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Leakage, metering and resilience: what the sector needs to do next

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Executive summary



**Resilience is now
front and centre**



**Demand volatility is
changing the challenge**



**Smart metering is becoming
strategic infrastructure**



**Better data only matters if it
changes decisions and behaviour**



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The scale of the challenge



- 37–41% leakage reduction target by 2038
- Southeast England must find 830 megalitres in the next 10 years
- Around half of the reduction depends on policy and behavioural change
- If demand reduction fails, fallback is major infrastructure

The sector is operating in a harsher environment

- Repeated heatwaves and dry periods
- Stronger and more sustained peak demand
- Less room for “business as usual”
- Resilience is becoming the central test



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Technology – maturity



The Challenge:

- Physical assets (pipes, meters) age over decades - often 20-50+ years
- Foundational hardware IP is expiring just as networks need it most
- Past infrastructure wasn't built to support today's sensing/data demands

The Shift:

- Value has moved from hardware (housings, transducers) to software (algorithms, AI models)
- Competitive edge now sits in data fusion, signal processing, and cloud analytics - not the physical sensor itself



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Timeline & Maturity Matrix

Peak installation years:

2005-2012	2006-2015	2010-2018	2013-2020	2018-present	2021-present
In-Pipe Free-Swimming Robotics (e.g., SmartBall)	Distributed Fiber-Optic Sensing (DAS / DTS)	Transient Pressure & Hydraulic Modeling	Satellite Earth Observation (SAR Soil Moisture)	Edge-AI Acoustic Loggers & Smart Meters	Virtual DMAs & Multi-Modal Data Fusion
IP age: 15-20 years	IP age: 15-20 years	IP age: 10-15 years	IP age: 8-12 years	IP age: 4-8 years	IP age: 2-5 years
Maturing / Core Expiring	Established	Maturing	Active & Growing	High growth / novel	Bleeding edge
Foundational hardware patents are expiring; recent IP focuses on autonomous navigation, multi-sensor payloads, and mini-tethers.	Base sensing IP is settled, but an active new layer (edge AI false-alarm filtering) is still being filed	Basic transient pressure wave detection is established; newer IP covers automated valve modulation (dynamic PRV control) and self-calibrating digital twins.	First commercialized in the mid-2010s (e.g., Utilis/ASTERRA); active patents protect algorithms that isolate treated water signatures from natural surface moisture.	Moving acoustic sensing directly inside ultrasonic customer smart meters (e.g., Kamstrup flowIQ) and using cloud-trained neural networks for noise de-correlation.	Software-only patents using AMI mass balances, pressure data, and satellite inputs together without closing physical boundary valves.



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The Three Generations of Leakage IP



Generation 1: Mechanical & Dedicated Sensors (2000–2010)

What emerged: In-pipe inspection balls, fiber optic lines, acoustic listening sticks/correlators.

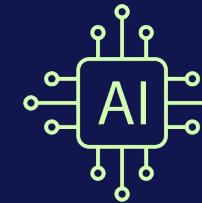
IP Characteristics: Hardware-heavy (housings, transducers, sensors). Foundational patents now expiring into public domain.



Generation 2: Remote & Networked Sensing (2010– 2019)

What emerged: Space-borne SAR, high-speed transient pressure loggers, and cloud-connected acoustic noise loggers.

IP Characteristics: Shift from hardware to signal-processing algorithms - isolating pipe signatures from orbit, correlating noise data over cellular networks.



Generation 3: Edge-AI, Fusion, and Software Twins (2020–Present)

What emerged: Smart meters as distributed acoustic arrays, chip-level ML noise filtering, and AI-driven Virtual DMAs.

IP Characteristics: Software/method patents - deep learning classifiers, sensor fusion, closed-loop pressure control.

