# Leakage management benchmarking – a comparison of utility performance, investment, and best practices

Gary Wyeth

Senior Consultant, Isle Utilities

IWA the international water association
WATER LOSS SPECIALIST GROUP

# Agenda

# 1.

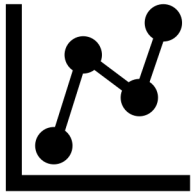
# Leakage Management Benchmarking

# PROGRAM OVERVIEW

# Program Overview – Objectives

Objectively assess performance and maturity in non-revenue water management

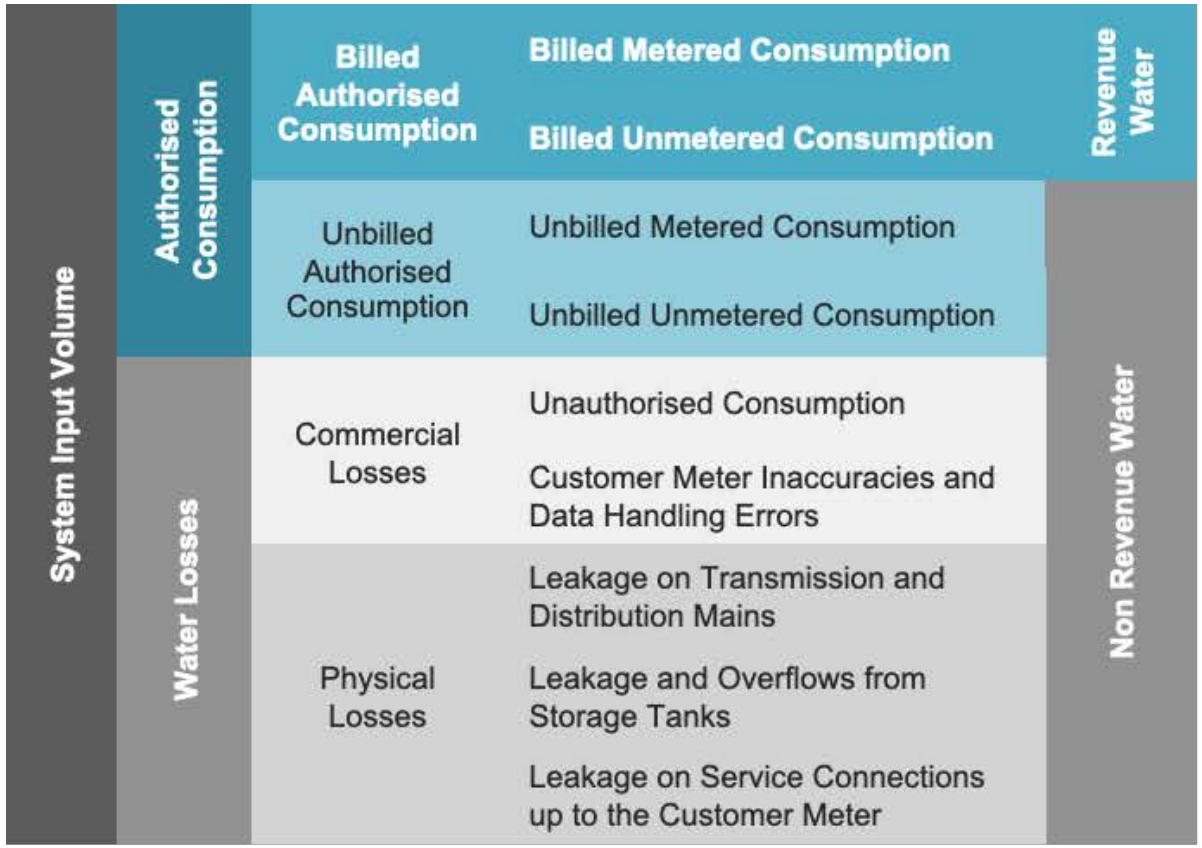
Access and share international innovation and best practice



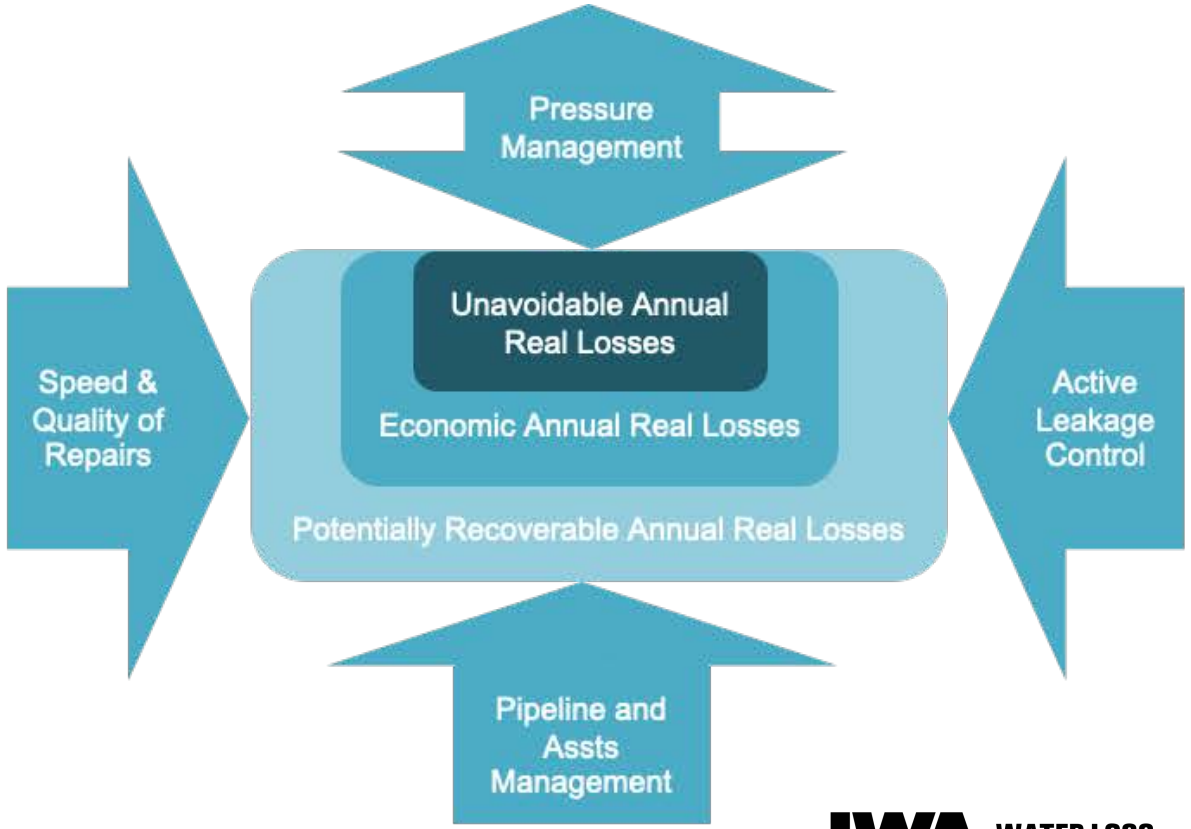
Customise improvement pathways for participants

