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When is AMI More Than Just New Technology?

Minneapolis City of Lakes

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mpls

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Advanced Metering Infrastructure (AMI) Presentation Outline

- Minneapolis Water Overview
- Previous Metering Reading Systems
- AMI Project Implementation
- AMI Research
- Conclusion

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PART 1
Minneapolis Water Overview

City of Minneapolis

- Largest city in the state of Minnesota – population of 410,939.
- 2nd largest economic center in the Midwest, behind Chicago.
- Located on both sides of the Mississippi River.
- Once the world's flour milling capital and a hub for timber.
- Abundantly rich with water – 20 lakes, creeks, waterfalls, and wetlands.

History

Pump Station 1

1867

Minneapolis City Council authorizes the establishment of the Minneapolis Water Works, which initially supports the Fire Department

1872

The City's first drinking water pump station is built at St. Anthony Falls. Mississippi River water is pumped directly into distribution

Minneapolis is the first Minnesota city with public drinking water

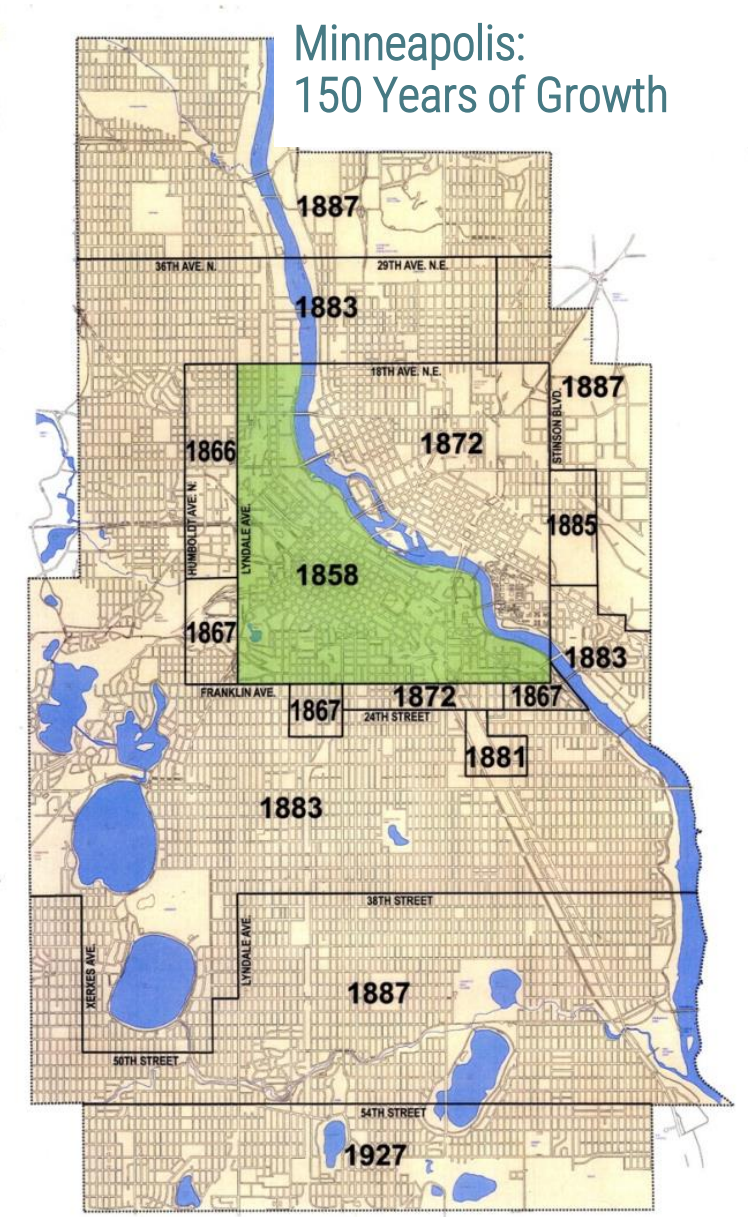
Minneapolis Water Works

Production

- Source Water Mississippi River
- Two Treatment Plants
- 8 Pump Stations
- Max Capacity 180 MGD
- Average Capacity 60 MGD
- 2017 Total Production 20.3 Billion Gallons

Distribution

- 3 Pump Stations
- 3 Pressure Zones
- 102,000 Water Meters
- 8,04 Hydrants
- 1,019 Miles of Ppe
- 17,563 Manholes
- 17,817 Valves



Customer Base - Water Sales by Volume

- 40% Residential
- 38% Institutional, commercial and industrial customers
- 22% Wholesale customers – 7 Municipalities

Minneapolis Saint Paul INTERNATIONAL AIRPORT msp going your way

TARGET CENTER MINNEAPOLIS MINNESOTA

UNIVERSITY OF MINNESOTA MEDICAL CENTER FAIRVIEW

CITY of CRYSTAL

CITY OF EDINA, MINNESOTA INCORPORATED 1888

City of NEW HOPE MINNESOTA

MINNESOTA VIKINGS

MINNESOTA TWINS BASEBALL CLUB

TARGET FIELD

city of golden valley

Hennepin

usbankstadium

CITY OF BLOOMINGTON MINNESOTA

934TH AIRLIFT WING

Hennepin County Medical Center

UNIVERSITY OF MINNESOTA

PART 2
Previous Metering Systems

REPORT REGISTRAR OF WATER WORKS

MINNEAPOLIS, MINNESOTA, January 1, 1906

For instance, the total amount of water pumped during ---

1903 was.....	7,467,840,050	Gallons
1904 was.....	6,723,171,240	Gallons
1905 was.....	6,112,268,305	Gallons

Or the daily average amount pumped in round figures ---

1903.....	20,459,000	Gallons
1904.....	18,369,000	Gallons
1905.....	16,745,000	Gallons

"While the saving in amount pumped is due partly to these causes, it cannot be denied that a large part of the saving was due to the increased use of meters, as only 1/3 of the taps were metered in 1903, while over 1/2 are now metered in 1905."

Metering Matters

Accountability Still Relevant

- Amount of water pumped between 1903 and 1905 dropped by 1.3 billion gallons due in large part to increasing metered consumption.
- People are more conscious of usage when metered (e.g., Community Gardens).

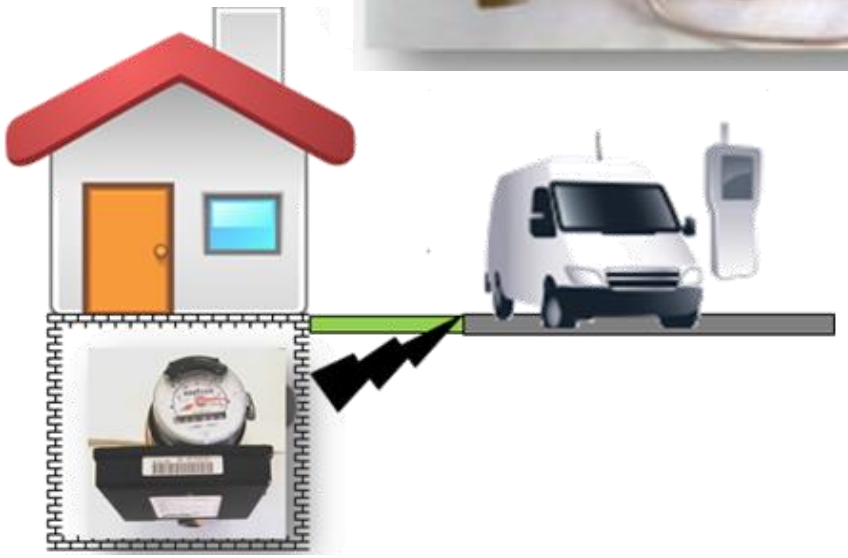
Meter Reading – Old School

Prior to 1992 – door-to-door reading

- Cycled through City (over 100,000 accounts) every 3 months
- Keys to some homes
- Read success rate of <50%

