Advanced Metering Infrastructure (AMI) 2016 Feasibility Study

NAV OTAL – UTILITIES DIRECTOR

COUNCIL PRESENTATION

APRIL 4, 2016

Goals and Agenda

Goals:

1. Update on Advanced Metering Infrastructure (AMI)
2. Direction for 2017-2018 proposed budget

Agenda:

1. Smart Cities' initiative - water
2. Challenges of the current meter reading program
3. AMI feasibility study findings
4. Proposed next steps

Bellevue City Council Vision Embraces Smart City

Vision Statements:

- Infrastructure is ample and in excellent condition, including roads, rails, high-speed data, reliable electricity, and clean water
- A state-of-the-art, intelligent transportation system moves people through the city with a minimum of wait times and frustration
- Bellevue is a “Smart City” with a clean, high-quality environment and excellent and reliable infrastructure that supports our vibrant and growing city, including high-tech connectivity
- Our institutes of higher learning are connected physically and digitally
- Our residents live in a safe, clean city that promotes healthy living
- We have superb infrastructure to support growing businesses and desirable residential opportunities

Two Year Priorities:

- Integrate our infrastructure planning with an economic development focus – departments should work collaboratively
- Develop the Smart City strategy to include high-speed data options to support business and residents and determine implementation steps
- Identify and implement technologies that improve customer service

What is a Smart City?

Collect + Communicate + Crunch ➡ Smart City

What are Bellevue's drivers for becoming a Smart City?

Livability

- Improve health and safety?
- Save time?
- Improve economic competitiveness?
- Provide better information?

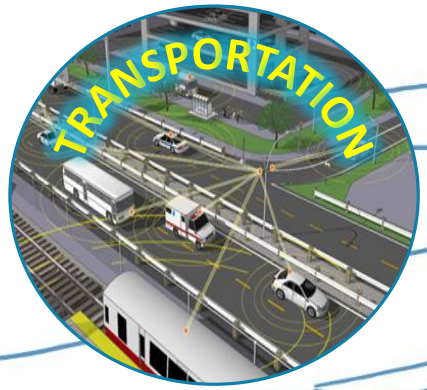
Sustainability

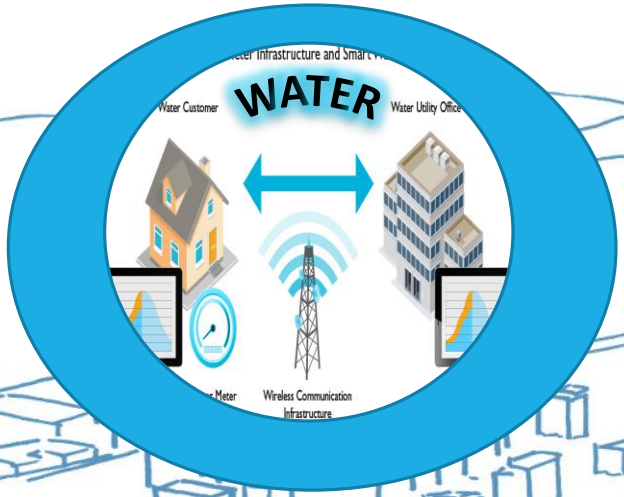
- Save resources?
- Save money?
- Reduce waste?
- Protect the environment?

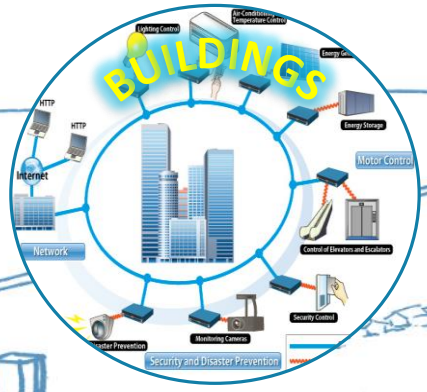
Resiliency

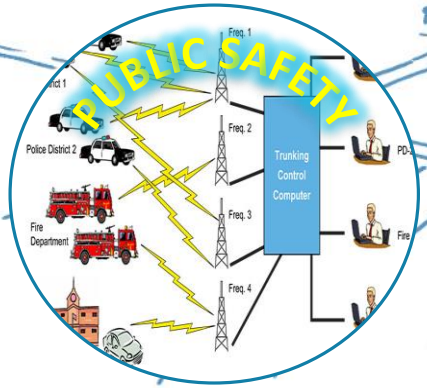
- Better prepared for emergencies?
- Improve recovery from disruptions?
- Increase reliability?

