The future of AMI and how to maximize your investment

Joel Westvold, E Source
Kody M. Salem, E Source
Kevin Healy, Halifax Water

Webinar

E Source
POWERING WHAT'S **NEXT**

Wednesday, November 8, 2023

Agenda

- Introductions
- AMI Day 2—Kody Salem
- AMI Day 2 example—Kevin Healy
- AMI 2.0—Joel Westvold
- Q&A

Introducing our speakers

Joel Westvold, PMP
Account Executive/Executive Consultant, Technology Planning and Implementation Consulting
E Source
503-944-9434
joel_westvold@esource.com

Kevin Healy
Acting Manager, West Water Operations
Halifax Water

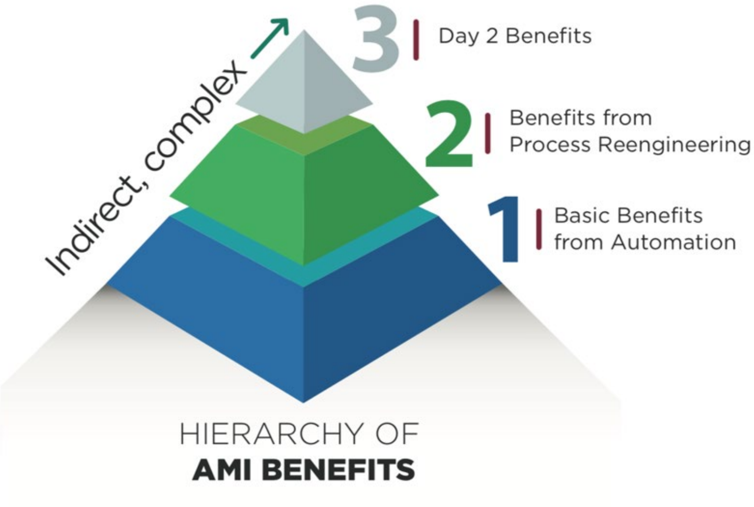
Kody M. Salem
Senior Vice President, Business Development, Technology Planning and Implementation Consulting
E Source
kody_salem@esource.com

Based on where you are in your AMI journey, where should your focus be?

- System age
- System performance
- Longing for that new car smell

AMI and utility benefits

- Most advanced metering infrastructure (AMI) implementations are based on a feasibility study that examines the economic benefits of AMI
- After AMI is installed, utilities want to improve the operation and look for ways to leverage the investment
- Most of these benefits focus on the advantages of automation and new technology features
- It's possible to get more-sophisticated benefits from:
  - Business process reengineering
  - Looking at a utility from a broader *"system of systems"* standpoint



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Proposition: AMI Day 2 roadmap

Move beyond the initial, more-direct benefits and incorporate those that build increasing value over time

Develop a roadmap as a collaborative effort with business and technology groups at your utility

Some areas to consider:

- Analytics—use of data across the organization
- Outage management
- Distribution automation
- Conservation voltage reduction
- Demand response
- Streetlighting control
- Prepay
- Time-of-use
- Sharing the AMI network

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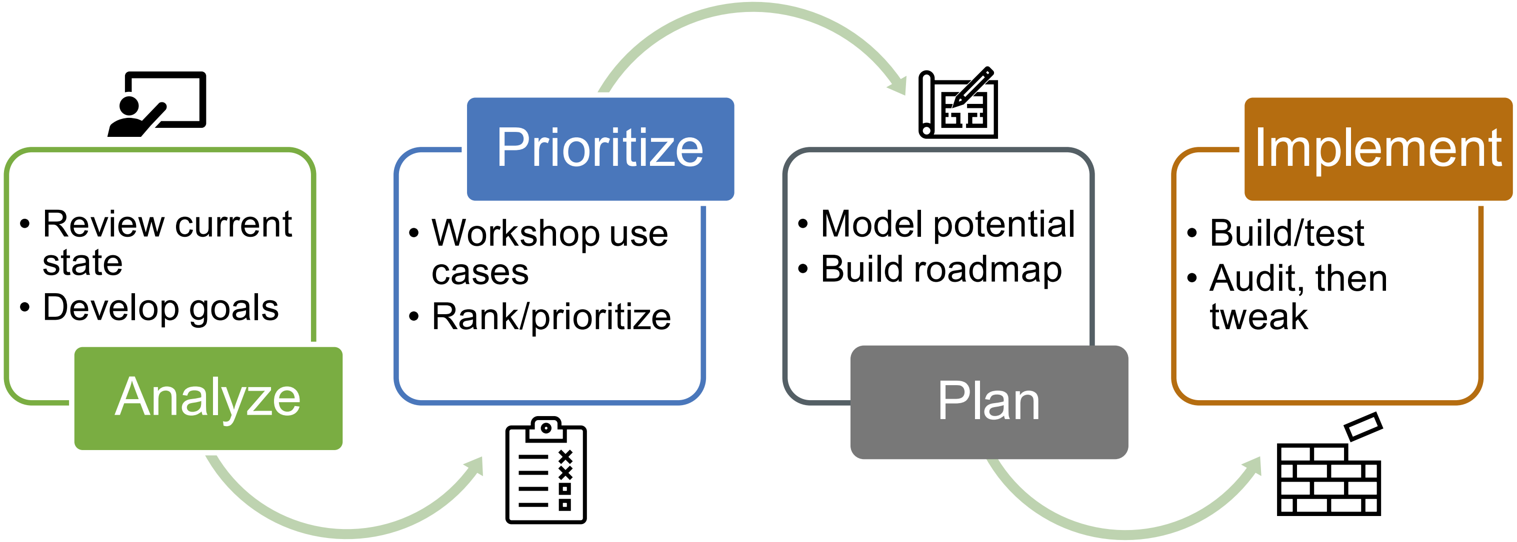
E Source facilitates an end-to-end process



Our experts bring the knowledge and experience to get it done!

