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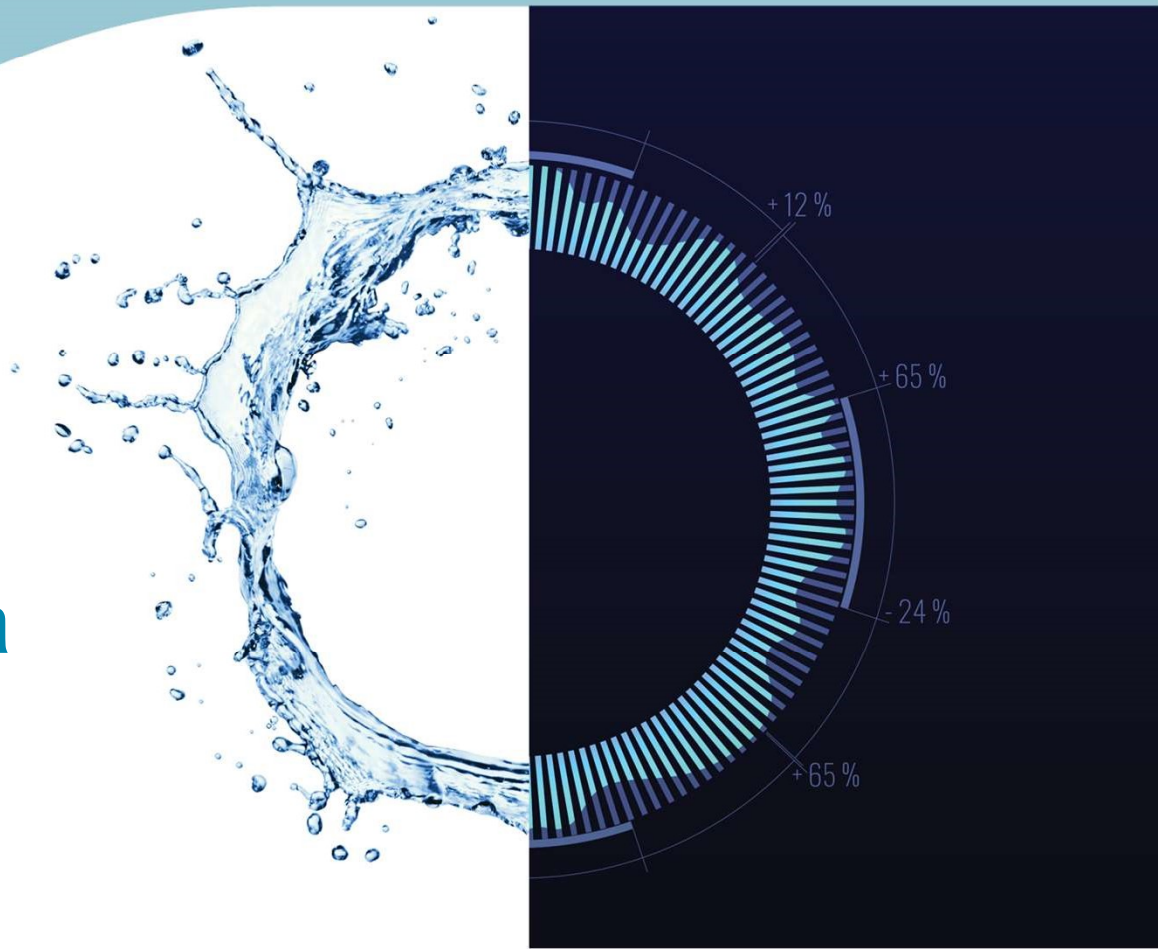
December 14, 2021

Going Beyond AMI – Houston's Holistic Approach to Building a Smart Utility Network



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Agenda

1. Speaker Introductions
2. The Smart Utility Network
3. Evolution of the City of Houston's Smart Utility Network
4. The Future for the City of Houston
5. Summary
6. Q&A

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Speaker Introductions

Chris Thomson, Xylem

Speaker Introductions

Matthew W. Thomas

- 40 years of professional utility experience
- Currently serves as Assistant Director at Houston Public Works (HPW), Customer Accounts Services (CAS)
- Customer Account Services provides customer information, billings, credit and collections, and all meter-associated services to utility customers within the City of Houston – and wholesale water services to many of nearby towns and utility districts.
- Prior to joining HPW, Matthew spent 22 years in leadership roles in Electric Utility Operations, followed by 12 years of Financial Planning and Analysis leadership in the Oil and Gas industry

Freddie Guerra

- Client Solutions Manager at Xylem
- Strategist who collaborates with clients to optimize their water/wastewater/stormwater operations and assets
- 30 years of professional experience
- Prior to joining Xylem, Freddie was Regional Sales Director for Hitachi Consulting focused on optimizing assets and infrastructure using technology, IoT, analytics, Big Data and predictive maintenance.

