Industry Review Part 1

Proposed Agenda

- Opening Remarks
- Introductions
- Three topics
  - Reading methods
  - Remote disconnect
  - Customer portals
- Closing Remarks

Engaging and Educating the Regulatory Communities

Increasing visibility and trust in Water & Wastewater Solutions

Trust — Act honestly, ethically, and with integrity

Collaboration — Work with impactful leaders and leverage diverse perspectives

Excellence — Meet commitments and continuously improve

Responsibility — Care for our employees, environment, and communities

Customer Focus — Build and nurture relationships

NARUC
National Association of
Regulatory Utility Commissioners

American Water Works Association

MACRUC

NAWC
NATIONAL ASSOCIATION
OF WATER COMPANIES

Badger Meter and Solutions Overview

01 **Over 120 Years of Innovation**: Founded in Milwaukee, Wisconsin in 1905, Badger Meter has a long-standing history of excellence in water technology solutions.

02 **Comprehensive Water-Centric Solutions**: We are a water technology leader, offering a complete suite of flow measurement, water quality, pressure monitoring, and leak detection solutions, integrated with advanced software and analytics.

03 **Global Presence**: With 9 manufacturing sites and 5 technology-focused R&D centers worldwide, we drive innovation and quality on a global scale.

04 **Market Leader**: As a publicly traded company on the NYSE (BMI), Badger Meter boasts a market capitalization of over $6 billion, reflecting our strong financial performance and industry leadership.

Badger Meter | ATi *A Badger Meter® Brand* | s::can *A Badger Meter® Brand* | Syrinix *A Badger Meter® Brand* | telog *A Badger Meter® Brand* | SMARTCOVER *A Badger Meter® Brand*

Meter Reading

Evolution of Meter Reads

AMR Overview

AMI Overview

Opportunities and Considerations

Why Advocate for AMI

Evolution of Meter Reading
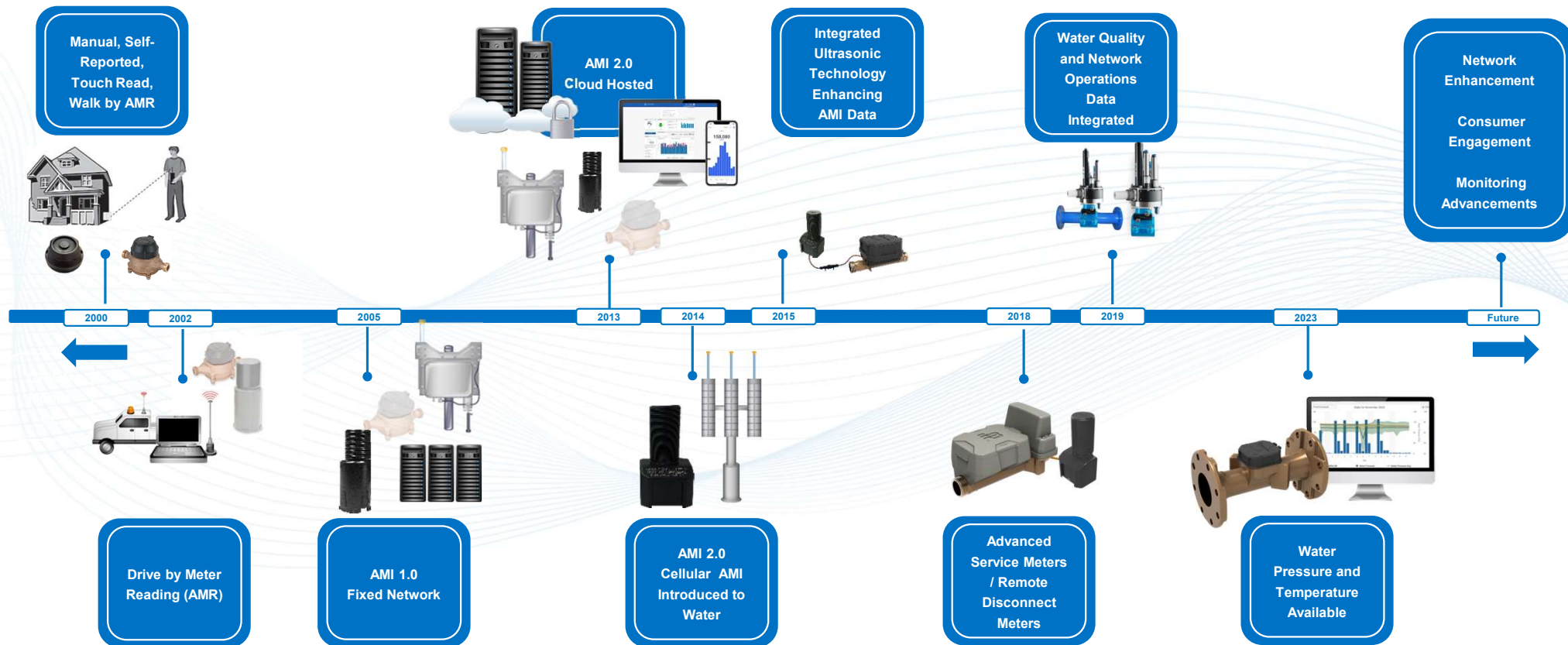
Development History

Manual, Self-Reported, Touch Read, Walk by AMR

AMI 2.0 Cloud Hosted

Integrated Ultrasonic Technology Enhancing AMI Data

Water Quality and Network Operations Data Integrated

Network Enhancement

Consumer Engagement

Monitoring Advancements

| 2000 | 2002 | 2005 | 2013 | 2014 | 2015 | 2018 | 2019 | 2023 | Future |

Drive by Meter Reading (AMR)