E Source use case library

Our team maintains a library of more than 150 (and growing) utility-focused use cases for water, electric, and gas utilities

Distribution grid management
- Demand response
- Distribution automation
- Electric storage
- Event detection
- Distributed energy resources
- System planning
- Volt/VAR optimization

Water/wastewater/ gas distribution system management
- Forecasting
- Monitoring
- Reclaimed
- Wastewater

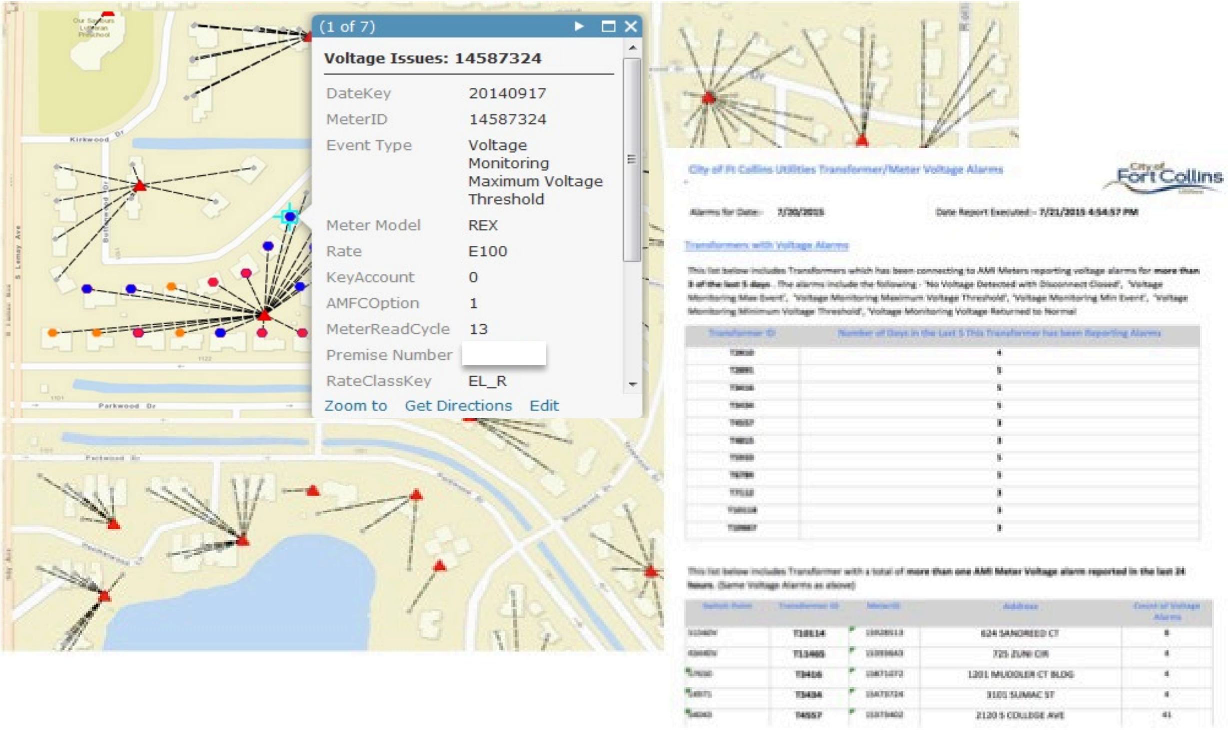
Meter operations
- Billing
- Meter installation
- Issue validation

Customer service
- Customer inquiry
- Water conservation
- Non-pay shut off
- Move in/move out
- Notifications
- Self-service

Market operations
- Forecasting
- Rate design

Case study: City of Fort Collins, Colorado

Transformer loading and related voltage alarms



Transformer loading and related alarms

Display indicates which transformers have had voltage alarms for at least three of the last five days from the attached meters

Review of historical voltage alarms suggested voltage drop due to loose connections

Use case for example

Electric	Water	Wastewater	Gas	Category	Subcategory	Functional use case	Use case description	Prerequisite technologies or integrations	Cost potential	Benefit potential	Notes
	X			Operations	Resource assurance	Pressure zone mass balance	Water usage within a water pressure zone can be aggregated and compared to SCADA to identify water loss in each pressure zone. Spatial analysis can enhance the analysis.	Custom analytics	3	3	
	X			Engineering	System planning	Water pressure zone trending	Utilities with more than one water pressure zone can trend the water usage for each zone. Aggregated water usage within a pressure zone can be trended for long-term usage, holidays, weekends, weekdays, or event related. The trends can be used for operational decisions and storage and pumping analysis.	Custom analytics	3	3	