SMART BELLEVUE









Devices Sensors Communications Integration Automation Intelligence

Bellevue's Water Metering Infrastructure

Population served – 146,000

- Day time population – 235,000

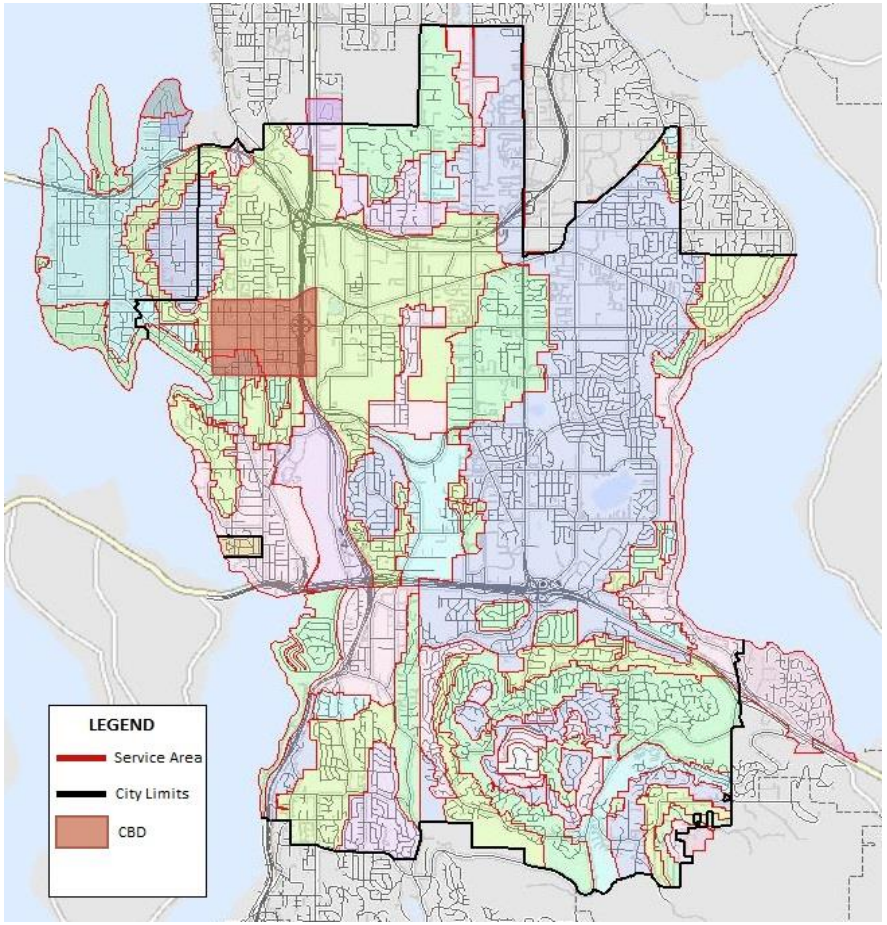
Service area - 37 square miles

- City of Bellevue
- Clyde Hill
- Hunts Point
- Medina
- Yarrow Point
- Sections of Kirkland and Issaquah

37,300 Customer accounts

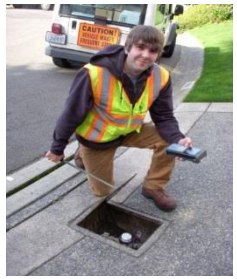
Utilities Meter Inventory by Size 2014 data

