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Initiative to Reassess Performance Indicators for Water Loss Management

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WaterSmart Innovations Conference 2017

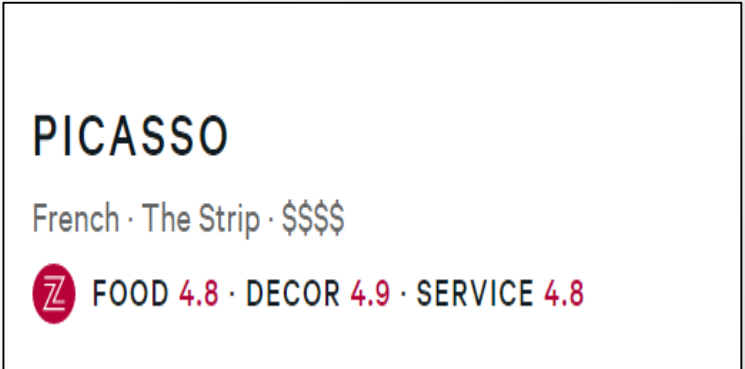
Las Vegas, NV

October 6, 2017

Performance Indicators are used throughout Society

- **Business:** Unemployment Rate, Inflation Rate, Dow Jones Industrials Average
- **Health:** Blood pressure, Cholesterol, Body Mass Index
- **Consumer:** 4-star or 5-star ratings for restaurants, hotels, movies, and other services. User reviews on websites, surveys are other mechanisms to rate performance.
- **Sports:** batting average, home runs, touchdowns or Goals scored, points per game
- **Weather:** High and low temperatures, rainfall, snowfall
- **Many other fields.....**

Best Restaurant in Las Vegas!
(at the Bellagio)



Source: zagat.com



Source: zagat.com



AWWA Free Water Audit Software:
System Attributes and Performance Indicators

WAS v5.0
American Water Works Association.
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Water Audit Report for: County Water Company

Reporting Year: 20131/2013 - 12/2013

*** YOUR WATER AUDIT DATA VALIDITY SCORE IS: 50 out of 100 ***

System Attributes:

Apparent Losses: 208.225 MG/Yr

+ Real Losses: 736.495 MG/Yr

= Water Losses: 944.720 MG/Yr

? Unavoidable Annual Real Losses (UARL): 83.69 MG/Yr

Annual cost of Apparent Losses: \$821,449

Annual cost of Real Losses: \$139,934 Valued at Variable Production Cost

Return to Reporting Worksheet to change this assumption

Performance Indicators:

Financial: { Non-revenue water as percent by volume of Water Supplied: 26.0%
Non-revenue water as percent by cost of operating system: 10.4% Real Losses valued at Variable Production Cost

Operational Efficiency: { Apparent Losses per service connection per day: 46.78 gallons/connection/day
Real Losses per service connection per day: 165.45 gallons/connection/day
Real Losses per length of main per day*: N/A
Real Losses per service connection per day per psi pressure: 2.55 gallons/connection/day/psi

From Above, Real Losses = Current Annual Real Losses (CARL): 736.49 million gallons/year

? Infrastructure Leakage Index (ILI) [CARL/UARL]: 8.80

* This performance indicator applies for systems with a low service connection density of less than 32 service connections/mile of pipeline

Using Performance Indicators to Assess the Water Efficiency of Utilities

- The old way: “unaccounted-for” water (UFW) and the UFW percentage indicator (UFW%)
- The new and better way: AWWA Water Audit Methodology

History of Water Loss Assessments



- First documented account of water loss tracking:
- 1957 AWWA Committee Report "Revenue Producing vs. Unaccounted-for Water."
- For several decades after this paper was published many state and regional water regulatory agencies adopted provisions that define:
 - Losses as varying definitions of "unaccounted-for" water (UFW)
 - Loss levels and targets expressed as an "unaccounted-for" percentage (UFW%), in some form of:

$$\frac{\text{Water Supplied minus Customer Consumption}}{\text{Water Supplied}}$$

Revenue-producing Versus Unaccounted-for Water

Committee Report

A report of Committee 4450 D—Revenue-producing Water, presented on May 13, 1957, at the Annual Conference, Atlantic City, N.J., by E. Shaw Cole (Chairman), Pres., Pitometer Assoc., New York, N.Y. Other members of the committee were: Ellwood H. Aldrich, E. Jerry Allen, David Auld, Egbert D. Case, Oswald A. Gierlich, Dewey W. Johnson, Arthur P. Kuranz, Howard W. Niemeyer, W. K. Van Zandt, and Howard R. Wright.

