENEFITS, OVER AND ABOVE THOSE YOU'VE ALREADY DESCRIBED?

A. Yes. Real-time customer usage data will allow us to react right away to potentially hazardous situations such as a spiked read alarm or a locked meter showing consumption alarm. With network implementation, we would be able to shut down meters remotely from a computer at a Company office. This can make a premises gas safe far faster than a field technician can respond in person. There is also potential for automation of these remote shut-off procedures, further enhancing safety for customers and employees.

Q. OPC HAS CRITICIZED SPIRE'S USE OF AMI BECAUSE THE COMPANY HAS NOT PROPOSED TIME OF USE RATES. WERE TIME OF USE RATES PART OF THE COMPANY'S AMI ANALYSIS?

A. No. Time of use rates have nothing to do with our ultrasonic meter program. Rather, Spire is using AMI to deliver all of the other benefits I've already discussed. I agree with OPC that time of use rates are not likely to be a customer benefit of AMI. That concept may be applicable to electric utilities, but not to Spire.

Q. OPC HAS ALSO CRITICIZED SPIRE'S DEPLOYMENT OF ULTRASONIC METERS, STATING THAT ON AVERAGE SPIRE IS REPLACING METERS THAT ARE ONLY 1/3 OF THE WAY THROUGH THEIR USEFUL LIFE. IS THAT ACCURATE?

A. No. Current Commission safety rules require that diaphragm meters be removed, inspected and tested at least once every 10 years of service[6]. Spire was previously granted a waiver to extend the service life of meters beyond ten years by sampling and accuracy testing by vintage and type of meter. This testing must begin when a meter reaches 10 years old. At the beginning of calendar year 2020, 337,000 meters are replacement eligible per Commission rules at Missouri West alone. Of that number, 70,000 meters were over 30 years old. Only 84.6% of legacy meters in Missouri West are currently meeting the accuracy testing—the worst performance of all Spire regions.

Q. CAN YOU DESCRIBE SPIRE'S AMI DEPLOYMENT PROCESS TO DATE?

A. Yes. So far, we have only installed ultrasonic meters in the Missouri West territory, not in Missouri East. This is not a wholesale replacement program. In Missouri West, the

[6] 20 CSR 4240-10.030 (19)

Company is targeting meters that are already more than ten years old for replacement with an ultrasonic meter. Of the 41,373 ultrasonic meters we have installed to date, 74% of replacements were meters that were already mandated for replacement by Commission rules. Presently, across Missouri, more than 60% of all residential meters are more than 10 years old, and should be replaced pursuant to Commission rules.

Q. WHAT IS YOUR PLAN FOR REPLACING DIAPHRAGM METERS WITH AMI GOING FORWARD?

A. In Missouri West Territory, we plan to continue replacing diaphragm meters with ultrasonic meters when we are already at a customer premises for another purpose, such as a turn on or an atmospheric corrosion inspection. In these instances, we already have a field technician at the customer's location. This trip is the largest portion of the overall replacement expense, and we can eliminate this marginal expense by performing the meter change when we are already at a location for another purpose. The meter swap itself is a simple process that does not require much additional time. Spire will also continue to target the replacement of aged meters by following the meter sampling program requirements that target aged meter populations that are underperforming during accuracy testing.

Q. ARE THERE ANY OTHER BENEFITS OF THIS STRATEGY?

A. Yes. Spire has committed to becoming a carbon neutral company by mid-century. By combining the meter replacement trip with another required trip to a customer premises, we can greatly reduce the total number of field trips and total vehicle miles driven. This has a corresponding decrease in greenhouse gas emissions.

