Village of Lombard

Water Meter Change Out Program

Presentation Objectives

1. History of Lombard Meter Replacement Programs
2. What is AMR? What is AMI?
3. Review of Data on **Small Meters** (≤1½")
4. Review of Data on **Large Meters** (≥2")
5. Review of FY 2011-2020 CIP Funding
6. Staff Recommendations

History of Lombard Meter Replacement Programs

1980 –Water Meter Program Development Group

- Lake Water Allocation Reporting Requirements
  - Commercial, Residential, Industrial Accounts
- Verify meter inventory and accuracy
  - Did not have an accurate large meter database (size, location, type)
  - 3 brands of meters
  - No remote read
  - Reduce unaccounted for water
- Identify Ordinance Revisions

Water Meter Program Development Group

- Organized a team to inspect and test meters, including change-out of meters:
  - Foreman
  - 2 Maintenance Workers
- 1981-1983 - Purchased meter test bench & began testing meters
  - Focus on Large Meter Repair & Replacement
- Installed remote generator reading units

1987-1989

- Analyzed 419 small meters for accuracy
  - Estimated 34% water loss
- FY 1988 – Large Meter Testing and Replacement Program
- FY 1988 – 1989 – Small Meter Replacement Program
  - Upgraded to Touch Read
- Charged customers for meter & installation

1987-1989

- Charged customers for meter & installation

Meter Size	Installation Cost	Meter Cost	Total Cost
5/8"	50.00	52.50	$102.50
3/4"	50.00	86.10	$136.10
1"	65.00	102.90	$167.90
1 ½"	110.00	240.45	$350.45
2"	180.00	465.56	$645.56
3"	270.00	702.56	$972.56
4"	360.00	900.56	$1,260.56
6"	360.00	1,335.56	$1,695.56

Program Review

- Successful implementation by Contractor
- Reduction in staffing allocated to meter reading function due to touch read
- Billing time reduced due to automatic downloading
- ***Charging residents and businesses for meter and installation was extremely unpopular***
- Did not see anticipated revenue increases until billing system (HTE) was changed in 1996

Program Review

- 1996 – Implemented HTE billing software
- 1997 – Joint Finance/PW Water Meter Replacement Program Recommendation to PWC and Village Board
  - Additional meter testing warranted, current data indicated meters need to be replaced in 6-10 years, upgrade reading system, need to fund the project through Water Rates. $2.9 to $5 million

Program Review

- 2001 – Large Meter Testing Program reinstated. Test all meters on 5 year rotation. Funded through Water Rates
- 2002 – Tested 26 small meters. Recommended meter change out program for meters exceeding recommended registration and an upgrade of the reading system (radio, phone)

Program Review

- 2004 - Meter Replacement Program incorporated in CIP for FY 2008-2010 at $5,100,000
- 2005 – Tested 84 small meters.
  - **27%** were below (92.81%) acceptable accuracy on low flow of 95.0%
- 2007 – Implemented accelerated large meter testing program to reduce meter repair rate.
  - Over 1 million gallons tested every year
  - Less than 1 million gallons tested every other year.
  - $90k per year

Program Review

- 2008-Formed a Committee to evaluate meters and new reading technology (Advanced Metering Infrastructure - AMI):
  - Sharon Myers, Water Billing
  - Angela Podesta, Tom Czajka, Dan Simons, PW
- Met with various vendors to determine features
- Visited Willowbrook and Aurora to see AMI Systems in action
  - Willowbrook – Badger Meters, Aclara Fixed Based Radio
  - Aurora – Sensus Meters and Drive By Radio

What is AMR? What is AMI?

