Promoting Non-revenue Water Management in the United States: A 30-year Journey

Main Presentation

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Interdisciplinary Webinar
Reducing Leakage in a City's Water Supply System

The University of Hong Kong
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KUNKEL
WATER EFFICIENCY CONSULTING

Key Point: Reliable Data and Performance Indicators are essential to Successful Non-revenue Water Management

"For every complex problem, there is an answer that is clear, simple, and wrong"

H.L. Mencken

20th Century American Journalist

Source: Wikiquote

This applies to the use of Volumetric Percentage Performance Indicators

Unfortunately, many water US regulatory agencies use volumetric percentage indicators and regard them as:

– Simple to employ and track

– Straightforward to use to set targets, despite an inability to motivate measurable loss reductions in water utilities

The Problem with Percentages

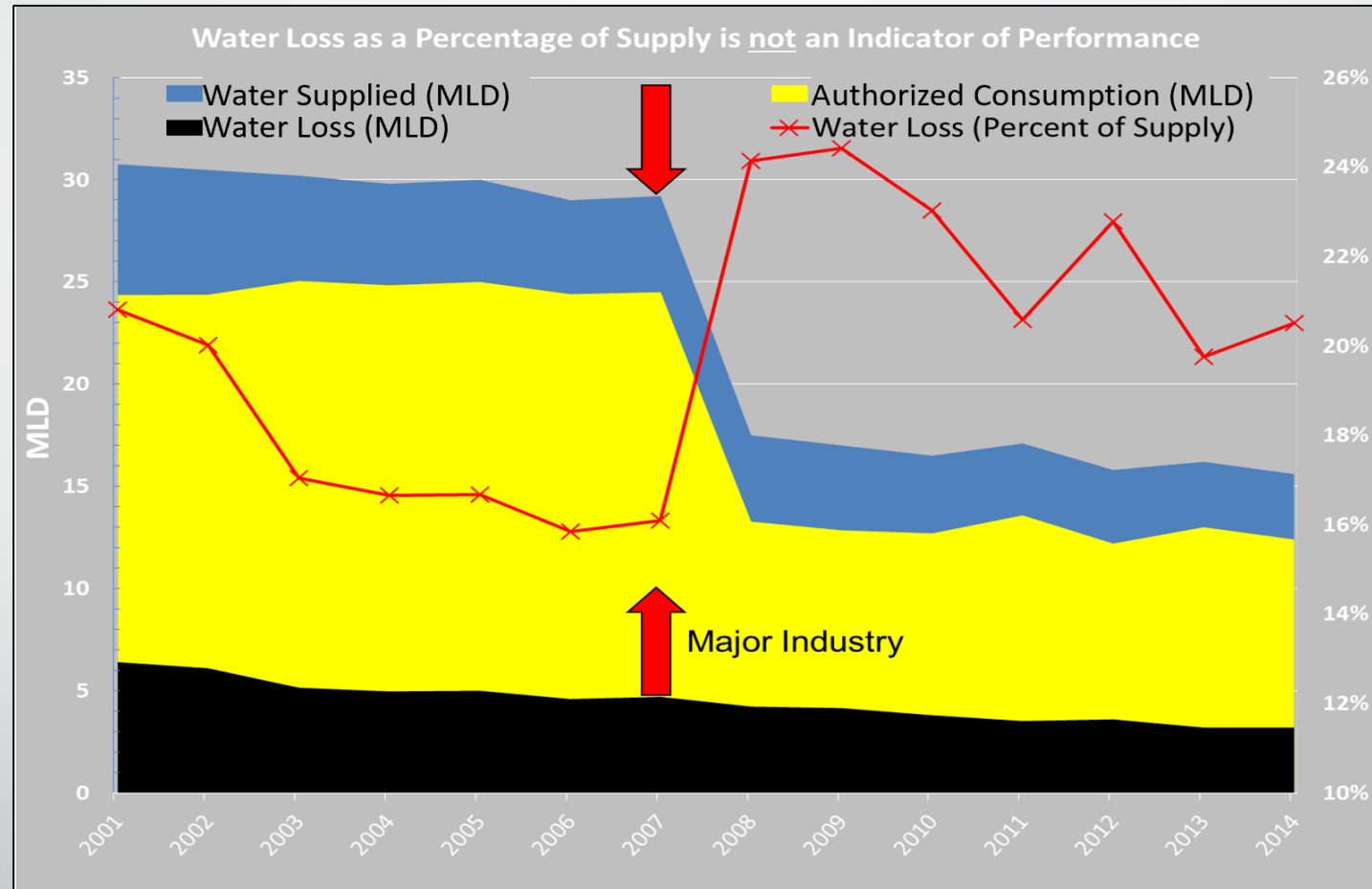**Skewed "unaccounted-for" water percentage**

An Example:

A large water-consuming industrial facility halts operations in 2007

The UFW% (**red line**) increases dramatically, but...