Meter Reading – Second Generation

- 1990's – MIU using land line telephones
  - 6,000 still in service
- Late 1990s – The decline of the land line. ERT via vehicle mounted data collector
  - 96,000 in service
- Read Success Rate is 99.2% (combined MIU and ERT)
- Reads collected monthly



MIU – Meter Interface Unit
ERT – Encoder Receive Transmit

Meter Reading – The Next Generation

AMI –

- Residential Meters are 25 years old and are scheduled for replacement
- Upgrading meter communication system to fixed network in conjunction with meter replacements
- Hourly reads will be available through customer engagement portal. Portal will also have videos for troubleshooting problems
- Aclara is the selected vendor for implementation

PART 3
AMI Project Implementation

AMI Project Includes Feasibility Study, System Requirements and Implementation

Feasibility Study

- Business Case
- Utility Benefits

System Requirements

- Define System Functions
- Leverage City Infrastructure
- Integrate with CIS
- RFI/RFP – 6 Vendors

Implementation

- Prepare Workforce
- Customer Outreach
- Advanced Capabilities

2015	2016	2017	2018-2021

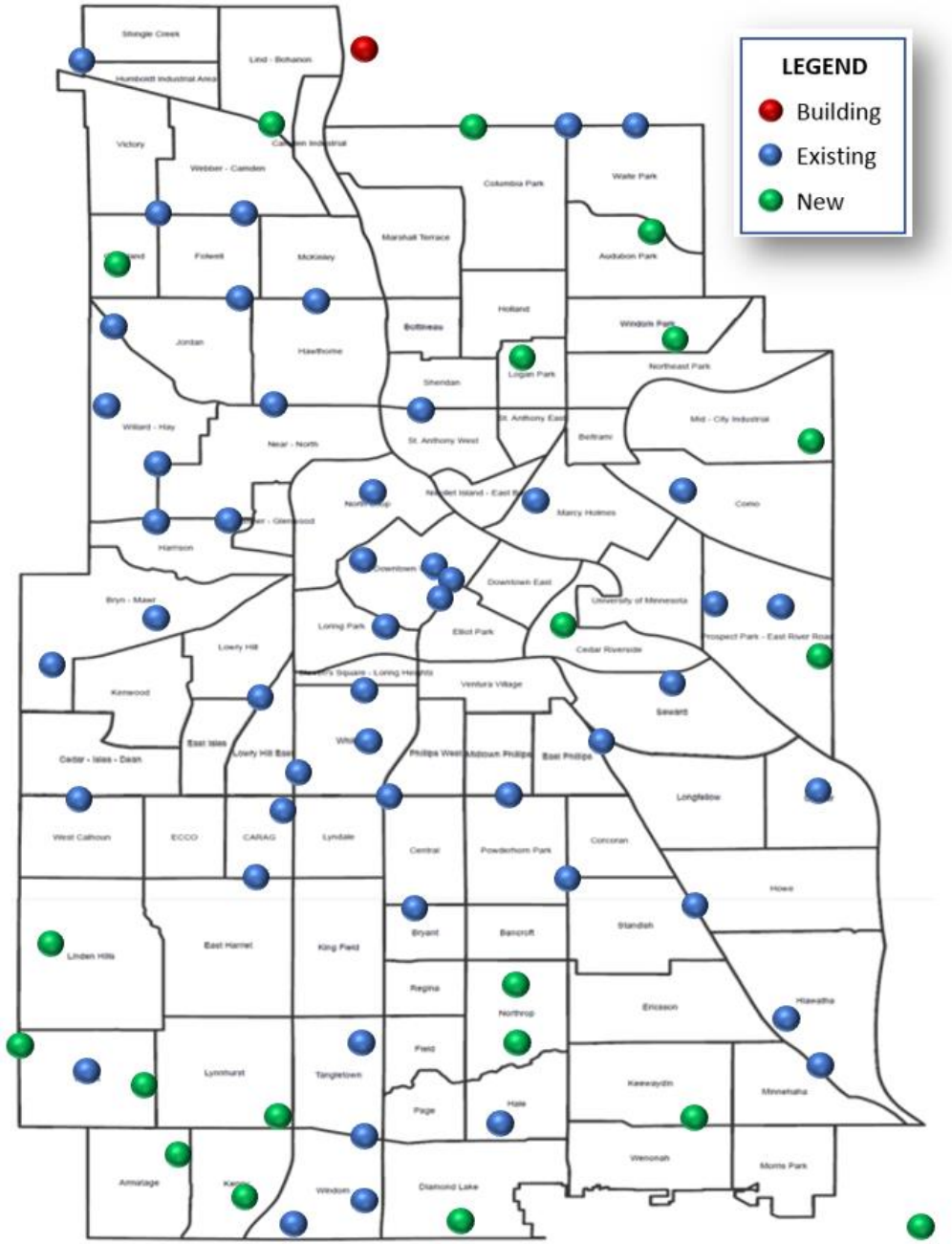
Feasibility Study Identified Key Needs and Benefits

- Customer Interactions
  - Leak Alerts and Backflow Detection
  - Remote Turn Off/On
- Metering and Billing Efficiency
  - Replace Failing Phone-Based Reads
  - Eliminate Special Readings (Final/New Customer)
- Transition to In-House Installation
  - Contractor Initial 45% Install
  - City Install Flexibility – Winter Season Over 3-5 Years

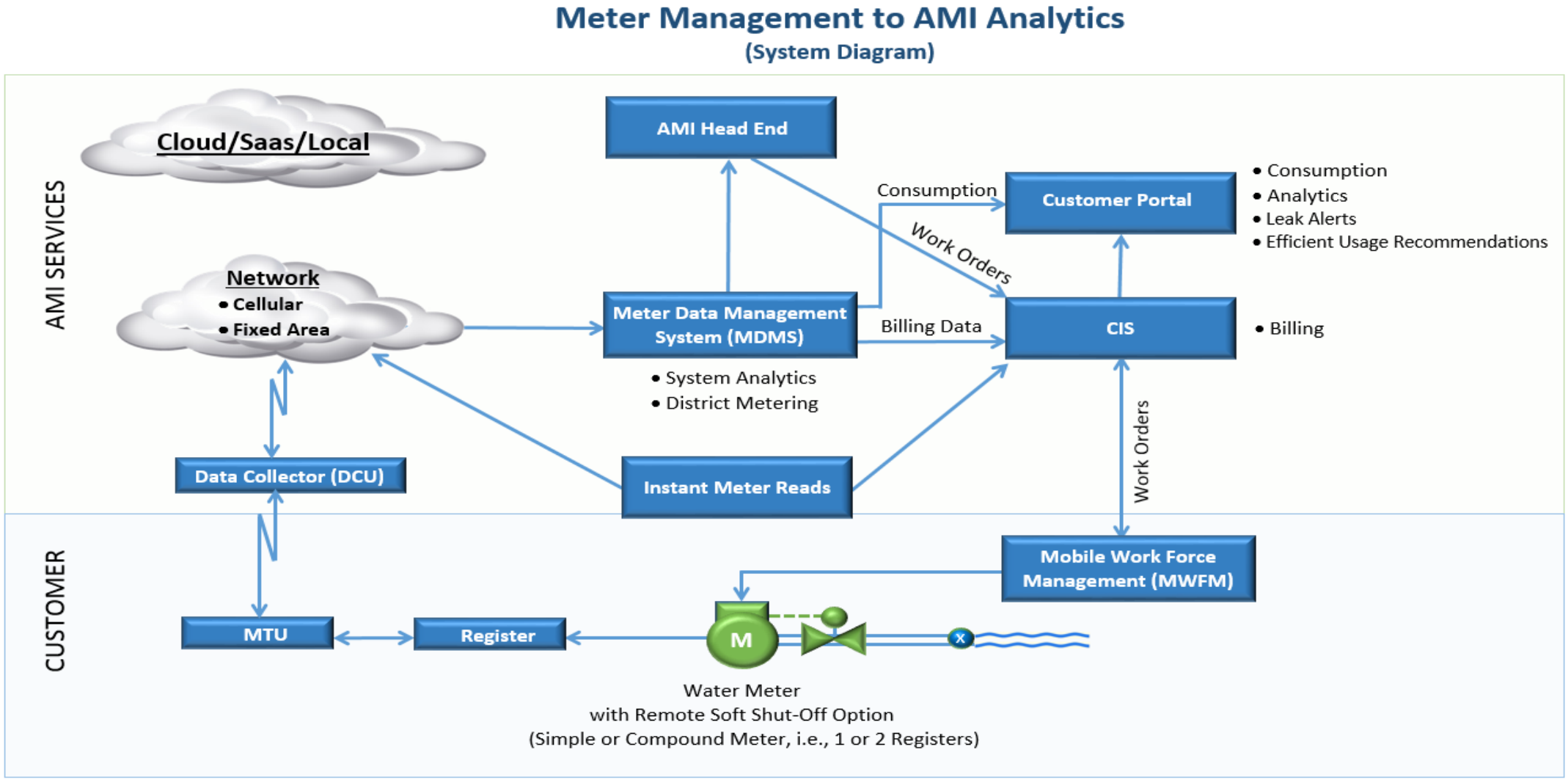
AMI System Leverages City Infrastructure

