

Cost benefit analysis, assessing the social and environmental case for a smart water meter rollout

Study finds a near £2bn net benefit to society and a close to two to one benefit to cost ratio from a coordinated smart water meter rollout.

READ ON



November 2021

frontier
economics

artesia

arqiva



The study concludes that the benefits exceed costs by close to two to one and would deliver nearly £2bn of net benefit.

Key Findings

The findings point to a very strong case for investing in smart water metering with notable social, environmental and economic benefits identified.

- Key benefits of smart water metering include **reduced water consumption – critical to addressing water scarcity issues**, and reduced carbon emissions – central to supporting environmental targets.
- For water companies, smart metering was seen to **enhance leakage detection** and improve network management.
- A coordinated rollout of smart water metering between 2025 and 2030 would **deliver benefits to society of £4.4bn against costs of £2.5bn**. That is a near two to one benefit-to-cost ratio and overall **net benefit of nearly £2bn**.
- Smart water metering can **have a positive social impact on every region and across every water company area in England and Wales**. Benefit-to-cost ratios vary based on existing penetration and water scarcity but are positive for individual water companies as well as society as a whole.
- The **cost of smart water metering for the water sector is more than offset by savings** on leakage control, network management, the reduced cost from producing less water and avoided costs of other water resources. This should result in lower water bills for households.
- Smart water metering **delivers the highest return** when households are moved onto a metered charging basis within 3 years of installation. Even where this is not the case, smart water metering still **delivers a positive benefit-to-cost ratio**.
- The analysis by Frontier Economics and Artesia shows that a full rollout of smart meters across England and Wales **could be pursued and supported by government and industry regulators** to secure benefits for industry, consumers, society and the environment.



Introduction

With smart water metering understood to deliver a range of benefits, independent specialists Frontier Economics and Artesia were commissioned to carry out a detailed cost benefit analysis.

The study aimed to identify and quantify the different cost and benefit categories and determine an overall assessment of whether smart metering is beneficial to the UK.

Modelling the costs and benefits of smart metering over 30-years, 'analysing the social impact of smart water meters' reveals a significant and sustained opportunity – with potential costs far outweighed by the expected social and environmental gains.

This paper offers a summary of the key findings. The full report is available for download at <https://admin.frontier-economics.com/media/4946/arqiva-cost-benefit-analysis-a4-full-report.pdf>.



Background to the study

'Analysing the social impact of smart water meters' was undertaken by Frontier Economics and Artesia and commissioned by Arqiva. The study calculates the benefit-to-cost ratio as the net present value (NPV) of gross benefits divided by the NPV of gross costs of deploying smart water meters. It employs methodology consistent with HM Treasury Green Book¹ evaluation methods and reflecting a best practice approach.

¹ HM Treasury, The Green Book - Central Government Guidance on Appraisal and Evaluation, 2020, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/938046/The_Green_Book_2020.pdf



What is a smart water meter?

A smart water meter measures water consumption in households – sending 'real time' usage data back to water companies much more frequently than conventional 'dumb' meters. Smart meters typically send hourly readings, whilst dumb meters are typically read once or twice a year. This regular flow of information allows water companies to more accurately monitor the amount of water used within the property, supporting earlier identification of leaks and better billing accuracy.

The benefits of smart water metering

One of main advantages offered by smart water metering is that it **helps reduce water usage and leaks, even more than dumb metering**. Alongside the reduction of stress on local water environments, using less water reduces company and in-home energy usage and provides a **material reduction in carbon emissions**.

A recent study by Waterwise and Arqiva found that smart meters could reduce UK greenhouse gas emissions by up to 0.5%.

For more on the environmental benefits of smart water, download the free report [here](#).