Vernadine Merrick

- Water Vertical Marketing Manager for Sensus, a Xylem brand
- More than 20 years of experience in industrial automation and control systems and equipment for a variety of industries, including Oil & Gas, Pulp & Paper, Mining and Municipal Water
- Vernadine holds a chemical engineering degree from Miami University of Ohio and MBA from Carnegie Mellon

Chris Thomson

- Director of Strategic Initiatives for Sensus, a Xylem brand
- More than 21 years in the water and wastewater industry – with progressive experience in consulting, design, and solutions across the water cycle
- Master's Degree of Science in Environmental Engineering from Johns Hopkins University
- Registered Professional Engineer in North Carolina and Maryland

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Audience Poll Question No. 1

How would you best describe your organization?

A. Utility
B. Consultant
C. Solutions Provider
D. Regulator
E. Other

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2

The Smart Utility Network

Vernadine Merrick, Xylem

The Smart Utility Network

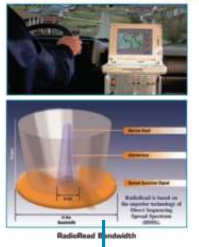
1870s
Municipal water **meters invented** and gain widespread adoption

1870s – 1984
Metering technology advances; data processes still based on **Manual Reads**

TouchRead

1984
Walk-By technology improves the speed and accuracy of meter reading

RadioRead



1993
Drive-By solution further improves the speed and accuracy to form Automatic Meter Reading **(AMR)**

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The Smart Utility Network

2006

Traditional **Advanced Metering Infrastructure (AMI)** begins to gain adoption – a fixed-based meter reading solution

Between 2006 and 2018, traditional **Advanced Metering Infrastructure (AMI)** provided many tangible outcomes to water utilities, including:

- More efficient meter reading
  - Reduced truck rolls
  - Reduced employee time to read meters
  - Reduced missed and estimated reads
- Billing efficiencies
  - Eliminated transcription errors
  - More frequent reads reduce customer “sticker shock”
- Improved Customer Service
  - Greater customer engagement from more accurate and more frequent data

2018

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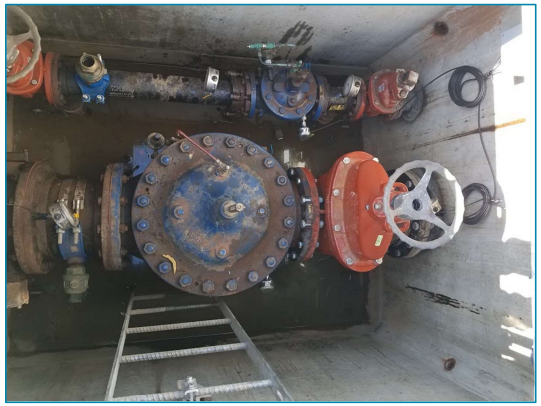
The Smart Utility Network

2018 +

Advancements expanded the traditional AMI system to the **Smart Utility Network**

Today, the Smart Utility Network is unlocking increasing value…

- Pressure & temperature monitoring at the service connection
- Remote control of meter services (for customer service activation, de-activation, flow throttling)
- Smart monitoring across the network, including pressure, temperature, level, and more.



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The Smart Utility Network

The Evolution of the Smart Utility Network:

→ Increasing Data Accuracy →

→ Increasing Data Frequency →

→ Broadening Applications & Outcomes →

→ Increasing Consumer Engagement →

→ Reduction in Human Effort and Error →

1870s
Municipal water **meters invented** and gain widespread adoption

2018 +
Advancements expanded the traditional AMI system to the **Smart Utility Network**

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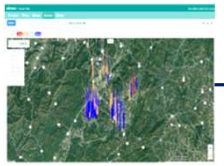
The Smart Utility Network Components