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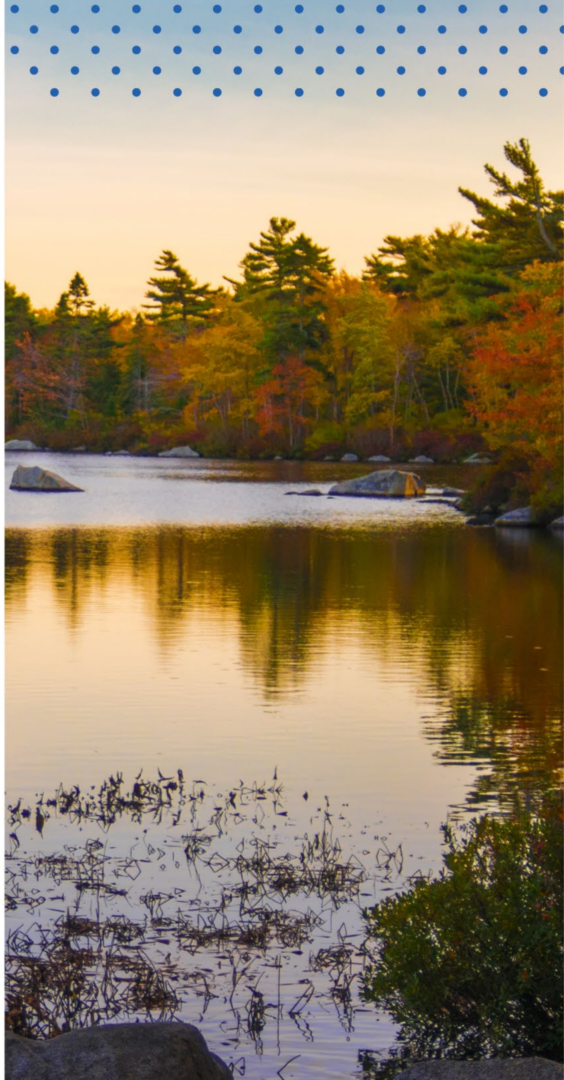
Halifax Water



STRAIGHT from the SOURCE

Halifax Water Network

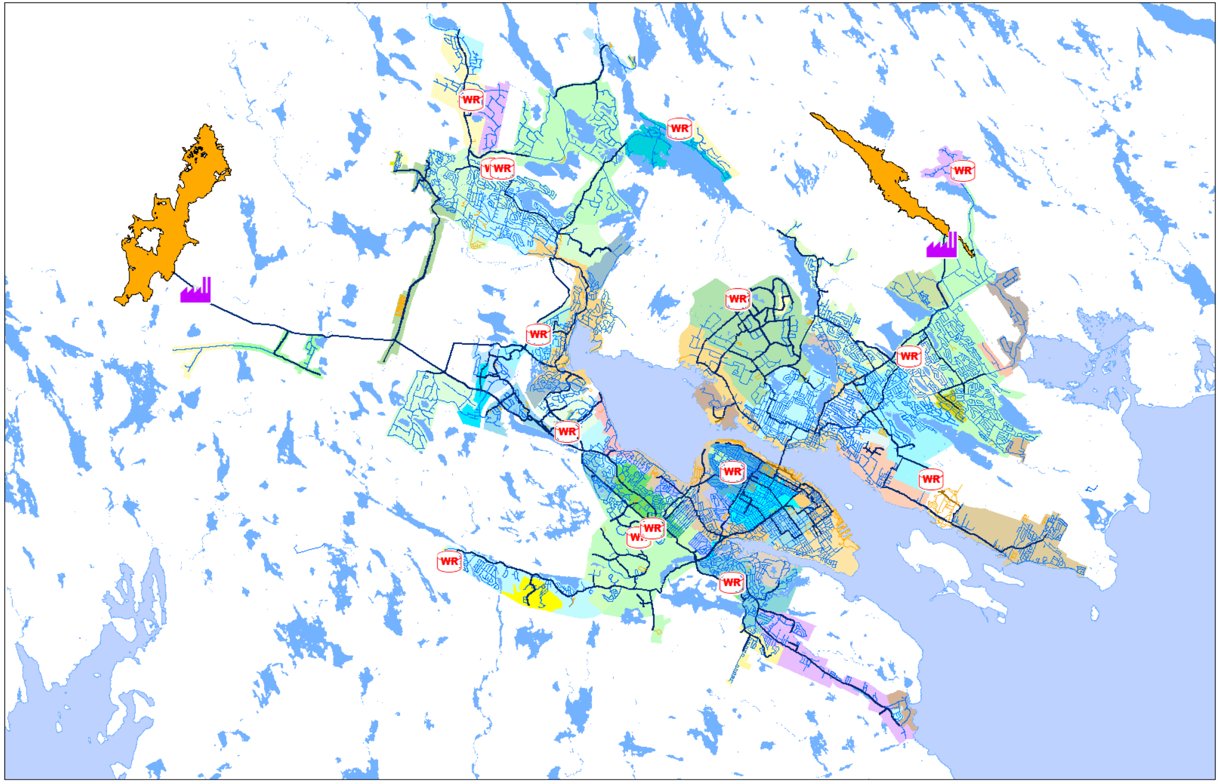
Halifax Water

2 Primary Supply Lakes

2 Primary WSP

155 KM Transmission Mains

1,250 KM Distribution Mains



16 Storage Reservoirs

72 Pressure Zones

84 District Meter Areas

91,000 Service Connections

Water Loss Control Program

Halifax Water

1999 – New WSP

- Production costs higher than other supply facility
- Motivation to develop system-wide water loss program

Reviewed North American Practices

- Most best practices were already being utilized

Extended Search Internationally

- International Water Association (IWA) best practices in use in UK
- First North American utility to adopt IWA methods
- District meter area (DMA) key tactic

2000s – Implementation

- Development of DMAs
- Robust monitoring network
- Pi as data historian
- Data available to all who can use it
- Skilled field staff
- Continuous improvement