Q. DOES THIS CONCLUDE YOUR REBUTTAL TESTIMONY?

A. Yes, it does.

BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI

In the Matter of Spire Missouri Inc.'s d/b/a Spire Request for Authority to Implement a General Rate Increase for Natural Gas Service Provided in the Company's Missouri Service Areas	))))	**Case No. GR-2021-0108**

A F F I D A V I T

STATE OF MISSOURI	)	
	)	SS.
CITY OF ST. LOUIS	)	

James Andrew Rieske, of lawful age, being first duly sworn, deposes and states:

1. My name is James Andrew Rieske. I am Director, Measurement for Spire Missouri Inc. My business address is 700 Market St., St Louis, Missouri, 63101.

2. Attached hereto and made a part hereof for all purposes is my rebuttal testimony on behalf of Spire Missouri Inc.

3. Under penalty of perjury, I declare that my answers to the questions contained in the foregoing rebuttal testimony are true and correct to the best of my knowledge and belief.

/s/ James A. Rieske
James Andrew Rieske

June 17, 2021
Date

New metering technology coming to communities we serve

Spire's advanced metering infrastructure (AMI) program

spire

Spire's commitment to service and safety

For more than 160 years, we've been finding new and better ways to serve our customers. And the advanced metering infrastructure (AMI) project provides endless opportunities for us to continue that legacy well into the future.

Diaphragm vs smart meter

Diaphragm vs. Smart Meter

What makes a meter “smart?”

AMI consists of smart meters, modules and other infrastructure that work together in a coordinated network, resulting in improved safety and energy usage insights for customers.

What makes meters “smart” is their ability to provide detailed and accurate analytics on gas usage in real-time or at predetermined intervals, all done remotely.

- A smart meter will replace an existing traditional meter when it’s at the end of its lifespan
- A smart module will be attached to an existing meter that’s already in good working order and can be installed without customer appointments unless the meter is inside

A smart meter always knows how much gas is passing through it, recognizing a threshold and having the ability to auto shut off when an issue is detected.

Enhanced service, support and safety

Seamless service

- With up-to-the-minute information transmitted through smart meters and modules, customers will have greater insight into their energy usage, helping them better plan and budget.

Even better support

- New technology provides clearer information on energy usage patterns. With this new level of insight, Spire can explore offering more customized solutions to better meet the specific needs of residential and commercial customers

Enhanced safety

- Auto and remote shut-off allow immediate remote response to customer usage above established safety thresholds
- When AMI technology is fully implemented, we'll be able to detect and mitigate potential issues and emergencies quickly using real-time monitoring—keeping employees and customers even safer.

Ultrasonic Meter Transition

Spire is transitioning to Ultrasonic metering for residential customers.

Existing diaphragm meter technology is obsolete and is difficult to sustain supply. Diaphragm meters will stop being manufactured in the near future.

Modern Ultrasonic technology is readily available and priced competitively.

Ultrasonic metering has the following immediate advantages over diaphragm metering.

- Safety – The smart meter provides an automated shut-off valve. The meter senses the flow and will shut-off in 10 to 15 seconds of sensing an increase in flow on customer fuel runs consist with a disconnected fuel run.
- Accuracy – The smart meter is accurate to +/- 0.1%. The Ultrasonic measurement does not have any moving parts and eliminates the potential degradation of accuracy that happens as the mechanical diaphragm meter ages.
- Reliability – The smart meter has no moving or mechanical parts. The simpler technology reduces maintenance requirements and customer inconvenience.
- Size – The smart meter is dramatically smaller than the existing diaphragm meters which will allow for more flexibility in placement and aesthetics for the customer.