AMI 1.0 Fixed Network

AMI 2.0 Cellular AMI Introduced to Water

Advanced Service Meters / Remote Disconnect Meters

Water Pressure and Temperature Available

Automated Meter Reading - Mobile Reading Solution

Low power radio technology used for over 50 years to collect meter read data

Two-Way Communication
- - - - - - - - - - - - - - -
Encoded Data

Two-Way Communication
- - - - - - - - - - - - - - -
Encoded Data

Mobile Endpoint

Connects to the Meter and collects and transmits current meter read along with exception statuses to Mobile Reading System

Mobile Reading System

Mobile meter reading software collects meter reads in either walk by or drive-by. Two-way transceiver can extract data profile information and upgrade endpoint firmware.
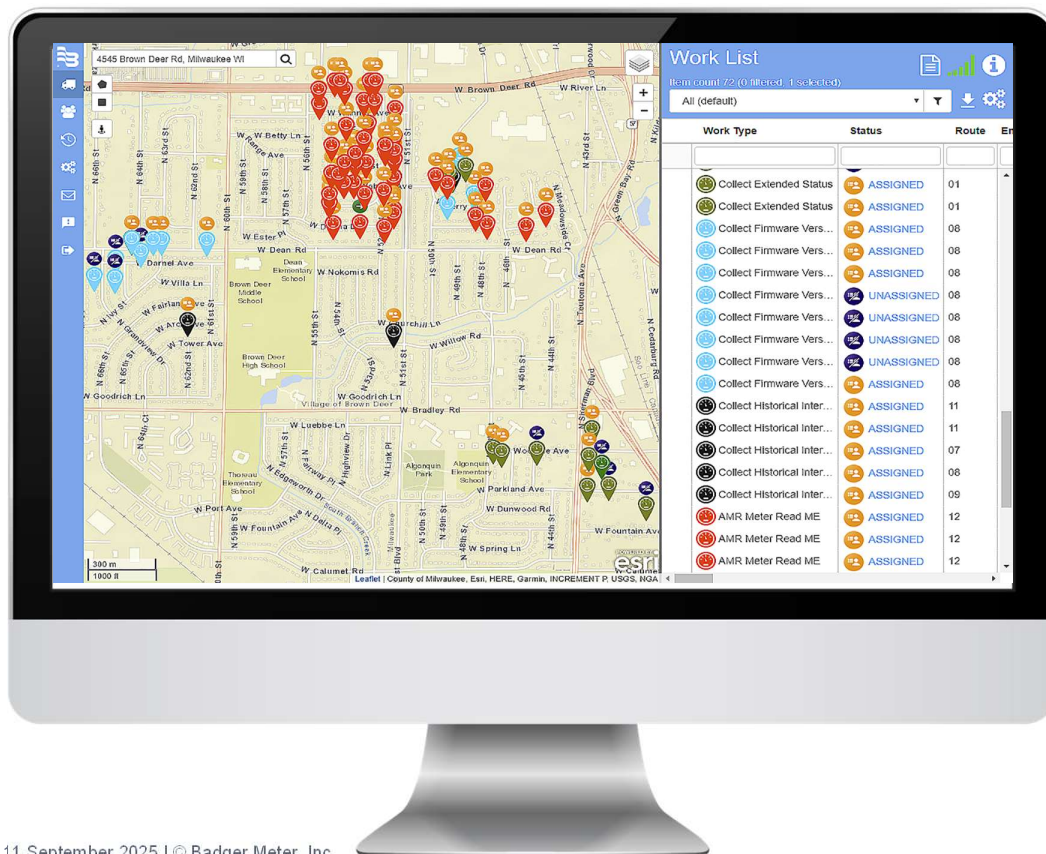
Meter Data Head End System

Manages route creation and loading via the internet. Securely stores Endpoint Data while allowing data access via internet connected device for Utility.

Automated Meter Reading - Mobile Reading Solution

Why are so many water utilities still using AMR?
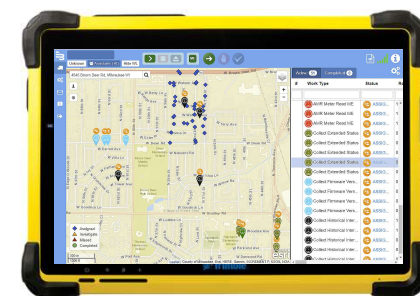

Reliable meter to cash operations

- Capture's an accurate meter reading

Capable of capturing basic alerts

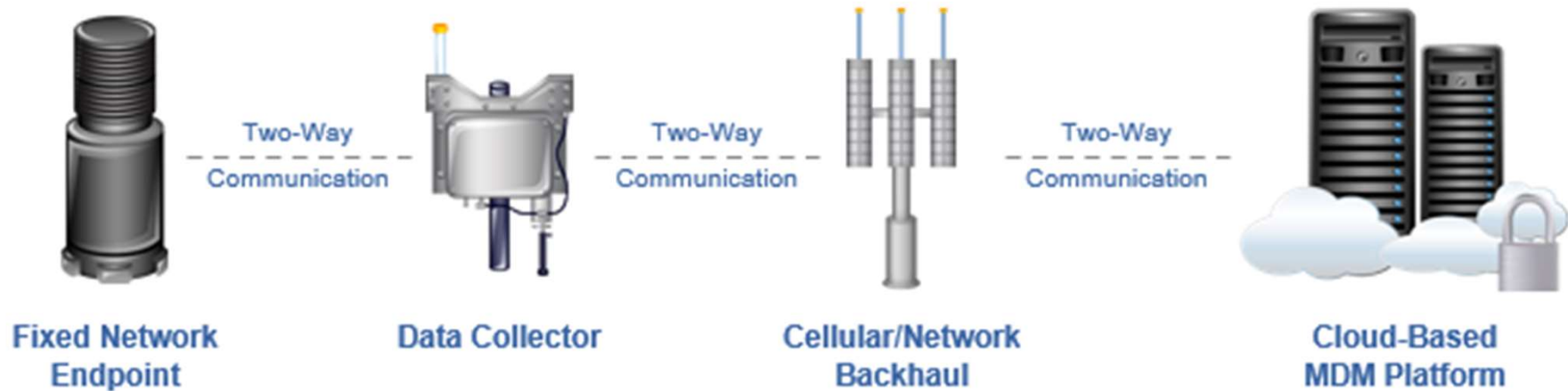- Can collect simple alerts from meter encoders

