# SRN-DDR-031: Water Resources – Smart Metering Enhancement Cost Evidence Case

28th August 2024

Version 1.0

from Southern Water

# Contents

# 1 Introduction

This evidence document responds to the Ofwat PR24 Draft Determination for Metering (inclusive of Meter Replacements and Meter Upgrades). The below table provides support to navigate our response to Metering. There are three main areas of response:

1. Alternative Metering Service. Ofwat has treated Smart Metering within the "existing regulatory framework". We continue to plan for an Alternative Metering Service as outlined in the Market Based Delivery technical annex (*SRN-DDR-039 - Market Based Delivery)*.
2. Cost allowances: Ofwat has allowed us to replace our meters and upgrade them to Smart AMI Meters. This will be sufficient to include 6.7% boundary box replacements, but there remains further risk. This document outlines our proposed mechanism for managing this uncertainty.
3. Price Control Deliverables (PCD): Ofwat has proposed a PCD for Metering (with meter replacements and meter upgrades applicable to Southern Water). We disagree with the PCD proposed for Meter Upgrades. The thresholds for performance are unrealistic, and the associated penalties too punitive. This document outlines our response and an alternative PCD approach.

# 2 Related Business Case Submission Documents & Dependencies

| Chapters | |
|---|---|
| Business cases | |
| Technical annexes | SRN17 Direct Procurement for Customers and Alternative Delivery Model (not the focus of this paper) |
| Enhancement cases | SRN27 Water Resources - Demand<br>SRN28 Water Resources - Smart metering |
| Cost adjustment claims | SRN24 Meter Replacement – Cost Adjustment Claim |
| Ofwat test areas | |
| Assurance | |
| Other – please specify | |

Data Tables impacted by the representation:

| Table/s Impacted | Data Lines Impacted |
|---|---|
| CW3 | Changes to lines:<br>CW3.87<br>CW3.88<br>CW3.89<br>CW3.90 |
| CW7 | Cost rows are modified to align to allowances, and benefits aligned to meter upgrades.<br>CW7.4-7.5 – Total costs updated to total allowance. |

| Table/s Impacted | Data Lines Impacted |
|---|---|
| | CW7.7 – Total volumes of New Selective Meter Installs, rollover of PR19 funded installations (33,864), minus optants completed in AMP7 (3,857)<br>CW7.9 & CW7.10 – Updated to align to allowed meter replacements.<br>CW7.26-33 – Meter Renewal Unit Costs - Total Cost equals allowed Meter Replacement Unit Cost (£128.89)<br>CW7.34-41 – Meter Upgrade Unit Costs – Total Cost equals allowed Meter Upgrade Unit Cost (£76.84)<br>CW7.44-47: Meter renewal average wastage and leakage benefits – removed as all benefits are associated to meter upgrades.<br>CW7.48-51: Meter upgrade average wastage and leakage benefits – included and calculated as inputs to the Water Resource Management Plan total wastage and leakage savings |
| SUP12 | Changes to row 14 "Smart Metering" |

# 3 Metering Costs following Draft Determination

Our updated metering costs allowed through of the Draft Determination, we have received a total allowance of £184.23m. This reflects a £31.93m total increase from submission in October 2023.

**Table 1: Updated allowed metering costs (£m)**

| Category | Related Submission Document | Submission | Reallocations to Base | Submission after Reallocations | Allowance | Variance |
|---|---|---|---|---|---|---|
| Meter Upgrade Enhancement | SRN28 Water Resources - Smart metering | £63.40 | -£3.82 | £59.58 | £75.68 | £16.10 |
| Meter Replacement Sector-Wide Base Allowance Uplift | Metering Base Cost Adjustment Claim v4 | £88.90 | £3.82 | £92.72 | £108.55 | £15.83 |
| **Total AMP8 Metering Allowance** | **Total** | **£152.30** | **£0.00** | **£152.30** | **£184.23** | **£31.93** |

*Source: Smart Metering Enhancement Model (PR24CA32_W_Metering), Metering Base Adjustment (1. Base Adj_PR24-DD-Meter-replacements-adjustment.xlsx)*

# 4 Issue 1: Smart Metering Delivery Route

## 4.1. Issue Statement

In our business plan, smart metering was identified as suitable for market-based delivery. However, Ofwat in its draft determination, has treated Smart Metering within the “existing regulatory framework”, while it does confirm it welcomes “proposals for innovation” and will “continue to discuss approaches and whether alternative models are likely to deliver greater benefits for customers”.

## 4.2. Our Response

We continue to plan to deliver Smart Metering via an Alternative Metering Services (or “AMS”) approach. We have outlined our justification in the *SRN-DDR-039 - Market Based Delivery technical annex*, and will continue to work with Ofwat to enable this delivery route.

The approach that we are proposing to take, with an AMS Provider[1] providing an end-to-end service inclusive of funding, builds upon a model that is proven to work. This approach to funding became the industry standard in the energy sector, with now 25 million meters in the UK funded by the model. The model can benefit Ofwat and water companies to tackle many of the challenges experienced so far in the water sector, and considers performance over the long-term.

Our Value for Money assessment indicates that this approach would provide a £16.5m NPV in customer savings vs the in-house delivery route.

We met with Ofwat on 29th July 2024 to discuss the proposed approach, and we have subsequently shared an initial view of the modifications that will be required to support the enablement of the approach through an appropriate regulatory mechanism.

A summary of scope allocations is included below for reference:

**Table 2: Summary of scope allocations**

| Area | Description | Candidate for Alternative Metering Service |
|---|---|---|
| **1. Meter Assets & Devices** | Meter devices capable of operating to Ofwat definitions of “AMI”, with associated local communications equipment. | Yes |
| **2. Meter Install, Replacement & Upgrade** | Field-force to remove meters, replacing them with smart capable meters and upgrading them to Smart AMI meters. | Yes |
| **3. Communications Network** | Fixed network capable of communicating with meters to secure reads in line with Ofwat definitions of “AMI”. | Yes |
| **4. Meter Data Management** | Storage of meter read data, other data from the meter, and reporting on performance. | **Proposed** |

[1] Further details in Annex SRN-DDR-039 - Market Based Delivery technical annex

| Area | Description | Candidate for Alternative Metering Service |
|---|---|---|
| **5. Data Provision** | Providing us with secure access to meter read data. | Yes |
| **6. Demand Reduction Tools** | New digital and data analytics tools to interact with customers to analyse consumption patterns, reduce usage, and interact with customers if they have a leak. | **Optional** |
| **7. IT Integration** | Modifications to interfaces with our wider business to enable other functions to benefit from Smart Meter read data, providing timely data to areas such as customer service and billing, and water operations. | **In-House Delivery** |
| **8. Smart Metering Operations** | New capabilities within our business to enable demand reduction (with the right data science and analytical, behavioural, and technology skills and expertise). We will continuously improve customer journeys to support an enhanced customer experience. Our Smart Operations Centre will also fulfil our responsibilities in support of meter rollout, such as manage the provision of customer data, processing the volume of meter exchanges, and triaging issues during meter exchange. This function will manage customer enquiries relating to meter health, and support the necessary transformation to our operational approaches to usage reduction and customer side leakage. | **In-House Delivery** |
| **9. Alternative Delivery Management** | This is a new approach to metering that has not been done before, therefore we expect to design, build, and operate new contract and commercial management capabilities to robustly manage the AMS Provider to ensure the outcomes as agreed in our contract. | **In-House Delivery** |

Ofwat has allowed £75.68m for metering enhancement, which is £16.1m more enhancement expenditure than requested by our Enhancement Business Case (after £3.82m re-allocations to base expenditure).

We have estimated that £42.1m will be part of the AMS Provider scope, spanning the additional devices necessary to upgrade a meter to an AMI enabled smart meter, the Communications Network (with costs per year that increase in-line with regional coverage as we rollout meters during AMP8). We are considering whether it would be feasible given the offerings provided by the market to include other aspects within this scope, such as Meter Data Management solutions and Demand Reduction toolsets..

The remaining £33.58m will support the in-house enhancements. Smart Metering will accelerate the transformation of our organisation, to data-led interactions with our customers. As outlined in table [X], this investment is critical to enabling the AMS Provider to deliver upon the stated volumes of meter replacements and upgrades, embed a robust new approach to contract and commercial management aligned with this delivery method, and transform our operations to drive customer experience, demand reduction, and customer side leakage interventions.

# 5 Issue 2: Boundary Box Risk

## 5.1. Issue Statement

Ofwat have allowed £108.55m for Meter Replacements, £15.83m more than we requested in our Business Plan. Ofwat has reallocated £3.82m of programme costs from enhancement into this unit cost rate and confirmed that boundary box replacements are included in the unit rate (as confirmed by the rejection of Anglian Water's Cost Adjustment Claim for boundary box replacements[2]).

We have included the following scope within our interpretation of meter replacement unit rate, to be covered within the allowances provided:

- Like for like meter replacement job costs for Households (all meter locations and types)
- Like for like meter replacement job costs for Non-Households (all meter sizes)
- Like for like meter asset and other related equipment
- Enablement costs (such as surveys, planning & scheduling, transport & parking, traffic management, appointment booking)
- Programme Resource costs (such as overall Smart Metering programme management and deployment management)
- Replacement of boundary box units where they are not suitable to replace a meter (incl. all associated works e.g. excavation and reinstatement)
- AMI Upgrade Job Costs as these were excluded from enhancement funding

Since our business plan submission, we have collected further evidence to understand the risks associated with boundary box replacements that could be a dependency prior to the replacement of a meter. As an early adopter of metering in the UK, this is a material risk to the success of our Smart Metering programme.

