NERA
ECONOMIC CONSULTING

Appraisal of IPART Building Blocks Approach

Prepared for Sydney Water

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CONFIDENTIALITY

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Executive Summary

Introduction

In early June 2021, Sydney Water submitted a response to an IPART discussion paper relating to the future of regulation in the NSW water sector. While responding to specific questions from IPART, Sydney Water's response also focused on the overall principles of regulation, including the trade-offs between long-term and short-term decision making and regulation, in particular, in light of Sydney Water's expectation of higher customer bills in future.

IPART subsequently requested further clarification on what Sydney Water proposes, particularly with respect to a long-term focus, bill smoothing and revenue caps. We provide this report in support of Sydney Water's response to demonstrate how the Building Blocks approach to remunerating capex can be combined with a longer-term planning model in order to achieve better outcomes for consumers through more stable bills.

Building Blocks Approach

As part of its ongoing regulatory regime, Sydney Water's revenues are remunerated through a Building Blocks method, whereby opex is recovered in year, and capex is added to a Regulatory Asset Base (RAB) and remunerated through two channels:

- Every year, a portion of the principal value of each asset in the RAB depreciates, shrinking the value of the RAB but also earning Sydney Water a revenue equal to that amount. In particular, IPART assumes straight line depreciation, so the same value depreciates over the life of the asset.
- For the entire value of the RAB, Sydney Water earns a return on capital, equal to the allowed Weighted Average Cost of Capital (WACC) multiplied by the value of the RAB.

IPART then combines the three elements of the allowance (opex, depreciation and return) into an annual revenue requirement. For each four-year revenue control period, the revenue requirement is smeared across the four years, in order to ensure smoother bill trajectories between years.

The focus of this report is the method through which capex is remunerated – we do not discuss opex remuneration further.

The economic principle underlying the depreciation-and-return approach to capex remuneration is that the cost of an asset should be paid for by the customers who benefit from it. Seeking to recover the costs of a large new piece of infrastructure in the year it was commissioned would result in volatile tariffs. In a world of incomplete capital markets and in the absence of hyper-rational consumers who forecasted their water bills over their lifetimes, very large tariffs in a single year could cause budgetary problems for customers. Volatile tariffs could also create potentially-inefficient incentives to bypass the network to avoid large but temporary increases in costs. Recovering capital costs in-year would have distributional implications for customers, because one generation of customers would pay for the assets whilst customers over the next several decades could make use of it free of charge. The approach is also practical, in that it provides greater stability in revenues to the utility company and bills to customers. For all of these reasons, a similar approach to capex remuneration exists in regulated network utilities in many jurisdictions.

However, the precise application of the user-pays principle is arbitrary from the perspective of encouraging economic efficiency. In a competitive market, a freely set price will yield an efficient economic outcome. Suppliers of a product will produce an output when consumers are willing to pay at least as much as the cost of producing it, and consumers will buy the product when the value they derive from it is at least as high as its price.

In a regulated infrastructure industry with long lasting assets, such as a water company, a single economically efficient outcome does not exist. This is because, for a given asset, the entirety of its build costs is incurred upfront, and it becomes fully useful in Year 1 of its operation. For every year thereafter, the build costs are "sunk" and the asset is available to be used by future customers for the remainder of the asset life. Irrespective of what future customers pay for the asset, it exists and can be used without imposing any further investment costs on the system at least for a period of time. Any price above short run marginal cost but below the price at which customers would choose to bypass the network inefficiently (i.e. the cost of standalone provision) is equally efficient from an economic perspective.

In short, there is nothing uniquely efficient about IPART's specific techniques for allowing the remuneration of capex.

There are at least two embedded distortions to capex repayment profiles which have little to do with sending efficient price signals to consumers:

- With a straight-line depreciation profile on assets, customers over the life of an asset pay equal amounts of the *principal* value of the asset (because the depreciation payments are identical), but decreasing levels of return, because the return element is paid on the full remaining asset value (which depreciates over time). As a result, assuming a constant level of WACC over the full remuneration period, customers' bills are frontloaded in repaying individual assets.
- Especially for assets with a long life (e.g. 50-60 years), most of the amount that customers pay is driven by the level of the WACC, which can fluctuate materially between revenue control period. If the WACC increases sharply in a new period, so too will consumer bills, even though their consumption of the assets has not changed.

In both cases, these dynamics are artefacts of IPART's methodology, but do not carry any value in terms of incentivising efficient behaviour on behalf of customers. If cyclical increases in capex or increases in the WACC are anticipated, it is not inherently optimal to pass those costs through specifically to bill payers at that time. Other options are equally valid, and may confer greater benefits to bill payers in terms of longer-term bill stability.

Long-term Planning of the System

Sydney Water's most recent price control determination took effect on 1 July 2020 and is due to last until 30 June 2024. The four-year time horizon is consistent with previous decisions for Sydney Water. IPART determined that a four-year period "appropriately balances a range of matters – including incentives for efficiency gains, minimising regulatory costs, and risks of inaccurate forecasts".[1]

[1] IPART (June 2020), Review of Prices for Sydney Water, p147.

Beyond case-by-case approvals where Sydney Water can demonstrate that a specific large investment is needed, the existing approach does not take a longer-term view of Sydney Water's capex plans, and therefore has not allowed Sydney Water to incorporate its anticipated investment needs.

IPART's approach to smearing Sydney Water's revenue requirement within a four-year period demonstrates its commitment to short-term bill stability, but the existing approach to regulation limits this bill stability consideration to just the short term, ignoring longer-term bill stability.

The short-term approach *implicitly* includes an assumption that longer-term capex requirements and WACC expectations will match their near-term levels. Where this implicit assumption is actually reasonable (rather than simply the default assumption), then there may not be any need to adjust the default approach.

To improve upon this outcome (or to confirm that it is the correct approach), a longer-term view would need to be adopted. There is international precedent for such an approach, for example the Water Resources Management Plans (WRMPs) in the UK. These plans require each water company to outline their approach towards the long-term management of water resources over the next 25 years. While the focus is primarily on ensuring that there will be an adequate supply of water to meet forecasted demand, this requires a plan for future investment to ensure demand will be met. Therefore, an important, and an explicitly required component, of the plan is the consideration of the impact it will have on customer bills.[2]

If Sydney Water were able to identify an expected change in capex or WACC, it could then propose an alternative capex recovery plan which results in smoother bills for customers. A longer-term planning approach would also be consistent with how Sydney Water would operate as a private company funded by private shareholders. In meeting its responsibilities to its shareholders, a privately-held company would need to carry out longer-term planning to ensure that it can remain profitable over the life of its assets.

Potential Approaches to Smoothed Capital Recovery

In the event that a longer-term approach suggests a likely increase in bills due to increased capex requirements or a WACC increase, Sydney Water and IPART have several levers which could achieve smoother long-term bills without distorting the economic efficiency of the system:

- *Accelerated depreciation:*

  The accelerated depreciation approach involves shortening the asset lives of new and/or existing assets prior to the arrival of the large investment or the increase in the WACC. This causes customers to pay higher depreciation payments today to decrease the size of the asset base. A smaller RAB once the large investment arrives or the WACC increases reduces the size of the increase in bills. This helps to smooth increases in customer bills.

  There is regulatory precedent for shortening asset lives to avoid sharp changes in bills. Between 2000 and 2010, Ofgem, the British gas and electricity regulator, shortened the lives of new assets from 33 years to 20 years for electricity distribution and transmission

2 https://www.gov.uk/government/publications/water-resources-planning-guideline/water-resources-planning-guideline

network operators. This was done to avoid a ‘cliff edge’, whereby there would be a sharp fall in depreciation allowances in 2010 due to the way the lives of existing assets had been treated following the privatisation of the British electricity industry.[3] The change was NPV neutral and helped to ensure that customer bills followed a smooth path.

- *Annuity of large investments:*

  The annuity approach involves spreading the costs of the new asset over more years than its asset life. This involves pre-paying for the asset prior to its commissioning, which helps to minimise the rise in customer bills. This is only applicable to a large new investment, not a predicted increase in the WACC, as it needs to be tied to an actual asset.

  There is already regulatory precedent for using annuities to fund capex in Australia. In Queensland, the QCA uses an annuity approach to recover expenditure on the renewal of existing assets for Queensland’s bulk water supplier, SunWater.[4] On a national level, the annuity approach was used to recover renewal expenditure for the Murray Darling basin. As noted by the ACCC, both annuity and RAB approaches can deliver the same NPV of a revenue stream, the difference being the time profile of the revenue stream. In particular, the ACCC suggests that the annuity approach is more desirable if smooth revenue path is desired.[5]

- *Escrow account:*

  The escrow account approach involves the use of an escrow fund which customers pre-pay into prior to a large investment or increase in the WACC. Sydney Water would not have access to this fund until the rise in investment or the WACC. Once this occurs, Sydney Water could withdraw the funds to pay down the RAB. This lowers bills following the investment/WACC increase so helps to smooth bills.

Any of these approaches could be introduced if a long-term planning study identified a need to do so, even if uncertain. If Sydney Water and IPART’s best guess about the future includes an expansion in capex and/or an increase in WACC, then consumers’ best interests are served by the implementation of longer-term bill smoothing, with no loss of economic efficiency. As forecasts improve or change, so too can Sydney Water’s application of each of these approaches.

The purpose of this report is not to advocate that any one of these approaches is adopted now – that would be the outcome of a longer-term study which we have not conducted. Moreover, a longer-term study could show that there is no need to introduce any of these measures, in which case the existing approach can be applied without amendment. Instead, we conclude that a longer-term approach to planning should be incorporated that would allow for a mutually-agreeable adjustment to bills if the expected trajectory in bills warranted it.

3 https://www.ofgem.gov.uk/publications/distribution-price-control-review-final-proposals-0

4 QCA (Jan 2020), Rural irrigation price review 2020–24 Part B: SunWater, Final Report

5 ACCC (May 2008) Issues Paper: Water charge rules for charges payable to irrigation infrastructure operators, Appendix D: Capital financing approaches

1. Introduction

In early June 2021, Sydney Water submitted a response to an IPART discussion paper relating to the future of regulation in the NSW water sector. While responding to specific questions from IPART, Sydney Water's response also focused on the overall principles of regulation, and in particular:

- Ideas around the culture of regulation between IPART and Sydney Water, between IPART and other regulatory entities with jurisdiction in NSW, and within IPART and Sydney Water.
- Trade-offs between price and quality, and customer choice in determining additional expenditure.
- Incentives around leakage; and
- The trade-offs between long-term and short-term decision making and regulation, in particular, in light of Sydney Water's expectation of higher customer bills in future.