Conventional Methods

Halifax Water

Leakage on Transmission and Distribution Mains

- Whiteboard

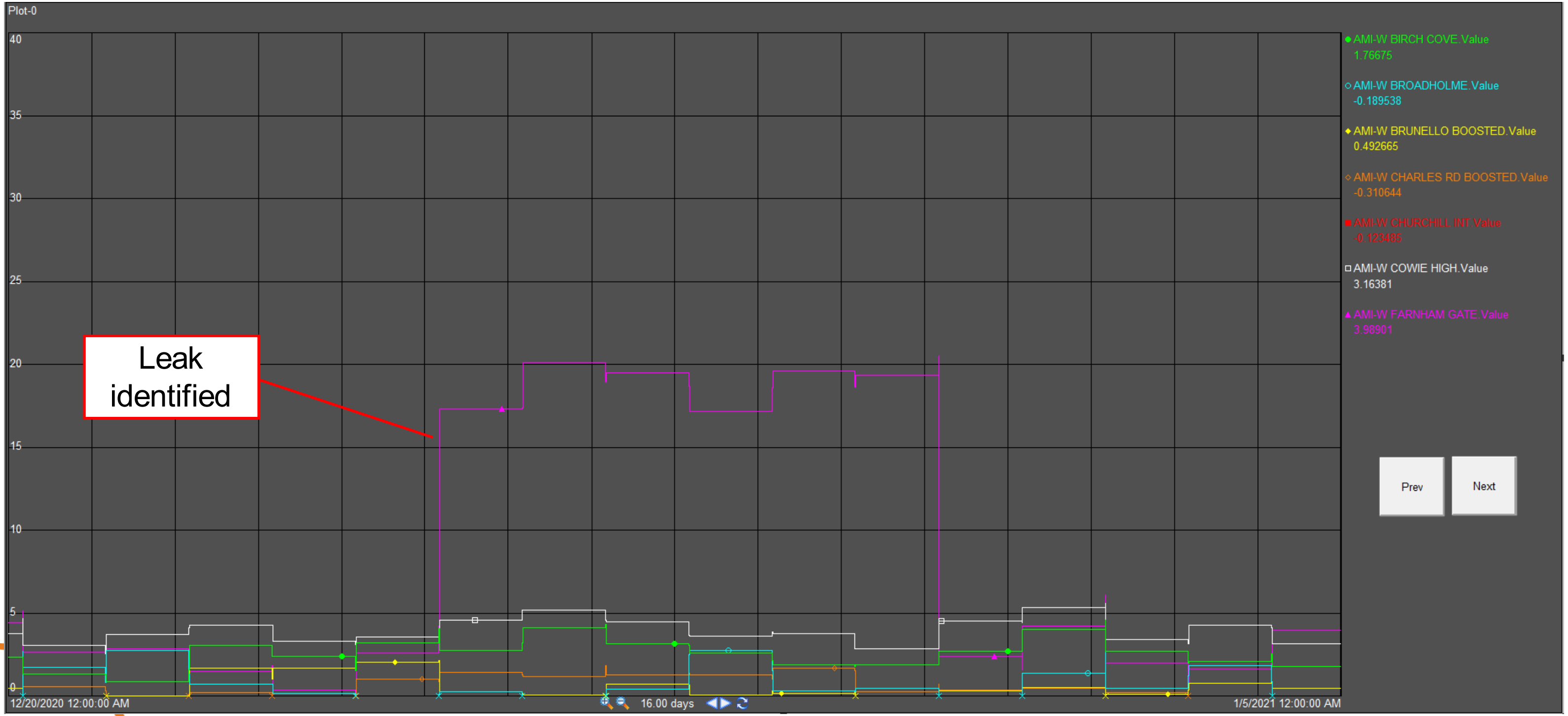
West Region Zone Night Flows (igpm)

	Benchmark	18-Sep	17-Sep	16-Sep	15-Sep	14-Sep	Diff
Peninsula Low North	1338	**1343.1**	1221.7	1320.1	1385.1	1354.5	5
Peninsula Low South	310	**295.4**	273.6	272.9	258.8	271.8	15
Intermediate Central	550	**340.1**	465.2	417.1	443.2	454.1	210
Intermediate South	933	**647.9**	630.9	580.6	572.6	716.2	285
Intermediate North	450	**595.2**	645.1	614.5	561.3	528.8	145
Peninsula Intermediate	2050	**1584.2**	1741.2	1611.6	1576.4	1694.3	466
Peninsula High	0	**65.1**	66.3	68.2	67.7	61.0	65
Fairview Clayton Park	185	**209.0**	177.7	233.9	209.6	220.5	24
Farnham Gate Intermediate	21	**51.6**	52.7	47.7	54.2	48.3	31
Broadholme Intermediate	19	**27.3**	20.6	25.1	12.6	24.3	8
Lakeside Intermediate	100	**39.0**	37.9	45.2	39.3	37.6	61
Spryfield Intermediate	187	**211.6**	131.6	142.4	121.4	142.9	25
Cowie High	3	**27.1**	24.8	27.3	26.2	23.7	24
Glenforest Intermediate	20	**15.1**	13.2	16.4	16.7	13.3	5
Titus Evans Low	120	**282.8**	266.9	268.0	264.0	278.7	163
Leiblin Boosted	0	**28.5**	31.1	25.3	36.9	37.1	29
Herring Cove Rd Intermediate	80	**83.7**	87.0	88.9	107.0	96.4	4
Herring Cove Low	0	**3.9**	7.8	14.8	14.2	12.0	4
Churchill Intermediate	0	**1.3**	1.7	1.8	1.5	2.9	1
Birch Cove	10	**27.5**	26.8	28.9	28.8	33.4	17
Brunello Boosted	0	**9.1**	4.9	3.3	2.8	5.4	9
Charles Road Boosted	7	**4.0**	3.5	4.7	4.0	4.3	3
Williams Lake Low	12	**19.1**	19.9	24.9	20.5	19.5	7
Daily System Input (igpd)			13,679,000	13,443,000	13,519,000	13,663,000	
Olands		**143.0**	211.4	141.0	100.2	80.7	