Low complexity

- Simple for staff to operate and troubleshoot
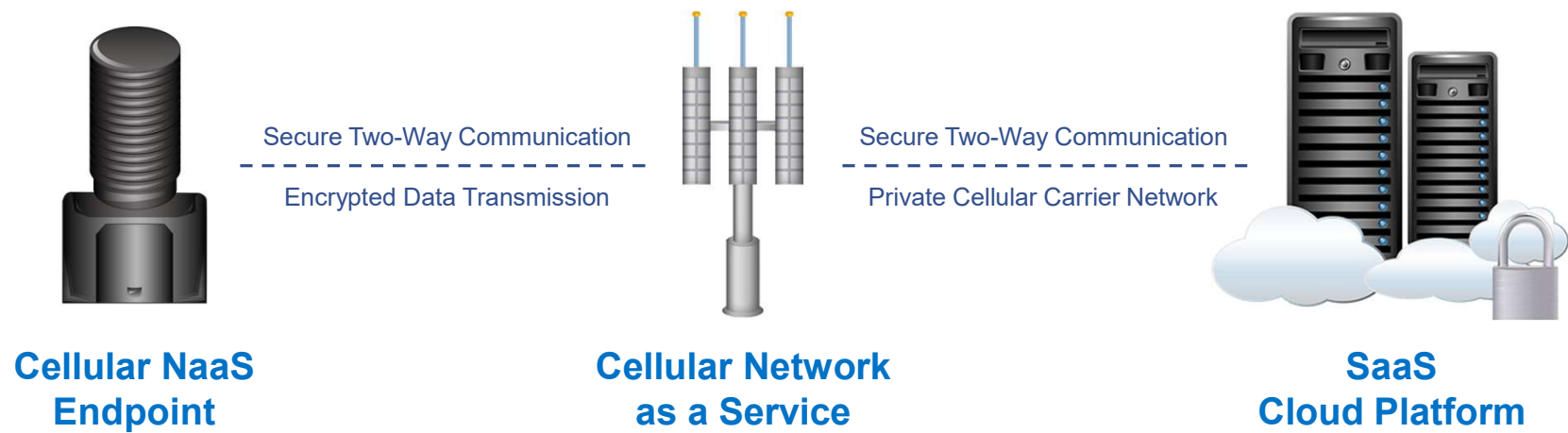
Fixed Network AMI Solution
Legacy Advanced Meter Infrastructure

Fixed Network Endpoint — Two-Way Communication — Data Collector — Two-Way Communication — Cellular/Network Backhaul — Two-Way Communication — Cloud-Based MDM Platform

Cellular AMI NaaS Solution

Advanced Meter Infrastructure 2.0 with Cellular Network-as-a-Service

Secure Two-Way Communication

Encrypted Data Transmission

Secure Two-Way Communication

Private Cellular Carrier Network

**Cellular NaaS
Endpoint**

**Cellular Network
as a Service**

**SaaS
Cloud Platform**

Comparing Networks: Cellular vs. Data Collectors

Question

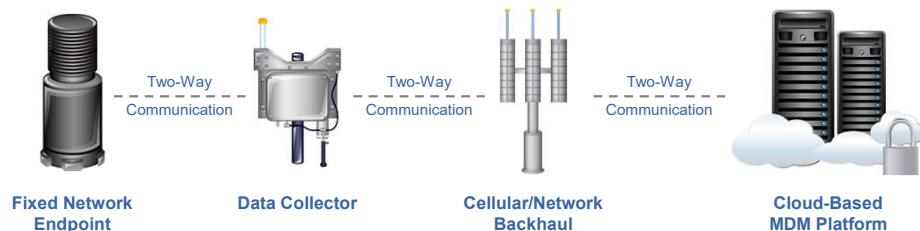What should I take into consideration when comparing fixed network technologies?

Answer

System Engineering, Deployment, Ongoing Maintenance and Reoccurring Fees

Data Collector Fixed Network

Single Purpose Network
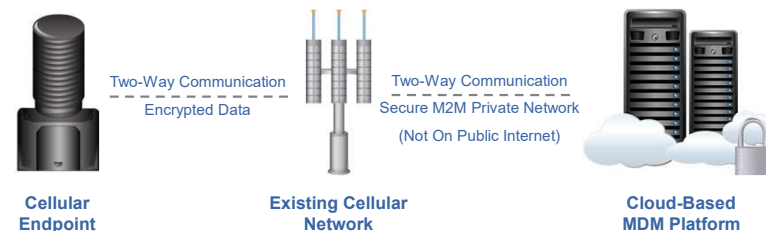
Fixed Network Endpoint — Two-Way Communication — Data Collector — Two-Way Communication — Cellular/Network Backhaul — Two-Way Communication — Cloud-Based MDM Platform

Fixed Network Endpoint

Data Collector

Cellular/Network Backhaul

Cloud-Based MDM Platform

System Engineering/Deployment

01 Initial Propagation Study

02 Visit Available Vertical Assets

03 Search Ring Area Validation

04 Rerun Propagation Study

05 Install Prep/Planning (Elec/Backhaul/Permits)

06 Data Collector Installation

07 Network RF Testing and Optimization

08 End-to-End Data Flow Testing

Ongoing System Maintenance/Fees

09 Monthly Fee for Data Hosting and Backhaul

10 Annual Data Collector Maintenance Contracts

11 8-10 Year Battery Replacements

12 Periodic Replacements Due to Failures/Weather (1-Yr Warranty)

13 Data Collector Firmware Updates

14 7-12 Year Full Data Collector Network Replacement (Contractor)