# Program Overview – Data Sources

***Part 1:*** *Comparing practices in calculating and managing the Non-Revenue Water (NRW) Balance*



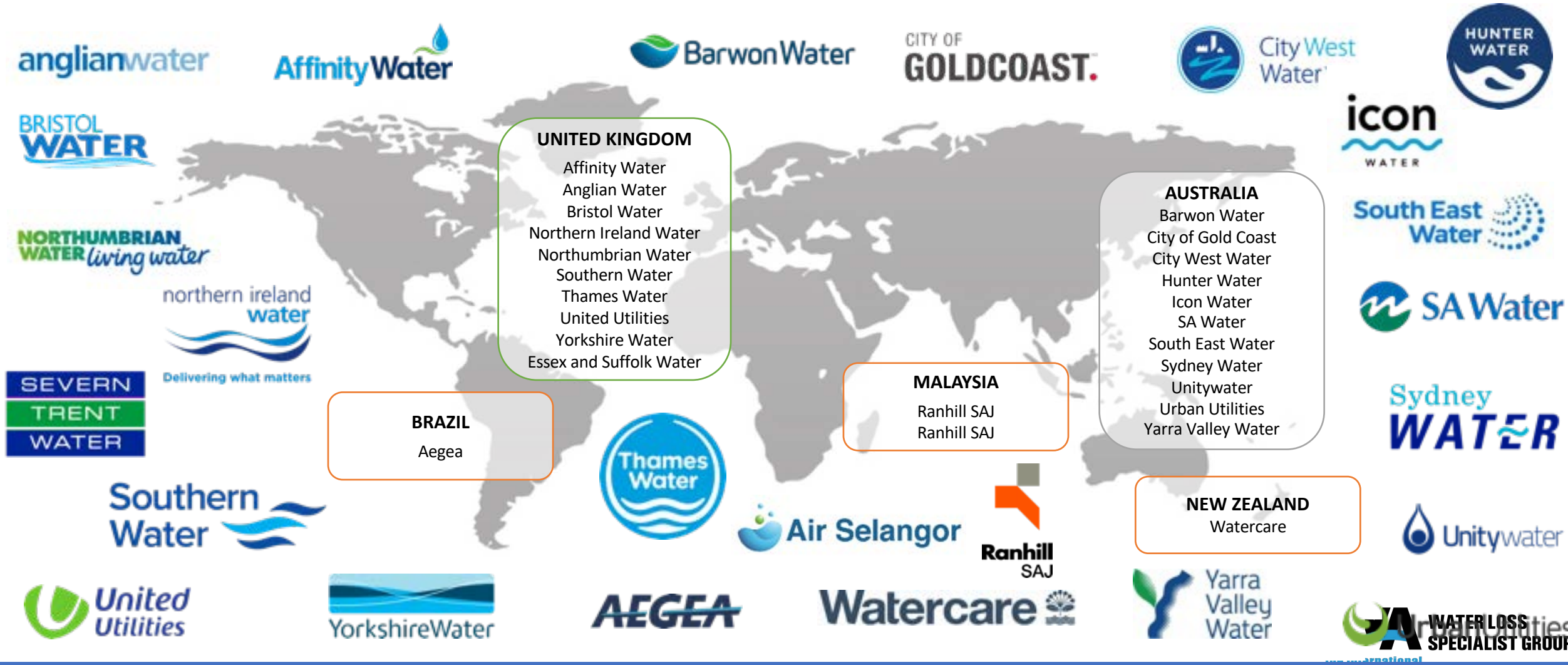

***Part 2:*** *Comparing practices in utilisation of the Four Pillars of Leakage Management*




IWA WATER LOSS SPECIALIST GROUP
the international water association

# Program Overview – Peer Group to date

- Since 2020, 25 utilities have participated in Isle's LMBM Program; from Australia, Brazil, Malaysia, New Zealand and the United Kingdom.



# Program Overview – Best Practice Workshop


- Workshops included participants from 21 utilities (approximately 100 x attendees)
- Best Practices shared from Australia, Malaysia, New Zealand and the United Kingdom
- 18 technology and 40 process Best Practices compiled into a compendium, accessible to all participants

