Smart metering

A scale trial of smart metering to establish its longer-term viability

Business case 06

Severn Trent
29 January 2021

WONDERFUL ON TAP

SEVERN TRENT

Executive summary

We propose to install a new generation of 157,000 smart meters in and around Coventry at a cost of just under £22 million[1] to help customers use water more efficiently, for us to identify leaks more quickly and to trial new ways of managing peak demand – potentially saving billions throughout the UK in the longer-term. The data the scheme will generate will also empower customers and help to unlock substantial future innovation.

Smart meters mark a step change from today's standard meters. They are a breed apart, providing customers and companies with immediate, real-time information about how much water is being used, how much carbon is being expended and the financial cost. For cost-conscious customers, this is the sort of insight that will them to better understand how their use can impact bills. For others, it is a great way to increase their own awareness of their environmental impact and carbon footprint from water use. For water companies, smart meters provide the opportunity to improve resilience by targeting key interventions on peak demand, improve water balance insight and improve the speed and efficiency of measures to reduce leakage.

Demand for water nationwide is increasing. At Severn Trent, we expect to face close to a 400 MLD (million litres a day) shortfall by 2035. As metering is an environmentally and financially efficient way to reduce demand, our ambition is to have universal metering across our network by 2035.

In building on that longer-term objective, we propose to:

- Take advantage of low interest rates and install 157,000 smart meters, across Coventry and the surrounding areas of Warwickshire, that can be monitored remotely on a minute-by-minute basis. This would include 91,000 replacement meters and 43,000 relatively difficult to fit boundary box meters.
- Save additional money by coordinating the work with our separate proposal to replace customers' lead pipes in the Coventry area – the same teams can do both jobs.
- Agree a costed programme for the efficient roll-out of the meters, complete with penalties if we fail to deliver on time, and then a separate incentive regime for maximising the benefits of the scheme over the longer-term.

We are especially keen to use smart meters that can monitor consumption remotely, on a minute-by-minute basis. They will provide us with the data we need to trial ways of reducing peak demand. We estimate that reducing peak demand – not just average demand – across the UK by five per cent could save £3-5 billion of capex and over a million tonnes of carbon by avoiding the need to build new treatment facilities that are only needed for a few hours a day during a few weeks of the year.

Other benefits of our proposal include:

- Taking advantage of historically low interest rates to release savings for customers and combining the work with the Taking Care of Customers Supply Pipes scheme to save almost [redacted] on the delivery cost.
- Enhancing resilience by effectively generating an extra 3.2 MLD of zero carbon water supplies through a combination of reduced customer demand and leakage reduction.

[1] All financial values are shown in 2017/18 prices.

- The ability to begin the work within weeks – the work is relatively straightforward, and no complicated design work is required.
- The generation of the equivalent of 78 full-time jobs for a year, with us offering supporting training opportunities at our new academy in Coventry.
- Creating the opportunity to test new water saving technology and ways of working on a city-wide basis, something that could help to transform Coventry into a testing hub for new technology – the global water industry equivalent of the Nürburgring[2].

In our independently conducted research with customers on our decarbonising water resources proposal – part of which included increased household metering – 75% of customers were supportive, with a further 20% not minding either way.

[2] The Nürburgring is widely considered to be the home of automotive development. It is a race track that, having proved too challenging for Formula 1 racing, is now used by car manufactures and tyre companies to push cars to the limits to find out how they would perform in the real world.

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1. Water meters

1.1 About our existing plans

Our latest view of the supply demand deficit, as set out in our Decarbonising Water Resources business case, is that it will be close to 400Ml/day by 2035. Our plan for tackling this deficit was built on a mix of supply-side and demand-side interventions, with the demand-side expected to deliver a minimum of 50% of the amount required. A key part of this plan is a significant expansion in metering – each of the planned sources for the demand-side saving are set out in the figure below.

Figure: WRMP19 sources of demand-side savings

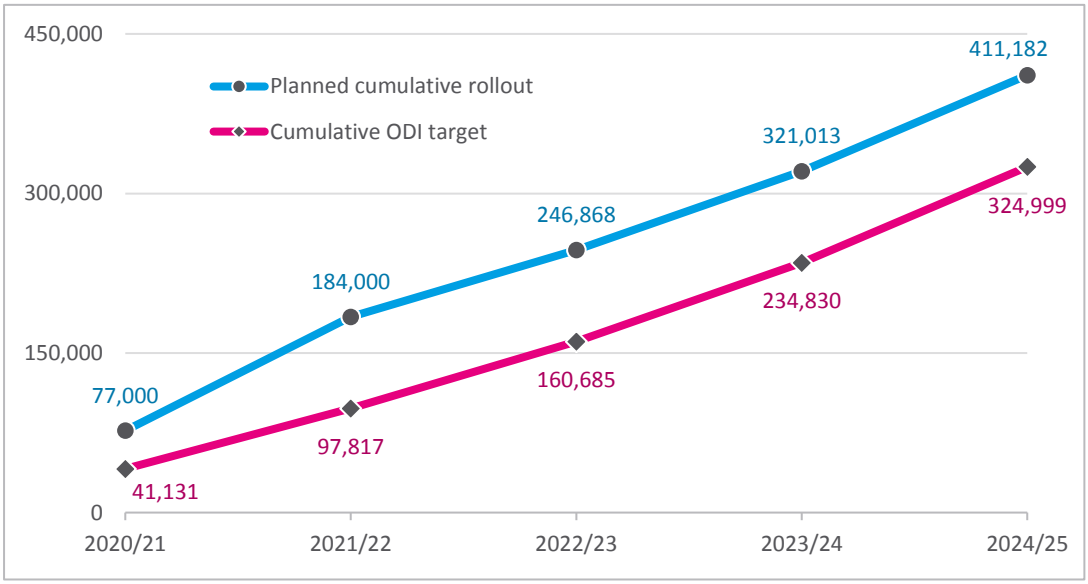
WRMP19 Demand-side measures	Leaks	Metering	PCC
	↓15% in AMP7 ↓50% by 2040	63% of customer supplies in AMP7 100% coverage by 2035	↓3.5% in AMP7 ↓9% by 2040

At WRMP19, we set 2035 as the ambitious target for us to hit full meter coverage and challenged ourselves to reach 63% by the end of AMP7. To meet this challenge, we designed a rollout programme that would prioritise the resource zones with the greatest deficits (Nottinghamshire, North Staffordshire and the Strategic Grid) and we are devising approaches to encourage even more customers to take up metered billing.

1.2 Progress with our existing plans

We have already accelerated our AMP7 plans for meters. This year, we are on track to install 88% more meters than set out in our PR19 ODI target. By the end of AMP7 we expect to have installed more than 86,000 meters over and above our AMP7 cumulative target. The 410,000 meters that this will deliver to customers for the first time will make an important contribution to the 500,000 meters target that we have set ourselves as part of our leakage ambition. The rest of the meters that will support this ambition are set to come from replacements of analogue meters with AMR meters and a number of additional DMA meters.

Figure: Metering rollout – cumulative number of meters installed over AMP7



2. The need to accelerate meter rollout

2.1 Overview

The need to increase investment in water meters is driven by the need for an integrated approach for delivering greater water resilience. In support of this journey, we already have an ODI target for us to deliver 325,000 extra meters by the end of AMP7 – a target that we are already planning to beat by over 86,000 meters. Nevertheless, we are acutely aware that this will not mark the end of meter rollouts and that many more will be needed in AMP8 and AMP9 if we are to fulfil our ambition of universal metering by 2035. Throughout this chapter, we step through the significant opportunities that are available if we can pull forward some of this investment into AMP7 to deliver extra demand-side savings of 3.2 MLD to support our Green Recovery plans for decarbonising water resources.

