Smart Management for Small Water Systems

Energy Management Workshop #1

Energy Management and Overall System Management
-Water Loss Reduction
-Asset Management

EFCN environmental finance center network

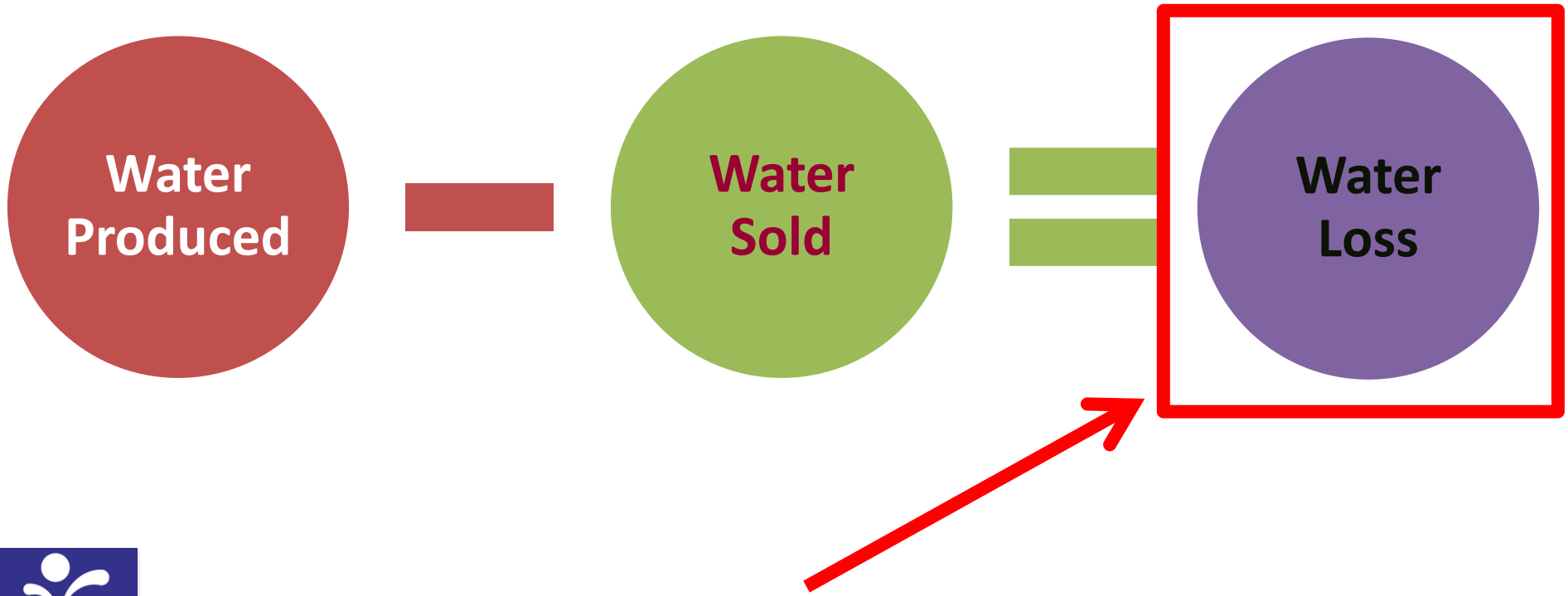
American Water Works Association

This program is made possible under a cooperative agreement with EPA.

Water Loss tied to Energy Management

- Case Study – Wisconsin
  - 1997-2000: Average use was 1.6 kWh per 1,000 gallons of water produced = $0.086 per 1,000 gallons of water produced
  - 23.5 billion gallons lost per year
  - 23,500,000 x $0.086 = ~ $2 million on 38 million kWh to produce lost water

DOES THIS LOOK FAMILIAR?



Water Loss

WHAT DOES THIS VALUE REPRESENT?

