

Bulk Charges for New Appointments and Variations (NAV's) Regime in the Water Industry in England and Wales

Ofwat

6 April 2020



FINAL REPORT

Important notice

This report was prepared by CEPA¹ for the exclusive use of the recipient(s) named herein.

The information contained in this document has been compiled by CEPA and may include material from other sources, which is believed to be reliable but has not been verified or audited. Public information, industry and statistical data are from sources we deem to be reliable; however, no reliance may be placed for any purposes whatsoever on the contents of this document or on its completeness. No representation or warranty, express or implied, is given and no responsibility or liability is or will be accepted by or on behalf of CEPA or by any of its directors, members, employees, agents or any other person as to the accuracy, completeness or correctness of the information contained in this document and any such liability is expressly disclaimed.

The findings enclosed in this report may contain predictions based on current data and historical trends. Any such predictions are subject to inherent risks and uncertainties.

The opinions expressed in this document are valid only for the purpose stated herein and as of the date stated. No obligation is assumed to revise this report to reflect changes, events or conditions, which occur subsequent to the date hereof.

CEPA does not accept or assume any responsibility in respect of the document to any readers of it (third parties), other than the recipient(s) named therein. To the fullest extent permitted by law, CEPA will accept no liability in respect of the report to any third parties. Should any third parties choose to rely on the report, then they do so at their own risk.

¹ "CEPA" is the trading name of Cambridge Economic Policy Associates Ltd (Registered: England & Wales, 04077684), CEPA LLP (A Limited Liability Partnership. Registered: England & Wales, OC326074) and Cambridge Economic Policy Associates Pty Ltd (ABN 16 606 266 602).

Contents

EXECUTIVE SUMMARY	5
1. INTRODUCTION	10
1.1. Context	10
1.2. Study objectives and approach	11
1.3. Report structure	12
PART 1 - EVALUATION OF CURRENT NAV BULK SUPPLY CHARGES	13
2. APPROACH	13
3. ASSESSMENT OF BASIC COMPLIANCE	15
3.1. Availability of tariff information	15
3.2. Transparency of pricing methodology	17
3.3. Application of wholesale minus approach.....	18
3.4. Overall evaluation of basic compliance	19
4. ASSESSMENT OF APPLICATION OF INDIVIDUAL BUILDING BLOCKS	21
4.1. Application of the relevant starting point.....	21
4.2. Application of on-site ongoing cost element.....	23
4.3. Application of WACC and depreciation element on on-site assets.....	36
4.4. Estimated operating margins based on existing NAV bulk supply charging practices	41
PART 2 – OPTIONS FOR FUTURE BULK SUPPLY CHARGING	48
5. PRINCIPLES FOR BULK SUPPLY CHARGING	48
5.1. Economic principles and cost concepts.....	48
5.2. Charging for last mile infrastructure in the energy sector	50
5.3. Implications for the application of Ofwat’s charging guidance	52
6. OPTIONS FOR REGULATING AND CALCULATING NAV BULK SUPPLY CHARGES	53
6.1. Relevant starting point.....	53
6.2. Direct operating costs	54
6.3. Indirect operating costs	55
6.4. Capital maintenance spend.....	56
6.5. Leakage adjustment	57
6.6. Rate of return element	58
6.7. Options for future bulk supply charging policy.....	60

6.8. Estimated operating margins based on a consistent top-down methodology.....	62
APPENDIX A MODELLING APPROACH	65
APPENDIX B LIST OF DIRECT COSTS AVOIDED ON NAV SITES	66
APPENDIX C RELEVANT COST DEFINITIONS.....	69
APPENDIX D SENSITIVITY ANALYSIS ON ESTIMATED MARGINS	71

EXECUTIVE SUMMARY

Ofwat has frequently emphasized the importance of well-functioning markets. New Appointments and Variations is one area where Ofwat has sought to introduce competition in a regulated market. It entails newly appointed companies (the “NAV’s”) providing water and/or sewerage services to developers and final consumers in an area across England and Wales instead of the local incumbent water and/or sewerage companies (the “incumbent companies”). The introduction of competition in this segment of the market is seen to provide benefits to developers and final customers.

A NAV can be appointed if one of three qualifying criteria are met:

- Unserved - the site does not contain any premises served by the incumbent company – these are typically new developments.
- Consent – the relevant incumbent company undertaker agrees to transfer either part or all of its area of appointment to a different company; or
- Large user – the appointment or variation relates only to an area where each of the premises are, or are likely to be, supplied with at least 50 megalitres of water per year in England or 250 megalitres of water per year in Wales, and the relevant customer wishes to change its supplier.

The majority of NAVs have so far been appointed under the unserved criterion.

Based on the findings of a 2017 market study of the NAVs market², Ofwat has been concerned that barriers may exist that restrict the level of competition in the NAVs market. One of those barriers could be the pricing methodologies that are used to set the bulk supply charges for NAVs who typically rely on access to wholesale services and infrastructure provided by the local incumbent provider. As NAVs are constrained by the ‘no worse off’ charging principle, the bulk supply charges the incumbent applies to NAV sites determine the operating margin that NAV operators can earn providing water and wastewater services at the site. The ‘no worse-off’ principle is embedded in the NAVs’ Instruments of Appointment (the “licenses”) and ensures that the charges levied by the NAV to its customers do not exceed the charges that would have been levied by the incumbent company had it served those customers itself.

To tackle the issues identified in the 2017 market study, during the last two years Ofwat has undertaken several policy actions aimed at ensuring a level playing field for NAVs to compete in the market. Most notably it has developed guidance for incumbents’ NAV bulk supply tariffs. Ofwat’s 2018 guidance on bulk supply charges for NAVs (“Ofwat’s guidance”) establishes that a “wholesale minus” avoided costs methodology should be used by incumbent companies to set bulk supply charges for NAVs.³ The “wholesale minus” approach starts from the relevant wholesale tariffs of the incumbent and deducts costs the incumbent avoids if the NAV supplies the site instead. This is meant to encourage efficient entry by NAVs that, over the entire life of the appointment, can provide the service at least as efficiently as the incumbent.

According to Ofwat’s guidance, the incumbent companies are also expected to publish bulk tariff information for NAVs. This may include the methodology the incumbent company would expect to follow to calculate NAV bulk supply tariffs and the cost assumptions used.

Ofwat commissioned CEPA to analyse the current regime for NAV Bulk Charges in England and Wales and to evaluate companies’ current application of this regime. We conducted our work in two parts.

First, to help Ofwat understand more accurately the current state of the market, we conducted an evaluation of the incumbent companies’ NAV bulk supply charging practices and how companies have been implementing Ofwat’s

² Frontier Economics (2017), “Study of the NAV market - Final report prepared for Ofwat”, May.

³ [Ofwat \(2018\), “Bulk charges for NAVs: final guidance”](#).

2018 guidance with reference to 2019/20 tariffs. This was based on publicly available information as well as information provided by companies in response to a Request for Information (RFI) sent out by Ofwat. Following this assessment, in the second stage of the work, we developed our own thinking on the application of the wholesale minus methodology in the water sector, options for its implementation and potential improvements to the current Ofwat guidance.

We set out a summary of our key findings in the subsections below.

Evaluation of current NAV bulk supply charges

We have found that there is a good level of basic compliance with Ofwat's 2018 guidance across the sector in terms of published tariffs and applying the wholesale minus concept to determining bulk supply charges.

The vast majority of incumbent water and wastewater companies (16 out of 17) calculated and published their NAV bulk supply tariffs. The majority provided at least a high-level description of their charging methodology and applied the wholesale minus approach described in Ofwat's published guidance. We conclude that for most areas of England and Wales, it should be possible for a prospective NAV to estimate bulk supply charges that might be applied to a site that it may compete to provide services to.

There is often less clarity in the information published by companies around how deductions for avoided costs have been calculated in applying a wholesale minus methodology. Publicly available information is generally limited on how each company has estimated avoided costs to calculate the individual building blocks of the NAV bulk supply charges methodology, and the assumptions and rationale for why certain costs are included or excluded from the companies' calculations.

We have been able to develop a relatively detailed understanding of how each incumbent company currently approaches these calculations, as we have been able to rely on confidential responses to the RFI from Ofwat as part of this project. We expect a prospective NAV would find it challenging to reach a similar level of understanding from the information available publicly compared to be RFI used for our assignment.

However, ultimately it is these detailed calculations and assumptions,⁴ and the rationale for what activities and costs incumbent companies consider they will avoid from not supplying a NAV site, that are central to the application of the wholesale minus methodology in practice. These aspects of companies' charging methodologies determine the operating margins that prospective NAVs may earn if competing in the relevant market. This suggests that further transparency of NAV bulk supply charging practices is still needed to enable NAVs to properly scrutinise and, if necessary, challenge incumbents on their bulk supply charges through commercial negotiations. Further transparency is also needed to enable Ofwat to properly monitor the implementation of its guidance.

This conclusion is strengthened by the fact that our evaluation found that incumbent companies adopted a wide range of approaches and assumptions in the building block calculations of their NAV bulk supply charges. We also built a model⁵ to estimate a NAV's wholesale operating margins for both water supply and wastewater services by applying our understanding of incumbent companies' charging methodologies for 2019/20.

Our evaluation and modelling of incumbent companies' current practices suggest:

- The majority of companies use their published wholesale tariffs as the starting point for calculating NAV bulk supply tariffs.
- There are major differences across the sector in the level of the ongoing operating costs included in the avoided cost calculation, and the basis on which these are estimated.

⁴ E.g. the choice of cost drivers that are used to allocate costs to prospective NAV sites.

⁵ The model calculates wholesale operating margins for a notional NAV site with assumed key characteristics (e.g. number of household and non-household connections and consumption per property).

- Several companies may not have given sufficient consideration to different costs drivers for on-site ongoing operating costs.
- Several companies do not appear to account for leakage in their NAV bulk supply calculations (or at least, how leakage is accounted for is unclear).

While comparisons between incumbent companies are challenging given the different bases on which the avoided cost deductions are often expressed and calculated, we observe a wide variation in the resulting wholesale operating margins for the notional NAV site that we modelled.

The avoided cost deductions also vary significantly in size, often between supply areas that are geographically close together. This suggests that the differences may not be driven by incumbent companies' cost characteristics alone. Instead, the range of current practices used by companies appears to be impacting the wholesale operating margins for prospective NAVs.

Variation in the operating margins for NAVs across local incumbent areas is not a problem per se. There may be many reasons explaining differences in margins, including variations in wholesale charges across incumbents' areas, or the fact that some incumbent companies may be more or less cost efficient than others.

Alternatively, the differences found could be due to the choice of methodology used (e.g. top-down or bottom-up costing methodology), choice of cost driver(s) applied to calculate avoided costs, deductions made or the cost structure of the company (for example, share of treated water distribution in overall company costs). However, as many incumbent providers use their existing costs (e.g. on a unit cost basis) to calculate avoided cost deductions, these methodological choices, and companies' current cost structure, will influence the NAV bulk supply charging calculations and these drivers of the final bulk supply charges should be as transparent as possible. Given that the ultimate objective of the wholesale minus methodology in Ofwat's guidance is to promote efficient entry from prospective NAVs (on a whole-life basis), it is also important that incumbents' bulk supply charges reflect as accurately as possible incumbent companies' costs, both in terms of their level and structure.

Our assessment of current bulk supply charging practices indicates that the observed differences in the operating margins for our modelled notional NAV site are driven by a combination of factors and current practices may also vary in the degree of cost reflectivity.

We have also found that, for 2019/20 bulk supply charges, there is currently an even split between companies that do *not* apply a weighted average cost of capital (WACC) and depreciation deduction for avoided on-site infrastructure and financing costs, and those that do. This may be one of the other explanations for the observed variation in operating margins between companies. We found that a number of incumbent companies that currently include a WACC and depreciation deduction in their 2019/20 bulk supply charge calculations also have NAV wholesale operating margins above the sector average, although this is not always the case.⁶

Many companies, however, say they do not expect to apply a WACC and depreciation deduction from April 2020 onwards and indeed, a number of companies may already be applying this policy in their bulk supply tariffs for 2019/20. This is due to changes in the way the income offset will be recognised and applied from this date, which will mean that on-site assets will be fully funded by developers upfront.

This change in methodology raises both conceptual and practical issues for the incentive for NAVs to enter the market under incumbent companies' bulk supply pricing practices. While NAVs may be able to earn a *profit* margin when providing upfront investment in infrastructure to site developers, if they are equally as efficient as the

⁶ This implies that either other companies that do not apply a WACC and depreciation avoided cost deduction apply a more significant deduction for avoided ongoing operating costs, or that companies that currently apply a WACC and depreciation deduction, apply a smaller deduction for ongoing operating costs within their calculations.

incumbent provider, they may not earn an ongoing profit after accounting for the ongoing operating costs of supplying the applicable site.⁷

While there are reasons why this may be a justifiable outcome – given the economic principles on which the wholesale minus pricing methodology is based – it is an issue we consider requires clarification and discussion within Ofwat’s charging guidance in future (see discussion below).

Options for future bulk supply charging practices

In the second part of the assignment we have developed our own thinking – informed by the industry’s current charging practices – on the application of the wholesale minus methodology in the water sector, options for its implementation and potential improvements to the current Ofwat guidance. This has included whether Ofwat should adopt a more prescriptive (e.g. rules based) approach to NAV bulk supply charging.

We have identified both advantages and disadvantages with the existing – less prescriptive – principles-based bulk supply charging guidance that Ofwat issued in 2018.

The main advantages of this less prescriptive approach are that:

- the guidance is sufficiently flexible to cater for differences in the types of sites and types of services required by NAVs; and
- sufficiently general and flexible to make it reasonably future proof.

As discussed above, there may also be good reasons – on cost reflectivity grounds – for incumbent companies to differ in their assumptions and methods for NAV bulk supply charging. Indeed, where these differences are justified by reference to incumbent companies’ costs, they will help to promote the objective of efficient entry from NAVs, a central underlying principle of the wholesale minus methodology.

However, cost reflectivity is just one of the many (often conflicting) objectives that Ofwat may want to achieve. Other objectives for NAVs’ bulk supply charges may include the transparency and the practicality of the incumbents’ charging methodology. In addition, our evaluation of current practices shows that Ofwat’s current guidance is leading to different charging methods across incumbent companies and it is not always clear that these differences are sufficiently justified by companies. Our analysis also suggests there are building blocks that could be calculated more consistently across the industry – and in the majority of circumstances should be deducted as an avoided incumbent cost in the charging calculations – but are not always done so by companies.

A more prescriptive set of common rules or more detailed guidance would help to address these issues. It would also provide greater clarity to incumbent companies on the steps that they should follow to calculate bulk supply tariffs and to NAV companies on the assumptions that underpin their bulk supply charges. It may also allow Ofwat to be more prescriptive on the cost standard that it expects companies to apply to meet the regulatory objectives within the sector and better enable monitoring of the implementation of its guidance.

Ultimately, the key question is whether a more prescribed, common, cost allocation method would help to produce a more cost reflective set of bulk supply charges *across the sector*. Our review of different approaches that companies could in principle take suggests there may not be a single ideal method. Information needed to implement some approaches on a prescribed basis may be required at a much more granular level than companies appear to currently collect and report (at least publicly). We expect that a significant industry consultation process would also be needed to develop a common, but also suitably cost reflective, NAV bulk supply methodology

⁷ While some incumbent companies currently include a small deduction for other financing costs associated with the ongoing operation of the relevant site – e.g. working capital for billing purposes – these are typically relatively small deductions.

(similar, for example, to the common approach that is used for DNOs electricity use of system charges for independent distribution network operators (IDNOs)).⁸

Overall, Ofwat should consider whether a very prescriptive, rules based, charging system is likely to be appropriate at this time. Ofwat could also consider requiring incumbent companies to publish more detailed regulatory accounts with information that would allow NAVs (and Ofwat) to better understand and scrutinise bulk supply charges.

Ofwat could also introduce incremental changes to its guidance to potentially achieve greater cost reflectivity and consistency across the industry. Some of the changes we suggest are:

- a common list of potential avoided direct ongoing operating costs that each company should demonstrate are included/excluded from their NAV bulk supply charge calculations;
- an explicit provision that some allowance for indirect costs should be deducted as an avoided cost within the charge calculations; and
- discussion on the treatment of leakage, given our review of current practices suggests that companies are not always considering this issue or the adjustments may not be applied correctly.

In light of the changes to the income offset rules, we think it is also important that Ofwat's future guidance is clear on what are the expected opportunity costs of capital involved in running operational 'last mile' infrastructure where the initial capital costs of the site are contributed upfront by developers. This includes:

- working capital that might be employed in provision of services to end consumers over the life of the site; and/or
- any 'risk capital' needed to operate last mile infrastructure under a long-term set of regulatory arrangements.

Ongoing capital maintenance – and in the long run, ultimately the replacement of the onsite asset base – may also provide justification for further deductions to derive the bulk supply tariff, as a number of incumbents already assume in their current charging practices.

How profits are accounted for within a wholesale minus pricing methodology under the new income offset rules will, in our view, require further consultation amongst industry stakeholders, particularly if Ofwat wishes to support sustainable competition in the NAV market.

⁸ Within the main report we illustrate how a common, but simple, top-down methodology could be applied to all water supply and wastewater licensees. While we find this provides more consistent operating margins across incumbent providers, we consider it may not provide as cost reflective NAV bulk supply charges as the methods currently employed by some of the companies.

1. INTRODUCTION

CEPA has been commissioned by Ofwat to analyse Bulk Charges for the New Appointments and Variations (NAVs) Regime in the Water Industry in England and Wales. This includes an evaluation of current bulk charging practices for NAVs and an assessment of how the wholesale minus methodology should be implemented.

1.1. CONTEXT

Ofwat has frequently emphasised the importance of well-functioning markets. NAVs is one area where Ofwat has sought to introduce competition in a regulated market. It entails newly appointed companies (the “NAVs”) providing water and/or sewerage services to developers and final consumers in an area across England and Wales instead of the local incumbent water and/or sewerage companies (the “incumbent companies”). Depending on whether a given NAV provides water services, sewerage services or both, the incumbent company in whose area the NAV operates will provide sewerage services, water services or neither.

A NAV can be appointed if one of three qualifying criteria are met:

- **Unserved** - the site does not contain any premises served by the incumbent company – these are typically new developments. The majority of NAVs have so far been appointed under the unserved criterion.
- **Consent** – the relevant incumbent company undertaker agrees to transfer either part or all of its area of appointment to a different company; or
- **Large user** – the appointment or variation relates only to an area where each of the premises are, or are likely to be, supplied with at least 50 megalitres of water per year in England or 250 megalitres of water per year in Wales, and the relevant customer wishes to change its supplier.

The latest information suggests that there are currently 107 NAV sites, operated by eight NAV companies, serving around 61,000 residential customers⁹.

The benefits of increased competition in the market are considered to include serving a site at a lower cost, facilitating multi-utility developer service and encouraging innovation.

Ofwat has previously identified concerns that barriers may exist that restrict the level of competition in the NAVs market. In December 2016, in the light of the modest increase in NAVs’ market shares, Ofwat commissioned Frontier Economics to undertake a NAVs market study. This study identified two key barriers potentially hampering the ability of NAVs to compete effectively with incumbents in the market:¹⁰

- **Process/behaviour** – the requirements and processes around applying to be a NAV operator and the transparency, timeliness and effectiveness of information provision by, and communications with, incumbent water companies.
- **Pricing** – the margin that NAV operators are able to earn, including the underlying methodology of the incumbents’ charges underpinning those margins, and whether there is a level playing field between NAVs, self-lay providers (SLPs) and incumbents regarding these charges.

Based on these findings, during the last two years Ofwat has undertaken several policy actions aimed at ensuring a level playing field for NAVs competing in the market, most notably it has developed detailed guidance on bulk supply charges for NAVs.¹¹ The guidance published by Ofwat in May 2018 sets out the approach Ofwat would

⁹ Ofwat, <https://www.ofwat.gov.uk/regulated-companies/markets/nav-market/>

¹⁰ Frontier Economics (2017), “Study of the NAV market - Final report prepared for Ofwat”, May.

¹¹ Ofwat (2018), “Bulk charges for NAVs: final guidance”

expect to take if asked to determine on the charges that should be set by an incumbent water company for bulk supply services provided to a NAV in England and Wales.

Bulk supply charges set by the incumbent water company are an important determinant of the ability of NAVs to enter and compete in the market as they affect the operating and profit margin that operators can earn. For the typical NAV, the overall operating margin depends on:

- **On-site development** – one-off profit margin they make on building/sub-contracting the on-site infrastructure for the developers. In this field, NAV operators compete both with incumbent companies and SLPs.
- **Margin on ongoing services provided to end-customers** – on-going margin determined by end-customer prices (constrained by 'no worse off' principle under which NAV cannot charge more than the incumbent) and bulk supply prices charged by the incumbent company.

Ofwat's guidance establishes that a "wholesale minus" avoided costs methodology should be used to set bulk supply charges for NAVs. The "wholesale minus" approach starts from the relevant wholesale tariffs of the incumbent and deducts the costs that the incumbent considers it will avoid if a NAV supplied the site instead. The four components are wholesale tariffs, on-site ongoing costs, WACC¹² and depreciation. According to the guidance, the incumbent companies are also expected to publish bulk supply tariff information.

Initial analysis from Ofwat of published information has suggested that the interpretation and application of the guidance by some companies results in a wide range of bulk supply charges and operating margins for NAVs. While variation in bulk supply tariffs and operating margins for NAVs across local incumbent supply areas is not a problem per se – as discussed in later sections of the report, there are many reasons why NAV margins would be *expected* to differ by site and incumbent supply area – the differences are not currently well understood.

1.2. STUDY OBJECTIVES AND APPROACH

The objectives of this study are to:

- help Ofwat understand more accurately what the incumbent companies' current NAV bulk supply charging practices are and whether companies are complying with Ofwat's charging guidance; and
- provide a basis for Ofwat to further develop its guidance (as necessary) to ensure that NAV bulk supply pricing policies are consistent with Ofwat's aims of ensuring a level playing field for NAVs.

To help Ofwat understand more accurately the current state of the market, we conducted an evaluation of the incumbent companies' NAV tariff practices and how companies have been implementing Ofwat's existing guidance for bulk water pricing with reference to 2019/20 tariffs. This was based on publicly available information as well as information provided by companies in response to a Request for Information (RFI) sent out by Ofwat.

Following this assessment, in the second stage of the work, we developed our own thinking on the application of the wholesale minus methodology in the water sector as well as possible improvements to the current Ofwat guidance, informed by the findings from our evaluation of current practices across the sector.

We developed a bulk supply pricing spreadsheet tool for a notional NAV site to provide worked examples of our understanding of how companies' current practices apply in practice and what could be the impact on a NAV's wholesale operating margins and bulk supply charges if alternative methodologies and assumptions were applied.

We have been limited in the modelling that we have been able to undertake by the cost and accounting information available in the public domain for each of the incumbent companies. However, we have sought to test the expected

¹² Weighted average cost of capital (WACC).

avoided cost activities and relevant cost drivers for NAV sites with a water industry engineering advisor to the project team. This has included consideration of:

- the asset types typically operated on NAV site sites and the activities undertaken by NAVs to operate, clean, maintain, replace etc., these assets; and
- the expected logic behind the potential avoided ongoing direct costs by the incumbent provider at a prospective NAV site.

1.3. REPORT STRUCTURE

The rest of this report is structured into two parts.

In Part 1 of the report:

- **Section 2** sets out the approach that we have taken to our evaluation of incumbent water and wastewater companies' current NAV bulk supply water practices.
- **Section 3** assesses how the incumbent companies perform in terms of basic compliance with Ofwat's guidance - i.e. in terms of availability of information, transparency and application of the wholesale minus approach.
- **Section 4** presents our findings in relation to how the incumbent companies apply the wholesale minus approach to calculating NAV bulk supply tariffs looking at each individual component of the methodology.

Part 2 of the report:

- Considers relevant economic principles and cost concepts for NAV bulk supply charging that may help guide Ofwat's future regulatory policy (**Section 5**).
- Sets out potential approaches and policy options that Ofwat could consider to develop its approach to NAV bulk supply charging (**Section 6**).

A series of appendices provide supporting information:

- **Appendix A** sets out the modelling methodology we have used to calculate bulk supply charges for a notional NAV site.
- **Appendix B** provides a list of direct ongoing costs that incumbents may avoid at a NAV site and analysis of the associated cost drivers.
- **Appendix C** provides relevant cost definitions.
- **Appendix D** presents additional results from our modelling and analysis of bulk supply charges under different assumptions about the characteristics of a notional NAV site.

PART 1 - EVALUATION OF CURRENT NAV BULK SUPPLY CHARGES

2. APPROACH

In this section we provide a brief overview of our approach to undertaking the evaluation of incumbent companies' current (i.e. 2019/20) bulk supply charging practices for NAV sites.

Our evaluation is primarily aimed at understanding and assessing the incumbents' recent pricing practices. The assessment is based on 2019/20 NAV bulk supply tariffs and methodologies.

The evaluation is applied against a set of criteria. These reflect the principles set out in the Ofwat NAV bulk supply charging guidance and the aim of promoting competition in the market by ensuring that there is a level playing field between NAVs, incumbents and other organisations.

We have developed our evaluation against the following criteria:

- **Basic compliance 1:** Availability of pricing information for NAVs – e.g. Could a typical NAV obtain a bulk supply tariff estimate based on the published information? Are the incumbent companies providing standard tariffs for all NAVs or using a bespoke set of assumptions to derive more site-specific tariffs?
- **Basic compliance 2:** Transparency – Is there clarity on tariffs and how they are calculated? Do the incumbent companies publish additional documents, such as stakeholder consultations, that describe their tariff methodology in greater detail?
- **Basic compliance 3:** Overall application of the wholesale-minus approach – Do the incumbent companies calculate tariffs according to the high-level methodology set out in Ofwat's 2018 guidance (i.e. start with a view of the relevant wholesale tariffs and apply a series of deductions for the avoidable costs)?
- **Detailed compliance:** Approach to calculating each element of the wholesale-minus methodology as set out in Ofwat's 2018 guidance document, including:
 - relevant wholesale tariff;
 - on-site ongoing costs;
 - WACC on on-site assets; and
 - depreciation.

Basic compliance has been assessed based on publicly available information.¹³ We note that our evaluation of basic compliance was generally undertaken in the autumn of 2019. We have not completed a detailed check as to whether companies have subsequently published or updated information that is publicly available.