In late June, IPART responded to Sydney Water's submission asking for further clarification on what Sydney Water proposes, particularly with respect to a long-term focus, bill smoothing and revenue caps. We provide this report to support Sydney Water's response, focusing on the following areas:

- In Chapter 2, we set out the mechanics for how the current Building Blocks approach works in practice;
- In Chapter 3, we discuss how different planning horizons can feed into the regulatory structure to improve outcomes for customers;
- In Chapter 4, we set out a series of illustrations on how it could be amended to account for an anticipated increase in capital and financing costs; and
- In Chapter 5, we conclude.

2. Building Blocks Approach

Sydney Water's costs are regulated using a building blocks approach as follows:

- Efficient operating expenditure (opex) is allowed to be recovered within the year in which it is spent;
- Efficient capital expenditure (capex) is added to the Regulated Asset Base (RAB). In each year, Sydney Water is allowed to recover a depreciation allowance based on the accounting depreciation of each asset in the RAB, and a return on capital on the amount that remains in the RAB, based on the Weighted Average Cost of Capital (WACC) determined for that period.

Taking together (a) the opex allowance; (b) the depreciation allowance; and (c) the return on capital, IPART calculates Sydney Water's Notional Revenue Requirement (NRR) for each year of the price control period (four years as currently defined). It then smooths the NRR across the four years (keeping equal in NPV terms), and divides by the customer base to arrive at a cap on customer bills.

In the current context, we are interested only in the capex component and how it translates into customer bills, itself a function of capex, asset lives and WACC assumptions.

2.1. Pay-As-You-Go Approach to Capital Recovery

With respect to capex, the building blocks approach is based on a principle of Pay-As-You-Go (PAYG), in which customers pay for assets as they are built by the network company. A PAYG principle should drive efficient investment decisions by a network and efficient consumption decisions by customers, because the network will build an asset when customers are willing to pay its price and customers will consume it when the value they derive from doing so exceeds its price.

In practice, however, the application of the principle is necessarily arbitrary. This is because, for a given asset, the entirety of its build costs are incurred upfront, and it becomes fully useful in Year 1. For every year thereafter, the build costs are "sunk" and the asset is available to be used by future customers for the remainder of the asset life.

In fact, Sydney Water is able to add capex to their RAB as they spend the capex rather than as an asset is brought into service. From Sydney Water's perspective, this allows the recovery revenue from an asset as soon as they spend capex. However, from customers' perspectives, this requires customers to pay in advance for assets that they do not benefit from.

It would therefore be consistent with the PAYG principle for a network to charge Year 1 customers the entirety of the capex for an asset and allow all future customers to benefit from the asset for free. There are countless problems with that approach, so regulators in high capex industries typically spread the recovery of capex over the life of an asset using a depreciation and return method of revenue requirement. This approach fits within the PAYG principle if one assumes that future customers are "consuming" an equal share of the asset, but that concept is a construct – the asset will exist for a certain amount of time regardless of whether it is "consumed", ignoring a small amount of use-based wear-and-tear.

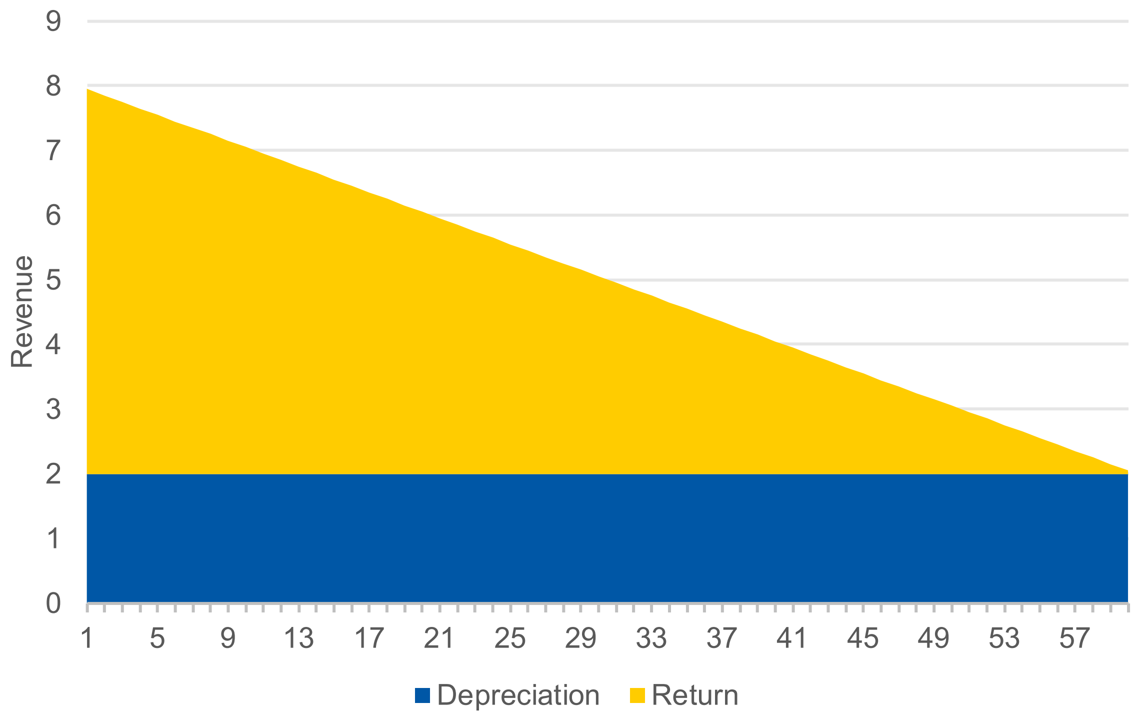
2.2. Straight-line Depreciation Creates a Front-loaded Repayment Dynamic

Most utility regulators, including IPART, use a straight-line approach to measuring depreciation: the same amount of value depreciates from an asset in each year over the course of the asset's life.[6]

For any given asset, customers over the life of the asset will pay for the principal of the investment in equal increments, reflecting that those customers equally use the asset. They do not pay an equal amount, however, because the return on capital on that asset declines as the remaining principal of the investment depreciates.

We demonstrate this dynamic in Figure 2.1 for a notional asset with an initial value of $120, a 60-year asset life, and a 5 per cent WACC. As the figures show, customers in Year 1 pay around $8 for the asset ($2 in depreciation and $6 in return), while customers in Year 20 pay around $2 for the asset ($2 in depreciation and $0 in return).

Figure 2.1: Illustrative Building Blocks Approach for a Single Asset



While customers in each year pay for an identical share of the asset's principal value, they do not pay the same amount in total because customers earlier in the period pay a much larger proportion of the financing costs of the investment. Customers' increased liability on this asset in early years is not driven by their use of it, but is simply an artefact of how the asset is financed, rather than the rate at which they consume it or the benefit they receive from it.

This dynamic will hold so long as we assume straight line depreciation. Other approaches to depreciation are possible, such as a sum-of-years-digits method (which makes the payment

6 We ignore inflation for the purpose of this report.

profile *more* front-loaded) or an annuity approach (which ensures that customers pay the same amount in total in each year, assuming a constant WACC).

In a steady state equilibrium, where the RAB is not systematically growing over time, this dynamic does not present a problem, because each customer is paying a disproportionately large share of newer assets and a disproportionately small share of older assets. These two effects offset each other in their final bill.

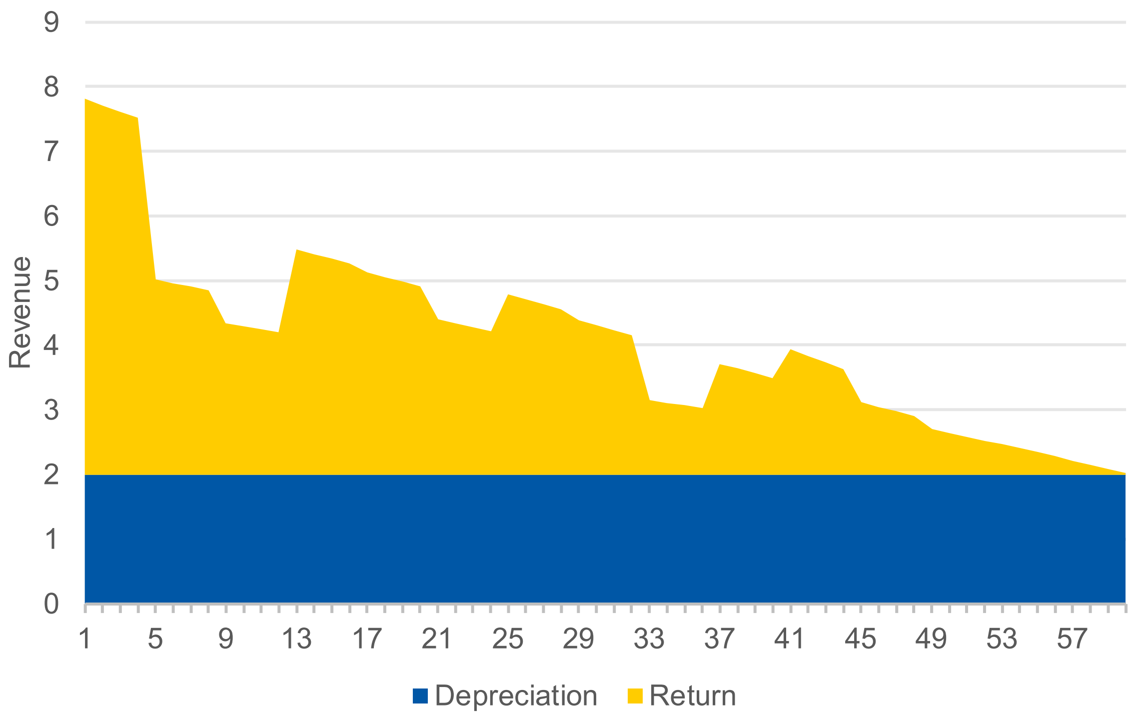
However, as we discuss throughout this report, Sydney Water is not necessarily in a steady state. It faces increased capex requirements in the coming years and decades due to (a) population growth; (b) the need for renewing many assets built in the 1960s and 1970s; and (c) the need to prepare for an increased likelihood of drought. As these capex requirements begin to materialise, customers at that time will pay a disproportionately high share of the cost (driven by financing costs) while not benefiting from these assets any more than customers further in the future.