The water saving benefits of metering are clear. They are a proven way of encouraging customers to manage demand and deliver per capita consumption (PCC) savings of 10%. They are also very helpful for tracking down leaks on the customer-side, with 1 MLD leakage saving for around every 71,000 meters installed – either for the first time or to replace old-tech dumb-meters. Beyond this, every megalitre of water saved means an extra 181 $kgCO_2e$ is saved every day. With a carbon footprint of 312tCO_2e[3] to 1,696 tCO_2e[4] for the meters that deliver this 1MLD saving, the ongoing carbon savings would be able to offset this footprint in less than 10 years (compared with typical life-expectancy for meters of 15 years).

2.2 Why accelerate now?

Step-change in stakeholder expectations

The level of ambition on the environment and the level of expectation for us as a sector has stepped up markedly since WRMP19 and PR19. It is already becoming clear that this is a game-changer moment and we already expect that WRMP24 will look very different.

We are acutely aware that the changing expectations from stakeholders are not a matter of political trends or fashion – it is down to the speed at which the climate is changing, the speed with which it is impacting the environment and the changes we are seeing in the way customers use water.

We are seeing a clear and consistent message from Government and regulators about the need to address the growing water deficit. We agree wholeheartedly with this direction and how it is starting to flow through into the Water Resource Planning Guideline. We have also taken note of how these guidelines have set out specific expectations on metering, in that we should:

- fully consider the benefits of increasing meter penetration, including the installation of smart meters,
- consider a range of scenarios as part of decision-making, including one that assumes roll-out as fast as possible, and
- consider the multiple benefits of metering (and smart metering).

[3] Simple screw installations on single supply.
[4] Boundary box installations (which require digging).

Greater clarity on the need to strengthen resilience

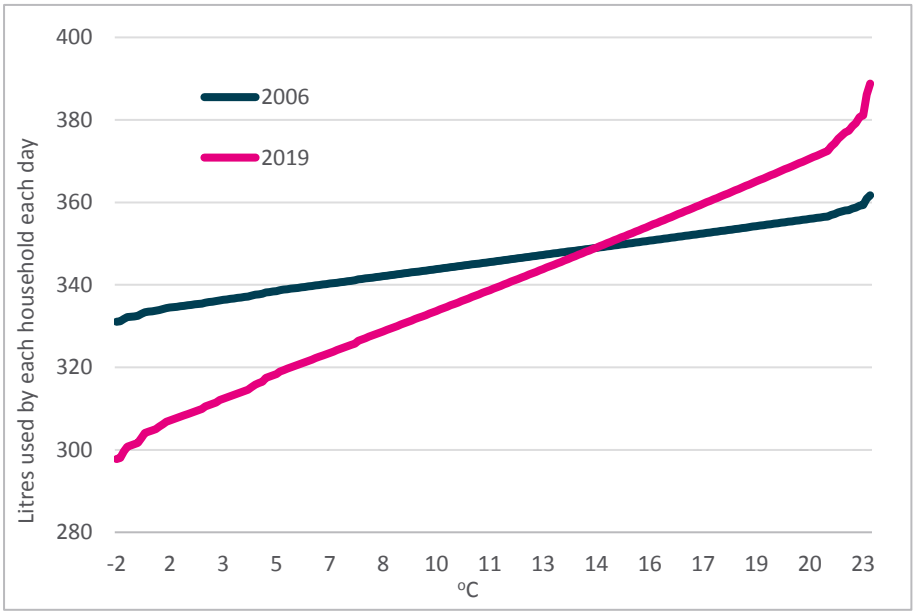
As we move to an expectation that we plan for more extreme droughts – taking a 1-in-500-year view rather than 1-in-200 – the need for extra resilience will be significant. Our integrated plans for getting on track to meet this challenge include an increase in water capacity of 105 MLD for our decarbonising water resources business case on the supply-side. We also have demand-side interventions lined up, with our Taking Care of Customers Supply Pipes scheme expected to save 1 MLD and measures to cut commercial demand that will save another 4 MLD.

Just as important will be making sure that every drop is used as efficiently as possible and goes as far as possible. This is where metering comes in to give us a further 3.2 MLD and takes the total expected boost to resilience past 113 MLD. To us, the speed with which expectations have increased gives a clear logic to do more on metering – faster rollout, and finding ways to harness technology so that each and every meter has a bigger, longer-lasting impact on the amount and way customers use water.

Increasing evidence of changing customer use

Over the last 15 years, we have witnessed a material change in the amount of water that customers use at different temperatures. Moreover, our detailed modelling of household use has found that this change is, in fact, statistically significant. As the following chart highlights, demand was relatively flat across a wide range of temperatures back in 2006. But, by 2019, customers were using substantially more at higher temperatures, even though they were using less overall.

Figure: Link between household daily use and changing temperatures

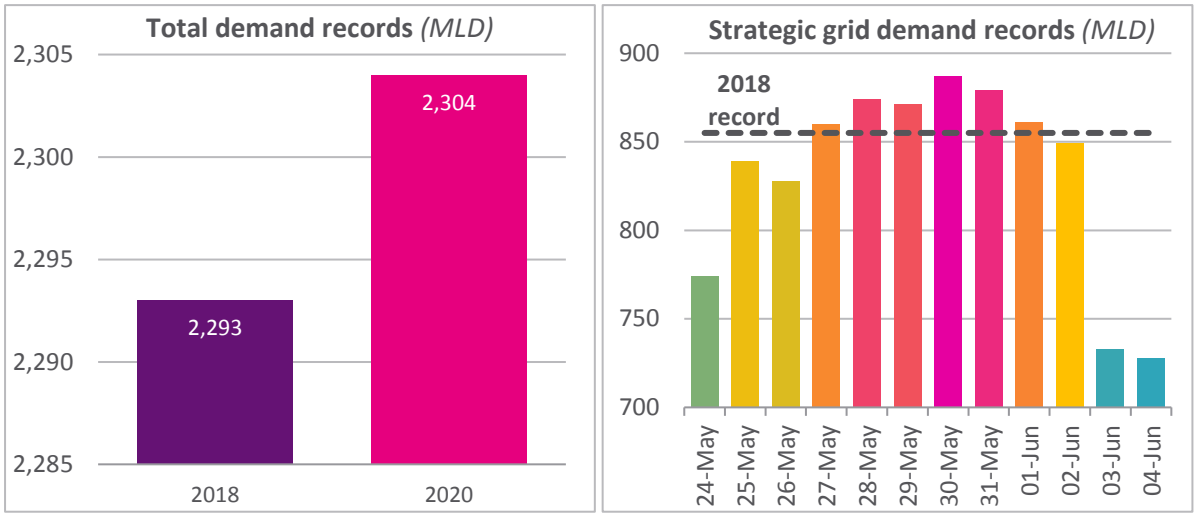


In the spring of 2020, we saw some of the most extreme demand ever from our customers. This change in use coincided with the Covid-19 lockdown and the sort of unprecedented warm and dry weather conditions that may well become all too common as our climate changes. For example, the Met Office Hadley Centre tells us that it has found higher rates of warming than previously expected[5].

[5] Met Office Hadley Centre (Nov 2018), *UKCP18*.