The results of the basic compliance assessment are presented in Section 3. We provide an appraisal of all incumbent companies' NAV tariff practices using an A-D scoring system, with a "traffic light" colour assigned to each grading to aid visualisation:

- **A (Dark green):** the company performs well against the criteria with no or only minor issues identified.
- **B (Light green):** the company performs satisfactorily against the criteria with some limitations identified.
- **C (Yellow):** the company meets some aspects of the criteria, but some significant improvements may be needed.
- **D (Red):** the company's pricing practice does not meet the criteria.

¹³ i.e. information on NAV bulk supply charges available on incumbent companies' websites.

Detailed compliance has been assessed based on both publicly available information and additional information that we have requested from companies. This assessment, presented in Section 4, covers both aspects of compliance with Ofwat's guidance (e.g. are the relevant wholesale tariffs used depending on the mix of the NAV's end-consumers?, is the adjusted WACC from Ofwat's guidance applied?) as well as broader aspects related to the calculation of bulk supply tariffs which may go beyond the level of prescription in Ofwat's guidance.

As part of our evaluation we identify best practices among companies which feed into our considerations around the pricing methodology in Part 2 of this report. When considering the assessment, it is worth bearing in mind that incumbent companies have different levels of existing engagement with the NAVs which may have an impact on their current level of thinking around NAV bulk supply tariffs.

3. ASSESSMENT OF BASIC COMPLIANCE

In this section we assess how the incumbent companies perform in terms of basic compliance with Ofwat's guidance.

3.1. AVAILABILITY OF TARIFF INFORMATION

Key messages

All except one company have published online their bulk supply tariffs for NAVs for 2019/20 in a way that should make it possible for a prospective NAV to estimate its bulk supply charges. Out of the companies that have published their tariffs, one company published tariffs that are not currently applicable (they are for 2018/19 and based on a draft methodology).

Ofwat's 2018 guidance document highlights availability of bulk pricing information as a key element for NAVs that "ought to have access to clear information on bulk charges ahead of bidding for developers' work in order to ensure a level playing field."

Table 3.1 below presents our assessment of how companies perform in terms of published information on NAV tariffs. We considered the following questions in this part of the evaluation:

- Are NAV bulk supply tariffs published online by the relevant company?
- Is it possible for standard NAVs to calculate with some precision how much they might expect to pay for bulk supply services based on published tariffs?
- Does the incumbent company provide tools (e.g. a tariff calculator) to facilitate NAVs' bulk supply charge calculations?

We find that all except two companies have published their current (2019/20 charging year) NAV charges online. One company has published tariffs that are not current (they apply to the 2018/19 charging year) and are in draft form. In its response to the RFI, the company has stated that, following the publication of draft NAV charges, it refined its approach and provided the charging spreadsheet model containing final 2019/20 NAV bulk supply tariffs to the only NAV operating in its area. Another incumbent company has not published any tariff information for 2019/20 in the public domain but has recently published draft 2020/21 tariffs.

We have found that the information published by each one of the companies would be sufficient for a standard NAV to achieve a reasonable assessment of expected bulk supply charges.

Five companies also provide a tariff calculator that NAVs can use to estimate their bulk supply charges. In one case, in particular, we found that the tariff calculator is essential for NAVs to be able to estimate their charges given that the tariff calculation relies on a number of site-specific characteristics such as length of on-site water and sewerage network. The NAV bulk supply tariffs published by two incumbent companies are indicative based on assumptions that the companies make about a potential NAV site. Stakeholders can use the NAV tariff calculators published online to estimate NAV bulk supply charges for their own sites.

Table 3.1 Availability of NAV bulk supply tariff information

Incumbent company	Are 2019/20 tariffs published on-line?	Is it possible for standard NAVs to calculate with some precision how much they might be expected to pay based on published tariffs?	Does the incumbent company provide tools (e.g. a tariff calculator) to facilitate these calculations?	Evaluation
Company A	Yes	Yes	No	B
Company B	Yes	Yes	No	B
Company C	Yes*	Yes**	No	C
Company D	Yes	Yes	Yes	A
Company E	Yes	Yes	No	B
Company F	No	No	No	D
Company G	Yes	Yes	No	B
Company H	Yes	Yes	No	B
Company I	Yes	Yes	No	B
Company J	Yes	Yes	No	B
Company K	Yes	Yes	Yes	A
Company L	Yes	Yes	Yes	A
Company M	Yes	Yes	No	B
Company N	Yes	Yes	No	B
Company O	Yes	Yes	Yes	A
Company P	Yes	Yes	No	B
Company Q	Yes	Yes	Yes	A

Source: CEPA research and analysis

* Not current tariffs. The published tariffs are for 2018/19 and draft.

** Except the WACC element

The published tariffs typically apply to ‘standard NAVs’, which we interpret as a NAV that provides standard services to its end-consumers (most commonly in new developments but not necessarily). Non-standard would mean a NAV that operates a site with specific characteristics, e.g. an on-site pumping station or sewerage treatment plant, that means that a standard tariff would not be appropriate for that site. Several companies state that where a site has significantly different characteristics a bespoke tariff would be determined on a site-specific basis. We note that two incumbent companies state that the published tariffs only apply to new appointees under the ‘unserved’ criterion while Ofwat’s guidance states that the approach to setting NAV bulk supply tariffs contained in the guidance applies to NAVs appointed under each of the three criteria.¹⁴ While NAV applications granted under the consent and large user criteria form a relatively small part of the current NAV market (and there may be no such NAVs in several of the incumbent companies areas), one benefit of making tariff information available is to enable *prospective* NAVs to make informed decisions about entering the market.

All companies which scored B and above were deemed to meet the requirements of Ofwat’s guidance in relation to publication of tariff information. We have awarded an A score to companies that provide a tariff calculator because

¹⁴ Note that sites under different criterion may serve similar types of users (e.g. unserved and consent sites are both likely to serve residential users) and, therefore, avoided costs (and thus NAV bulk supply tariffs) should in this scenario presumably be similar. In contrast, avoided costs may be different for sites comprised of mainly large users.

we believe these provide value to the NAVs by reducing the risk of any misinterpretation of the published information when calculating bulk charges.

3.2. TRANSPARENCY OF PRICING METHODOLOGY

Key messages

All of the companies that published their NAV tariffs online also included a description of their tariff methodology that in most cases makes it possible to understand, at least at a high-level, how tariffs are determined. The area where there is often less clarity is around how the deductions for avoided costs are calculated.

Three companies published stakeholder consultation documents (and their responses to the consultations) which provide further details on their adopted pricing methodology.

For the transparency criteria we consider the following questions:

- Do companies publish an explanation of how tariffs have been calculated (i.e. a tariff methodology)?
- Do companies publish additional documents such as stakeholder consultation or independent reports on their NAV bulk supply tariff methodology which provide additional insight into their tariff methodology?
- Is it possible, based on the information contained in the above documents, to understand at a high-level how NAV bulk supply tariffs have been calculated? This would include, for example, understanding the main classifications and magnitude of avoided costs.
- Is it possible, based on the information contained in the above documents, to understand in detail how NAV bulk supply tariffs have been calculated? This would include for example understanding in detail how the avoided costs have been estimated, including the methodologies applied for calculating individual classes of costs and source data that has been used.

Our findings are presented in Table 3.2.

With the exception of one company that did not publish 2019/20 bulk supply charges for NAVs, in all cases some explanation of the tariff methodology is provided alongside the NAV bulk supply tariff information published by companies. Generally, the level of detail is sufficient to offer a high-level understanding but not sufficient to gain detailed insight into the tariff calculation method. The area which most often lacks clarity in published information is around how the avoided costs deducted from the wholesale tariffs are estimated.

Three incumbent companies have published stakeholder consultations and responses to consultations. We found that these consultation documents helped to provide a better understanding of the NAV bulk supply tariff methodologies.

Table 3.2 Transparency of NAV bulk supply tariff methodology

Incumbent company	Are there published documents explaining how tariffs have been calculated?	Are there any other supporting documents (e.g. stakeholder consultations, specialist reports) published on-line?	Is it possible to understand at a high level how NAV bulk supply tariffs have been calculated based on these documents?	Is it possible to understand in detail how NAV bulk supply tariffs have been calculated based on these documents?	Evaluation
Company A	Yes	No	Yes	Yes	A
Company B	Yes	No	Yes	No	B
Company C	Yes	No	To some extent	No	C
Company D	Yes	Yes (consultation)	Yes	To some extent (based on the NAV tariff calculator)	A
Company E	Yes	No	To some extent	No	C
Company F	No	No	No	No	D
Company G	Yes	No	Yes	No	B
Company H	Yes	No	Yes	No	B
Company I	Yes	Yes (consultation)	Yes	To some extent	A
Company J	Yes	No	To some extent	No	C
Company K	Yes	No	Yes	To some extent (absence of clarity on calculation of avoided costs)	B
Company L	Yes	No	Yes	To some extent	B
Company M	Yes	No	To some extent	No	C
Company N	Yes	No	Yes	To some extent	B
Company O	Yes	Yes (consultation)	Yes	No (absence of clarity on calculation of avoided costs)	B
Company P	Yes	No	Yes	No	B
Company Q	Yes	Yes*	Yes	To some extent	B

Source: CEPA research and analysis

* Assurance note on charging arrangements from external consultant

3.3. APPLICATION OF WHOLESALE MINUS APPROACH

Key messages

All the companies that published NAV tariffs applied the wholesale minus approach set out in Ofwat's guidance when determining their NAV bulk supply tariffs.

Based on publicly available information regarding the methodologies used to calculate NAV tariffs, it appears that all companies have adopted the wholesale minus approach set out in Ofwat's guidance. We have not been able to verify this for only one company, which did not publish any tariff information for 2019/20.

We note that two incumbent companies used a discounted cash flow approach to calculate the bulk supply discounts. This approach may look different at face value, but, in theory, it is in fact analogous to the standard wholesale minus approach outlined in Ofwat’s guidance.¹⁵

We have identified a potential issue in the way one incumbent company calculated NAV charges. This issue, involving a supplementary large user charge being applied to NAV bulk supply charges, is explained in Box 1 below.

Box 1: Supplementary large user charge applied to NAV bulk supply charges

The wholesale minus approach described in Ofwat’s guidance determines NAV bulk supply charges by reference to the NAV’s end consumers rather than treating the NAV site as one single consumer. This is meant to reflect the revenue that the NAV is able to collect from its end-consumers.

One incumbent company calculated its NAV bulk supply tariff by taking the standard wholesale tariff (for residential consumers only for practical reasons, as described in Section 4.1) and then applied deductions for avoided costs to determine a standard volumetric NAV tariff. The tariff methodology then stated that the bulk supply charges for the NAV will include charges based on its NAV tariff plus a supplementary large user charge related to the annual volumetric consumption.

The supplementary large use charge is an annual fixed charge that applies to large users on the incumbent’s network. The annual consumption volume used to determine the charge applied to a NAV is the total consumption of all consumers on the NAV site (i.e. treating the NAV site as a single large user). Therefore, a NAV site made up of small residential consumers may qualify for a supplementary large user charge under the incumbent’s bulk supply charging methodology although no individual end-consumer on site would qualify for the charge.

We note that the impact of this charge could be significant. In a hypothetical NAV tariff example provided by the incumbent, an annual supplementary charge of £13,455 was applied to a NAV site comprising 663 household consumers and 50 non-household properties. This represented around 13% of the total bulk supply charge estimated for the NAV.

In their response to the RFI, the incumbent company stated that they will remove the supplementary charge for the new set of 2020/21 NAV bulk supply charges.

Due to this issue, we have given this company a ‘C’ under this assessment criteria. All other companies score an A under this assessment criteria.

3.4. OVERALL EVALUATION OF BASIC COMPLIANCE

Key messages

Overall, there is a good level of basic compliance with Ofwat’s guidance. The vast majority of companies (16 out of 17) calculated and published their NAV bulk supply tariffs, provided at least a high-level description of their tariff methodology and applied the wholesale minus approach described in Ofwat’s charging guidance.

Table 3.3 below presents the overall assessment of basic compliance with Ofwat’s guidance. Fourteen out of the seventeen companies have an overall score of B or above, which indicates that there is a good level of basic compliance with Ofwat’s guidance across the board.

¹⁵ A full explanation of why the two approaches are equal is provided in: Green, R. and Pardina, M. (1999) “Resetting price controls for privatized utilities: a manual for regulators”, World Bank, Chapter 5.

Table 3.3: Overall assessment of basic compliance with Ofwat’s guidance

Company / criteria	Availability of information	Transparency	Application of wholesale minus approach	Overall evaluation
Company A	B	A	A	A
Company B	B	B	A	B
Company C	C	C	A	C
Company D	A	A	A	A
Company E	B	C	A	B
Company F	D	D	Not possible to assign a rating based on publicly available information	
Company G	B	B	A	B
Company H	B	B	A	B
Company I	B	A	A	A
Company J	B	C	A	B
Company K	A	B	A	A
Company L	A	B	A	A
Company M	B	C	A	B
Company N	B	B	A	B
Company O	A	B	A	A
Company P	B	B	C	C *
Company Q	A	B	A	A

Source: CEPA research and analysis

* Company P would score a B except for the supplementary large user charge. As noted above, the company has said that it will remove the supplementary charge for the new set of 2020/21 NAV bulk supply charges which would result in the company scoring a B under our evaluation framework

4. ASSESSMENT OF APPLICATION OF INDIVIDUAL BUILDING BLOCKS

In this section we present our findings in relation to how the incumbent companies applied the wholesale minus approach to calculating NAV bulk supply tariffs for 2019/20 looking at each individual component of the methodology.

Publicly available information is generally limited on the application of the individual building blocks, particularly around how the avoided cost elements are estimated. The incumbent companies have provided additional information on their bulk supply pricing methodology, including in some cases detailed spreadsheets showing the calculations, in response to the RFI sent out by Ofwat. The assessment in this section reflects both the publicly available information and the information provided by companies in the RFI.

Consistent with the steps in the wholesale minus methodology in Ofwat's guidance, first we discuss incumbent companies' current practices for determining the relevant starting point for NAV bulk supply tariffs (e.g. published wholesale tariffs) – section 4.1. We then consider the deductions that companies apply for avoided costs, including ongoing costs at the prospective NAV site and potential avoided WACC and depreciation charges – sections 4.2 and 4.3.

Finally, we provide analysis, using a spreadsheet model to estimate bulk supply charges for a notional NAV site, of the wholesale operating margins that may apply to the notional site based on our understanding of companies' existing NAV bulk supply charging practices – section 4.4.

4.1. APPLICATION OF THE RELEVANT STARTING POINT

Key messages

All the companies for which information is available, used their published wholesale tariffs as the starting point for calculating NAV bulk supply tariffs.

Most companies published a range of wholesale tariffs for different consumer types to which a series of deductions can be applied. This means that companies are not publishing a final NAV bulk supply tariff but are instead publishing a methodology and the tariff components that a NAV requires in order to calculate its bulk supply charge. We believe this is a sensible approach.

Some questions arise particularly in relation to how fixed charges are treated in the weighted average calculation and the fact that a few companies based their NAV tariffs solely on their residential wholesale tariffs.

Ofwat's guidance states that the relevant starting point for NAV tariffs is the set of the incumbent company's wholesale tariffs that reflects the NAV's potential end-customer base. This is meant to closely reflect the services a NAV provides to its end-consumers and the revenue that the NAV is able to collect from its end-consumers (with the NAVs being ultimately bound by the "no worse off" principle where they cannot charge end-consumers on average more than the incumbent companies would charge).

Ofwat's guidance mentions two potential approaches to determining an appropriate starting point:

- determining a relevant overall weighted average tariff; and
- publishing a menu of all the relevant tariff components that can be used to calculate a NAV charge for a particular site.

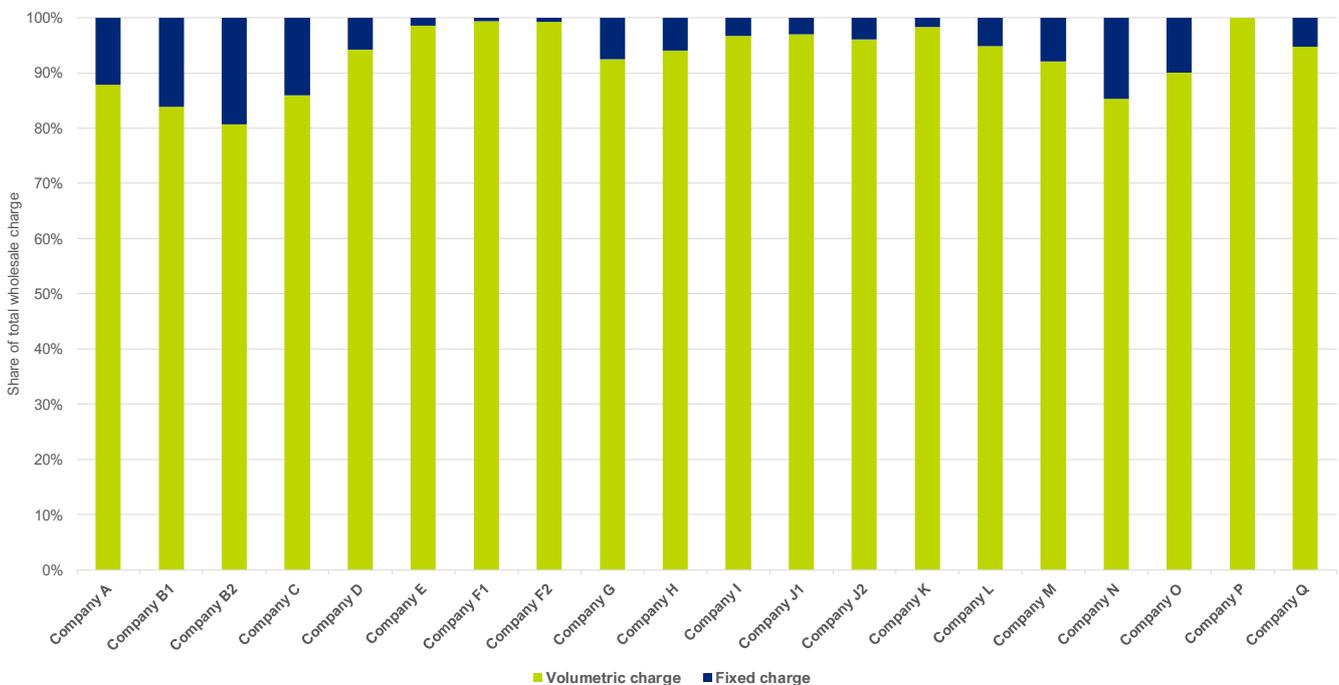
If applied consistently and using the same information, the two methods are equivalent and should give the same result. We found that most companies tended to follow the second approach where they published their relevant wholesale tariffs, a range of deductions and a methodology for calculating bulk supply charges based on these tariffs and deductions. We note that the first method is less practical to apply ex-ante because the overall weighted average tariff requires assumptions about the mix of consumers on a NAV's site. We believe that the overall

weighted average tariff calculation should be a site-specific calculation that takes into account the actual mix of end-consumers and their consumption pattern rather than relying on a ‘typical’ mix of end-consumers.

Another issue related to the relevant starting point involves the tariff structure for bulk supplies (i.e. should the bulk supply tariff be a fixed tariff, a volumetric one or a combination of the two?) and how cost deductions should be applied to the various elements of the charging structure. This issue is not explicitly addressed in Ofwat’s guidance and as the following sections show, there are different approaches adopted by incumbent companies in terms of applying cost deductions on a fixed or volumetric basis as well as in terms of the structure of NAV charges (all companies apply a volumetric element to NAV charges but not all include a fixed component as well).

In Figure 4.1, we show the proportion of fixed/volumetric charges of the estimated wholesale bill for a notional NAV site’s end-consumers. The assumed characteristics of the notional NAV site are presented in Section 4.4. While the volumetric component makes up the vast majority of the wholesale charge for all companies, the proportion of fixed charges ranges from zero to 19%.

Figure 4.1: Proportion of fixed/volumetric component of estimated wholesale water bill for notional NAV site end-consumers



Source: CEPA analysis based on 2019/20 wholesale tariffs

The example provided in Box 1 of Ofwat’s 2018 guidance suggests that the overall weighted average should be calculated by taking into consideration both the fixed and variable elements of wholesale charges (i.e. keeping the wholesale tariff structure) and the number of customers and consumption volume for each type of end-consumers on the NAV site.¹⁶

Most companies publish a range of wholesale tariffs for different consumer types to which a series of deductions can be applied. This means that companies are not publishing a final NAV bulk supply tariff but are instead

¹⁶ The wholesale residential tariff is set out as: $P(R) = 10 + 1 \cdot q$. We interpret this as the total charge levied on this type of consumer is equal to the fixed charge (10) plus a volumetric charge (1) multiplied by volume of consumption (q). We note that there is a potential inaccuracy in the example presented in Ofwat’s guidance. The same q = volume of water consumed is used in all three tariff calculations shown in the example. We believe there should be a distinction between $q(r)$ = volume of water consumer by residential consumers; $q(b)$ = volume of water consumed by business consumers and $q(\text{bulk})$ = volume of bulk water supplied (sum of on-site residential and business consumption).

publishing a methodology and the tariff components that a NAV requires in order to calculate its bulk supply charge.

Some exceptions to this are:

- Three incumbent companies publish a NAV tariff solely based on their residential wholesale tariff. One of these companies states that this is the case because 99% of their non-household consumers are on a wholesale tariff that is only marginally different from their residential wholesale tariff. Whilst this may technically result in a less accurate estimate of the revenue that the NAV is able to collect from its end-consumers, it can be justified on the grounds of simplicity. Another incumbent’s published methodology states that a weighted average tariff would be calculated for sites with non-household consumers where a large user tariff is applicable.
- One incumbent company calculates an overall weighted average tariff by converting all fixed charges of the wholesale tariff into volumetric ones based on estimated consumption. This can raise methodological issues particularly if the conversion is done ex ante based on estimated volumes rather than using actual consumption volumes.

4.2. APPLICATION OF ON-SITE ONGOING COST ELEMENT

Key messages

All the incumbent companies that published NAV bulk supply tariffs for 2019/20 applied deductions for on-site ongoing costs in their NAV tariff calculation. There are some notable differences between companies both in terms of the approach used to estimate these costs and the basis on which these costs are estimated. This may be the result of the fact that the guidance is not very prescriptive in this area.

Overall, we found that many companies may not have given sufficient consideration to the specific cost drivers related to on-site ongoing costs. This could affect the basis on which costs are estimated (e.g. fixed versus variable costs) and in turn impact on how bulk supply charges vary by site depending on their key characteristics (e.g. small versus large site).

Our analysis of the costs and cost drivers for typical NAV sites – supported by input from the team’s engineering advisors (see Appendix B) – also suggests that the ongoing on-site costs avoided by incumbents are very dependent upon the specific characteristics of the NAV site, e.g. the numbers and types of properties, the numbers and types of assets and the physical site characteristics (e.g. topology). In contrast, the NAV bulk supply charges levied by many companies use a “top-down” approach for estimating avoided ongoing site costs, with the volume of water supplied often used as the relevant cost driver within the tariff calculations.

While this may be a pragmatic and transparent approach for calculating NAV charges, there is also a potential cost reflectivity trade-off compared to methodologies that assess on-site avoided costs with closer reference to the asset base and activities of each NAV site. The number of properties and length of mains and sewers are likely to be key primary cost drivers for most typical NAV sites, but there are also other relevant factors related to topology that may impact individual site costs (e.g. ground conditions and location).

Several incumbent companies did not seem to account for leakage in their NAV bulk supply tariff calculation.

While not a direct on-site cost, in existing charging methodologies there is generally limited discussion of the potential for avoided indirect costs (e.g. corporate service costs) as a result of NAVs supplying a site, either in the short term or longer term. While some incumbent companies applied an explicit adjustment for business overheads in their calculations, others may be implicitly allocating a share of indirect costs to the on-site network where business overheads and other indirect costs are allocated to different business units within their Annual Performance Reports (APRs)¹⁷ (and so are captured within the unit cost calculations that are used to calculate avoided ongoing costs). This issue may benefit from further clarification in any future Ofwat guidance.

¹⁷ Companies are required to report annually to Ofwat on their expenditure and outcome delivery in the APRs.

The on-site ongoing cost is likely to be the element in the wholesale minus approach that has the biggest impact on the margin available to NAVs (i.e. the difference between the wholesale tariff for end consumers and the bulk supply tariff). This is also an area where Ofwat's guidance is not overly prescriptive so there is a fair amount of discretion available to companies as to how they interpret and apply the guidance.

Apart from one incumbent company, for which tariffs and methodologies are not available, all the other companies applied deductions for on-site ongoing costs in their 2019/20 NAV tariff calculation.

We found several differences in how companies considered their on-site ongoing costs. One of the main differences concerns **the approach used to estimate on-site ongoing costs**:

- Many companies used a **top-down approach** to estimate ongoing costs. This often involves using data from Annual Performance Reports (Tables 4D and 4E in particular) to derive operating unit cost estimates. There is no common approach to how the unit costs are calculated. One of the common approaches is to divide treated water distribution operating costs from table 4D by total consumption volume to obtain a water distribution cost per m³. The main issue with this type of approach is that the operating costs may not be specific to the 'last mile' infrastructure operated by the NAV but reflect the cost of wholesale water and wastewater services over the incumbent's entire network, including the off-site network element. In addition, our analysis of cost activities and cost drivers for a NAV site suggests that the volume of water delivered may not be a good basis on which to estimate avoided costs. As a result, this approach, while simple and transparent, may not result in the most cost reflective ongoing cost deductions for NAVs.

This is acknowledged by several incumbent companies which state that they adopt this approach because of simplicity and that it benefits NAVs because on-site ongoing costs are, in their view, overestimated. Another common approach is to divide treated water distribution operating costs by length of network to obtain an operating cost per meter of network. The relevant cost for the NAV site is then calculated by assuming a typical length of the on-site network. A more complex top-down approach used by one incumbent company allocates costs to different elements of the network using asset data, asset values and engineering judgement then divides the costs at the relevant network levels by volume of consumption.

- A more disaggregated or **bottom-up approach** is used by at least five incumbent companies. A largely **bottom-up** approach applied by three companies uses estimates of costs for different activities avoided by the incumbent. These are often based on contractor rates paid by the company, typically expressed as cost per metre of network then aggregated and converted to a volumetric rate based on assumed volume of consumption for different types of on-site consumers. Two other incumbent companies employ a disaggregated approach which can be viewed in some ways as a middle way between the top-down and bottom-up approaches. It involves using annual data across the company for different types of activities which are avoided by the incumbent then dividing these costs by a relevant cost driver.

Another major difference in how incumbent companies determine ongoing cost deductions refers to the **basis on which estimated avoided costs are introduced into the wholesale minus formula**. Different companies use different cost drivers to incorporate costs in the wholesale minus formula. Based on available information, the most common way to express on-site ongoing costs is as a volumetric component (£ per m³ of consumption). Other companies express on-site ongoing costs as a fixed cost per connection. A couple of companies express ongoing costs using network length as a cost driver (£ per m of water main or sewer). This can then be translated into a fixed cost per site/consumer based on assumptions about the length of the network on NAV's site.

