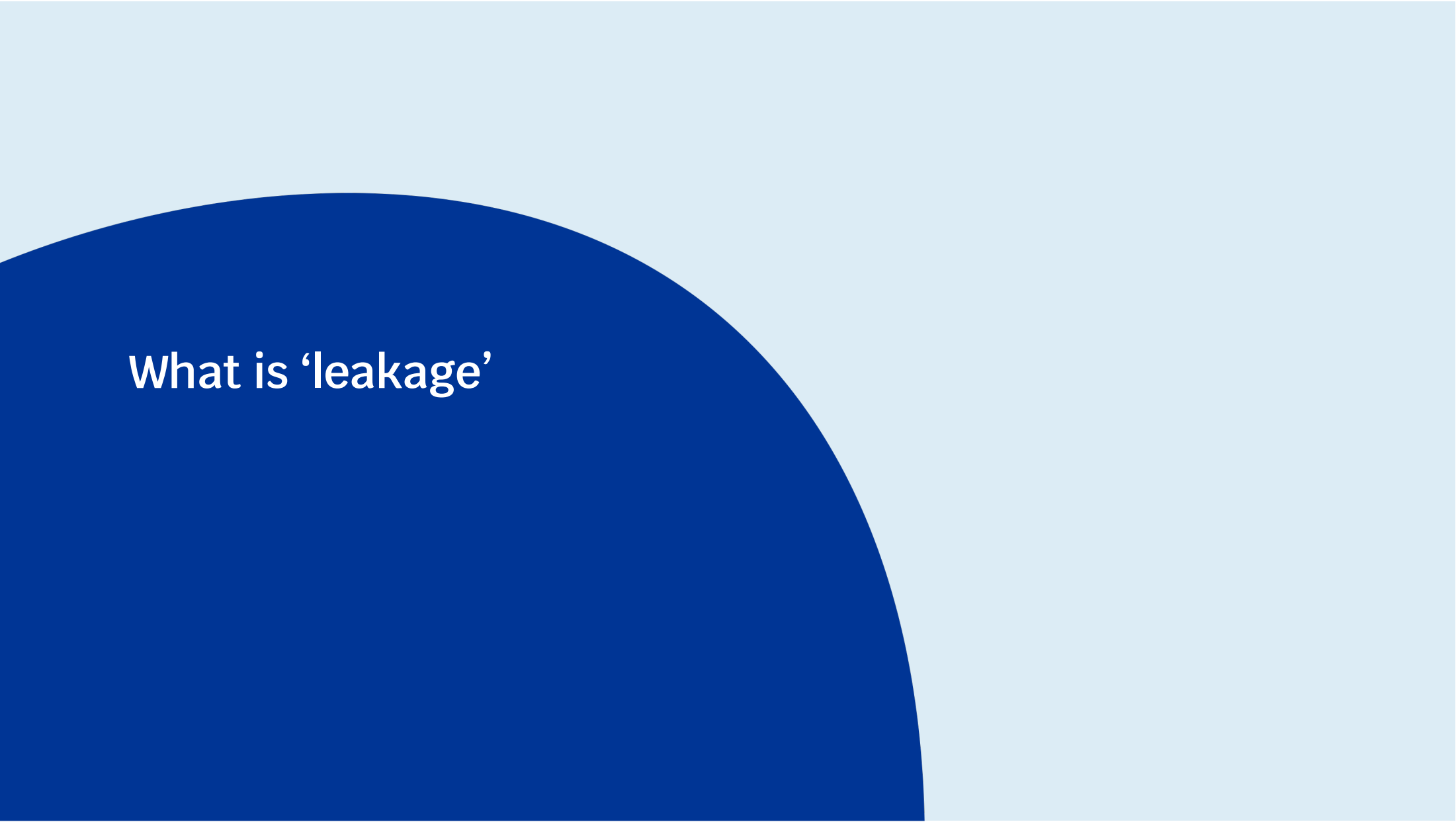


The Leakage Calculation –

How Do Companies Globally Address It

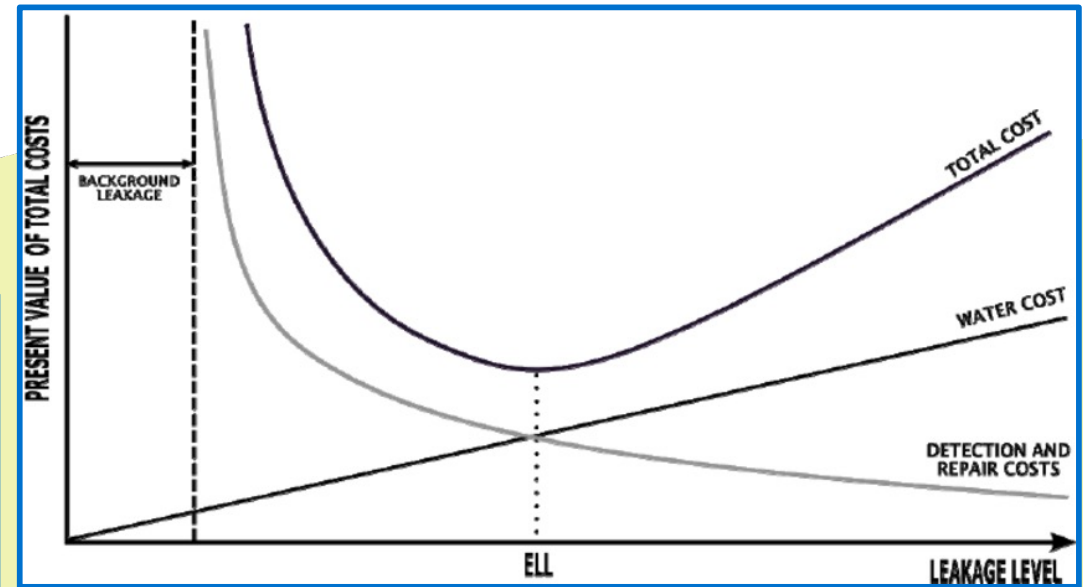
Ian Pemberton
September 2026



The image features a light blue background with a large, dark blue semi-circle on the left side. The semi-circle is positioned such that its flat edge is at the bottom, and its curved edge extends towards the top and right. The text 'What is 'leakage'' is written in white, sans-serif font within the dark blue area.

What is 'leakage'

Question : What is 'Leakage'? (In England and Wales)

[illegible]

Background Leakage is currently defined in the Water UK Leakage Routemap (2022) as the “**level of leakage that cannot be reduced further using current detection technology**”.

it can only be altered by **replacing pipes**, or by **reducing pressure**, within the distribution network.