- Fixed Network Design
  - Co-locate Data Collectors on City WiFi Poles/Buildings Where Possible
  - "Back-Haul" Data on Wi-Fi Backbone and Cellular
- Vendor "Cloud-Based" (SaaS) for AMI Head-End
  - Lower Total Cost of Ownership
  - Security and Reliability with Hosted Solution
  - City Owns AMI Meter Data
- Integration With Existing CIS
  - Meter Reads (MDM) for Billing Data Synchronization
  - Customer Data Transfer AMI-Meter Exchange Scheduling

Data Collector Locations Leverage City Light Poles and Wi-Fi Back-Haul



AMI Integration With Existing CIS for Data Transfer

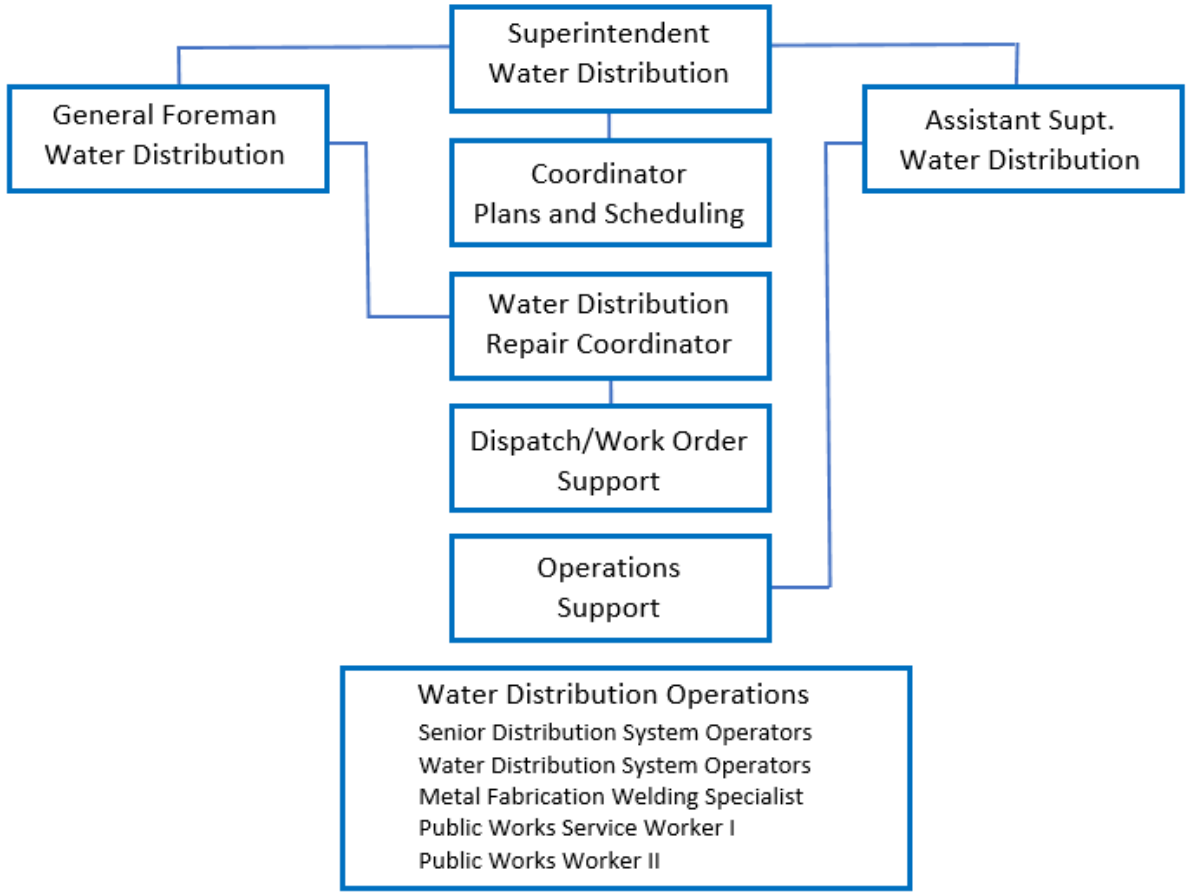


AMI Enables Workforce Changes

- Entry into over 100,000 homes for AMI Installation
  - 45% Contractor
  - 55% City – plus future capability
- Develop cross-functional staff to address meter shop retirements – consolidate job titles
- Shift summer peak distribution workforce to winter re-deployment for AMI/meter installation

Added Workforce Flexibility

- Align workforce assignments with two main functions:
  - Asset-Based Services
  - Customer Account Services
- Seasonal flexibility of workforce assignments



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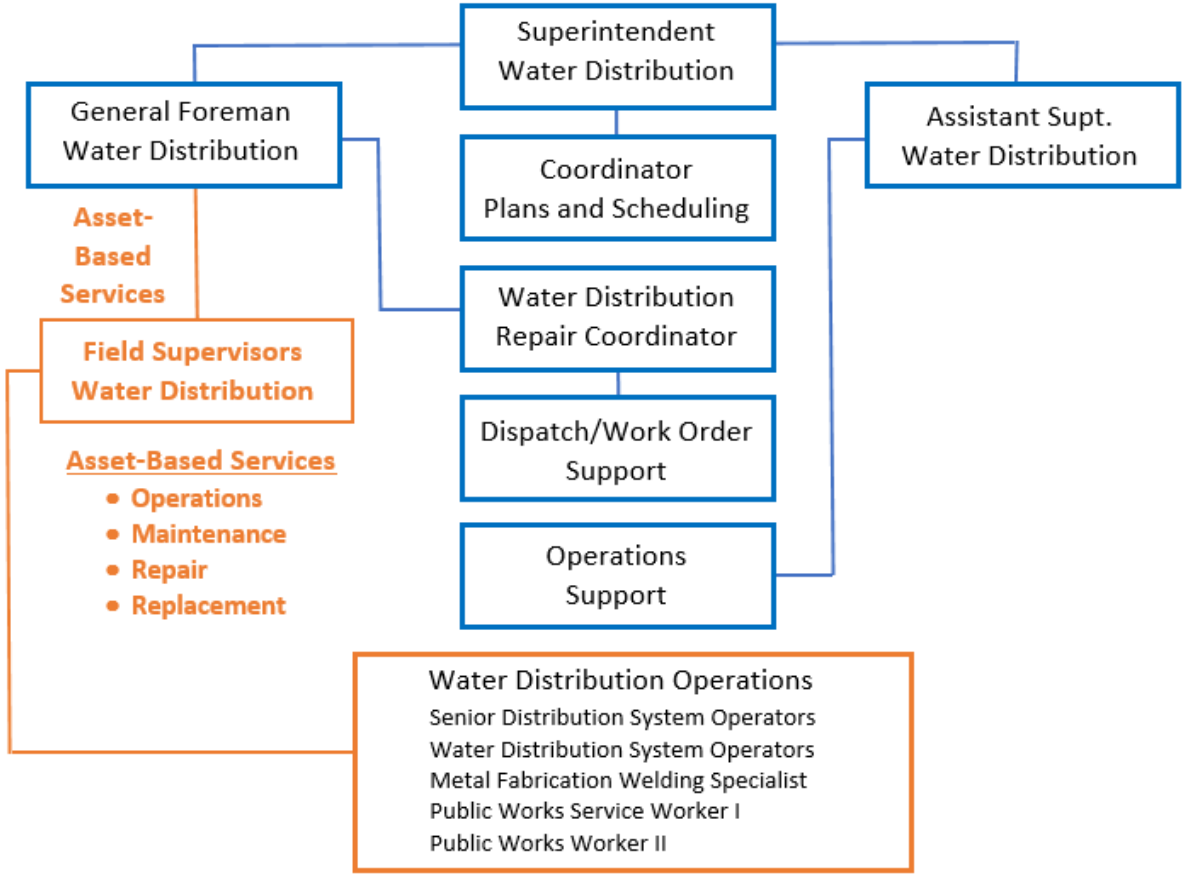