IWA WATER LOSS SPECIALIST GROUP
the international water association

# 2.

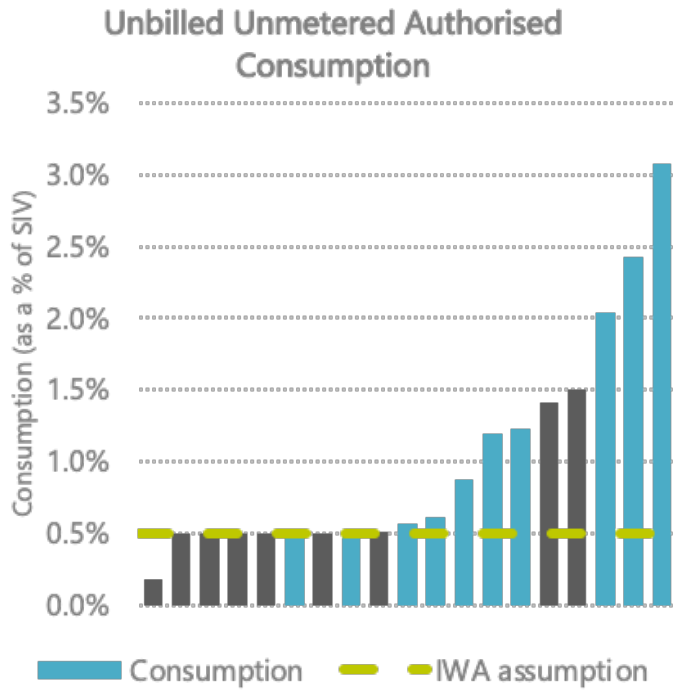
# Leakage Management Benchmarking

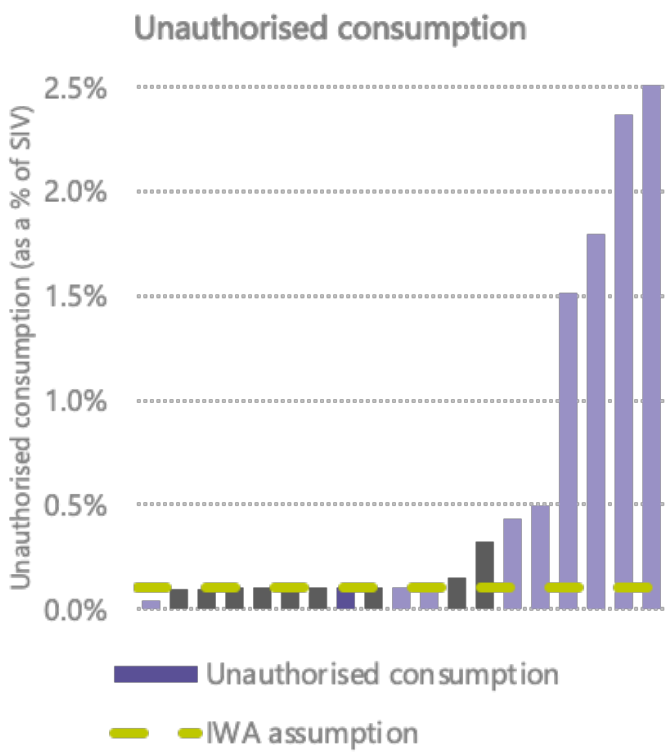
# PROGRAM INSIGHTS AND BEST PRACTICES

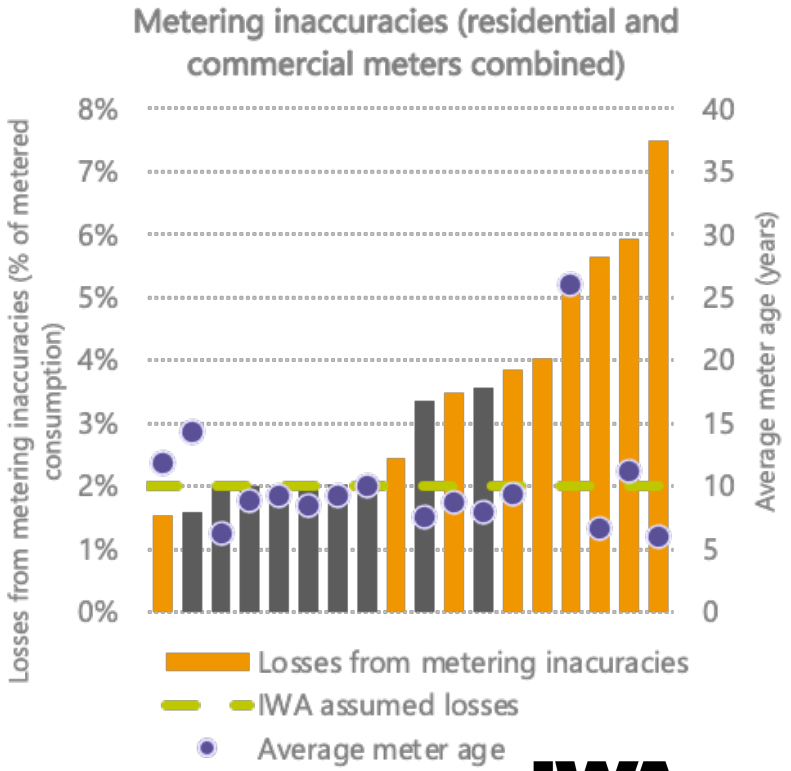
IWA WATER LOSS SPECIALIST GROUP
the international water association

# Program Insights – IWA Balance

- Varying levels of confidence in the accuracy of NRW values for Unbilled Authorised Consumption and Unauthorised Consumption.
- Many Australian utilities use IWA assumptions whilst UK utilities use internally developed figures (due to regulatory reporting requirements).
- IWA assumes 0.1% of the system input volume can be assigned to theft – measured figures are much larger than that!




WATER LOSS SPECIALIST GROUP
the international water association

# Case Study – Yorkshire Water, UK

| Network: | Ofwat Utilities (England and Wales) as presented by Yorkshire Water | Services: | Integrated water/wastewater, bulk water | Connections: | ~1.2m | SIV: | ~456 GL |
|---|---|---|---|---|---|---|---|

**About:**

The economic regulator of the water sector in England and Wales (**Ofwat) requires that water companies quantify all components of the standard International Water Association (IWA) water mass balance. This process typically results in companies using figures higher or lower as applicable than the standard IWA figures** for Unbilled Unmetered Authorised Consumption (0.5% of SIV), Unauthorised Consumption (0.1% of SIV) and Customer Metering Inaccuracies (2% of residential metered consumption). Yorkshire Water considerations are captured in the **Table** below. **The Ofwat approach requires that:**

- **Any imbalance (positive or negative) must be reconciled**
- **Imbalance must be <5% of distribution input**
- **Reconciliation must take place to produce regulatory reported components (e.g. Per capita consumption, Leakage)**