WATER LEAKAGE FROM PIPES

PARTIALLY CORRECT

UNACCOUNTED WATER

OUTDATED TERMINOLOGY

WATER NOT DELIVERED TO CUSTOMERS

PARTIALLY CORRECT

NON-REVENUE WATER

RIGHT ANSWER

INACCURATE READINGS

PARTIALLY CORRECT

POOR BILLING PRACTICES

PARTIALLY CORRECT

THIS VALUE IS NOT WATER LOSS

Water Produced

−

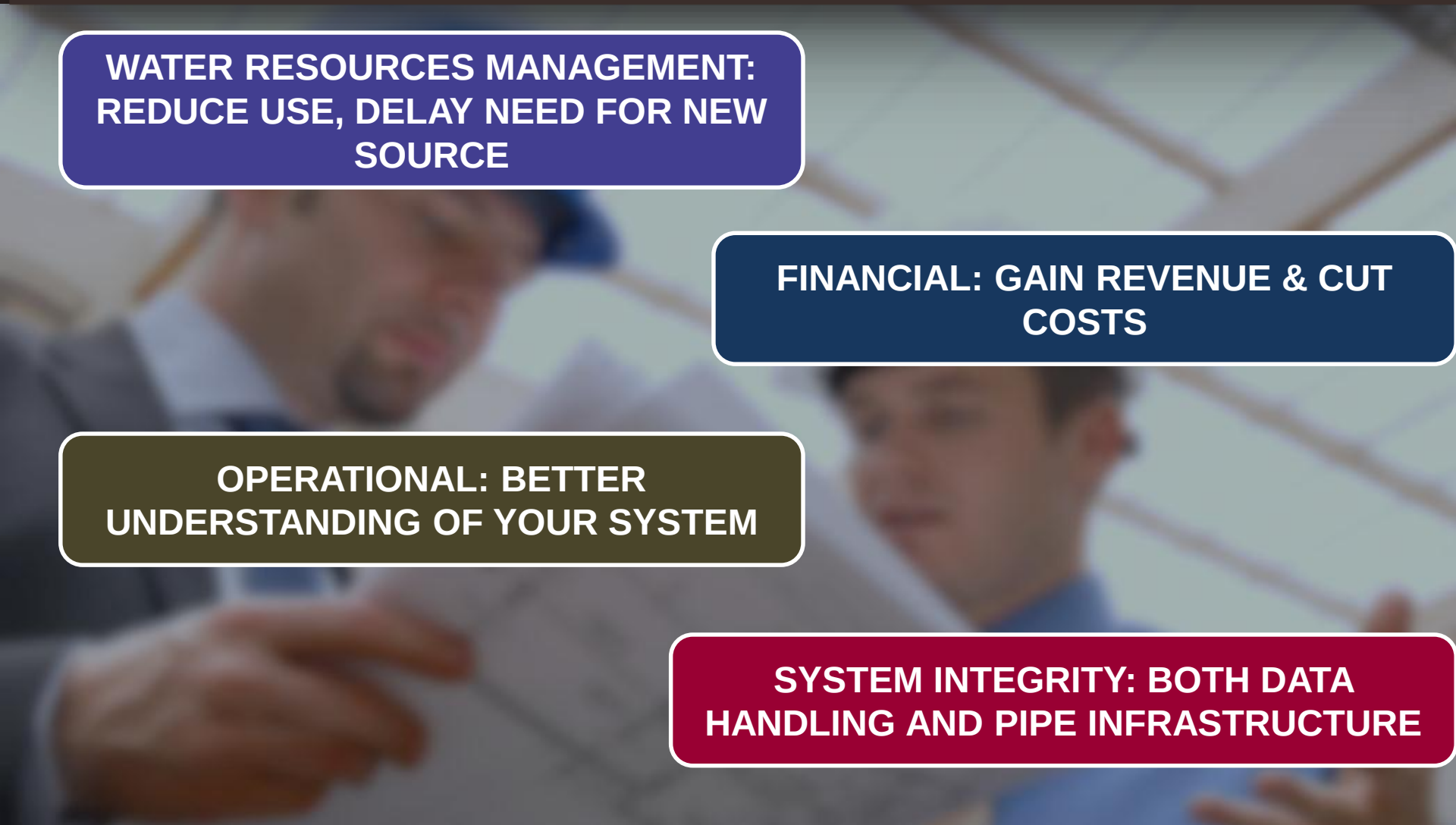
Water Sold

=

NON-REVENUE WATER (NRW)

NON-REVENUE WATER:

WHY CARE ABOUT NRW?