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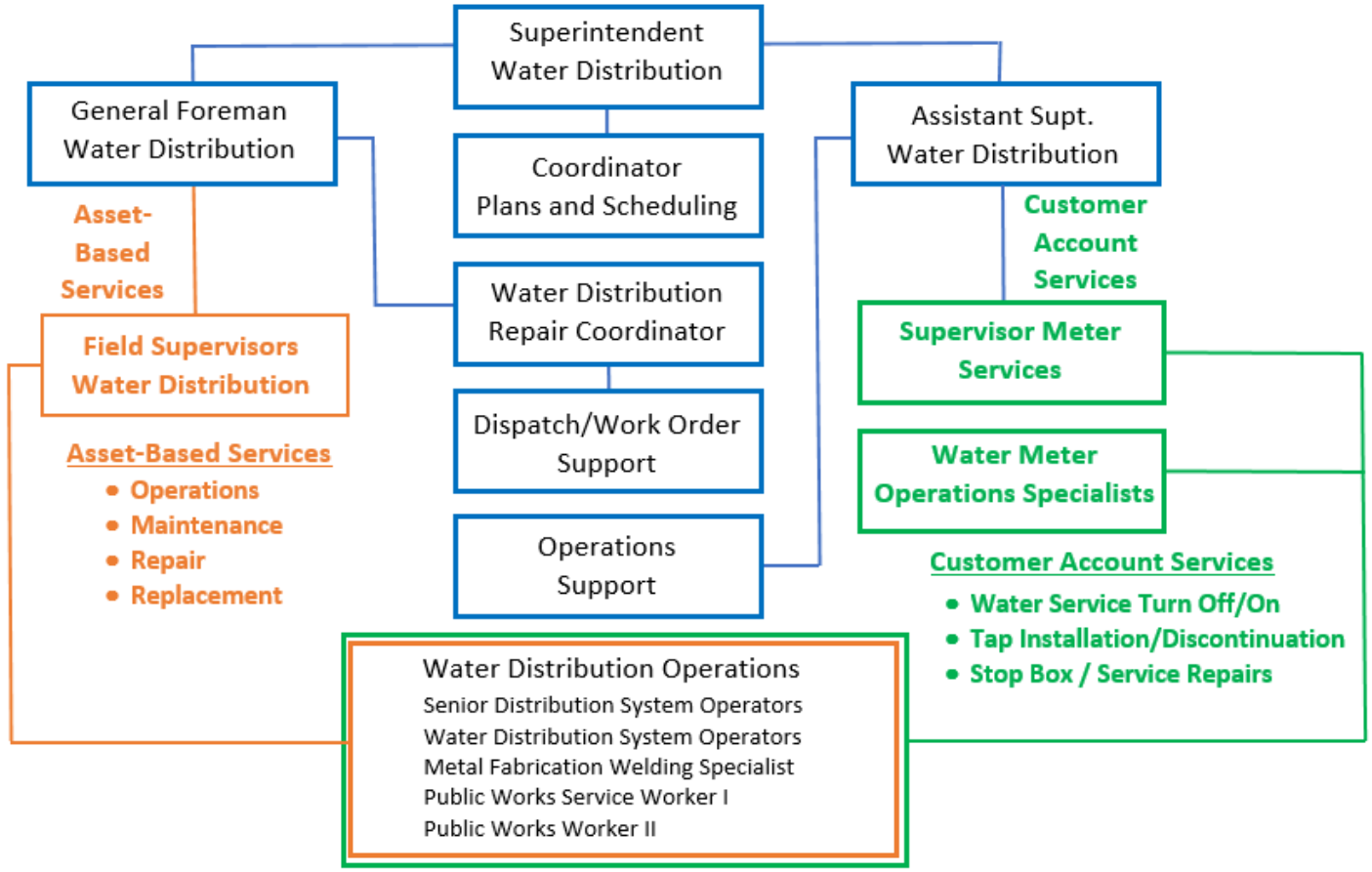
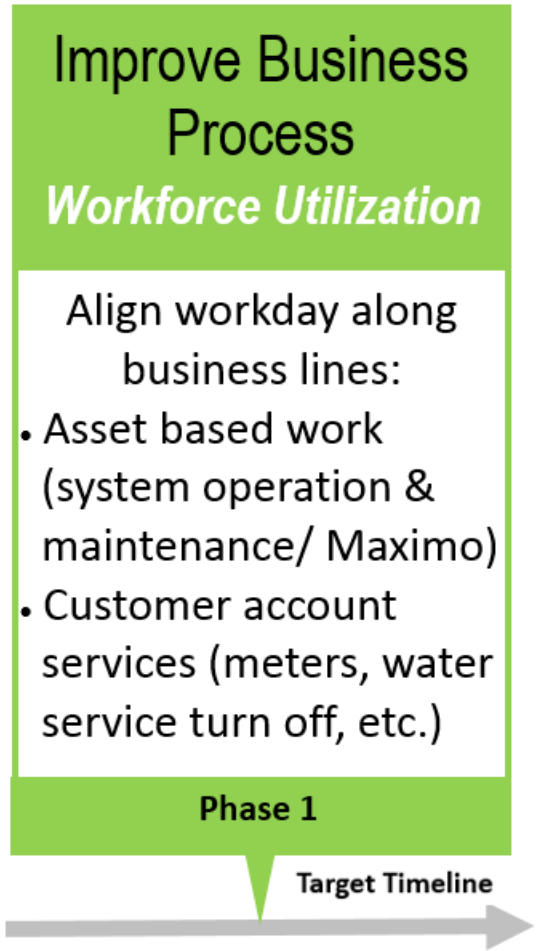


