C715 -18

Addressing Non-Revenue Water with Static Meters

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AWWA C715 Standard

AWWA C715 Standard

- Purpose: Define minimum requirements for potable cold water meters of the electromagnetic and ultrasonic type, in sizes 1/2 inch through 20 inches, in revenue applications.

- Scope:
  - Type I – Residential and commercial applications where low flow accuracy is important
  - Type II – Commercial applications where low flow is not primary concern

- Application: Standard can guide purchase decisions by utilities and serve as a guide to manufacturing.

AWWA C715 Standard

- Materials – standard defines acceptable material for
  - Main cases
  - Measuring chambers
  - Reflectors
  - Electrodes & transducers
  - Coupling tail pieces & nuts
  - Companion flanges
- Minimum and maximum flow measurement
- Standard alarms like leak, reverse flow, tamper
- End of life battery alarm
- Rate of flow indicator
- Partial pipe warning

- AWWA Manual M6 has been updated (2018) to include test parameters

Drivers for C715-18

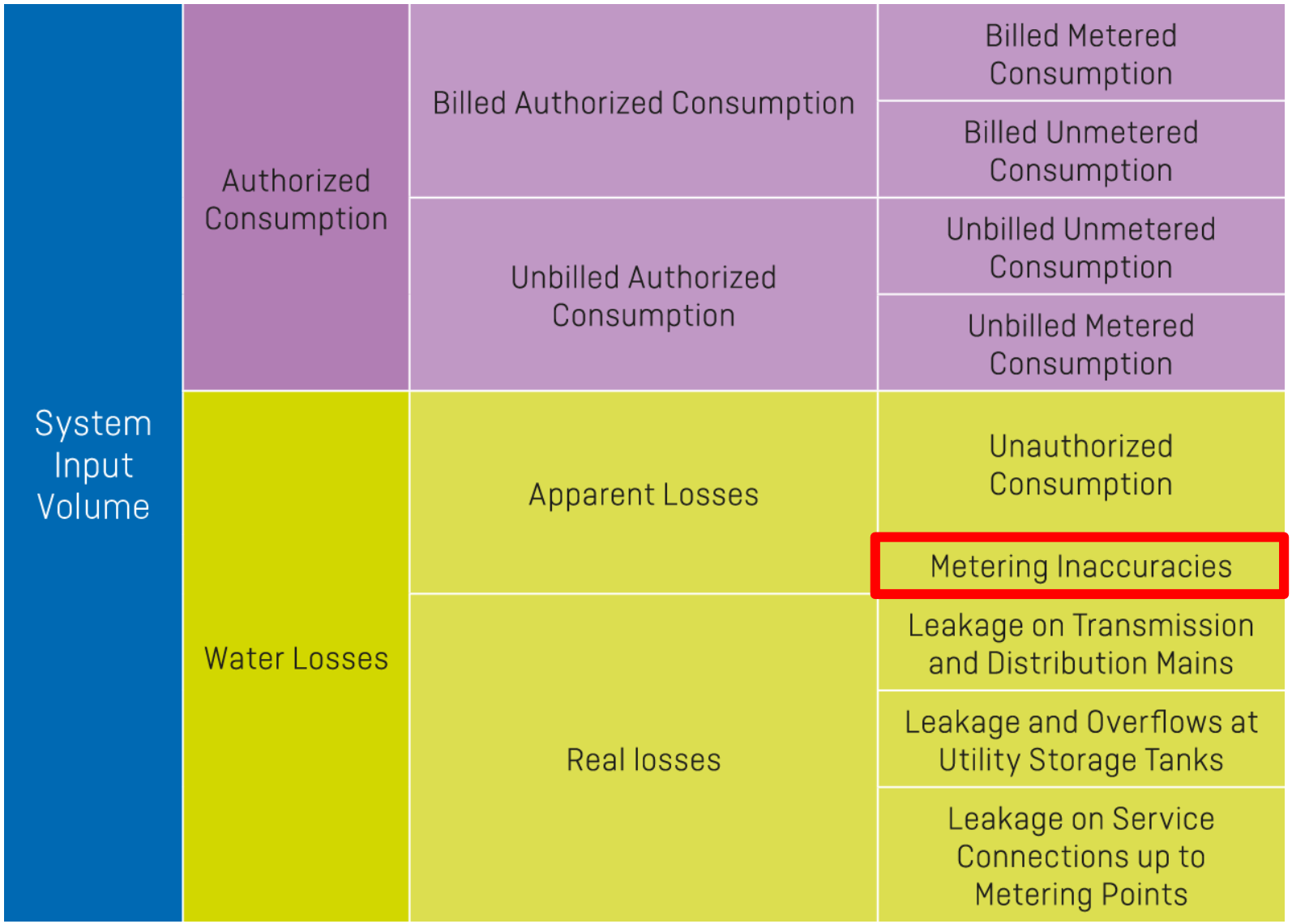
- Rising water and wastewater service costs
- Resource scarcity
- Customer usage patterns changing
- Cutbacks in staffing, higher labor costs, retirement of skilled staff
- More sensitivity to looking at whole life cost of ownership
- Alignment of meter life with reading automation technology life