WATER RESOURCES MANAGEMENT: REDUCE USE, DELAY NEED FOR NEW SOURCE

FINANCIAL: GAIN REVENUE & CUT COSTS

OPERATIONAL: BETTER UNDERSTANDING OF YOUR SYSTEM

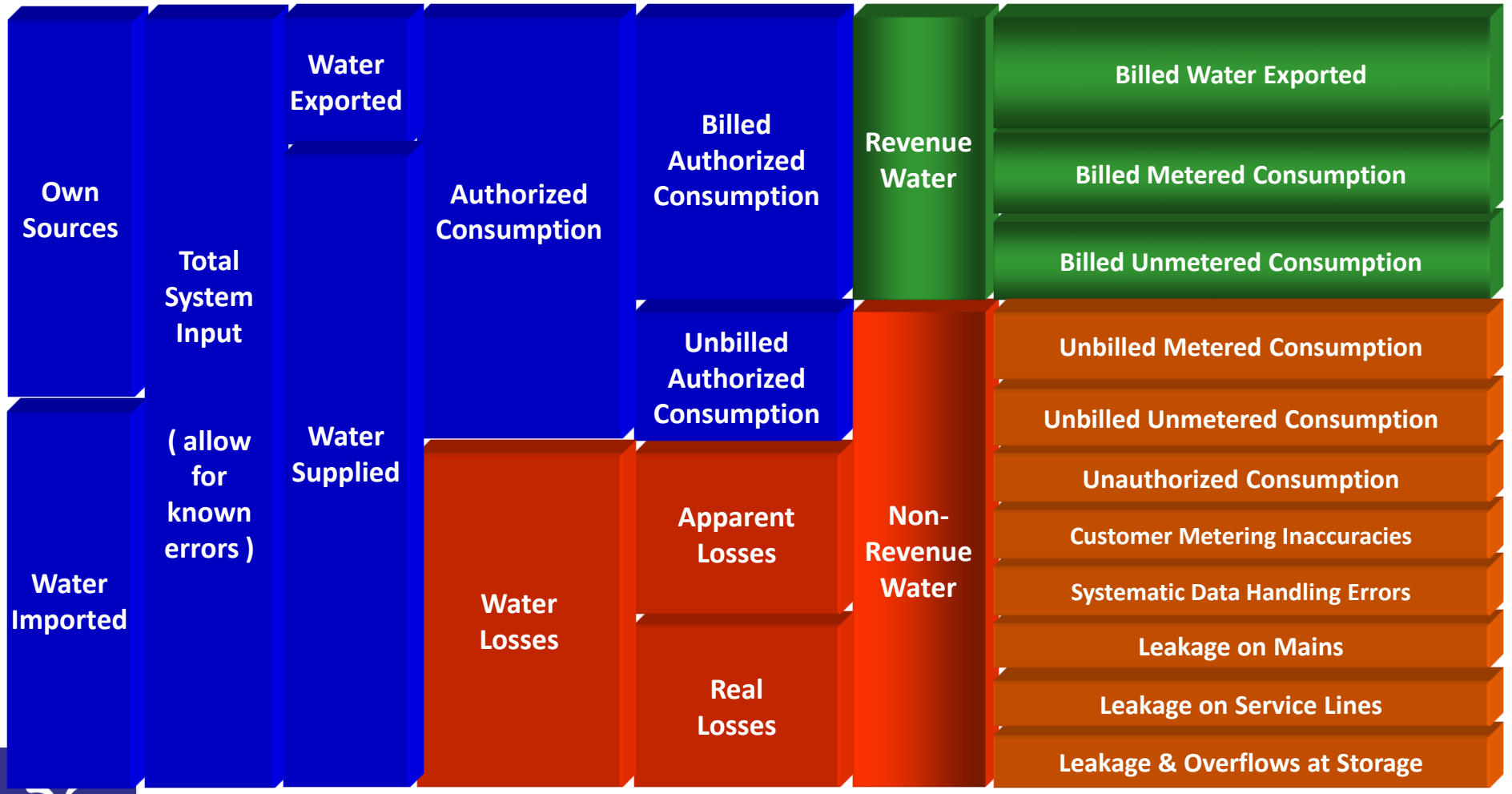
SYSTEM INTEGRITY: BOTH DATA HANDLING AND PIPE INFRASTRUCTURE


Establish Nature of the Problem
Set Goals
Choose Appropriate Strategies
Prioritize Strategies for Implemen-tation
Develop Funding Plan (Assess Potential for Increased Revenue to Fund Part of the Program)
WATER LOSS AS A PROCESS

CONDUCT A WATER AUDIT TO DETERMINE NATURE OF THE PROBLEM

If we don’t understand the nature of the problem, we may apply the wrong solution.