The implication of this dynamic is that customers at a time when assets are disproportionately near the end of their life (as is the case now) will pay less for those assets than customers when they were new, or customers when those assets are newly replaced. When capex increases (as it is expected to do in the near future), those customers will pay more for those new assets than customers using the same assets nearer to the end of their life.

2.3. The Building Blocks Approach is Highly Sensitive to the WACC

In the previous section, we assume that the WACC is constant over a 60-year period. In Figure 2.2 below, we allow the WACC to fluctuate randomly between 2 per cent and 5 per cent, fixed for four years at a time (in line with the current price control period).

Figure 2.2: Illustrative Building Blocks Approach for a Single Asset, Variable WACC



As the figure shows, the bills that customers pay are sensitive to the level of the WACC, especially early in the period when the asset retains most of its initial value. Customers when the WACC is high do not "consume" any more of the asset than customers when the WACC is low do, but they still pay for a much larger share of the total costs.

In practice, the allowed WACC is calculated based on the combination of a 10-year trailing average observation window (for historical debt) and 40-day trailing average observation window (for new debt). Particularly because of the 40-day observation window, the WACC that Sydney Water is allowed to recover on its assets over a 4-year period can be highly volatile from one control period to the next.

Such volatility in the WACC allowances may be logical from the company's perspective, as this may reflect the volatility in its own financing cost pressures. Moreover, as a regulated network company, Sydney Water should be incentivised to obtain financing at the cheapest possible rates, which would reflect how it would operate in a competitive market.

However, these fluctuations are entirely arbitrary from a customer's perspective, particularly residential customers with limited interest in financial markets. If customer bills are intended to reflect a customer's use of the system, there is no inherent value in passing through short-term financing costs to the customer, as these do not reflect the use or the depreciation of the system. If customer bills are intended to signal efficient use of the system, there is no inherent value in passing through short-term financing costs, as the burden that a customer places on the physical network does not depend on the state of financial markets.

In short, while IPART's methodology for determining the allowed WACC may be efficient for determining Sydney Water's revenue requirement, it does not follow that the allowed WACC needs to feed directly into customer bills. It is not an integral component of the building blocks method from the customer's perspective.

We discuss in Chapter 4 how customers' bills could be varied to smooth fluctuations in WACC without changing the WACC itself. On top of these approaches, IPART could adopt a more stable method for determining the WACC:

- A long-term WACC could fixed and held constant over a long period of time. However, this approach is probably not optimal: if financing costs were to drop, Sydney Water would not be faced with the pressure to obtain cheaper financing; if financing costs were to increase, Sydney Water may find it challenging to finance its operations. In either case, a redetermination of the WACC would be likely, thereby negated the stability that a long-term WACC could provide.
- A Total Market Returns (TMR) method relies on the (empirically verifiable) assumption that equity market returns as a whole are approximately stable over time, with increases in the Risk Free Rate (RFR) offset by decreases in the Equity Risk Premium (ERP), and vice versa. Individual firms' cost of equity varies according to their equity beta (Sydney Water's is around 0.7-0.8). In times of cheap financing (as indicated by the RFR), a company with an equity beta below 1 (i.e. Sydney Water) would require a somewhat lower WACC than in times of more expensive financing. However, the volatility of the WACC would be lower than it is under IPART's current method, while still reflecting the competitive cost of financing for a company of Sydney Water's structure.

In the remainder of this report, we focus on how bills could be varied *without* changing the underlying WACC calculation approach, but we recommend that IPART revisit its WACC methodology to ensure that it drives efficient behaviour for both Sydney Water and its customers.

3. Long-term Planning of the System

In this chapter, we discuss how different planning horizons can be used to deliver a more efficient outcome for customers.

3.1. Current Approach to Planning Horizons

Sydney Water's most recent price control determination took effect on 1 July 2020 and is due to last until 30 June 2024. The four-year time horizon is consistent with previous decisions for Sydney Water. IPART determined that a four-year period "appropriately balances a range of matters – including incentives for efficiency gains, minimising regulatory costs, and risks of inaccurate forecasts".[7]

Sydney Water's four-year price determinations have on occasion taken into account some specific capex programmes that last longer than a single period. For example, in anticipation of growth in greenfield connections in the Rouse Hill region, IPART's 2016 decision allowed Sydney Water to recover its expected expenditure to 2025/26 by introducing it into its Regulated Asset Base (RAB). In particular, Sydney Water was allowed to take its Net Present Value (NPV) forecast of efficiently incurred capex in Rouse Hill between 2012/13 and 2025/26 and put half of it into the RAB. The other half was levied specifically on customers in the area.

However, beyond case-by-case approvals where Sydney Water can demonstrate that a specific large investment is needed, IPART does not take a longer-term view of Sydney Water's capex plans and has not allowed for Sydney Water to incorporate its anticipated investment needs.

At the same time, IPART acknowledges that Sydney Water required record level capex during the 2020-24 period "to support growth, build resilience to drought, and maintain or improve its levels of service and environmental performance".[8]

We understand that Sydney Water expects these additional requirements to persist or grow over the coming decades as (a) a large volume of assets built in the 1960s and 1970s requires replacement; (b) Sydney continues to grow; and (c) drought concerns driven by climate change worsen, and more reservoir capacity is required. As these additional capex requirements do not fall during the 2020-24 period specifically, Sydney Water cannot incorporate them into their revenue requirement.

Within each four-year period, IPART smooths Sydney Water's revenue requirement by calculating the NPV of each year's revenue requirement and smearing the total across the four-year period. This approach "smooths the impact of price changes over the period, thus reducing the price volatility for customers, and revenue volatility for Sydney Water".[9] This is only partially true: volatility in customer bills within a period may still happen because of fluctuations in consumption levels, and rates increase if the Sydney Desalination Plant is switched on.

[7] IPART (June 2020), Review of Prices for Sydney Water, p147.

[8] IPART (June 2020), Review of Prices for Sydney Water, p2.

[9] IPART (June 2020), Review of Prices for Sydney Water, p59.

Furthermore, the existing approach does not reduce price volatility for customers or revenue volatility for Sydney Water *between* periods. If Sydney Water expects a large increase in costs to occur in an upcoming period, even if IPART agrees with Sydney Water's assessment, then customers will face near-certain volatility in their water prices when the upcoming period comes into effect. Similarly, Sydney Water will face near-certain volatility in revenues. If price volatility within a single four-year period is undesirable, then by extension, price volatility once every four years is likely to be undesirable as well.

3.2. IPART Should Introduce a Two-track Planning Approach

The challenges identified above could be mitigated by a longer-term planning horizon which explicitly accounts for the expectation of changes in bills in an upcoming period. We do not necessarily recommend a longer price control period (though striking the right balance between incentive strength, bill stability and forecast accuracy is a perennially open question), but instead that IPART explicitly consider the longer-term trajectory when defining the shorter-term revenue requirement.

There is some precedent for long-term planning in the water sector as seen by Water Resources Management Plans (WRMPs) in the UK. The English and Welsh water regulator, Ofwat, sets a price control over five-year periods. Alongside this, there is a statutory requirement that each water company publishes a WRMP every five years.[10] These plans require each company to outline their approach towards the long-term management of water resources over the next 25 years. While the focus is primarily on ensuring that there will be an adequate supply of water to meet forecasted demand, this requires a plan for future investment to ensure demand will be met. Therefore, an important, and an explicitly required component, of the plan is the consideration of the impact it will have on customer bills.[11] Ofwat decides the extent to which and the conditions under which these additional investment costs can be recovered from charges to customers.

This shows that a two-track planning approach can be used to retain the benefits of current price control periods while ensuring there is also a long-term outlook on water resources, future investment needs and customer bills.

A longer-term planning approach would also be consistent with how Sydney Water would operate as a private company funded by private shareholders. In meeting its responsibilities to its shareholders, a privately held company would need to carry out longer-term planning to ensure that it can remain profitable over a longer period of time. In the case of a network infrastructure company like Sydney Water, a long-term plan is essential to ensure that capex investments are optimised over a longer time horizon than just four years. In looking at just a four-year period, as IPART does presently in the PAYG system, a company may make decisions that minimise costs and maximise profits over just that short horizon but which are detrimental to cost minimisation and system functioning over the longer term.

By focusing only on the short term while ignoring longer term investment requirements, the existing approach does not allow Sydney Water to operate as a privately-held company in a competitive landscape would, to the detriment of consumers.

10 https://www.ofwat.gov.uk/regulated-companies/resilience-in-the-round/water-resource-planning/

11 https://www.gov.uk/government/publications/water-resources-planning-guideline/water-resources-planning-guideline

4. Potential Solutions to Expected Increase in Customer Bills

If a longer-term planning approach is adopted, then additional capex needs or increases in the WACC are more likely to be anticipated. It also allows for actions to be taken, assuming that bill stability is valued, to ease the transition towards higher bills. These solutions include: accelerating asset depreciation, funding large capex through an annuity or using an escrow account. In this chapter, we use an illustrative financial model to explain how these approaches can help to smooth bills in the face of expected increases in bills.