Our analysis, based on 7,100 surveys commissioned with Morrison Data Services, indicates that 6.7% of our boundary boxes across our region will require excavation and reinstatement prior to the replacement of an aged meter asset. Data captured from our operational teams indicates that 11% of our portfolio have required boundary box replacements due to inoperable stop taps, at an average cost of £700 in 2024-25. Our collaboration with other water companies who have aged boundary box estates has confirmed that there is significant uncertainty over the volume of likely boundary box replacements, some estimating that as many as 35% of replacements will first require a boundary box replacement.

Within the unit rates allowed by Ofwat, we estimate that 6.7% of boundary boxes can be accommodated, however there is significant risk that this will not be sufficient funding for AMP8, based on the significant uncertainty of volume suggested by our evidence.

Further details of the cost and volume assumptions are enclosed in 7 Appendix 1: Issue 2: Boundary Box Volume & Cost Estimates.

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[2] PR24-draft-determinations-Expenditure-allowances-to-upload.pdf (ofwat.gov.uk) *"Reject: Replacement of boundary boxes already covered through metering sector wide cost adjustment and accompanying PCD. Any excess boundary box replacements not covered by the metering sector wide cost adjustment are immaterial."*

## 5.2. Our Response

We have accounted for 6.7% boundary boxes within our business plan, however there is a risk there could be significantly more boundary boxes needing repair and replacement. We will only know exactly how many needs replacement once our providers have completed pre-installation surveys to plan each meter replacement. We will need to repair these boundary boxes as soon as the inspection is complete, any delay to the boundary box replacement will impact our smart meter delivery.

The financial implications of this risk are considerable, as per the evidence set out in Appendix 7.1 the amount of boundary box replacements could be up to 35%, if this were the case, this would require an extra £177m funding on top of the £42m we are already accounting for within our smart meter replacement programme.

Therefore, we are proposing an uncertainty mechanism to cover the risk of there being more boundary box replacements than we are estimating. This will ensure there are reduced financeability risks when we are replacing the boundary boxes.

As per our draft determination response we are estimating the need to replace 6.7% boundary boxes this is the limit to how much we can cover through our botex allowances. 6.7% of boundary box replacement is equivalent to 66,065 replacements.

We are proposing the following uncertainty mechanism:

**Table 3: Proposed boundary box uncertainty mechanism**

| Unit | Number of replacements for uncertainty mechanism to start | Unit rate £/replacement 22/23 prices | Incentive form | Customer Sharing | Timing |
|---|---|---|---|---|---|
| Boundary box replacements | 66,065 (6.71%) | £643.25 | revenue | 90/10 | In-period |

This data will be collected as part of the APR. We are proposing the starting point at 6.71% of boundary box replacements, because past this point the volume of work is material.

Further, we have proposed to a sharing rate on this uncertainty mechanism, which will drive us to deliver the most efficient replacements.

An example of the uncertainty mechanism:

> *"In 2026/27 we have past the gated amount of boundary box replacements, and for AMP8 so far have had 76,065 boundary box replacements, this is 10,000 more than the gated amount. The amount that we will recover through the uncertainty mechanism will be (10,000 x 643.25) x 90% = £5,789,250. This is 2022/23 prices and will be confirmed and recovered through the in-period determinations, in order to flow through to 2028/29 charges."*

We recognise that in the draft determination, you rejected Anglian Water bespoke uncertainty mechanism. We agree that it is not a bespoke issue, although as the evidence we have provided proves it is a material risk. We would encourage Ofwat to set this as a common uncertainty mechanism as Smart metering is crucial for the whole water industry and Ofwat should limit any obstacles it can remove to ensure the roll out is successful.

# 6 Issue 3: Meter Upgrade Price Control Deliverable (PCD)

## 6.1. Issue statement

Ofwat has set a PCD for metering that includes Non-Delivery Payments and Time Incentives (underperformance or outperformance payments), linked to measurements and reporting on "levels of connectivity and levels of completeness of data reporting, for an installed, upgraded and replaced meter to count as delivered as part of this PCD."[3]

1. **Completeness:** Measure and record water consumption data at least once an hour with a 95% or higher success rate.
2. **Connectivity:** Transmit the recorded consumption data to the smart infrastructure network at least once every 24 hours with a 95% or higher success rate.

The success rates are based on the number of data points recorded or transmitted since the meter was installed, with a minimum acceptable period of time to report a successful installation of an active meter set at **one month of data from installation** – with Ofwat expecting that these success rates **should be achieved on average until the end of the reporting period** (31 March 2030).

If an installed meter does not achieve either the data recording or transmission thresholds it should not be reported as delivered in the PCD until it does achieve these requirements. Non-delivery payments will apply to funded meters which are not delivered nor meeting the active thresholds as described above by the end of the control period.

However, real-world evidence suggests the proposed performance levels have not been achieved unrealistic. Setting these thresholds and penalty measures are overly punitive, are set at unrealistic levels, and therefore will have negative short and long-term consequences on costs to customers, limit reductions in demand.

## 6.2. Our Response

Southern Water is supportive of Ofwat's decision to fund meter replacements and upgrading those meters to AMI meters across 2025-2030. We operate in an increasingly water stressed region, with 10 out of 14 of our water resource zones at risk of a water deficit by early in AMP8. We have put smart metering at the forefront of our Water Resources Management Plan as it is a key enabler that will revolutionise leakage detection and unlock reductions in household and business consumption. We estimate that our smart metering programme will save 20.6Ml/d by the end of AMP8 and this is a critical foundation for us to meet our WRMP to help mitigate water scarcity risk. We see smart metering as a low regret option for managing our supply-demand balance as reducing household demand provides us with significant benefits, such as delaying, avoiding, or reducing the need for investment in large supply schemes.

[3] PR24-draft-determinations-Price-control-deliverables-appendix.pdf (ofwat.gov.uk)

We recognise the importance of using PCD's as a tool to incentivise water companies to deliver on funded improvements and are supportive of a mechanism to help ensure that customers receive value for money from smart metering.

However, we are challenging the proposed PCD approach and measures, and through our technical appendix, we provide evidence to support our challenge. Delivery of a Smart Metering programme is very challenging, and requires many factors to be true to achieve the successful outcome of high volumes of automated meter readings, many of which are outside of the direct control of the water company (e.g. signal issues caused by new buildings, parked vehicles, and many which are dependent upon environmental factors in our region). Our technical appendix details further real-world evidence of achieved performance in the Water Sector and the Energy Sector, and the factors that influence those success rates initially, and over time. We also propose an alternative approach that considers those evidence points while recognising the outcomes we want to achieve across the sector.

Our challenges are based on the following areas:

1. **Non-delivery and time incentive penalties are overly punitive:** Through the proposed non-delivery and time-under delivery payments, there is a risk that a Smart AMI Meter that was installed in 2025, which achieves 94% connectivity and completeness on average across the control period, receives five time penalties, and a full non-delivery payment (total penalties of £87.46 vs an allowance of £76.84). An alternative scenario is a Smart AMI Meter that was installed in Y1, has successfully met the thresholds for over one year, that doesn't sustain it over five years, receives four time penalties and a full non-delivery payment. When considering that these units have an estimated 15 year lifespan, it is highly likely any regime stays in place beyond the end of the Control Period, risking further penalties. There are also ODI penalties if Performance Commitments are not met which is an incentive to assure delivery of enabling capabilities. Finally, the penalty approach does not consider the significant amount of sunk costs that have provided customer value, therefore it is unreasonable that penalties that are greater than the value of the meter upgrade are levied.

2. **PCD Non-Delivery should measure delivered units, not enduring performance:** the scope of the PCD has been extended into two components. (1) the "AMI Upgrade" i.e., the successful confirmation of the upgraded meter following an install using a one month reporting period, and (2) the "Read Performance" from that unit for completeness and connectivity on average during the control period. It is reasonable for the Non-Delivery element of the PCD to cover item (1) the "AMI Upgrade" to ensure funded deliverables are met. It is unreasonable for the Non-Delivery Payment element of the PCD to cover item (2) "Read Performance" as this is governed by a combination of time incentives and Performance Commitment ODIs, and would not be deemed "failure to deliver the funded improvements".

3. **Proposed measurement thresholds are unrealistic based on evidenced performance:** The performance measurement thresholds of the PCDs are unreasonably high, without provided sources of evidence (with definitions). . Evidence gathered from water companies suggests that they are achieving on average 89.5% meters "connected to the network", and those connected meters are achieving 85% read performance (across completeness of hourly data and next day read transmission). To achieve this position has taken significant amount of investment to improve performance in targeted areas that are favourable for coverage, not in all parts of their region. Additionally, DESNZ report that the proportion of gas and electricity meters operating in smart mode is on average 83% and 86% respectively in between 2019 to 2023 (definition of "operating in Smart Mode" is not published by DESNZ, however both Ofgem and the DCC use the Citizens Advice's definition of smart mode; "Smart mode means your meter should automatically send readings to your supplier", which is a significantly lower threshold than Ofwat is proposing).

4. **Proposed measurement thresholds will drive unintended short-term costs for customers and stifle innovation**: We are currently mid-tender for our Alternative Metering Service provider. This tender will need to be re-designed to pass through higher than planned performance rates, upon which we anticipate we will receive higher quotations from our bidders to warrant the assets and meet the ongoing performance levels. We are also aware that in the Water Sector, there is significant variance of performance across the sector, with Thames Water and Anglian Water using the Arqiva/Sensus Flexnet technology since 2016 which is not achieving the measures stated, yet is achieving higher rates than LoRAWAN technology which has only been in use since 2022 by Severn Trent as part of Green Recovery. New technologies such as LoRAWAN and NBIOT in the UK Water Sector, have not yet been afforded the time to prove it can achieve connectivity at scale at a competitive price, which risks stifling innovation by forcing water companies to select one technology.