SIZE	0.62"-0.75"	1"-2"	>2"	TOTAL
TOTAL	32,945	7,575	284	40,804

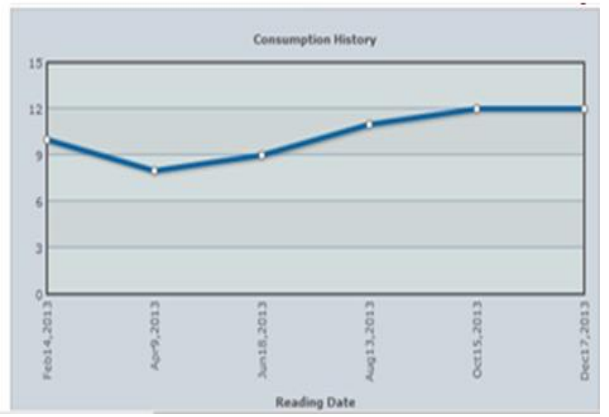


Existing Meter Reading Program

- **Bi-monthly** reading frequency
- **Manual reading**
- **Meter readers** allocate approximately 55% of their time to meter reading
- Meter reading **accuracy is very good** - 99.75%
- Meter reads entered in **handheld data loggers**, and downloaded into **billing system** for customer bills
- **Customers can use MyUtilityBill** to manage their account online and get bi-monthly consumption data



Bi-monthly consumption history – Water



Challenges with Current Meter Reading Program

Significant water loss due to undetected leaks

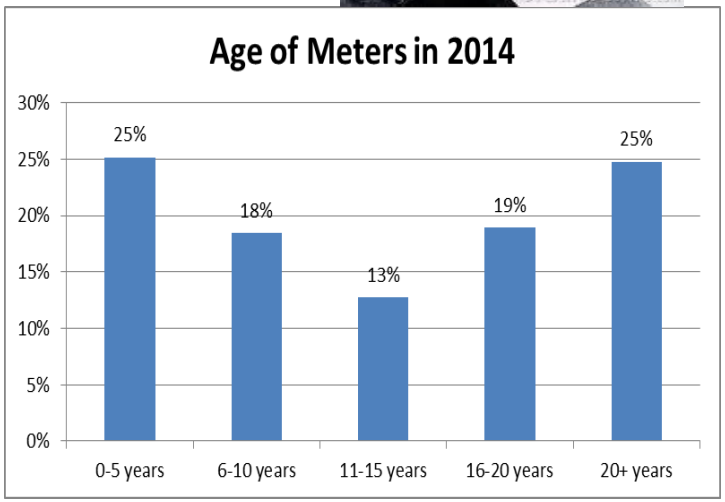
- High customer bills
- Waste of precious resource