Ultrasonic Meter Transition

Ultrasonic meters are installed when:

- A meter is scheduled for replacement
- The meter is sample eligible and it can be replaced when the customer service is already interrupted
- Meter is replaced as part of main or service replacement project
- New installations

Diaphragm vs. Smart Meter

Employee training

Training – How to install a Smart Meter
MO West

Training – Reading the LCD
MO West

Advance Metering Infrastructure - Technology

A network that communicates with all Spire customer meters

This network will be 2-way capable

- Hourly reads will be received 3 times a day
- Alarms that are sent based on meter conditions
- A meter can be contacted on demand through the network
- Additional capabilities for pressure measurement and cathodic monitoring

Every customer meter will be capable of 2-way communication

- Smart Module – Communicates usage to network hourly and on demand
- Smart Meter – Communicates usage and has auto and remote shut-off

How AMI works

Smart Meters & Modules

Alabama
Gulf Coast
Missouri

Hourly Reads
3 Times a day

Spire AMI Tower

Network
Monitoring
Software

Field Technology &
Training - Skills

IBM MAXIMO ORACLE

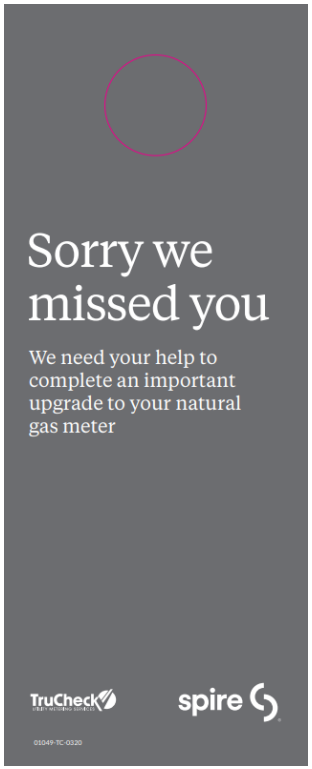
Customer Billing

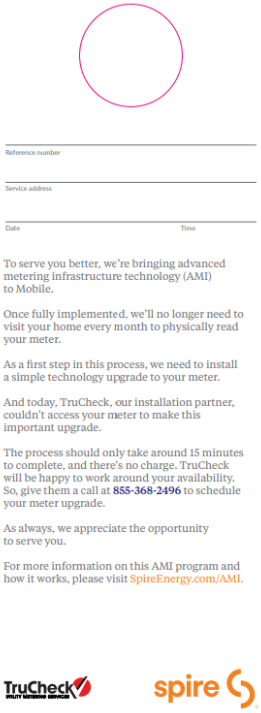
Hourly Meter
Data Business
Intelligence

Meter data strategy
development

Planned customer communications

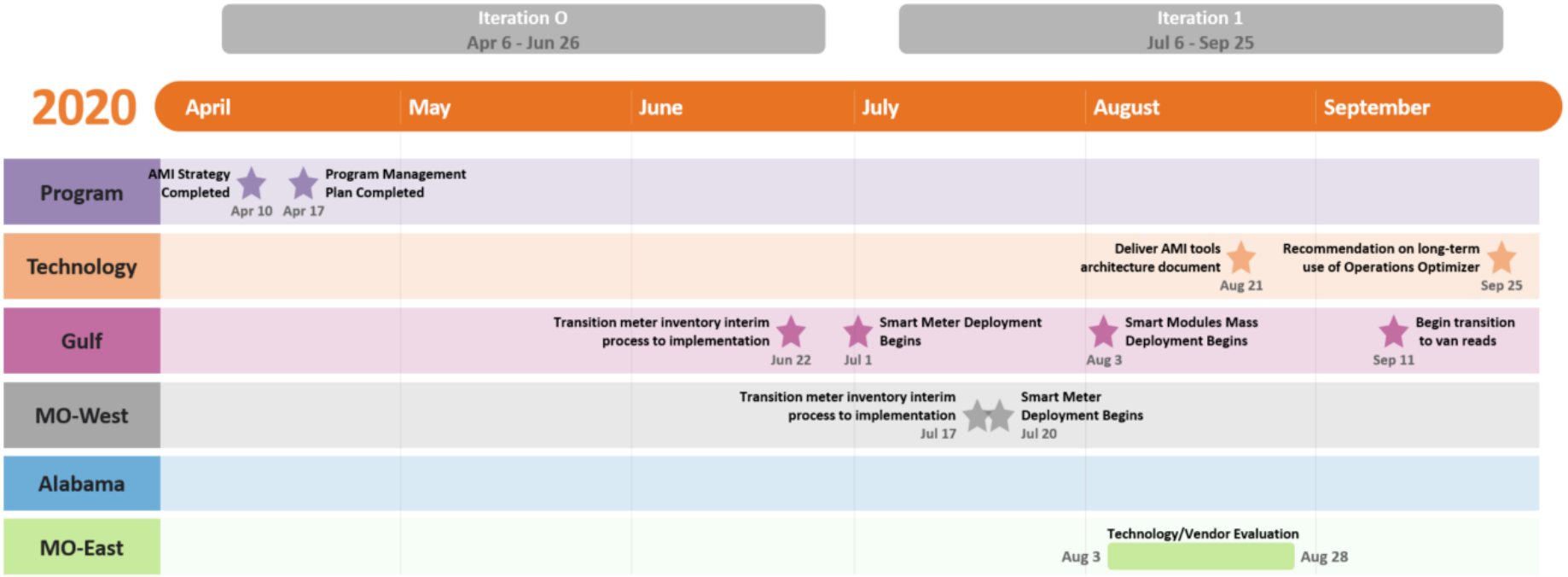
Door tags





Postcards

2020 project timeline



What's next

- We expect to continue upgrading residential and commercial meters through 2025

- When the AMI program is complete, all of Spire will benefit from upgraded technology systems and standardized internal processes to read meters and collect information about energy usage

- While all these added benefits will take time to fully implement, we know the AMI project will help us find fresh ways to serve our customers for another 160 years

Itron Product Information Letter

PIL-20-1247
Product Lines: METRIS and I-250 Diaphragm Gas Meters

Distribution:

☒ **Itron Internal** ☒ **Distributors / Manufacturer Reps** ☒ **Customers**

End of Life Announcement for METRIS® and I-250 Gas Meters