5. **Proposed measurement thresholds will drive unintended long-term costs for customers**: The specified levels for connectivity and completeness, will drive negative unintended long-term cost benefit consequences. The PCD risks shortening the battery lifespan of meters by over 5 years, that could result in mass replacement programmes significantly before the expected life of the meter assets. Our real-world experience of AMR metering has evidenced meter batteries failing at between 9-10 years against an expectation of 15 years. Our knowledge of metering technology indicates that over-contacting the meter drains battery life at faster rates, which would be necessary to achieve the stated performance levels.

6. **Proposed measurement thresholds will disincentivise upgrading meters in hard to reach areas:** We have received information from potential suppliers that some areas (~7% of our postcode areas) of our region will be harder to achieve the thresholds stated due to environmental factors such as whether the dwelling is rural or urban, or the meter is situated internally or externally. In the more challenging environments, there is risk that it unreasonably expensive to achieve the proposed thresholds, which will make it more expensive in likely penalties than upgrading the meter; which is not the best value for money for customers. If upgrades are prohibitively expensive, it will prevent an upgrade taking place which will directly erode our benefits.

The current proposed PCD framework exposes risks to customer experience and value for money issues associated with achieving unsustainable levels of performance, and incentivises the wrong behaviours in the sector (water companies and supply chain partners). There is also significant risk that levying significant and regular penalties on performing Smart AMI Meters undermines public perceptions of smart water metering, which limits their willingness to engage with efforts to reduce demand or fix leaks, or to have a meter installed (if it is located inside the home).

Southern Water has carefully considered the PCD framework, and Ofwat’s intentions and have concluded this response with a proposed alternative PCD that we believe provides a suitably stretching, yet achievable goal for Smart AMI Meter “Upgrades” and “Read Performance”, and will set the correct incentives to Water Companies.

## 6.3. Our Proposed Alternative PCD

We propose that the PCD is founded upon the principle of ensuring delivery of the funded enhancement, using a simple, easy to measure approach to governing outcomes.

Our proposed alternative approach is for the Meter Replacement PCD to apply as-is, to govern the timely delivery of AMI Capable meters, which applies to all planned meter replacements.

The Meter Upgrade PCD aims to measure the successful outcome of a meter that has been proven to be connected to the network, reported at the end of the Control Period. The number of meters connected to the network is set at 90%, recognising the industry data from Smart AMI Metering in Water and Energy as a sufficiently stretching target, and defined as:

- **Meters Connected to the Network >90%:** The number of meters which have successfully registered with the Company's meter data management system and been connected to the communication network for 7 consecutive days after installation or replacement, divided by the total number of installed / replaced meters, multiplied by 100.

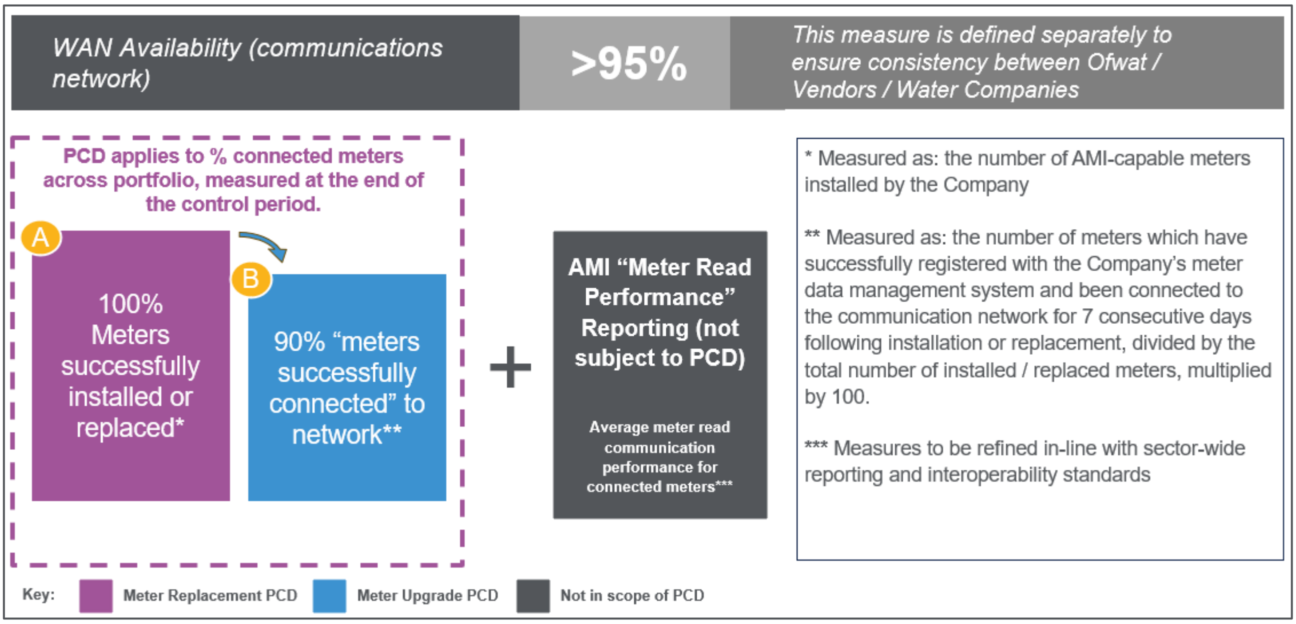
The Outcome Delivery Incentives (ODI) then govern "meter read performance", recognising that water companies should establish the right resolution of data from the meter to support their demand reduction objectives, according to their Water Resource Management Plans and Performance Commitments.

As part of our proposal, we recommend that water companies report upon AMI Meter Read Performance annually, to ensure there is sufficient collaboration and competition to achieve the optimum data resolution to enable demand reduction benefits.

We believe that our alternative PCD achieves the appropriate balance of mitigating the risk of non-delivery, while giving sufficient flexibility to water companies to deliver and optimise the right technology solutions that assure the long-term integrity of the smart metering programme.

The below graphic highlights our proposed approach to the PCD and associated definitions:

**Figure 1: Southern Water's proposed PCD definition**




Southern Water would suggest that Ofwat should review and publish a final PCD structure following engagement with Water Companies based on the PCD representations across the sector. As highlighted by the evidence provided, there is significant risk that if the PCD remains as it is currently designed it will have a material impact on costs, which should be re-submitted and re-evaluated considering final PCD requirements.

# 7 Appendix 1: Issue 2: Boundary Box Evidence

## 7.1. Boundary Box Volume & Cost Estimates

We have calculated our proposal based on the estimated position of 6.71% of replacements (based on evidence provided below) requiring a boundary box excavation, replacement and reinstatement prior to the installation of an AMI meter.

**Table 4: Calculation of Boundary box Costs**

| Southern Water | Number | Requiring replacement (%) | Requiring replacement (number) | Unit Cost per box (£) | Cost (£m) over AMP8 |
|---|---|---|---|---|---|
| Households and Non-households | | | | | |
| **Estimated Position (see evidence in section 5.2.3)** | **984,926** | **6.71%** | **66,065** | **£634.25** | **£41.902** |
| *Risk Sensitivity – Moderate (see evidence in section 5.2.4)* | *984,926* | *10.00%* | *98,943* | *£634.25* | *£62.469* |
| *Risk Sensitivity – High (see evidence in section 5.2.5)* | *984,926* | *20.00%* | *196,985* | *£634.25* | *£124.938* |

As we were an early adopter in the roll out of our metering programme, it has led to higher meter penetration and above average age of meter assets. In addition to the required higher than average meter replacement rate, the housing of these meters has deteriorated, which also now require replacing at a higher rate than funded.

At the time of our October 2023 business plan submission, we did not have evidence about the condition of our boundary box assets and, therefore, did not claim funding for replacing boundary boxes. Since then, we have gathered evidence (summarised further in this appendix) on the need for boundary box replacement to understand the potential associated risk.

Boundary boxes require replacement as they are subject to deterioration over time due to factors such as ground movement and damage over time (e.g. inoperable stop taps would require a whole chamber replacement). We are now experiencing failure of these meter chambers which require remediation to enable meter replacement and smart meters to be installed. As these assets age further, the deterioration and failure of boundary boxes will continue to increase in AMP8, which will lead to significant replacement costs above those funded in the historic average modelled cost allowances.

### 7.1.1. Cost Efficiency

The efficient cost to excavate and replace a meter boundary box was calculated to be £634.25, in 2022/23 prices.

This was derived from historical contractor rates for meter replacement and boundary box installation. The historical unit cost for an external meter exchange including the provision and installation of a completely new meter chamber at a depth not exceeding 1.0m was £740.05 in 2022/23 prices. Given that the mean unit efficient cost for a household meter replacement during our submission in October was found to be £105.80, we have estimated that the unit cost for the boundary box replacement to be £634.25.This is an appropriate calculation because it ensures the full costs of removing the meter and replacing it with a new meter is separated from the works related to the boundary box, so that both elements can be benchmarked in-line with Ofwat replacement unit costs and other water company assumptions.

This is likely to be an under-estimate given that the cost of construction materials and labour for AMP8 are expected to be significantly higher than the inflation adjustment. The unit cost estimate is also based on a boundary box to accommodate a 15mm household meter. The cost for the excavation and installations of a larger meter chamber for a non-household meter will be significantly more, and therefore the overall average efficient unit cost is likely to be more than £634.25.