**Table: Bottom up NRW balance considerations at Yorkshire Water**

| Unbilled Authorised Consumption | Apparent Losses | Current Annual Real Losses |
|---|---|---|
| **Unbilled Metered Consumption**<br>• Company own use at sites<br>• Free metered supplies to steelworks<br>• 3rd party metered standpipe usage<br>**Unbilled Unmetered Consumption**<br>• Free supplies – e.g. water donations to vulnerable customers<br>• Firefighting usage – assumptions using quarterly data from 4x regional fire services<br>• Free unmetered supplies to farms – assumptions made regarding usage & PCC<br>• Operational water usage – routine and proactive flushing, reservoir sampling and cleaning<br>• Losses from 3rd party bursts | **Unauthorised Consumption**<br>• Occupied voids incl. internal losses<br>• Residential – c.30% vacant, c.45% occupied<br>• Businesses – conservative estimates for high-risk voids<br>• Illegal connections – connected properties not in billing system<br>• Illegal hydrant use<br>**Customer Metering Inaccuracies**<br>• Meter under registration (MUR):<br>o WRC independent study to assign MUR% across cohorts of meters (size, consumption, age)<br>o MUR figure for each consumption type (residential, business) | **Service Reservoir leakage**<br>• Annual drop tests, minor component<br>**Trunk Main leakage**<br>• Representative sample of trunk mains<br>o Daily flow balances available<br>o Scaled to full network with statistical treatment of outliers<br>**DMA leakage**<br>• Area flows measured at night, with deduction for:<br>o Residential consumption (using sample)<br>o Business consumption (logged users, plus sample)<br>• Includes supply pipe leakage (between service pipe and property boundary) |

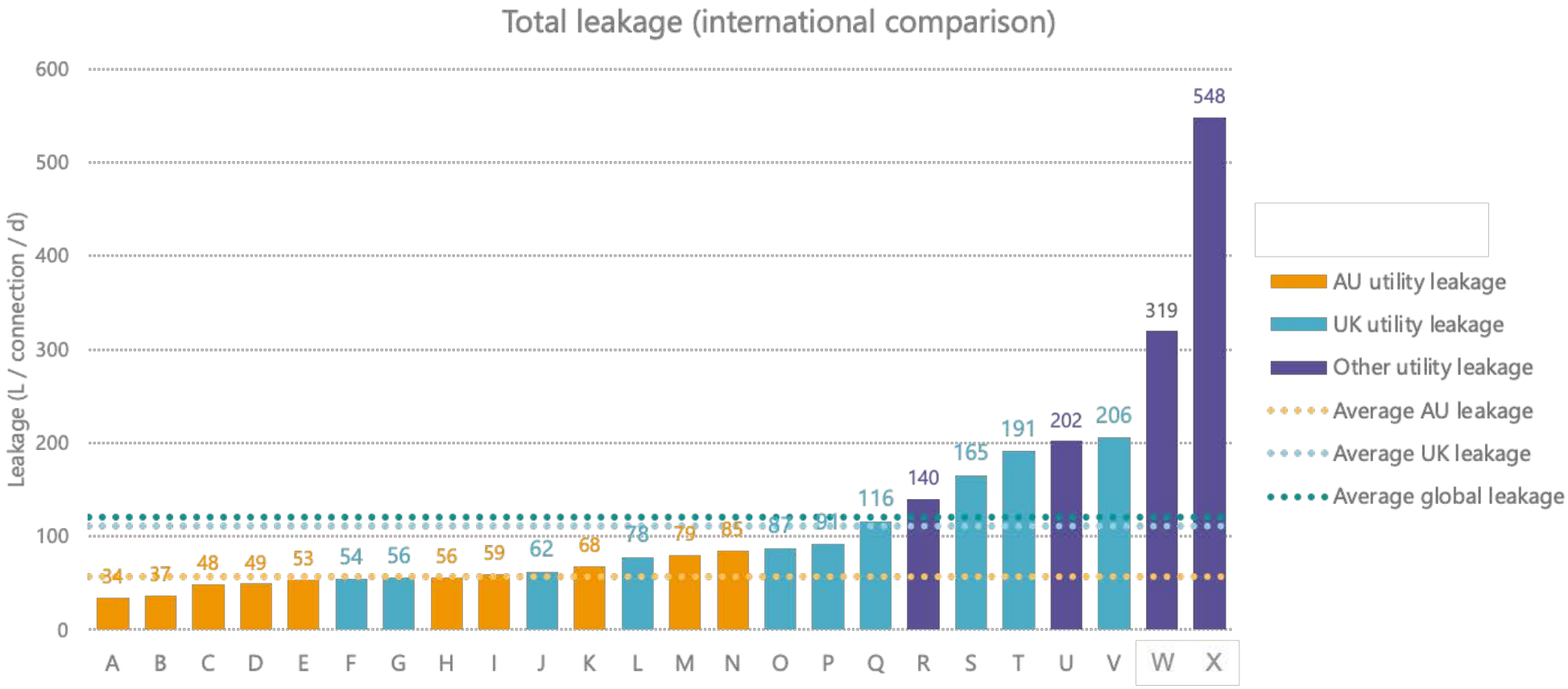
**Benefits:**

Water balance reconciliation drives UK water companies to account for NRW and **has driven companies to undertake 'Data Improvement' programmes to improve the robustness of their water balances**

IWA WATER LOSS SPECIALIST GROUP
the international water association

# Program Insights – Real Losses

- Younger asset base results in lower Real Losses for Australian utilities.
- Some using the UK Background and Bursts Estimates (BABE) Model to estimate real losses.