- **Effective 30 March 2021, Itron will end production of all METRIS Gas Meters**
- **Effective 31 December 2021, Itron will end production of all I-250 Gas Meters**

For decades, Itron has successfully designed and manufactured state-of-the-art mechanical meters for the gas industry. Itron's dedication to meeting our customers' evolving needs with innovative solutions has led us to transition towards the Intelis Gas Meter platform's next generation of gas measurement technology. This transition brings the end of production for all METRIS and I-250 gas meters. Itron will pivot its research and development efforts towards expanding its solid-state metering portfolio while maintaining a strong focus on delivering solutions that improve operational efficiency and ensure the safe and reliable delivery of natural gas.

Itron is committed to supporting you during this transition with a last-time buying opportunity. Refer to the following table for important dates for the residential diaphragm gas meters.

Type	Last ordering date	Last manufacturing date	End of support
METRIS®	31 October 2020	30 March 2021	30 March 2023
I-250	31 October 2020	31 December 2021	31 December 2023

Note that our manufacturing capabilities will be constrained as we end the 250-class diaphragm meter's production. Our teams will do their best to acknowledge and serve any remaining demand.

Itron Product Information Letter

End of Support

Itron will support METRIS gas meters under standard warranty conditions until 30 March 2023, unless otherwise stated in customer contracts.

Itron will support I-250 gas meters under standard warranty conditions until 31 December 2023, unless otherwise stated in customer contracts.

For further questions, please contact your Itron sales representative.

Julie Watson

Product Manager

Intelis Gas Meter

Transforming Gas Metering

Given advances in solid state metering and the integration of RF (radio frequency), Itron is pleased to offer the Intelis Gas Meter, an exceptionally compact and feature-rich ultrasonic solid-state residential gas meter with integrated radio frequency communications, temperature sensing, and internal safety shutoff valve.