IWA/AWWA Standard Water Balance



Goal: No "Unaccounted for" water

All Water placed in it's applicable category

AWWA Free Water Audit Software

American Water Works Association

AWWA Free Water Audit Software:
Reporting Worksheet

WAS v5.0
American Water Works Association.
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? Click to access definition
+ Click to add a comment

Water Audit Report for: Northern San Leandro Combined Water Sewer Storm Utility District (0007900)
Reporting Year: 2013 1/2013 - 12/2013

Please enter data in the white cells below. Where available, metered values should be used; if metered values are unavailable please estimate a value. Indicate your confidence in the accuracy of the input data by grading each component (n/a or 1-10) using the drop-down list to the left of the input cell. Hover the mouse over the cell to obtain a description of the grades

All volumes to be entered as: MILLION GALLONS (US) PER YEAR

To select the correct data grading for each input, determine the highest grade where the utility meets or exceeds all criteria for that grade and all grades below it.

Master Meter Error Adjustments

WATER SUPPLIED

	<---------- Enter grading in column 'E' and 'J' ---------->			Pcnt:	Value:	
Volume from own sources:	5	1,000.000	MG/Yr		100.000	MG/Yr
Water imported:	1		MG/Yr			MG/Yr
Water exported:	9	100.000	MG/Yr		25.000	MG/Yr

Enter negative % or value for under-registration
Enter positive % or value for over-registration

WATER SUPPLIED: 825.000 MG/Yr

AUTHORIZED CONSUMPTION

Click here: ? for help using option buttons below

			Pcnt:	Value:	
Billed metered:	8	700.000	MG/Yr			
Billed unmetered:	9	50.000	MG/Yr			
Unbilled metered:			MG/Yr			
Unbilled unmetered:		10.313	MG/Yr	1.25%		MG/Yr

Default option selected for Unbilled unmetered - a grading of 5 is applied but not displayed

AUTHORIZED CONSUMPTION: 760.313 MG/Yr

Use buttons to select percentage of water supplied **OR** value

WATER LOSSES (Water Supplied - Authorized Consumption) 64.688 MG/Yr

Apparent Losses

			Pcnt:	Value:	
Unauthorized consumption:	10	3.000	MG/Yr		3.000	MG/Yr

Unauthorized consumption volume entered is greater than the recommended default value

			Pcnt:	Value:	
Customer metering inaccuracies:	5	7.071	MG/Yr	1.00%		MG/Yr
Systematic data handling errors:	4	5.000	MG/Yr		5.000	MG/Yr

Apparent Losses: 15.071 MG/Yr

Real Losses (Current Annual Real Losses or CARL)

Real Losses = Water Losses - Apparent Losses: 49.617 MG/Yr

WATER LOSSES: 64.688 MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER: 75.000 MG/Yr

= Water Losses + Unbilled Metered + Unbilled Unmetered

SYSTEM DATA

Length of mains:	7	100.0	miles
Number of active AND inactive service connections:	6	1,000	
Service connection density:		10	conn./mile main

Are customer meters typically located at the curbstop or property line? Yes

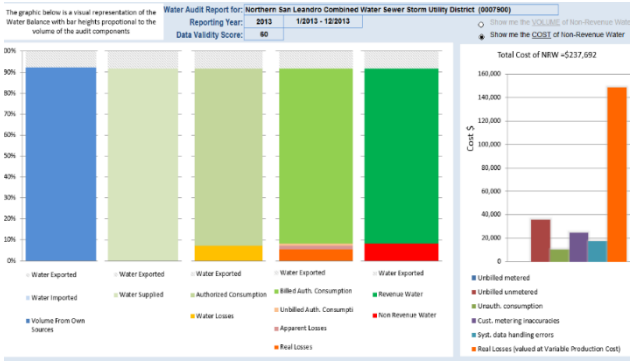
Average length of customer service line: (length of service line, beyond the property boundary, that is the responsibility of the utility)

Average length of customer service line has been set to zero and a data grading score of 10 has been applied

Average operating pressure: 6 60.0 psi

COST DATA

Total annual cost of operating water system:	5	$1,000,000	$/Year
Customer retail unit cost (applied to Apparent Losses):	7	$3.50	$/1000 gallons (US)
Variable production cost (applied to Real Losses):	7	$3,000.00	$/Million gallons ☐ Use Customer Retail Unit Cost to value real losses



Industry Standard (M36)