Lack of real time data

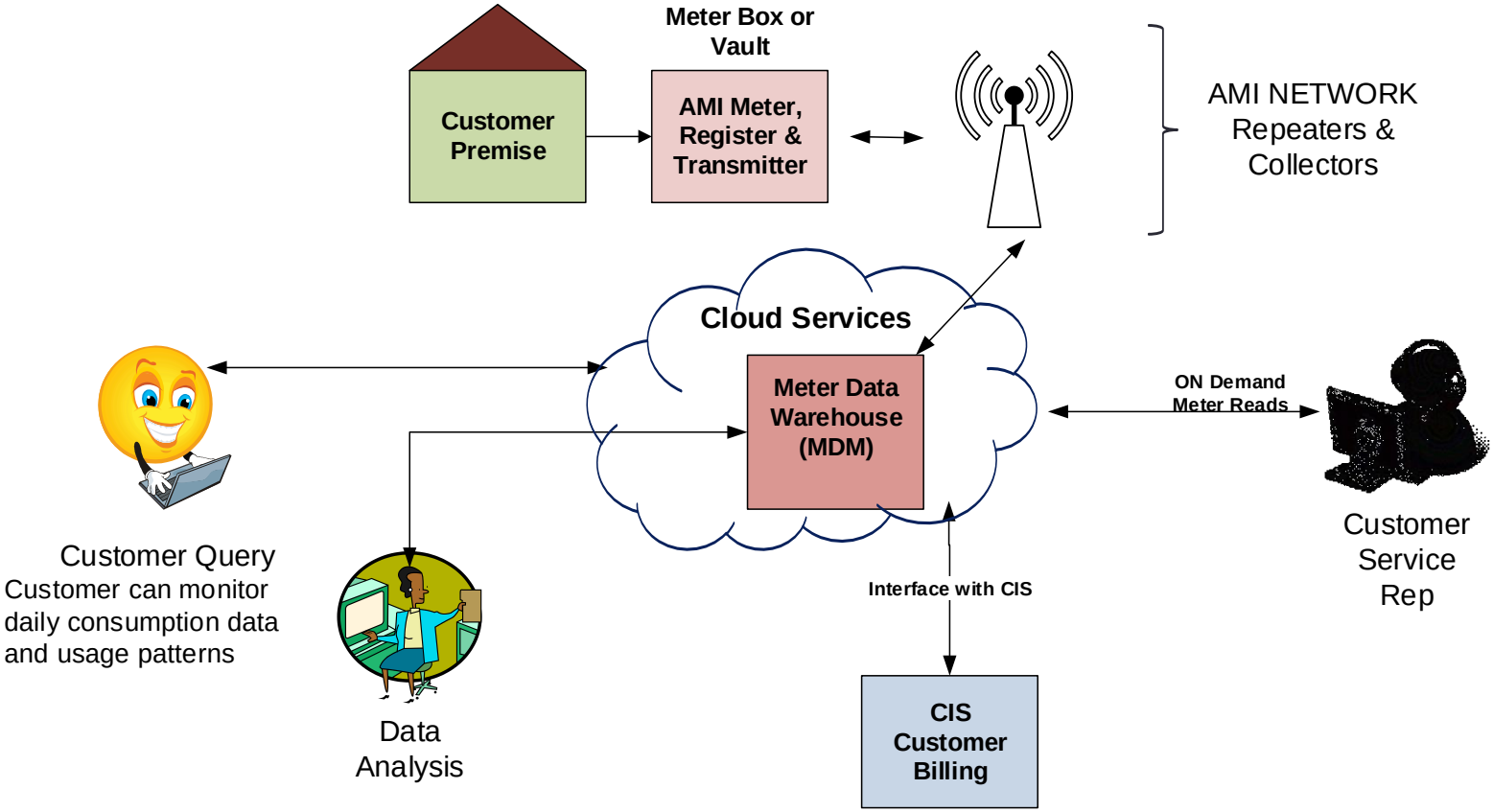
- Customers can't self-monitor and manage consumption
- Water conservation

Inequitable water charges

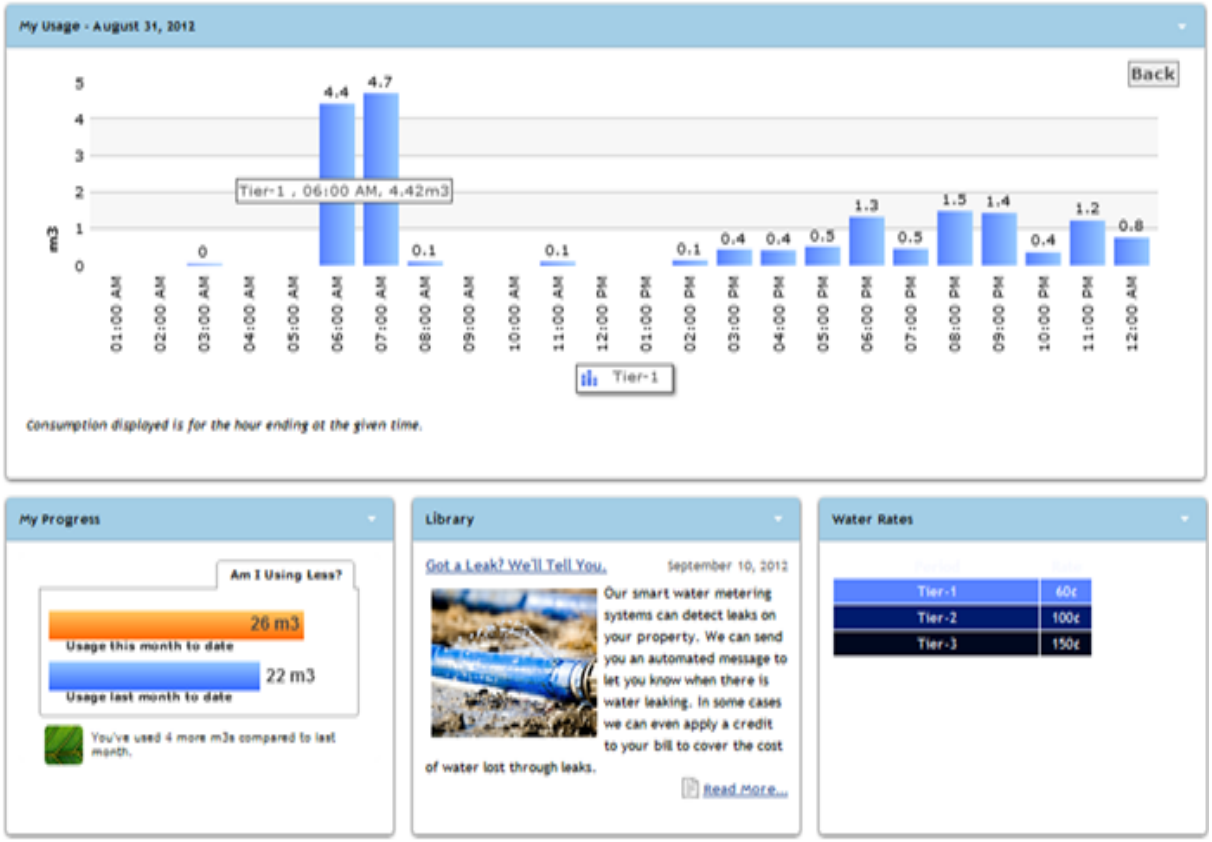
- Aging meters under-register
- Current meters do not capture low flow