4.1. Description of Illustrative Approach

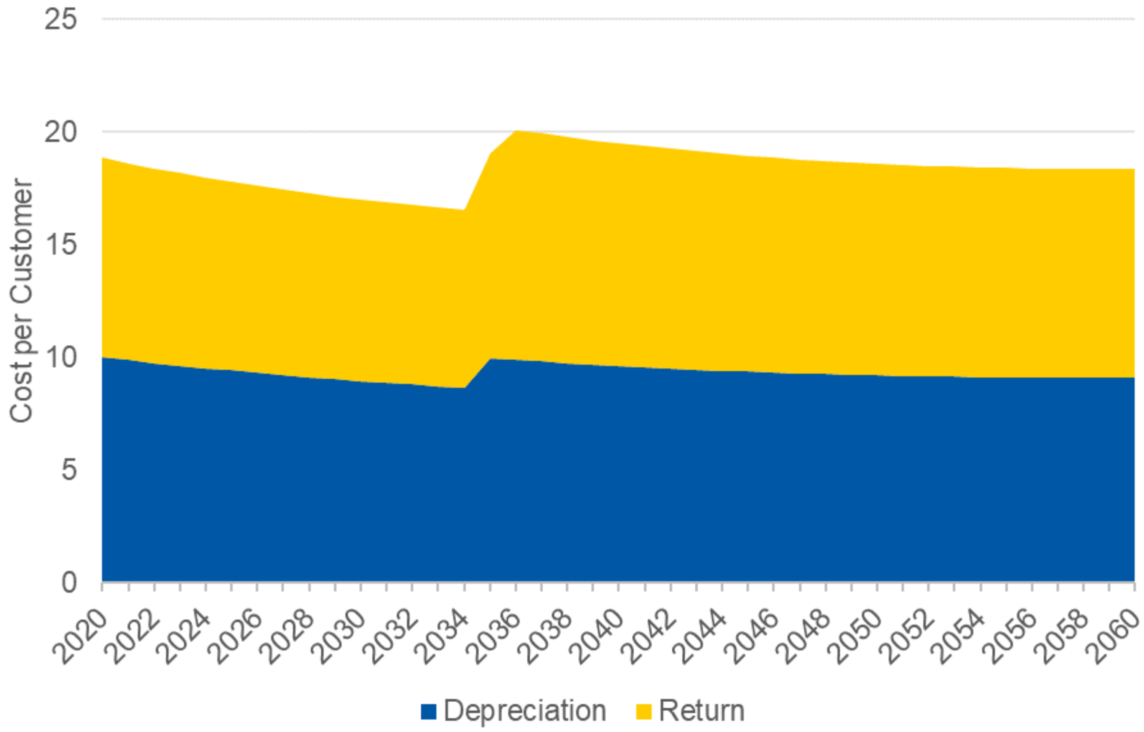
We have developed a simplified financial model using the building blocks approach. We assume that asset lives are 60 years to reflect Sydney Water's true asset lives. From 1960 to 2020, an asset base is built up with yearly additions of $10 (not to scale). We assume, starting from 1 in 2020, a customer growth rate of 1.3 per cent, reflecting Sydney's projected population growth, and an additions growth rate of 2 per cent to reflect the growing costs of the network. Throughout we consider bills on a per customer basis.

On top of the baseline assumptions shown above, we illustrate three potential increases to Sydney Water's revenue requirement:

- A large increase in capex (Capex Increase scenario);
- An increase in the WACC (WACC Increase scenario);
- Both of the above together (Combined Capex and WACC Increase scenario).

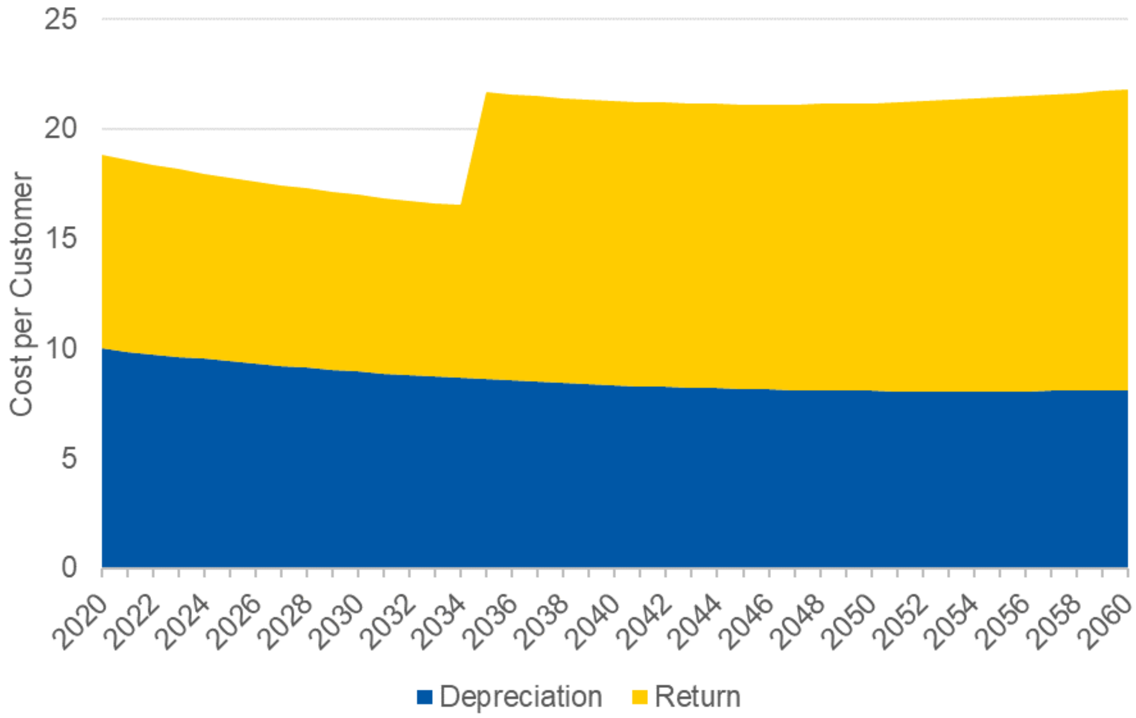
In the first scenario, we assume that a large new addition of $100, reflecting a large capital investment project such as a desalination plant, arrives in 2035. We also assume a constant WACC of 3 per cent to isolate the impact of the addition. As shown in Figure 4.1, this leads to a sharp rise in bills driven by the increase in return and depreciation payments. The impact on depreciation payments is relatively small as this is spread across the entirety of the asset's 60-year life. For the return payments, the impact is more significant as the large addition causes the RAB to stay high for a long period of time.

Figure 4.1: Capex Increase



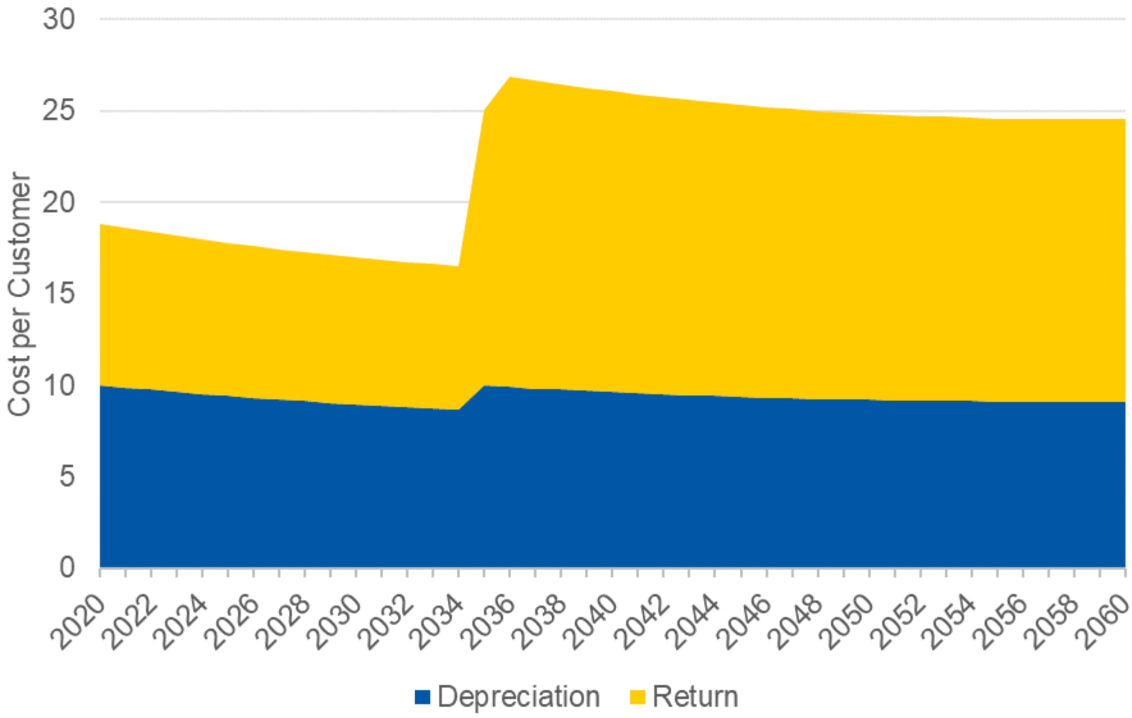
In the second scenario, we instead assume there is an increase in the WACC from an initial 3 per cent to 5 per cent in 2035 rather than a new large addition. As shown by Figure 4.2, this leads to a spike in bills due to the increase in the return payments.

Figure 4.2: WACC Increase



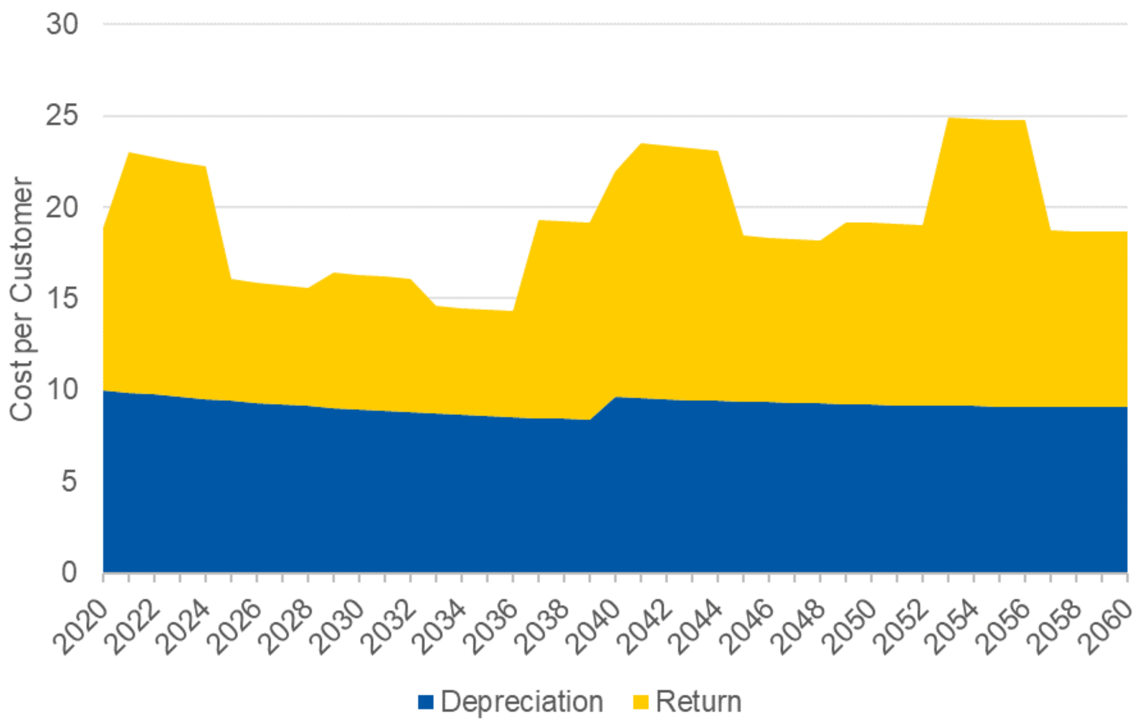
In the final scenario, we assume the arrival of both a new large addition of $100 and an increase of the WACC from 3 per cent to 5 per cent in 2035. As shown by Figure 4.3, the two have compounding effects and significantly increase the size of bills. This is primarily driven by the large return payments generated by the increase in the RAB and the increase in the WACC.