Table 4.1 summarises the approach to estimating on-site ongoing costs adopted by each incumbent company. It seeks to answer the following questions:

- Do companies use a top-down or bottom-up approach for estimating avoided ongoing site costs at the NAV site?
- Which data sources do companies currently use for estimating these their avoided on-site ongoing costs?
- Do the companies included capital maintenance spent in the estimate of avoided on-site costs?

- Are leakage costs included in the avoided cost calculation?

Following the findings in Table 4.1 we also provide:

- a more detailed discussion of the treatment of replacement capital costs and leakage within the incumbent companies' pricing methodologies; and
- analysis of the magnitude of reductions that companies currently make and the possible implications for Ofwat's charging guidance.

Table 4.1 Approach to estimating on-site ongoing cost

Incumbent company	Are costs estimated using a top down or a bottom up approach?	Which data sources are used for estimating these costs?	Has capital maintenance spend been included into these costs?	Have leakage costs been included?
Company A	Top down (Divide relevant costs by total length of network. Multiply by NAV's length of mains, assuming different lengths for households and non-households.)	Annual accounting separation exercise, and other sources	Yes	No (but example based on end-consumer metered volumes which already capture leakages)
Company B	Top down (proportion of distribution costs related to local network infrastructure divided by total volume of water supplied)	Not known	Not known	No
Company C	Not known - 100% discount on fixed charges, and 5.75% discount on volumetric charges for household and small non-household users, equal to the discount applied to calculate mid-users wholesale tariffs. No discount for mid and large users	Not known	Not known	No
Company D	More disaggregated approach - uses 2017/18 expenditure values for different avoidable activities and key cost drivers (length of mains or number of customers) to come up with unit costs	Some data from APR, other unknown	Yes, based on bottom up cost assessment using the equivalent annual annuity (EAA) approach	Yes, applied as % reduction to wholesale tariff after deductions
Company E	Top down (allocated costs to different pipe sizes. Then calculate avoided costs for different sizes of NAVs given the different proportions of pipe sizes they have)	Table 4D and 4E	Not known	No
Company F	Not known	Not known	Not known	Not known

Incumbent company	Are costs estimated using a top down or a bottom up approach?	Which data sources are used for estimating these costs?	Has capital maintenance spend been included into these costs?	Have leakage costs been included?
Company G	Top down (divide relevant operating costs by length of pipes and calculate a cost per connection using an assumed length of pipe per connection)	Table 4D and 4E data contained in the company's Annual Performance Report and Regulatory Reporting report (the Regulatory Accounts); and other sources	Not known	Yes, applied as % reduction to wholesale tariff after deductions
Company H	Top down (divide relevant costs by total length of network, then multiply by NAV's length of mains, assuming a length per connection)	PR19 data tables (same as APR table 4D and 4E)	Presumably yes (included in operating costs through annual renewals expenditure)	Yes, as % reduction to bulk metered volumes
Company I	Top down for opex (divide relevant operating costs by length of pipes and calculate a cost per connection using an assumed length of pipe per connection) Bottom up for capital maintenance (profile of hypothetical future replacement for different asset types)	Annual Performance Report for operating costs	Yes	Yes, as % reduction to metered volumes
Company J	Disaggregated approach (annual costs across the company for each activity deemed to have been avoided, divided by distribution input volume to obtain an avoided cost per m3.)	Regulatory accounts separation analysis	No	Yes, applied as % reduction to wholesale tariff after deductions
Company K	Top down - allocate costs to different elements of the network using asset data, asset values and engineering judgement. Costs divided by billed consumption on local network	Regulatory accounts and other sources	Yes (included in ongoing cost)	Yes, as % reduction to bulk metered volumes
Company L	Bottom up	Mostly internal management / engineering information sources	Yes	Yes, included within the calculation of the costs. (Also consider meter under-registration and water taken unbilled)

Incumbent company	Are costs estimated using a top down or a bottom up approach?	Which data sources are used for estimating these costs?	Has capital maintenance spend been included into these costs?	Have leakage costs been included?
Company M	Top down (allocate relevant operating costs to on-site distribution given a number of assumptions, then divide by volume of water)	Annual Performance Report - Other sources (AMP6 programme analysis, management assumptions)	No	Apparently included in the calculation of the discount but unclear how it is applied
Company N	Top down (divide water distribution opex by total water delivered to obtain cost per m3)	Annual Performance Report table 4D	Yes (calculated using capital maintenance spend from APR)	Yes, applied as % increase on the avoided costs per m3
Company O	Bottom up (commercial rates for different types of activities)	Mostly internal management / engineering information sources	Yes (included in ongoing cost)	Yes, applied as % reduction to wholesale tariff after deductions*
Company P	Top down (based on treated water distribution opex divided by total water delivered)	Tables 4D and 4E of APR	Yes (costed using published 'Charging Arrangements Document')	Yes, applied as £/m3 deduction
Company Q	Bottom up	Mostly internal management / engineering information sources	Yes	Yes, included within the calculation of the costs. (They also consider meter under-registration and water taken unbilled)

Source: CEPA research and analysis

* Includes other on-site losses

Treatment of capital maintenance costs

One significant difference we have identified refers to the inclusion of costs related to **capital maintenance of on-site assets** over time.

Seven incumbent companies explicitly calculate and deduct from their wholesale tariff a cost component related to the need to replace assets on the on-site network over time. This is considered to be an avoided cost for the incumbent as the NAV will be required to replace assets on its local network. For the other incumbent companies, it is not clear if replacement costs have been considered either implicitly or explicitly in the calculation.

We note that capital maintenance can be treated as either an operating or capital cost. This means that in practice capital maintenance costs could be incorporated either through the ongoing costs element of the wholesale minus formula or through the capex elements (applying a WACC on assets and depreciation charge).

Treatment of leakage

One element related to the ongoing cost explicitly mentioned in the guidance is on-site **leakage**.

The general principle behind avoided leakage is that the incumbent normally loses some volume of water on the local network. These losses occur beyond the bulk supply point so, when the NAV operates the site, the bulk supply volumes registered at the bulk supply meter include the volume of water consumed by on-site customers plus the volume of water losses that occur on-site – e.g. if overall on-site leakages are 2% and bulk supply volumes are 100m³, the NAV will only bill its consumers for 98 m³.

In terms of how the leakage element is reflected in the incumbent companies' NAV bulk supply tariff methodology we found that:

- Seven companies account for leakages by applying a % reduction to bulk metered volumes or the wholesale tariff after deductions (both methods have the same result of reducing the total bulk supply charge by the % of estimated on-site leakages).
- One incumbent company estimates a leakage rate of 2.2% of bulk metered volumes, and then applies this percentage as a discount on the wholesale tariff. The fact that the percentage is applied to the full wholesale tariff rather than the tariff after deductions (or bulk supply volume), as in the case of the seven companies mentioned above, may imply that the leakage adjustment is overestimated.
- One incumbent company accounts for leakages by applying a % increase on the estimated avoided costs per m³.
- One incumbent company states that it accounts for leakages in its ongoing cost calculation, however, we have not been able to identify how this is done.
- Two incumbent companies calculate the cost of leakage (and of meter under-registration and water taken unbilled) by multiplying expected volumes by the weighted average wholesale volumetric rate that would apply to the site.
- Four companies do not seem to explicitly account for leakages. One of these incumbent companies applies a % discount to the wholesale tariff depending on the size of the NAV site. However, this seems to reflect avoided leakage repair costs (rather than the volume of water losses).

We have also identified a potential issue related to how bulk supply charges for NAVs are presented in some NAV tariff documents or some of the NAV charges calculators:

- A wholesale charge is calculated based on wholesale tariffs for end-consumers and assumptions regarding number and consumption volume for each type of consumer on the NAV site (note that in this case, consumption refers to end-consumer metered volumes).
- A series of cost deductions are then applied to the wholesale tariffs including a % (or volumetric) reduction to account for leakages.
- An estimate of the total NAV charge is then provided based on the consumption volumes (i.e. the end consumer volumes used to calculate wholesale tariff revenue) and the discounted NAV tariff (already adjusted for leakages). We believe this underestimates the total bulk supply charge because the NAV would be charged based on bulk metered volumes which are likely to be higher than end-consumer metered volumes due to leakages. Because leakages have already been accounted for in the wholesale tariff deductions, using end-consumer volumes to calculate the total NAV charge would be double counting. If the total NAV charge is based on end-consumer metered volumes rather than bulk metered volumes, then an adjustment for leakages would no longer be needed.

We note that this issue only affects the accuracy with which NAV charges can be estimated based on published information. In practice we expect that NAVs would be charged based on bulk metered volumes, therefore, this issue would not occur.¹⁸

In addition, to on-site leakages, there may other circumstances where water provided by the incumbent to a NAV site is not billed to end consumers. Such a situation may occur for example in the case of water used for firefighting. While this issue is not usually addressed explicitly in bulk supply charging documents, our understanding is that water used for firefighting is typically not accounted for ex-ante in setting bulk supply charges. Instead, a number of companies' state that, where such situations arise, the NAV would not be charged for the volume of water used for firefighting. The approach taken to determine the volume of water used in such circumstances is however unclear.

Finally, there may also be benefits in providing incentives for NAVs to improve water efficiency through bulk supply tariffs. We note that some incentives, to reduce leakage for example below the rate of the incumbent, would already exist where bulk supply charges incorporate a deduction for leakages. Where incumbent companies apply tariff structures and avoided costs deductions that are as cost reflective as possible (e.g. the balance of the fixed vs. variable component of the tariff structure) this will also help promote efficient water consumption decisions.

However, additional incentives could in principle also be provided in the form of introducing a deduction for any upstream (i.e. off-site) costs that are avoided by the incumbent company as a result of reduced consumption on the NAV site. Our understanding is that none of the incumbent companies have currently identified off-site avoided costs that should be reflected in the bulk supply charges for NAVs. The difficulty in assessing these costs may be that any water efficiencies by NAVs would only result in avoided upstream costs for the incumbent over a very long-run time horizon. Experience from other sectors (such as energy) also suggests that it may be difficult to incorporate accurate signals of this type in network charges.

Magnitude of avoided ongoing costs

We present in Table 4.2 below the magnitude of ongoing cost deductions for water and wastewater services. The unit cost deductions in columns 2, 3 and 4 are the levels available in the methodology and charging documents published by the incumbent companies. A meaningful comparison of these unit cost deductions is difficult because:

- Cost deductions are expressed on different bases – either as a £/ m³, fixed cost per customer, cost per metre of network, or % reduction to tariffs.
- The level of cost deductions may vary depending on site characteristics such as number of properties or length of network.
- Companies may include different cost components into one number – e.g. the ongoing cost estimate may include capital replacement costs and leakage costs; alternatively these may be estimated as separate components and, in some cases, it may be unclear what elements are or are not included in the cost estimates available.

¹⁸ In another example of this issue, the incumbent company calculates indicative NAV charges based on wholesale tariffs and unit cost deductions using assumptions on the consumption volume of each type of end-consumer. A leakage adjustment is not applied as part of the calculations. However, the company's illustrative tariff calculations are based purely on end-consumers metered volumes which implicitly means that leakages are accounted for. It is unclear though if, in practice, NAVs would be billed based on end-consumer metered volumes or bulk metered volumes. If NAVs are billed for bulk supply based on end-consumer metered volumes, then a leakage adjustment does not need to be applied and the NAV could estimate their NAV charges with accuracy based on the published information. If, however, the bulk metered volume is used (which seems more likely), then this means that avoided leakage is not reflected in the bulk supply charges for NAVs and the indicative NAV charges calculated using the published approach would be under-estimated.

As a result, to allow comparisons between companies we have calculated the £ ongoing cost deductions for a notional NAV site for each incumbent company using the worked examples set out in section 4.4¹⁹ and report this as % of the total wholesale charges for the notional NAV site.

Table 4.2: Magnitude of ongoing cost deductions for water and wastewater services (unit costs and costs for notional NAV site)

Incumbent company	Ongoing operational costs	Capital replacement costs	Leakage costs	Total ongoing costs deduction for notional NAV site (£)	Total ongoing costs deduction for notional NAV site (% of wholesale charges)
Water services					
Company A	£1.60 per m of network	£0.35 per m of network	0	10,751	22.00%
Company B	33p/m ³			29,803	44% - 52%
Company C	100% of fixed charges and 5.75% of volumetric charges	0	0.00%	12,654	19.50%
Company D	Depends on site characteristics (e.g. length of water mains/sewers)		Depends on site characteristics (e.g. length of water mains/sewers)	1.7% to 8.1% depending on site network density	13,554
Company E	From 0% to 13% of wholesale tariff depending on number of properties	Could or could not be included in the figures in the left column	0	9,294	11.70%
Company F					
Company G	£22.96 per property	Could or could not be included in the figures in the left column	2.32%	12,628	11.30%
Company H	£17.62 per connection		5%	9,691	11.60%
Company I	£18.46 (per connection)	£15.96 (per connection)	2.16%	19,030	20.50%
Company J	4.4p/m ³	0	1.45%	5,747	5.4% – 7.1%
Company K	18.1p/m ³		5.50%	10,383	8.30%
Company L ²⁰	Depends on site characteristics			13,850	16.50%
Company M	6.1p/m ³	0	0	3,512	4.20%
Company N	£19.79/£20.6 per connection	£12.57/£12.88 per connection	2.85%	18,669	23.10%
Company O	21.6p/m ³		2.56% for large users	22,486	20%

¹⁹ The notional NAV site consists of 500 households and 50 non-households with site characteristics described in Table 4.5.

²⁰ Ongoing cost deductions depend on a range of site characteristics. The deduction as % of wholesale charges have been estimated using the NAV bulk supply charges models published by the company.

Incumbent company	Ongoing operational costs	Capital replacement costs	Leakage costs	Total ongoing costs deduction for notional NAV site (£)	Total ongoing costs deduction for notional NAV site (% of wholesale charges)
Company P	24.5p/m ³	16.8p/m ³	2.9p/m ³	23,713	30.5% ²¹
Company Q	Depends on site characteristics			16,151	18.60%
Wastewater services					
Company D	Depends on site characteristics (e.g. length of water mains/sewers)	Depends on site characteristics (e.g. length of water mains/sewers)	1.7% to 8.1% depending on site network density	10,255.73	10.90%
Company E	From 0% to 9.3% of wholesale tariff depending on number of properties	Could or could not be included in the figures in the left column	0	11,794.34	8.80%
Company G	£19.53 (without surface water) and £21.46 (with surface water) per property	Could or could not be included in the figures in the left column	2.32%	10,741.50	7.60%
Company H	£6.54 per connection		5%	3,597.00	3.70%
Company I	£13.47 per connection	£6.88 per connection	0.00%	5,555.00	5.00%
Company K	4.2p/m ³		0	2,300.84	2.40%
Company L	0.9% of wholesale charges		0	429.43	0.80%
Company N	£6.37 per connection	£4.25 per connection	2.85%	6,108.71	8.30%
Company O	4.9p/m ³		0	2,534.00	4%
Company P	12.3p/m ³	2p/m ³	0	7,805.91	13% ²²
Company Q	1% of wholesale charges		0	543.78	0.90%

Source: CEPA analysis and research.

Note: Where cost deductions vary by type of user, we present the value applied for household consumers

Based on the findings set out in Table 4.2, some high-level observations about the magnitude of ongoing costs deductions are as follows:

- The estimated ongoing operating costs are in the range of £17.6 to £20.6 per connection per year for water services and £6.4 to £13.47 per connection per year for wastewater services. In the case of costs estimated on a volumetric basis, these range between £0.0437 per m³ to £0.327 per m³ for water services and between £0.036 / m³ to £0.1230 per m³ for wastewater services.

²¹ Calculated as % of wholesale charges to NAV's end-consumers which does not include the supplementary large user charge applied by the company to bulk supply charges (as discussed in Section 4.1).

²² This includes the direct ongoing cost deductions applied to volumetric wholesale tariffs. For wastewater services, the NAV is also charged a fixed fee set as the lower of the applicable charge based on bulk supply meter size and the sum of charges payable by individual consumers on-site. This can result in an additional discount to wholesale charges which is the case for the notional NAV site modelled.

- Where deductions are made for capital replacement costs, these can be significant but are almost always lower than the deductions for ongoing operational costs (with one exception).
- Leakage estimates are generally around 2-3% although the deductions can be as high as 8%.
- As % of wholesale charges, ongoing cost deductions for water supply services range from 2.4% to 52%. For wastewater services, the cost deductions are in general smaller relative to wholesale charges, ranging from just under 1% to 13.3%.

As noted above, comparisons between companies are challenging as a result of the different bases on which the deductions are expressed and calculated. What can be drawn from the analysis is the wide variation in assumptions that appear to be applied across the industry. Our analysis of a notional NAV site suggests the deductions can vary very significantly in size, often between supply areas that are geographically close together, which suggests differences are not driven by company cost characteristics alone.

In relation to the specific methodologies applied by companies to derive ongoing cost deductions, we note that:

- The ongoing cost deductions, as % of wholesale charges, for four companies that use a bottom-up approach to estimating 'last-mile' infrastructure costs range between 16.2% to 20%, close to the average level of 18%.
- One of the companies with the lowest ongoing costs deductions applies a disaggregated approach where the total annual cost for a set of activities are divided by water distribution input to get a cost per m³. The company states that the following activities have been included:
 - reactive communication pipe repair/renewal;
 - service desk management;
 - distribution network/customer boundary activity;
 - third party activity (e.g. fire hydrants); and
 - wholesale funded free leak repairs.

While activities and cost categories may be defined differently by companies which makes it challenging to assess if all relevant costs have been captured, it is possible that, in this case, the company has captured only a subset of the relevant activities performed by NAVs in its bulk supply charge calculation.

Based on the engineering judgement of our team, we have included in Appendix B a list of relevant cost activities that a NAV is likely to undertake. This suggests that some activities such as repair, renewal and cleaning of on-site mains (not just communication pipes) may have been omitted from the incumbent's bulk supply charge calculation (see further discussion below).

- The largest ongoing cost deductions are partly due to the fact that, in calculating NAV bulk supply charges, the incumbent company (Company B) provides a 100% discount on fixed wholesale charges. According to the company, its wholesale standing charges represent the cost of the meter and any associated maintenance at the customer's property. As this is provided by the NAV, this element should be deducted from the wholesale charges.

As Figure 4.1 shows, Company B has the highest proportion of fixed charges therefore this discount is significant. In addition, the company applies a deduction to the volumetric wholesale tariff based on the "distribution cost of the local network infrastructure divided by total volume of water supplied". We were not able to identify the exact nature of the costs that are included in the company's calculation of avoided costs. It may be possible that there was some double counting if some of the costs covered by fixed

standing charges were also included in the volumetric cost deductions, or ongoing distribution costs could simply be overestimated.²³

- Some, but not all companies, include a deduction for indirect costs, not specifically assigned to the operation, maintenance etc., of the onsite infrastructure of a NAV site. At least two companies apply an explicit adjustment for business overheads in the current bulk supply charging calculations (see discussion below).

We have noted above the challenges of comparing the magnitude and the approach to calculating ongoing on-site cost deductions between the incumbent companies given the range of assumptions and different methodologies employed by individual companies. Nevertheless, we consider that this basic comparison highlights a number of important points for the industry and Ofwat to consider going forward:

- **Avoided costs and activities.** Incumbent companies appear to adopt a range of different approaches and assumptions of the on-site costs that are avoided. For companies that adopt more of a top-down approach, this results from the categories of costs (e.g. from the Annual Performance Reports) that are included in avoided unit cost calculations. For companies that adopt a more disaggregated methodology, the deductions follow from the activities and estimated costs that are deemed to be avoided.

The exercise that we have gone through with our engineering advisors to identify the direct (on-site) activities and services associated with the operation of the typical NAV sites (see Appendix B) suggests that these avoided activities primarily relate to the operation, cleaning, maintenance, repair and replacement of assets on the relevant site. While the costs of these different activities may in the round be captured by companies that employ “top-down” tariff methodologies, there is also a risk of under or over-estimating the scope of avoided costs and activities with this approach²⁴.

In contrast, a more disaggregated approach permits a more specific and tailored assessment of avoided activities and costs for each individual NAV site and its asset base. However, the risk in this case is that certain avoided activities may not be included in the tariff calculations (see above) unless a comprehensive list of direct and indirect activities that an incumbent may avoid, both in the short and longer term, is developed as part of the applied tariff methodology.

- Similarly, for adopted **cost drivers**, incumbent companies currently apply a range of different approaches, with volume of water in many cases used as the relevant cost driver for the avoided cost calculations.

Our analysis of the technical cost drivers of on-site costs – again, see Appendix B – suggests ongoing on-site costs are very dependent upon the specific characteristics of the NAV site, e.g. the numbers and types of properties, the numbers and types of assets and the physical site characteristics (e.g. topology). We consider the number of properties and the length of mains and sewers are, in the majority of cases, likely to be a better primary cost driver of avoided costs for NAV sites, than volume of water consumed.

While simple cost drivers, such as volume of water supplied, applied within a top-down charging methodology, may be a pragmatic and transparent approach for calculating NAV bulk supply charges, there are likely to be trade-offs in terms of cost reflectivity relative to methodologies that assess avoided costs with closer reference to the asset base and topology of each individual NAV site and/or methods that use cost drivers that are more closely linked to the assets operated on the site.

²³ A simple analysis suggests that the level of the volumetric ongoing cost deduction applied by the company (33p/m³) is in the same region as overall treated water distribution operating costs divided by total volume of water delivered. This in itself may overestimate costs as it reflects the cost of transporting water over the incumbent’s entire network, not just the ‘last-mile’ infrastructure.

²⁴ For example, if costs that are associated with the operation and maintenance of upstream services and assets (e.g. for water distribution) are included in calculated unit costs, but in practice are not avoided.

In the subsection which follows, we consider the issue of cost drivers in further detail, and the extent to which ongoing costs may be expected to vary with the size and composition of the NAV site.

- Finally, avoided **indirect costs** receive relatively limited discussion within most companies' existing tariff methodologies, in part we expect because this is not a part of the current Ofwat' guidance.

While a few companies apply an explicit adjustment for business overheads in their calculations, some companies that apply a top-down method may also be implicitly allocating a share of indirect costs to the on-site network where business overheads (and other indirect costs) are allocated to different business units and are captured within the unit costs applied to calculate avoided ongoing costs.

How these factors are addressed within incumbent companies' NAV bulk supply charging methodologies involves trade-offs between different charging objectives, including:

- the relative complexity and transparency of the tariff methodology on the one hand; and
- cost reflectivity on the other.

However, as they are all fundamental issues to the application of the wholesale minus methodology in practice, they may benefit from further clarification in any future Ofwat guidance and are discussed in further detail in the second part of our report.

Ongoing costs and size of the NAV site

Most of the incumbent companies have not proposed NAV's bulk supply tariffs structures that differ from their wholesale tariff structures. Note that Ofwat's guidance does not explicitly address the issue of whether the NAV bulk supply tariff structure should be changed to allow tariffs to reflect cost variations generated by relevant cost drivers such as size of the NAV site. However, to achieve cost reflectivity and to provide the right incentives, in particular in terms of water use (see discussion above), it may be necessary that companies propose alternative NAV bulk supply tariff structures. We discuss this issue in Box 2 below with focus on the size of the NAV site.

Overall, we have found that most companies may not have given sufficient consideration to the cost drivers related to on-site ongoing costs. This applies both to the issue of whether ongoing costs should be expressed as a fixed or variable (volumetric) cost and to whether costs should vary with the size of the NAV site (discussed in Box 2) or other potentially relevant cost driver. As discussed in the previous subsection, input from engineering advisors also suggests the ongoing on-site costs avoided by incumbents are very dependent upon the specific characteristics of the NAV site, such as the numbers and types of properties, the numbers and types of assets and the physical site characteristics (e.g. topology). However, most companies have estimated avoided ongoing cost on a £/m³ basis, while our review suggests that most of these costs are likely to be driven by number of customers or length of network (one notable exception is leakage costs which would vary with consumption).²⁵

²⁵ One example would be repair and replacement of communication and supply pipes. For a NAV these costs are likely to be driven by length and number of pipes (i.e. number of properties on-site).

Box 2: Variation in NAV bulk supply tariffs depending on size of the NAV site

Most incumbent companies have interpreted Ofwat's guidance in such a way that NAV bulk supply tariffs do not vary with the size of the NAV site (expressed, for example, in terms of the number of properties supplied).

To illustrate this, consider a NAV site comprising residential consumers only. The NAV bulk supply tariff would be determined by taking the wholesale tariff and applying deductions to obtain a NAV bulk supply tariff for residential consumers. The same tariff would apply irrespective of the number of residential consumers on-site – i.e. the total charge would go up with the number of customers/volume of consumption but the charge per customer/per m^3 would be the same. The potential issue with this approach is that it may not be cost reflective if on-site costs (per customer or per m^3) vary with the size of the site meaning it may be profitable for NAVs to operate certain sites. In addition, in some cases, there may be an inconsistency between the incumbent's wholesale tariff structure and its NAV bulk supply charges. The wholesale tariff structure may include unit tariffs that decline for larger users. If the NAV bulk supply charge does not vary with the size of the development, it could result in situations where the wholesale tariff for a large user is lower than the NAV bulk supply tariff.

Almost all of the incumbent companies (with three exceptions) currently follow an approach where they estimate tariff deductions that may vary with the type of consumer but not with the overall size of the NAV site.

One incumbent company estimates tariff deductions for five different categories of NAV sites depending on the number of properties. The approach is based on the notion that a larger NAV site would replace a larger part of the incumbent's network which means that larger NAV sites receive a larger discount on their wholesale tariffs. Conceptually we believe the approach is reasonable. Two other incumbent companies provide two separate NAV bulk supply tariffs for NAV sites with less than or more than 10 plots. The difference between these two tariffs seems to reflect the fact that, for sites with less than 10 plots, the companies would not install a bulk meter but rely on end-consumer meter readings to set bulk supply charges.

We note, however, that in practice most NAV sites are residential developments usually with somewhere between 50 to 500 houses. Based on our engineering advice, slightly bigger mains or sewers would be used on the larger sites but we would not necessarily expect the NAVs to operate larger sections of the incumbent's network for these larger sites. In fact, we would expect the overall operating costs, on a per property basis, for larger NAV sites using larger mains to be lower than for smaller sites due to economies of scale. Due to this, we would expect that it would be more profitable for NAVs to operate larger sites compared to smaller sites under existing bulk supply charges that do not vary with the size of the development (and even more so under the approach described above). This is because the NAV would earn the same margin between wholesale charges and bulk supply charges for each additional property/unit of water consumed on-site while the cost of operating the site per property/ m^3 would decline.