THE increase in the demand for water due to improved living standards, population growth, and industrial expansion is rapidly approaching the limit of the great natural resources. Most communities are finding it increasingly difficult and expensive to enlarge their sources of supply and plant facilities, so that the incentive to conserve their existing supply is greater than ever.

The cost of an additional supply is frequently more expensive than the original construction because of the need to go a greater distance from the community or to develop a new source which has less yield per invested dollar or simply because of inflation. Ground water is being depleted, and water tables are being lowered. The least expensive supplies were developed initially; but even without considering the steady rise in construction costs, future supplies will be almost certain to cost more than the existing ones.

Conservation is, therefore, a fundamental part of water works operation in an established community, due to the direct money savings in operation and the longer range savings from deferred capital costs for plant expansion.

Direct savings can be made in the cost of production by reducing the amount of chemicals or power consumed, or, if the water supply is purchased, the saving is in dollars paid to the wholesaler. Deferment of the need for plant expansion saves capital expenditures, and is thus another type of saving.

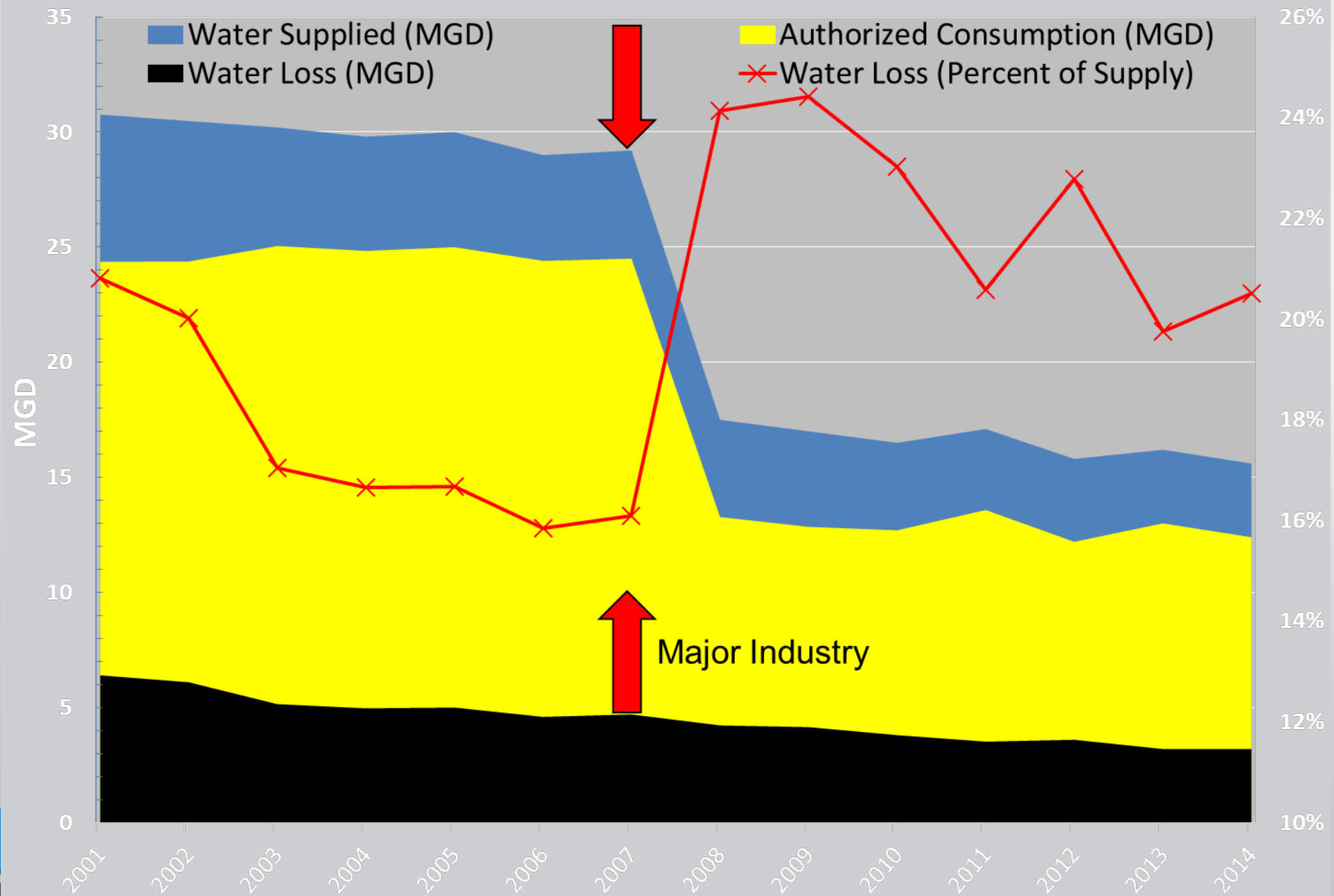
Transmission mains and distribution systems need to be expanded or reinforced when their designed capacity is exceeded, so as to maintain adequate pressures and a satisfactory reserve capacity. Reservoirs, standpipes, and elevated tanks likewise may need to be expanded as consumption increases.