Cellular NaaS Fixed Network

Cellular/Smart City/IoT Network

Cellular Endpoint — Two-Way Communication Encrypted Data — Existing Cellular Network — Two-Way Communication Secure M2M Private Network (Not On Public Internet) — Cloud-Based MDM Platform

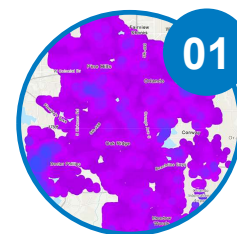**Cellular Endpoint**

Existing Cellular Network

Cloud-Based MDM Platform

System Engineering/Deployment

Cellular Coverage Analysis
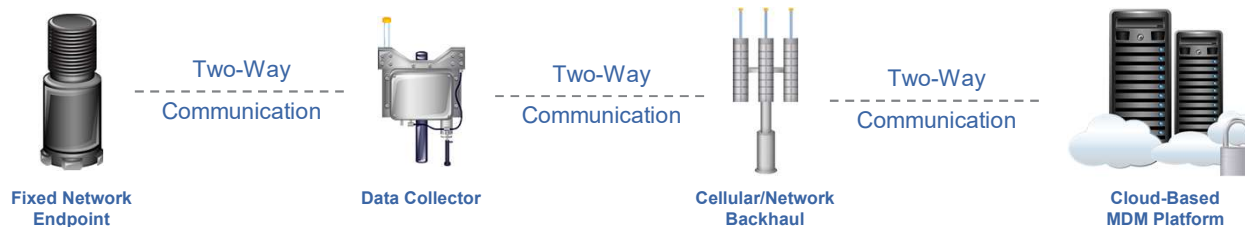Built-in Redundancy/Expedited Project With No Network Installation Needed

01

Ongoing System Maintenance/Fees

NaaS Management Fee

02

12

Data Collector Fixed Network – Single Purpose Network

Fixed Network Endpoint — Two-Way Communication — **Data Collector** — Two-Way Communication — **Cellular/Network Backhaul** — Two-Way Communication — **Cloud-Based MDM Platform**

System Engineering/Deployment

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Ongoing System Maintenance/Fees

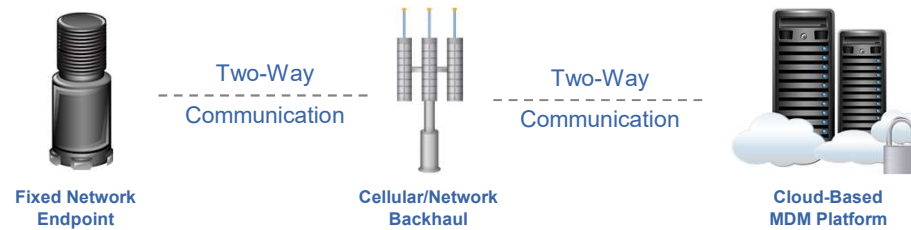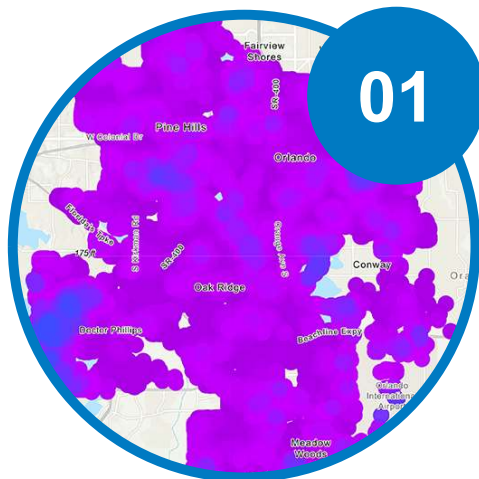| 09 Monthly Fee for Data Hosting and Backhaul | 10 Annual Data Collector Maintenance Contracts | 11 8-10 Year Battery Replacements | 12 Periodic Replacements due to Failures/Weather (1-Yr Warranty) | 13 Data Collector Firmware Updates | 14 7-12 Year Full Data Collector Network Replacement (Contractor) |

13

Two-Way
Communication

Two-Way
Communication

**Fixed Network
Endpoint**

**Cellular/Network
Backhaul**

**Cloud-Based
MDM Platform**

System Engineering/Deployment

Ongoing System Maintenance/Fees

Cellular Coverage Analysis

Built-in Redundancy/Expedited Project With No Network Installation Needed

01

NaaS Management Fee

02

Data Collector Fixed Network

Single Purpose Network

Fixed Network Endpoint → Two-Way Communication → Data Collector → Two-Way Communication → Cellular/Network Backhaul → Two-Way Communication → Cloud-Based MDM Platform

System Engineering/Deployment

- **01** Initial Propagation Study
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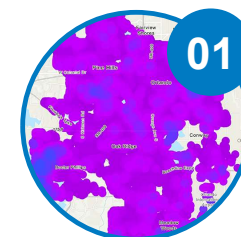
System Engineering/Deployment

Cellular Coverage Analysis
Built-in Redundancy/Expedited Project With No Network Installation Needed

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Ongoing System Maintenance/Fees