Phasing of Workforce Changes



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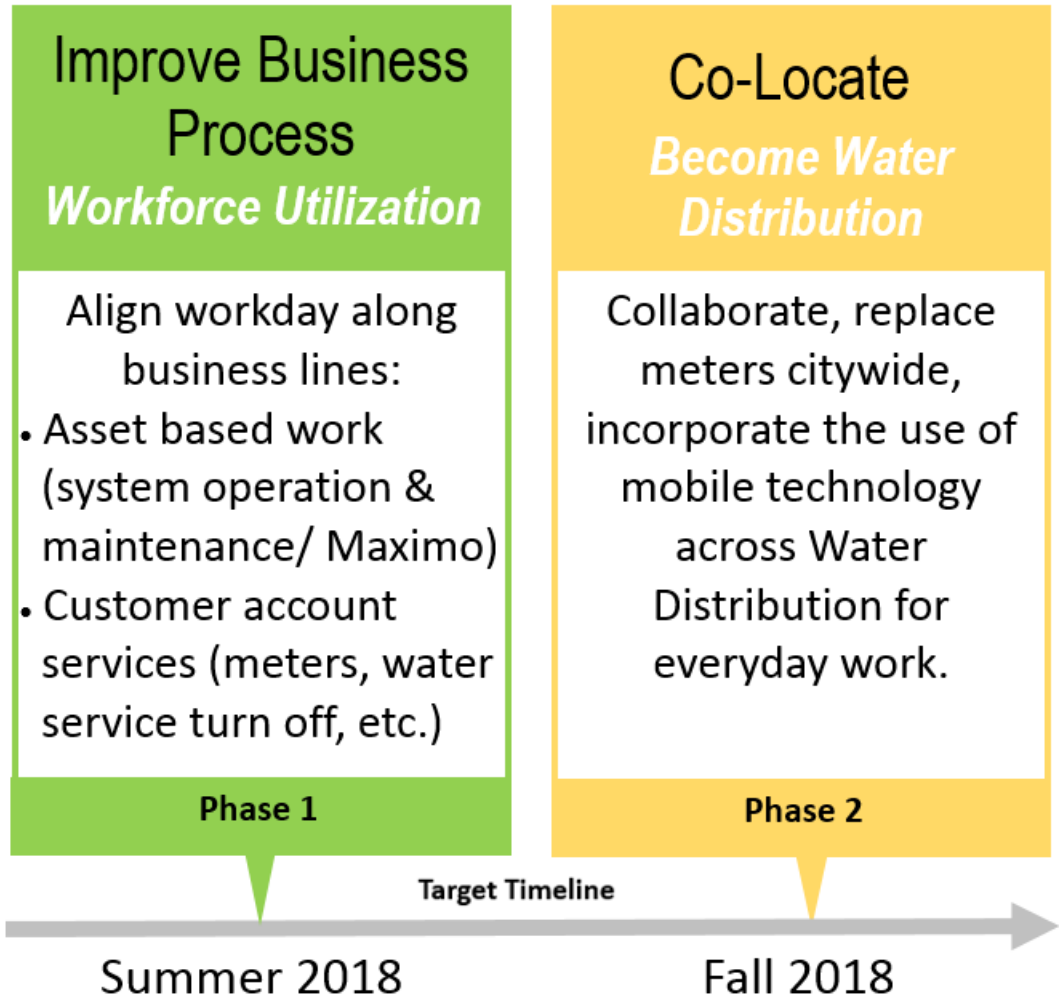

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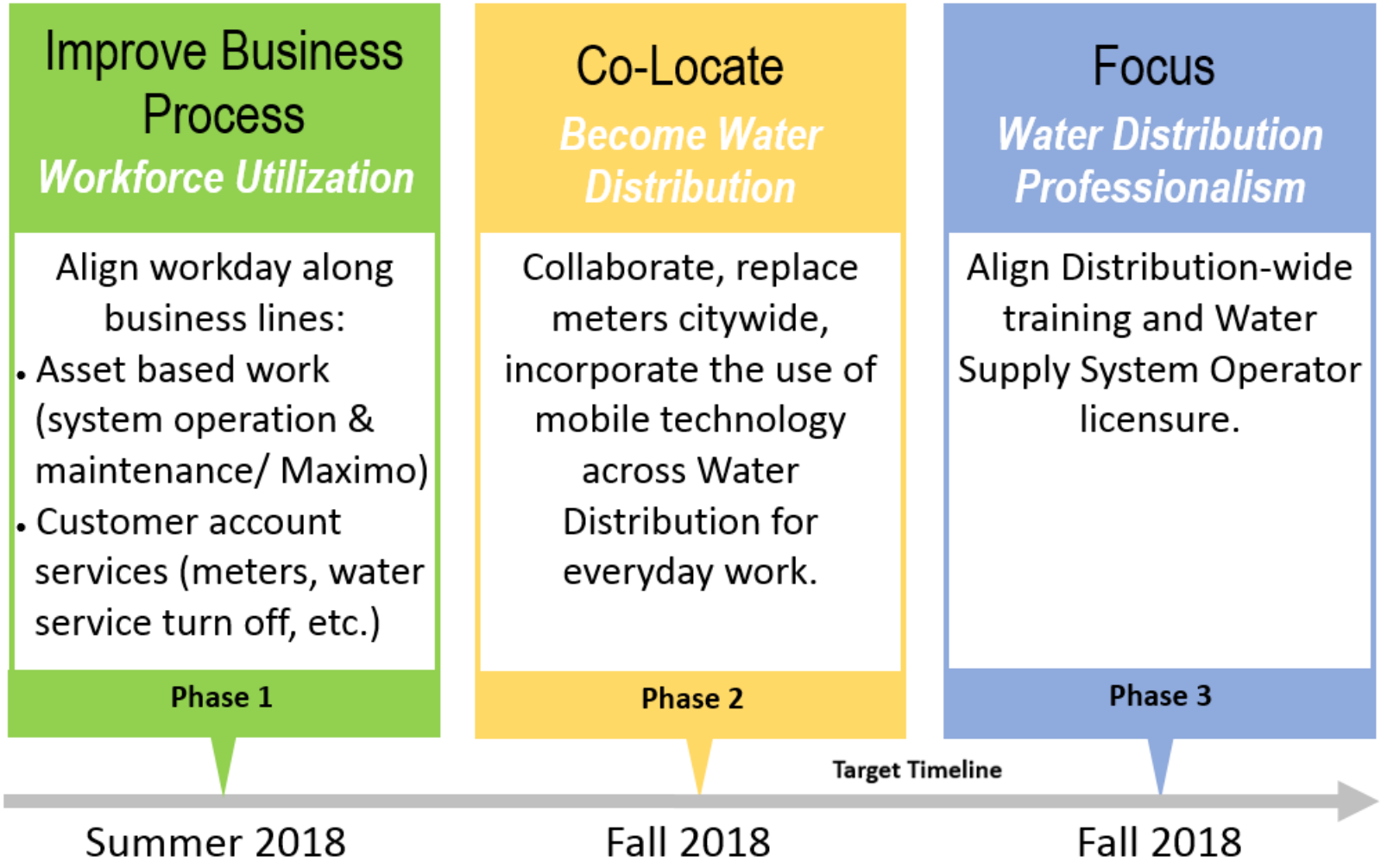