This report is intended to aid the water works industry in its efforts to evaluate and improve conservation practices. It furnishes the operator of the water works plant complete information on the items which must be considered in accounting for the water supplied to the distribution system. If a proper analysis is made, he then will be in a position to determine whether his plant is being operated at maximum efficiency; or if not, what steps he should take to improve conditions.

The flaws of “unaccounted-for” approaches

- UFW is defined in a wide variety of manners by regulatory agencies – thus consistent comparison of data across states is impossible
 - Some include known leaks in “accounted-for” categories despite being a loss
 - Tracking “unaccounted-for” water does not speak professionally of the water industry
- The UFW% is flawed because:
 - It is mathematically skewed by varying levels of customer consumption
 - It does not reveal volumes of real (physical) losses and apparent (customer) losses
 - It does not take into account the costs of the activities to control losses
 - It is rarely successful in motivating actual loss reductions in water utilities

Water Loss as a Percentage of Supply is not an Indicator of Performance



Volumetric Percentage Indicators

“For every complex problem, there is an answer that is clear, simple, and wrong.”

H.L. Mencken

20th Century American Journalist

Unfortunately, many water regulatory agencies still employ the UFW% and regard it as:

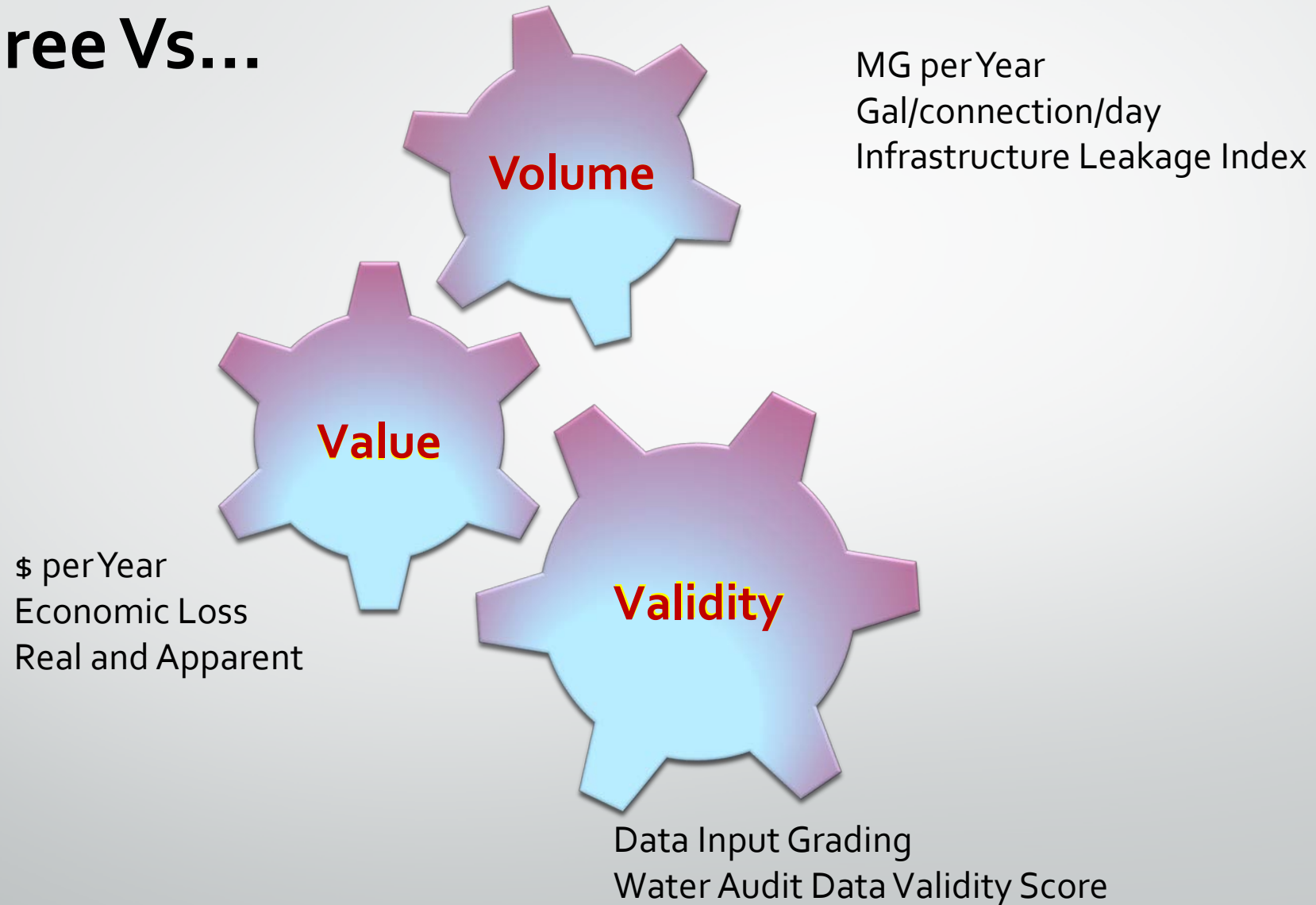
- Simple to employ and track
- Straightforward to use to set targets (despite a history of inability to motivate measurable loss reductions in water utilities)



Source: Wikiquote

How to Assess Water Loss and Its Impacts?

Three Vs...



AWWA Water Audit Method includes two % PIs *but should it?.....*

- System Attributes include:
 - Apparent loss volume