What does reported leakage mean to each of us

Top Down
/Bottom Up

Distribution
Input

**LEAKAGE
Fraternity**

OFWAT

Leakage
Targets

Government
Policy

Water
Resources

Trunk Mains
Service Reservoirs

Base costs
Enhancement costs

Licence
Compliance

Environment
Agency

Meters

Smart
Meters

Household / Non Household
Per Capita Consumption

Assurance
Annual
Performance
Reviews

Smart Meters
Innovation

Natural
Resources Wales

- Specification
- Accuracy
- Availability
- Life Cycle
- Verification
- Comms

Measured /Unmeasured

DMAs
Operability
and
Availability

HHNU
NHHNU

Background
Leakage
CSPL PALM

Outcomes
(PC definitions)

Investors

Media Interest

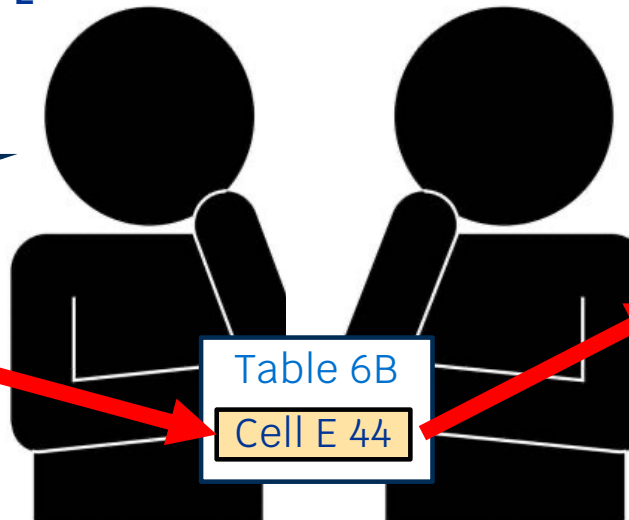
Customer Experience

Stakeholder confidence

MLE

Business
Demand

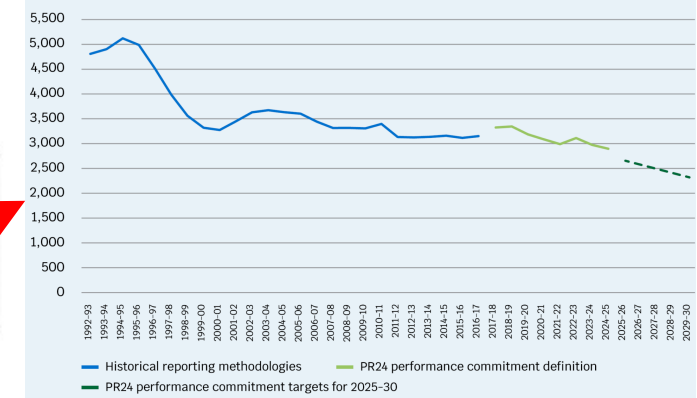
Hour to Day



	B	C	D	E	F
36	Peak 7 day rolling average distribution input	Mi/d	2		
37	Peak 7 day rolling average distribution input / annual average distribution input	%	2	0.00%	
38					
39	Water balance - company level				
40	Measured household consumption (excluding supply pipe leakage)	Mi/d	2		
41	Unmeasured household consumption (excluding supply pipe leakage)	Mi/d	2		
42	Measured non-household consumption (excluding supply pipe leakage)	Mi/d	2		
43	Unmeasured non-household consumption (excluding supply pipe leakage)	Mi/d	2		
44	Total annual leakage	Mi/d	2		
45	Distribution system operational use	Mi/d	2		
46	Water taken unbilled	Mi/d	2		
47	Distribution input	Mi/d	2		
48	Distribution input (pre-MLE)	Mi/d	2		



Improving life through water | Gwella by



The accuracy of measurement

“If you can’t
measure it, you
can’t improve it”

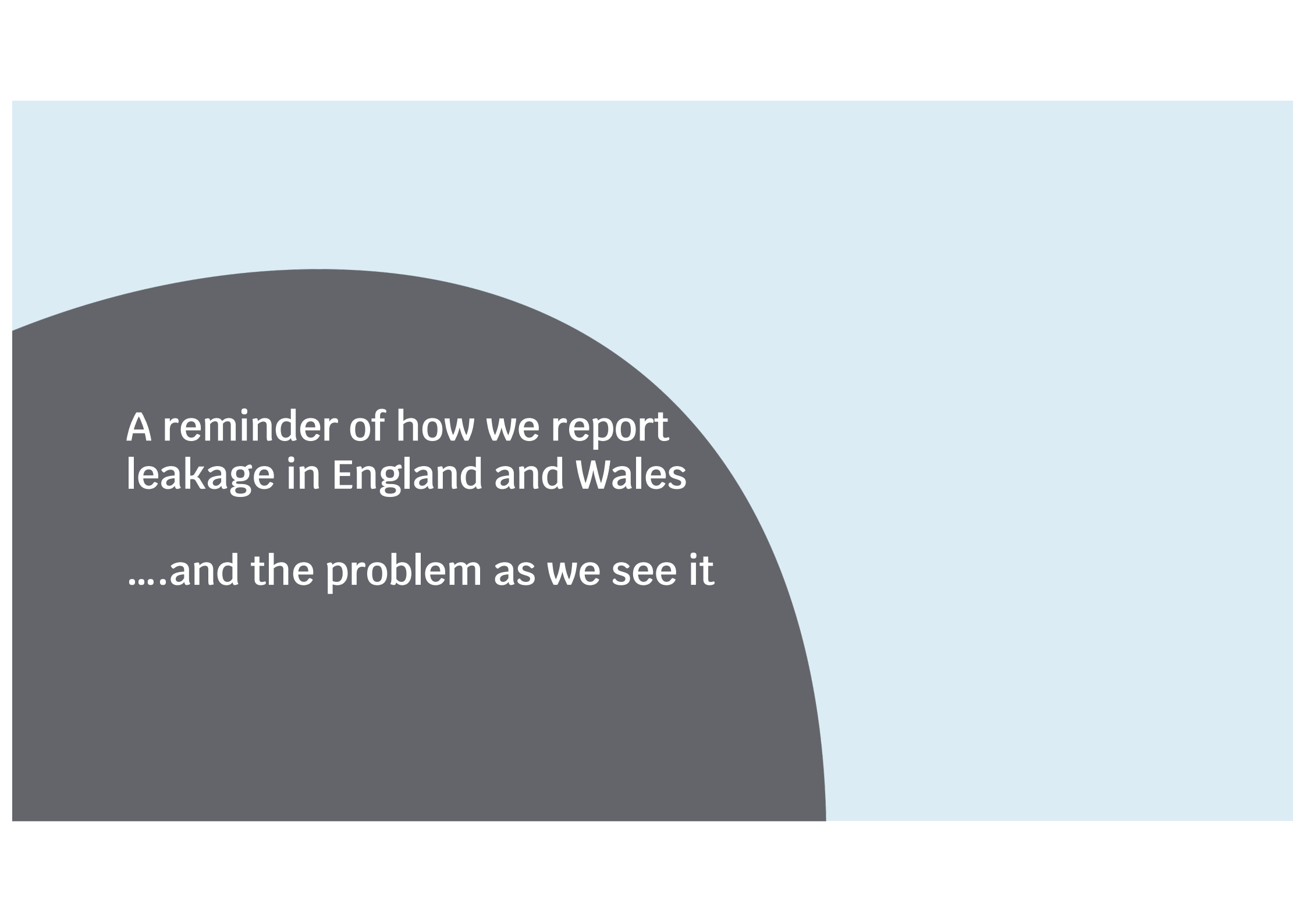
Attributed to
Lord Kelvin

“When a measure
becomes a target,
it ceases to be a
good measure”