Free

Defaults provided

~10 Volume Inputs
~7 System Data Inputs

awwa.org/waterlosscontrol

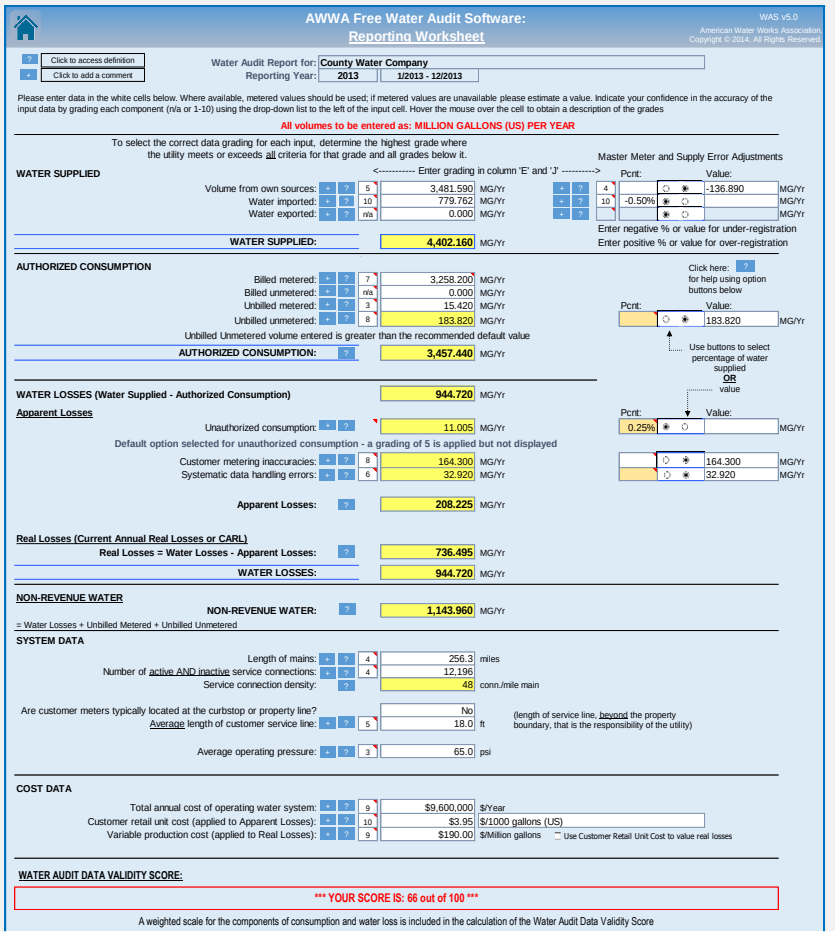
IT'S NOT AS BAD AS IT LOOKS

Inputs

- 13 Volume inputs
- 5 System attribute inputs
- 3 Cost inputs
- 21 total

After defaults & n/a's:

only about <u>10-15 inputs</u> to deal with



AWWA Free Water Audit Software: Reporting Worksheet

WAS v5.0

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Click to access definition
Click to add a comment

Water Audit Report for: County Water Company
Reporting Year: 2013 (1/2013 - 12/2013)

Please enter data in the white cells below. Where available, metered values should be used; if metered values are unavailable please estimate a value. Indicate your confidence in the accuracy of the input data by grading each component (n/a or 1-10) using the drop-down list to the left of the input cell. Hover the mouse over the cell to obtain a description of the grades

All volumes to be entered as: MILLION GALLONS (US) PER YEAR

To select the correct data grading for each input, determine the highest grade where the utility meets or exceeds all criteria for that grade and all grades below it.

Master Meter and Supply Error Adjustments

<---------- Enter grading in column 'E' and 'J' ----------> Pcnt: Value:

WATER SUPPLIED

Volume from own sources:	5	3,481.590	MG/Yr	4		-136.890	MG/Yr
Water imported:	10	779.762	MG/Yr	10	-0.50%		MG/Yr
Water exported:	n/a	0.000	MG/Yr				MG/Yr
WATER SUPPLIED:		4,402.160	MG/Yr				

Enter negative % or value for under-registration
Enter positive % or value for over-registration

AUTHORIZED CONSUMPTION

Click here: for help using option buttons below

Billed metered:	7	3,258.200	MG/Yr		
Billed unmetered:	n/a	0.000	MG/Yr		
Unbilled metered:	3	15.420	MG/Yr		
Unbilled unmetered:	8	183.820	MG/Yr	183.820	MG/Yr
AUTHORIZED CONSUMPTION:		3,457.440	MG/Yr		

Pcnt: Value:

Use buttons to select percentage of water supplied OR value

Unbilled Unmetered volume entered is greater than the recommended default value

WATER LOSSES (Water Supplied - Authorized Consumption) 944.720 MG/Yr

Apparent Losses

Pcnt: Value:

Unauthorized consumption:		11.005	MG/Yr	0.25%	MG/Yr
Default option selected for unauthorized consumption - a grading of 5 is applied but not displayed					
Customer metering inaccuracies:	8	164.300	MG/Yr	164.300	MG/Yr
Systematic data handling errors:	6	32.920	MG/Yr	32.920	MG/Yr
Apparent Losses:		208.225	MG/Yr		

Real Losses (Current Annual Real Losses or CARL)

Real Losses = Water Losses - Apparent Losses:	736.495	MG/Yr
WATER LOSSES:	944.720	MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER:	1,143.960	MG/Yr

= Water Losses + Unbilled Metered + Unbilled Unmetered

SYSTEM DATA

Length of mains:	4	256.3	miles	
Number of active AND inactive service connections:	4	12,196		
Service connection density:		48	conn./mile main	
Are customer meters typically located at the curbstop or property line?		No		
Average length of customer service line:	5	18.0	ft	(length of service line, beyond the property boundary, that is the responsibility of the utility)
Average operating pressure:	3	65.0	psi	

COST DATA

Total annual cost of operating water system:	9	$9,600,000	$/Year	
Customer retail unit cost (applied to Apparent Losses):	10	$3.95	$/1000 gallons (US)	
Variable production cost (applied to Real Losses):	9	$190.00	$/Million gallons	Use Customer Retail Unit Cost to value real losses

WATER AUDIT DATA VALIDITY SCORE:

*** YOUR SCORE IS: 66 out of 100 ***

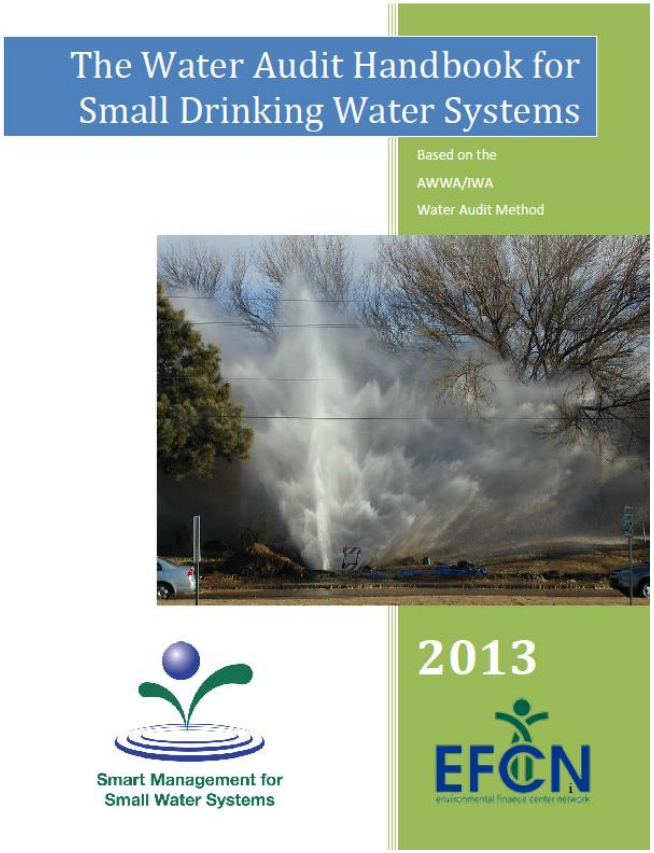
A weighted scale for the components of consumption and water loss is included in the calculation of the Water Audit Data Validity Score

Resource: AWWA Water Audit Software© (version 5.0)

- Free Excel Workbook at http://www.awwa.org/resources-tools/water-knowledge/water-loss-control.aspx
- Must log in or register to access the tool – the tool is free

Resource: EFCN's "The Water Audit Handbook for Small Drinking Water Systems"

- http://efcnetwork.org/documents/2014/01/water-audit-handbook.pdf



Asset Management tied to Energy Management

- The process of Energy Management follows a similar framework to Asset Management. Combining the two provides the utility with the tools to develop a comprehensive program of managing its assets in a cost-effective, environmentally sound and energy efficient manner.