Source: CEPA analysis

How costs are incorporated into the broad price offering (understood as price categories, structures, and levels) can have an impact on the resulting bulk supply charge and the margin that NAVs can earn.

To illustrate, consider a simple example where all the NAVs costs are driven by number of properties and do not vary with volume of consumption but the cost deductions in their NAV bulk supply charges are calculated on a volumetric basis. In this case, higher water consumption on-site would result in higher revenue collected by the NAV from its end consumers and higher bulk supply charges paid to the incumbent. The absolute level of the margin between the two (i.e. the level of deductions) would also increase with the level of consumption – the $£/m^3$ deduction for avoided costs would be multiplied by a higher level of consumption. The NAV's actual costs of operating the site would not change however because, in our example, these costs do not vary with volume of consumption. This suggests that NAVs with relatively high volume of consumption may benefit from such a situation, while NAVs with a relatively low volume of consumption may potentially lose out. There may also be an adverse impact on the NAVs' incentive to reduce consumption on-site.

4.3. APPLICATION OF WACC AND DEPRECIATION ELEMENT ON ON-SITE ASSETS

Key messages

We find that there is an even split between companies that do not apply a WACC and depreciation element on on-site assets (at least for NAV sites after April 2018) and those that do apply these components (at least for 2019/20 bulk supply charges).

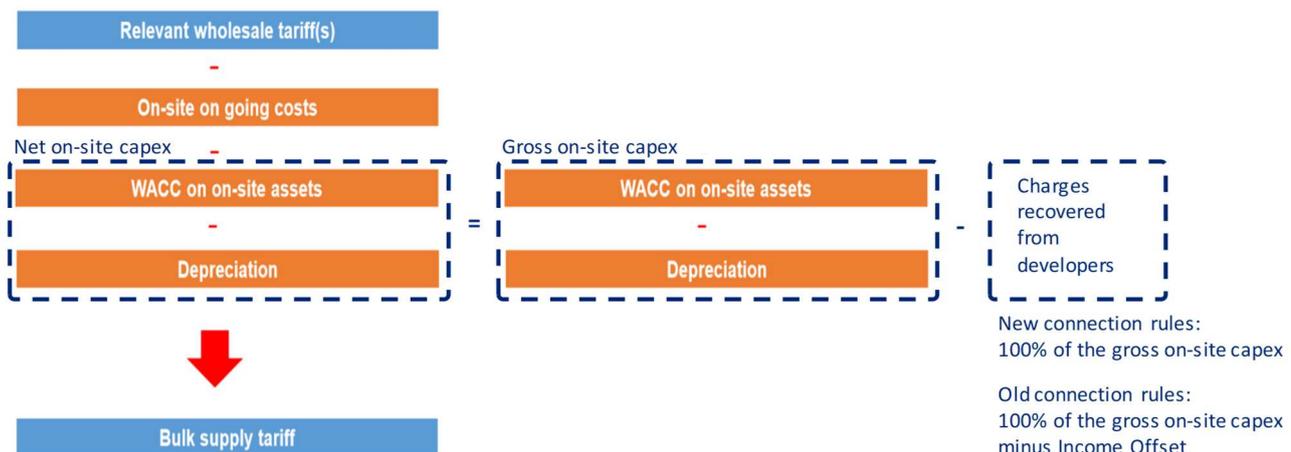
Neither of the approaches can be claimed to be incorrect, as there has been a period of reform in the way the income offset should be recognised that appears to have been reflected, at different speeds for different companies, in the WACC and depreciation element of the NAV bulk supply tariffs. It is clear however, that after April 2020, when the changes in the recognition of the income offset in England will be fully implemented and since when on-site assets will be fully funded by developers, the bulk of what previously has been the WACC and depreciation element of the tariff calculation will no longer need to be included. We discuss this in Section 6.6.

Where a WACC is used, this seems to be in line with the adjusted WACC recommended in Ofwat’s guidance with one potential exception.

The WACC²⁶ and depreciation elements of the wholesale minus formula are intended to reflect the remuneration required for the opportunity cost of the capital invested in the business: WACC (or more precisely WACC * RCV) representing the return *on* capital; and depreciation representing the return *of* capital.

Ofwat’s 2018 guidance is clear that, in applying the wholesale minus methodology, incumbent water and wastewater companies should deduct an appropriate level of WACC on the on-site assets. Incumbent companies are also required to make a deduction for depreciation, *to the extent that the incumbent water company accrued the on-site assets to its RCV if it undertook the development instead of the NAV*. The guidance also states that costs recovered from developers should not be considered when setting bulk charges. This means that the WACC and depreciation elements of the wholesale minus approach should not be applied to assets (or the portion of the assets) funded by developers (i.e. it should be based on the net capex of on-site assets after deducting the charges recovered from developers). This is depicted in the figure below.

Figure 4.2: Calculation of the WACC and depreciation elements of wholesale minus formula



Source: CEPA

²⁶ Recent regulatory proceedings on cost of capital (e.g. the UKRN 2018 study) have distinguished between different return concepts that are used in price control determinations, e.g. the WACC, CAPM-WACC (an estimate of the weighted average cost of capital that comes from the using the capital asset pricing model (CAPM)) and the Regulatory Allowed Return (RAR) defined as the return on the regulatory capital value. In this specific context of NAV bulk supply pricing, references to the ‘WACC’ are intended to refer to the expected opportunity cost of capital that would be associated with the incremental and/or avoided capital employed in the supply of a new development site by an incumbent water business.

Under the pre-April 2020 connection charging rules, the charges recovered from developers would not always be 100% of the capex, given that developers were benefiting from the “income offset”. Under the new connection rules applicable from April 2020 in England, incumbents would recover from developers 100% of the gross on-site capex through requisition charges. The “income offset” will continue to be offered by incumbent companies through a discount on infrastructure charges that cover the cost of off-site works. The same “income offset” will be reflected in infrastructure charges paid by the NAVs. We understand that the new rules do not apply in Wales.

The implication of these changes is that the WACC and depreciation elements of the wholesale minus formula become negligible as the net capex for on-site assets becomes equal to zero. Apart from the changes coming into place in April 2020, Ofwat has also introduced temporary measures which require incumbent companies to include the payment of the income offset in their bulk supply agreements.

Our assessment has found that many incumbent companies do not calculate a capital cost-related deduction when setting their NAV tariffs after April 2018 because they state that the income offset is already reflected elsewhere in their bulk supply agreements or an income offset is not offered to developers. In the case of companies that apply a WACC and depreciation component to their NAV bulk supply tariff calculation, it is unclear whether this is because the “income offset” has not yet been reflected in other parts of their bulk supply agreements.

There are also instances where a WACC and depreciation allowance for avoided future capital maintenance costs on the NAV site is applied by some companies and could, in principle, be used to justify an ongoing WACC and depreciation adjustment even when the on-site assets are fully funded by developers. We have considered this ongoing cost element as capital maintenance expenditure in our assessment (see previous section) but in principle at least, this could provide a justification for retaining a WACC and depreciation deduction even when the upfront capital costs are funded by the developer provided a deduction was not applied elsewhere within the incumbent’s tariff calculations. However, applying a WACC and depreciation deduction in this way would apply an “ultra-long run” view of the expected avoided costs of the incumbent and could risk overestimating the avoided cost.

Table 4.3 below summarises the approach to estimating the WACC and depreciation avoided costs adopted by each company. Eight companies, including the two companies operating in Wales, are currently applying a non-zero WACC and depreciation component to NAV sites post-April 2018. In most cases, it is unclear whether these companies are planning to make changes to the way this is applied after April 2020 although we would expect that this component will no longer be applied which would result in an increase in bulk supply charges for NAVs. An exception are the two Welsh companies which are likely to continue to apply a WACC and depreciation component as they are not affected by the new connection rules. One incumbent company states that there is a difference in their bulk supply charging approach starting in April 2020 because of the new connection rules which means that the discount applied will no longer reflect the value of the initial investment. The other eight companies are not applying a WACC and depreciation element or are only applying it to legacy sites operational before April 2018.

In addition, we have found that two incumbent companies apply an allowance for working capital in their standard NAV tariffs. This is meant to compensate the NAVs for the fact that they would likely bill their consumers once every several months while they would be billed by the incumbent and incur other costs every month. Neither of the two companies apply a WACC and depreciation discount for the initial on-site assets.

We note that a number of companies have raised the fact that the WACC in Ofwat’s bulk supply charging guidance should be updated to reflect the WACC set for incumbent companies at PR19.

Table 4.3 Approach to estimating the WACC and depreciation avoided costs

Incumbent company	Are WACC on on-site assets considered as a separate building block for the purpose of applying the wholesale minus formula?	Is depreciation considered as a separate building block for the purpose of applying the wholesale minus formula?	Are these costs estimated using a top down approach, a bottom up approach, or some other method?	Is the WACC used the WACC recommended in Ofwat's guidance?
Company A	Yes	No	Bottom up (only costs of overground assets - meter and chamber)	Yes
Company B	Yes	Yes	Top down (allocation of RCV using value of local mains as % of asset base divided by volume of water supplied)	Yes
Company C	Yes	Yes	Top down (initial investment based on historic average unit cost per property)	Yes
Company D	Only to future modelled asset replacement costs and not the initial on-site or off-site capital costs	Only to future modelled asset replacement costs and not the initial on-site or off-site capital costs	Bottom up. Assets included are: meters, meter chambers, electrical & mechanical equipment, water mains sewers.	Yes (for replacement costs)
Company E	No (only for working capital)	Yes*	WACC calculated using bottom up approach (deriving working capital given bill payment assumptions). Depreciation calculated using top down approach (Annual depreciations allocated using MEAV RCV allocation and assumptions on pipe sizes).	Yes
Company F	Not known	Not known	Not known	Not known
Company G	No, assumed 0 given that all assets are assumed to be fully funded by developers	No, assumed 0 given that all assets are assumed to be fully funded by developers	Simply assumed zero	Yes (company states that they agree with Ofwat's recommended WACC)
Company H	Yes	Yes	Top down (average company new development expenditure, in £ per m of main, less an adjustment for the Income offset).	Yes
Company I	Only for legacy sites (pre April 2018)	Only for legacy sites (pre April 2018)	Bottom up (based on values of individual assets). Assets included are: meters; meter boxes; water mains; communication pipes; foul water sewers; surface water sewers; and laterals.	Yes, but for the purposes of calculating the annuitized value replacement costs for individual assets, the company has used the wholesale PR14 WACC allowed by Ofwat of 3.6%
Company J	Only for legacy sites (pre April 2018)	Only for legacy sites (pre April 2018)	Presumably top down (but source data is unclear)	Yes

Company K	Yes	Yes	Top down - allocate depreciation over last three years to different network components using overall asset value to calculate depreciation on local network, then divide by billed consumption, and multiply by 15% (value of income offset)	Yes
Company L	Yes	Implicitly through the discounted cash flow approach	Assumed zero	Yes (the WACC is used to discount cash flows)
Company M	Yes	Yes	Presumably top down (but source data is unclear)	Yes
Company N	Only for legacy sites (pre April 2018)	Only for legacy sites (pre April 2018)	Presumably top down (but source data is unclear)	Yes
Company O	No (only for working capital, income offset applied elsewhere)	No (income offset applied elsewhere)	Assumed zero	Yes, for working capital
Company P	Only for legacy sites (pre April 2018)	Only for legacy sites (pre April 2018)	Not known	Yes (for replacement costs)
Company Q	Yes	Implicitly through the discounted cash flow approach	Assumed zero	Yes (the WACC is used to discount cash flows)

Source: CEPA research and analysis

* Depreciation element applied to allow for the ongoing maintenance of water and wastewater networks.

As part of our analysis we also considered if a WACC and depreciation deduction was applied to other assets than the on-site infrastructure, e.g. vans, computers, etc., and other capital stock that may not be directly related to the on-site infrastructure. In principle at least, across a number of years and large number of NAV sites, incumbent companies may in part avoid this investment where it is expected to vary with the number of customers and sites connected to the incumbent's network. Neither companies that apply a bottom-up or more top-down methodology appear to apply an explicit adjustment for these assets in their current methodologies.

Magnitude of avoided WACC and depreciation costs

We present in Table 4.4 below the information available on the magnitude of WACC and depreciation costs. We note that, in some cases, the values stated in the report apply only to legacy NAV sites. To allow comparisons between companies we have also included values, calculated by CEPA based on the methodologies of each company, expressed in £'s and as a % of the wholesale charges for our notional NAV site²⁷.

²⁷ See section 4.4 for assumptions of this notional site.

Table 4.4: Magnitude of WACC and depreciation deductions for water and wastewater services (unit costs and costs for notional NAV site)

Incumbent company	Depreciation	WACC	Total WACC and depreciation deductions for notional NAV site (£)	Total WACC and depreciation deductions for notional NAV site (% of wholesale charges)
Water services				
Company A	0	£11.90 per m of network	6,547	13.40%
Company B	1.5p/m ³	5.8p/m ³	4,198	6.2% - 7.4%
Company C	£0.2365/m ³		1,770	2.10%
Company D	0	0	-	-
Company E	From 0% to 4.9% of wholesale tariff depending on number of properties	1,185% of bulk tariff**	4,246	5.4%**
Company F	-	-	-	-
Company G	0	0	-	-
Company H	£6.76 per connection	£19.23 per connection	14,295	17%
Company I	On site by site basis where there is an impact on RCV*		-	-
Company J	21p/m ³ *		-	-
Company K	0.67p/m ³	16p/m ³	9,589	7.70%
Company L	Depends on site characteristics		15,277	18.20%
Company M	13.9p/m ³	10.9p/m ³	14,249	17.10%
Company N	£3.46/£4 per connection*	£19.67/£22.75 per connection*	-	-
Company O	0	1.3p/m ³ **	1,017	0.9%**
Company P	0	0	-	-
Company Q	Depends on site characteristics		5,158	19%
Wastewater services				
Company D	0	0	-	-
Company E	From 0% to 5.8% of wholesale tariff depending on number of properties	0.593% of bulk tariff	7,985	5.90%
Company G	0	0	-	-
Company H	0 (no on-site capital costs as new development sewers are adopted)		-	-
Company I	On site by site basis*	On site by site basis*	-	-
Company K	0.58p/m ³	14.3p/m ³	8,108	8.60%
Company L	0	0	-	-
Company N	£0.47 per connection*	£2.65 per connection*	-	-
Company O	0	0	735**	1.2%**
Company P	0	0	-	-
Company Q	0	0	-	-

Source: CEPA research and analysis

* Discount applied to pre-April 2018 legacy sites only.

**Deduction for working capital rather than investment in initial on-site assets

4.4. ESTIMATED OPERATING MARGINS BASED ON EXISTING NAV BULK SUPPLY CHARGING PRACTICES

Key messages

Our evaluation of the incumbent companies' current charging methodologies has found that incumbent water supply and wastewater service providers adopt a wide range of approaches and assumptions in the building block calculations of their NAV bulk supply charges.

Using a notional NAV site, we have estimated wholesale operating margins based on our understanding of companies' bulk supply charging methodologies and a simple NAV bulk supply pricing tool which we have developed for the purposes of this study. We find that, given the modelling assumptions we adopt, the incumbent companies' existing charging practices results in a wide range of wholesale operating margins for prospective NAVs.

Based on existing wholesale tariffs and the existing bulk supply charges for each of the incumbent companies, we have estimated wholesale operating margins for water supply and wastewater services for a notional NAV site with the characteristics shown below (see table 4.5). We present the impact of sensitivity analysis from varying some of these characteristics in Appendix D.

We have based our calculations on 2019/20 wholesale and NAV bulk supply tariffs. In some cases, NAVs have the option of choosing between being charged based on the bulk supply charges calculated according to the wholesale minus approach and the tariffs applied to large users on the incumbent's network. For clarity, the estimated wholesale operating margins presented in this report are entirely based on bulk supply charges published by incumbent companies. Where a NAV chooses to be charged based on the large user tariff instead, its operating margin may be different.

It is also worth drawing attention to the fact that the numbers presented in this section do not represent profit margins for the NAV business as they do not account for the costs incurred by the NAV in operating the site, nor do they reflect any margin earned on retail or developer services.

Table 4.5: Assumptions on notional NAV site

Variable	Unit	Household	Non-Household
Number of connections	number	500	50
Water consumption volume per connection	m ³ /year	100	150
Return to sewer rate	%	95%	95%
Wastewater discharge volume per connection	m ³ /year	95.00	142.50
Length of network per connection	m/connection	10	10
Meter size	mm	12.00	15.00

Source: CEPA

Note: Water consumption is assumed to be the volume measured at end-consumer meters. Bulk supply metered volumes are calculated by applying an assumed on-site leakage rate.

Other modelling assumptions we have made include:

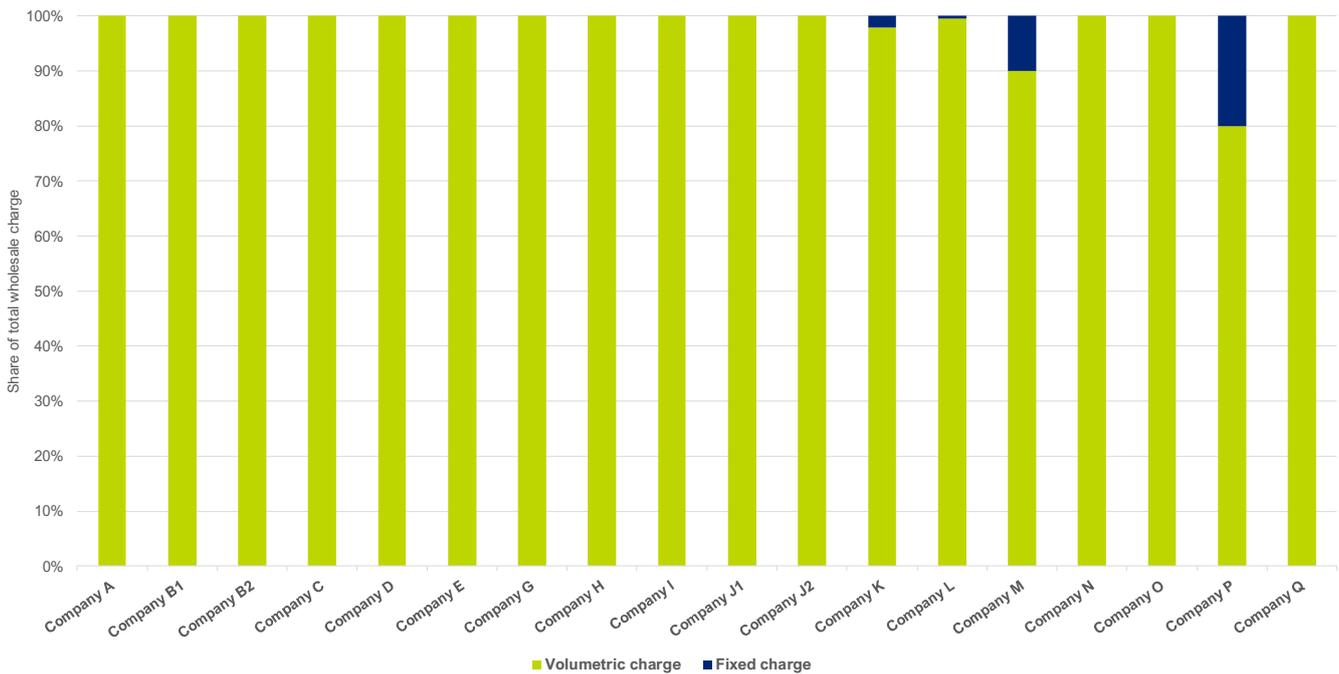
- Incumbents provide foul water services for the NAV site but no surface water drainage and highway drainage. There is also no trade effluent on the NAV site.
- There are no large users on site.

The results are presented below.

Water supply

In Figure 4.4 below, we present the proportion of fixed/volumetric charges of the estimated bulk supply charge for the notional NAV site. For the vast majority of incumbent companies, the bulk supply charge is made up entirely of volumetric charges. In fact, in some cases, the fixed charge for the NAV site can be regarded as negative, as the avoided cost deductions expressed on a fixed basis (e.g. per connection or length of network) are larger than the fixed charge element of the wholesale bill. The largest fixed charge element (20% of the bulk supply charge) relates to the company that applied a supplementary large user charge to bulk supply charges. In the case of three other companies, the bulk supply charge includes a fixed element equivalent to 10%, 2% and 0.5% respectively, of the bulk supply charge.

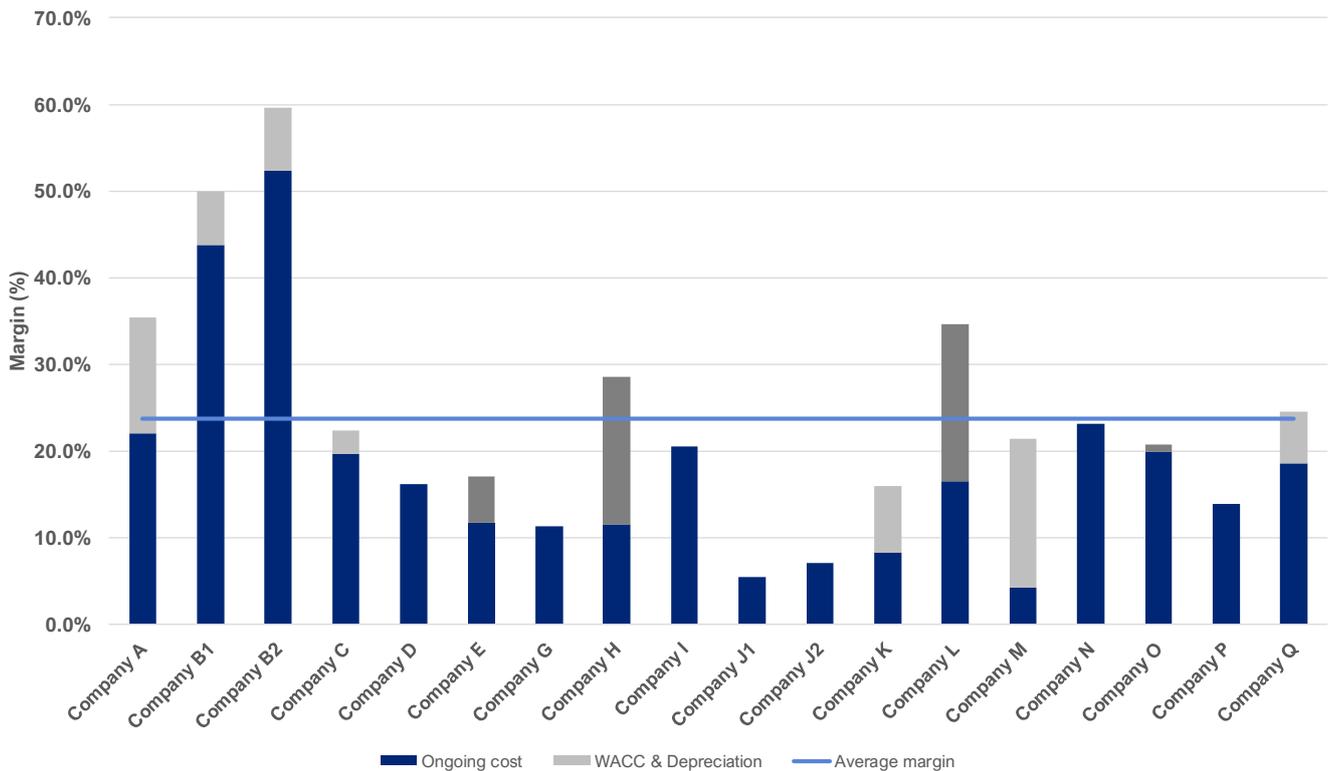
Figure 4.3: Proportion of fixed/volumetric component of estimated water bulk supply bill for notional NAV site



Source: CEPA analysis based on 2019/20 wholesale tariffs and NAV bulk supply tariffs

Figure 4.4 below shows estimated wholesale operating margins (as a percentage of the wholesale tariff) related to water supply services provided by the NAV based on the current NAV bulk supply charges. We show the wholesale margin split into the element related to ongoing cost deductions and that related to WACC and depreciation.

Figure 4.4: NAV wholesale margin (%) for water supply services based on current NAV bulk supply charges



Source: CEPA analysis based on 2019/20 wholesale and NAV bulk supply tariffs

Notes: The WACC and depreciation elements highlighted in darker grey represent either companies that are not affected by the changes to income offset rules (the Welsh companies) or they relate to costs other than initial investment in on-site assets. In all these cases we do not expect these deductions to be affected by changes to the income offset rules post-April 2020.

We have not calculated the wholesale operating margin for one incumbent company (company F) for which NAV bulk supply charges for 2019/20 were not available at the time of writing this report

We make the following key observations around the results in Figure 4.3:

- The average operating margin across all companies is 23.7%. The median (less affected by extreme low and high values) is 21.1%.
- The operating margins range from 5.4% to 60%. The margins for most companies are within the 15-30% range.
- The variation in operating margins is driven both by the level of ongoing cost deductions applied by companies and whether a company applies a deduction for WACC and depreciation on initial on-site assets or not. While companies that include a WACC and depreciation deduction component tend to have higher operating margins (all companies with above average margins include this deduction), this is not always the case. In the case of two companies, excluding the WACC and depreciation component would result in wholesale margins for NAVs below 10%.
- The wholesale operating margin for one company (Company P) is driven by the supplementary large user charge applied to NAV bulk supply charges. Excluding this charge from the calculation would raise the margin to around 30%.

