

AMI STRATEGIC PLAN STATUS

Citizens Water Advisory Committee



May 8, 2013

Meeting Agenda

1. Overview of AMI Strategic Plan
2. Overview of AMR and AMI capabilities
3. Itron hardware and software functionalities
4. Results of staff functional requirements workshop
5. Economic comparison approach

Overview of AMI Strategic Plan

Tucson Water's Challenge:

Coordinating technology improvement in water metering and SCADA upgrades for better customer service

- Utilize Advanced Metering Infrastructure (AMI) technology to increase efficiency in measuring water use
- Further conservation by giving easy access for customers to daily water demand information
- Implement SCADA upgrades to enhance water operations and energy efficiencies

Local Issues and Questions

1. Customer acceptance – Use
2. Scalability – Magnitude/complexity of system
3. Data management – System architecture
4. Bandwidth – How much is enough?
5. Data storage – Archiving
6. Data mining application development platform for developers
7. Partnering with local electric utilities

Project Context

Advanced Metering Infrastructure (AMI)

- Tucson Water has ~240k water meters and ~70k meters have drive-by Automatic Meter Reading (AMR) hardware
- AMR offers flexible upgrades from drive-by meter-reading to a fixed network AMI system
- All manually read (walk-by) meters will be converted to AMR via a ten-year capital improvement project

The AMI Strategic Plan presents the costs/benefits of various approaches to reading water meters and establishes the business case for implementation of recommendations

Consultant Scope of Work

1. Obtain/review information
2. Conduct Functional Requirements Workshop
3. Define meter reading alternatives
4. Collaborate with Tucson Electric Power
5. Prepare spreadsheet cost evaluation
6. Prepare Draft AMI Strategic Plan
7. Attend/present at management meetings
8. Administer project execution

Keys to Developing a Utility-Specific AMI Plan (Process)

- Determine/Assemble Utility Stakeholders
- Educate Stakeholders
 - Terminology and hardware/software capabilities
- List Short- and Long-Term Functional Needs and Wants
- Prioritize Needs and Wants
- Develop a Utility-Specific Dynamic Build-out Business Case
 - Compare functional costs today with AMI costs
 - Develop key assumptions and cost information
 - Assume a 15-year AMI equipment life
 - Determine present worth capital and operating costs

Keys to Developing a Utility-Specific AMI Plan (Process)

2

- Determine What is Affordable Now
 - Terminology and hardware/software capabilities
- Develop Financing Plan
 - Current revenues, savings in labor costs
 - Green project grants and loans (saves energy & GHG)
 - Revenue bonds
 - Performance-based incentive contracts
- Develop Implementation Plan
 - Large meters first?
 - High cost meter read routes?
 - High demand meter read routes with NRW recovery?
- Develop Business Case for Implementation Plan

Project Schedule (2013)

Task #	Description	Jan	Feb	March	April	May
1	Obtain/review information	█				
2	Conduct functional workshop		█			
3	Define meter reading alternatives		█			
4	Collaborate with TEP		█			
5	Prepare cost evaluation		█			
6	Prepare draft AMI Strategic Plan					█
7	Attend management meetings		█			█
8	Administer project execution	█				

Overview of AMR & AMI Capabilities

Envisioned Future *Electric Utility* Smart Grid Capabilities

- Control of Customer End Use Devices to Reduce Peaks
- Real Time Pricing – Time of Day Rates
- Customer Profiling and Data Access
- Automatic Transmission/Distribution Control
- Infrastructure Pre-Failure Diagnosis

Which of the above are potential and desired capabilities for water utilities?

Why Meter?

- Equitable assignment of water cost.
- A water use history.
- Customer water auditing.
- A means of accurately analyzing growth areas.
- A signal of system water loss or leaks.
- Trends in water usage.
- A view of seasonal changes in water demand.
- Effects of system changes - rate hikes or conservation programs.
- Water use policing for conservation/drought management.
- Non-revenue water auditing.