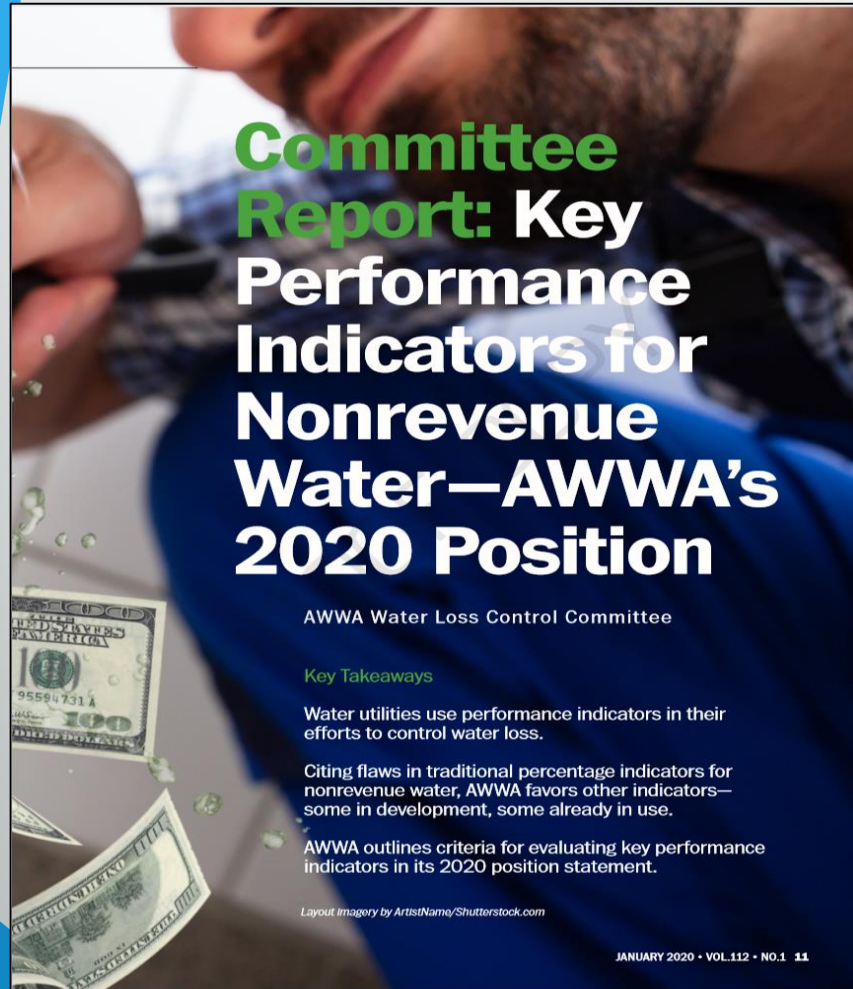*Water losses by volume (**black graph**) continue to drop!*

Thus, the UFW% misrepresents the water loss reduction that has occurred.

Industry shuts down

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

Water Supplied (MLD)
Water Loss (MLD)
Authorized Consumption (MLD)
Water Loss (Percent of Supply)

Major Industry

Courtesy of Will Jernigan, P.E. and Cavanaugh Solutions

American Water Works Association 2020 Committee Report*

Committee Report: Key Performance Indicators for Nonrevenue Water—AWWA's 2020 Position

AWWA Water Loss Control Committee

Key Takeaways

Water utilities use performance indicators in their efforts to control water loss.

Citing flaws in traditional percentage indicators for nonrevenue water, AWWA favors other indicators—some in development, some already in use.

AWWA outlines criteria for evaluating key performance indicators in its 2020 position statement.