1

The benefits of smart water metering

2

Making the case for a coordinated rollout

3

Benefits across the board

4

The mandated rollout with optional metered billing alternative

5

Observations and recommendations



Utilities, households, and society can all benefit from smart water meters in other ways, too:



Smart water meters can help households gain a better understanding of their usage, increase the accuracy of their bills, and reduce the amount that they spend



Smart water meters help identify and tackle “customer side” leakage – leading to lower operating costs for water companies and reductions in expenditure on future water resource schemes



Water companies can also reduce meter reading costs, improve demand forecasting, and use incoming data to manage their infrastructure more effectively



Other potential benefits

While these issues were not subject to detailed analysis in our study, there are clear indications that smart water metering can also aid with:

- Health and safety improvements
- Backflow detection
- Integration with other smart technologies
- Innovation in tariff strategies
- Improved bad debt management

1

The benefits of smart water metering

2

Making the case for a coordinated rollout

3

Benefits across the board

4

The mandated rollout with optional metered billing alternative

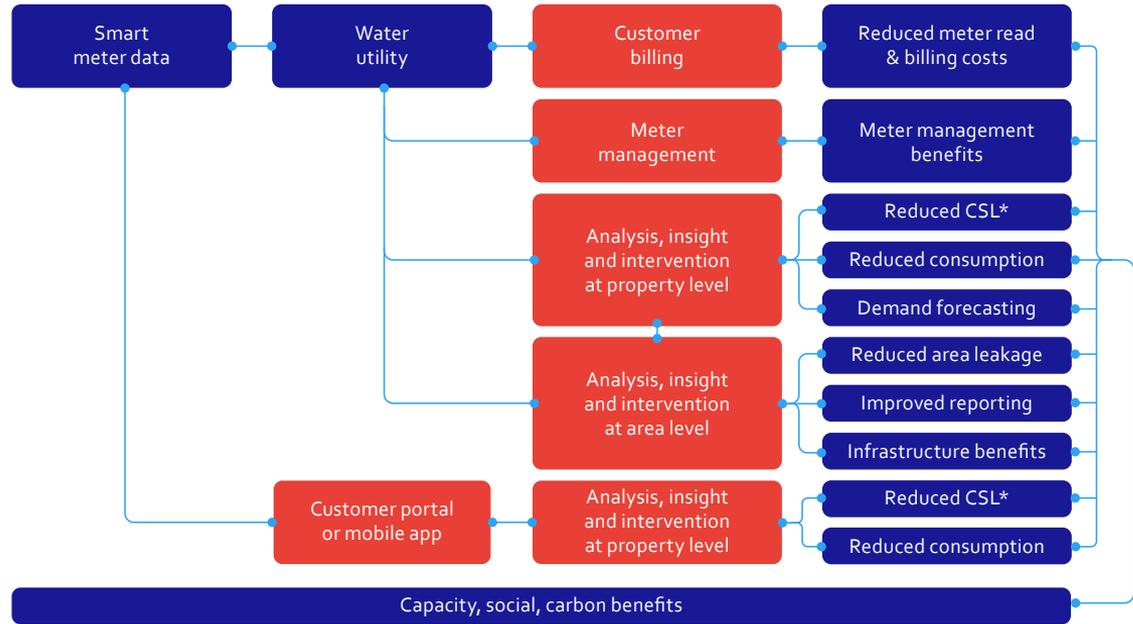
5

Observations and recommendations





Figure 1:
The flow of benefits from smart water metering



Source: Frontier / Artesia
*Customer side leakage

1

The benefits of smart water metering

2

Making the case for a coordinated rollout

3

Benefits across the board

4

The mandated rollout with optional metered billing alternative

5

Observations and recommendations



Making the case for a coordinated rollout

A near two-to-one return for society

One of the primary goals of our study was to assess the impact of a coordinated rollout of smart water meters. To do this, we modelled potential costs and benefits to society and the environment using a five-year rollout period (2025 – 2030) as our base, and the assumption that all households would switch to metered billing within three years of having a smart water meter installed.

As a result, we found that a coordinated smart water meter rollout would deliver $\pounds 1.73$ in social benefits for every $\pounds 1$ spent.