Water Industry Meter Reading Averages

Direct Read Meters (manual)

200 to 350 reads per day

Touch/Wand Reading Systems

300 to 450 reads per day

Radio Frequency – Handheld (walk-by mode)

1,800 to 2,200 reads per day

Radio Frequency – Mobile Interrogator (drive-by)

6,500 to 8,000 reads per day

Fixed Network (Advanced Metering Infrastructure)

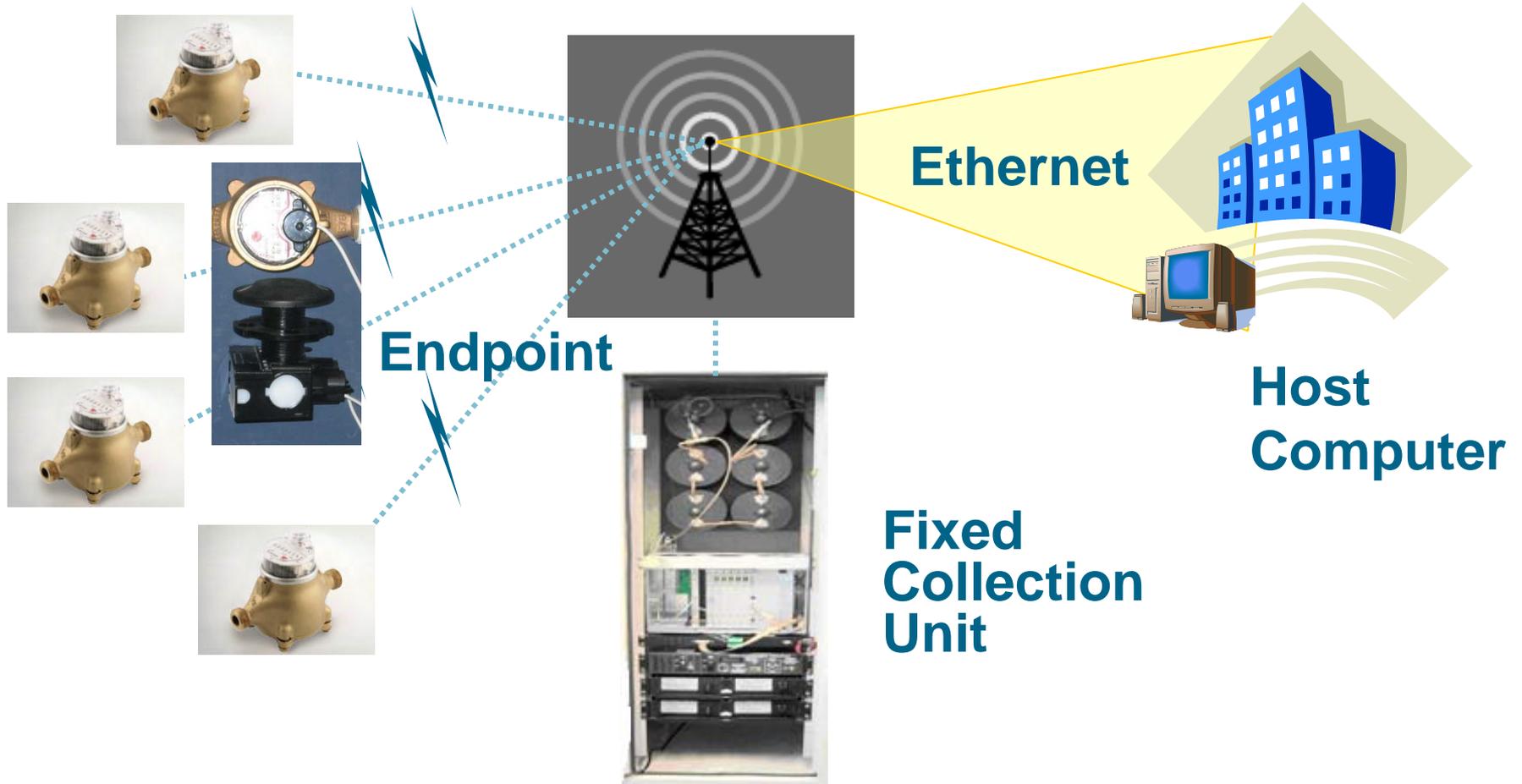
Multiple reads per meter per day (24/7 upload)



What are AMR/AMI?

- AMR- Automatic Meter Reading technology used for automating collection of metered water consumption data for the purposes of real-time billing and consumption analysis
- AMI- Advanced Metering Infrastructure systems that measure, collect, and analyze water usage **and other data** through various communication media on request or on a pre-defined schedule