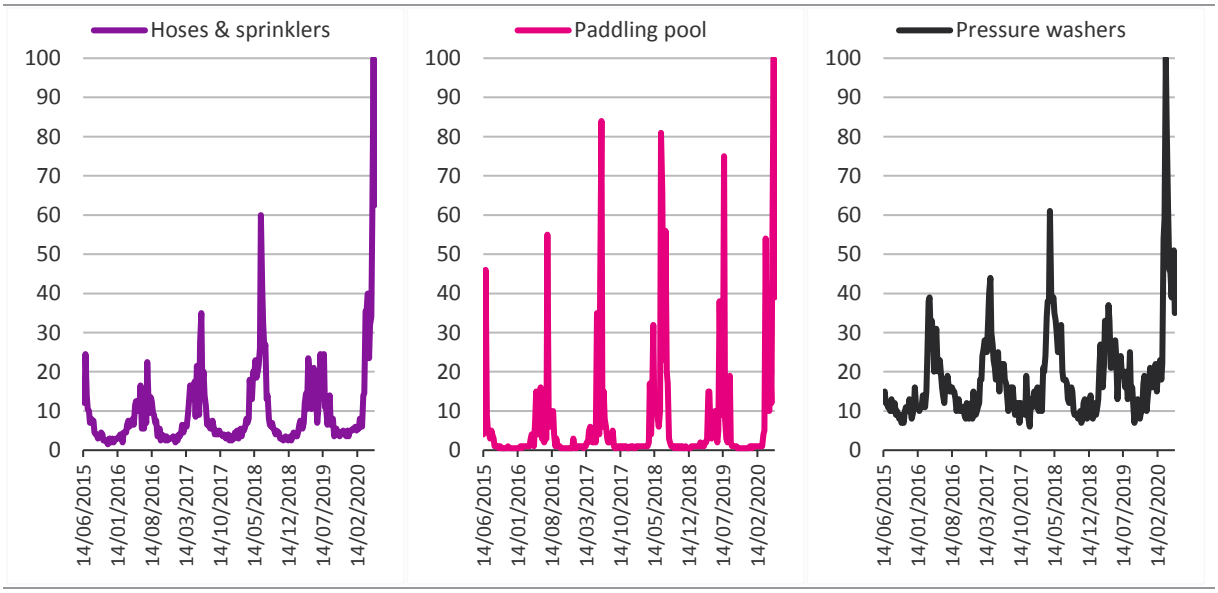
By the end of May, we had seen total demand break the 2018 record, with the 2018 record on our strategic grid broken on six consecutive days. In just a 48-hour period between 23-25 May, we saw demand jump 18% – a speed of increase that we had never seen before.

Figure: Demand records broken in 2020



While the Covid19 lockdown will have played a part in the story, our assessment is that the weather patterns and the way customers used water are part of a long-term trend and cannot be put down to one-off events. By the time the end of May 2020 came round, we had seen three solid months of dry, warm (but not hot) weather. We also know that customer interest in relatively inexpensive, water-intensive products, such as hoses and sprinklers, paddling pools and pressure washers hit an all-time high.

Figure: Trends in searches for recreational high water use products



Source: Google Trends, search results in England between Summer 2015 and Summer 2020

These low-cost high-volume products are a mere click away from being lined-up for next day delivery. For just £60 (including next day delivery) someone can buy a three-metre wide, half-meter deep paddling pool that will hold 3,500 litres – enough to supply a family of four with enough water for a full week of regular use.

In our view, there is every likelihood that the behaviours that we saw established in the spring of 2020 will become engrained – all those water-intensive devices bought by consumers back then are now sitting in sheds, garages and basements poised to roll-out at a moment's notice in the next heatwave or dry spell. These behaviours also fit with the long-term trend of increasing peak demand from customers that we identified above.

Overall, the changes in the way customers are using water means that we need to act faster to get meters in place and strengthen the incentives for customers to value every drop of water. Furthermore, if we can find the right ways to harness technology to accompany this acceleration, then we can start to make a meaningful impact on peak use.

The dramatic shift in economic conditions

The economic impacts of Covid19 are all too apparent. Large parts of the economy are closed down and many businesses may not reopen. Millions of workers are on furlough and hundreds of thousands may not have jobs to return to. We have seen many businesses that are household names collapse into administration and seen tens-of-thousands people laid-off.

As a large employer and one of the only large companies headquartered in this region, we have a real opportunity and a real responsibility to step in to help out. Despite the economic headwinds, we have still recruited apprentices and graduates, and are poised to take on 500 Kickstarters (the second highest number of any company in the country). So, that's 500 people joining our company who may never have had a job before, but now have a chance to find out what the world of work looks like. The way we see it, the more schemes we can get underway, the more investment that we can pull forwards, the more we can we give opportunities to people needing work in our area, whether that is through work experience, or through permanent jobs.

The economic shockwaves from Covid19 have also hit the financial markets. Alongside the impacts on share prices and the volatility in valuations for a great number of companies, borrowing costs have dropped to unprecedented, exceptionally low levels. In amongst all the bad news, this perhaps offers a small crumb of comfort and an opportunity – one that can benefit the economic recovery and our customers. If we can agree on the investments that we would have put forward at PR24 for AMP8, we can make an early start to take full advantage of the ultra-low borrowing costs and deliver at a lower overall cost for customers.

Installing meters is perhaps one of the fastest programmes that can be rolled out – the most shovel-ready of shovel-ready projects. It is quick and easy to ramp-up, requires a lot of labour to deliver successfully and it is a readily trainable skill. In other words, it stands to create a material number of jobs – right at the time the economy needs it most. We calculate the work requires a year's worth of 78 FTEs to deliver the scheme.

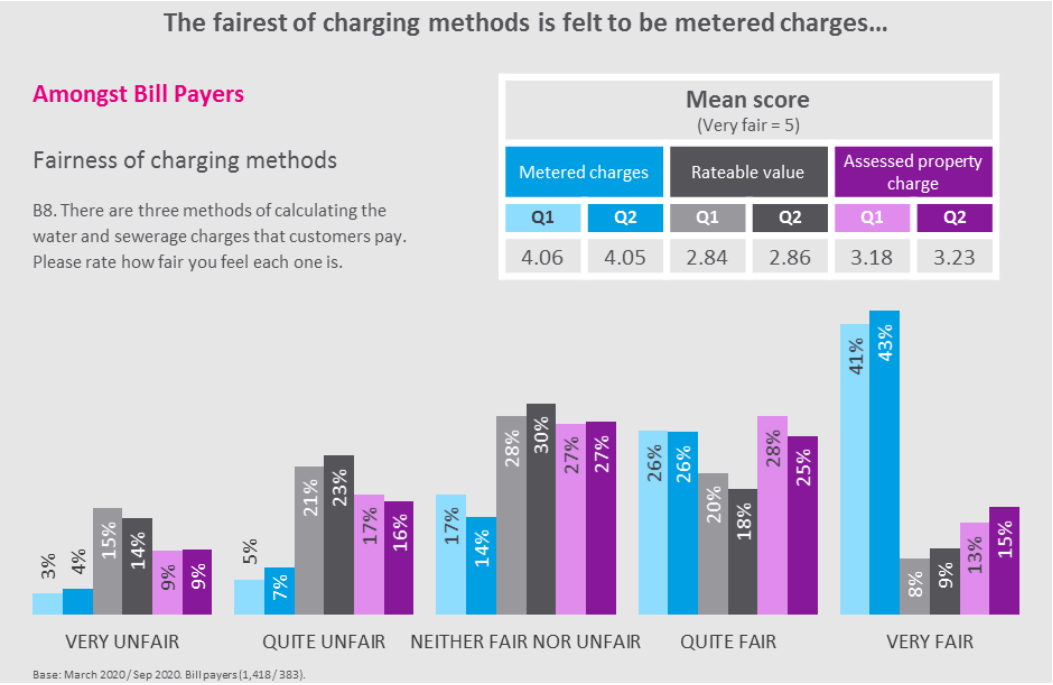
Customers support meter rollout

In our PR19 'supply and demand' research, increased metering was the water resources option that received most support. The idea of saving money on a water meter is motivating for many customers. Some also like the enhanced level of personal responsibility that meters bring. Customers also told us that ultimately we should aim to move all customers to a water meter – although there were concerns about higher bills for larger households.