All water and
wastewater
facilities are made
up of many, many
individual assets

ASSETS CAN BE SEPARATED BY CLASS/CATEGORY

BUILDINGS

WELLS

PUMPS

VEHICLES

PIPES

VALVES

METERS

It costs money to construct, operate, maintain, repair, rehabilitate and replace the assets

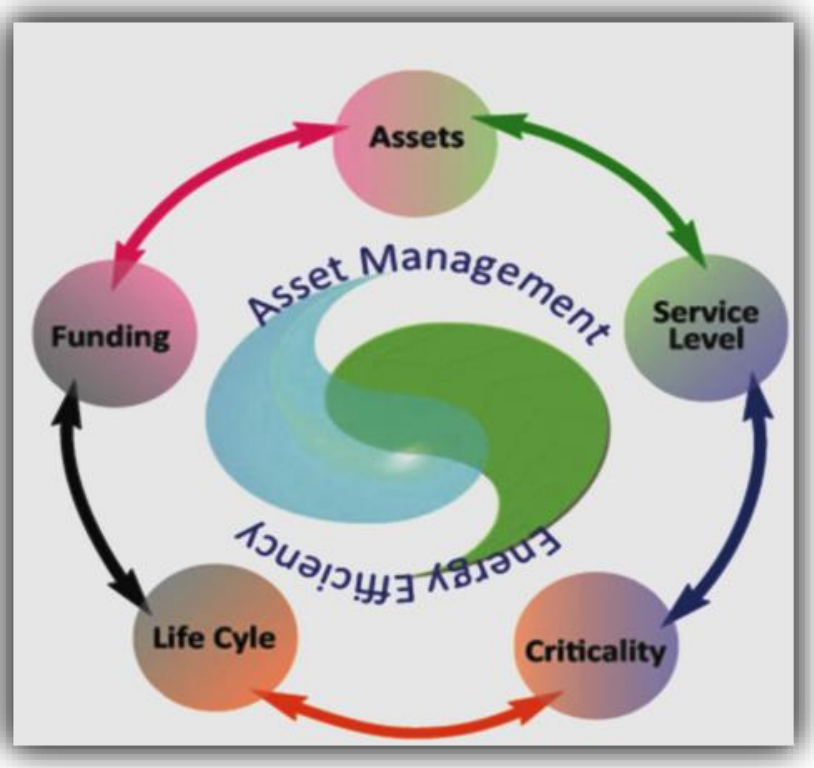
You most likely don't have all the money you need to do everything that needs to be done within the facility.....

VS

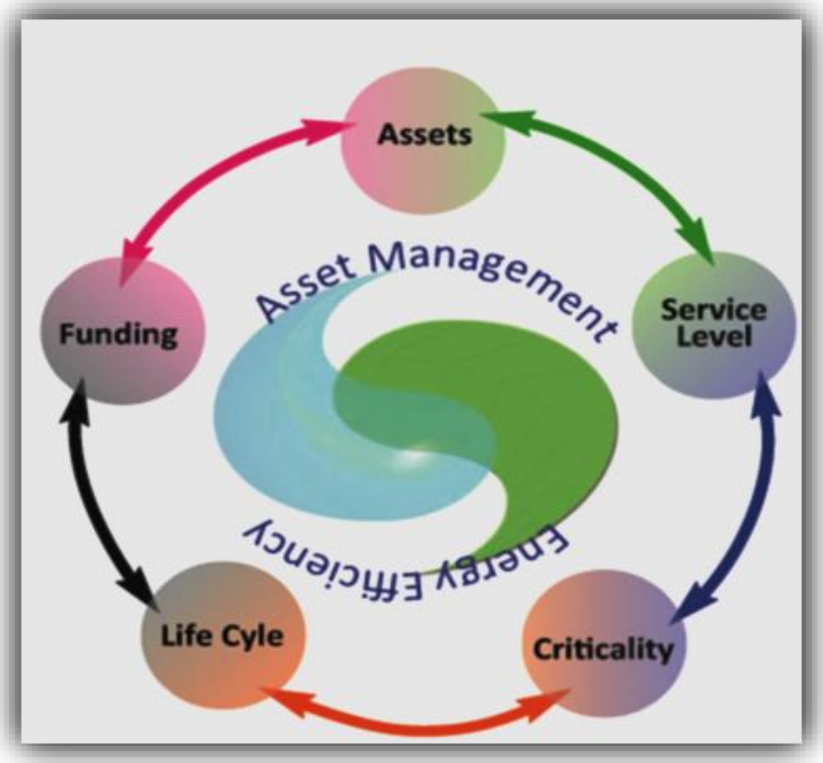
Therefore, you have to make choices about where to spend the money