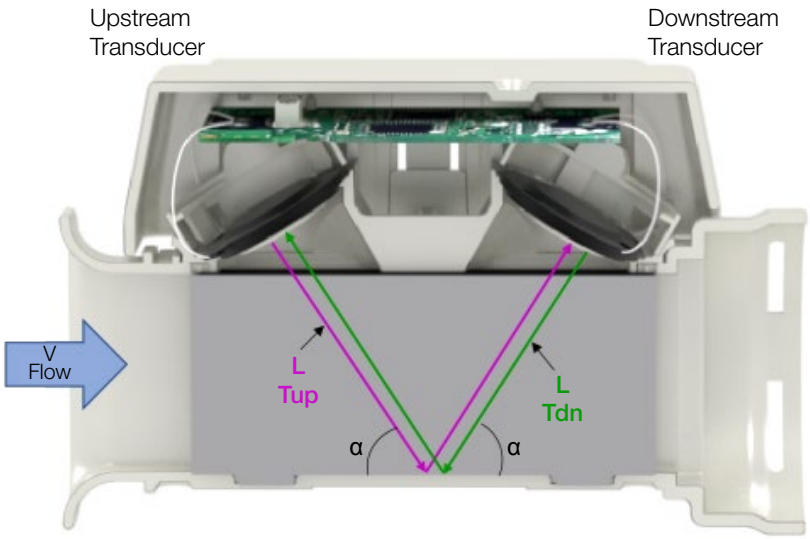
At only **4 ½ pounds**, the Intelis Gas Meter is the lightest residential gas meter available in the North American market. Intelis has 6" center-to-center hub connections so field retrofits are easily accomplished. Intelis builds on Itron's latest RF communications module, enabling the option for mobile mode or network mode, allowing flexible and migratable operation in AMR or AMI environments. In addition, Intelis is equipped with an internal **safety shutoff valve** on the outlet of every meter. Intelis delivers distributed intelligence to gas metering by providing the ability to self-monitor and shut off the flow of gas during a high flow incident, independent of operator involvement or the RF reading topology, similar to the function of an excess flow valve. Leveraging Intelis as part of a smart gas communication platform enables utilities to automatically make intelligent decisions across the gas distribution network, delivering opportunities for operational savings and enhanced customer and employee safety by potentially preventing an explosion.

Key Features

- Compact size
- Integrated safety shutoff valve
- High flow alarm
- Air detection alarm
- High temperature alarm
- Embedded RF communications
- +/- 0.5% accuracy at room temperature
- UL Class I, Division 1
- Retrievable TC and NTC volume
- Whisper quiet operation

SPECIFICATIONS

Ultrasonic single path with two transducers



L = length of path between transducers

Tup = time from transducer upstream to downstream

$$Tup = \frac{L}{C+\cos\alpha * V}$$

Tdn = time from transducer downstream to upstream

$$Tdn = \frac{L}{C-\cos\alpha * V}$$

C = speed of sound

$$C = \frac{L}{2} * \frac{Tup + Tdn}{Tup * Tdn}$$

V = velocity

$$V = \frac{L}{2 * (\cos\alpha)} * \frac{Tdn - Tup}{Tup * Tdn}$$

Volume = Velocity * cross sectional area of the measurement channel * time

ULTRASONIC MEASUREMENT PRINCIPLE

Ultrasonic meters are state of the art technology and have been around for many decades, dating back to their introduction in the 1960's and commercial applications in the 1970's in Japan. Technology advancements have made them more affordable for the residential market. Europe and Asia are currently leading residential solid state installations.

Time of flight single path measurement method utilizes two transducers, one is upstream and one downstream of the gas flow. One transducer will emit an ultrasonic signal and the other will sense it, then the process will reverse. The difference in time for the ultrasonic signals to travel upstream versus downstream and the length between them is used to determine the velocity. Velocity multiplied by the cross sectional area of the measurement channel and time provide the volume. With gas flowing through the meter, the signal takes a shorter time to travel in the direction of gas flow and longer against it. At no flow conditions, the transit time is the same in the upstream and downstream directions.