During late May and early June 2020, we experienced a sharp increase in household demand related to a long spell of hot weather and the Covid19 lockdown. In our 'Hot weather usage' survey completed

by 2,000 customers shortly afterwards we learned that the perceived low cost of water can be a major barrier to reducing water consumption. A further evident barrier is that 50% of those surveyed perceived that they already do all they can do to save water – without regular measurement or comparison, it is difficult for them to gauge otherwise.

Figure: Perceived fairness of different charging methods



It is widely held that metering is the fairest way of charging for water. According to our tracker survey (March and September 2020 – c.800 customers), metering is considered a fairer method of charging than rateable value or assessed property charge. This is the case even amongst those not currently metered and amongst those who struggle to pay.

In our independently conducted research with customers on our decarbonising water resources proposal – part of which included increased household metering – 75% of customers were supportive, with a further 20% not minding either way. Given this level of support, we think that it is logical to accelerate our plans on metering. There will do more to meet stakeholder expectations, meet the challenges posed by climate change and changing customer use, and play our part in supporting the economic recovery in a way that benefits customers.

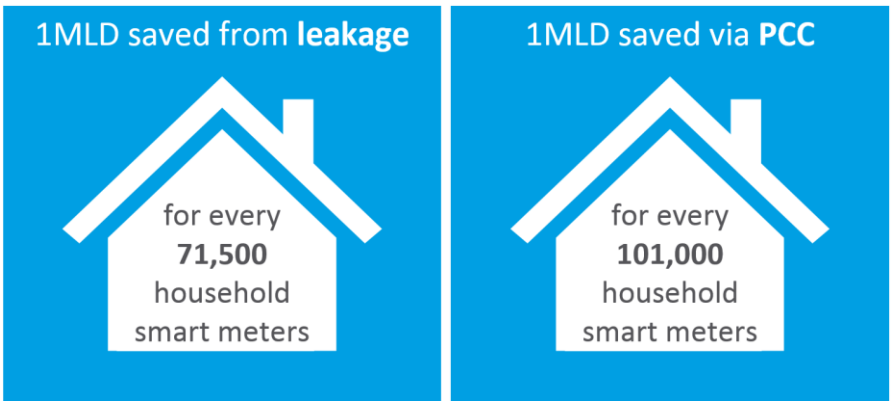
3. The benefits from faster meter rollout

3.1 Reducing demand

Our experience of water meter rollout shows that water meters not only help to reduce demand when customers switch to metered billing, they also help spot leaks much faster. In fact, our data shows that it is the leakage savings that have traditionally contributed the larger share to demand savings.

We estimate that 1MLD is saved from leakage for every 71,500 meters rolled out. When it comes to customer use, we estimate that meters will reduce PCC by 10% where customers choose to switch to metered billing. We would also expect smart meters to deliver further PCC savings by identifying leaks taking place within properties. Overall, we would expect to save 1MLD via PCC for every 101,000 meters installed.

Figure: Demand savings from meters



If we convert these potential savings into per meter values, we can expect each meter installed will save an average of 5.1 m^3 a year from leakage. Where meters are installed for the first time, the average savings per meter for lower demand would be 3.6 m^3 a year.

Clearly these savings will have implications for our leakage and PCC ODIs. In Chapter 6, we set out our plans for making sure that the PR19 ODIs will continue to operate in customers interests as we go about delivering this Green Recovery scheme.

3.2 Job creation

As the AMI metering trial is very much a shovel-ready scheme, we would expect to start rolling out these meters from September 2021. To do this, we will need extra resources on the ground – a year's worth of 78 FTEs. With the outlook for UK jobs looking the weakest in Europe, with an expected surge in unemployment in Q1 of 2021[6], creating job opportunities as soon as possible is essential.

3.3 Saving carbon

The carbon footprint of the water that we supply to customers is coming down all the time. Even with this trend in place, it remains true that the greenest units of water are those that are left in the environment and are never treated and put into supply.

[6] https://www.manpowergroup.co.uk/wp-content/uploads/2020/12/meos_q121_brochure.pdf

With each meter installed saving around 5.1 to 8.7 m^3 of water a year, this would save a likely 9 -17 kg of carbon over the next ten years. Given that the carbon footprint of installing a meter ranges from 4 kg for the simplest install[7] to 19 kg on the most complex[8], on average each new meter will net out into positive carbon territory within 10-years.

3.4 Creating a platform for even bigger changes in future

The faster we rollout meters, the sooner we get to a point where we can use the metering technology more innovatively to benefit the sector and customers. With the advances that are taking place in metering technology there is an opportunity to build these into rollout plans and expand the potential for innovation substantially. Possibilities include:

- supersizing the impact meters can have on demand though intelligent tariffs that target peak demand or excessive use and support affordability for essential use,
- using the full capabilities of the technology to provide behavioural nudges to customers on consumption and peak-demand use, and
- empowering companies to set bolder ambitions on leakage by using meters not only to detect more leaks but also to speed up their discovery.

At this stage, it is too soon to put numbers on the benefits that could be expected in each of these areas. Before this can happen, it will be important to test different approaches to assess effectiveness and suitability for wider deployment – hence the need to create a platform that we can build on to deliver even bigger changes in the future.

3.5 A national strategy

From a wider perspective, if the Green Recovery means that several companies get to accelerate their meter rollout programmes, then there will be an opportunity at the national level for communication campaigns. These would focus on (i) helping people understand the beneficial role of metering and how metering can benefit them, (ii) setting a fresh set of social norms around metering and (iii) ultimately, persuading sceptical households to have meters installed and switch to metered billing.

[7] Screw installs on a single supply.
[8] Boundary box installs.

4. Investigating the potential of advancing technology

4.1 The logic for a trial

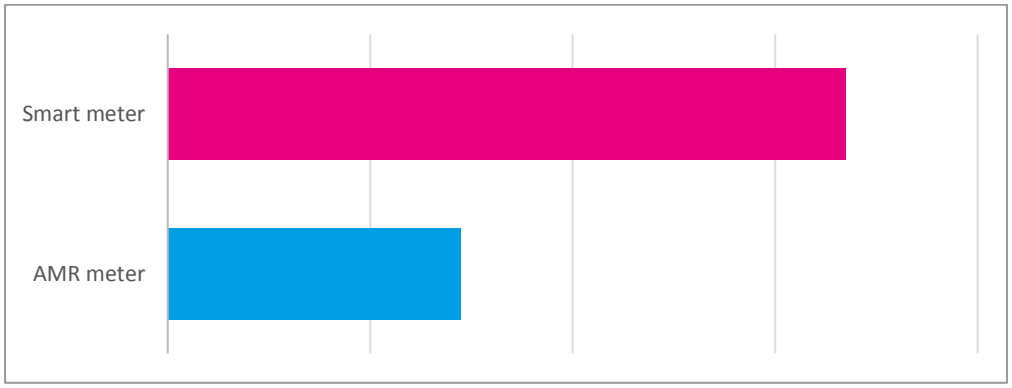
If we are to deliver the demand savings needed to support water resilience, then we need to act now to do more on metering rather than waiting until AMP8 or later. In doing this, we need to go beyond overall demand savings and find ways to reduce the peak. As we set out in Chapter 2, our experience during the spring and summer of 2020 has really brought home the importance of tackling peak demand. Our initial impression from the evidence we have reviewed is that smart metering may have the potential to do this. So we consider that a scale trial of this technology would offer us a brilliant way to establish whether it can reliably deliver for customers.