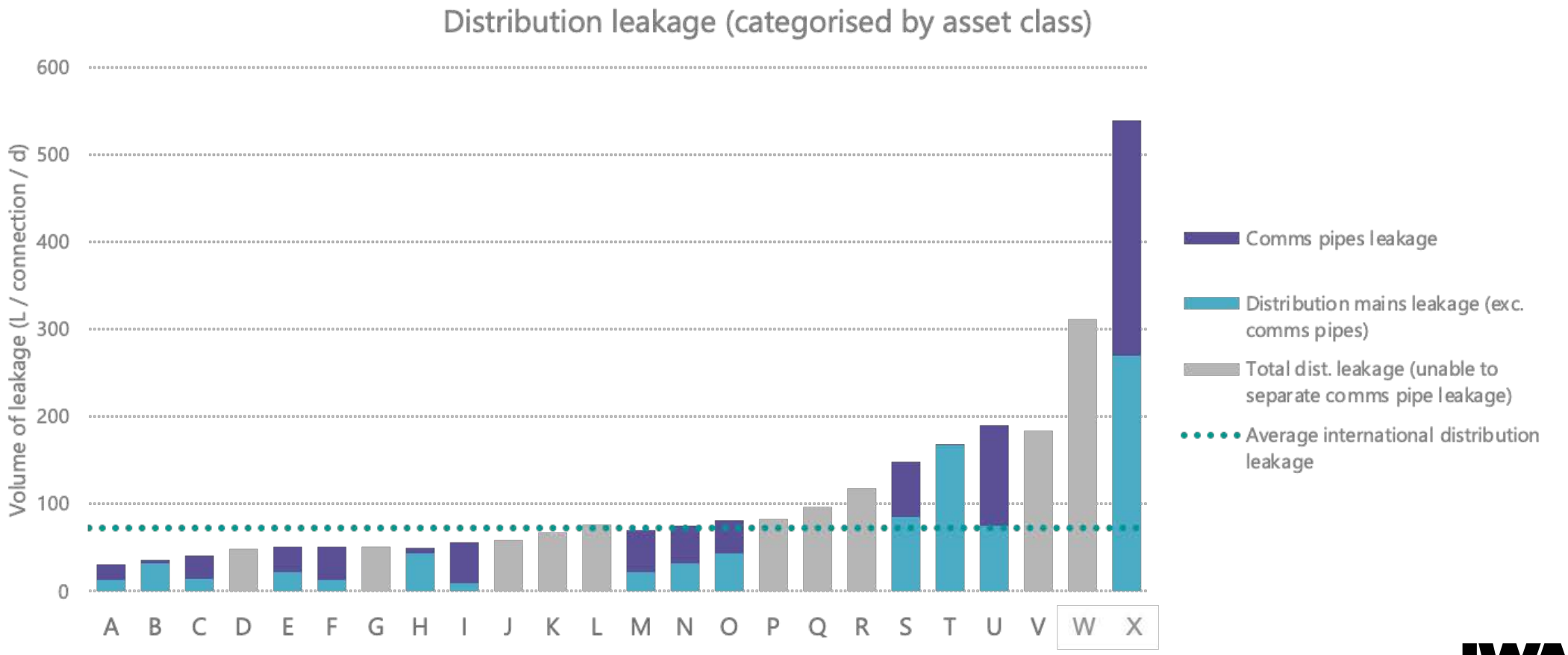





IWA WATER LOSS SPECIALIST GROUP
the international water association

# Program Insights – Real Losses

- Leakage events are predominantly in services, where premature failure of material and little knowledge of these assets has increased event numbers for some utilities.



# Case Study – Unitywater, Australia

| Network: | Unitywater | Services: | Water/wastewater, retailer | Connections: | ~260k | SIV: | ~66GL |
|---|---|---|---|---|---|---|---|

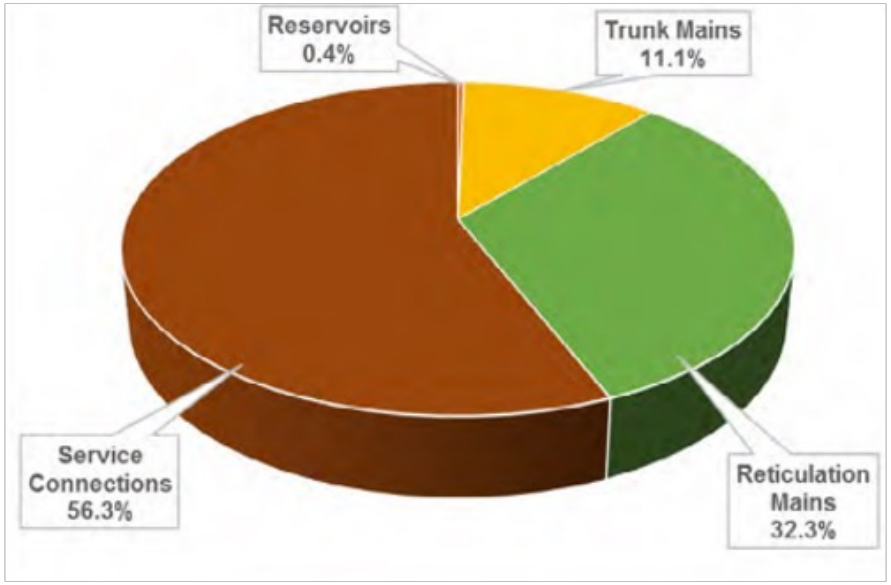
**About:**

Traditionally, water utilities have used rough estimates for determining how their Real Losses are distributed across their assets (e.g. using industry-standard distributions, or estimating a distribution based on length of mains and/or burst rates). However, the distribution of Real Losses across different assets is dependent on a large number of variables and can vary significantly between utilities.

**Unitywater undertook a bottom-up analysis of leakage across their assets (reservoirs, trunk mains, distribution mains, and service connections),** where leakage was classed as (1) reported leakage (i.e. visible leaks reported to the utility); (2) unreported leakage (i.e. detectable only by active leak detection (ALD)); and (3) background leakage (small, undetectable leakage that persists until it worsens to the point of being detectable by ALD.

**Unitywater ensured that operational crews were recording the estimated reported leakage and set out to determine the level of unreported leakage using significant levels of ALD. The results of this significantly changed Unitywater's understanding of which assets contributed the most to Real Losses. E.g. Distribution mains contribute 44% of reported leakage by volume but only 32% of leakage volume in the bottom-up analysis** (see **Figure**).