AMI Technology



Benefits to the Customer – Access to real time data



Hourly consumption - Water

- Earlier detection of leaks can enable customers to avoid high bills
- Ability to proactively manage higher bills
- Quick response to issues and inquiries

Stewardship of Scarce Resource - System-Wide Leak Detection Benefits

Sometimes it is obvious where water loss is occurring. However, a large percentage of water loss can go undetected for weeks or months.

AMI interval data and fixed network acoustic sensors can provide critical information in support of an effective leak detection and avoidance program.

Activities include:

- Leak detection
- Pressure management
- Faster break repair times
- Line replacement projects
- Condition assessment
- Operational modifications

Leak Detection Techniques

- System-wide surveys
- Permanent and semi-permanent monitors
- Hydraulic modeling
- Zone metering

AMI - Economic Benefits

- Reduced meter reading labor–from 6 to 2
- Reduced meter reading vehicles–from 6 to 2
- Reduced cost from gasket repairs
- New meters – higher accuracy
- Salvage value from old meters

Environmental Benefits

- Water conservation
- Prevent water contamination
- Improved system planning
- Reduced Greenhouse Gases

AMI Feasibility Study Scope

CH2M HILL retained to perform a comprehensive Feasibility Study and economic evaluation on current AMI technologies.

- Objectives
- Business processes
- Customer Benefits
- Operational Benefits

- Fixed based AMI
- Cellular
- Smart Cities
- Interoperability
- Internet of Things

- Meter reading
- Customer Service
- Capital Planning
- Improve registration
- Leak detection

- Conclusions
- Recommendations
- Technology
- Risk Factors
- Procurement

Options Considered

- Base Case – Manual read
- Standard AMI Solution
- High Power AMI Solution
- Cellular AMI Solution

Standard AMI Solution

- Meters are connected to a communication device
- Hourly reads transmitted once a day
- Data is transmitted through collectors and repeaters
- Data can be read through a customer portal

High-Powered AMI Solution

- Communications occurs through fewer devices because of higher power
- Higher initial cost compared to Standard AMI solution
- Lower battery life – require more frequent battery replacement

(e.g., Sensus)

Cellular AMI Solution

- Communications occurs through an existing Cellular network (e.g., AT&T, Sprint, Verizon, etc.)
- Lowest initial capital cost, but higher on-going cost because of cellular network costs

(e.g., Badger)

Summary of Business Case Results

Business Case Outputs:	Manual Read (No AMI)	Standard AMI Solution	High Power AMI Solution	Cellular AMI Solution
Capital Costs	$9.2M	$23.1M	$24.1M	$22.9M
Life Cycle Cost (Net Present Value (NPV))	-$11.4M	-$9.8M	-$11.4M	-$17M
NPV Compared to Manual Reads		$1.6M	-$27,000	-$5.7M

Standard AMI - Costs

Capital Costs

	Cost Component	Total
1	Meters – Solid State	$10,280,000
2	Meter Boxes	$5,256,000
3	Lids	$608,000
4	Transmitters (MIUs)	$4,008,000
5	Communication and Other Installation	$445,000
6	Integration	$1,068,000
7	Bellevue Implementation Cost	$1,425,000
	Total	**$23,089,000**

Standard AMI - Costs cont.