Typical AMI Technology: Fixed Network Architecture



Components of an AMI System

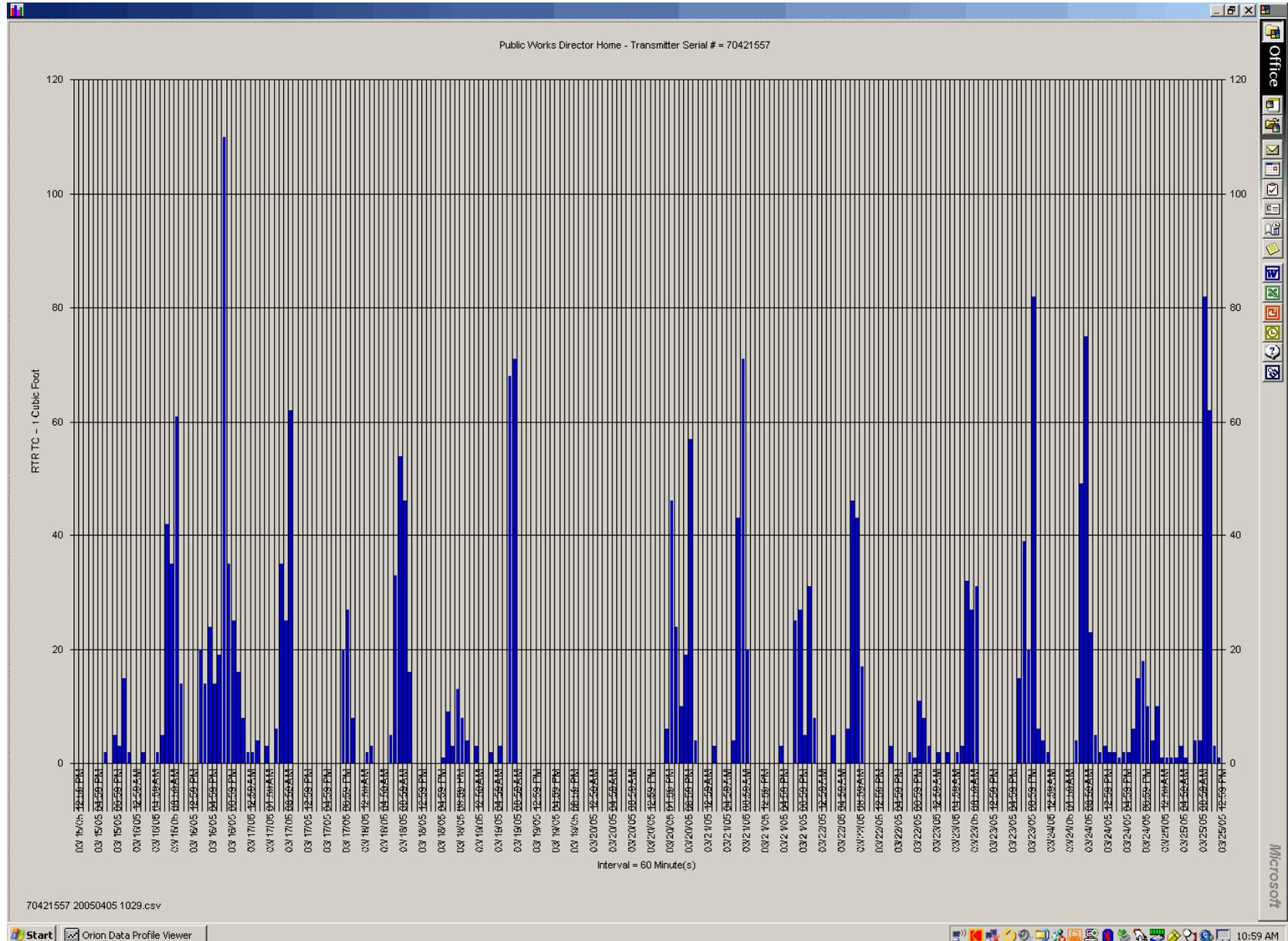
- Meter register capable of producing a digital output
- Radio endpoint to transmit information from the meter to a collector and/or repeater
- Fixed tower collectors
- Mobile collector or data backhaul with a fixed system to return data to the office or host for reading database
- Meter Data Management (MDM) software to process reads for billing and data analysis

Some Major Driving Forces for Water Utility AMI

- Cost reduction in traditionally labor intense areas
- Reduction in fleet and fuel costs
- Carbon footprint reduction
- Water loss reduction and revenue recovery
- Improvement of customer service
- Access to customer-specific water usage data
- Customer notification of excess water use
- Water conservation
- Asset management – meters and transmission/distribution system