 - Real loss volume
 - Water losses
 - Unavoidable Annual Real Losses (UARL)
 - Apparent loss cost
 - Real loss cost
- Performance Indicators include:
 - Financial
 - NRW% by volume
 - NRW% by cost
 - Operational Efficiency
 - Apparent loss normalized
 - Real loss normalized (3 forms)
 - Infrastructure Leakage Index (ILI) = CARL/UARL

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Water Audit Report for: **County Water Company**
Reporting Year: **2013** | **1/2013 - 12/2013**

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AWWA Non-revenue Water Performance Indicators Task Force (PITF)

- Launched in 2015
- Goals
 - Communicate that AWWA does not have a “goal” for water utilities to achieve a certain level of losses as measured by a percentage, such as 15% UFW
 - Affirm an updated AWWA WLCC position regarding PI’s, and any continued use of percentage indicators, by **June 2019**.
 - Conduct planning for an improved system of NRW performance measurement and effective targeting that can meet the twin goals of technical rigor and ease of comprehension

AWWA NRW PITF Members

- George Kunkel, Kunkel Water Efficiency Consulting, chair
- Andrew Chastain-Howley, Black & Veatch
- Steve Cavanaugh, Cavanaugh
- Steve Davis, Metering Technology Consultants
- Will Jernigan, Cavanaugh
- Chris Leauber, W/WW Authority of Wilson County, TN
- Sofia Marcus, Los Angeles Dept of Water & Power
- David Sayers, Black & Veatch
- Brian Skeens, CH2M
- Dan Strub, City of Austin, TX
- Reinhard Sturm, Water Systems Optimization
- Gary Trachtman, Arcadis
- Alan Wyatt, Independent Consultant

International Effort

Professionals Abandon Percentages

- Effort of international water loss practitioners to advocate for the discontinued use of percentage indicators
- Have rallied 126 supporters from 22 countries who advise against using volumetric percentage performance indicators.