New Operating Costs

- Software licenses and backhaul fees
- 1 FTE - Data analyst / business intelligence

Revenue Impact

- Fewer leaks
- Water conservation

Cost to the Customer

= $1.80 a Month

Pays for installation and 20-year operations of the Full AMI System

Options

Question is not if, but *when* to implement AMI

OPTION 1 - RECOMMENDED

IMPLEMENT AMI IN 2018-2019

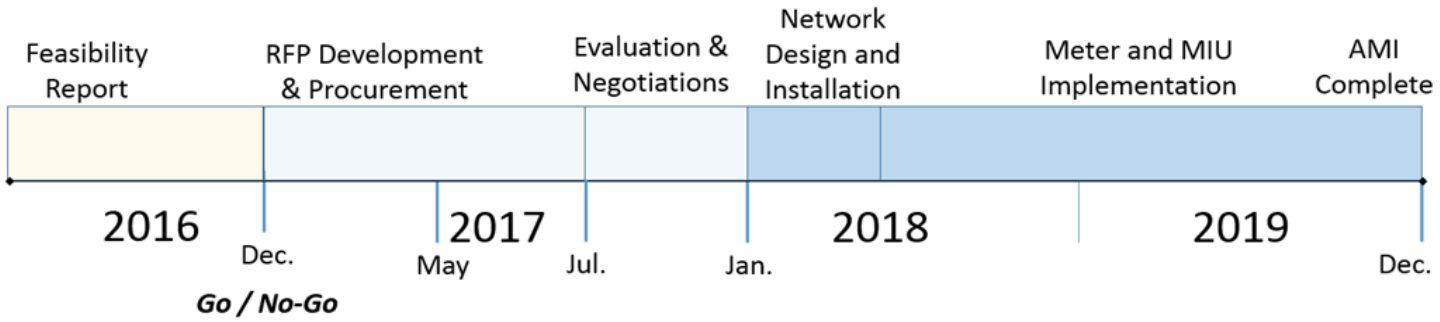
- Realize benefits immediately
- Potential catalyst for other Smart City initiatives
- Potential for better pricing from vendor

Option 2 - DELAY AMI IMPLEMENTATION

- Allow more time to AMI technology to mature
- Potential for more favorable pricing, particularly for cellular communications technologies

Proposed Next Steps - AMI Implementation Schedule

- Go/No-Go Decision – December 2016
- RFP Release Date – May 2017
- Proposals Due – July 2017
- Notice to Proceed – December 2017
- Implementation Begins – January 2018
- Implementation Complete – December 2019