We have benchmarked our boundary box replacement unit cost and found it to be comparable, but lower than other estimates. Anglian Water applied a unit cost £649.45 within their cost adjustment claim for boundary box replacement. Anglian Water stated that they "applied a unit cost which is not based on the costs we are currently seeing and have seen historically but have built in an efficient assumption around economies of scale." Therefore, we believe our assumption of a unit cost of £634.25 to be cost efficient.

### 7.1.2. Evidence 1: Site Surveys

To validate the need for adjustment and the business case assumptions on boundary box conditions, we commissioned Morrison Data Services to survey a representative sample of our boundary box asset estate.

We surveyed c.7,140 boundary boxes (approximately 1% of our asset base) to understand their condition and need for replacement. The survey took place in October 2023. It gathered necessary information on the meter box condition and the work required to repair/replace the chamber.

We surveyed a cross section of our boundary boxes to gather sample data across our asset base. The sample set criteria included:

- County (Hampshire, Sussex, Isle of Wight, Kent);
- Rural vs urban classification; and
- Domestic versus commercial properties.

The table below summarises the sample of boundary boxes we surveyed.

**Table 5: Sample set of boundary box survey**

| County | Classification | Households | Non-Households | Total |
|---|---|---|---|---|
| Hampshire | Rural town and fringe | 378 | 0 | 1,720 |
| | Rural hamlets and isolated dwellings | 84 | 5 | |
| | Rural village | 143 | 27 | |
| | Urban town | 940 | 143 | |
| Sussex | Rural town and fringe | 320 | 7 | 2,404 |
| | Rural hamlets and isolated dwellings | 54 | 66 | |
| | Rural village | 55 | 19 | |
| | Urban town | 1,585 | 298 | |
| Isle of Wight | Rural town and fringe | 144 | 30 | 724 |
| | Rural hamlets and isolated dwellings | 16 | 8 | |

| County | Classification | Households | Non-Households | Total |
|---|---|---|---|---|
| | Rural village | 78 | 40 | |
| | Urban town | 397 | 11 | |
| | | | | |
| Kent | Rural town and fringe | 322 | 33 | 2,292 |
| | Rural hamlets and isolated dwellings | 23 | 18 | |
| | Rural village | 48 | 18 | |
| | Urban town | 1,684 | 146 | |
| **Total boundary boxes surveyed** | | **6,271** | **869** | **7,140** |

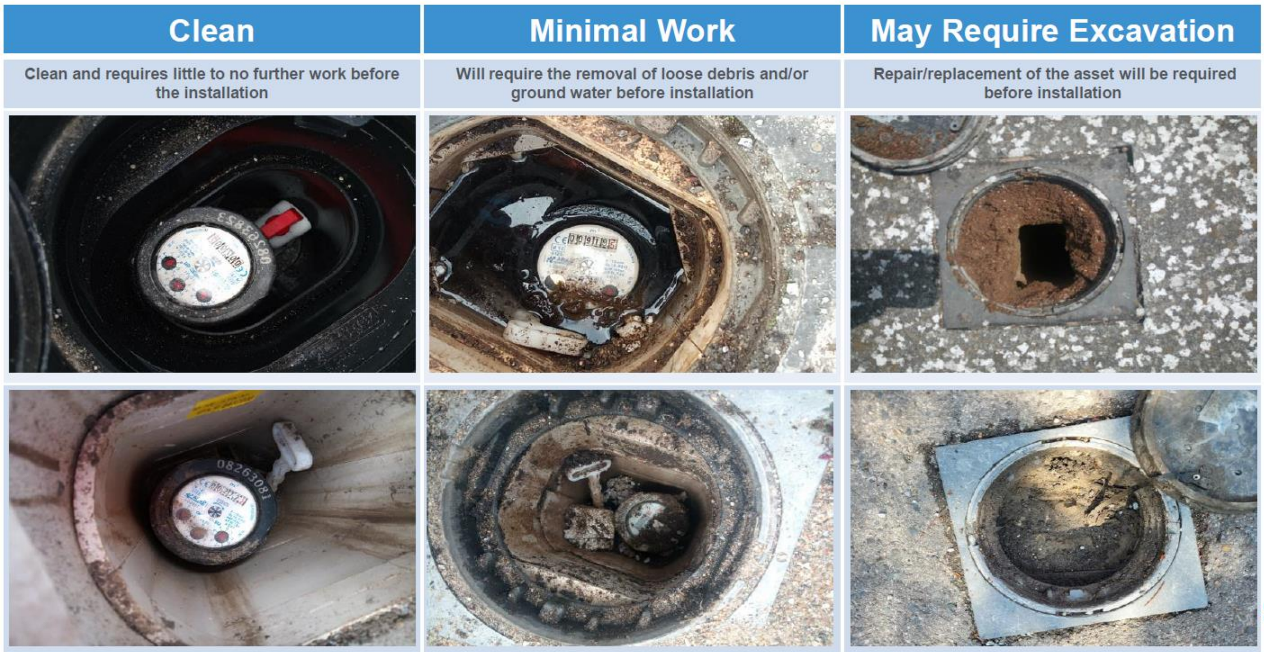
*Source: Survey commissioned to Morrison Data Services. The survey was conducted in October 2023.*

The survey determined a range of conditions for the meter chambers and identified the proportion that would need:

- cleaning but no further work;
- minimal work before meter replacement; and
- those that require comprehensive repair or replacement and excavation.

Examples of each assessment are demonstrated in the figure below.

### Figure 2: Assessment of boundary box condition




*Source: Survey commissioned to Morrison Data Services. The survey was conducted in October 2023.*

As shown in the table below, the survey found that almost two thirds (65%) of boundary boxes surveyed were in good condition and required little or no further maintenance work. About 29% of the boundary boxes were found to be contaminated with loose debris and/or ground water but had structural integrity and required minimal maintenance work.

However, the survey found that 6.7% of meter boxes were considered seriously compromised and required excavation and replacement.

**Table 6: Results from the boundary box survey**

| Condition | Households and Non-households |
|---|---|
| Clean | 64.6% |
| Contaminated | 28.7% |
| **Require excavation and replacement** | **6.7%** |
| Total | 100.0% |

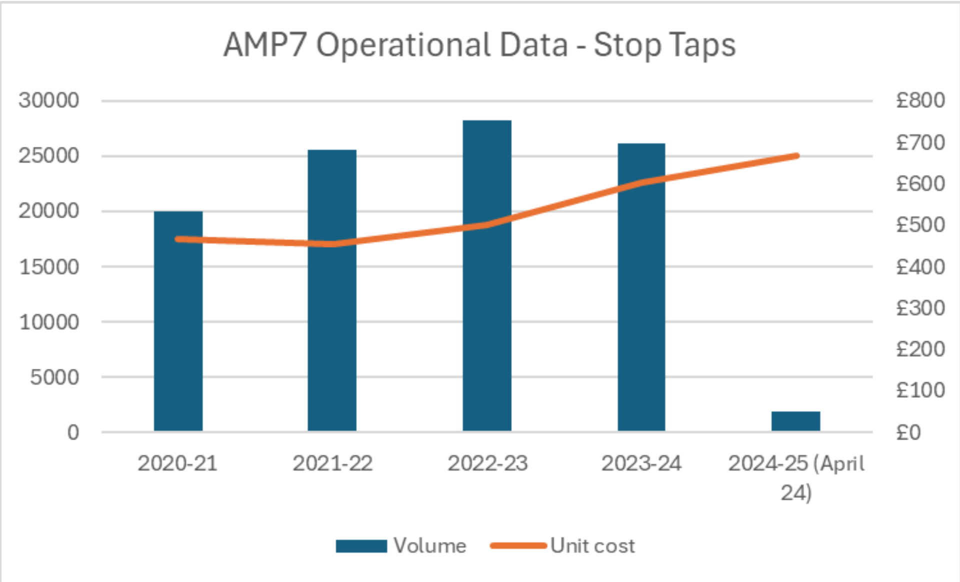
Source: Survey commissioned to Morrison Data Services. The survey was conducted in October 2023.

### 7.1.3. Evidence 2: AMP7 Operational Data

Our operational teams have reported that there have been 101,761 stop tap replacements in AMP7 that have required the replacement of the boundary box (~10% of all boundary boxes). The cost of the associated works (related equipment and labour, not including permitting and lane rental) has risen to nearly £700 per unit.

Our experience replacing meters in AMP7 suggests that additional boundary boxes may require replacement because of the installation effort (e.g. when dealing with the units unscrewing and reinstalling meters can lead to cross threading, cracked units and other defects emerging, which are difficult to distinguish from defective boundary boxes).