Goodhart’s Law

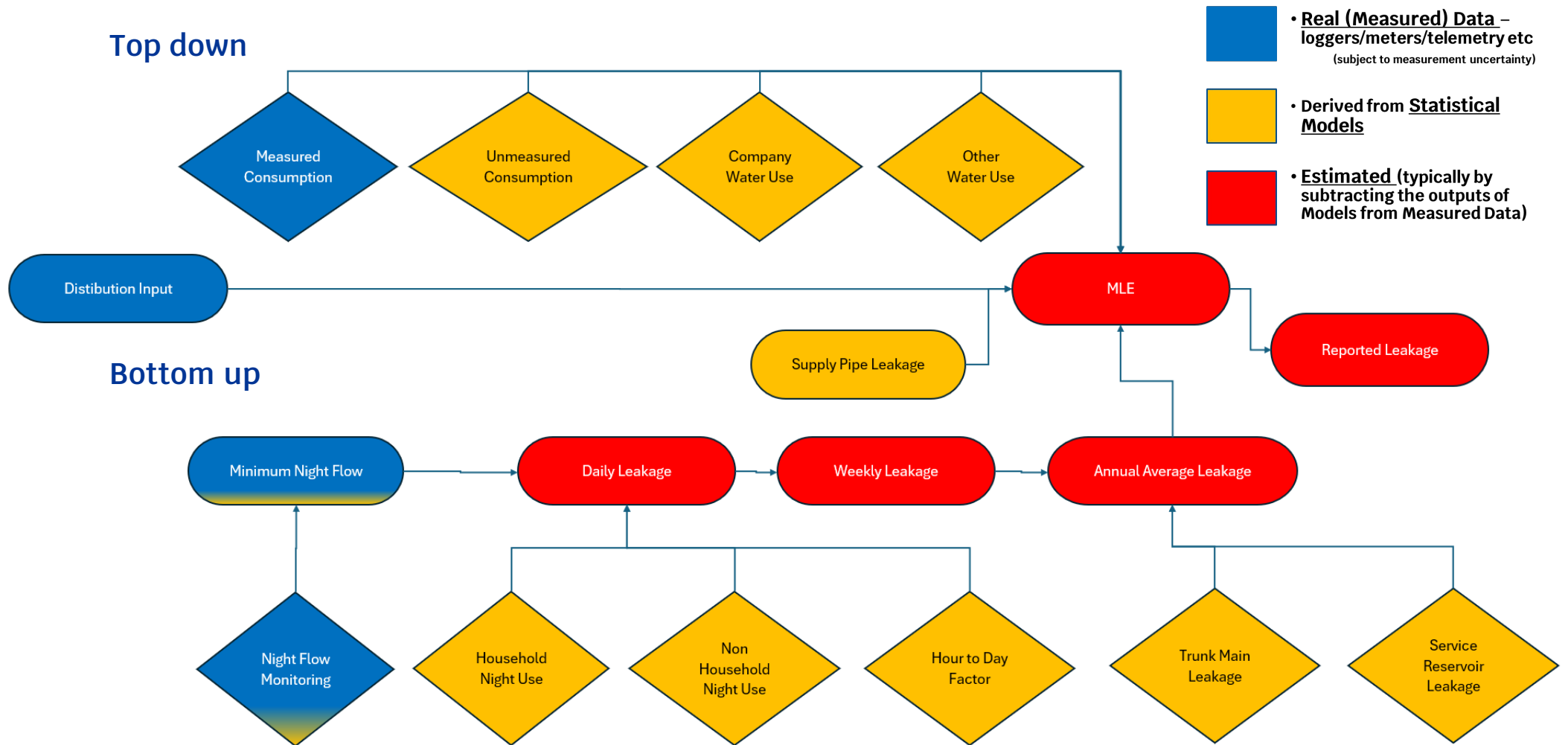
“Your scientists
were so preoccupied
with whether or not
they *could*, they didn’t
stop to think if they
should”

Jurassic Park



A reminder of how we report
leakage in England and Wales
....and the problem as we see it

Leakage 'estimation' process



Accuracy of components in the water balance

"If you can't measure it, you can't improve it"

Attributed to Lord Kelvin

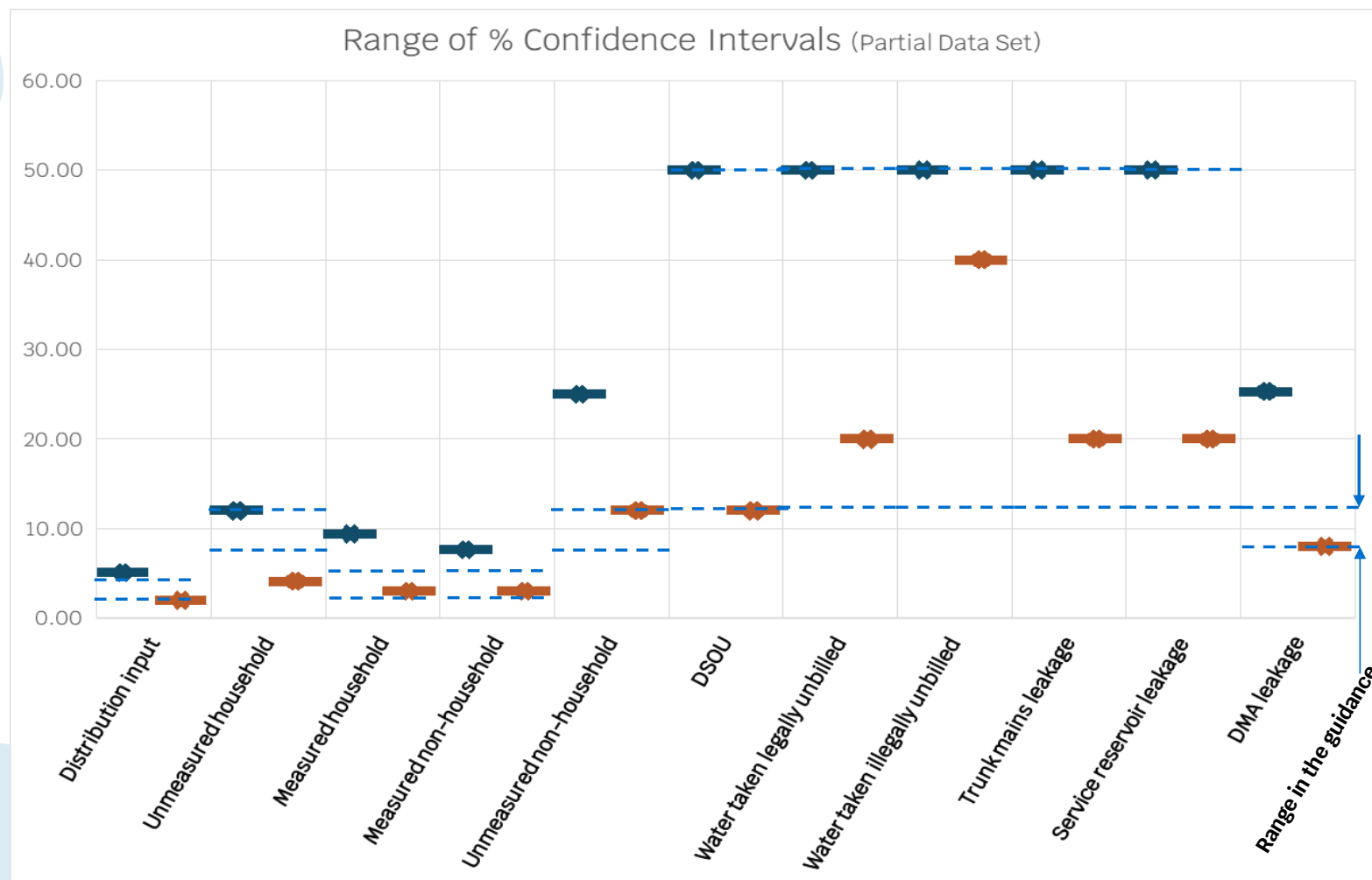
"When a measure becomes a target, it ceases to be a good measure"