***Figure:** Unitywater Real Losses from Various Components of Water Supply Network*




**Benefits:**

- **Improved understanding of where Real Losses are occurring**. This is due to better information about smaller leaks rather than using industry-generalised assumptions of where losses are occurring or only using reported leakage.
- Greater understanding of the water supply network to help **inform utilities in their leakage management decision-making.**

**Considerations:**

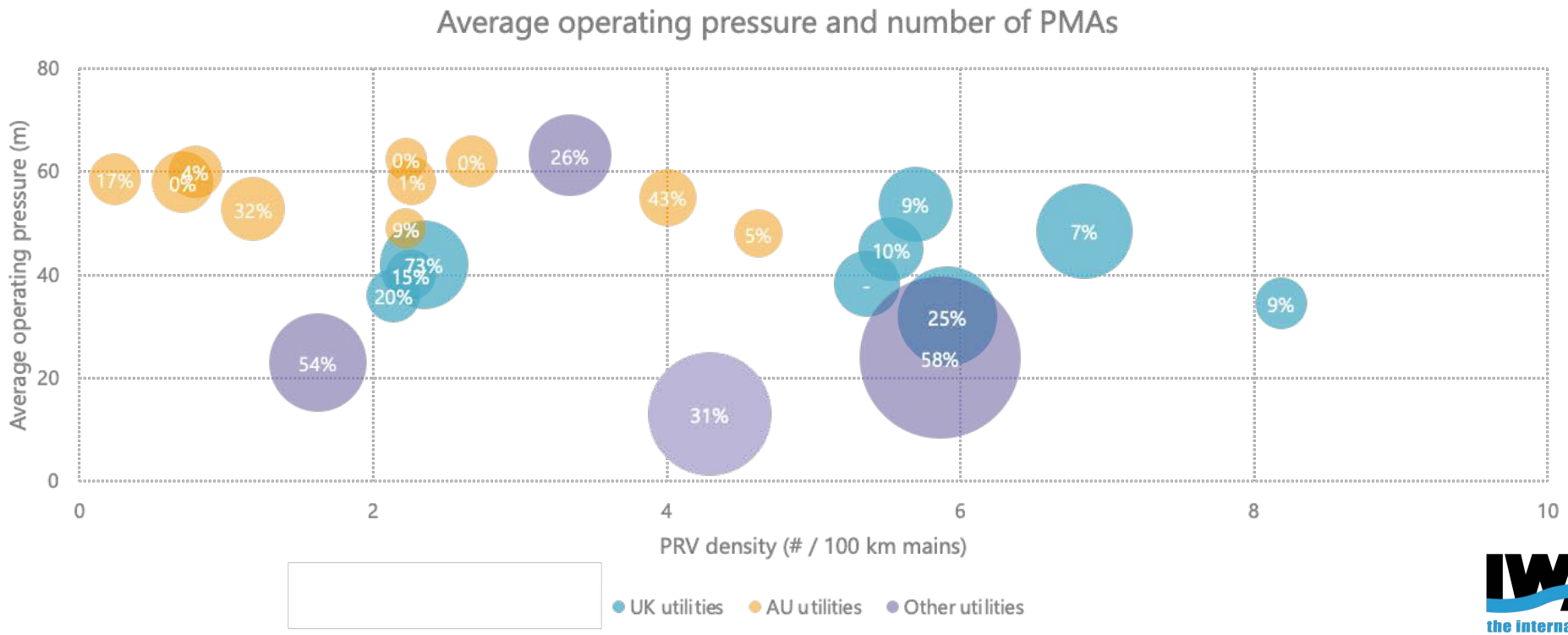
Significant active leak detection is required across the majority of the network in order to determine an accurate estimate of unreported leakage.



IWA WATER LOSS SPECIALIST GROUP
the international water association

# Program Insights – Pressure Management

- UK utilities generally have a history of higher investment in Pressure Management than Australian utilities, which is evident in consideration of their density of PRVs and DMAs.
- UK utilities have higher applications of technology (e.g. remote-controlled PRV technologies), with investment yet to progress beyond mostly fixed outlet PRVs within Australian utilities. The UK companies have cited performance improvements through using remote-controlled PRVs to respond to emergency requirements and in managing fire flows.