**Figure 3: Stop tap replacements in AMP7**



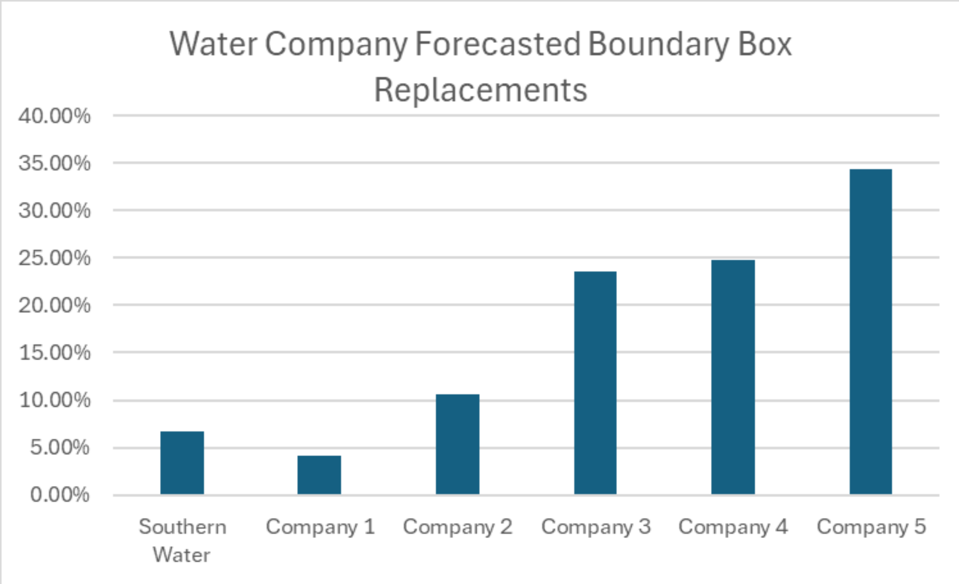

*Source: Operational data provided by Southern Water Operations*

### 7.1.4. Evidence 3: Other Water Company Insights

Using the evidence submitted by water companies in Cost Adjustment Claims, or their Enhancement Business Cases, it is clear there is significant uncertainty in the volume of boundary box replacements that are going to be necessary in AMP8. Anglian Water have stated based on historical replacement rates from their proactive programme, that 239,331 replacements are likely (>20% of their planned replacements in AMP8). Thames Water have stated that they expect 5% of their planned replacements to require a "dig" before a meter can be installed. Other water companies have suggested via the Smart Metering Advisory

Group that their estimates are as high as 35%. The below diagram shows the range of assumptions being made by water companies.

**Figure 4: Industry view on boundary box replacements**




*Source: Water Company shared inputs into the Smart Metering Advisory Group.*

# 8 Appendix 2: Issue 3: Metering PCD Response Evidence

This section highlights further details on the key challenge areas to Ofwat's proposed PCD associated with "Upgraded" meters. This section does not propose to challenge the Meter Replacement PCD.

## 8.1. PCD penalties are too punitive

To ensure that customers do not lose out if improvements are not delivered, Ofwat is using a combination of PCD payments, outcome delivery incentive payments and cost sharing arrangements to return to customers more than the allowed cost of the enhancements, which is intended to reflect any foregone benefits. To support this, Ofwat has proposed two types of incentives:

1. **Non-delivery payment:** This is a one-way incentive that seeks to return funding to customers when companies fail to deliver benefit by the end of the 2025-2030 period. If a company fails to deliver a benefit, it will return to customers the funding associated with the units of benefit not delivered. In the context of the Meter Upgrade PCD, this payment would apply if a Water Company has not delivered a meter upgrade that it had received funding for, or, if an upgraded meter has not met the connectivity and completeness performance thresholds.

2. **Time incentive payment:** A two-way incentive that seeks to encourage timely delivery so that consumers do not receive benefits later than promised. This offers companies the opportunity to benefit from outperformance and underperformance. The intention is that these are focused on expenditure that is most material and where timing of delivery has no significant overlay with outcome delivery incentives (ODIs) – this includes expenditure areas relating to metering. Time delivery payments will be applied to the yearly profile of delivery of AMI meters.

Linking the delivery of upgraded meters, and enduring meter read performance exposes water companies to significant financial risk from both non-delivery payments and time incentive payments. Below, Southern Water has developed a non-exhaustive list of illustrative examples of how non-delivery and time incentive payments could unfairly punish water companies:

1. **Upgraded meter reaching 94% performance:** Analysis of currently deployed AMI meters by water companies has shown that reaching higher meter read performance is challenging, while benefits are being delivered at lower performance levels. If over the control period a water company successfully upgrades all the planned meters to smart AMI meters, and achieves performance levels close to, but not exceeding the PCD measurement thresholds, the water company will be liable for time incentive and non-delivery payments. For example, a Smart AMI Meter that was installed in 2025, which achieves 94% connectivity and completeness on average across the control period, receives five time penalties, and a full non-delivery payment (total penalties of £87.46 vs an allowance of £76.84). The non-delivery and time incentive penalties facing the water company would be equivalent to the penalties facing a water company that has made no attempt to upgrade any AMI meters, and in addition the water company would face many sunk costs, such as undertaking the physical installation of the AMI meters and associated devices, plus demand reduction interventions.

2. **Upgraded meter initially meets performance threshold, before declining:** An alternative scenario is a Smart AMI Meter that was installed in Y1, has successfully met the thresholds for over one year, remains connected to the network, but does not sustain >95% performance on average over five years. In this example the water company would receive four time penalties and a full non-delivery payment, despite the meter being physically installed (with sunk costs), connected to the network providing regular readings, while achieving and proving sustained performance. It should be

expected that the water company has utilised appropriate measures to secure the right granularity of reads to achieve its Performance Commitments, with any shortfall or issues managed through BOTEX.

3. **Upgraded meter is installed with performance lag:** Anecdotes from other water companies, and the factors that influence securing successful meter readings[4] demonstrate that achieving sustainably high performance levels takes time to achieve. In addition, Ofwat expect that at least one month reporting is needed before a meter can be considered upgraded. Given this reporting lag, a meter upgraded in month 11 will always be liable for a time penalty, and there is significant risk that significant numbers of meters will under-perform in their first year, before improving to sustainable performance levels. This is an unnecessary construct that exposes water companies to time incentive payment risk, even if they are hitting their planned deployment targets

These examples have only considered penalties within the upcoming Control Period, and do not consider the additional ODI penalties if Performance Commitments are not met. There is significant risk that similar PCD levels remain in place beyond AMP8. In addition, the penalty approach does not consider the significant amount of sunk costs that have provided customer value, therefore it is unreasonable that penalties that are greater than the value of the meter upgrade are levied.

## 8.2. Overlap between PCD and ODIs

### 8.2.1. Outcome Delivery Incentives

Ofwat has applied outcome delivery incentives (ODIs) since 2015, with the ODI framework being developed to move from delivery of specific outputs, towards a focus on what matters for customers and the environment. Ofwat's intention with ODIs was to improve the alignment between the interests of water companies and the customers that they serve, by directly linking shareholders' returns to the quality of service that are provided by companies and the outcomes that are delivered.

Performance commitments (PCs) have been set by Ofwat to outline the outcomes that Ofwat expect water companies to achieve. Ofwat has outlined 24 common PCs for PR24, with each company set a specific target against the common PCs. Within the 24 PCs, there are three commitments that directly apply to the outcomes that can be achieved through smart meter deployment, these include:

- #13 **Leakage**: Measured as a percentage reduction of three-year average leakage from the 2019-20 baseline
- #14 **Per Capita Consumption**: Measured as the percentage reduction of three-year average PCC in litres per day from the 2019-20 baseline.
- #15 **Business demand:** Measured as the percentage reduction of three-year average business demand, in Ml/d from the 2019-20 baseline.

[4] Cited in Section 8.3.1. Challenges affecting read performance

Financial ODIs provide incentives to deliver key outcomes through the prospect of underperformance and outperformance payments. Outperformance payments provide financial payments to water companies from customers for performing beyond their committed levels of service ('outperformance payments') or from companies to customers for performing below their commitments ('underperformance payments'). ODIs are linked to performance commitments (PCs), which are metrics that measure the service that water companies deliver for their customers and the environment

Through these ODIs, Ofwat has placed performance commitments on the physical outcomes that water companies need to achieve, with penalties if these are not achieved of over £8m, in addition to the PCD payments.

### 8.2.2. Price Control Deliverables

PCDs are intended to act as an incentive to encourage water companies to deliver on their funded improvements in a timely manner and protect both customers and companies against failure to deliver. The expenditure allowances technical appendix outlines the common framework that was used to develop the PCDs, designed around four guiding principles, PCDs should:

1. Cover the benefits of the investment not fully protected by performance commitments
2. Should be used to protect customers for material enhancements in investments
3. Should cover outcomes over outputs/inputs
4. Be set at the highest level of aggregation possible to maximise flexibility

In the context of meter installation, Ofwat intends to set a PCD to hold water companies to account for the delivery of new AMI meter installation, AMI meter upgrades to existing meters and like for like replacements of basic or AMR meters. Ofwat separated these three deliverables to reflect the approach used to assess and set the allowances for different meter activities. To protect consumers against underperformance, Ofwat has set a non-delivery incentive which is intended to protect consumers against AMI meters not being installed, despite receiving enhancement funding.

In addition to non-delivery incentives, Ofwat has outlined a time incentive PCD for meters due to:

1. Metering being one of the most material areas of enhancement expenditure
2. Timing of meter delivery being important to make progress towards reducing PCC to 110 litres of water per head per day by 2050
3. Metering enhancement expenditure is not sufficiently protected by ODIs

### 8.2.3. Measuring connected meters and read performance

We agree with Ofwat’s rationale for requiring a PCD related to the delivery of upgraded AMI meters. AMI metering is a significant area of enhancement expenditure and Ofwat need to provide consumer protection to ensure that this enhancement expenditure is being spent on smart AMIs and that consumers are receiving the AMIs and outcomes that they have paid for. We also agree that existing ODIs do not sufficiently protect consumers against the physical delivery of the unit.

However, the scope of the PCD has been extended into two components. (1) the “AMI Meter Upgrade” i.e., the successful confirmation of the upgraded meter following an install using a one month reporting period, and (2) the “Read Performance” from that unit for completeness and connectivity on average during the control period. It is reasonable for the Non-Delivery element of the PCD to cover item (1) the “AMI Upgrade” to ensure funded deliverables are met. It is unreasonable for the Non-Delivery Payment element of the PCD to cover item (2) “Read Performance” as this is governed by a combination of time incentives and Performance Commitment ODIs, and would not be deemed “failure to deliver the funded improvements. Additionally, the enduring nature of this PCD poses risk where responsibilities are outside the control of water companies (e.g., new buildings or transient issues such as parked cars affect signal for sustained periods). Therefore it <95% completeness and connectivity of meter read data on average across the Control Period should not be deemed failure to deliver the funded improvements.