Automated Meter Reading = AMR

- AMR refers to the ability to collect data from a metering device remotely and automatically.
- Methods
  - Touchpad
  - Drive-by
  - Fixed Point
- Data collection process is generally a one way process

AMR

- The Village currently uses Sensus Touch Read system
  - Requires labor to read approximately 12,700 meters
  - $60,000 annual reading contract
  - Requires labor to obtain Final Readings
  - No data transferred without work effort

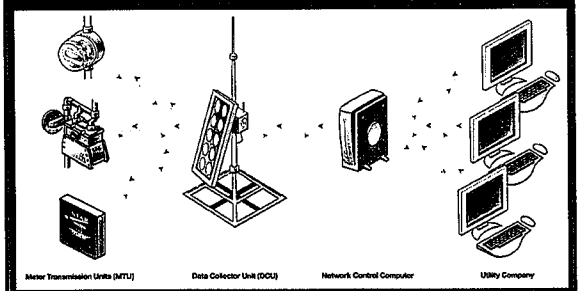
Advanced Metering Infrastructure (AMI)

- Advanced Metering Infrastructure (AMI) is an architecture for automated, two-way communication between a smart utility meter and a utility company.
- The goal of an AMI is to provide utility companies with real-time data about consumption and allow customers to make informed choices about usage.
- AMI is an important part of what is known as a "smart grid"

AMI & Smart Grid Technology

- Smart grid initiatives seek to improve operations, maintenance and planning by making sure that each component of the system can both 'talk' and 'listen'.
- Provides more accurate meter readings electronically
- Some systems can identify water leaks, even before customers call
- Offers quicker final readings and interim readings
- Allows Village oversight of vital water infrastructure 24 hours/day; 7 days a week, 365 days a year.

Advanced Metering Infrastructure (AMI)



WHERE ARE WE NOW?

- Developed list of AMI features that the team thought were important:
  - Proven record integrating with HTE
  - Use existing meter wire (minimize disruption and cost)
  - Two way communication… allows expansion of uses
- Invited Sensus, Badger and Neptune to perform propagation studies and to discuss their AMI systems in more detail.
- Invited Aclara to discuss their AMI systems. This system is compatible with all meters

Customer Service Benefits of an AMI System

- Increased billing accuracy due to elimination of estimated bills
- Programmable per meter size so that a meter can be billed in smaller increments
- Leak detection down to 1/10 gallon - tell customer they have a leak before they even know it! *"No more $800 bills because of toilet running for 2 months"*
- Reduced operational costs - No meter reading contracts ($60,000/yr)

Customer Service Benefits of an AMI System

- No personnel needed for final readings – and if someone calls after they've moved out, we're able to get actual reading from that date. (Some times customers who've moved only call after they get the next bill and our policy is to send someone out to get reading next day unless there was a reading taken "close" to the time they moved)
- Can, without a doubt, tell customer that "yes you did use this water" with print-out of readings provided on hourly basis (depending on who we go with)
- No more backwards meters.

Customer Service Benefits of an AMI System

- Can detect tampering with meters. No more finding accounts with bypassed meters and/or removing meter to fill pools, etc.
- Able to program all meters to read at Midnight on first of month in order to tie out customer usage with usage from DWC billing on a monthly basis.
- Report for installed meters not being billed.
- Stopped meters – can catch those quickly!
- Flexibility to go to monthly billing without a problem.

Small Meters

5/8" – 1½"

Small Meter Consumption (2009)

Meter Size	Number of Meters	Total Consumption	Percentage of Consumption
5/8"	9,992	569,035,000	43%
¾"	1,260	71,143,000	5%
1"	849	70,906,000	5%
1½"	302	87,568,000	7%
Total	12,403	798,652,000	61%

Current Data

- 340 meters (1½ or less) tested from 2003-2007
- Residential and Commercial
- Randomly chosen, mix of meters within recommended registration/age and meters exceeding recommended registration/age
- Based upon Lombard testing, the efficiency rating of meters does not necessarily correlate to the AWWA age or registration standards

Recommended Meter Replacement

- Industry standard provides for the replacement of **small meters** based upon "registration" or flow that passes through the metering device.