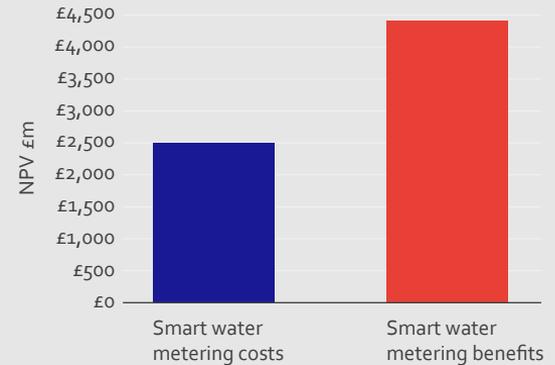
Our study projects $\pounds 4.4$ bn in social benefits compared to $\pounds 2.5$ bn of costs over 30 years. That represents a net benefit of $\pounds 1.86$ bn.



Figure 2: A comparison between the costs and benefits of a coordinated five-years smart water meter rollout

Costs and Benefits relative to Base Case

Source: Frontier / Artesia



1

The benefits of smart water metering

2

Making the case for a coordinated rollout

3

Benefits across the board

4

The mandated rollout with optional metered billing alternative

5

Observations and recommendations



Costs and benefits explained

We explored costs and benefits across a broad spectrum. Major factors include:



Incremental costs, which include meter acquisition and installation costs as well as communications infrastructure and back-office costs.



Reduced consumption, which allows water companies to defer their investment in other demand reduction schemes or new supply schemes.

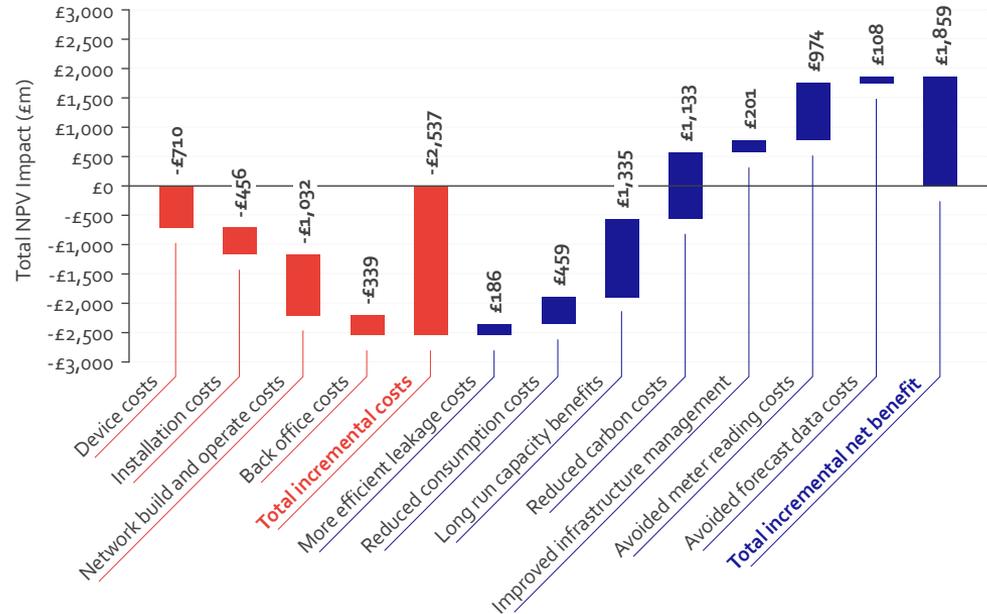


Lower carbon emissions, which – despite being adjusted to reflect existing plans to decarbonise the energy sector – delivers a material benefit.



Lower operational costs resulting from reduced consumption and reduced meter reading costs.