NaaS Management Fee

- **02**
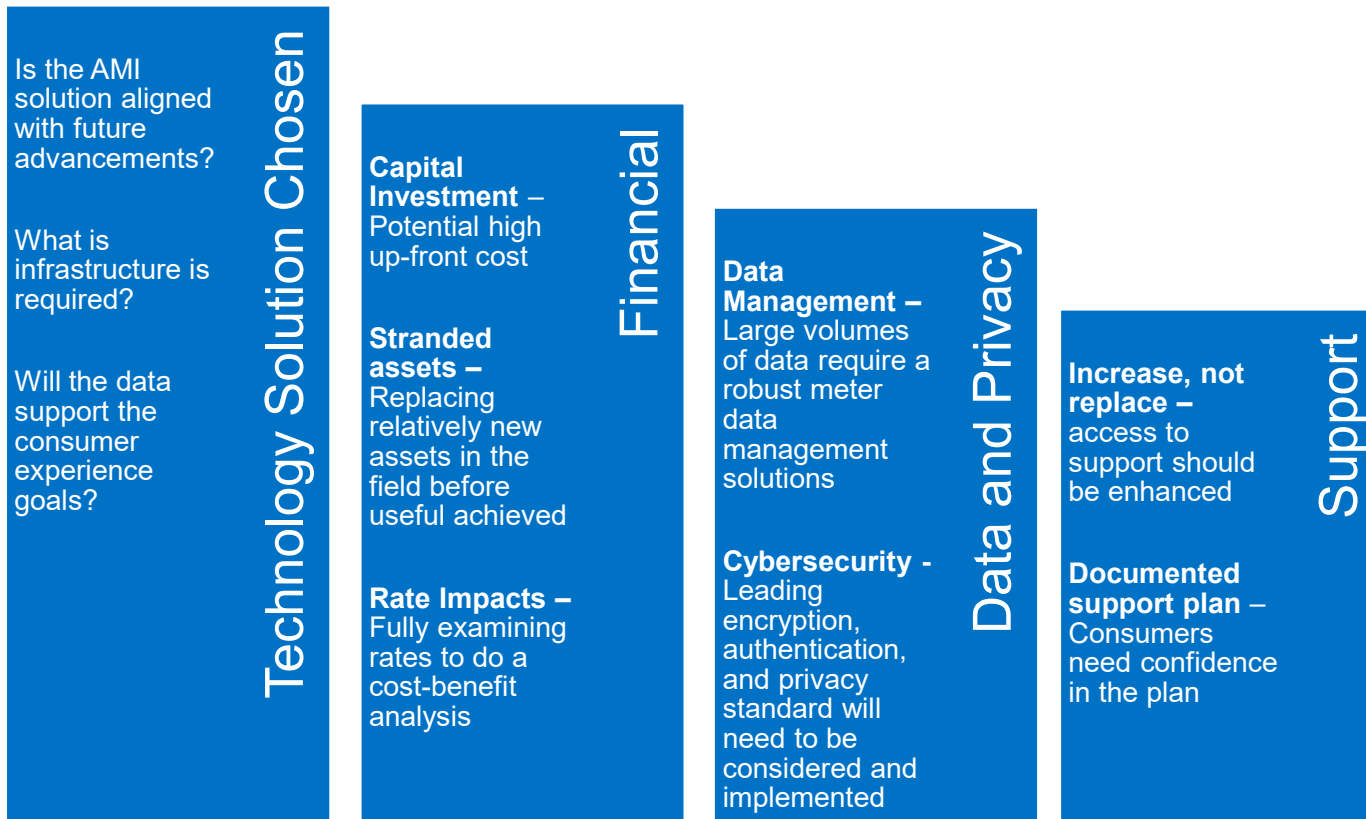
Fixed Network AMI compared to Cellular AMI

Network as a Service Considerations when deploying evaluating solutions

Endpoint Considerations Under NaaS Agreement	Managed by Water Utility	Managed by NaaS Provider
Ownership of Radio Endpoints	✓	
Installation of Radio Endpoints	✓	
Pit/Mounting Maintenance of Radio Endpoints	✓	
Firmware Updates of Radio Endpoints		✓
Fixed Network Considerations Under NaaS Agreement	**Managed by Water Utility**	**Managed by NaaS Provider**
Ownership of Fixed Network		✓
Planning/Installation of Fixed Network		✓
Access Lease Negotiation/Cost of Fixed Network		✓
Continuous Monitoring of Fixed Network		✓
Security of Fixed Network		✓
Annual Hardware/Tower/Foundation/Structure/Guy Wire Inspection		✓
Routine Preventive Maintenance of Fixed Network (Radio Equipment/Batteries/Generators/HVAC/Fencing/Security)		✓
Disaster Recovery of Fixed Network (Tornado/Hurricane)		✓
Periodic Outage Repair of Fixed Network (Lightning Strike/Storm Damage)		✓
Inventory of Spare Parts for Fixed Network		✓
Hardware Firmware Updates/ Patches		✓
Replacement/Long-term Management of Fixed Network		✓
Future Growth Outside of Current Service Territory of Fixed Network (Additional Cost)		✓

Opportunities and Considerations

Ensuring success with AMI

Technology Solution Chosen

Is the AMI solution aligned with future advancements?

What is infrastructure is required?

Will the data support the consumer experience goals?

Financial

Capital Investment – Potential high up-front cost

Stranded assets – Replacing relatively new assets in the field before useful achieved

Rate Impacts – Fully examining rates to do a cost-benefit analysis

Data and Privacy

Data Management – Large volumes of data require a robust meter data management solutions

Cybersecurity - Leading encryption, authentication, and privacy standard will need to be considered and implemented

Support

Increase, not replace – access to support should be enhanced

Documented support plan – Consumers need confidence in the plan

Why advocate for AMI

What can we achieve with advanced metering infrastructure?