Meter Size	Registration (in gallons)	Time Period (in years)
5/8"	1,500,000	15
3/4"	2,250,000	15
1"	3,000,000	15
1½"	5,000,000-7,500,000	10

Meters Exceeding Registration

Meter Size	Number of Meters Exceeding Registration	Percentage of Meters in Service
5/8"	3596	36%
3/4"	3	.2%
1"	26	3%
1-1/2"	0	0%

Small Meter Usage vs Flow Rate

	GPM	% Usage	
Low Flow	< 1.0	13.1	Small Leaks
Normal Flow	1 to 10	83.5	Normal Household Use (Shower, Flush Toilet, Outdoor Use)
High Flow	> 10	3.5	Irrigation Systems

From AWWA Research Foundation Study (1993) by Paul Bowen

AWWA Meter Test Standards

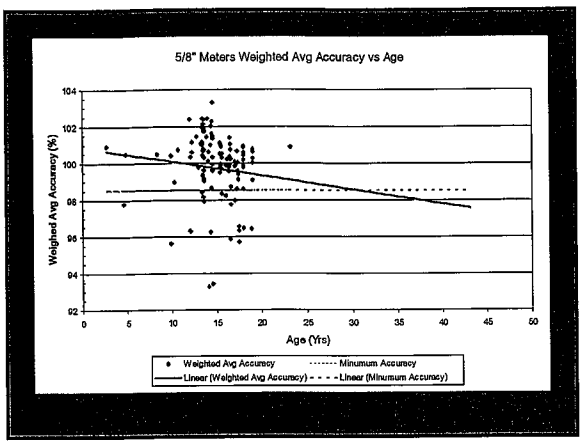
- AWWA Standard C-700 uses meter accuracy at Low and Normal Flow ranges to determine if a meter should be replaced (1½ or less)

	Acceptable Accuracy Limits (%)
Low Flow	95.0-101
Normal Flow	98.5-101.5
High Flow	98.5-101.5

Meter Accuracy (%) by Size & Flow Rate

	5/8"	3/4"	1"	1-1/2"
Low Flow	93.7	95.3	91.7	95.0
Medium Flow	100.5	99.5	99.6	98.0
High Flow	100.6	99.9	100.2	97.7
Weighted Average*	99.7	99.1	98.8	97.6

* Accounts for the percentage of flow



Predicted Meter Age to Drop to 98.5% Minimum Acceptable Accuracy

	Predicted Meter Age	Average Age of Meters*	Number of Meters Older than Prediction*
All	20	18	8522
5/8"	30	20	0
3/4"	17	11	122
1"	37	7	0
1-1/2"	10.5	15	231

*2009 Meter Data

Impact on Revenue

- 43% of overall flow is attributable to 5/8" meters
- Majority of inaccuracy is on the low flow, which represents 13% of flow
- Running at 6.3% below AWWA efficiency standard
- IMPACT is approximately $29,000 per year in lost revenue

Large Meters
2"-6"

Large Meter Consumption (2009)

Meter Size	Number of Meters	Total Consumption	Percentage of Consumption
2"	242	144,805,000	11%
3"	119	118,550,000	9%
4"	61	215,520,000	16%
6"	5	37,400,000	3%
Total	427	516,275,000	39%

Recommended Meter Replacement

- **AWWA Standard C-702** standard provides for the replacement of **large meters** based upon "registration" or flow that passes through the metering device.

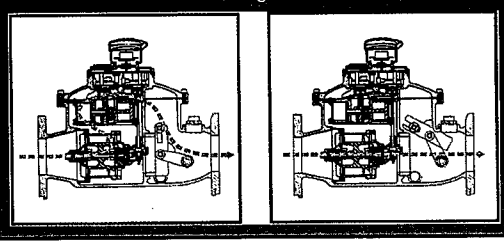
Meter Size	Registration (in gallons)	Time Period (in years)
2"	20,000,000	10
3"	40,000,000	7
4"	150,000,000	5
6"	300,000,000	3

Meters Exceeding Registration

Meter Size	Number of Meters Exceeding Registration	Percentage of Meters in Service
2" Meter	35	14.4%
3" Meter	11	9.2%
4" Meter	6	9.8%
6" Meter	0	0%

Large Meter Operation

- Compound meters consist of 3 components:
  - A turbine meter
  - A positive-displacement meter
  - An automatic valve arrangement



AWWA Meter Test Standards

- AWWA M36 uses meter accuracy at Flow Rate to determine if a meter should be replaced