<http://www.leakssuite.com/kpis-fit-for-purpose/pros-abandon-percents-of-siv/>



Allan Lambert (UK)
*"the world's foremost
authority on leakage
management" is leading
this effort*

The Paradox

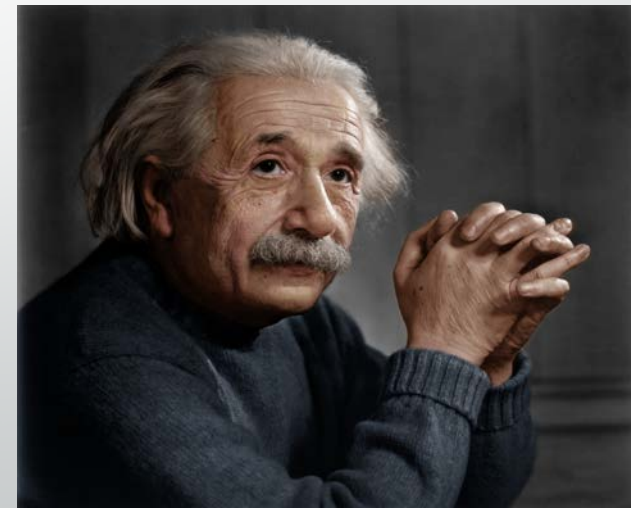
- AWWA Water Audit Methodology performance indicators *are* technically robust

but

- Percentage Indicators *appear* to be easier to understand

'Everything should be as simple as possible, but no simpler.'

Albert Einstein



Source: TheBullyPulpit

The Long-term Challenge

Targeting Loss Levels: How Low Should You Go?

- **Output PI's** need system-specific targets - not one size, fits all (as used in water quality regulations)
- Targeting should be economically based
 - Direct water production and retail costs vs. the costs of loss reduction activities
 - Indirect costs of deferring infrastructure expansion, gaining environmental improvements, assisting economic development in communities, others
- AWWA Water Audit Methodology does not currently provide an explicit, user-friendly tool to set water loss targets
- Using UFW% for targeting has been largely unsuccessful in motivating effective loss control

Both AWWA Method and UFW currently lack an effective, user-friendly targeting capability but an ideal targeting setting system will require a comprehensive system of data collection and evaluation – this will be a long-term endeavor

Some Short-term Approaches for Targeting

- Don't require all systems to meet defined low loss levels – instead assist systems that exist with very high loss levels
- The State of Tennessee – uses Data Validity Score (DVS) and percentage of NRW by Cost
- The State of Georgia/Atlanta Metro area – using Normalized PI's
 - Reduce to at least 60 gallons/service connection/day of leakage by 2025
- Take a **Process** approach rather than a strictly **Output** approach – ensure utilities take proper steps to control loss
 - Compile/Submit AWWA water audit annually
 - Require all water audits to be validated
 - Key on Data Validity Score
 - Evaluate leakage management activities

State of Tennessee

Utilities meeting below high criteria are referred to the State for specific review

- A. Incomplete AWWA water audit submitted anytime on or after January 1, 2013;
- B. Water audits for 1/1/2015 to 12/31/2016 - Validity score of 70 or less, or NRW by Cost of 25% or greater;
- C. Water audits for 1/1/2017 to 12/31/2018 - Validity score of 75 or less, or NRW by cost of 20% or greater;
- D. Water audits for 1/1/2019 to 12/31/2020 Validity score of 80 or less, or NRW by cost of 20% or greater.

Conclusion

- The “unaccounted-for” water & percentage approach should be put to rest
 - Do this before the ultimate target-setting system is in place?

OR

- Abandon percentage indicators now and employ short-term target-setting approaches?
- The AWWA WLCC will determine an updated position on Percentage Indicators by 2019
- Do you have any thoughts to provide to the WLCC?



Source: Daily Mail

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