Base Station

Network Management Software



Smart Applications & Data Analytics

Customer Portal

Smart Residential Meters and SmartPoints

Commercial & Industrial Meters and SmartPoints

Smart Gateways with 3rd Party Sensors

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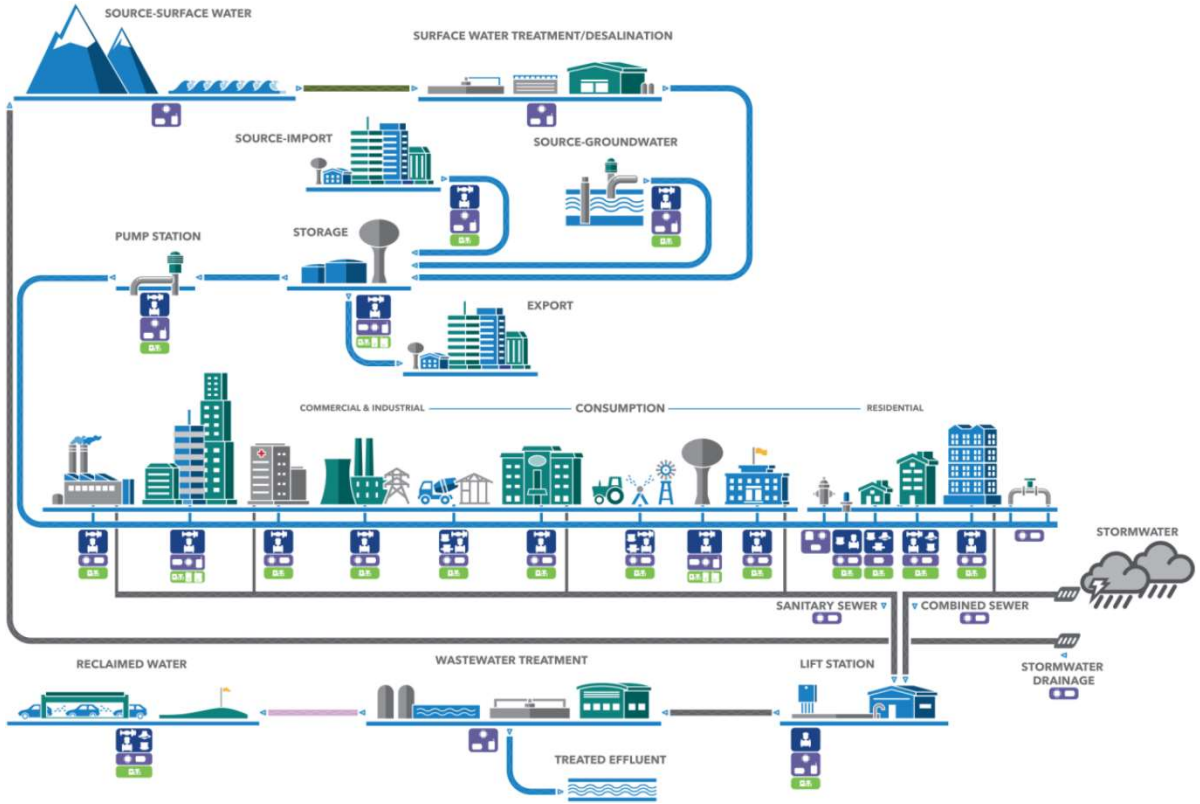
The Smart Utility Network

Leverages the same network to provide solutions for…

- Water Distribution
  - Pressure Monitoring and Management
  - Increasing Water System Operational Efficiency
  - Long-Term Capacity Planning
  - Data Sharing With Departments and Partners
- Elsewhere in the Water Cycle
  - Stormwater
  - Flooding
  - Wastewater
  - Reclaimed Water Distribution



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Audience Poll Question No. 2

Where are you (or most utilities) in the Smart Utility Network evolution?

A. Currently Direct Read (Manual Reading, Transcription, etc.)
B. Currently AMR (Walk By / Drive By)
C. Evaluating AMI
D. Migrating to / currently at AMI
E. Going Beyond AMI (Pressure Monitoring, Smart Analytics, etc.)
F. Other

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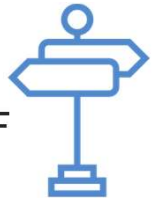
Evolution of the City of Houston's Smart Utility Network