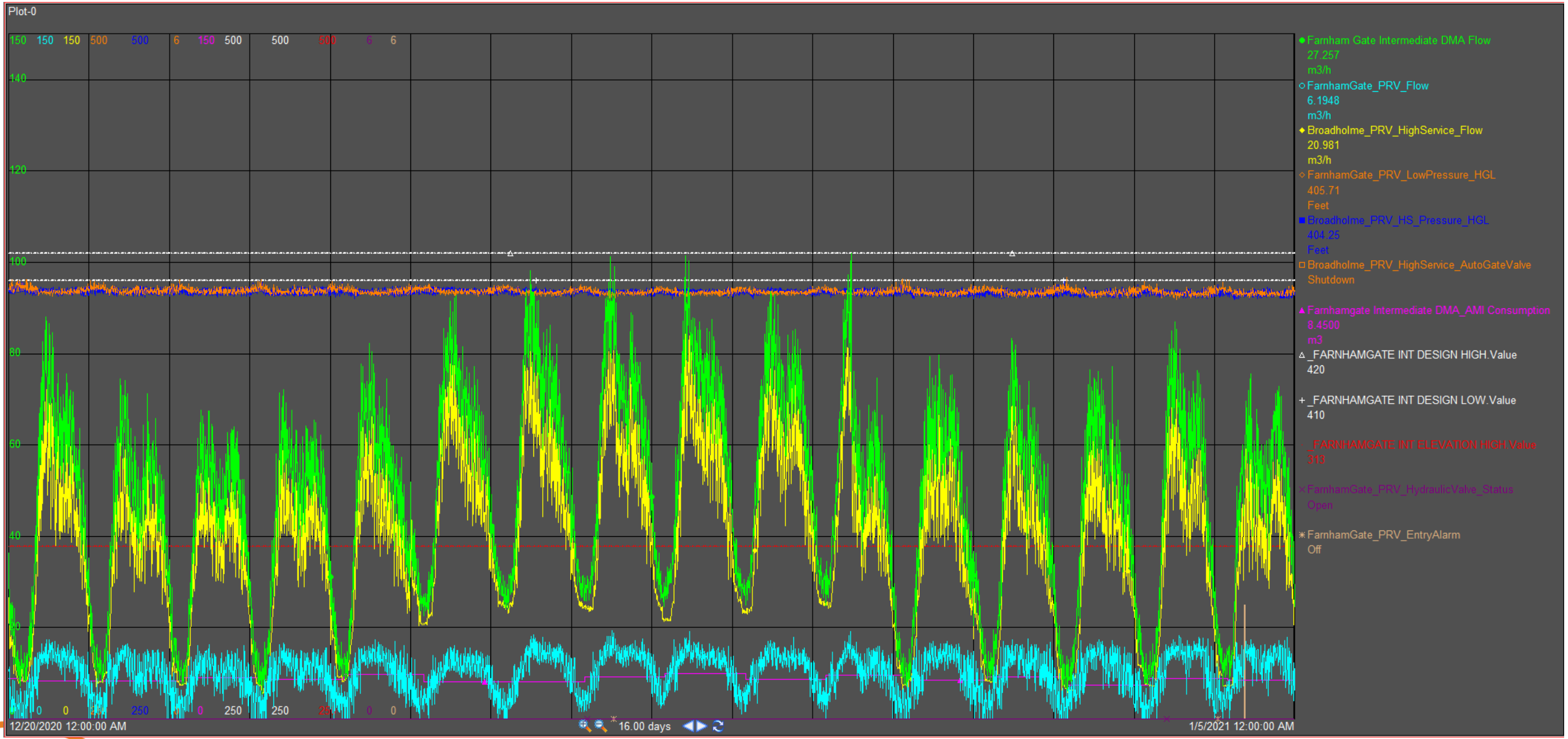
Utilizing AMI Data

AMI data in Pi

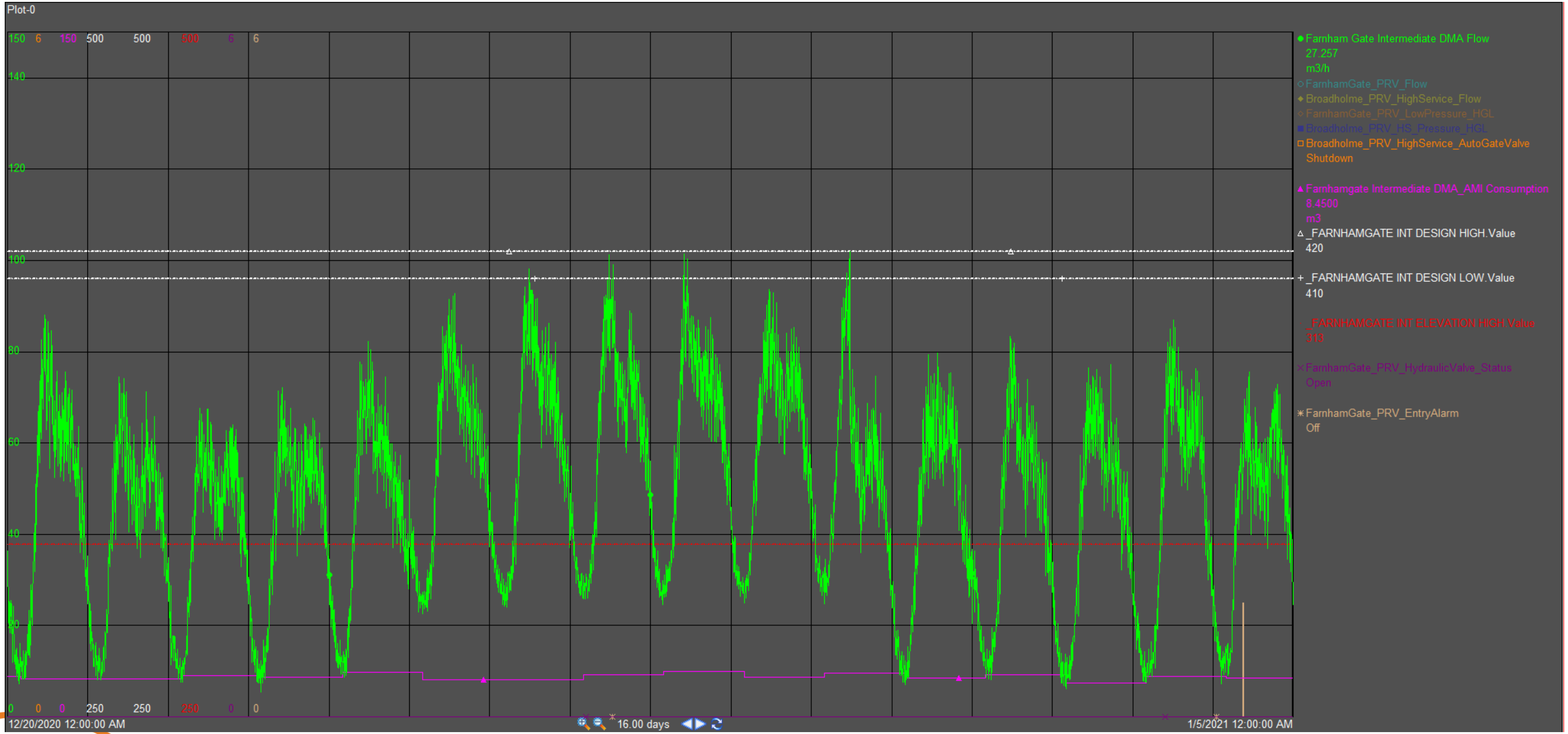
- Night flow differentials (AMI consumption versus DMA supply)



Utilizing AMI Data



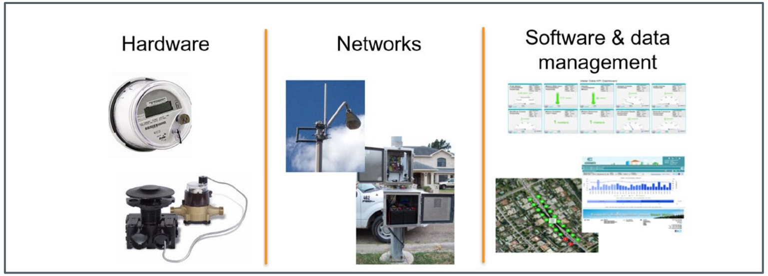
Utilizing AMI Data



AMI 2.0

- Also known as next-generation AMI
- AMI 2.0 definition varies based on the expectations of utilities replacing their AMI systems
  - Utilities that installed AMI using SGIG grants are approaching end of life for their original investments
  - What more can be done?
- There's a wide range of how AMI vendors are approaching AMI 2.0
  - Some of the applications we'll discuss are being delivered; some are aspirational—will continue to evolve
- Let's explore this by the individual components

AMI today



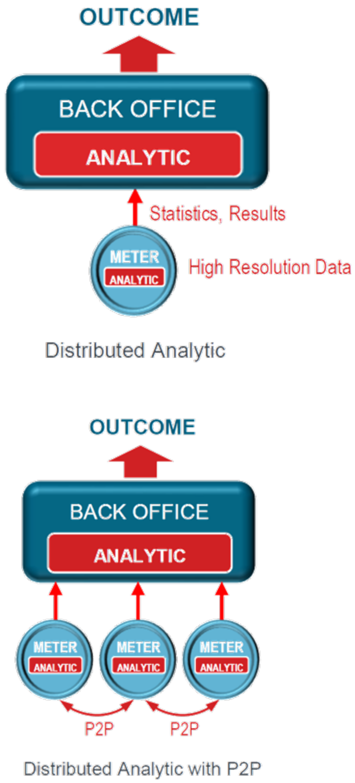
AMI allows **two-way communication** between a customer's meter and the utility, and it provides information about usage.

Electric metering

- Increasing computing power and memory
- Higher-resolution reading and billing (for transactive/distributed energy)
- Higher-amp remote disconnects
- Increasing edge computing functionality for utility and customer
  - Self-determination of location on grid (transformer, phase, feeder); could also lead to feeding real-time connectivity models
  - EV/distributed energy resource (DER) awareness
  - Improved power quality awareness

Distributed intelligence/grid edge

- Increased computing power in electric meters enables distributed intelligence/grid-edge applications at the meter
- These applications will probably be proprietary to the specific vendors and their meter models; examples:
  - L&G:
    - Grid location awareness, anomaly detection, and intelligent voltage monitoring
    - Home analytics, real-time high-energy-usage alerts, and meter safety alerts
  - Itron:
    - Active transformer load monitoring, active voltage monitoring, temperature monitoring, load management, high-impedance detection
    - EV awareness, Solar awareness
- Widespread use of third-party application development goes beyond AMI 2.0