Figure 3: Tracking the individual costs and benefits





Benefits across the board

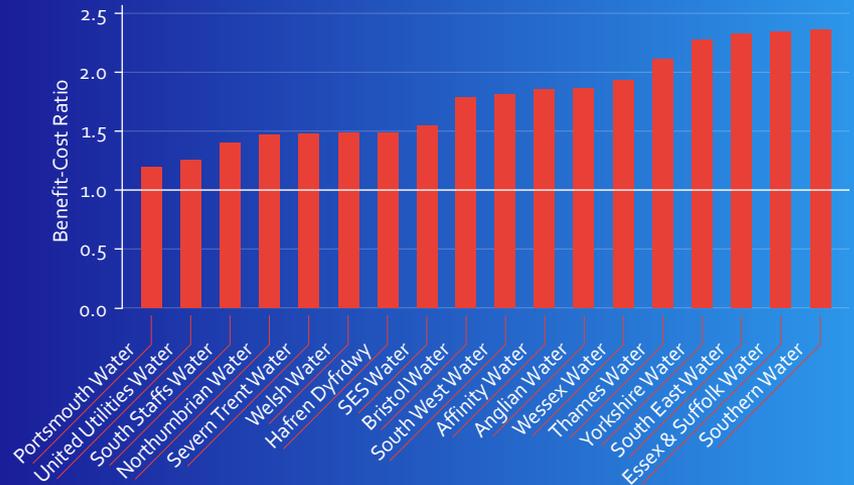
A smart choice with a gain for society in every location



We also evaluated costs and benefits on an area-by-area basis. In doing so, we saw a positive social cost-benefit ratio across the entirety of England and Wales, meaning that all areas stand to gain from the rollout of smart water meters.

Companies in the East and South East of England saw particularly strong results.

Figure 4: A cost-benefit analysis of smart water meters on an area-by-area basis



Source: Frontier / Artesia

1

The benefits of smart water metering

2

Making the case for a coordinated rollout

3

Benefits across the board

4

The mandated rollout with optional metered billing alternative

5

Observations and recommendations





Using this model, costs remain stable at £2.5bn, while benefits equate to £3.3bn – a net gain of **more than £726m**. The investment case is clear, as is the opportunity to pass some of those savings on to household customers.



How costs and benefits vary

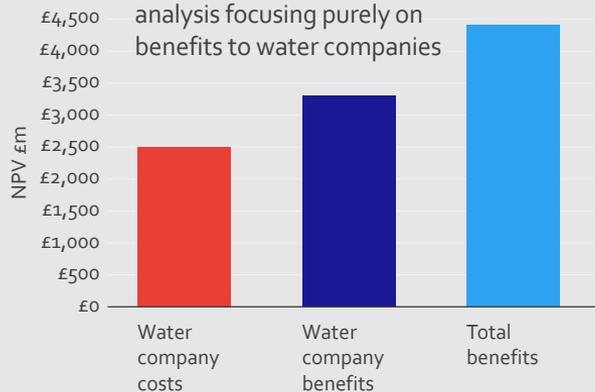
To ensure the validity of our modelling, we took account of the specific circumstances of each water company area. This helps to explain why some areas see higher returns than others.

Issues that had a positive impact on the benefit-to-cost ratio included **existing meter penetration** and **greater water scarcity**, both of which facilitate significant elimination of costs. Agreed costs for smaller companies are lower than for larger companies but higher on a per customer basis.

Positive cost benefit at individual water company level

The figures shown on the previous page are based on a wide analysis of smart water metering's advantages, including societal and carbon reduction benefits. Even when we remove those aspects and focus purely on the water companies, the case for smart water metering remains strong and highlights a positive case for water company investment.

Figure 5: Cost-benefit analysis focusing purely on benefits to water companies



Costs and Benefits relative to Base Case

Source: Frontier / Artesia

1

The benefits of smart water metering

2

Making the case for a coordinated rollout

3

Benefits across the board

4

The mandated rollout with optional metered billing alternative

5

Observations and recommendations

The mandated rollout with optional metered billing alternative

As noted earlier, our overall calculations assume that all households would automatically transfer to metered billing within three years of having a smart water meter installed.

To understand the implications of an alternative situation – one in which water companies continued to provide their customers with a choice between metered or unmetered billing – we explored the difference in the benefits that would result.