We have spoken with De Watergroep – the main water company in Flanders, Belgium – to find out about their thinking on meters, especially as it already has 100% of its 2.6 million customers on water meters. We found out that it is now looking at switching customers to smart meters, so that it can provide them with better signals about consumption as well as gain a better sense of what is going on with its network. For example, with smart meters it will be able to warn customers that they risk going over a critical threshold unless they moderate use for the rest of the day/week/month. They also plan to investigate the potential for smart tariffs to increase the incentives and benefits for customers that use water carefully. **The lesson that we take from this is that 100% metering is only part of the journey to persuade customers to use water even more efficiently**.

Advances in technology mean that that the meters of the future could offer more than just a way to financially incentivise customers to use less water. They could also help shape customer demand, track down leaks and even identify loss of supply before a customer becomes aware. If the technology works out, we could see meters move from functional devices for measuring water volumes into hi-tech products with dynamic capabilities that turn meters into a platform for services.

Figure: Differences in metering costs (£/meter)

[costs redacted]



Our current metering strategy, as well as that in AMP6, is built on the rollout of AMR meters. Given (i) the proven capabilities of AMR, (ii) the relative infancy of smart metering and (iii) that smart meters cost more than twice as much as an AMR meter, we think this remains the right strategy for the bulk of our region.

Once we have run the smart metering trial, it will give us the insight on whether we should diversify our technology and give smart metering a role in our overall metering strategy for AMP8 and beyond. Should it prove a worthwhile technology, we expect that it will become part of our metering mix,

rather than become the only type of meter that we choose to install. For example, the extra expense of these meters might only be justified in water scarce or water stressed area. It is also possible that the telemetry requirements of smart meters could rule them out in very rural environments with poor mobile coverage.

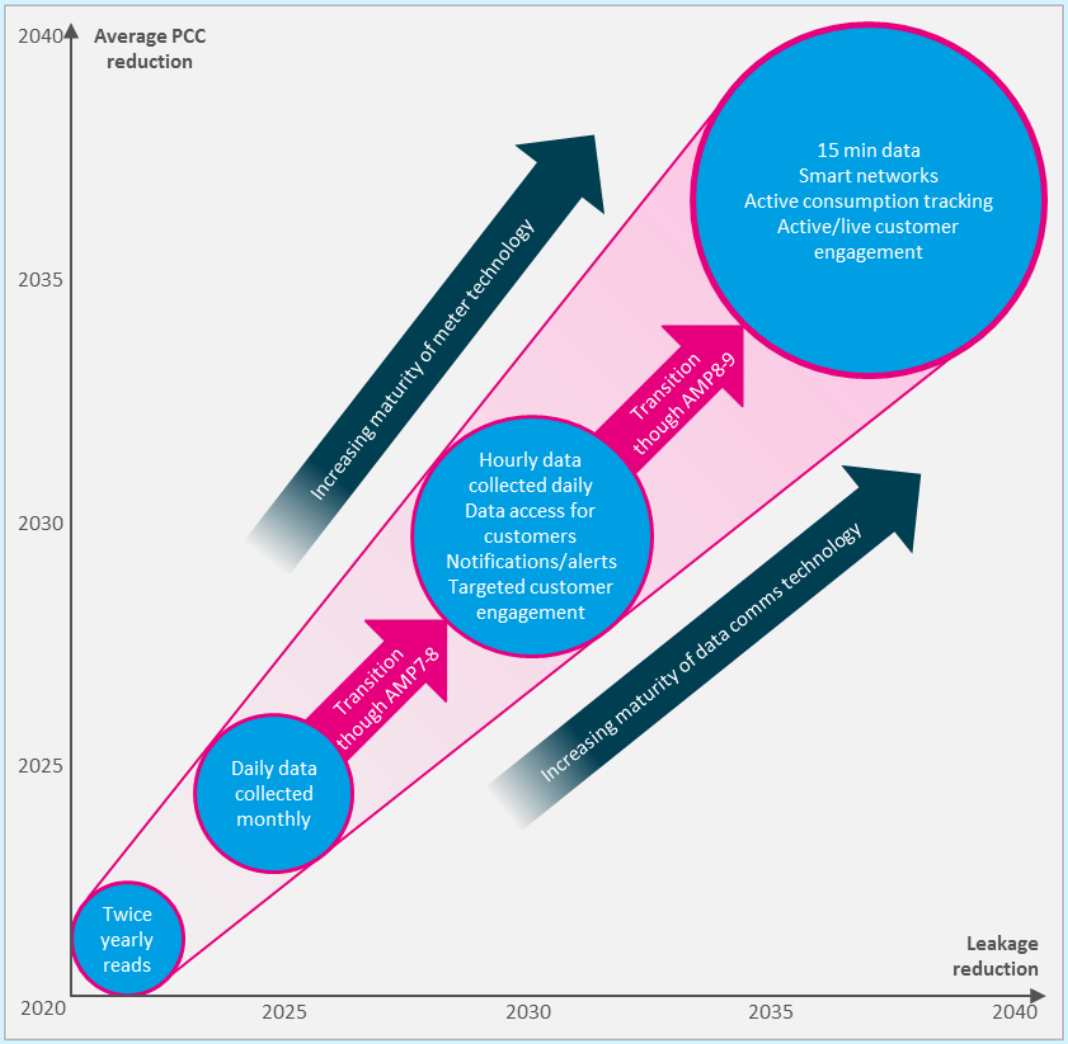
Advancing metering technology

The traditional **analogue meters** commonly seen used are passive devices that log water volumes and need physical reads – typically twice yearly – in order to collect data. **Automated Meter Reading (AMR) meters** that have entered service more recently have greater technical capabilities. For example, they can record usage on a daily basis and have continuous flow alarms that can help identify leaks. However, this data cannot be used until it is gathered and this requires close contact with meter-readers so that it can be downloaded periodically.

Gains in data commincations technology mean that it is now possible to have **Advance Metering Infrastructure (AMI)** that can push data out and so do away the need for in-person meter reading and data collection. In turn, this creates the potential for hourly data to be gathered and analysed so that companies can (i) provide notices and alerts to customers, (ii) engage with them on a targeted basis, and (iii) give customers direct access to their data.

In the longer-term, integrated smart networks become a real possibility, along with active consumption tracking and the opportunity for live, active engagement with customers.

Figure: The transformative potential of advances in metering technology



4.2 Building the evidence base

The clearest reason for opting for a trial is that it will allow us to make sure that any future decision for wider rollout of smart meters will be grounded in robust evidence that it is in the customer interest. The risks of omitting this step can be seen in the energy sector's early experience with its own smart meters. This saw a first generation of meters that ended up falling short of customer and industry expectations – a legacy challenge that the sector is still working to overcome today.

We are also seeing other in our sector trial smart meters. Yorkshire Water is currently getting a one underway in Sheffield, where it is planning to test whether smart meters can help out in an area that is prone to freeze-thaw events and whether the meters' communication technology is capable of overcoming the challenges presented by the city's hilly nature.

We have also seen Anglian Water conduct trials recently in Newmarket and Norwich. We are aware that Anglian judged these trials to have been successful and is now working on a programme to rollout smart metering more widely. Through the trial, it found that customers with smart meters felt very positive about them, because they saw that the meters could help them to save money though lower personal use and by quickly identifying leaks at their own property.