Figure 4.3: Capex Increase and WACC Increase



Due to the 60-year length of asset lives, bills are much more sensitive to WACC fluctuations than they are to fluctuations in capex. To demonstrate this, we allow the WACC to fluctuate randomly between 2 per cent and 5 per cent, fixed for four years at a time (in line with the current price control period length). As shown in Figure 4.4, fluctuations in the WACC has a significantly larger impact on bills than the arrival of the large addition in 2035.

Figure 4.4: WACC fluctuations



In all three of the scenarios that we have discussed above, we expect to see a large increase in customer bills in 2035. By introducing long-term planning into the regulatory system, Sydney Water can better anticipate and react to these developments. This allows Sydney Water and IPART to take the appropriate actions to help maintain bill stability for customers.

In the face of future large increases in Sydney Water's required revenues, we illustrate three different approaches that could be used to help maintain bill stability:

- Accelerated depreciation of existing assets;
- Annuity of the large new investment, paid in advance of commissioning;
- An escrow account, that consumers pay into but Sydney Water does not withdraw from until it is required.

Each of these approaches reduces the impact of the large new investment and/or the increase in the WACC in 2035 by bringing forward payments. This ensures that the required bill increases are more gradual. We also assess the implications of these approaches if there are errors in the forecasted timing of investment and/or WACC rises.

4.2. Accelerated Depreciation

4.2.1. Rationale and precedent for solution

The accelerated depreciation approach involves shortening the asset lives of new and/or existing assets prior to the arrival of the large investment or the increase in the WACC. This causes customers to pay higher depreciation payments today to decrease the size of the asset base. A smaller RAB once the large investment arrives or the WACC increases reduces the size of the increase in bills. This helps to smooth increases in customer bills.

There is regulatory precedent for shortening asset lives to avoid sharp changes in bills. Between 2000 and 2010, Ofgem, the British gas and electricity regulator, shortened the lives of new assets from 33 years to 20 years for electricity distribution and transmission network operators. This was done to avoid a 'cliff edge', whereby there would be a sharp fall in depreciation allowances in 2010 due to the way the lives of existing assets had been treated following the privatisation of the British electricity industry.[12] The change was NPV neutral and helped to ensure that customer bills followed a smooth path.

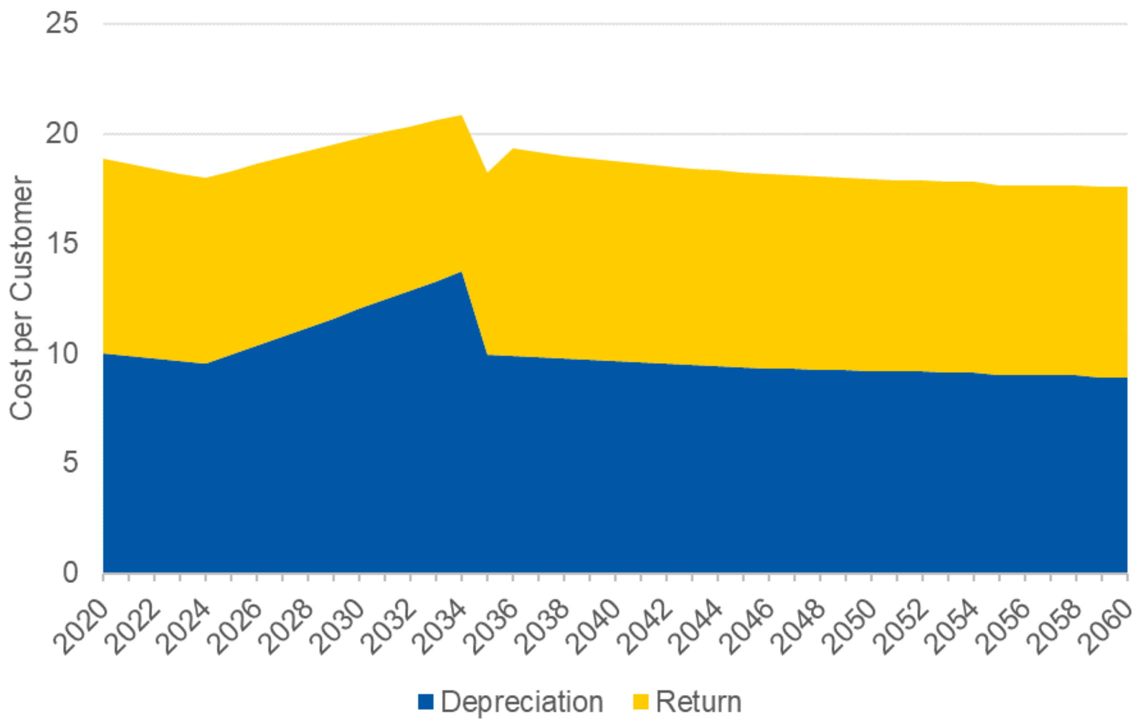
4.2.2. Illustration of approach

We assume that there is perfect foresight of an incoming increase in investment needs and/or the WACC in 2035. To smooth bills in anticipation of these changes, the asset lives of all new additions from 2025 until 2035 are reduced to 15 years. The lives of these assets are then elongated back to 60 years in 2035 by doubling their remaining asset lives to ease payments. This increases bills in the short term due to larger depreciation payments and reduces the size of the RAB. This means that once the change comes into effect return payments are lower due to the smaller RAB.

In the Capex Increase scenario, as shown by Figure 4.5, the reduction in asset lives from 2025 onwards leads to rising bills through increased depreciation payments. In 2035, the elongation of asset lives reduces depreciation payments and the new addition increases the size of the RAB, leading to larger return payments. The accelerated depreciation helps to reduce the size of the RAB to lower return payments in 2035. This helps to ensure the increase in bills is more gradual.

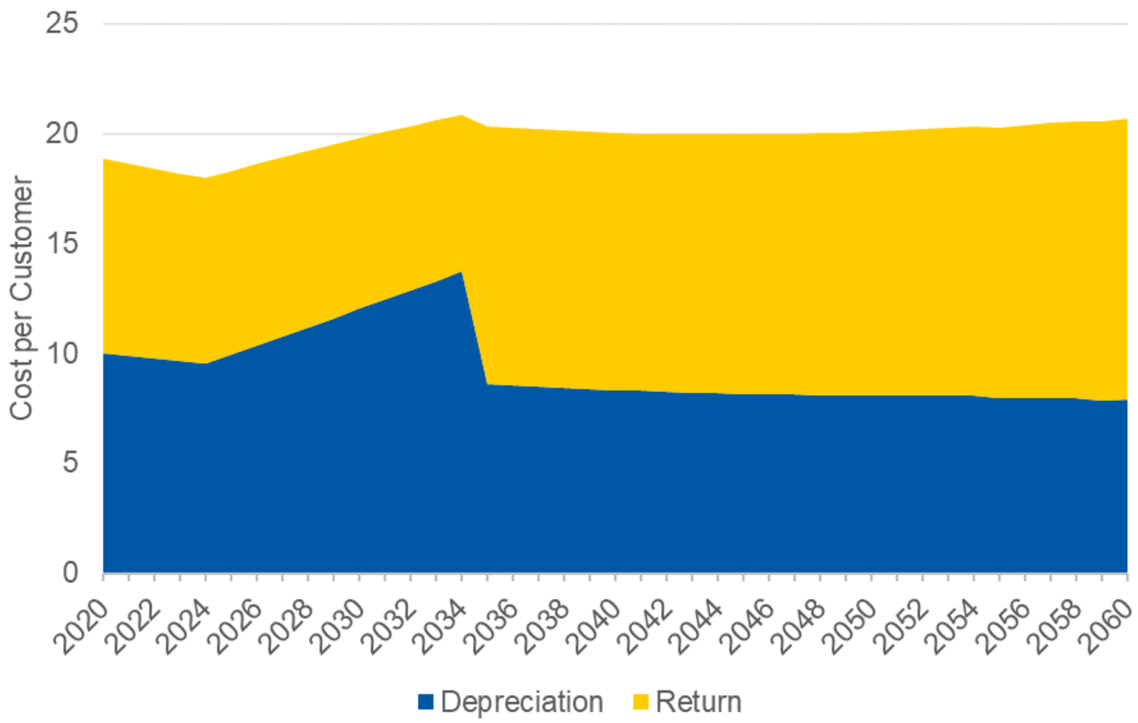
[12] https://www.ofgem.gov.uk/publications/distribution-price-control-review-final-proposals-0

Figure 4.5: Capex Increase



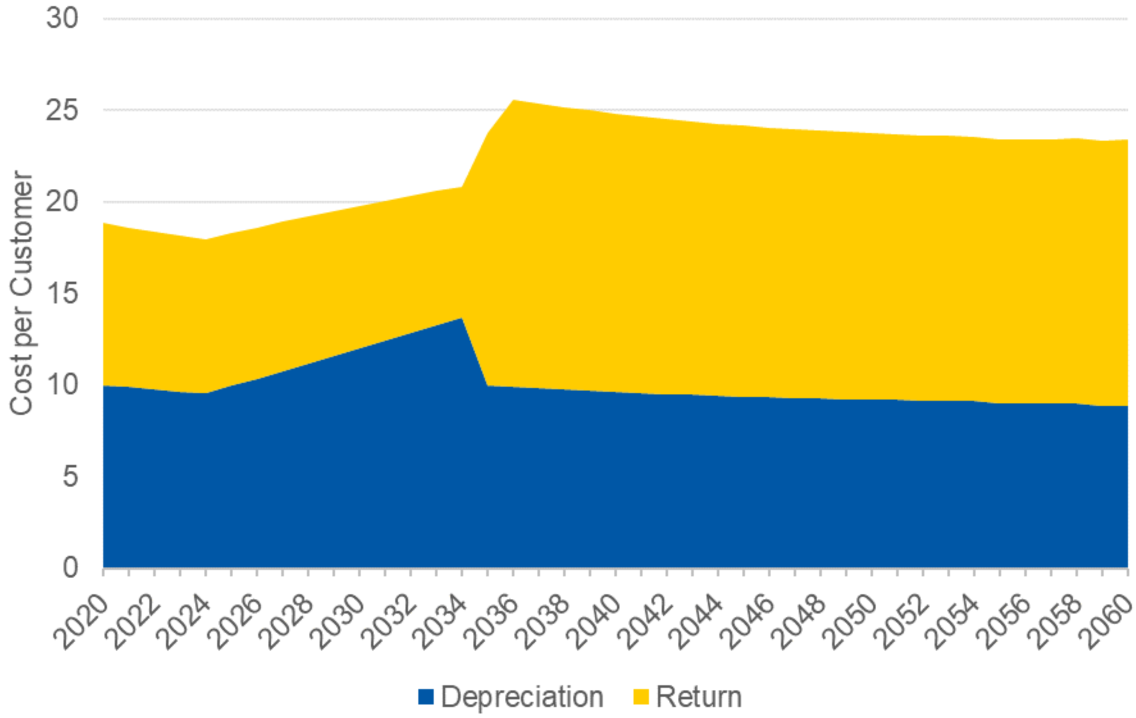
In the WACC Increase scenario, as shown in Figure 4.6, the same bill smoothing can be achieved using accelerated depreciation. Bringing forward depreciation to 2025-35 reduces the size of the RAB, meaning that the spike in bills is lower when the WACC increases to 5 per cent.