Goodhart's Law

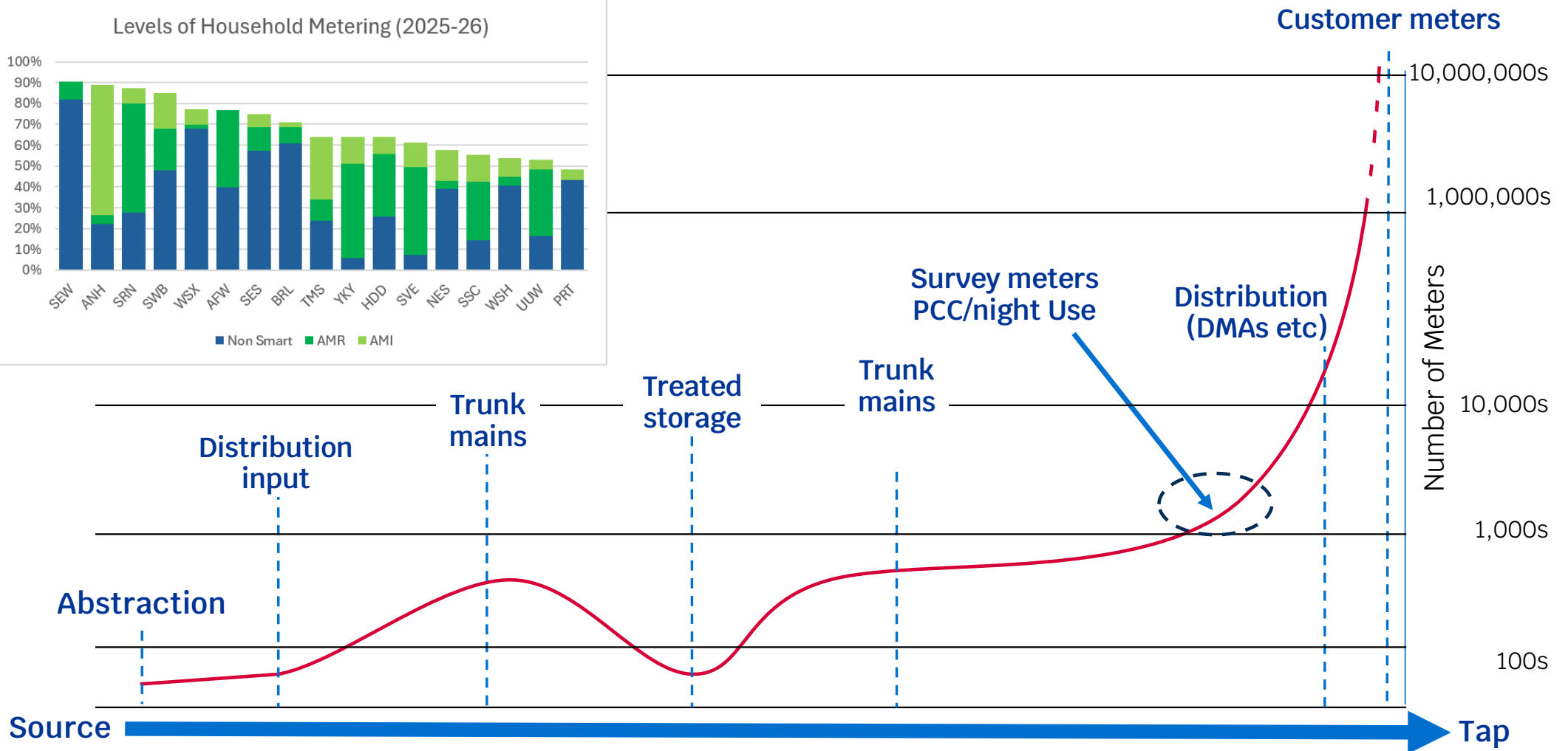
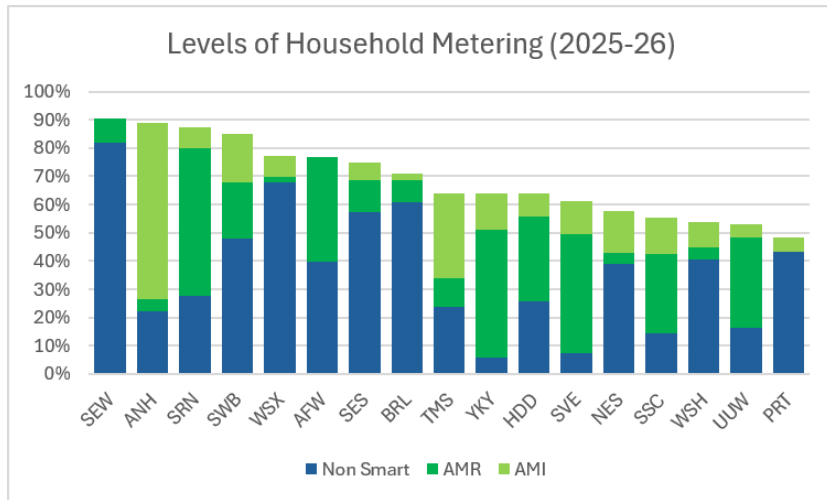
"Your scientists were so preoccupied with whether or not they *could*, they didn't stop to think if they *should*"