3

Matthew W. Thomas, Houston Public Works

Houston Public Works

16,000
LANE MILES OF STREETS



3,900
MILES OF STORM DRAINS

146B
GALLONS OF WATER TREATED PER YEAR

2,450
TRAFFIC SIGNALS

2,800
MILES OF ROADSIDE DITCHES

5.8M
WATERBILLS SENT PER YEAR

467

TYPES OF PERMITS

$2.1B

ANNUAL BUDGET

4,000
EMPLOYEES

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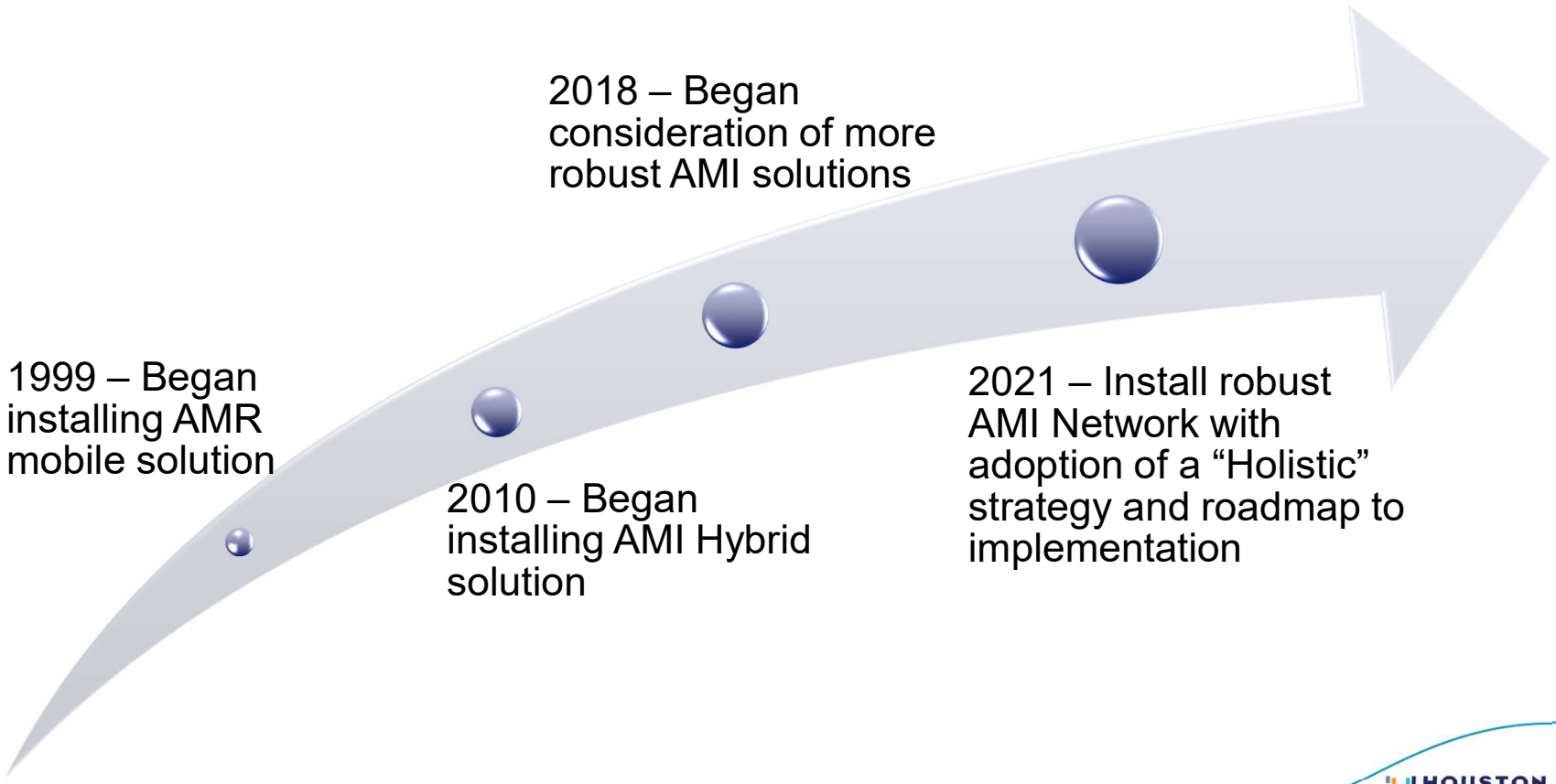
Houston Public Works (HPW) Network Journey