Net benefits do fall in the optional metered billing scenario, but the impact is not significant. The cost-benefit ratio falls from £1.73:£1 to £1.70:£1 – a very slight decrease.

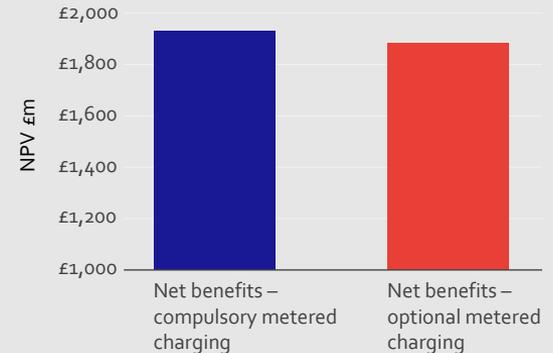
This is because, even in the optional scenario, a high proportion of customers will voluntarily switch to metered charging over time. In addition, benefits such as leak detection and improved flow are independent of billing, and are not reliant on customers changing their behaviour.



Figure 6: A comparison in net benefits between metered and unmetered billing

Costs and Benefits relative to Base Case

Source: Frontier / Artesia



1

The benefits of smart water metering

2

Making the case for a coordinated rollout

3

Benefits across the board

4

The mandated rollout with optional metered billing alternative

5

Observations and recommendations



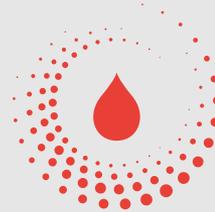
Observations and recommendations

Defra has stated that it expects Ofwat to “support and encourage water companies to... address leakage on customers’ own pipes,” and that it should “hold companies to account for their contribution towards reducing personal water consumption.”

This study shows that smart water metering can play a critical role in meeting those expectations.

The methodology used in this study was designed in such a way that it can be employed by individual companies to help them conduct their own cost-benefit analysis. This serves to ensure that the return on smart water meter rollouts can be calculated in a consistent and standardised way.

The Environment Agency Water Resources Planning Guide proposes that water companies operating in areas of serious water stress should consider charging by volume based on universal metering. The results of this study lead us to believe that these companies should also explore smart water metering, compulsory metering, metering on change of occupier, and metering street-by-street with comparative billing.



While the responsibility for planning and delivering smart water meters sits with individual water companies, these companies develop their plans based on a regulatory framework shaped by the Government, Environment Agency, and Ofwat. These parties should work together to ensure that universally beneficial programmes such as smart water metering are supported and encouraged.

1

The benefits of smart water metering

2

Making the case for a coordinated rollout

3

Benefits across the board

4

The mandated rollout with optional metered billing alternative

5

Observations and recommendations



About the authors



Frontier Economics is a consulting firm with over 250 economists across London, Berlin, Brussels, Cologne, Dublin, Madrid and Paris.

Frontier Economics specialises in competition, regulation, and strategy across all major sectors and areas of economic analysis. The company also advises on all aspects of the economics of water including regulatory design, market mechanisms, investment appraisal, and environmental economics. Recent clients include Ofwat, UKWIR, Water UK, and many water utilities.

Rob Francis

Associate Director, Frontier
rob.francis@frontier-economics.com



Artesia is a dynamic and forward-thinking company serving the water sector since 2008.

Artesia uses a combination of extensive industry knowledge and expert data science skills to provide specialist solutions, consultancy and technical support in water resource management, water supply planning, asset management, and water conservation.

Rob Lawson

Director, Artesia
rob.lawson@artesia-consulting.co.uk



Arqiva is a communications infrastructure and media services company, operating at the heart of the broadcast and utilities industries in the UK.

Arqiva is at the forefront of network solutions and services in an increasingly digital world. Arqiva is the only large-scale provider of smart water infrastructure in the UK. It has contracts with some of the UK's largest water companies, including Anglian Water, Thames Water and Yorkshire Water.

Laurie Patten

Director of Strategy and Regulation, Arqiva
laurie.patten@arqiva.com



frontier
economics

artesia

arqiva