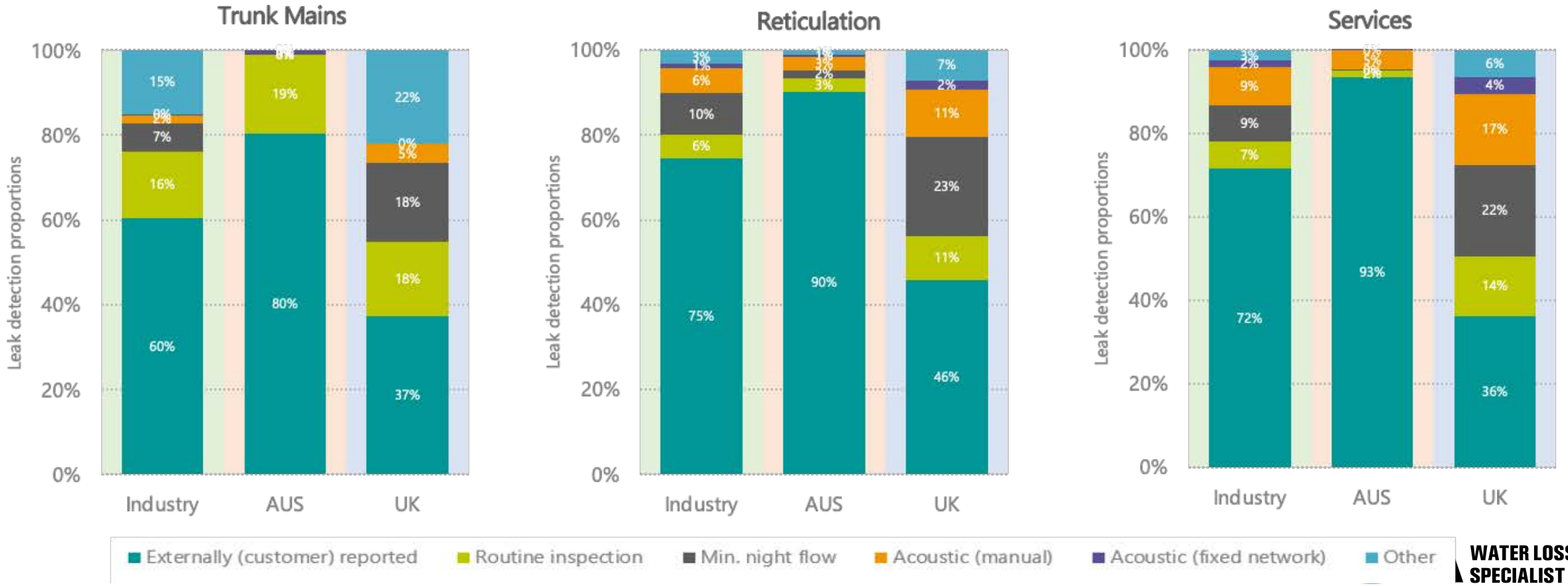





WATER LOSS SPECIALIST GROUP
the international water association

# Program Insights – ALD

- UK utilities generally adopt a much higher penetration of technology for the identification of Transmission, Distribution and Service Connection assets.
- Australian utilities have a higher reliance on customer reporting of leaks in comparison to UK peers, with limited deployment of technology.




WATER LOSS SPECIALIST GROUP
the international water association

# Case Study – United Utilities, UK

| Network: | United Utilities | Services: | Integrated water/wastewater, retailer | Connections: | 2.9 M | SIV: | 660 GL/yr |
|---|---|---|---|---|---|---|---|

**About:**

United Utilities (UU) was looking for a **step-change improvement in order to meet a target of 15% reduction in leakage.** A multi-pronged approach was implemented, beginning with studies, pilots, and trials to inform UU's strategy. This included **fast logging for night use, acoustic loggers, satellite technologies, sniffer dogs, and remote pressure control.**

A significant part of UU's strategy was the use of acoustic leak detection. As part of Phase 1 (2019), **46,000 loggers were installed in select DMAs accounting for 10% of UU's network** (refer TP4 in Appendix C for technology). In 12 months, 10,000 alarms were analysed and 7,281 leaks were raised (accounting for 24% of leaks in the DMAs with loggers). **This was accompanied by the development of a formal Leakage Apprenticeship Scheme, and hiring of over 20 new apprentices.**

**Phase 2 of UU's plan includes the deployment of more acoustic loggers, the development of automated analysis of alarms, and automated detection of leak size.** UU have noted that maintenance of the loggers and management of data from the loggers is of critical importance to the continued success of this program.

**Benefits:**

- **7,281 leaks raised (from 10,000 alarms)**
- **Acoustic loggers accounted for 24% of detected leaks** (in DMAs where the loggers were installed)
- **12 ML/d reduction in DMA leakage** (~14% in logged DMAs) (**expected to increase by an additional 17 ML/d in Phase 2 of the project**)
- 12% of DMAs are now below their historic minimum leakage levels.

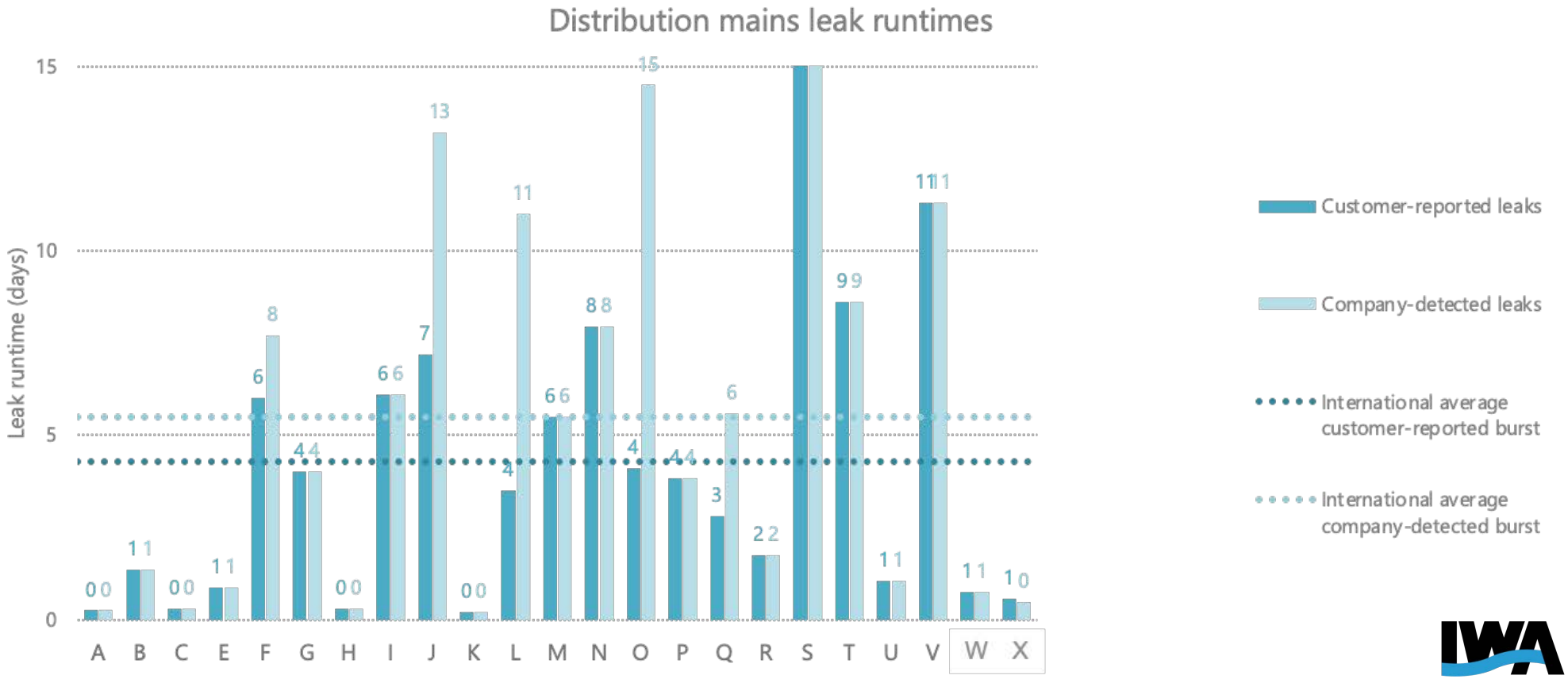
**Considerations:**

- Significant investment required to get enough acoustic loggers
- Additional technical training is required for operational staff

IWA WATER LOSS SPECIALIST GROUP
the international water association

# Program Insights – Speed & Quality of Repairs

- Australian utilities adopt high prioritisation of mains and services leak approaches, with repair performance reinforced through tight contract management of outsourced service providers, leading to high quality and very quick response and repair times.
- Many UK utilities noted significant delays encountered in arranging access to assets with third parties.