Source: Itron

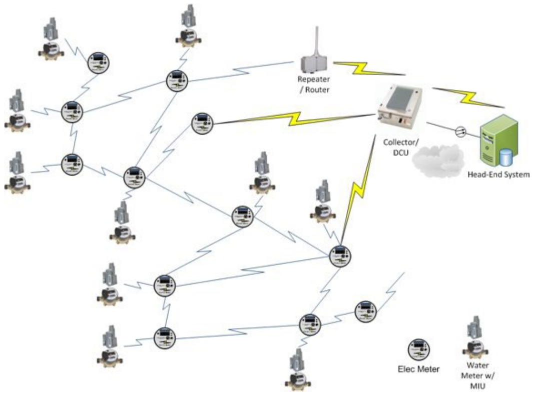
Water metering

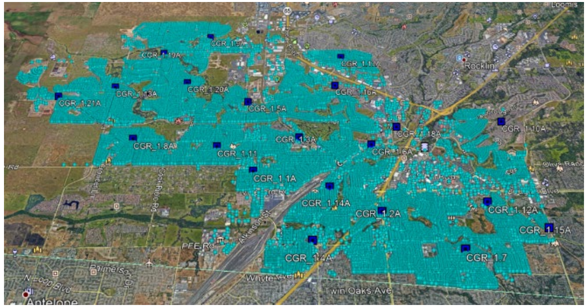
- Higher-resolution reading (0.1 cubic feet or gallon) (improved leak and backflow detection)
- Pressure and temperature measurement
- Remote disconnects (integrated or separate valve)
- Acoustic leak detection

AMI networks

- Increased bandwidth, reduced latency to meet increasing demands
- Increased frequency of data delivery (e.g., 5- or 15-minute intervals returned every hour) for customers, transactional energy, system grid awareness, etc.
- Reduced latency improves support for distribution automation control
- Open-standards communications modules or gateways to support generic and third-party sensors (WiSun and LoRa Wan)
- Network-as-a-service (NaaS)
- Commercialization of utility networks to other entities
- What is the future of propriety networks versus utility-owned (private LTE) versus public cell?

RF mesh solution and propagation analysis

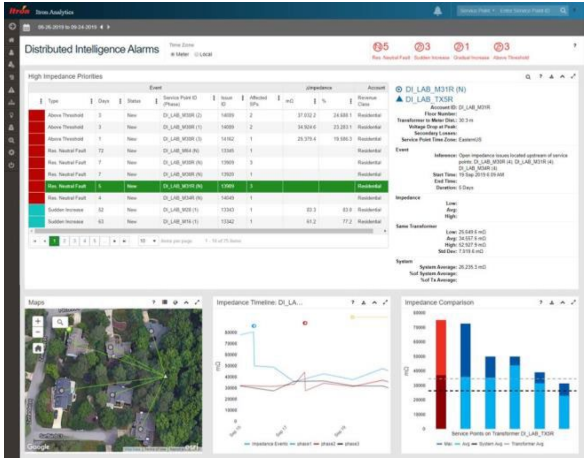




Source: Itron

Headend systems (HESs)

- More-user-friendly functionality
- Absorption of meter data management (MDM) functionality (longer data storage; validating, editing, and estimation [VEE]; integration support) to eliminate need for separate MDM
- Absorbing MDM functionality may not benefit larger utilities, but it may reduce complexity for smaller utilities



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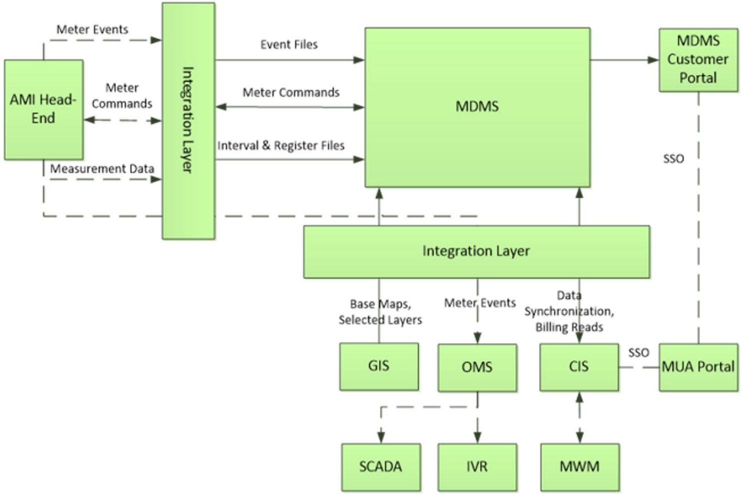
MDM systems

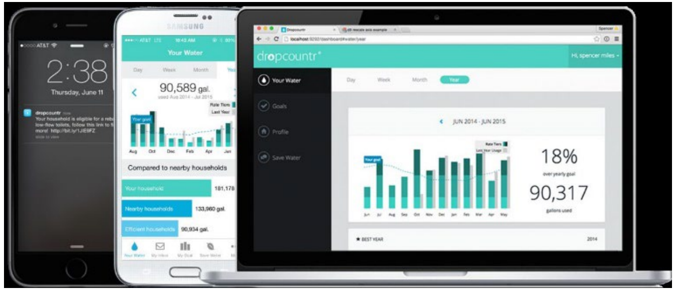
- Easier integration, or preintegrated, with headend system and/or customer information system (CIS)
- Move away from “daily data” paradigm; data is available as it’s received
- Adding optional analytics modules
- Moving to more-generalized analytics platforms included for data ingress and manipulation
- More options in approach to calculating demand and complex rates
- Availability of data warehouse/data lake for extended data storage