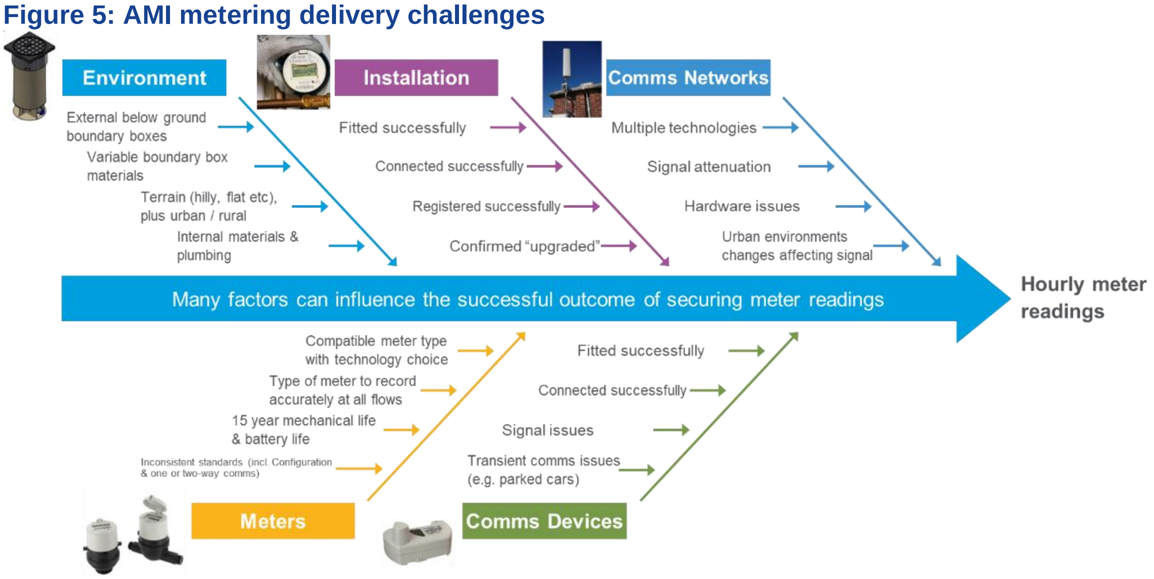
A PCD is not required to measure the ongoing performance of a meter as this is incentivised through existing ODIs. The use of AMI meters will enable water companies to make direct progress against at least three commitments outlined in the PC framework (leakage, PCC and business demand). Having used the enhancement expenditure to upgrade a meter to an AMI meter, water companies have a strong incentive to generate high levels of performance to deliver on the PCs and avoid the significant financial penalties of underperformance. As outlined in our business plan, our AMI programme will deliver a saving of 20.6Ml/d by the end of AMP8, but to achieve these we need to generate AMI meter performance through the frequency of data collection and the timeliness of data availability.

## 8.3. PCD measurements are unrealistic

### 8.3.1. Challenges affecting read performance

Smart AMI Metering delivery is challenging, to achieve the successful outcomes of consistent and high volumes of meter read data requires a number of independent factors to be true at the same time to perform well at scale. This is summarised in the diagram below, and further explored in this section.

**Figure 5: AMI metering delivery challenges**




*Source: Southern Water*

### Environment

Smart metering devices and infrastructure are exposed to significant risks that can erode AMI meter performance. AMI meters are typically installed in boundary boxes. These are normally located underground outside of a property. Boundary boxes do not have power sources, so an AMI meter requires a battery to record and transmit data to water companies. Communication is enabled by local communications networks, which need to be set up and managed by a communications provider. Given the physical location of the AMI meters in boundary boxes, there are many factors that can influence signal strength including the depth of the boundary box and physical obstacles (both temporary such as cars above the boundary box and permanent such as buildings).

The materials necessary for a stable communication is also dependent upon the chambers in which it is held; for example, non-communication can sometimes result due to the material the lid to the chamber is made from.

It is also heavily influenced by the type of environment it is placed, with significant variance between rural and urban meter reading performance. Vendors have told us that they would need multiple technology types to achieve cost-efficient coverage in our region, and some postcodes may yet remain unserved. Reaching the 6.31% of postcodes not served by their primary technology, they may need to utilise NBIOT which is an unproven technology in the UK Water Sector at scale.

**Table 7: Southern Water's network coverage by network type**

| Network Type | # Postcodes Served | % of Total Postcodes in Region |
|---|---|---|
| Primary Network | 60689 | 93.69% |
| Secondary Network | 3515 | 5.43% |
| Potentially Unserved | 571 | 0.88% |

*Source: Southern Water*

### Meters & Communications Devices

There have been no industry standards set for Smart AMI Meters in the UK Water Sector. This has led to several challenges in the technology landscape, such as meters and devices that are only operable with one communications network technology type and associated platforms. This makes achieving coverage immediately more challenging, recognising that our region will require multiple technologies to achieve the outcomes stated.

Smart AMI Water Meters have an expected mechanical lifespan of 15 years and are increasingly digital meters. Supply chain vendors have communicated that this lifespan can also be achieved in the batteries of the devices, based upon hourly meter readings, transmitted to Southern Water daily. However, the lack of industry standards on battery testing, and noting that the earliest deployment of Smart AMI Water Meters was in 2016 (8 years ago), it is unproven these assets can reach the forecasted battery lifespans stated. This risk is proven further by the high additional costs required by manufacturers to provide warranty for those assets for longer than 10 years (as materialised during procurement of our new meter type in 2023).

Meanwhile those assets are not conforming to a common set of use cases across the sector, with some meters being required to provide more than hourly readings (with increased reading frequency configurations for overnight hours). Over the 15 year lifespan of meters, new and innovative use cases will emerge and should inform a common set of standards. These will further challenge the capabilities of the meter to transmit data in a way that is efficient for the batteries.

Furthermore, if a meter has lost connectivity to a network, it will have to attempt more times to re-connect, further draining the battery of the asset.

### Installation

It is often challenging for water companies to anticipate communications performance issues before the physical installation and in some cases an AMI meter could be installed before the communications network has been established (e.g., reactive replacement of a meter when it fails). This could lead to a lag between meter installation and connectivity and performance will likely be lower immediately after installation, with performance increasing over time as water companies and communications companies implement solutions to improve performance. In many cases, despite improvements that water companies and communications providers can implement, the physical characteristics of a site may make it unachievable for an AMI meter to achieve the PCD performance levels.

There are often challenges in the fitting of meters; devices must be fitted at the right angles and with the right connection to the meter for connectivity with the communications network to be achieved. It can often take some time for meter readings to stabilise post install.

### Communications Networks

There are several major technologies that can provide communications networks available in the UK, however there are two that have become the prominent technologies in the UK market; Flexnet and LoRAWAN. Those networks need to be designed correctly by the Communications Network company, installed on infrastructure in the right locations (for some technologies this may require public infrastructure with council permission necessary), to reach the spread of meters in its area. It requires many factors to remain true over time to maintain connectivity; in particular a stable built environment and resilient hardware over the long term.

### Summary

Each component of the smart AMI metering value chain must be operating successfully to provide the successful outcome of consistent and high volumes of meter readings. This must be true while protecting those assets for the long term to maximise their lifespans in a challenging environment.

## 8.3.2. Smart AMI Water Metering Trial Findings

Water companies have undertaken trials to test the performance of AMI meters and communication networks, with the aim of further understanding those factors that influence performance. Those trials have suggested that less than between 60-80% of AMI meters were providing consistent connectivity and data provision, far below the thresholds set by Ofwat.

- In AMP7, Southern Water have conducted a trial using 1500 B4T Jellyfish Devices utilising the Sigfox network. These deployments were targeted at randomised properties to evaluate connectivity in different parts of our region. The trial found that 65% of AMI devices tested achieved consistent connectivity and were reporting data, which was lower than the 85% proposed by the communication provider in the contract. Connectivity issues existed across both urban and rural environments, with connectivity levels that ranged between 14% and 92% in individual areas and is likely that additional signal boosters are required to achieve higher performance. A conclusion from this trial was that in the future each individual proposed target area should require a thorough pre assessment for signal strength before the installation of any devices and that potentially deploying limited test devices to confirm connectivity levels is strongly recommended.

- In Severn Trent's initial trial phase with Suez, AMI meter performance varied significantly across different types of locations, with results showing large variation in performance. Rural properties had the lowest overall performance, with 80% of trial AMI meters providing hourly reads and 95% meeting data availability requirements.[5]

### 8.3.3. Smart AMI Water Metering at Scale Findings

All water companies in England and Wales have plans to deploy smart AMI meters to customers across the AMP8 period. Some water companies have been installing Smart AMI Meters at pace in AMP7 following approvals at PR19 and Green Recovery. Lessons can be learned from those that have installed material volumes of Smart AMI Meters in AMP7.