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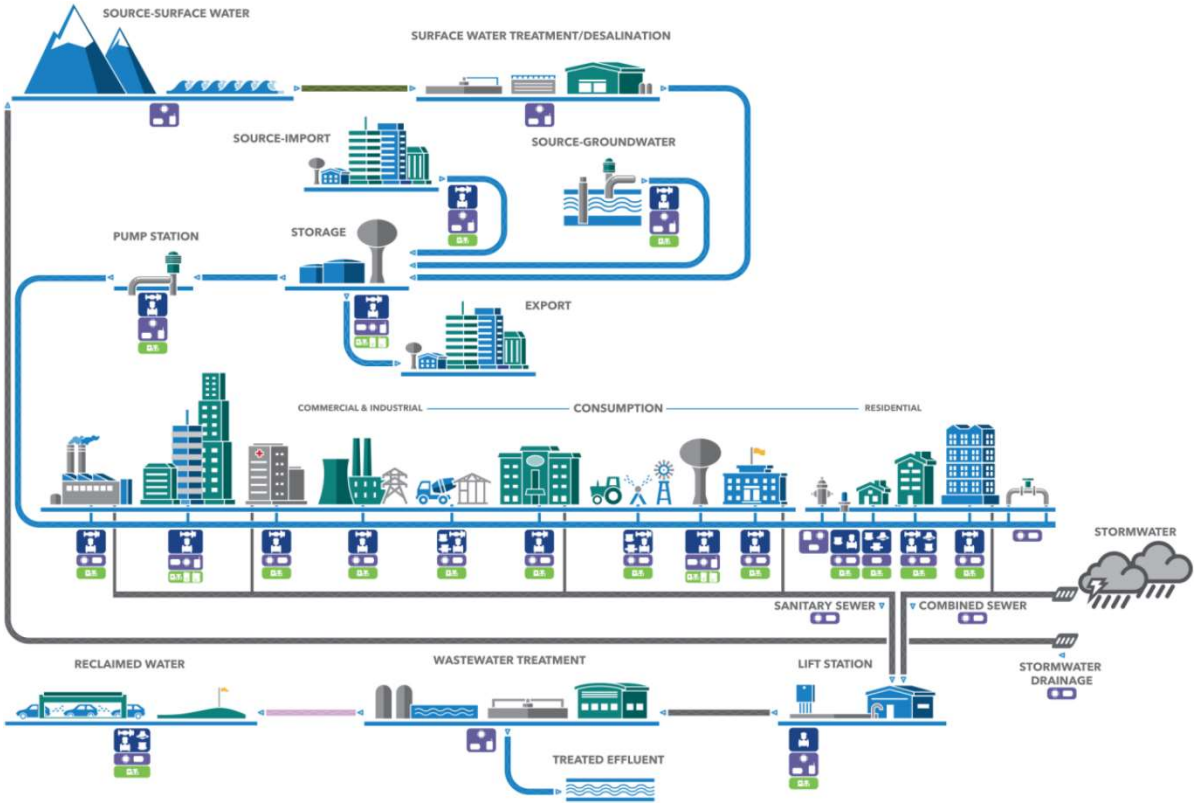
Smart Utility Network

- Leverages network to solve other utility issues
- Battery-powered radios & sensors communicate data from non-traditional sources
- Tangible & adaptable
- Supplements SCADA