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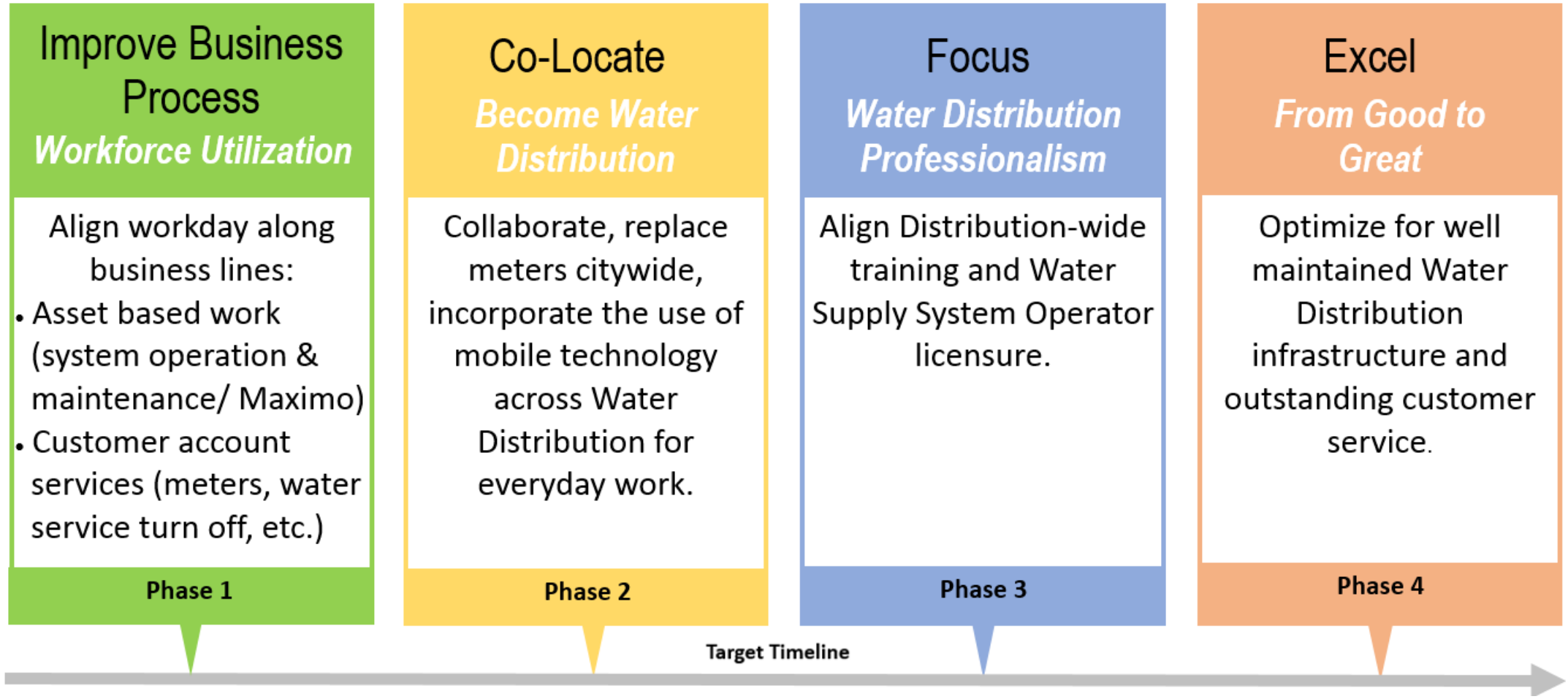
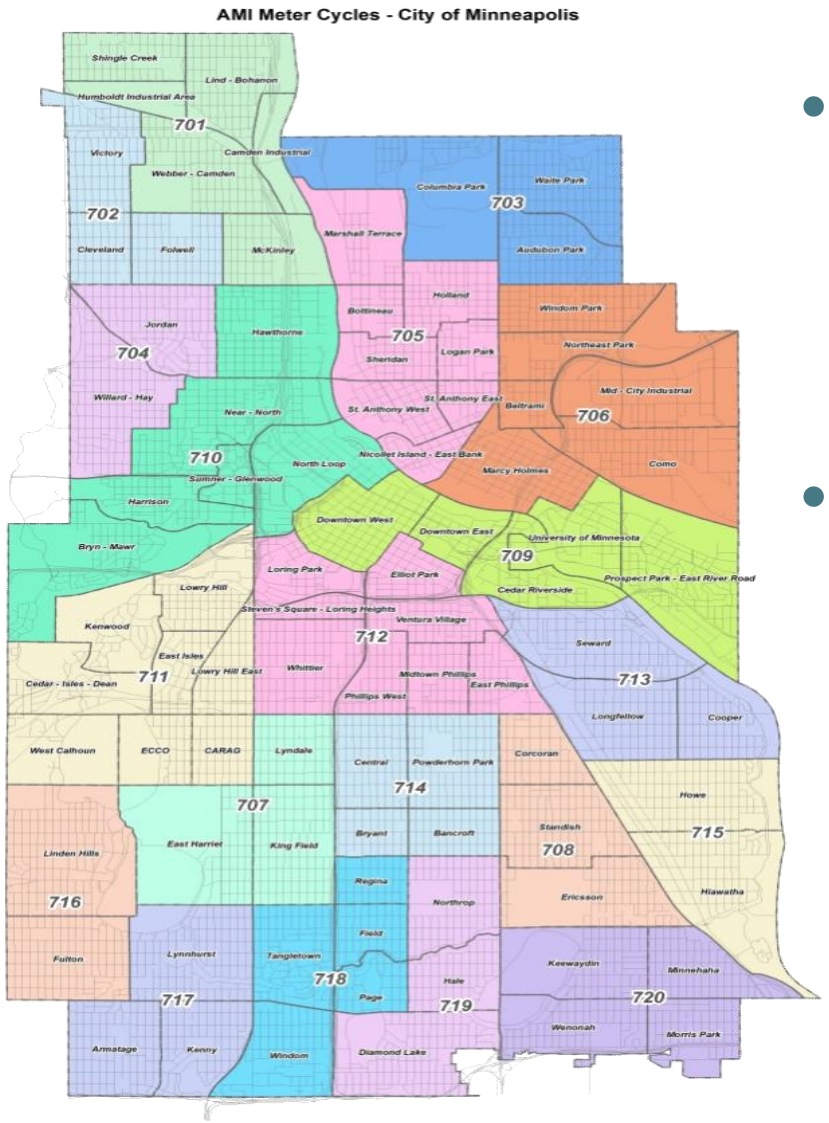
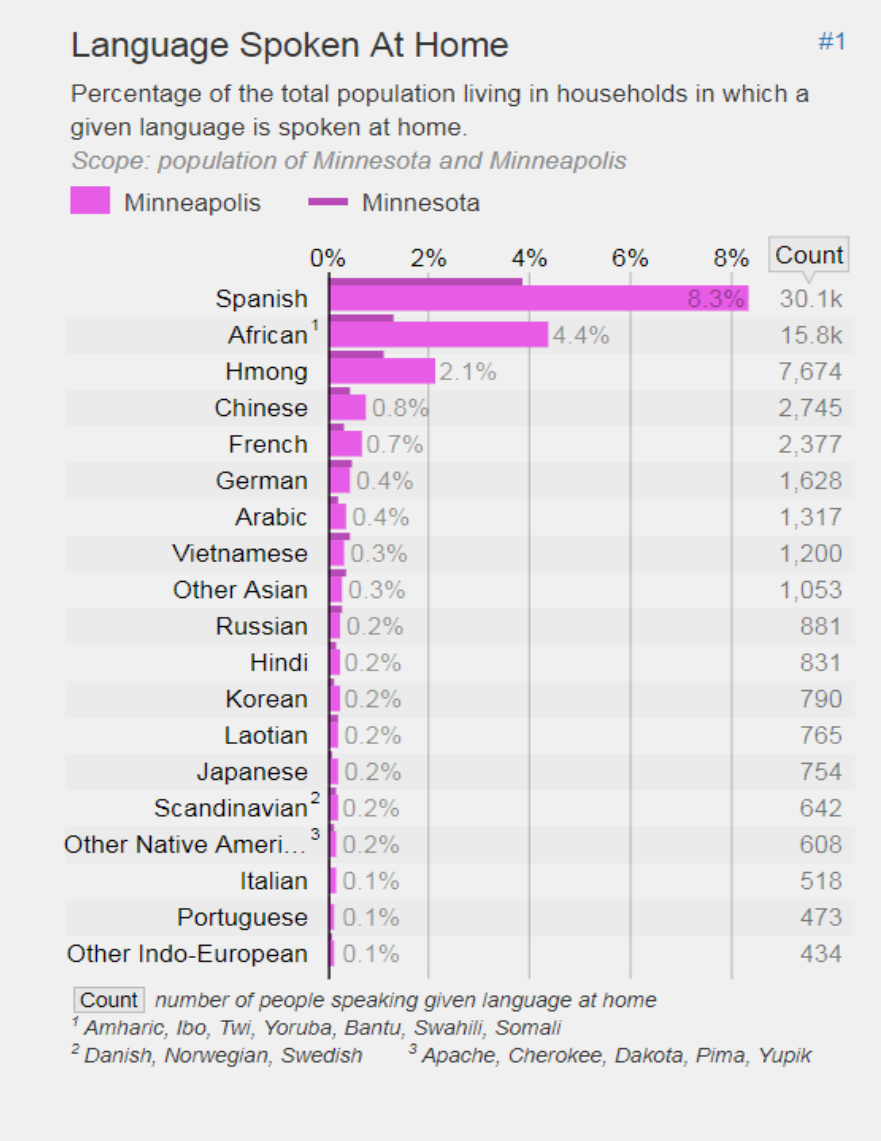