Layout imagery by ArtistName/Shutterstock.com

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Published in *Journal AWWA*

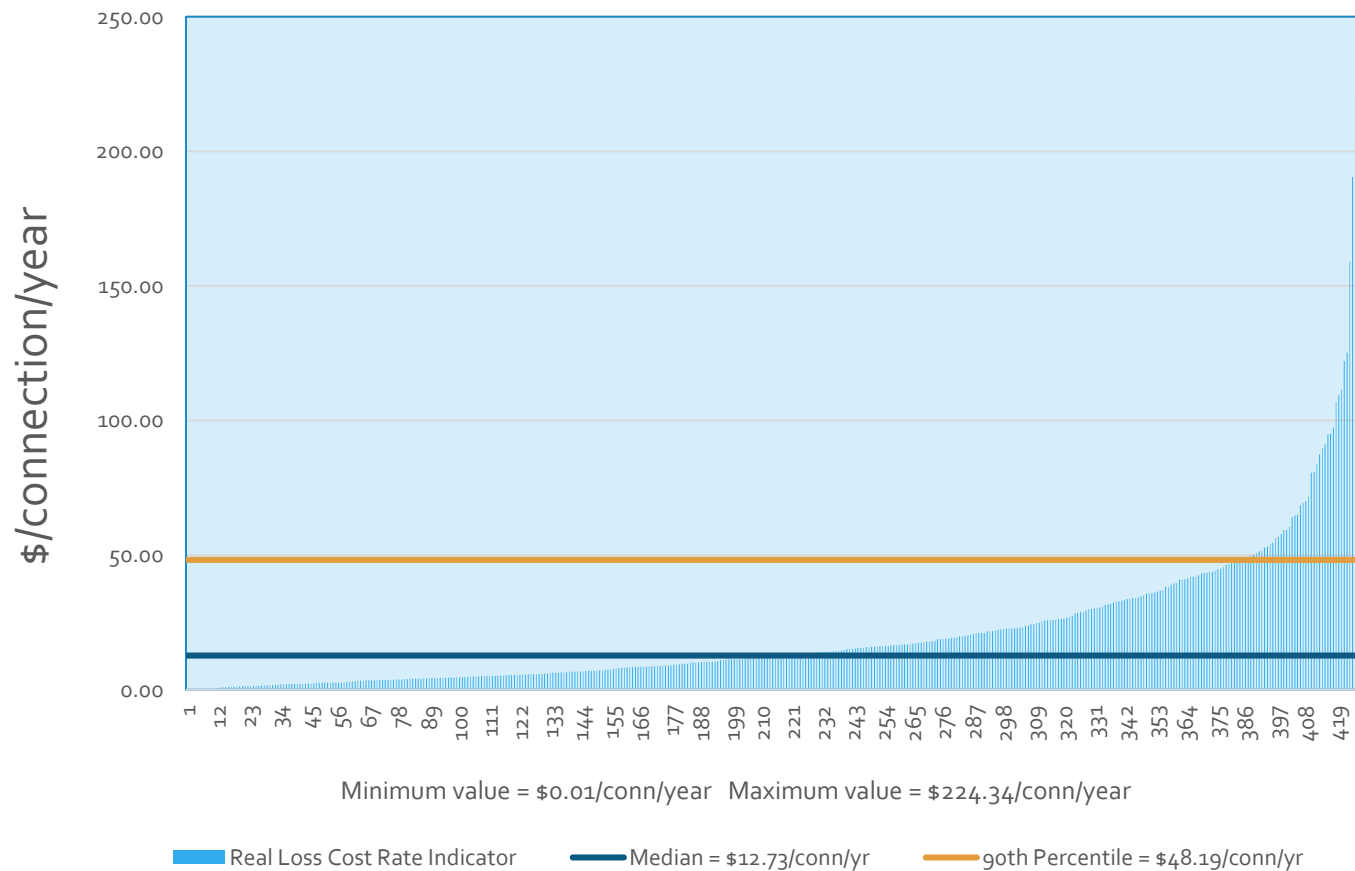January 2020

- Recommends <u>against</u> use of any form of percentage indicator

- Offers two <u>new</u> indicators:

  - **Loss cost rate**:
    Important new indicator

  - **Water losses rate**:
    A helpful secondary indicator

*Companion research report was also published

Loss Cost Rate: A New Financial Indicator

Real (Leakage) Loss Cost Rate Performance Indicator for 437 Georgia and California Water Utilities with validated Water Audit Data for 2017