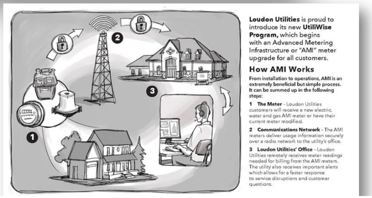


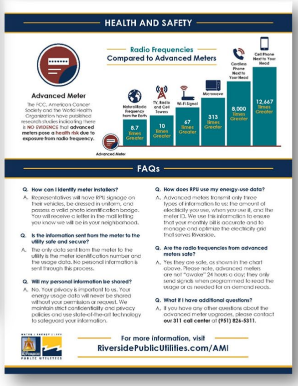
- Long-term storage
- Basic analytics
- Source of customer portal data
- Integrations facilitate greater uses
- VEE functionality
  - Helps automate manual pre-AMI processes

Customer experience/functionality

- More-timely usage data
- Potential behind-the-meter functionality (just not ZigBee; need better, more-enhanced use cases)
- Phone or app-based

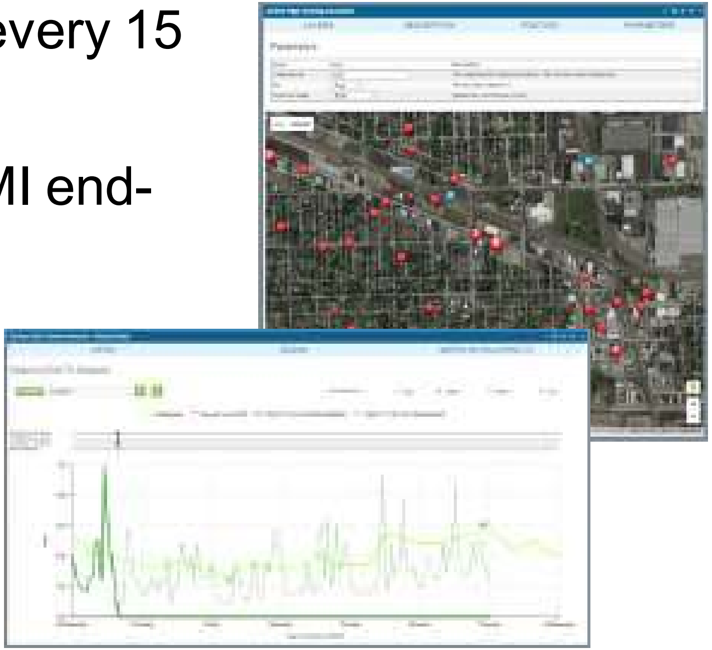






Grid

- Simple bellwether meter configuration and frequency—15-minute voltage delivered every 15 minutes or more frequently
- Conservation voltage reduction—tie to AMI end-node voltages
- Phase detection
- Transformer loading
- EV/DER disaggregation
- Rolling blackout and cold load pickup management



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Behind the meter

- Communications reach into buildings to support in-home devices; initial HAN devices and systems largely abandoned
- Expanded suite of two-way demand response devices controlled via AMI network that’s not dependent on the meter
- Control smart inverters, storage, etc. that are not dependent on the meter
  - Applicable to EVs and DERs
- Energy disaggregation (premise appliances/systems) and load profiling for these applications

Support for smart cities

- Robust endpoint partnerships controlled via the AMI network
- Open, shared data platform across entities
- Unified network—AMI, water and gas Internet of Things, streetlighting/gunshot/air quality, parking, distribution automation, etc.
- Emergency services; ability to disconnect or reconnect services as needed (e.g., building fire)

End user perspectives

Desire for near real-time view of my usage/production/net so I can determine how changes to my living/business patterns, appliances, temperature settings, etc., impact my usage and bill. Waiting to see today's usage tomorrow isn't cutting it.

- Residential
- Small and midsize business (SMB) customers
- Commercial and industrial customers
- Customers with distributed generation

Faster or more-complete communication of events that directly impact my life or business (whether provided by a grid-edge application directly to the customer or central processing communicated via a customer engagement portal, SMS alerts, etc.)

- Electric—outages, power quality issues, usage spikes or increased usage during peak-time rates, safety and hot socket events, etc.
- Pricing signals so I can determine if I want to use my distributed energy internally (directly or storage) or sell into the grid at that price point
- For each location/meter
  - Outages, power quality issues, increased usage during peak-time rates, peak demand to date, coincident peak to date, power factor to date, etc.

What are we seeing from utilities?

- AMI 2.0 roadmaps
  - Developing their definition of what they expect from AMI 2.0
  - Key step in developing internal and external stakeholder vision
- AMI 2.0 migrations
  - Migrating to a next-generation system within the partnership of their existing vendor(s)
  - Network and meter migration plan—managing a mixed system
  - Migration of ownership, hosting, and support models to meet their vision
- Next-generation AMI RFPs
  - Beginning the process of replacing their existing AMI system
  - Requirements, deployment strategy, and requested services tailored to their unique situation and vision
- You are educated buyers
  - You have many years of AMI experience to your advantage—vendor awareness, self-awareness
  - Staffing continues to be lean

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Replacing an AMI system

- Network replacement strategy
  - Locations
  - Interference
- Meter replacement strategy
  - Replace by cycle—again?
  - Replace by age, failures?
  - Replace by strategic objectives?
  - Minimize impact on the mesh?

To replace a mesh, you need a methodical analysis and approach

What is a break in the mesh (define it)	What are the consequences of a break	What are the mitigation factors if a break occurs
How do we keep a break from happening	What is the impact of these on the new AMI system	What are we missing

MDM as a buffer during replacement

- AMI 2.0 may not require replacement of your MDM
- Keep existing integrations and minimize disruptions to billing, operational reporting, etc.
- No migration of historical data required
- Does your MDM have a growth path consistent with your vision?

Questions?

Contact us

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Account Executive/Executive Consultant,
Technology Planning and Implementation Consulting
E Source
503-944-9434
joel_westvold@esource.com

Kody M. Salem
Senior Vice President, Business Development,
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kody_salem@esource.com