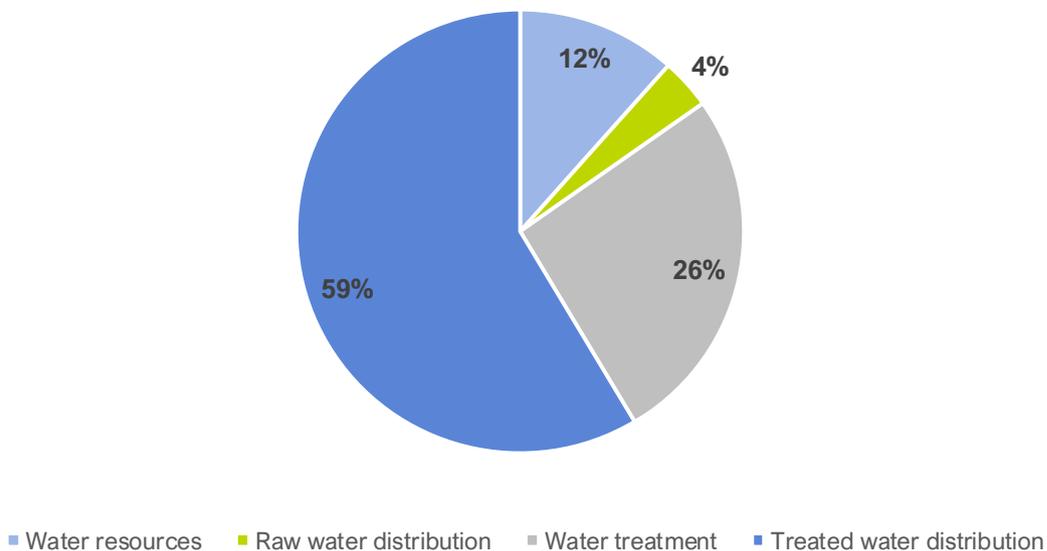
The operating margin levels observed in our notional NAV site calculations appear high in some cases but need to be considered in the context of the NAV replacing last mile infrastructure and services that would be provided by an incumbent company’s business. To provide more context around the observed margins, it is useful to consider the breakdown of costs across the entire value chain for the water industry. The ‘all-the way’ wholesale tariffs

charged by incumbent water companies for water supply recover costs across a range of activities of the industry value chain such as:

- water resources;
- raw water distribution;
- water treatment; and
- treated water distribution.

Based on regulatory accounting data for 2018/19, we estimate the average breakdown of costs for these segments for the entire industry as shown below. Costs related to treated water distribution account for 59% of total industry costs. The costs avoided by the incumbent related to the ‘last-mile’ infrastructure operated by NAVs will represent a portion of treated water distribution costs.

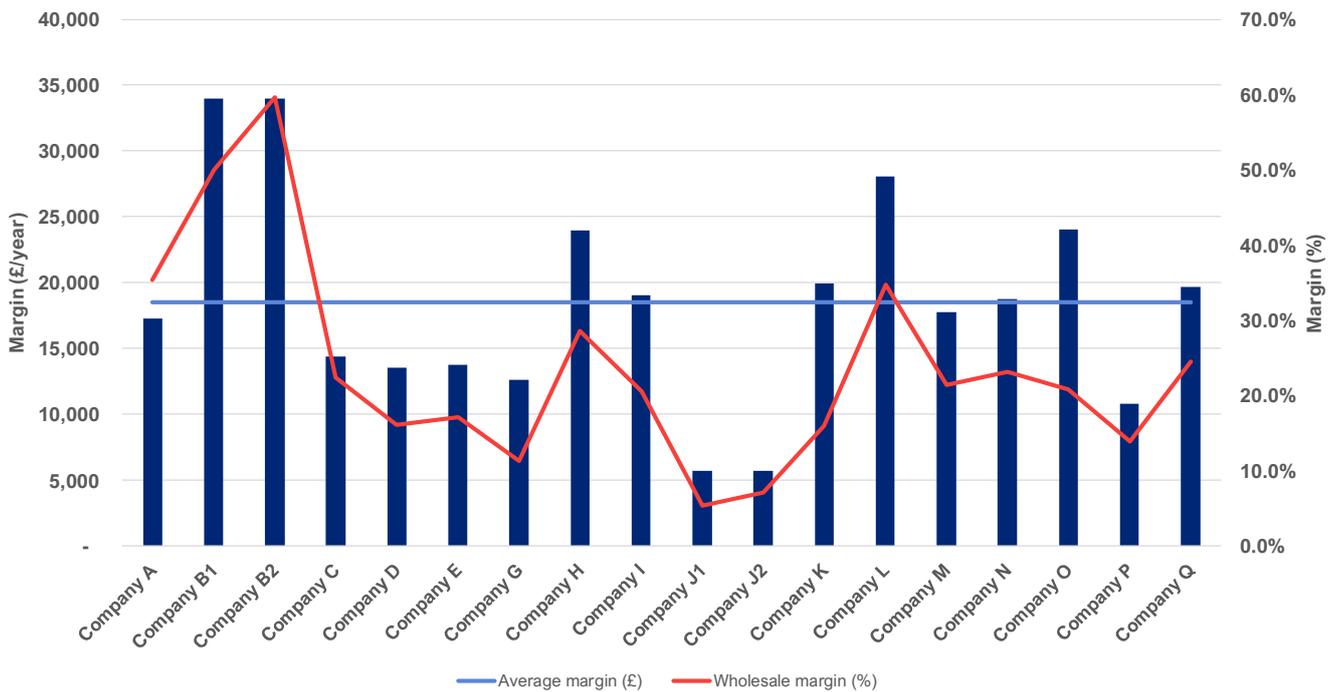
Figure 4.5: Breakdown of average water industry costs across different value chain segments (%)



Source: CEPA analysis based on 2018/19 Annual Performance Reports

Figure 4.6 below shows the absolute level of the estimated wholesale margin for each company in £ per year with a (red) line showing the margin as a % of wholesale charges for comparison.

Figure 4.6: NAV wholesale margin (£) for water supply services based on current NAV bulk supply charges



Source: CEPA analysis based on 2019/20 wholesale and NAV bulk supply tariffs

We have not calculated the wholesale operating margin for one incumbent company (company F) for which NAV bulk supply charges for 2019/20 were not available at the time of writing this report

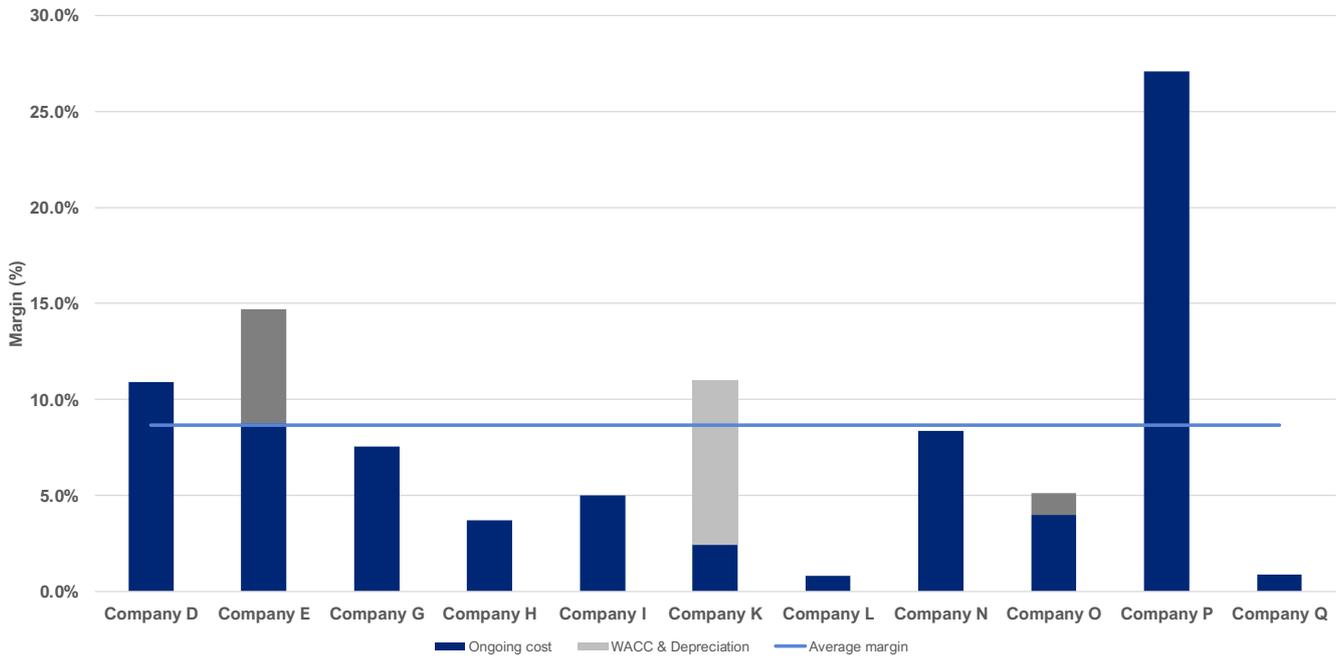
A key question that follows from these findings is related to the factors that drive the difference between companies. This could be due to the choice of methodology (e.g. top down or bottom up), choice of cost driver used to express costs or the cost structure of the company such as for example the share of treated water distribution or sewage collection costs in overall company costs (we discuss the latter factor in more detail when presenting results for wastewater services below).

It is likely that the differences are driven by a combination of factors. Clearly, if the observed wide range of margins from our notional NAV site calculations are justified on cost reflectivity grounds, then the variation is not an issue. Indeed, the outcome would be justified, as cost reflective charges would incentivise appropriate entry from NAVs in cases where they can reduce costs below the expected avoided costs of the incumbent. While we would expect a degree of variation, the observed variation is wide which suggests that assumptions and differences in different companies’ methodologies may also be a relevant factor. As our analysis of avoided ongoing cost deductions in section 4.2 shows, there tends to be greater variation in the magnitude of cost deductions among incumbent companies that express avoided costs on a volumetric basis (i.e. per unit of water supplied) compared to methodologies that allocate costs on a per property/per length of network basis. This may be, at least partly, a reflection of the fact that volume of water supplied is not the primary cost driver of water distribution costs.

Wastewater

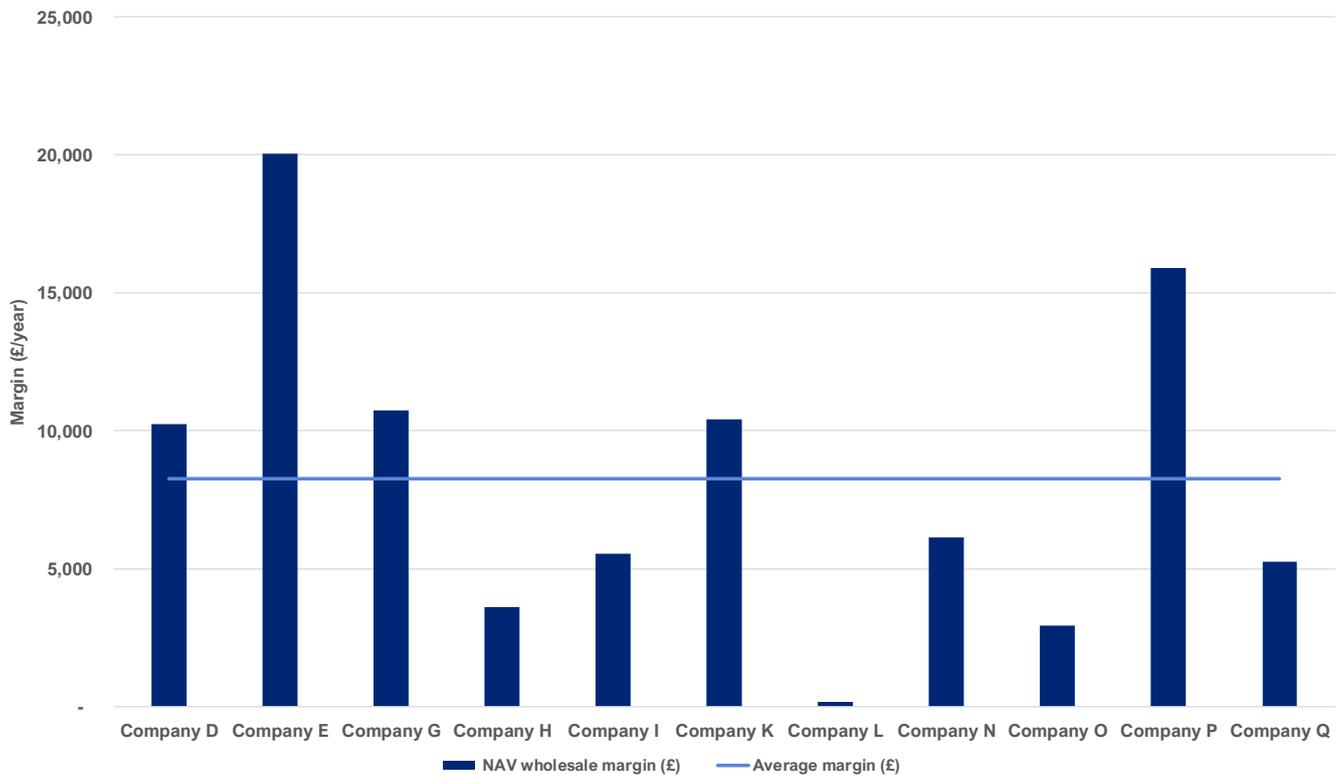
Figure 4.7 and Figure 4.8 show estimated wholesale margins for the notional site related to wastewater services provided by the NAV based on the current NAV bulk supply charges, split into ongoing costs and WACC and depreciation related elements. Figure 4.7 illustrates the operating margins as a percentage of the applicable wholesale tariff, while Figure 4.8 shows the operating margins in absolute (i.e. £) terms.

Figure 4.7: NAV wholesale margin (%) for wastewater services based on current NAV bulk supply charges



Source: CEPA analysis based on 2019/20 wholesale and NAV bulk supply tariffs, Note: The WACC and depreciation elements for two incumbent companies are highlighted in darker grey as they relate to costs other than initial investment in on-site assets and should not be affected by changes to income offset rules post-April 2020.

Figure 4.8: NAV wholesale margin (£) for wastewater services based on current NAV bulk supply charges



Source: CEPA analysis based on 2019/20 wholesale and NAV bulk supply tariffs

The estimated wholesale wastewater operating margins indicate that:

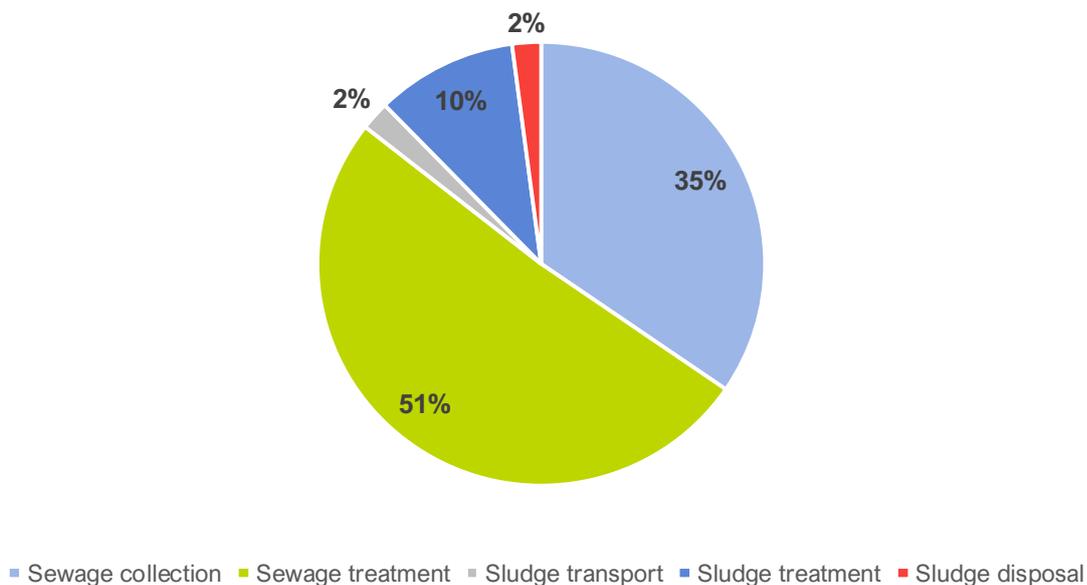
- Wholesale margins for wastewater services appear to be significantly lower than for water supply services. The average margin across all companies is 8.6%.
- The margins range from 0.8% to 27%.

One potential reason why estimated operating margins for wastewater services are lower than for water supply services is that the network related costs, as a proportion of overall company costs, are lower in the case of wastewater services compared to water supply services.

As discussed above, wholesale tariffs recover company costs across the entire supply chain – in the case of water supply, this means water resources and water treatment as well as treated water distribution, while for wastewater, it means sewage collection (the network part of the supply chain) plus sewage treatment and sludge related costs. The costs that are deducted from wholesale tariffs are typically only network related costs (water or sewage treatment services could also be provided by a NAV but this is less common). Therefore, where network costs represent a smaller proportion of overall costs, the cost deductions are also likely to represent a smaller proportion of wholesale tariffs, thus resulting in a lower wholesale operating margin in percentage terms.

Using 2018-19 cost data, we estimate that, at an industry level, treated water distribution totex accounts for 59% of total water supply costs. In contrast, sewage collection totex represents only 35% of total wastewater costs as illustrated in Figure 4.9.

Figure 4.9: Breakdown of average wastewater industry costs across different value chain segments (%)



Source: CEPA analysis based on 2018/19 Annual Performance Reports

Another explanation for the observed differences between water supply and sewerage, is that some companies currently apply a WACC and depreciation element to their bulk supply charges calculation for water services only. This is because, according to the companies, the cost of sewers is borne entirely by developers.

PART 2 – OPTIONS FOR FUTURE BULK SUPPLY CHARGING

5. PRINCIPLES FOR BULK SUPPLY CHARGING

Key messages

This section considers some of the economic principles that underlie the approach to bulk supply pricing for NAVs in England & Wales. In particular, it considers what these principles may imply as regards to how Ofwat's existing guidance on NAV bulk supply charging might be interpreted and applied going forward.

It highlights the importance of distinguishing between the different cost allocation concepts and standards that can be applied in the wholesale minus methodology as they form the conceptual and theoretical basis for the existing pricing methodology set out in Ofwat's 2018 guidance. The objective of the wholesale minus methodology is to base NAV bulk supply charges on incumbents' existing wholesale charges and *avoided costs*. This standard of 'cost reflective' bulk supply charges for NAV sites should in theory only incentivise efficient entry from NAVs and enable fair access to competition for NAVs.

Experience of access pricing methodologies in other utility sectors suggests that there are complexities in how the avoided cost standard is applied in practice.

5.1. ECONOMIC PRINCIPLES AND COST CONCEPTS

The objective of the NAV bulk supply pricing regime is to derive bulk supply prices that contribute to a level playing field in the provision of services to end-consumers in new developments (or other sites potentially served by NAVs). Bulk supply prices that are charged by an incumbent to a NAV should be set to allow an 'appropriate' operating margin between the price that the NAV will be able to charge its customers on the site and the charge for the bulk supply services provided by the incumbent company to the NAV.

The Ofwat guidance on bulk supply pricing for NAVs recommends a wholesale minus approach based on deducting costs that the incumbent would avoid if a NAV supplied the applicable site in question instead.

By referring to the use of the incumbents' actual avoidable costs, the guidance seems to align with an "equally efficient operator" (EEO) standard for encouraging entry into the NAV market. In this case, the costs and prices of the incumbent firm are used to determine if the company's own downstream operations could trade profitably on the basis of the access price charged to its potential competitors. In the context of the NAV market, this means the bulk supply charging methodology results in a wedge or operating margin between the incumbent provider's wholesale tariff and the bulk supply charge which would allow a NAV with similar costs to enter the market.

However, Ofwat's existing guidance contains no explicit reference to what cost allocation method and standard should be employed for determining the relevant costs avoided by the incumbent.

When considering potential cost allocation methods, it is useful to distinguish between:

- **Direct costs** which are costs that can be directly traceable to a specific activity (for example, in the case of NAVs, the operating costs of the on-site infrastructure); and
- **Indirect costs** which are costs that cannot be assigned directly to a specific product or service (examples of indirect costs are marketing and advertising costs, senior management costs, etc.).

Indirect costs can then be further grouped in the following two categories:

- **Joint costs**, which arise when a single and indivisible process gives rise to several products or services within a business.
- **Common costs**, which arise when a single process gives rise to several products or services, even though they can be produced separately.

IPART – the water sector regulator in New South Wales, Australia – has published a cost allocation guide²⁸ that suggests that most indirect costs for water businesses are common costs, with the most notable example provided being corporate overheads. In principle, it can be possible to allocate common costs on the basis of cost drivers (or allocators) although the allocation can involve degrees of subjectivity.²⁹

The Ofwat 2018 guidance for NAV bulk supply pricing is clear that direct costs that the incumbent avoids should be deducted from the wholesale tariff (e.g. ongoing operating costs, maintenance and adjustments for leakages) but, as discussed in the previous section, provides no explicit guidance on how to treat indirect costs. Regulators in other contexts have suggested that common costs can be attributed to different activities and services within an incumbent’s integrated business and should be reflected in access price calculations; although this element of access charges can be open to discretion, uncertainty and, as indicated by IPART, subjectivity.

There are a number of cost allocation standards that can be employed in these circumstances including:

- **Fully distributed costs**, where all costs are allocated across all cost activities using cost drivers or value-based drivers.
- **Incremental costs**, describing the increase in the business’s total cost attributable to the provision of services to the new development. This is usually defined over the long run as LRAIC³⁰.
- **Stand-alone costs**, which allocates all costs that the incremental business would incur as a separate entity including all indirect costs incurred by a standalone operation serving the new development.

A more detailed discussion of these cost concepts and cost allocation standards is provided in Appendix C.

A short (certainly not comprehensive) review of relevant literature suggests that LRAIC is the cost standard that is typically applied in a margin squeeze assessment. While LRAIC excludes joint costs, typically common costs, either in whole or in part, are attributed to the relevant activity on the basis of an appropriate cost driver or allocator (e.g. FTEs, expected sales or profits). This means LRAIC can give rise to a similar result to a fully distributed cost allocation method under circumstances where there are few or no joint costs.

Our review of current NAV bulk supply charging practices found that some incumbent companies currently only make explicit deductions for direct costs, such as ongoing operating costs, maintenance and leakages in their bulk supply charge calculations, while some companies, typically those who apply a more disaggregated methodology, make some explicit deduction for certain indirect costs such as overheads. Companies that apply a top-down methodology may be including indirect costs as a result of items like business overheads being included in the operating costs reported in companies’ APRs and, therefore, allocated using top-down cost drivers.

Consistent with the LRAIC standard, we think it is appropriate that incumbent companies consider the allocation of common costs within their NAV bulk supply charging methodologies, as we would expect them to avoid (scale) common costs (in full or in part) in response to entry by NAVs (or when serving the applicable site themselves). This issue may benefit from further clarification in Ofwat’s guidance and companies published charging methodologies, as it is currently unclear within the practices we reviewed in the previous section.

A pure interpretation of LRAIC in the context of an EEO principle would treat NAV sites as an incremental activity with only those common costs attributable to the on-site infrastructure business, and expected to increase (scale) or reduce (avoid) depending on whether the incumbent or NAV supplies the site, reflected in the avoided cost deductions. This approach would be justified on the grounds of productive efficiency - new entry would not duplicate costs - but may create a strong efficiency challenge for NAV entry given the economies of scale and scope integrated incumbent water and sewerage businesses may benefit from.

²⁸ IPART (2018): ‘Cost allocation guide – Water Industry Competition Act 2006’

²⁹ Ibid.

³⁰ Long Run Average Incremental Cost

Alternatively, if Ofwat wished to encourage entry into the NAV market and believed the dynamic benefits from increased competition may outweigh potential productive efficiency losses due to possible duplication of costs, then it might consider applying or encouraging an approach to determining NAV bulk supply charges that goes beyond a pure incremental/avoidable cost approach. This might involve guiding incumbent companies to include a larger deduction for indirect costs to a standard closer to stand-alone cost allocation.³¹ This is, however, a policy decision for Ofwat that goes beyond the application of the current guidance.

We note that applying the guidance consistent with an avoidable cost principle may represent a minimum in terms of the operating margin that a NAV might expect to earn through the terms of the bulk supply charging methodology and the treatment of the incumbent's common costs within this adopted cost standard is likely to be particularly important to meeting the charging methodology objectives. At the other end of the spectrum, following a principle based on stand-alone costs would set the upper boundary on the margin that a NAV might need to earn, or expect to be able to earn, in order to enter the market.³²

5.2. CHARGING FOR LAST MILE INFRASTRUCTURE IN THE ENERGY SECTOR

In the energy sector, Independent Distribution Network Operators (IDNOs) develop, operate and maintain local electricity distribution networks located within the areas covered by the incumbent Distribution Network Operators (DNOs). Similar to NAVs, IDNOs mainly operate extensions to the DNO networks serving new housing and commercial developments.

IDNO charges to end-users are capped at a level broadly consistent with the DNO equivalent charge. The charges that the IDNOs pay to incumbent DNOs are set at a discount to the “all-the-way” tariff charged to end-consumers. The percentage discount is calculated by allocating the total cost of the incumbent recovered through DNO charges to the different network voltage levels – e.g. Extra High Voltage (EHV), High Voltage (HV), Low Voltage (LV) – using specified cost drivers. The cost allocation broadly follows a Fully Distributed Cost approach where all costs, including overheads, are allocated to each network level. In most cases, costs are allocated based on the estimated MEAV for each network level. The allocated costs at each network level are calculated on a p/kWh basis. The percentage discount is then calculated as the sum of revenue (on a p/kWh basis) allocated to network tiers for which the LDNO³³ is responsible as a percentage of total revenue.

The calculated percentage discount is then applied to end-user DNO tariffs to determine the charge paid by the IDNO to the incumbent DNOs. The percentage discount varies depending on the combination of voltage levels – e.g. the percentage discount for an IDNO connected at the HV level of the DNO network but serving LV-connected consumers would be higher than the discount applied to an IDNO connected at the LV level of the DNO network and serving the same LV-connected consumers. This reflects the fact that, in the former case, the incumbent DNO avoids costs at both the LV and HV levels.

A worked example for an LDNO connecting to the EHV/HV level of the incumbent DNO and serving users connected at the HV/LV level is shown below in Figure 5.1 This shows the share of costs allocated to different network levels. These allocations are used to determine the share of costs covered by:

- network levels provided by the IDNO up to the connection boundary (the “LDNO allocation”); and

³¹ We understand that the expectation of dynamic benefits from increased competition is one of the reasons for the use of a Reasonably Efficient Operator (REO) standard in the telecoms sector. These issues are discussed in the recent Competition Appeals Tribunal (CAT) decision on Royal Mail's access pricing arrangements. Case No: 1299/1/3/18. See para 495 – 503.

³² This point is made by Baumol and Sidak (1994): ‘The pricing of Inputs Sold to Competitors’ Yale Journal of Regulation, Vol 11: 171, p.178 “Under the competitive-market standard for regulation, marginal costs and average-incremental costs are the figures relevant for price floors, while standalone cost are the figures relevant for price ceilings”.

³³ The term LDNO stands for Local Distribution Network Operator. The term LDNO incorporates both IDNOs and incumbent DNOs operating outside their normal Distribution Service Area.

- network levels represented in the all-the way tariff that would apply if the user were connected to the DNO network (the “all the way” allocation).

The discount is calculated as the proportion of the LDNO allocation to the all the way allocation.