Minimum value = $0.01/conn/year   Maximum value = $224.34/conn/year

Real Loss Cost Rate Indicator   Median = $12.73/conn/yr   90th Percentile = $48.19/conn/yr
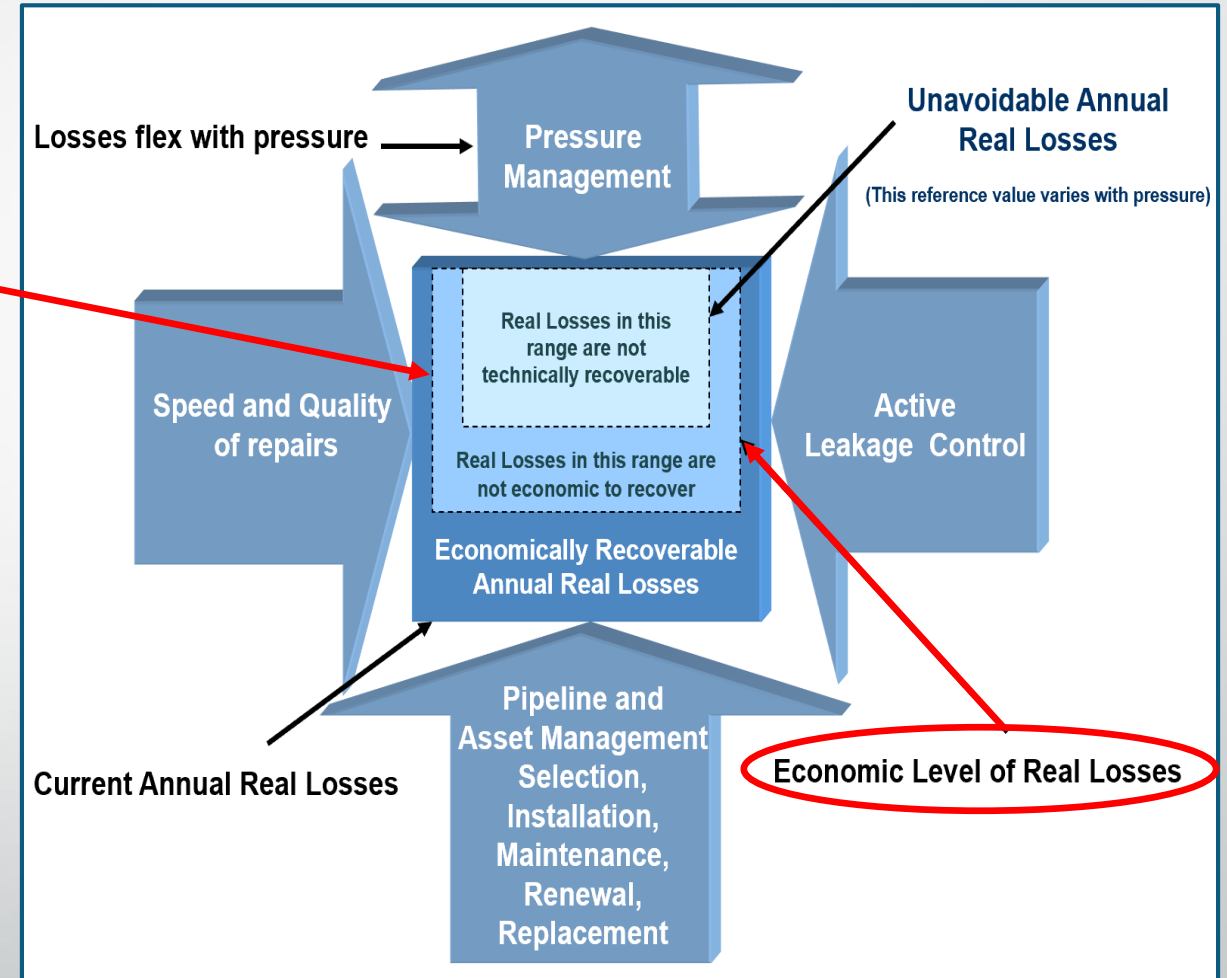
Values shown in US dollars

- Expressed in **value/ service connection/ year**

- Marries the **rate of loss** (*real* and *apparent*)

  with

- The **unit cost of the loss** (variable production cost for real loss; retail cost for apparent loss)