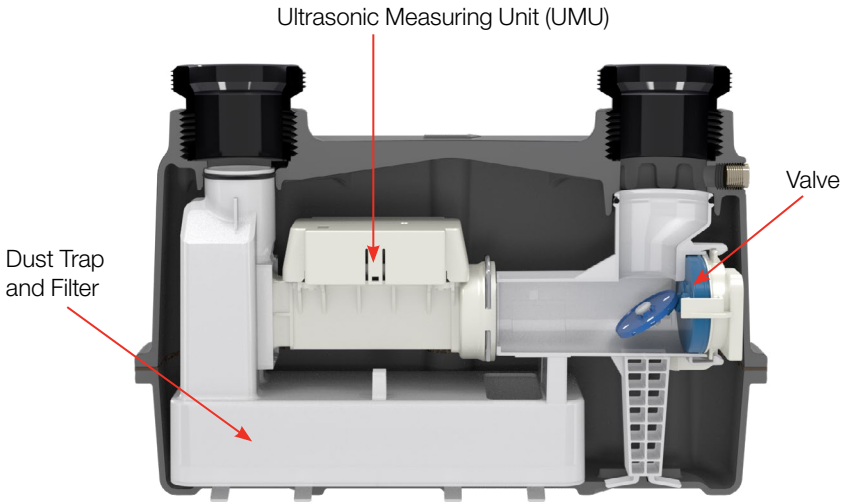
INTELIS GAS METER FEATURES

A safety feature with a ***high flow alarm*** and an ***integrated valve*** that acts similar to an excess flow valve is standard in every Intelis meter. With an internal high flow alarm that is configurable by the utility, a threshold can be set in the meter indicative of an open fuel line downstream of the meter. This high flow event automatically triggers the shutoff valve to close, potentially preventing an explosion and property damage or even loss of life. This safety feature is a key demonstration of intelligence at the meter and will work in both mobile and network mode. It is mandatory to be on-site at the meter to re-open the valve to ensure safe conditions.

An ***air detection alarm*** can be triggered notifying the utility that air was detected in the meter. This can be used for potential tampering information, for example if the meter was removed from installation.

Reverse flow detection function will determine if gas is flowing from the outlet to inlet instead of in the standard operating direction. An alarm will be logged and this can be used for potential tampering information.

A Look Inside Intelis



Intelis Gas Meter is an impressive 70% size reduction of the traditional diaphragm meter.

A ***high temperature alarm*** can be utilized to notify of a potential fire or other dangerous conditions and optionally the valve can be programmed to close upon high temperature detection.

The Intelis Gas meter offers the most flexibility in ***RF reading options*** of any Itron gas module. It is designed to be read by legacy ChoiceConnect handheld and mobile readers and also under Itron's OpenWay Riva and Gen5 Industrial Internet of Things (IIoT) networks. With new features for IoT operation like firmware download, sub hourly interval data and extended data storage, the integrated RF communications offers additional value while continuing to offer the highest in reliability, accuracy, battery life, security standards and intrinsic safety that you have come to expect from the industry leader in gas modules.

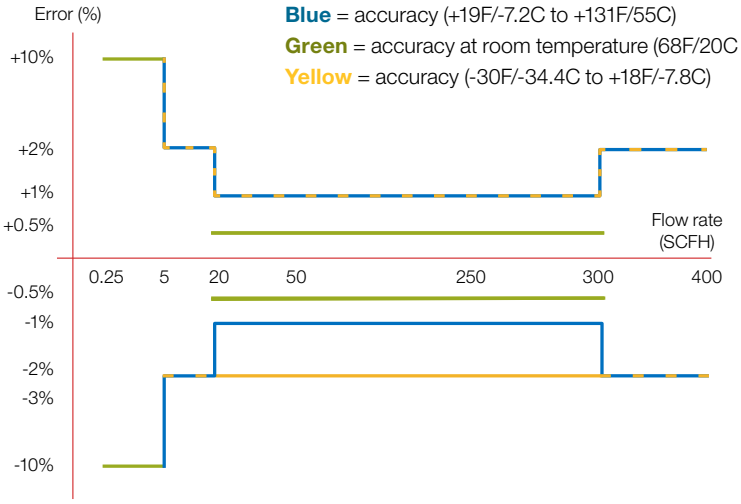
This smart meter features on-board ***self-diagnostics*** including monitoring of transducer failure, remaining battery capacity and gas temperature.