WATER LOSS SPECIALIST GROUP
the international water association

# Case Study – City West Water, Australia

| Network: | City West Water | Services: | Water and wastewater retailer | Connections: | ~320k | SIV: | ~115 GL |
|---|---|---|---|---|---|---|---|

**About:**

**In response to the Millennium Drought (1997-2009),** City West Water undertook a variety of initiatives to optimise contract management processes and associated leakage response prioritisation in order to enhance responsiveness and speed in rectification of network leaks.

The terms of City West Water's maintenance contract renewal included **a re-prioritisation of all leakage events across the network (e.g. transmission/distribution mains and service connections) to the highest two levels of priority in response (i.e. P1 and P2 in alignment with the Essential Service Commission's definitions).**

Burst and/or leak work orders are received into City West Water's maintenance delivery mobility system, then jobs dispatched to the maintenance contractor's supervisor for assessment and actioning for repair. **The maintenance contract has strong KPIs to drive and monitor commitment to the prioritisation of leakage repairs.**

**Benefits:**

**1. Working together to achieve efficiency gains**

2. Shared mobility system to enable smooth dispatch and assessment process

3. **KPI applied to prioritise leakage repairs and reduce leak run time**

4. The development of KPIs enabled appropriate resource level to meet the activities requirement.

5. **Minimize water loss and non-revenue water**

6. Achieve better customer outcomes

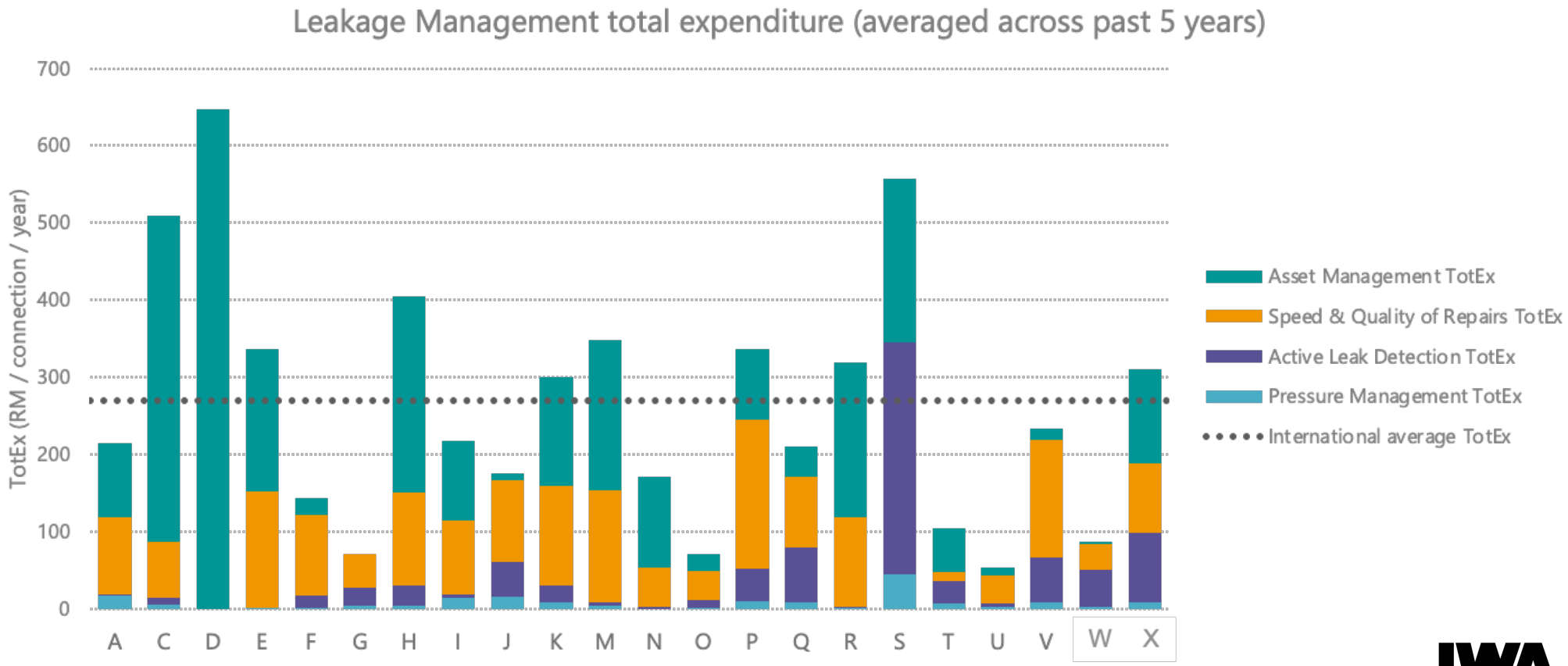
**Considerations:**

Bedding down the new contract model to understand the KPI implications in the first year of the contract should be a priority. Accommodating increased field activities (e.g. dry conditions lead to high level of activities) require balancing resources and activities. Good contract management system is key to manage the contract performance, including continuous improvement, flexibility and agility of resources.

IWA WATER LOSS SPECIALIST GROUP
the international water association

# Program Insights – Investment

- Asset Management (distribution mains renewal) has considerably higher expenditure in Australia than the UK.
- UK utilities have typically invested considerably more historically in the development of DMAs, and installation of PRVs and ALD than their international peers.






IWA WATER LOSS SPECIALIST GROUP
the international water association

# Thank You

IWA WATER LOSS SPECIALIST GROUP
the international water association