Source: Veolia – North American Water Loss Conference 2017

C715-18 Drivers

- Sources and Impacts of Non-Revenue Water
- Mechanical meters
- Electromagnetic & Ultrasonic meters and the C715 Standard
- Static meters and AMR/AMI
- What can you do at your utility?

What is Non-Revenue Water?



Source: IWA Water Balance

Drivers for C715-18

1) Meters are old and under registering
2) AMR/AMI initiatives
3) Large meters are losing revenue
4) Advances in battery technology
5) Greater frequency of measurement → better accuracy

Drivers for C715-18

6) Reduce meter maintenance
7) Customer service – e.g., leak notifications
8) Water use efficiency
9) Reduce need for rate increases
10) ROI

Why is Non-Revenue Water important?

- Public water systems face:
  - Aging infrastructure
  - Increasing regulatory requirements
  - Water supply and quality concerns
  - Inadequate resources
  - Aging workforce

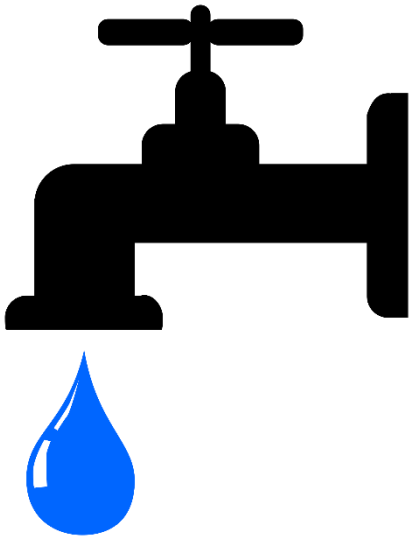
Why is Non- Revenue Water important?

- Non-Revenue Water will never go away completely
- Metering inaccuracies are easily addressable
- Static meters are well suited for AMR/AMI
- Driver for C715-18

Why is Non-Revenue Water important?

- AWWA “Buried No Longer” report:
  - The national level of investment will double from about $13 billion a year in 2010 to almost $30 billion annually by the 2040s for replacement.
  - Small communities may find a steeper challenge ahead on water infrastructure.

Average water loss in US systems



16% Loss

75% Recoverable

Source: EPA

It’s not just a water meter…

Water Meter

=

$$$$

Residential Meters - Mechanical

Mechanical Meter Types Most Commonly Installed

- Positive displacement (C700)
  - Nutating Disc
  - Oscillating Piston
- Velocity (C708)
  - Multi-Jet
- Turbine (C701)
- Compound (C702)
- New mechanical standards established to meet today's water needs

	C700/PD AWWA	C708/MJ AWWA	C702 AWWA Compound	C715-18 AWWA
5/8	.25-20	.25	N/A	.13
3/4	.50-30	.50	N/A	.15
1	.75-50	.75	N/A	.30
1 1/2	1-1/2 - 100	Intermedia	N/A	.60
2	2 -160		½ -200	1

Utah Water Research Laboratory Study

- Existing mechanical meters measure only a small percentage of flow below 1/4 GPM
- Measuring elements stop, lose accuracy, due to wear caused by water quality, debris, installation position.
- Loss of accuracy is a large contributor to non-revenue water.
- These losses add up over the years. Rate increase used to make up revenue shortfall
- Meter change-outs, proper meter sizing are sometimes used to solve revenue issues.