Asset management helps you determine how, where, and when to spend your money

Asset management is first and foremost a process to help you run your systems in a better way



THE AM THOUGHT PROCESS CONSISTS OF 5 CORE COMPONENTS

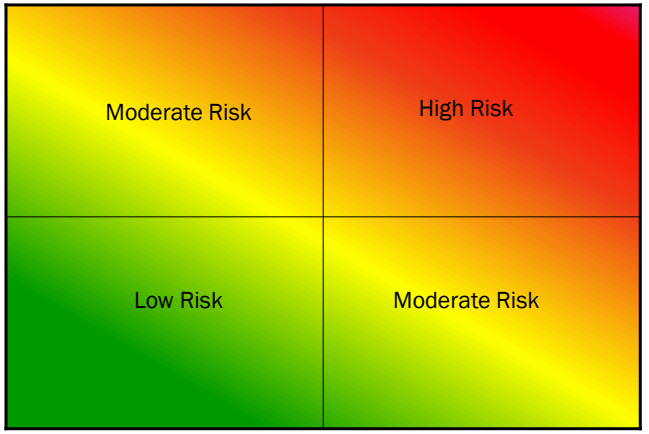


CURRENT STATE OF THE ASSETS

THE AM THOUGHT PROCESS CONSISTS OF 5 CORE COMPONENTS

LEVEL OF SERVICE

THE AM THOUGHT PROCESS CONSISTS OF 5 CORE COMPONENTS

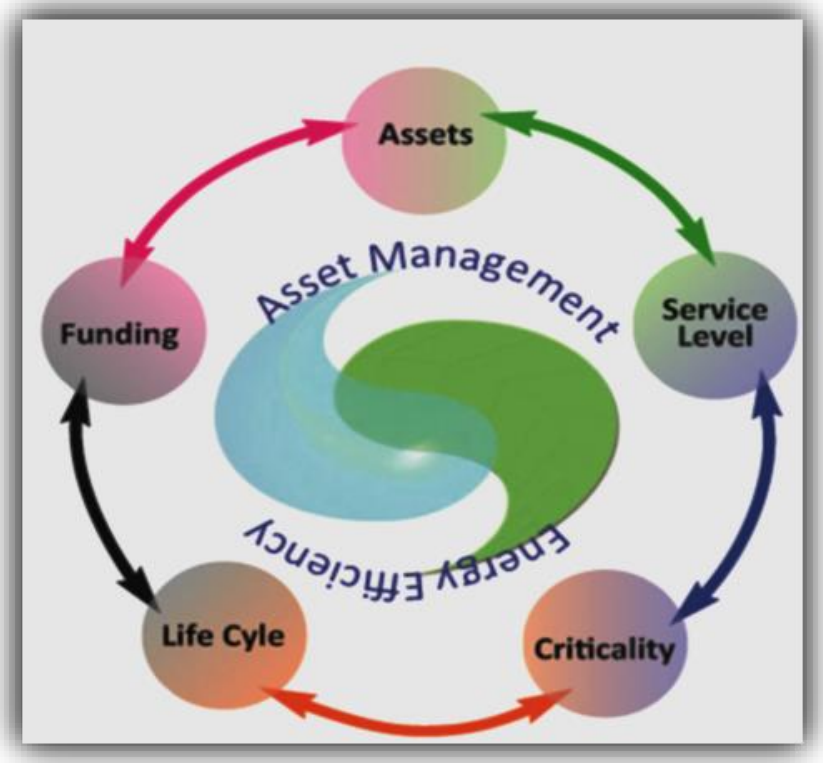


CRITICALITY

THE AM THOUGHT PROCESS CONSISTS OF 5 CORE COMPONENTS

LIFE CYCLE COSTING

THE AM THOUGHT PROCESS CONSISTS OF 5 CORE COMPONENTS



FUNDING

THE BENEFITS OF USING ASSET MANAGEMENT

- ✓ Better operational decisions
- ✓ Improved emergency response
- ✓ Greater ability to plan and pay for future repairs and replacements
- ✓ Increased knowledge of asset location and condition
- ✓ Increased understanding of which assets are critical to the utility
- ✓ More efficient operation
- ✓ Improved customer communication & service
- ✓ Easier rate-setting
- ✓ Rates based on sound information
- ✓ Increased acceptance of rates
- ✓ Better prioritization of capital improvement projects