Customer Outreach - Community Relations



- Implementation phased by billing cycle not meter reading route
  - Equalizes billing cycles – revenue stream
  - Distributes CSR load – customer response
- Outreach Sequence
  - Letter #1 - Coming to your neighborhood soon
  - Community meeting – what/why we are doing
  - Letter #2 - Make an appointment
  - Letter # 3-4 - Increasingly more direct
  - Letter #5 - Water shut off notice

Customer Outreach - Non-English Speaking



15% (53,000 people) speak at home:

- Spanish
- Somali
- Hmong

City of Minneapolis Neighborhood and Community Relations – Trusted Liaison

- Community gatherings
- Spanish, Somali, and Hmong radio stations
- Translated literature

Remote Off/On For Customer Affordability & Equity

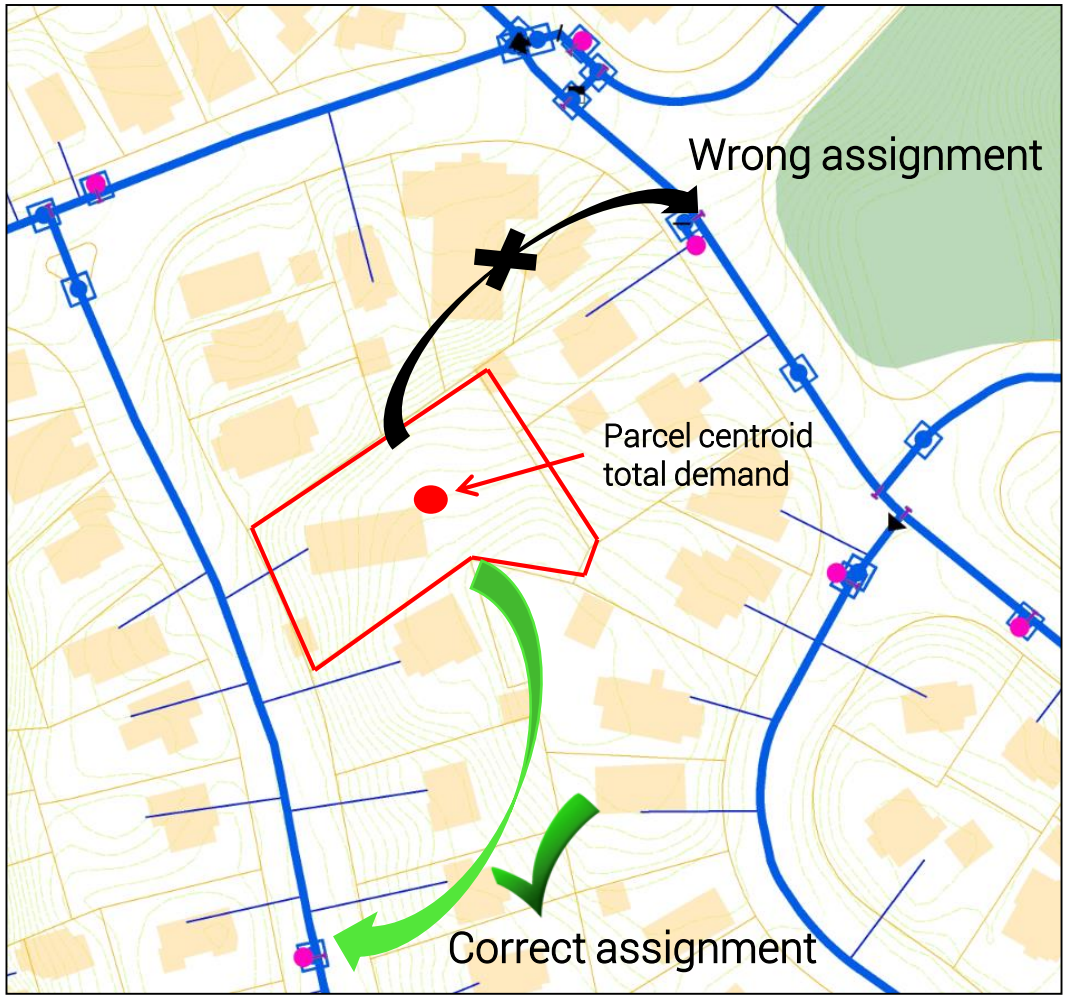
- Turn-Offs for Non-Payment
  - Average 3,800 per year (4%)
  - Statistical analysis - 691 accounts likely future nonpayment
- Provides Equity – Reduces Burden for Turn Off/On
  - $50 for each = $100 for turn off/on
  - Extra $75 if more than 3 days off (City health regulation)
- Pilot - Remote Shut Off/On (AMI Control Valve)
  - Install with AMI for likely future nonpayment accounts
  - Partial closure for health and safety

Future Meter Replacement Cycles To Be Based on Performance Testing

- "Pulled" Meter Testing Will Determine Replacement Plans
  - Defined "Statistically Significant" Sample for Meter Tests
  - 25-30% of meters tested outside AWWA low flow standard
  - AMI Data shows % of consumption at low flows with higher resolution meters
- Future Meter Maintenance and Replacements
  - Age vs Consumption vs Performance (accuracy)
  - Water Main Conditions (Lined, Unlined)

Future Synergy of Data – AMI and GIS and WMS

- City-wide enterprise project links property/parcel GIS location with addresses
- Separate project will convert water tap records to geospatial data
- With geospatial tap records and AMI, hydraulic model becomes dynamic, with demands assigned to the correct water main based on consumption patterns
- Work assignments for distribution and meter functions based on flexible worker locations – not predefined "beats"