Figure 5.1: LDNO discount worked example

				LDNO boundary ↓				User level ↓
Not shared	132kV	132kV/EHV	EHV	EHV/HV	HV	HV/LV	LV	
3%	10%	4%	5%	4%	30%	11%	33%	
DNO Party allocation					LDNO allocation			
26%					41%			
All-the-way allocation								
67%								

$$41\% / 67\% = 61.2\% \text{ discount}$$

Source: CEPA analysis

In general, discounts are calculated generically for all LDNOs within a DNO’s service area and do not reflect specific features of LDNO’s network beyond the network level where its boundary is. DNO discounts are also currently relatively stable over time as most values used are from specific historic years with only a few values potentially changing from year to year.

Discounts are in the range of:

- 27 - 40% (average of 34% across all DNOs) for an LDNO serving customers connected at the LV level (e.g. residential consumers) and connecting to the LV boundary of the incumbent DNO’s network.
- 46 - 65% (average of 57% across all DNOs) for an LDNO serving customers connected at the LV level (e.g. residential consumers) and connecting to the HV boundary of the incumbent DNO’s network. In this case, the larger discount reflects the fact that the LDNO replaces a larger portion of the incumbent DNO’s network.³⁴

While the general principles applied to setting IDNO charges are similar to the bulk supply charging for NAV, there are a few significant differences in approach:

- A fully allocated cost allocation method appears to be used rather than an incremental/avoidable cost approach.
- A percentage discount is calculated and applied to all elements of the end-user tariffs as opposed to a £ deduction. This is meant to reconcile the fact that different cost allocation methods are used to determine end-user tariffs and IDNO tariffs. In the absence of this, it is likely that a p/kWh deduction would result in a different % margin between end-user tariffs and IDNO tariffs than implied by the fully allocated cost method.
- The nature and segmentation of the energy distribution network means that tariffs can be set solely by reference to the network level of connection of both end users and the last mile infrastructure provider. This avoids the need for additional assumptions or variables to be used in the tariff calculation as seen in

³⁴ CEPA analysis of Distribution Connection and Use of System Agreement (DCUSA) published charging models.

some of the current bulk supply charging methodologies for NAVs (e.g. length of network, size of development, etc.).

The experience with IDNOs in the electricity sector also demonstrates that a common methodology can in principle be developed across the industry for upstream access prices. The DNOs apply a common methodology for IDNO discounts and, indeed, use a common financial model to calculate the discounts for annual charges. The inputs to the charging model differ by network licensee to promote cost reflectivity. The process is conducted under the Distribution Connection and Use of System Agreement (DCUSA), which is managed by the electricity industry but with any amendments requiring approval from Ofgem as the sector regulator.

5.3. IMPLICATIONS FOR THE APPLICATION OF OFWAT'S CHARGING GUIDANCE

The economic principles underpinning access pricing in the context of opening up infrastructure sectors to competition involve complex issues. The economic literature offers essential indications as to the relevant standards that can be applied but does not offer a definitive answer as to the method to be adopted.

We have set out above some of these principles and the implications for the approach to bulk supply charges for NAVs. Our discussion is not meant to be an assessment of competition policy and law. However, we believe these economic principles need to be considered as they underpin the design of the bulk supply pricing methodology as we discuss in other parts of this report.

In the rest of this report, we focus on the elements of the bulk supply charge calculation following the principle of avoided cost, but we also discuss where the approach may be varied to reflect some of the concepts discussed above.

6. OPTIONS FOR REGULATING AND CALCULATING NAV BULK SUPPLY CHARGES

Key messages

Informed by our evaluation of incumbent companies' current NAV bulk supply charging practices, in this section we consider potential approaches that could be used to calculate individual building blocks of NAV bulk supply charges. We also consider more strategic questions around the future development of Ofwat's NAV bulk supply charging guidance, such as whether the guidance should continue to apply a principles-based or a more prescriptive approach to future bulk supply charges.

We believe it is appropriate to use the incumbent companies' wholesale tariffs that reflects the NAV's end-consumer base as the relevant starting point for calculating bulk supply charges for NAVs.

We discuss the advantages and disadvantages of different methodologies for calculating direct operating costs and conclude there is not a single best methodology.

It may be difficult to impose a prescriptive approach to determine avoided indirect costs given the absence of a clear method for allocating indirect costs or identifying costs that are truly avoidable. We conclude that future guidance could instead contain an explicit provision that an allowance for indirect costs should be deducted, or at least considered, in setting bulk supply charge for NAVs.

We discuss the issues that may need to be considered in future regulatory guidance around incumbents' avoided financing costs, in light of the changes to the income offset rules. We outline a number of options for how an additional deduction for avoided financing costs, if deemed appropriate, could be accommodated in future Ofwat guidance. This element, in particular, interrelates with the principles for NAV bulk supply charging that were discussed in the previous section.

Finally, we discuss the issue of a principles based vs. prescriptive (rules based) approach to Ofwat's regulation of NAV bulk supply charging. Overall, we consider that a prescriptive, rules based, charging system is likely to impose a greater regulatory burden on both incumbent companies and Ofwat with uncertain benefits in terms of the NAVs market. Instead we would propose that Ofwat develops its existing guidance to reflect the findings that were set out in previous sections of the report and the subsections below. However, this conclusion may benefit from consultation with industry stakeholders.

In this section we consider potential approaches that could be used to calculate individual building blocks of NAV bulk supply charges. We also consider more strategic questions around the future development of Ofwat's NAV bulk supply charging guidance, such as whether the guidance should continue to apply a principles-based or a more prescriptive approach to future bulk supply charges.

The subsections which follow consider the following topic areas in turn: (i) the relevant starting point for the NAV bulk supply charge calculation; (ii) direct operating costs; (iii) indirect operating costs; (iv) capital maintenance spend; (v) leakage; (vi) the rate of return/profit element in the avoided cost deductions; and (vi) options for future NAV bulk supply charging policy.

A final subsection then provides analysis of the impact on NAVs' wholesale operating margins of applying a consistent 'top-down' charging methodology to all incumbent companies using the same notional NAV site examples that were modelled using incumbents' existing charging practices.

6.1. RELEVANT STARTING POINT

We believe it is appropriate to use the incumbent companies' wholesale tariffs that reflect the NAV's end-consumer base as the relevant starting point for calculating bulk supply charges for NAVs.

As mentioned in Section 4.1, we consider that applying an approach where cost deductions are applied to the site-specific wholesale tariffs is likely to result in a more accurate calculation of bulk supply charges than using a weighted average tariff calculated ex-ante.

This method, however, adds more complexity into the process because NAVs would have to estimate their own bulk supply charges based on the characteristics of their site and the building blocks published by the incumbents. The NAV bulk supply charge consultations published by incumbent companies, as well as their responses to the RFI, suggest that feedback from NAVs is that they tend to prefer approaches that are simple and require few interactions with the incumbent to estimate NAV charges.

In response to this feedback, one of the incumbent companies has stated in its RFI response that it amended its bulk supply charging methodology for 2020/21 to use a standardised blended bulk supply charge covering both household and non-household users instead of the approach used for 2019/20 where different charges were applied for different types of end-consumers. While this change may impact the cost reflectivity of the bulk supply charge, this needs to be balanced against the benefits provided to prospective NAVs by simple and transparent charging methodologies.

It may therefore be appropriate to continue to allow this flexibility in the guidance, potentially subject to the provision that, where an ex-ante weighted average tariff is determined, the NAV should have the possibility to ask for a bespoke tariff to be calculated if the mix of end-consumers on their site differs significantly from what was assumed in the calculation of the weighted average tariff.

6.2. DIRECT OPERATING COSTS

Direct operating costs are those costs that can be directly attributed to a service. Based on a review of current charging practices and our own expertise, we identified three potential types of approaches for estimating ongoing operating costs related to the last mile infrastructure:

- **a top-down approach** – e.g. using company data from regulatory accounts and allocating this to last mile infrastructure operations and service based on suitable cost allocation methods/cost drivers; or
- **a middle-up approach** – using company level data for different activities identified as avoided and allocating this to the on-site network³⁵; or
- **a bottom-up approach** – estimating typical costs incurred by each incumbent for different activities identified as avoided, e.g. cost of taking a water sample for testing, cost of flushing a 10m pipe, etc.

Under each of the approaches set out above, a relevant unit cost for operating the last mile infrastructure would be calculated. The cost deduction applied to the calculation of bulk supply charges would be determined by multiplying the unit cost by the relevant cost driver (e.g. number of customers, length of on-site network, consumption volume).

As our review of current bulk supply charging practices has shown, all three approaches are currently being used with most companies currently applying a form of top-down approach.

A top-down approach has the advantage of relying on the actual costs incurred by the incumbents as reported in their company accounts (i.e. it is transparent). The main challenge is how to allocate costs appropriately to the last mile infrastructure operated by the NAVs. Relatively simple methods involve allocating costs based on generic cost drivers such as length of network or number of properties. More complex methods could include allocating top down costs to different segments of the network (defined, for example, by asset types such as pipes of various sizes) based on drivers such as share of total MEAV and dividing the costs for each network segment by the number of customers or volume of water delivered at the relevant network levels.

The approach may suffer from the fact that the costs reported in regulatory accounts are aggregated at a high level (both in terms of cost categories and value chain segments) and it may not be possible to exclude costs which are not relevant to the NAV on-site network, potentially incentivising inefficient entry.

³⁵ This would require a breakdown of company expenditure into certain categories that may not be easily available.

For example, it is possible to exclude power costs (related to water pumping and generally not attributable to the local network unless a pumping station is located on the NAV site) from the overall operating costs reported by water companies in their APRs. However, as at least one water company highlighted in its RFI response, manpower costs associated with pumping stations are included elsewhere and cannot be easily excluded from the top-down opex allocation based on information reported in the APR.

A middle-up approach would involve using more granular cost information such as total company operating expenditure disaggregated into different categories such as the cost activities listed in Appendix B (e.g. mains repair expenditure or leakage detection costs). The ‘middle-up’ term reflects the fact that unit costs can be estimated for different types of activities which can then be summed to produce a cost for the entire NAV site. This could resolve some of these issues linked to the top down approach as the more granular cost information would mean that only the most relevant costs are allocated to the on-site network. The disaggregated nature of the costs would make it easier to exclude costs which are not relevant to the last-mile infrastructure. A cost allocation method would still need to be used to allocate costs in each relevant category to the last-mile infrastructure portion of the network. A better breakdown of costs could however allow different cost drivers to be used to allocate different types of costs more accurately.

A bottom-up approach usually implies determining an efficient or a typical cost of an activity. It could be used, for example, to estimate the costs that would be incurred by a hypothetical new entrant. However, in this case, a view of the efficient or typical cost of an activity may not be the appropriate benchmark to use. This is the case if the test for market entry, based on an EEO (see discussion in the previous section), relies on the incumbent’s actual avoided costs irrespective of whether these are efficient or not. In this case, a bottom-up approach would have to rely on information about the actual costs that incumbent companies incur.

The companies that are using a bottom-up approach at present do this by using commercial rates incurred for different types of activities. Doing this could potentially introduce an element of cherry-picking as these rates may differ by location and site-specific conditions. Therefore, this may be a suitable approach for determining more bespoke NAV tariffs that vary by region and site characteristics, for example. However, it may be less suitable for determining standard NAV tariffs.³⁶

Overall, we consider there is not a single preferred method for calculating deductions for avoided direct operating costs. However, one of the advantages of a top-down methodology – or a middle-up methodology that uses consistent cost data reported by the incumbent providers – is that, in principle, it could be applied consistently across the sector by using a common, prescribed methodology. This would help improve the transparency of the bulk supply charge calculations, although there is likely to be a trade-off in terms of cost reflectivity – e.g. compared to a middle-up or bottom-up method that applies greater explicit focus on the direct costs which an incumbent may avoid and the relevant cost drivers and assets on the specific NAV site.

We have used an illustrative top-down methodology to investigate the potential impact on the operating margins in our notional NAV site spreadsheet tool where a consistent method is used across the sector based on published APR data. As set out in section 6.8, this demonstrates that a simple top-down method would be likely to lead to more consistent – and on average slightly higher – wholesale operating margins for NAVs than our analysis of the same notional NAV site using companies’ current methodologies. However, whether this is better from a cost reflectivity perspective is unclear and highlights the fact that there are likely to be a range of different methods that could be considered to determine NAV bulk supply charges.

6.3. INDIRECT OPERATING COSTS

As discussed in the previous section, indirect costs are those costs that cannot be assigned directly to the part of the business to be operated by the NAV (for example, advertising costs or senior management costs). Part of these

³⁶ A bottom-up approach could also be used as a cross-check against more top-down estimates for a specific site.

costs could be avoided by the incumbent if a NAV operated the site instead of the incumbent. The other part (the part represented by genuine joint costs) would not be avoided.

Although the Ofwat guidance does not mention explicitly how indirect costs should be treated, the nature of the “wholesale minus avoidable costs” methodology indicates that only those costs that are avoided (i.e. a portion of the common costs) should be included in the calculation, while no joint costs should be included (as these are by definition not avoidable). This poses two methodological challenges:

- **Need to identify the nature of indirect costs.** The first challenge is to identify which part of companies indirect costs have joint and/or common cost characteristics and which part can be avoided (or would be expected to increase if the incumbent were to operate the site rather than the NAV). This is challenging because the boundary between common and joint costs is often blurred. For example, are management costs common or joint?

To get to an answer to this question, costs would have to be disaggregated to granular levels. For example, the salary of the CEO is largely fixed (salaries of CEOs of companies of different sizes could be argued to be broadly the same within the range of sizes in the water industry), while the salaries of middle tier managers added together are probably more common than joint (a larger company would presumably need to hire more middle tier managers than a smaller company for example to manage more regions).

- **Need to identify a reasonable cost driver** that can be used to allocate the avoidable part of common costs to the NAV business. This is challenging as different cost drivers could give different results, and there is often a lack of theoretical rationale to choose among different cost drivers. For example, should the common part of the management costs discussed above be allocated using a length of mains measure or a sales measure?

At least two incumbent companies apply an explicit adjustment for business overheads in their current bulk supply charging calculation. This is likely to be related to the fact that they determine their ongoing costs deductions based on a more disaggregated approach.

As discussed above, the companies that currently use a top-down approach to estimate operating costs using data from the APR are implicitly also allocating a share of indirect costs to the on-site network. This is because business overheads, allocated to the different business units of the water companies, are currently included in the operating costs numbers reported in the APRs. However, it is possible this risks overestimating the business overheads that are avoided as no adjustment is made for the fact that a portion of these costs is likely to be fixed.

In terms of developing the bulk supply charging guidance, it appears difficult to impose a prescriptive approach to determine avoided indirect costs given the absence of a clear method for allocating indirect costs or identifying costs that are truly avoidable. Future guidance could instead contain an explicit provision that an allowance for indirect costs should be deducted in setting bulk supply charge for NAVs. However, as discussed in the previous section of the report, we consider this component of Ofwat’s charging guidance and companies’ charging methodologies in practice, would benefit from further clarification. We have set out above – and in the previous section – some of the relevant economic principles and considerations that might input to the clarification of the charging guidance.

6.4. CAPITAL MAINTENANCE SPEND

Capital maintenance expenditure related to the NAV site reflects the need for future investment to replace on-site assets. Potential methods for estimating capital maintenance related to the last mile infrastructure are broadly similar to those described for ongoing operating costs:

- A **top-down approach** which would treat capital maintenance as operating expenditure. For example, renewals expenditure as reported in the regulatory accounts can be allocated to the last mile infrastructure operations using the same allocation method as for ongoing operating cost. A drawback of this approach is

the high-level information contained in regulatory accounts which does not contain information on expenditure on different asset categories.

- A **middle-up approach** using more granular information, such as capital maintenance expenditure on different types of assets relevant to provision of last mile infrastructure services. Again, this would require a breakdown of company expenditure into certain categories that may not be easily available.
- A **bottom-up approach**, which considers the cost of replacing the assets at some point in the future and the relevant asset life of each asset and then applying depreciation and return assumptions. An annuitised net present value would need to be calculated and applied to tariffs (this is equivalent to the Discounted Cash Flow (DCF) approach that some companies are using).

The three approaches are likely to give very different answers. The first is not specific to on-site assets and could be affected by larger expenditure items on other parts of the network. The third is more complicated and may suffer from similar issues as highlighted for the bottom-up approach to estimating ongoing costs.

It is also worth noting that, for a typical NAV site (new development), the on-site costs are likely to be lower in the first few years as assets are new, and then increase over time as assets deteriorate. The implication is that the NAV would not undertake all the avoided cost activities identified in Appendix B every year, but some of these activities, such as replacement of assets, will occur after a certain period of time. Similarly, repair costs and leakage rates may increase over time (or until assets are replaced). However, in terms of setting bulk supply charges, it is a reasonable approach for avoided cost deductions for capital maintenance spend (and other costs) to reflect costs incurred over the lifetime of the assets, i.e. a deduction for capital maintenance spend can be made even if the NAV will replace assets and incur these costs at a point in the future.

6.5. LEAKAGE ADJUSTMENT

The review of incumbents' current charging practices suggests that the adjustment for leakage is one area where the approach may benefit from more guidance from Ofwat as to how the adjustment should be reflected in the bulk supply charges calculation. In particular, we believe the guidance could be more explicit on the following issues:

- The adjustment should account for the expected volume of water losses between the bulk supply meter and the end-consumers' meters. This is an avoided cost for the incumbent when a NAV operates the site. Costs related to leakage detection and repair on-site are also avoided costs, but these should be captured under the ongoing cost deduction.
- The leakage adjustment can be applied as a percentage reduction to bulk metered volumes used for charging the NAV. Alternatively, the percentage discount can be applied as a percentage reduction in volumetric wholesale charges after all other avoided costs deductions are applied.
- The leakage adjustment only needs to be applied when the NAV is charged based on bulk metered volumes. If the NAV is charged based on end-consumers metered volumes, a leakage adjustment does not need to be applied.

The adjustment for leakage in the bulk supply charge calculation should be based on an estimate of leakages in the incumbent's last mile infrastructure.³⁷ This is more appropriate than using actual leakages on-site as this would not incentivise NAVs to reduce leakages.

³⁷ Noting that this may be different from the average level of leakage across the network.

6.6. RATE OF RETURN ELEMENT

The strict application of Ofwat's guidance would probably render zero WACC and depreciation avoidable costs in light of the changes to the income offset rules and assuming that avoided capital maintenance spend is captured as part of a separate deduction (as discussed above).

However, without any return element being provided through the WACC that is applied to incumbent's avoided on-site assets (given this is now fully contributed by the developer upfront), a NAV that was equally efficient as the incumbent would earn no profit margin above that which they make on building or sub-contracting the construction of the on-site infrastructure for the developers.³⁸ There would effectively be no future remuneration over the life of the site, even though the NAV is exposed to various operating risks including:

- demand and occupancy risk;
- cost risk; and
- performance risk.

The NAV could still earn a profit margin if it can 'beat' the costs of the incumbent. But this would still seem to be inconsistent with the principle that the wholesale minus methodology should give rise to a margin consistent with allowing entry by an EEO. In the absence of the income offset, the strict application of the wholesale minus methodology (i.e. assuming zero WACC and depreciation avoided costs) may not provide for any 'normal' rate of return for risks associated with the provision of last mile infrastructure services. In other words, with the upfront investment totally excluded from the calculations of the margin, while a NAV may be assumed to incur an incremental opportunity cost of capital from operating the new site³⁹, this is not considered to be an avoided component and, therefore, cost, of the incumbent supplying the new development site.

The question obviously arises then, why would a NAV be assumed to incur an incremental cost of capital in serving the new development site, but an incumbent company has no avoided cost for access pricing purposes?

One potential rationale is that the capital employed in the incumbent's business can effectively be thought of like a fixed cost of production. The risk of operating the on-site assets on a NAV site is indeed transferred from the incumbent to the NAV. However, the change in overall business risk faced by an incumbent company when a NAV operates a single site is marginal. A large volume of (sunk) capital is already employed in the incumbent's water business (as proxied by the existing RCV of the company) and this can be used to finance a range of products and services including the operation of new development sites. Clearly, the existing RCV and the capital employed within the incumbent's water business (and its associated opportunity cost) is not avoided if the NAV operates a new development site rather than the incumbent. However, setting the access price in this way may result in NAVs being unprofitable if they do incur an incremental cost of capital.

³⁸ There is one potential exception to this. If the incumbent assumes that there will be future investment – e.g. to replace assets – in calculating the deductions to its wholesale tariff, then this may introduce a future source of profit margin into the bulk supply charge calculation.

³⁹ This would assume that the NAV is effectively an 'asset light' operator of the new development site with no existing capital employed in the physical asset base of the new development site. In practice, however, we know that NAV businesses can often provide a range of 'last mile' infrastructure services (e.g. energy pipes and wires as well as water infrastructure and services) which mean limited additional 'risk capital' may in practice be needed by the NAV over and above that which is already employed within the bundle of services and physical assets that the company supplies customers on the new development. However, this is a challenging scenario to account for in reaching notional pricing decisions for NAV bulk supply prices.

From one perspective, this may be considered the efficient outcome for consumers.⁴⁰ However, for regulatory policy purposes, it may not be considered the best long-term outcome for consumers, if account is made for *potential* dynamic benefits from competition. In this case, some additional cost deduction under the wholesale minus access pricing rule might still be considered, although would be more consistent with a standalone, as opposed to incremental, cost benchmark for setting NAV's bulk supply access prices.

It is also true that the marginal change in business risk for the incumbent related to a NAV site can have an impact if the increment is defined over a multitude of NAV sites. Whether the incumbent or a NAV operates a large number of sites could theoretically make a difference in terms of the risk capital and remuneration required for the business. This suggests there may be both an avoided cost for the incumbent and a cost incurred by the NAV related to risks of operating the on-site infrastructure.

Should it be deemed that some additional deduction from the incumbent's wholesale tariffs is needed, then the resulting challenge is how to calculate this opportunity cost of capital. Unfortunately, there is not a clear undisputed methodology to do this because of the particular nature of this cost.

Principally, the opportunity cost of capital is not clearly part of incumbents' existing accounting costs, so there is not a pre-set level to be allocated to different parts of the business. Standard regulatory practice is to use the amount of capital needed in a business to infer the cost of capital. This can be very clearly calculated when the capital needed is for capex. However, in the case of the NAV (stripped out of upfront capex) the capital may be needed for other reasons such as ensuring there are contingency funds ("risk capital") available in the case of negative cost shocks or performance events. This significantly complicates the calculation and regulators have struggled with similar issues in other contexts.⁴¹ For example, it may be difficult to determine with reasonable precision how much capital is necessary to maintain as a contingency fund. Even more complicated to determine the joint versus common proportions of that amount of money. For these reasons, the methods that we suggest could be used, presented below, are not deemed to be perfect and should be applied with careful consideration and clarity of underlying assumptions.

In light of the changes to the income offset rules, we think it is important that Ofwat's future guidance is clear on what are the expected opportunity costs of capital (if any) involved in running operational 'last mile' infrastructure where the capital costs of the site are contributed upfront by developers. This includes:

- working capital that might be employed in provision of services to end consumers over the life of the site⁴²; and/or
- any 'risk capital' needed to operate last mile infrastructure under a long-term set of regulatory arrangements - for example, this would include the costs of maintaining or drawing on a fund for contingency support as part of, or alongside, an assumption of required or avoided working capital from serving the new development site.⁴³

To provide a remuneration for the opportunity costs of capital employed in a NAV's business, several options could be considered such as:

⁴⁰ Baumol and Sidak (1994) note that "*the efficient component-pricing rule [on which the wholesale minus rule for NAV bulk supply pricing is based] offers the prospect of success to entrants who can add efficiency to the supply of the final product, while it ensures that inefficient entrants are not made profitable by an implicit cross-subsidy extracted from the incumbent. An entrant may have to replicate some of the incumbent's activities or facilities, and the costs of such duplication can render an entrant unprofitable. But if that is the case under efficient component-pricing, then the requisite replication of costs correspondingly renders the entry inefficient and, ultimately, harmful to consumers and to society.*" p. 201

⁴¹ See for example, the ongoing debate around the required remuneration of the electricity system operator (ESO) in the RII0-2 price review process.

⁴² Working capital has a clear common cost basis as more or less of it may be required due to billing date differences depending on the number of customers that an incumbent business has to serve.

⁴³ Potentially charging for an assumed Parent Company Guarantee might be another option.

- A return in the form of an operating margin – e.g. % of turnover on the site.
- A return on risk capital employed – over and above working capital.
- A risk premium on on-site infrastructure – e.g. return above the risk free rate element of the WACC.
- A deduction for avoided indirect capital costs over the long run – e.g. capital costs incurred by the incumbent for vans, computers, common buildings etc.

We briefly assess these potential options in Table 6.1 below. How profits are accounted for within a wholesale minus pricing methodology under the new income offset rules will, in our view, require further consultation amongst industry stakeholders.

Table 6.1: High level assessment of options for providing a suitable rate of return for NAVs

Option	Rationale	Pros	Cons
Margin approach (e.g. % of site turnover)	The NAV incurs business and shareholder risks in running on-site infrastructure	Relatively simple to apply once an assumption is adopted	Difficult to establish an appropriate arms-length benchmark for this deduction
Return on risk capital (e.g. apply a rate of return to risk capital)	The NAV incurs business and shareholder risks in running on-site infrastructure	Focus on capital employed and how this relates to the risks of running on-site infrastructure	Very difficult to establish what is the appropriate assumption for 'risk capital employed' incurred or avoided The approach relates to the cost that the NAV incurs rather than what the incumbent avoids which may be inconsistent with the wholesale minus methodology
Risk premium on on-site infrastructure	Part of the return on incumbent's RAB is to reflect operating risks. The deduction reflects reduced operating risks for the incumbent / risks incurred by the NAV	Simple and pragmatic approach to remunerating incurred or avoided risks from running on-site infrastructure	Difficult to justify conceptually why this is the right deduction to apply (e.g. it assumes that the full risk premium is associated with running the assets as opposed to construction risk).
Avoided costs	Depending on the time horizon adopted, the incumbent may avoid capital costs within its business	Fully consistent with the wholesale minus and incremental cost approaches	Challenging in practice to work out what the avoided capital is and what is an appropriate time period

Source: CEPA analysis

6.7. OPTIONS FOR FUTURE BULK SUPPLY CHARGING POLICY

The guidance issued by Ofwat in May 2018 goes further than the framework and principles for bulk supply established in previous Ofwat documents by setting out a methodology that Ofwat expects incumbent companies to follow when setting NAV charges.

However, the guidance is not overly prescriptive, leaving significant scope for interpretation in different areas. This is set out in the objectives of the guidance which state that the guidance is aimed at:

- being sufficiently flexible to cater for differences in the types of sites and the types of services required by NAVs; and
- being sufficiently general and flexible to make it reasonably future-proof.