Itron continues its long-standing tradition of superb battery life performance. The entire meter package has a ***20-year battery life*** including the meter, RF communications and valve when using recommended parameters.

Intelis includes a ***secondary retrievable index*** read. An NTC meter has the ability to retrieve through AMR/AMI the TC volume and vice versa, to aid utilities in analysis purposes.

The ***accuracy*** of Intelis is designed to meet applicable requirements in ANSI B109.1 as well as ANSI B109.0 draft and Measurement Canada PS-G-06 Class 1. In addition, Intelis will achieve ***+/- 0.5%*** at room temperature from 20-300 SCFH. There are no moving parts for ultrasonic measurement, therefore it is highly unlikely to lock-up due to contamination or freezeups within the gas stream. The meter is less likely to drift over time.

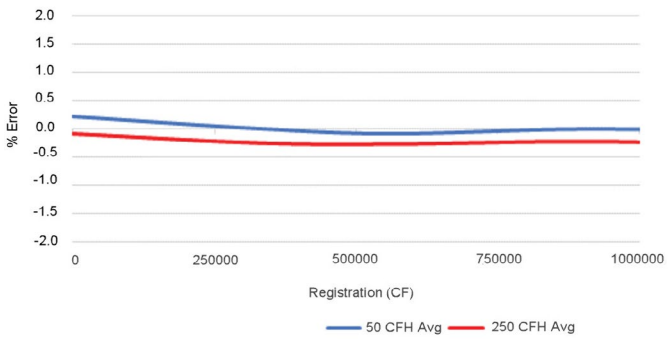
% Error vs Flow Rate



Flow rate definitions	
Pilot Flow	0.25 CFH (0.007 m^3/h)
Qmin	5 CFH (0.14 m^3/h)
Qt	20 CFH (0.57 m^3/h)
Qmax	300 CFH (7.1 m^3/h)
Qr	400 CFH (11.3 m^3/h)

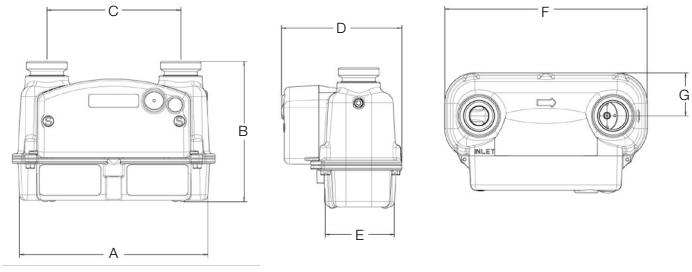
The accuracy of Intelis is Class 1. Specifically this is +/- 1% from 20 CFH to 300 CFH from +19F/-7.2C to +131F/55C. In addition, it will achieve +/- 0.5% at room temperature. ***Note: Graph is not to scale.***

Accelerated Life Test



The accelerated life test of Intelis is stable and the open (250 CFH) and check (50 CFH) track tightly.