Given the success seen by Anglian, we did consider whether this might provide compelling and robust enough evidence for us to review our current metering strategy and propose a programme to rollout smart metering across the Severn Trent region. However, we think that there is considerable uncertainty over the extent these results might be applicable to our area. In the first instance, Anglian Water bills are almost 20% higher than Severn Trent bills, meaning customers are likely to value water differently. There's also the nature of the trial areas to consider – Newmarket is a very small rural market town with a population of just 16,000 people and Norwich, even though it is the county town for Norfolk and is a city, has a population of 192,000.

In the case of Newmarket, we identified that (i) average earning of the 10th percentile – a measure of deprivation – are over 40% higher than the Severn Trent region, (ii) the proportion of wealthy households is 45% higher and (iii) it has proportionally 37% fewer financially-stretched households. Norwich also has notable differences – it has around half as many affluent households and its proportion of private sector housing is around one-fifth lower than the Severn Trent region.

Given these large observable differences, there look to be significant uncertainties over the applicability of the Newmarket and Norwich results to our area. This has led us to conclude that **we need more research – research that that is clearly relevant to our own area – before we can be certain that a Severn Trent-wide rollout of smart meters would be in customers interests**.

We are also looking at how we can use our smart metering trial to create a hub than can provide meaningful and transferable insight to a wide audience. This has led us to hold early discussions with the 50 Litre Coalition about creating a global hub for experimentation, once we have been able to rollout smart meters across our chosen, representative trial area. This is a coalition where Global companies such as Ericsson and Proctor & Gamble have come together with key stakeholders such as the World Economic Forum to work towards reducing global daily water consumption to 50 litres a person.

Although the global economic, environmental and social benefits of achieving this goal would be enormous, a key challenge is developing a diverse, city-wide 'test centre' to try out new technology, ways of working and customer engagement. It is easy to test ideas in a laboratory or even in a small town: it is very different to test them across a large, diverse city and its rural hinterlands. Once our

trial area is up and running, the smart meters would enable us and others to monitor the effectiveness of countless interventions. The benefits for the global water sector, and the trial area's economy, would be immense.

One of the key steps that we are already planning to take is to make sure that the results of the trial are transparent and made publicly available. Not only is this likely to be an important step for helping the trial area to achieve global hub status, the innovative nature of this proposal means that it is crucial that we share learning across the sector for the broader benefit of water customers.

5. Scheme options

5.1 Introduction

In Chapter 1, we explained how metering is part of a range of supply-side and demand-side interventions needed to address the water deficit in our region. In working out how best to deliver an accelerated meter rollout plan, we have looked at a range of ways we could do this, including:

- determining if we should just target overall consumption or whether we should give ourselves a shot at peak demand as well,
- settling on whether AMR or AMI meters would provide the best-fit technology,
- assessing the right pace for a faster rollout,
- deciding if the existing ODI incentive on metering could fund the expanded programme, and
- choosing whether we should spread the extra meters out right across our area, or focus in a particular patch.

In making these decisions, we took account of a number of factors including likely costs, potential benefits, expected outcomes and possible contributions to a longer-term strategy on metering and demand.

5.2 Options for targeting usage

The benefits from saving water are well understood. At the operational level, each unit saved means one less unit incurring the costs and environmental footprint of treatment and being put into supply. At the capex investment level, if enough units can be saved, they will (i) boost resilience, (ii) slow or curtail demand growth and (iii) delay or remove the need to expand resources.

The reality is that only the water savings made or sustained at times of peak demand will help boost resilience and so reduce investment and capacity needs. However, this is proving to be the toughest type of usage to go after – despite wider successes in the sector on overall per capita consumption levels. As our own data showed in Chapter 2, even though overall usage has fallen, peak usage has not fallen but risen instead.

Against this backdrop, **we think it is sensible to structure our metering proposal in a way that not only allows us to go after general usage savings but also opens the door to peak demand savings that will benefit water resilience**.

We also considered whether we should target usage by both household and non-household customers. As the retailer for household customers, **there is nothing holding us back from targeting household usage at the very least**. So, the question for us became whether or not we could do anything meaningful with non-household customers, particularly as these customers use a lot of water and a good many only have meter-readings once a year. The challenge for us is that there is a retail market for non-household customers and that our role is limited to that of a wholesale provider of water to the retailers in this market. In other words, we do not have direct relationships with these customers and have limited ability to work directly with them to reduce usage. So, **for now, we have concluded that targeting non-household usage is too challenging given the speed with which the economy needs us to get schemes underway**.

5.3 Choice of metering technology

With the decision to seek both overall usage efficiencies and peak demand savings, the logical next step is to pick a metering technology that will give us the best chance in both these areas.

The successes of traditional dumb-meters and AMR have typically occurred where customers have chosen to switch to measured bills and opted to use water more efficiently. But – as noted above – peak demand has not responded in the same way, which strongly supports the idea that these meters are not effective in this area.

By contrast, AMI smart meters bring the ability to collect granular data and communicate it at frequent intervals – for example quarter-hourly records that are pushed out every 12 hours. To us, this looks to be just the sort of information that we need to have an effect on peak demand. Furthermore, as we noted back in Chapter 4, with AMI smart meters well-placed to be the breakthrough technology that makes older technologies obsolete, this feels the wrong time to go larger on our existing plans for AMR rollout. **On balance, we think this makes AMI smart meters the right choice for our proposal**.

Used in the right way, we think smart meters could provide the perfect test-bed platform for experimenting with (i) the effectiveness of different behavioural messages and tools, (ii) ways of engaging with customers and influencing usage levels, and (iii) tailored customer journeys and education to drive down peak usage.

5.4 Focus for scheme rollout

Having selected AMI smart meters for our Green Recovery proposal on metering, the choice of area for rolling out these meters becomes very important. If we were to simply install these widely across our network, we would lose the ability to establish whether they can deliver collectively meaningful impacts on consumption and peak demand. So, to get this meaningful insight as well as a much clearer understanding of larger-scale rollout costs, **we believe that the logical way forward is for the rollout to focus on a specific area and effectively become a smart metering trial**.

To get the most from this approach, we would need to install meters across a wide range of property types, a range of installation challenges and different socio-economic groupings. For example, it would (i) give us a mix of measured and unmeasured properties, (ii) see us need to tackle flats, terraced houses, semis and detached houses, (iii) involve us providing meters to people in different socio-economic groups and (iii) see us having to overcome significant installation-challenges such as joint supplies and lead pipes.

We also think that **picking an area that is centred around a large urban conurbation makes sense**. It would give us a high enough level of property density for operational efficiency, without reducing the mix of properties and installation challenges. It would also be the best geographical spot for the trial, as urban areas have the telecoms technology and capacity in place that could handle the data generated by smart meters.

Structuring a trial in this way is expected to yield a number of extra benefits beyond the ability to measure usage levels of a much larger number of customers. It will give us a really good understanding of the impact from smart meters in urban areas and the level of penetration needed to support the water balance in an area. Overall, the idea is to create a model of AMI organisation and rollout that establishes how best to maximise its value.