At the same time, Ofwat has recently been given powers by Defra and the Welsh Government to issue charging rules for bulk supply agreements. We understand Ofwat may consider introducing rules for bulk supply agreements in the future.

This points to a common trade-off between principles-based and rules-based regulation that many regulators have had to navigate. A principles-based approach sets out the broad set of principles that regulated parties must follow but leaves it open to parties to decide how best to implement these principles. The main advantage of this approach, as reflected in the objectives of the Ofwat guidance, is allowing the flexibility needed either to reflect different circumstances or to allow different approaches to be used that deliver the same outcomes desired by the regulator. It may however allow regulated parties to adopt approaches which are not fully in line with the regulatory objectives. If regulated parties fail to implement the principles set by the regulator in a reasonable manner, the regulator could ultimately resort to enforcement powers where these are available. However this may be problematic particularly where the outcomes are difficult to measure and therefore compliance difficult to enforce.

In contrast, a rules-based approach requires the regulator to come up with more specific rules and gives less flexibility to regulated parties on how to deliver the outcomes required (which may mean that the best outcomes are not always delivered). This introduces more clarity regarding the steps that regulated parties must take to ensure compliance and reduces the scope for parties to adopt practices which are inconsistent with the regulatory objectives.

Whether to implement more prescriptive rules in relation to bulk supply agreements will be a policy decision for Ofwat to make. In terms of potential approaches to future bulk supply charging, we believe there are several options for Ofwat to consider:

- Continue with the current, less prescriptive, approach but introduce more clarity in certain areas. This is likely to mean that companies will continue to apply different methodologies for allocating costs and estimating cost deductions although it is possible that, as more information about bulk supply charging becomes available publicly, companies will learn from each other and there will be a natural reduction in the number of methodologies applied. Ofwat could also consider if this principles-based approach could be complemented by enforcement powers to incentivise incumbent companies to apply the principles correctly.
- Apply a more prescriptive approach specifying both the avoided activities that should be captured in bulk supply charging and the methodology for allocating costs.

At the moment, applying a consistent approach across all companies would mean adopting either a top-down approach based on regulatory accounting information or a pure bottom-up approach based on estimating typical costs for the different types of activities.

As we set out earlier in the report, we believe that there are downsides with both these approaches. Applying a middle-up approach would require companies to collect and report information at a much more granular level than they currently do. If Ofwat were to expand the regulatory reporting requirements to cover granular information about the type of activities relevant for the 'last-mile' infrastructure operated by a NAV, this could potentially add a significant regulatory burden on the companies. We also highlight that, while, in theory, such an approach would result in a more accurate calculation of bulk supply charges, in practice, the impact on the margins available to NAVs is highly uncertain.⁴⁴

⁴⁴ Other sectors have also developed generic LRAIC methodologies that can be applied for the purposes of access pricing. While this may have benefits in theory, in practice such a methodology can take years to develop and apply appropriately.

Instead, we consider there are merits in an industry-led process, overseen by Ofwat, which would determine the most effective way to collect information relevant for setting bulk supply charging and to allocate costs to the 'last-mile' infrastructure. This could cover:

- The type of information currently collected by companies through their internal accounting systems to determine the most feasible and efficient way for companies to report and make use of information related to avoided activities on the 'last mile' infrastructure in a consistent way.
- Where granular information is difficult to collect, the most appropriate method for allocating costs to downstream network elements that can be operated by NAVs.

This industry-led process would resemble in some ways the DCUSA process in the electricity distribution sector where network companies work together to put forward proposals for changes to the network charging methodologies including tariffs for IDNOs. These proposals must be approved by Ofgem.

6.8. ESTIMATED OPERATING MARGINS BASED ON A CONSISTENT TOP-DOWN METHODOLOGY

In previous sections, we noted that in evaluating companies existing charging practices, and options for how companies might in principle calculate bulk supply charges in future, we have used our notional NAV site modelling tool to demonstrate how a 'top-down' methodology could be applied consistently across the sector.

In this section we present the resulting wholesale operating margins for water supply and wastewater services using this methodology.

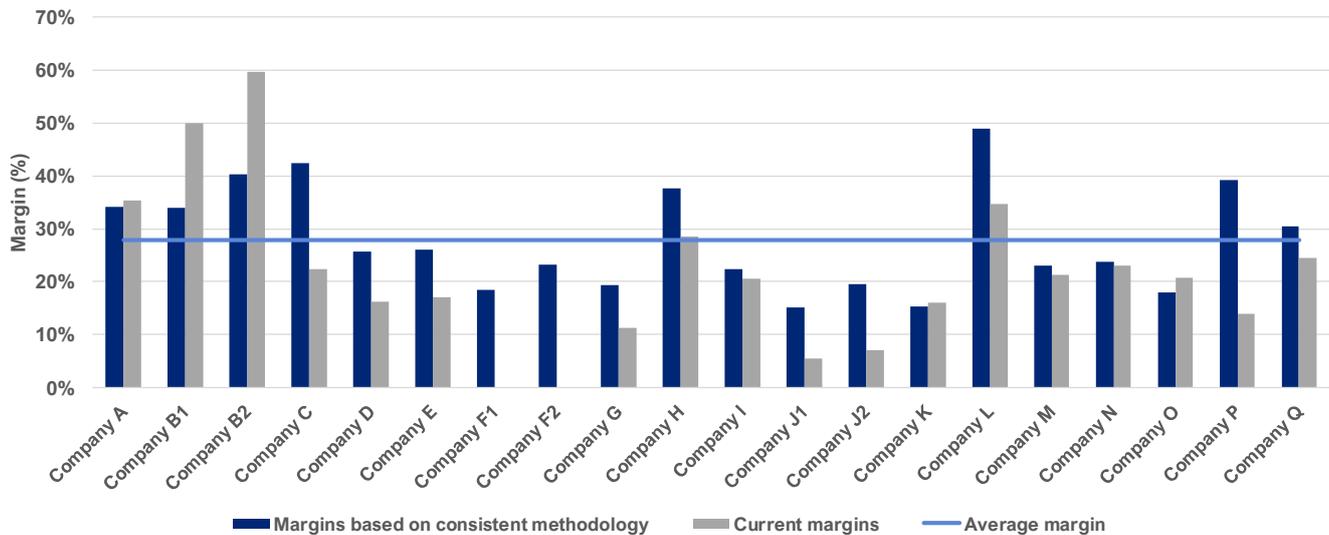
This is calculated based on existing wholesale tariffs and applying a consistent top-down methodology for calculating cost deductions to arrive at NAV bulk supply charges and wholesale margins for each of the incumbent companies. The top-down methodology we have applied in our calculations is described in Appendix A.

While this approach helps to illustrate how a more consistent methodology could in principle be applied, it may not provide as cost reflective bulk supply charges as the methods that are employed by some of the companies currently. This is because it is based on relatively simple assumptions of cost drivers and allocating costs (see Appendix A). As a result, we expect it may lead to a degree of 'headroom' above the costs that companies may in practice avoid from a NAV operating the notional site.

Water supply

Figure 6.1 shows estimated wholesale operating margins related to water supply services provided by the NAV based on a consistent methodology for calculating NAV bulk supply charges and compares these to the wholesale operating margins based on the existing charging practices (see section 4).

Figure 6.1: NAV wholesale operating margin for water supply services based on applying a consistent NAV charging methodology



Source: CEPA analysis based on 2019/20 wholesale tariffs and own calculations of bulk supply charges for NAVs

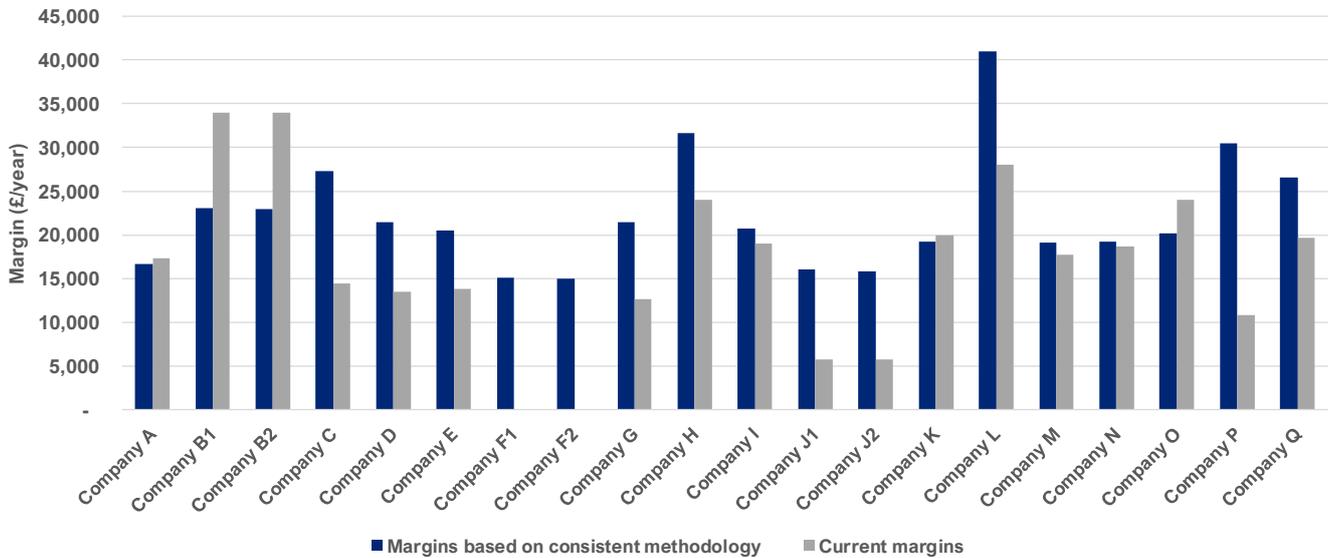
Based on these results, we observe that compared to the results presented in Section 4.4:

- In general, operating margins are slightly higher using our top down methodology than applying companies’ current methodologies. The average margin using our top down methodology is 27.8%, while the average margin applying companies’ current methodologies (outlined in Figure 4.4.) is 23.7%..
- Overall there is less variation across the companies relative to the industry average. Operating margins for companies that have the lowest margins according to their current methodology are higher using our top-down methodology. Some of the higher margins are significantly lower using our methodology though still above average.
- Operating margins for Company P are significantly higher using our methodology which is mostly driven by the fact that the supplementary charge is not applied in our calculations.

While the operating margins estimated based on this top-down methodology are on average higher than those based on current charging practices and there is less variation across the companies, we observe that, in general, the relative ranking of companies in terms of margins is similar between those based on current charging practices and our methodology (with some exceptions). To some extent, this suggests that the difference in margins based on current NAV bulk supply charges may be driven more by underlying company costs and/or the allocation of these costs across different business units, rather than choice of methodology.

Figure 6.2 below shows the absolute level of the estimated wholesale margin for each company in £ per year compared to the wholesale operating margins based on the existing charging practices. This also shows that there is less variation across companies in the wholesale operating margin based on a consistent methodology. At the same time, it also indicates that the variations observed in the % operating margin shown above cannot be explained entirely by differences in wholesale charges.

Figure 6.2: NAV wholesale margin (£) for water supply services based on applying a consistent NAV charging methodology

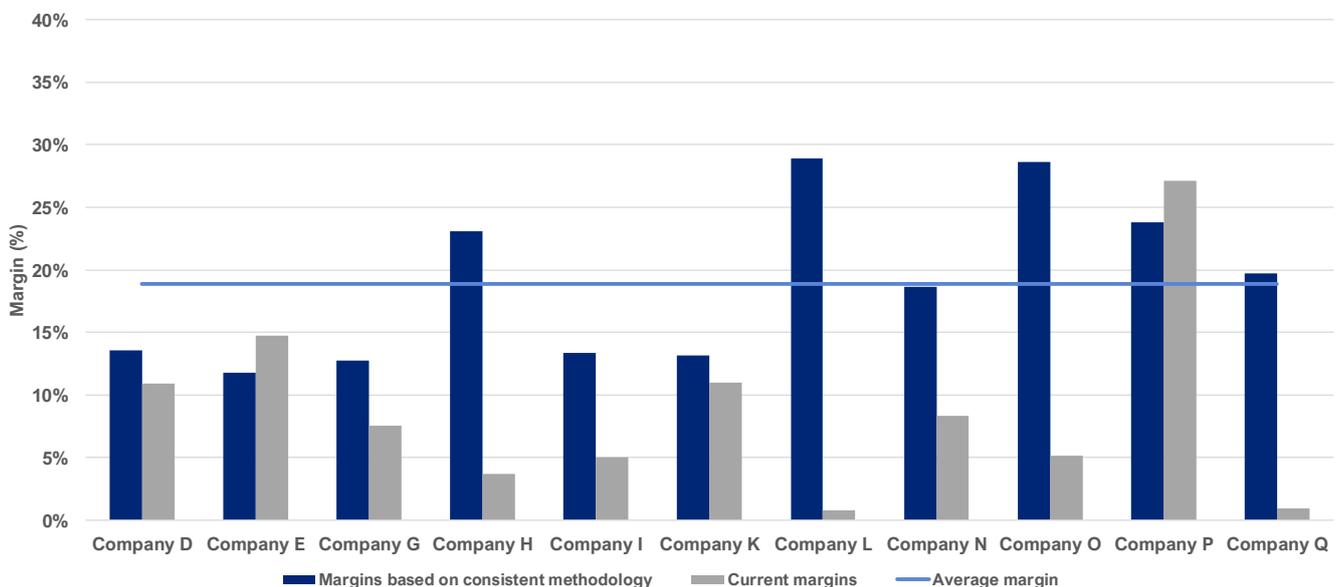


Source: CEPA analysis based on 2019/20 wholesale tariffs and own calculations of bulk supply charges for NAVs

Wastewater

Figure 6.3 shows estimated wholesale operating margins related to wastewater services provided by the NAV based on a consistent methodology for calculating NAV bulk supply charges.

Figure 6.3: NAV wholesale operating margin for wastewater services based on applying a consistent NAV charging methodology



Source: CEPA analysis based on 2019/20 wholesale tariffs and own calculations of bulk supply charges for NAVs

As for water supply services, wholesale operating margins are generally higher using our top-down methodology. The average operating margin is 18.9%, up from 8.6% based on current charging practices. In addition:

- Overall there is less variation in the margin across companies.
- We observe large jumps for some companies which have gone from very low margins to some of the highest.

Appendix A MODELLING APPROACH

To calculate NAV bulk supply charges in a consistent way across all companies we applied the following top-down methodology.

The starting point was to calculate a wholesale tariff revenue for the notional NAV site based on each of the incumbent's wholesale tariffs and assumptions about the NAV site. We then deducted the costs avoided by the incumbent.

Costs were assessed based on a top-down methodology using company costs as reported in Annual Performance Reports (APRs) and PR19 submissions. We took average costs over the last three years (2016/17 to 2018/19) to smooth of any unusual or lumpy expenditure.

Deductions were applied for the following cost components:

- **Ongoing operating costs:** Relevant operating costs were defined as total operating expenditure for treated water distribution or sewage collection, excluding third party services, power, renewals and local authority rates. We then applied the following steps:
 - Assumed 20% of "Other operating expenditure" is indirect costs and that 50% of indirect costs are fixed while the other 50% is avoidable. The remaining operating expenditure represents direct operating costs.
 - Allocated direct operating costs to different sections of the network based on length of mains of different sizes. The smallest diameter mains reported in regulatory accounts are potable water mains less than 320mm. We allocated direct operating costs to this part of the network based on the proportion of mains less than 320mm to total length of potable mains.
 - We then divided the direct operating costs allocated to mains less than 320mm by the total number of connected properties to determine a £/property direct operating cost.
 - For indirect costs, there is no clear cost driver that can be used to allocate costs. We consider that a sensible way in which consumers could contribute towards indirect costs is based on use of the network. We therefore divided avoidable indirect costs by the total volume of water delivered to obtain a £/m³ cost.
- **For capital maintenance,** we took average annual renewals costs for treated water distribution or sewage collection over the last three years. As for operating costs, we allocated the costs to different sections of the network based on the length of mains of different sizes. We divided the costs allocated to potable water mains less than 320mm by the total number of connected properties to determine a £/property capital maintenance cost.
- **Working capital allowance:** We included a working capital allowance in our bulk supply charging calculation by assuming the NAV bills its customers every 6 months and the incumbent bills the NAV monthly for bulk supplies. The working capital allowance represents around 1% of wholesale revenues for water supply services.
- For **leakage,** we assumed the actual leakage rate on the NAV site is equal to the incumbent's estimated leakage rate. Therefore, the leakage deduction has no effect on the estimated wholesale margin.
- We assumed the methodology applies to bulk supply agreements concluded based on the new income offset rules that come into place in April 2020. Therefore, we assumed no WACC and depreciation components are included for on-site assets which are fully funded by developers.

These costs were deducted from the wholesale charges to obtain a bulk supply charge for the notional NAV site. The wholesale margin was calculated as total cost deductions as a percentage of wholesale charges.

Appendix B LIST OF DIRECT COSTS AVOIDED ON NAV SITES

In this appendix, we set out a list of direct costs related to the operation of the 'last-mile' infrastructure, which are normally incurred by an incumbent company, but which are avoided when the site is operated by a NAV. These costs are relevant because, according to Ofwat's guidance, costs related to avoided activities/assets should be deducted from the bulk supply tariff charged by the incumbent company to the NAV.

This analysis of the costs and cost drivers for typical NAV sites has been supported by input from the team's engineering advisors. Our engineering expert panel has experience of assisting NAVs (or prospective NAVs) with their site application process. This experience has covered more than 30 NAV sites ranging in size from around 50 to more than 1000 residential properties, with some sites also including commercial units covering retail, hospitality and leisure activities covering areas up to 20,000 m². The ratio of residential to commercial units has been generally 95% to 5% on the sites reviewed. The work has included site inspections and discussions with and information gathering from NAV applicants and their technical advisors, developers and the incumbent water and sewerage suppliers.

The applications have covered water and/or sewerage services and have included both greenfield and brownfield sites in urban, semi-urban and rural locations, both in land and near the coast.

The asset types operated by the NAVs on the sites reviewed have included:

- water mains and communication pipes;
- water supply meters and boxes;
- surface water and foul sewers (both gravity and pumped);
- water pumping stations (pumps and chambers);
- sewage pumping stations (pumps and chambers);
- water supply valves and chambers;
- washout valves and chambers;
- fire hydrants; and
- surface water attenuation ponds and structures.

Typically, the NAVs are required to operate, clean, maintain, repair and replace these assets.

A few key observations related to the direct costs avoided on NAV sites are:

- Size of property and the volume or rate of consumption are unlikely to be key cost drivers for most of the avoided direct costs with the exception of pumping activities. Instead the key drivers are likely to be the number of connections and/or the lengths of water mains or sewers. Typically the higher the number of connections, the greater the number of assets serving them and thus the higher the costs of operation, cleaning, maintenance, repair and replacement of these assets. These asset quantities include the numbers of communication pipes (and their connections to water mains) and the lengths of water mains and sewers.
- Site characteristics such as topology and location can have an impact on the costs incurred by a NAV. For example, sites close to the coast could in theory be more expensive to serve. Such sites may require more pumping of wastewater in order to connect into the local sewerage network. However such pumping can also be required on inland sites where the local topography necessitates this. In limited site-specific cases surface water drainage at coastal sites may be impeded at high tide requiring surface water storage and possibly pumping but these additional costs are unlikely to be material.

- Water mains constructed in certain types of ground material such as clay can be more prone to bursts and in theory have higher replacement costs. However, appropriate modern pipe design and construction should mitigate this.

Table B.1 sets out a list of activities that a NAV would be expected to undertake (and the incumbent would avoid) together with our assessment of the relevant cost driver for each type of activity. These costs are likely to be common to most sites with some specific costs mentioned below.

Table B.1: List of activities avoided

Activity/Service	Description	Primary cost driver
Water		
Water quality sampling	Costs associated with taking and analysing water samples	Number of properties
Regulatory compliance	Costs associated with complying with regulatory requirements and inspections (Byelaw inspections, Drinking Water Safety Plans)	Number of properties ⁴⁵
Leakage detection	Costs of detecting and solving on-site leakages	Number of properties
Mains repair and replacement	Costs associated with the inspection, repair and renewal of on-site water distribution mains	Length of main
Communication pipe repair and replacement	Costs associated with the repair and renewal of pipes that connect the water main with each property	Number of properties
Mains cleaning	Costs associated with the cleaning of on-site mains	Length of main
Emergency support ⁴⁶	Costs associated with investigating and dealing with emergency issues or faults such as mains bursts	Number of properties / length of main
Meter space	Costs associated with the repair and renewal of meter boxes	Number of properties
Sewerage		
Sewer repair and replacement	Costs associated with the repair and renewal of on-site sewers/drains	Length of sewer
Sewer cleaning	Costs associated with on-site sewer inspections, desilting, etc.	Length of sewer
Emergency support	Costs associated with investigating and dealing with emergency issues and clean-up of on-site sewer blockages and sewer collapses	Length of pipe / number of properties
Pumps	Costs associated with the operation, repair and renewal of pumps and pumping station structures	Number of pumps
Storage and attenuation	Costs associated with the operation (e.g. desilting), repair and renewal of attenuation tanks	Number of attenuation tanks

Note: Meter related costs are not included as they are likely to be captured under retail activities

Potential additional activities to consider include:

⁴⁵ Some costs may be fixed per site (e.g. there may be one Drinking Water Safety Plan per site or even per company).

⁴⁶ Relevant where the NAV is providing emergency support instead of the incumbent.

- Repair and replacement of mains and sewer ‘accessories’ including water main valves and valve chambers, fire hydrants, washout valves/pipes/structures and sewer manholes. Length of main or sewer might be the primary cost drivers in these cases.
- In limited cases, there may be several other activities applicable to specific sites including:
 - Provision of on-site water supply and/or treatment by the NAV, e.g. from an on-site borehole.
 - On-site sewage treatment and disposal by the NAV.
 - Possible trade effluent discharges on mixed use developments. The treatment of trade effluent is often more costly than for domestic effluent.
 - Sewage bulk discharge agreements may include a surface water element if there is no on-site drainage of surface water and the incumbent receives sewage including all or some surface water flows. Also see reference to SUDS below.
 - Use of on-site grey water recycling facilities as a means of reducing treated water consumption.
 - Use of Sustainable Urban Drainage Systems (SUDS) to reduce the demand for bulk wastewater services. The use of SUDS is now commonplace on new developments.

Appendix C RELEVANT COST DEFINITIONS

Box 3: Key cost types

Direct costs are costs that can be directly traceable to a specific activity. Materials and labour directly used when producing a specific good or delivering a specific service are direct costs. The cost of the fuel used by a generator and the salaries of the technicians in charge of that generator are direct costs of energy generation, for example.

Indirect costs are costs that cannot be assigned directly to a specific product or service. These are often referred to as overheads. Examples of indirect costs are marketing and advertising costs, top management costs, human resources, indirect factory-labour costs, and depreciation of buildings. Indirect costs can be grouped in the following two categories:

- **Joint costs**, which arise when a single and indivisible process gives rise to several products or services. An example of a joint cost is the cost of cattle for producing hides and beef (one cow less or more means a reduction or increase in the same proportion of hides and beef). Another example is the cost of a cotton field to produce cotton seed and cotton fibre. With joint costs, variation in production of one product drives simultaneous variation in production of the other product.
- **Common costs**, which arise when a single process gives rise to several products or services, even though they can be produced separately. For example, the cost of equipment that can be used to produce two products is a common cost. Unlike joint costs, common costs can vary to some degree with the quantity of production of each product, even though they are not directly attributable to a single product.

In practice, it can be very difficult to distinguish between joint and common costs. The literature often refers to a single set of common costs (or common and joint costs) to describe indirect costs as a whole. Indirect costs can give rise to problems, because they need to be assigned to the different products and services provided by the company. When allocating costs, tracing common costs back to units of a specific output (product or service) is usually easier than tracing joint costs because of their relative variability characteristics.

Source: Rodriguez Pardina et al (2008), "Accounting for Infrastructure Regulation", The World Bank,

Box 4: Key cost allocation methods

There are a number of different methods for allocating costs to different activities or items.

Fully distributed costs (FDC) allocates all costs (direct and indirect) among all cost objectives (i.e. activities or items such as a product or service) on the basis of the principle of causality intrinsic in the key cost types described above using cost drivers, such as broad volume-based driver (number of units sold) or value-based drivers (sales). Direct costs are allocated to their respective activities while joint and common costs are allocated pro-rata to activities based on chosen drivers.

Incremental cost is the increase in a business's total cost attributable to the production of a particular type of good or service. This is usually defined over the long run and larger increments than the marginal unit of output and is often expressed as the long run average incremental cost (LRAIC) which is the incremental cost per unit of additional output.

The concept of incremental costs is closely related to that of avoidable costs. While incremental cost is the additional cost of producing a service, avoidable cost is the cost that would be avoided if the service would no longer be provided by the business. In other words, the cost saved by not producing the product is usually the same as the additional cost of making the product available.

LRAIC excludes joint costs that remain unchanged when the relevant increment is produced although a share of common costs can be included to the extent that they are avoided if the activity is not undertaken. LRAIC can give a similar result to FDC under certain circumstances (e.g. where there are few or no joint costs).

Stand-alone cost allocates all costs that the incremental business would incur as a separate entity including all joint costs and a share of common costs.

Example

Assume two costs objectives, A and B. Segment the indirect costs of A and B into common costs and joint costs to cost objective A and B. Incremental costing views one objective, A for example, as the primary objective and the other, B, as the incremental objective. Under FDC, a share of both joint and common costs are allocated to objective B. Under incremental cost, one part of the common costs is allocated to the incremental part B, but none of the joint costs (as these expenses are incurred anyway by the primary objective). In stand-alone costing of B, all joint costs are allocated to B as well as a share of common costs, as explained in the formulas below:

FDC of B = all direct costs of B + % joint costs of A and B + % common costs of A and B

Incremental cost of B = all direct costs of B + % common costs of A and B

Stand-alone costs of B = all direct costs of B + all joint costs of A and B + % common costs of A and B

The lower limit and upper limit of costs allocated to a business unit (or in the context of this paper, the prices charged for access to essential services) are indicated by the **incremental costs** and the **stand-alone costs**, respectively.

Source: Rodriguez Pardina et al (2008), "Accounting for Infrastructure Regulation", The World Bank,

Appendix D SENSITIVITY ANALYSIS ON ESTIMATED MARGINS

In this appendix, we present sensitivity analysis around the estimated wholesale margins for water supply and wastewater services by varying the assumed characteristics of the notional NAV site. The sensitivity analysis is based on incumbent companies' current charging practices. We discuss each of the sensitivities in turn.