Jurassic Park

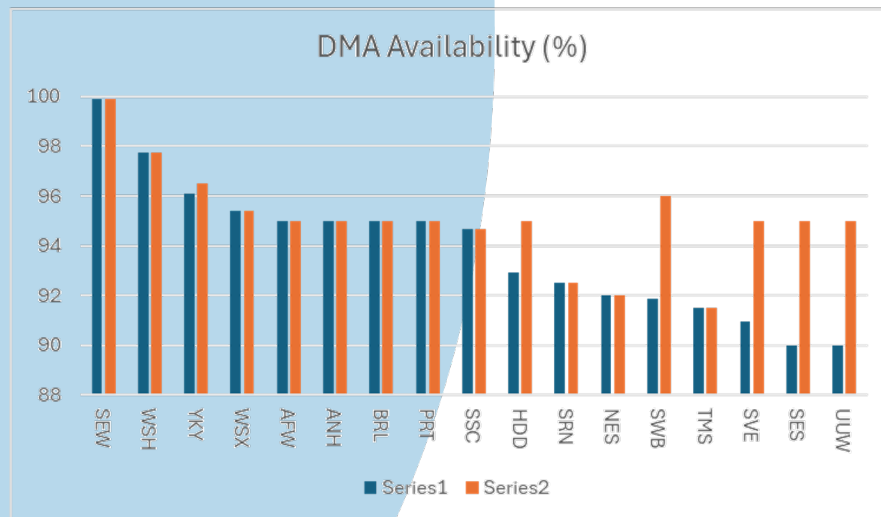
Water Balance Line	Min	Max
Distribution input	2.00	5.09
Unmeasured household	4.10	12.00
Measured household	3.00	9.37
Measured non-household	3.00	7.67
Unmeasured non-household	12.00	25.00
DSOU	12.00	50.00
Water taken legally unbilled	20.00	50.00
Water taken illegally unbilled	40.00	50.00
Trunk mains leakage	20.00	50.00
Service reservoir leakage	20.00	50.00
DMA leakage	8.00	25.30



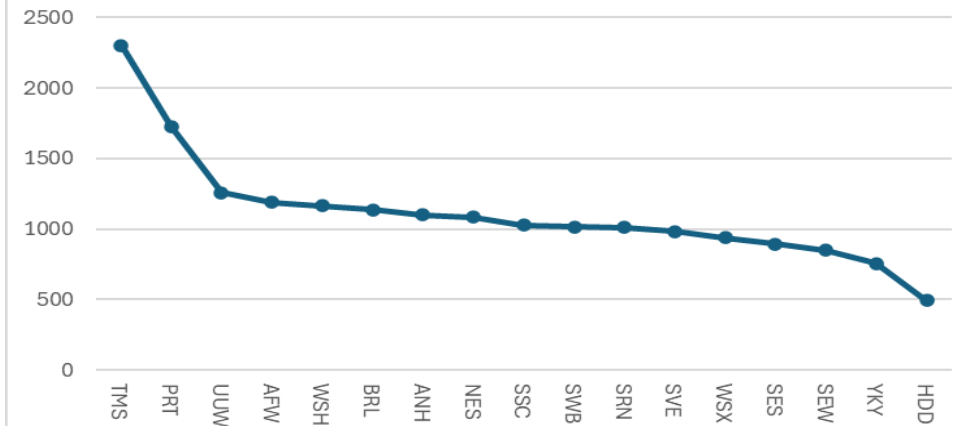
Where are our meters (now and needs)?



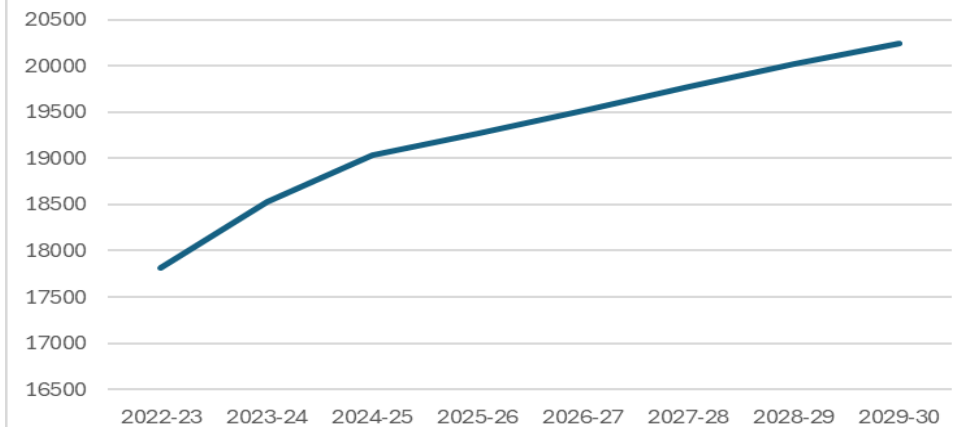
Bottom-Up leakage - DMAs



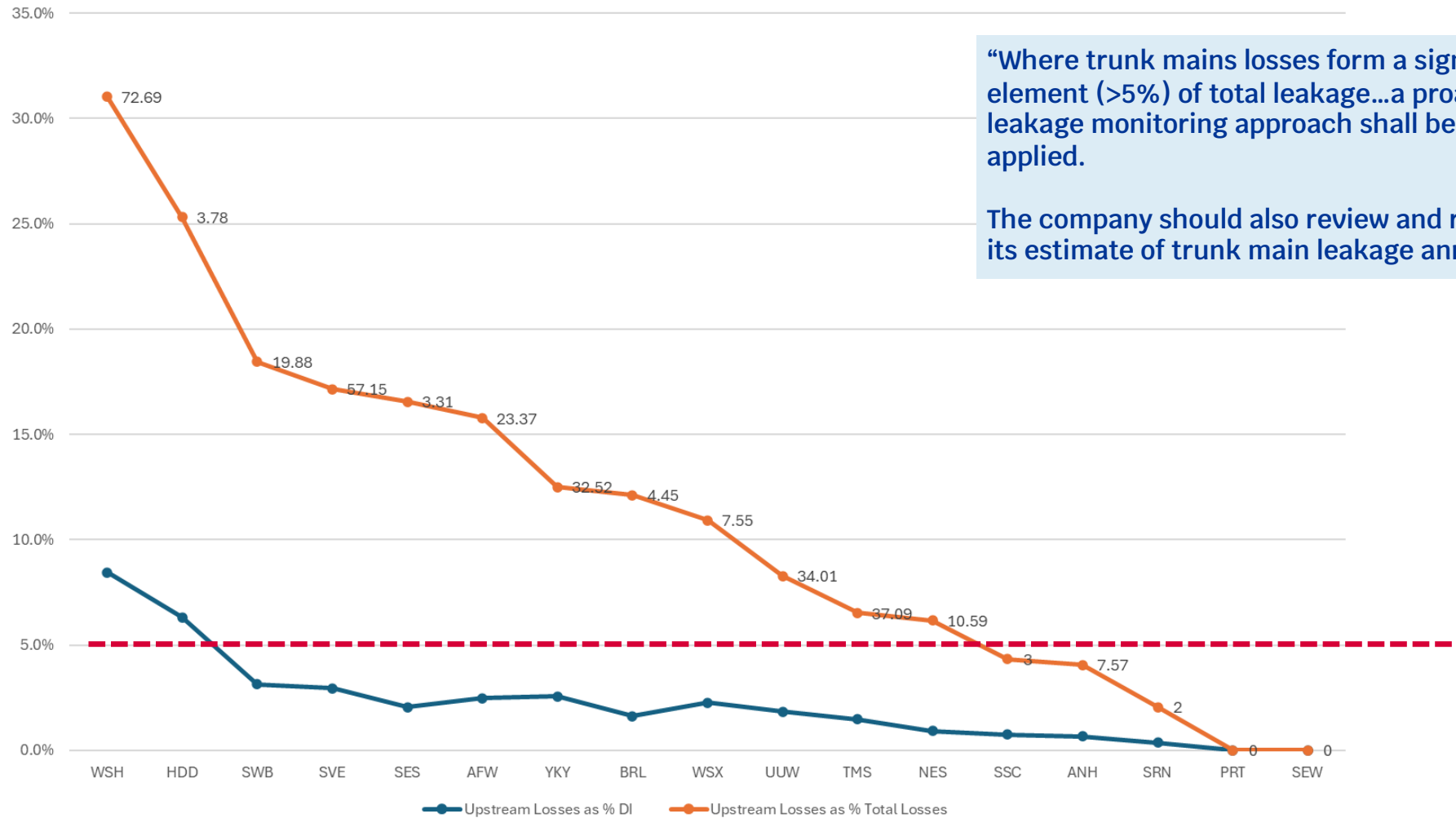
Average DMA size (2024-25)