Cost of undetected leak

Flow (GPM)	CF/Hour	GPD	CF/month	G/month	$/month
1/32	0.25	45	180	1,350	$5.40
1/16	0.5	90	360	2,700	$10.80
1/8	**1**	**180**	**720**	**5,400**	**$21.60**
¼	2	360	1,440	10,800	$43.20
½	4	720	2,880	21,600	$86.40
1	8	1,440	5,760	43,200	$172.80

**Assume water cost about $3/unit or $4 per thousand gallon*

Commercial Meters

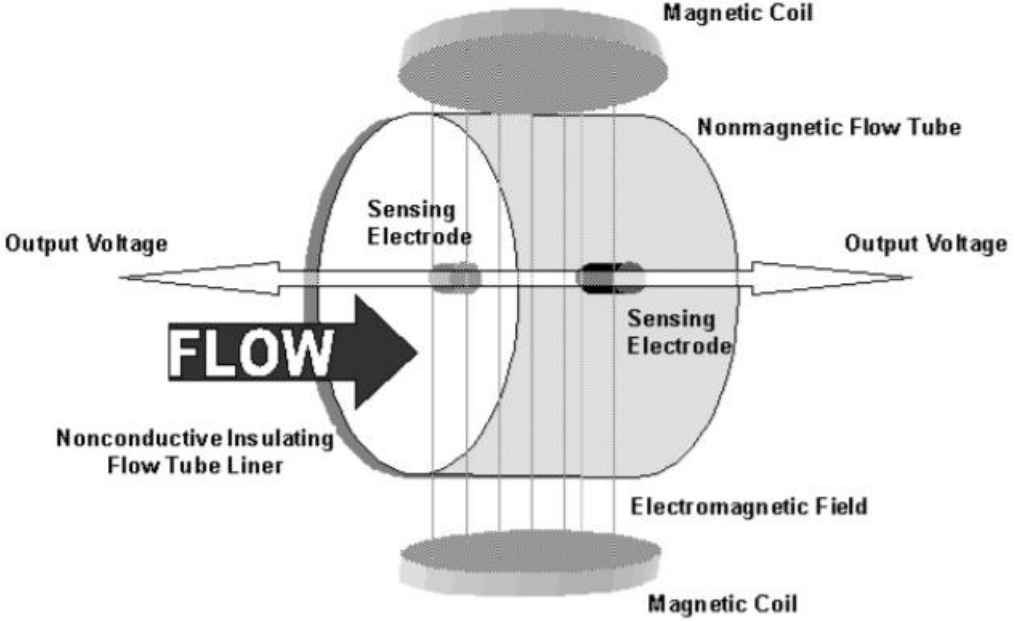
Meter Types Most Commonly Installed

- Turbine Meters (C701)
  - One flow rotor
  - Parks and some irrigation
  - Mid to high flow range, no low flow measured
  - Billing meter, affects revenue
- Compound Meters (C702)
  - Turbine flow rotor with residential chamber
  - Apartments , commercial
  - All flow ranges
  - Billing meter, affects revenue
- Propeller Meters (C704)
  - Rotor shaft with rotor
  - Irritation or pump stations
  - Wide flow range with no low flow range
  - Consumption Meter