We have collaborated with those water companies to understand performance levels achieved so far. The following companies provided input data:

**Table 8: Water company AMI deployment**

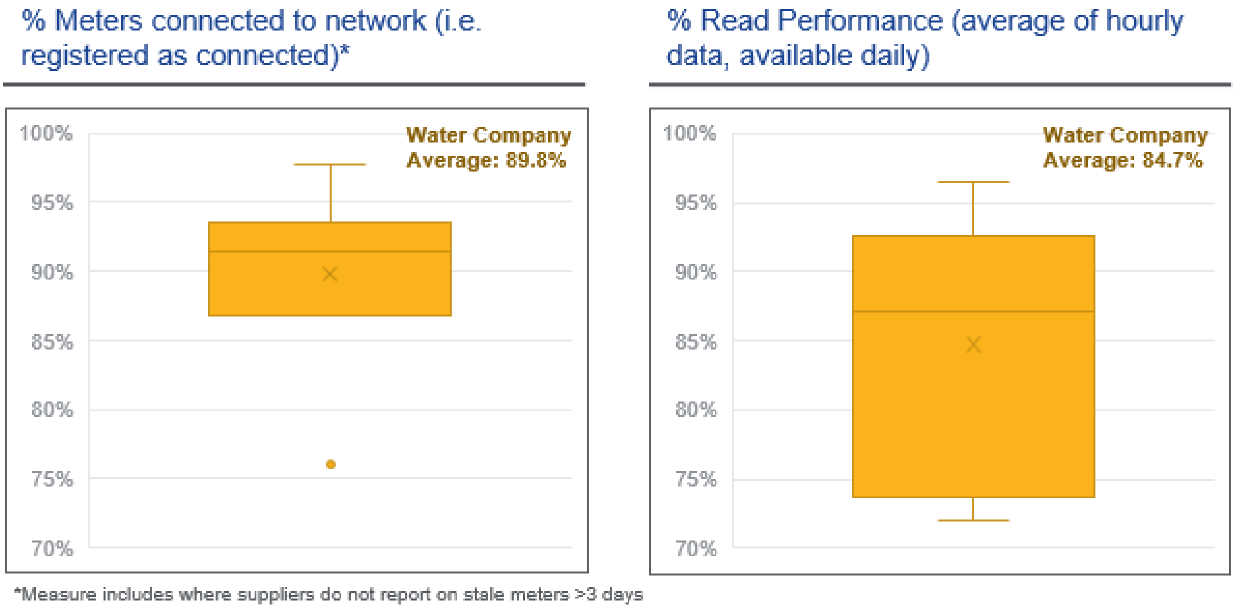
| Water Company | Volume of AMI Meters | First Install | Meter Manufacturer | Communications Network Technology |
|---|---|---|---|---|
| Anglian Water | **0.94m** | 2016 | Sensus | Flexnet (Arqiva) |
| Northumbrian Water | **0.20m** | 2021 | Sensus + Itron | Flexnet (Arqiva) + LoRAWAN (Connexin) |
| Severn Trent Water | **0.14m** | 2022 | Itron | LoRAWAN (Connexin) |
| Thames Water | **1.07m** | 2015 | Sensus | Flexnet (Arqiva) |
| United Utilities | **(trial – 1k)** | 2023 | Itron | LoRAWAN (Connexin) |
| Yorkshire Water | **0.10m** | 2021 | Itron | LoRAWAN (Connexin + Netmore) |

*Source: Southern Water*

Data from participating water companies, has demonstrated that performance issues remain a challenge at scale. Water companies have on average 89.8% of their meters "connected to the network", and those meters are achieving on average 84.7% connectivity and completeness of data. These findings would be materially short of the 95% completeness and connectivity that Ofwat is proposing through its Price Control Deliverable, however, is proving sufficient to enable benefits.

[5] SU008SevernTrentCSv52LR.pdf (suez.com)

**Figure 6: Installed AMI meter performance**




*Source: Analysis of water company AMI performance collected by Southern Water*

It has also exposed challenges in the consistent reporting of data between water companies, and between those water companies and their supply chain partners. Participants cited that suppliers would not report within their figures meters that are unable to connect to the communications network, or meters that were not connected (having gone "stale") over 3 days. This further demonstrates the need for detailed definitions of reporting requirements that are standardised across Smart AMI Metering in the Water Sector.

Environmental factors influencing performance are already having an impact on performance. Approximately 10% of meters have not been able to connect to a network, with many out of coverage of a fixed network, and others half facing connectivity issues due to "skyline" changes, such as new building construction interfering with communication networks or meters being installed in hard-to-reach locations. Issues affecting completeness and connectivity levels are then typically driven by lost or intermittent connectivity (e.g., due to materials or transient signal blockages).

If these levels were achieved in AMP8, the majority of Smart AMI Meter units would be considered "not delivered", incurring both time penalties each year and non-delivery penalties at the end of the control period.

## 8.3.4. Benefits enabled so far

At the levels of connectivity achieved by water companies, benefits are already being delivered. The performance levels are enabling considerable reductions in demand and leakage which have formed the basis of Water Resource Management Plan forecasts.

- Thames Water has claimed that on average, metered customers tend to use 12% less water. In addition, smart meters have helped detect more than 80,000 leaks on customers' private supply pipes, which have been repaired, saving 57 million litres of water a day.[6]
- Other water company shared data indicates that an installation of smart AMI meters has led to a per capita consumption reduction of between 6-22 l/h/d and a customer side leakage (incl. continuous flow and customer supply pipe leaks) reduction of 7.6 and 12.6 l/h/d.
- Severn Trent has experienced faster identification and resolution of customer side leaks, such as a reduction in the time it takes to identify and fix a leak on a customer's supply from 134 days with a traditional meter to 32 days with a smart meter.

### 8.3.5. Lessons from Smart Metering in Energy

The Energy Act 2008 gave the government powers to begin a smart energy meter rollout. In 2011, the deployment of smart meters began, and the government set out a vision for every home and small business in Great Britain to have smart meters installed and set an intention to effectively complete the rollout in 2019. However, this target has not been met, and by the end of March 2024, 35.5 million smart and advanced meters were installed in homes and small businesses across Great Britain, representing around 62% of all meters.

Most homes have two smart meters, one for gas and the other for electricity and the installation also includes a communications hub, which allows smart meters and in-home display equipment to communicate and links the smart metering system to the secure national smart meter network.

Over the first eight years of smart meter rollout, SMETS1 meters were being installed in homes. Overtime, it became clear that a significant downside of the SMETS1 system was that they did not always allow consumers to change energy supplier without losing the ability to send meter readings automatically. This problem has now been overcome through interoperable second-generation meters (SMETS2), introduced in 2018 as well as the development of an upgrade scheme to migrate SMETS1 to SMETS2 onto the DCC (Data Communications Company) network. The DCC is responsible for proving the central technology and communications infrastructure for all energy smart metering systems, linking smart meters in homes and small business with energy suppliers, network operators and energy service companies.

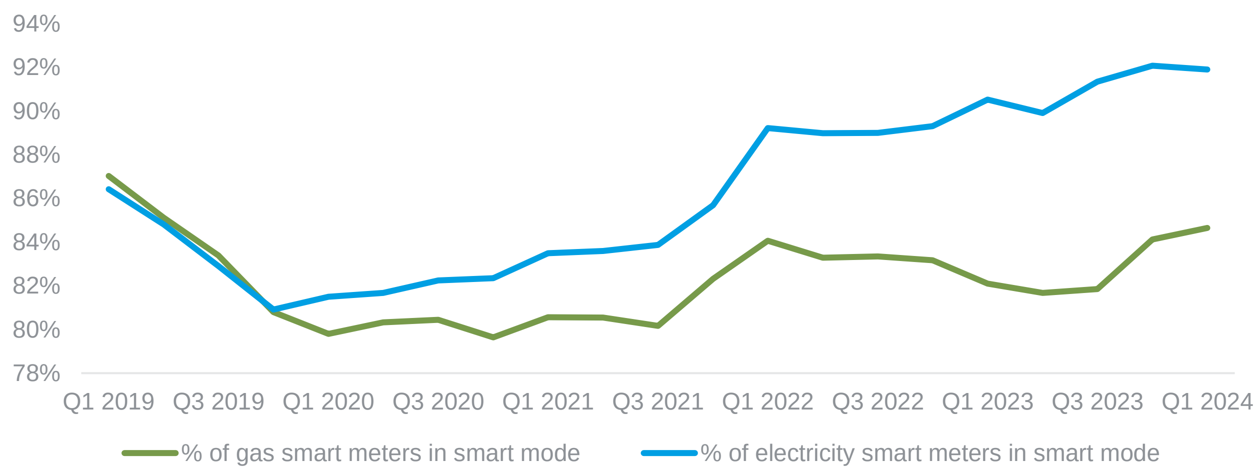
Smart meters continue to face performance challenges and a small proportion of properties remain technically incompatible with smart meters (DESNZ expect that is it now technically possible for smart meters to function in 96.5% of homes and small businesses[7] - some locations such as high-rise flats remain harder-to-connect). Enabling meters to record data at the required frequency and transmit this to suppliers has had mixed success, with performance improving over time.

Meters operating in "Smart Mode" should automatically send readings via a remote connection to energy suppliers. Despite smart meter being well into the thirteenth year, DESNZ Q1 2024 data show that 8% of electricity smart meters and 15% of gas smart meters are still not operating in "smart mode". The higher

[6] One million smart meters | Newsroom | Thames Water
[7] Update on the rollout of smart meters (parliament.uk)

levels of connectivity achieved this year have taken many years to reach, with 19% of gas and electricity meters not operating in smart mode in Q4 2019. On average, the data reported by DESNZ suggests that gas and electricity meters operating in smart mode on average 83% and 86% respectively in between 2019 to 2023 (definition of "operating in Smart Mode" is not published by DESNZ).

**Figure 7: Percentage of smart meters operating in "Smart Mode" since 2019**




*Source: DESNZ Official Statistics (Smart Meters in Great Britain, quarterly update March 2024[8]*
*Notes: Both Ofgem and the DCC use the Citizens Advice's definition of smart mode; "Smart mode means your meter should automatically send readings to your supplier".*

There are a range of reasons for the lower levels of performance experienced by gas and electricity meters. Southern Water has summarised some of these issues in **Error! Reference source not found.**, and based o n the experience of those involved in the rollout, provided an indicative range for how many energy meters each reason has impacted and identified if these issues are also likely to impact the water sector.