Number of DMAs



How Much Does 'leakage upstream of DMAs' contribute to 'Total Annual Leakage'

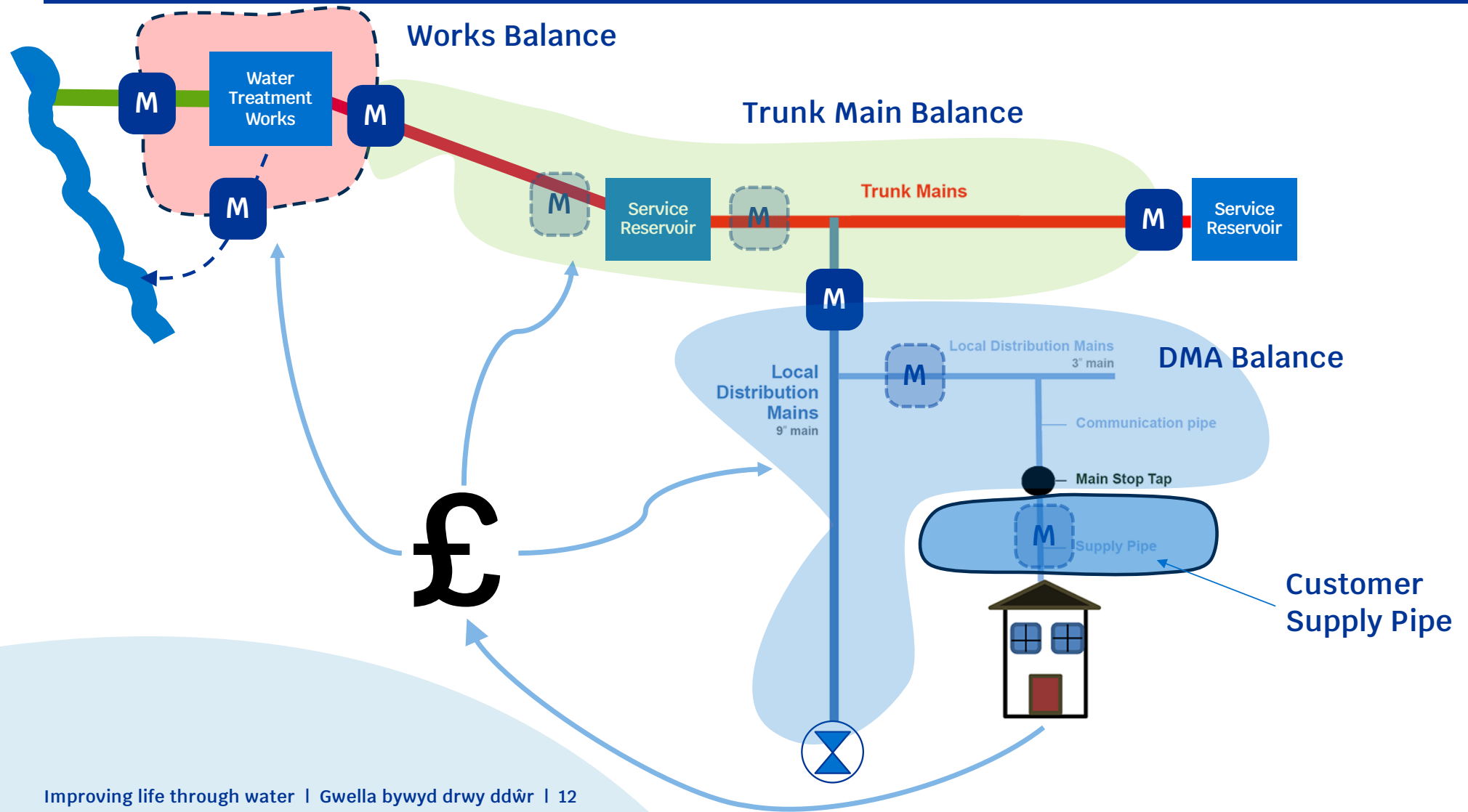


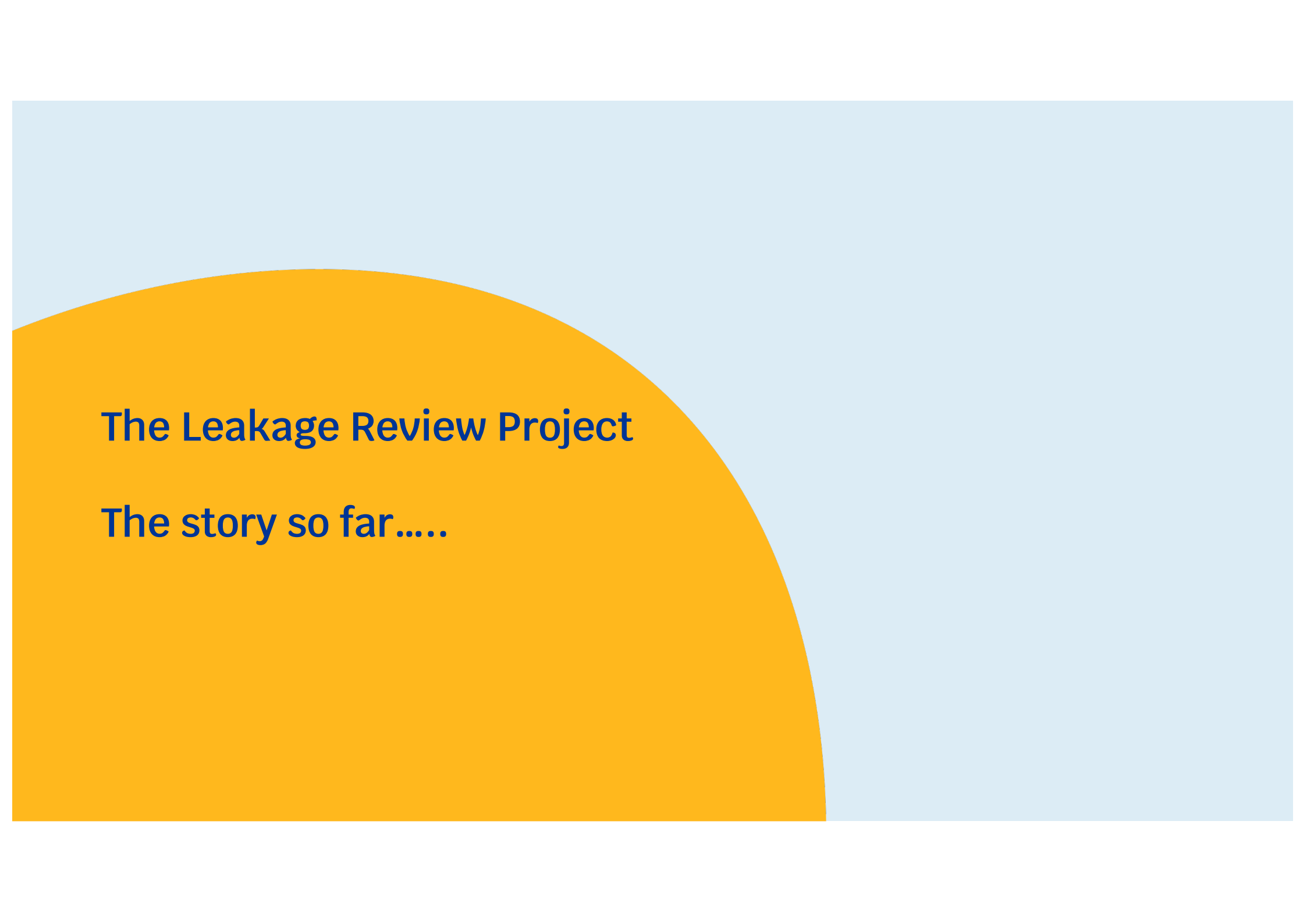
“Where trunk mains losses form a significant element (>5%) of total leakage...a proactive leakage monitoring approach shall be applied.