Figure 4.6: WACC Increase



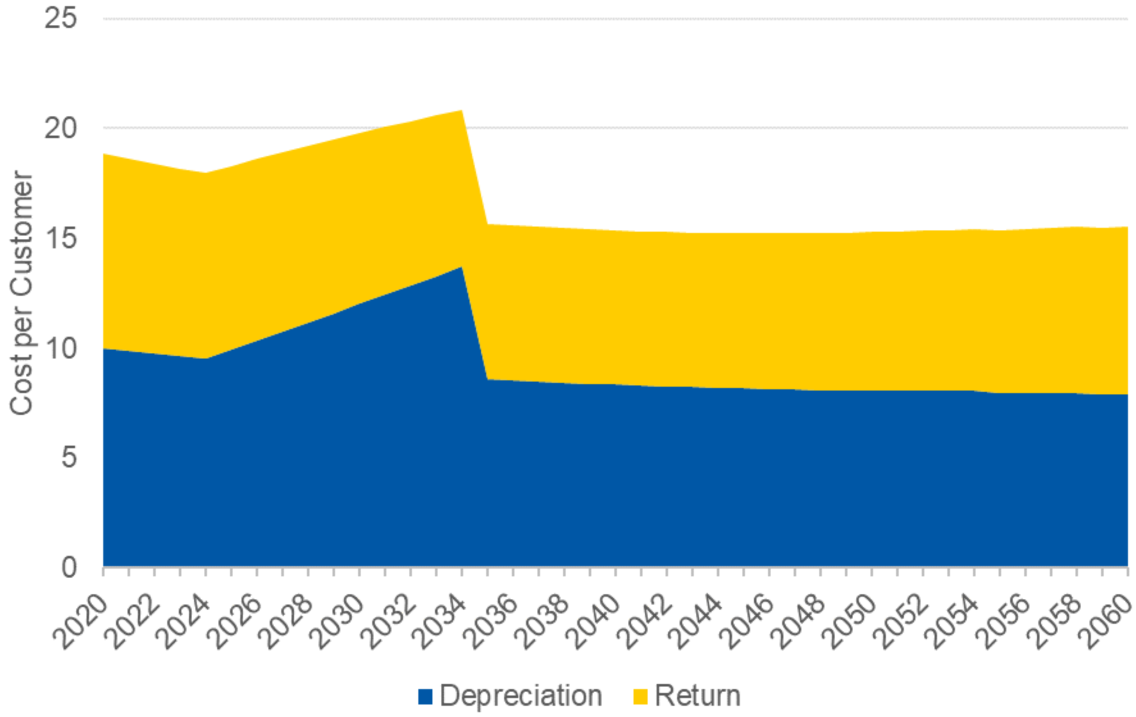
In the Combined Capex and WACC Increase scenario, as shown in Figure 4.7, accelerated depreciation brings forward depreciation so that bill increases are more gradual. While in this case there is still a large rise in bills in 2035, the sharpness of this rise is reduced. More aggressive acceleration of depreciation could be used to further smooth bills if this dual shock was known to be arriving.

Figure 4.7: Capex Increase and WACC Increase



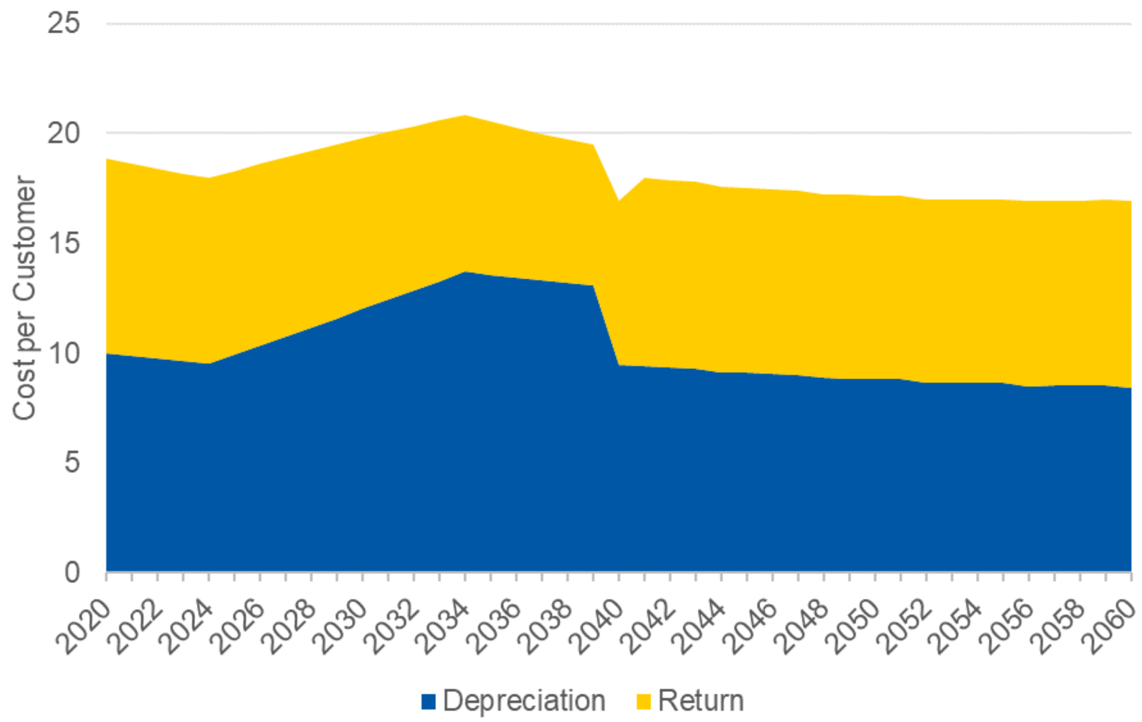
Next, we consider the implications of this approach if our forecasts do not materialise. In the case of the WACC increase, as shown in Figure 4.8, bills will fall below their steady state levels after 2035 when assets lives are elongated. This does not achieve the intended goal of bill smoothing but there are no large increases in bills. Instead there is a gradual increase and then a large fall. For Sydney Water this arrangement would be NPV neutral. However, such a forecasting error does generate an issue of inter-generational equity as customers in 2025-35 pay higher bills, while customers from 2035 onwards benefit from the lower bills.

Figure 4.8: WACC does not Increase



As shown in Figure 4.9, if the WACC increase does not materialise and the large investment is delayed to 2040, then bill smoothing can still be ensured. This can be achieved via IPART prolonging the shorter lives on the depreciated assets until 2040, while no longer shortening the lives of newly built assets. This would be possible as IPART would be able to update their view in light of new information about the delay to the project in 2035. If IPART instead took no action, then bills would fall in 2035 and then rise in 2040, generating bill instability.

Figure 4.9: Investment Delayed to 2040 and WACC does not Increase



4.2.3. Assessment of approach

There is already strong regulatory precedent for changing asset lives. As noted above, Ofgem shortened asset lives in the face of a large fall in depreciation allowances to maintain a smoother bill path.

This approach fits within the framework of the Building Blocks method and aligns with the objective of cost reflectivity as it just involves adjusting asset lives so remains NPV neutral. Customers are only asked to pay for assets that they are currently using, albeit at a faster rate, so the current PAYG system is also retained. As noted above, this approach allows for flexibility to forecasting error as the downsides from forecast errors or delays are relatively minor and asset lives can be continually tweaked in response to new information.

The approach, in a sense, represents an intergenerational transfer from today's billpayers (who enjoy the benefits of a low WACC and an adequately large system), to future billpayers (who may face a higher WACC or have to pay for a new large asset), by bringing forward depreciation payments. In the Capex Increase scenario, this intergenerational transfer may be a concern to IPART, as future customers will benefit from the investment while current customers will not. As described in Chapter 2, the level of return paid by customers in a given period is effectively an arbitrary outcome of financing conditions that is not driven by, nor does it affect, the way they utilise the network. Any adjustment to depreciation profiles which offsets a change in WACC from a customer's perspective is therefore not an intergenerational transfer when looking at the revenue requirement as a whole.

While any desired path of bill smoothing is theoretically possible using this approach, this may lead to a complex and unintuitive rules regarding the setting of asset lives. If simpler rules are used, as we have used in our illustrative approach, then the possible paths of bill smoothing are more limited.

4.3. Annuity of Large New Investment

4.3.1. Rationale and precedent for solution

The annuity approach involves spreading the costs of the new asset over more years than its asset life. This involves pre-paying for the asset prior to its commissioning, which helps to minimise the rise in customer bills. This is only applicable to a large new investment, not a predicted increase in the WACC, as it needs to be tied to an actual asset.