Equity

- Fewer estimated bills
- Protects vulnerable households
- Faster leak alerts and notifications

Measurable Benefit

- Increased data holds utility accountable
- Able to measure operational efficiency
- Aligns with state and federal goals

Conservation

- Leaks, backflow, burts events caught quicker
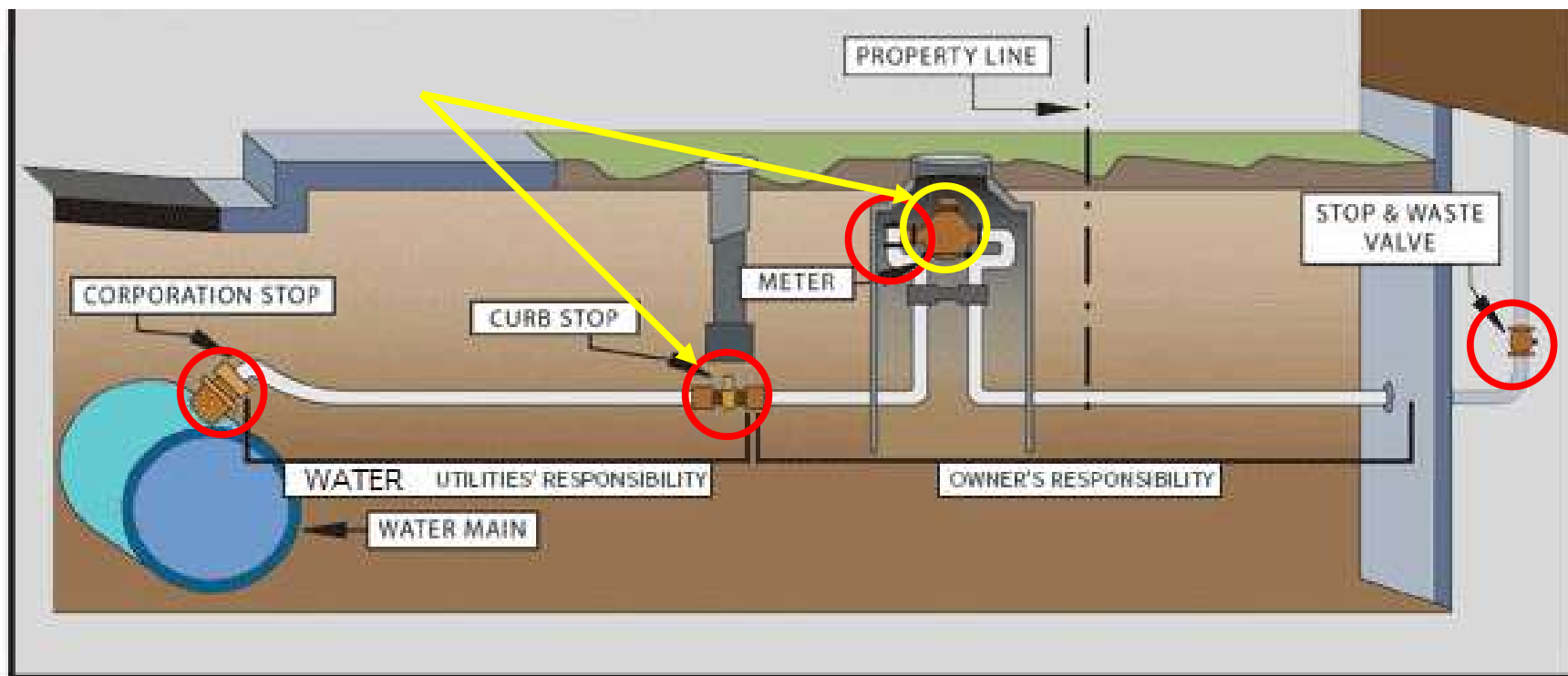- Aligns with conservation efforts
- Increases access to information for consumers

Access to Support

- Enables utility to provide consumer engagement portal
- Improves issue resolution
- Promotes support efficiences