How they work – Electromagnetic Meters

- Employs Faraday's Law of magnetic induction to sense the flow of water
- Flow of conductive liquid (water)
- Through a magnetic field causes a voltage signal
- Sensed by electrodes located on the flow tube walls

iPERL
accuMAG
HbMAG
TRU/MAG
ModMAG

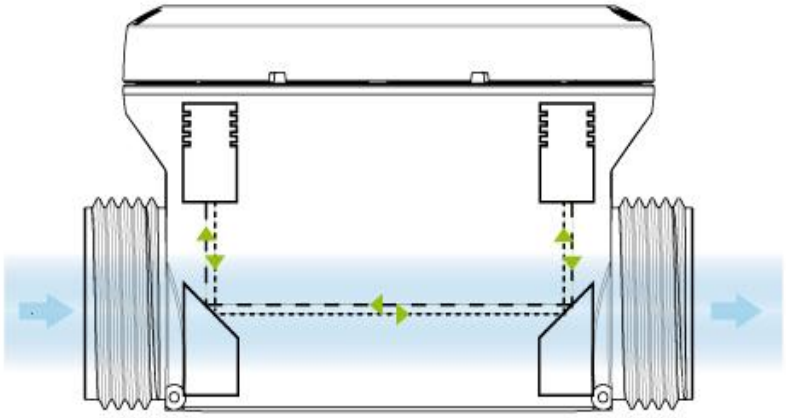


Source: Veolia – North American Water Loss Conference 2017

How they work – Ultrasonic Meters

- Uses sound waves to determine the velocity of water flowing through a pipe
- Sends and receives ultrasonic waves between transducers
- Upstream and downstream in the pipe
- No flow – same time between transducers
- With flow – upstream waves slower than downstream
- Time increases with velocity

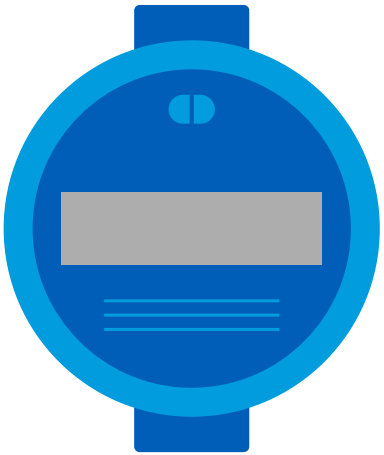
E-Series
Octave
flowIQ 2100
Mueller SSM
MACH 10
Sonata



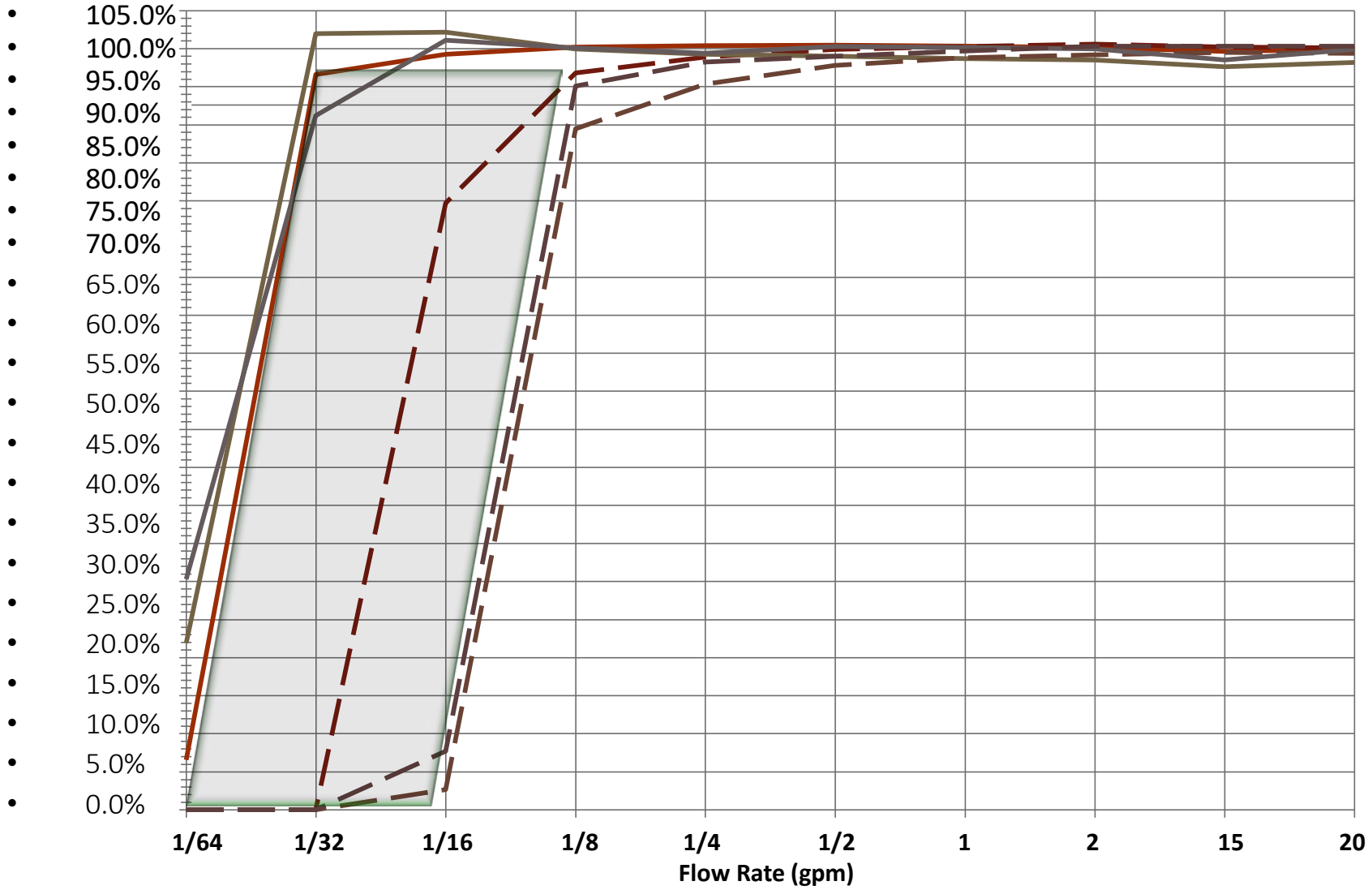
Source: Veolia – North American Water Loss Conference 2017