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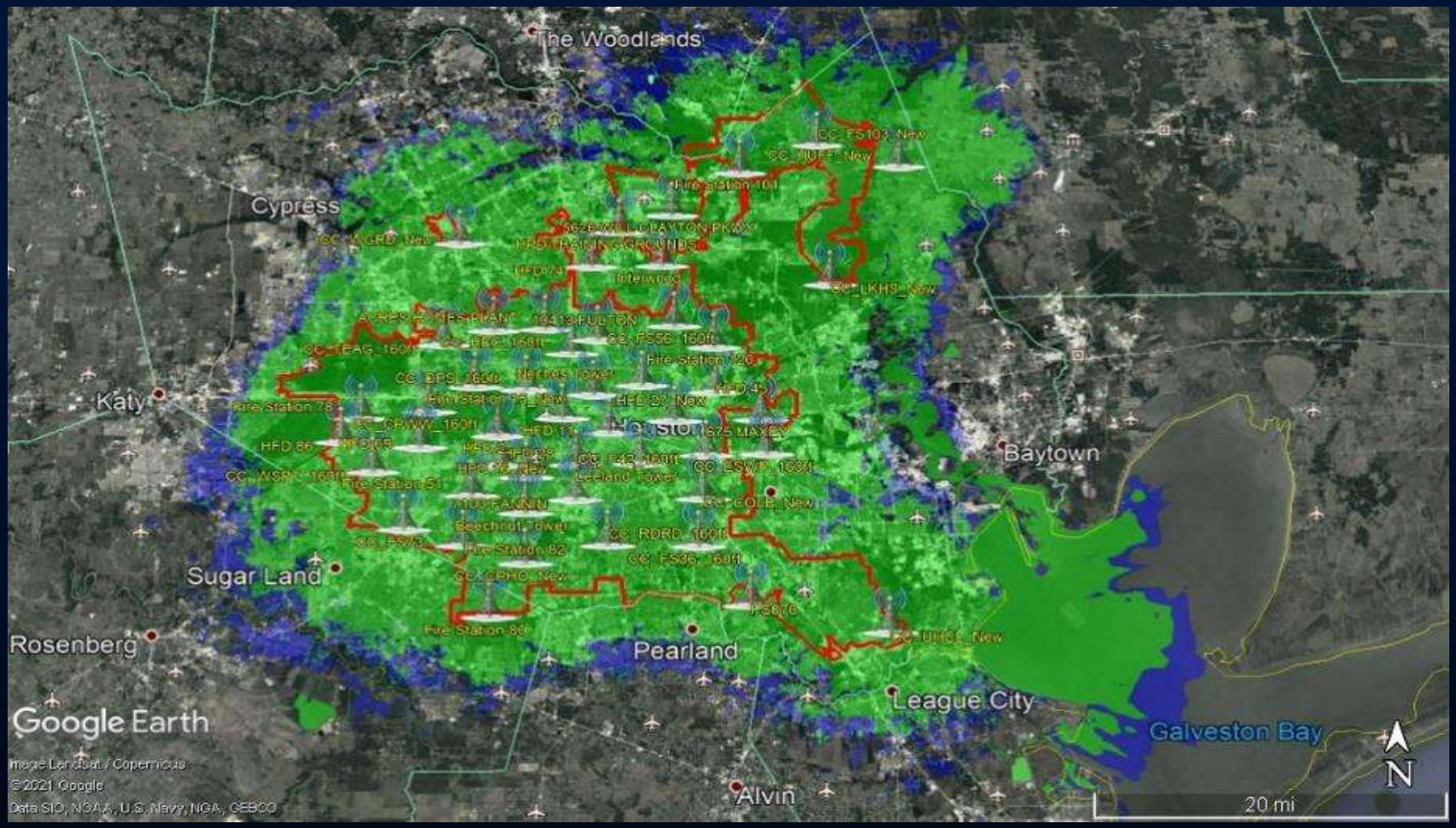
City of Houston Network Coverage



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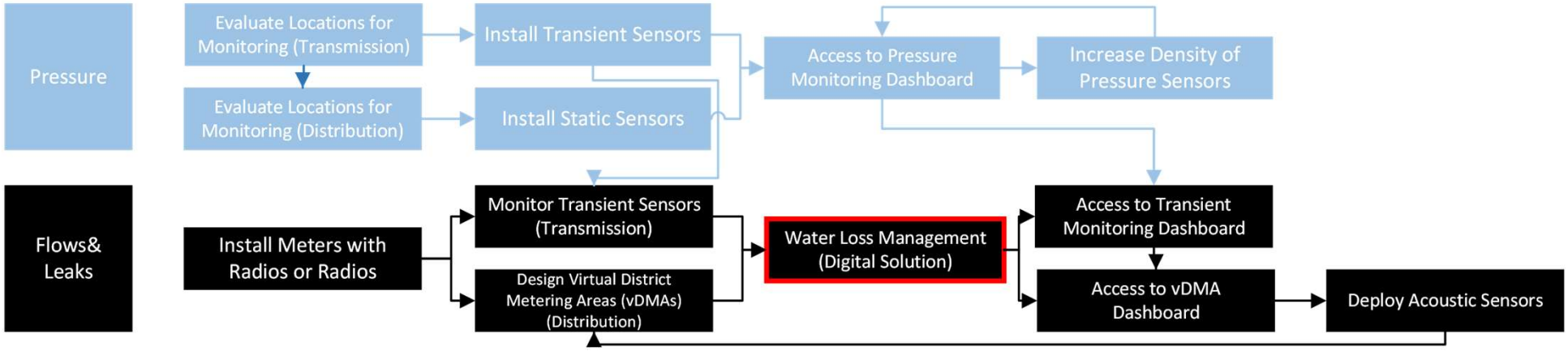
Flow & Pressure



Utility & City Roadmap

CONNECTIVITY

BIG DATA

ANALYTICS

- Build a roadmap
- Evaluate metrics & value with an enterprise-wide approach
- Consider the end user, people come first
- Do NOT isolate projects
- Pursue improvement NOT perfection

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Audience Poll Question No. 3

Besides metering and billing, what Smart Utility Network application do you find most intriguing?