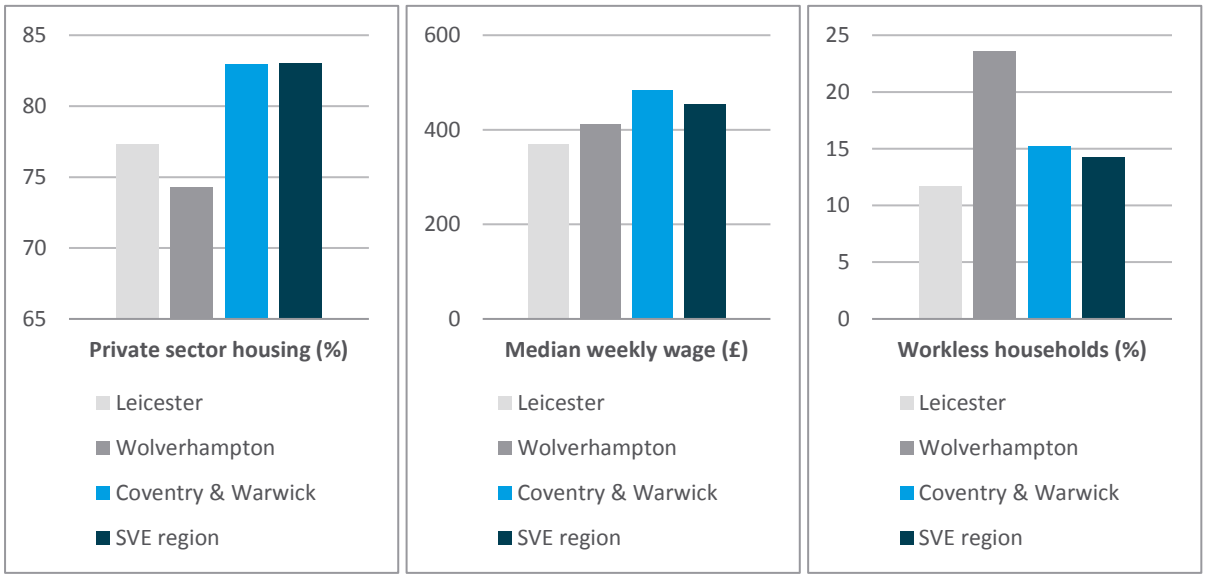
5.5 Finding the right area for scheme rollout

Under our existing metering commitments, we are installing large numbers across the Nottinghamshire and North Staffordshire regions. As we fully intend to see these programmes through, **we ruled out these as areas for trialling smart meters**.

Given that we are looking for meters to help out with resilience – a particular challenge on our Strategic Grid – **the logical choice for us was to find an area connected to this grid**. The next step was to land on a suitably sized urban conurbation to form the heart of our selected area. This did mean that **we had to rule out Birmingham because it is just too large for a trial**.

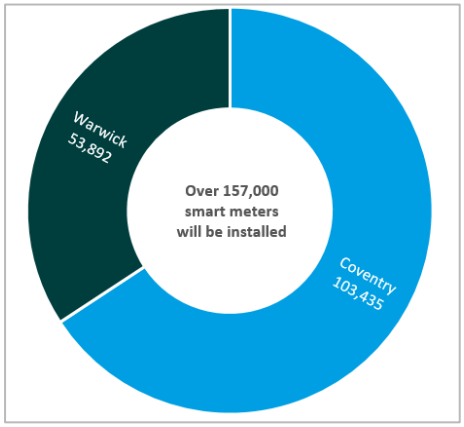
This left us with three contenders for the heart of the trial – **Wolverhampton, Coventry and Leicester**. While each of these afforded a good mix of housing types and installation challenges, we concluded that the trial area would need to cover a larger patch so that it could bring in a wider mix of socio-economic groupings to align with our wider region – for example, in terms of median wages, private sector housing and workless households.

Figure: Key socio-economic characteristics of the three contender areas for the trial



We found that neither Wolverhampton nor Leicester had close enough neighbours that would help bring in this mix, but that this was possible with Coventry if we brought Warwick into play. **In our view, this makes the Coventry and Warwick the right location for the rollout of AMI meters and the smart metering trial**.

Figure: Expected number of smart meter installs

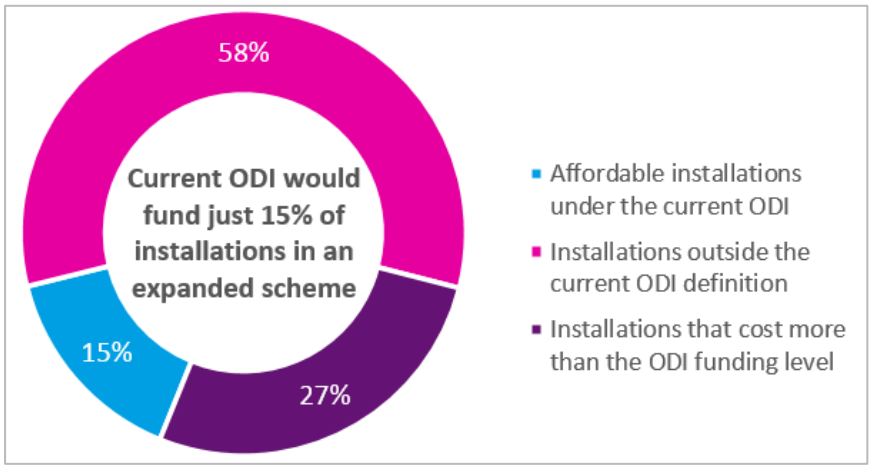


A further benefit of centring the options on Coventry is that offers the opportunity for synergies with our Green Recovery scheme for Taking Care of Customers Supply Pipes, which is also focused on Coventry. If holes are being dug to replace lead pipes, it seems sensible to use this as an opportunity to install meters at the same time. This will can reduce the scheme's cost and make sure that customers benefit from this efficiency saving. We have calculated that **the efficiency benefit of this approach is worth almost [redacted] and would reduce the expected scheme cost by [redacted]%**.

5.6 Funding options

When we began looking at an expanded metering programme and trialling AMI meters, we saw this as being an acceleration scheme that we could deliver using the ODI incentive established at PR19. With a reward rate of £103 per meter, we are effectively funded to spend up £206 on each meter installation (because we can recover the remaining £103 from customers through the totex efficiency sharing mechanism).

Figure: Financeability of smart meters with ODI funding



The first challenge we noticed is that the ODI does not extend funding to replacement meters. For an expanded metering programme looking to trial smart meters, this is critical. We expect that around 60% of meters will involve replacements if we are to get the penetration and coverage needed for a meaningful trial.

A further challenge is the level of funding provided through the ODI. We have calculated that this would be enough to finance screw-installations on single supplies and internal installations on joint supplies, but not new boundary box installations – the trickiest locations. These cost around [redacted] per installation – more than [redacted]% above the level funded though the ODI.

With over 85% of meters either unfunded or under-funded by the ODI, we concluded that this would make the scheme unviable and that we would need a separate Green Recovery proposal instead. We also concluded that we would need to **make sure that this scheme is fully ringfenced from the current metering ODI**. This would mean that once this scheme is given the go-ahead, any meter installed in the Coventry and Warwick areas would neither count toward the ODI target, nor count towards any ODI incentive payments.

6. Proposed scheme

6.1 Scheme output

The scheme would deliver just over 157,000 smart meters over the next three years across the Coventry and Warwick area. This would involve around:

- 91,000 replacement meters,
- 19,000 screw installations to single supplies,
- 5,000 internal installations on joint supply (subject to customer consent), and
- 43,000 of the most tricky installations involving boundary boxes.

Figure: Breakdown of 157,327 expected meter Installations

6.2 Scheme costs

The expected cost of delivering smart meters across the Coventry and Warwick area is £21.9m[9] assuming we can realise synergies with the Taking Care of Customers Supply Pipes scheme. That said, if the supply pipes scheme does not go ahead then the cost of this metering scheme would increase to [redacted].

Figure: Breakdown of £21.9m scheme cost (£m)

[redacted]

[9] All costs are in 2017/18 prices and capital delivery costs have allowed for shared opex costs that are incurred in support of capital delivery.