The Water Demand Observatory



- Multi-company initiative to evaluate demand interventions
- Aim: separate weather, behaviour and leakage effects
- Shared framework for process, impact and value assessment
- Tested on 12 case studies

Why it matters

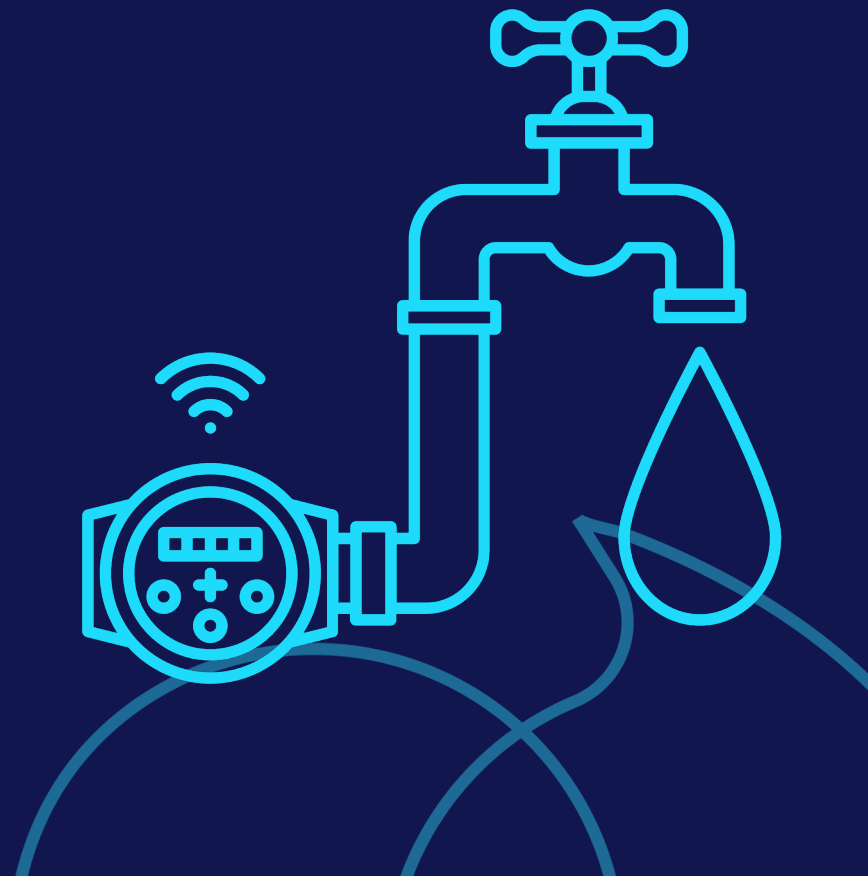
- Regulatory Support: Helps water companies meet strict reporting and efficiency targets
- Climate Resilience: Improves planning accuracy as climate pressures mount



Smart metering has become strategic



- Thames: 34M reads per day
- Around 25,000 smart meters installed per month
- Metering now supports:
 - planning
 - leakage targeting
 - continuous flow detection
 - customer engagement
- Sector becoming much more data-driven



What the data is revealing



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**25% of homes use over
500L per day**



**8% of homes show
continuous flow**



**24% of business water
registers as continuous flow**



**Removing continuous flow can
save 30L per property per day**



**A small group of very active
people drives most of the
value, cost, or impact.**

Metering quality matters

- Small errors can distort performance understanding
- Installation quality matters
- Verification and maintenance matter
- “Fit and forget” is not enough
- Stronger metering discipline is needed



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Customer-side leakage and demand

- Smart data is exposing customer-side issues more clearly
- High use and continuous flow are often customer-side
- Some of the fastest gains may come from targeting these losses
- Implications for support, messaging and intervention design



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Behaviour change is now central

**information alone does not change behaviour;
knowledge does not automatically become action**

- Best interventions are:
 - personal
 - timely
 - simple
 - comparative
- “One clear message” beats a dashboard
- Smart meter value depends on behaviour change

Pressure management and operational control

- Pressure management still reduces leakage
- It also reduces bursts and stress on networks
- Networks need active, not passive, management
- Better data should improve system control, not just reporting



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The last part of rollout is where complexity rises sharply



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- Final 5–10% of meters are hardest and most expensive
- Rural and deep-pit connectivity remain difficult
- Internal installs and missed appointments remain barriers
- Trust is an operational constraint
- Installation strategy matters as much as technology

Regulation and coordination are still catching up



- PCD methodology still lacks full consistency
- Reporting approaches risk diverging
- Conflicting incentives remain
- Coordination across market actors is incomplete
- More common frameworks are needed

What the sector should take from this



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- Think whole-system, not single-issue
- Push for better metering quality and data confidence
- Treat customer-side leakage and continuous flow as strategic
- Prioritise interventions that actually work
- Design customer engagement as carefully as infrastructure
- Support consistency, collaboration and practical innovation



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**The next step for the sector is not just lower leakage.
It is better understanding, better prioritisation and better
resilience.**