AMR/AMI Customer Profiling



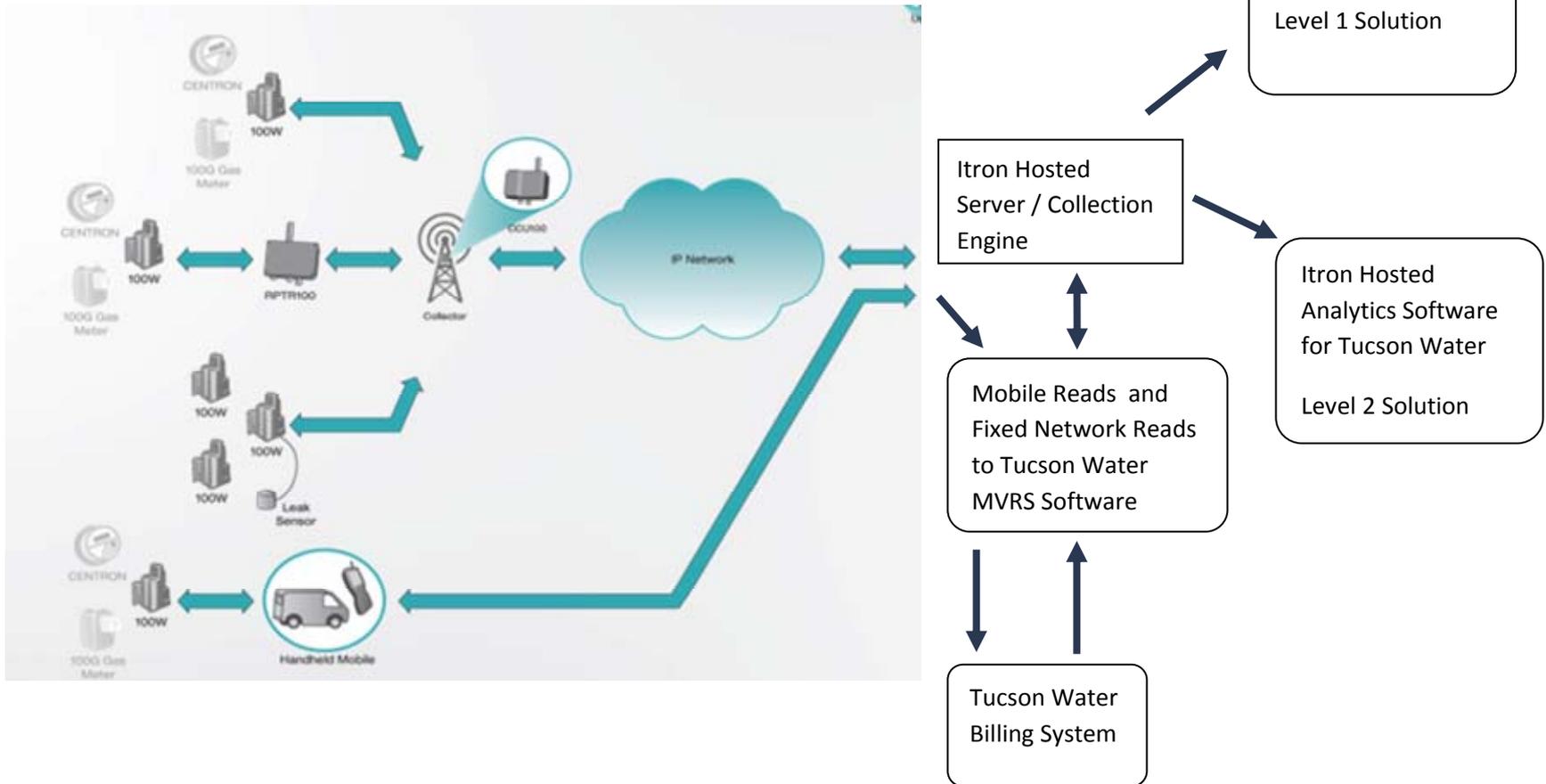
Itron Hardware & Software Functionalities

Features of the 100W Endpoint

- **Advanced features including:**
 - Leak Flag
 - Cut Cable Tamper Flag
 - Reverse Flow Flag
 - Low Battery Alarm (20-year Itron warranty)
 - Daily Time Synchronization
- Auto-sensing for any encoder register – no programming makes installation and change-outs easy
- Compact and various mounting options
- Open architecture at the meter interface
- **Compatible with fixed network, mobile, or handheld collectors**
- Special data aggregation modes for meter right-sizing
- Option for acoustic leak sensing technology