- **"Install & Leave" :** This could occur for example where a meter has been installed in a new build premises and is awaiting formal commissioning by a customer, or where a meter has been installed in an area that has not yet developed a WAN network.
- **Dark Sites:** This can include issues with smart meters losing signal to the network that can be caused by signals being unable to pass through walls etc.
- **No Readings & Estimated Bills:** This occurs where a meter has achieved connectivity, but is not providing usable meter readings to the Energy Supplier.

[8] Smart meters in Great Britain, quarterly update March 2024 - GOV.UK (www.gov.uk)

**Table 9: Indicative reasons affecting smart performance**

| Reason | Indicative Range | Applicable to Water? (✓/✗) |
|---|---|---|
| 1. Install & Leave | 5-10% | ✓ |
| 2. SMETs1 Dormant | 2.5-5% | ✗ |
| 3. SMETs 1 enrolled not operational | 1-5% | ✗ |
| 4. Intermittent | 1-5% | ✗ |
| 5. Dark Sites (No Comms) | 2.5-5% | ✓ |
| 6. No Readings | 2.5-5% | ✓ |
| 7. Estimated bill | 2.5-5% | ✓ |

*Source: Southern Water, cited by George Donoghue*

The rollout of smart energy meters has shown that it is reasonable to expect performance issues with meters, particularly in the initial phase of deployment. It can be difficult to anticipate performance related challenges ahead of deployment and it has taken many years for gas and electricity smart meters to overcome these challenges and reach higher performance levels, which have been improving slowly over the last 5 years. Smart gas and electricity meters benefited from common standards, such as through the use of SMETS1 and SMETS2 devices and access to common smart infrastructure through the DCC. Water companies are using a range of AMI devices and communications networks, which may lead to different types of challenges for different technology configurations and reduce the potential for water companies to benefit from economies of scale.

There remain buildings that are not compatible with smart energy meters and despite the continued performance improvements over several years, a significant proportion of installed smart meters are still operating at lower performance levels. This highlights the challenge that water companies and communication companies will face in meeting the PCD measurement thresholds. It will be unachievable for some locations to every achieve PCD performance thresholds and for other locations could take many years of improvements to increase performance towards the PCD thresholds.

## 8.3.6. Summary of evidence

The evidence provided suggests that read performance at scale is not achieving the proposed measurement thresholds after many years of optimisation, therefore it is an unrealistic and overly stretching target to achieve for the sector in AMP8. As water companies have been able to start realising the benefits of Smart Metering, it is an unreasonably high level to achieve.

## 8.4. PCD drives unintended short-term costs for customers and stifle innovation

We are currently mid-tender for our Alternative Metering Service provider. This tender will need to be re-designed to pass through higher than planned performance rates, upon which we anticipate we will receive higher quotations from our bidders to meet the ongoing performance levels. We are also aware there is significant variance of performance across the sector, with the Arqiva/Sensus Flexnet technology achieving higher performance levels than other technologies, but with the benefit of having since 2016 to rollout and learn the lessons to improve upon performance. There is significant risk that the PCD design limits technology choice and reduces feasible options in our selection.

New technologies such as LoRAWAN and NBIOT in the UK Water Sector, have not yet been afforded the time to prove they can achieve connectivity at scale at a competitive price, which risks stifling innovation by forcing water companies to select one technology. The lack of standards in place also makes it more challenging for different supply chain vendors to enter the market with a clear understanding of the use cases and standards that must be met.

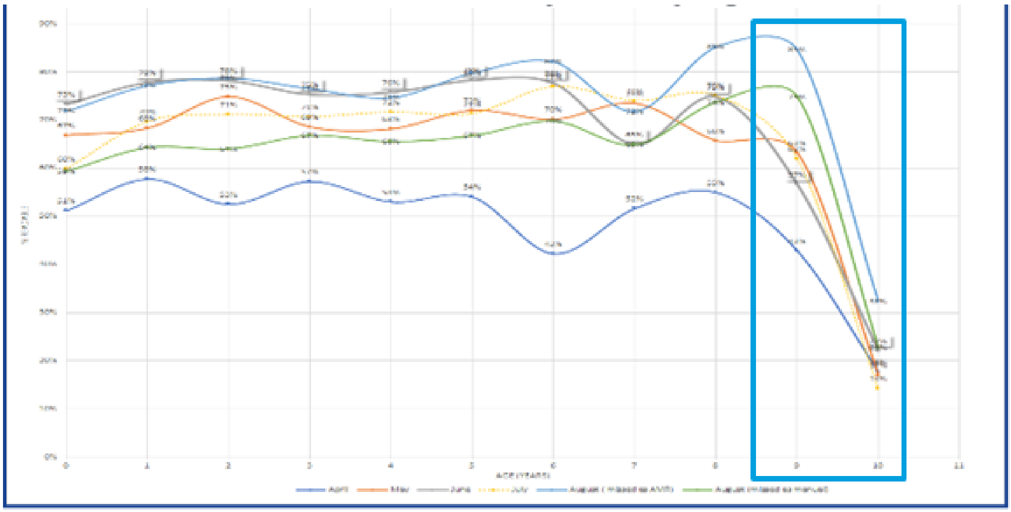
## 8.5. PCD drives unintended long-term costs for customers

AMI water meters are battery powered and once the battery has been fully used, the full unit will need to be replaced. The most efficient approach to replacing AMI batteries is to align this with the AMI meter replacement frequency, so that both tasks can be completed by an engineer during one visit. Typically, water meters have a lifespan of around 15 years, which makes this the optimal frequency for a meter battery replacement. If an AMI battery is unable to last for this duration, multiple visits and replacements will be required, which will lead to negative consumer outcomes due to the cost associated with each meter replacement, and the experience of more regular visits.

Battery life of AMI meters can be influenced by multiple factors including performance requirements, levels of connectivity and the physical environment. Batteries will be placed under increased strain when performance requirements are more demanding, such as more frequent requirements to record and transmit data. Similarly, connectivity issues can influence battery life, with meters facing signal connection issues using more of their battery searching for a connection. This presents risk that the treatment of those assets could cause early life failure. No water company has yet had Smart AMI Water Meters in place over 10 years, so there is limited evidence of the performance of batteries in their installed environments.

Real-world evidence of the AMR meters installed during our Universal Metering Programme from 2010 onwards, indicates that batteries are failing faster than anticipated, within 9-10 years of its lifespan. These meters retain the capability to be visually read by meter reading operatives, which means the mechanical meters remain useful, however at 2.5x the costs of a drive-by reading.

## Figure 8: AMR meters successful read by age



*Source: Southern Water*

Table 10 illustrates the total cost of maintaining a smart AMI meter across a 20-year period (recognising a 5 year installation phase of meters, and subsequent 15 year operational service phase per meter). In each scenario, the benefit delivered by the AMI meter is the same for the consumer, as the AMI meter is in operation across its lifespan, but the cost associated with this benefit is dependent on the life of the battery. If a battery in an AMI meter can last for 15 years, the total cost of maintaining this meter would be £204, which covers the initial installation in year 1 only, with the next planned replacement to take place at the end of its lifespan. If battery life is shorter, lasting 10 years, the cost of maintaining this AMI meter doubles to £409 because of an unplanned replacement within the period, and if the battery has a shorter 8-year life span, the cost increases to £612 as a result of three replacement cycles within the same period.

## Table 10: Implied cost of meter replacement over 20 years

| Case | Mechanical Failure (years) | AMI Battery Life (years) | Total Cost (real 2024) |
|---|---|---|---|
| Assumed | 15 | 15 | £204 |
| Likely | 15 | 10 | £408 |
| Worst | 15 | 8 | £612 |

*Source: Southern Water*

Given the cost escalation associated with battery replacement and the range of factors that could influence battery life. There is an inherent trade off around reporting/transmission frequency, battery life and value to the consumer. Ofwat has set a PCD based on targets at the end of the 5-year price review period, but this does not recognise the longer-term efficiencies that should also be considered associated with the frequency of meter replacement. There is a risk that a PCD set based on frequent recording and transmission requirements may risk reducing battery life and requiring more frequent meter upgrades. This increases the cost to the end user and is not consistent with Ofwat's goal of protecting consumer goals.

## 8.6. PCD disincentivises upgrading meters in hard to reach areas

We have forecasted that some areas of our region will be harder to achieve the thresholds stated due to environmental factors such as whether the dwelling is rural or urban, or the meter is situated internally or externally. Supply chain vendors have suggested this could be 7% or more of our postcode areas which may be unserved, or on an unproven technology. In the more challenging environments, there is risk that it unreasonably expensive to achieve the proposed thresholds, which will make it more expensive in likely penalties than upgrading the meter; which is not the best value for money for customers. If upgrades are prohibitively expensive, it will prevent an upgrade taking place, which will directly erode our benefits.

The design of the PCDs will drive the rollout programme behaviour of water companies. Under the current design, upgrades are likely to be targeted where there is greatest confidence in achieving the PCDs, rather than where there could be greater benefit in reducing demand, such as in areas of water scarcity. Water companies will be reviewing their potential financial risk when rolling out AMI meters and will be conscious of the potential penalties that they could be liable for. Depending on the communication technology solution, rolling out meters before network coverage has been achieved could be considered too great a risk due to the uncertain performance that might be achieved once a communications network has been established. This could substantially slow the pace of AMI rollout where hard choices need to be made to optimise deployment plans where it is not economic to upgrade AMI meters in areas that will not achieve PCD levels of performance.