There is already regulatory precedent for using annuities to fund capex in Australia. In Queensland, the QCA uses an annuity approach to recover expenditure on the renewal of existing assets for Queensland's bulk water supplier, SunWater.[13] On a national level, the annuity approach was used to recover renewal expenditure for the Murray Darling basin. As noted by the ACCC, both annuity and RAB approaches can deliver the same NPV of a revenue stream, the difference being the time profile of the revenue stream. In particular, the ACCC suggests that the annuity approach is more desirable if smooth revenue path is desired.[14]

4.3.2. Illustration of approach

We assume that there is perfect foresight of an incoming large investment in 2035. As the annuity needs to be tied to an asset, it is not an appropriate tool for smoothing bills in preparation for an increasing WACC. To smooth bills in anticipation of a large investment, we assume that the investment is paid for via an annuity, which spreads the cost of the project across additional years. We assume that annuity begins to be paid in 2025, 10 years before the asset is commissioned, and ends in 2094, to coincide with the end of the large asset's life. We also assume that the total annuity payment is spread equally across all customers. This means that as customer numbers are rising, the per customer annuity payment falls over time.

In the Capex Increase scenario, as shown in Figure 4.10, the annuity separates the large investment from the rest of the asset base. This leads to a step increase in bills in 2025, when the annuity begins to be paid, but this increase is smaller than the status quo scenario. This helps to spread the impact of the large investment on bills across a greater number of years, leading to a smoother bill path.

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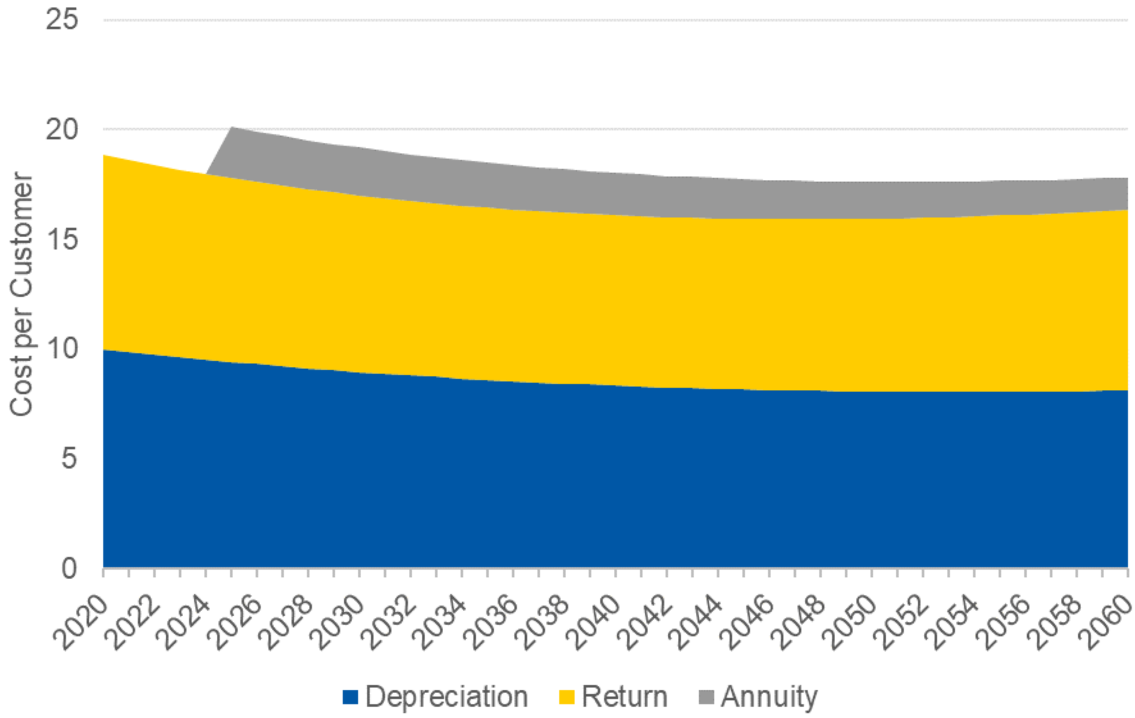
13 QCA (Jan 2020), Rural irrigation price review 2020–24 Part B: SunWater, Final Report

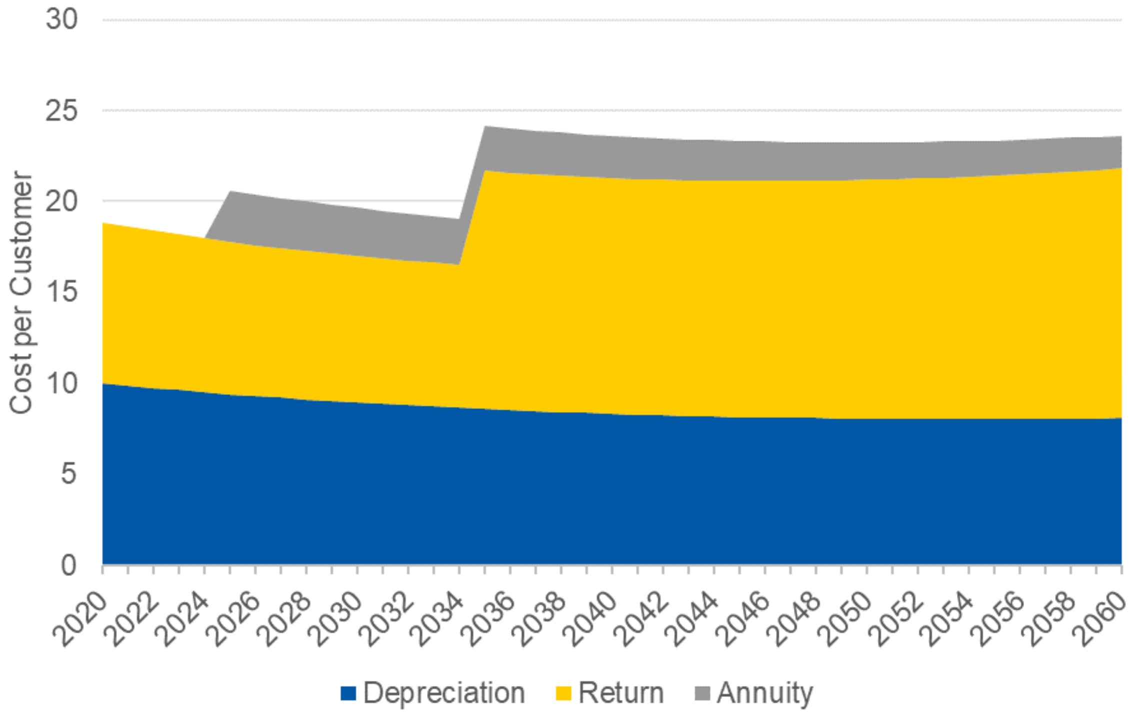
14 ACCC (May 2008) Issues Paper: Water charge rules for charges payable to irrigation infrastructure operators, Appendix D: Capital financing approaches

Figure 4.10: Capex Increase



In the Combined Capex and WACC Increase scenario, as shown in Figure 4.11, the annuity smooths the impact of the large investment on bills. As the annuity is tied to the investment, it does not reduce the impact of the WACC increase on the rest of the asset base so there is still a spike in bills in 2035. However, this spike is smaller than it would otherwise be.

Figure 4.11: Capex Increase and WACC Increase



4.3.3. Assessment of approach

There is already regulatory precedent for using annuities to pay for large investments in Australia, as noted above.

This approach ties payment to the specific asset that is being commissioned and has a transparent and intuitive implementation by dividing the total cost (in NPV terms) across a certain number of years.

Customers pay in advance of the large investment, so it does not align with the PAYG principle. However, as discussed in Chapter 2, this does not extensively differ from the system currently in place. Sydney Water is able to add capex to the RAB as it is spent rather than as assets are brough into service. In either case, the customer is contributing towards the asset when they are not able to use the asset. This does, however, raise concerns about intergenerational equity as customers today will contribute towards an asset that they are not using.

If the asset is commissioned on time, this approach would be NPV neutral. However, if commissioning is delayed, then annuity payments would need to be recalculated as they would no longer be NPV neutral. While this would be possible, it does break with the key idea of the annuity approach. As Sydney Water could earn revenue for an investment prior to it being made, this presents a challenge if the asset is not commissioned at all. This revenue would need to be returned to customers, but this would be difficult to do as the revenue would not have been kept separated from Sydney Water's other revenue streams. This means this approach is less flexible than others to forecasting errors.

4.4. Escrow Account

4.4.1. Rationale and precedent for solution

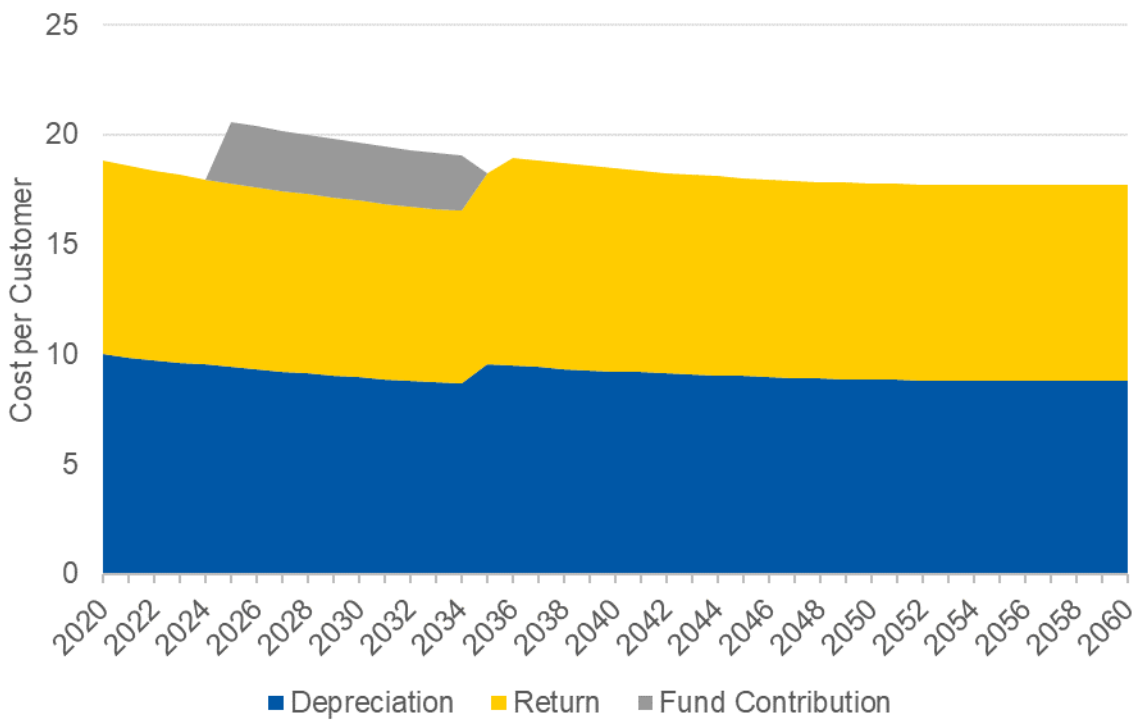
The escrow account approach involves the use of an escrow fund which customers pre-pay into prior to a large investment or increase in the WACC. Sydney Water does not have access to this fund until the rise in investment or the WACC. Once this occurs, Sydney Water could withdraw the funds to pay down the RAB. This lowers bills following the investment/WACC increase so helps to smooth bills.