Tucson Water's Vision for Itron ChoiceConnect



Meter Data Management System Considerations

- **Far more than monthly billing reads**
- **Multiple metering systems**
- **Provider options**
 - **Utility builds it**
 - **Acquired/leased**
 - **Turnkey/hosted**
- **Integration with other systems (billing, SCADA, DMAs, system audits)**
- **Phasing and timing of deployment**
- **Operational ownership**
- **Applications development**
- **Maintenance & upgrade**
- **Reports, custom queries, data mining**
- **Migratability**
- **Expandability**
- **Customer data access**
- **Security**

Functional Requirements Staff Workshop

Functional Requirements Staff Workshop held on February 13, 2013 (18 Stakeholder Attendees)

Described AMI
Strategic Plan
goals and
approach

Reviewed
functional
requirements

Solicited
feedback and
supplemented
requirements

Voted on the
importance of
each functional
requirement

Need versus want? Unimportant?

- *Short term (starting in 0-3 years)*
- *Long term (starting in >3 years)*

Tucson Water Functional Requirements (>70% criticality)

1. Accurate, reliable readings for billing
2. Reliable and secure data storage and transmission
3. End to end cyber security
4. Public outreach/ marketing
5. Demonstrated migration path (drive by to fixed network w/o hardware change)
6. Easier/ faster high bill investigation
7. Stuck meter detection
8. City of Tucson AMI data hosting
9. Tamper detection
10. Customer consumption profiling

Tucson Water Functional Requirements (cont'd)

11. Integration with asset management system
12. Conservation monitoring and enforcement
13. Integration with billing system
14. Customer-specific daily usage information
15. Theft of service detection
16. Both manual and AMI capability in the meter register
17. Distribution system leak detection
18. Customizable reporting and data mining
19. On-cycle and off-cycle meter reading
20. Real-time water quality monitoring

Tucson Water Functional Requirements (cont'd)

21. Customer access to data

22. Customer leak detection

23. Noise-logging for leak detection (system and/or customer)

24. Integration with SCADA

Economic Evaluation of Alternatives

Resultant Long-Term Four Meter Reading Alternatives

- 1 Maintain Existing System: Manual Read Plus AMR
- 2 All AMR
- 3 Hybrid System: AMR Plus AMI
- 4 All AMI

Monthly Meter Reading O&M Cost Considerations

- Monthly Meter Reading for Billing
- High Bill Investigation
- High Consumption
- Meter Lock Out
- Inactive Service With Consumption
- Meter Re-read
- Can't Read Meter
- Leak at Meter
- Test for Stuck Meter
- Turn On/Turn Off Meter
- Tampering Investigation
- 100W Data Logging
- Meter Master Data Logging

Example Economic Assumptions

Item	Assumptions for comparative analysis	Maintain Existing Hybrid System: Manual Read Plus AMR	All AMR (100W Drive By)	Hybrid System: AMR Plus AMI (Itron)	All AMI (Itron)
1	Monthly reading frequency	1	1	1/No Limit	No Limit
2	Hourly labor rate meter reader	\$ 20.59	\$ 20.59	\$ 20.59	\$ 20.59
3	Number of meter readers	30	10	8	6
4	Hourly labor rate service workers	\$ 22.71	\$ 22.71	\$ 22.71	\$ 22.71
5	Number of service workers	22	22	14	10
6	Hourly labor rate auditors	\$ 23.50	\$ 23.50	\$ 23.50	\$ 23.50
7	Number of auditors	6	6	6	6
8	Hourly labor rate meter repairer	\$ 20.75	\$ 20.75	\$ 20.75	\$ 20.75
9	Number of meter repairers	3	3	3	3
10	High Bill Investigation (min/event)	65	65	40	15
11	High Bill Investigation (event/month)	305	305	192	80
12	High Consumption (min/event)	50	50	32	15
13	High Consumption (event/month)	173	173	107	40
14	Meter Lock Out (min/event)	30	30	30	30
15	Meter Lock Out (event/month)	1,849	1,849	1,849	1,849

Endpoint Assumptions for 2023 Cost Comparison

	Maintain Existing Hybrid System: Manual Read Plus AMR	All AMR (100W Drive By)	Hybrid System: 50% AMR and 50% AMI	All AMI
Manual	167,579	0	0	0
AMR Non-100W	23,108	0	0	0
AMR 100W	81,313	272,000	136,000	0
AMI 100W	0	0	136,000	272,000
Total	272,000	272,000	272,000	272,000

Next Steps

- Finalize assumptions
- Validate economic comparison
- Evaluate Tucson Electric Power network use feasibility and cost
- Prepare recommended plan

Feedback and Questions