Benefits of static meters

- Extreme low flow capability – as low as 1/60 GPM
- Sustainable flow accuracy for life of meter
- 10-20 year warrantied life (dependent on manufacturer) vs 3-5 mechanical
- Higher resolution reading
- Data logging
- No moving parts, not susceptible to wear
  - Ideal for areas with high particulate
- Install meter at any angle, use for
  - submetering applications
- AMR/AMI ready



Mechanical vs. Solid State Meters



Source: Johnson Controls

Low flow registration and ROI

Meter Size	Mechanical	Min Flow (GPM)	Static	Min Flow (GPM)
5/8" x 3/4"	Nutating Disc	0.25	Ultrasonic	0.05
2 inch	Nutating Disc	1.5	Ultrasonic	0.5
4 inch	Turbo	6	Ultrasonic	0.75
4 inch	Compound	0.375	Mag	3.3

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- Most static meters are designed for AMR/AMI
- Integration with RF transmitters
- Built-in data logging and alarms
- Water temperature logging and alarms
- Low flow registration
- Low battery alarm
- Minimal or no field programming
- Minimal or no maintenance
- Meter life of up to 20 years

AWWA C715-18

- Both meter types can measure much lower flows than mechanical meters
- Both are well suited for AMR/AMI
- Higher price point for residential static meters
- Prices start to equalize around two inches and above
- Ultrasonic meters tend to be more compact, lower profile than mag meters

C715-18 Considerations

- Ultrasonic in residential applications less affected by noise
- Mag meters are a good solution in many larger meter applications
- Most manufacturers offer a choice of metal or composite flow tubes
- How well are the electronics protected against moisture intrusion?

C715-18 – How to approach

- Assess your current metering environment, test older meters
- Review C715 Standard
- Talk to manufacturers about their static meter offerings
- Test few meters in the field
- Important to remember test benches are designed for mechanical meter testing, not designed to pick up static meter low flow
- Talk to other utilities who have deployed static meters in their systems

C715-18

- Consider AMR/AMI include option for static meters in your RFQ/RFP specification

- Keep in mind that ultrasonic technology is not new. Keep in it has been used outside of U.S. to measure and bill customers

- Consider static meters as a means to help meet your conservation, customer service and revenue objectives.