Next Steps

Direction needed from Council

- Include AMI in Utilities proposed CIP budget and rates
- Customer Outreach

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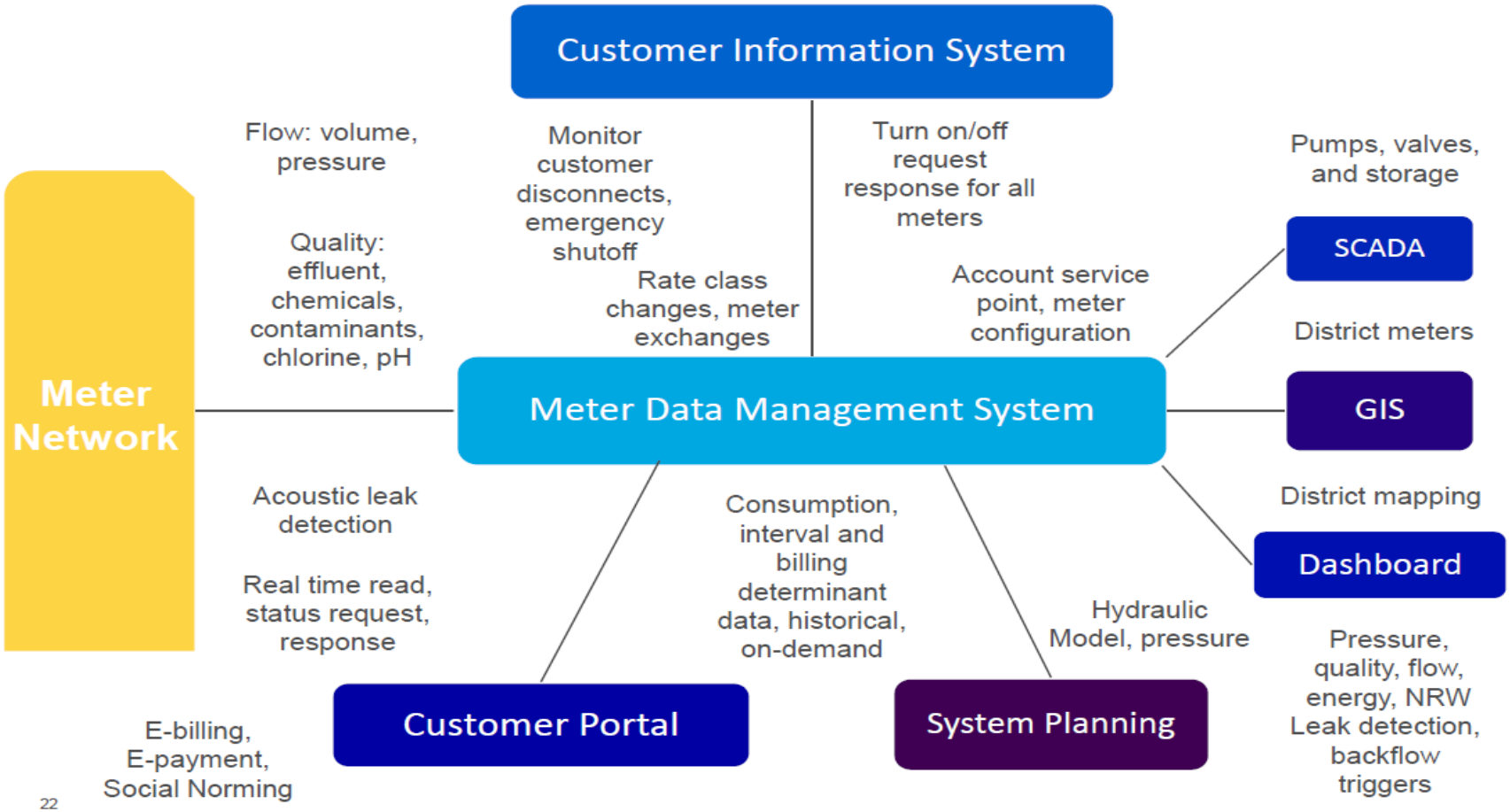
AMI Data Can Be Integrated with Other Data to Deliver Additional Improvements



AMI Can Provide Other Smart City Benefits

Livability *Sustainability* *Resiliency*

Benefits

For People	For Systems		For Resources
Greater safety and resilience	Efficiency	Safety	Less waste
Transparency and choice	Resiliency	Predictive	Lower costs
Convenience and better service	Automation	Adaptive	Sustainable operations

Smart Systems

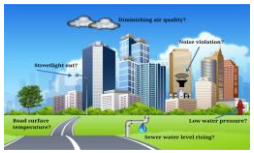
Dashboards | Reports | Apps | Data | Alerts

Transportation	Water	Buildings	Public Safety	Energy
ITS Street Light Management	AMI SCADA	Building Controls Smart Meters	911 System Mobile Apps	Smart Grid Meters Renewable Energy Generation