The company should also review and refresh its estimate of trunk main leakage annually.”



A balanced view of the network – Where to target the effort?





The Leakage Review Project

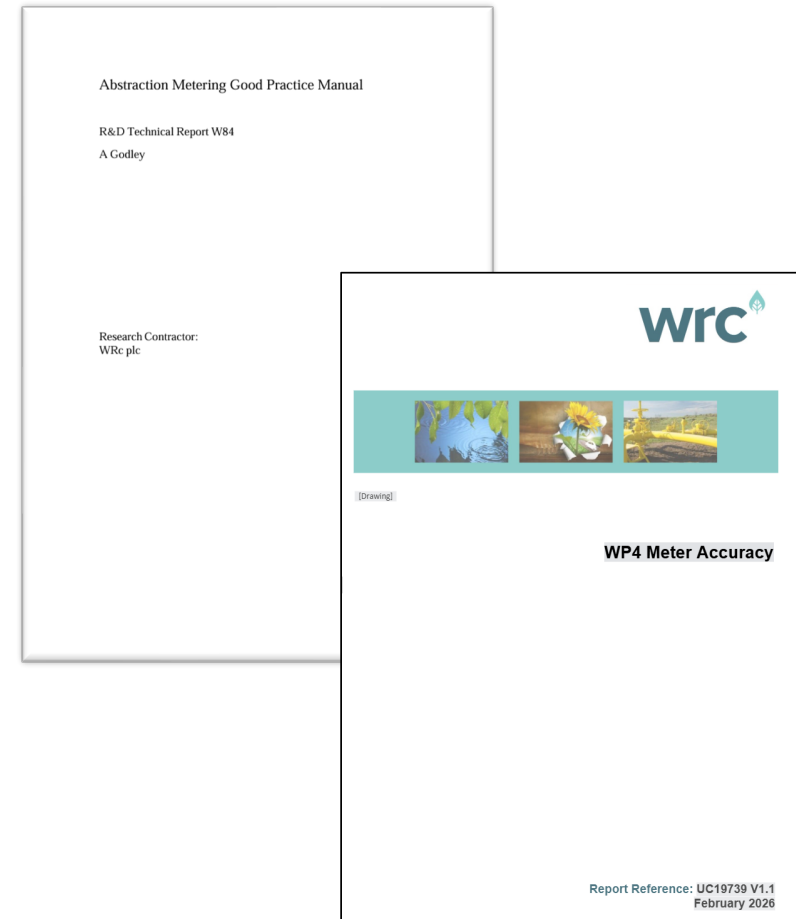
The story so far.....

Five reports now on our website.....

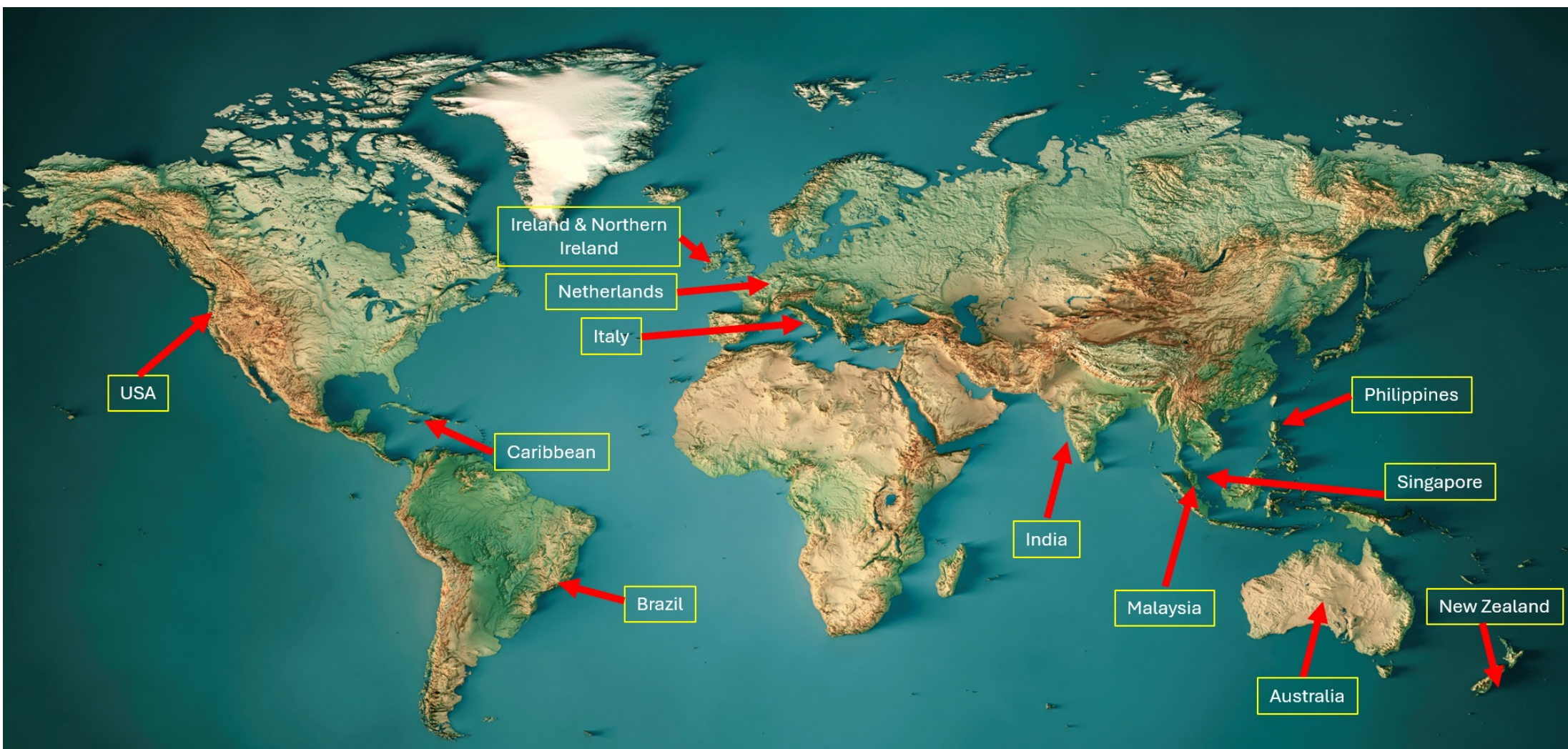


Metering (measurement)