A. Pressure Monitoring and Management
B. Data Sharing with Departments and Partners
C. Increasing Water System Operational Efficiency
D. Long-Term Capacity Planning
E. Other

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4

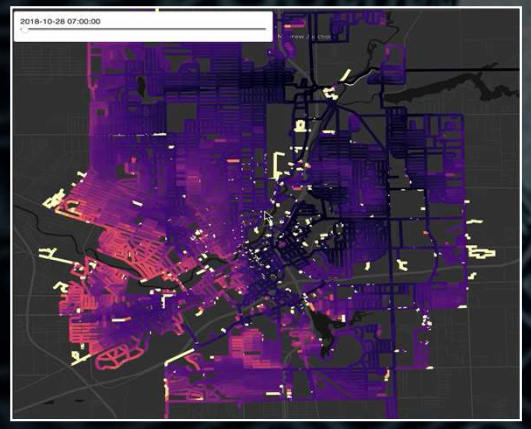
The Future for the City of Houston

Freddie Guerra, Xylem

ROADMAP LEVERING AMI TO PROVIDE THE RIGHT INFORMATION AT THE RIGHT TIME

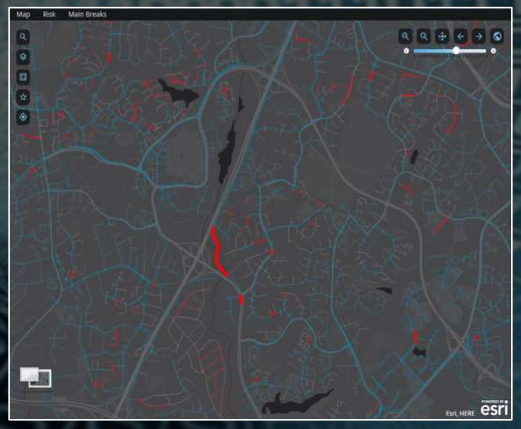
Situation Intelligence

"What is happening in the City's System(s)?"



Minimizing Risks

"What is likely to happen in the City's system?"



Real-time Optimization

"What does the City need to do?"

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PIVOTING TO DIGITAL ASSET MANAGEMENT

DIGITAL TO PHYSICAL
(Proactive Regimes)

PHYSICAL TO DIGITAL
(Facilitate Management)

DIGITAL TO DIGITAL
(Enhance Management Activities)

Digital Thread

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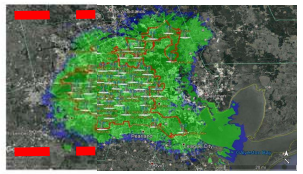
Digital Roadmap



Smart Water Utility Roadmap

Revenue Proection (Revenue Locator)

Apparent Losses

Risk Analysis (Asset Performance Optimization) (Digital Solution)

Cluster Analysis

Strategic Interventions

Real Losses

Identify Risks

Dynamic Asset Management

Optimize Performance

Mitigate Risks

Pressure

Evaluate Locations for Monitoring (Transmission)

Install Transient Sensors

Access to Pressure Monitoring Dashboard

Increase Density of Pressure Sensors

Evaluate Locations for Monitoring (Distribution)

Install Static Sensors

Improve LOS

Flows& Leaks

Install Meters with Radios or Radios

Monitor Transient Sensors (Transmission)

Design Virtual District Metering Areas (vDMAs) (Distribution)

Water Loss Management (Digital Solution)

Access to Transient Monitoring Dashboard

Access to vDMA Dashboard

Deploy Acoustic Sensors

Water Quality

Water Network Optimization (WNO) (Digital Solution)

Install Water Quality Sensors

Access to WNO Dashboard

Emergency Preparedness & Response

Operations & Maintenance

Master & Capital Planning

Analytics

Update Hydraulic Model

Implement Holistic, City-wide Analytics

Data-Driven Decisions

Near Real-time Insights

Decision Intelligence

Creation of a Digital Twin

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Audience Poll Question No. 4

What is the biggest barrier to utilities adopting new technologies?