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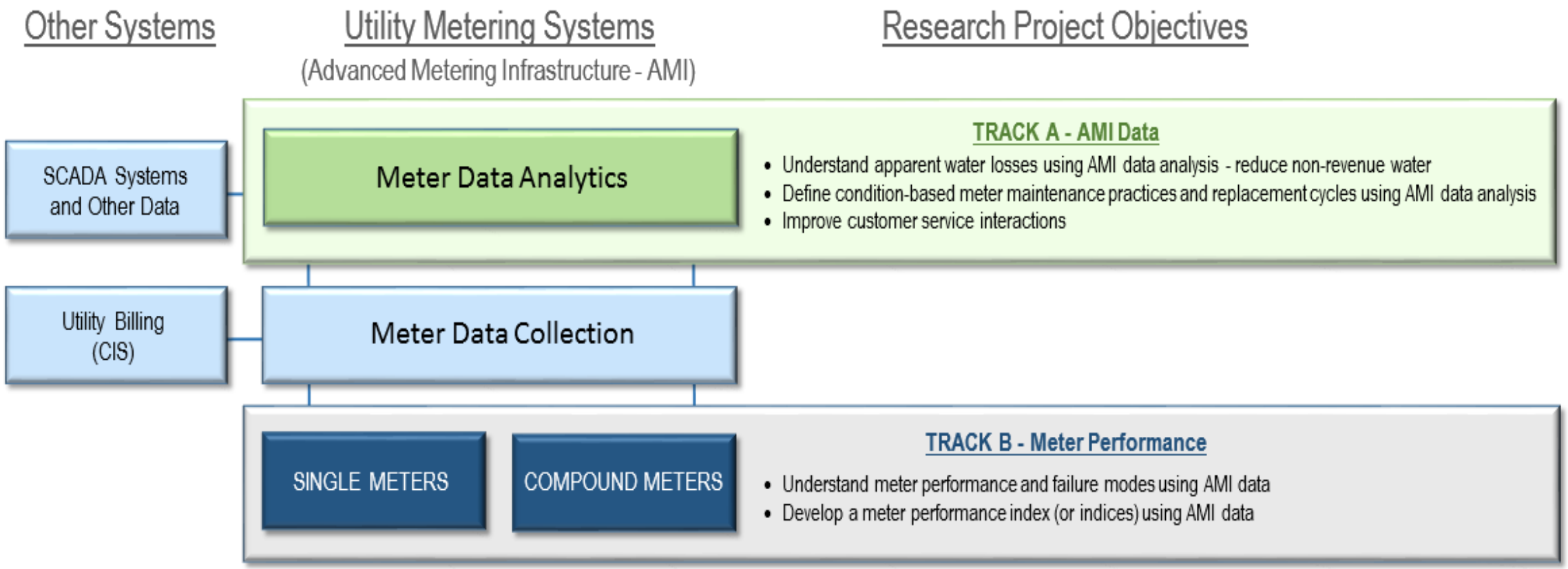
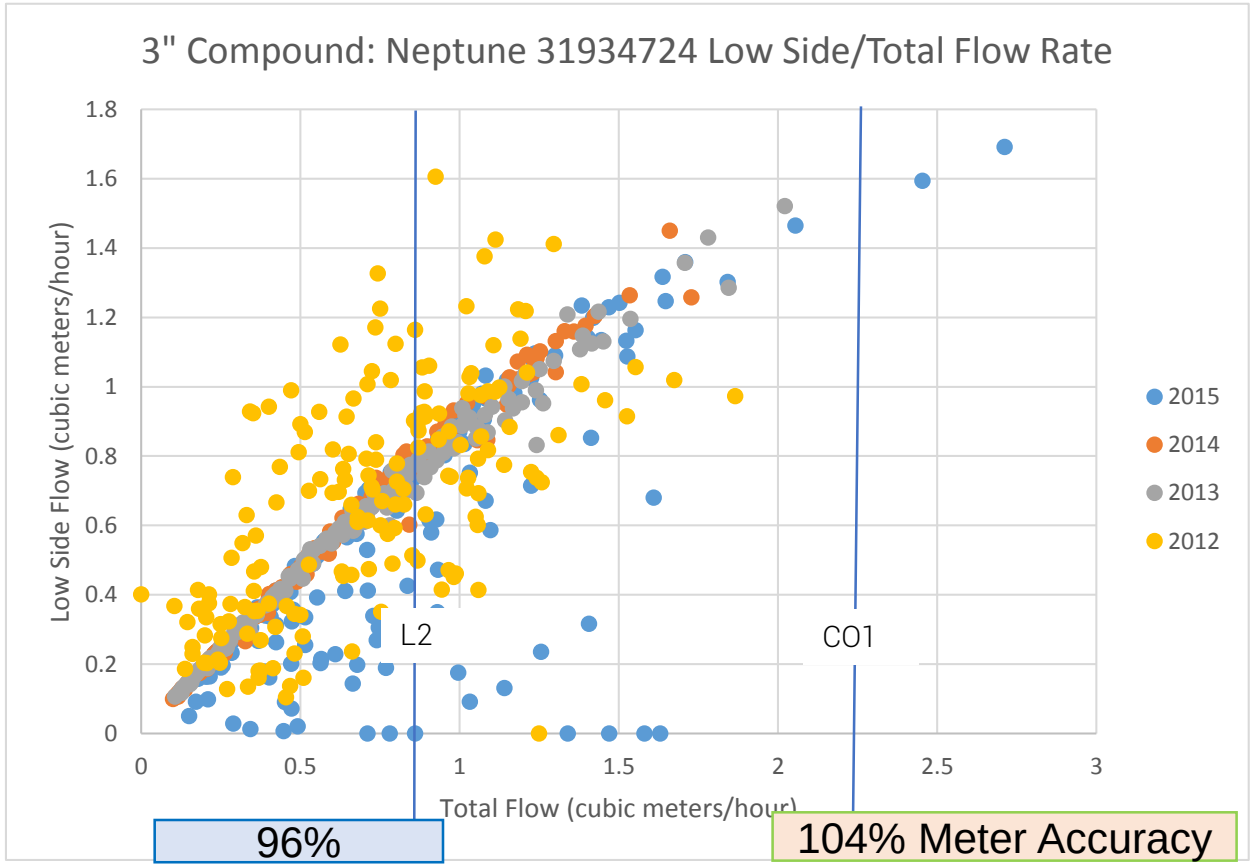
PART 4
AMI Research

Current WRF Project Has Two Parallel Tracks to Focus on AMI Data Analytics and Meter Performance



Example AMI Data Shows Meter Performance Issues

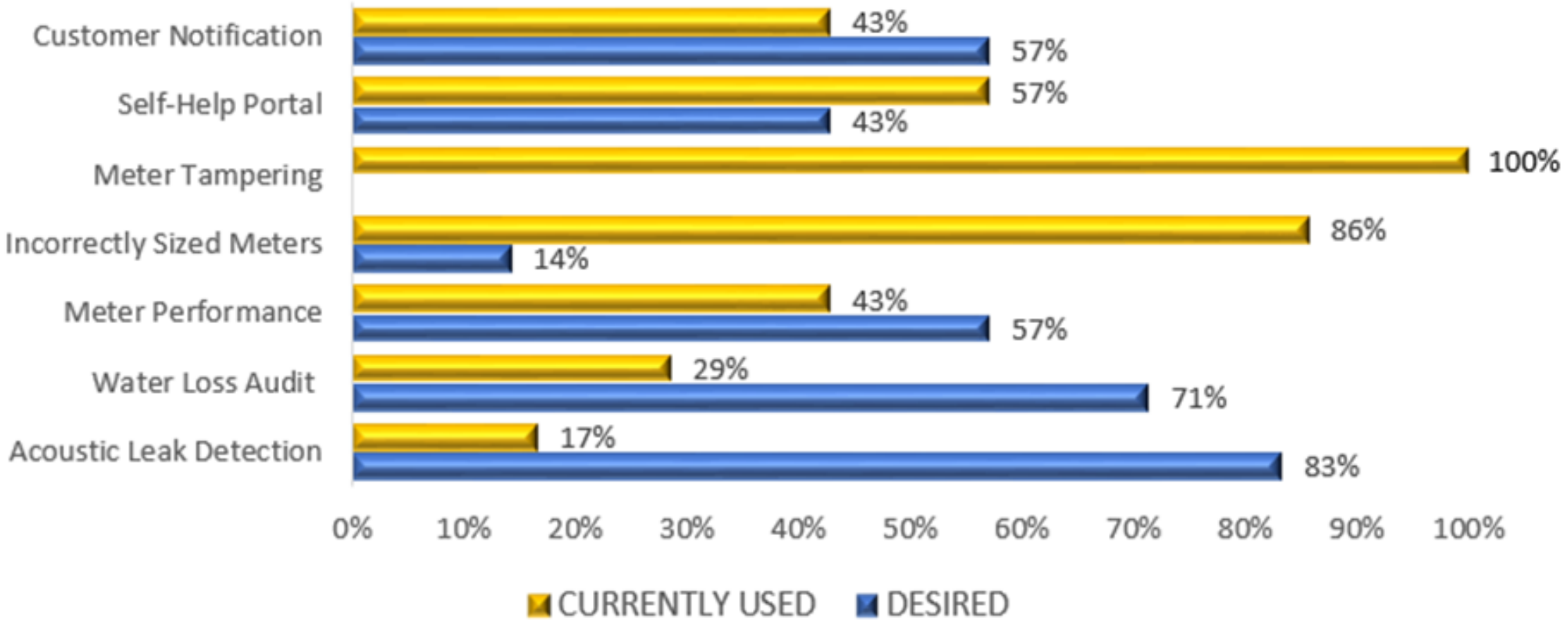
97% overall accuracy in operating range



Low-side vs Total Meter Flow

- Low-side is stopping in some intervals
- Does reading data indicate meter performance?

WRF Project Shows Use of AMI by Experienced Utilities (>2 years of AMI Data)



PART 5
Conclusion

Minneapolis Water AMI Project Meets Unique Needs With Current and Future Benefits

- Replaces Aging Systems With New AMI Capabilities
- Leverages City's Infrastructure
- Provides City Installation Flexibility for Seasonal Work Priority
- Addresses Community Outreach and Customer Equity
- Creates Basis for Improved Meter Replacement Cycles
- Research Shows AMI Data Use for Future Minneapolis Benefit

QUESTIONS?

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