  – Reveals the impact of changing annual loss <u>and</u> cost values

  – Good public relations value, by giving cost impact on a "per customer" level

  – Strong "out-of-bounds" indicator that flags utilities with very high values

  – <u>Not</u> appropriate to use to set optimally low loss targets in water utilities
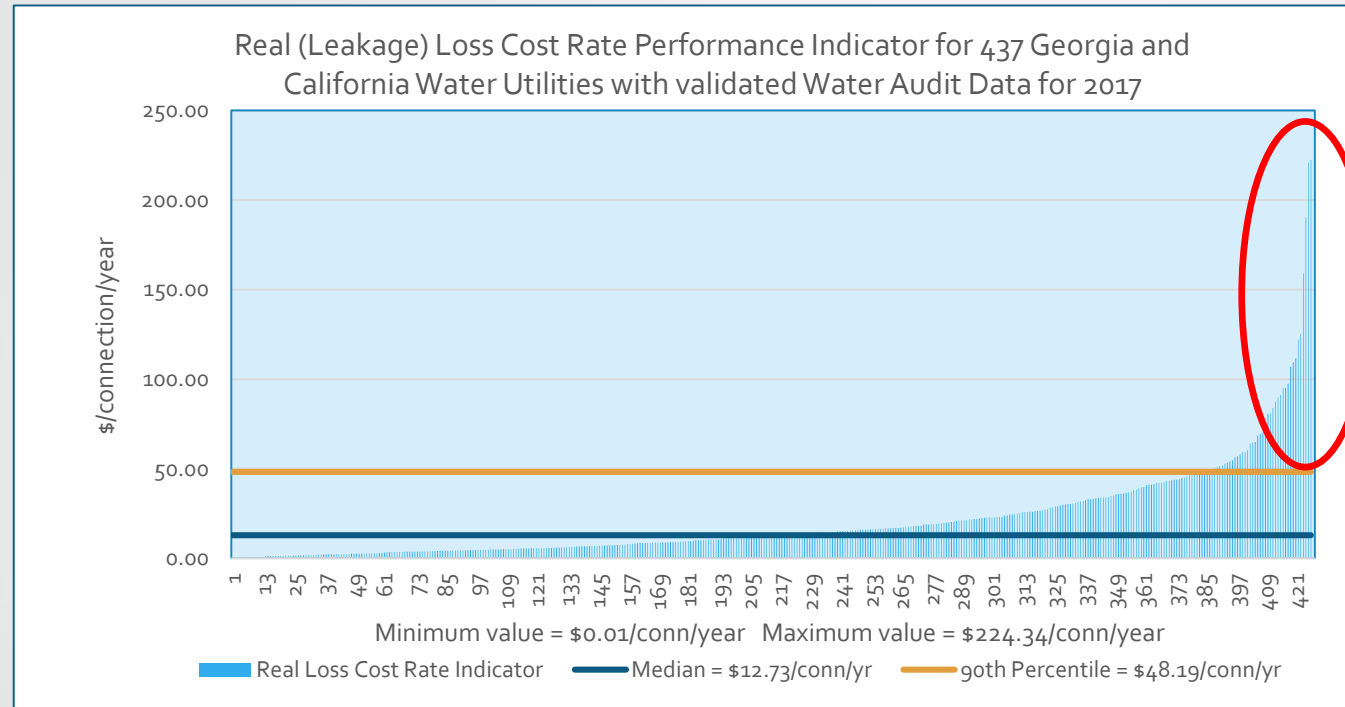
Setting NRW Reduction Targets – How Low to Go?

Best Approach

- Seek an **Economic Level of Loss**: Real (leakage) losses shown

- Assessment is data intensive: It needs reliable data on losses and costs

- *This could be an appropriate approach for large systems like Hong Kong*

USA NRW Reduction Target-setting: a different approach – for now

Real (Leakage) Loss Cost Rate Performance Indicator for 437 Georgia and California Water Utilities with validated Water Audit Data for 2017