Enablers

Analytics


Security and Privacy


Sensors and Devices


System Integration


Computing Resources

Connectivity


WiFi


Fiber and conduit network


Radio network


Service providers

Costs

Capital Costs

	Cost Component	2018	2019	Total
1	Meters – Solid State	$6,799,000	$3,481,000	$10,280,000
2	Meter Boxes	$3,476,000	$1,780,000	$5,256,000
3	Lids	$402,000	$206,000	$608,000
4	MIUs	$2,651,000	$1,357,000	$4,008,000
5	Communication and Other Installation	$445,000	$0	$445,000
6	Integration	$1,068,000	$0	$1,068,000
7	Bellevue Implementation Cost	$794,000	$630,000	$1,425,000
	Total	$15,635,000	$7,454,000	$23,089,000

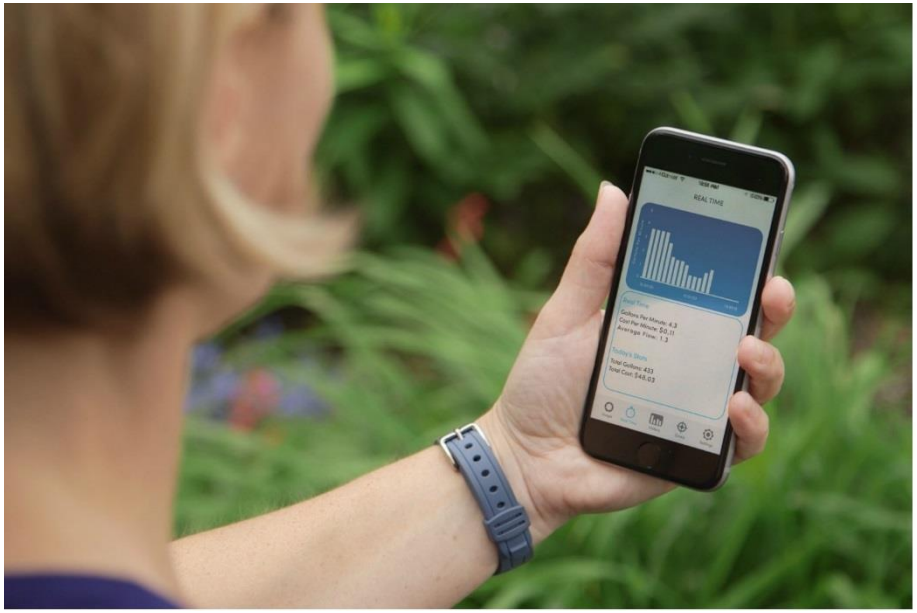
Solid State vs Positive Displacement Meters

Mechanical **Positive Displacement or Velocity meters**	**Solid State meters -** Fluidic Oscillator, Ultrasonic or Magnetic
• Proven technology • Inherent Low Flow Performance Limitations • Measure Only A Small Percentage of Flow Below 1/4 GPM –Even When New • Calcium and partials in the water can cause problems • Source of non-revenue water • Significant Pressure loss • Requires maintenance	• Newer technology • No Moving Parts to Wear Out • Particles Do Not Cause Meters to Stick or Stop • Reduced Pressure Loss • No Maintenance • Better Low Flow Accuracy • Better High Flow Durability





AMI Could Enable New Rate Structures



Interval data would allow for:

Seasonal rates

Time of Use rates

Budget based (tiered) rates

- Alarms notifying customers when entering higher tiers.

Pre-pay accounts

“Cell phone” plans (i.e. allocated minutes)

AMI Vendor Comparison (Meters)

	Neptune	Sensus	Mueller	Badger
AMI System	R450	FlexNet	Mi.Net	Orion
Meter Model	T-10	iPerl	420 Series	E-Series
Material & Type	Bronze, PD	Composite, electro-magnetic	Composite or bronze, PD	Composite, ultrasonic
Low flow accuracy	0.25 gpm	0.03 gpm	0.125 gpm	0.05 gpm
Licensed / Unlicensed RF	450 MHz Licensed	900 MHz Licensed	900 MHz Unlicensed	CDMA Cellular
Transmission Frequency	1x per day	6x per day	1x per day	1x per day
Priority Alerts	Immediate	< 4 hours	Immediate	< 24 hours
Remote Shutoff / On Demand Reads	No	Yes	Yes	No
MIU storage	1 day	35 days	120 days	120 days