Shut Off Example

Shut Off Cycle
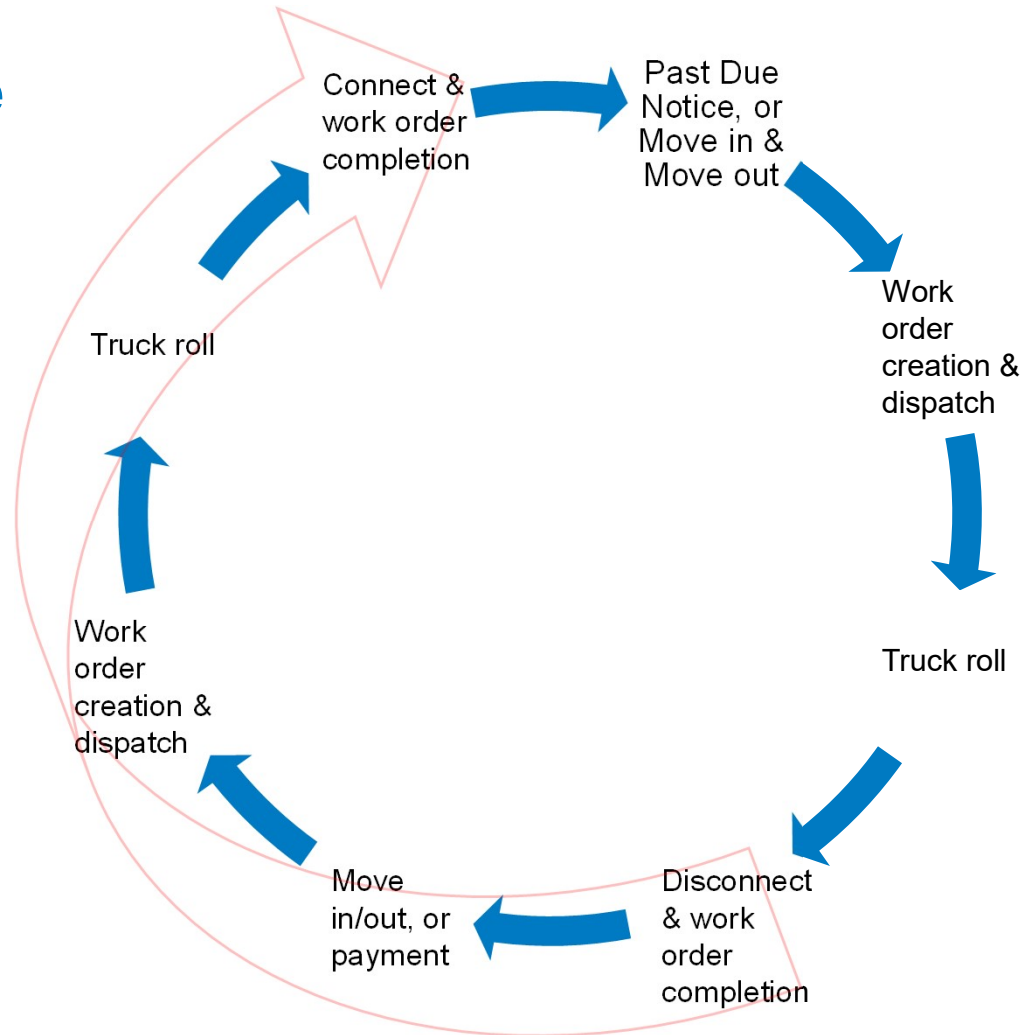
Shut Off Cycle
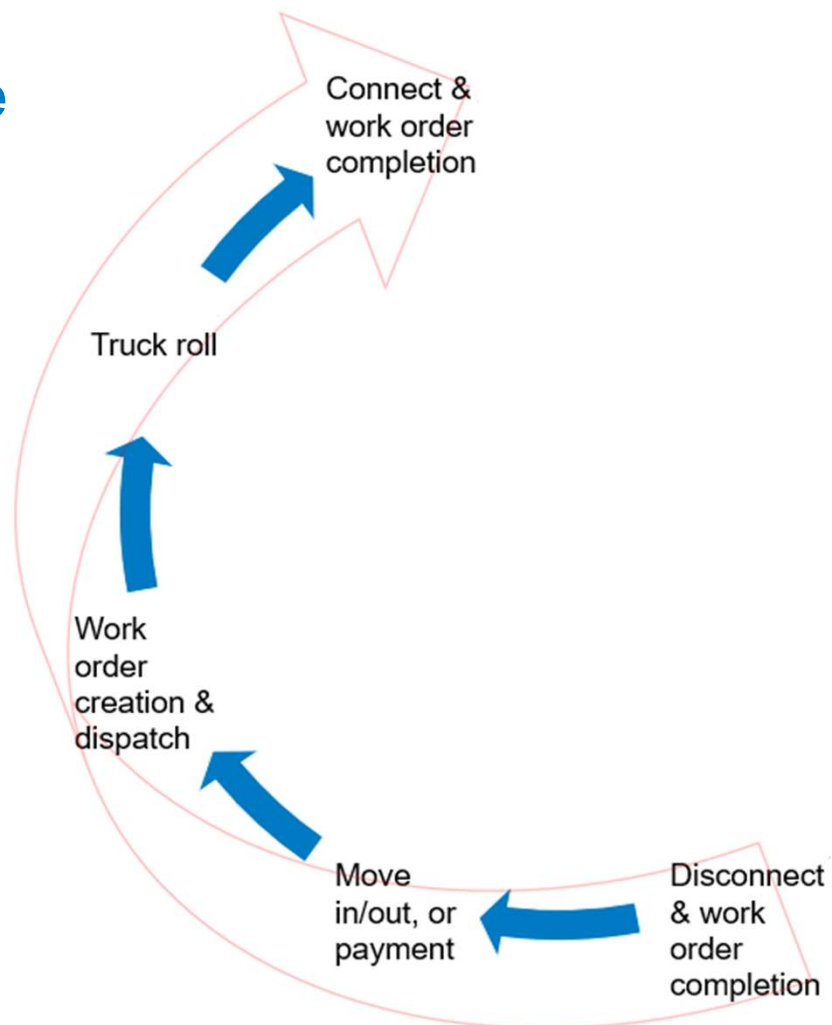
Advanced Service Meters / Remote Disconnect Meters

- Ideal for applications where controlling water flow is required, including non-payment customers, multitenant buildings, seasonal homes, and weather-related events

- Saves time, money and human resources with improved customer service

- Some provide multiple settings (open, partial, restricted, closed)

- Customer benefits: Reduction of time without full service, life saving water access, lowering of reconnection fees

- Badger Meter, Mueller, Sensus offer advance service meters

- Considerations: Cost, Deployment, Process

Consumer Engagement Portals

- Overview

- Benefits to Consumers

- Opportunities and Considerations

Consumer Portals Overview

Enhancing utility customer experience and customer engagement with digital self-service platforms

Common Features:

- Track water usage

- Access conservation and usage tips

- Communicate with utility customer service

- Access links to bill pay, support, rebate programs

- Receive outage and service alerts

Keys to Functionality:

- Relies on accurate metering (AMI) data to provide accurate information in the Consumer Portal