Minimum value = $0.01/conn/year   Maximum value = $224.34/conn/year

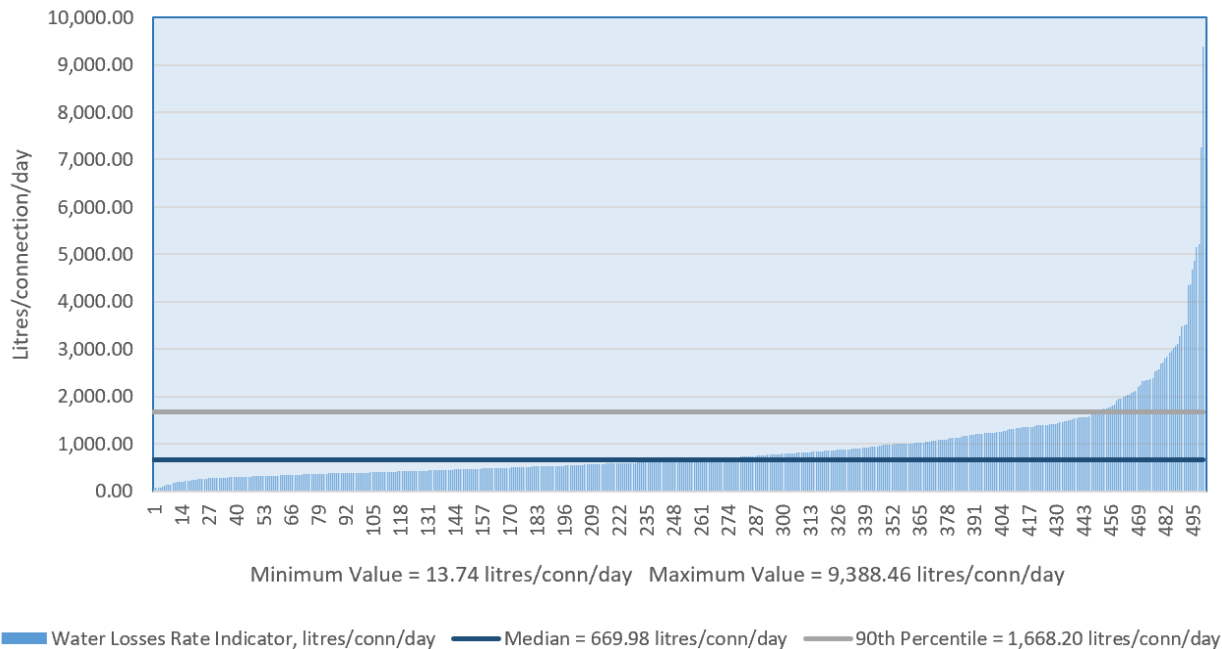Real Loss Cost Rate Indicator   Median = $12.73/conn/yr   90th Percentile = $48.19/conn/yr

Values shown in US dollars

- Many systems: Widely ranging capabilities and limitations

- Status: Early in NRW Management, need focus on data gathering

- Targeting may best focus on system with the highest losses – possibly above 90th percentile – for now

- Loss control is likely to be economic for these systems given high losses and/or costs

Water Losses Rate: a Good Trending Indicator

Water Losses Rate Performance Indicator for 502 Georgia and California Water Utilities with Validated Water Audit Data for 2017