A. Procurement Processes
B. Change Management
C. Community Acceptance
D. Financial Challenges
E. Other

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5

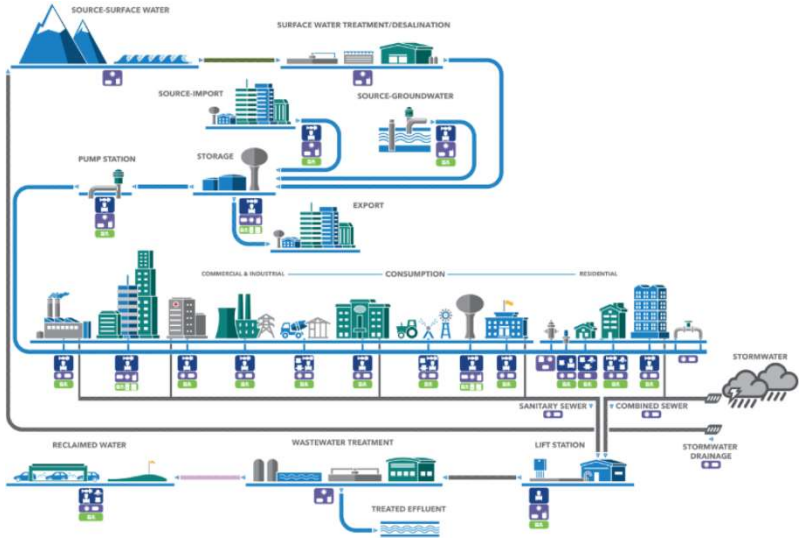
Summary

Chris Thomson, Xylem

Summary

- The Smart Utility Network is the latest evolution in a long history of water data solutions.

- Today, the Smart Utility Network provides remote metering and billing – and its applications and value are expanding:
  - Pressure Monitoring
  - Temperature Monitoring
  - Remote Control of Service Connections



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Summary

- The City of Houston is on the cutting edge of the Smart Utility Network evolution.

- In addition to metering and billing, Houston is looking to the system to provide…
  - Pressure Monitoring and Management
  - Data Sharing Among other Departments
  - Long-Term Capacity Planning
  - Data Sharing with Partner Utilities

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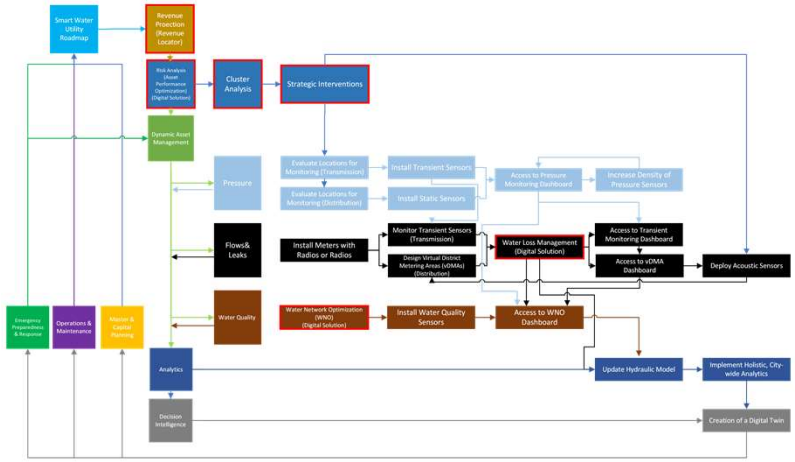
Summary

- Looking forward, the Smart Utility Network is the base of Houston's roadmap for smart applications and outcomes.
- It provides the ability to pivot from billing and metering to digital asset management across the water cycle.



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6

Q&A

Panel

Q&A

Matthew W. Thomas
- Assistant Director, Customer Account Services (CAS)
- Houston Public Works (HPW)
- Matthew.Thomas@houstontx.gov

Vernadine Merrick
- Vertical Marketing Manager
- Xylem
- Vernadine.Merrick@xylem.com

Freddie Guerra
- Client Solutions Manager
- Xylem
- Freddie.Guerra@xylem.com

Chris Thomson
- Director of Strategic Initiatives
- Xylem
- Chris.Thomson@xylem.com

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Q&A (Seeded Questions*)

1. What is the biggest opportunity for Houston in leveraging a Smart Utility Network? {For Matthew}

2. What factors did Houston take into account in your selection of the Smart Utility Network? {For Matthew}

3. We understand it's early in the project, but what improvements or changes have you seen at Houston already in the implementation of the network? {For Matthew}

4. You talked a lot about the evolution of these networks. What do you think is the next step in the evolution? {For Each on Panel}

* These questions won't be shown to the Webinar. They are meant to "prime the pump" to get questions flowing in.

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