DIMENSIONS



	A	B*	C	D	E	F	G
Inches	8.4	6.4	6.0	5.4	3.1	9.1	1.9
mm	214.4	161.9	152.4	138.3	78.6	230.6	48.8

*Dimensions for 20LT

PACKAGING CONFIGURATION

	Meters per Layer	Layers per Pallet	Meters per Pallet	Pallet Dimensions (inches) LxWxH	Total Pallet Weight (lbs) estimate	FTL (full truck load) # pallets	FTL Total Meters
6-pack	24	6	144	48 x 40 x 44.5	760	52	7488
Bulk-pack	30	6	180	48 x 40 x 44.5	875	52	9360

SPECIFICATIONS

General Specifications	
Meter Capacity	250 CFH at 1/2" WC / 7.1 m^3/h @ 0.125 kPa
Measurement Principle	Ultrasonic time of flight
Accuracy	Class 1 and +/- 0.5% at room temperature
Meter Type	TC or NTC
Hub Center-to-Center	6" (152.4mm)
Hub Size Options	10LT, 20LT, 30LT, 1A, 1 ¼", ISO G 1 ¼"
Meter MAOP	5 PSIG (35 kPa)
Valve	Actuated swing valve, maximum 0.035 CFH (1 L/H) leakage rate
LCD Displayed Units	CCF (100 x cubic feet) or cubic meter
LCD Resolution	00000.001 CCF (0.1 CF) or 00000.001 m^3
Case	Aluminum case with ASA 49 gray powder coat finish
Weight	4.5 lbs (2.0 kg)
Gas Type	Natural Gas Type H, E, L (per EN 437) Reference gases G20, G21, G23, G25, G26, G27
Battery Information	4 Lithium Manganese Dioxide (LiMnO2) 'A' cell batteries, replaceable
Battery Life	20 years for meter, RF and valve using recommended parameters
Badging	Standard aluminum manufacturing and optional customer badge
Test Pulse Weight (volume per pulse)	0.10CF, 0.25CF, 0.50CF, 1.0CF, 10dm^3, 50dm^3
Standards	Designed in compliance with ANSI B109.1, ANSI B109.0 (draft) and Measurement Canada PS-G-06
Intrinsically Safe per UL 913	Highest rating of UL Class I, Division 1

Component Materials	
UMU (ultrasonic measuring unit)	PBT + PC (Polybutylene terephthalate + Polycarbonate)
Valve Plastics	PBT (Polybutylene terephthalate)
Inlet & Outlet Tubes	POM (Polyoxymethylene)
Operating Temperature Ratings	
Measurement	-30°F (-34°C) to +131°F (55°C)
Valve	-13°F (-25°C) to +131°F (55°C)
RF Communications	-40°F (-40°C) to +158°F (70°C)
LCD	-40°F (-40°C) to +185°F (85°C)*
Storage Temperature Rating	
Measurement/Valve/RF	-40F° (-40°C) to +158F° (70°C)
Software	
Minimum Software Required for Mobile and Riva** Network	FCS v4.1 FDM Tools v4.1.1 ISM v3.6 (if using Enhanced Security) Itron Mobile v1.5 Mobile Collection v3.8.2
Minimum Software Required for Gen5 Network	Gen3, 4, 5 CPD hardware running UtilOS v5.0 FCS v4.3.1 FDM Tools v4.3 ISM v4.2 UtilityIQ v4.15

* Electro-optical characteristic and optical performance is affected during high temperature operation (approximately 176°F/80°C to 185°F/85°C) and low temperature operation (approximately -22°F/-30°C to -40°F/-40°C). Performance recovers under normal temperature range.

** Refer to GSR5.0 Compatibility Matrix for OpenWay Riva Network Software Required: INF-7220-000

Related Documents

Intelis Gas Meter Technical Reference Guide (815-0119-00)
Intelis Gas Meter Proving and Setup Guide (815-0154-00)
Intelis Gas Meter Ordering Guide (815-0335-00)
FDM Mobile Application Guide
500G specifications sheet (101510SP)
550G specifications sheet (101742SP)
OpenWay Riva Next Generation IoT Solution (101493MP)

Itron

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