4.4.2. Illustration of approach

We assume that from 2025 to 2035, customers contribute $3 into a fund. This $3 is shared across all customers, so the fund contribution per customer falls over time due to customer growth. We assume that the fund earns a return equal to the WACC each year. In 2035, when the change arrives, the fund is used to pay down the cost of the new addition/pay down the RAB.

In the Capex Increase scenario, as shown in Figure 4.12, the fund reduces the size resulting from the addition of the large investment as the fund is used to pay down the initial costs. This allows for a smoother bill path and lowers the size of the spike in bills. This leads to a small spike in bills in 2025, but it would instead be possible to gradually build up yearly fund contributions to avoid this if desired.

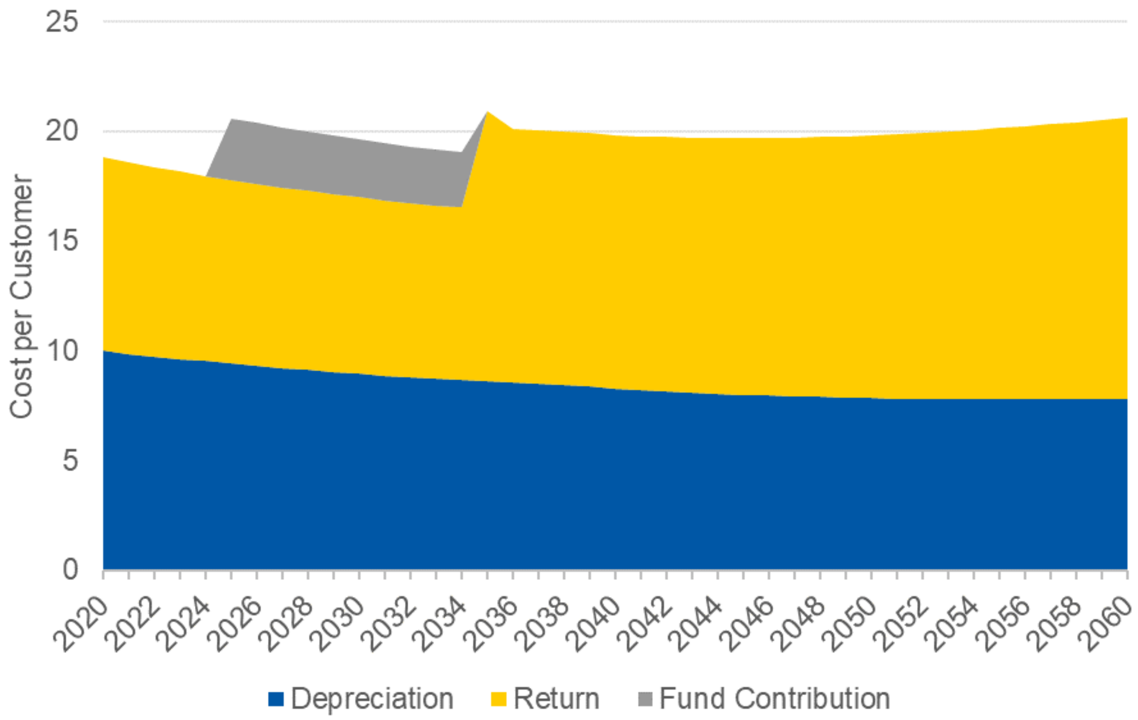
Figure 4.12: Capex Increase



In the WACC Increase scenario, as shown in Figure 4.13, the fund reduces the spike in bills in 2035. As there is no asset to pay down, we assume that the fund is used to pay down the RAB in 2035. This reduces the rise in return component of bills from the increase in the

WACC as the asset base is smaller. This reduction in the RAB is spread across the 55 newest assets, weighted by each asset's relative share of these 55 assets' remaining value. This results in a smoother bills path with smaller step changes than in the status quo.

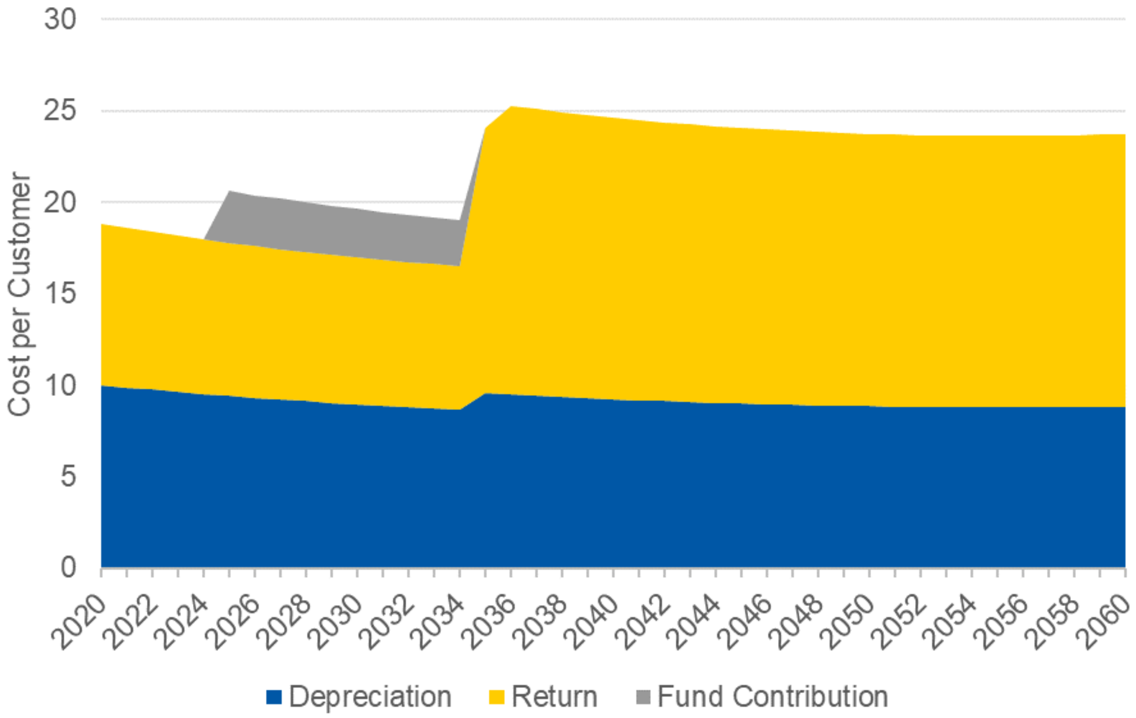
Figure 4.13: WACC Increase



Source: NERA Analysis

In the Combined Capex and WACC Increase scenario, as shown in Figure 4.14, the fund is used to paydown the initial cost of the large investment in 2035. This both reduces the size of the depreciation payments and reduces the size of the increase in the RAB. This means return payments do not increase by as much when the WACC rises to 5 per cent. This still generates a large spike in bills in 2035. However, the spike is smaller than in the status quo and more aggressive fund contributions could be used prior to the incoming change to reduce the size of this spike.

Figure 4.14: Capex Increase and WACC Increase



4.4.3. Assessment of approach

The path of bills is flexible and easy to control using this approach by changing the dynamics of the fund contribution. For instance, while we have assumed a flat contribution rate, this could easily gradually increase over time to achieve the desired path of bill smoothing. This provides a simpler way to adjust the path of bills compared to other approaches such as accelerated depreciation as the yearly fund contribution is easy to adjust.

Compared to the annuity approach, this approach may be preferable as Sydney Water does not earn any revenue until the large investment/WACC increase occurs. However, the approach no longer retains the current PAYG principle as it requires payments to occur prior to the changes occurring.

This approach is flexible to forecast errors. If the large project/WACC increase is delayed, then the fund can be held until it is needed, with the flexibility that contributions can be continued or not. If the fund is never needed, then it could be paid back out to customers. This would be an intergenerational transfer between current and future customers.

In general, this approach may also raise some concerns about intergenerational equality as it requires current customers to contribute towards a scheme that will lower bills for future customers.

There would also be a substantial regulatory oversight requirement for this fund to ensure that it earns a reasonable return (in line with Sydney Water's WACC), and that neither Sydney Water nor other parties such as the NSW government can access the funds before they are needed.

5. Conclusions and Recommendations

Based on IPART's stated preference for smoothing customer bills *within* a period, it should by extension seek to smooth customer bills *between* periods. For the most part, differences in bills between consumers today versus consumers in the future do not reflect differences in their behaviour, nor do they incentivise efficient behaviour. Instead, they reflect the current state of financial markets, as well as legacy planning decisions dating back to the 1960s. We therefore conclude that intergenerational transfers (i.e. today's customers paying more and future customers paying less) are no less arbitrary than the current state of the building blocks approach, and should be examined as a way of maintaining bill stability over a longer period of time.

By explicitly recognising a longer-term planning approach alongside the shorter-term planning which informs the four-year price control period, IPART can explicitly evaluate the likelihood of an increase in capex and financing costs in the coming decades. If IPART concludes that bills are indeed likely to increase, it could account for this expectation within the parameters of the building blocks method.

We have presented three ways that IPART could adjust bill profiles that are NPV neutral, while maintaining a more stable bill profile:

- Accelerated depreciation of existing assets. This approach fits neatly within existing price control parameters, but does not relate specifically to any expected need for new capex;
- Annuity of large new investments, paid in advance of commissioning. This approach ties customer bills to a specific increase in the capex requirement, but requires customers to pay for an asset they do not yet use. It may also be a riskier option if the need and timing of new capex is less certain;
- An escrow account, that consumers pay into but Sydney Water does not withdraw from until it is required. This approach is very flexible, as customers could be required to contribute any amount into the fund, and it could be held in escrow until it is needed. However, significant new regulations and institutions may be required to ensure that the account is secure.

The three approaches above differ in how they are applied and in the complexity required to do so. However, all three achieve the principle objective of reducing the shock in bills for future customers when Sydney Water's capex requirements come to fruition and if the WACC increases above its current low level.

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