D.1. SENSITIVITY 1 – SMALL RESIDENTIAL SITE

This sensitivity assumes a small NAV site made up of 25 residential households with a total water consumption of 2,500 m³/year.

Table D.1: Assumptions on notional NAV site – small residential site

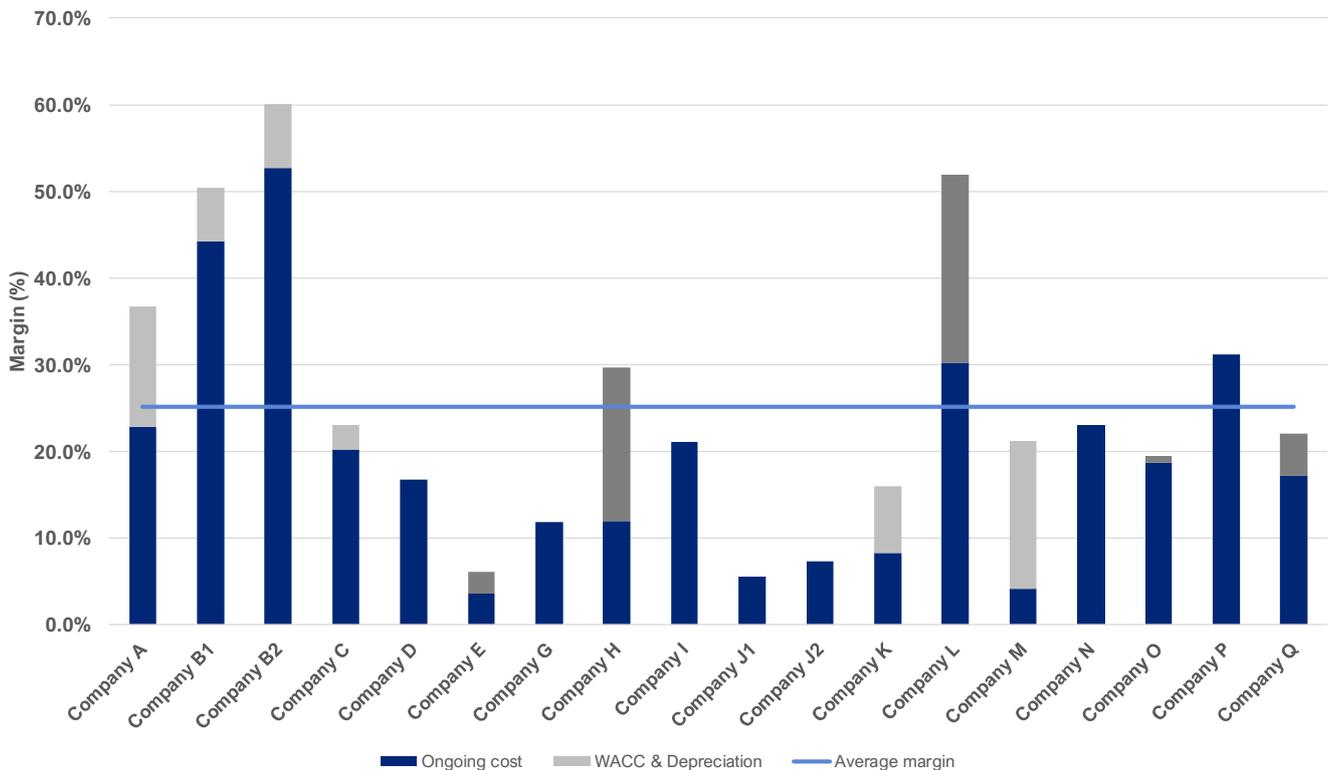
Variable	Unit	Household	Non-Household
Sensitivity 1			
Number of connections	Number	25	-
Water consumption volume per connection	m ³ /year	100	-
Return to sewer rate	%	95%	-
Wastewater discharge volume per connection	m ³ /year	95.00	-
Length of network per connection	m/connection	10	-
Meter size	Mm	12.00	-

Source: CEPA

D.1.1. Water supply

The figure below shows estimated wholesale operating margins (as a percentage of the wholesale tariff) related to water supply services provided by a NAV to a small residential site, based on the current NAV bulk supply charges.

Figure Appx D.1: NAV wholesale operating margin (%) for water supply services based on current NAV bulk supply charges – sensitivity 1



Source: CEPA analysis based on 2019/20 wholesale tariffs and own calculations of bulk supply charges for NAVs.

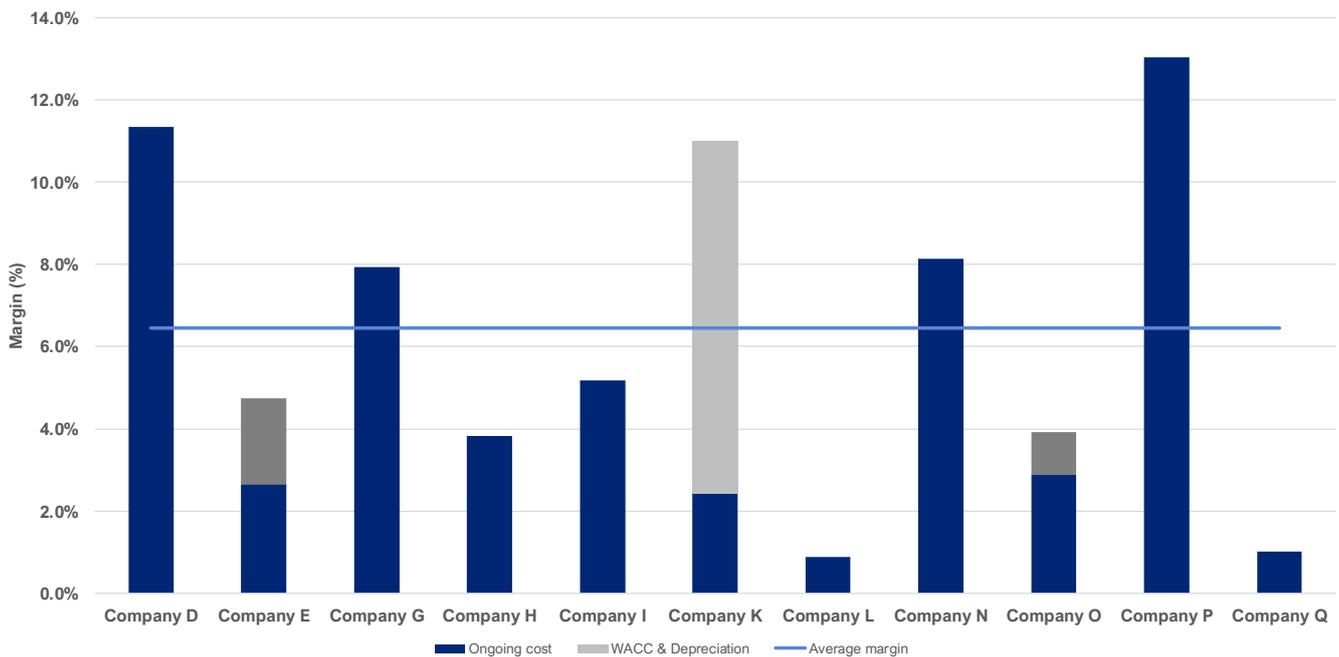
Compared to the results presented in Section 4.4, the estimated wholesale operating margins for the small notional NAV site show that:

- The average wholesale operating margin is higher, at 25.2%. This is driven by relatively big changes in margins for a few companies.
- In the case of Company P, the wholesale operating margin increases to 31.2% because the small NAV site would not incur the supplementary large user charge.
- In the case of Company L, the estimated wholesale operating margin increases from 35% to 52%.
- In contrast, the wholesale operating margin for Company E decreases from 17% to 6%.
- For the rest of the companies, the estimated wholesale operating margins remain broadly the same, with changes in margins not greater than 1.5%.

D.1.2.Wastewater

The figure below shows estimated wholesale operating margins (as a percentage of the wholesale tariff) related to wastewater services provided by a NAV to a small residential site, based on the current NAV bulk supply charges.

Figure Appx D.2: NAV wholesale operating margin (%) for wastewater services based on current NAV bulk supply charges – sensitivity 1



Source: CEPA analysis based on 2019/20 wholesale tariffs and own calculations of bulk supply charges for NAVs

Compared to the results presented in Section 4.4, the estimated wholesale margins for the small notional NAV site show that the average wholesale margin drops to 6.8% from 8.6%. This is largely driven by the margin for Company P dropping from 27% to 13% and for Company E dropping from 14.7% to 4.7%. For the other companies, estimated wholesale margins for NAVs change very little.

D.2. SENSITIVITY 2 – LARGE MIXED SITE

This sensitivity assumes a large NAV site made up of 2,000 residential households and 100 non-household properties.

Table D.2: Assumptions on notional NAV site – large mixed site

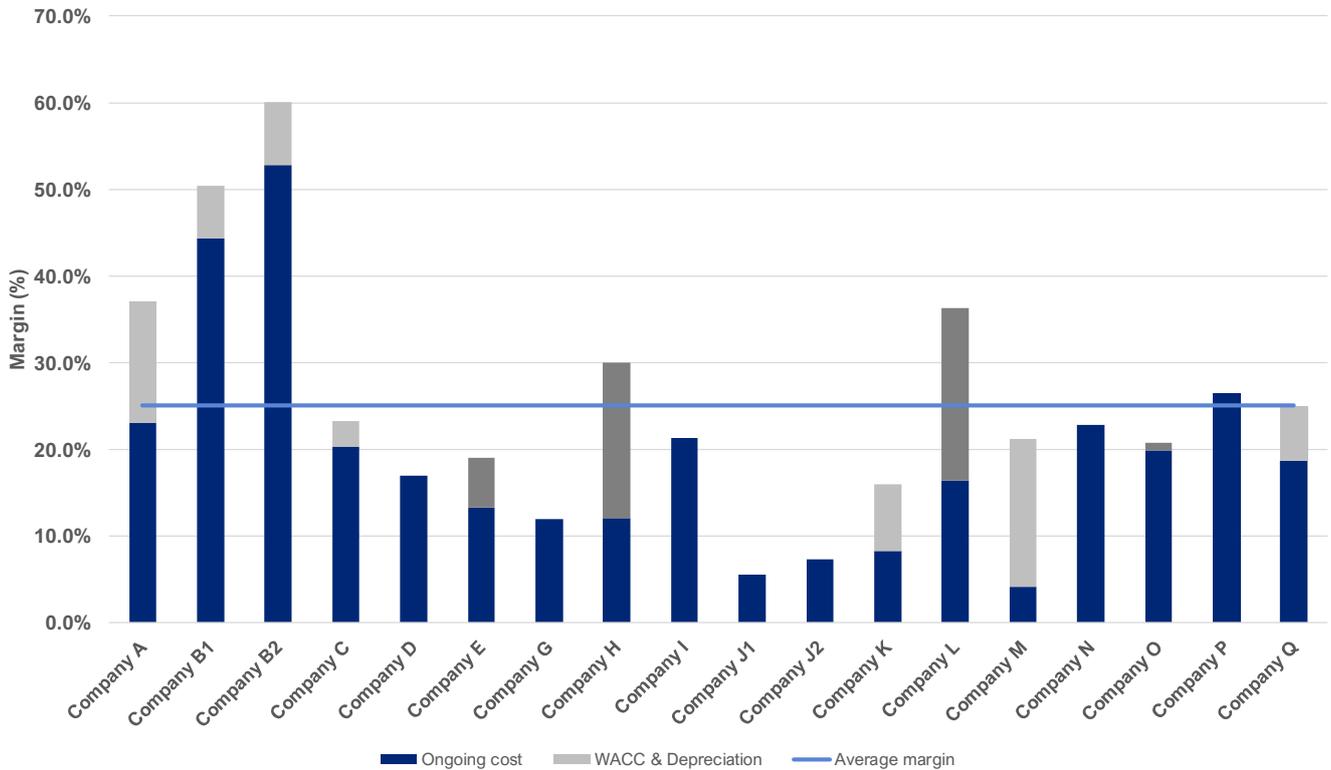
Variable	Unit	Household	Non-Household
Sensitivity 2			
Number of connections	number	2,000	100
Water consumption volume per connection	m ³ /year	100	80
Return to sewer rate	%	95%	95%
Wastewater discharge volume per connection	m ³ /year	95.00	76.00
Length of network per connection	m/connection	10	10
Meter size	mm	12.00	15.00

Source: CEPA

D.2.1. Water supply

The figure below shows estimated wholesale operating margins (as a percentage of the wholesale tariff) related to water supply services provided by the NAV to a large mixed site, based on the current NAV bulk supply charges.

Figure Appx D.3: NAV wholesale operating margin (%) for water supply services based on current NAV bulk supply charges – sensitivity 2



Source: CEPA analysis based on 2019/20 wholesale tariffs and own calculations of bulk supply charges for NAVs

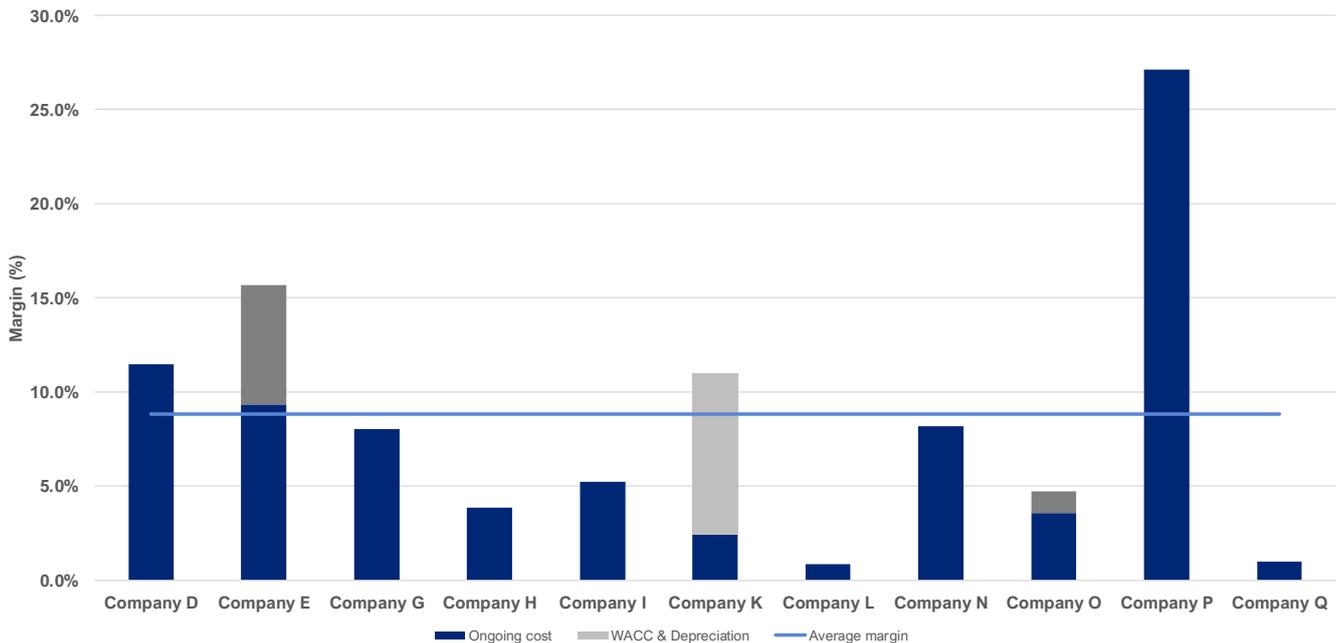
Compared to the results presented in Section 4.4, the estimated wholesale operating margins for the large notional NAV site show that:

- The average wholesale operating margin is higher, at 25.2%. This is driven by slightly higher margins for most of the companies (up to 1-2% increase in operating margins).
- A larger change is seen for Company P. The wholesale operating margin increases to 26.4% from 13.9%. This is due to the fact that the fixed supplementary large user charge represents a smaller overall proportion of bulk supply charges for a large site compared to a smaller site.

D.2.2. Wastewater

The figure below shows estimated wholesale operating margins (as a percentage of the wholesale tariff) related to wastewater services provided by a NAV to a large mixed site, based on the current NAV bulk supply charges.

Figure Appx D.4: NAV wholesale operating margin (%) for wastewater services based on current NAV bulk supply charges – sensitivity 2



Source: CEPA analysis based on 2019/20 wholesale tariffs and own calculations of bulk supply charges for NAVs

Compared to the results presented in Section 4.4, the estimated wholesale operating margins for this sensitivity show that:

- The average wholesale operating margin increases marginally from 8.6% to 8.8%.
- For most companies, the wholesale operating margins remain largely unchanged.

D.3. SENSITIVITY 3 – HIGHER WATER CONSUMPTION

This sensitivity assumes annual water and wastewater consumption volumes per connection are 20% higher than under the base set of assumptions.

Table D.3: Assumptions on notional NAV site – higher water consumption

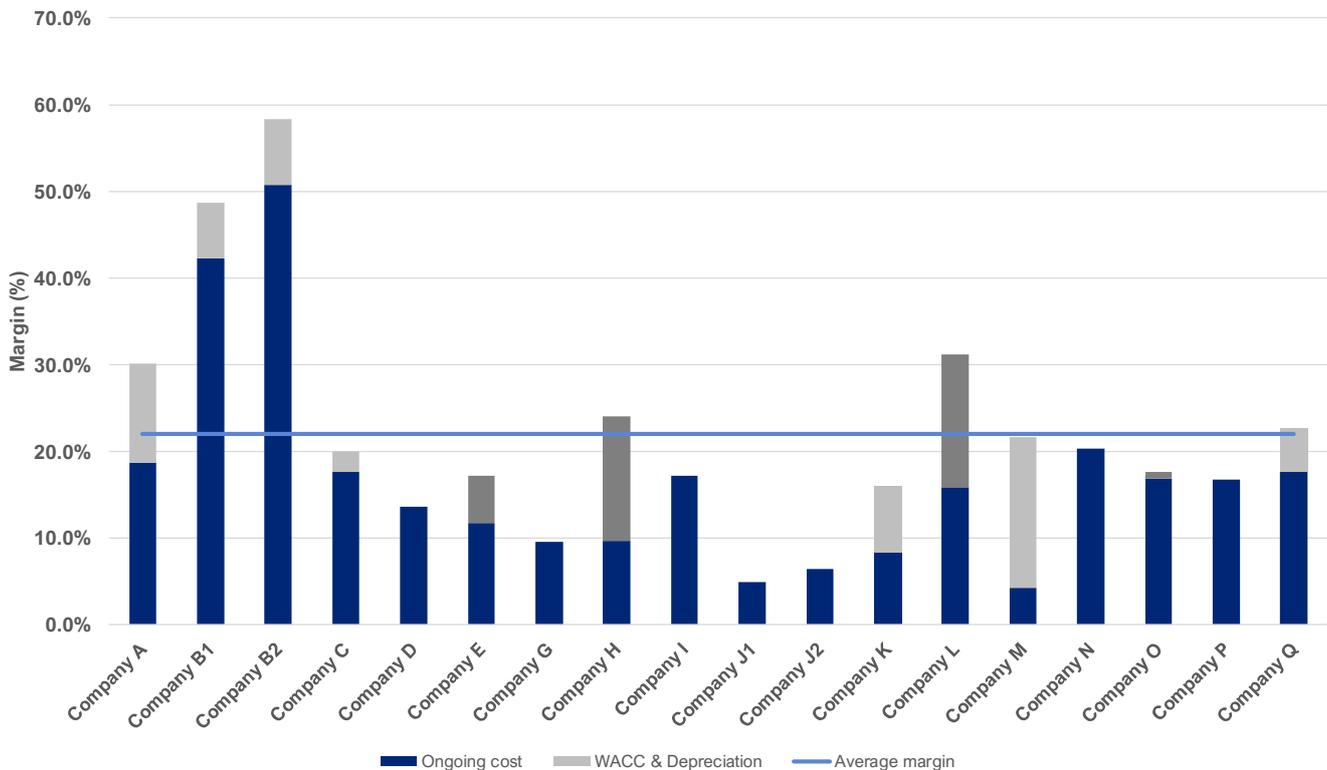
Variable	Unit	Household	Non-Household
Sensitivity 3			
Number of connections	number	2,000	100
Water consumption volume per connection	m3/year	120	180
Return to sewer rate	%	95%	95%
Wastewater discharge volume per connection	m3/year	114	171
Length of network per connection	m/connection	10	10
Meter size	mm	12.00	15.00

Source: CEPA

D.3.1. Water supply

The figure below shows estimated wholesale operating margins (as a percentage of the wholesale tariff) related to water supply services provided by the NAV to a site with higher water consumption volumes, based on the current NAV bulk supply charges.

Figure Appx D.5: NAV wholesale operating margin (%) for water supply services based on current NAV bulk supply charges – sensitivity 3



Source: CEPA analysis based on 2019/20 wholesale tariffs and own calculations of bulk supply charges for NAVs

Compared to the results presented in Section 4.4, the estimated wholesale operating margins for a notional NAV site with higher water consumption volumes show that:

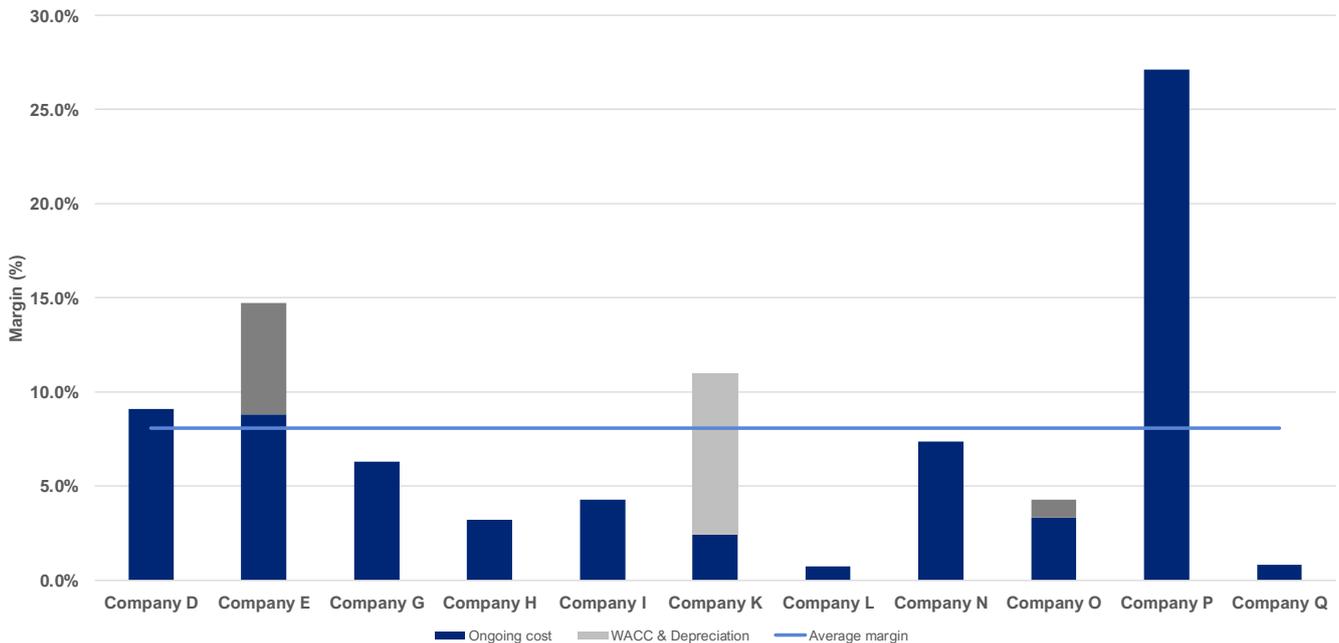
- The average wholesale operating margin is lower, at 22%.
- This reflects lower wholesale operating margins (in % terms) across most companies, as cost deductions tend to increase in a smaller proportion to wholesale charges when the volume of consumption increases (due to cost deductions which do not vary with the volume of consumption).
- The only companies for which the operating wholesale margins do not decrease under this sensitivity are those companies which calculate cost deductions purely on a volumetric basis.

If, on the other hand, we consider wholesale operating margins in £ terms, we find that the wholesale operating margins increase (or at least remain constant) with higher volume of consumption on-site. This is because, where cost deductions are calculated on a volumetric basis, the level of these cost deductions increases with the level of water consumption. This is especially the case for incumbent companies that calculate cost deductions solely on a volumetric basis. In this case the wholesale operating margin can increase by around 20% in £ terms under this sensitivity. If the actual costs incurred by the NAV do not vary significantly with the volume of water consumption on-site then the NAV would be better off in this situation.

D.3.2. Wastewater

The figure below shows estimated wholesale operating margins (as a percentage of the wholesale tariff) related to wastewater services provided by a NAV to a site with higher wastewater discharge volumes, based on the current NAV bulk supply charges.

Figure Appx D.6: NAV wholesale operating margin (%) for wastewater services based on current NAV bulk supply charges – sensitivity 3



Source: CEPA analysis based on 2019/20 wholesale tariffs and own calculations of bulk supply charges for NAVs

Compared to the results presented in Section 4.4, the estimated wholesale operating margins for this sensitivity show that:

- The average wholesale operating margin decreases from 8.6% to 8.1% as the margin for most companies decreases for the same reasons outlined above.
- The wholesale operating margin for three incumbent companies, that calculate cost deductions purely on a volumetric basis, remains the same.

As for water supply services, the wholesale operating margin in £ terms for wastewater services increases or remains the same for all companies under this sensitivity.

D.4. OTHER SENSITIVITIES

The notional NAV site includes assumptions about the length of the on-site network per connection. Length of network is a key cost driver for a number of activities that the NAV would undertake on its sites, such as cleaning, repair and replacement of mains and sewers.

Based on current bulk supply charging practices, varying the assumptions around the length of the on-site network would only change results for a very limited number of companies that use length of network in their avoided cost calculations. In these cases, assuming a shorter length of network per connection would result in a lower cost deduction and therefore a lower wholesale operating margin for the NAV. Assuming a longer length of network per connection would have the opposite effect. Under our top down methodology, varying the length of network also does not have an impact on estimated operating margins, as cost deductions are determined based on the number of connections on-site.



UK

Queens House
55-56 Lincoln's Inn Fields
London WC2A 3LJ

T. +44 (0)20 7269 0210

E. info@cepa.co.uk

www.cepa.co.uk

 [cepa-ltd](https://www.linkedin.com/company/cepa-ltd)  [@cepald](https://twitter.com/cepald)

Australia

Level 20, Tower 2 Darling Park
201 Sussex St
Sydney NSW2000

T. +61 2 9006 1307

E. info@cepa.net.au

www.cepa.net.au