- Data is typically connected from multiple utility platforms into one **single point of interaction**
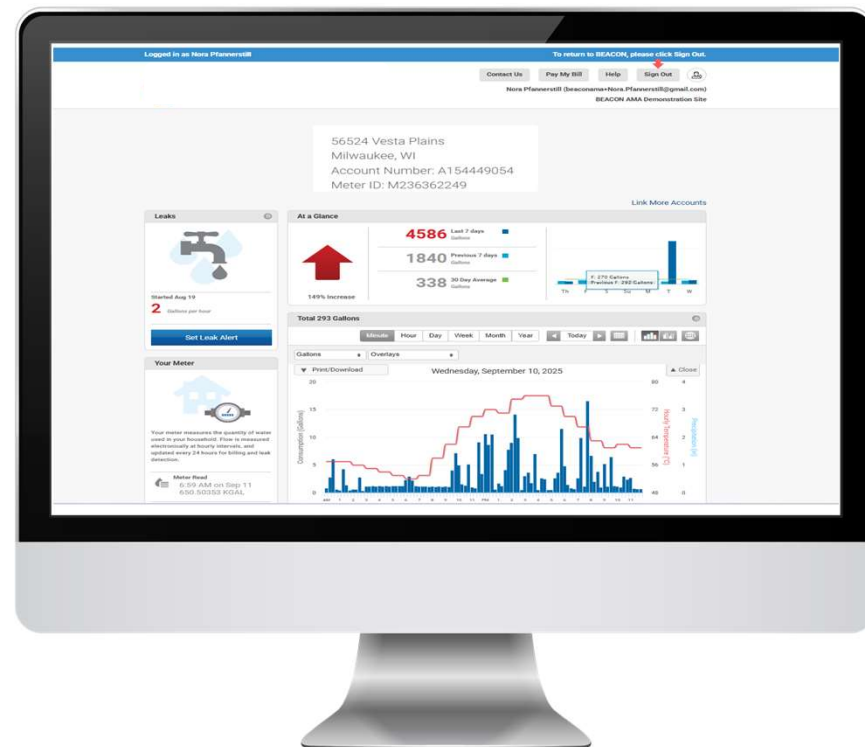
Benefits to Consumers

and why advocacy groups care

Convenience and Transparency

- 24/7 access to account information and usage history

- Access to consumption data increases knowledge of usage patterns

- Clear breakdown of usage and how it aligns with billing

Cost Savings and Conservation

- Early leak detection with usage notifications

- Usage and conservation analysis

- Personalized notifications

Accessibility and Engagement

- Mobile-first interfaces expand access via iOS and Android

- Increased communication channels to utility support

- Improved support resources that are customer centric
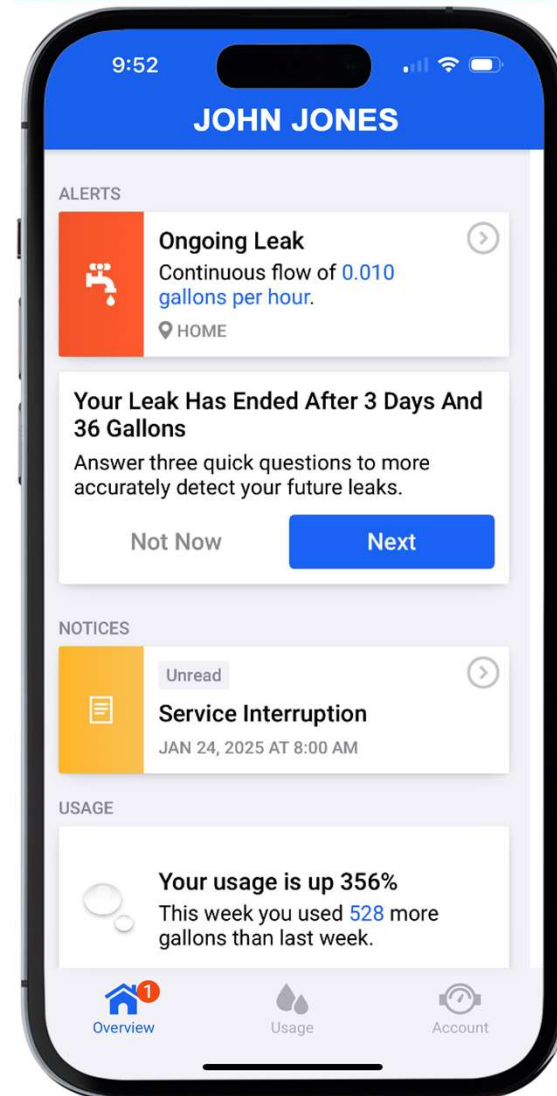
Opportunities and Considerations

Smart adoption ensures benefits without leaving anyone behind

Digital divide leaves some behind

- Phone and in-person service options need to be maintained
- Self-service is an enhancement. Not a replacement

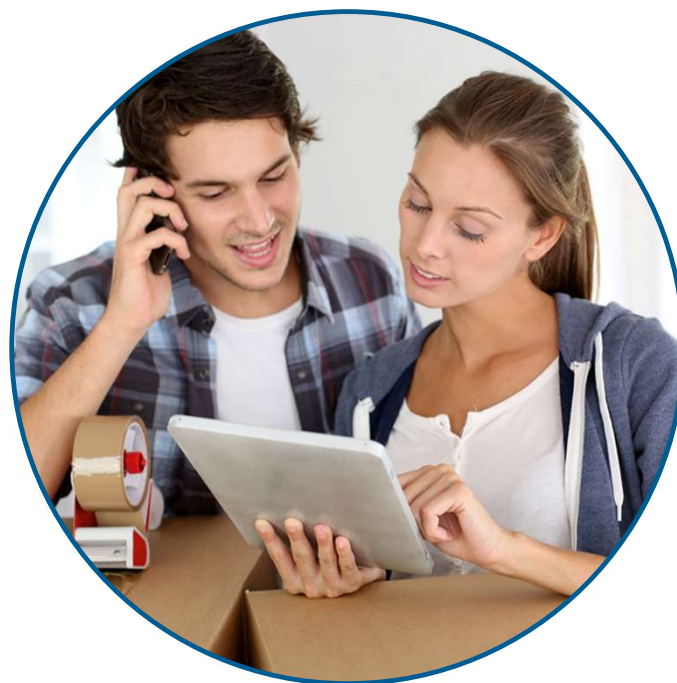## Data privacy and security concerns

- Leverage industry leading encryption and security practices
- Align with secure, compliant, solution providers

Implementation costs passed to ratepayers

- Advocate for clear transparent cost-benefit analysis in rate case
- Set a clearly defined re-evaluation strategy

Questions & Answers