Minimum Value = 13.74 litres/conn/day   Maximum Value = 9,388.46 litres/conn/day

Water Losses Rate Indicator, litres/conn/day — Median = 669.98 litres/conn/day — 90th Percentile = 1,668.20 litres/conn/day
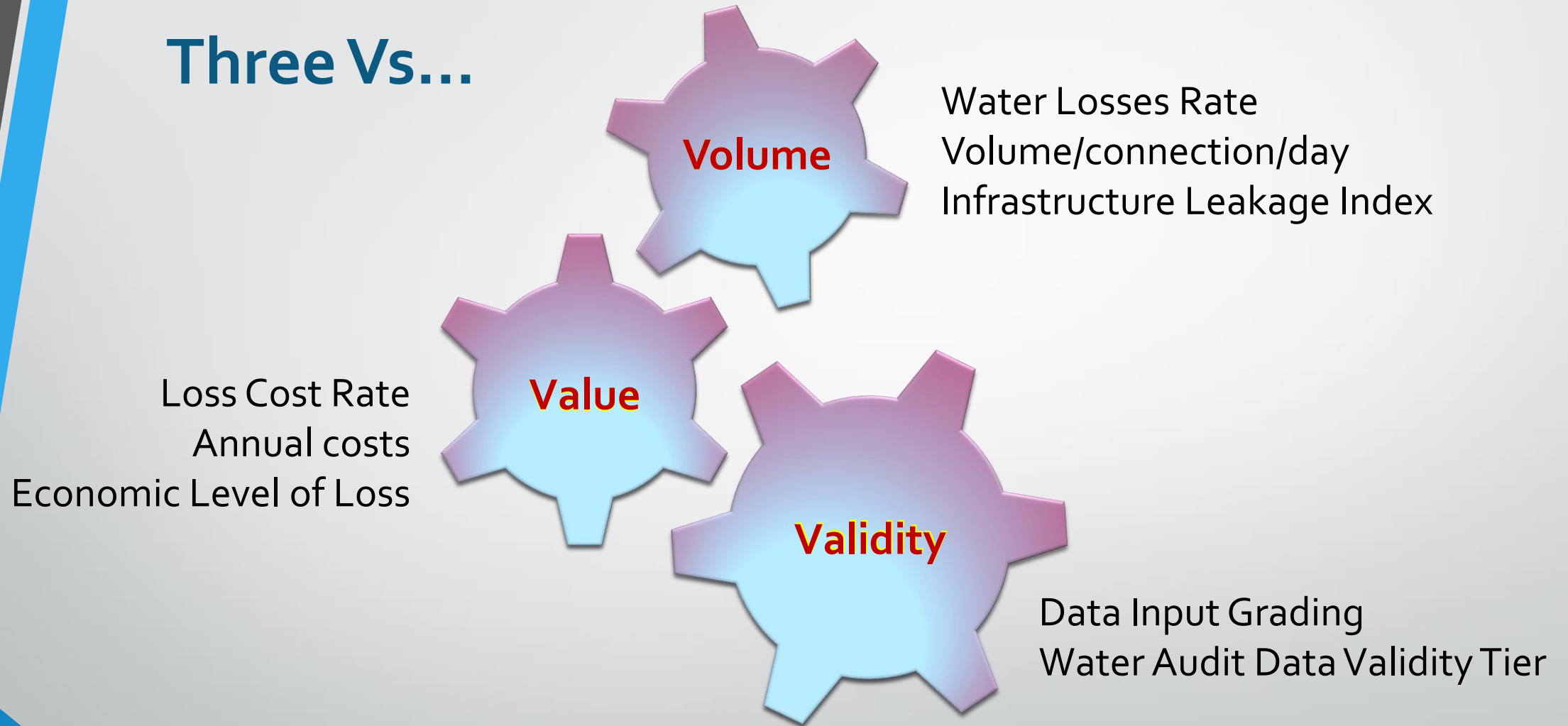
- Water Losses = real loss + apparent loss; expressed in **volume/ service connection/ day**

- High-level indicator for trending year-to-year losses

- Assists data validation; better insight to sharp changes in real or apparent losses

- Don't use in "stand-alone" fashion; best to use in tandem with apparent and real loss rate indicators. WLR alone is not actionable; its components include water that is *physically lost* (real losses) and water *not physically lost* but under-billed (apparent losses)

- **Do not use for target-setting**. Instead, targets can be set using the Apparent Loss Rate and the Real Loss Rate

How to Assess Water Loss and Its Impacts?

Three Vs…

Volume

Water Losses Rate
Volume/connection/day
Infrastructure Leakage Index

Value

Loss Cost Rate
Annual costs
Economic Level of Loss

Validity

Data Input Grading
Water Audit Data Validity Tier

AWWA Key Performance Indicators – *more than one exists!*

| AWWA Recommended Water Loss Performance Indicators – Fit for Multiple Purposes and Users									
Type	Indicator	Description	Suitable Purposes					Limitations Needing Further Data Collection and Assessment	Principal Users
			Assess-ment	Bench-marking	Target-Setting	Plan-ning	Track-ing		
Volume	Apparent losses (vol / conn / day)[1]	Strong and understandable indicator for multiple users	✓	✓	✓	✓	✓		Utilities Regulators
	Real losses (vol / conn / day)	Strong and understandable indicator for multiple users	✓	✓	✓	✓	✓		Utilities, Regulators, Policy Makers
	Real losses (vol / pipeline length / day)	Strong and understandable indicator for use by utilities with low connection density	✓	✓	✓	✓	✓	Data collection and assessment of the level of "low" connection density	Utilities, Regulators, Policy Makers
	Total Water losses (vol / conn / day)	Strong and understandable indicator; suitable for high-level performance measurement	✓	✓			✓		Utilities, Regulators, Policy Makers, Customers
	Real losses by pressure (vol / conn / day / pressure unit)	Robust but specialized indicator; technical rigor may be influenced by network materials.	✓	✓		✓	✓	Data collection and assessment of the use and applicable context(s) in NA	Utilities
	Infrastructure Leakage Index (ILI)	Robust but specialized ratio indicator, which can be influenced by pressure and connection density.	✓	✓			✓	Data collection and assessment for guidance on wide use in NA	Utilities
Value	Apparent Loss Cost Rate (value / conn / year)	Indicators with sufficient technical rigor. Provide the unit financial value of each type of loss, which is very useful for planning and assessment of cost efficiency of water loss reduction and control interventions and programs.	✓			✓	✓	Data collection and assessment on AWWA indicators or contextual parameters to use in conjunction with Loss Cost Rates	Utilities, Regulators, Customers
	Real Loss Cost Rate (value / conn / year)		✓			✓	✓		Utilities, Regulators, Customers
Validity	Data Validity Tier (DVT)[2]	Strong indicator of water loss audit data quality, if data has been validated. Tier provides guidance on priority areas of activity.	✓	✓		✓	✓		Regulators, Utilities