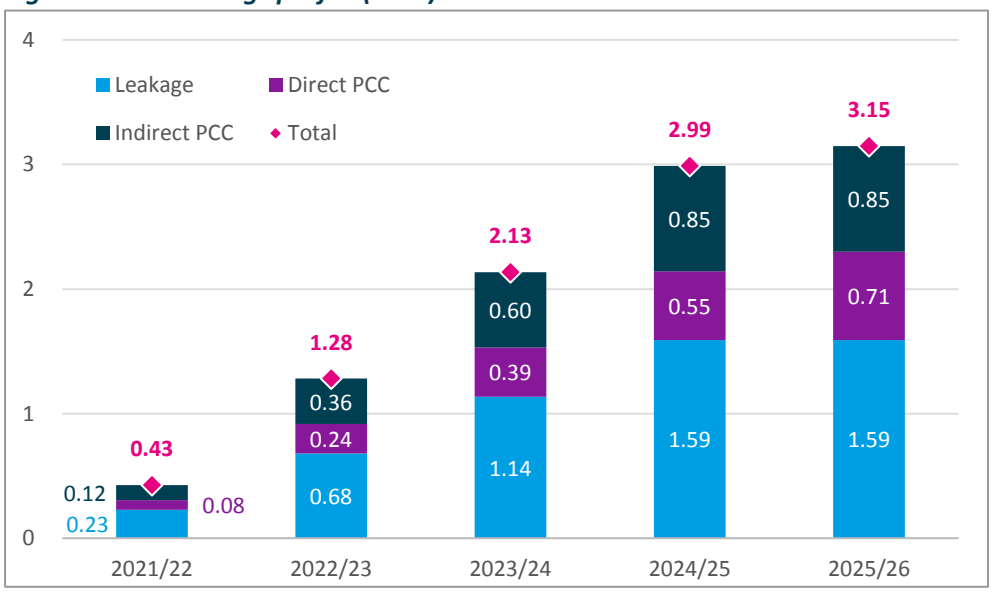
The bulk of the expected costs relate to the installation of 157,327 meters, which is expected to come in at £22m. As noted above, synergies with the Taking Care of Customers Supply Pipes scheme could yield an extra [redacted] in efficiency savings that would reduce the installation costs to[redacted]. The scheme overheads – costs for planning and survey support, IT costs, and programme costs – are forecast at [redacted]. The opex required over the remainder of AMP7 is calculated to be [redacted], net of the efficiency savings to be had from no longer needing to carry out physical meter reads. This extra opex also provides [redacted] for repairing the leaks that this programme will identify. This extra spend for repairs does not include provision for work that will be delivered through the Taking Care of Customers Supply Pipes scheme. It also excludes the costs of repairing the leaks that the existing AMR meters would have identified had this scheme not gone ahead.

6.3 Direct scheme benefits

Water savings

The total water saving from both leakage and PCC is 3.15 MLD. The expected savings will feed from the second half of 2021/22 before reaching their full potential in 2025/26 once the time to shift customers to measured bills is factored in.

Figure: Water savings profile (MLD)



The leakage part of this total is worth 1.59 MLD, as smart meters will rapidly identify supply pipe bursts on the customer's side – bursts that traditionally are only identified once periodic reads have been taken, or even extremely difficult to detect for customers without meters. This figure is net of the leakage benefits that will accrue to the Taking Care of Customers Supply Pipes scheme – in the Coventry area that scheme will give us about 25,000 opportunities to install smart meters. If the Taking Care of Customers Supply Pipes scheme were not to go ahead, the leakage benefits from the metering scheme would increase to 1.76 MLD, with the total scheme benefit increasing to 3.32 MLD. The figure also takes account of the AMR meters that will be replaced in the trial – the introduction of smart meters will allow us to identify leaks around three months faster on average.

For PCC savings there are two way in which we expect these to happen. The first is the direct savings that arise when customers switch to measured bills and we have estimated that we can expect a take-

up rate of 30% from those 66,000 customers who will have meters installed for the first time. Based on an occupancy rate of 2.68 across these households, **the direct PCC savings will be worth 0.71 MLD**.

The second source of PCC savings comes from the ability of smart meters to rapidly identify where customers have an internal leak – such as a leaking toilet cistern or roof tank overflow. The savings will be available for all properties where smart meters are installed, not just those taking up the option for metered billing. Our historic data shows that where continuous flow alarms have identified leaks, around 27% relate to those that are inside the property. On average, each new meter delivers around 5.4 litres of savings a day, from internal leaks. In total, we expect the **smart metering trial will deliver an extra saving on PCC worth 0.85 MLD from internal leaks**.

The potential for peak demand savings

As we've noted, we think that the AMI trial will allow us to get to the point where we can use the technology more innovatively to benefit the sector and customers. We see that there is a lot of potential here to find out the best ways to motivate and encourage customers to reduce peak demand. This would allow us to test a range of behavioural nudges with customers, as well as trialling intelligent tariffs could that target peak and/or excessive use while protecting affordability for essential use.

So, while it is too soon to put numbers on the benefit we could see for peak demand, we are excited about (i) the knowledge that we could gain through the trial and (ii) the potential to identify transformative savings in peak demand. We estimate that reducing peak demand – not just average demand – across the UK by 5% could save £3-5 billion and over a million tonnes of carbon by avoiding the need to build new treatment facilities that are only needed for a few hours a day during a few weeks of the year.

Net carbon impact

The carbon footprint for the proposed programme of 157,327 meters is 1,215 tCO_2e based on the expected numbers for different types of installations – from the most complex boundary box installs to the simplest screw installs. The resulting annual average carbon benefit from the 2.69 MLD water saving is 208 tCO_2e, which means that **the project becomes climate positive in its sixth year**. So, if these meters last as long as the 15 years that we have typically seen with existing meters, we can expect that these meters will spend over half of their lifetime making a climate positive contribution.

6.4 Wider scheme benefits

Employment boost from the scheme

The investment proposals will provide a steady pipeline of work over three and a half years that will create jobs and employment opportunities. This will be a mixture of internal and external opportunities due to the different delivery models needed to install the meters for the trial.

The majority of the jobs created would be network technicians, contractors and the plumbers who install the meters, as well as reinstatement contractors and landscapers to make-good afterwards. There will also be smaller numbers of jobs created for fittings inspections, programme management and supportive roles. Essentially, we would look to expand already existing delivery and operational teams. Overall, this trial will create a year's worth of 78 FTEs to deliver the installation programme.

Beyond the jobs created to install the meters, the arrival of AMI smart meters require new skills in areas such as IT systems, software, and data processing. They will also require expertise on as behavioural messaging and experiments so that we can take full advantage of the new granular insight and influence peak demand. We would also seek to develop our skills via close partnership and collaboration with those that already have deep experience with smart metering, such as energy companies. This will help make sure that our workforce is equipped with the invaluable learnings and skills that will support effective use and rollout of metering in future AMPs.

6.5 Protecting customer interests

For each business case it will be necessary to ensure that it can be integrated into the regulatory framework, so that (i) customers are protected and avoid paying twice for service improvements and (ii) we are appropriately remunerated for successful delivery of the proposals. Our approach to managing these issues is set out in Annex 11 - Customer protections. This annex explains:

- how we propose to be held accountable to deliver each Green Recovery proposal, and in turn be remunerated for successful delivery (and includes the description of each new PC we propose to implement this using the PR19 template),
- what overlaps exist across each of our existing suite of PCs and the Green Recovery schemes how we will adjust for these to avoid any double remuneration,
- how the totex costs sharing should be applied to better protect customers, and
- how the funding of the Green Recovery proposals could be implemented within the current AMP.