	Acceptable Accuracy Limits (%)
Low	95 - 101
Crossover	90 - 103
High	97 - 103

Meter Accuracy (%) by Size & Flow Rate

Flow	2"	3"	4"	6"
Low	84.60	77.16	97.41	99.48
Crossover	92.03	86.83	93.65	95.73
High	99.96	98.56	100.95	100.88
Weighted Average	93.15	88.80	95.85	97.91

Impact on Revenue

- FY2009 spent $79,513 on testing & repair
- For meters outside the acceptable Meter Accuracy Range, the Village billed 28,101,000 fewer gallons = $250,376.11*
  - *This figure does not account for meters that had stopped operating*

*assumes 100% accuracy

RECOMMENDATION #1

- Small Meter - Single Family Application
  - Continue random meter testing program
  - Continue to monitor the efficiency of the meters
  - As meters are replaced (or new meters installed), upgrade to AMI compatible meter and reading technology
  - Install AMI device on existing meters that are compatible with AMI system (approximately 1,000) - $180,000
  - For planning purposes, shift the small meter replacement program into FY 2016 of the CIP

RECOMMENDATION #2

- Commercial & Multi-Family Application
  - Continue Large Meter testing program
  - Contract for the replacement of the 412 Multi-Family and 1,127 Commercial Meters
- Cost of the replacement program is estimated at $1,441,602 based upon current cost for compatible system

Multi-Family Replacement Cost

Meter Size	Equipment Cost	Installation Cost	Quantity	Total Cost
5/8	253	86	13	$4,407
3/4	282	86	84	$30,912
1	323	86	48	$19,632
1½	599	215	114	$92,796
2	1,409	225	43	$70,262
3	1,947	325	60	$136,320
4	3,168	325	48	$167,664
6	5,386	500	2	$11,772
Total Multi-family			412	$533,765

Commercial Replacement Cost

Meter Size	Equipment Cost	Installation Cost	Quantity	Total Cost
5/8	253	86	282	$95,598
3/4	282	86	259	$95,312
1	323	86	144	$58,896
1½	599	215	170	$138,380
2	1,409	225	196	$320,264
3	1,947	325	60	$136,320
4	3,168	325	13	$45,409
6	5,386	500	3	$17,658
Total Commercial			1,127	$907,837

RECOMMENDATION #3

- Automated Metering Infrastructure (AMI)
  - Proceed with installation of backbone infrastructure (towers and data collection)
  - In order to gain efficiency at ability to detect leaks or abnormal usage, registers on the meter head must read to a factor of less than 1,000 gallons

AMI Cost

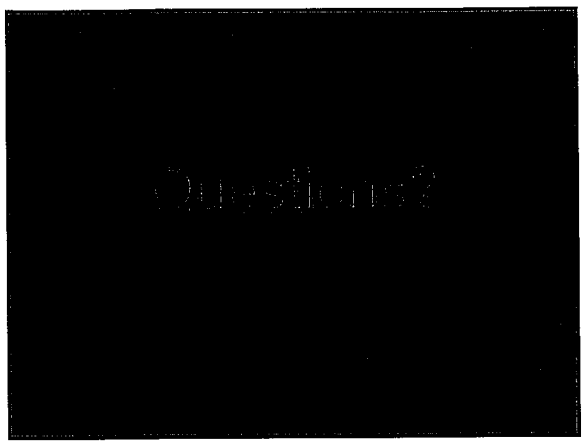
Estimated costs are not based upon full design and engineering of the system, but on the preliminary propagation study.

	Quantity	Cost	Total
Tower	2	78,000	156,000
Regional Network Interface	1	35,000	35,000
INFRASTRUCTURE COSTS			191,000

	Quantity	Cost	Total
Support	1	3,000	3,000
Maint	1	4,000	4,000
Backhaul	2	1,200	2,400
ANNUAL COSTS			9,400

Summary

- Replacement of all commercial and multifamily meters in FY 2011
  - Estimated cost of $2,000,000
- Installation of AMI infrastructure
- Program $5,000,000 in FY 2016 for single family residential meter replacement program


Questions?