Notes: 1. Blue shading highlights real losses, green shading highlights apparent losses.
2. Data Validity Tier is a band-type grouping of Data Validity Scores: Tier I: DVS=0-25; Tier II: DVS=26-50; Tier III: DVS=51-70; Tier IV: DVS=71-90; Tier V: DVS=91-100

Best to employ several indicators – using a single number is limiting

Implementing Improved Methods

- Improved regulatory structures in several states

  - Georgia & California are leaders

  - Annual water audits are required and are validated

  - Moving toward loss reduction targeting
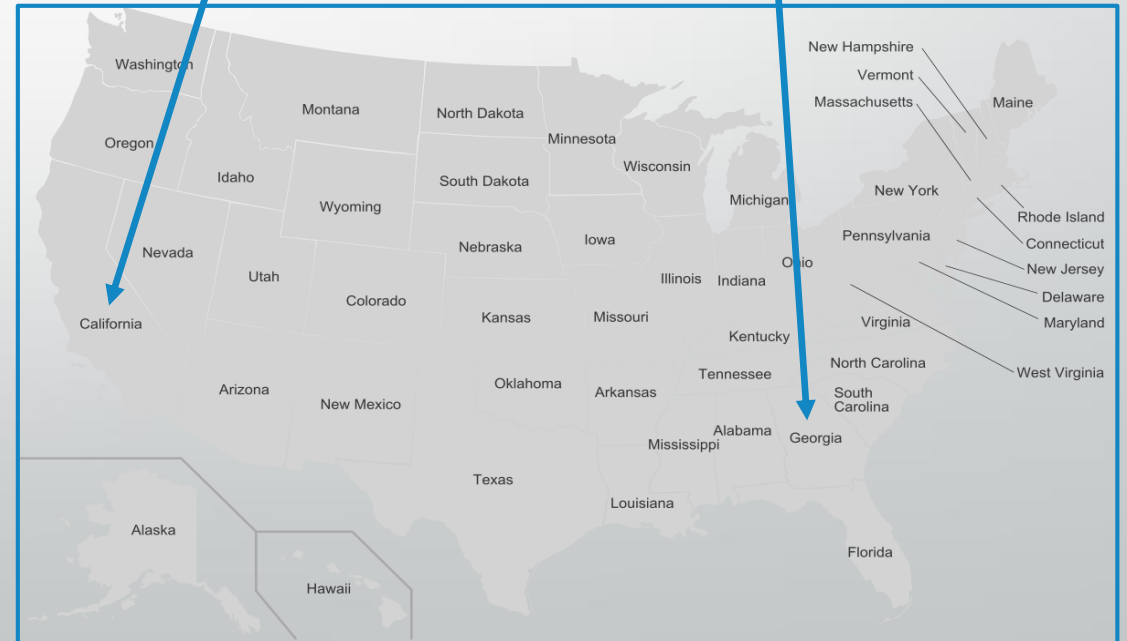
Progressive Water Utilities: Success in Reducing NRW

Los Angeles Department of Water and Power
(Los Angeles, California)

One of the largest water supply systems in the United States supplying 1.63 million cubic metres per day to over 4 million people

Halifax Water
(Halifax, Nova Scotia, Canada)

Coastal city with varying elevations and topography similar to Hong Kong

Reliable Data and Strong Performance Indicators are key!
Looking ahead..........

- **Drivers for improved water efficiency**
  - Water shortages and scarcity: Climate change
  - Water supply infrastructure decline
  - Funding gaps: optimizing revenue capture

- **The Way Forward**
  - Additional regulatory requirements?
  - Further implementation of new technologies?

- **The Future**
  - Managed low levels of non-revenue water?

    or

  - A struggling water future?

Predicting the future?
We may need a magical crystal ball!
Source: PolicyMed.com