- a key theme ...was a **lack of consistent and rigorous management of meter stocks...** as critical assets.
- While there is evidence of good practice... it is **not consistent even within any individual company**
- ..there is a **need ...to improve asset records**



The Countries IWS/HR Wallingford chose to compare



Country	Average leakage (l/conn/day)	Resource constraints	Regulated industry	Adopted definition available	Standard guidance available
England and Wales	110	Yes	Yes, Ofwat	Yes (Ofwat)	Yes
Australia	40-80	Yes, drought	Yes, State Regulators	IWA	Yes, National Performance Reporting Urban Water Utilities Guideline
Malaysia	300-500	No, but raw water quality can be an issue	Yes, SPAN, Federal water regulator	IWA	Yes, SPAN guidance
Philippines	100-700	No, but over population and raw water pollution is putting a strain on resources	Yes, fragmented across multiple bodies	IWA	Yes, Commission of Audit
Brazil	300-400	Yes, in some regions over population and raw water quality is putting strain on resources.	Yes, fragmented across multiple bodies and one national body	Consistent with IWA approach	IWA approach adopted
USA (California)	40-200	Yes, drought. Both surface and ground water resources constraints.	Yes, State regulators. Public Utilities Commission of California (CPUC) and State Water Resources Control Board (SWRCB).	American Water Works Association (AWWA)/International Water Association (IWA)	Yes, from SWRCB
India	300-400	Yes, intermittent supply in most utilities	Yes, Ministry of Housing and Urban Affairs (MOHUA)	IWA	Yes, from MOHUA
Ireland	350	Yes, deficits in major cities mainly due to growth	Yes, Commission for the Regulation of Utilities	Consistent with Ofwat guidance	Consistent with Ofwat guidance
Scotland	180	No, reducing leakage to benefit customers	Yes, Water Industry Commission for Scotland	Consistent with Ofwat guidance	Consistent with Ofwat guidance
Singapore	Not quoted	No.	Yes, self-regulated	IWA	Internal procedures
Netherlands	24	Yes, mainly due to growth, source pollution and land competition for new source sites.	Yes, Dutch Inspectorate	IWA (working to adopt broader EC approach)	IWA approach adopted
Northern Ireland	190	Yes, mainly due to growth	Yes, Utility Regulator	Consistent with Ofwat guidance	Consistent with Ofwat guidance
Italy		Yes, drought and access to water supply in some regions	Yes, ARERA	Yes	Yes, ARERA guidance
Saint Lucia		Yes, drought	Yes, National Utilities Regulatory Commission (NURC)	IWA	IWA approach adopted
New Zealand	241.5 (2015/16)	No, water scarcity is not a problem the issue is environmental.	Yes, Water services regulator Taumata Arowai	Water NZ Guidelines based on IWA approach	Water New Zealand Guidelines based on IWA

Leakage reporting								
Country	Approach	Trunk mains vs supply leakage	DMAs	Frequency	KPIs	Leakage rate	Penalty system in place	
England and Wales	Top down, MLE & MNF	Separated	Yes	Annual	MI/day	Available online	Yes	
Australia	Top Down	No	Yes, but at early stages	Annual	%/ILI/l/c/d	Yes, National Performance Reports	No	
Malaysia	Top Down	No	Yes	Quarterly	% and l/c/d	Yes, SPAN Factbook	No	
Philippines	Top Down	No	Yes	Annual	%		No	
Brazil	Top Down	No	Yes, in some utilities	Annual	% and l/c/d m3/km/day	Yes, National reporting SINISA	Yes, federal funding affected	
USA (California)	Top Down	Yes	Some Utilities	Annual	% and l/c/d	Yes, SWRCB website	Yes	
India	Top-Down (some B/U)	Yes	Some Utilities	Annual	% and l/c/d and ILI	No	No	
Ireland				Annual	% and MI/d/SELL	Published online by the water company and regulator		
Scotland				Annual	% and MI/d	Published online by the water company and regulator		
Singapore	Top-Down and Bottom-up	Yes	Yes	Annual	% and leaks per kilometre	No	No	
Netherlands	Top-Down	Yes	Partly	Every 3-year (required) Annual (voluntary)	m ³ /property per year and ILI.	Yes, Published by Dutch Inspectorate and Vewin association of water companies		
Northern Ireland				Annual	% and MI/d/SELL	Published online by the water company and regulator		
Italy	Macro indicators and top down approach for the regulator*	Separated	Some utilities	Annual	m3/km/day or %	Published online by the regulator	Yes	
Saint Lucia					%	% as part of tariff review		
New Zealand				Annual	ILI	Published online by the regulator		



The Consultation

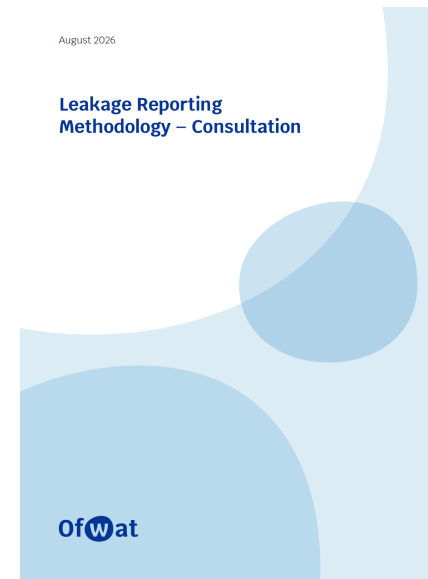
August 2026

**Leakage Reporting
Methodology – Consultation**

ofwat

What we're asking...

- Should we stay with Top-Down Bottom-Up?
 - Or move to Top Down – if so how and when?
- How do we best use smart meter data in the leakage calculation?
- Bottom-Up leakage –
 - should this be extrapolated from night flows, or
 - should we move to a 24 hour mass balance?
- Should upstream leakage should be reported as a mass balance or MNF?
- Do we need a metering standard?
- How would we incentivise
 - companies to comply with any such standard?
 - accuracy?
- Views on
 - how quickly any changes should be implemented?
 - any investment that would be required (e.g. metering or software updates)?
 - step change or a phased approach?



Thank you and questions

Ian Pemberton
BSc CEng CWEM MICE MCIWEM
Principal Engineer

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ofwat.gov.uk/](https://consult.ofwat.gov.uk/)



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